

ZFORCE

950Sport

1000Sport

CF1000US
CF1000US-A
CF1000UTR-B

Edition Number: 20191228

Edition Item: CF1000US CF1000US-A CF1000UTR-B
(5BY#-00WX02-6000) SM-20191228

FOREWORD INDEX

This manual outlines CF1000US, CF1000US-A, CF1000UTR-B maintenance information, removal & installation procedures, inspection & adjustment methods, troubleshooting and technical specifications in detail. There are illustrations to guide your operations.

Please read this manual carefully and maintain the vehicle according to the intervals indicated, which can effectively prolong parts service life, improve the engine performance and the reliability of the vehicle.

Chapters 1, 2 and 3 outline safety information, general information and maintenance information.

Chapters 4 to 12 outline parts removal, inspection, repair and installation procedures of each system, and points for attention.

Appendix: Start circuit diagram, EFI schematic diagram and Electrical schematic diagram.

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.

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This manual is applicable to the following vehicle(s):
CF1000US/CF1000US-A/CF1000UTR-B

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1.1 Service Manual

Before maintenance, please read this service manual carefully. This manual introduces maintenance information, removal & installation procedures, checking & adjustment methods, troubleshooting and technical specifications with detailed images and diagrams to guide maintenance technicians. It will help improve the efficiency of vehicle repair and maintenance.

1.2 Safety Tips

Follow the safety tips in this service manual.

Safety tips is highlighted in text.

⚠ CAUTION: There are labels or warning labels on the visible places of vehicle. Do not remove any label, or people may not be able to identify the danger, which could result in injury.

1.3 Hazardous Level and Symbol

Danger/Warning/Caution

Please read the following explanations carefully of “Danger/ Warning/Caution”:

⚠ DANGER: The Danger alert and icon indicates a potential hazard that may cause serious injuries or death.

⚠ WARNING: The Warning alert and icon indicates a potential hazard that may cause light or medium injury.

⚠ CAUTION: The Caution alert and icon indicates a potential hazard that requires you to pay attention.

NOTE or NOTICE: A note or notice alerts to important information or instructions.

Danger, Warning, Caution and Note instructions can not include all the risks during use or maintenance of the vehicle. Therefore, besides the notices on the vehicle, technicians should have basic mechanical and safety knowledge, or ask a senior mechanic for help.

1.4 Operation Notice

For some procedures, special tools are required. These tools can be purchased according to the part number displayed in this service manual.

During installation, certain parts such as seals, o-rings, cotter pins, circlips, etc. cannot be reused and must be replaced with a new. Follow the instructions when applying threadlocker to screws.

For those parts that will be reused after removal, clean them up and inspect for damages or cracks. Replace it if damaged.

Ensure vehicle safety after repair or maintenance.

1.5 General Precaution

1.5.1 Avoid Carbon Monoxide Poisoning

⚠ CAUTION: Exhausted gas is poisonous. Do not run the engine in a closed or poorly ventilated area for a long time.

1.5.2 Avoid Corrosion Injury by Electrolyte

⚠ CAUTION:

1. Battery electrolyte (dilute sulfuric acid) is highly caustic and can result in burns. If you spill electrolyte on skin, flush with water and seek for medical attention immediately.
2. If you spill electrolyte on clothes, flush with water to avoid burns.
3. Keep battery and electrolyte out of reach of children.

1.5.3 Avoid Injury

⚠ CAUTION: Wear suitable work clothes, cap, boots, glasses, dust-proof mask, and gloves if necessary.

1.5.4 Avoid Burns

⚠ CAUTION: Engine and muffler temperatures are still high when the engine is just stopped for a very short time. Avoid getting burned. Do not touch the engine before it completely cools down.

1.5.5 Avoid Toxic Coolant

⚠ CAUTION:

1. Coolant is poisonous. Do not drink or spill it on skin, eyes or clothes. If you spill coolant on skin, wash with soap and water. If you spill coolant on eyes, flush with water and seek prompt medical attention.
2. If coolant is swallowed, induce vomiting and ask a doctor for medical care.
3. Keep coolant out of reach of children, and keep it away from pets.

1.5.6 Avoid Explosions and Fire

⚠ CAUTION:

1. Gasoline is highly flammable. Keep gasoline away from sparks. Vaporized gasoline is also explosive. Fuel and operate vehicle in a well ventilated area.
2. The battery produces flammable and explosive hydrogen when it is charged. It has the potential danger of explosion if there is a fire or sparks. Charge the battery in a well-ventilated area.

1.5.7 Operational Safety

⚠ CAUTION:

1. Be careful not to get pinched by turning parts such as wheels, axles, and clutches.
2. When more than two persons are working on the vehicle, remind each other of operational safety.

1.6 Cautions for Removal and Installation

CAUTION:

1. Use only genuine CFMOTO parts, lubricants and service products.
2. Store removed components separately in order for correct installation.
3. Clean the vehicle of mud, dust and debris before servicing.
4. Replace removed seals, o-rings, piston pin retainers, cotter pins with new ones.
5. Elastic retainers might get distorted after disassembly. Do not use loosened retainers.
6. Clean and blow off components after removal. Apply lubricants on the surface of moving parts before installation.
7. If you do not know the length of screws, install the screws one by one and make sure they screw in the same depth.
8. Pre-tighten installed bolts, nuts and screws, then torque them to specified specification. The basic sequence is: from big to small, from inside to outside and criss-cross.
9. Replace aged rubber parts when assembling. Do not splash gasoline, grease onto the surface, as this could cause damage.
10. Apply or inject recommended lubricant into the specified lubrication points.
11. Use the correct special tools for removal and installation.
12. When a ball bearing is removed by pressing steel balls, it cannot be reused.
 - Replace bearings if the axial or radial free play is too big.
 - If the running surface feels uneven, clean with oil and check again. Replace it if the cleaning does not work.
 - When pressing the bearing into the machine or onto the shaft, if the bearing can not be securely seated, replace it.
13. Install one-side dust-proof bearings in the correct direction. When assembling open-type or double-side dust-proof bearings, install with the manufacturer's mark outward.
14. Install elastic circlips properly. Turn the circlip after assembling to make sure it has been installed into the slot.
15. After assembling, check that all the tightened parts are properly tightened and can move smoothly.
16. Brake fluid and coolant may damage painting, plastic and rubber parts. Flush with water if splashed on these parts.
17. Install oil seals with the manufacturer's mark outward.
 - Do not fold or scratch the oil seal lip.
 - Apply grease to the oil seal lip before assembling.
18. When installing pipes, insert the pipe until it bottoms in the end of the joint. Fit the pipe clip, if any, into the groove. Replace pipes or hoses that cannot be tightened.
19. Do not allow mud or dust into the engine and/or the hydraulic brake system.
20. Clean old gasket and sealant off engine casings before assembling with new. Remove scratches on the joint faces by polishing evenly with a polish stone.
21. Do not twist or bend cables too much. Distorted or damaged cables may cause poor operation or even damage components.
22. When assembling parts with protection caps, insert the caps to the grooves.

1.7 Engine Break-in

There are many moving components inside the engine such as the piston, piston rings, cylinder, crankshaft, gears, etc. During the initial use period, proper run-in for every critical component is necessary. Break-in helps engine components match to each other and adjust to working conditions. A new engine with careful treatment will have more efficient performance and a longer service life.

Recommended break-in period: **20 hours or 320km (200 miles) whichever comes first.**

Operation guide:

0-10 hours or 0~160km (100 miles): Vary throttle position slowly and smoothly. Do not operate continuously at more than 50% open throttle position. Cool down the engine for 5~10 minutes after every hour of operation. Avoid prolonged heavy acceleration.

10-20 hours or 160~320km (100 miles): Vary throttle positions slowly and smoothly. Do not operate continuously at more than 75% open throttle position. Avoid prolonged heavy acceleration.

⚠ CAUTION:

1. Maintain and repair as required during the break-in period.
2. After break-in, check and maintain the vehicle before normal use.

1.8 Warranty

Maintenance procedures specified in the schedule should be carried out in CFMOTO authorized service stations. Otherwise, warranty and warranty rights may be affected.

1.9 Fuel, Engine Oil, Transmission Oil and Coolant

Fuel: Octane US: 89 or higher unleaded gasoline. EU: E10 or 95 (RON)

Engine oil: Use of any oil other than those recommended may cause serious engine damage. CFMOTO recommends the use of 10W-40 for 4-stroke engines. Changing engine oil viscosity to 5W-40 due to extreme cold environments or 15W-40 due to hot environments is acceptable. Reference the chart below for ambient temperature and viscosity choice.

API: SJ or above engine oil.

Transmission oil: 75W-90-GL5.

Coolant: Any commercially available 50/50 mix antifreeze with appropriate anti-corrosion and rust-proof properties. Freeze temperature must be lower than environment air temperature (Typically -5 °C or lower).

Oil Viscosity	15W-40							
F°	10W-40							
C°	5W-40							
	-22	-4	14	32	50	68	86	104
	-30	-20	-10	0	10	20	30	40

⚠ CAUTION: Improper handling of fuel or oil can cause pollution. Fuel or oil is not allowed to enter into groundwater, soil, or pipe systems.

⚠ CAUTION: CFMOTO recommends to use - 35°C mixed, anti-corrosion and high boiling coolant.

Please only use spare parts and accessories approved or recommended by CFMOTO.

If any loss is caused by using unapproved products, CFMOTO shall not be responsible.

For latest information about vehicle use, please visit CFMOTO official website:

<http://www.cfmoto.com>

1.10 Instructions and Captions

Certain instructions and pictures in this service manual require optional special tools. Parts may have been removed or not shown in certain pictures for better display and illustration. Depending on the repair required, not all instructions need to be followed, please note the text.

Numbers in the corner of the pictures in this service manual are only for CFMOTO internal use.

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02 Specifications/Vehicle Data

2.1 Unit Conversion Table and Symbols

Unit Conversion Table

Item	Unit conversion
Pressure	1kgf/cm ² =98.0665kPa
	1psi= 6.895kPa = 0.06895bar
	1mmHg=133.322Pa=0.133322kPa
Torque	1kgf·m=9.80665N·m
	1N·m= 8.85(lbf·in)
	1N·m= 0.7375621(lbf·ft)
Volume	1mL=1cm ³ =1cc
	1L=1000cm ³
Force	1kgf=9.80665N
Length	1in=25.4mm

Symbols

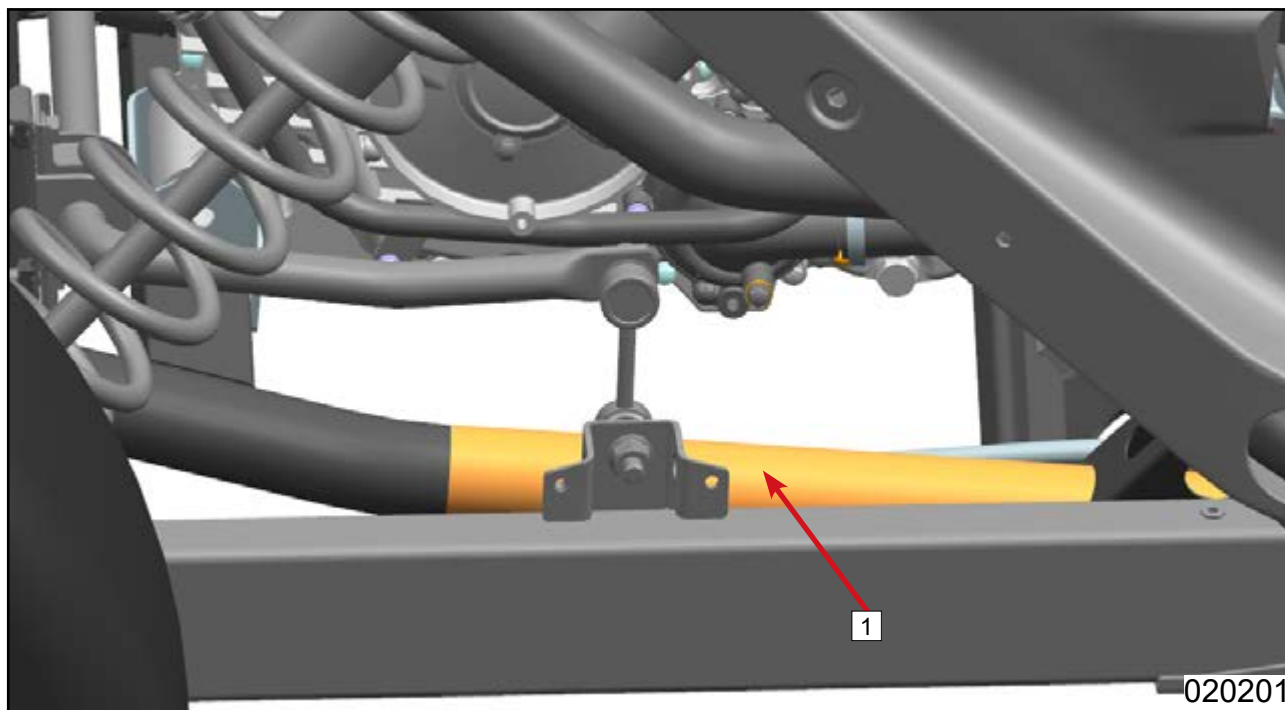
V	Voltage
A	Electric current
Ω	Resistance
VAC	Alternating current voltage
Vdc	Direct current voltage

2.2 Identification Number Locations

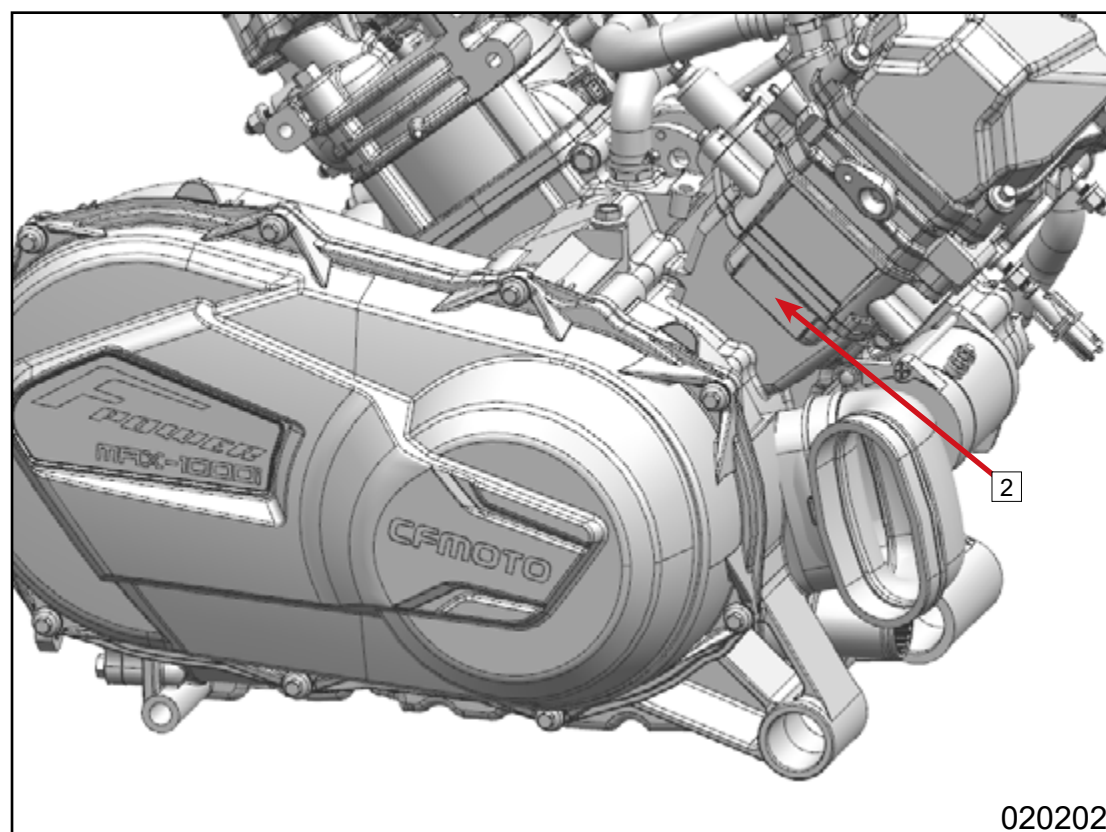
Model: CF1000US / CF1000US-A / CF1000UTR-B

1. Vehicle identification number (VIN): LCELV1Z1 / LCELV1ZG / LCELV1ZB

2. Engine identification number (EIN): 2V91Y ~



1 VIN Location



2 EIN - PTO

02 Specifications/Vehicle Data

2.3 Main Specifications

Vehicle	Specification		
Model	CF1000US	CF1000US-A	CF1000UTR-B
Size: length×width×height	3020×1650×1850	2990×1565×1820	3135×1820×1820
Wheelbase	2285mm		
Min. ground clearance	340mm	310mm	310mm
Dry weight	685kg	680kg	690kg
Passengers	2 person (includes driver)		
Rear cargo box maximum load	100kg		
Max. vehicle load allowed	290kg		
Recommended Towing Capacities: Towing Hitch Weight Trailer and Cargo Weight	40kg (bolt type) / 25kg (plug pin type) 400kg (bolt type) / 250kg (plug pin type)		
Frame type	Steel tube		

Engine		Specification
Model		2V91Y
Type		V-twin, liquid-cooled, 4-stroke, 8 valves, SOHC chain drive
Bore×Stroke		91mm×74mm
Displacement		962.6cc
Compression ratio		10.6:1
Min. no-load stabilized speed (idling)		1300r/min±130r/min
Physical size: Length×Width×Height		679mm×556mm×589mm
Net weight		79kg
Output style		Front and rear shaft
Engine output rotating direction		Clockwise (rear view)
Electrical system	Ignition method	ECU / Coil
	Spark plug	DCPR8E (NGK)
	Magneto	VAC 3-phase
	Starting method	Electric start
EFI system	ECU	Bosch
	Injectors	Bosch
	Idle speed	1300r/min ± 130r/min
Lubrication system	Lubrication method	Pressure + splash
	Oil pump	Rotor motor
	Filter style	Full flow cartridge filter
	Engine oil	SAE 10W-40 SJ SAE 5W-40 SJ SAE 15W-40 SJ or higher API
	Transmission oil	SAE 75W/90 GL-5
Cooling system	Cooling type	Closed-circuit coolant radiator
	Coolant	-35°C Anti-freeze mix
	Oil cooling	Integrated heat transfer cooler
Throttle	Valve diameter	57 mm
Air Filter		Paper cartridge filter

Engine		Specification	
Transmission	Type	CVT+Gearshift Transmission	
	Gears	2 forward, 1 reverse, 1 parking	
	Shift/Order	Manual/L-H-N-R-P	
	Clutch type	Dry CVT	
	CVT ratio range	2.88~0.70	
	Gear ratios	Final	1.333(20/15, Bevel gear)
		Secondary	1.952(41/21)
		Speed Gears L gear: 2.529(43/17); H gear: 1.143(32/28) R gear: 2.231(29/13)	
		Total ratio: L: 6.585; H: 2.975; R: 5.807	
	Axle ratios	Front axle	33/9
		Rear axle	33/9

Fuel System	Specification
Fuel type	US: 89 octane or higher unleaded gasoline EU167: E10/95 or higher unleaded gasoline EU168: E5/95 or higher unleaded gasoline
Fuel tank capacity	36.5L
Reserve fuel indicator	Indicator turns yellow and keeps on when the fuel is below 11.5L. Indicator flashes when the fuel reaches one grid.
Fuel pump	35L per hour at 0.33 Mpa ± 0.02 Mpa
Fuel filter	15-micron, inline type

Steering	Specification
Min. turning radius	5500mm
Turn angle	Inside 33.3°
	Outside 25.2°

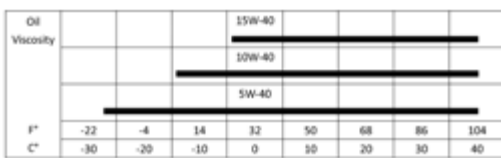
Brakes	Specification
Front	Dual Hydraulic Disc
Rear	Dual Hydraulic Disc
Parking	Integrated Hand Brake / Rear Discs Only

Suspension	Specification		
Type	CF1000US	CF1000US-A	CF1000UTR-B
	Front: Dual swing arm independent 340mm travel	Front: Dual swing arm independent 280mm travel	Front: Dual swing arm independent 280mm travel
	Rear: Dual swing arm independent 395mm travel	Rear: Dual swing arm independent 300mm travel	Rear: Dual swing arm independent 300mm travel
Shock absorber	Front: Oil / Gas - Pre-load Adjustable Rear: Oil / Gas - Pre-load Adjustable		
Standard spring pre-load setting	Front: 65mm Rear: 85mm	Front: 45mm Rear: 60mm	Front: 45mm Rear: 60mm

02 Specifications/Vehicle Data

Wheel/Tire	Specification		
	CF1000US	CF1000US-A	CF1000UTR-B
Front tire	29×9.00 R14	27×9.00 R14	27×9.00 R14
Rear tire	29×11.00 R14	27×11.00 R14	27×11.00 R14
Wheel bolt pattern	M12×1.25-6h	M12×1.25-6h	M12×1.25-6h
Wheel nut pattern	M12×1.25-6H	M12×1.25-6H	M12×1.25-6H

2.4 Specifications for Service

Lubrication														
Item	Standard													
Engine oil capacity	Replace oil and oil filter	2500mL (2.64 qt.)												
	Total capacity	2600mL (2.74 qt.)												
Recommended engine oil	<table><caption>Oil Viscosity Chart</caption><thead><tr><th>Oil Viscosity</th><th>15W-40</th><th>10W-40</th><th>5W-40</th></tr></thead><tbody><tr><td>F°</td><td>-22</td><td>-4</td><td>14</td></tr><tr><td>C°</td><td>-30</td><td>-20</td><td>-10</td></tr></tbody></table>	Oil Viscosity	15W-40	10W-40	5W-40	F°	-22	-4	14	C°	-30	-20	-10	SAE: Use of any oil other than those recommended may cause serious engine damage. CFMOTO recommends the use of 10W-40 for 4-stroke engines. Changing engine oil viscosity to 5W-40 due to extreme cold environments or 15W-40 due to hot environments is acceptable. Reference the chart below for ambient temperature and viscosity choice. API level: SJ or higher.
Oil Viscosity	15W-40	10W-40	5W-40											
F°	-22	-4	14											
C°	-30	-20	-10											
Oil pressure	Engine RPM 1300r/min and oil temperature 90°C: Oil pressure should be between 100kPa to 400kPa. Typical is 200kPa.													
	Engine RPM 6000r/min and oil temperature 90°C: Oil pressure should be between 350kPa to 700kPa. Typical is 580kPa.													
Transmission oil	Total capacity	600mL												
	Recommended oil	SAE 75W/90 GL-5												
Front gearcase oil	Total capacity	330 mL												
	Recommended oil	SAE 80W-90 GL-5												
Rear gearcase oil	Total capacity	400 mL												
	Recommended oil	SAE 80W-90 GL-5												

Cooling System		
Item		Standard
Thermostat	Open temperature	65°C ± 2°C
	Full open temperature	85°C
	Full open clearance	Equal to or greater than 5mm at 85°C
Radiator cap opening pressure		108 kPa (1.1kgf/cm ²)

Coolant temperature sensor temperature vs resistance	Coolant temperature (°C)	Resistance B terminal-Earth (Ω)	Resistance A-C terminals (kΩ)
	-20	--	28.528±0.004
	25	--	2.795±0.0025
	50	216~264	0.98±0.00227
	80	74.6~90.6	0.334±0.00204
	110	32~36	0.133±0.00252
Coolant capacity	System	Approximately 4.5L (4.8 qt.)	
	Reservoir	410mL (upper line)	
Coolant type		Commercially available, -35°C anti-freezing, anti-corrosive and high boiling point	
Mix ratio		50% coolant / 50% distilled water	

Wheel (Front and Rear)			
	Item	Standard	Service limit
Wheel jump	Axial	1.0mm	2.0mm
	Radial	1.0mm	2.0mm
Tire	Groove depth	--	3.0mm
	Front tire pressure	110kPa	--
	Rear tire pressure	120kPa	--

Brakes		
	Item	Standard
	Brake Fluid	DOT 4
	Brake pad wear value	--
	Brake disc thickness - Front	5.0mm
	Brake disc wear value - Front	1.0mm
	Brake pedal free play	60mm~70mm
	Brake disc thickness - Rear	5.0mm
	Brake disc wear value - Rear	1.0mm

Battery / Charging			
	Item	Standard	
Battery	Type	AGM	
	Capacity	12V 30Ah	
	Voltage	Fully charged	14.4V
		Discharged	≤11.8V
	Recharging current/time	Standard	2.7A/5h~10h
		Quick	12A/1h
A/C magneto	Magneto Type	Magneto 3-phase A/C generator	
	Output	3-phase A/C	
	Resistance of coils (20°C)	0.2Ω~0.3Ω	
	Max. output power	600W at 5000r/min	
	Charging voltage	13.5V~15.0V at 5000r/min	
	Regulator type	3-phase supply / 12Vdc power output	

02 Specifications/Vehicle Data

Ignition / EFI / Electrical		
Item		Standard
Ignition controller		Bosch ECU
Spark plug	Type	Resistance control
	Model	DCPR8E(NGK)
	Spark clearance	0.8mm~0.9mm
	Spark specification	>8mm, 1 kPa
Ignition coil resistance	Primary	740Ω~780mΩ
	Secondary	10.1kΩ~11.1 kΩ
Peak voltage	Ignition primary	≥1.5V, 200r/min
	Pulse starter	≥25kV
Start relay coil resistance		3Ω~5Ω
Start auxiliary coil resistance		90Ω~100Ω
Peak voltage of trigger coil	≥1.5V, 200r/min	
Resistance of trigger coil	250Ω~300Ω	

Fuses / Lights		
Item		Standard
Fuses	Main	40A
	Secondary	5A×1 10A×2 15A×4 40A×1
Lights	Headlight	30W (High-beam) 14.2W (Low-beam) 3.5W (position light) 23W (turn light)
	Brake light	4.5W
	Indicators	LCD+LED
	Rear license light	H2 W5W bulb

CVT / Transmission				
Item		Standard - mm		Limit Remark
Drive belt width		33.7(Fiber level)		32.2
Sliding sleeve diameter, driven pulley		38.10~38.14		38.30
Clearance between shifting fork and groove		0.20~0.40		0.50
Shifting fork moving thickness		5.80~5.90		5.70
H/L sliding fork groove width		6.10~6.20		6.30
Output main gear sliding groove width		6.10~6.20		6.30
Shifting drum groove width		8.02~8.12		
Shifting fork pin diameter		7.90~7.95		7.83
Shifting gear hole diameter		29.000~29.021		29.025
Reverse dual gear hole diameter		29.007~29.028		29.032
Shifting main shaft diameter	φ30	28.980~29.993		29.970
	φ17	16.983~16.994		16.978
Driven shaft diameter	φ24	23.980~23.993		23.974
	φ17	16.983~16.994		16.978
Drive bevel gear shaft diameter		φ17 16.983~16.994		16.978
Reverse dual gear shaft diameter		φ25 24.980~24.993		24.974

Valve / Camshaft / Rocker Arm / Cylinder Head				
Item	Standard - mm		Limit	Remark
Valve diameter	IN	33	--	
	EX	29	--	
Valve thickness	IN & EX	1	0.5	
Valve clearance (Cold engine)	IN	0.06~0.14	--	
	EX	0.11~0.19	--	
Valve guide diameter	IN & EX	5.000~5.012	5.045	
Valve stem outer diameter	IN	4.965~4.980	4.93	
	EX	4.955~4.970	4.93	
Valve guide and stem clearance	IN	0.020~0.047	--	
	EX	0.030~0.057	--	
Valve stem roundness (run out)	IN & EX	0.01	0.05	
Valve stem end run out	IN & EX	0.02	0.05	
Valve length	IN	90.1	--	
	EX	88.7	--	
Valve bevel side run out	IN & EX	0.03	0.05	
Valve sealing line width	IN	1.2±0.1	1.7	
	EX	1.3±0.1	1.8	
Valve spring free length	IN & EX	40	38.2	
Valve spring force	IN & EX	Compress to 33mm: 200.5 N~235.5 N Compress to 23mm: 531 N~587 N	--	
Cam lobe height - Cylinder 1	IN	32.931~33.051	32.831	
	EX	32.945~33.065	32.845	
Cam lobe height - Cylinder 2	IN	33.019~33.139	32.919	
	EX	32.853~32.973	32.753	
Camshaft journal diameter	φ35	34.959~34.975	34.95	
	φ22	21.959~21.980	21.95	
Camshaft bearing diameter	φ35	35.007~35.025	35.04	
	φ22	22.012~22.025	22.04	
Camshaft bearing fit clearance	φ35	0.032~0.066	0.09	
	φ22	0.032~0.066	0.09	
Camshaft axial clearance	0.12~0.28		--	
Camshaft run out			0.10	
Rocker arm inner hole diameter	IN & EX	12.000~12.018	12.03	
Rocker arm shaft diameter	IN & EX	11.973~11.984	11.96	
Rocker arm shaft fit clearance	IN & EX	0.016~0.045	0.07	
Rocker arm shaft axial clearance	IN & EX	0.06~0.34	--	
Cylinder head flatness	0.03		0.05	

02 Specifications/Vehicle Data

Cylinder / Piston / Piston Ring / Connecting Rod / Crankshaft				
Item	Standard - mm		Limit	Remark
Cylinder compression pressure	1000kPa		--	
Cylinder taper	0.038		0.090	
Cylinder roundness	0.015		0.020	
Cylinder hole clearance	90.99~91.01		--	
Piston diameter	90.94~90.96		90.85	Above 8mm from piston bottom
Piston and cylinder clearance	0.04~0.06		0.10	
Cylinder upside and bottom flatness	0.03		0.05	
Piston ring gap clearance	1st	0.15~0.30	1.35	
	2nd	0.15~0.30	1.35	
	Oil	0.2~0.7	1.5	
Piston ring thickness	1st	1.17~1.19	--	
	2nd	1.47~1.49	--	
	Oil	2.37~2.47	--	
Piston ring groove depth	1st	1.21~1.23	--	
	2nd	1.51~1.53	--	
	Oil	2.50~2.52	--	
Piston ring/groove thickness	1st	0.02~0.06	0.15	
	2nd	0.02~0.06	0.15	
	Oil	0.03~0.15	0.25	
Piston pin hole inner diameter	22.004~22.010		--	
Connecting rod small end inner diameter	22.01~22.02		22.06	
Piston pin hole inner diameter	21.995~22.000		21.980	
Piston pin hole/piston pin clearance	0.004~0.015		0.08	
Connecting rod small end hole/piston pin clearance	0.010~0.025		0.08	
Connecting rod big end axial clearance	0.3~0.56		0.8	
Connecting rod journal diameter	43.930~43.950		43.915	
Connecting rod big end bearing diameter	43.970~44.000		44.03	
Connecting rod big end radial clearance	0.028~0.049		0.09	
Crankshaft main journal diameter	41.960~41.970		41.935	
Crankcase main bearing hole diameter	41.980~42.020		42.10	
Crankshaft main journal radial clearance	0.02~0.05		0.09	
Crankshaft axial clearance	0.26~0.54		0.64	

Oil Pump		
Oil pump rotor	Clearance between inner and outer rotor	0.06mm~0.14mm
	Clearance between outer rotor and bore	0.09mm~0.15mm
	Rotor end clearance	0.023mm~0.109mm

2.5 Fastener Torque Tables

Torque Table - Vehicle Components

Fasteners excluded in below table should also be torqued to specification.

NOTE: Threads and contact area should be coated with oil.

No.	Item	Type	Qty	Torque(N•m)
1	Front mounting shaft, engine	7030-000401	1	60~70
2	Rear LH mounting bolt, engine	GB5789 M10×1.25×100	1	55~65
3	Rear RH mounting bolt, engine	GB5789 M10×1.25×130	1	55~65
4	Nut, exhaust pipe joint	8010-020001 M8	4	25~35
5	Upper mounting bolt, muffler body	GB5789 M10×1.25×70	1	40~50
6	Lower mounting bolt, muffler body	GB5789 M8×65	1	30~40
7	Mounting shaft, front lower swing arm	5BY0-050203	2	90~100
	Mounting shaft, front upper swing arm	5BY0-050103	2	90~100
8	Bolt, front shock absorber	GB5789 M10×1.25×50	2	45~55
		GB5789 M10×1.25×55	2	45~55
9	Slotted nut, upper&lower swing arm ball pin	GB9459 M12×1.25	4	50~60
10	Bolt, rear shock absorber	GB5789 M10×1.25×55	4	45~55
11	Mounting shaft, rear bearing carrier	GB5789 M10×1.25×80	4	45~55
12	Mounting shaft, rear swing arm	GB5789 M10×1.25×65	2	45~55
13	Bolt, rear swing arm tie-rod	GB5789 M12×1.25×70	2	90~100
14	Bolt, rear swing arm tie-rod	GB5789 M12×1.25×60	6	90~100
15	Rear tie rod Shaft	5BY0-060703	4	90~100
16	Mounting nut, rim	5HY0-070203(Aluminum)	16	110~120
17	Hex slotted nut	5HY0-110001	4	220~250
18	Mounting nut, front gear case	GB6187 M10×1.25	1	50~60
19	Mounting bolt, front gear case	GB5789M10×1.25×25	1	50~60
20	Mounting bolt, front gear case	GB5789M10×1.25×35	1	50~60
21	Mounting bolt, rear gear case	GB5789 M10×1.25×75	2	50~60
22	Mounting nut, rear gear case	GB6187 M10×1.25	2	60~70
23	Screw, front drive shaft	GB/T70.1 M10×1.25×25	8	40~50
24	Screw, rear drive shaft	GB/T70.1 M10×1.25×25	4	40~50
25	Bolt, front brake caliper	GB5789 M10×1.25×25	4	40~50
26	Bolt, rear brake caliper	GB5789 M10×1.25×35	4	40~50
27	Bolt, front brake disc	A000-080001	16	25~30
28	Lock nut, steering tie-rod&knuckle	GB/T 9459 M12×1.25	2	50~60

02 Specifications/Vehicle Data

No.	Item	Type	Qty	Torque(N•m)
29	Adjusting nut, steering tie-rod	GB6173 M14×1.5	2	50~60
30	Lock nut, steering wheel	GB6187 M12×1.25	1	50~60
31	Bolt, steering tie-rod&steering motor rack	M12×1.25	2	70~80
32	Lock nut, steering universal shaft	GB5783 M8×35	6	35~45
33	Bolt, EPS&mounting bracket	GB5789 M8×16	6	25~35
34	Mounting bolt, steering motor	GB5780 M8×90	2	25~35
35		GB5780 M8×80	1	25~35
36	Bolt, steering wheel mounting bracket	GB5789 M8×28	2	30~40
37	Mounting bolt, air spring	9060-102002	1	10~15
		9060-102003	1	10~15
38	Mounting bolt, rear bumper	GB5789 M8×16	4	30~40
39	Mounting bolt, cab	9010-300001 M10×1.25×30	16	40~50
40	Nut, muffler joint	8010-020001	4	25~35
41	Mounting bolt, winch bracket	GB5789 M8×16	4	35~45
42	Mounting bolt, winch motor	GB5789 M8×20	3	35~45
43	Mounting bolt, cable pulley	GB5789 M10×1.25×20	2	40~50
44	Mounting bolt, three-point seat belt	9030-341005	4	40~50
		9060-341006	4	40~50
45	Mounting bolt, five-point seat belt	9060-342012	8	40~50

Torque Table - Engine Components

Item	Qty	Type (mm)	Torque (N·m)	Remark
Bolt M14×1.5	4	M14×1.5	40	
Magnetic drain bolt M14×1.5	1	M14×1.5	25	
Screw plug	1	ZM14	20	Apply thread locker
Drain bolt M12×1.5	1	M12×1.5	20	
Flange bolt M8×12.5 (MAG side crankcase)	1	M8×12.5	20	
Restriction plug	1	R21/8	20	Apply thread locker
Screw R21/8 (Oil line in PTO side crankcase)	1	R21/8	20	Apply thread locker
Screw M4×10 (Crankshaft washer lock nut)	2	M4×1	3	Apply thread locker
Nut M6 (PTO side crankcase)	4	M6	10	
Bolt (MAG side cover)	2	M5×10	6	Apply thread locker
Bolt M12×1.25×35 (Magnetorotor)	1	M12×1.25	70	
Adjusting nut, valve clearance	8	M6	12	
Bolt, timing chain	2	M8	30	Apply thread locker
Bolt plug, tensioner	2	M6×5	5	
Bolt, cylinder	8	M10	20,60	2-step torque procedure
Pushing nut M8 (air exhaust port)	4	M8	13	
Spark Plug	2	M12×1.25	20	
Stud M8×42 (air exhaust port)	4	M8×42	25	Apply thread locker
Screw plug M12×1.5 (first cylinder head)	1	M12×1.5	20	
Self-tapping screw ST4.8×13 (Thermostat cover)	2	ST4.8×13	5	
Lock pin, tensioner	2	M6×16	10	Apply thread locker
Bolt M8×25, air inlet pipe	4	M8×25	20	
Bolt, connecting rod	4	M9×1	10, 20, 50	3-step torque procedure
Nut, drive pulley	1	M20×1.5	180	Left-hand thread
Bolt, drive pulley (CVT drive pulley)	1	M12×1.5	60	Left-hand thread
Nut, main drive shaft (CVT driven pulley)	1	M22×1.5	150	
Lock nut, bevel gear	1	M27×1.5	145	
Bolt M8×28 (Drive bevel bearing seat)	4	M8×28	30	
Screw M8×25 (Drive bevel bearing pressing plate)	4	M8×25	15	
Bearing retainer, front output shaft bearing retainer	1	M55×1.5	80	Apply thread locker

02 Specifications/Vehicle Data

Lock nut M65×1.5, bearing	1	M65×1.5	110	Apply thread locker
Bolt M8×28 (Driven bevel bearing seat)	4	M8×28	25	
Screw T25 (shift drum)	1	M5×8	6	
Spring seat, shifting limit	1	M12×1	20	
Bolt M5×16 (Oil pump)	3	M5×16	7	Apply thread locker
Screw M8×20 (Overriding clutch)	6	M8×20	30	Apply thread locker
Bolt M6×30 (No EPS Magneto stator)	3	M6×30	16	Optional: Apply thread locker
Bolt M6×35 (EPS magneto stator)	3	M6×35	16	Optional: Apply thread locker
Bolt kit, cylinder head cover	8	M6	7	
Bolt M6×45 (First cylinder thermostat cover)	2	M6×45	6	
Bolt M6×25 (Tensioner and second thermostat cover)	6	M6×25	6	
Coolant temperature sensor	1	M12×1.5	16	
Oil pressure switch	1	M10×1	12	
Lock bolt, oil cooler	4	M6×18	10	
Lock bolt, oil cooler seat	2	M10×20	25	
Retainer, front middle output bearing	1	M55×1.5	80	Apply thread locker Left-hand thread

Torque Table - Non-specific Fasteners

Type	Torque N•m	Type	Torque N•m
M5 bolt, nut	5	M5 screw	4
M6 bolt, nut	10	M6 screw	9
M8 bolt, nut	20~30	M6 SH flange bolt	10
M10 bolt, nut	30~40	M6 flange bolt and nut	12
M12 bolt, nut	40~50	M8 flange bolt and nut	20~30
		M10 flange bolt and nut	30~40

2.6 Grease and Sealant

Location	Precautions	Type
Steering bearing Brake pedal moving point Suspension moving point Steering column inner face Seat lock moving point		Multifunction lithium grease

Cable, bearing and other moving parts lubrication

Location	Item	Type
Rear wheel hub	Lubrication	Lithium grease for auto GB/T5671
Shock absorber knuckle bearing		
Parking cable connecting point		

2.7 Service Products

Engine service materials include engine oil, transmission oil, grease, coolant, flat sealing glue, cylinder locking glue and ect.

Name	Specification	Use position	Remark
Oil	SAE 10W-40 SAE 5W-40 SAE 15W-40 API level: SJ or higher (See page 02-06)	Cylinder inner moving parts. Crankcase, CVT case inner moving parts. Cylinder head moving parts. Check lubrication system for more details	Capacity: 2500mL(engine oil & filter replacement) 2600mL(Engine overhaul)
Transmission oil	75W/90 GL-5	Gear case	Capacity: 600mL
Lubrication oil		Piston pin, Valve rod, Valve oil seal, Camshaft	
Grease	3# MoS ₂ lithium grease	Oil seal lip, O-ring and other sealing material surface and sealed bearing.	
Coolant	-35°C anti-corrosion, anti-freeze, high boiling point coolant	Cooling system, water seal installation	Capacity: Approximately 4.5L (4.8 qt)
Flat surface sealant		Magneto stator wire rubber sleeve and left crankcase cover. Crankcase and cylinder body. Water seal and water pump and washer.	
Blue Thread locker		Screws	
648 Cylinder sealant		Oil seal and crankcase surface	

2.8 Service Tools

Measuring Tools

No.	Tool name	Specification	Usage	Remark
1	Vernier caliper	0mm~150mm	Measure the length and thickness	
2	Micrometer	0mm~25mm	Measure rocker arm shaft, valve rod, camshaft's diameter.	
3	Micrometer	25mm~50mm	Measure the max-range of cam	
4	Micrometer	75mm~100mm	Measure the piston size	
5	Cylinder inner dial gauge		Measure the cylinder diameter run out	
6	Inner dial caliper	10mm~34mm	Measure rocker arm inner diameter, cylinder pin hole, connecting rod small hole.	
7	Dial gauge	1/100	Measure the running out	
8	Flatness gauge		Measure the flatness	
9	Clearance gauge		Measure the flatness and adjust the valve clearance.	
10	Plastic clearance gauge		Measure fitness clearance	
11	Force gauge		Measure the spring force	
12	RPM gauge		Measure the engine speed	
13	Cylinder pressure gauge and connector		Measure cylinder pressure	
14	Oil pressure gauge		Measure oil pressure	
15	Air pressure gauge		Measure radiator cap open pressure	
16	Ohm meter		Measure the resistance	
17	Ampere meter		Measure the current	
18	Thermo gauge		Measure the temperature	
19	Timing flasher		Test the ignition timing	
20	Torque wrench	In sets	Measure the tighten torque	

Usual and Auxiliary Tools

21	Alcohol lighter		Heating up	
22	Magneto gauge stand		Install dial gauge	
23	Flat plate		Supplement the measuring	
24	V-block		Measure the running out data	
25	Caliper		Install valve locking block	
26	Retainer caliper		Install and remove the caliper	
27	Caliper		Install and remove the retainer	
28	Impact screw driver		Remove the screw	
29	Screwdriver(-)			
30	Screwdriver(+)			

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03 Maintenance Information

3.1 Maintenance Schedule

The following icon keys are used to note special circumstances:

- = 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.

3.1.1 Pre-Ride Maintenance Checklist

Perform these inspections before operating the vehicle:

Item		Maintenance before operation			
		Hour	Calendar	Miles (km)	Remarks
■	Steering system	-	Pre-Ride	-	Visually inspect, test, or check components. Make adjustments and/or schedule repairs when required.
■	Throttle return	-	Pre-Ride	-	
	Front suspension and axles	-	Pre-Ride	-	
	Rear suspension and axles	-	Pre-Ride	-	
	Tires	-	Pre-Ride	-	
	Brake fluid level	-	Pre-Ride	-	
	Brake lever / foot brake function	-	Pre-Ride	-	
	Brake system function	-	Pre-Ride	-	
	Wheels / fasteners	-	Pre-Ride	-	
	Engine oil level	-	Pre-Ride	-	Visually inspect. Replace filter when dirty.
►	Air filter / Air box and connections	-	Pre-Ride	-	
►	Air box sediment tube	-	Pre-Ride	-	
►	CVT sediment tube	-	Pre-Ride	-	Inspect. If deposits are visible, drain / clean the CVT or have it serviced by a dealer.
■	Headlight aim / General lighting and turn indicators (if equipped)	-	Pre-Ride	-	Inspect. Adjust or replace lights when necessary.
►	Radiator	-	Pre-Ride	-	Inspect for mud or debris blocking airflow. Clean surfaces when necessary.

3.1.2 Break-In Maintenance Checklist

Perform these maintenance items at 20-hours or the distance interval, whichever arrives first.

Item		Break-in Maintenance (Perform at the interval that arrives first)			
		Hour	Calendar	Miles (km)	Remarks
	General lubrication	20	-	200 (320)	Lubricate all grease points, pivots, cables, etc.
	Engine oil / oil filter / oil strainer	20	-	200 (320)	Change oil and filter. Clean oil strainer.
►	Engine air filter	20	-	200 (320)	Inspect; replace if dirty; do not clean
■	Engine valve clearance	20	-	200 (320)	Check and adjust as necessary.
	Front / Rear gear case oil	20	-	200 (320)	Check level. Inspect for leaks.
	Coolant	20	-	200 (320)	Check level. Inspect for leaks.
	Transmission oil	20	-	200 (320)	Inspect level.
	Engine hoses, gaskets and seals	20	-	200 (320)	Inspect for leaks.
►	Brake pads	20	-	200 (320)	Inspect pad thickness.
	Battery	20	-	200 (320)	Check terminals, clean, test battery condition if required.
■	Idle condition	20	-	200 (320)	Inspect for proper rpm. See dealer for service if out of spec or erratic.
■	Steering / Wheel Alignment	20	-	200 (320)	Inspect steering system. See dealer for service if wheel alignment is required.
►	Foot brake / Hand brake	20	-	200 (320)	Inspect function. Adjust as necessary.
	Gear cases, CV shafts, Propshafts	20	-	200 (320)	Inspect for leaks.

03 Maintenance Information

3.1.3 Periodic Maintenance Schedule

Perform maintenance at the interval that arrives first after the 20-hour break-in period:

Item		Periodic Maintenance Intervals (Perform at the interval that arrives first)			
		Hour	Calendar	Miles (km)	Remarks
▶	Brake pads	10	Monthly	100 (160)	Inspect pad thickness.
	Battery	20	--	200 (320)	Check terminals. Clean and test battery condition as necessary.
	Engine hoses, gaskets and seals	20	-	200 (320)	Inspect for leaks.
▶	Air filter	50h	--	500 (800)	Always inspect pre-ride. Inspect frequently if subjected to severe use. Replace if dirty. Do not clean.
▶	General lubrication	50h	3M	500 (800)	Lubricate all fittings, pivots, cables, etc.
▶	Front gear case oil	50h	12M	500 (800)	Inspect level. Change yearly if hours or distance interval is not met.
▶	Rear gear case oil	50h	12M	500 (800)	Inspect level. Change yearly if hours or distance interval is not met..
▶	Engine oil / oil filter / oil strainer	100h	12M	1000 (1600)	Inspect for color change. Change if dirty and clean strainer. Change yearly if hours or distance interval is not met.
	Cooling system	50h	6M	500 (800)	Test coolant strength. Pressure test system yearly.
▶	Radiator	50h	6M	500 (800)	Inspect; clean external surfaces. Clean more frequently if subjected to severe use.
■	Steering system	50h	6M	500 (800)	Inspect. Lubricate.
▶	Front suspension	50h	6M	500 (800)	Lubricate. Check fasteners.
▶	Rear suspension	50h	6M	500 (800)	Lubricate. Check fasteners.
▶	Gear shift	50h	1M	500 (800)	Inspect, lubricate, adjust as necessary.
▶ ■	Throttle body / throttle cable	50h	6M	500 (800)	Inspect. Clean carbon deposits. Inspect cable and lubricate frequently if subjected to severe use.
▶ ■	CVT drive belt	50h	12M	1500 (2400)	Inspect. Replace as necessary. See dealer for service.
■	CVT drive and driven pulleys	100h	12M	500 (800)	Clean and Inspect pulleys. Replace worn parts. See dealer for service.

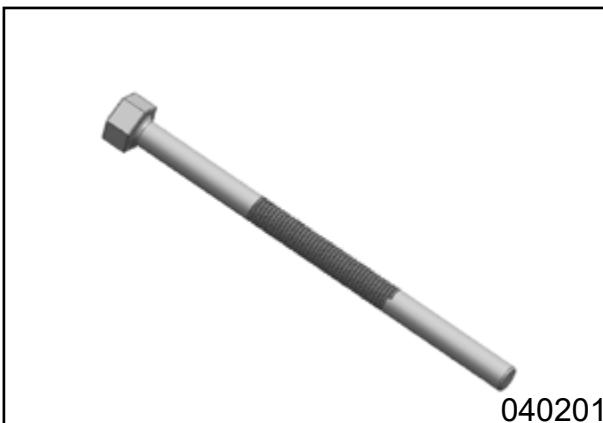
Item		Periodic Maintenance Intervals (Perform at the interval that arrives first)			
		Hour	Calendar	Miles (km)	Remarks
	Fuel filter and hoses	100h	24M	2000 (3200)	Inspect routing and condition. Replace filter and high-pressure hoses every 4 years.
	Cooling hoses	100h	--	1000 (1600)	Inspect routing and condition.
▶	Valve clearance	100h	--	2000 (3200)	Inspect and adjust as necessary. See dealer for service.
●	Fuel system	100h	12M	500 (800)	Inspect fuel tank, cap, fuel pump and fuel pump relay.
	Spark plug	100h	24M	2000 (3200)	Inspect; Replace if worn or fouled.
■	Engine mounts	100h	12M	1500 (2400)	Inspect condition.
	Exhaust pipe and spark arrestor	100h	12M	500 (800)	Inspect. Clean spark arrestor.
▶	Wiring, fuses, connectors, relays, and cables	100h	12M	1000 (1600)	Inspect wire routing for wear, security. Apply dielectric grease as necessary to connectors subjected to water, mud, etc.
▶ ■	Wheel bearings	100h	12M	1500 (2400)	Inspect for noise or looseness. Replace as necessary.
▶	Safety Belts	100h	12M	2000 (3200)	Visually inspect belts and test latches. Clean latch mechanism more often if used in severe conditions. Replace as necessary. Replace as necessary.
▶	Transmission oil	200h	12M	2000 (3200)	Inspect level. Change yearly if hours or distance interval is not met.
	Coolant	200h	24M	4000 (6400)	Change coolant every 2 years if hours or distance interval is not met.
▶	Brake fluid	200h	24M	1000 (1600)	Inspect fluid for color change. Change fluid every two years.
	Idle condition	--	12M	--	Inspect for proper rpm. See dealer for service if out of spec or erratic.
■	Steering / Wheel Alignment	--	12M	--	Inspect steering system. See dealer for service whenever steering parts or wheel alignment are required.
▶	Foot brake height	--	12M	--	Inspect. Replace brake pads or adjust height as required.

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4.1 CVT Special Tool

Drive Pulley Removal Tool

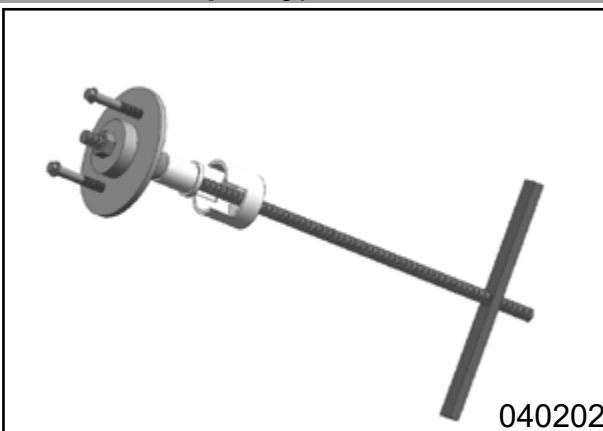
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Driven Pulley Disassembly Tool (to disassemble driven pulley)

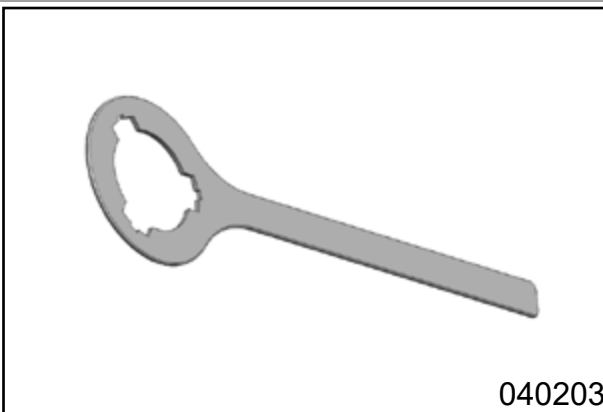
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040202

Drive Pulley Holding Wrench

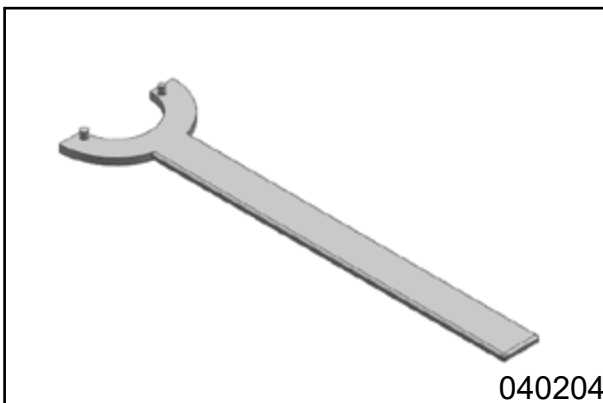
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040203

Driven Pulley Holding Wrench

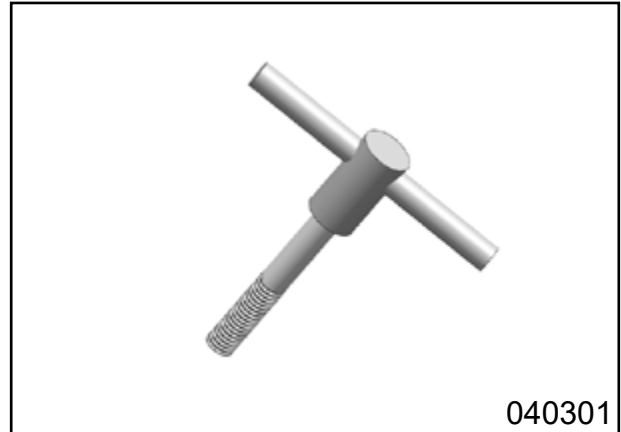
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040204

Driven Pulley Sheave Separating Tool

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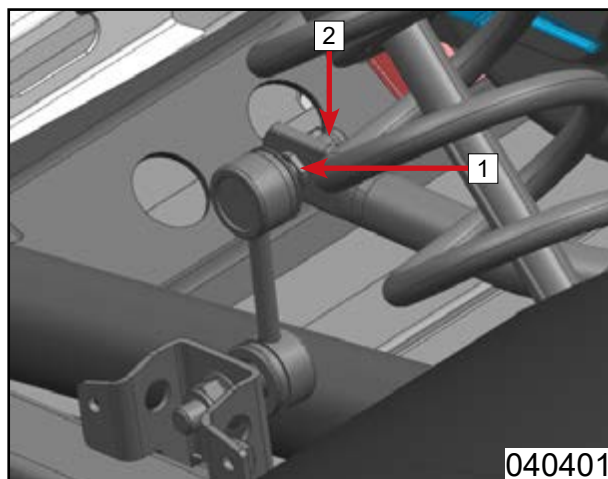
4.2 CVT Removal

4.2.1 Preliminary Work

Lock ball pin **1** with an appropriate tool.

Loosen nut **2**.

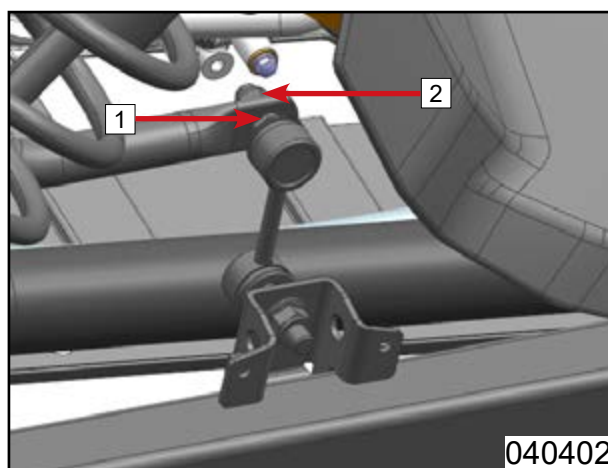
Remove sway bar ball pin assy.



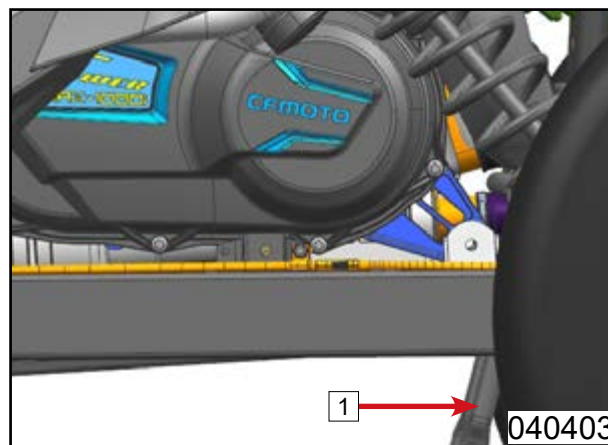
Lock ball pin **1** with calipers.

Loosen nut **2**.

Remove sway bar ball pin assy.

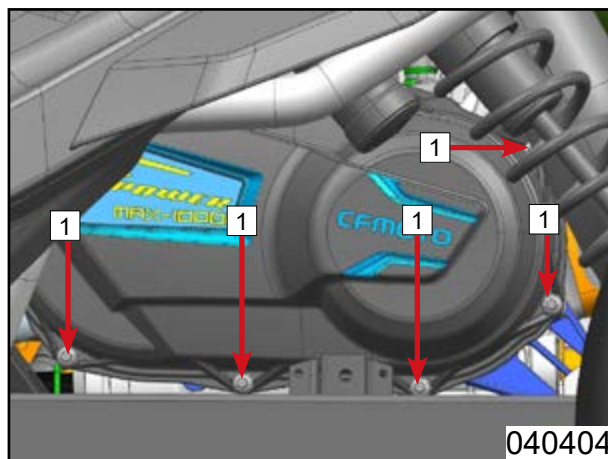


Rotate sway bar assy **1** underneath.



4.2.2 CVT Case Cover Removal

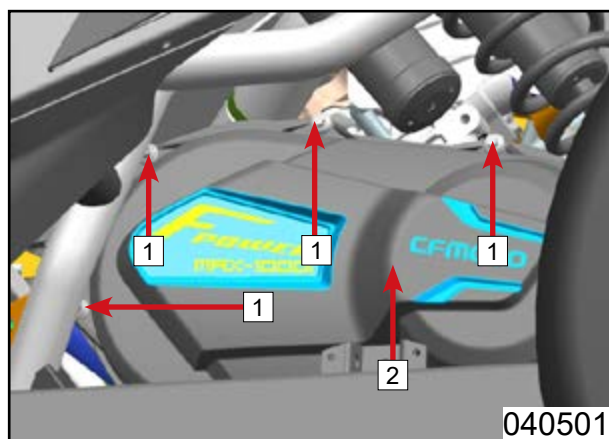
Remove CVT case cover bolts **1**.



Remove CVT case cover bolts [1].

Remove CVT case cover [2] by pulling it away from the pulleys, then rotating it 90 degrees clockwise. Maneuver the cover upward in the engine compartment to gain clearance for the lower part of the cover to clear the suspension arm, and remove it.

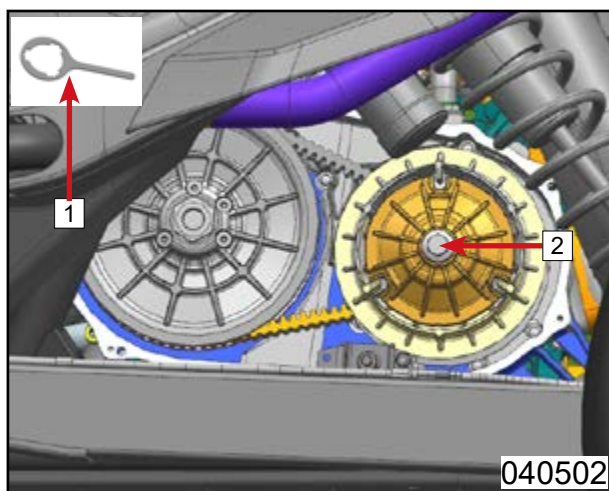
Remove the CVT seal ring from the case cover.



4.2.3 CVT Drive Pulley, Driven Pulley and Drive Belt Removal

Use special tool: Drive Pulley Holding Wrench [1] to hold drive pulley.

Remove drive pulley bolt [2] (left-hand thread).



Separate driven pulley fixed sheave and sliding sheave with special tool [6].

NOTE: Only one hole contains threads.

Use special tool: Drive Pulley Holding Wrench to secure the drive pulley.

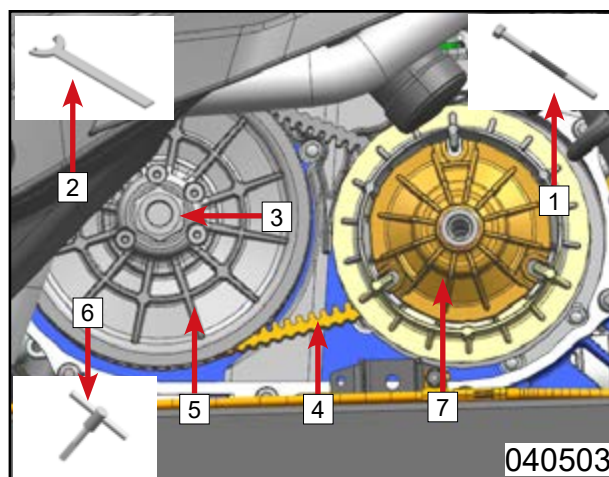
Use special tool: Drive Pulley removal tool [1] to remove drive pulley [7] (left-hand thread).

Use special tool: Driven Pulley Holding Wrench [2] to hold driven pulley.

Remove driven pulley nut [3].

Remove drive pulley [7], driven pulley [5] and drive belt [4] together.

Remove drive belt [4].

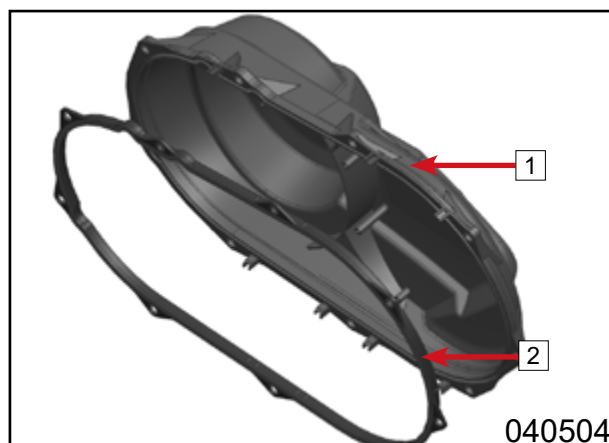


4.3 CVT Parts Inspection

4.3.1 CVT Case Cover Inspection

Inspect CVT case cover [1] for cracks or damage. Replace if any defect is found.

Inspect CVT case cover seal ring [2] for aging, damage or other defects. Replace if any defect is found.



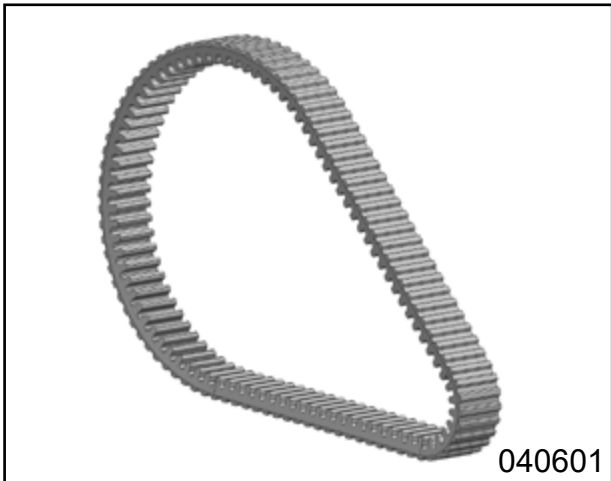
4.3.2 Drive Belt Inspection

Inspect drive belt for oil stain or damage. Inspect belt contact surface for cracks or damage. Measure belt width with vernier caliper.

Replace with a new belt if damaged or beyond service limit.

Drive belt service limit: 33.5 mm

NOTE: Clean the belt thoroughly if oil and grease is on the belt surface.



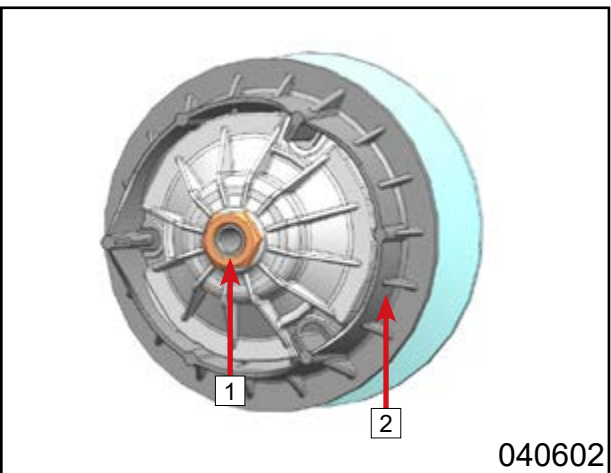
4.3.3 Drive Pulley Inspection

Disassembly

NOTE: Before disassembly of the drive pulley, mark the ramp place, moveable sheave and stationary sheave for alignment.

Remove drive pulley nut [1] (left-hand thread).

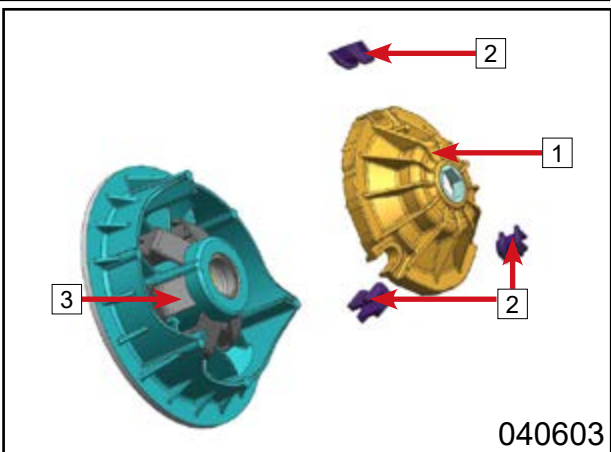
Remove drive pulley moving sheave assembly [2].



Remove ramp plate [1].

Remove nylon sliders [2].

Remove weight rollers [3].



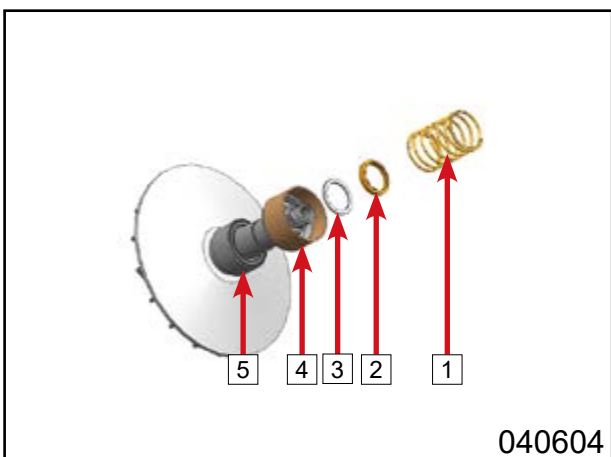
Remove drive pulley spring [1].

Remove nylon washer [2].

Remove steel washer [3].

Remove spring seat [4].

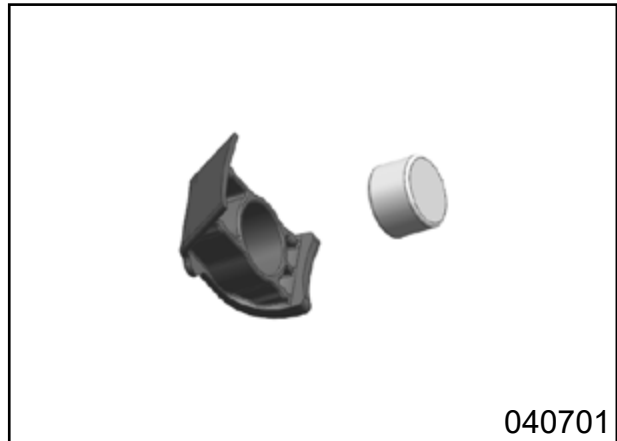
Remove bearing [5].



Inspection

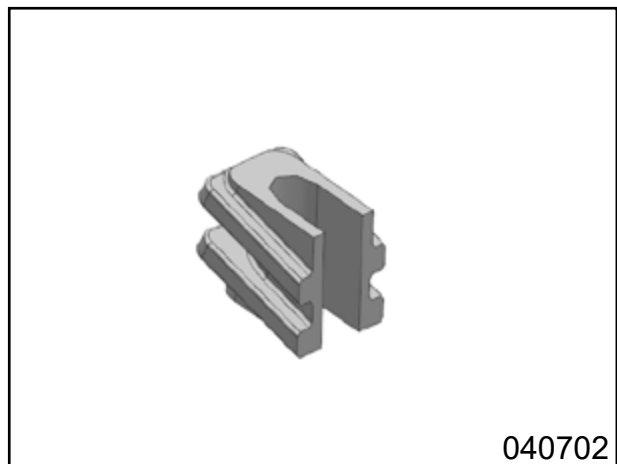
Inspect every weight and sliding surface for damage or wear. Replace all sliders if any defect occurs.

NOTE: Weight sliders must be replaced as a whole set.



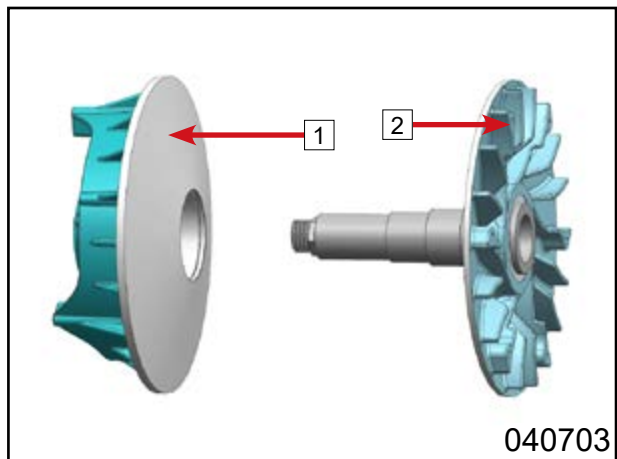
Inspect ramp plate sliders for wear or damage. Replace all sliders if any defect occurs.

NOTE: Ramp sliders must be replaced as a whole set.



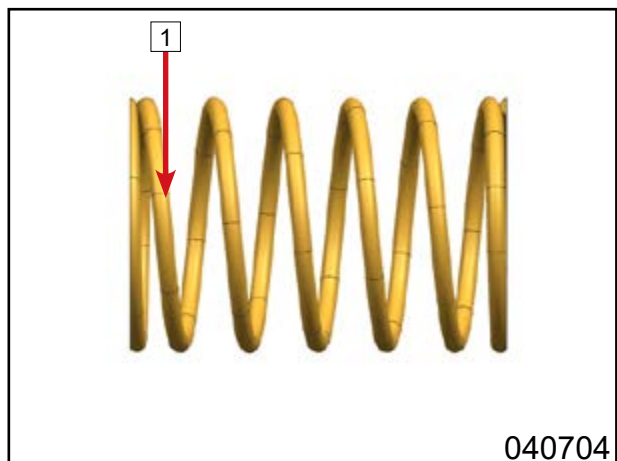
Drive Pulley Stationary Sheave and Moving Sheave Inspection

Inspect drive pulley stationary sheave **2** and moving sheave **1** surfaces for wear or damage. Replace if necessary.



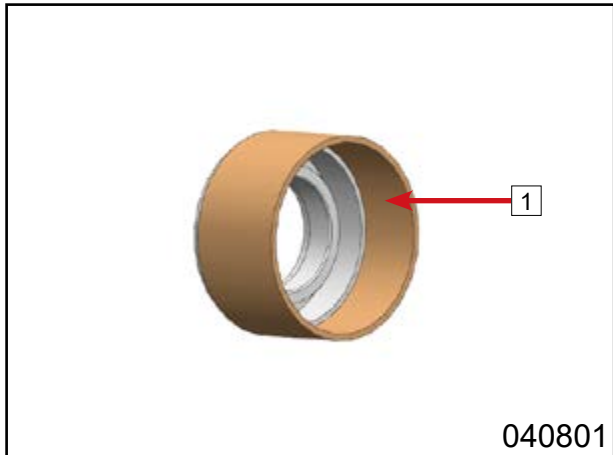
Drive Pulley Spring Inspection

Inspect the drive pulley spring **1** for severe deformation or break. Replace if any defect is found.



Spring Seat

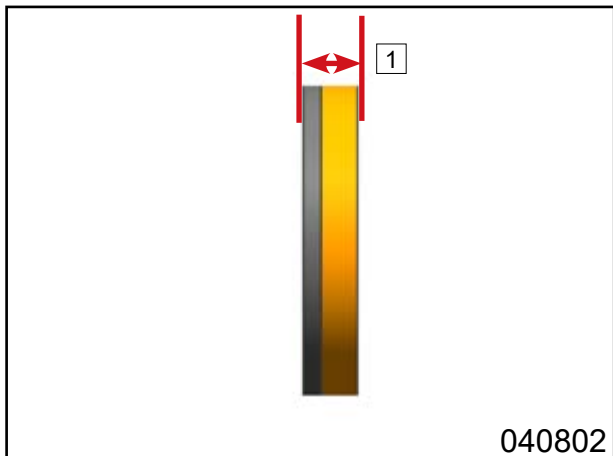
Inspect spring seat **1** for damage. Replace if any defect is found.



Steel Washer and Nylon Washer

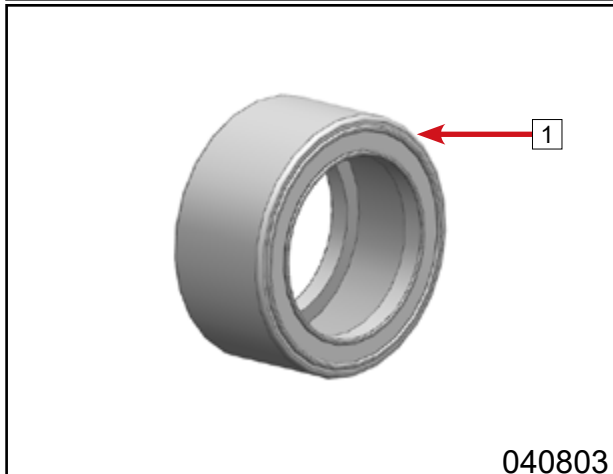
Measure thickness of the nylon and steel adjusting washer with a vernier caliper. Replace washers and adjust the thickness if beyond service limit.

Adjusting washer thickness **1: 5mm~6mm**



Bearing

Inspect the bearing **1** for smooth rotation. Replace if rough or locked.



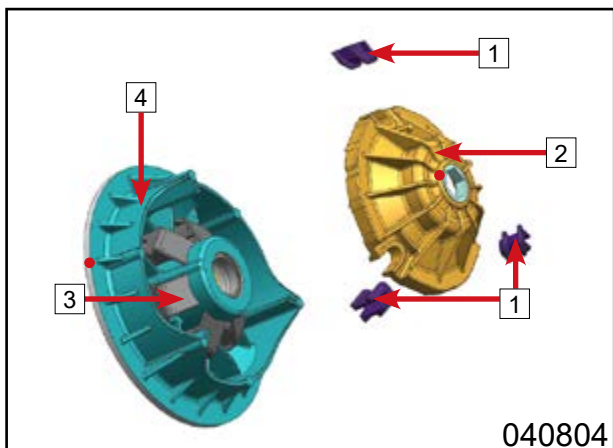
Installation

Install sliders **1** on ramp plate **2**.

Place weight sliders **3** into the drive pulley moving sheave **4**.

Install ramp plate **2** on drive pulley moving sheave **4**.

NOTE: Align the marks made on ramp plate and drive pulley moving sheave.



On the stationary sheave:

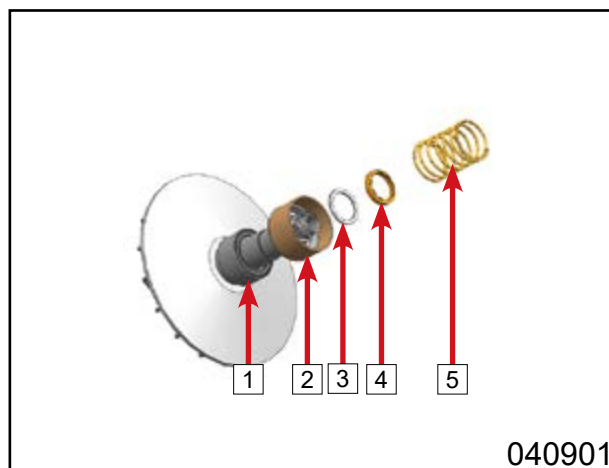
Install bearing [1].

Install spring seat [2].

Install steel washer [3].

Install nylon washer [4].

Install drive pulley spring [5].



Place the stationary sheave [1] assembly in a work bench vise.

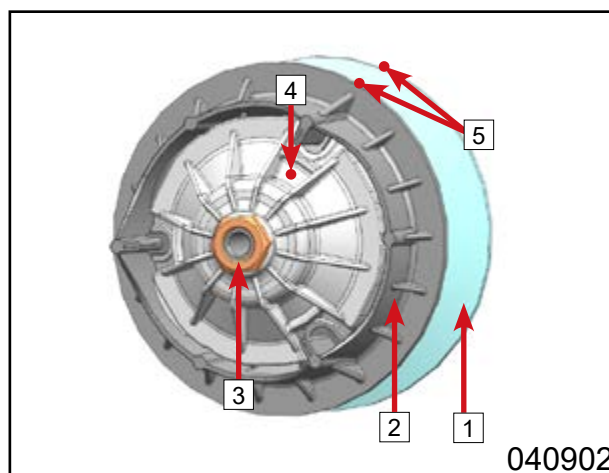
Install moving sheave [2] assembly on the stationary sheave [1].

Compress the moving sheave assembly [2] then install drive pulley nut [3] (left-hand thread).

Nut Torque: 180N•m~216N•m

NOTE: Align marks on moving and stationary sheaves. Make sure the marks of ramp plate, moving sheave and stationary sheave [4] [5] are on the same line.

NOTE: When compressing drive pulley moving sheave [2], align the thrust disc inner hex holes and drive pulley stationary sheave mounting holes.



4.3.4 Driven Pulley Inspection Disassembly

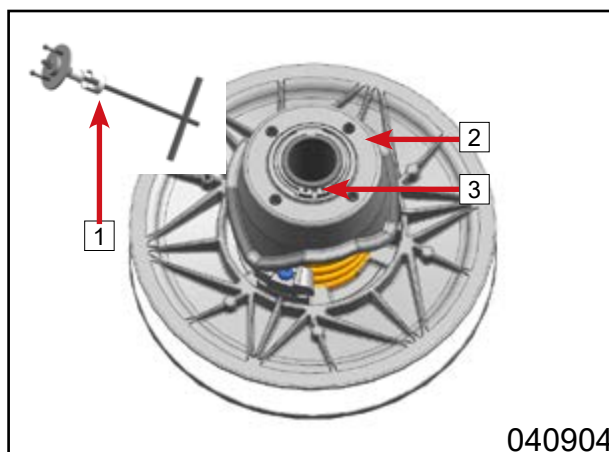
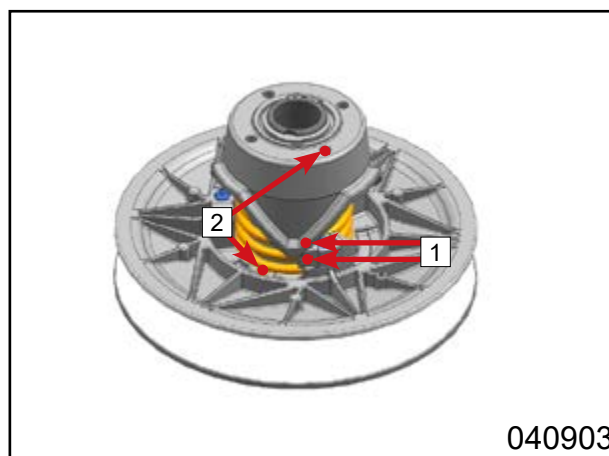
NOTE: Before disassembly of the driven pulley, mark on the spring seat mounting holes and slider positions.

Use special tool: Driven Pulley Disassembly Tool [1] to compress the cam plate [2].

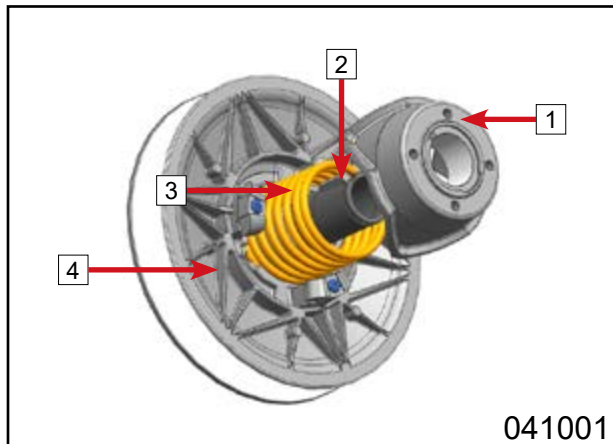
Remove circlip [3] with pliers.

Loosen Driven Pulley Disassembly Tool [1] slowly.

CAUTION: Spring is under pressure. Use care when removing the special tool to prevent injury.



Remove cam plate [1].
 Remove shaft key [2].
 Remove driven pulley spring [3].
 Remove driven pulley stationary sheave [4].

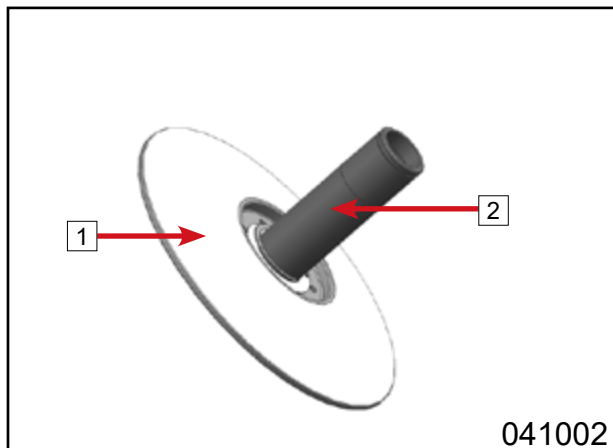


Inspection Driven Pulley Sheaves

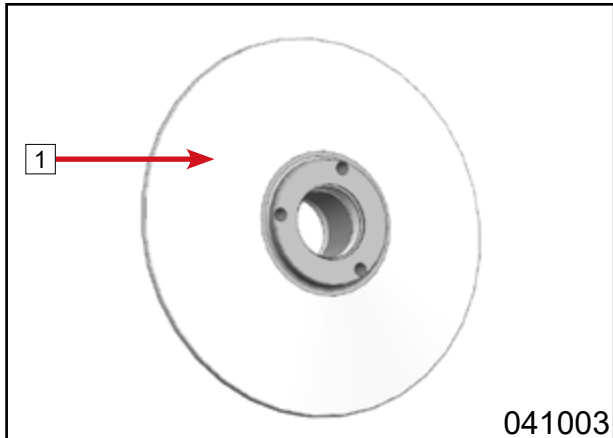
Inspect the stationary sheave surface [1] for wear, damage or other defects. Replace if any defect is found. Inspect shaft sleeve [2] for wear or other defects. Replace if necessary.

NOTE: Clean before inspection.

NOTE: Driven pulley parts are precisely matched. Replacement of separate components may cause engine vibration. Replace as a set.

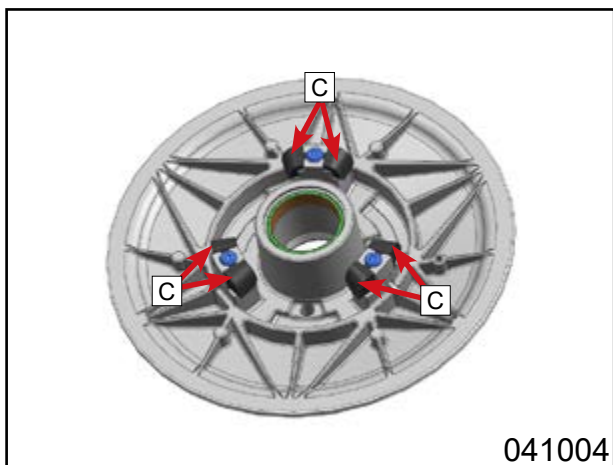


Inspect the moveable sheave surface [1] for wear, damage or other defects. Replace if any defect is found.

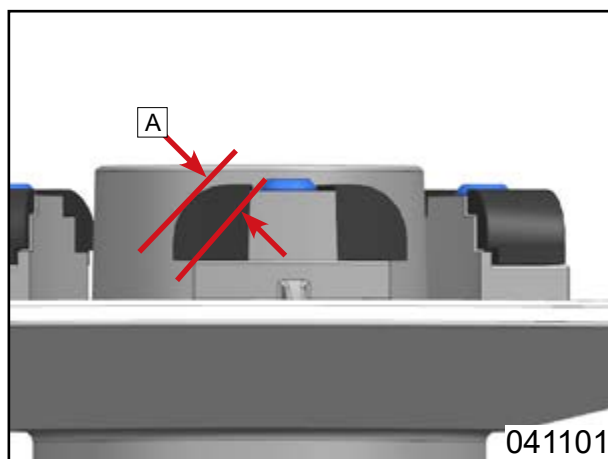


Inspect driven pulley sliders [C] for wear or other defects. Replace if beyond value [A]. Inspect sliding sleeve for wear or damage. Replace if severely worn.

NOTE: Clean before inspection.

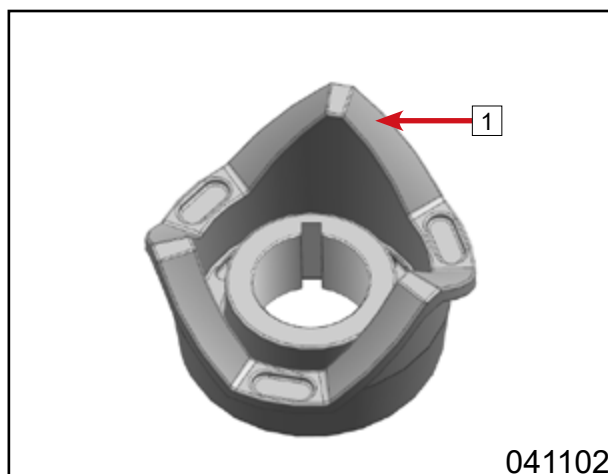


A $\geq 1.5\text{mm}$



Cam Plate Inspection

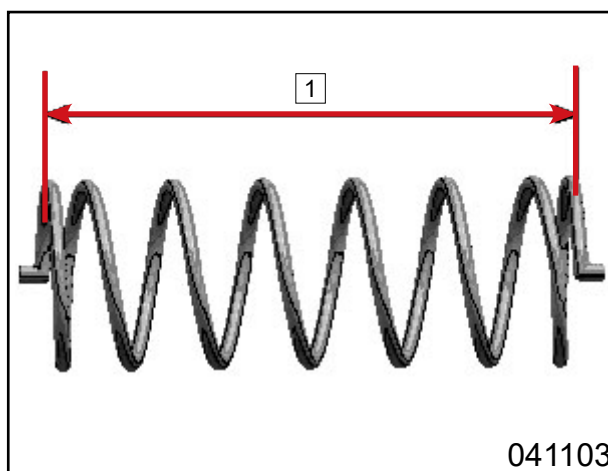
Inspect cam plate contact surface **1** for wear or other defects. Replace if necessary.



Spring Inspection

Measure spring free length. Replace with a new spring if less than service limit.

Spring free length **1 service limit: 214mm**

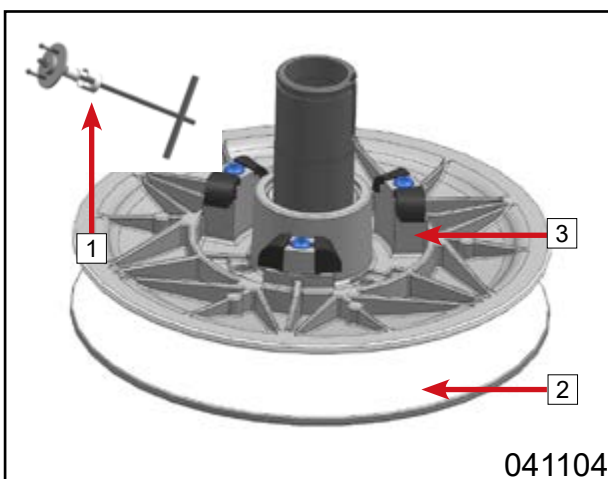


Assembly

Use special tool: Driven Pulley Disassembly Tool **1** to assemble.

Install driven fixed sheave **2** on Driven Pulley Disassembly Tool **1**.

Install moving sheave **3** on stationary sheave **2**.

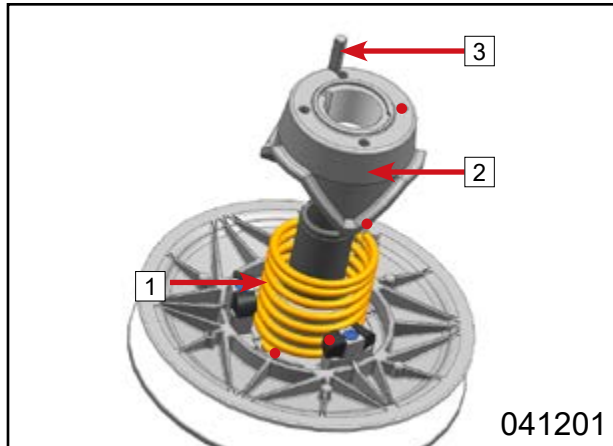


Install driven pulley spring [1] according to the marks made during removal.

Install cam plate [2] onto the spring according to the marks during removal. The marks on sliders should be aligned with those on cam plate.

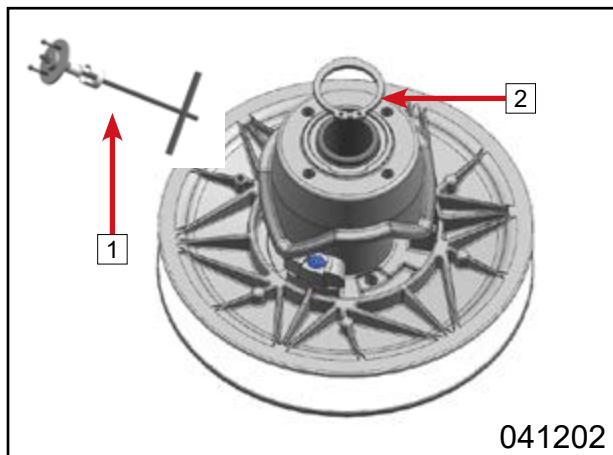
Install shaft key [3].

Factory Setting: B1



Use special tool: Driven Pulley Disassembly Tool [1] to compress cam plate.

When compressed into position, install circlip [2]. Verify it is fully installed after installation, then loosen the special tool.

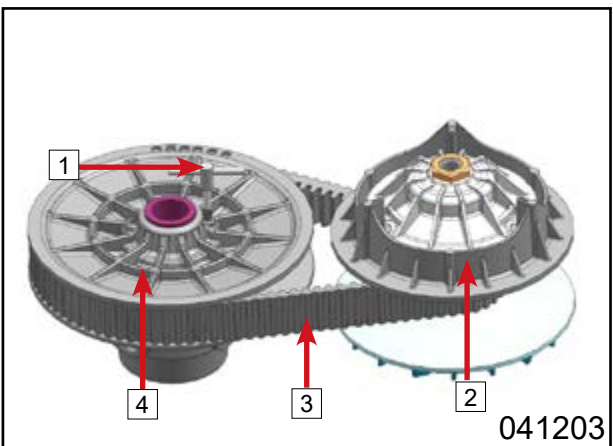


4.4 CVT Installation

4.4.1 Drive Pulley, Driven Pulley and Drive Belt Installation

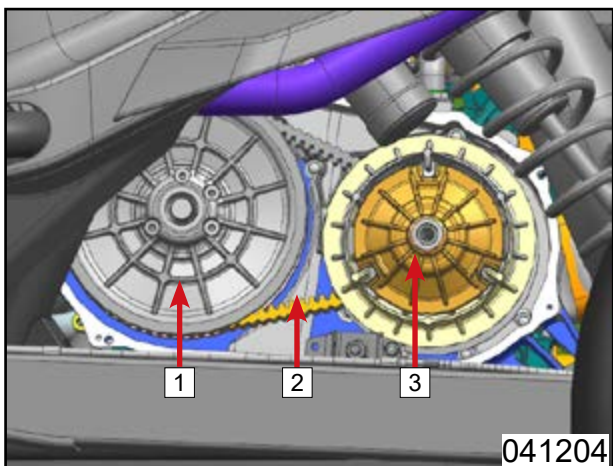
Use special tool: Driven Pulley Fixed Sheave and Sliding Sheave Separating Tool [1] to separate the sheaves.

Place the drive belt [3] around the drive pulley [2] and driven pulley [4].



NOTE: Clean the belt thoroughly if oil and grease is on the belt surface.

Install the driven pulley assy [1], drive belt [2] and drive pulley assy [3] together on the engine.

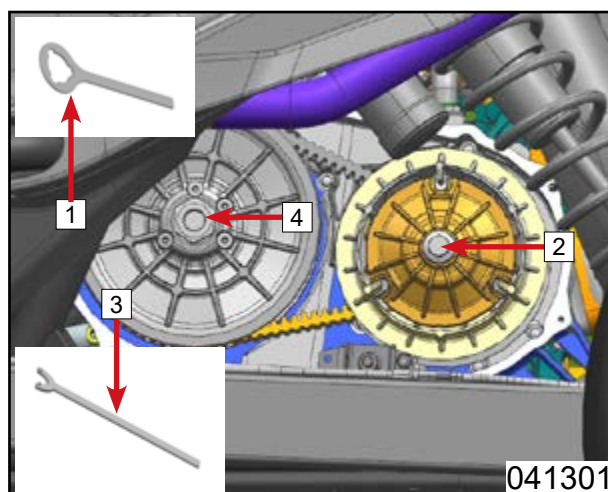


Use special tool: Drive Pulley Holding Wrench [1] to hold the drive pulley.
Install drive pulley bolt [2] (left-hand thread).

Tighten torque: 55N•m~65N•m

Use special tool: Driven Pulley Holding Wrench [3] to hold the driven pulley.
Install driven pulley nut [4].

Tighten torque: 150N•m~180N•m

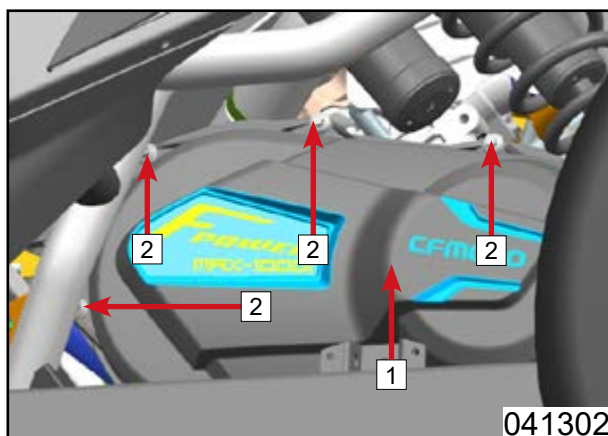


4.4.2 CVT Case Cover Installation

Install seal ring on CVT cover [1].

Install CVT cover [1].

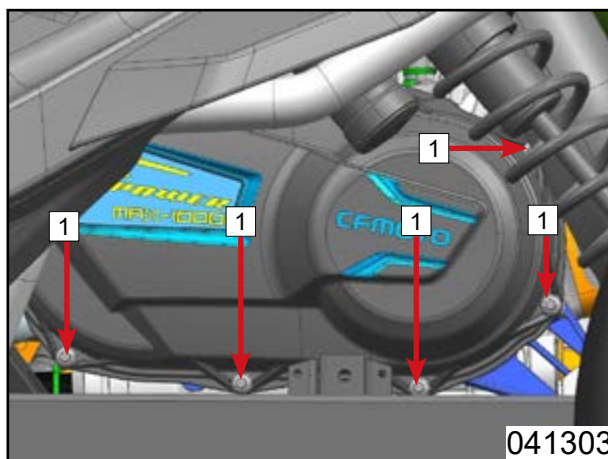
Install cover bolts [2].



Install cover bolts [1].

Torque all CVT cover bolts.

Tighten torque: 7 N•m



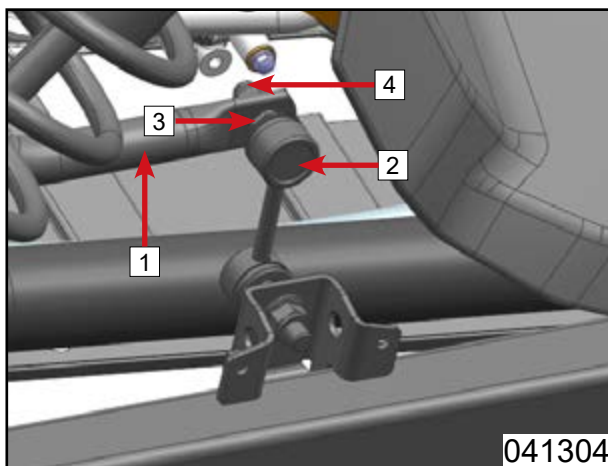
4.4.3 CVT Surrounding Parts Installation

Rotate the sway bar [1] into position.

Install right sway bar ball pin [2].

Secure ball pin [3] with a suitable tool, then install nut [4] and torque to specification.

Tighten torque: 30N•m~40N•m

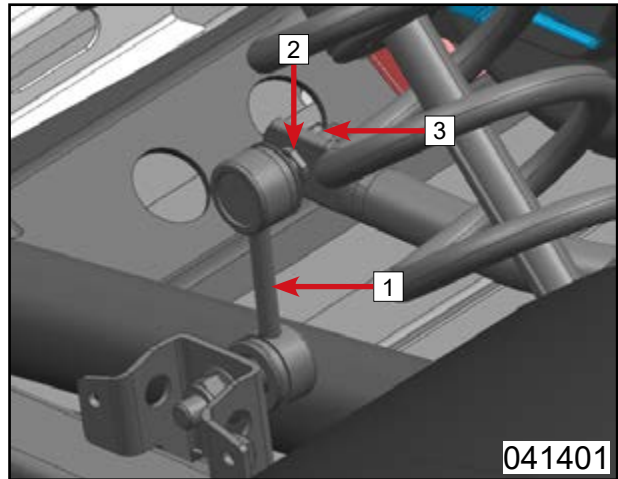


CFMOTO

Install left sway bar ball pin assy [1].

Secure ball pin [2] with suitable tool, then install nut [3] and torque to specification.

Tighten torque: 30N•m~40N•m



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5.1 Special Tools for Engine

Magneto Rotor Removal Tool

0800-031000-922-001



050501

Front Output Shaft Oil Seal Installer

0800-060000-923-001



050502

Valve Stem Seal Ring Installer

152MI-022500-923-001



050503

Front Output Shaft Bearing Retainer Tool (to remove the retainer)

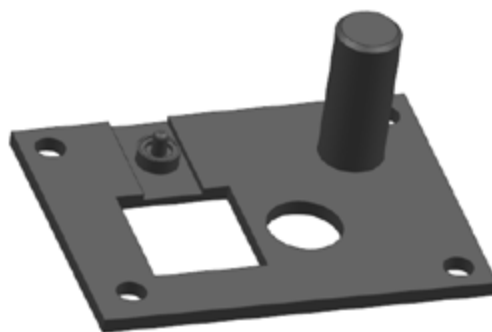
0180-060008-922-001



050504

Supporting Block

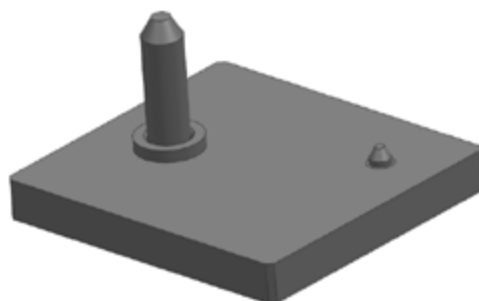
0JWA-081000-921-002-2



050601

Oil Seal Cushion Block

0180-065002-923-002



050602

6203 Bearing Installer

152MI-060002-921-002



050603

PTO Crankcase Bearing (3206A) Installer

0180-012100-921-004



050604

30X45X7 Oil Seal Installer

0180-012006-923-001



050701

Oil Seal Installer

0JWA-012000-921-003



050702

Bearing 6205 Installer

0JWA-012000-921-004



050703

Front Output Shaft Bearing Retainer Tool

0JWA-012000-922-005



050704

Breather Seat Installer

0800-011105-923-001



050801

MAG Crankcase Main Shaft Bearing 6303 Installer

0180-011100-921-004



050802

Drive Bevel Gear Shaft Bearing 6305 Installer

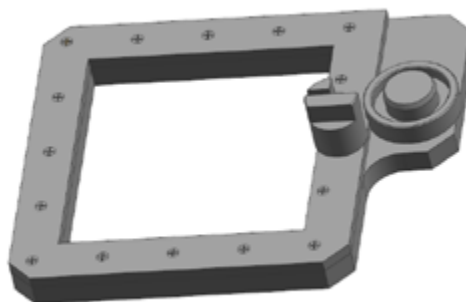
0180-062103-921-002



050803

PTO Crankcase Bearing Compression Supporting Block

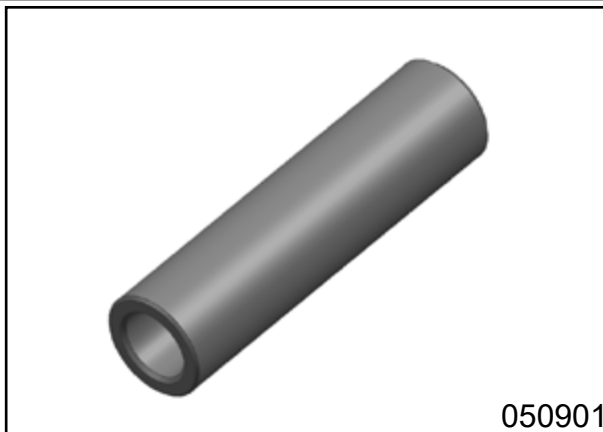
0800-012101-921-001



050804

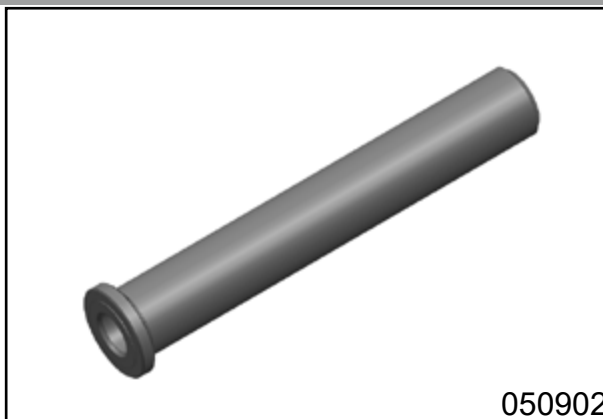
Front Output Shaft Bearing 6205 Installer

0180-062301-921-001



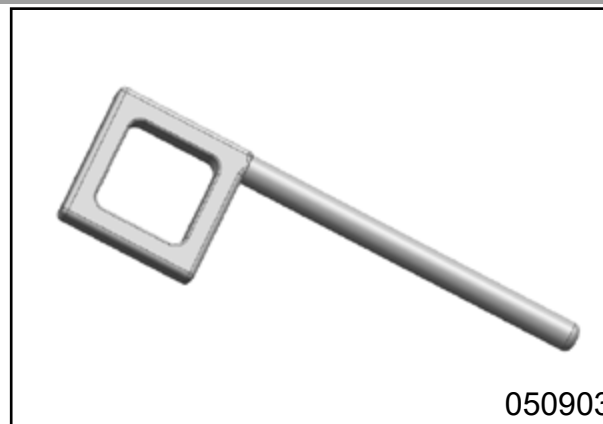
15×25×5 Oil Seal Installer

0180-065002-923-001



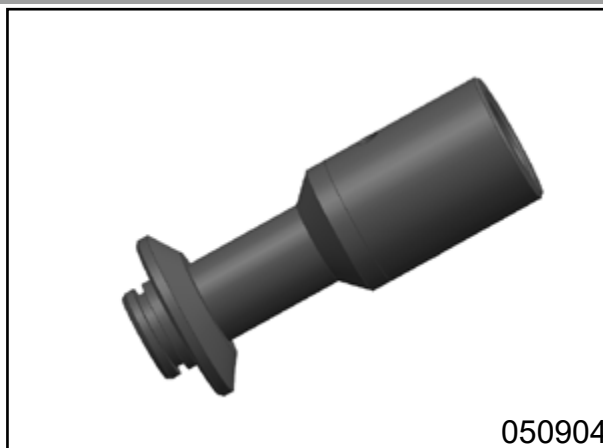
Rear Output Coupler Holding Wrench

0180-060006-922-001



MAG Crankcase Crankshaft Bearing Installer

0180-014001-921-002



MAG Crankcase Cover Bearing Installer

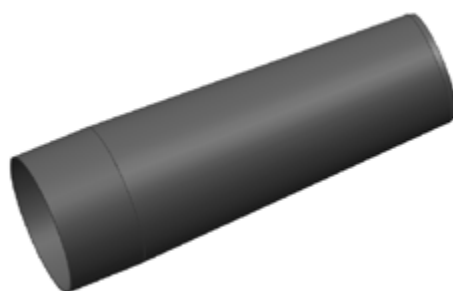
0800-014001-921-002



051001

Crankshaft Plain Bearing Protecting Sleeve

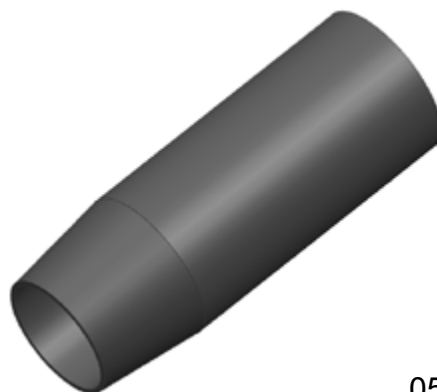
0GQ0-000000-922-001



051002

Gearshift Main Shaft Oil Seal Protecting Sleeve

0800-060004-922-002



051003

32X55X10 Oil Seal Installer

0JY0-013103-923-001



051004

Magneto Rotor Holding Wrench

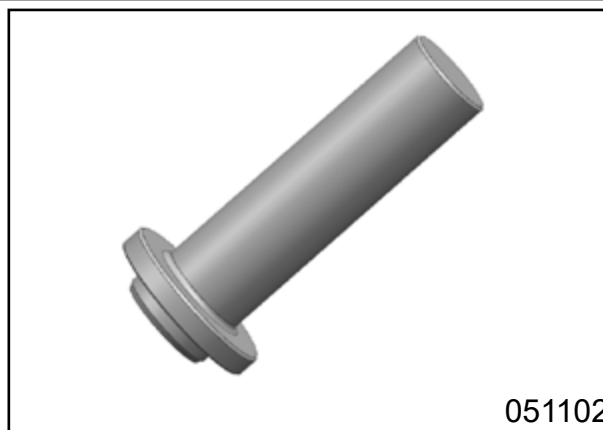
0800-031000-922-002



051101

Driven Bevel Gear Oil Seal Installer

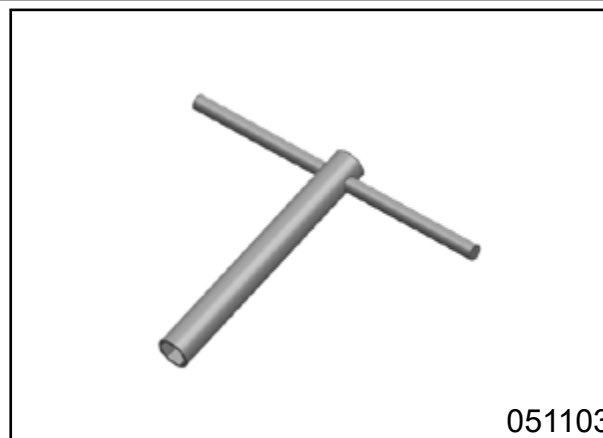
0800-062204-923-001



051102

Spark Plug Wrench

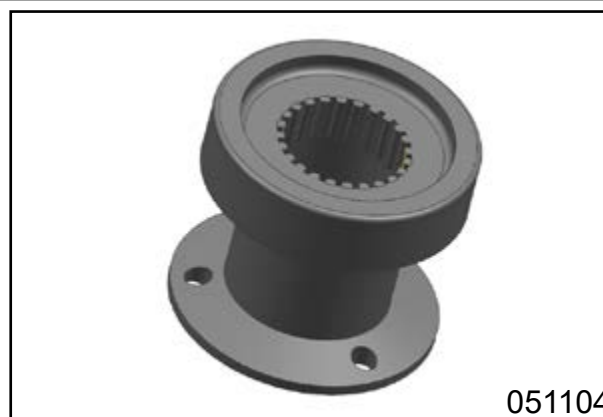
0800-022800-922-001



051103

Drive Bevel Gear Holding Tool

0JYA-062100-922-003



051104

CFMOTO

Oil Hose Adapter (to measure oil pressure)

0800-000000-871-001



051201

Valve Clearance Adjusting Wrench

1P39MB-022102-922-001



051202

Valve Spring Compressing Clamp

0180-022006-922-001



051203

Water Seal A/B Tool

0JWA-081000-922-002



051204

Bevel Gear Lock Nut Socket B

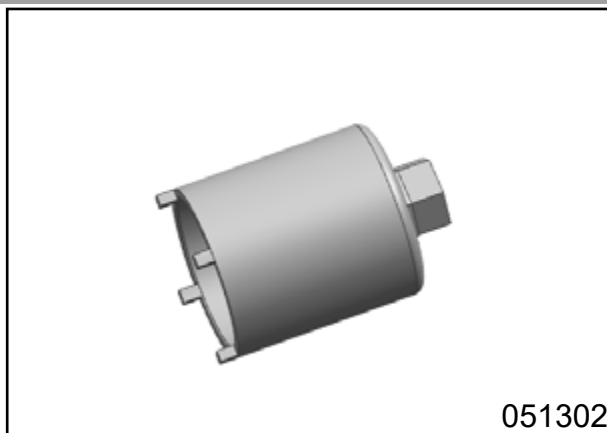
0JYA-062100-922-002



051301

Driven Bevel Gear Bearing Limit Nut Tool

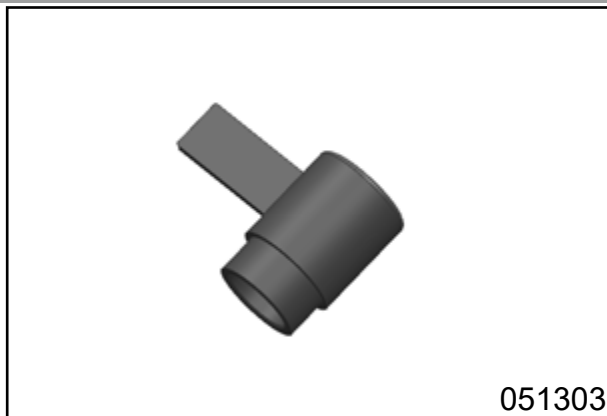
0800-062206-922-001



051302

Bevel Gear Side Clearance Measuring Tool

0JWA-062000-860-001



051303

Bearing Removal Tool

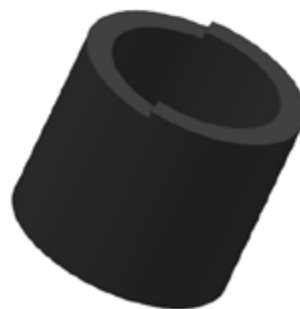
0800-011102-922-001



051304

MAG Crankcase Plain Bearing Supporting Tool

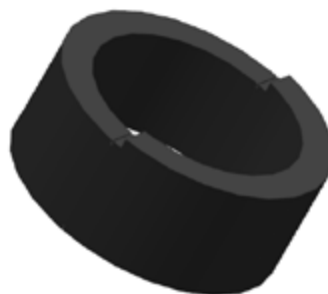
0800-011101-922-001



051401

PTO Crankcase Plain Bearing Supporting Tool

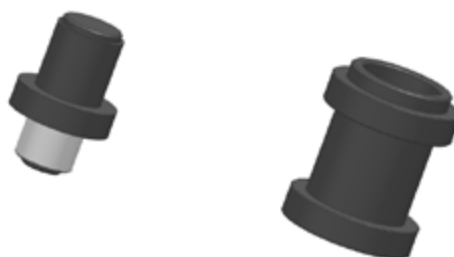
0800-012101-922-001



051402

CVT Crankcase Plain Bearing Installer

0JY0-013101-921-001



051403

Crankcase Bearing Removal Tool

It is recommended to use such tools to remove bearings.



051404

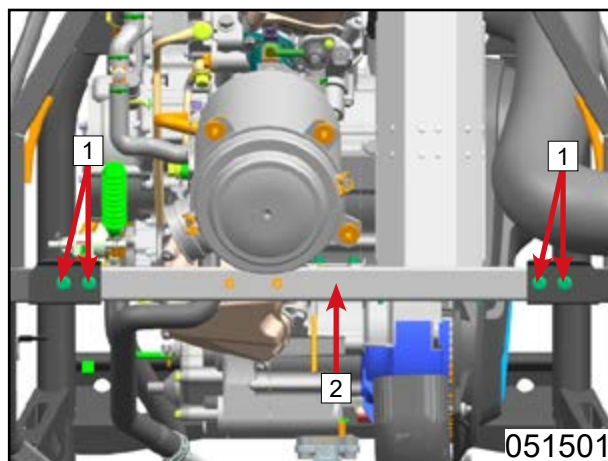
5.2 Engine Removal

5.2.1 Preliminary Work

Remove muffler (refer to Muffler section).
Remove fuel tank (refer to fuel system section).
Remove air filter inlet pipe (refer to Air Filter section).
Remove CVT inlet and outlet pipes (refer to Body Covering Parts section).
Remove gearshift assy (refer Gearshift Assy section).
Remove cab.
Disconnect injector connectors.
Disconnect ignition coils.
Disconnect water temperature connector.
Disconnect crankshaft position sensor connector.
Disconnect speed sensor connector.
Disconnect gear sensor connector.
Disconnect O2 sensor connectors.
Disconnect T-MAP connector.
Disconnect throttle valve connector.
Remove engine ground wire.
Disconnect oil pressure sensor connector.
Disconnect high-pressure hose and fuel vapor hose.

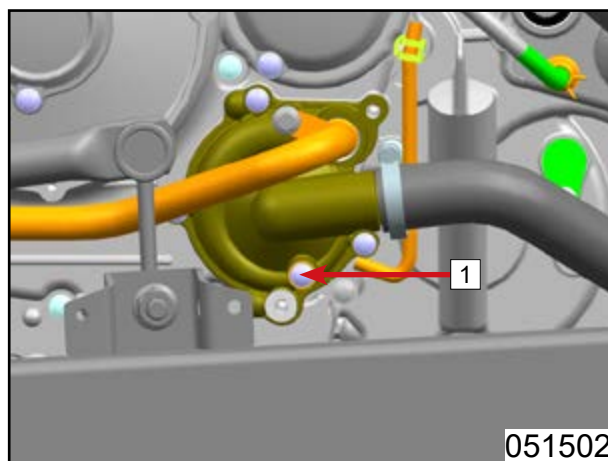
5.2.2 Removal

Remove bolts [1].
Remove engine upper horizontal pipe [2].

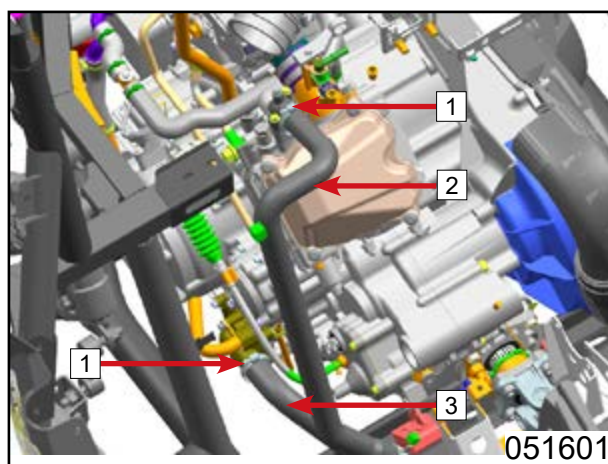


Coolant Drain

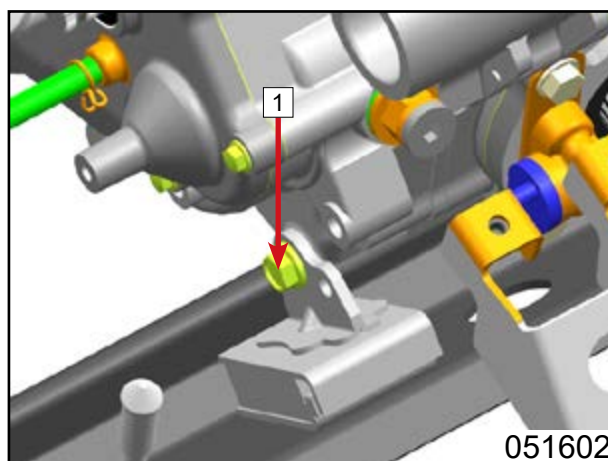
Open radiator cap and place a container under engine water pump to store the coolant.
Remove drain bolt [1] and washer to drain the coolant until it completely drains.



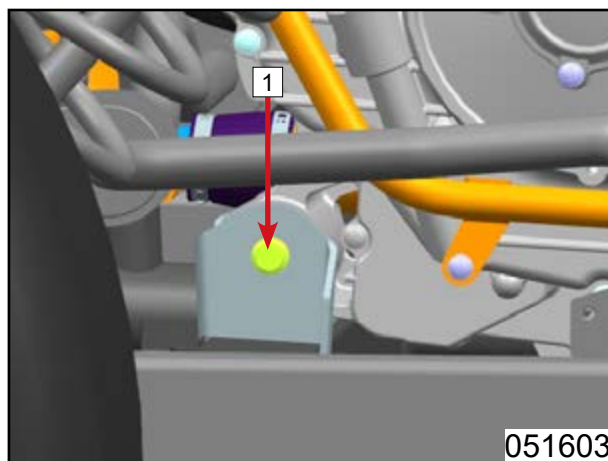
Loosen clamps **1**.
Remove engine outlet pipe **2**.
Remove engine inlet pipe **3**.



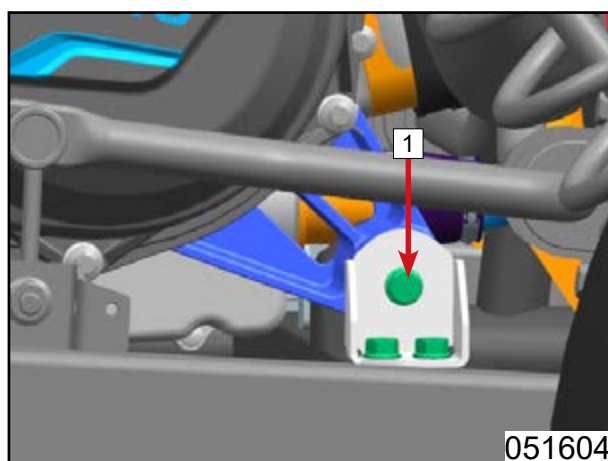
Use lifting device to hang the engine. The lifting device has to be fixed.
Lock nut on bolt **1** to remove the bolt.



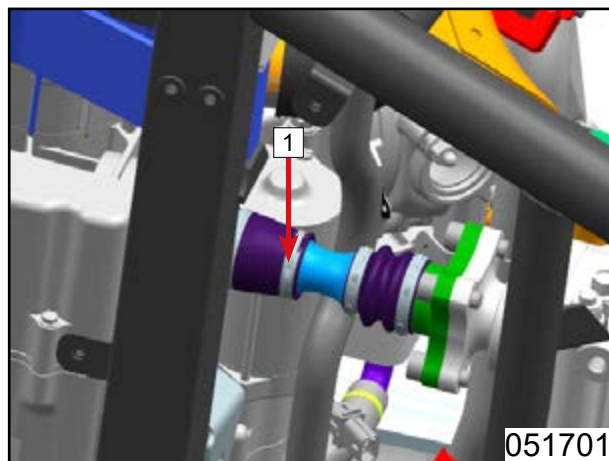
Lock nut on bolt **1** to remove the bolt.



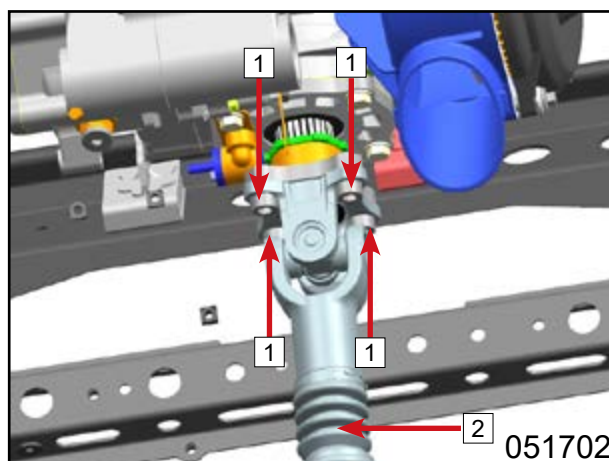
Lock nut on bolt **1** to remove the bolt.



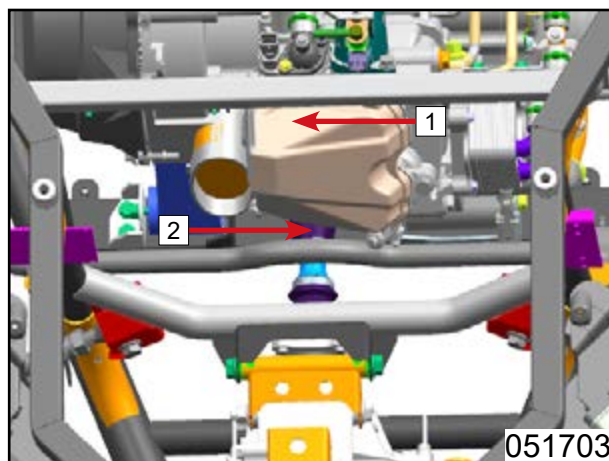
Loosen clamp **1**.



Remove bolts **1**.
Lift front drive shaft **2** to separate it with the engine output flange coupler.



Pry engine **1** until output shaft **2** and duct boot separate. Lift the engine with lifting device and put it on service bench.



5.3 Engine Air Inlet/Outlet System

5.3.1 Air Filter

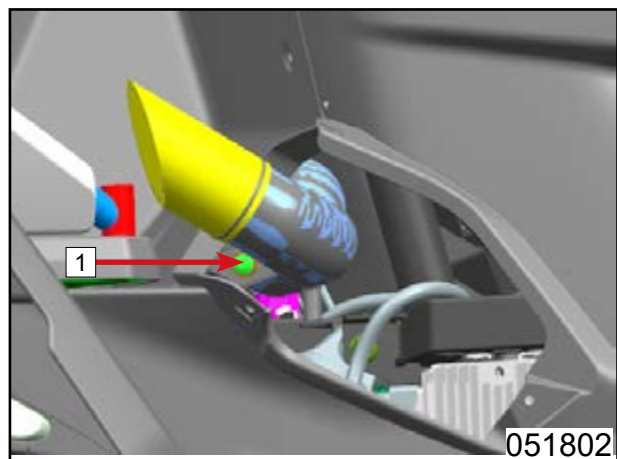
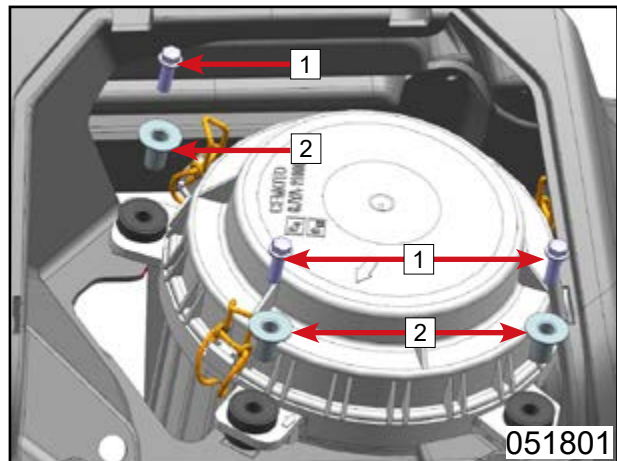
5.3.1.1 Removal

Remove rear wheel fender.
Remove rear rack assy.
Remove CVT deco cover.
Remove air filter service cover.

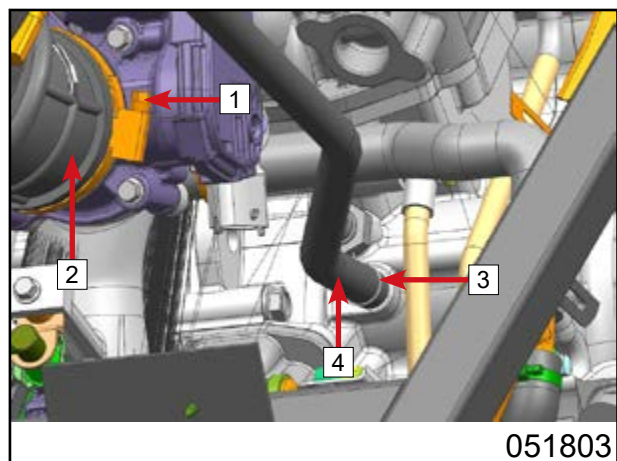
Removal refers to Body Covering Parts section.

Remove bolts [1].
Remove T-type bushings [2].
Remove CVT RH outer deco cover (refer to Body Covering Parts section).

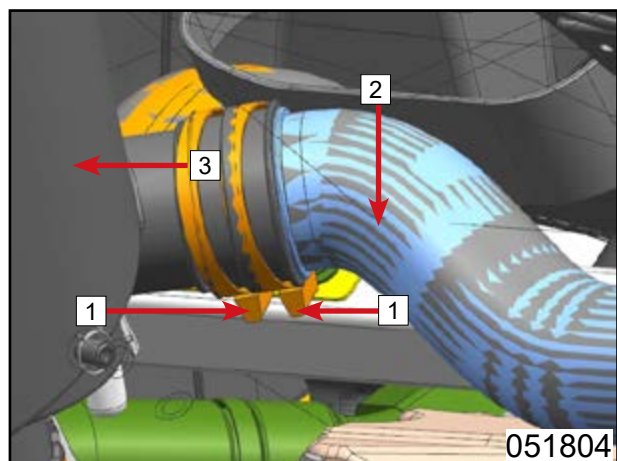
Remove bolt [1].
Remove cargo box base plate (refer to Body Covering Parts section).



Loosen clamp [1].
Remove air filter outlet pipe [2].
Loosen clamp [3].
Remove breather hose [4].



Loosen clamp [1].
Remove air filter inlet pipe [2].
Remove air filter assy [3].

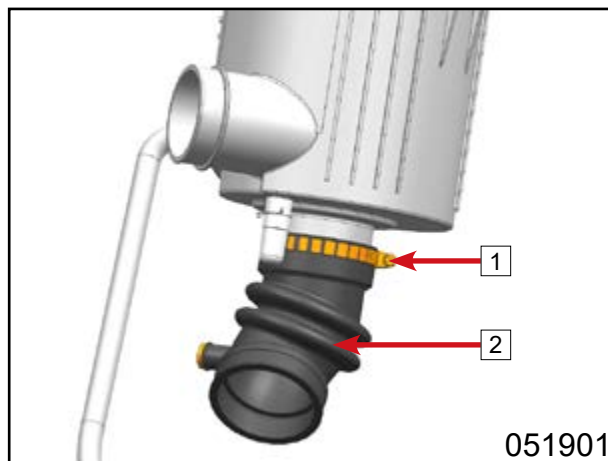


5.3.1.2 Air Filter Parts Inspection

Disassembly

Loosen clamp [1].

Remove air filter outlet pipe [2].



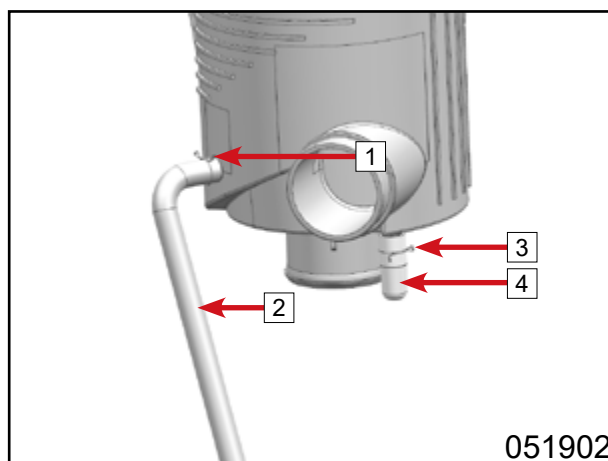
051901

Loosen clamp [1].

Remove breather hose [2].

Loosen clamp [3].

Remove indicator hose [4].

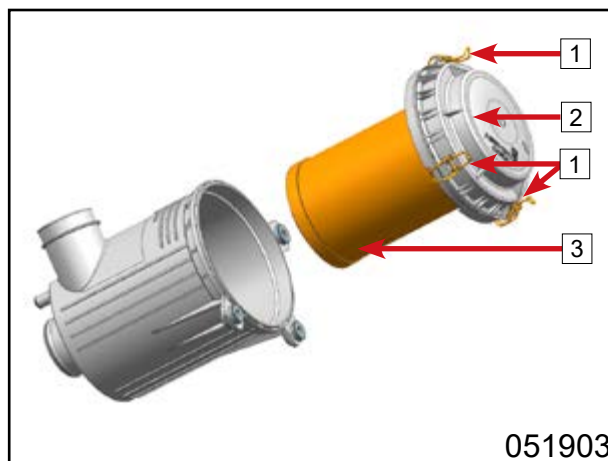


051902

Loosen clasp [1].

Remove air filter cover [2].

Remove air filter element [3].



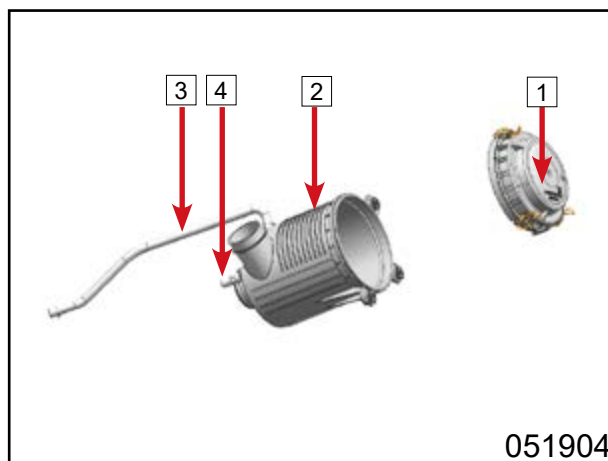
051903

Inspection

Inspect air filter cover [1], housing [2], breather hose [3] and oil reservoir [4] for damage. Replace as required.

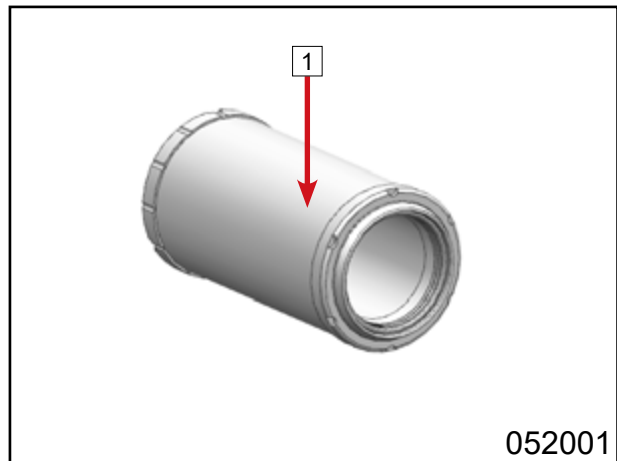
Clean air filter cover [1], housing [2], breather hose [3] and indicator hose [4].

NOTE: If the vehicle is used in severe conditions, increase the frequency of inspection, cleaning and maintenance (Refer to Maintenance Chart).

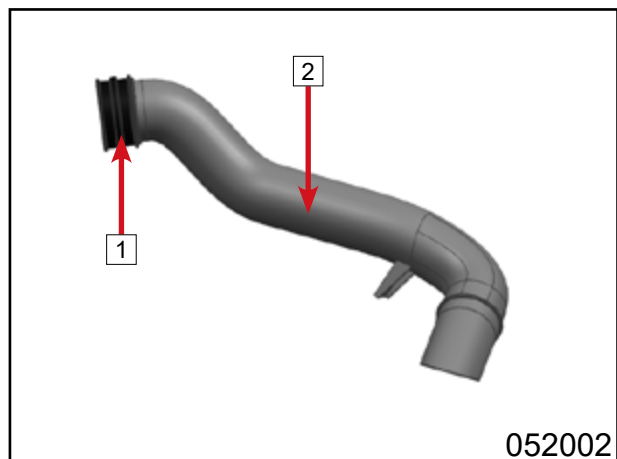


051904

Air filter element **1** cannot be cleaned. Replace the filter element **1** if it is dirty (refer to Maintenance Chart).



Inspect connecting hose **1** and air filter inlet pipe **2** for damage. Replace if it does. Clean connecting hose **1** and air filter inlet pipe **2**.

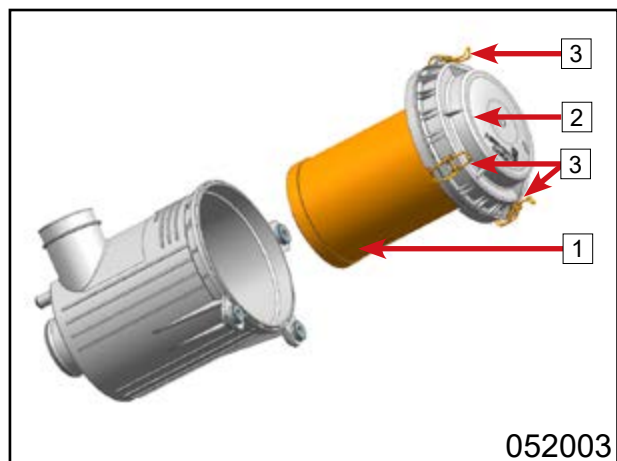


Installation

Apply a thin layer of grease on the lower lip of air filter element. Install air filter element **1**.

Install air filter cover **2**.

Clip clasps **3**.



Put clamp **1** on breather hose **2**.

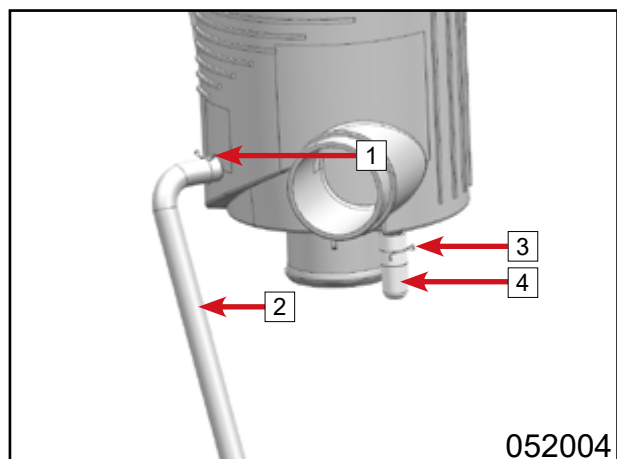
Loosen clamp **1**.

Install breather hose **2**.

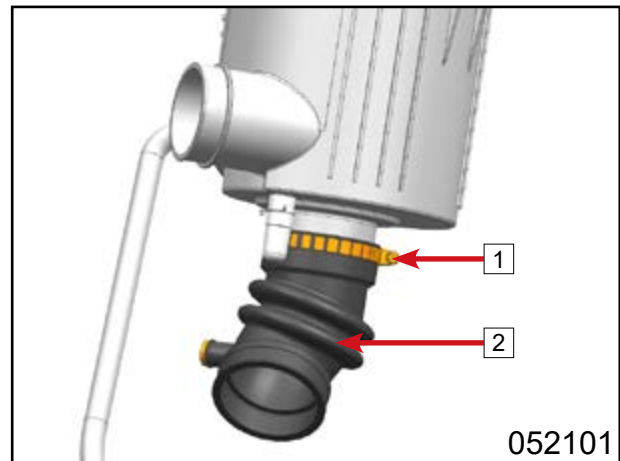
Put clamp **3** on indicator hose **4**.

Loosen clamp **3**.

Install indicator hose **4**.

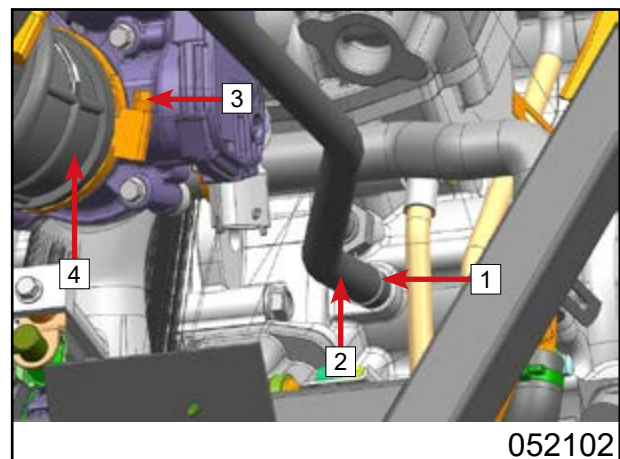


Loosen clamp [1].
Put clamp [1] on air filter outlet pipe [2].
Install air filter outlet pipe [2].
Tighten clamp [1].

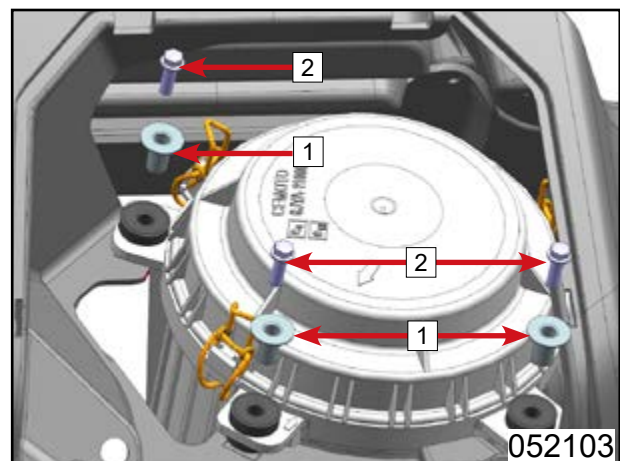


5.3.1.3 Air Filter Installation

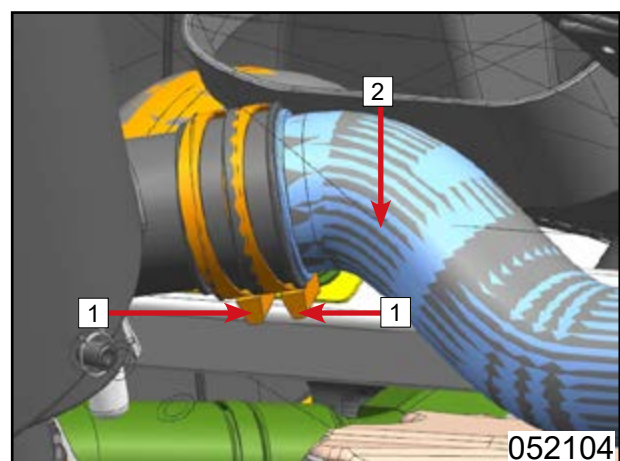
Put clamp [1] on breather hose [2].
Loosen clamp [1] to install breather hose [2].
Put clamp [1] on air filter outlet pipe.
Install air filter [4] on throttle valve and tighten the clamp [3].



Install T-type bushings [1].
Install bolts [2].



Loosen clamp [1] and put it on connecting hose.
Install air filter inlet pipe [2] with connecting hose on air filter.
Tighten clamp [1].



Install bolt **1**.

Install cargo box base plate.

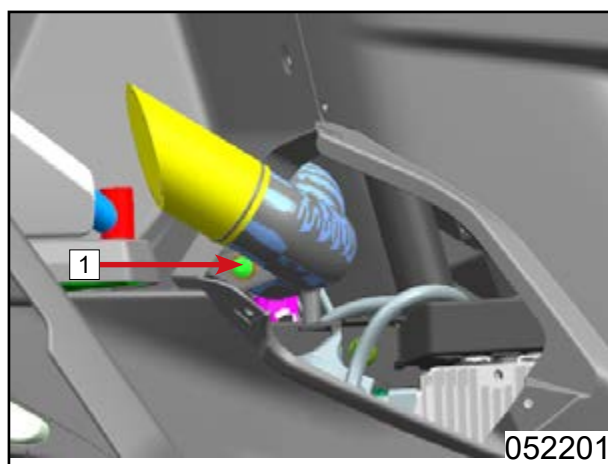
Install CVT RH outer deco cover.

Install rear service cover.

Install air filter cover.

Install rear cargo box cover plate.

Installation refers to Body Covering Parts section.



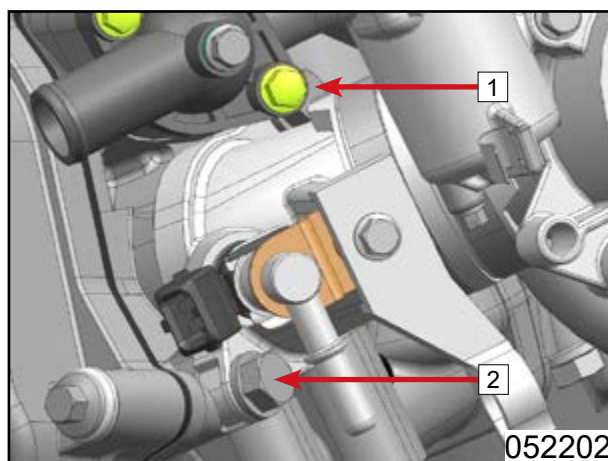
5.3.2 Engine Inlet Pipe

Removal

Engine Inlet Pipe

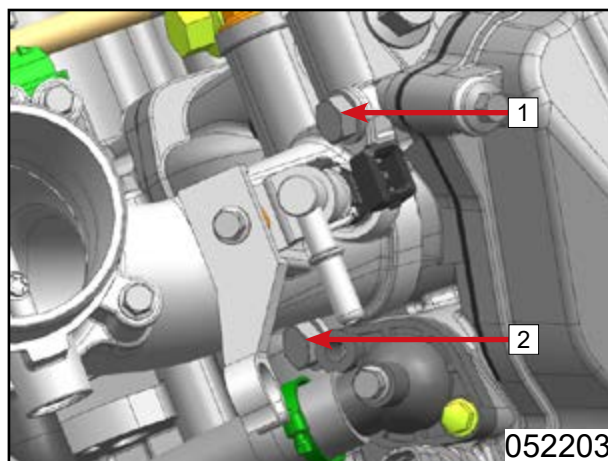
Remove bolt **1**.

Remove bolt **2**.

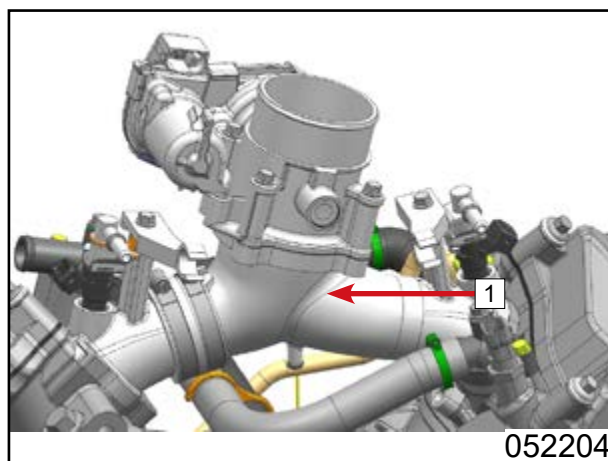


Remove bolt **1**.

Remove bolt **2**.



Remove engine inlet pipe assy **1**.

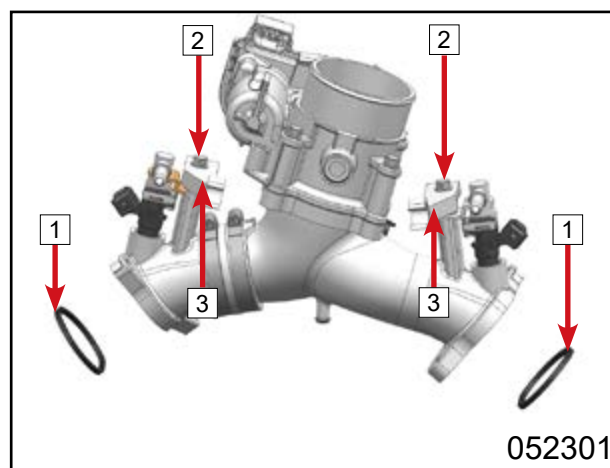


Fuel Injector

Remove seal rings [1].

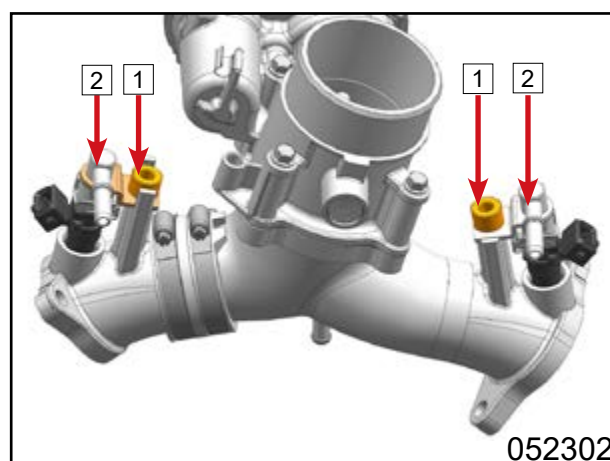
Remove bolts [2].

Remove fuel injector brackets [3].



Remove bushings [1].

Remove fuel injectors [2].

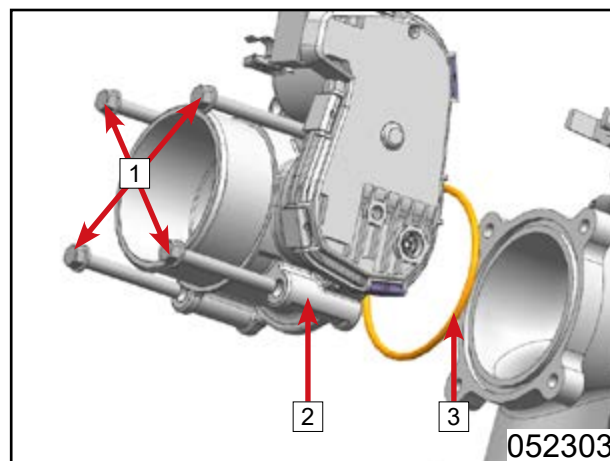


Throttle Valve

Remove bolts [1].

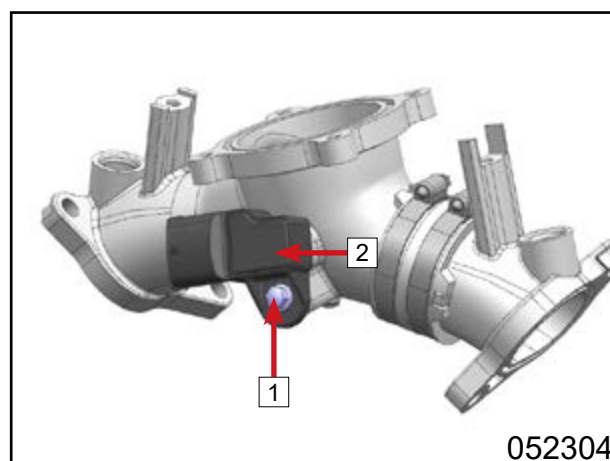
Remove throttle valve [2].

Remove o-seal ring [3].

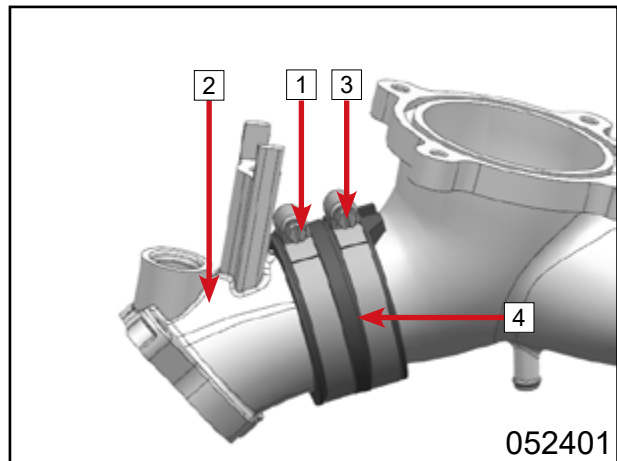


Remove bolt [1].

Remove T-MAP [2].

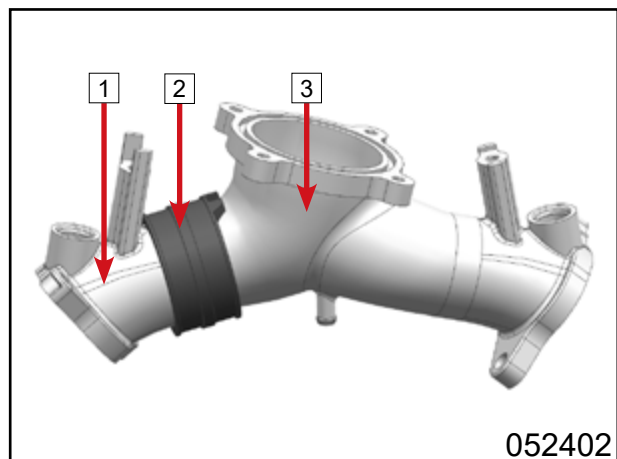


Loosen clamp [1].
 Remove auxiliary air inlet pipe [2].
 Loosen clamp [3].
 Remove air inlet pipe joint hose [4].



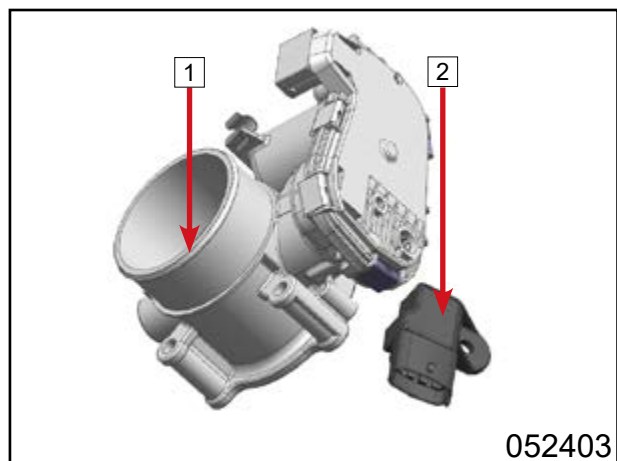
Inspection Air Inlet Pipe, Auxiliary Air Inlet Pipe and Joint Hose

Inspect auxiliary air inlet pipe [1], joint hose [2] and air inlet pipe [3] for cracks and damage. Replace if it does.



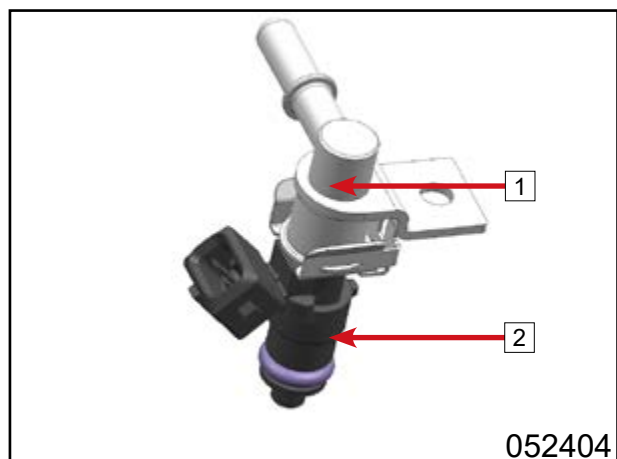
Throttle Valve and T-MAP

Inspect throttle valve [1] and T-MAP [2] for damage. Replace if necessary.
Details refer to Electrical chapter.



Fuel Injector

Inspect fuel injector cap [1]. Oil, grease or other impurities are not allowed to exist. No defects like scratches, cracks or corrosion. Replace if it does. The other fuel injector applies the same procedures.
 Inspect fuel injector [2]. Details refer to Electrical System chapter.
 Inspect fuel injector for blocking. Start the vehicle to see whether the fuel atomization is normal or not. Replace if abnormal. The other injector applies the same procedures.



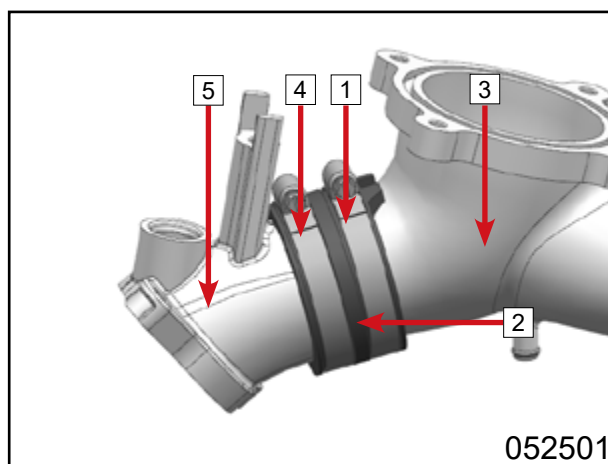
Installation

Loosen clamp [1] and put it on air inlet pipe joint hose [2].

Install joint hose [2] on air inlet pipe [3], and tighten the clamp [1].

Loosen clamp [4] and put it on air inlet joint hose [2].

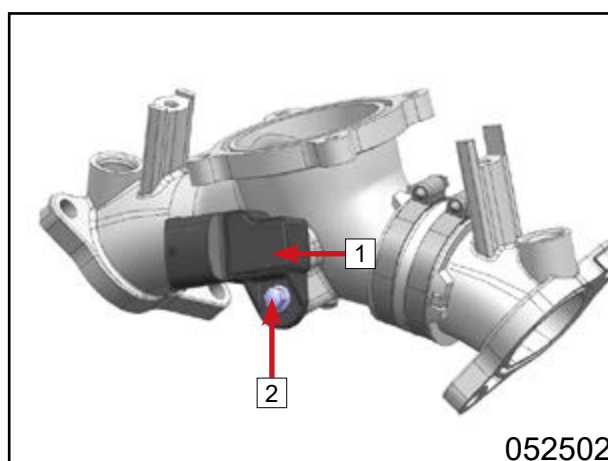
Install auxiliary air inlet pipe [5] on joint hose [2], and tighten the clamp [4].



052501

Install T-MAP [1].

Install bolt [2].



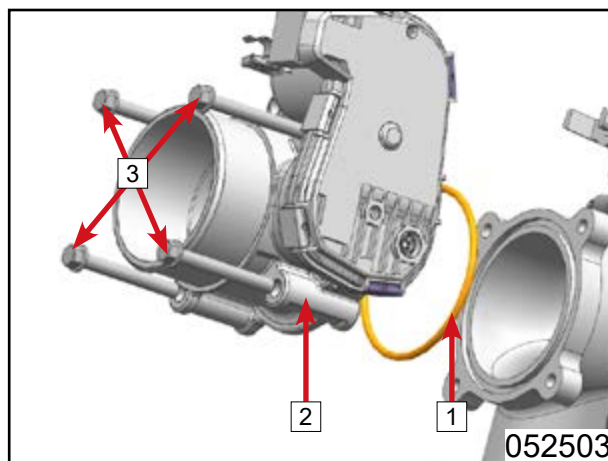
052502

Install o-seal ring [1] on air inlet pipe.

Install throttle valve [2].

Install bolts [3].

Tighten to specific torque.



052503

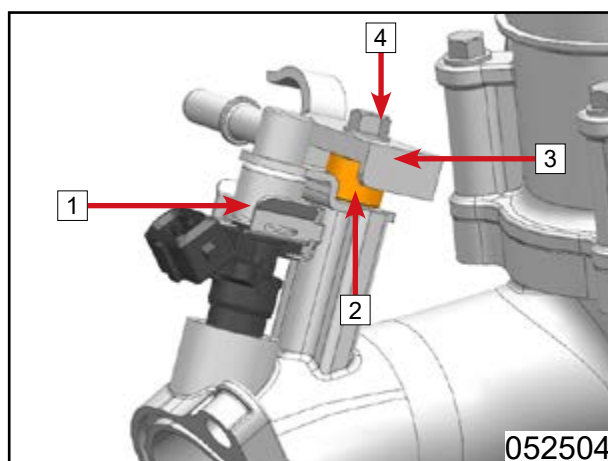
Install fuel injector [1].

Install bushing [2].

Install fuel injector hose bracket [3].

Install bolt [4].

The other fuel injector applies the same procedures.



052504

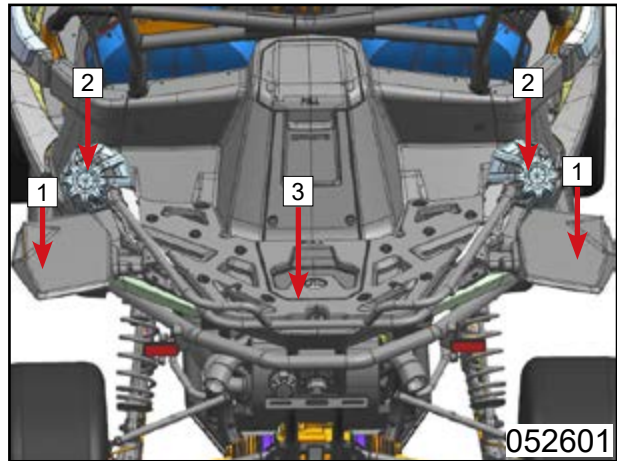
5.3.3 Air Exhaust System

5.3.3.1 Muffler Assy Removal

Remove rear LH&RH fenders [1].

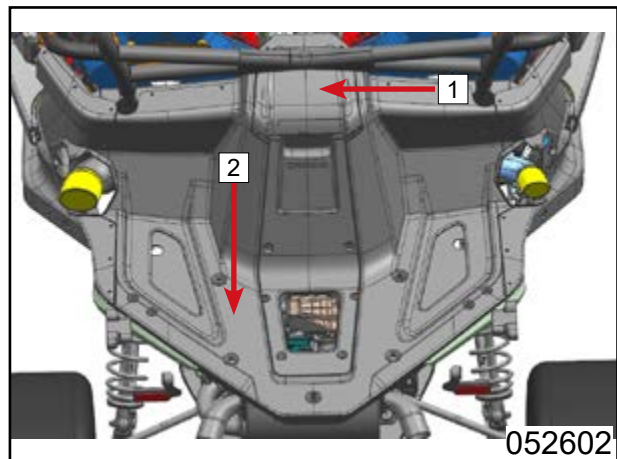
Remove CVT LH&RH outer deco plates [2].

Remove rear rack assy [3] (refer to Body Covering Parts chapter).



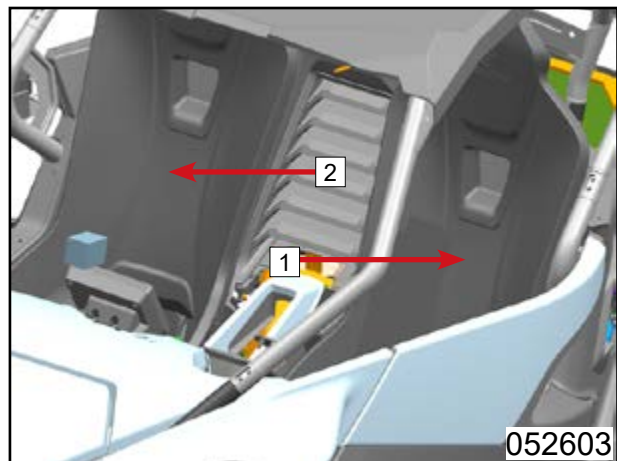
Remove air filter cover [1] and three bolts.

Remove cargo box base plate assy [2] (refer to Body Covering Parts chapter).



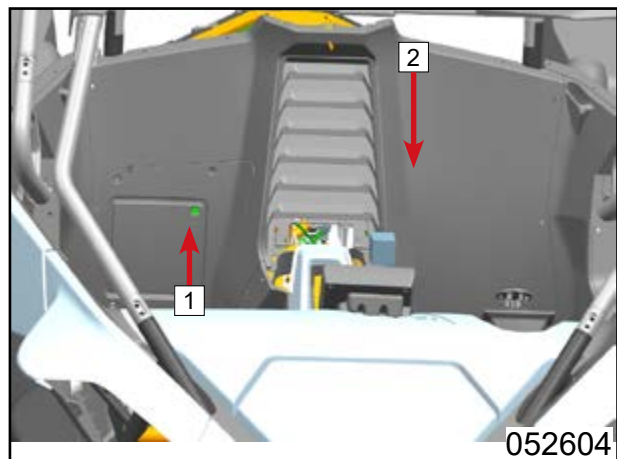
Remove driver seat [1].

Remove passenger seat [2] (refer to Seat section).

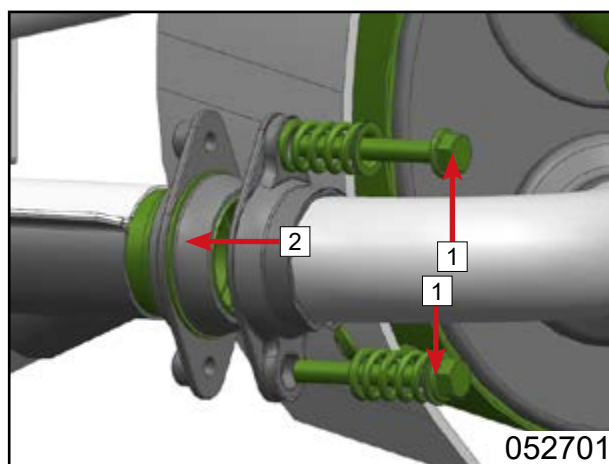


Remove ECU cover [1] and then remove the ECU, diagnosis connector.

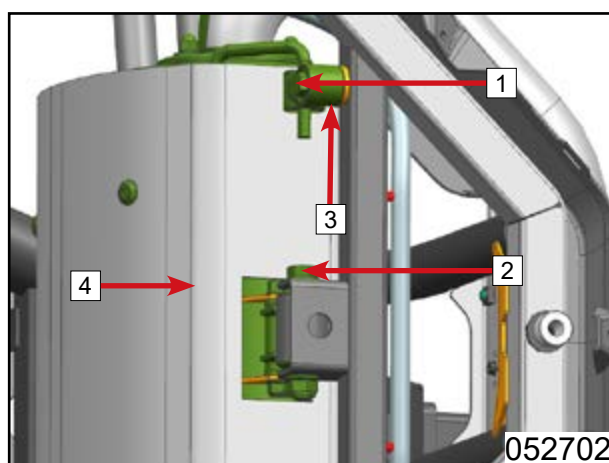
Remove seat rear back plate assy [2] (refer to Seat section).



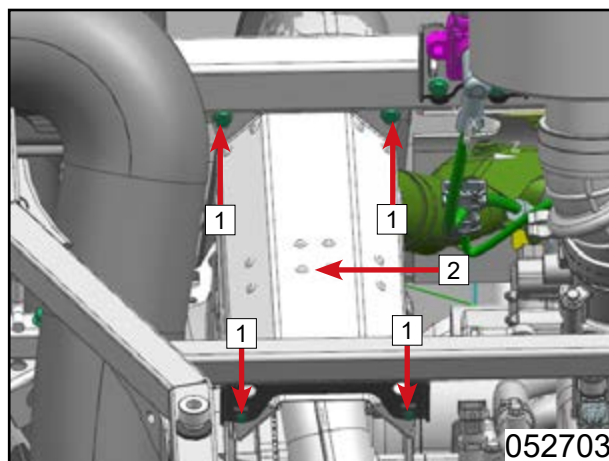
Remove bolts **1** and springs.
Remove graphite seal ring **2**.



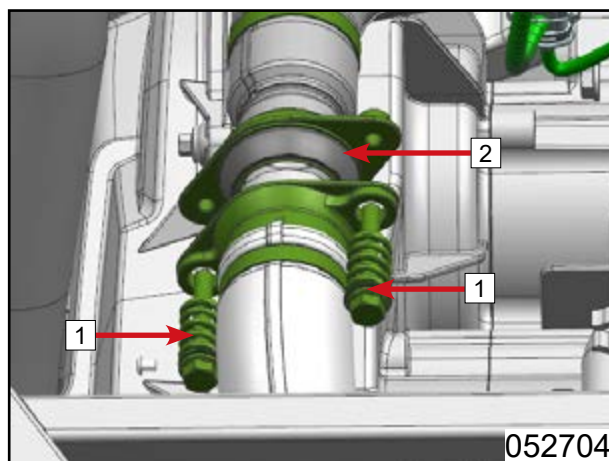
Remove bolt **1**.
Remove bolt **2**.
Remove engine upper mounting bracket **3**.
Remove muffler body assy **4**.



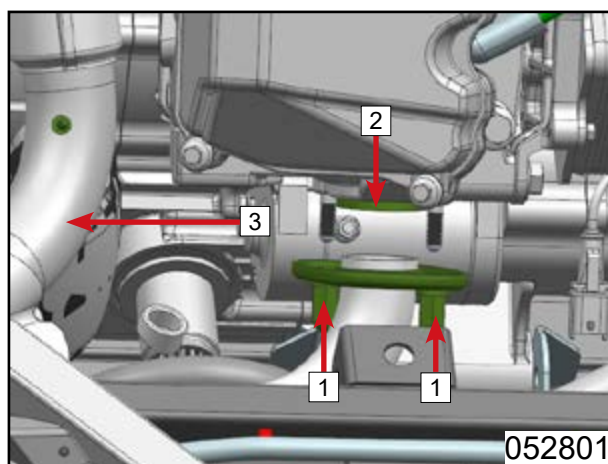
Remove bolts **1**.
Remove heat insulator **2**.



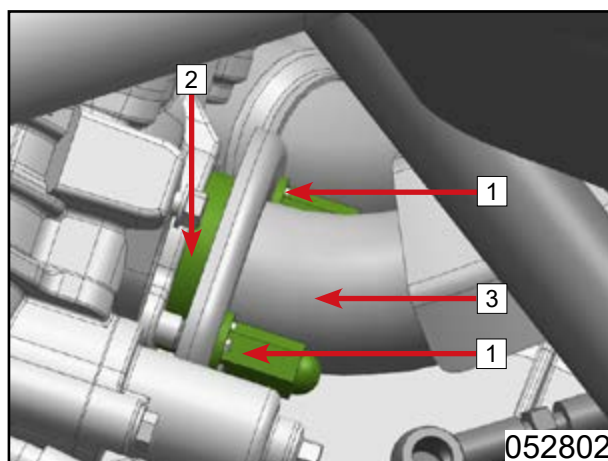
Remove bolts **1** with springs and washers.
Remove graphite seal ring **2**.



- Remove muffler nuts [1].
- Remove graphite seal ring [2].
- Remove muffler rear pipe assy [3].

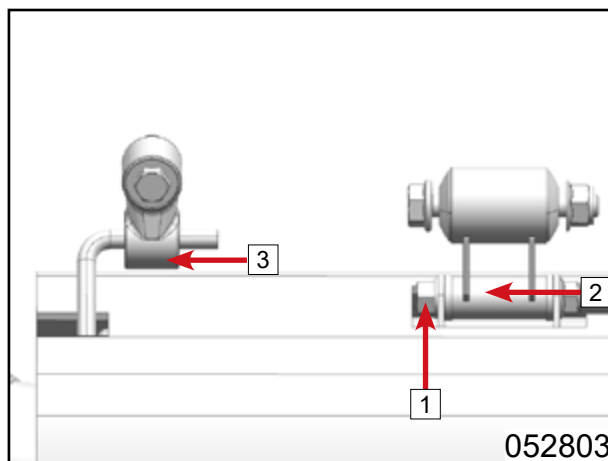


- Remove muffler joint nuts [1].
- Remove graphite seal ring [2].
- Remove muffler front pipe assy [3].

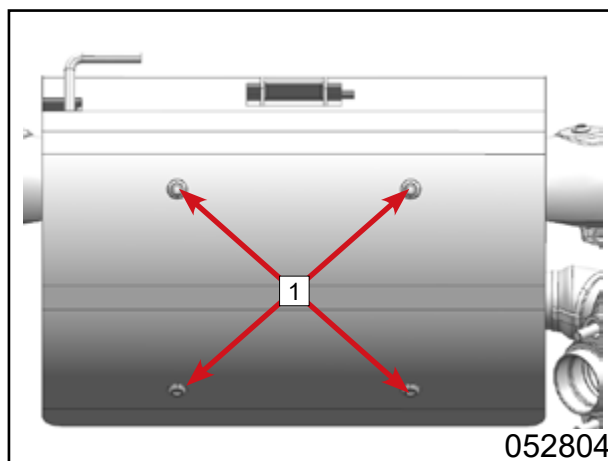


5.3.3.2 Muffler Parts Inspection Muffler Body Assy Disassembly

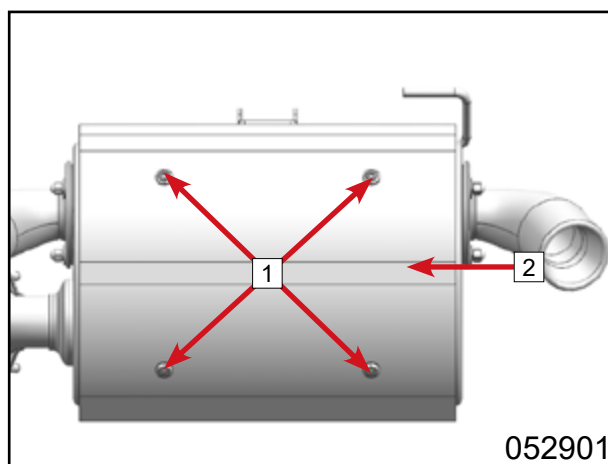
- Remove bolt [1].
- Remove muffler hanging bracket assy [2].
- Remove engine upper bracket [3].



- Remove M6 inner hex screws [1].



Remove M6 inner hex screws [1].
Remove muffler heat insulator [2].

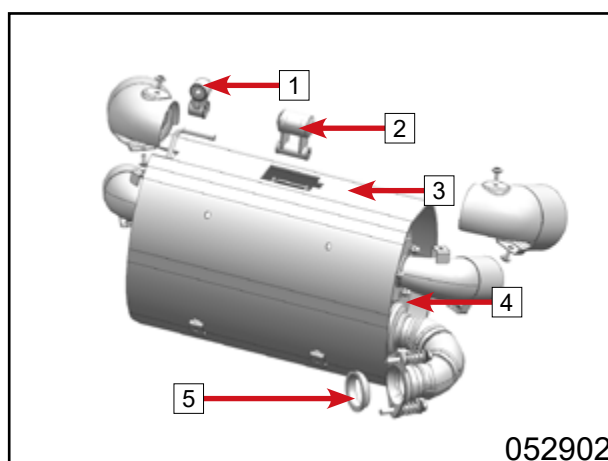


Inspection

Inspect engine upper bracket [1], muffler hanging bracket assy [2], muffler heat insulator [3], muffler body assy [4], graphite seal ring [5] for damage. Replace if necessary.

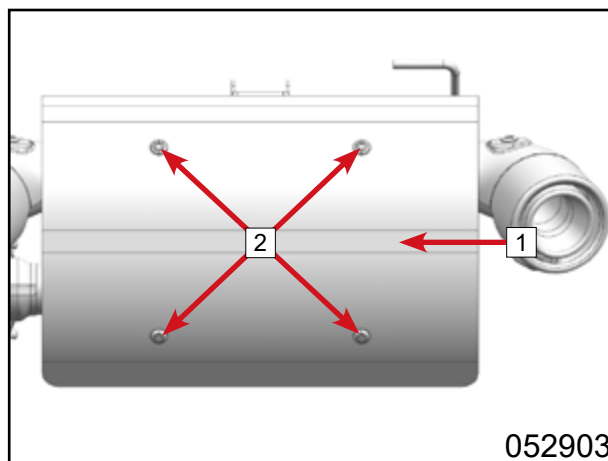
If exhaust air leaks in muffler junction area, inspect graphite seal ring [5] for damage. Replace if necessary.

Engine upper bracket [1] and muffler hanging bracket assy [2] should be inspected periodically. Replace if damaged.

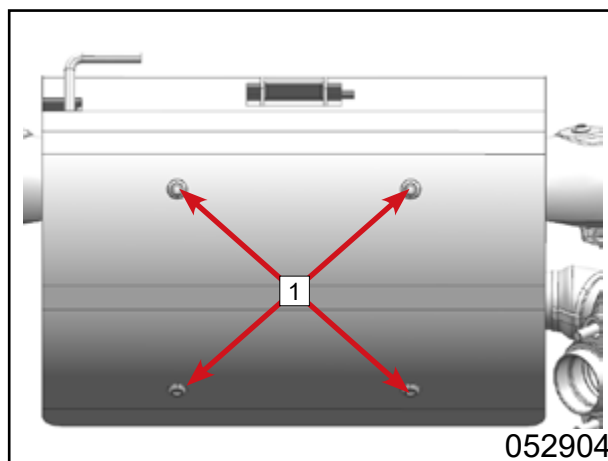


Installation

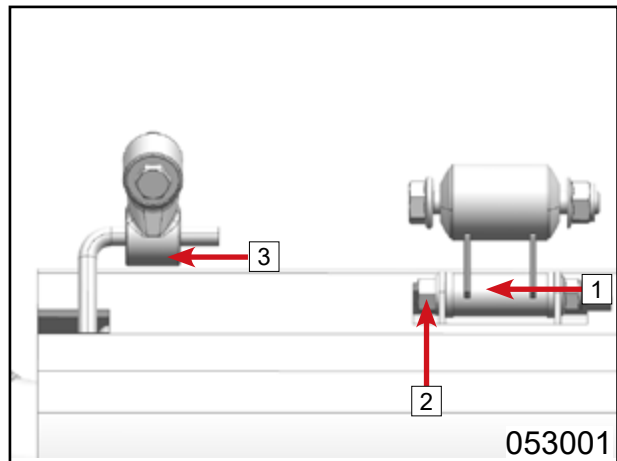
Install muffler heat insulator [1].
Install inner hex screws [2].



Install inner hex screws [1].

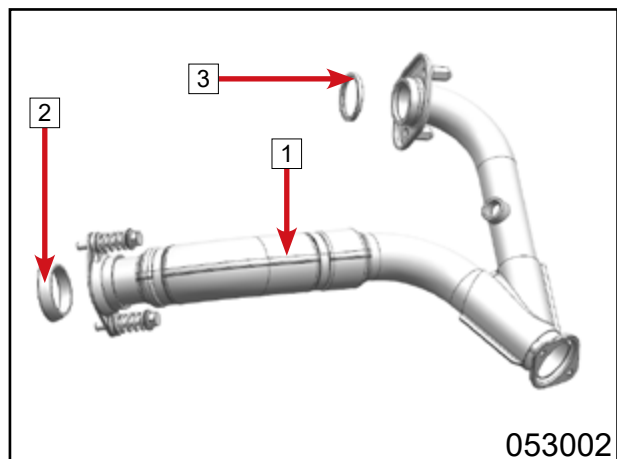


Install muffler hanging bracket assy [1].
 Install bolt [2].
 Install engine upper bracket [3].



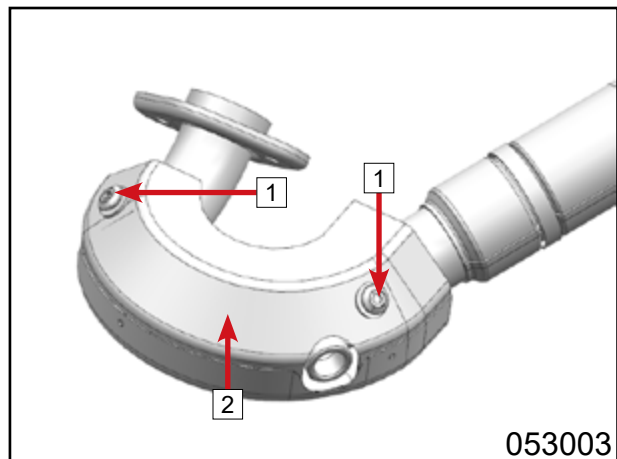
Muffler Rear Pipe Assy

Inspect muffler rear pipe assy [1] for damage. Replace if it does.
 If the junction area of muffler occurs to smoke leaking, inspect graphite seal ring [2]. Replace if damaged.
 If the junction area between first cylinder and muffler occurs to smoke leaking, inspect graphite seal ring [2]. Replace if damaged.



Muffler Front Pipe Assy Disassembly

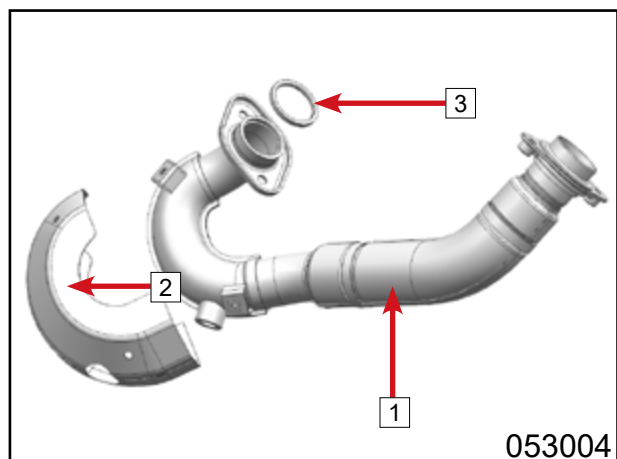
Remove M6 inner hex screws [1] with washers.
 Remove front pipe heat insulator parts [2].



Inspection

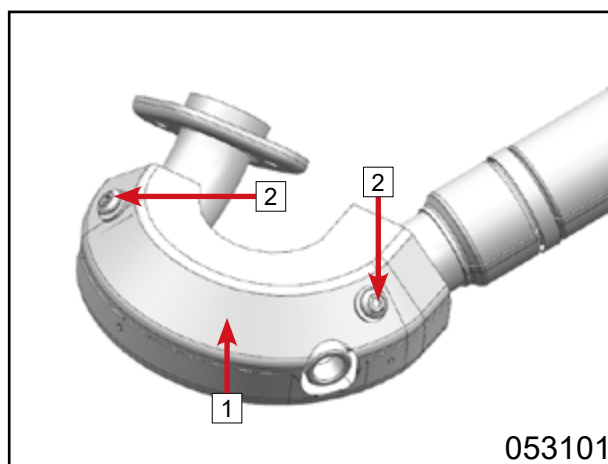
Inspect muffler front pipe assy [1] and heat insulator parts [2] for damage. Replace if necessary.

If the junction area between second cylinder and muffler occurs to smoke leaking, inspect graphite seal ring [3]. Replace if damaged.

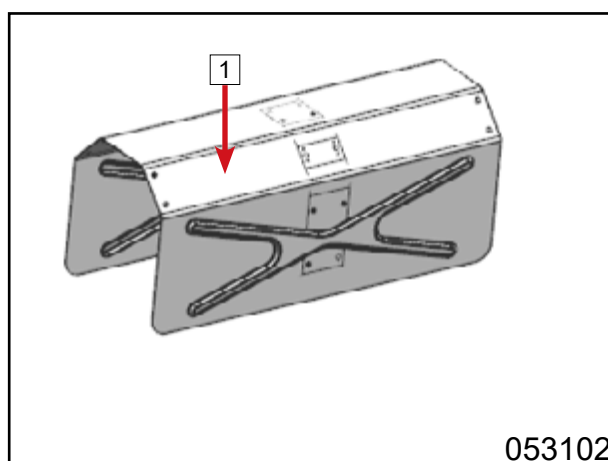


Assembly

Install front pipe heat insulator parts [1].
Install inner hex screws [2].

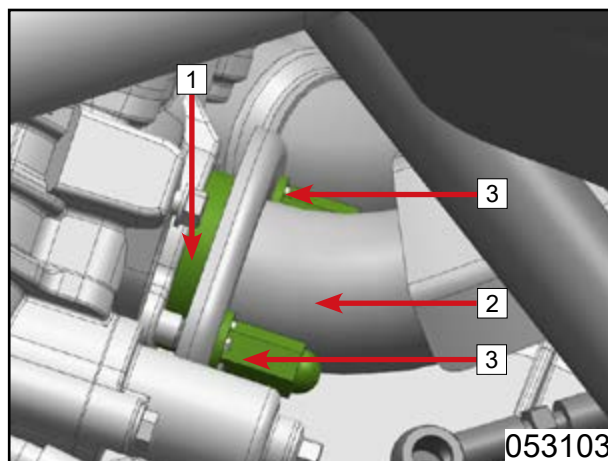


Inspect heat insulator parts [1] for damage.
Replace if necessary.

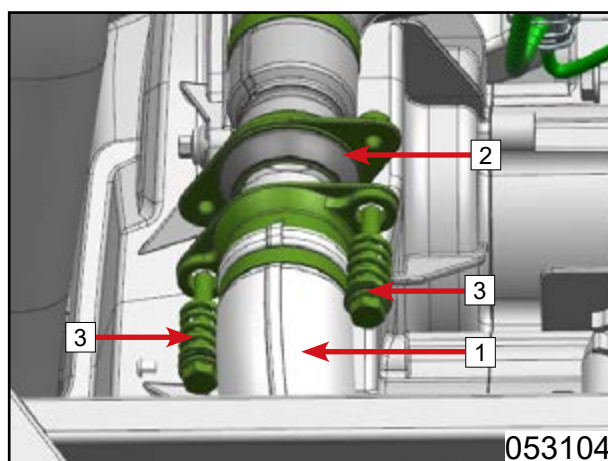


5.3.3.3 Muffler Assy Assembly

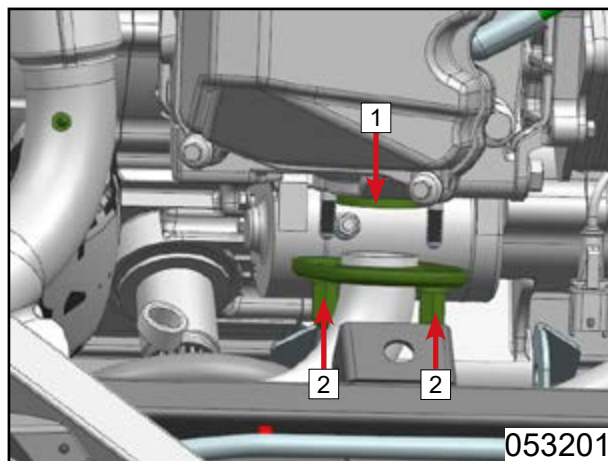
Install graphite seal ring [1].
Install front pipe heat insulator parts [2].
Install muffler joint nuts [3].



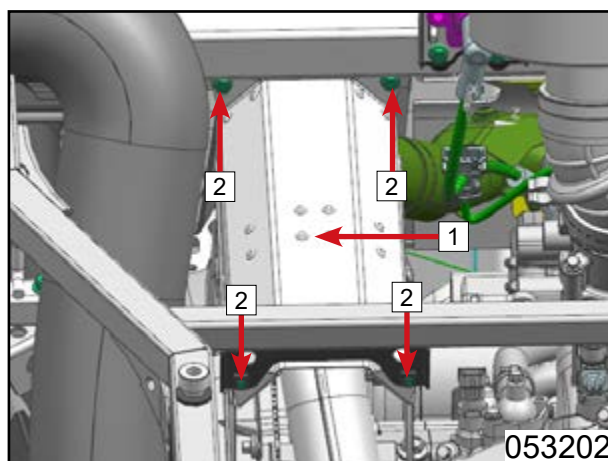
Install muffler rear pipe assy [1].
Install graphite seal ring [2].
Install bolts [3] with springs and washers.



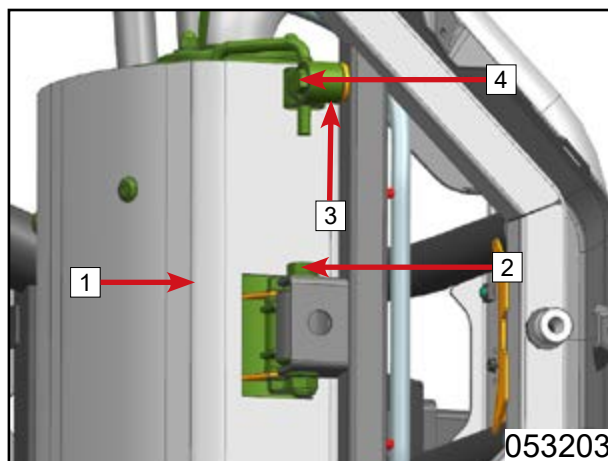
Install graphite seal ring [1].
Install muffler joint nuts [2].



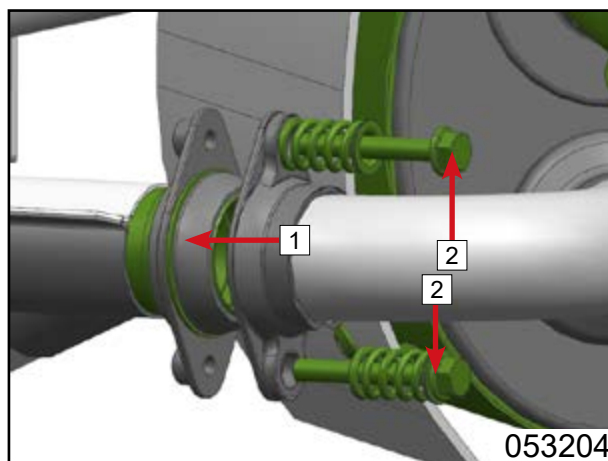
Install heat insulator [1].
Install bolts [2].



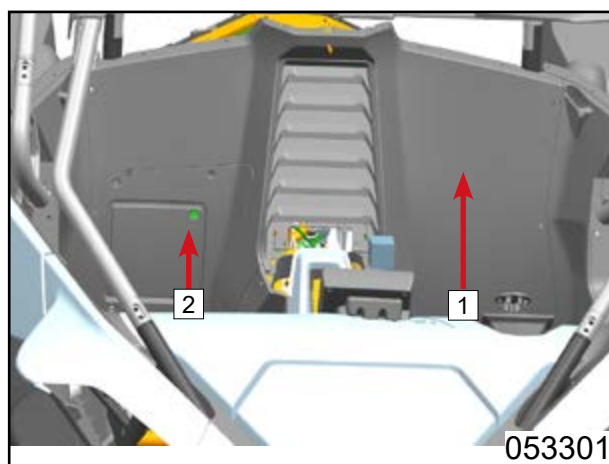
Install muffler body assy [1].
Install bolt [2].
Install engine upper bracket [3].
Install bolt [4].



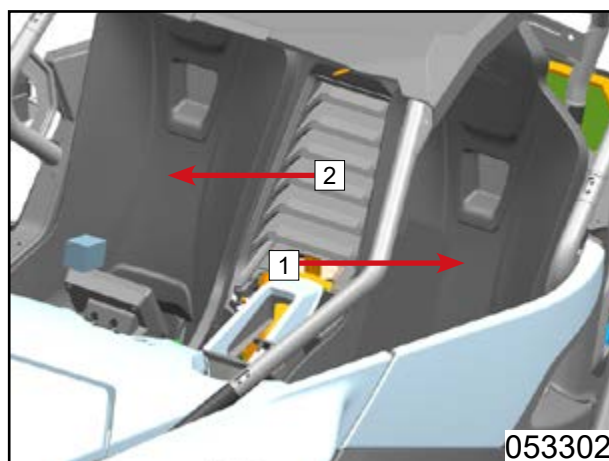
Install graphite seal ring [1].
Install bolts [2] with springs.



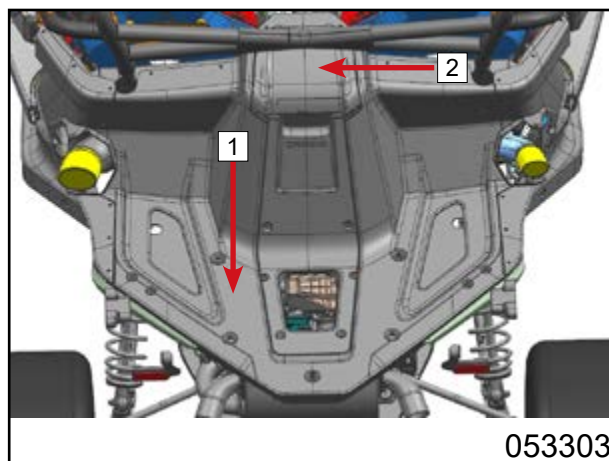
Connect oxygen sensor connectors.
Install seat rear back plate assy [1].
Install ECU, ECU service cover [2] and diagnosis connector.
(refer to **Body Covering Parts** chapter).



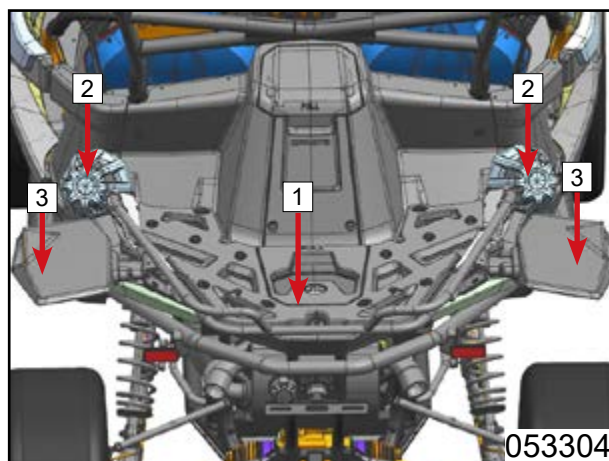
Install driver seat [1].
Install passenger seat [2].
(Installation procedures refer to **Seat** section.)



Install cargo box base plate assy [1].
Install three bolts and air filter cover [2]
(refer to **Body Covering Parts** chapter).



Install rear rack assy [1].
Install CVT LH&RH outer deco covers [2].
Install LH&RH rear fenders [3].
(Installation procedures refer to **Body Covering Parts** chapter.)



5.3.3.4 Air Filter Element

Removal

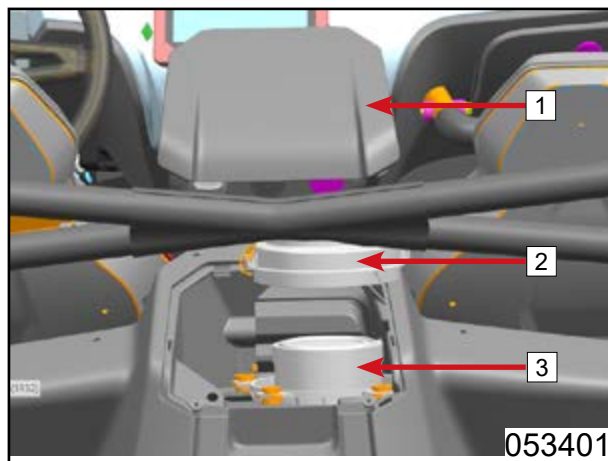
Remove air filter cover [1].

Loosen clasps to remove air filter protection cover [2].

Remove air filter element [3].

Installation

Reverse the removal procedures for installation.



5.4 Engine Disassembly

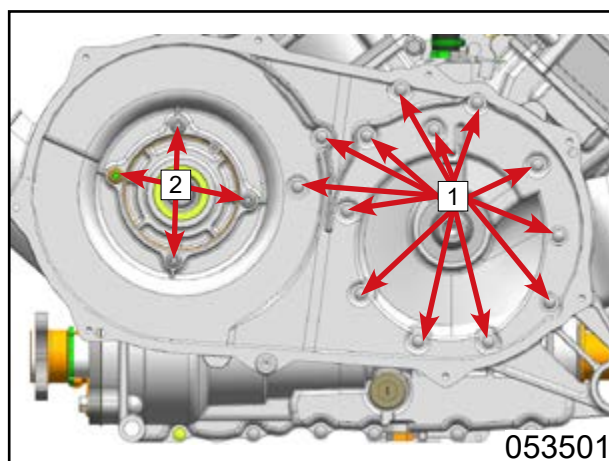
Put engine on work bench and fixate it, in case the engine falls down to cause injury and damage.

5.4.1 CVT

CVT removal procedures refer to 04 CVT chapter.

Remove bolts [1].

Remove nuts [2].



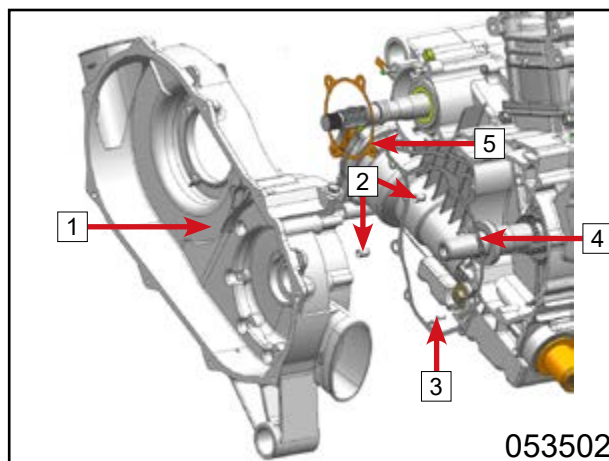
Remove CVT case [1].

Remove dowel pins [2].

Remove roller needle [3].

Remove seal gasket [4].

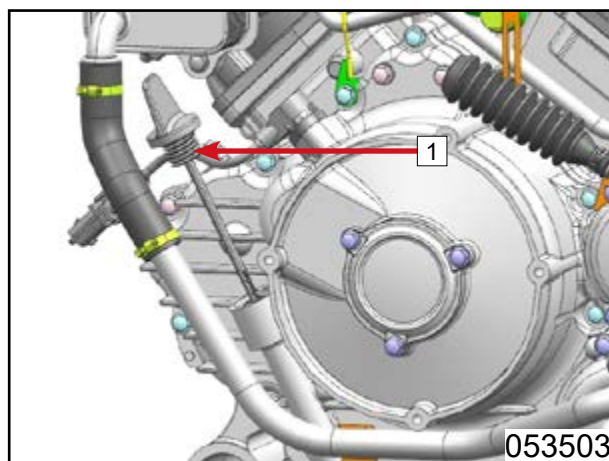
Remove seal gasket [5].



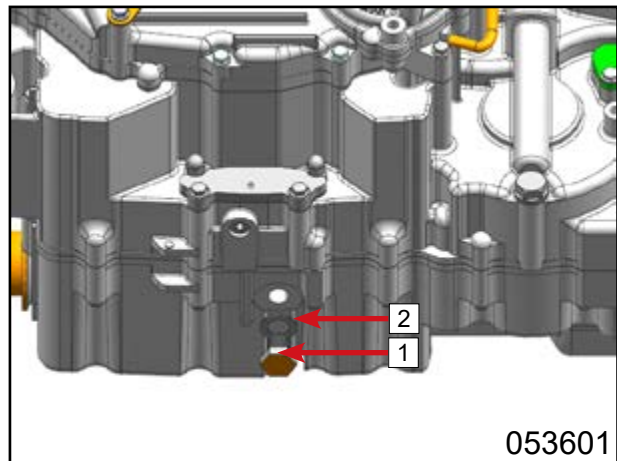
5.4.2 Engine Oil and Transmission Oil Drain

Engine Oil

Remove oil dipstick [1].

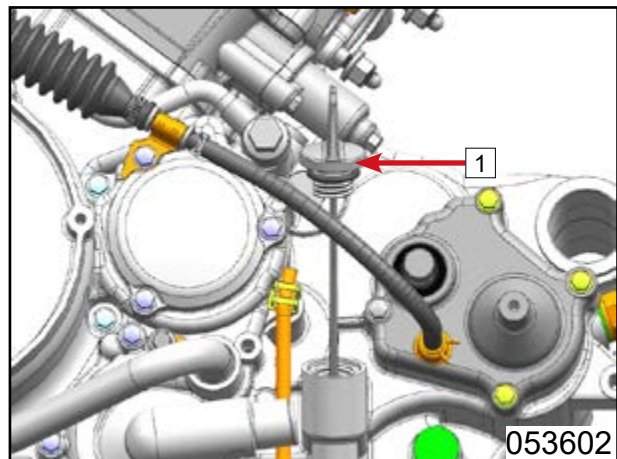


Put a container under magnetic drain bolt to store the drained engine oil.
Remove magnetic drain bolt [1].
Remove washer [2].

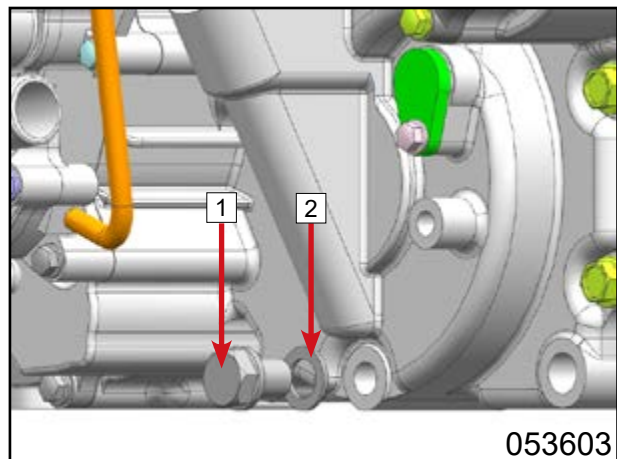


Transmission Oil

Remove oil dipstick [1].

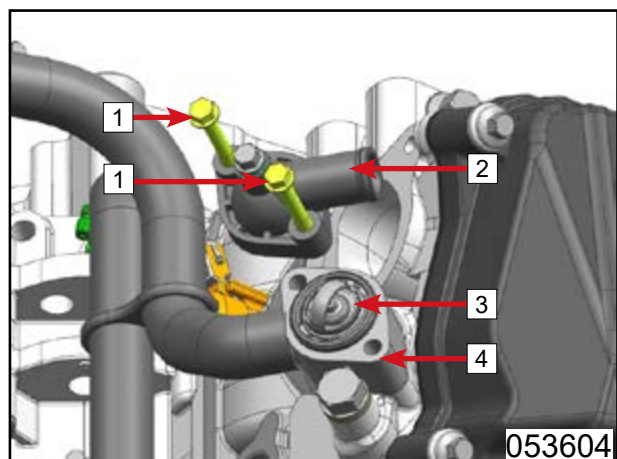


Put a container under magnetic drain bolt to store the drained engine oil.
Remove magnetic drain bolt [1].
Remove washer [2].

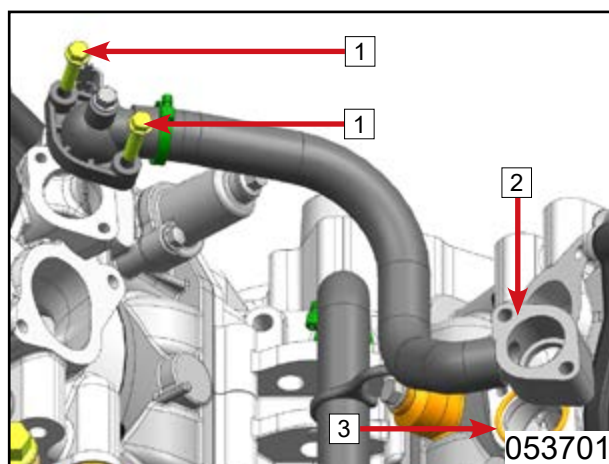


5.4.3 Thermostat and Thermostat Seat

Remove bolts [1].
Remove thermostat cover [2].
Remove thermostat [3].
The thermostat seat [4] separates from cylinder head.

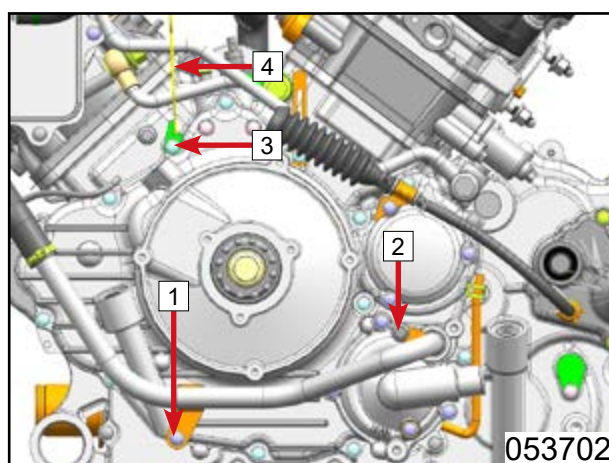


Remove bolts [1].
Remove the thermostat seat [2] and water pipe.
Remove o-seal ring [3].

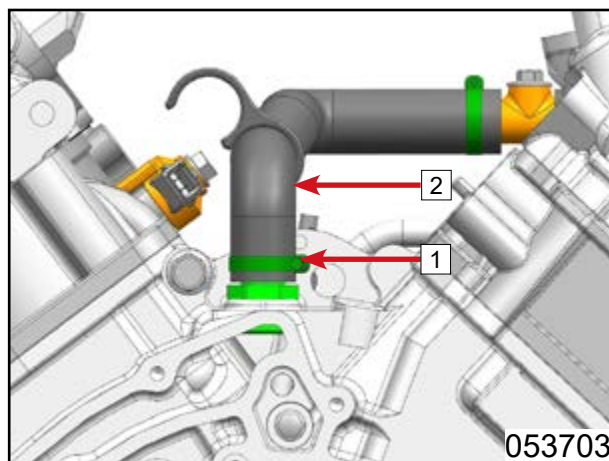


5.4.4 Oil Cooler

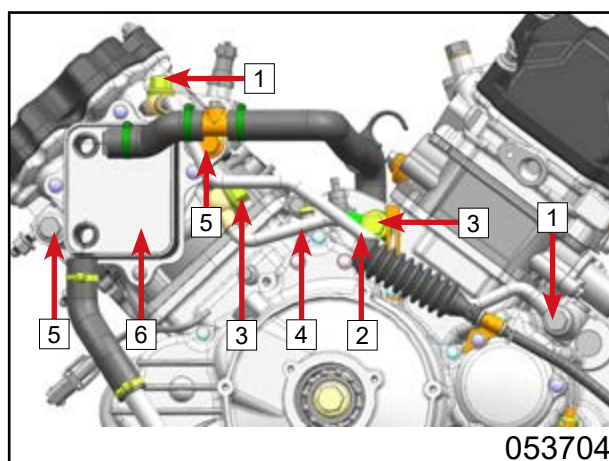
Remove bolt [1].
Remove bolt [2].
Remove bolt [3].
Remove water pipe bracket [4].



Loosen clamp [1].
Pull out oil cooler water outlet pipe [2].

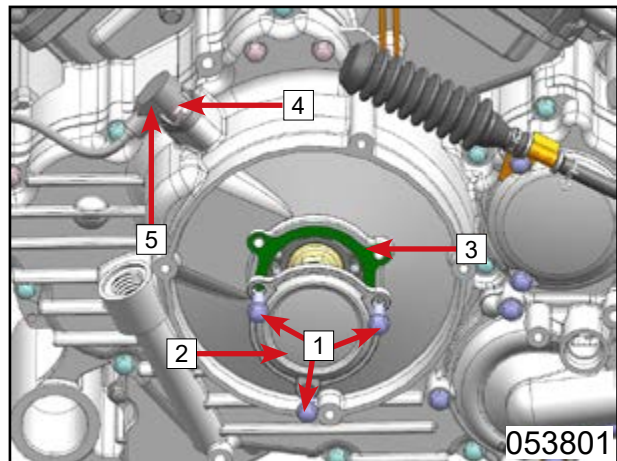


Remove bolts [1].
Remove oil cooler oil inlet pipe [2].
Remove bolts [3].
Remove oil cooler oil outlet pipe [4].
Remove bolts [5].
Remove oil cooler assy [6].

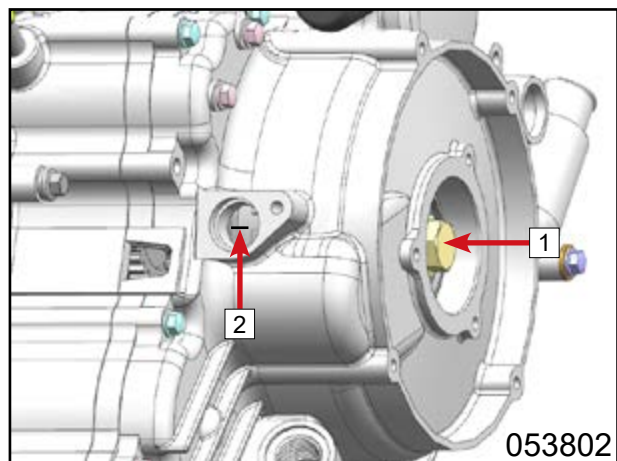


5.4.5 First Cylinder TDC Adjustment

- Remove bolts [1].
- Remove plug [2].
- Remove seal gasket [3].
- Remove bolt [4].
- Remove RPM sensor [5].



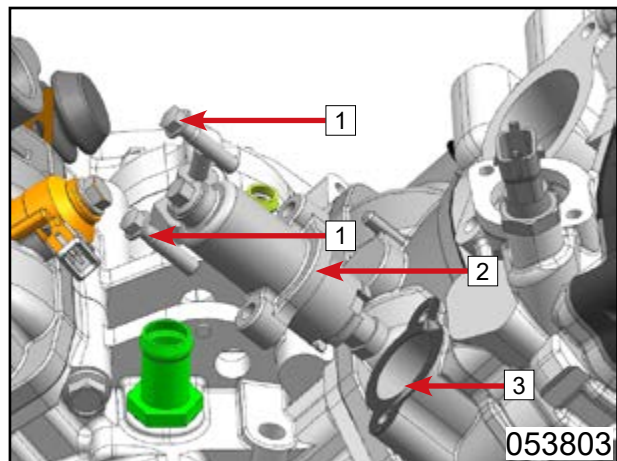
Use a socket to rotate bolt [1] counter-clockwise. Watch the mark "I" [2] through viewing hole. Rotate using the socket until the mark is at the center of the hole. Such position is the TDC of first (starter side) cylinder.



5.4.6 First Cylinder Tensioner

- Remove bolts [1].
- Remove tensioner [2].
- Remove seal gasket [3].

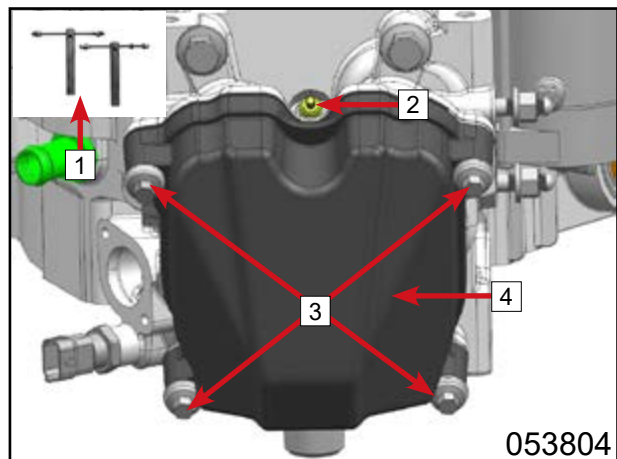
NOTE: Make marks on tensioners during removal, to prevent getting mixed up during installation.



5.4.7 First Cylinder Head Cover

- Use special tool: Spark Plug Wrench [1] (0800-022800-922-001) to remove spark plug [2].
- Remove bolts [3].
- Remove first cylinder head cover [4] and seal ring.

NOTE: Make marks on cylinder head covers during removal, to prevent getting mixed up during installation.



5.4.8 First Cylinder Head

NOTE: The timing sprocket scale **1** should be at the position as picture shows, paralleling with cylinder head lower surface **2**.

Remove timing sprocket bolt **3**.

Remove timing sprocket **4**.

NOTE: Hook timing chain after removing sprocket, in case the chain falls inside the engine.

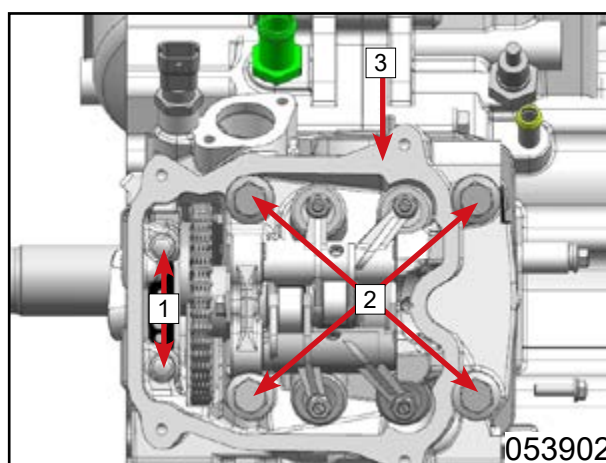
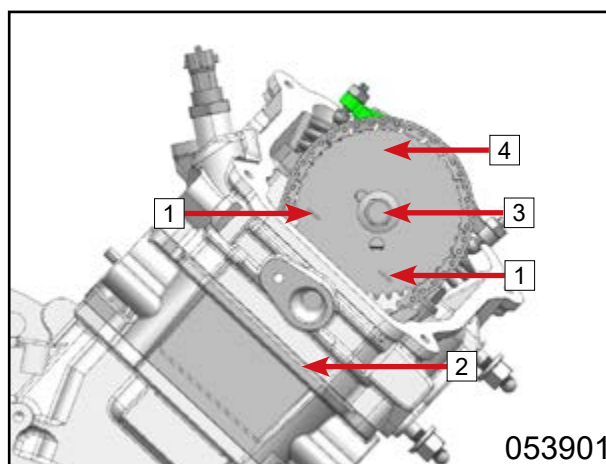
NOTE: Make marks on timing sprockets during removal, to prevent getting mixed up during installation.

Remove bolts **1**.

Remove bolts **2**.

Remove cylinder head **3**.

NOTE: Make marks on first cylinder head during removal, to prevent getting mixed up during installation.

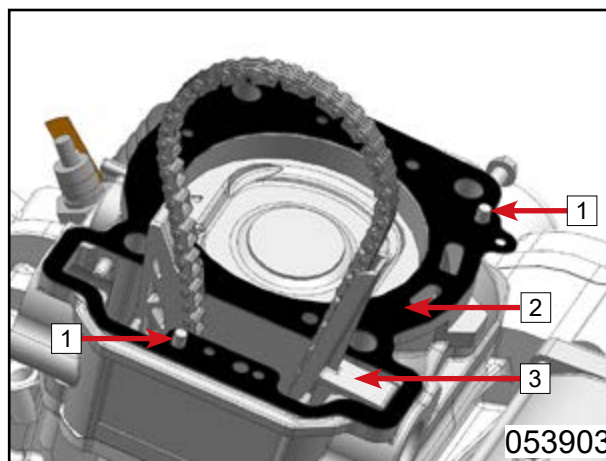


Remove roller needle **1**.

Remove cylinder head gasket **2**.

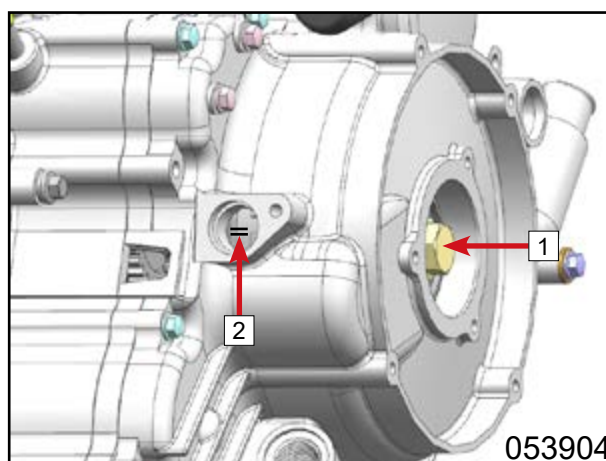
Remove chain guide **3**.

NOTE: Make marks on chain guides during removal, to prevent getting mixed up during installation.



5.4.9 Second Cylinder TDC Adjustment

When the first is at TDC, use a socket to rotate bolt **1** one 360-degree turn, then continue to rotate and watch for the mark "II" **2** through viewing hole. Rotate using the socket until the mark is at the center of the hole. Such position is the TDC of second (transmission side) cylinder.



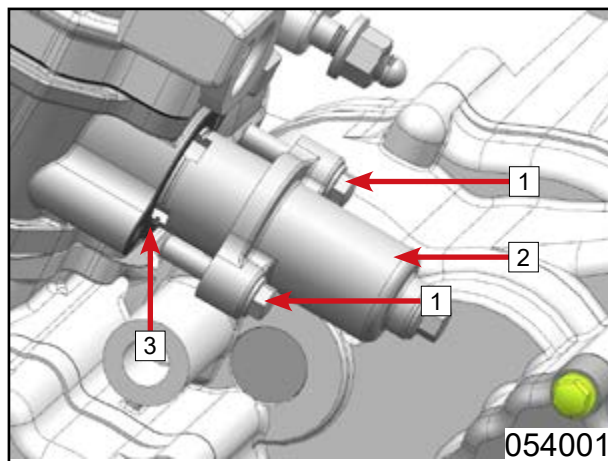
5.4.10 Second Cylinder Tensioner

Remove bolts [1].

Remove tensioner [2].

Remove seal gasket [3].

NOTE: Make marks on tensioner during removal, to prevent getting mixed up during installation.



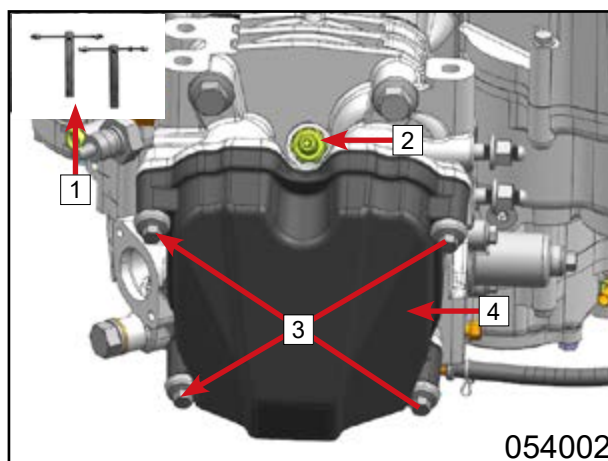
5.4.11 Second Cylinder Head Cover

Use special tool: Spark Plug Wrench [1] (0800-022800-922-001) to remove spark plug [2].

Remove bolts [3].

Remove second cylinder head cover [4] and seal ring.

NOTE: Make marks on cylinder head covers during removal, to prevent getting mixed up during installation.



5.4.12 Second Cylinder Head

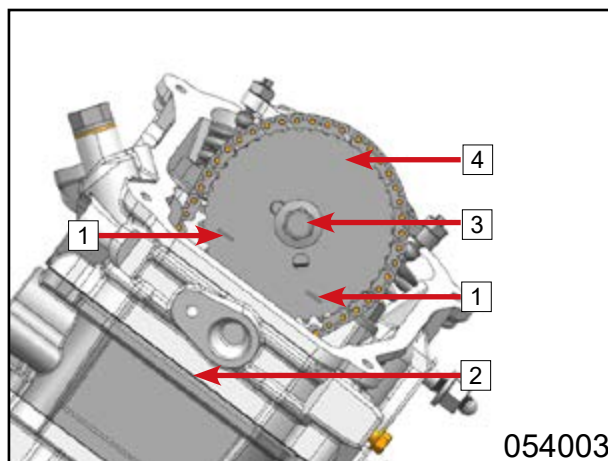
NOTE: The timing sprocket scale [1] should be at the position as picture shows, paralleling with cylinder head lower surface [2].

Remove timing sprocket bolt [3].

Remove timing sprocket [4].

NOTE: Hook timing chain after removing sprocket, in case the chain falls inside the engine.

NOTE: Make marks on timing sprockets during removal, to prevent getting mixed up during installation.

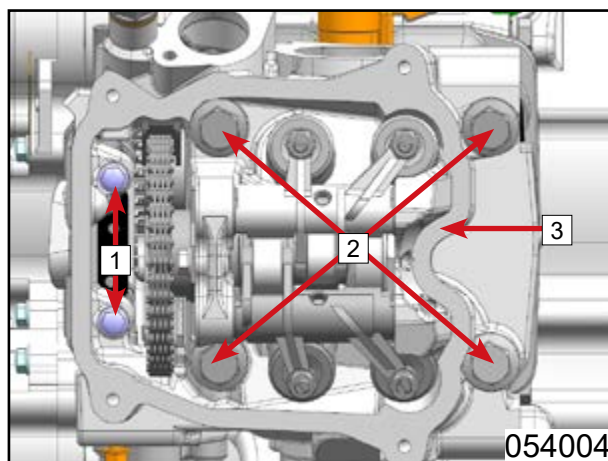


Remove bolts [1].

Remove bolts [2].

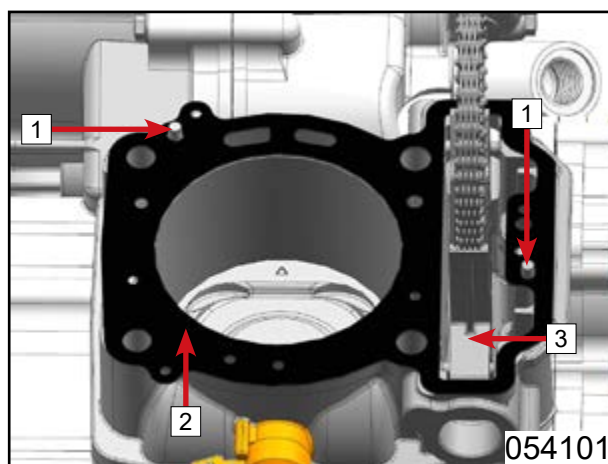
Remove cylinder head [3].

NOTE: Make marks on second cylinder head during removal, to prevent getting mixed up during installation.



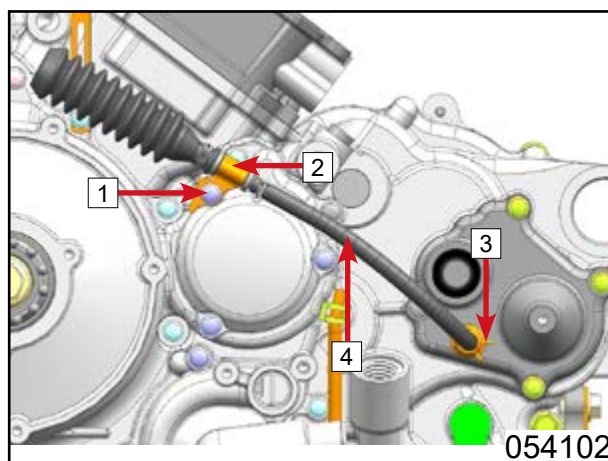
- Remove roller needle [1].
- Remove cylinder head gasket [2].
- Remove chain guide [3].

NOTE: Make marks on chain guides during removal, to prevent getting mixed up during installation.



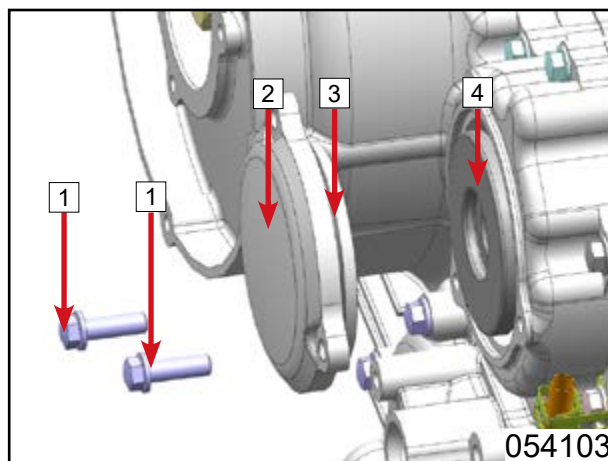
5.4.13 Air Bag

- Remove bolt [1].
- Remove air bag bracket [2].
- Remove clamp [3].
- Remove air bag [4].



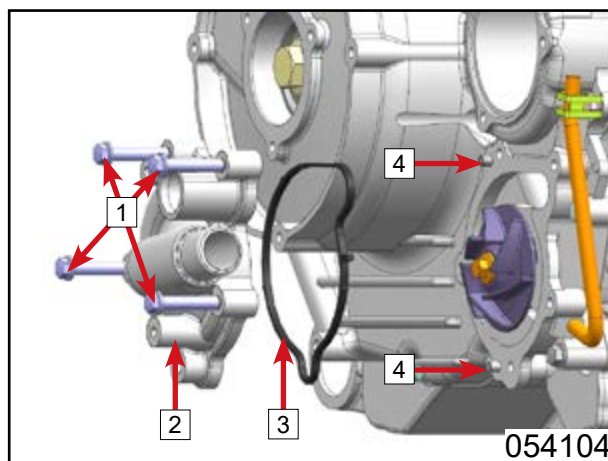
5.4.14 Oil Filter

- Remove bolts [1].
- Remove oil filter cover [2].
- Remove o-ring [3] from oil filter cover.
- Remove oil filter element [4].



5.4.15 Water Pump

- Remove bolts [1].
- Remove water pump cover [2].
- Remove seal ring [3] from water pump.
- Remove roller needle [4].

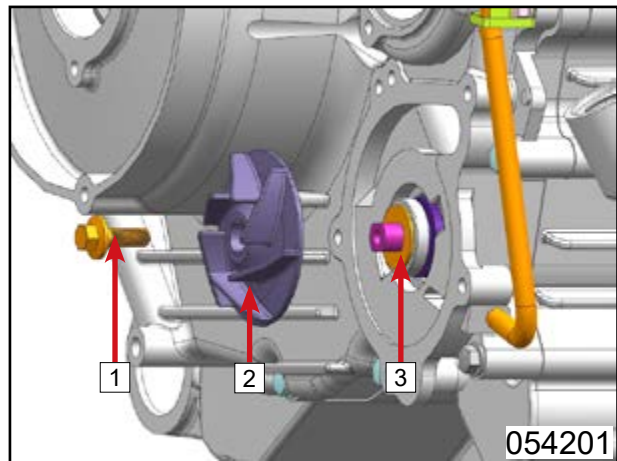


Remove bolt [1].

Remove water pump impeller [2].

Remove water seal washer [3].

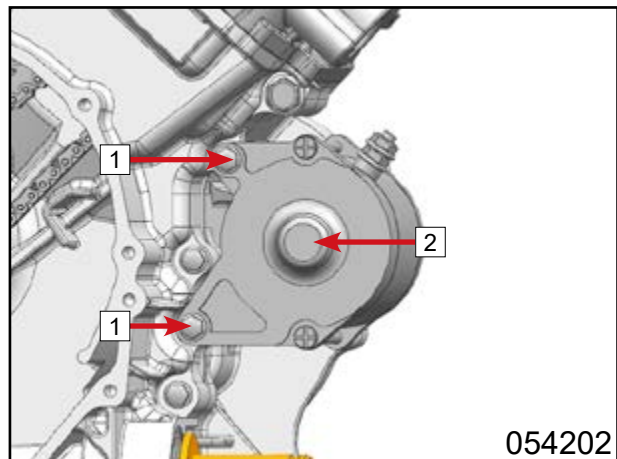
NOTE: Pay attention not to damage water pump impeller during removal. The bolt [1] is left-hand thread.



5.4.16 Starter Motor

Remove bolts [1].

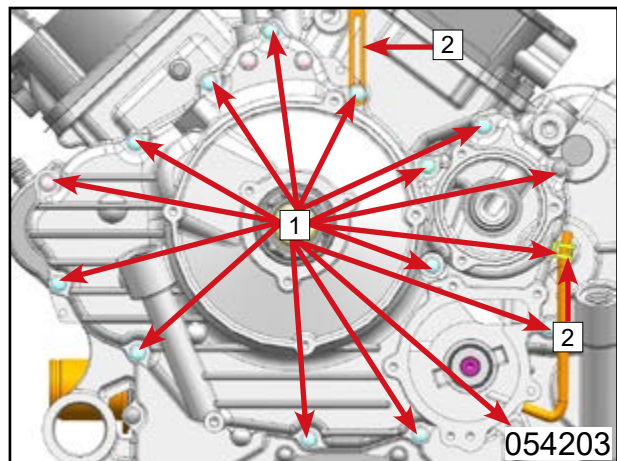
Remove starter motor [2].



5.4.17 MAG Crankcase Cover

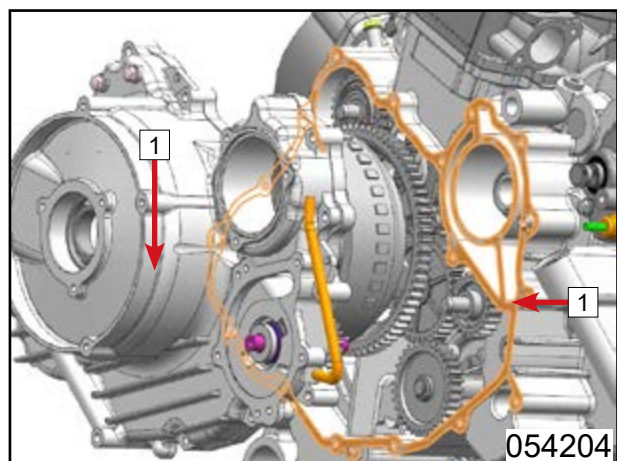
Remove bolts [1].

Remove wire clips [2].

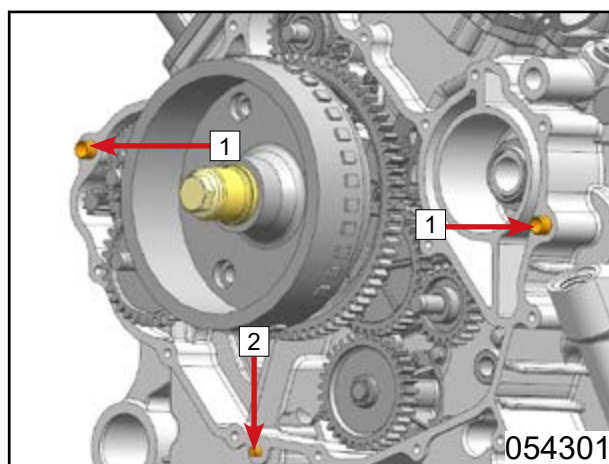


Remove MAG crankcase cover [1].

Remove seal gasket [2].

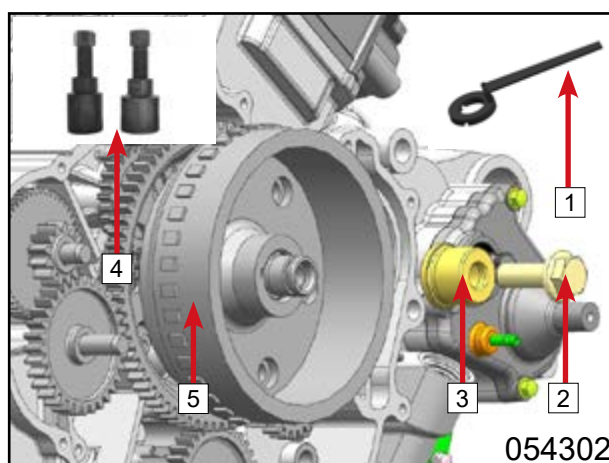


Remove dowel pins [1].
Remove roller needle [2].

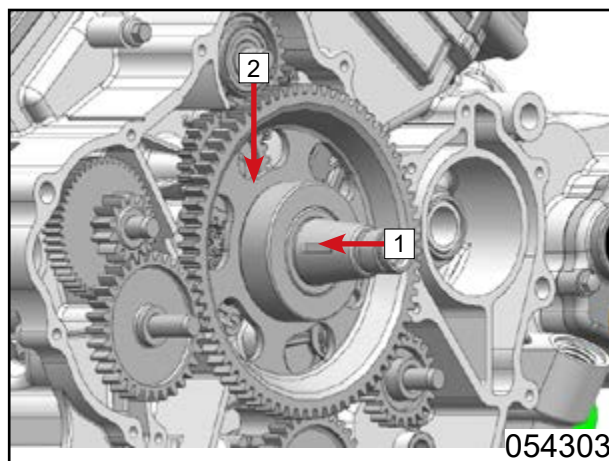


5.4.18 Magneto Rotor

Use special tool: Magneto Rotor Holding Wrench [1] to fix rotor [5].
Remove bolt [2].
Remove spacer [3].
Use special tool [4] to remove magneto rotor [5].

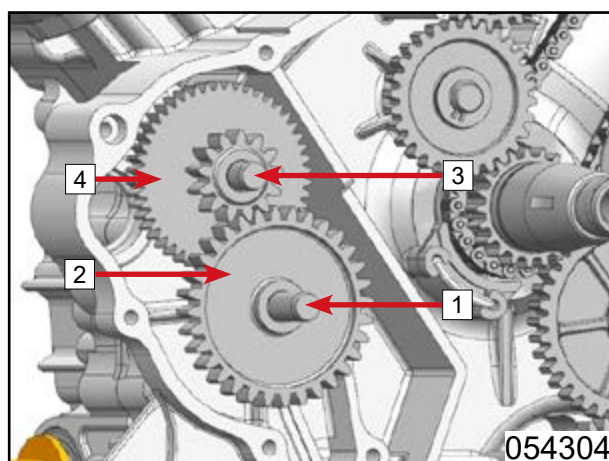


Remove woodruff key [1].
Remove driven gear [2].



5.4.19 Starter Dual Gear

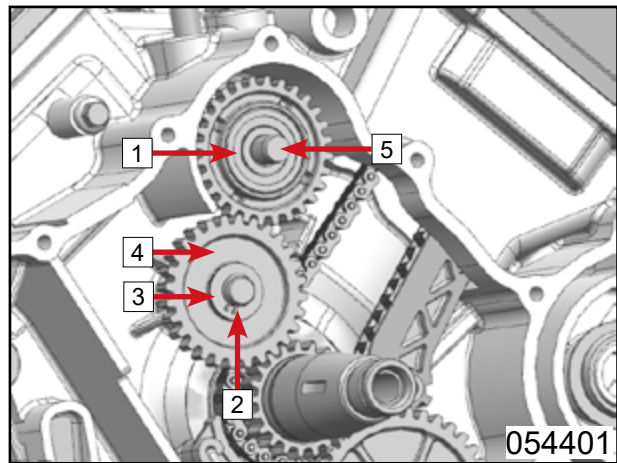
Remove breather shaft [1].
Remove middle gear [2].
Remove breather shaft [3].
Remove dual gear [4].



5.4.20 Breather Parts

- Remove breather part [1].
- Remove circlip [2].
- Remove washer [3].
- Remove breather idle gear [4].

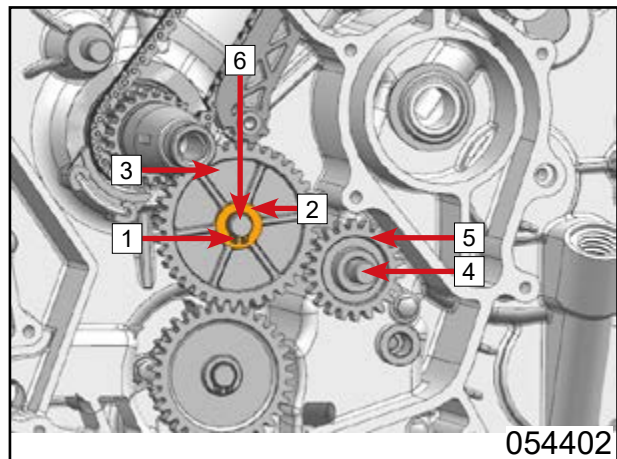
NOTE: The breather idle gear shaft [5] is not allowed to remove.



5.4.21 Oil Pump Idle Gear and Water Pump Idle Gear

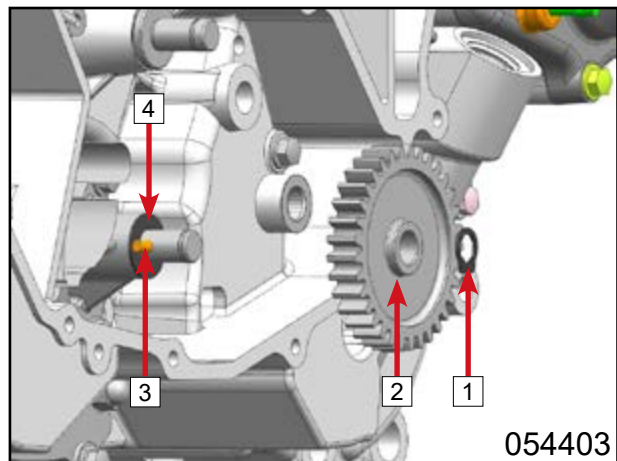
- Remove circlip [1].
- Remove washer [2].
- Remove oil pump idle gear [3].
- Remove breather shaft [4].
- Remove water pump idle gear [5].

NOTE: The breather idle gear shaft [6] is not allowed to remove.

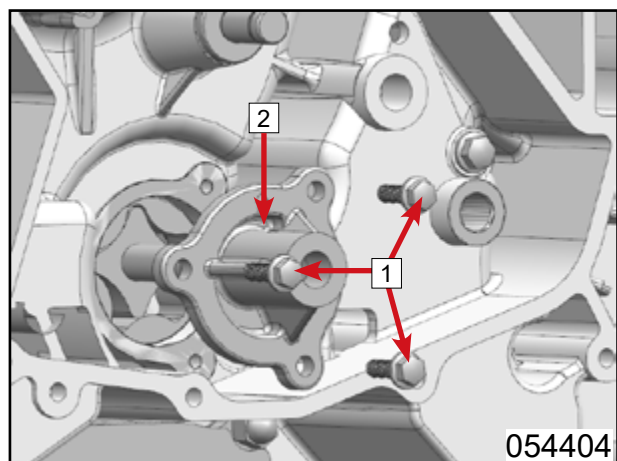


5.4.22 Oil Pump

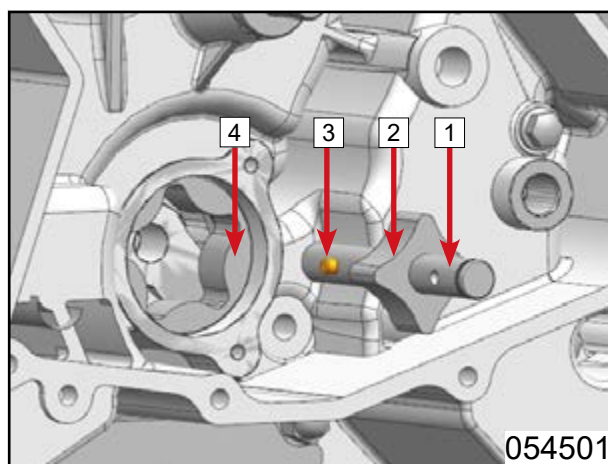
- Remove circlip [1].
- Remove oil pump gear [2].
- Remove roller needle [3].
- Remove washer [4].



- Remove bolts [1].
- Remove oil pump cover [2].

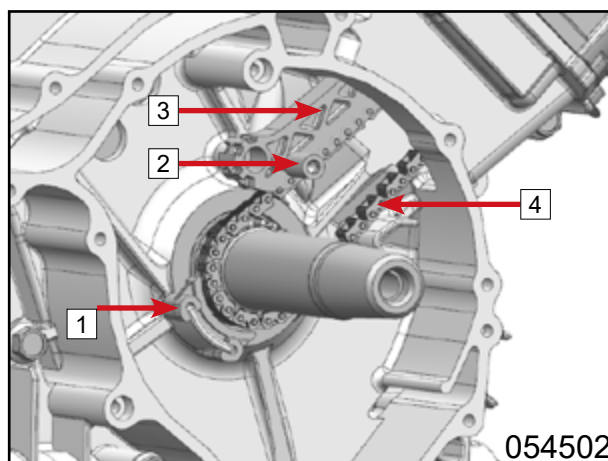


Remove oil pump shaft [1].
 Remove oil pump inner rotor [2] from oil pump shaft.
 Remove roller needle [3] from oil pump shaft.
 Remove oil pump outer rotor [4].



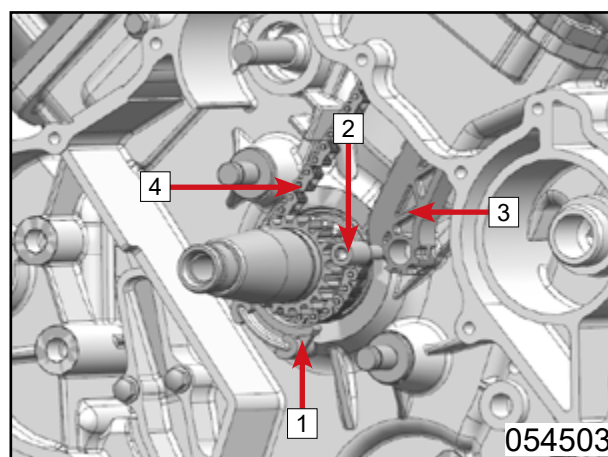
5.4.23 First Cylinder Timing Chain

Remove chain guard [1].
 Remove threaded pin shaft [2].
 Remove tensioner plate [3].
 Remove timing chain [4].



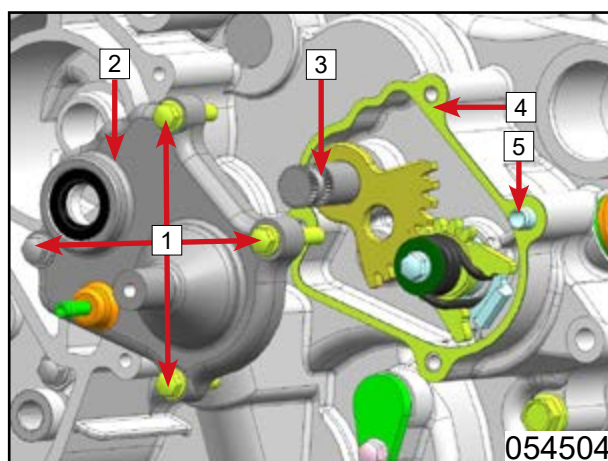
5.4.24 Second Cylinder Timing Chain

Remove chain guard [1].
 Remove threaded pin shaft [2].
 Remove tensioner plate [3].
 Remove timing chain [4].

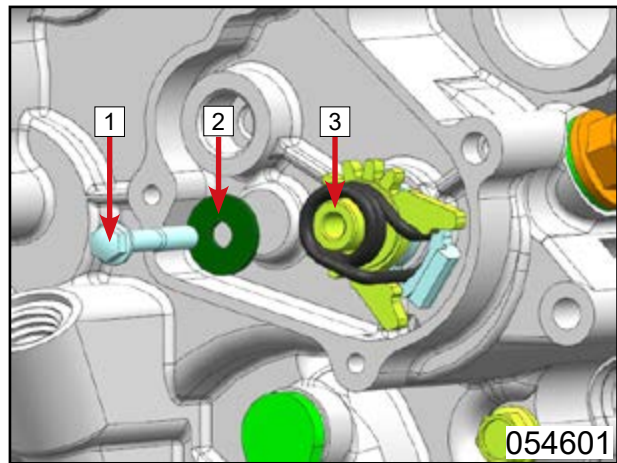


5.4.25 Gearshift Assy

Remove bolts [1].
 Remove gearshift cover [2].
 Remove gearshift drive sector gear assy [3].
 Remove gasket [4].
 Remove dowel pin [5].

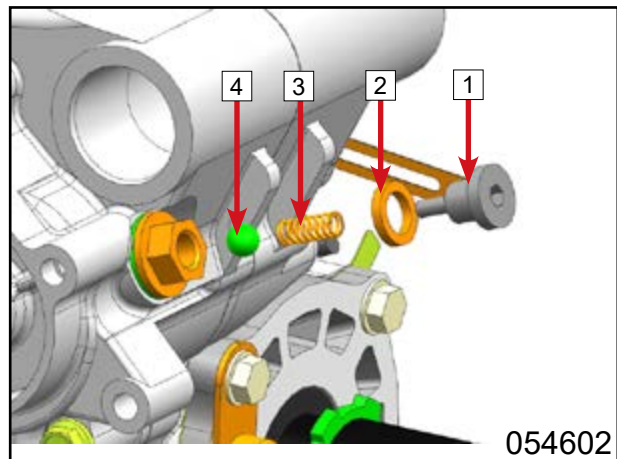


Remove bolt [1].
Remove washer [2].
Remove gearshift driven sector gear assy [3].



Remove gearshift limit spring seat [1].
Remove retainer [2].
Remove spring [3] and steel ball [4] with magnet.

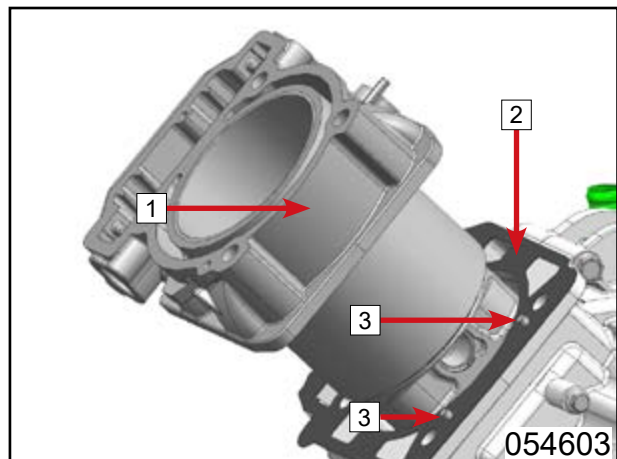
NOTE: Pay attention to retainer and steel ball during removal, in case they get lost.



5.4.26 First Cylinder and Piston

Remove first cylinder [1].
Remove seal gasket [2].
Remove roller needle [3].

NOTE: Make marks on cylinders during removal, to prevent getting mixed up during installation.

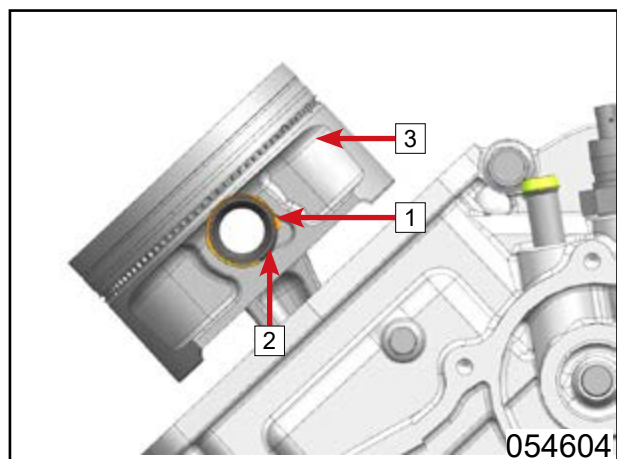


Rotate crankshaft until first cylinder piston exposes.

Remove from either side:

Remove piston pin circlip [1].
Remove piston pin [2].
Remove piston [3].

NOTE: Make marks on pistons during removal, to prevent getting mixed up during installation.



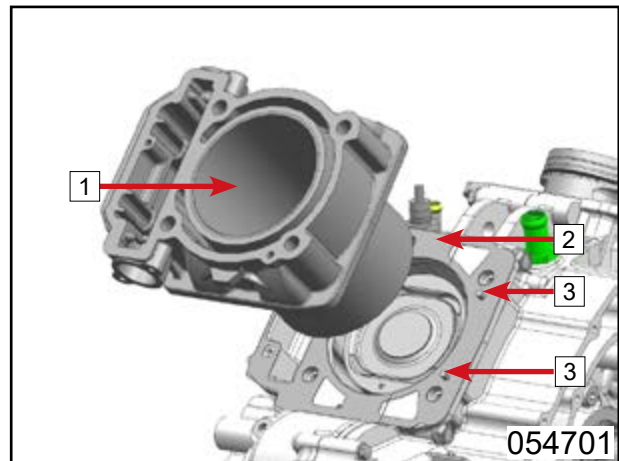
5.4.27 Second Cylinder and Piston

Remove second cylinder [1].

Remove seal gasket [2].

Remove roller needle [3].

NOTE: Make marks on cylinders during removal, to prevent getting mixed up during installation.



Rotate crankshaft until second cylinder piston exposes.

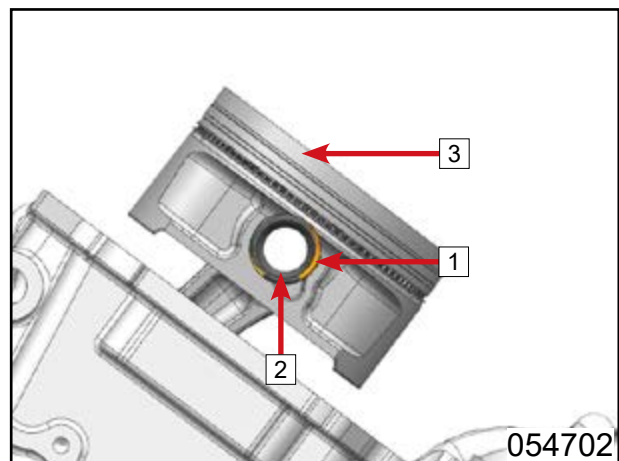
Remove from either side:

Remove piston pin circlip [1].

Remove piston pin [2].

Remove piston [3].

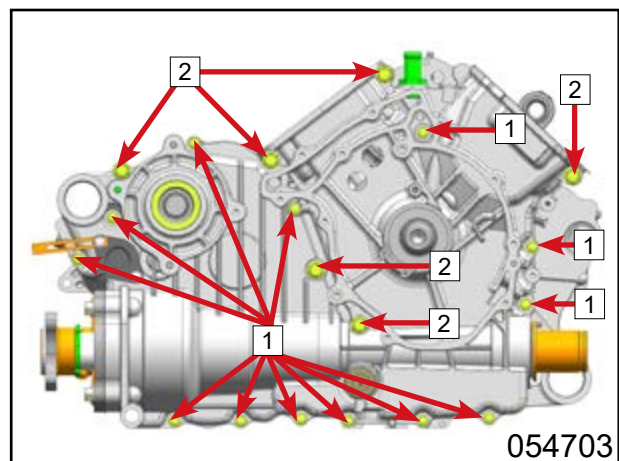
NOTE: Make marks on pistons during removal, to prevent getting mixed up during installation.



5.4.28 Crankcase Disassembly

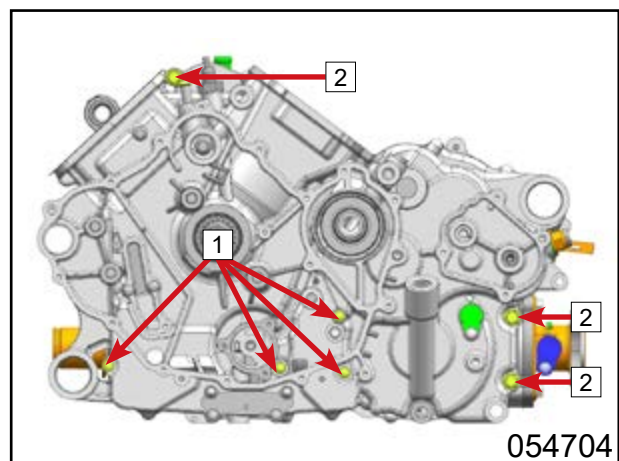
Remove bolts [1].

Remove bolts [2].

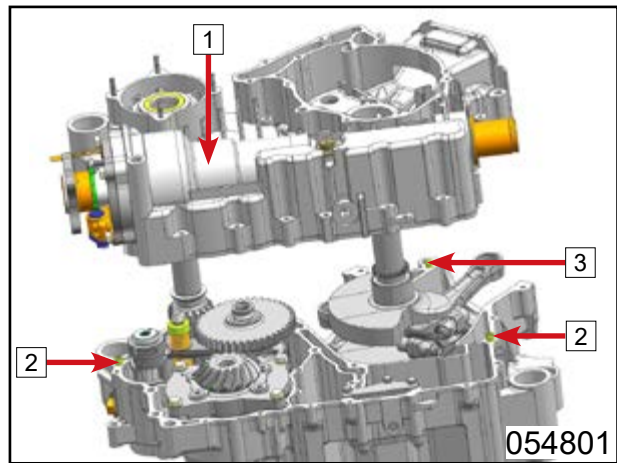


Remove bolts [1].

Remove bolts [2].

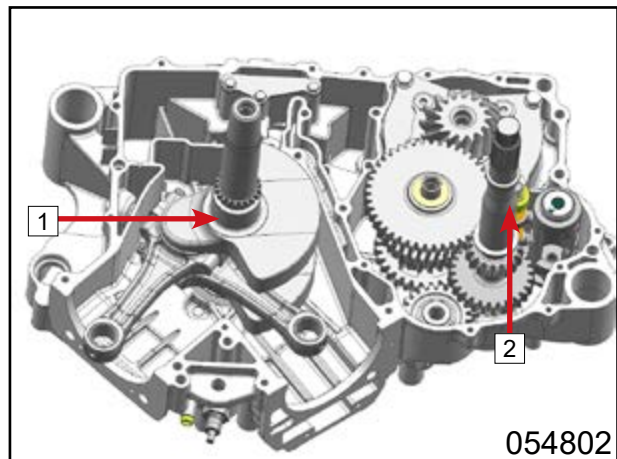


Remove PTO crankcase body [1].
 Remove dowel pins [2].
 Remove roller needle [3].



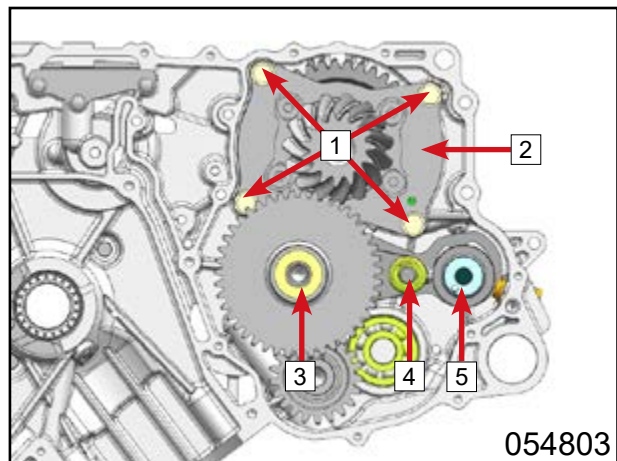
5.4.29 Crankshaft Connecting Rod Assy and Main Shaft

Remove crankshaft connecting rod assy [1].
 Remove main shaft [2].

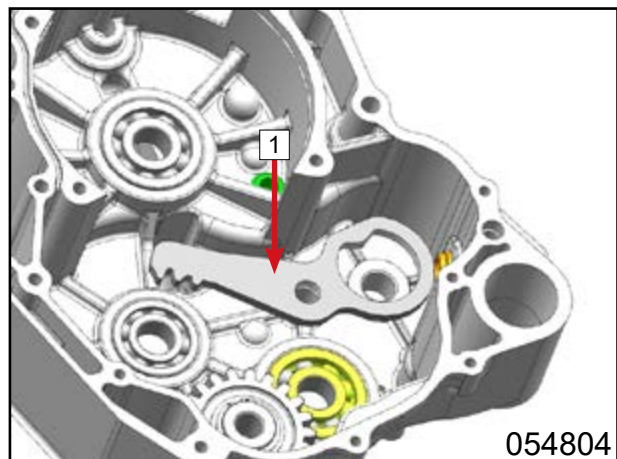


5.4.30 Countershaft Assy, Shift Fork and Shift Drum

Remove bolts [1].
 Remove drive bevel gear assy [2].
 Remove countershaft assy [3], shift fork [4] and shift drum [5] together (they can not be removed separately).



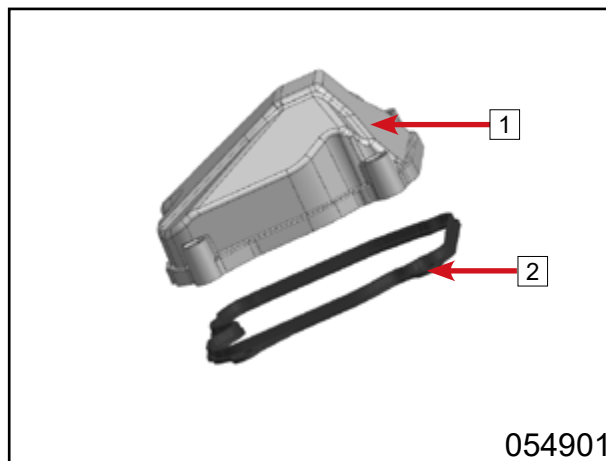
Remove parking swing arm [1].



5.5 Engine Parts Inspection

5.5.1 Cylinder Head Cover

Inspect the seal ring [2] on cylinder head cover [1] for cracks or hardening. Replace if necessary.

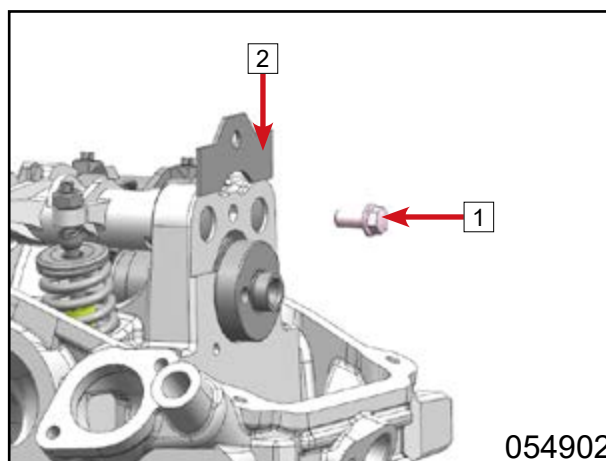


5.5.2 Cylinder Head

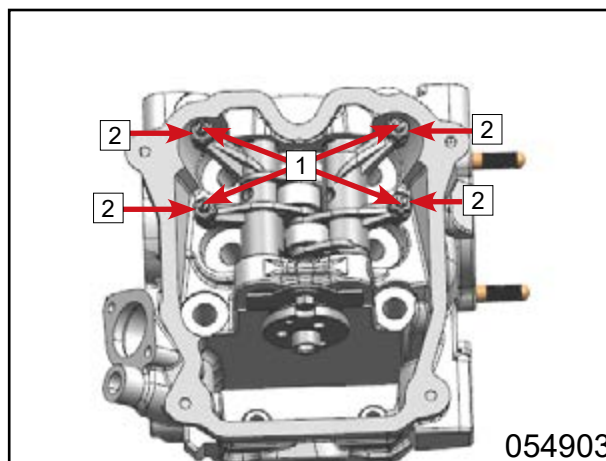
Disassembly

Remove bolt [1].

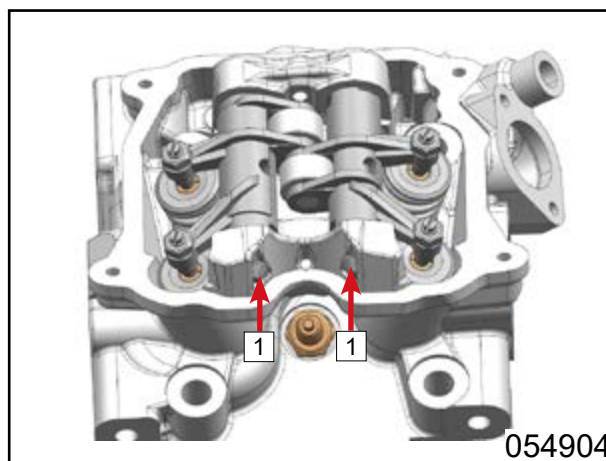
Remove camshaft holding strip [2].



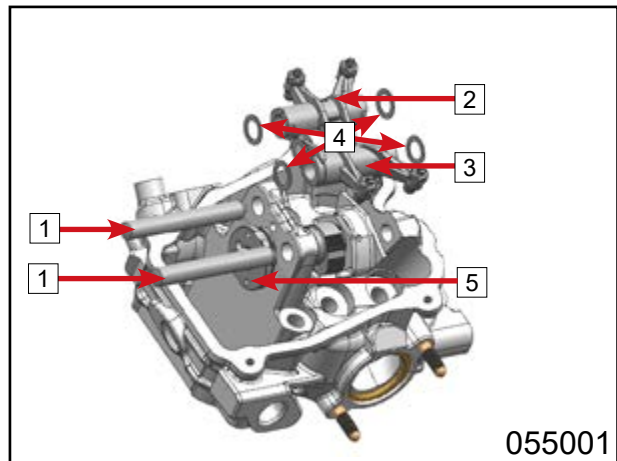
Loosen valve clearance adjusting nuts [1].
Use special tool: Valve Clearance Adjusting Wrench to loosen adjusting screws [2].



Push out rocker arms from positions [1].

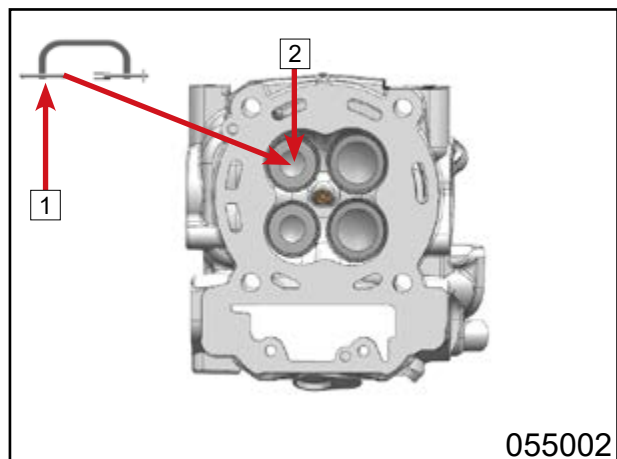


Remove rocker arms [1].
 Remove air intake rocker arm [2].
 Remove air exhaust rocker arm [3].
 Remove retainers [4].
 Rotate camshaft [5] to proper position to remove it.



055001

Put the valve compressing clamp [1] at the center of the valve [2] as picture shows.

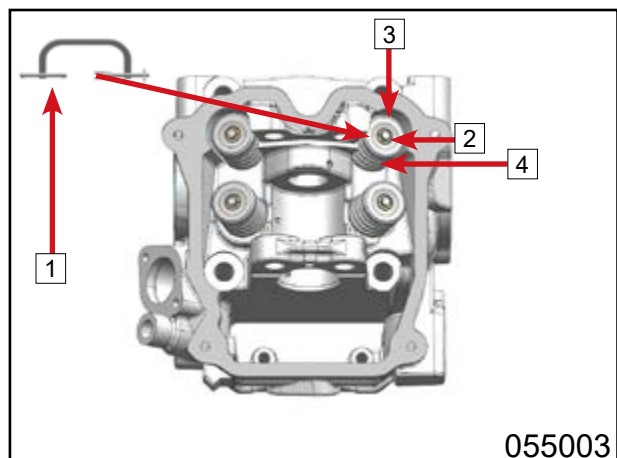


055002

Put the valve compressing clamp [1] at the valve spring upper seat [3]. Tighten the clamp to compress the valve spring.

Remove valve lock clip [2] with tweezers.
 Loosen valve spring compressing clamp [1].

Remove valve spring upper seat [3].
 Remove valve outer spring [4].

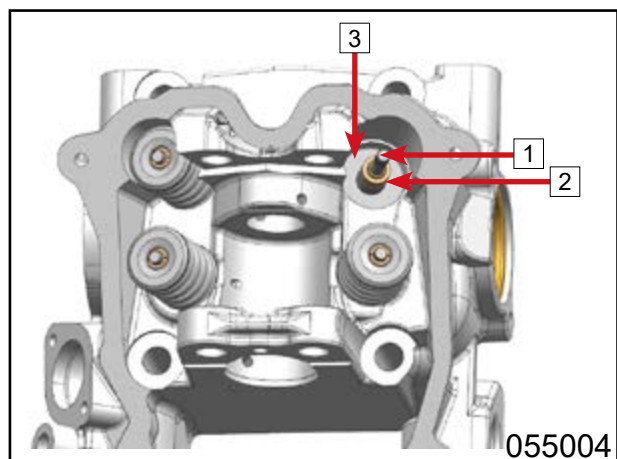


055003

Pull out the intake valve [1] from the other side.

Remove valve stem seal ring [2] discard it.
 Remove valve spring seat [3].

Exhaust valve removal applies the same procedures.

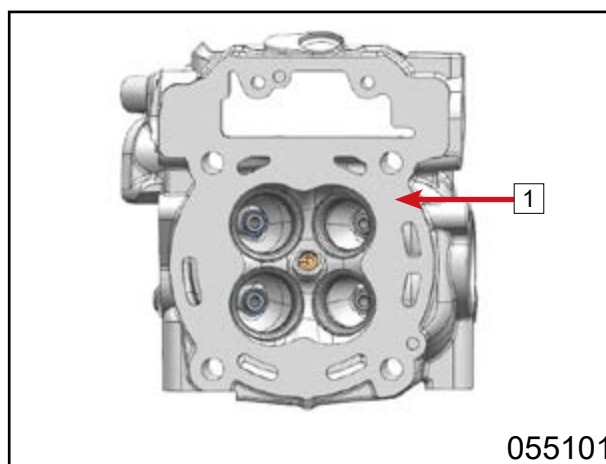


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5.5.3 Parts Inspection

Cylinder Head Inspection

- Clean the carbon deposit in combustor and on junction surface **1**.
- Inspect cylinder head valve seat for cracks. Replace if necessary.
- Use knife-edge ruler and filler gauge to inspect the junction area **1** between cylinder head and body for deformation and damage. Measure at different positions. Replace with a new cylinder head if beyond service limit. Replace with a new cylinder head if damaged.
- Clean grease oil trail on cylinder head.



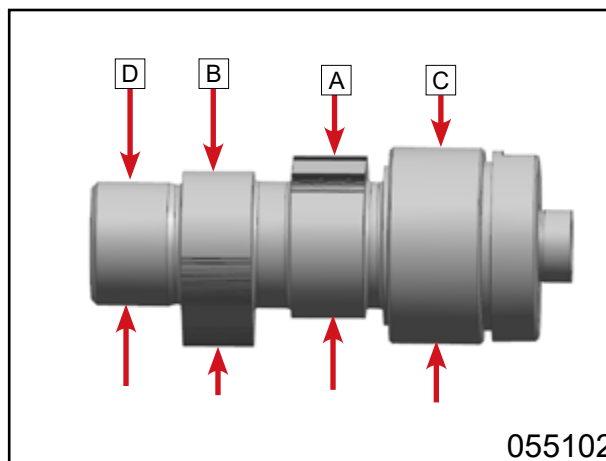
Cylinder head deformation limit value:
0.03mm

Tool: knife-edge ruler, filler gauge

Camshaft Inspection

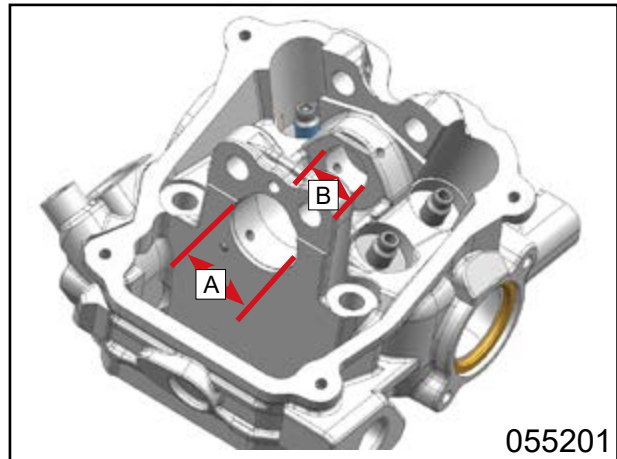
Inspect camshaft every cam and journal for scratches, wear, cracks or other damage. Measure camshaft journal diameter and cam height with micrometer.

First cylinder camshaft	
Cam(EX) A	
New	32.945 mm~33.065 mm (1.2970 in~1.3018 in)
Service limit	32.845 mm(1.2931 in)
Cam(IN) B	
New	32.931 mm~33.051 mm (1.2965 in~1.3012 in)
Service limit	32.831 mm(1.2926 in)
Second cylinder camshaft	
Cam(EX) A	
New	32.853 mm~32.973 mm (1.2934 in~1.2981 in)
Service limit	32.753 mm(1.2895 in)
Cam(IN) B	
New	33.019 mm~33.139 mm (1.300 in~1.3047 in)
Service limit	32.919 mm(1.2960 in)
Camshaft journal (timing chain side) C	
New	34.959 mm~34.975 mm (1.3763 in~1.3770 in)
Service limit	34.950 mm(1.3760 in)
Camshaft journal (spark plug side) D	
New	21.959 mm~21.980 mm (0.8645 in~0.8654 in)
Service limit	21.950 mm(0.8642 in)



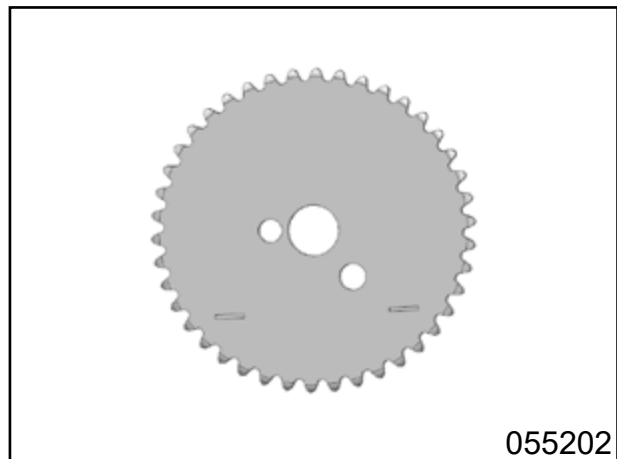
- Measure the clearance between camshaft and cylinder head on both sides.

Camshaft bearing hole diameter (timing chain side) A	
New	35.007 mm~35.025 mm (1.3782 in~1.3789 in)
Service limit	35.040 mm(1.3795 in)
Camshaft bearing hole diameter (spark plug side) B	
New	22.012 mm~22.025 mm (0.8666 in~0.8671 in)
Service limit	22.040 mm(0.8677 in)



Timing Sprocket Inspection

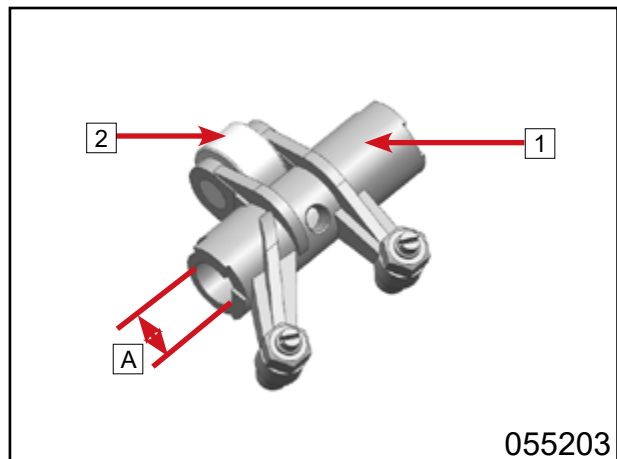
Inspect camshaft timing sprocket for wear or damage. Replace the whole set (camshaft timing sprocket and timing chain) if worn or damaged.



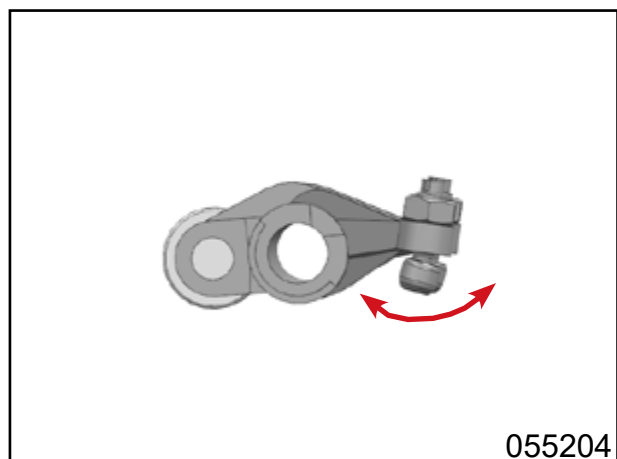
Rocker Arm Inspection

- Inspect every rocker arm **1** for cracks or scratches. Replace if it does.
- Inspect rocker arm idler wheel **2** for smooth rotation, damage or large radial run-out. Replace if necessary.
- Measure rocker arm inner diameter **A**. Replace if beyond service limit.

Rocker arm inner diameter A	
New	12.000mm~12.018mm (0.4724in~0.4731in)
Service limit	12.030mm (0.4736in)



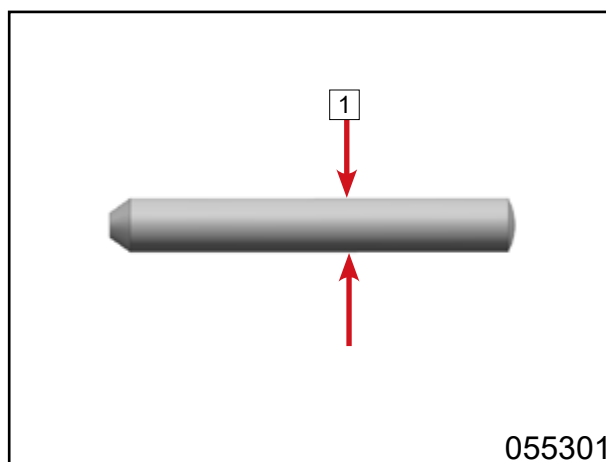
- Inspect adjusting screw for free movement, cracks and large run-out. Inspect washers, seal rings and dowel pins for damage. Replace if damaged.



Rocker Arm Shaft

- Inspect every rocker arm shaft **1** for wear and scratches. Replace if it does.
- Measure rocker arm shaft diameter **1**.

Rocker arm shaft diameter 1	
New	11.973 mm~11.984 mm (0.4714 in~0.4718 in)
Service limit	11.960 mm (0.4709 in)



Valve Stem Seal Ring

NOTE: Replace with new valve stem seal rings during installation. The removed seal rings are sorted for waste disposal.

Valve Inspection

Inspect valve stem **1** for abnormal wear or bending. Replace if it does.

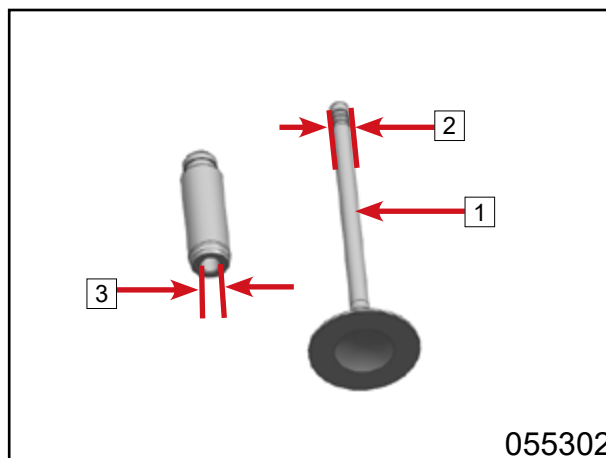
Valve stem roundness (diameter difference) (intake valve and exhaust valve)	
New	0.01 mm(0.0004 in)
Service limit	0.05 mm(0.0020 in)

Inspect valve guide inner diameter **3**. Adjust the valve guide with reamer if beyond standard.

Valve guide inner diameter (intake valve and exhaust valve)	
New	5.000 mm~5.012 mm (0.1969 in~0.1973 in)
Service limit	5.045 mm(0.1986 in)

NOTE: Pay attention the rotating direction of the reamer. Clean the metal debris on reamer and valve guide.

NOTE: Valve guides can not be removed. Replace the whole cylinder head if damaged.



Valve Stem

NOTE: Clean the carbon deposit before measurement.

Replace the valve stems if they are beyond service limit, severely worn or they have scratches.

Valve stem diameter	
Exhaust valve	
New	4.955 mm~4.970 mm (0.195 1in~0.1957 in)
Service limit	4.930 mm (0.1941in)
Intake valve	
New	4.965mm~4.980mm (0.1955in~0.1960in)
Service limit	4.930mm (0.1941in)

Valve Bevel and Valve Seat

Inspect valve bevel 2 and valve seat 1 for being burnt or sunk. Replace valves or cylinder head if necessary.

Apply some grinding agent on valve bevel. Grind valve with grinding tool (refer to the following valve guide section).

NOTE: Make sure valve seats are qualified. Apply some identification agent to inspect valve contacting area condition.

Grind the valve until the sealing between valve and seat is qualified.

NOTE: The remained grinding agent has to be cleaned.

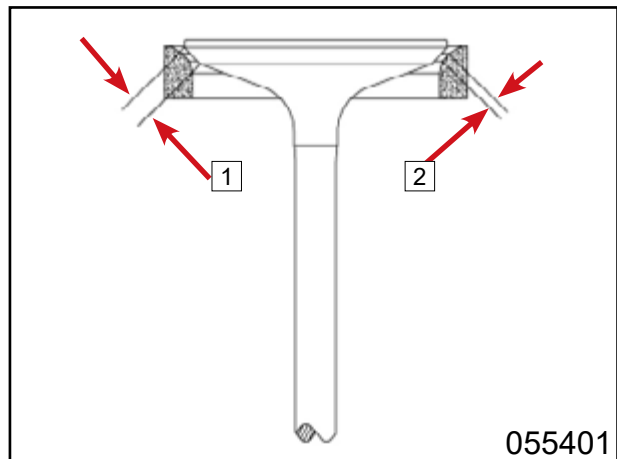
Measure valve bevel width 1 and contacting width 2.

NOTE: The contacting area should be at the center of valve seat.

Measure spring seat width.

Spring seat contacting width	
Exhaust valve	
New	1.20 mm~1.40 mm (0.047 in~0.055 in)
Service limit	1.80mm (0.071 in)
Intake valve	
New	1.10 mm~1.30 mm (0.043 in~0.051 in)
Service limit	1.70 mm(0.067 in)

If the valve seat contacting width is beyond service limit or has dark spots, replace cylinder head.



Valve Spring

Inspect valve spring for visible damage.
Replace if it does.
Inspect valve spring free length.

Valve spring free length	
New	40 mm (1.575 in)
Service limit	38.2 mm (1.504 in)

Replace valve spring if beyond service limit.

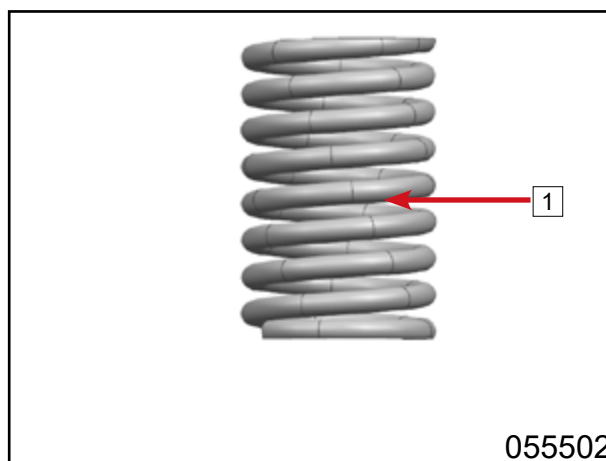
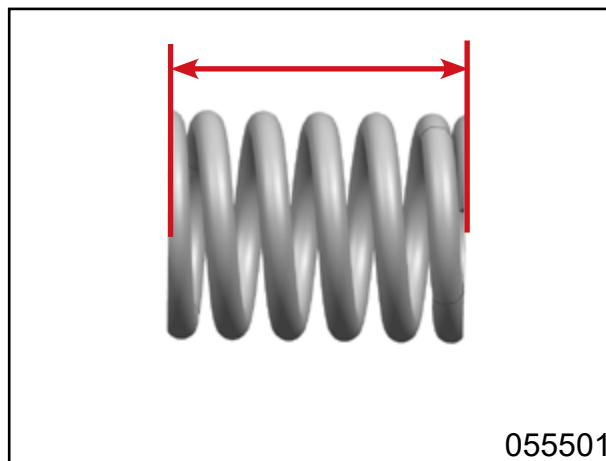
Measure spring gradient. Replace if beyond standard.

Spring gradient standard: 2°

Measure the spring force when the spring **1** is compressed to certain length.
Replace if the force is beyond standard.

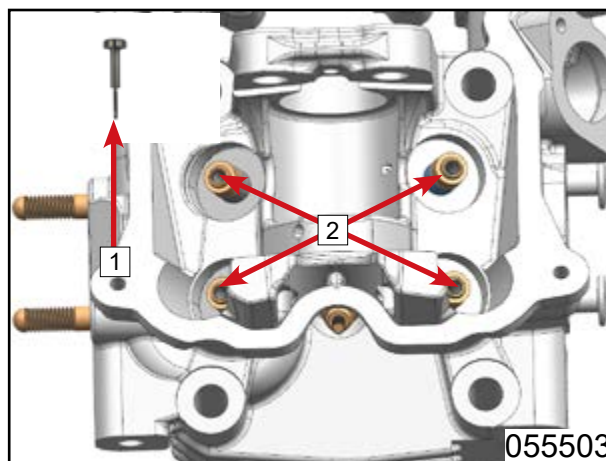
Valve spring force standard (intake and exhaust): 200.5N~235.5N when compressed to 33 mm

Valve spring force standard (intake and exhaust): 531N~587N when compressed to 23 mm

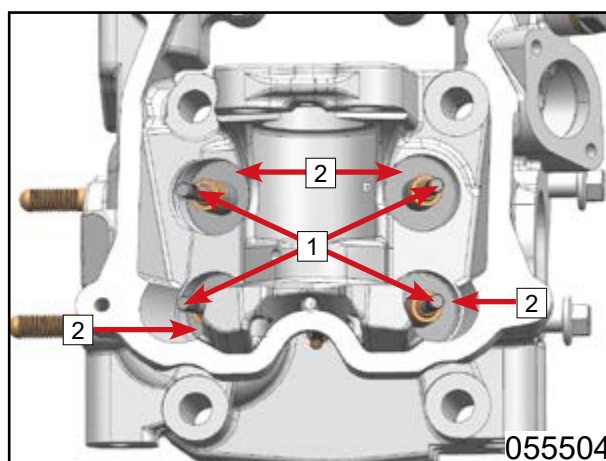


5.5.4 Cylinder Head Assy

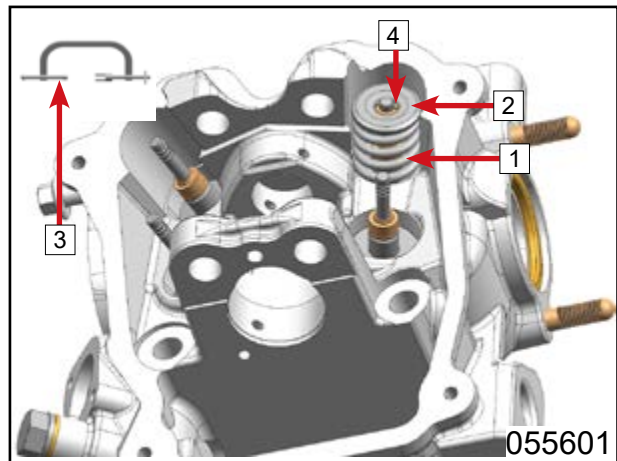
Use special tool: Valve Stem Seal Ring Installer **1** to put the new seal rings **2** on valve guides.



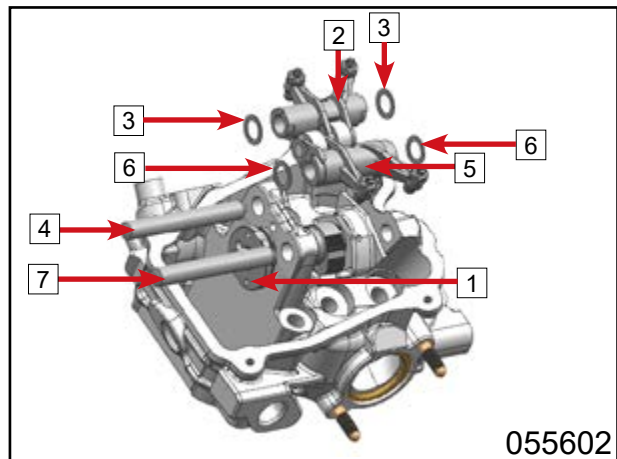
Install valve stems **1**.
Install valve spring seats **2**.



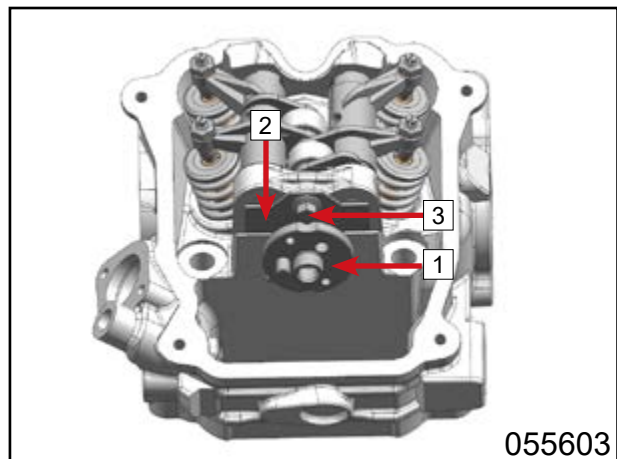
Install valve spring [1].
Put valve spring upper seat [2] in place.
Use special tool: Valve Spring Compressing Clamp [3] to compress spring. Put two valve lock clips [4] into the groove of valve stem with tweezers. Loosen the tool.



Rotate camshaft [1] to proper position to install camshaft.
Install air intake rocker arm assy [2].
Install washers [3].
Install rocker arm shaft [4].
Install air exhaust rocker arm assy [5].
Install washers [6].
Install rocker arm shaft [7].



Rotate camshaft [1] to suitable position and install it on cylinder head.
Install camshaft limit plate [2].
Install bolt [3].

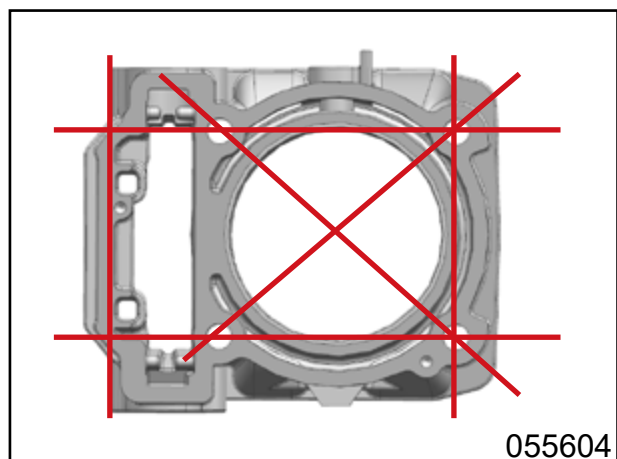


5.5.5 Cylinder Body Cylinder Body Deformation

Inspect cylinder sealing surface flatness with knife-edge ruler and filler gauge at 7 positions as picture shows. Record each value. Replace cylinder if beyond service limit.

Cylinder sealing surface flatness service limit: 0.05 mm

Tool: knife-edge ruler, filler gauge



Cylinder Taper

Measure cylinder body inner diameter. Replace cylinder body and piston rings if it beyond service limit.

Measure cylinder inner diameter at 3 recommended positions.

1	First diameter measuring position
2	Second diameter measuring position
3	Third diameter measuring position
A	6 mm (0.2362 in)
B	43 mm (1.6930 in)
C	116 mm (4.5670 in)

Cylinder taper (diameter difference)

New (Max.)	0.038 mm (0.0015 in)
Service limit	0.090 mm (0.0035 in)

Difference between measurements should not exceed the service limit mentioned above.

Cylinder Body Roundness

Measure cylinder diameter in piston axis direction from top of cylinder [1]. Take another measurement from the angle of 90° [2] and compare with the first one.

NOTE: Take the same measuring points described in Cylinder Taper above.

Cylinder body roundness (diameter difference)

New (Max.)	0.015 mm (0.0006 in)
Service limit	0.020 mm (0.0008 in)

5.5.6 Timing Chain Tensioner

Remove screw [1].

Remove o-ring [2].

Inspect tensioner for damage and abnormal work. Replace if necessary.

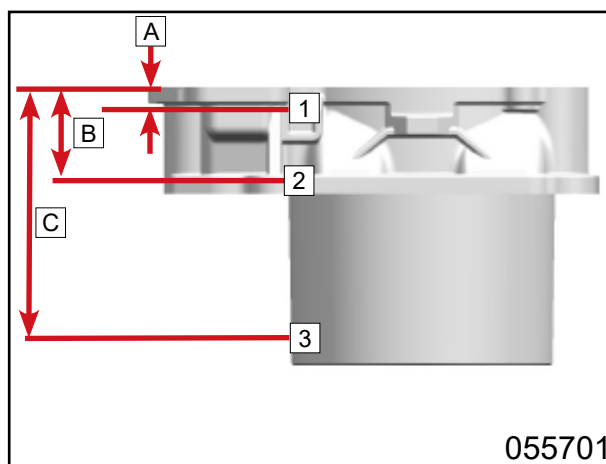
Inspection method:

1. Rotate adjusting screw clockwise with screw driver through hole [3]. And compress the tensioner arm [4] to the end with hand.

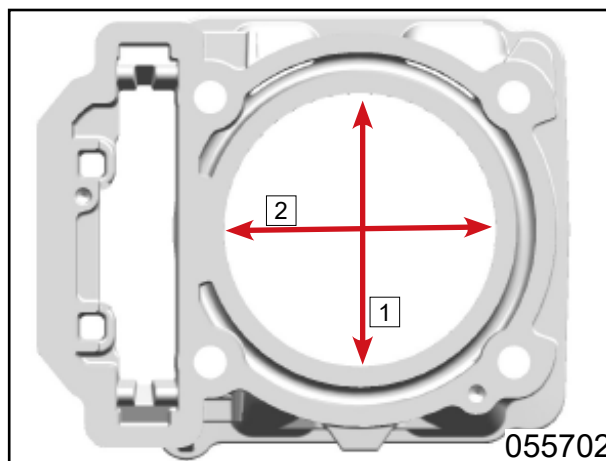
2. Loosen screw driver and tensioner arm [4] slowly. Make sure it returns gently. Replace if not.

Inspect tensioner arm [4] for abnormal function or scratches. Replace if it does.

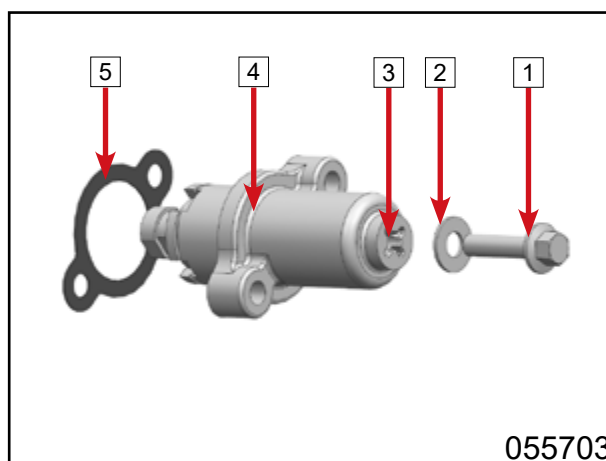
Replace with new gasket [5] during installation.



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5.5.7 Piston

Piston Diameter

Inspect piston for scratches, cracks or other damage. Replace if necessary. Measure piston at 8 mm (0.315 in) perpendicularly (90°) to piston pin with a micrometer.

The measuring value should be within service limit. Replace if not.

Piston size	
New	90.940 mm~90.960 mm (3.5803 in~3.5811 in)
Service limit	90.85 mm (3.577 in)

Piston Ring/Groove Clearance

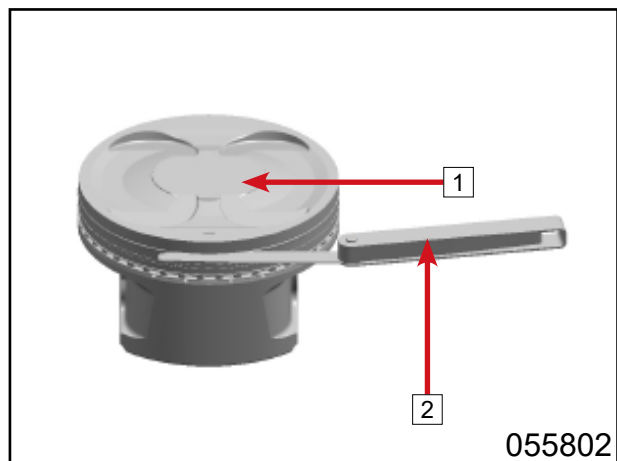
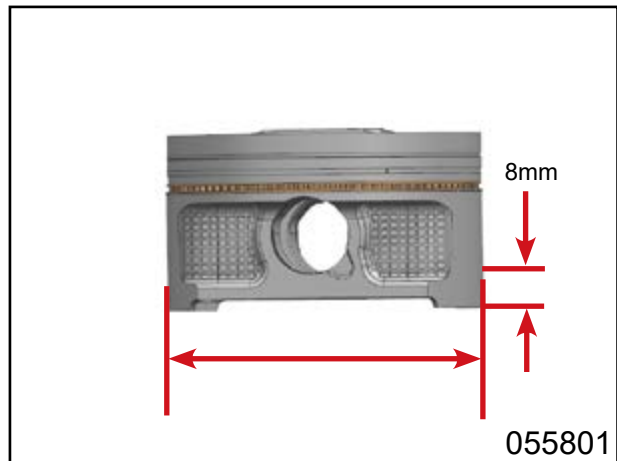
Use a feeler gauge [2] to measure each ring/piston groove clearance. Replace piston [1] and piston rings if beyond service limit.

Piston ring/groove clearance	
Piston ring (1)	
New	0.020 mm~0.060 mm (0.0008 in~0.0024 in)
Service limit	0.150 mm(0.0059 in)
Piston ring (2)	
New	0.020 mm~0.060 mm (0.0008 in~0.0024 in)
Service limit	0.150 mm(0.0059 in)
Oil ring	
New	0.030 mm~0.150 mm (0.0012 in~0.0059 in)
Service limit	0.250 mm(0.0098 in)

Piston Ring Open Clearance

●Measure each ring open clearance with vernier caliper before and after installation. Replace piston rings if clearance difference is beyond service limit.

Piston ring open clearance	
Piston ring (1)	
New	0.25mm~0.40 mm (0.010 in~0.016 in)
Service limit	1.35 mm(0.053 in)
Piston ring (2)	
New	0.30mm~0.45 mm (0.012 in~0.018 in)
Service limit	1.35 mm(0.053 in)
Oil ring	
New	0.20 mm~0.70 mm (0.008 in~0.028 in)
Service limit	1.50 mm(0.059 in)



Place the ring 8mm~16mm(5/16in.~5/8in.) from top of cylinder when measuring the piston ring open clearance.

NOTE: In order to Put the ring at the correct position, use piston as a pusher.

Use feeler gauge to measure piston ring working open clearance. Replace if beyond service limit.

Piston ring working open clearance service limit:

Piston ring 1: 1.5 mm

Piston ring 2: 1.5 mm

Oil ring: 1.75 mm

Piston Pin and Pin Hole

Clean the deposit on piston pin. Inspect piston pin for scratches, cracks or other damage. Replace if necessary.

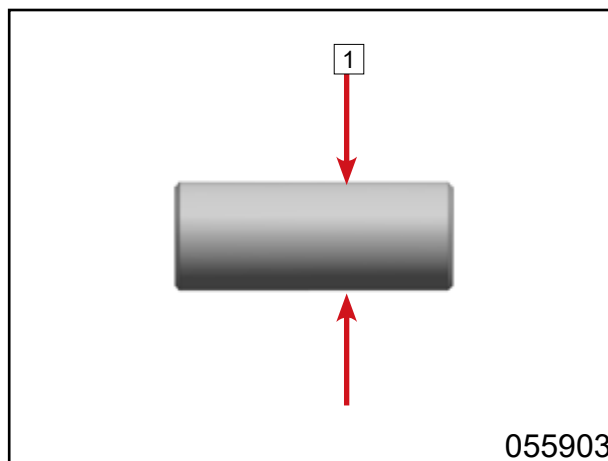
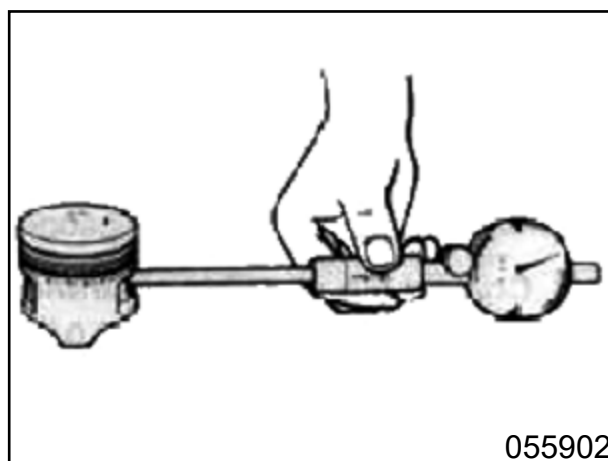
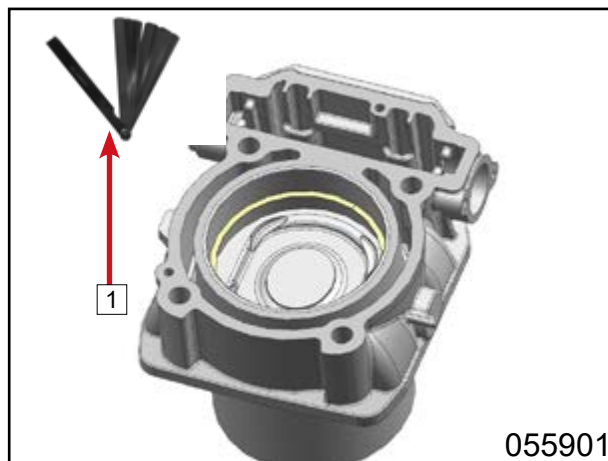
Measure piston pin. Replace if the diameter is beyond service limit.

Measure piston pin hole inner diameter with dial bore gauge and outer diameter with micrometer. Replace piston and piston pin together if beyond service limit.

Piston pin hole service limit: 22.010 mm

Measure piston pin outer diameter 1 with micrometer at three measuring points.

Piston pin diameter	
New	21.995 mm~22.000 mm (0.8659 mm~0.8661 in)
Service limit	21.980 mm (0.8654 in)



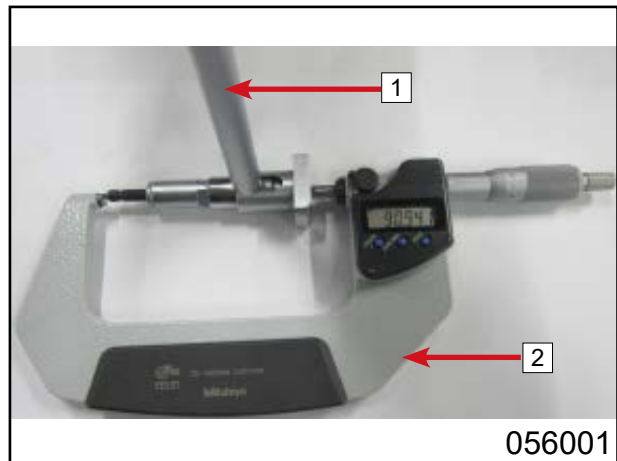
Piston/Cylinder Clearance

Adjust and lock micrometer [2] to the piston dimension.

With the micrometer set to the dimension, adjust a cylinder bore gauge [1] to the micrometer dimension and set the indicator to 0(zero).

Position the dial bore gauge 20 mm (0.787 in) above cylinder base, measure perpendicularly (90°) to piston pin axis.

Read the measurement on the cylinder bore gauge. The result is the exact piston/cylinder wall clearance.



Piston/cylinder body clearance	
New	0.040 mm~0.060 mm (0.0016 in~0.0024 in)
Service limit	0.100 mm (0.0040 in)

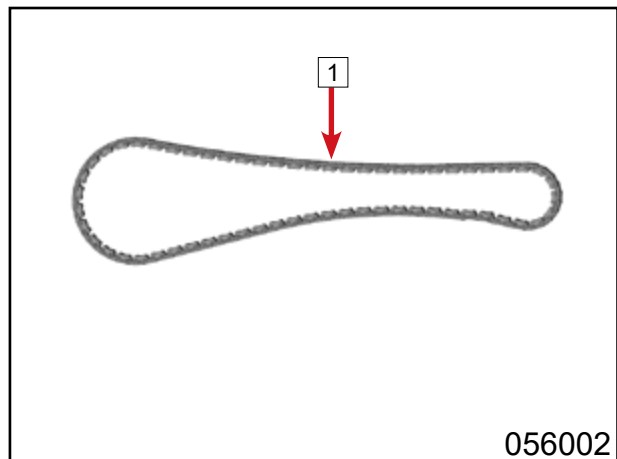
NOTE: Make sure the piston is not worn. Replace with a new piston to measure the clearance again if beyond service limit.

NOTE: Make sure the cylinder bore gauge indicator is set exactly at the same position as with the micrometer. Otherwise, the reading will be false.

5.5.8 Timing Chain

Inspect timing chain [1] radial clearance on timing sprocket.

Inspect chain contacting area for severe wear. Replace the whole set (timing sprocket and timing chain) if severely worn.

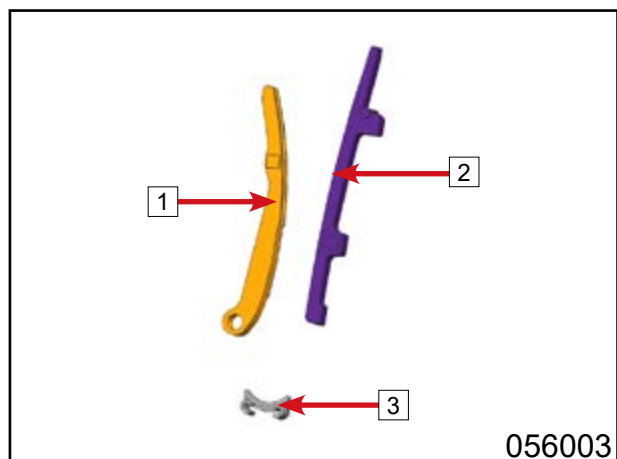


5.5.9 Tension Plate, Chain Guide and Chain Guard

Inspect tension plate [1] for damage, aging or other defects. Replace if necessary.

Inspect chain guide [2] for damage, aging or other defects. Replace if necessary.

Inspect chain guard [3] for damage, aging or other defects. Replace if necessary.



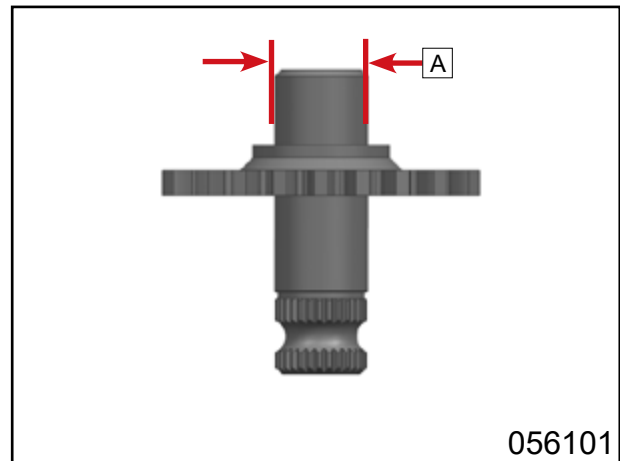
5.5.10 Shift Gear Assy

Drive Sector Gear

Inspect drive sector gear for cracks or other damage. Replace if necessary.

Measure gear shaft diameter A with vernier caliper. Replace if beyond service limit.

Diameter service limit: 14.976 mm~14.994 mm



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Driven Sector Gear

Inspect driven sector gear for defects. Replace if necessary.



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5.5.11 Gearshift Cover

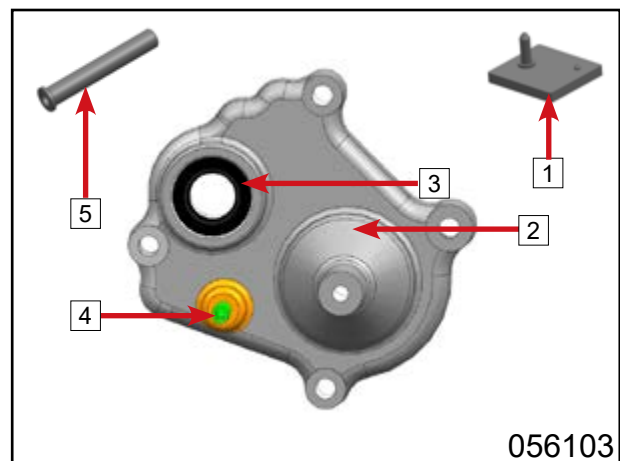
Put gearshift cover on special tool: Oil Seal Cushion Block 1.

Inspect gearshift cover 2 for cracks, damage or other defects. Repair or place with a new one if necessary.

Inspect oil seal 3 for damage or oil leaking. Replace if it does.

The removed oil seal can not be reused. Replace with a new one during installation and apply 648 sealant on the surface. Use special tool: SD15×25×5 oil seal installer 5 to compress it.

NOTE: The breather hose joint 4 can not be removed. Replace with gearshift cover 2 together if damaged.



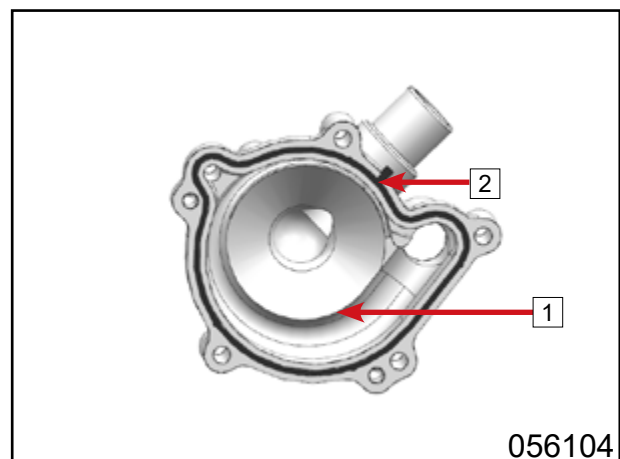
056103

5.5.12 Water Pump Assy

Water Pump Cover

Inspect water pump cover 1 for cracks, damage or other defects. Replace if necessary.

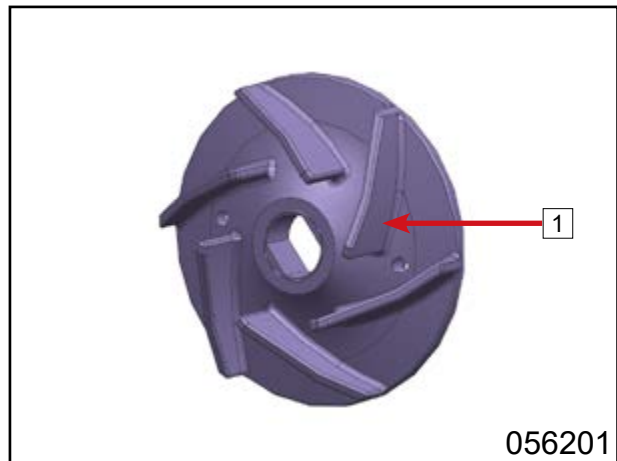
Inspect water pump seal ring 2 for hardening, break or other damage. Replace if necessary.



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Water Pump Impeller

Inspect water pump impeller **1** for damage. Replace if necessary.



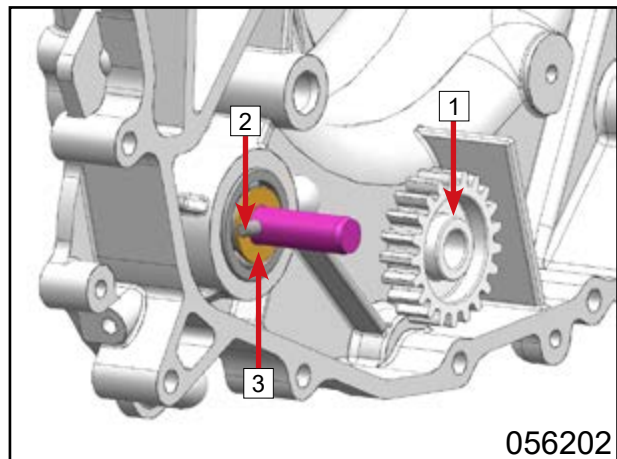
Water Pump Gear, Shaft, Oil Seal and Bearing Disassembly

Remove water pump gear **1**.

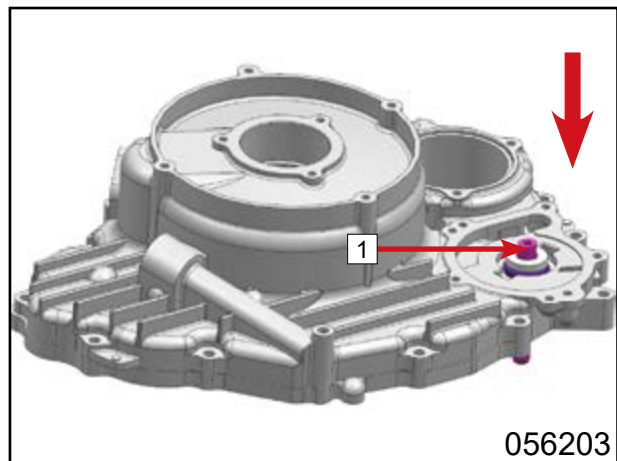
Remove roller needle **2**.

Remove washer **3**.

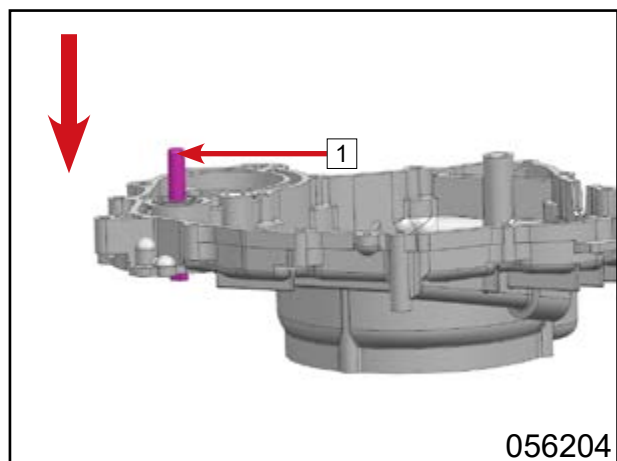
NOTE: If there is no defect on water pump gear, shaft, oil seal, bearing or water seal, it is not necessary to remove them.



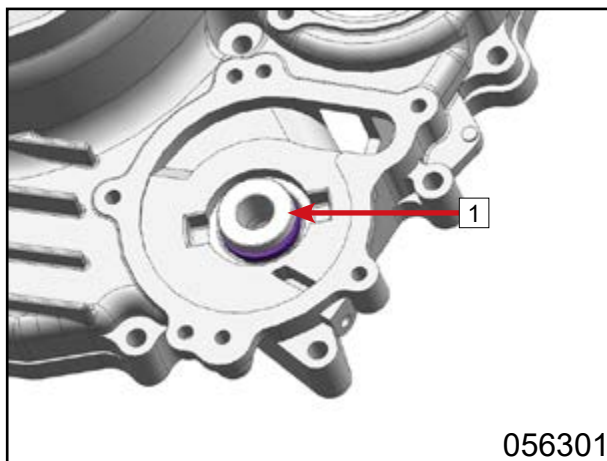
Put the MAG crankcase cover on flat place and make sure the water pump shaft **1** is floating. Fix crankcase cover, knock the shaft **1** with rubber hammer gently in the direction of arrow to loosen it.



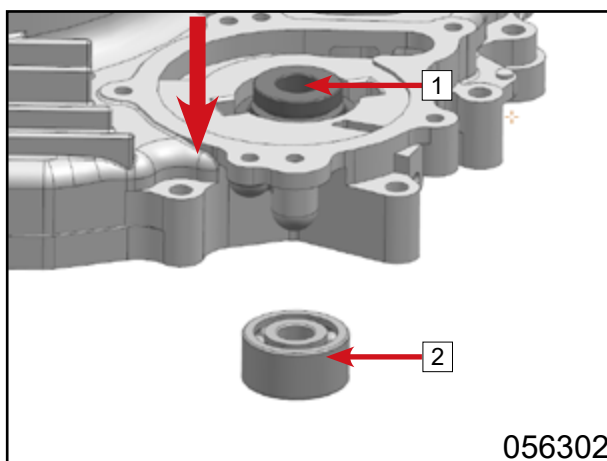
Put the MAG crankcase cover on flat place and make sure the water pump shaft **1** is floating. Fix crankcase cover, knock the shaft **1** with rubber hammer gently in the direction of arrow to remove it.



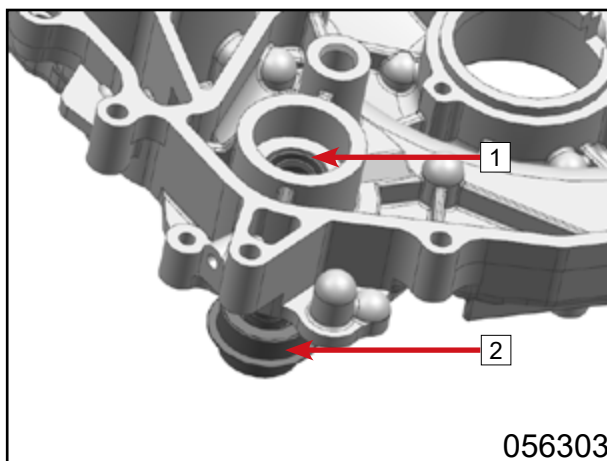
Pry the water seal moving ring [1] with a screw driver.



Put the MAG crankcase cover on flat place and make sure the water pump bearing [2] is floating. Fix crankcase cover, use a proper tool (like gearshift fork shaft) to knock the bearing [2] out of hole [1] in the direction of arrow.



Use a proper tool to knock out oil seal [1] and water seal [2].

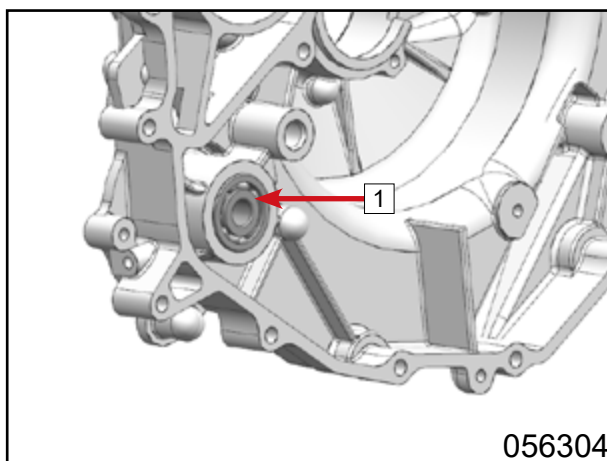


Inspection Bearing

When bearing [1] is on water pump, inspect the bearing clearance.

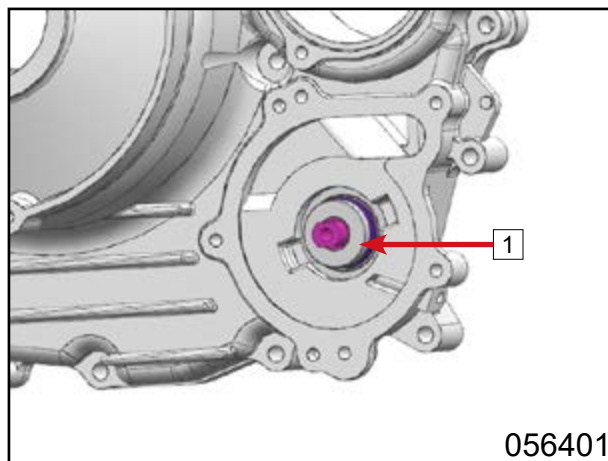
Rotate bearing to inspect bearing for smooth and stable rotation and noise condition.

Replace with a new bearing if any defect occurs.



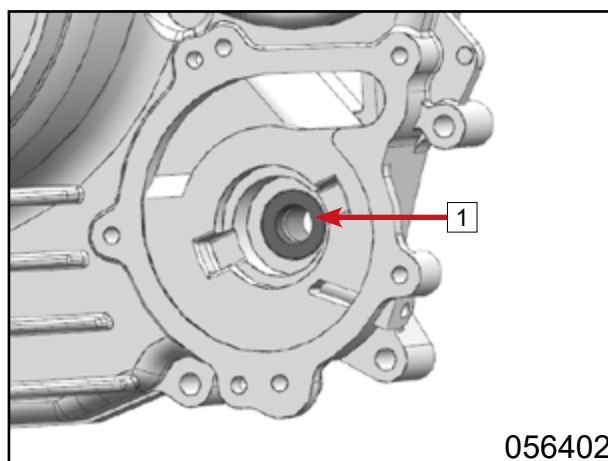
Water Seal Assy

Inspect water seal assy [1] for damage, leaking and sealing condition. Replace if necessary.



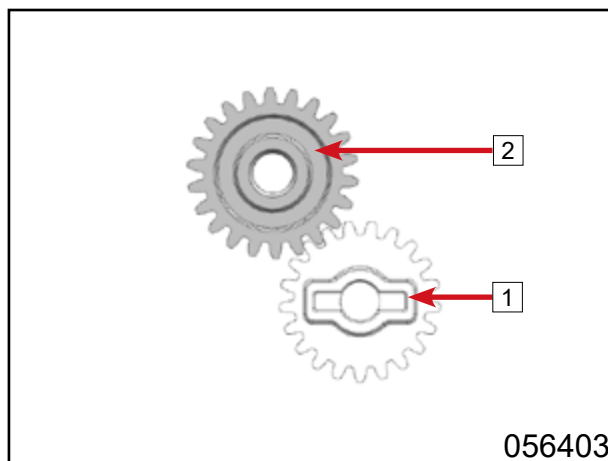
Oil Seal

Inspect oil seal [1], especially oil seal lip. Replace if necessary.



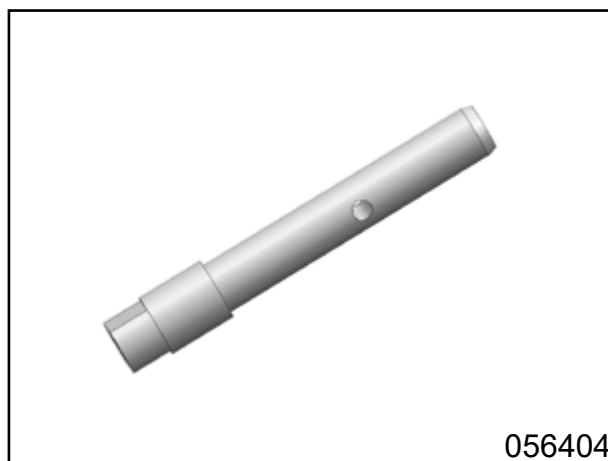
Water Pump Impeller and Idle Gear

Inspect water pump impeller for cracks or other damage. Replace if necessary. Inspect water pump idle gear [2] and water pump gear [1] for cracks, scratches or other damage (especially the contacting area). Replace if necessary.



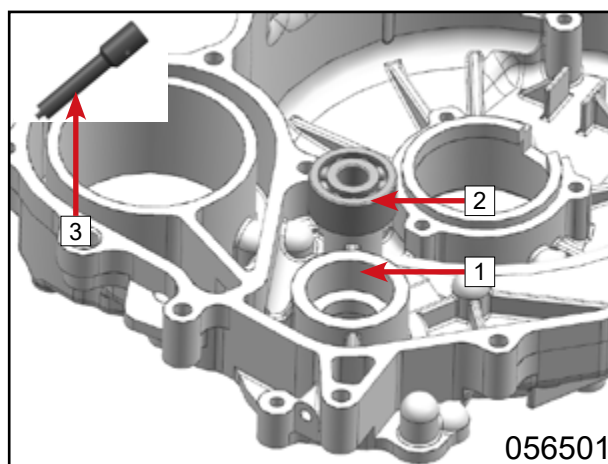
Water Pump Shaft

Inspect water pump shaft. Replace if damaged.

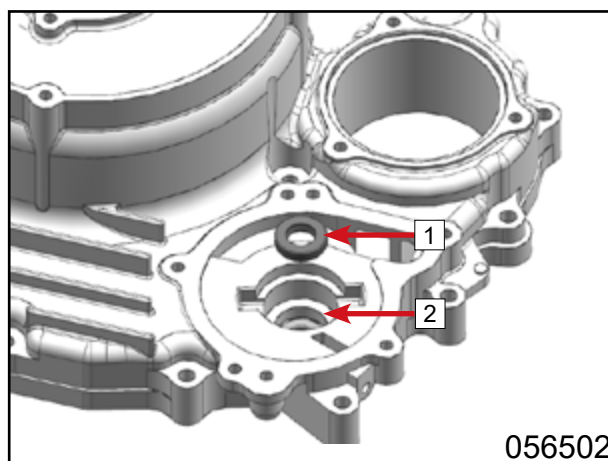


Assembly

Apply some grease on water pump bearing hole [1] of MAG crankcase cover. Use special tool: MAG Crankcase Cover Bearing Installer [3] to install water pump bearing [2].

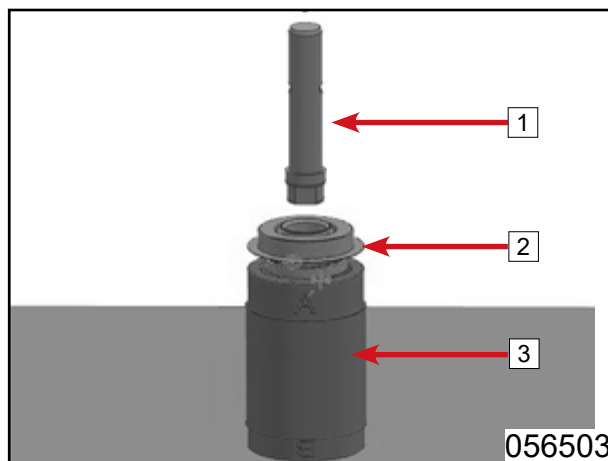


Apply 648 sealant on 10×20×5 oil seal outer surface and then compress it into MAG crankcase cover bearing hole [2].

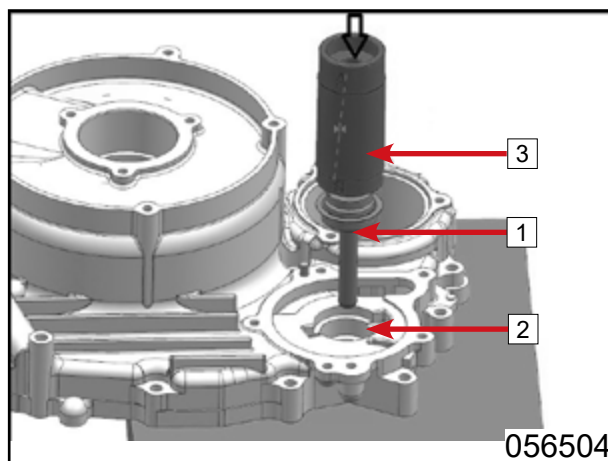


Put the special tool: Water Seal A/B tool on flat place with A side upward. Then put the water seal [2] on the tool as picture shows.

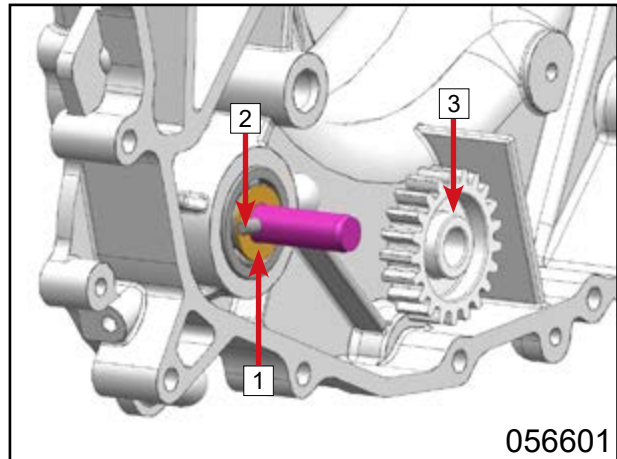
Apply 5699 sealant on water pump shaft and water seal contacting area. Compress the water pump shaft [1] into the water seal.



Install the water seal assy [1] with the shaft into the 3200A bearing hole [2] by using the special tool [3]. Make sure the water seal assy is compressed in place.



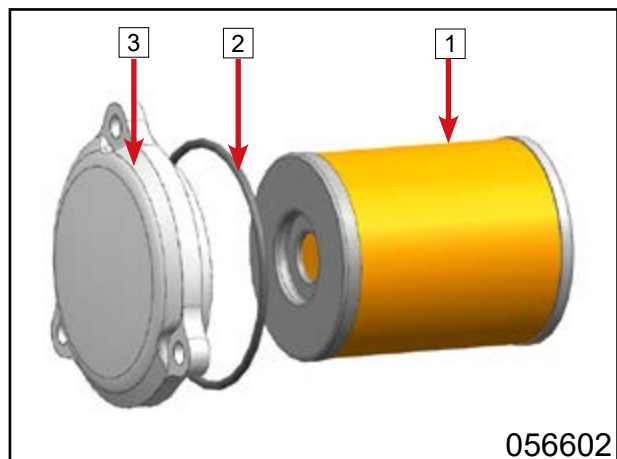
Install washer [1].
Install roller needle [2].
Install water pump gear [3].



5.5.13 Oil Filter

Replace with a new oil filter element [1].
Inspect o-seal ring [2] for cracks or damage. Replace if necessary.
Inspect oil filter cover [3] for damage. Replace if necessary.

NOTE: Replace with a new oil filter element [1] after removal.

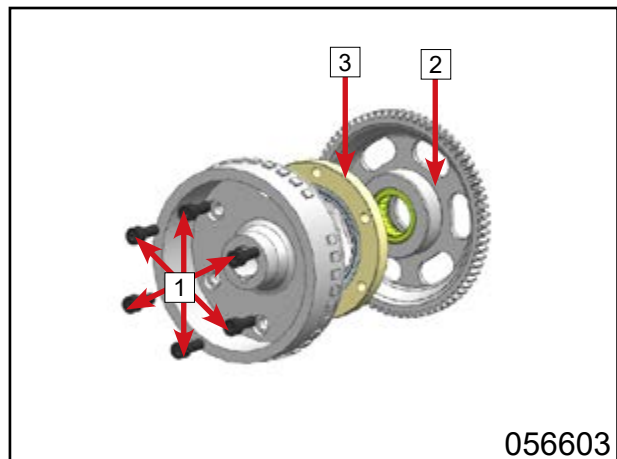


5.5.14 Overriding Clutch

Disassembly

Remove driven gear [2].
Remove bolts [1].
Remove overriding clutch [3].

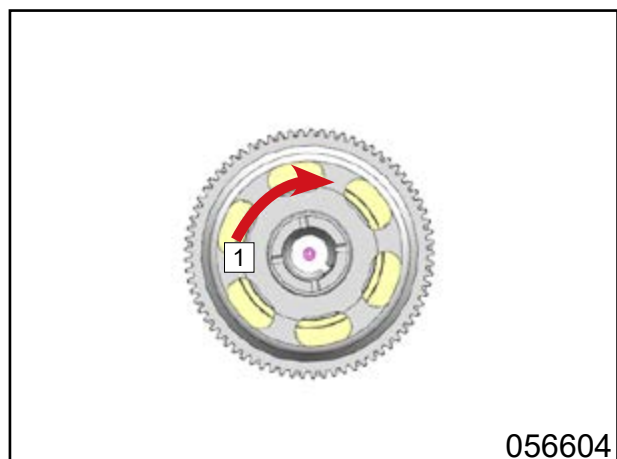
NOTE: If there is no defect on overriding clutch, it is not necessary to remove it.



Inspection

Inspect overriding clutch function. Rotate driven gear in overriding clutch.
Inspect overriding clutch and clutch housing for wear or other damage.

NOTE: The clock-wise rotation of overriding clutch must be locked. Replace the clutch, housing and gears together if damaged.

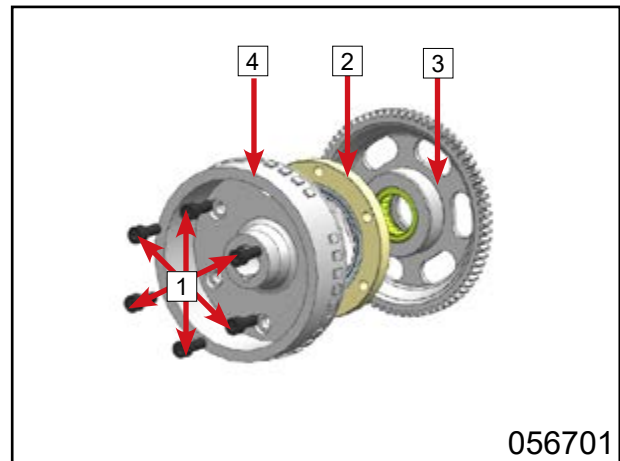


Assembly

Install overriding clutch [2] on magneto rotor [4]. Install bolts [1] (with 243 thread locker) and tighten them.

Tighten torque: $26 \pm 2 \text{ N}\cdot\text{m}$

Install driven gear [3].



5.5.15 Magneto Rotor

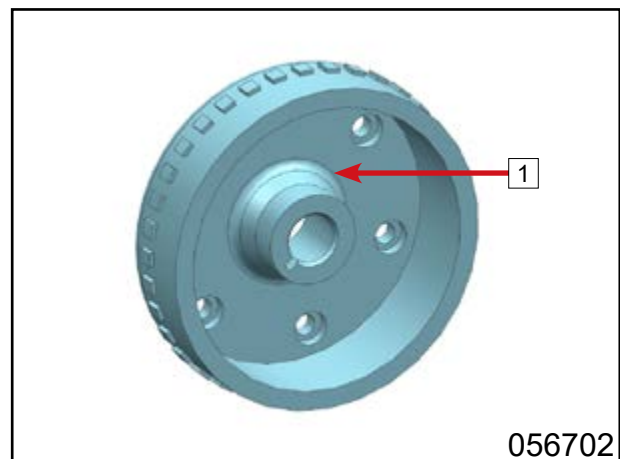
Inspect rotor [1] inside for scratches or other damage;

Inspect rotor [1] key grooves for wear or other damage;

Inspect rotor [1] outer trigger teeth for slant or other damage;

Inspect woodruff key and key grooves on crankshaft for wear or other damage;

Replace if necessary.



5.5.16 Magneto Stator

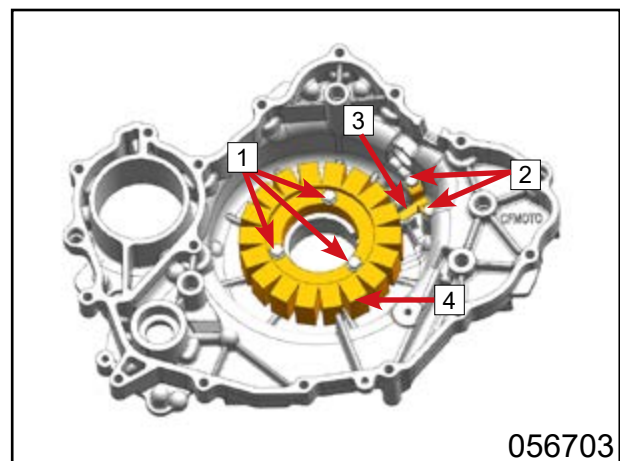
Disassembly

Remove bolts [1].

Remove bolts [2].

Remove press plate [3].

Remove magneto stator [4].



Inspection

Inspect magneto stator [1].

Inspect stator [1] condition. Replace if damaged.

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



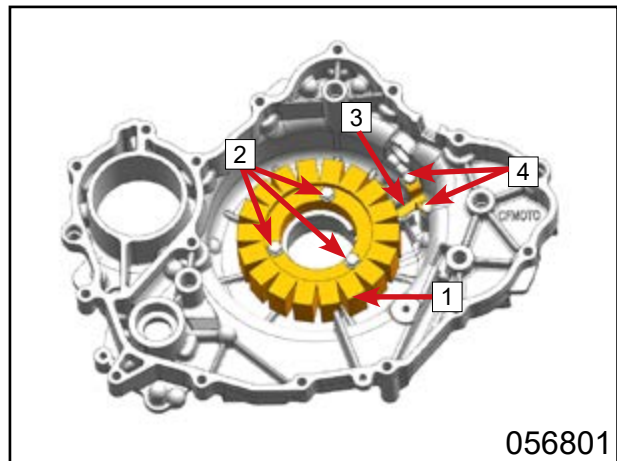
Assembly

Install magneto stator [1].

Install bolts [2].

Settle wires and install press plate [3].

Install bolts [4].

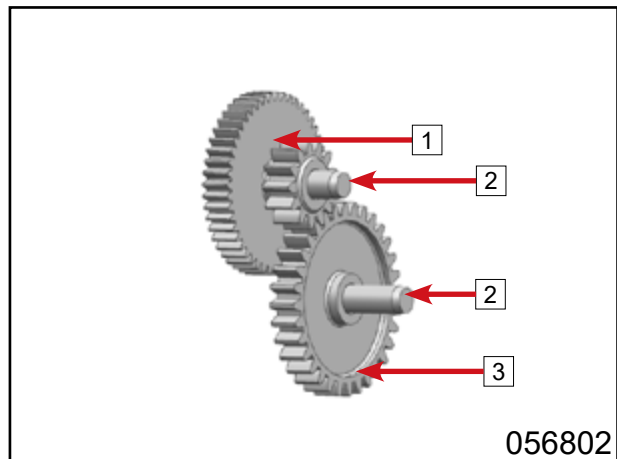


5.5.17 Starter Dual Gear

Inspect starter dual gear [1] for wear or damage. Replace if necessary.

Inspect breather shaft [2] for wear or damage. Replace if necessary.

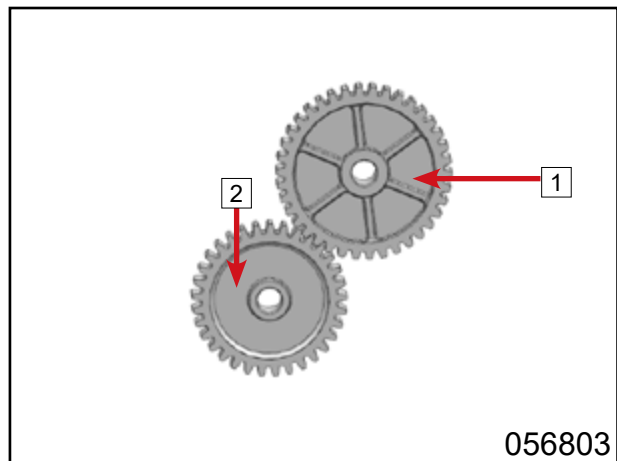
Inspect middle gear [3] for wear or damage. Replace if necessary.



5.5.18 Oil Pump Gear and Oil Pump Idle Gear

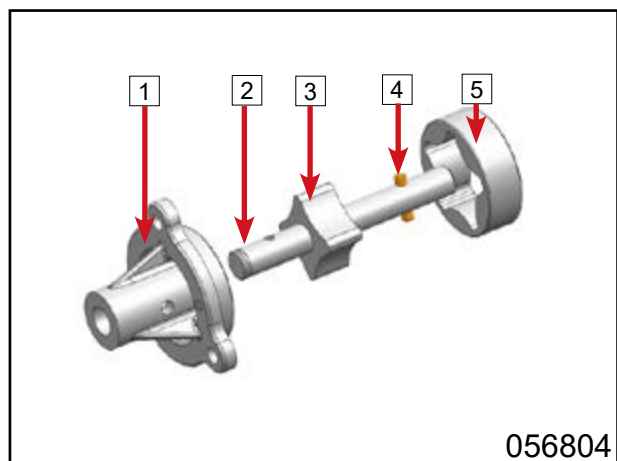
Inspect oil pump idle gear [1] teeth and surface for cracks or damage. Replace if necessary.

Inspect oil pump gear [2] teeth and surface for cracks or damage. Replace if necessary.

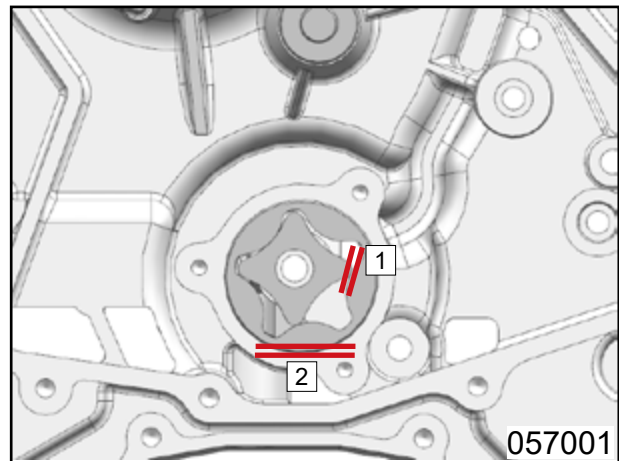


5.5.19 Oil Pump Assy

Inspect oil pump cover [1], shaft [2], inner rotor [3], roller needle [4], outer rotor [5]. Replace if any defect occurs.

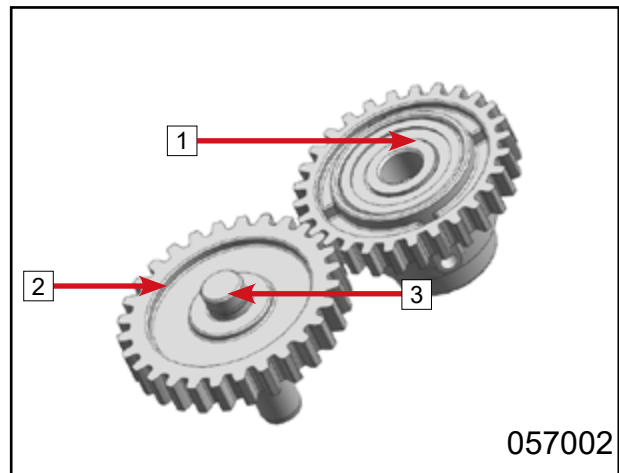


Measure bottom clearance [1] (between inner and outer rotor) and side clearance [2] (between outer rotor and crankcase). Replace oil pump if beyond service limit.
Bottom clearance [1] service limit: 0.25 mm
Side clearance [2] service limit: 0.25 mm



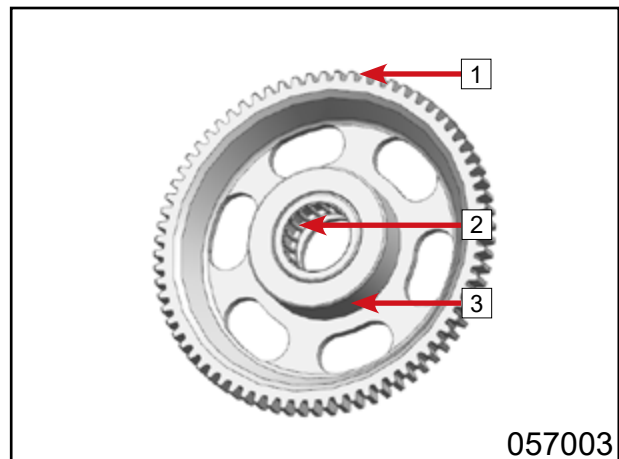
5.5.20 Breather and Breather Idle Gear

Inspect breather [1] for damage or other defect. Replace if necessary.
Inspect breather idle gear [2] for damage or other defect. Replace if necessary.
Inspect breather shaft [3] for damage or other defect. Replace if necessary.



5.5.21 Driven Gear

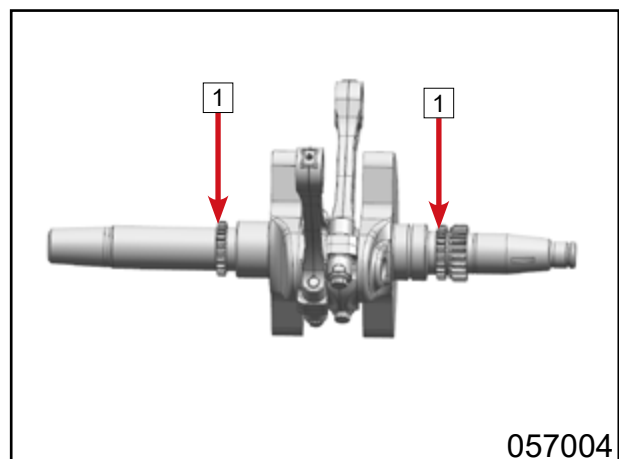
Inspect gear teeth [1] and cylindrical surface [3] for wear or other damage.
Inspect needle bearing [2].
Replace driven gear if necessary.



5.5.22 Crankshaft Assy

Inspect each journal for scratches, cracks or other damage. Replace if it does or the crankshaft sprocket [1] breaks.

⚠ CAUTION: Replace with new parts if the dimension is beyond service limit. Otherwise, it will damage the engine.



Crankshaft Axial Clearance

NOTE: Measure crankshaft axial clearance before disassemble MAG and PTO crankcase.

Use dial gauge to measure crankshaft axial play at MAG.

Crankshaft axial play	
New	0.260 mm~0.540 mm (0.010 in~0.021 in)
Service limit	0.64 mm (0.025 in)

Replace with new thrust washers or crankshaft if beyond service limit. (Crankshaft thrust washer tighten screw should be applied 243 thread locker, tighten torque: 3N•m)

Connecting Rod Big End Axial Clearance

Use a filler gauge 1 to measure the clearance between connecting rod big end and crankshaft. Replace if beyond service limit.

Connecting Rod Big End Axial Clearance	
New	0.300 mm~0.560 mm (0.012 in~0.022 in)
Service limit	0.8 mm (0.031 in)

Crankshaft Connecting Rod Disassembly

Remove connecting rod bolts 1.

Remove connecting rod cap 2.

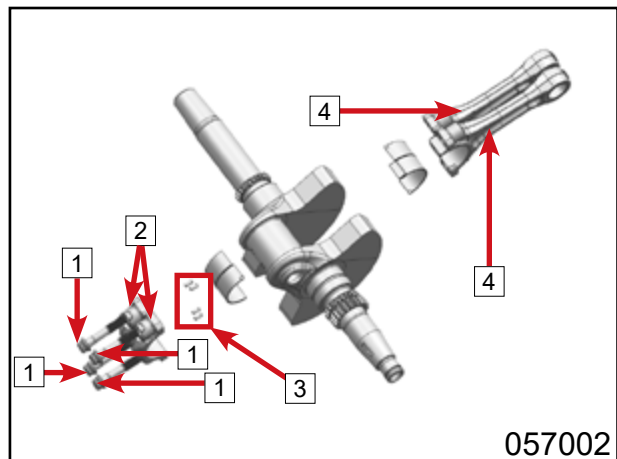
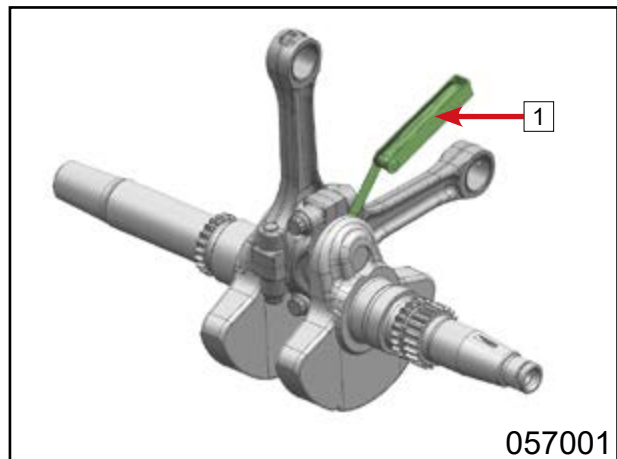
Remove pins 3.

Remove connecting rod 4.

⚠ CAUTION: If connecting rod bolts are removed, replace with new plain bearings during installation.

Crankshaft Connecting Rod Inspection

Inspect crankshaft connecting rod assy for damage or severe wear. Replace if necessary.

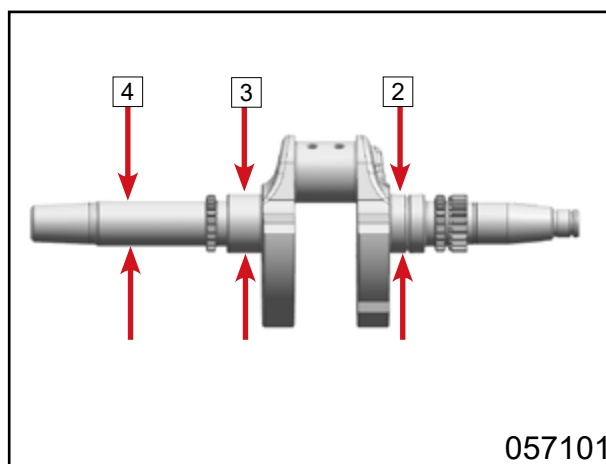


Crankshaft Inspection

Measure crankshaft journal diameters on both sides. Compare them with sliding bearing inner diameter (refer to Crankcase section).

Crankshaft main journal diameter (CVT/MAG side) 3 2	
New	41.960 mm~41.970 mm
Service limit	41.935 mm

Crankshaft main journal axial clearance (CVT/MAG side)	
Service limit	0.09 mm



Measure crankshaft CVT side journal diameter. Compare it with CVT case bearing inner diameter (refer to CVT Case section).

Crankshaft CVT side journal diameter	
New	31.955 mm~31.970 mm (1.2581 in~1.2587 in)
Service limit	31.940 mm (1.2575 in)

Crankshaft CVT side journal axial clearance	
Service limit	0.10 mm

Connecting Rod/Journal Clearance

Connecting Rod Assembly

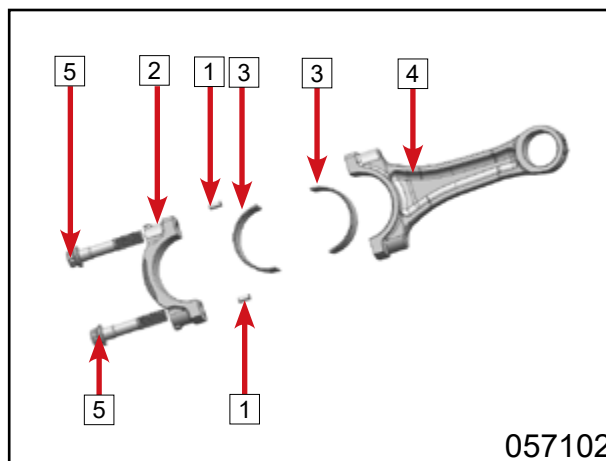
Before assembly, match plain bearings according their conditions.

Install pins 1 on connecting rod cap 2.

Install connecting rod plain bearings 3 on cap 2 and connecting rod body 4 respectively.

Install cap 2 on connecting rod body 4.

Install connecting rod bolts 5.



NOTE: Tighten the connecting bolts twice. First tighten the bolt to 30N.m for 2 seconds. Then tighten the bolt to 60±2.1N•m.

NOTE: Install the connecting rods according to the signs. Connecting rods of first cylinder and second cylinder can not be mixed up.

⚠ CAUTION: If connecting rod bolts are removed, replace with new plain bearings during installation.

Measure crankshaft connecting rod journal diameter [1]. Compare it with connecting rod big end bearing inner diameter. (Install connecting rod plain bearings. Install bolts and tighten them, then measure connecting rod big end bearing inner diameter.)

Connecting rod journal diameter	
New	43.930 mm~43.950 mm (1.7295 in~1.7303 in)
Service limit	43.915 mm (1.7289 in)
Connecting rod big end bearing inner diameter	
Service limit	44.03mm(1.7334 in)
Connecting rod big end axial clearance	
Service limit	0.09mm(0.0035 in)

Measure connecting rod small end inner diameter [3] (with plain bearings) with dial bore gauge. Replace if beyond service limit.

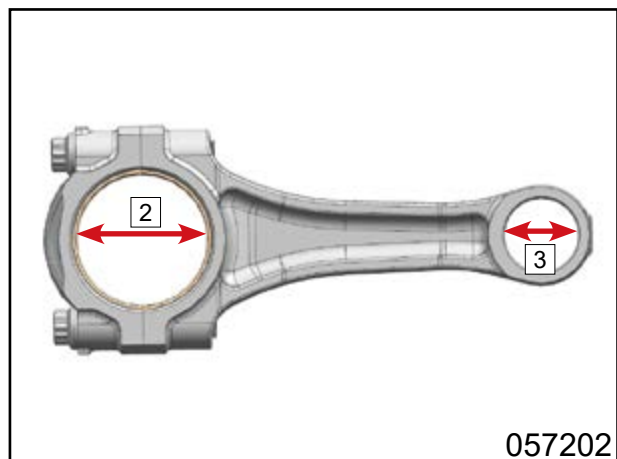
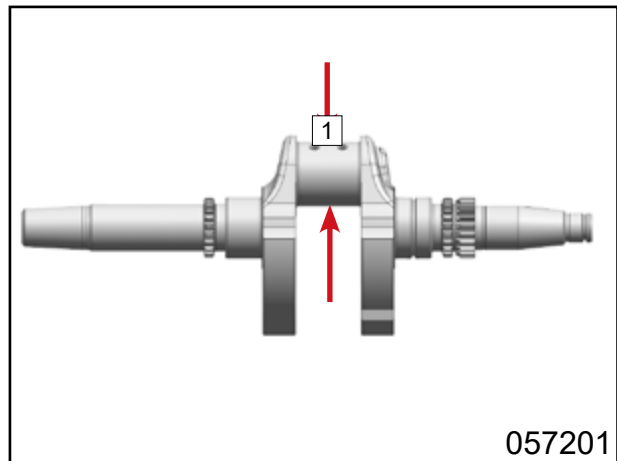
Connecting rod small end inner diameter [3]	
New	22.01 mm~22.02 mm 0.8665 in~0.8669 in

Crankshaft Connecting Rod Assembly Match

NOTE: Crankshaft, connecting rod and plain bearings must be matched according to the following requirements.

Connecting rod big hole inner diameter (sign)	
47.004 mm~47.010 mm (I)	
47.010 mm~47.016 mm (II)	

Connecting rod journal (sign)	
43.938 mm~43.950 mm (A)	
43.938 mm~43.950 mm (A)	



Connecting rod plain bearing (sign)	
I	1.519 mm~1.523 mm, black
II	1.523 mm~1.528 mm, blue
I	1.514 mm~1.519 mm, red

Big hole (sign)	Journal (sign)	Plain bearing (sign)	Axial clearance (mm)
I	A	Black	0.028~0.049
II		Blue	
I	B	Red	
II		Black	

Assembly

According to the tables above, choose the proper plain bearings.

Install pins [4] on connecting rod cap [2].

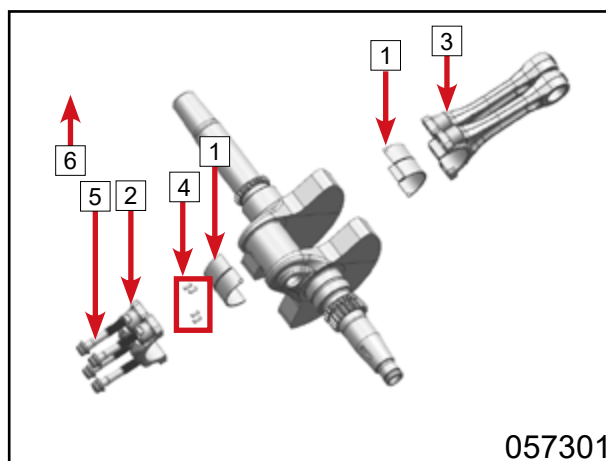
Put plain bearings [1] on cap [2] and connecting rod body [3] and install them in place. Clean the plain bearing with compressed air.

Install cap [2] and connecting rod body [3] on crankshaft.

Install connecting rod bolts [5].

Tighten the connecting bolts twice. First tighten the bolt to 30N.m for 2 seconds. Then tighten the bolt to 60±2.1N.m.

Rotate the connecting rod after installation. Inspect if it is rotated freely without stuck feeling or has other defects.

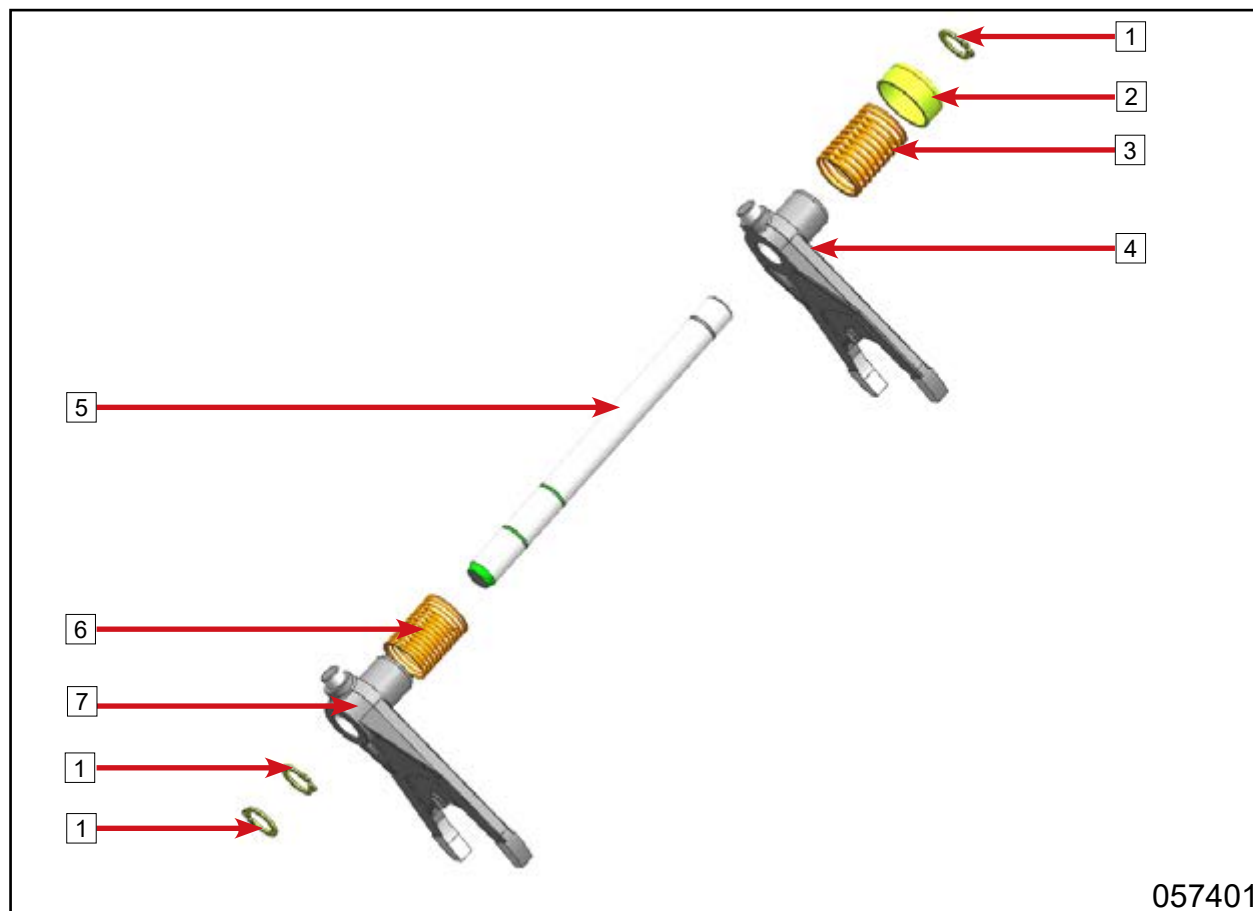


NOTE: Apply some engine oil on plain bearing inner surface and connecting rod journal surface before installation.

NOTE: The "0JY0" side on connecting rods of first cylinder and second cylinder should face towards two ends of crankshaft (the "0JY0" sign should face outside).

5.5.23 Transmission Assy

Shift Fork Assy



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1	Circlip 12	2	Spring seat	3	Fork spring, thick
4	Shift fork, RH	5	Shaft, shift fork	6	Fork spring, thin
7	Shift fork, LH				

Shift Fork/Shaft

Inspect shift forks for severe wear or damage.

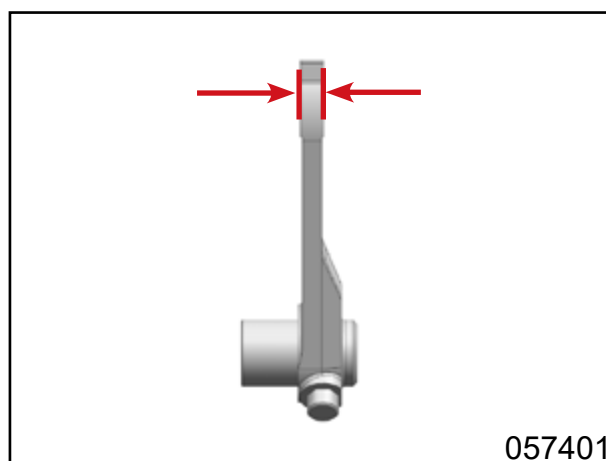
Inspect shift fork claw for bending.

Measure shift fork claw thickness.

Replace if beyond service limit.

Shifting fork thickness (LH&RH)	
New	5.8 mm~5.9 mm (0.228 in~0.232 in)
Service limit	5.7 mm (0.224 in)

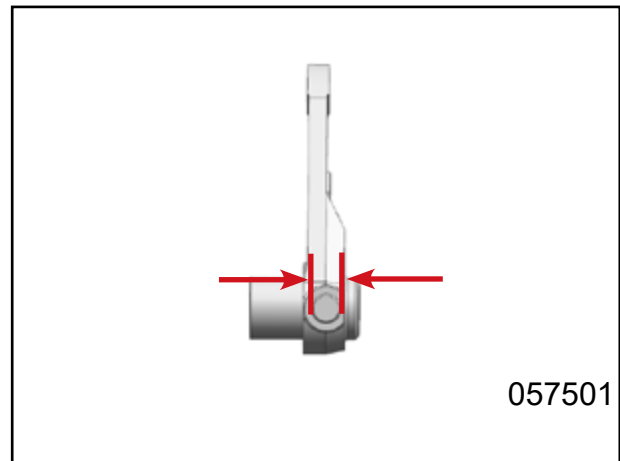
NOTE: The removed circlips can not be reused. Replace with new ones during installation. If there is no failure on shift fork assy, it is not necessary to disassemble.



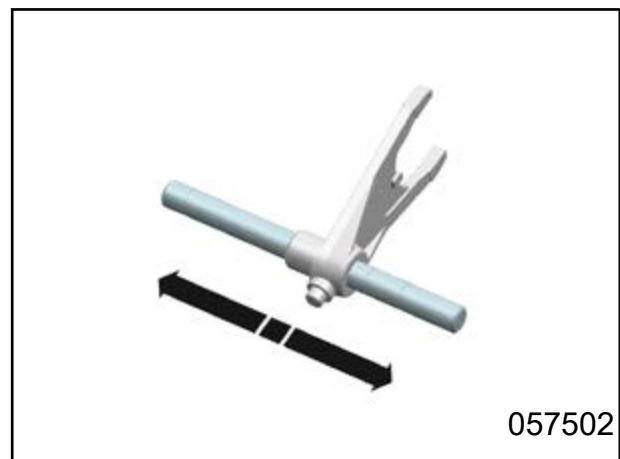
057401

Measure shift fork pin diameter (LH&RH).
Replace if beyond service limit.

Shift fork pin diameter (LH&RH)	
New	7.9 mm~7.95 mm
	(0.311 in~0.313 in)
Service limit	7.83 mm (0.308 in)



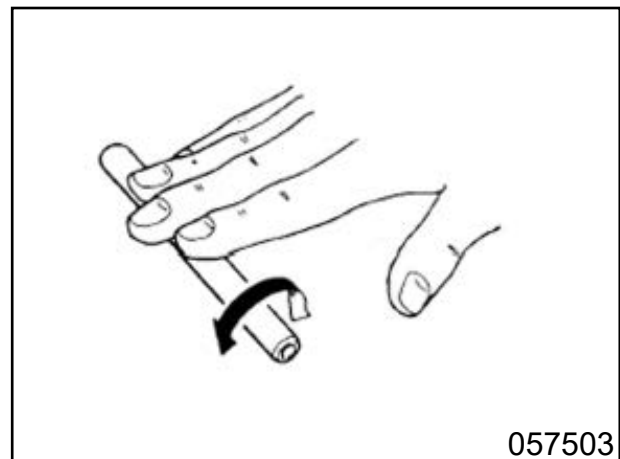
Put shift fork onto the shift fork shaft, then move the shaft as illustrated. Check if shift fork slides smoothly. Replace if necessary.



Shift Fork Shaft

Place shift fork shaft on a level surface and roll it. Replace if bending issue occurs.

⚠ CAUTION: Do not try to correct the bend shift fork shaft.

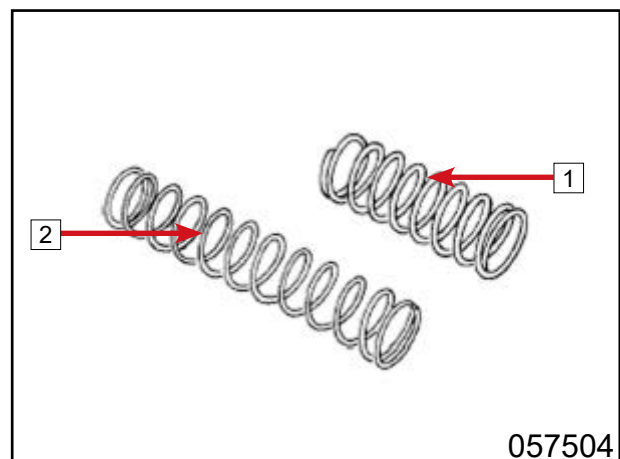


Shift Fork Spring

Inspect shift fork spring for break, crack or damage. Replace if any defect occurs.

Measure shift fork spring free length.
Replace if beyond standard.

1	Thin fork spring (free length: 114 mm)
2	Thick fork spring (free length: 82 mm)

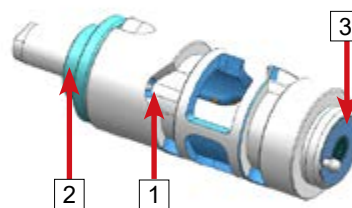


Shift Drum

Inspect shift drum [1] grooves for damage or severe wear. Replace if necessary.

Inspect parking cam [2] on shift drum for damage or severe wear. Replace if necessary.

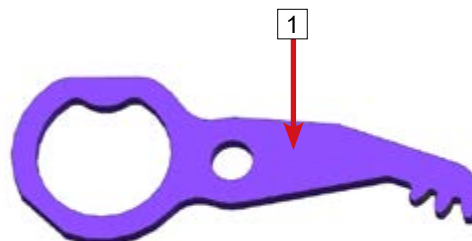
Inspect thrust washer [3] for damage. Replace if necessary.



057601

Parking Swing Arm

Inspect parking swing arm [1] for cracks or damage. Replace if necessary.



057602

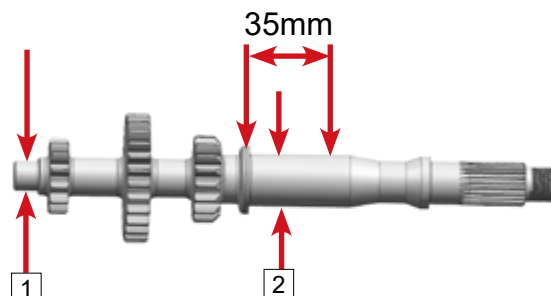
Shifting Main Shaft

Inspect shifting main shaft for damage. Replace if necessary.

Inspect shifting main shaft teeth for dark spots, damage or severe wear. Replace if necessary.

Measure journal diameter on both sides. Replace if beyond service limit.

Shifting main shaft journal diameter	
Service limit	
MAG side [1]	16.978 mm (0.6684 in)
CVT side [2]	29.97 mm (1.180 in)



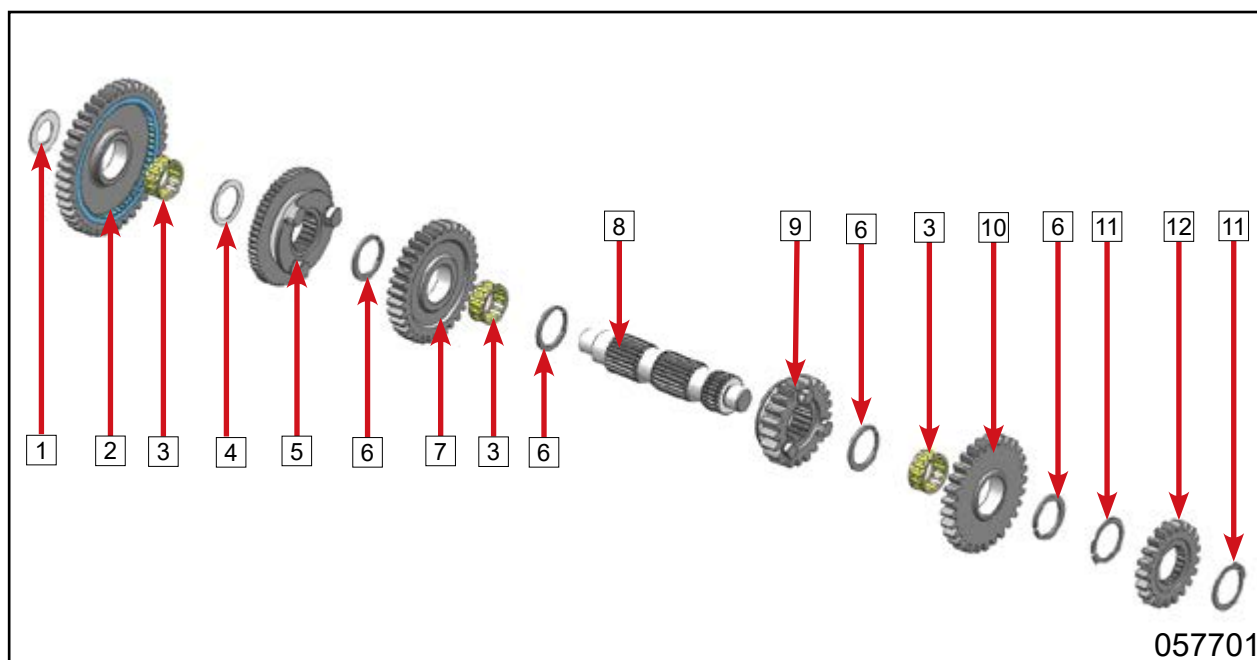
057603

Shifting Driven Shaft Assy

Disassemble shifting driven shaft.

Inspect gear teeth for pitting, damage or severe wear. Replace if necessary.

NOTE: The removed circlips can not be reused. Replace with new ones during installation. If there is no failure on shifting driven shaft assy, it is not necessary to disassemble.



1	Washer 17.5×32×1	7	Driven high gear
2	Driven low gear	8	Driven shaft
3	Needle bearing	9	Driven output shaft
4	Washer 24.5×33.5×1	10	Driven reverse gear
5	Shifting slide sleeve	11	Circlip 29
6	Retainer 29	12	Parking gear

Gear

Driven shaft output gear is for reverse gear shifting.

Gearshift sliding sleeve is for high and low gear shifting.

Measure the width for engagement of shift fork. Replace if beyond service limit.

The width for engagement of shift fork on the gear should be the same with the one on the sliding sleeve.

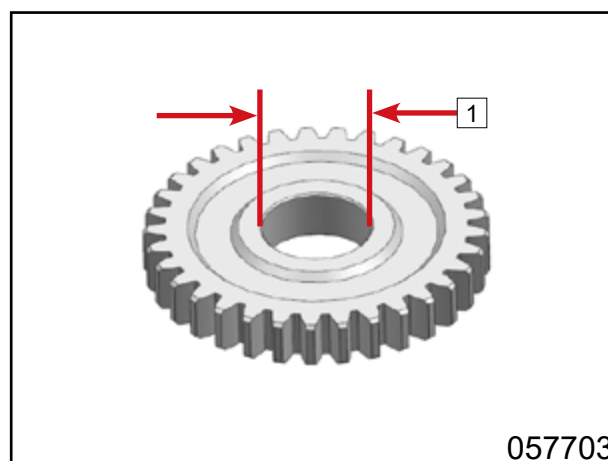
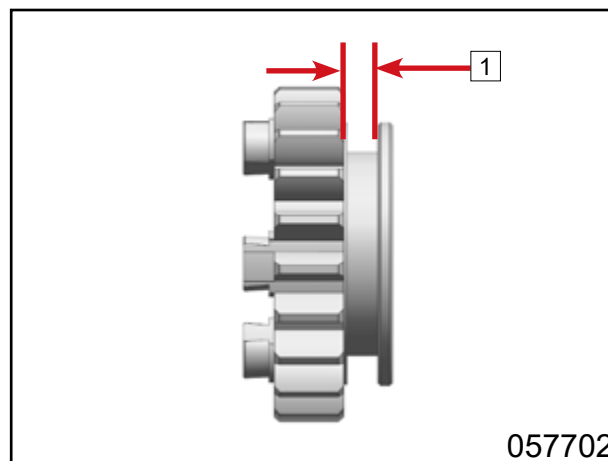
Shifting groove width ¹	
New	6.1 mm~6.2 mm (0.240 in~0.244 in)
Service limit	6.3 mm (0.248 in)

Inspect reverse driven gear, high range gear, low range gear for damages.

Measure the gear inner diameter. Replace if beyond service limit.

The inner diameter of reverse driven gear, high range gear, low range gear are the same.

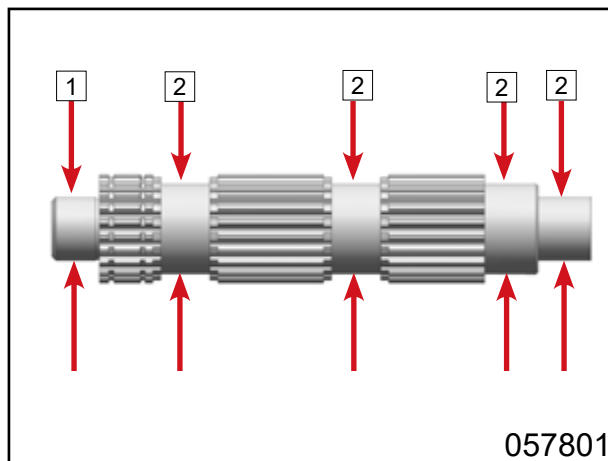
Gear inner diameter ¹	
New	29 mm~29.021 mm (1.1417 in~1.1425 in)
Service limit	29.025 mm (1.1427 in)



Driven Shaft

Check driven shaft for damage.
Check driven shaft for pitting, break and severe wear. Replace if necessary.
Measure driven shaft journal diameter.
Replace if beyond service limit.

Driven shaft	
Service limit	
1	16.978 mm (0.6684 in)
2	23.974 mm (0.9439 in)



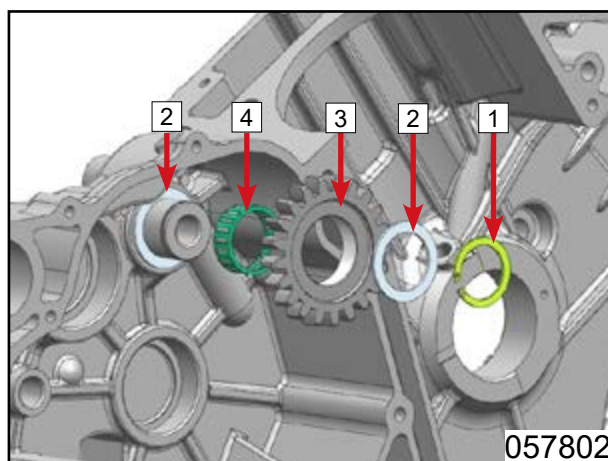
5.5.24 Reverse Intermediate Gear

Disassembly

Remove circlip 1.
Remove washer 2.
Remove reverse intermediate gear 3.
Remove needle bearing 4.
Remove washer 2.

NOTE: If reverse intermediate gear and needle bearing can rotate freely, the clearance is qualified, it is not necessary to disassemble.

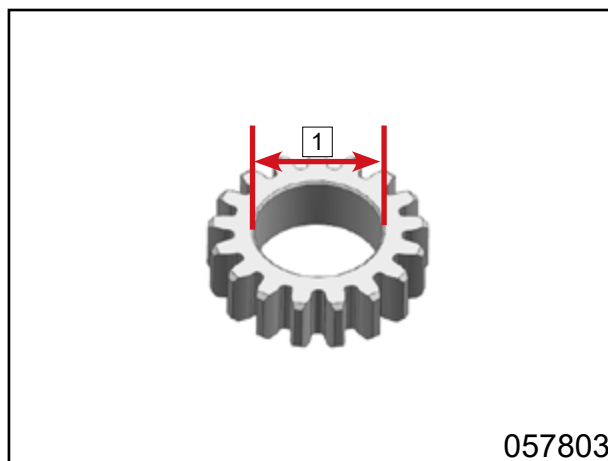
NOTE: The reverse intermediate gear shaft can not be removed. Replace the gear shaft along with crankcase together if damaged.



Inspection

Inspect reverse intermediate gear for damage. Measure gear inner diameter. Replace if beyond service limit.

Reverse intermediate gear inner diameter	
New	29.007 mm~29.028 mm (1.1420 in~1.1428 in)
Service limit	29.032 mm (1.1430 in)

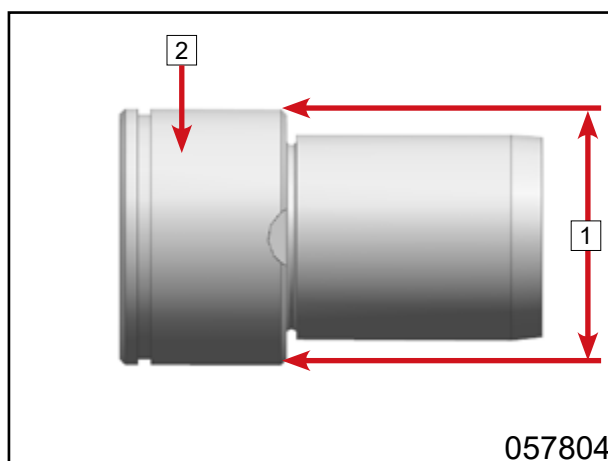


Reverse Intermediate Gear Shaft

Inspect reverse intermediate gear shaft 2 for damage. Measure shaft outer diameter 1. Replace if beyond service limit.

Reverse intermediate gear shaft outer diameter	
New	24.980 mm~24.993 mm (0.9834 in~0.984 in)
Service limit	24.974 mm (0.9832 in)

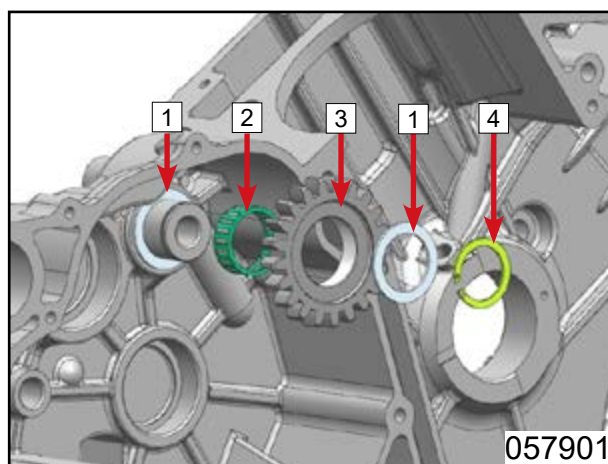
NOTE: The reverse intermediate gear shaft can not be removed. Replace the gear shaft along with crankcase together if damaged.



Assembly

- Install washer [1].
- Install needle bearing [2].
- Install reverse intermediate gear [3].
- Install washer [1].
- Install circlip [4].

NOTE: The removed circlips can not be reused. Replace with new ones during installation.

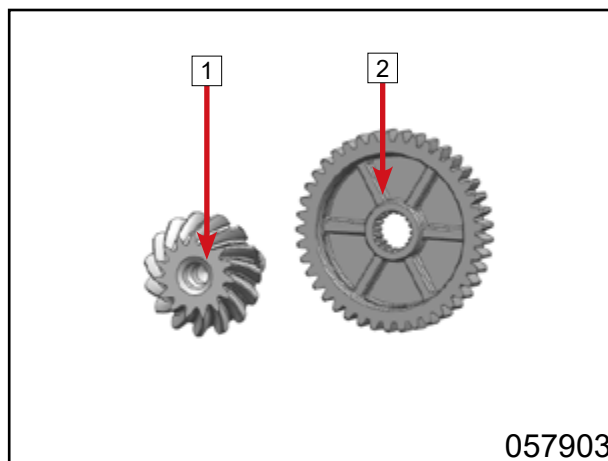
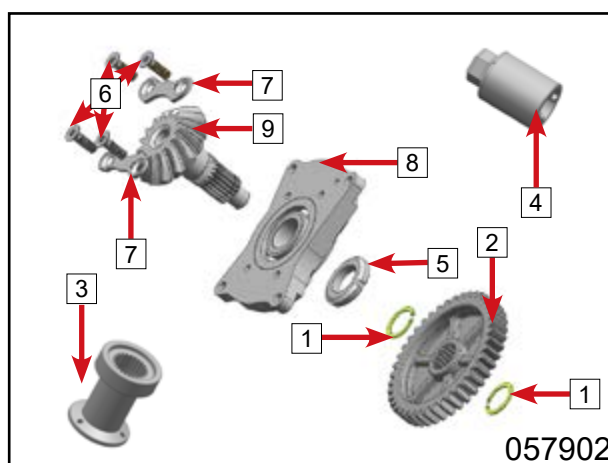


5.5.25 Drive Bevel Gear

Disassembly

- Remove circlip [1].
- Remove output driven gear [2].
- Remove circlip [1].
- Use special tool: Drive Bevel Gear Holding tool [3] to stop drive bevel gear rotating.
- Use special tool: Bevel Gear Lock Nut Socket B [4] to remove bevel gear lock nut [5].
- Remove drive bevel gear [9] from bearing seat [8].
- Remove screws [6].
- Remove bearing limit plates [7].

NOTE: Inspect bearings, drive bevel gear and bearing seat before disassembly. It is not necessary to disassemble if not damaged.

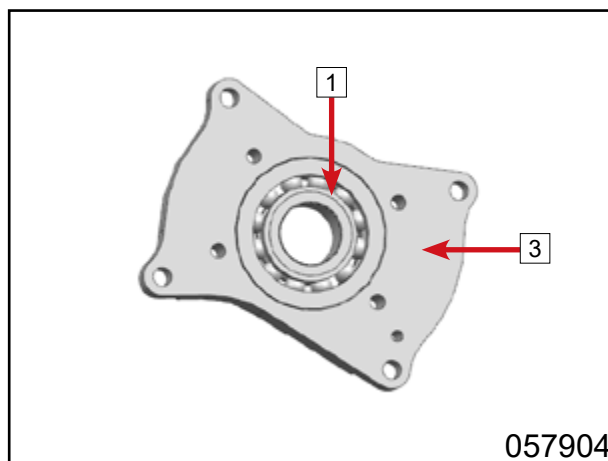


Inspection

Inspect drive bevel gear [1] and output driven gear [2] teeth for corrosion, scratches, wear or damage. Replace if necessary.

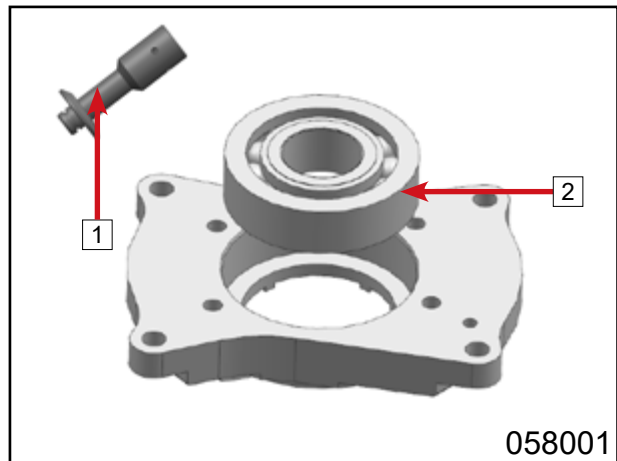
NOTE: Inspect bearing [1] and drive bevel gear bearing seat [3]. It is not necessary to disassemble if not damaged.

If bearing or drive bevel gear bearing seat is damaged, remove the bearing [1] with proper bearing puller and replace parts.



Put the clean drive bevel gear bearing seat on work bench.

Apply engine oil on bearing [2] evenly inside and outside. Use special tool: 63/28 Bearing Installer [1] to Install 62/28 needle bearing [2] into the hole on drive bevel gear bearing seat. The bearing should be rotated freely without stuck feeling after installation.



Assembly

Install bearing limit plates [7].

Install screws [6].

Put drive bevel gear [9] on drive bevel gear bearing seat [8].

Use special tool: Drive Bevel Gear Holding Tool [3] to stop drive bevel gear rotating.

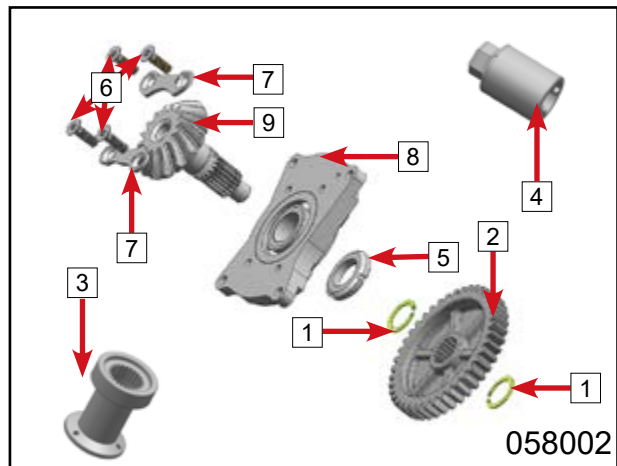
Use special tool: Bevel Gear Lock Nut Socket B [4] to install bevel gear lock nut [5] (with thread locker).

Tighten torque: 135 N•m~155 N•m

Install circlip [1].

Install output driven gear [2].

Install circlip [1].

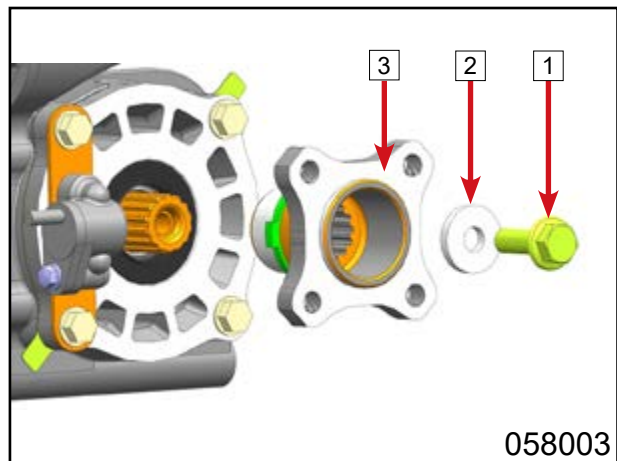


5.5.26 Driven Bevel Gear Disassembly

Remove bolt [1].

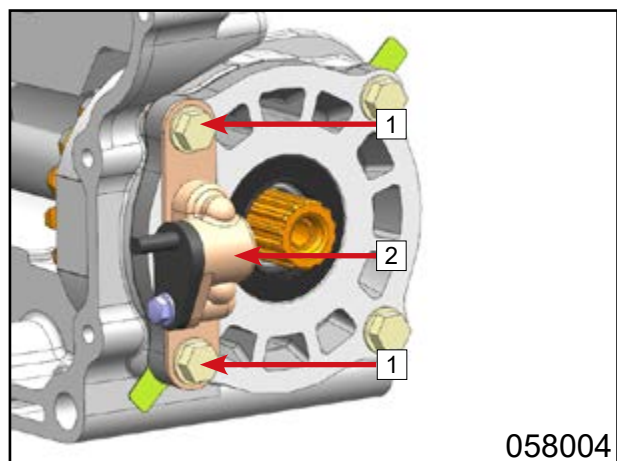
Remove washer [2].

Remove rear output coupler assy [3].



Remove bolts [1].

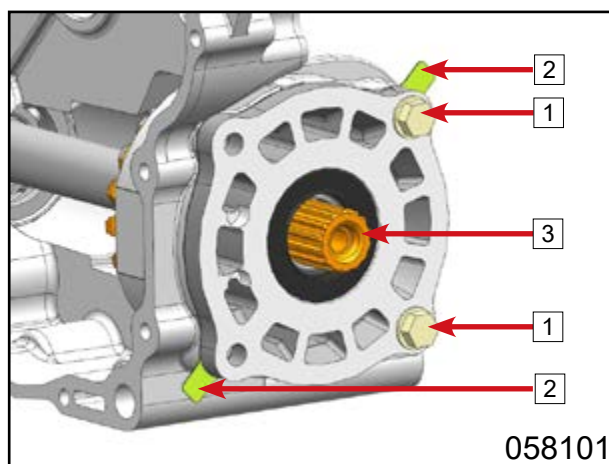
Remove speed sensor assy [2] (speed sensor inspection refers to Electrical System chapter).



Remove bolts [1].

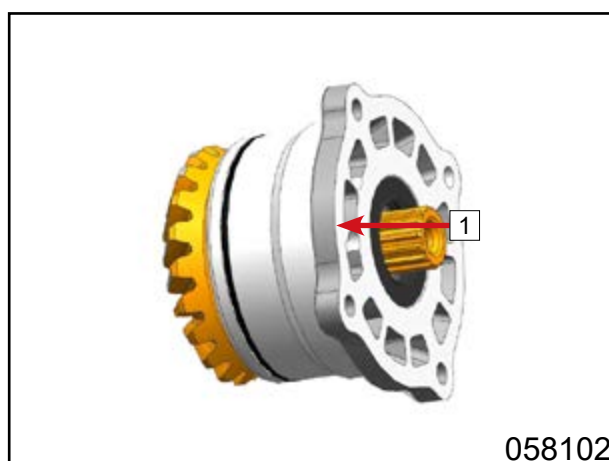
Remove driven bevel gear adjusting washers [2].

Remove driven bevel gear bearing seat [3].



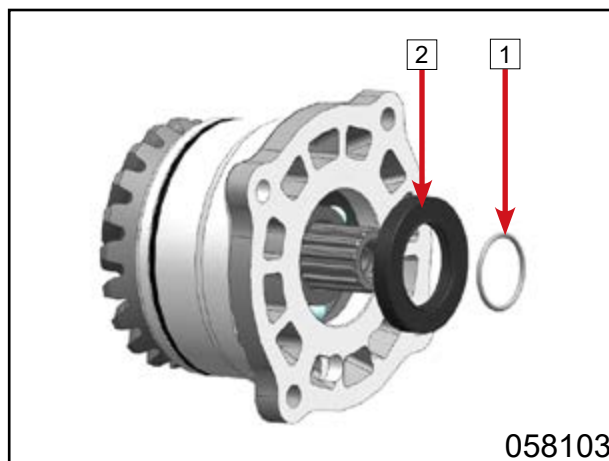
Inspection

Inspect driven bevel gear assy [1] for damage. If yes, disassemble and replace fault parts. If not, it is not necessary to disassemble.

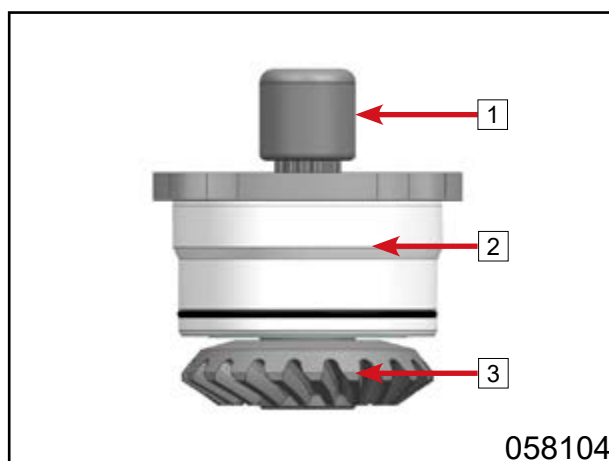


Remove o-seal ring [1].

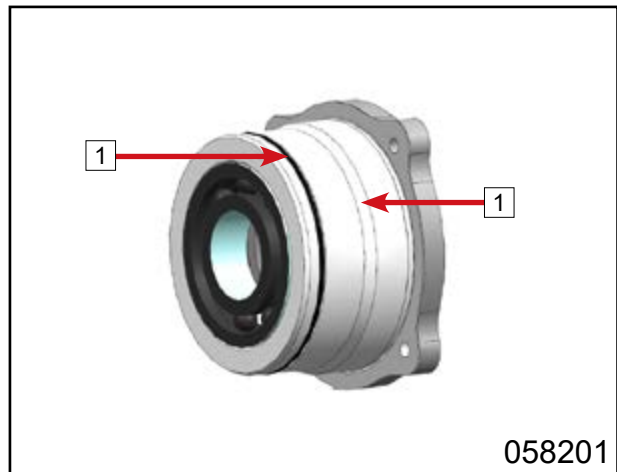
Remove oil seal [2].



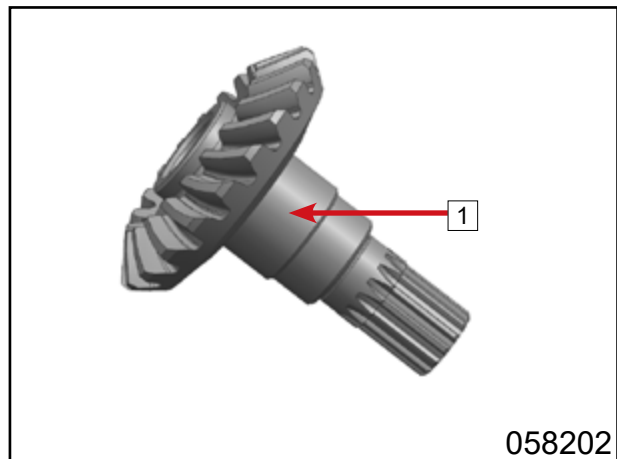
Protect drive bevel gear end with protective tool [1]. Fix driven bevel gear bearing seat [2] and compress out driven bevel gear [3].



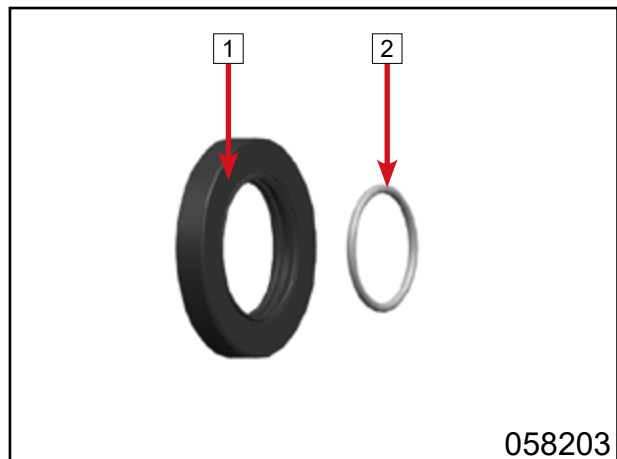
Inspect o-seal ring [1] for cracks, aging or other damage. Replace if necessary.
Inspect driven bevel gear bearing seat assy [1] for damage. Replace if necessary.
Inspect driven bevel gear bearing. Replace if stuck or damaged.



Inspect drive bevel gear [1] for scratches, wear or other damage. Replace the whole set if necessary.

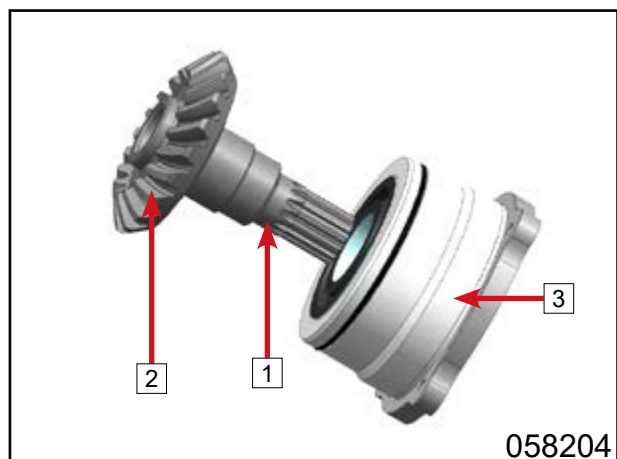


The removed oil seal [1] can not be reused. Replace with new ones during installation.
Inspect o-seal ring [2] for cracks, aging or other damage. Replace if necessary.



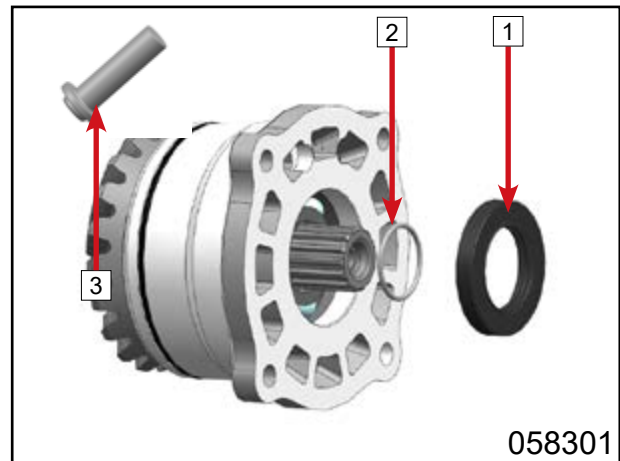
Assembly

Apply 648 sealant on driven bevel gear [1] and 6305 bearing contacting area. Pay attention not to apply on splines.
Compress driven bevel gear [2] on driven bevel gear bearing seat [3].



Apply engine oil on o-seal ring [1] and install it on driven bevel gear.

Apply grease on oil seal [2] lip. Use special tool: Driven Bevel Gear Oil Seal Installer [3] to install oil seal [2] on driven bevel gear bearing seat.

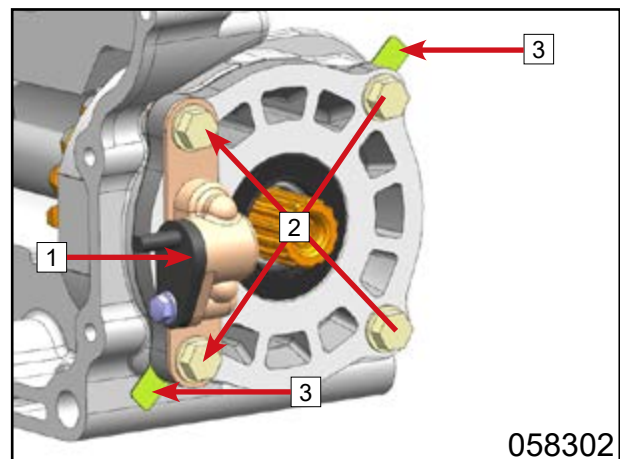


058301

Install speed sensor [1].

Install bolts [2] without being tightened completely.

Install driven bevel gear adjusting washers [3] and tighten bolts [2] (bevel gear clearance adjustment refers to Engine Assembly section).

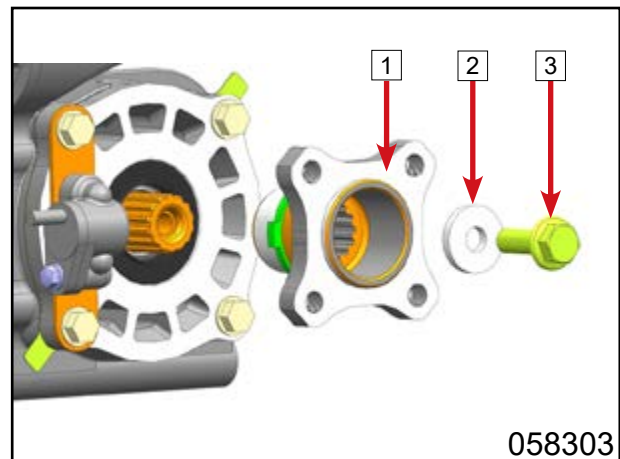


058302

Install rear output coupler assy [1].

Install washer [2].

Install bolt [3] (with 243 thread locker).
M10×1.25×30 bolt tighten torque: 60 N•m



058303

5.5.27 Front Output Shaft

Disassembly

Remove bolt [1].

Remove washer [2].

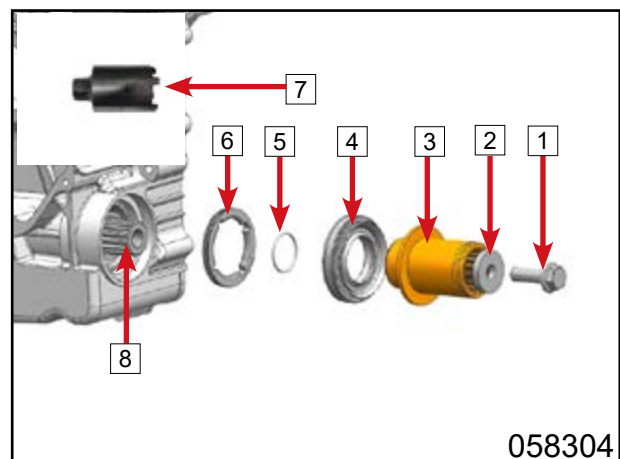
Remove front output coupler assy [3].

Remove oil seal [4].

Remove o-seal ring [5].

Use special tool: Front Output Shaft Bearing Retainer Tool [7] to remove bearing retainer [6] (left-hand thread).

Remove front output shaft [8].



058304

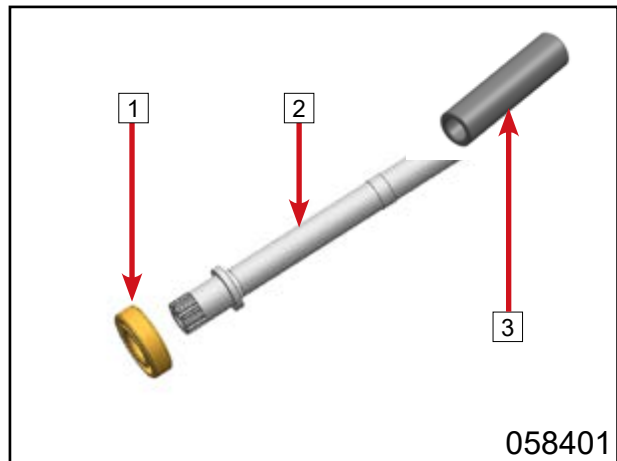
Inspection

Inspect bearing [1] for smooth rotation and abnormal wear. If yes, remove bearing [1] from front output shaft [2] and replace with a new one. During installation, apply some 648 sealant on front output shaft [2] installing surface first. Then put 6205 bearing on front output shaft. Use special tool: front output shaft bearing 6205 installer [3] to install the bearing in place. Inspect front output shaft for bending or damage. Replace if necessary.

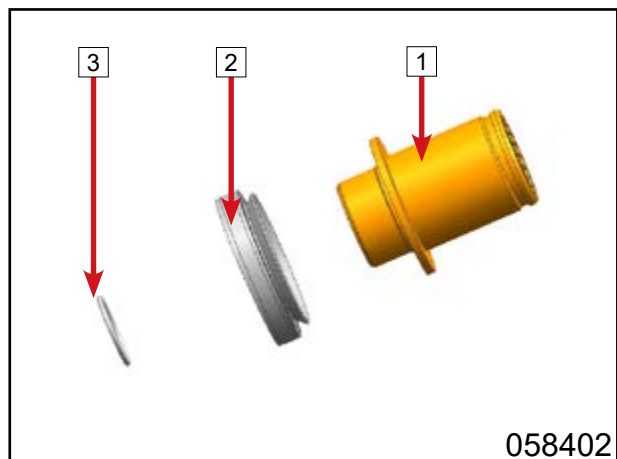
NOTE: Do not break front output shaft during bearing removal and installation.

Inspect front output coupler assy [1] for damage. Replace if necessary. Inspect o-seal ring [3] for cracks, aging or other damage. Replace if necessary.

NOTE: The removed oil seal [2] can not be reused. Replace with new ones during installation.



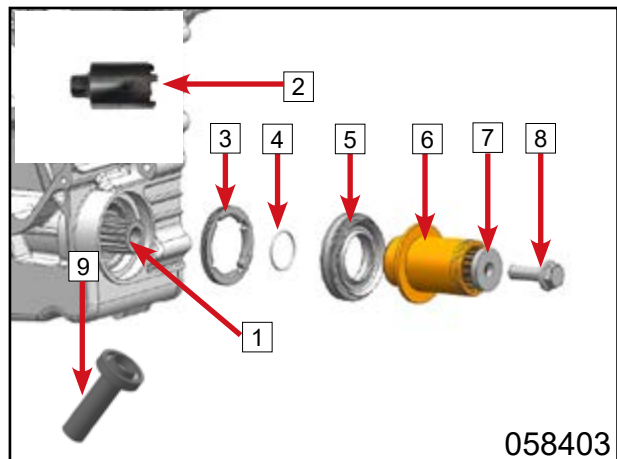
058401



058402

Assembly

Install front output shaft [1].
Use special tool: Front Output Shaft Bearing Retainer Tool [2] to install bearing retainer [3] (left-hand thread).
Tighten torque: 80 N•m
Apply engine oil on o-seal ring [4] and install it on driven bevel gear.
Apply grease on new oil seal [5] lip. Use special tool: Front Output Oil Seal Installer [9] to install oil seal [5].
Install front output coupler assy [6].
Install washer [7].
Install bolt [8].

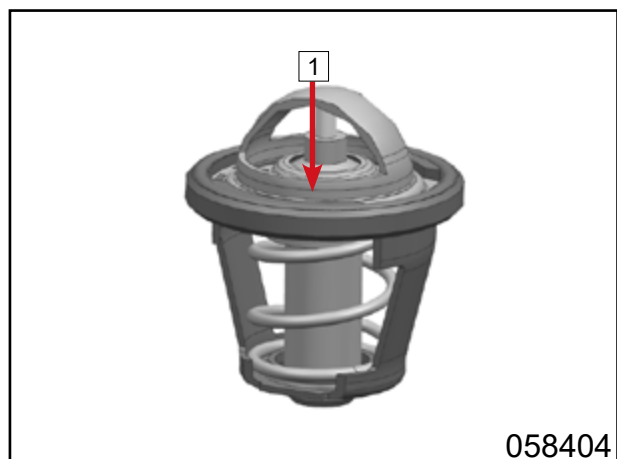


058403

5.5.28 Thermostat and Water Temperature Sensor

Thermostat

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



058404

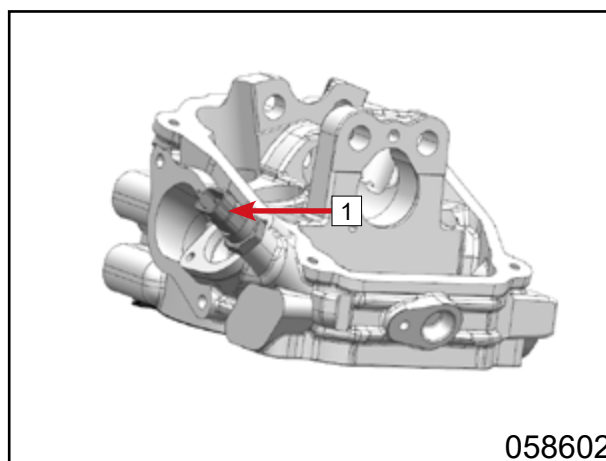
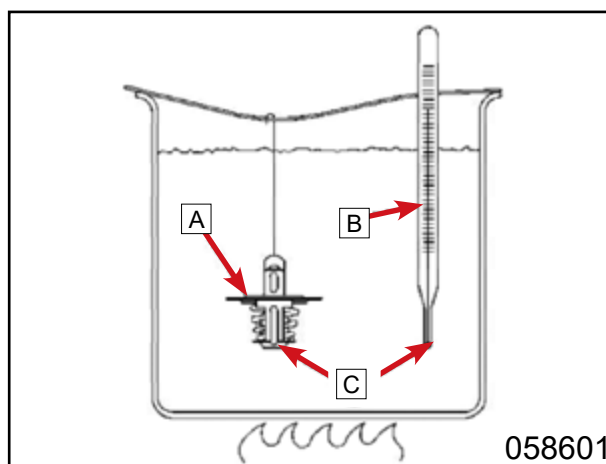
For valve open temperature inspection, hang thermostat **A** into the container full of water. Heat the water slowly. The thermostat should be fully immersed without touching container wall and bottom. Hang a thermometer **B** at the same level without touching wall and bottom either. Then the thermal position **C** is the same.

Replace with a new thermostat if beyond standard.

Thermostat valve open temperature:
Open temperature: 63°C~67°C
Fully open temperature: 85°C, lift range≥5.0

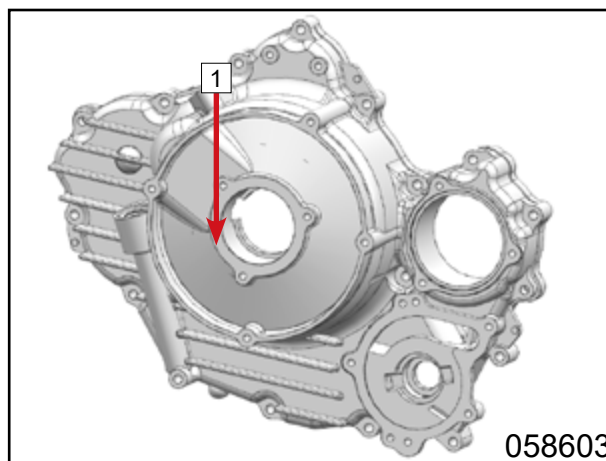
Water Temperature Sensor

Remove water temperature sensor **1**.
Water temperature sensor inspection refers to Electrical System chapter.
Replace if damaged.



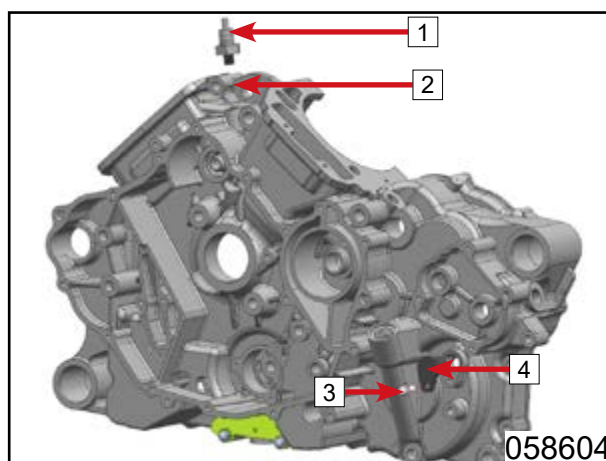
5.5.29 MAG Crankcase Cover

Inspect MAG crankcase cover **1** for cracks or damage. Replace the whole set if necessary.



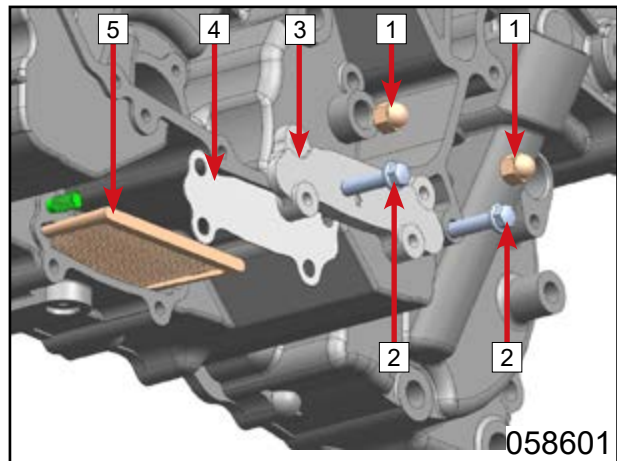
5.5.30 MAG Crankcase Oil Pressure Sensor and Speedometer Sensor

Remove oil pressure sensor **1**.
Remove washer **2**.
Remove bolt **3**.
Remove speedometer sensor **4**.



Oil Strainer

Remove cap nuts [1].
 Remove bolts [2].
 Remove oil strainer outer side plate [3] with a straight screw driver.
 Remove oil strainer outer washer [4] with a screw driver.
 Remove oil strainer [5] with nipper pliers.



Inspection

Oil temperature&pressure sensor and speedometer sensor inspection refers to Electrical System chapter.

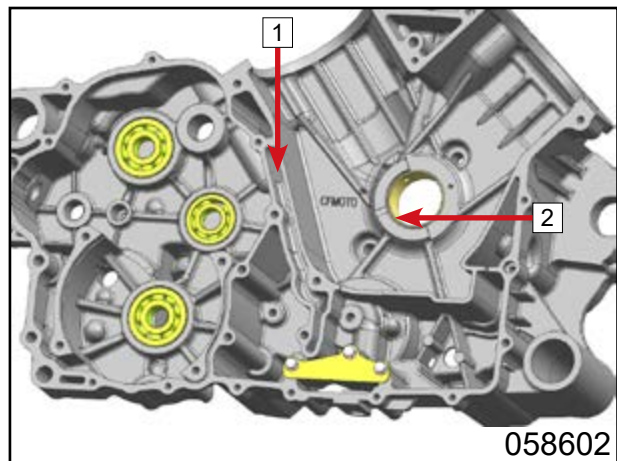
Oil Strainer

Clean oil strainer with detergent and dry with compressed air.
 Inspect every part. Replace if damaged.

NOTE: Pay attention to protect eyes during cleaning. In case the chemicals in detergent gets into eyes and causes injury.

MAG Crankcase

Inspect MAG crankcase [1] for cracks or damage. Replace the whole set if necessary.
 Inspect bearings for stuck issue or damage. Replace if necessary.
 Inspect plain bearings [2] for severe wear or damage. Replace the whole crankcase if damaged.

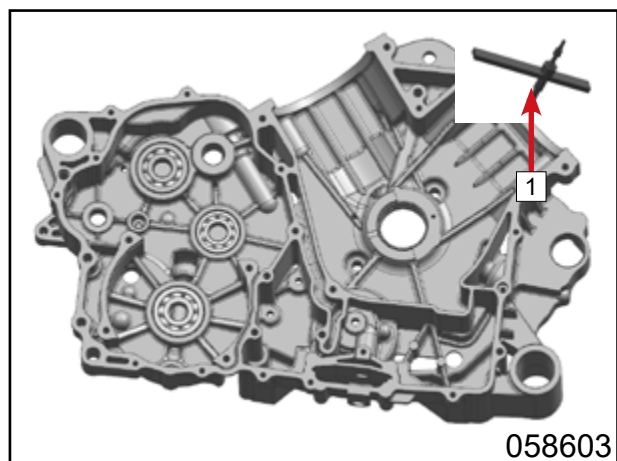


Bearing

Rotate bearing inner ring with finger. The bearing should rotate smoothly and quietly.
 Replace if it is stuck, noisy or has other defects.

Removal

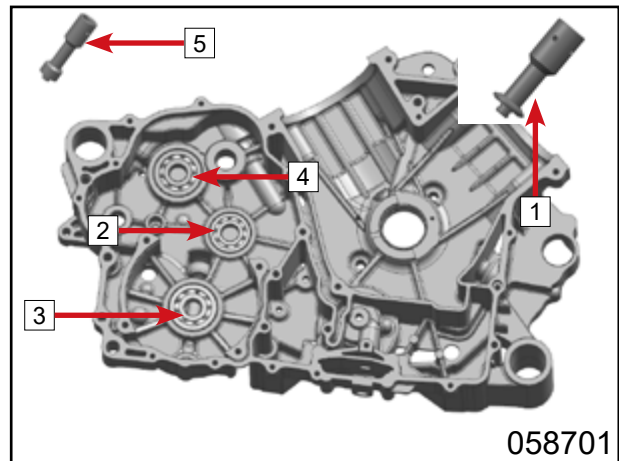
Use special tool: MAG Crankcase Bearing Removal Tool [1] to remove fault bearings and replace with new ones.



Installation

Use special tool: MAG Crankcase Main Shaft Bearing 6303 Installer **1** to install 6303 bearings **3** and **4**.

NOTE: The bearing should rotate freely without stuck feeling after installation. Bearing surface with marks should face outside. No damage on crankcase.



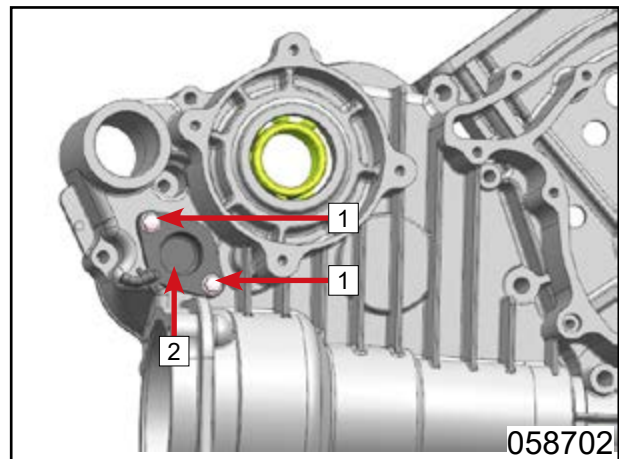
5.5.31 PTO Crankcase

Gear Sensor

Remove bolts **1**.

Remove gear sensor **2**.

Gear sensor inspection refers to Electrical System chapter.



Relief Valve

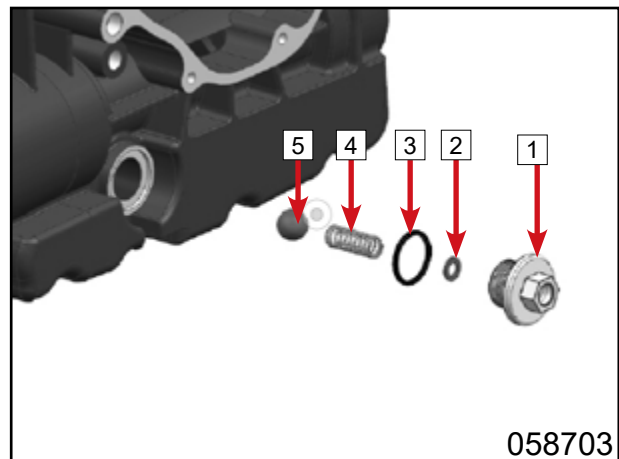
Disassembly (status 1)

Remove screw plug **1**.

Remove retainer **2**.

Remove o-seal ring **3**.

Remove spring **4** and steel ball **5** with magnet.



Inspection

Inspect steel ball, o-seal ring, relief valve screw plug and retainer. Replace if damaged.

Inspect relief valve spring free length. Replace if beyond the value in the table below.

Spring free length	
New (Min.)	24.1 mm
Service limit	23 mm

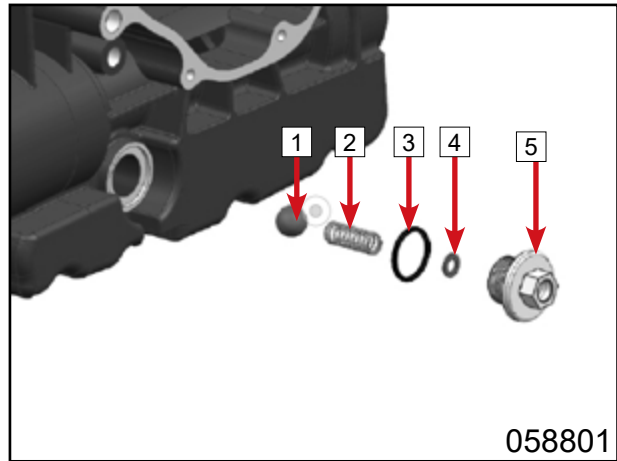
Assembly

Place PTO crankcase as picture shows.

Install steel ball [1].

Put o-seal ring [3] on screw plug [5].

Put retainer [4] and spring [2] together on screw plug. Then rotate the relief valve screw plug assy for installation.

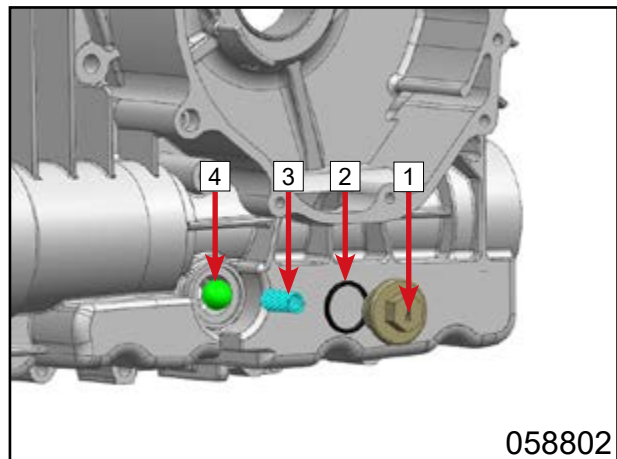


Disassembly (status 2)

Remove screw plug [1].

Remove o-seal ring [2].

Remove spring [3] and steel ball [4] with magnet.



Inspection

Inspect steel ball, o-seal ring and relief valve screw plug. Replace if damaged.

Inspect relief valve spring free length. Replace if beyond the value in the table below.

Spring free length	
New (Min.)	24.1 mm
Service limit	23 mm

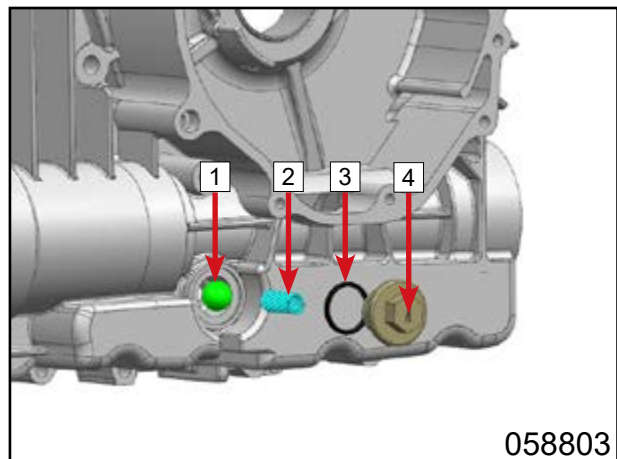
Assembly

Place PTO crankcase as picture shows.

Install steel ball [1].

Put o-seal ring [3] on screw plug [4].

Put spring [2] together on screw plug. Then rotate the relief valve screw plug assy for installation.



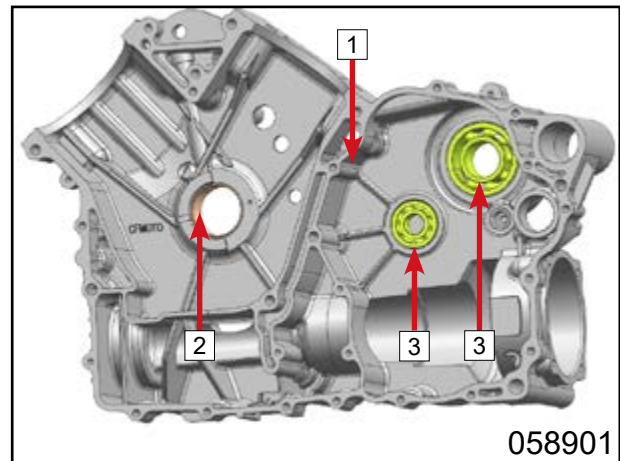
NOTE: Measure oil pressure after installation. If beyond standard, inspect the parts according to engine fault diagnosis procedures to figure out fault parts.

NOTE: The relief value screw plug of status 1 has mark "A" on screw plug. It is not necessary to disassemble if the oil pressure is normal.

NOTE: Two kinds of relief valve coexist. Maintain the part according to its status. Normally the quantity of washers is 0~2 in status 2.

PTO Crankcase

Inspect PTO crankcase [1] for cracks or damage. Replace the whole set if necessary. Inspect bearings [3] for stuck issue or damage. Replace if necessary. Inspect plain bearings [2] for severe wear or damage. Replace the whole crankcase if damaged.



058901

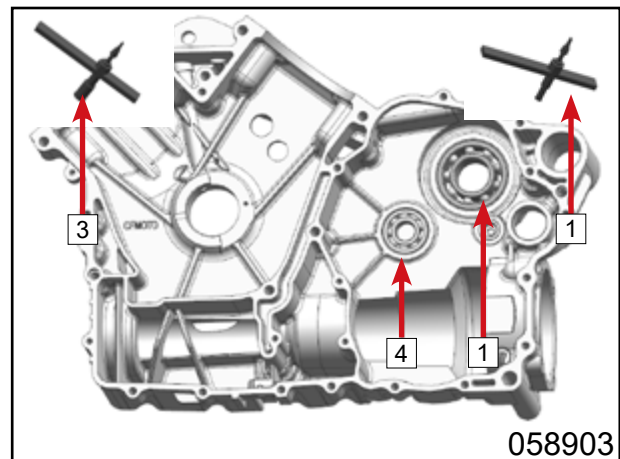
Bearing

Rotate bearing inner ring with finger. The bearing should rotate smoothly and quietly. Replace if it is stuck, noisy or has other defects.

Removal

Use special tool: **MAG Crankcase Bearing Removal Tool** [1] to remove fault bearings [2] and replace with new ones.

Use special tool: **PTO Crankcase Bearing 5206 Removal Tool** [3] to remove fault bearings [4] and replace with new ones.



058903

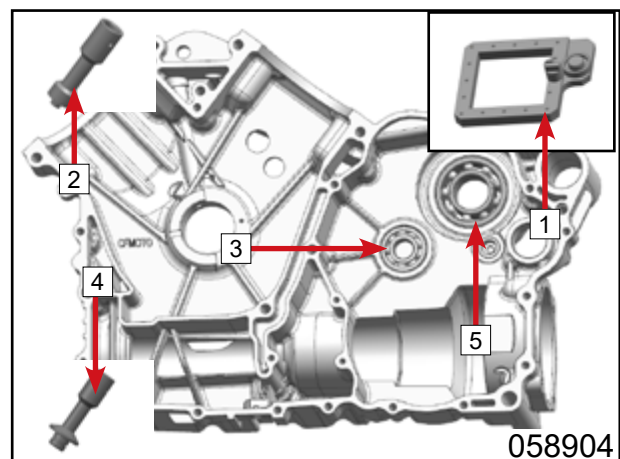
Installation

Put PTO crankcase on special tool: **PTO Crankcase Bearing Compression Supporting Block** [1] and fix it.

Use special tool: **6203 Bearing Installer** [2] to install 6303 bearing [3].

Use special tool: **PTO Crankcase Bearing (3206A) installer** to install 6303 bearing [5].

NOTE: The bearing should rotate freely without stuck feeling after installation. Bearing surface with marks should face outside. No damage on crankcase.



058904

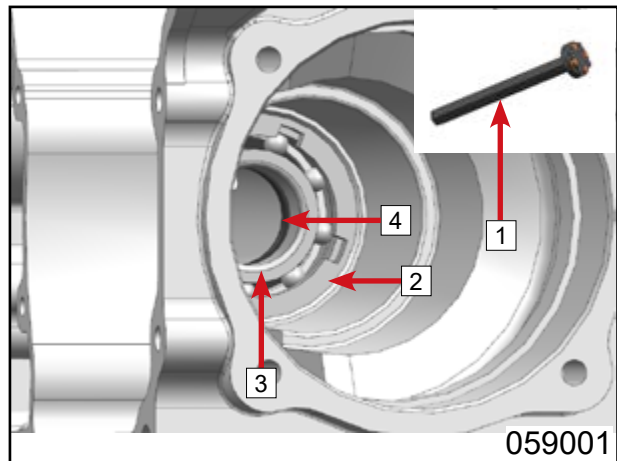
Front Output Bearing and Oil Seal

Removal

Use special tool: Front Output Bearing Retainer Tool **1** to remove the bearing retainer **2**.

Remove bearing **3** with bearing puller.

Remove oil seal **4**.



NOTE: The removed oil seal can not be reused. Replace with new ones during installation.

NOTE: Inspect oil seal for leaking and damage before removal. Replace if necessary. If not, it is not necessary to remove it.

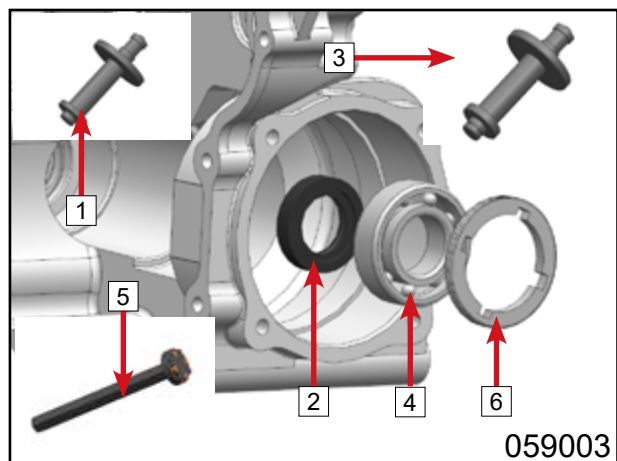
NOTE: Rotate bearing inner ring with finger. The bearing should rotate smoothly and quietly. Replace if it is stuck, noisy or has other defects.

Installation

Apply some grease on new oil seal **2** lip. Use special tool: Oil Seal Installer **1** to install oil seal **2** on PTO crankcase.

Use special tool: Bearing 6205 Installer **3** to install bearing 6205 **4** on PTO crankcase.

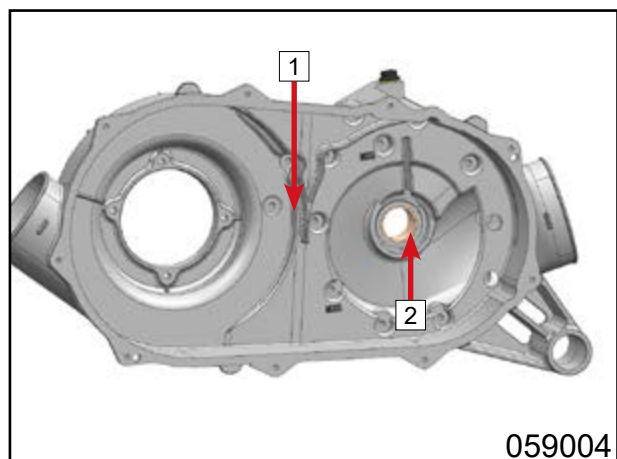
Use special tool: Front Output Bearing Retainer Tool **5** to tighten the front output bearing retainer **6** in place.



5.5.32 CVT Case

Inspect CVT case **1** for cracks or damage. Replace if necessary.

Inspect plain bearings **2** for severe wear or damage. Replace the whole case together if severely worn or damaged.

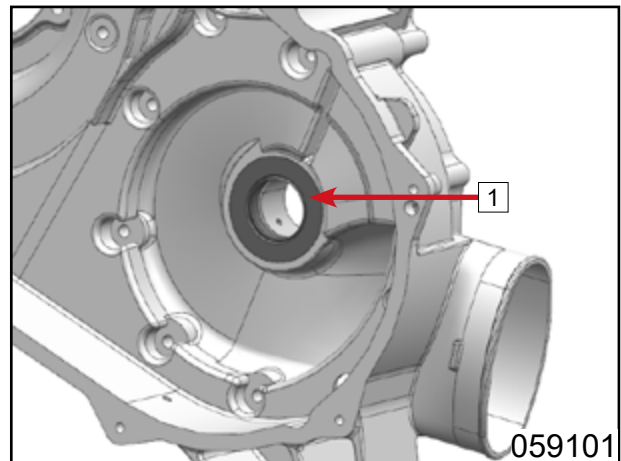


Oil Seal

Inspect oil seal [1] for damage or leak.
Replace if necessary.

Removal

Remove oil seal [1].

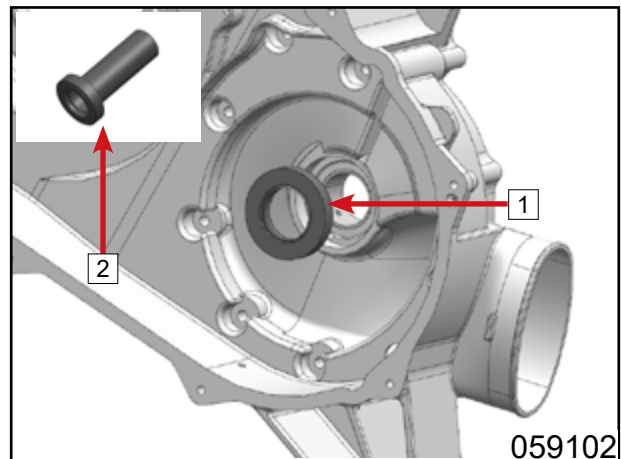


Installation

Apply 648 sealant on oil seal [1] outer surface.

Use special tool: Oil Seal 32×55×10 Installer [2] to install oil seal into the hole on CVT case.

NOTE: Turn the oil seal installer during installation to make sure the force is even. The surface of oil seal should be flat after installation. The side with words should face outside.



5.5.33 Oil Cooler Assy

Disassembly

Loosen clamp [1].

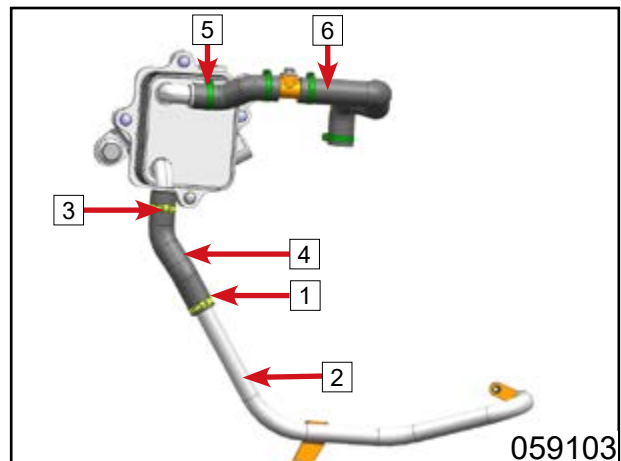
Remove water pump water outlet pipe [2].

Loosen clamp [3].

Remove oil cooler water inlet pipe [4].

Loosen clamp [5].

Remove oil cooler water outlet pipe [6].

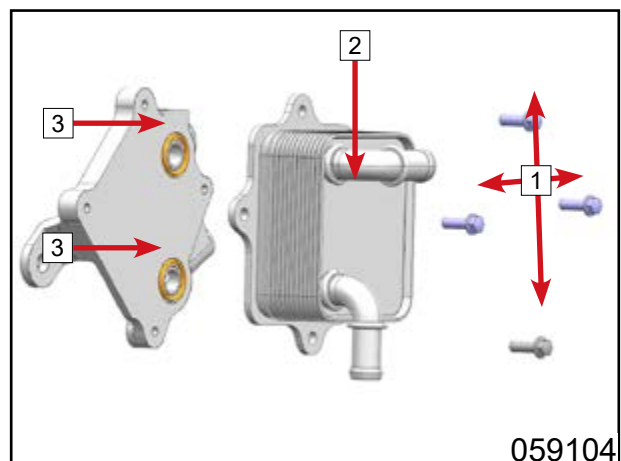


Oil Cooler Assy

Remove bolts [1].

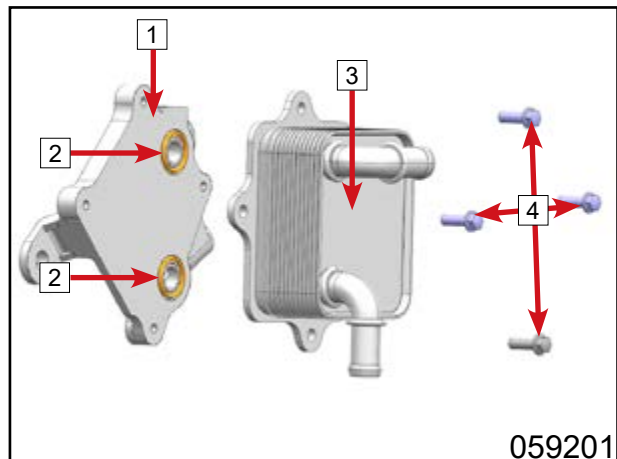
Remove oil cooler [2].

Remove o-seal ring [3].

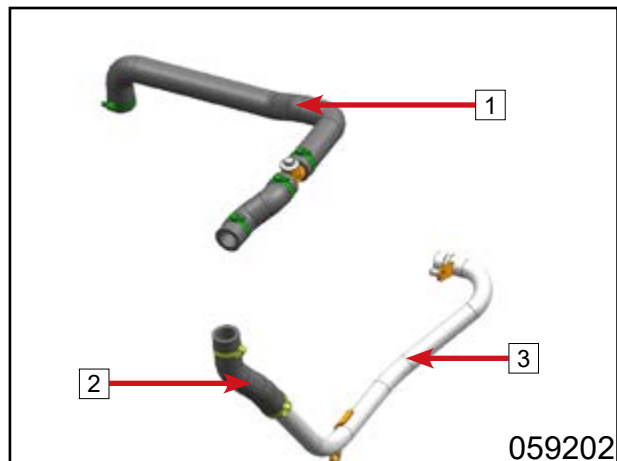


Inspect o-seal ring for damage or hardening.
Replace if necessary.
Clean oil cooler and oil cooler base. Blow
to dry oil cooler oil trail and water trail
respectively with air gun.
Inspect oil trail and water trail on oil cooler
and base. Replace if damaged.

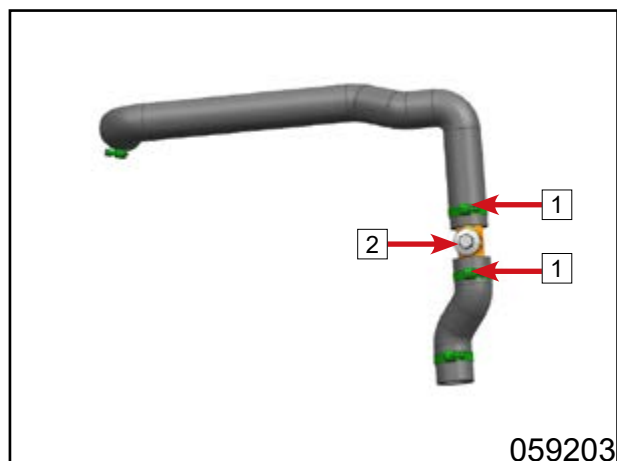
Install o-seal ring [2] on oil cooler base [1].
Install oil cooler [3] on the base [1].
Install bolts [4].



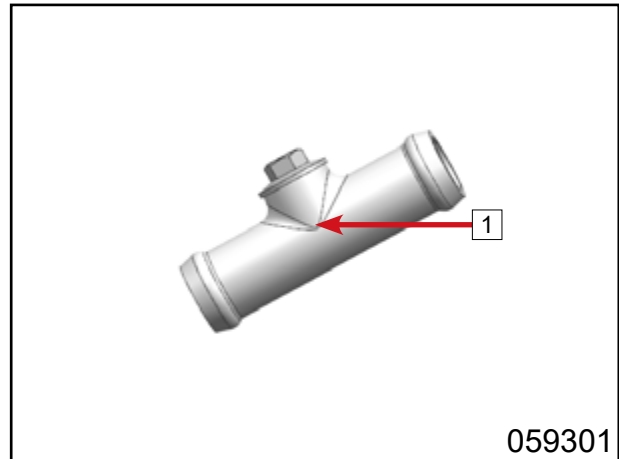
Inspect oil cooler water inlet pipe [2], oil
outlet pipe [1], water pump water outlet
pipe [3] for leak or damage. Replace if
leaking or damaged.



Oil Cooler Water Outlet Pipe
Loosen and remove clamp [1].
Remove two-way joint [2].

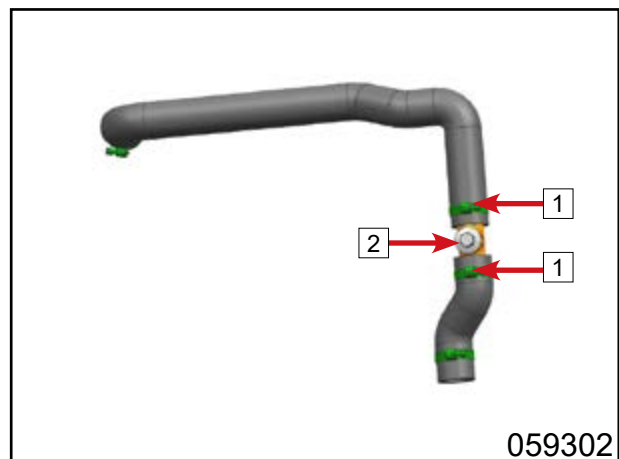


Inspect two-way joint [1] for damage.
Replace if damaged.



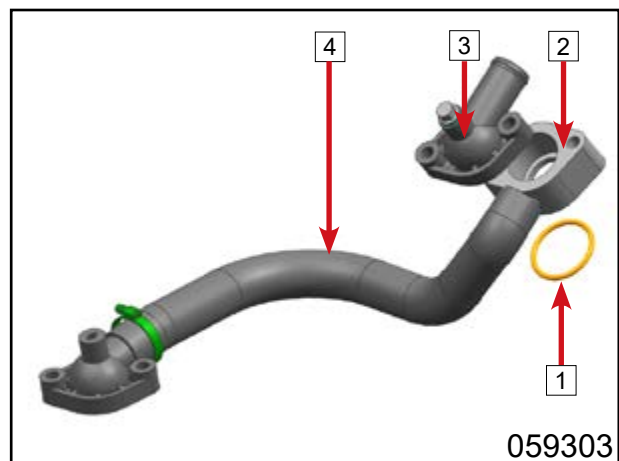
Loosen clamp [1] and put it on oil cooler water outlet pipe.
Install oil cooler water outlet pipe on two-way joint [2].

NOTE: Installation must be made according to the mark. "MARK" sign on water pipe should be aligned with the center of two-way joint bulge.



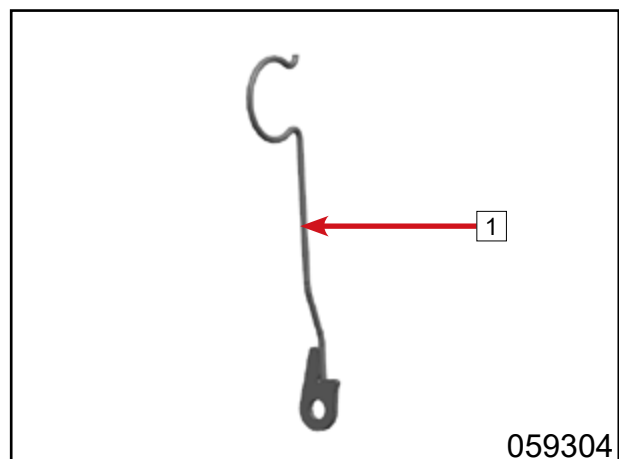
5.5.34 Thermostat Seat and Water Pipe

Inspect o-seal ring [1] for damage or hardening. Replace if necessary.
Inspect thermostat seat [2], thermostat cap [3], water pipe [4] for damage. Replace if necessary.

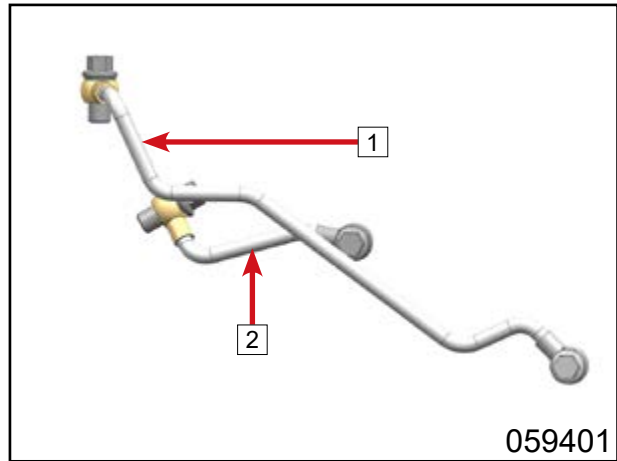


5.5.35 Water Pipe Bracket and Oil Cooler Pipes

Inspect water pipe bracket [1] for damage.
Replace if necessary.



Inspect oil cooler oil inlet pipe [1], oil outlet pipe [2] for oil leak or damage. Inspect joint bolt for damage or being stuck. Replace fault parts if necessary.



5.6 Engine Assembly

⚠ CAUTION: Once the retainer is removed, it cannot be reused. The open end of the retainer cannot be too much widened. Check retainers in place after installation.

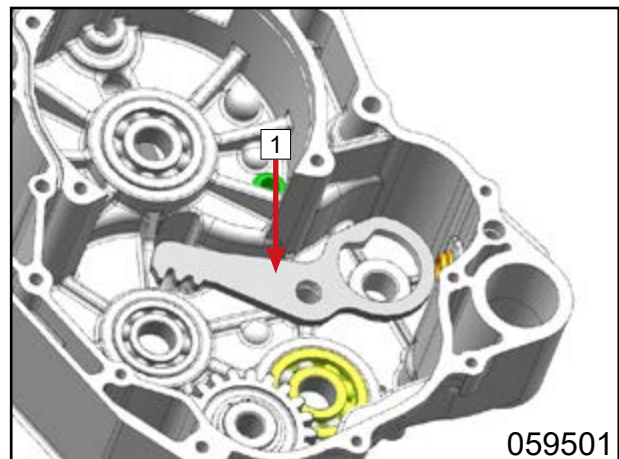
NOTE: Inspect every part before installation. Make sure the installation is correct without missing any part. Clean every part with coal oil or gasoline before installation. No debris is allowed to exist on part.

NOTE: The removed gasket can not be reused. Replace with new ones during installation. The remaining gasket on crankcase or parts has to be cleaned.

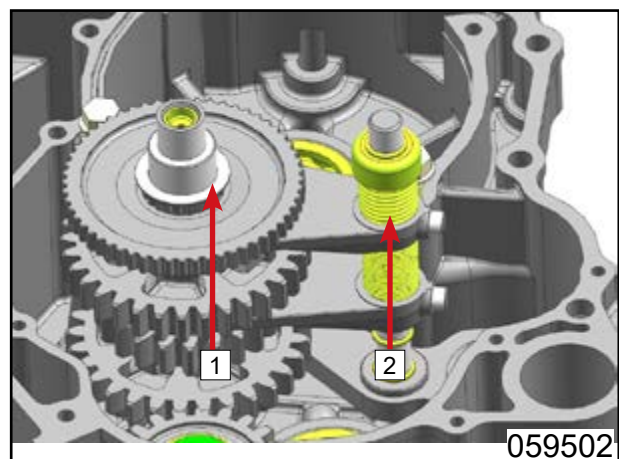
NOTE: The removed oil seal can not be reused. Replace with new ones during installation.

5.6.1 Countershaft Assy, Shift Fork Assy and Shift Drum Assy

Place MAG crankcase on work bench.
Install parking swing arm **1**.



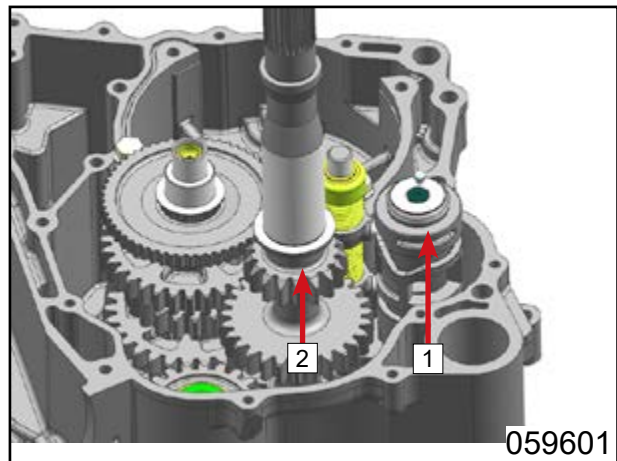
Apply some grease on shafts.
Combine countershaft assy **1**, shift fork assy **2** together and install them into MAG crankcase.



Apply grease on shafts.

Install shift drum **1** and setting it into low gear position.

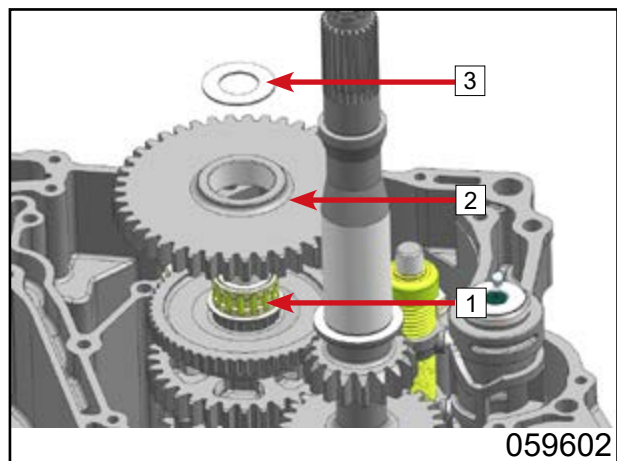
Install main shaft **2**. Rotate main shaft to make sure it rotates freely without stuck feeling and noise. There should be some clearance between teeth.



Install needle bearing **1**.

Install driven low gear **2**.

Install washer **3**.



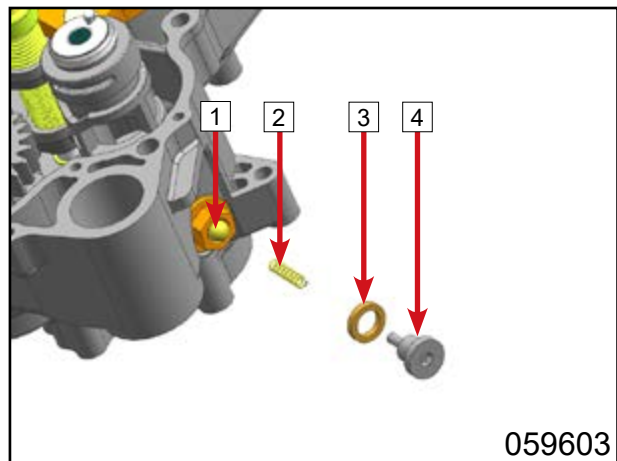
Install steel ball **1**.

Install spring **2**.

Install washer **3**.

Install gearshift limit spring seat **4** and tighten it.

Tighten torque: 18 N•m~22 N•m

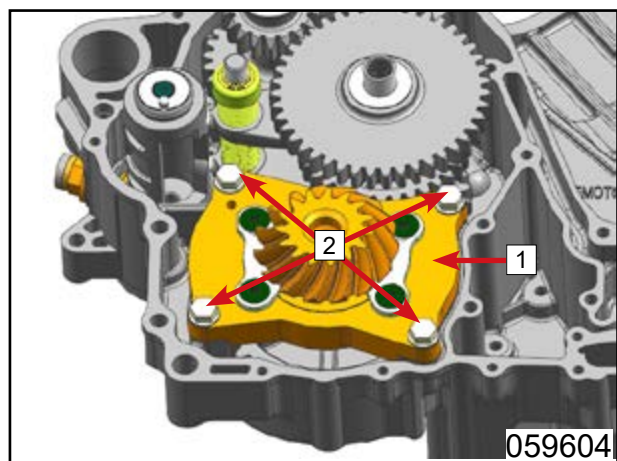


5.6.2 Drive Bevel Gear Assy

Install drive bevel gear assy **1**.

Install bolts **2** with thread locker.

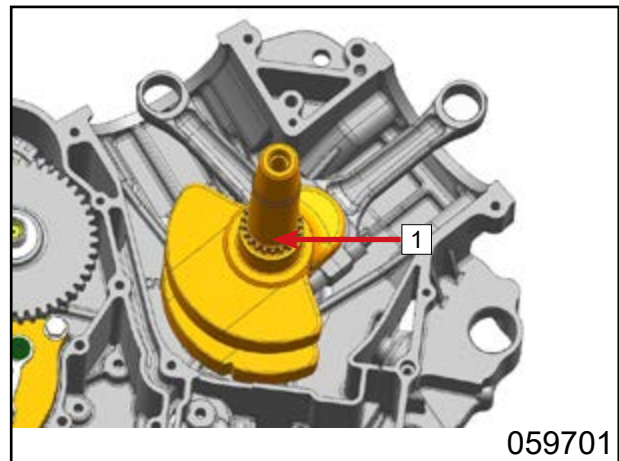
Tighten torque: 28 N•m~32 N•m



5.6.3 Crankshaft Connecting Rod Assy

Apply some engine oil on MAG crankcase plain bearings and crankshaft journal.
Install crankshaft connecting rod assy [1].

NOTE: The connecting rod, which is closed to MAG crankcase, should be set into second cylinder. Rotate crankshaft a little bit to install it in place. The crankshaft should rotate freely without stuck feeling.



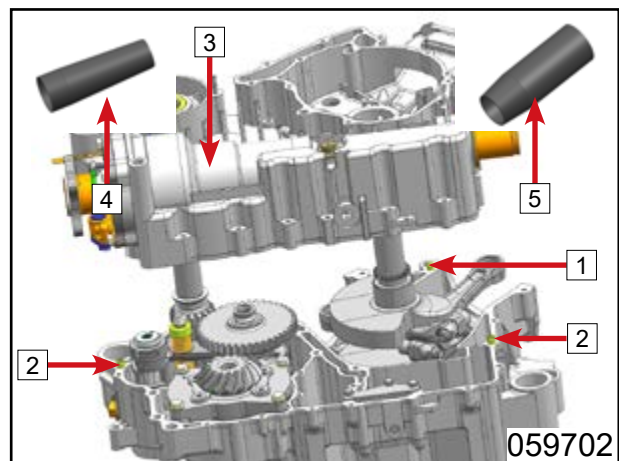
Crankcase Assembly

Put Crankshaft Plain Bearing Protecting Sleeve [4] on crankshaft and Gearshift Main Shaft Oil Seal Protecting Sleeve [5] on main shaft.

Install roller needle [1].

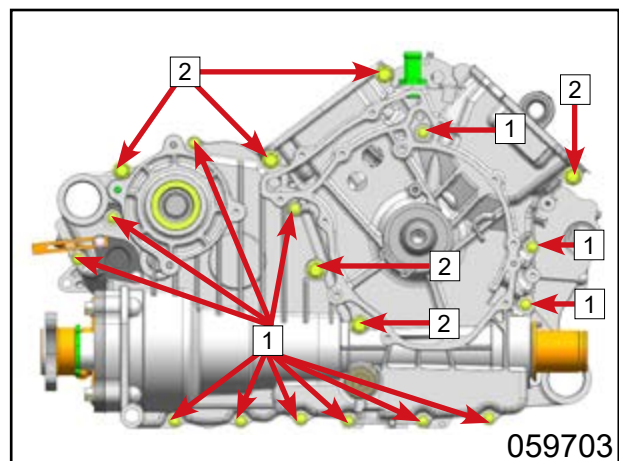
Install dowel pins [2].

Install PTO crankcase [3].



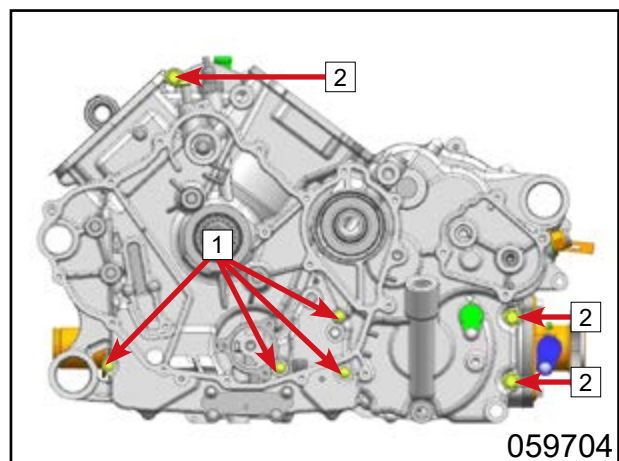
Install bolts [1].

Install bolts [2].



Install bolts [1].

Install bolts [2].



5.6.4 Bevel Gear Washer Adjustment

When crankcase and/or bevel gears (in pair) and/or bevel gear seat get replaced, the washers must be adjusted.

⚠ CAUTION: Make sure the clearances between gears and teeth are within a appropriate range.

Bevel Gear Side Clearance

Install drive and driven bevel gear on crankcase. Assemble crankcase with the gasket placed. Install some bolts.

Insert a clean screw driver **1** through the mounting hole **2** on MAG crankcase. Insert it into the hole on drive bevel gear bearing seat to fixate output driven gear, which prevents drive bevel gear rotating.

Install special tool: Bevel Gear Side Clearance Measuring Tool **1** and dial gauge **2**.

Rotate driven bevel gear shaft to measure the side clearance.

NOTE: Measure at 4 points in the perpendicular direction.

Adjust the thickness of driven bevel gear washer if beyond standard. Repeat above procedures until the clearance is qualified.

Bevel gear side clearance standard: 0.1 mm~0.2 mm

Adjusting Method

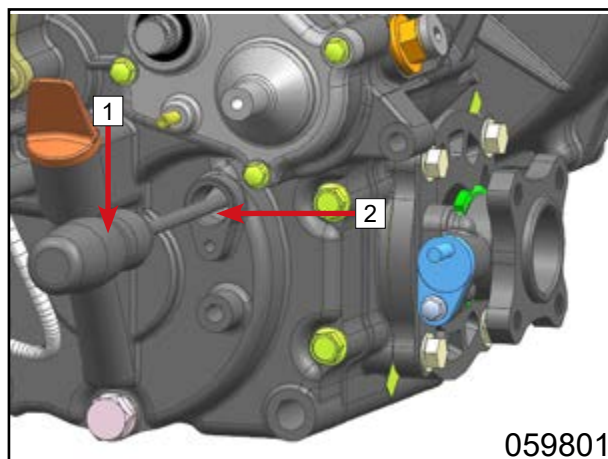
Side clearance	Method
<0.1mm	Increase thickness
0.1mm~0.2mm	OK
>0.2mm	Decrease thickness

Teeth Contact Condition Inspection

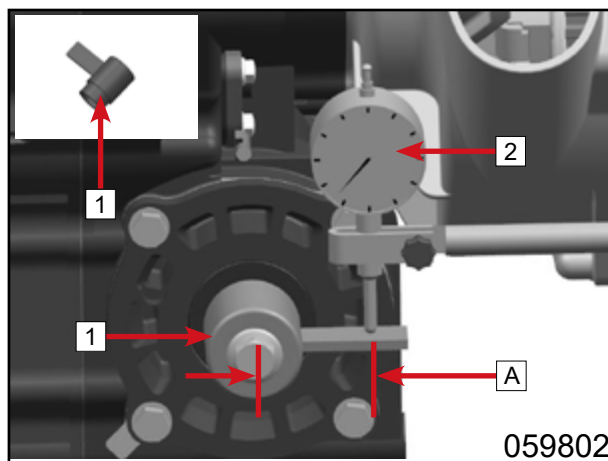
After adjustment, inspect teeth contact condition:

Remove driven bevel gear from crankcase;
Clean the drive and driven bevel gear teeth surface;

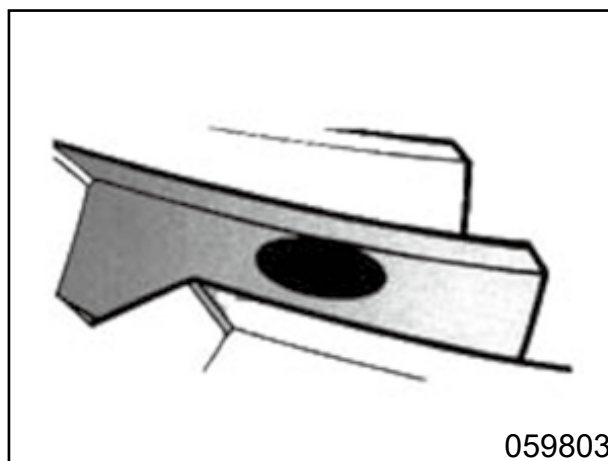
Dye driven bevel gear every tooth surface;
Install driven bevel gear.



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Rotate driven bevel gear several circles forward and backward.

Remove drive and driven bevel gear assy to see the dye coating results.

Status A	On the top	No
Status B	In the middle	Yes
Status C	On the bottom	No

If the teeth surface contact area is qualified (Status B), continue following procedures.
If the teeth surface contact area is not qualified (Status A or C), adjust the thickness of drive bevel gear adjusting washers. Repeat above procedures until qualified.

NOTE: Clean the dye on gear teeth after adjustment.

Adjusting Method

Contact condition	Method
Status A	Increase thickness
Status C	Decrease thickness

⚠ CAUTION: After adjustment, measure gear clearance again. If it is still not qualified, replace drive and driven bevel gear until it is qualified.

5.6.5 First Cylinder Body and Piston

Rotate crankshaft to make the first cylinder connecting rod exposed.

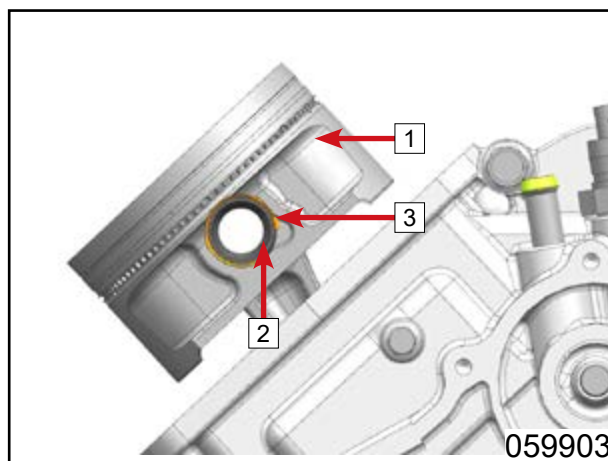
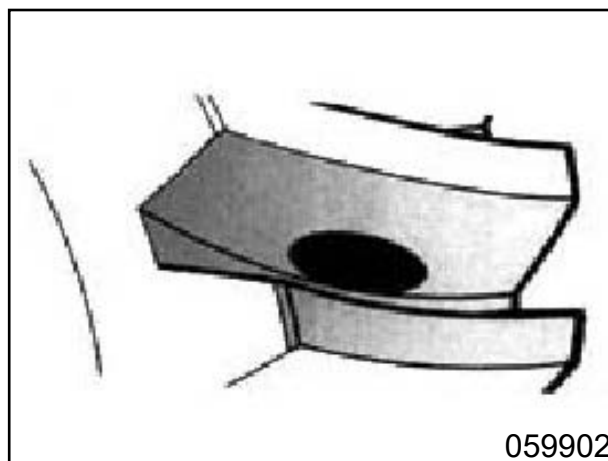
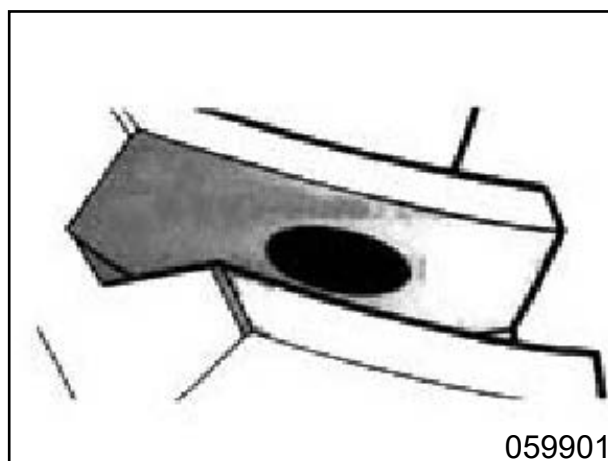
Install piston **1**.

During installation, the "▲" mark on piston should face towards the transmission.

Apply engine oil on piston pin **2** and insert it into piston pin hole and connecting rod small end hole.

Install circlip **3**. (The open of circlip and the groove should be staggered.)

NOTE: Install pistons according to the made marks, to prevent incorrect installation.



After piston installation, adjust the piston rings as picture shows:

There should be 180 degrees angle between piston top ring open [1] and second ring open [2].

Oil ring expander open [3] and top ring open [1] should be the same. There should be 120 degrees angle between oil control ring [4] and [5] and oil ring expander open [3].

There should be approximately 30 degrees between top ring open [A] and the direction of twelve o'clock.

Inspect the piston rings position before installation.

Install roller needle [1].

Apply on sealant glue on contact surface.

Install new seal gasket [2].

Apply some engine oil on piston and cylinder body contact surface. Then install cylinder body assy [3] into crankcase in place. Clean the redundant engine oil on the top of piston.

NOTE: Install cylinder bodies according to the made marks, to prevent incorrect installation.

NOTE: Pay attention to piston rings and oil rings during cylinder body installation. Do not damage them. Do not rotate cylinder body during installation.

5.6.6 Second Cylinder Body and Piston

Rotate crankshaft to make the second cylinder connecting rod exposed.

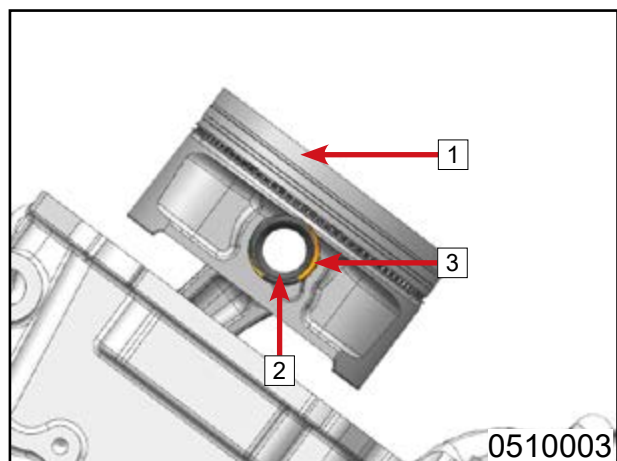
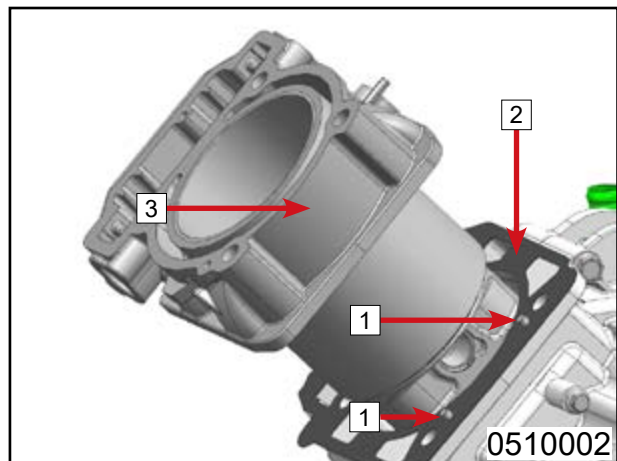
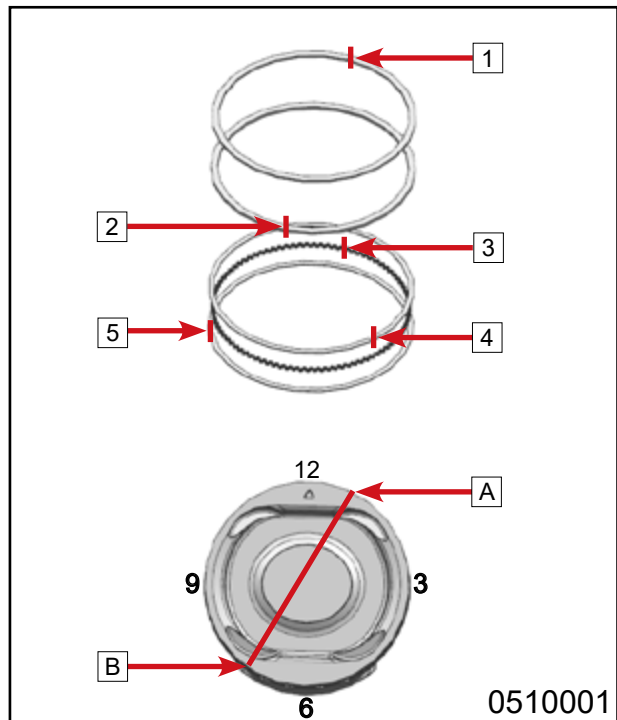
Install piston [1].

During installation, the “▲” mark on piston should face towards the transmission.

Apply engine oil on piston pin [2] and insert it into piston pin hole and connecting rod small end hole.

Install circlip [3]. (The open of circlip and the groove should be stagger.)

NOTE: Install pistons according to the made marks, to prevent incorrect installation.



After piston installation, adjust the piston rings as picture shows:

There should be 180 degrees angle between piston top ring open [1] and second ring open [2].

Oil ring expander open [3] and top ring open [1] should be the same. There should be 120 degrees angle between oil control ring [4] and [5] and oil ring expander open [3].

There should be approximately 30 degrees between top ring open [A] and the direction of twelve o'clock.

Inspect the piston rings position before installation.

Install roller needle [1].

Apply on sealant glue on contact surface.

Install new seal gasket [2].

Apply some engine oil on piston and cylinder body contact surface. Then install cylinder body assy [3] into crankcase in place. Clean the redundant engine oil on the top of piston.

NOTE: Install cylinder bodies according to the made marks, to prevent incorrect installation.

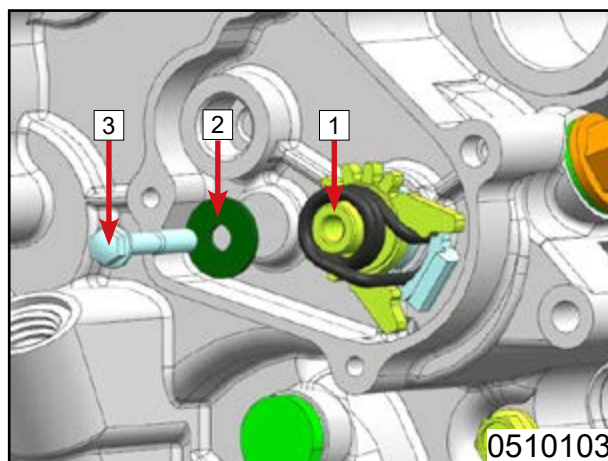
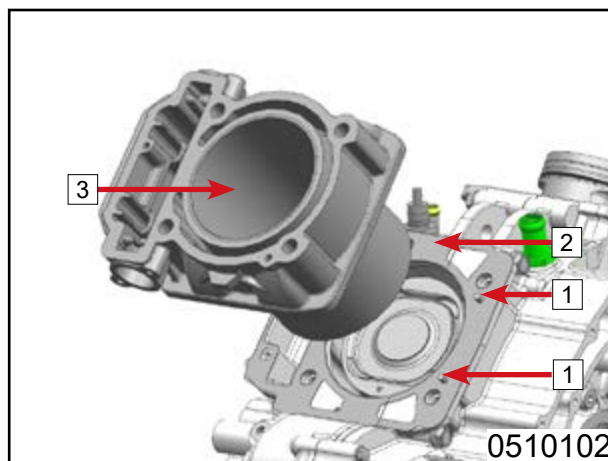
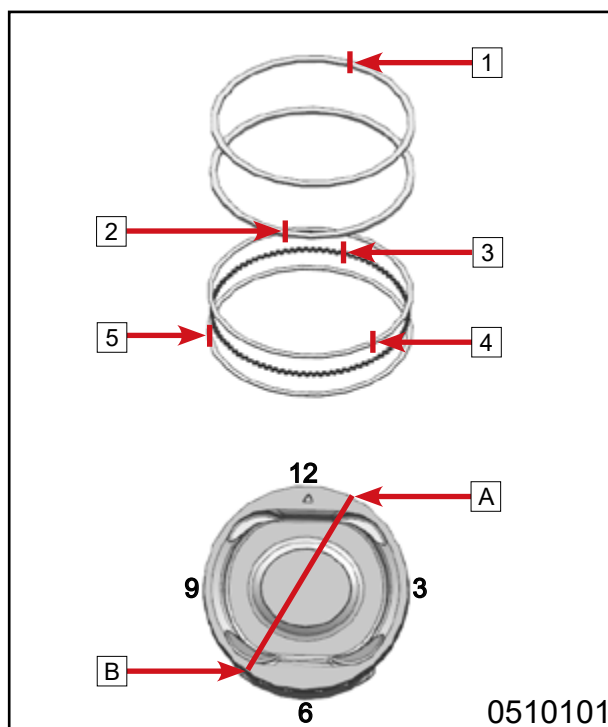
NOTE: Pay attention to piston rings and oil rings during cylinder body installation. Do not damage them. Do not rotate cylinder body during installation.

5.6.7 Gearshift Assy

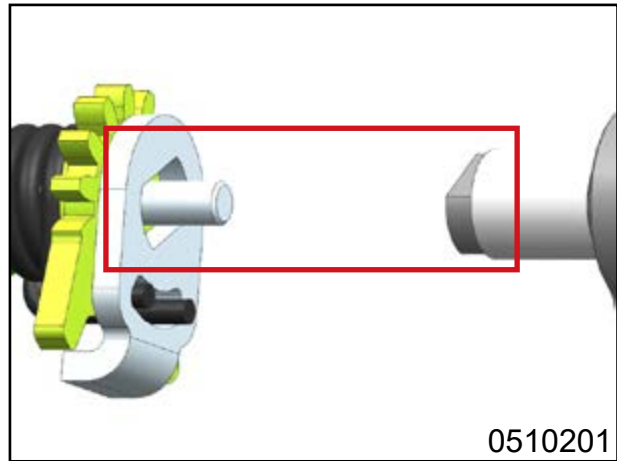
Install gearshift driven sector gear [1].

Install washer [2].

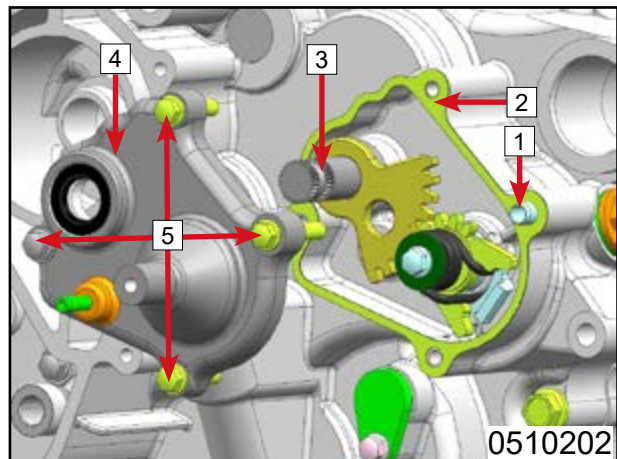
Install bolt [3].



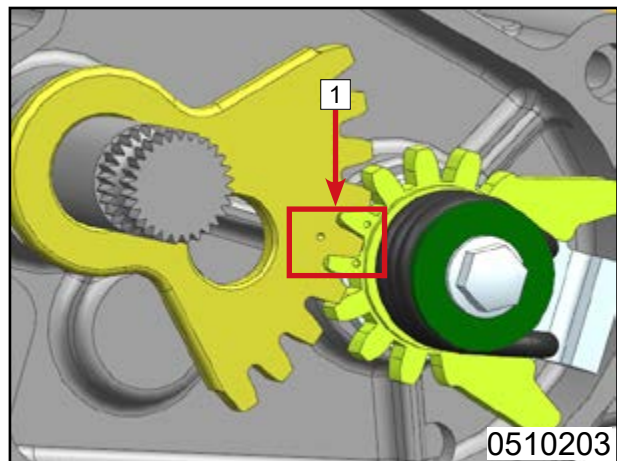
NOTE: During gearshift driven sector gear installation, the quadrate groove should be aligned with quadrate bulge on shift drum.



Install dowel pin [1].
Install new gasket [2].
Install gearshift drive sector gear assy [3].
Install gearshift cover [4].
Install bolts [5].



NOTE: The marks [1] on shift drive and driven sector gear should be aligned as picture shows.



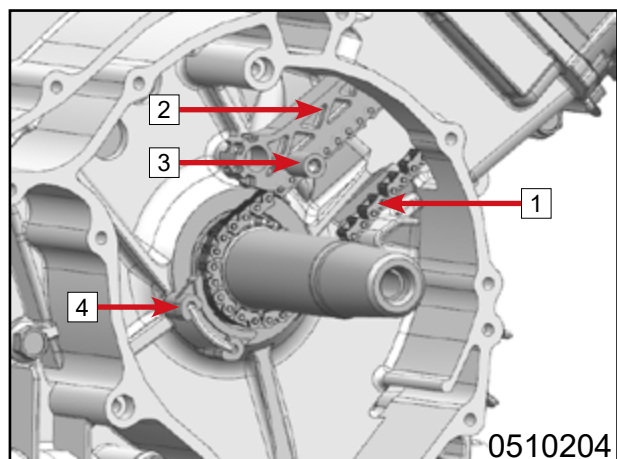
5.6.8 First Cylinder Timing Chain

Put timing chain [1] into crankcase from first cylinder. Set it on crankshaft timing sprocket. Hook it to prevent it from falling down.

Install tensioner plate [2] from first cylinder. Apply 243 thread locker and install tensioner plate screw [3].

Tighten torque: 8N•m~12N•m.)

Install chain guard [4].



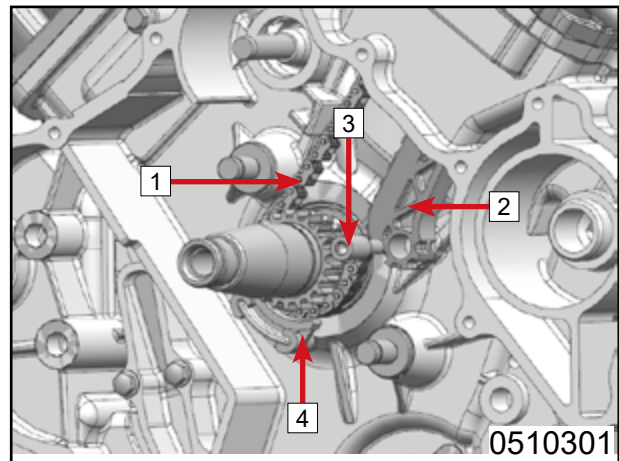
5.6.9 Second Cylinder Timing Chain

Put timing chain **1** into crankcase from second cylinder. Set it on crankshaft timing sprocket. Hook it to prevent it from falling down.

Install tensioner plate **2** from second cylinder. Apply 243 thread locker and install tensioner plate screw **3**.

Tighten torque: 8N•m~12N•m.)

Install chain guard **4**.



5.6.10 Oil Pump

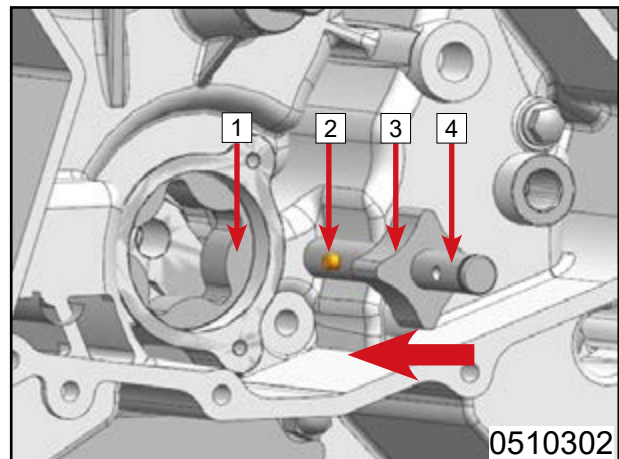
Apply some engine oil on oil pump outer rotor **1**.

Install oil pump outer rotor **1**.

Install roller needle **2**.

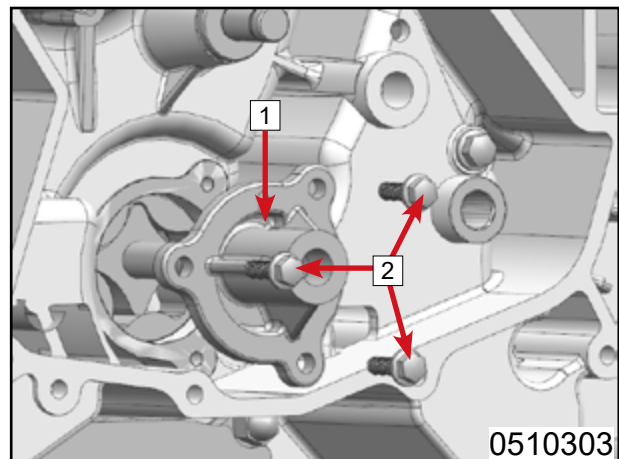
Install oil pump inner rotor **3** in the direction of arrow on oil pump shaft **4**. Turn inner rotor **3** until roller needle clips into the groove on inner rotor.

Install oil pump shaft **4** with inner rotor on MAG crankcase (with appropriate angle).



Install oil pump cap **1**.

Install bolts **2**.

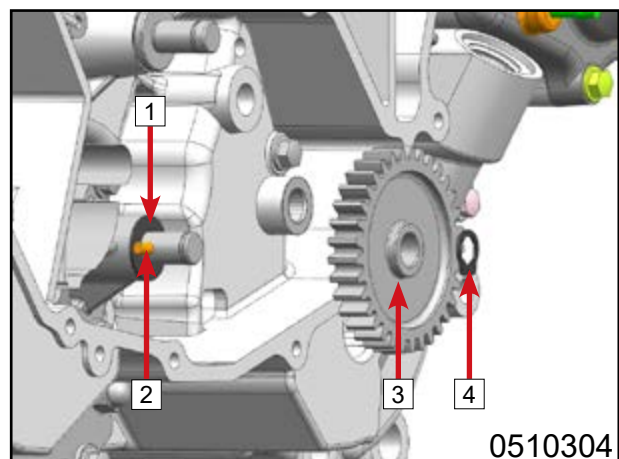


Install washer **1**.

Install roller needle **2**.

Install oil pump gear **3** (the roller needle should clip into the groove on oil pump gear).

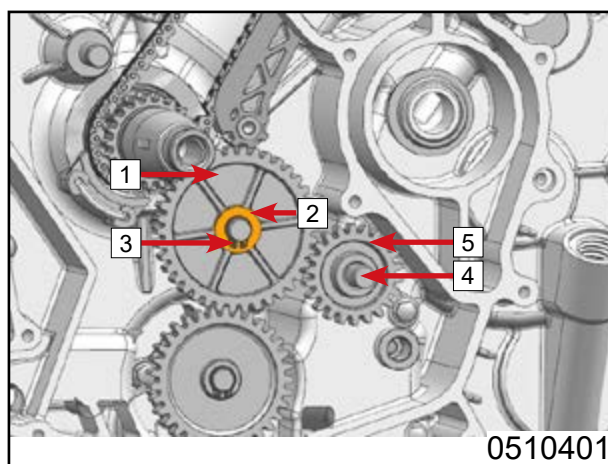
Install new circlip **4**.



NOTE: The removed circlips can not be reused. Replace with new ones during installation.

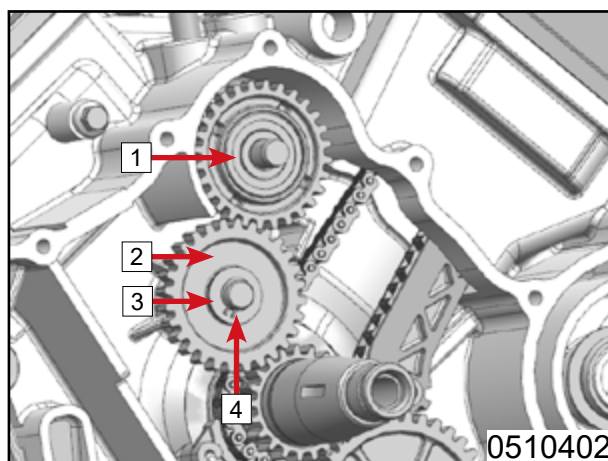
5.6.11 Oil Pump Idle Gear and Water Pump Idle Gear

Install oil pump idle gear [1].
Install washer [2].
Install circlip [3].
Install breather shaft [4].
Install water pump idle gear [5].



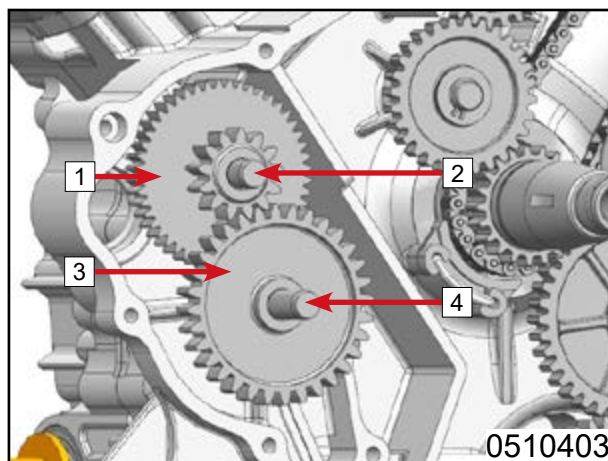
5.6.12 Breather Assy

Install breather assy [1].
Install breather idle gear [2].
Install washer [3].
Install circlip [4].



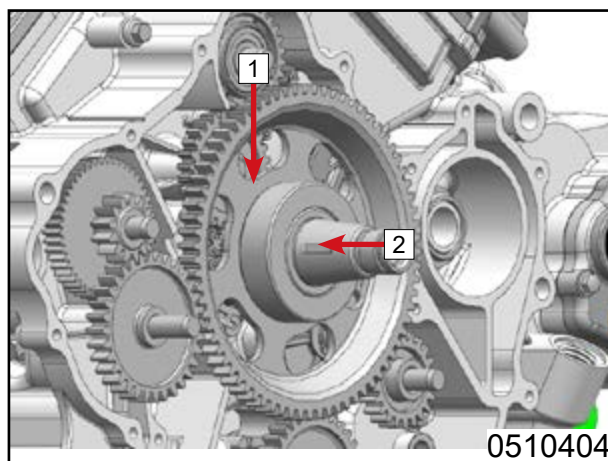
5.6.13 Starter Dual Gear

Install dual gear [1].
Install breather shaft [2].
Install middle gear [3].
Install breather shaft [4].



5.6.14 Magneto Rotor

Install driven gear [1].
Install woodruff key [2].



Install magneto rotor **1**.

Install spacer **2**.

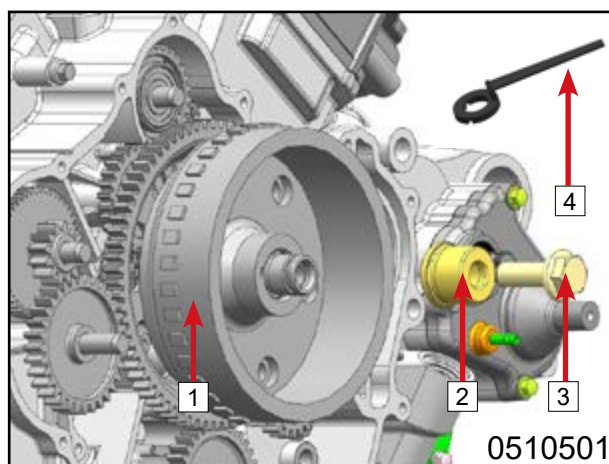
Install bolt **3** with thread locker but not tighten it.

Use special tool: Magneto Rotor Holding Wrench **4** to fix magneto rotor.

Tighten bolt **3**.

M12×1.25 bolt tighten torque: 70 N·m

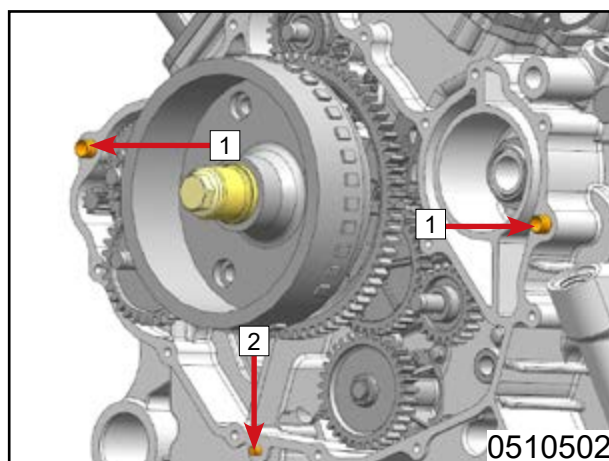
NOTE: During installation, align the woodruff key with the key groove on magneto rotor.



5.6.15 MAG Crankcase Cover

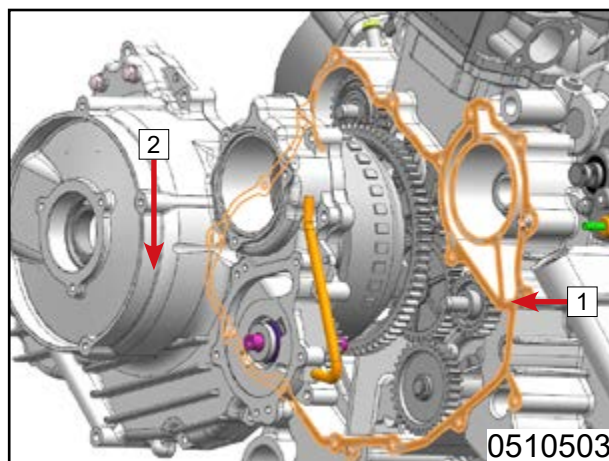
Install dowel pins **1**.

Install roller needle **2**.



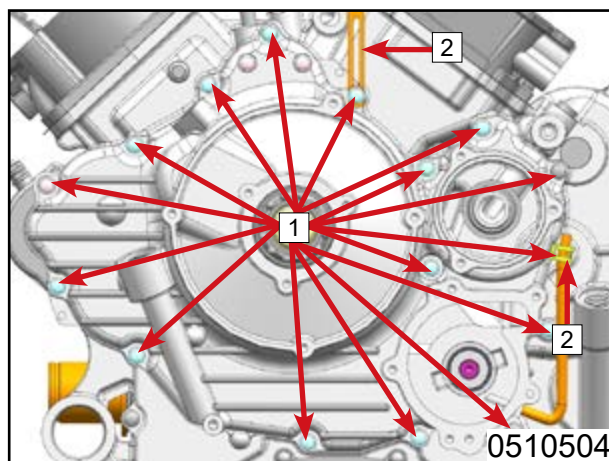
Install seal gasket **1**.

Install MAG crankcase cover **2**.



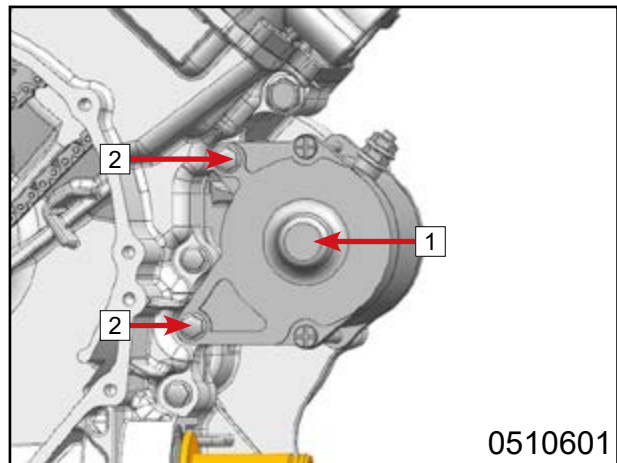
Install wire clips **2**.

Install bolts **1**.



5.6.16 Starter Motor

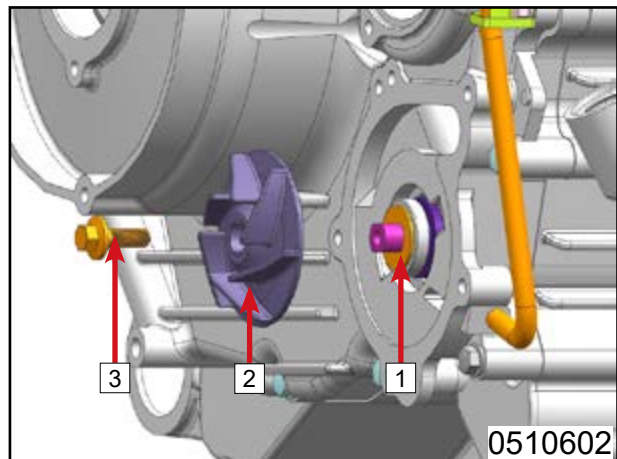
Install starter motor [1].
Install bolts [2].



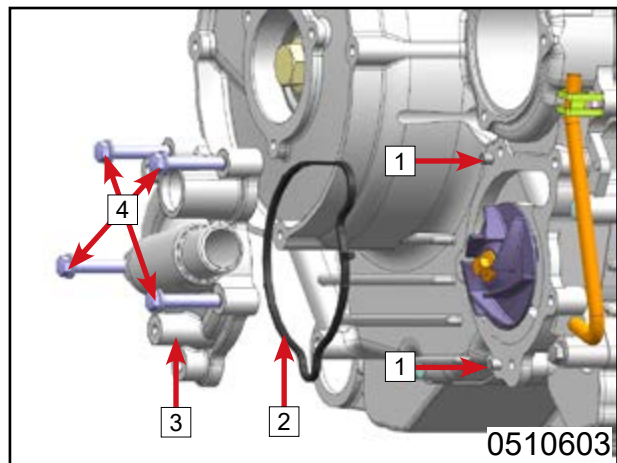
5.6.17 Water Pump

Install water seal washer [1].
Install water pump impeller [2].
Install bolt [3] with thread locker (Left-hand thread).
M12×17 bolt tighten torque: 10N•m

NOTE: Pay attention not to damage water pump impeller during installation. Bolt [1] is left-hand thread.

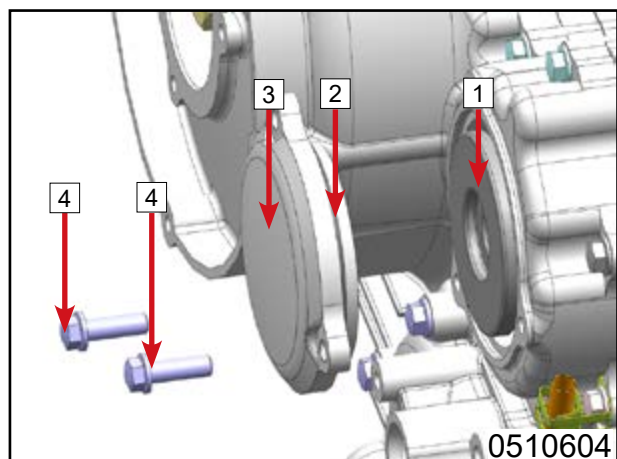


Install roller needle [1].
Install seal ring [2] on water pump cover [3].
Install water pump cover [3].
Install bolts [4].



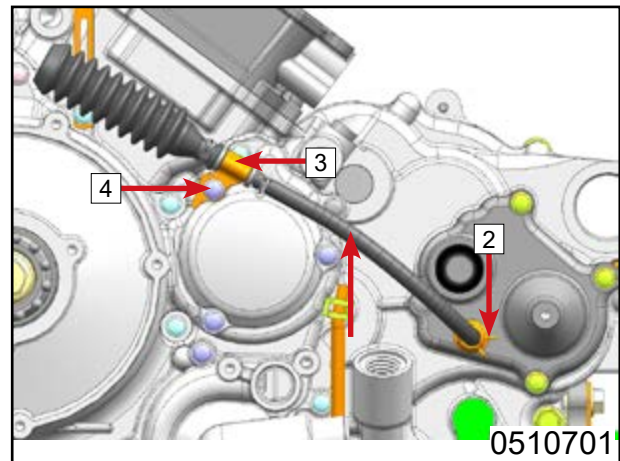
5.6.18 Oil Filter

Install oil filter element [1].
Install o-ring [2] on oil filter cover [3].
Install oil filter cover [3].
Install bolts [4].



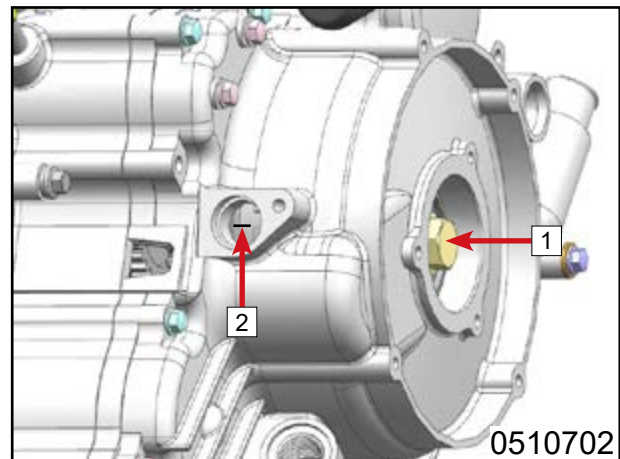
5.6.19 Air Bag

Install air bag [1].
Install clamp [2].
Install air bag bracket [3].
Install bolt [4].



5.6.20 First Cylinder TDC Adjustment

Rotate bolt [1] with a socket until the "I" mark [2] is at the center of the hole. Such position is the the TDC for first cylinder.



5.6.21 First Cylinder Head Assy

Install roller needles [1].
Install cylinder head gasket [2].
Install chain guide [3].

NOTE: Install chain guides according to the made marks, to prevent incorrect installation.

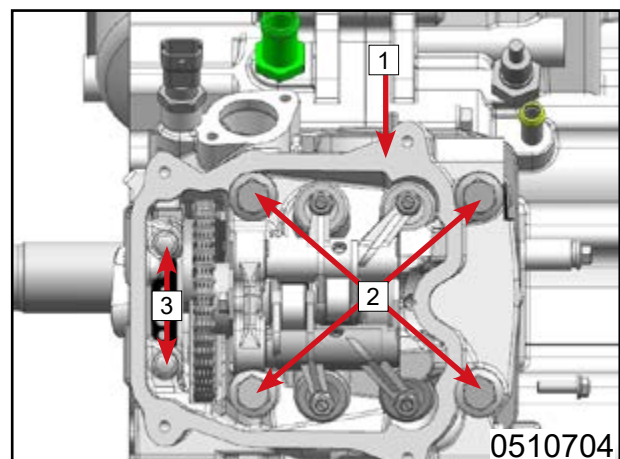
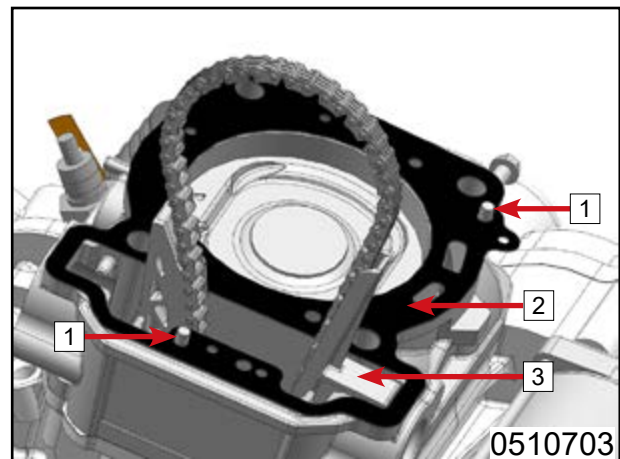
NOTE: Hook the timing chain during installation, in case it falls into engine.

Install cylinder head assy [1].
Install bolts [2]. (Pre-tighten to 20N•m in criss-cross pattern, and then tighten to 60N•m.)
Install bolts [3]. M6×80 bolt tighten torque: 10N•m.

NOTE: Install cylinder head assy according to the made marks, to prevent incorrect installation.

NOTE: Hook the timing chain during installation, in case it falls into engine.

NOTE: Install bolts [2] first and then bolts [1].



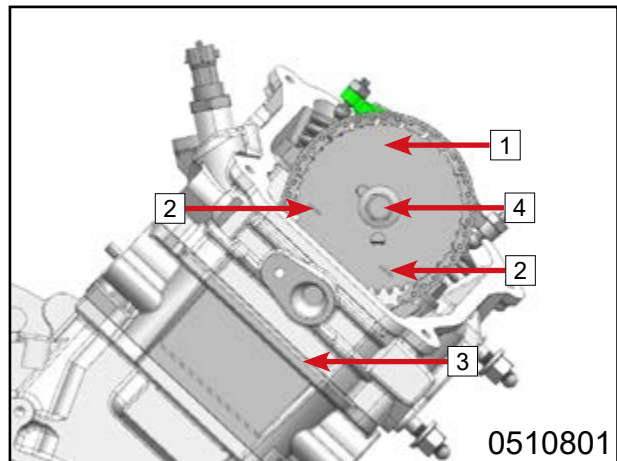
Set timing sprocket **1** in timing chain. Make the marker lines **2** on timing sprocket parallel with cylinder head lower surface **3**.

Install timing sprocket bolt **4** with thread locker. Tighten torque: 30N•m.

NOTE: Install timing sprockets according to the made marks, to prevent incorrect installation.

NOTE: The marker lines **2 on timing sprocket should be parallel with cylinder head lower surface **3** as picture shows.**

NOTE: Do not rotate crankshaft during installation. Inspect TDC position constantly during installation.



5.6.22 First Cylinder Tensioner

Remove bolt **1**.

Remove washer **2**.

Put cross screw driver into hole **3**. Rotate it clockwise to adjust tensioner arm to the appropriate length. (Do not loosen screw driver.)

Install new seal gasket **4**.

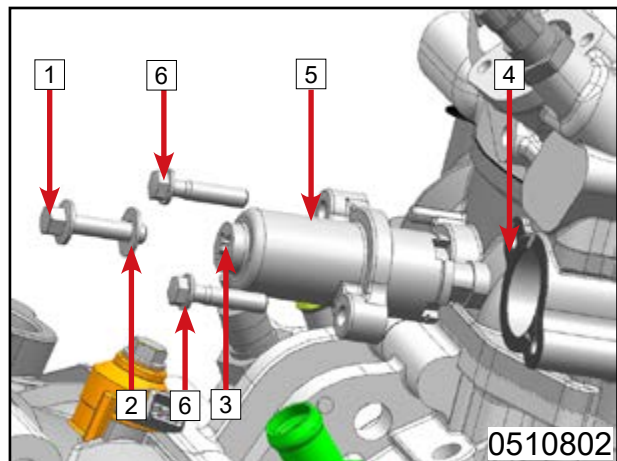
Install timing chain tensioner **5**.

Install bolts **6**.

Loosen cross screw driver.

Install washer **2**.

Install bolt **1**.



NOTE: Install tensioners according to the made marks, to prevent incorrect installation.

5.6.23 First Cylinder Valve Clearance Adjustment

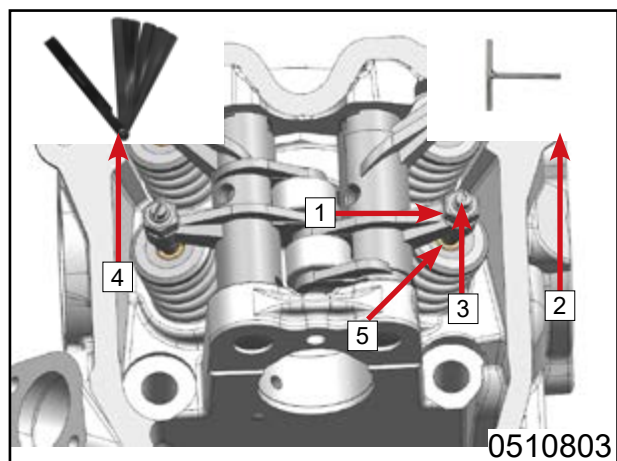
Fix nut **1** with wrench.

Use special tool: Valve Clearance adjusting wrench **2** to loosen adjusting screw **3**.

Insert filler gauge **4** of appropriate thickness between rocker arm and valve spring lock clip **5**.

The filler gauge **4** can be moved without much force. Then tighten adjusting nut **1**. Inspect again to make sure the clearance is qualified.

NOTE: The cylinder must be at TDC position before clearance adjustment.



Valve clearance	
Intake valve	0.06 mm~0.14 mm (0.0024 in~0.0055 in)
Exhaust valve	0.11 mm~0.19 mm (0.0043 in~0.0075 in)

NOTE: Inspect and adjust valve clearance when the engine is cold.

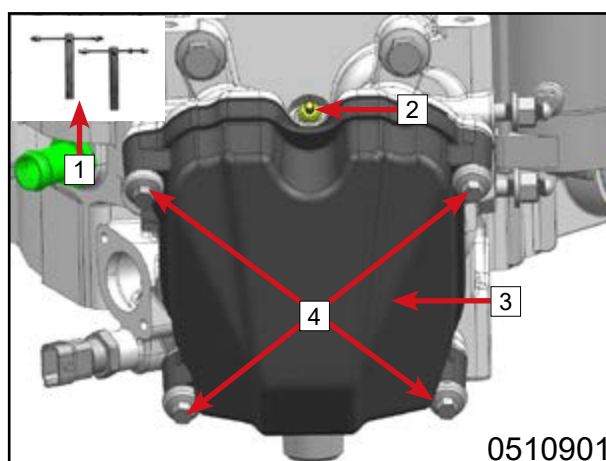
5.6.24 First Cylinder Head Cover

Use special tool: Spark Plug Wrench [1] to install spark plug [2].

Install first cylinder head cover [3] with seal ring.

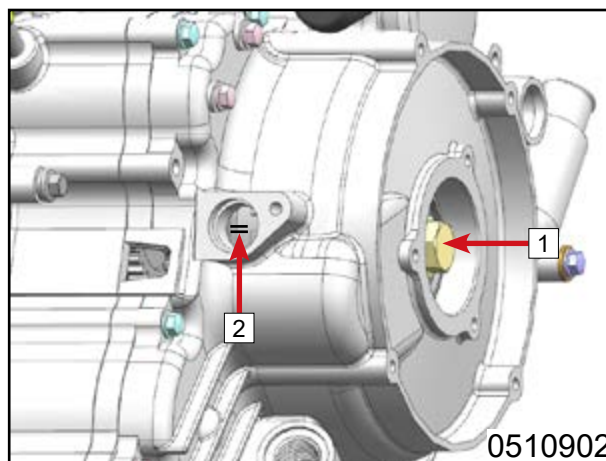
Install cylinder head cover bolts [4].

NOTE: Install cylinder head covers according to the made marks, to prevent incorrect installation.



5.6.25 Second Cylinder TDC Adjustment

Rotate bolt [1] with a socket until the “II” mark [2] is at the center of the hole. Such position is the TDC for second cylinder.



5.6.26 Second Cylinder Head Assy

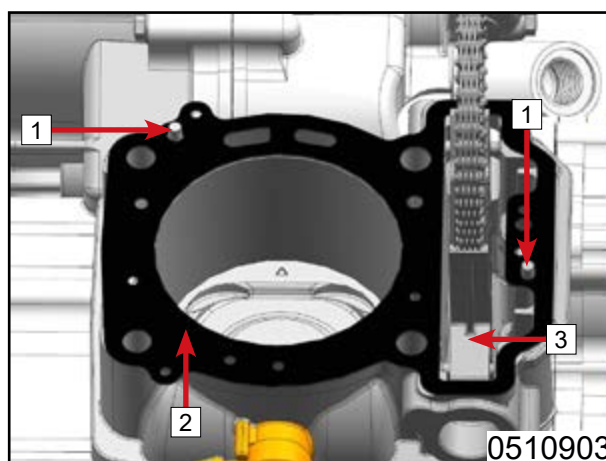
Install roller needles [1].

Install cylinder head gasket [2].

Install chain guide [3].

NOTE: Install chain guides according to the made marks, to prevent incorrect installation.

NOTE: Hook the timing chain during installation, in case it falls into engine.



Install cylinder head assy [1].

Install bolts [2]. (Pre-tighten to 20N•m in criss-cross pattern, and then tighten to 60N•m.)

Install bolts [3]. M6×80 bolt tighten torque: 10N•m.

NOTE: Install cylinder head assy according to the made marks, to prevent incorrect installation.

NOTE: Hook the timing chain during installation, in case it falls into engine.

NOTE: Install bolts [2] first and then bolts [1].

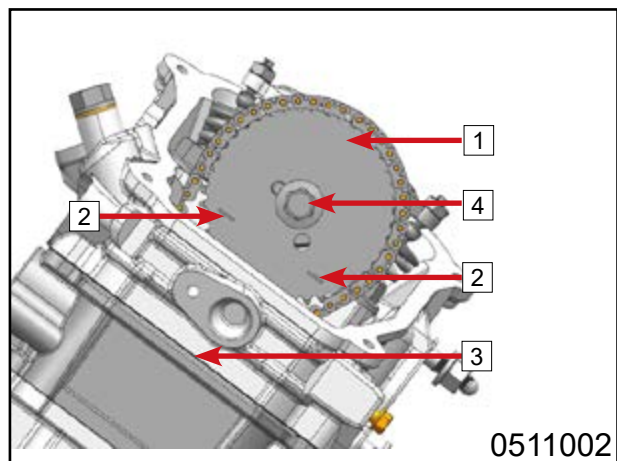
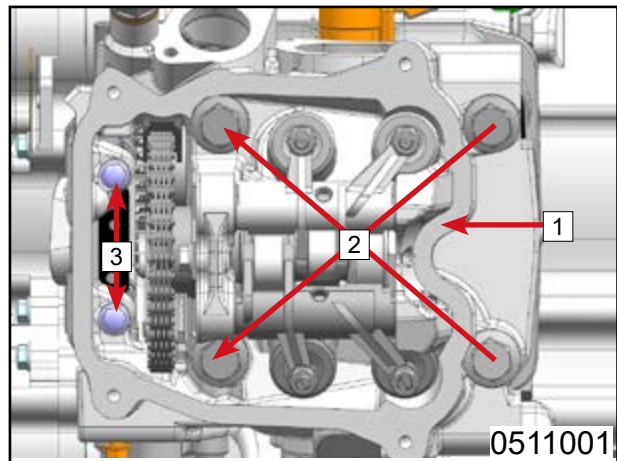
Set timing sprocket [1] in timing chain. Make the marker lines [2] on timing sprocket parallel with cylinder head lower surface [3].

Install timing sprocket bolt [4] with thread locker.

NOTE: Install timing sprockets according to the made marks to prevent incorrect installation.

NOTE: The marker lines [2] on timing sprocket should be parallel with cylinder head lower surface [3] as picture shows.

NOTE: Do not rotate crankshaft during installation. Inspect timing position constantly during installation.



5.6.27 Second Cylinder Tensioner

Remove bolt [1].

Remove washer [2].

Put cross screw driver into hole [3]. Rotate it clockwise to adjust tensioner arm to the appropriate length. (Do not loosen screw driver.)

Install new seal gasket [4].

Install timing chain tensioner [5].

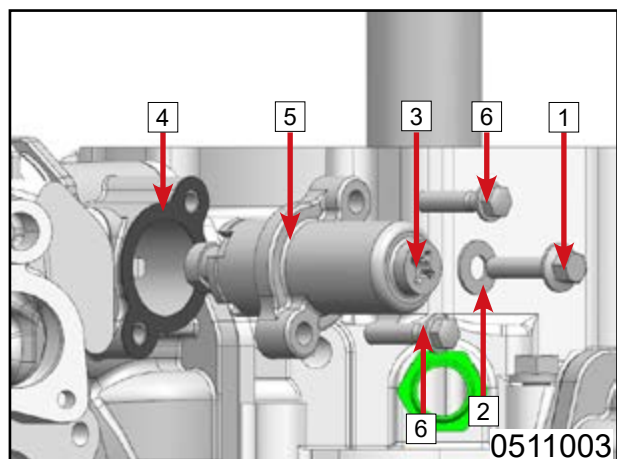
Install bolts [6].

Loosen cross screw driver.

Install washer [2].

Install bolt [1].

NOTE: Install tensioners according to the made marks to prevent incorrect installation.



5.6.28 Second Cylinder Valve Clearance Adjustment

Fix nut [1] with wrench.

Use special tool: Valve Clearance adjusting wrench [2] to loosen adjusting screw [3].

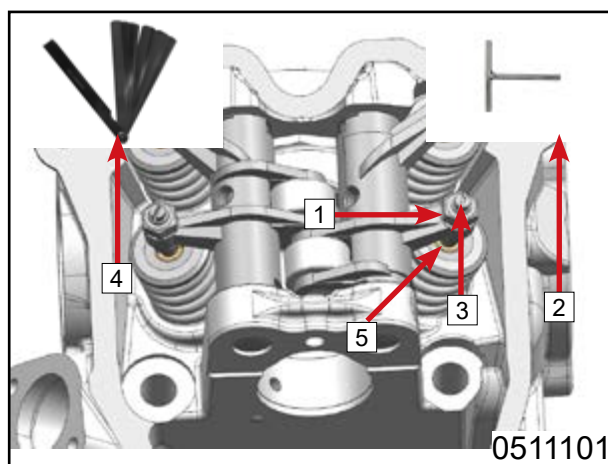
Insert filler gauge [4] of appropriate thickness between rocker arm and valve spring lock clip [5].

The filler gauge [4] can be moved without much force. Then tighten adjusting nut [1]. Inspect again to make sure the clearance is qualified.

NOTE: The cylinder must be at TDC position before clearance adjustment.

Valve clearance	
Air intake valve	0.06 mm~0.14 mm (0.0024 in~0.0055 in)
Air exhaust valve	0.11 mm~0.19 mm (0.0043 in~0.0075 in)

NOTE: Inspect and adjust valve clearance when the engine is cold.



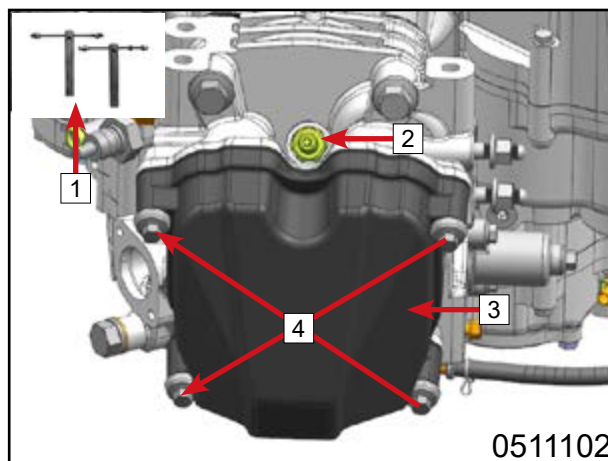
5.6.29 Second Cylinder Head Cover

Use special tool: Spark Plug Wrench [1] to install spark plug [2].

Install first cylinder head cover [3] with seal ring.

Install cylinder head cover bolts [4].

NOTE: Install cylinder head covers according to their made marks to prevent incorrect installation.



5.6.30 Plug Cover and RPM Sensor

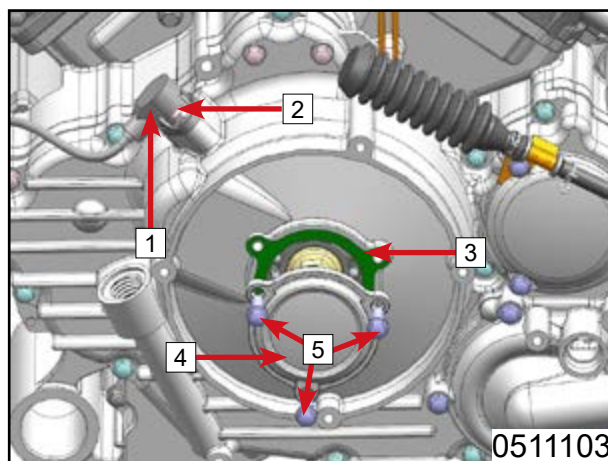
Install RPM sensor [1].

Install bolt [2].

Install seal gasket [3].

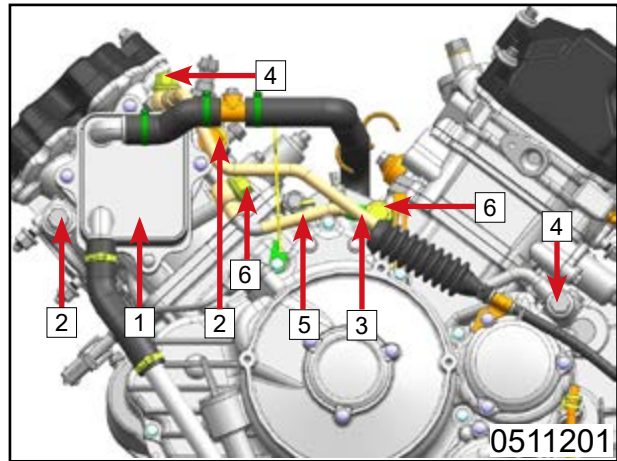
Install plug cover [4].

Install bolts [5].

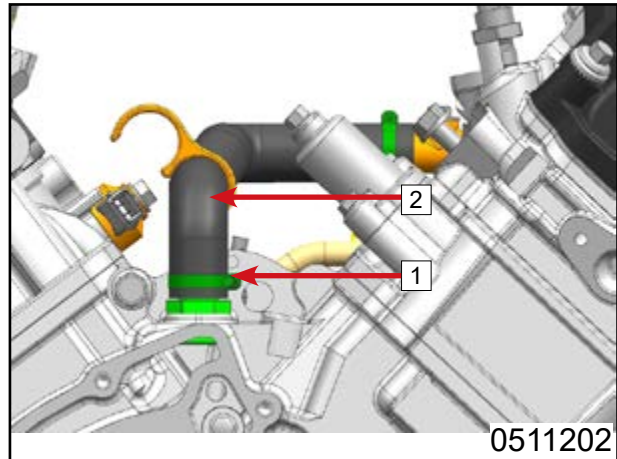


5.6.31 Oil Cooler Assy

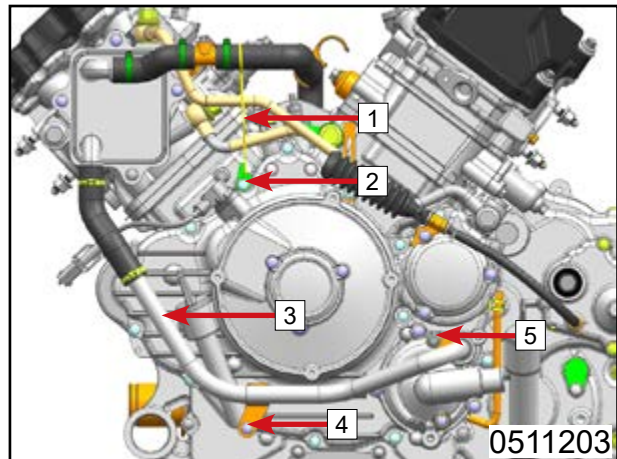
Install oil cooler assy [1].
 Install bolts [2].
 Install oil cooler oil inlet pipe [3].
 Install joint bolts [4] with washers.
 Install oil cooler oil outlet pipe [5].
 Install joint bolts [6] with washers.



Loosen clamp [1] and put it on oil cooler water outlet pipe [2].
 Install oil cooler water outlet pipe [2].
 Tighten clamp [1].

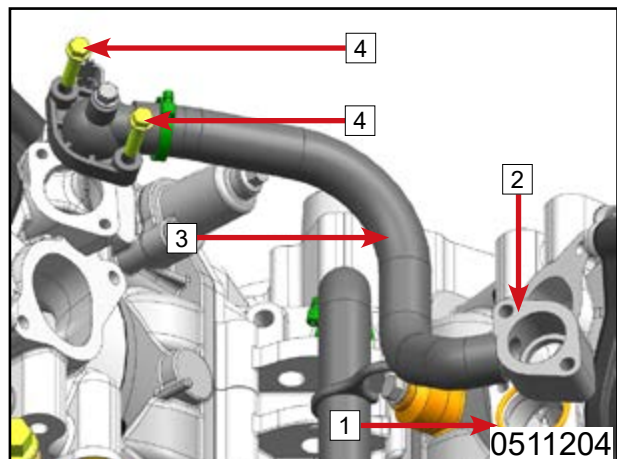


Install water pipe bracket [1].
 Install bolt [2].
 Install water pump water outlet pipe [3].
 Install bolt [4].
 Install bolt [5].

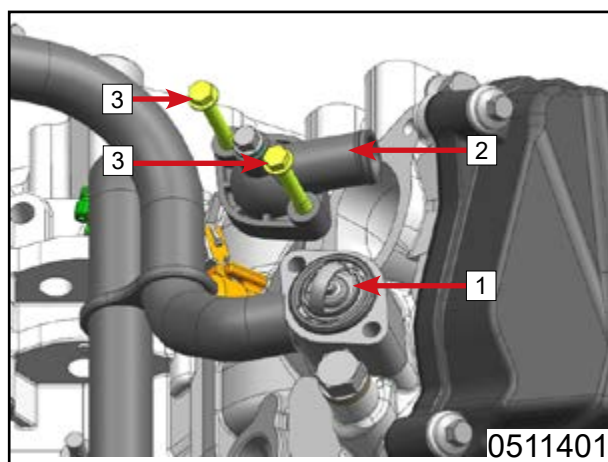


5.6.32 Thermostat and Thermostat Seat

Put o-seal ring [1] in thermostat seat [2].
 Install water pipe [3].
 Install bolts [4].

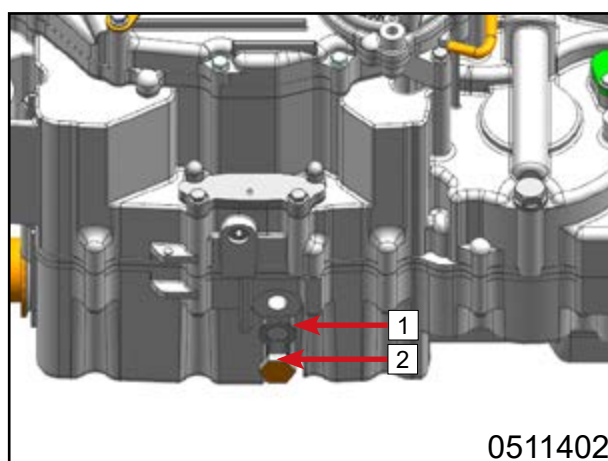


Install thermostat [1].
Install thermostat cap [2].
Install bolts [3].



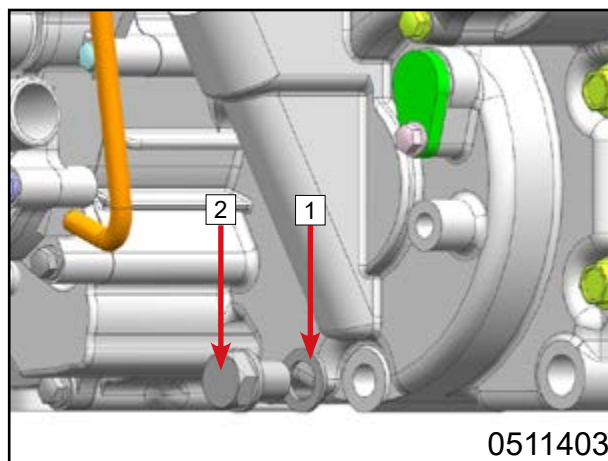
5.6.33 Drain Bolt Crankcase

Put washer [1] on magnetic drain bolt [2].
Install magnetic drain bolt [2].
Add engine oil.



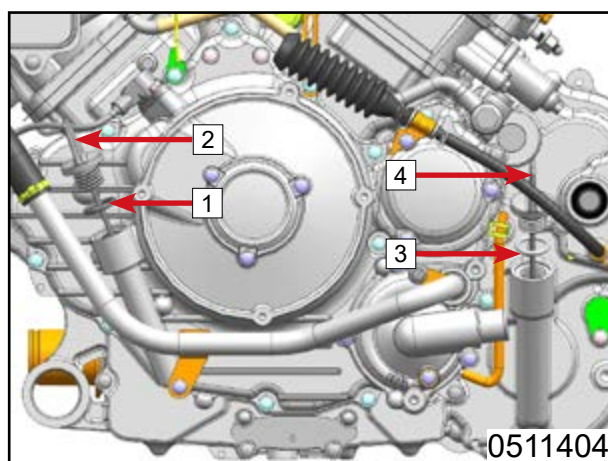
Transmission Gear Case

Put washer [1] on magnetic drain bolt [2].
Install magnetic drain bolt [2].
Add transmission oil.



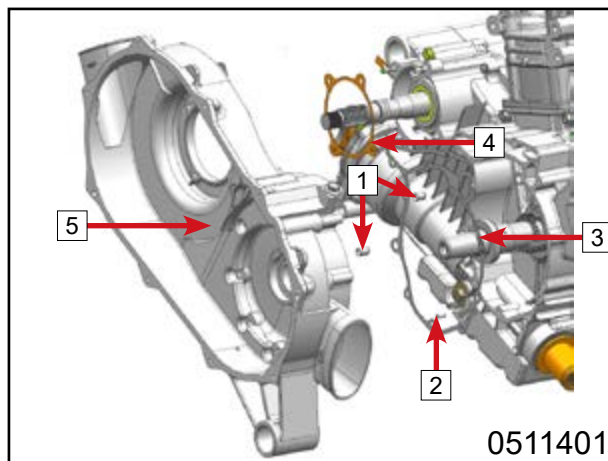
5.6.34 Oil Dipstick

Install o-seal ring [1].
Install crankcase oil dipstick [2].
Install o-seal ring [3].
Install transmission gear case oil dipstick [4].



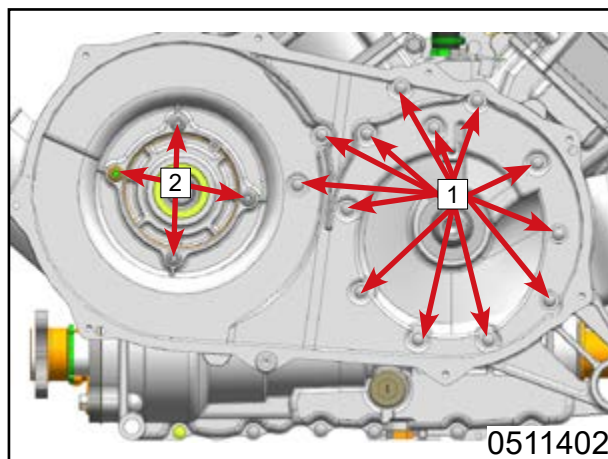
5.6.35 CVT Case

- Install dowel pins [1].
- Install roller needle [2].
- Install seal gasket [3].
- Install seal gasket [4].
- Install CVT case [5].



- Install bolts [1].
- Install nuts [2].

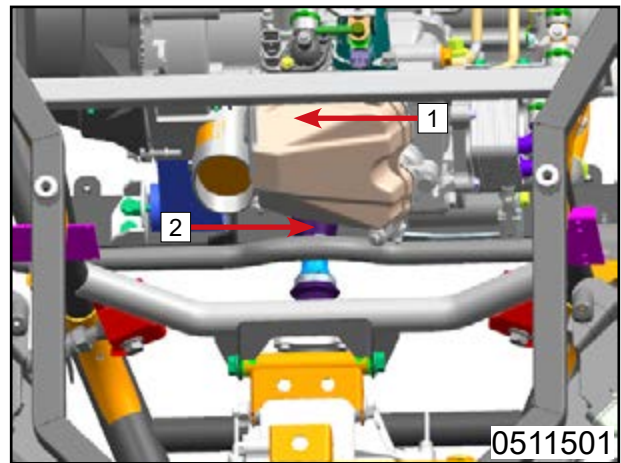
Detailed information refers to 04 CVT System.



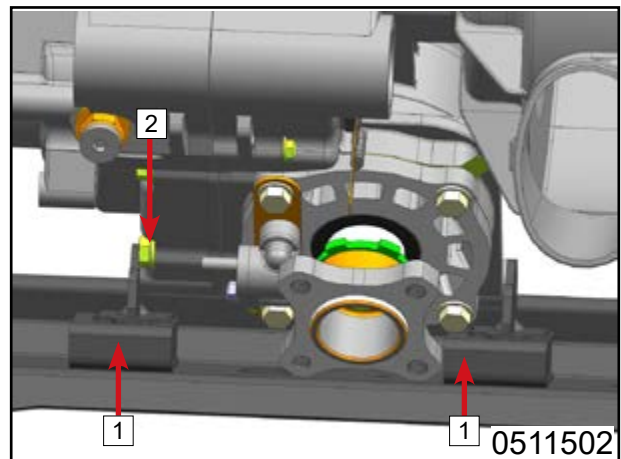
5.7 Engine Installation

Hang engine [1] on vehicle. Connect engine rear output shaft [2] and rear gear case output shaft. Then put down engine.

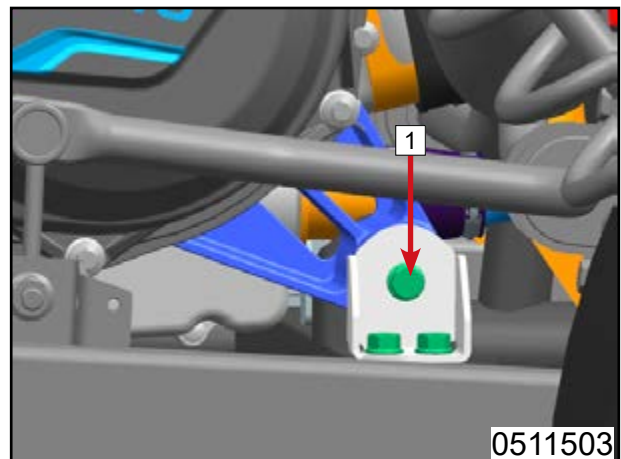
NOTE: Apply some grease in output shaft coupler before installation.



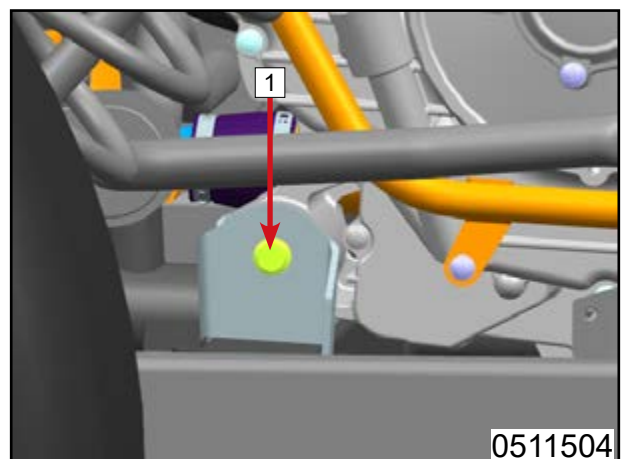
Install engine cushion blocks [1].
Put down the engine slowly.
Install bolt [2] with nut.



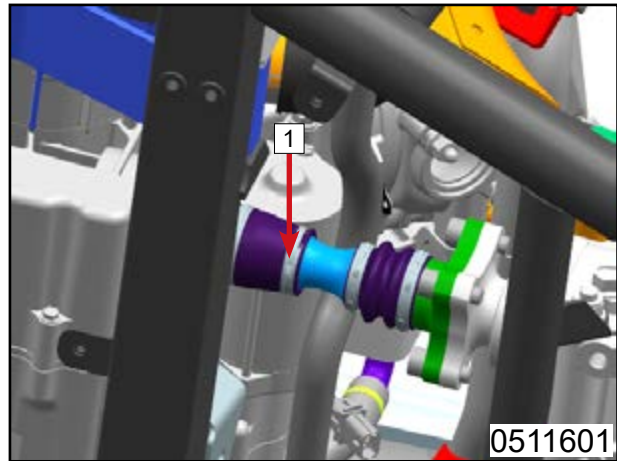
Install bolt [1] with nut.
Tighten torque: 55N•m~65N•m.



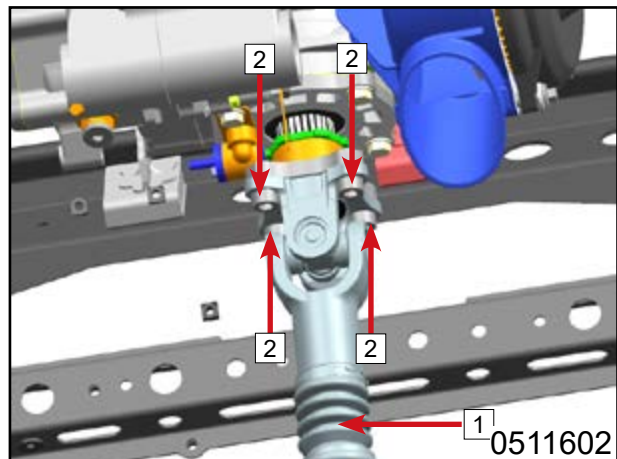
Install bolt [1] with nut.
Tighten torque: 55N•m~65N•m.



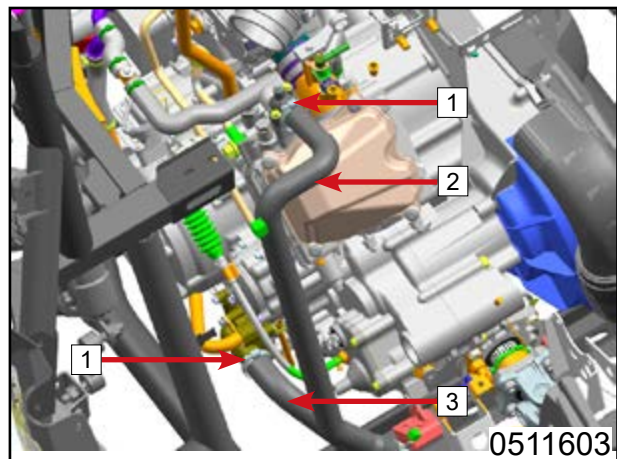
Install and tighten clamp **1**.



Push front drive shaft **1** forward to align with engine output flange coupler.
Install bolts **2** with thread locker. Tighten torque: 40N•m~50N•m.



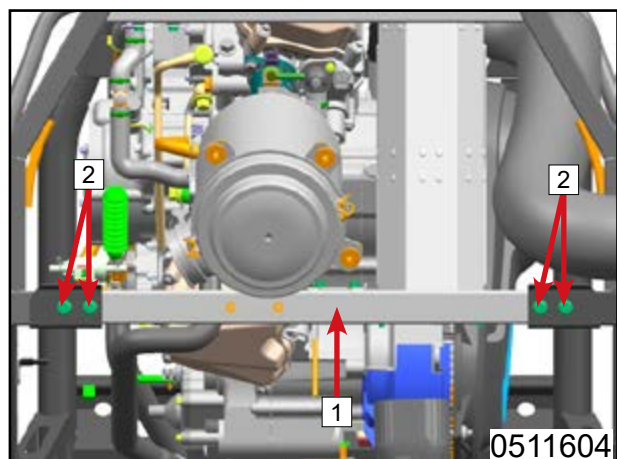
Loosen clamp **1** and put it on engine water outlet pipe **2**.
Install engine water outlet pipe **2** and tighten clamp **1**.
Loosen clamp **3** and put it on engine water inlet pipe **4**.
Install engine water inlet pipe **4** and tighten clamp **3**.



Install engine upper bracket **1**.
Install bolts **2**.

Coolant filling refers to Cooling System section.

Installations for muffler, body parts, gearshift, fuel tank and seat refer to other chapters.



5.8 Cooling System

5.8.1 Sealing Inspection

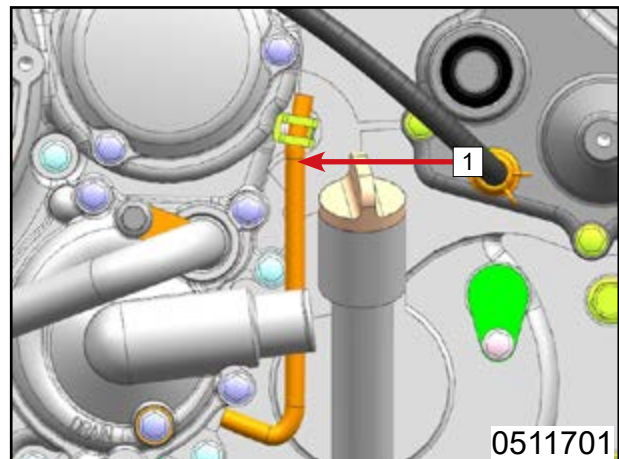
⚠ CAUTION: Never open radiator cap or remove water pipe and radiator parts before engine is cooled down, to prevent getting burnt.

Run the engine (idle). Stop the engine until fan works. Inspect cooling system each part for leak. Replace fault parts if leaking.

Inspect all pipes, radiator, cylinder body, cylinder head and contact surfaces for leak or bubbles. Replace fault parts if necessary.

Inspect pipes condition. Make sure the junction area is installed well. Inspect overfilling hose **1** for coolant or engine oil leak.

NOTE: Water seal allows a little drop leaking. Only the leaking hose continuously dropping is regarded as leaking. The water seal must be replaced. Leaking coolant indicates a defective rotary seal. Leaking oil indicates a defective inner oil seal. If either seal is leaking, both seals must be replaced at the same time.



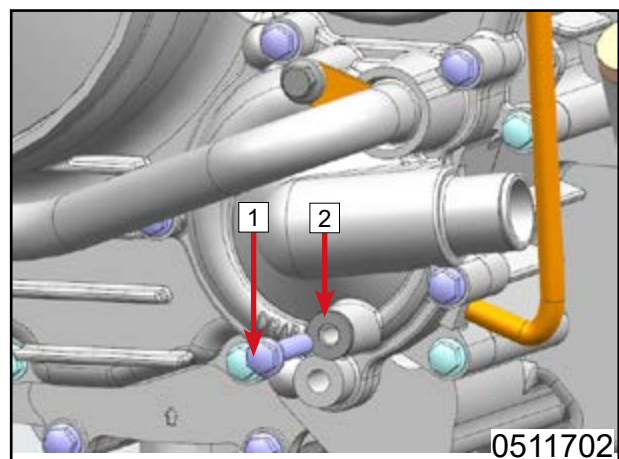
5.8.2 Coolant Replacement

Coolant Drain

⚠ CAUTION: Never make operations on cooling system when the engine is hot.

Loosen radiator cap.
Place a pan under engine water pump to store the drained coolant.
Remove coolant drain bolt **1**.
Remove washer **2**.

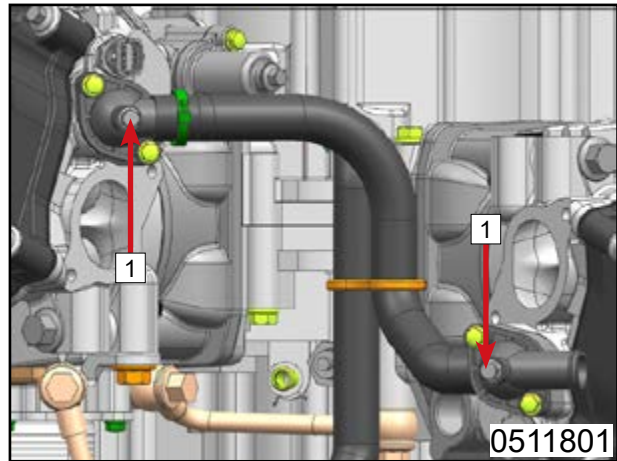
After draining coolant, install drain bolt with a new washer and tighten it to 10 N•m.



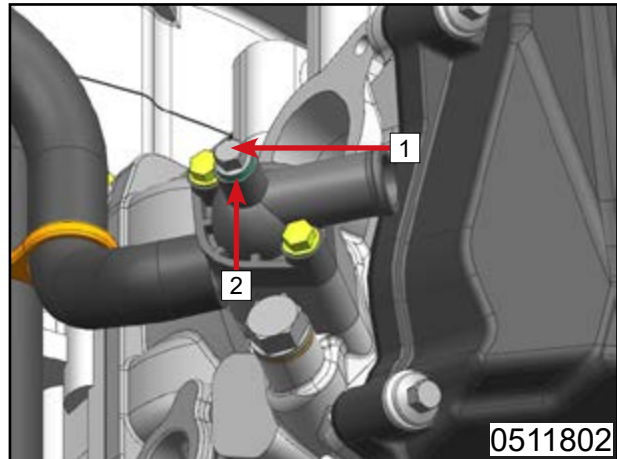
Coolant Filling

Remove the relief screw **1** on thermostat cap.

NOTE: Both two cylinders must be vented.



Place the vehicle on flat ground and cool down engine. Add coolant to radiator until it comes out from the hole on thermostat cap. Install relief screw **1** with seal washer **2** and tighten it to 5 N•m(44 lbf•in). After full filling, install radiator cap. Add coolant in coolant reservoir until the level reaches lower line. Install reservoir cap. Start and run the engine until the thermostat opens. Then stop the engine. When the engine cools down, inspect the coolant level in radiator and reservoir. Make sure the coolant level in reservoir is between LOWER and UPPER marker lines.



Thermostat information refers to Engine Inspection section.

Water pump information refers to Engine Inspection section.

Oil cooler information refers to Engine Inspection section.

5.9 Lubrication System

5.9.1 Engine Oil Level Inspection

Ensure vehicle is on a level surface.

Start the engine and allow it to idle for a few minutes.

Stop the engine and wait for a few minutes to allow oil flow down to crankcase. Inspect the oil level.

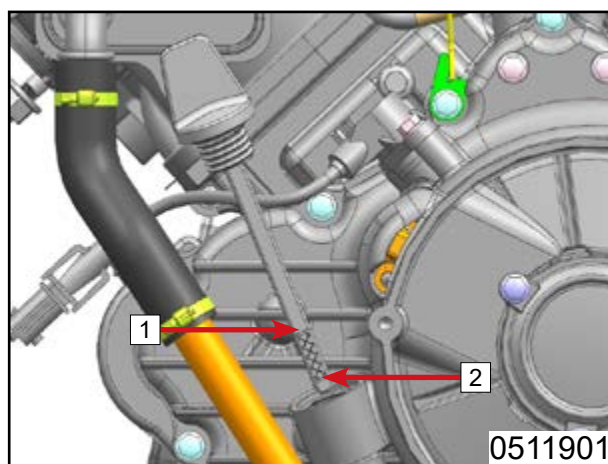
Remove dipstick and wipe away the remaining oil. Insert the dipstick into the hole. Make dipstick threads contact the hole surface without tightening it.

Remove dipstick and read oil level, which should be between "upper" **1** and "lower" **2** marks. There is 400ml oil capacity between "upper" **1** and "lower" **2** marks.

Add or drain engine oil until the level is in between.

Install oil dipstick.

NOTE: Strictly follow the procedures above. Otherwise, wrong oil level may be indicated.



5.9.2 Engine Oil Replacement

Ensure vehicle is on a level surface before operation.

Replace engine oil and filter element at the same time when the engine is warm.

NOTE: The engine oil can be very hot. Wait until engine temperature is appropriate.

Place a pan under the engine oil drain bolt to store the drained oil.

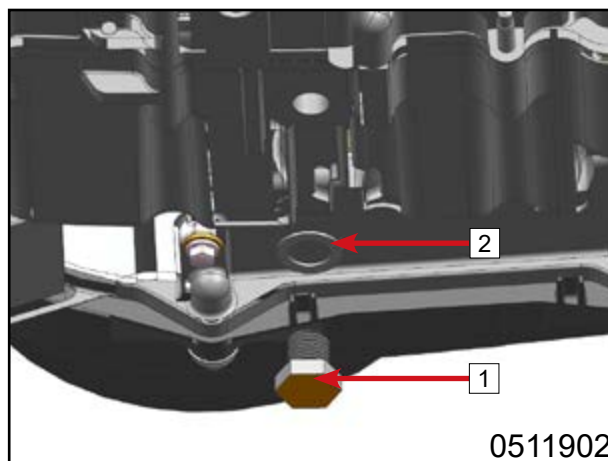
Clean the drain bolt area.

Remove oil dipstick.

Remove drain bolt **1** with seal ring **2**.

Wait for several minutes to drain the oil completely from crankcase.

NOTE: Oil condition reflects engine condition. Check if drained engine oil contains engine shavings and residue. Presence of debris indicates a failure inside the engine. Check the engine to fix the problem.



Clean drain bolt.

Replace with a new seal washer if damaged.

Install and tighten drain bolt with seal washer.

Tighten torque: 20 N•m

Oil Filter Element Replacement

Oil filter element removal and installation refer to Engine Disassembly and Engine Assembly section.

Engine Oil Filling

Add recommended engine oil through oil dipstick hole.

Engine oil capacity (replace oil filter element at the same time): 2.5 L

Inspect engine oil level after filling (refer to the procedures above).

Start the engine and make sure there is no leak at oil filter and drain bolt places.

5.9.3 Transmission Oil Inspection

Ensure vehicle is on a level surface.

Start the engine and allow it to idle for a few minutes.

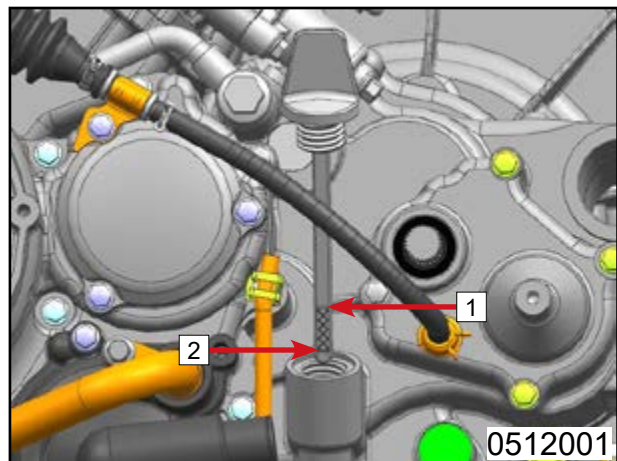
Stop the engine and wait for a few minutes to allow oil flow down to transmission gear case. Inspect the oil level.

Remove dipstick and wipe away the remaining oil. Insert the dipstick into the hole. Make dipstick threads contact the hole surface without tightening it.

Remove dipstick and read oil level, which should be between "upper" **1** and "lower" **2** marks. There is 200ml oil capacity between "upper" **1** and "lower" **2** marks.

Add or drain transmission oil until the level is in between.

Install oil dipstick.



NOTE: Strictly follow the procedures above. Otherwise, wrong oil level may be indicated.

5.9.4 Transmission Oil Replacement

Ensure vehicle is on a level surface before operation.

NOTE: The transmission oil can be very hot. Wait until engine temperature is appropriate.

Place a pan under the transmission oil drain bolt to store the drained oil.

Clean the drain bolt area.

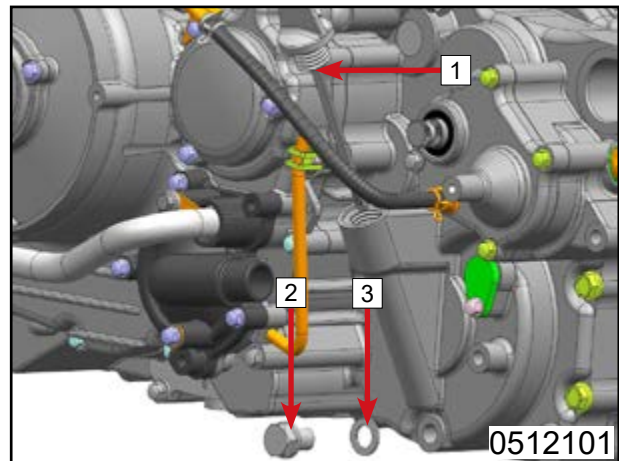
Remove oil dipstick **1**.

Remove drain bolt **2** with seal ring **3**.

Wait for several minutes to drain the oil completely.

NOTE: Remove oil dipstick before draining, in case oil spills out to cause injury.

NOTE: Oil condition reflects transmission gear case condition. Check if drained engine oil contains engine shavings and residue. Presence of debris indicates a failure inside the transmission gear case. Check the gear case to fix the problem.



Clean drain bolt.

Replace with a new seal washer if damaged.

Install and tighten drain bolt with seal washer.

Tighten torque: 20 N•m

Add 75W/90 GL-5 transmission oil through oil dipstick hole.

Transmission oil capacity (replace oil filter element at the same time): 0.6 L

Inspect transmission oil level after filling (refer to the procedures above).

Start the engine and make sure there is no leak at drain bolt place.

5.9.5 Engine Oil Pressure Inspection

Inspect engine oil pressure when the engine temperature is 90°C.

Remove engine oil pressure switch.

Install engine oil pressure gauge and adapter hose.

The engine oil pressure (90°C) should be within the following values:



Oil pressure	1300r/min	6000r/min
Min.	100kPa	500kPa
Regular	200kPa	580kPa
Max.	400kPa	700kPa

If the engine oil pressure beyond specifications, check parts described in Trouble Shooting section.

Remove engine oil pressure gauge and adapter hose after measurement.

Install the engine oil pressure switch.

NOTE: Use special tools to install and remove oil pressure gauge and adapter hose.



5.10 Fuel System

⚠ DANGER: Never fuel near spark or lighted cigarette. Stop engine before fueling. Do not spill fuel on high-temperature components of the vehicle. If the fuel spills, wipe off the fuel immediately.

⚠ WARNING: Fuel in the tank will expand when gets heated, and may overflows when it is overfilled.

⚠ WARNING: Fuel is toxic and harmful. Do not allow fuel to touch the skin, eyes and clothing. Do not breathe fuel vapor. Immediately wash the fuel when in contact with the eyes and seek medical advice. If swallowed, swiftly seek medical attention.

⚠ WARNING: Please replace the clothes soiled with fuel. Store the fuel in a suitable bucket as specified. Make sure to keep the fuel away from children. Please dispose of the used fuel in a proper way to avoid any pollution to the environment.

NOTE: Oil hose removal and fuel filter replacement should be operated by technicians in a well-ventilated place.

5.10.1 Fuel System Removal

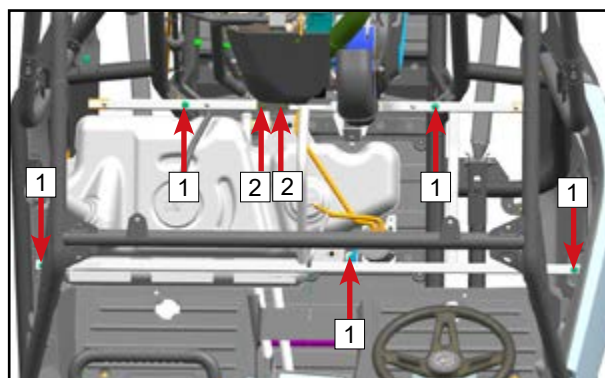
Preliminary Work

Remove driver and passenger seat.
 Remove LH&RH rear wheel fenders.
 Remove CVT LH&RH outer deco covers.
 Remove LH&RH rear side plates.
 Remove LH&RH door upper inner plates.
 Remove LH&RH side door rear plates.
 Remove LH&RH door upper deco plates.
 Remove ECU cap and pull out connectors and diagnosis connector.
 Remove seat rear plate.
 Remove seat middle plates.
 Remove LH&RH seat front plates.
 Remove middle cover and gearshift cover.
 Remove LH&RH middle plate.
 Remove gearshift assy and hand brake assy.

Removal (with EVAP)

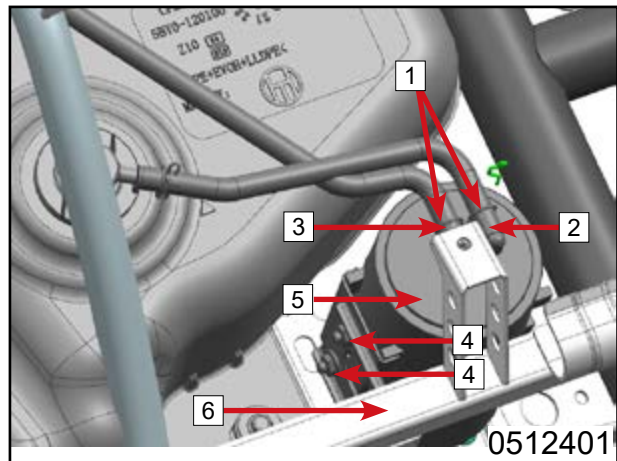
Remove bolts 1.

Remove bolts 2.

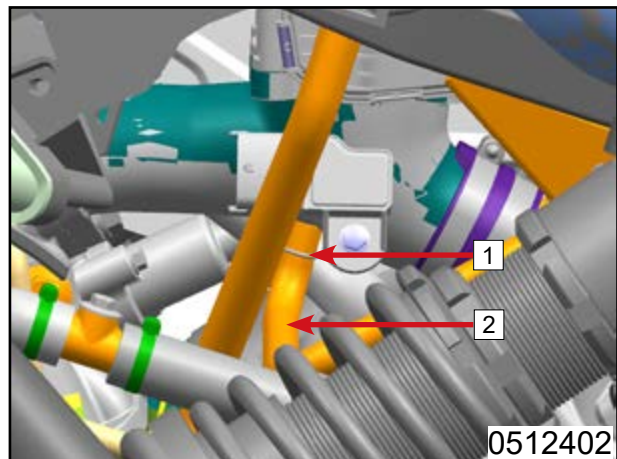


0512301

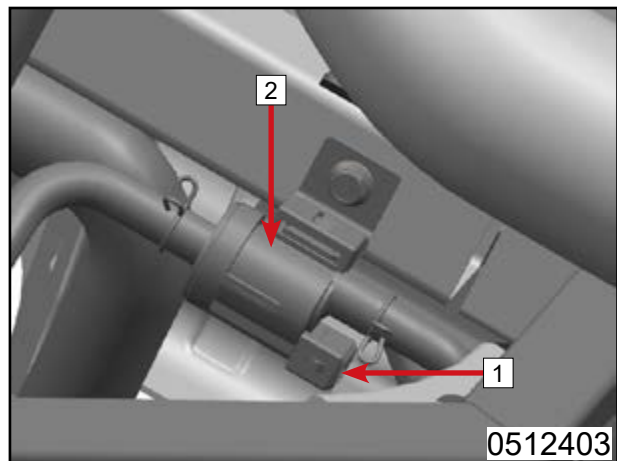
- Loosen clamp [1].
- Pull out fuel vapor hose I [2].
- Pull out fuel vapor hose II [3].
- Remove nuts [4].
- Remove canister [5].
- Remove seat bracket [6].



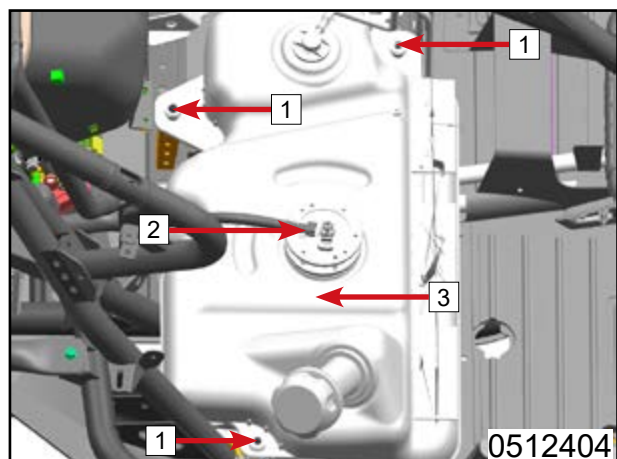
- Loosen clamp [1].
- Pull out fuel vapor hose III [2].
- Remove fuel vapor hose.



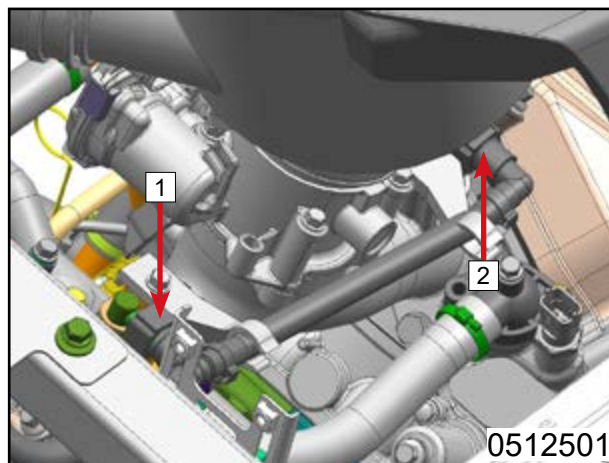
- Disconnect canister control valve connector [1].
- Pull out canister control valve [2].
- Remove fuel vapor hose.



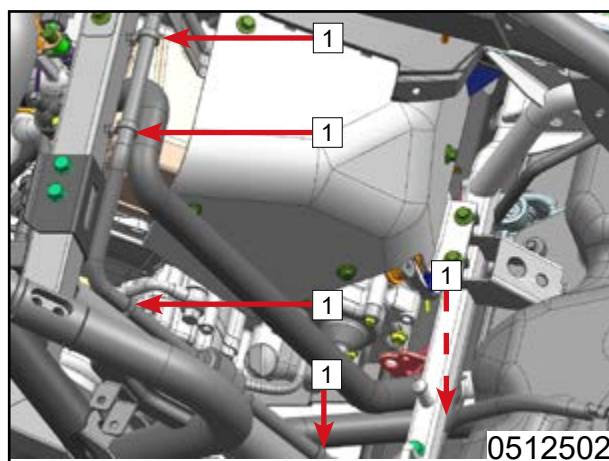
- Remove bolts [1].
- Pull out quick joint [2].
- Pull out fuel pump connectors.
- Remove fuel pump [3].



Pull out quick joint **1**.
Pull out quick joint **2**.

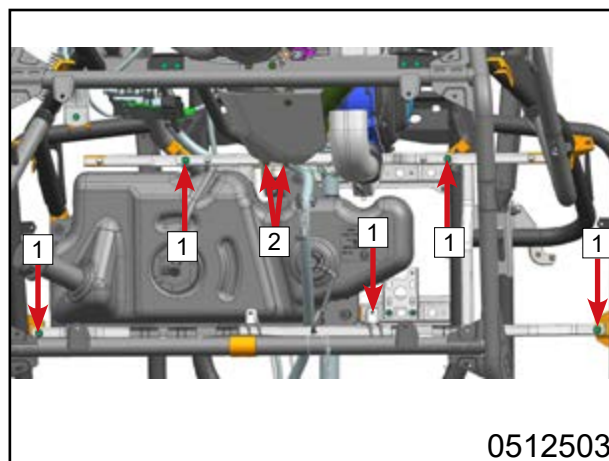


Open high pressure oil hose clips **1** to remove high press oil hose.

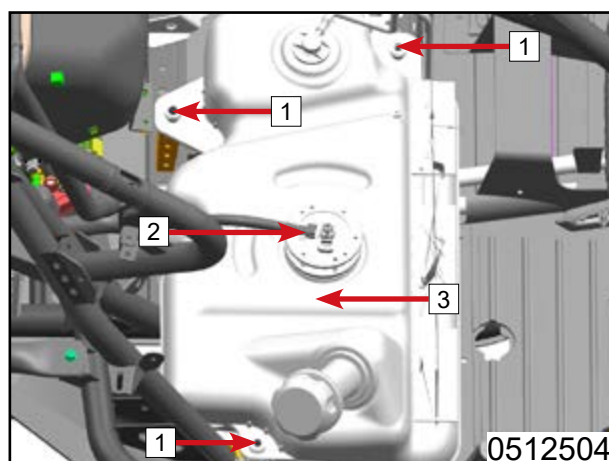


Removal (without EVAP)

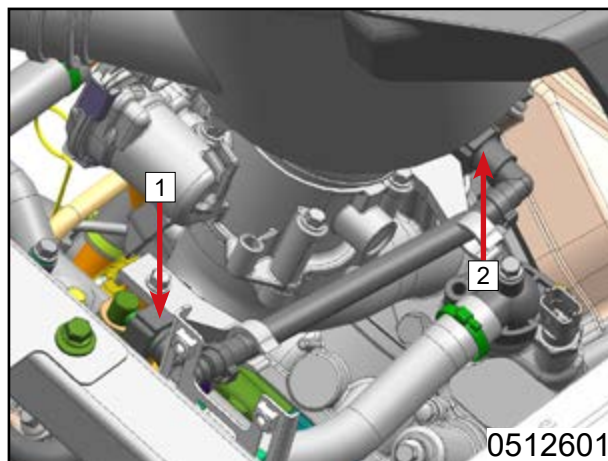
Remove bolts **1**.
Remove bolts **2**.



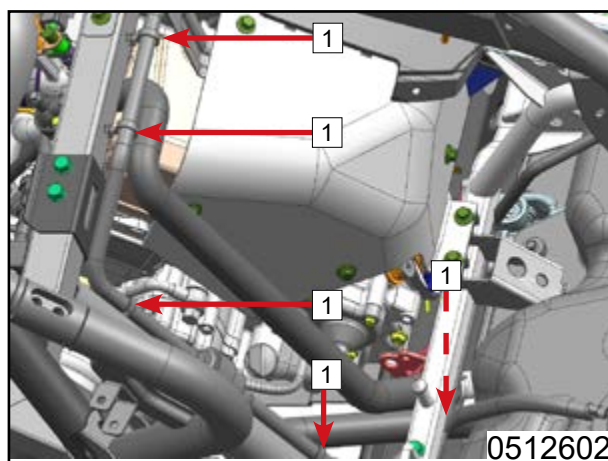
Remove bolts **1**.
Pull out quick joint **2**.
Pull out fuel pump connectors.
Remove fuel pump **3**.



Pull out quick joint **1**.
Pull out quick joint **2**.



Open high pressure oil hose clips **1** to remove high press oil hose.

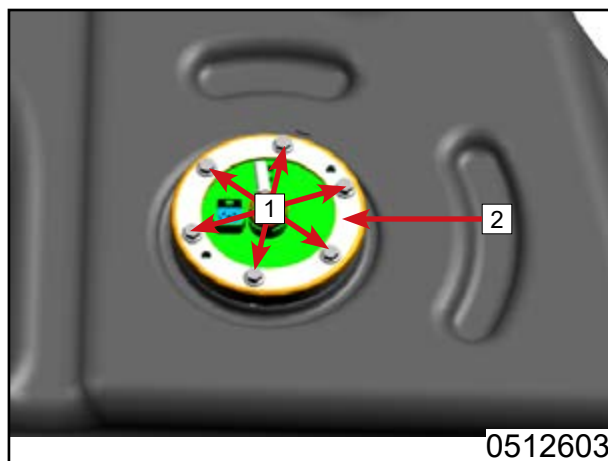


5.10.2 Fuel System Inspection

Fuel Tank

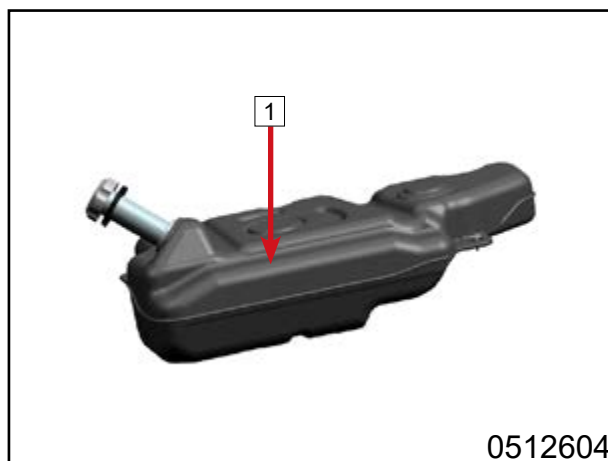
Disassembly

Remove bolts **1**.
Remove fuel pump **2**.



Inspection

Inspect fuel tank **1** for damage or leaks.
Replace if necessary.



Fuel Pump Pressure Inspection

Inspect fuel pump for damage. Replace if damaged.

Ensure that the battery voltage doesn't drop below 12V.

NOTE: A small amount of remaining fuel may come out of the hose when removing fuel pump.

One side of the hose of pressure gauge connects fuel outlet port, the other side connects fuel drum.

Connect the battery. Measure fuel pressure value when it is stabilized and then disconnect the battery.

NOTE: Dwell time is one minute and fuel pressure is more than 2.5bar.

Voltage 12V	3.0 bar±0.3 bar
Voltage 13V	3.3 bar±0.3 bar

Replace a new fuel pump if the pressure is beyond the specification.

Remove pressure gauge and battery.

Properly dispose the fuel in the drum to prevent pollution.

Use compressed air to clean joint of hose.

Installation

Install fuel pump [1].

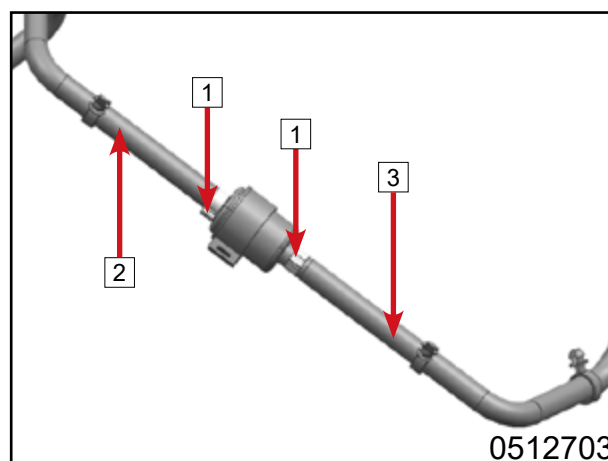
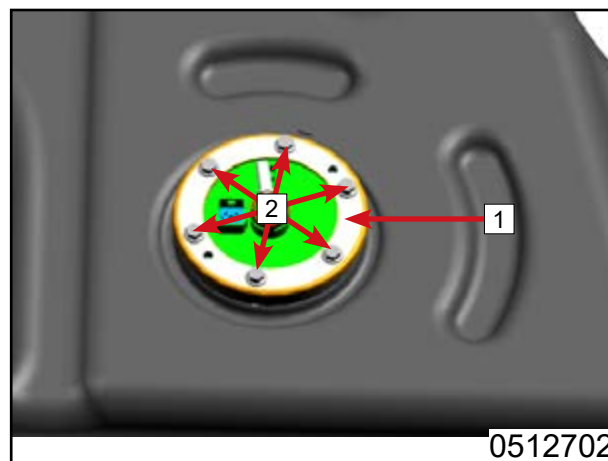
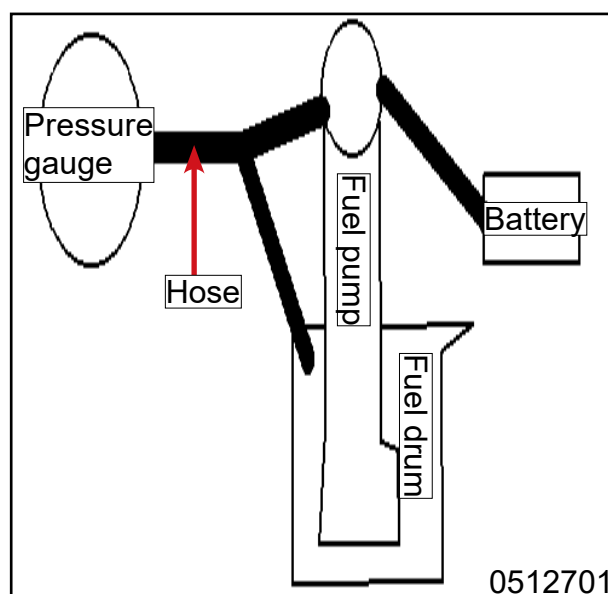
Install bolts [2].

High Pressure Hose, EFI Fuel Filter Disassembly

Loosen clamps [1].

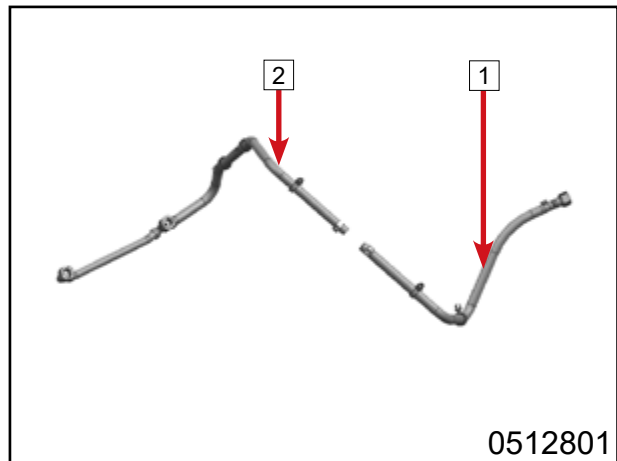
Pull out high pressure hose assy 2 [2].

Pull out high pressure hose assy 1 [3].

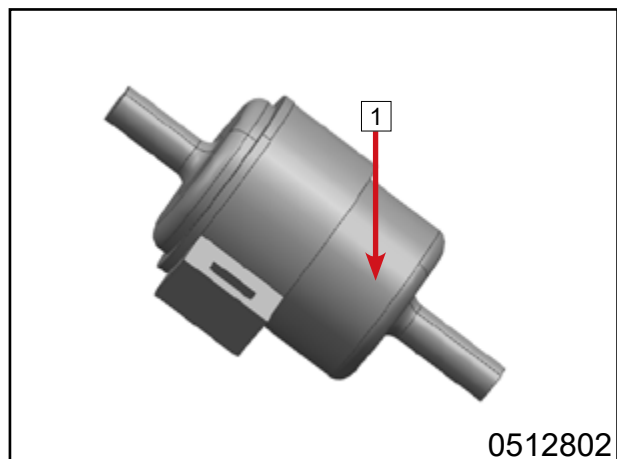


Inspection

Inspect high pressure oil hose 1 [1] and oil hose 2 [2] for break, damage, crack or hardening. Replace if necessary.

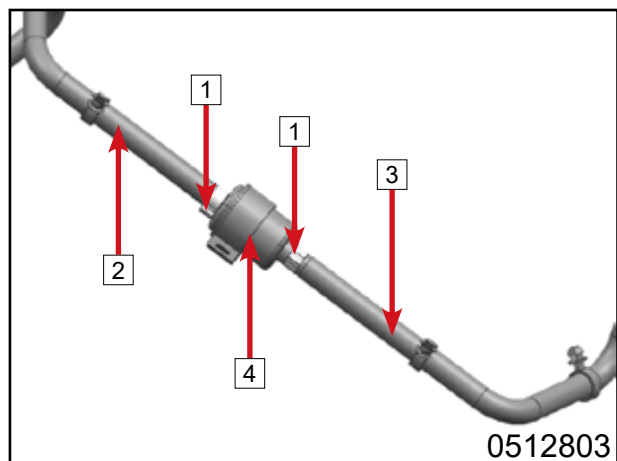


Inspect EFI fuel filter [1] for damage. Replace if necessary. Fuel filter belongs to maintenance parts. Replace it periodically according to the maintenance schedule.



Assembly

Put clamps [1] on high pressure oil hose 2 [2] and oil hose 1 [3]. Install high pressure oil hose assy on EFI fuel filter [4]. Fix parts and tighten clamps [1].

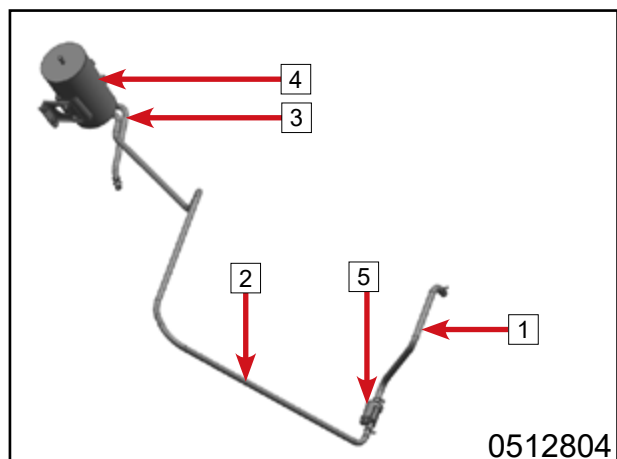


Canister and Canister Control Valve

Inspect fuel vapor hose III [1], fuel vapor hose II [2] and fuel vapor hose I [3] for break, damage, crack or hardening. Replace if necessary.

Inspect canister [4] for damage. Replace if damaged.

Inspect canister control valve [5] for damage. Replace if damaged.



5.10.3 Fuel System Installation

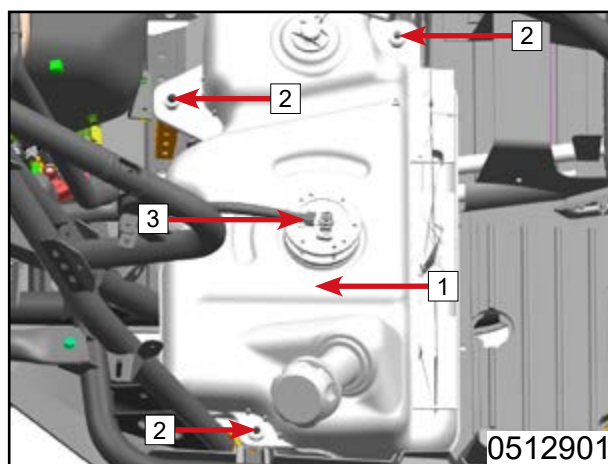
Installation (with EVAP)

Install fuel tank [1].

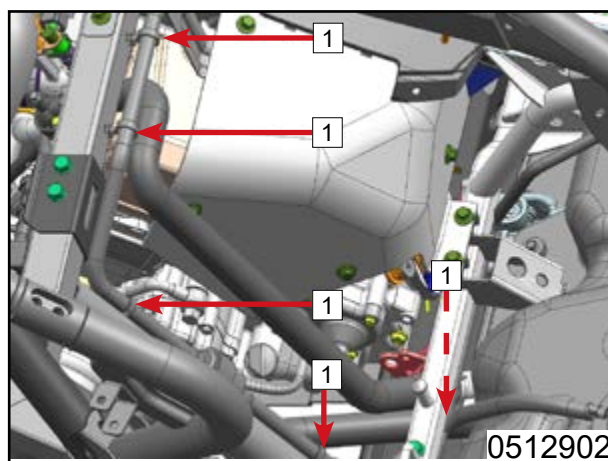
Install bolts [2].

Connect quick joint [3].

Connect fuel pump connectors.

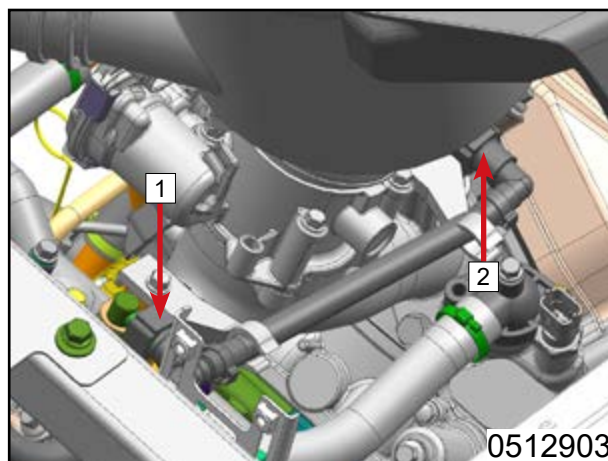


Fix high pressure oil hose by clipping oil hose clips [1].



Connect quick joint [1].

Connect quick joint [2].

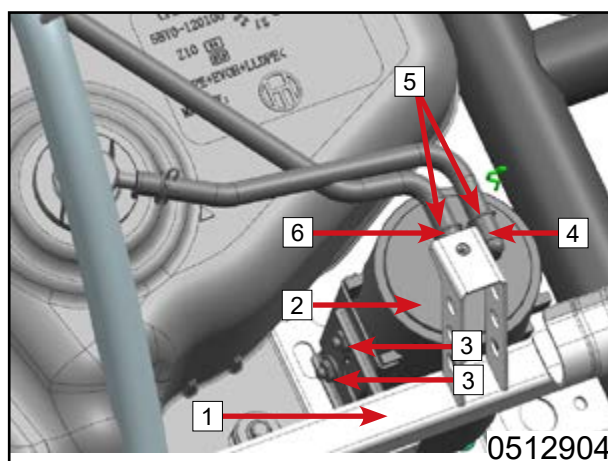


Install seat bracket [1].

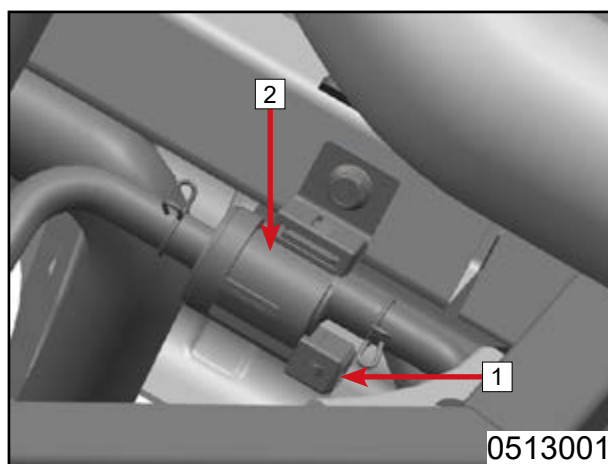
Install canister [2].

Install nuts [3].

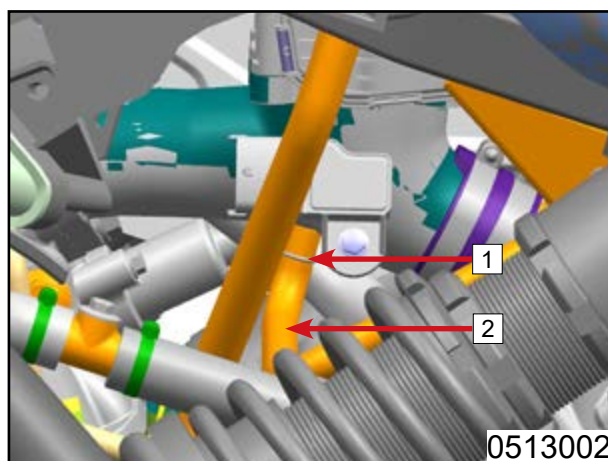
Put clamps [5] on fuel vapor hose I [4] and fuel vapor hose II [6]. Install and fix fuel vapor hoses. Then tighten clamps [5].



Install canister control valve [2].
Connect canister control valve connector [1].

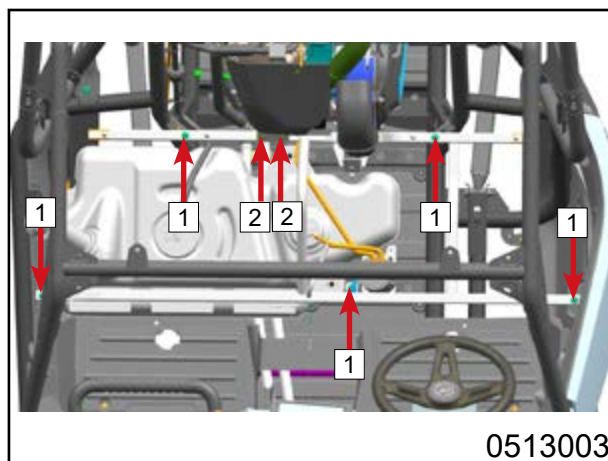


Put clamp [1] on fuel vapor hose [2]. Install and fix fuel vapor hose. Then tighten clamp [1].



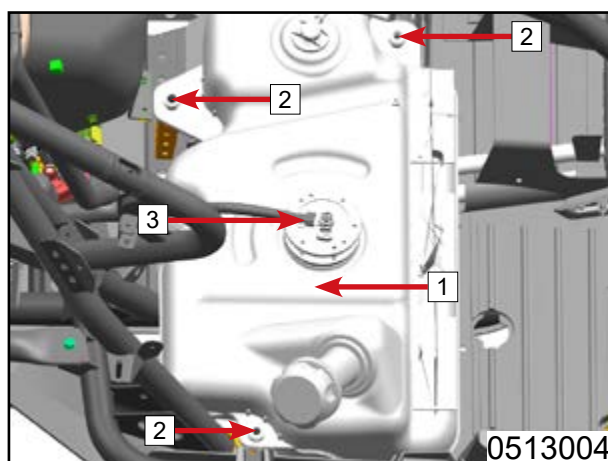
Install bolts [1].
Install bolts [2].

Install body plastic parts, gearshift assy and hand brake assy, etc.

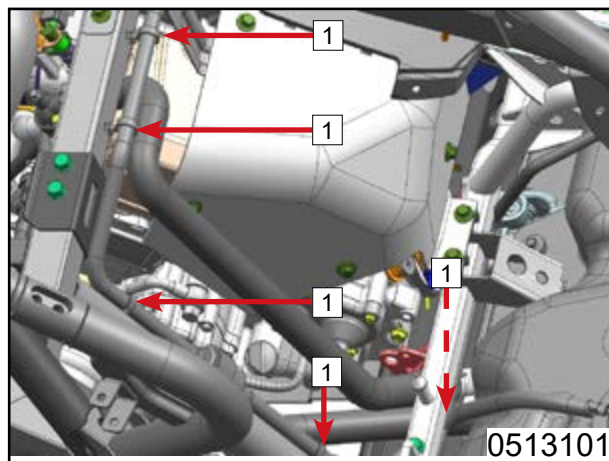


Installation (without EVAP)

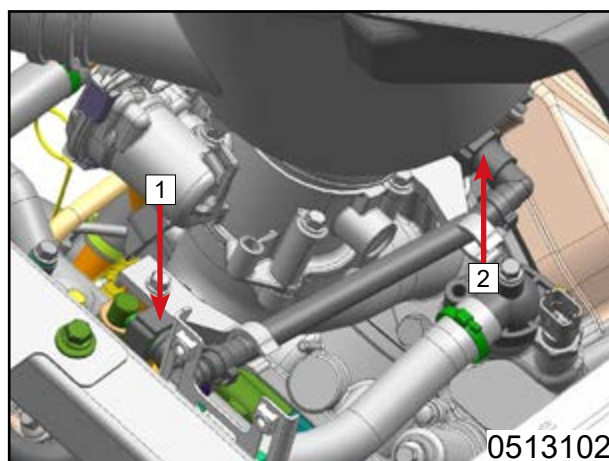
Install fuel tank [1].
Install bolts [2].
Connect quick joint [3].
Connect fuel pump connectors.



Fix high pressure oil hose by clipping oil hose clips **1**.

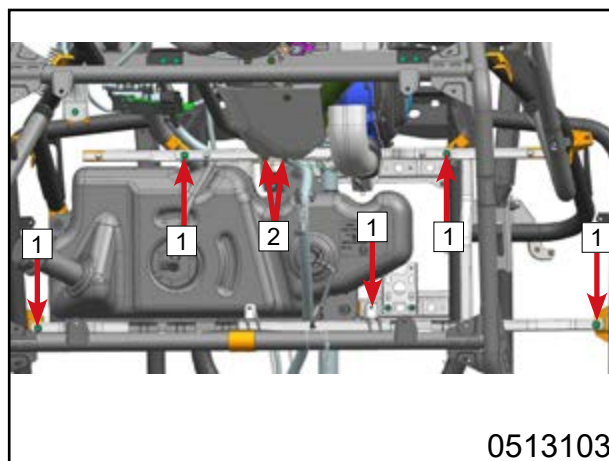


Connect quick joint **1**.
Connect quick joint **2**.



Install bolts **1**.
Install bolts **2**.

Install body plastic parts, gearshift assy and hand brake assy, etc.



06 Body Covering Parts

6.1 Seat	06-2
6.2 Front Top Cover	06-2
6.2.1 Front Service Cover	06-2
6.2.2 Seat Lower Fender	06-2
6.2.3 Passenger Seat Lower Fender	06-2
6.2.4 Seat Middle RH Protection Plate	06-3
6.2.5 Middle Protection Cover	06-3
6.2.6 Middle Panel	06-4
6.3 Lock Hook	06-5
6.3.1 Dashboard Panel	06-5
6.3.2 Storage Box Cover Assy	06-7
6.4 Front Wheel Fender (Status 1)	06-7
6.5 Front Wheel Fender (Status 2)	06-7
6.6 Damping Deco Guard	06-8
6.7 Headlight Panel	06-8
6.8 Cab	06-9
6.8.1 Rear View Mirror	06-9
6.8.2 Cab	06-9
6.9 Side Door (Status 1)	06-10
6.10 Side Door (Status 2)	06-11
6.11 Ventilation Grid	06-11
6.12 Winch Deco Cover	06-12
6.13 Front Inner Fixed Plate	06-12
6.14 Battery Box	06-12
6.15 Front Fender	06-13
6.16 Rear Fender (Status 1)	06-14
6.17 Rear Fender (Status 2)	06-14
6.18 CVT Deco Cover Assy	06-14
6.18.1 CVT Inner Deco Cover	06-14
6.18.2 Rear Rack Cover Plate	06-15
6.19 Rear Side Protection Plate	06-15
6.20 Seat LH Protection Plate	06-16
6.21 Seat Rear Protection Plate	06-16
6.21.1 ECU Cover	06-16
6.21.2 Seat Rear Service Plate	06-16
6.21.3 Seat Rear Protection Plate	06-16
6.21.4 Rear Ventilation Plate	06-17
6.22 Seat Front Protection Plate	06-17
6.23 Foot Pedal	06-17
6.24 Front Side Protection Plate	06-17
6.25 Air Filter Cover	06-18
6.26 Rear Cargo Box Base Plate	06-18
6.26.1 Rear Cargo Box Deco Cover	06-18
6.27 Rear Rack Assy	06-19

6.1 Seat

Removal

Loosen lock clip [1].

Lift up passenger seat [2].

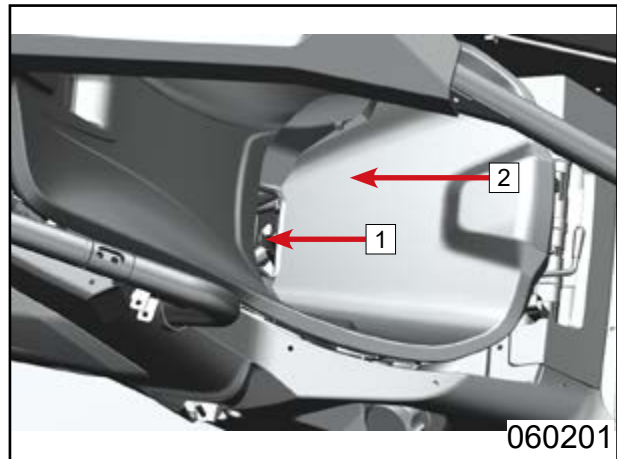
Remove passenger seat [2].

Driver seat removal follows the same removal procedures.

NOTE: The seat shall be pushed to the highest position during removal.

Installation

Reverse the removal procedures for installation.



6.2 Front Top Cover

6.2.1 Front Service Cover

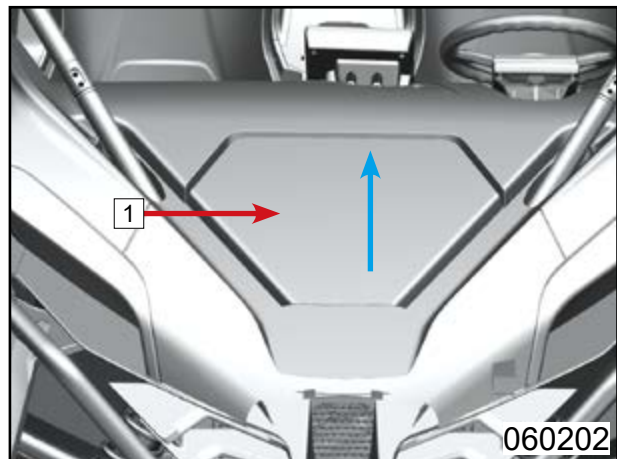
Removal

Lift up front service cover [1].

Pull out front service cover [1].

Installation

Reverse the removal procedures for installation.



6.2.2 Seat Lower Fender

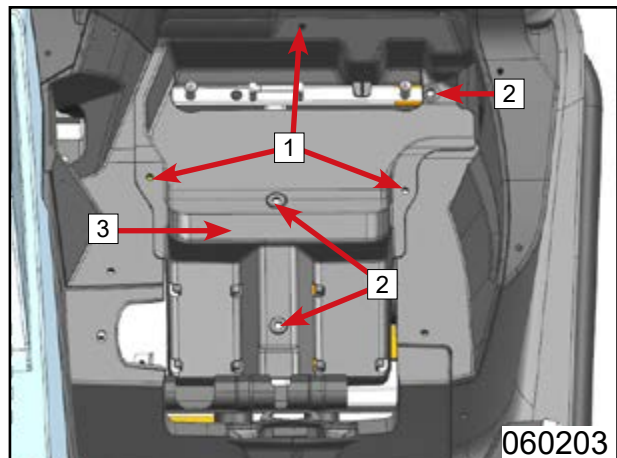
Remove expansion screws [1].

Remove bolts [2].

Remove seat lower fender [3].

Installation

Reverse the removal procedures for installation.



6.2.3 Passenger Seat Lower Fender

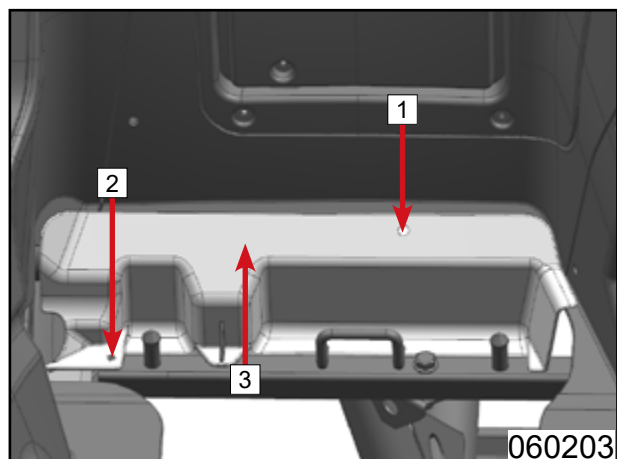
Remove expansion screws [1].

Remove bolts [2].

Remove seat lower fender [3].

Installation

Reverse the removal procedures for installation.

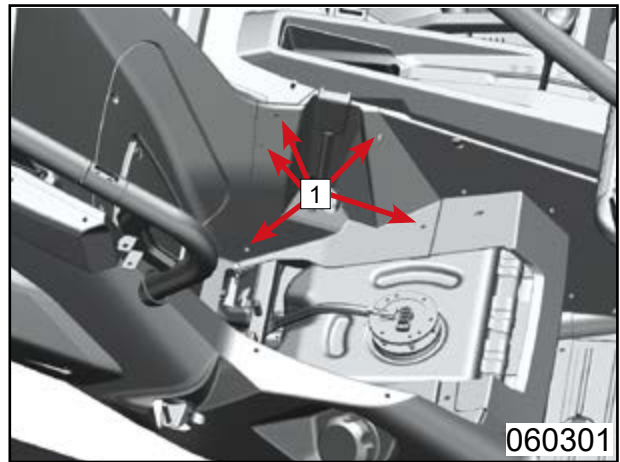


6.2.4 Seat Middle RH Protection Plate Removal

Remove five expansion screws.
Remove seat middle RH protection plate [1].
Middle LH protection plate follows the same removal procedures.

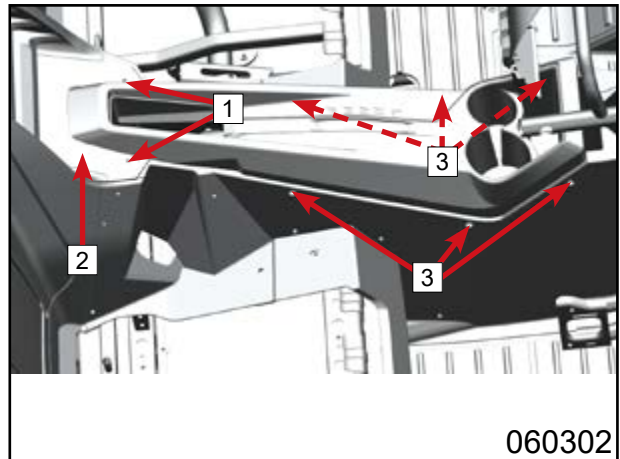
Installation

Reverse the removal procedures for installation.

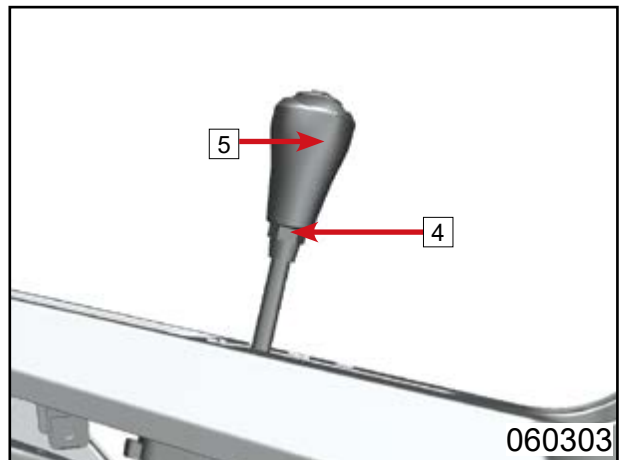


6.2.5 Middle Protection Cover Removal

Remove two screws [1].
Remove rear ventilation plate connecting plate [2].
Remove six self-tapping screws [3].



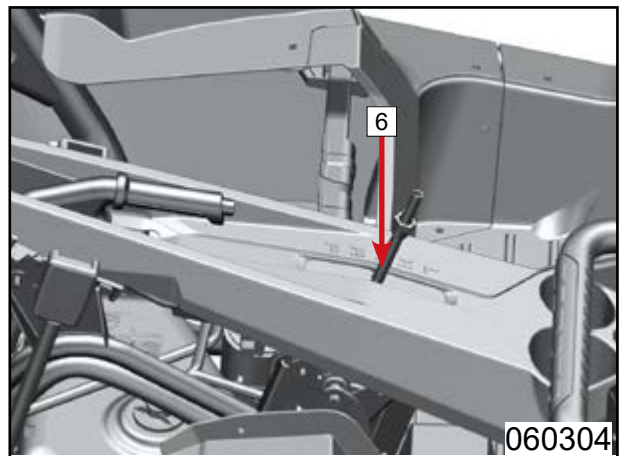
Loosen gearshift lever nut [4].
Remove gearshift lever knob [5].



Remove middle protection cover assy [6].

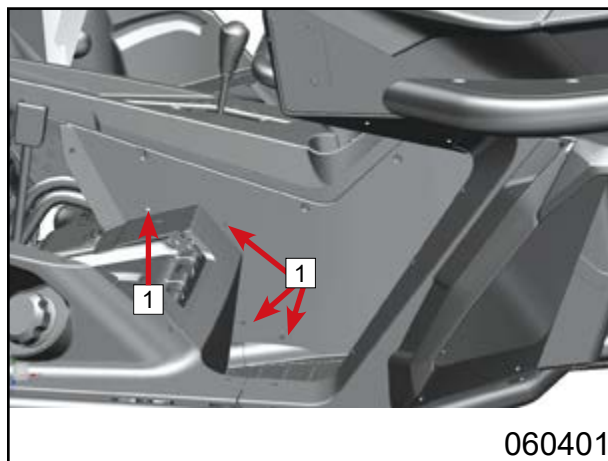
Installation

Reverse the removal procedures for installation.

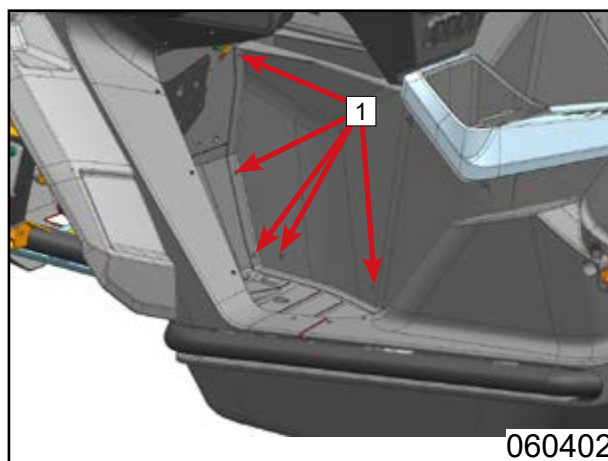


6.2.6 Middle Panel Removal

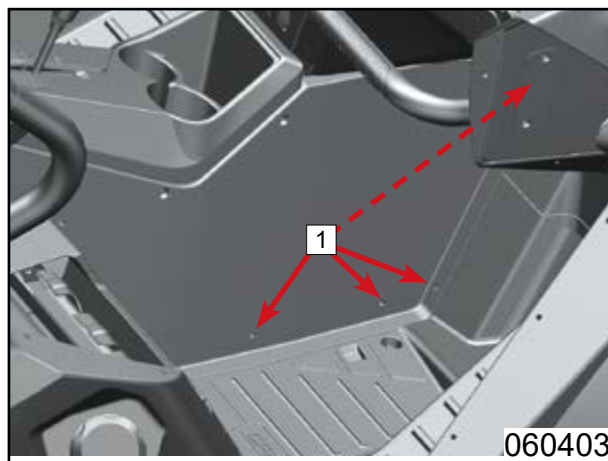
Remove four expansion screws [1].



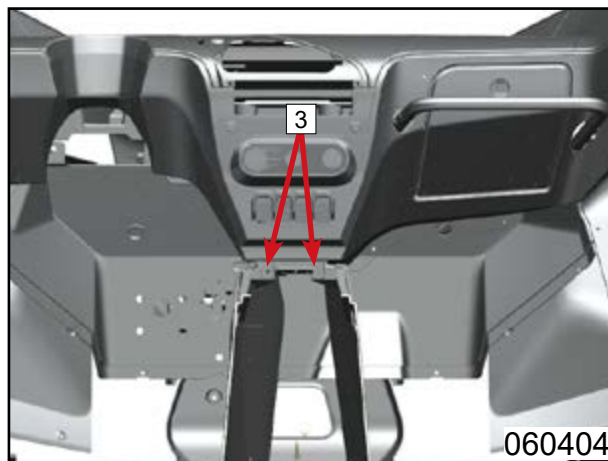
Remove five expansion screws [1].



Remove four expansion screws [1].



Remove two bolts [3].

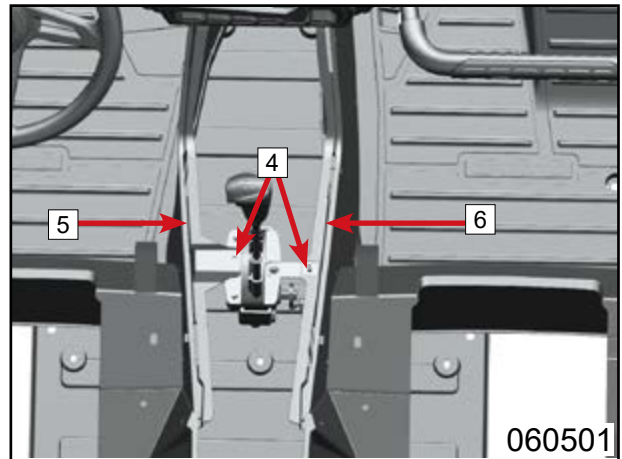


Remove two bolts [4].

Remove middle LH panel [5] and middle RH panel [6].

Installation

Reverse the removal procedures for installation.



6.3 Lock Hook

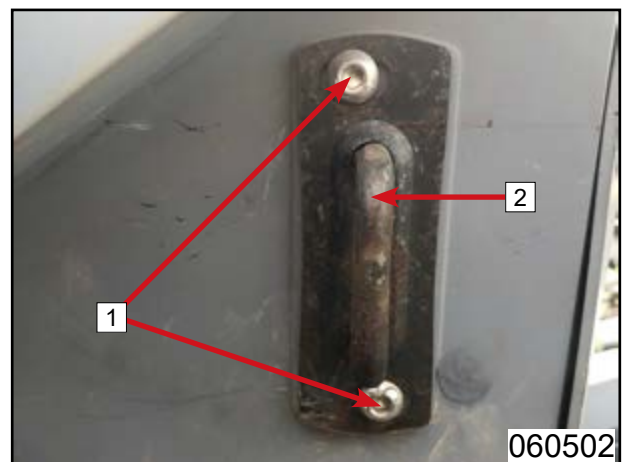
Removal

Remove two inner hex bolts [1].

Remove side door lock hook [3].

Installation

Reverse the removal procedures for installation.

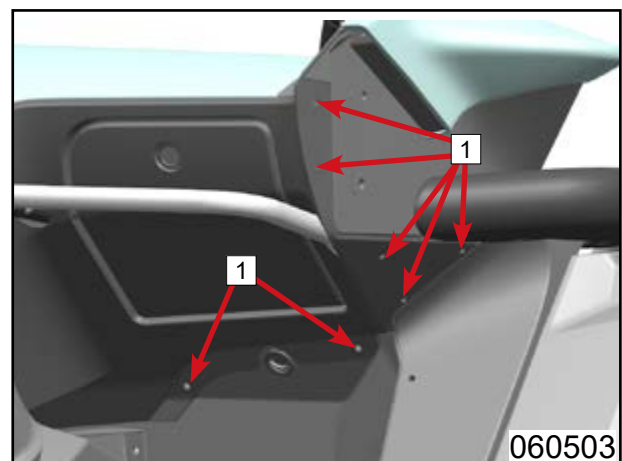


6.3.1 Dashboard Panel

Removal

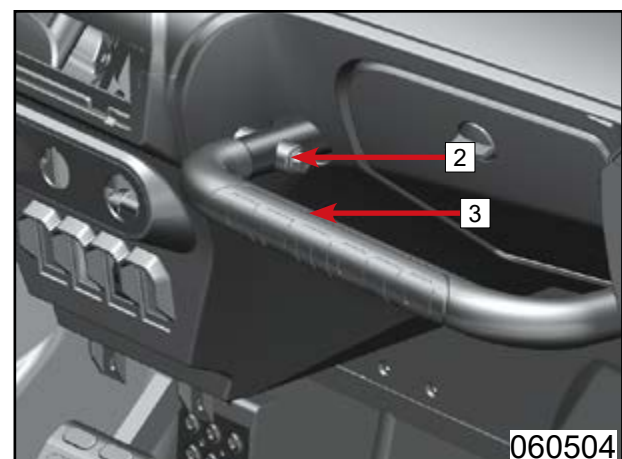
Steering wheel deco guard and bracket removal refer to Chapter 10.

Remove six expansion screws [1].

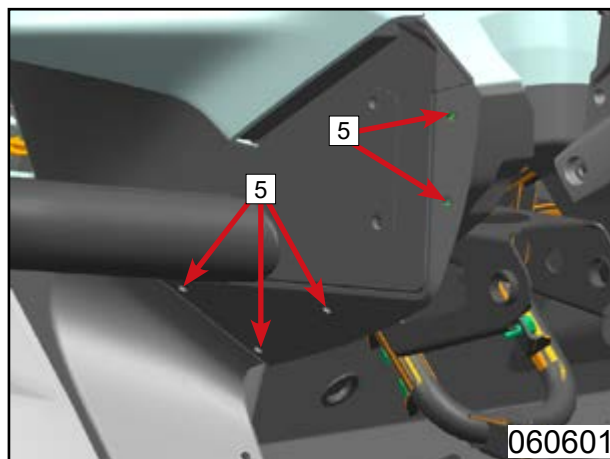


Remove bolt [2].

Remove passenger armrest bracket [3].



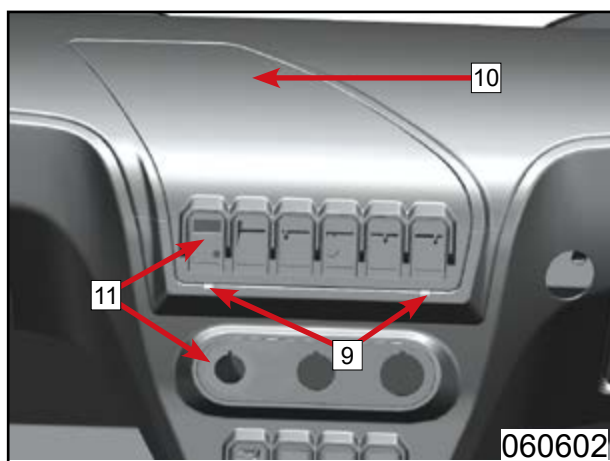
Remove four expansion screws [5].



Pry dashboard panel [9] with a screw driver.

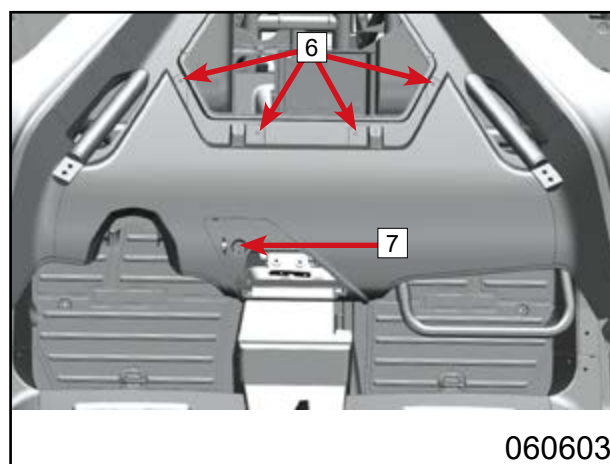
Pull out dashboard upper plate [10].

Unplug all switch connectors [11].



Remove four expansion screws [6].

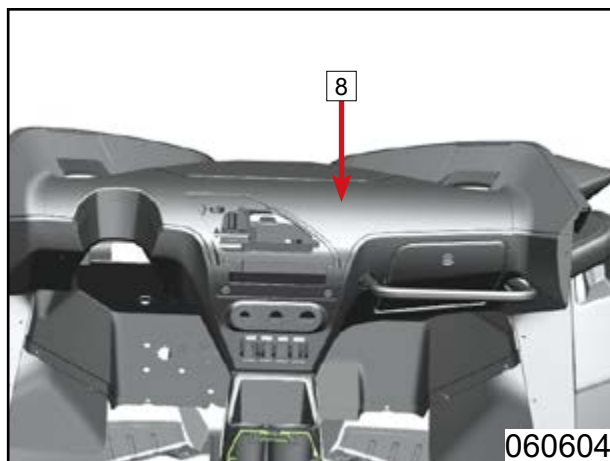
Remove screw [7].



Remove dashboard panel assy [8].

Installation

Reverse the removal procedures for installation.



6.3.2 Storage Box Cover Assy

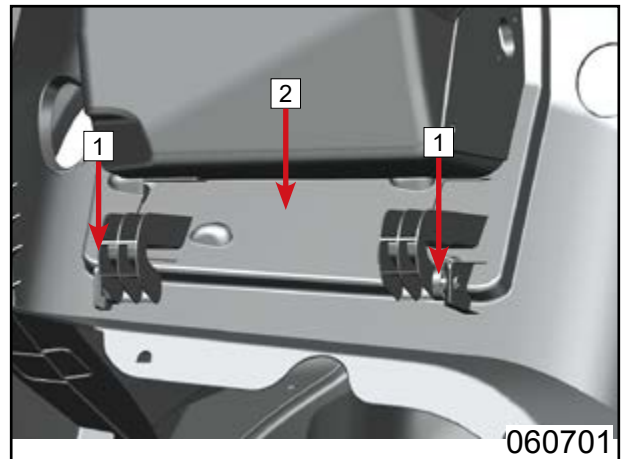
Removal

Remove self-tapping screws [1].

Remove storage box cover assy [2].

Installation

Reverse the removal procedures for installation.



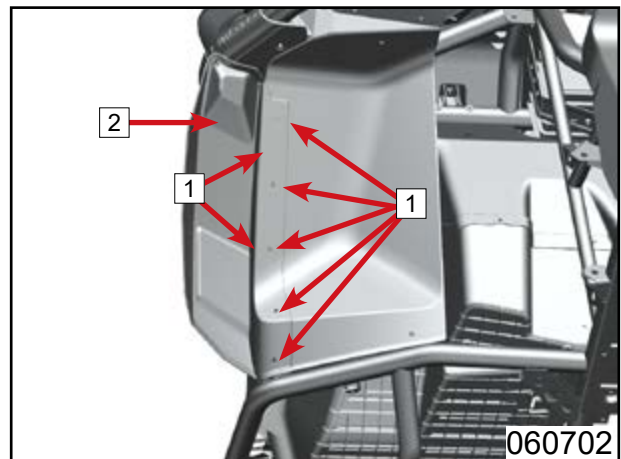
6.4 Front Wheel Fender (Status 1)

Removal

Remove seven expansion screws [3].

Remove front RH wheel fender rear part [4].

Front LH wheel fender rear part follows the same removal procedures.



6.5 Front Wheel Fender (Status 2)

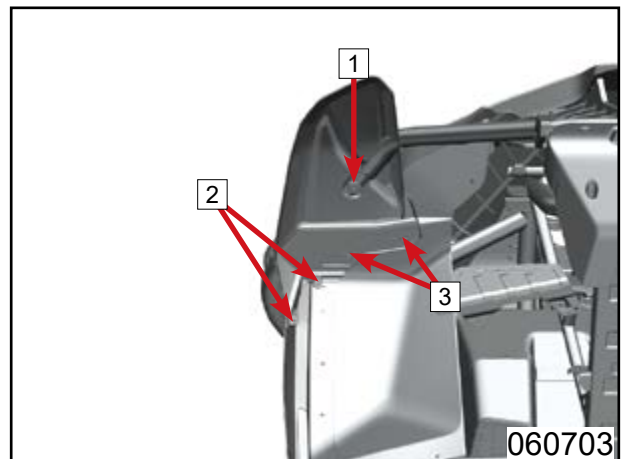
Removal

Remove bolt [1].

Remove two self-tapping screws [2].

Remove two self-tapping screws [3].

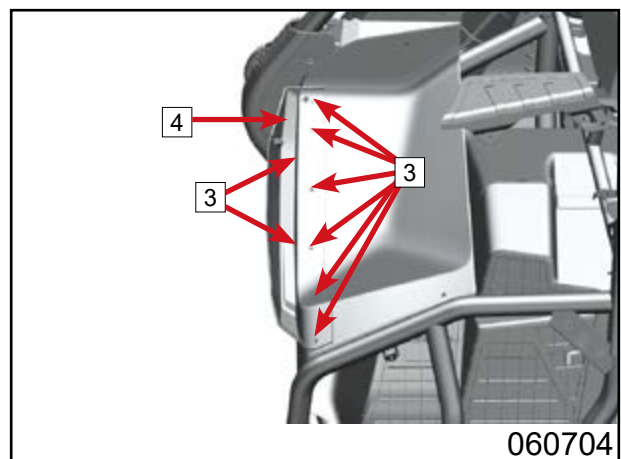
Remove front RH wheel fender front part.



Remove six expansion screws [3].

Remove front RH wheel fender [4].

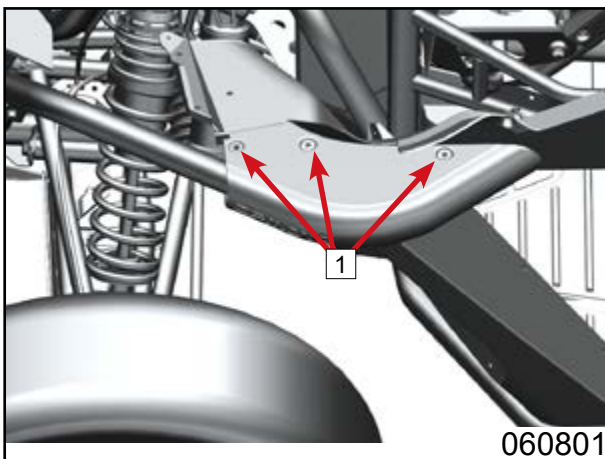
Front LH wheel fender follows the same removal procedures.



6.6 Damping Deco Guard

Removal

Remove three expansion screws [1].



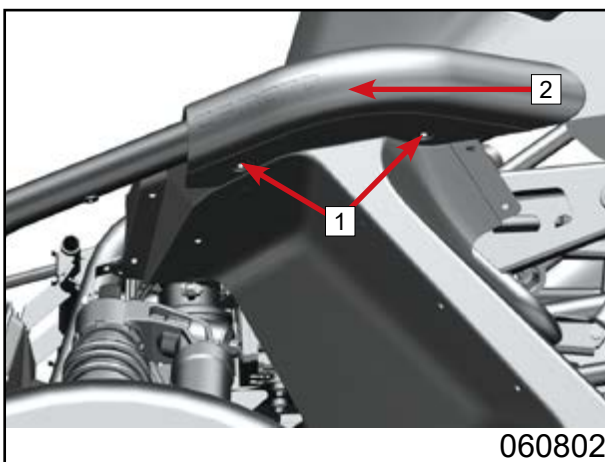
Remove two expansion screws [1].

Remove LH damping deco guard [2].

RH damping deco guard removal applies the same removal procedures.

Installation

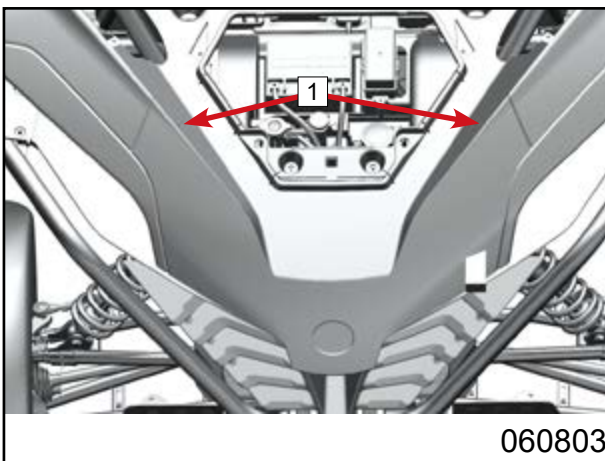
Reverse the removal procedures for installation.



6.7 Headlight Panel

Removal

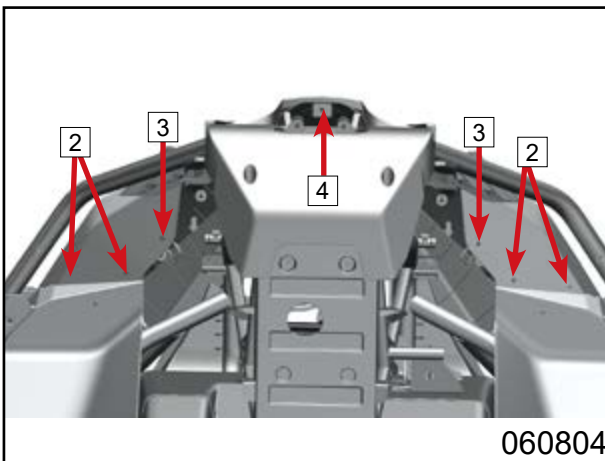
Remove bolts [1].



Remove four expansion screws [2].

Remove two self-tapping screws [3].

Remove bolt [4].

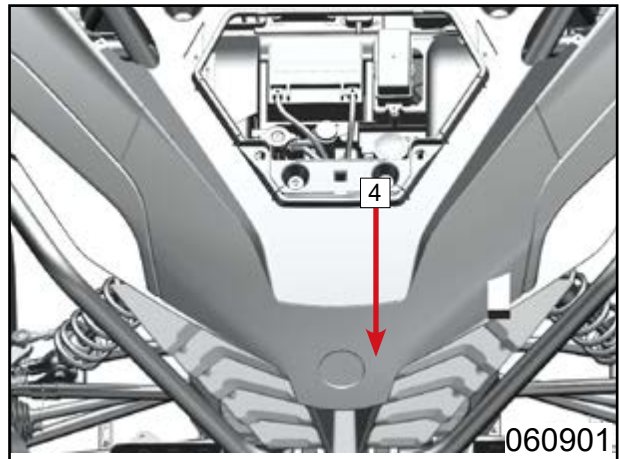


06 Body Covering Parts

Remove headlight panel [4].

Installation

Reverse the removal procedures for installation.



6.8 Cab

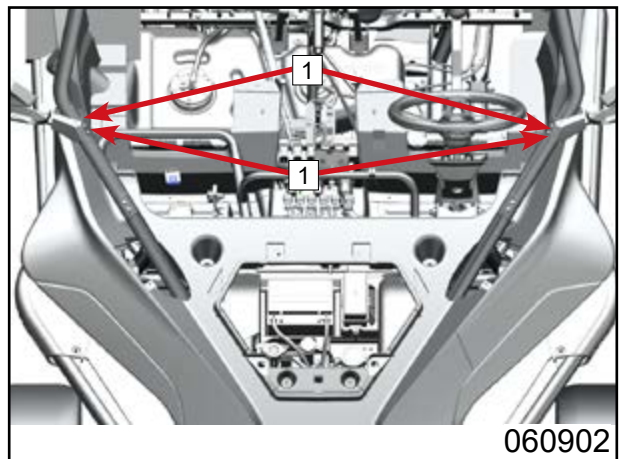
6.8.1 Rear View Mirror

Removal

Remove four bolts [1].
Remove rear view mirrors.

Installation

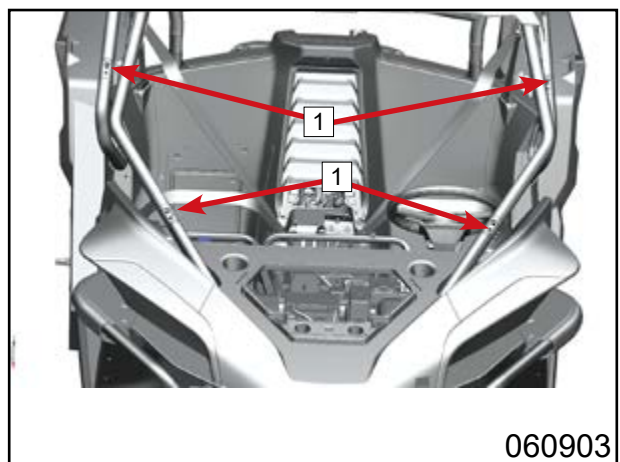
Reverse the removal procedures for installation.



6.8.2 Cab

Removal

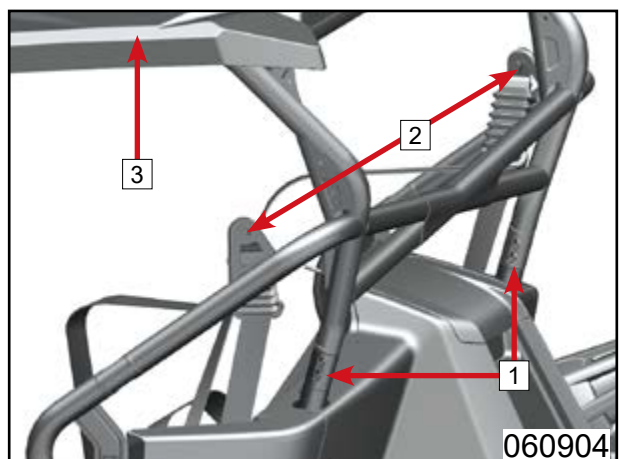
Remove eight bolts [1].



Remove four bolts [1].
Remove seat belt bolts [2].
Remove cab [3].

Installation

Reverse the removal procedures for installation.

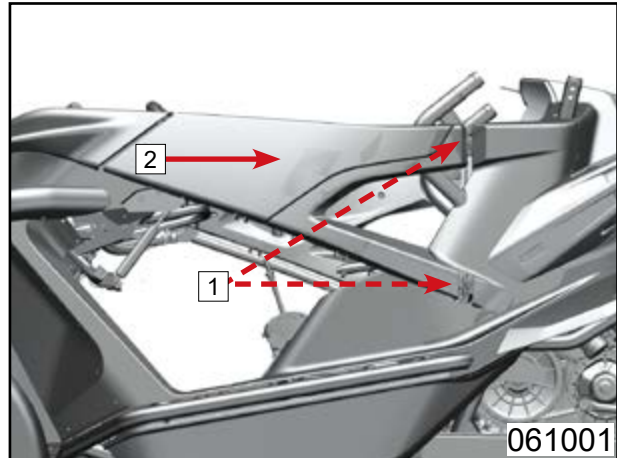


6.9 Side Door (Status 1)

Removal

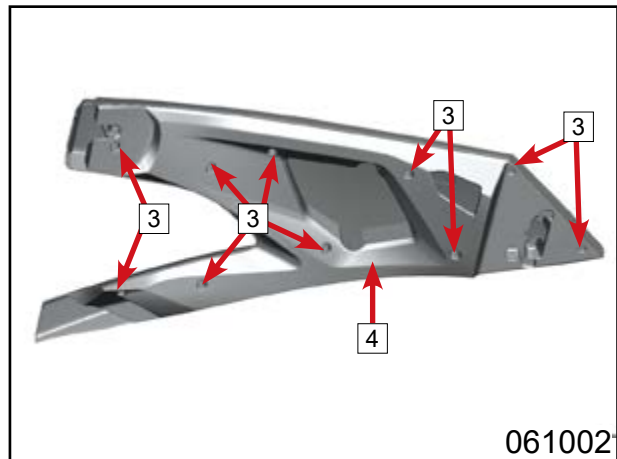
Remove four bolts [1].

Remove side door [2].



Remove ten screws [3].

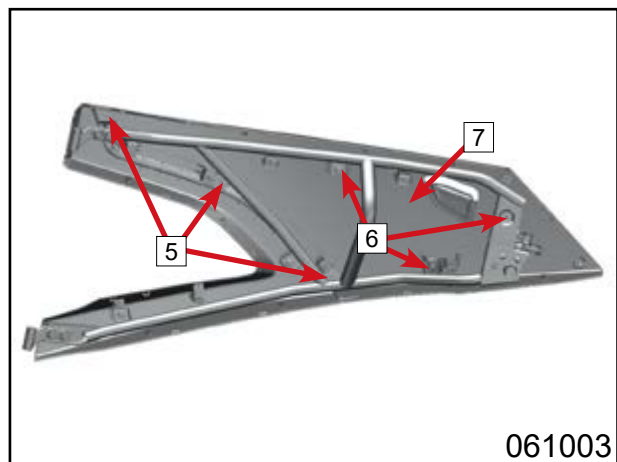
Remove LH upper door inner plate [4].



Remove three self-tapping screws [5].

Remove three screws [6].

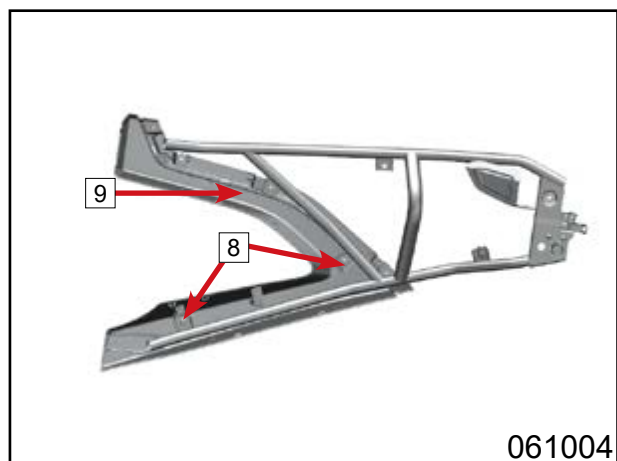
Remove LH upper door deco cover [7].



Remove two bolts [8].

Remove LH side door rear protection plate [9].

RH side door follows the same removal procedures.



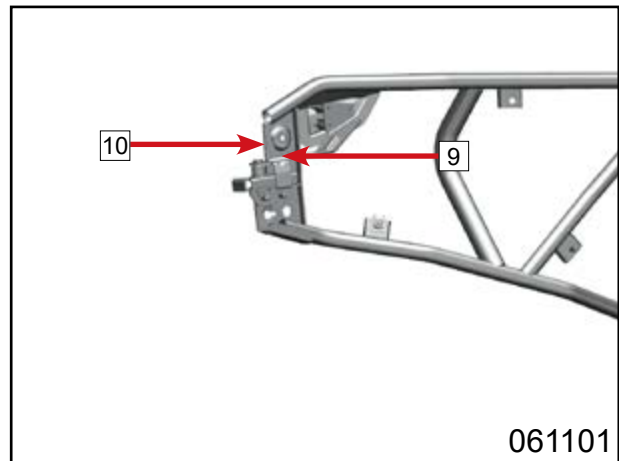
NOTE: If side door lock is rusted or broken, please replace side door lock kit out of safety reason.

06 Body Covering Parts

Remove inner hex screw [9].
Remove side door lock kit [10].

Installation

Reverse the removal procedures for installation.

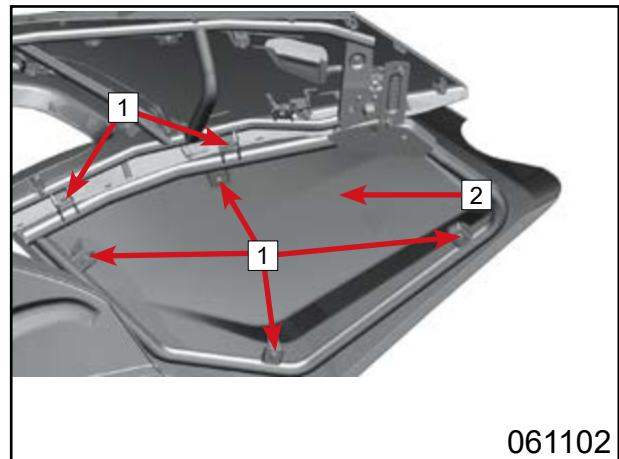


6.10 Side Door (Status 2)

Removal

The removal procedures for LH upper door inner plate, LH upper door deco cover, LH side door rear protection plate and lock kit are the same as status 1.

Remove five bolts [1].
Remove LH lower side door [2].
RH side door follows the same removal procedures.



Installation

Reverse the removal procedures for installation.

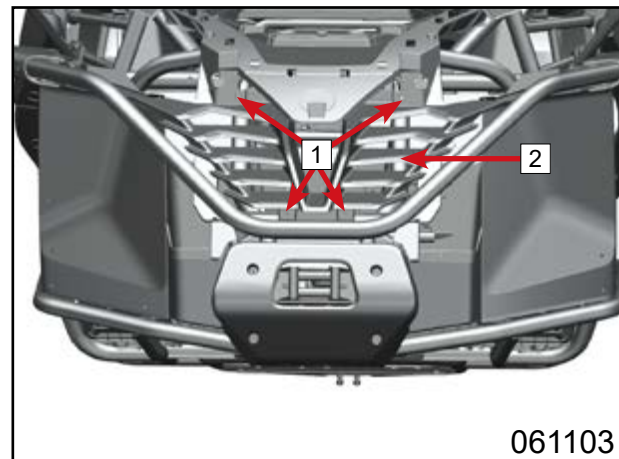
6.11 Ventilation Grid

Removal

Remove four bolts [1].
Remove ventilation grid [2].

Installation

Reverse the removal procedures for installation.



6.12 Winch Deco Cover

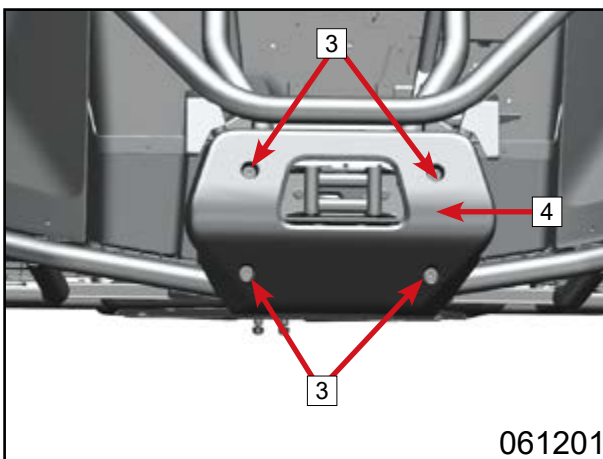
Removal

Remove four bolts [3].

Remove winch deco cover [4].

Installation

Reverse the removal procedures for installation.



6.13 Front Inner Fixed Plate

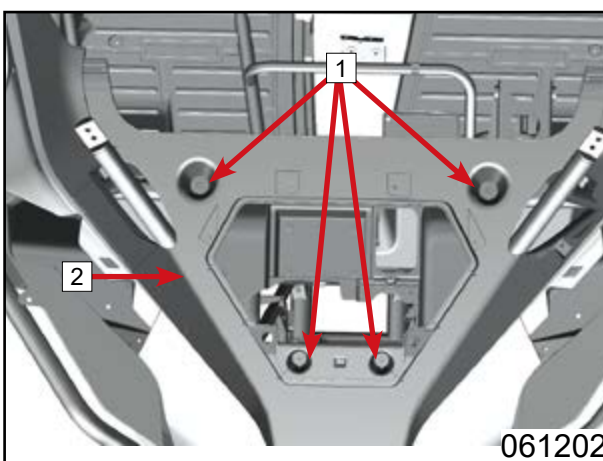
Removal

Remove bolts [1].

Remove front inner fixed plate [2].

Installation

Reverse the removal procedures for installation.



6.14 Battery Box

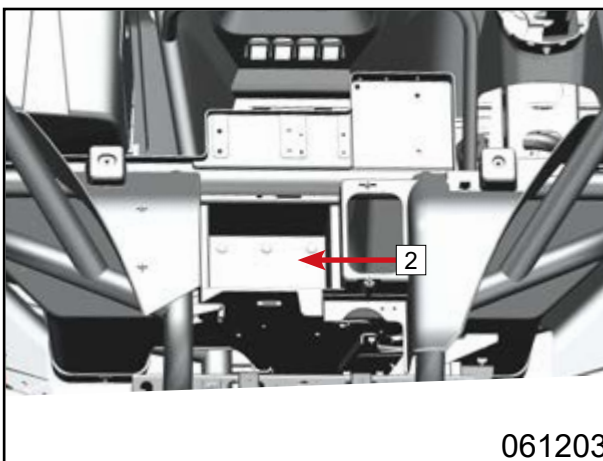
Removal

Unplug all electric parts.

Remove battery box [1].

Installation

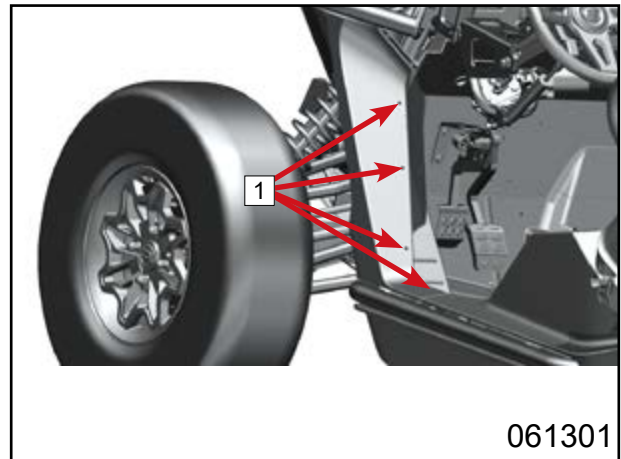
Reverse the removal procedures for installation.



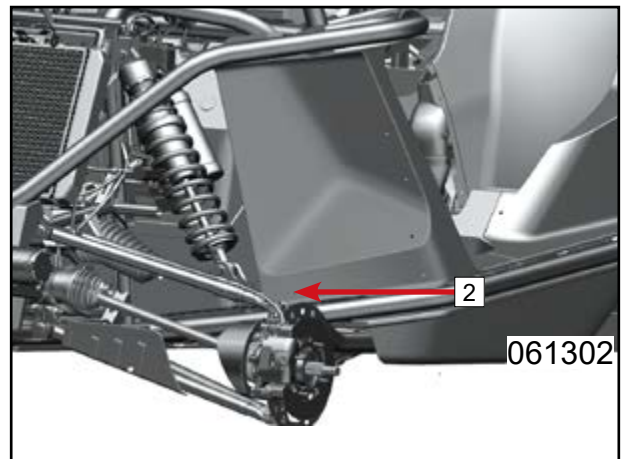
6.15 Front Fender

Removal

Remove four expansion screws [1].



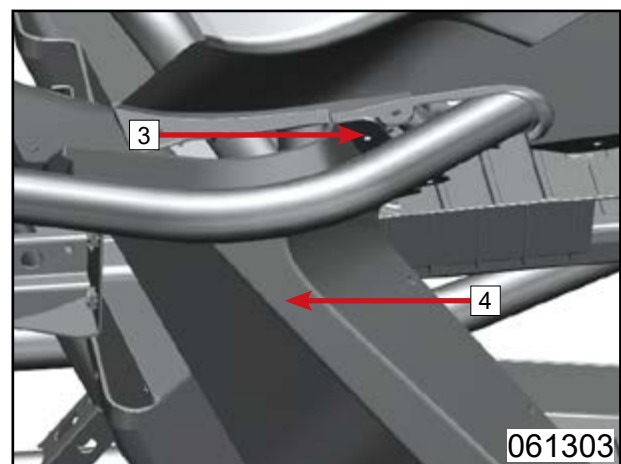
Remove bolt [2].



Remove bolt [3].

Remove LH front fender [4].

RH front fender follows the same removal procedures.

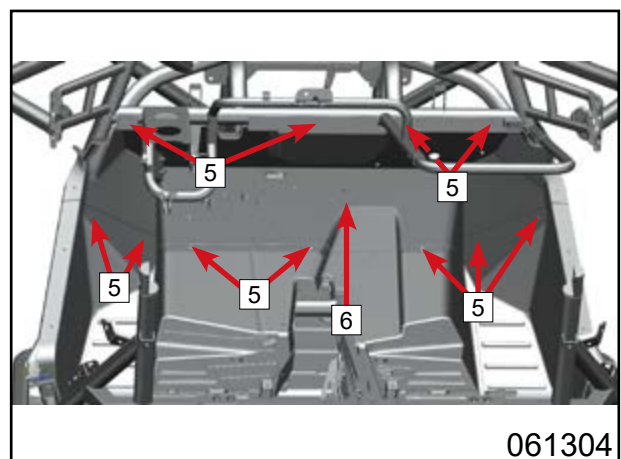


Remove eleven M6 bolts [5].

Remove front fender [6].

Installation

Reverse the removal procedures for installation.



6.16 Rear Fender (Status 1)

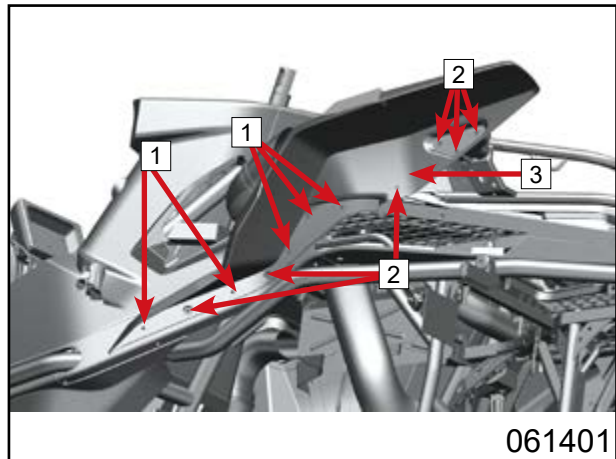
Removal

Remove five expansion screws [1].

Remove six bolts [2].

Remove LH rear fender [3].

RH rear fender follows the same removal procedures.



6.17 Rear Fender (Status 2)

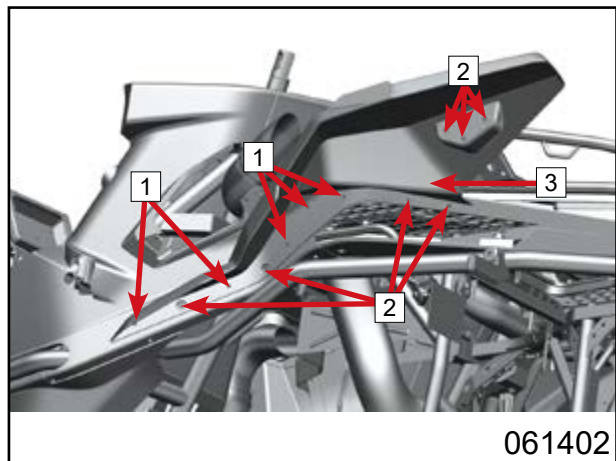
Removal

Remove five expansion screws [1].

Remove seven bolts [2].

Remove LH rear fender [3].

RH rear fender follows the same removal procedures.



6.18 CVT Deco Cover Assy

Removal

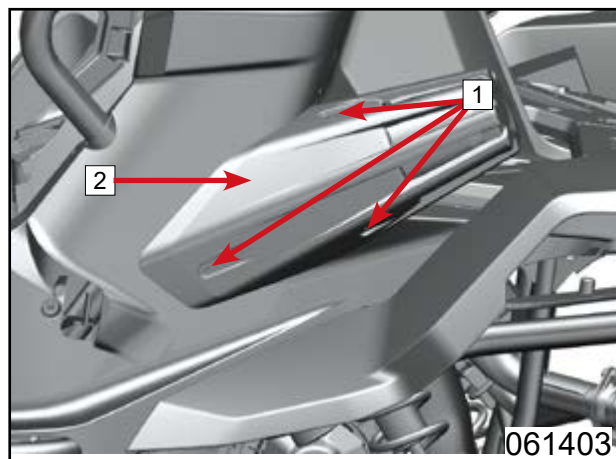
Remove three screws [1].

Remove CVT LH deco cover assy [2].

CVT RH deco cover follows the same removal procedures.

Installation

Reverse the removal procedures for installation.



6.18.1 CVT Inner Deco Cover

Removal

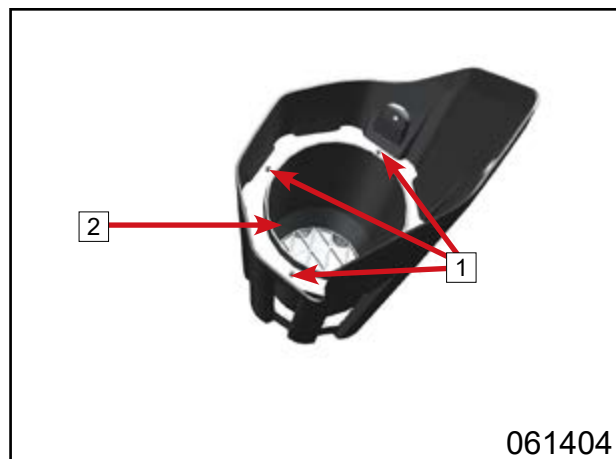
Remove three bolts [1].

Remove CVT LH inner deco cover [2].

CVT RH inner deco cover follows the same removal procedures.

Installation

Reverse the removal procedures for installation.



6.18.2 Rear Rack Cover Plate

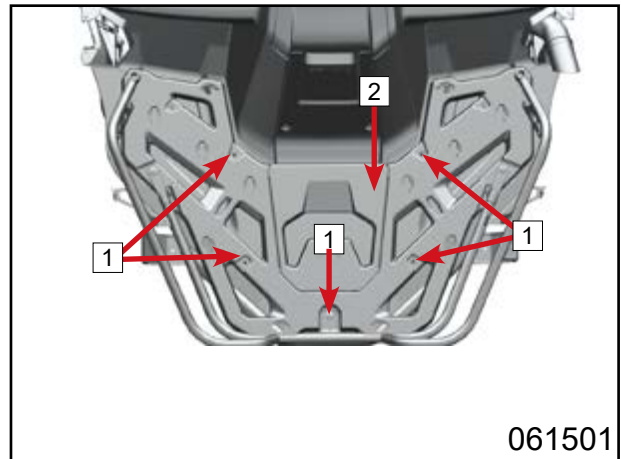
Removal

Remove five bolts [1].

Remove rear rack cover plate [2].

Installation

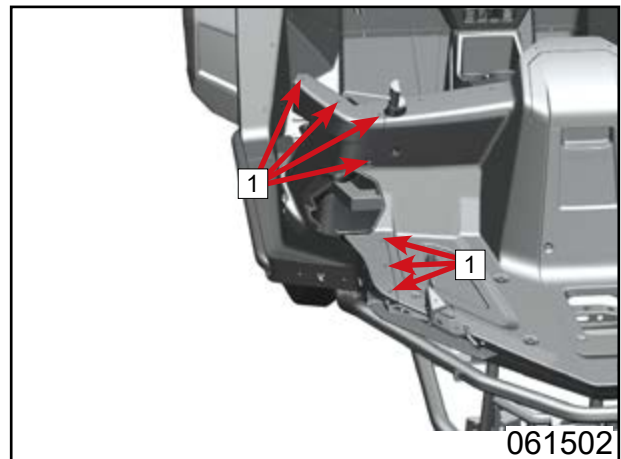
Reverse the removal procedures for installation.



6.19 Rear Side Protection Plate

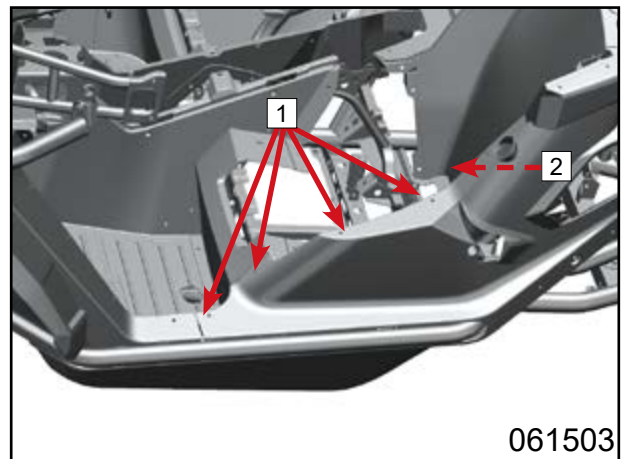
Removal

Remove seven expansion screws.



Remove four expansion screws [1].

Remove bolt [2].



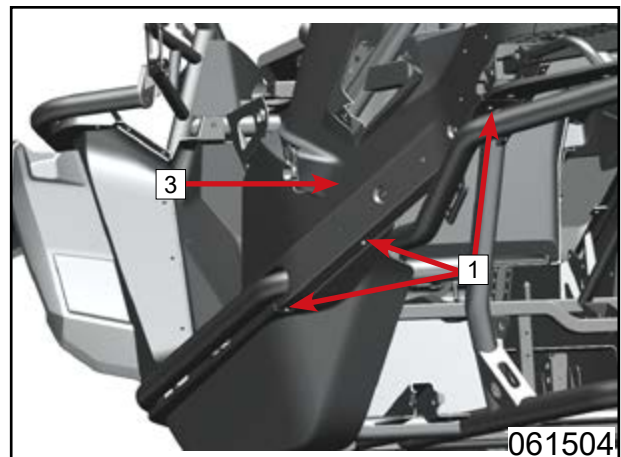
Remove three expansion screws [1].

Remove LH rear side protection plate [3].

RH rear side protection plate follows the same removal procedures.

Installation

Reverse the removal procedures for installation.



6.20 Seat LH Protection Plate

Removal

Remove three expansion screws [1].

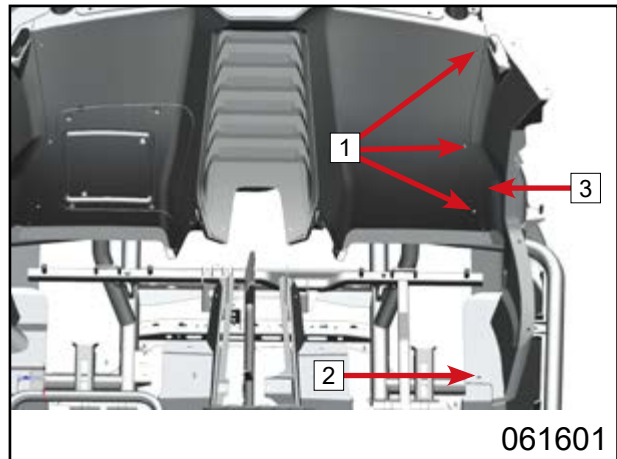
Remove bolt [2].

Remove seat LH protection plate [3].

Seat RH protection plate follows the same removal procedures.

Installation

Reverse the removal procedures for installation.



6.21 Seat Rear Protection Plate

6.21.1 ECU Cover

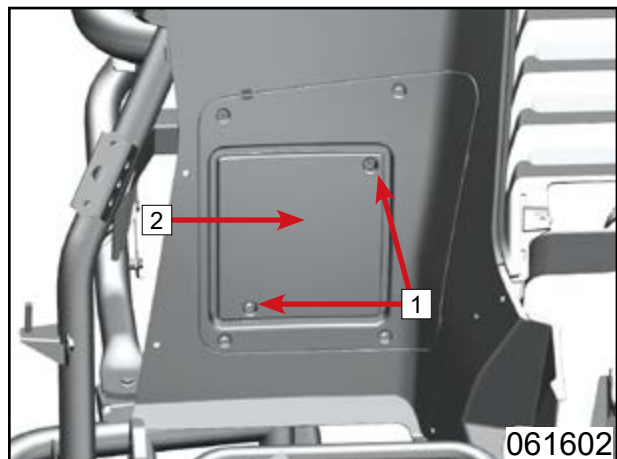
Removal

Remove two bolts [1].

Remove ECU cover [2].

Installation

Reverse the removal procedures for installation.



6.21.2 Seat Rear Service Plate

Removal

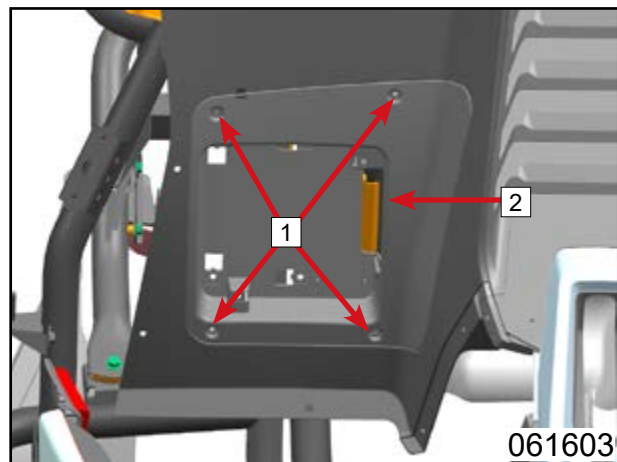
Unplug ECU connectors.

Remove four bolts [1].

Remove seat rear service plate [2].

Installation

Reverse the removal procedures for installation.



6.21.3 Seat Rear Protection Plate

Removal

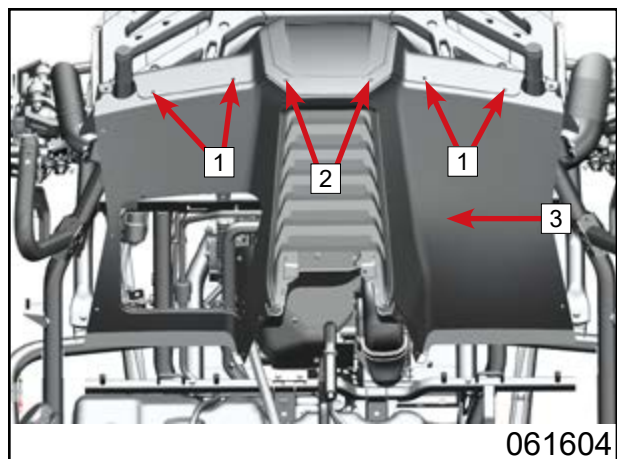
Remove four expansion screws [1].

Remove screws [2].

Remove seat rear protection plate [3].

Installation

Reverse the removal procedures for installation.



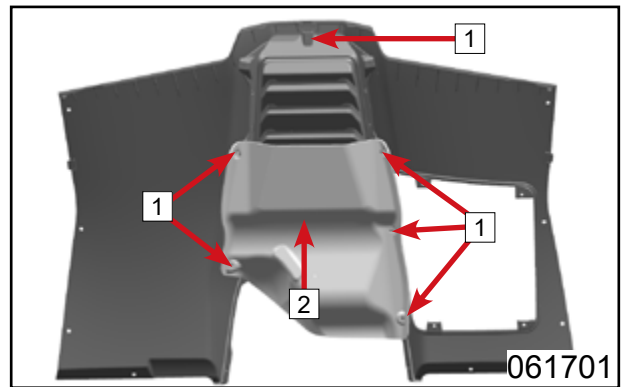
6.21.4 Rear Ventilation Plate

Removal

Remove self-tapping screws [1].
Remove rear ventilation plate [2].

Installation

Reverse the removal procedures for installation.



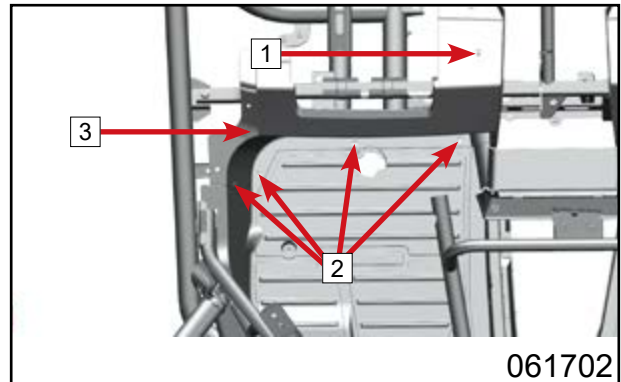
6.22 Seat Front Protection Plate

Removal

Remove bolt [1].
Remove four expansion screws [2].
Remove RH seat front protection plate [3].
LH seat front protection plate follows the same removal procedures.

Installation

Reverse the removal procedures for installation.



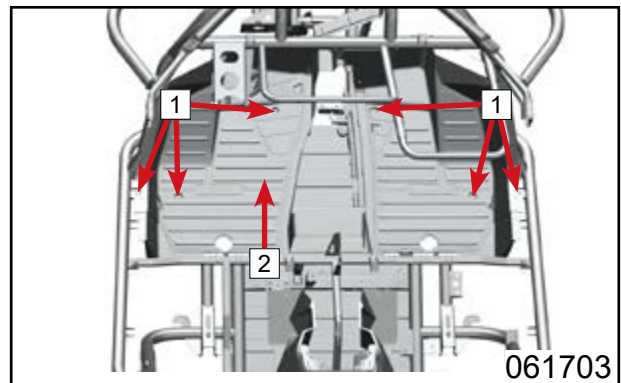
6.23 Foot Pedal

Removal

Remove six bolts [1].
Remove foot pedal [2].

Installation

Reverse the removal procedures for installation.



6.24 Front Side Protection Plate

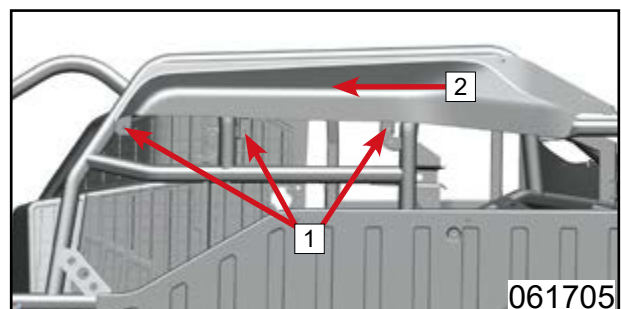
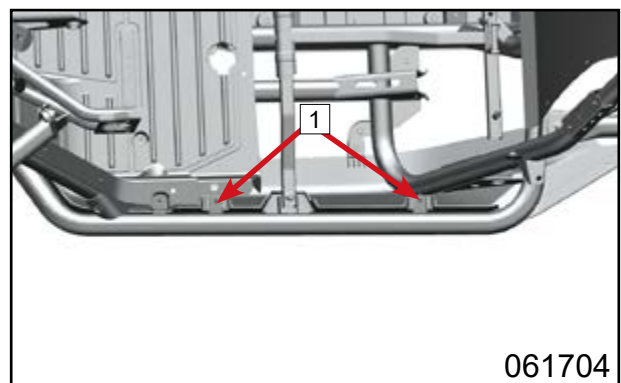
Removal

Remove two bolts [1].

Remove three bolts [1].
Remove LH front side protection plate [2].

Installation

Reverse the removal procedures for installation.



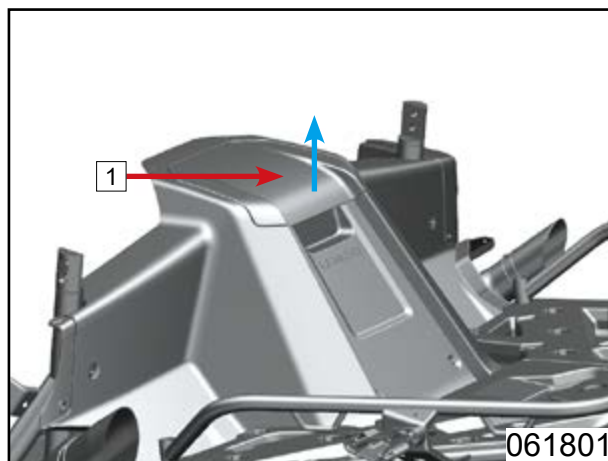
6.25 Air Filter Cover

Removal

Lift and remove the air filter cover [1] in the direction of the arrow shown in the picture.

Installation

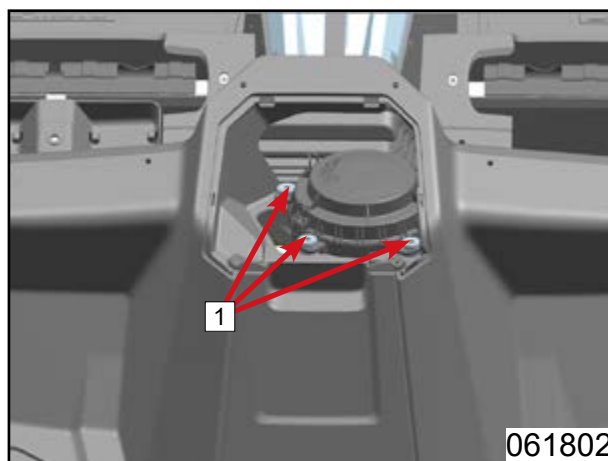
Reverse the removal procedures for installation.



6.26 Rear Cargo Box Base Plate

Removal

Remove three bolts [1].

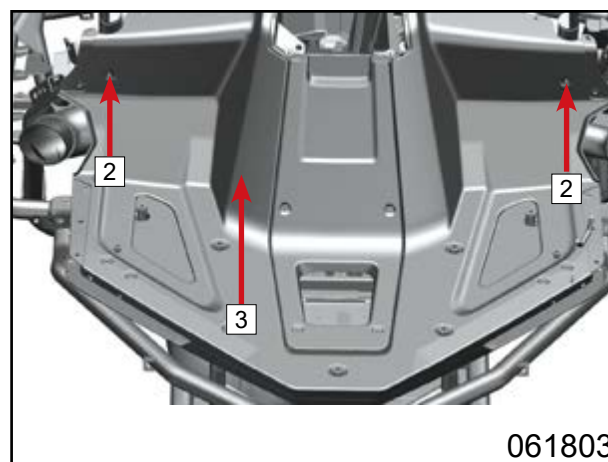


Remove two screws [2].

Remove rear cargo box base plate [3].

Installation

Reverse the removal procedures for installation.

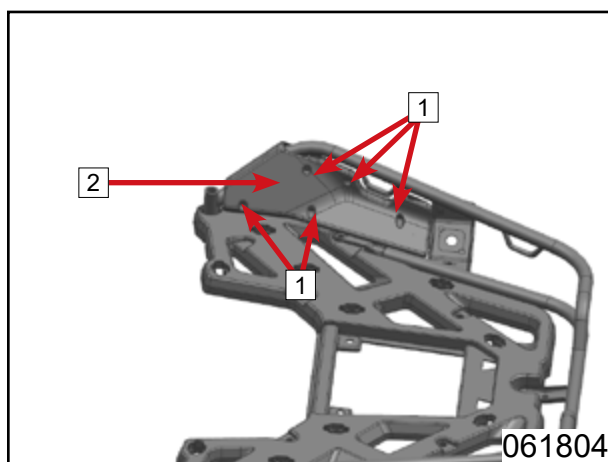


6.26.1 Rear Cargo Box Deco Cover

Removal

Remove five self-tapping screws [1].

Remove rear cargo box inner deco cover [2].



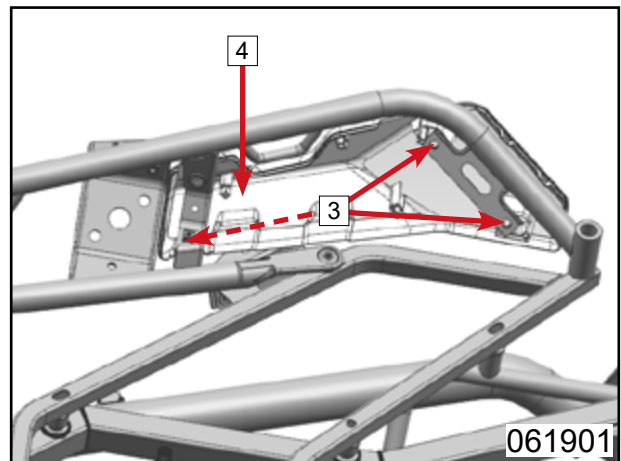
06 Body Covering Parts

Remove three bolts [3].

Remove rear rack outer deco cover [4].

Installation

Reverse the removal procedures for installation.



6.27 Rear Rack Assy

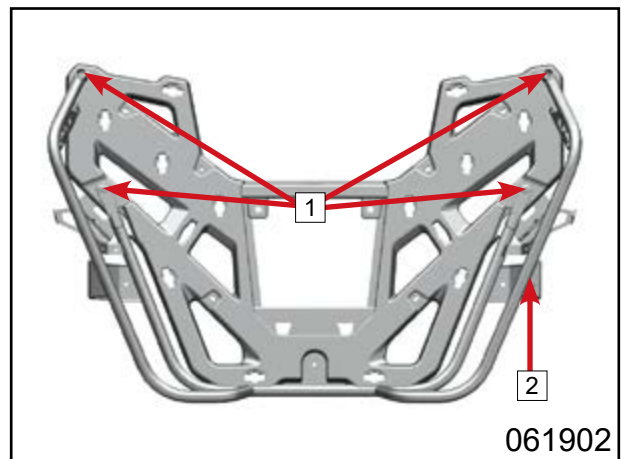
Removal

Remove four bolts [1].

Remove rear rack assy [2].

Installation

Reverse the removal procedures for installation.



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7.1 CV Drive Shaft

Removal

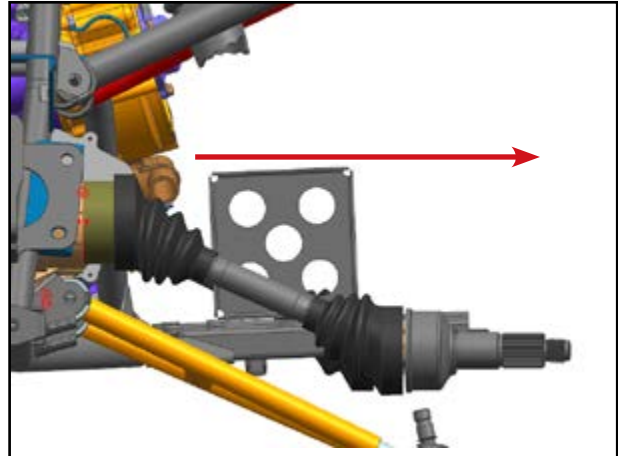
Remove wheels.

Remove shock absorbers.

Remove LH&RH steering knuckles (refer to Chapter 09).

Pull out CV drive shaft in the horizontal direction.

Other CV drive shafts apply the same removal procedures.



7.2 CV Drive Shaft Service

7.2.1 CV Drive Shaft Inspection

1. Both sides of CV drive shafts should rotate freely. Disassemble to inspect or replace with new parts if any defect, like being stuck, discrete rotation or noise, is found.
2. Inspect the clearance between fixed end dust boot universal shaft and middle spline. Replace with new parts if the clearance is larger than 1°30'.
3. Inspect dust boots on both sides for damage or leakage. Replace if necessary.
4. Inspect shaft spline and limit circlip for abnormal wear or damage. Replace if any defect is found.

After inspection, if there is problems with the shaft while no defect is found, please refer to step 5. If the shaft is in good condition, it is not necessary to do step 5 inspection.

5. Inspect shaft cage retainer, planet sleeve, steel balls, steel ball track and middle shaft spline. Replace if any defect is found.
6. Inspect shaft other parts for damage. Replace if necessary.

7.2.1.1 Shaft Cage Dust Boot

Removal

Remove clamps [1].

Pull dust boots [2] towards middle shaft [3].

Remove circlip [4].

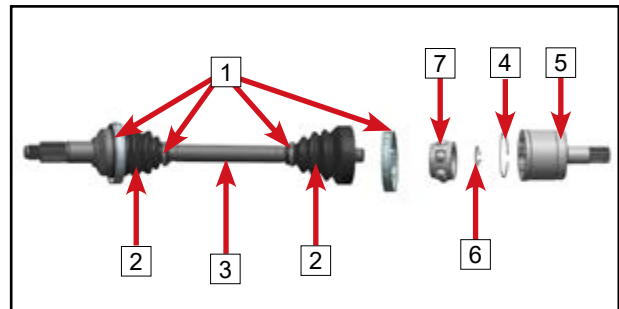
Remove housing [5].

Remove circlip [6].

Remove universal shaft assy [7].

Remove dust boots [2].

Replace with new dust boots during installation.



Installation

Reverse the removal procedures for installation.

NOTE:

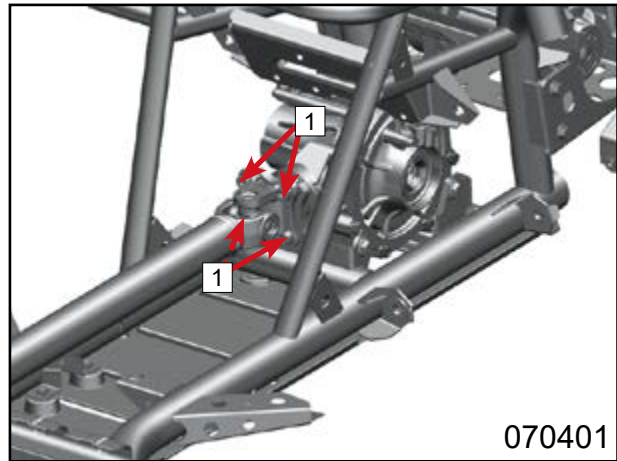
Front gear case: Inject MoS2 lithium grease on universal joint during drive shaft installation.

Fill 45g±5g grease in fixed end cage universal joint, 50g±5g grease in fixed end seal enclosure, 65g±10g grease in front axial movement cage universal joint, 110g±10g grease in rear axial movement cage universal joint.

7.3 Drive Shaft

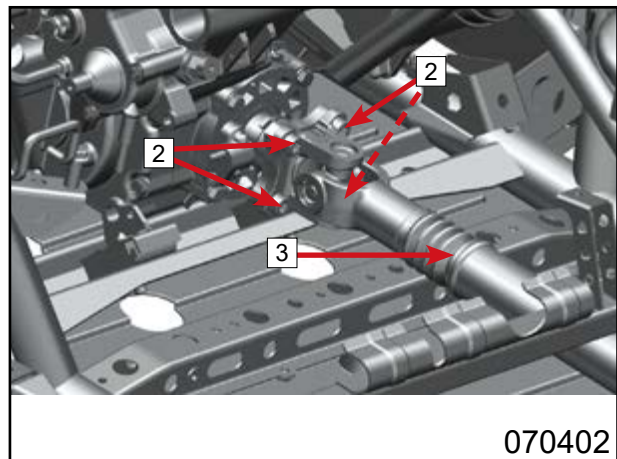
7.3.1 Front Drive Shaft Removal

Remove bolts [1] on front gear case.



Remove bolts [2] on engine.

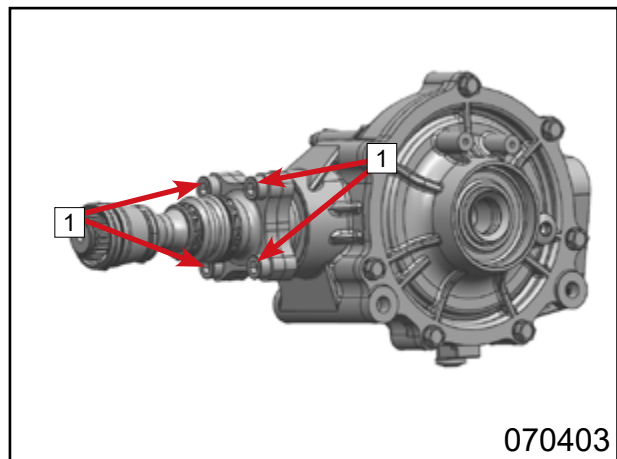
Remove front drive shaft [3].



7.3.2 Rear Drive Shaft Removal

Remove rear gear case assy (refer to Rear Gear Case Disassembly section).

Remove four bolts [1] on rear gear case.



7.3.3 Drive Shaft Maintenance

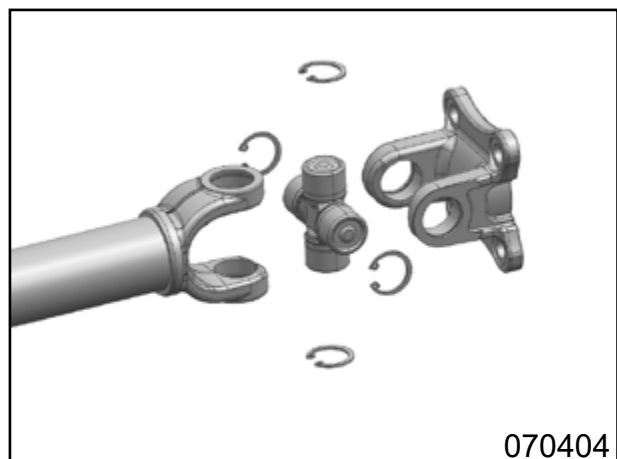
7.3.3.1 Drive Shaft Inspection

Front Drive Shaft Inspection

NOTE: Disassemble to replace with new parts if the clearance is too big, or universal joints are severely worn. Otherwise, it is not necessary to disassemble.

1. Inspect front drive shaft universal joints for damage. Replace if necessary.

2. Inspect front drive shaft middle spline for damage. Replace if necessary.



Rear Drive Shaft Inspection

1. Inspect rear drive shaft dust boots for damage. Replace if necessary.
2. Inspect rear drive shaft middle spline for damage or abnormal wear. Replace if necessary.

NOTE: Inject 15g~18g grease into both spline joints.

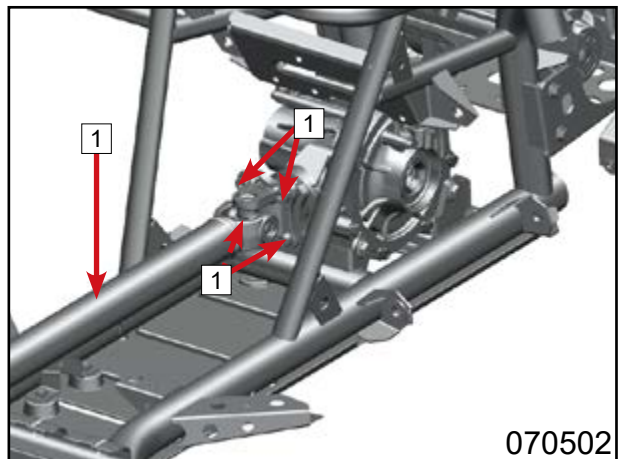


7.3.4 Drive Shaft Installation

7.3.4.1 Front Drive Shaft Installation

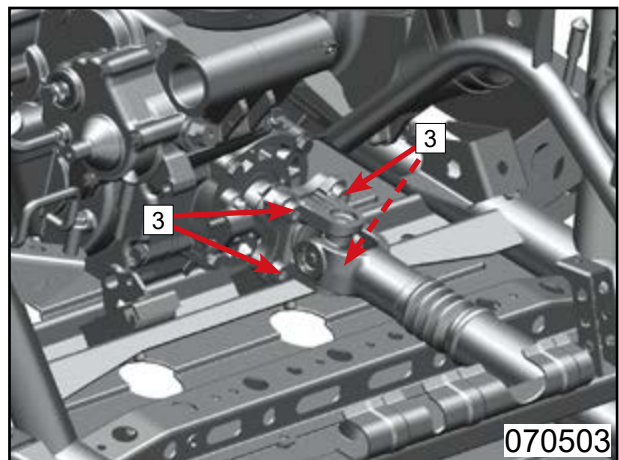
Install drive shaft **1**.

Install bolts **2** on engine side (just with some threads, not necessary to tighten them).



Install bolts **3** on front gear case side and tighten them.

NOTE: Pre-tighten the bolts first, then tighten the bolts in criss-cross way during installation.



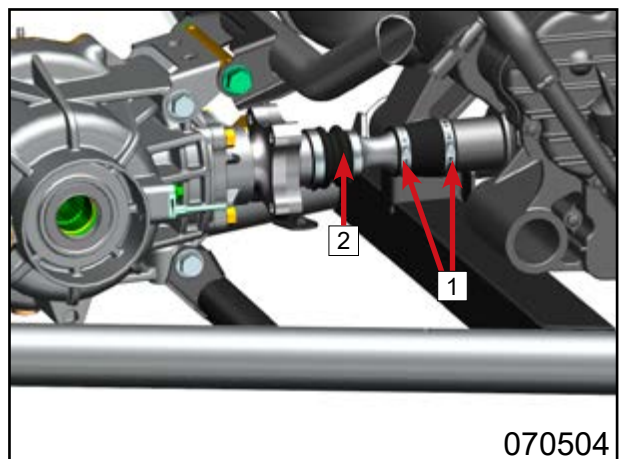
7.3.4.2 Rear Drive Shaft Installation

Install rear gear case assy (refer to 07 chapter).

Install clamps **1**.

NOTE: Inject 15g~18g grease into both spline joints.

NOTE: Replace with new boots if any defect, like cracks or damage, is found.



7.4 Front and Rear Gear Case

7.4.1 Maintenance Information

Lubrication Schedule				
Item	Specification	Capacity	Interval	
Front gear case	SAE80W/90 GL-5	0.33L	Break-in	Periodic
Rear gear case		0.40L	200miles (320km)	3000miles (4800km)

7.4.2 Inspection and Maintenance

If trouble below is found, there may be something wrong with front or rear gear case. Please maintain the vehicle.

Trouble	Reason
1. Vehicle running unstable during acceleration, deceleration or normal running.	A. Bearing damaged
2. Front or rear gear case noise.	B. Gear clearance too large or too small
3. Engine power cannot be transmitted to wheels.	C. Gear severe wear
	D. Gear teeth loose
	E. Drive shaft damaged
	F. Less or more lubricant
	G. Foreigns in gear cases

NOTE: It is hard to find out the reason 1, 2 and 3. Analyze the trouble to exclude engine fault. Then disassemble the gear case for inspection.

Inspection and Analysis

1. Do not miss any strange noise:
 - a. If the vehicle has noise during acceleration and deceleration. It may be the wheel bearing damaged.
 - b. If the vehicle keeps making noise during acceleration and deceleration. It may be the improper gear clearance.

⚠ CAUTION: Improper gear clearance may cause the gear wear or gear teeth broken.

- c. If the vehicle comes out noise at low speed, which may not be detected at high speed, maybe the gear teeth is broken.

WARNING: If any fault above is found during when running the vehicle, stop the bike to check and solve the trouble. Otherwise, it may cause accident.

2. Inspect the lubrication. Check lubrication consumption is at normal range or not. And check the metal content in lubricating oil.
3. Inspect the lubricating oil leakage.
 - a. Inspect the oil dirt around front and rear case gear.
 - b. Inspect the oil dirt on the floor.
 - c. Inspect the oil splash dirt.

Determine if it is the seal leaking or case leaking. Replace the damaged parts.

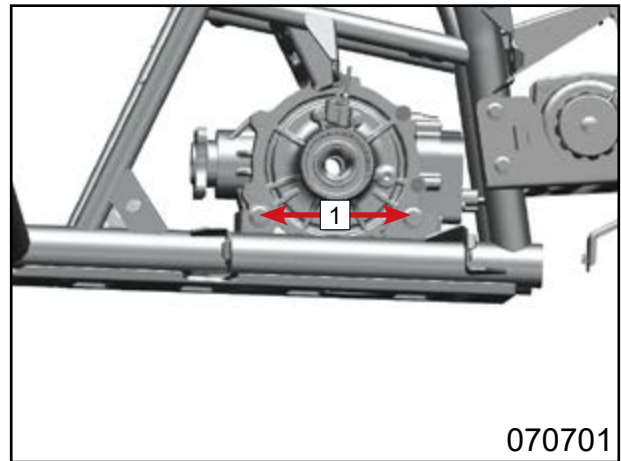
7.4.3 Front Gear Case

Removal

⚠ DANGER: Before inspection, make sure the operation is made on flat ground and the vehicle is jacked up. Do not put any limbs under the vehicle, in case of injury caused by sudden fall during inspection.

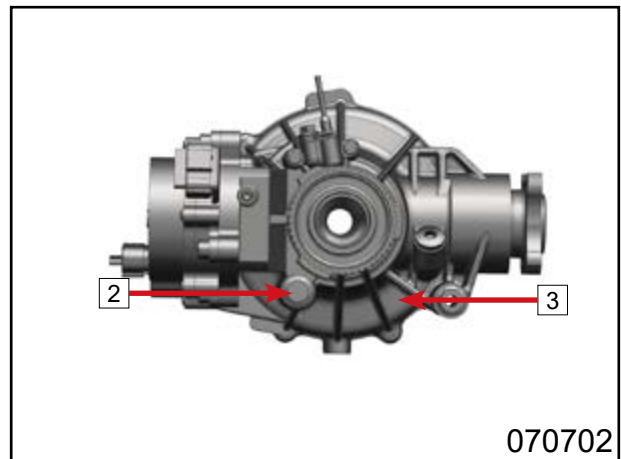
Unplug connectors.

Remove two bolts [1].



Remove bolt [2].

Remove front gear case [3].



7.4.4 Front Gear Case Disassembly

7.4.4.1 Front Gear Case Motor

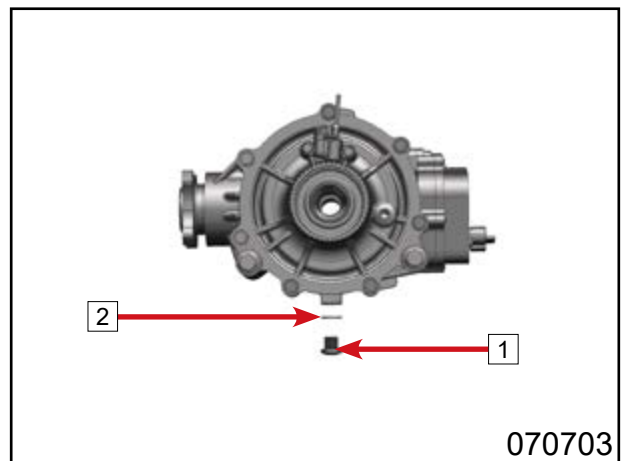
Removal

Place a pan under front gear case.

Remove oil drain bolt [1].

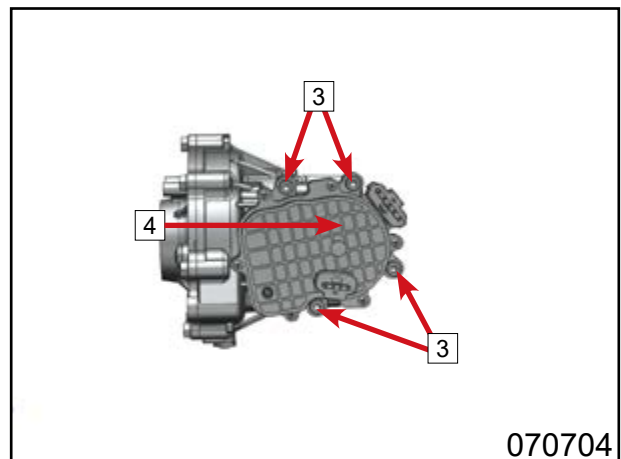
Remove washer [2].

Drain the oil.



Remove four bolts [3].

Remove front gear case motor [4].



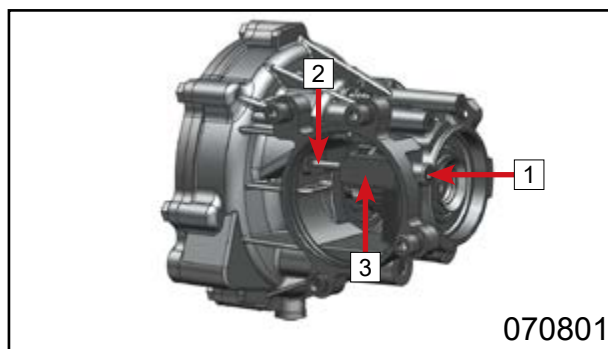
7.4.5 Fork

Removal

Remove inner hex screws [1].

Remove pin shaft [2].

Remove fork [3].

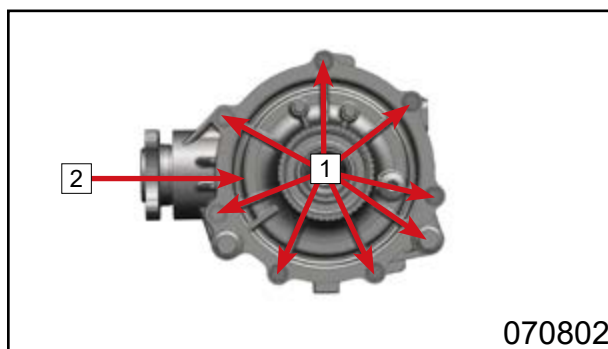


7.4.6 Front Gear Case Cover

Removal

Remove eight M8 bolts [1].

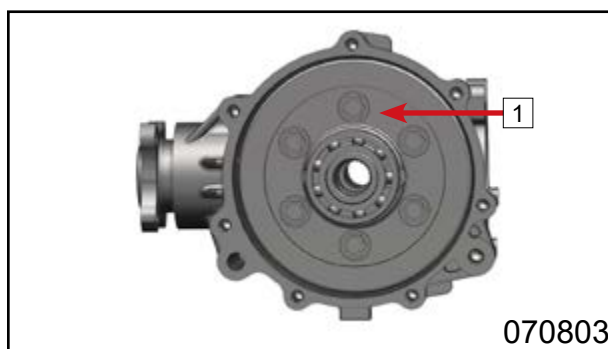
Remove front gear case cover [2].



7.4.7 Differential Assy

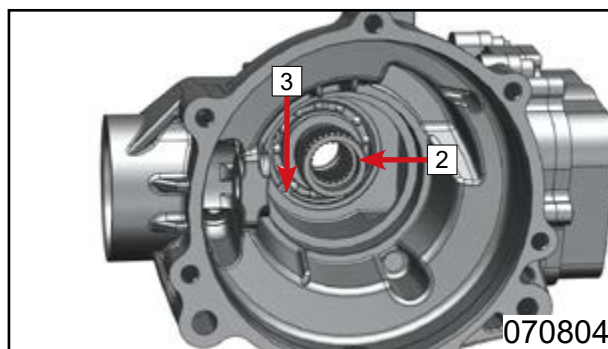
Removal

Remove differential assy [1].

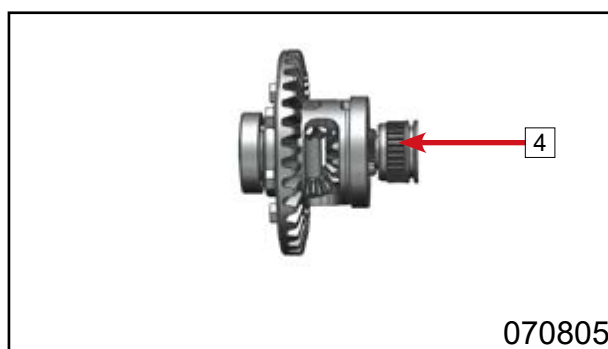


Remove spline sleeve [2].

Remove circlip [3].



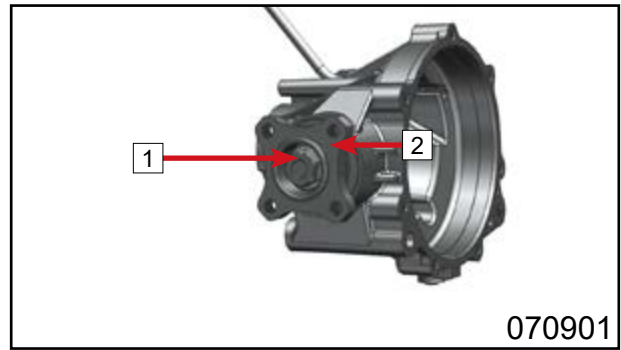
Remove spline bushing [4].



7.4.8 Front Gear Case Input Shaft Removal

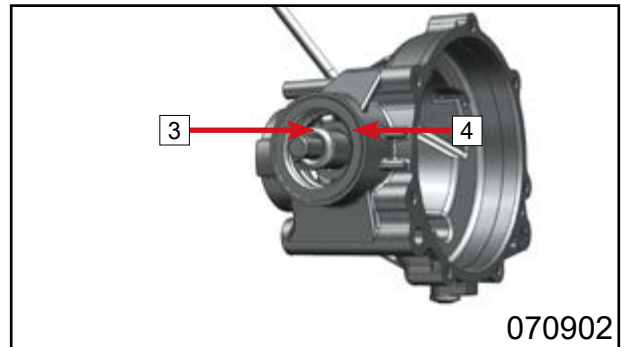
Remove input shaft nut [1].

Remove input coupler [2].

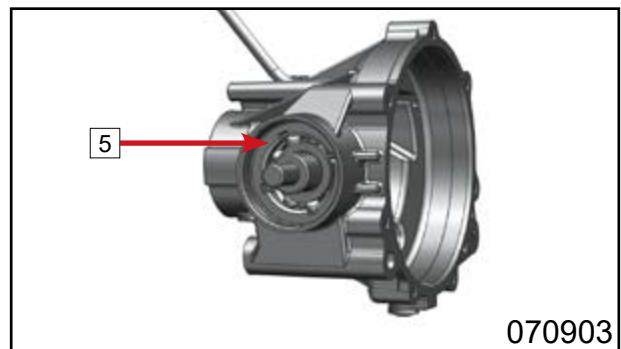


Remove seal ring [3].

Remove oil seal [4].

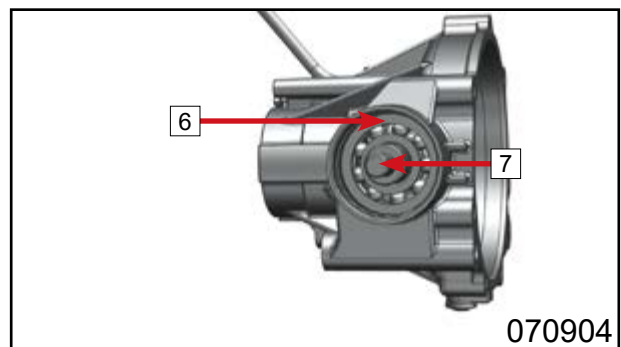


Remove limit retainer [5] with special tool: bearing retainer locking tool.



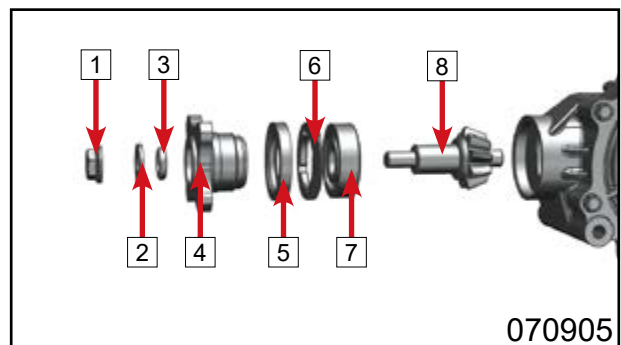
Remove bearing [6].

Remove drive bevel gear [7].



Front gear case input shaft exploded view

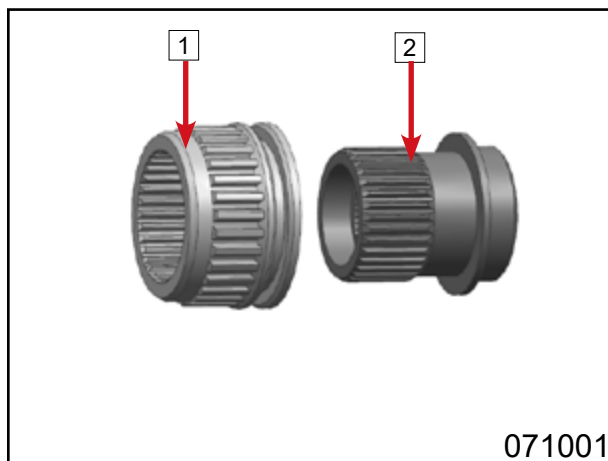
1	Input shaft nut M14	6	Limit retainer
2	Washer, front gear case nut	7	Bearing
3	O-seal ring	8	Drive bevel gear
4	Input coupler		
5	Oil seal		



7.4.9 Parts Inspection

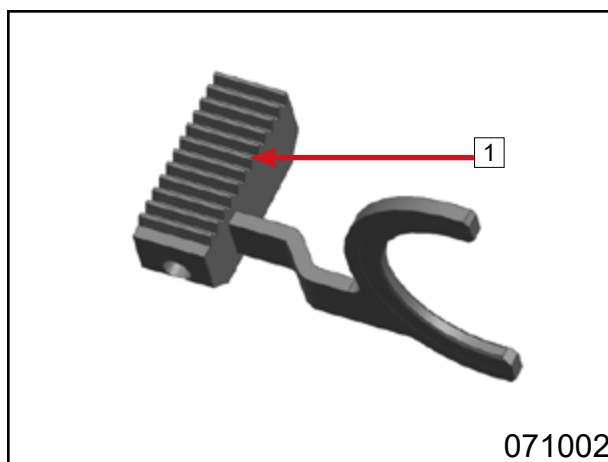
Spline Bushing Assy Inspection

Inspect spline bushing [1] and bushing [2] for break, damage, severe wear or teeth deletion. Replace if any defect is found.



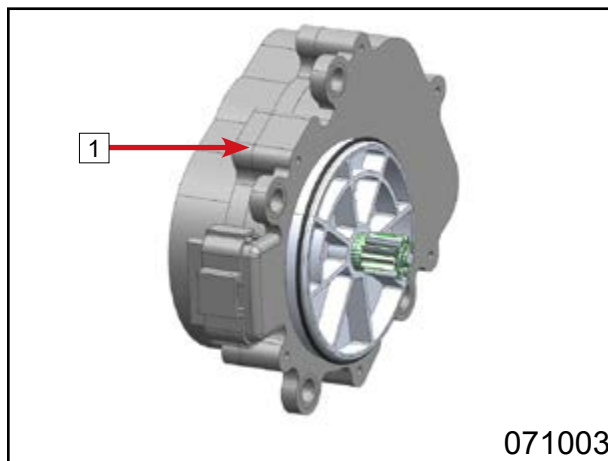
Rack Assy Inspection

Inspect rack assy [1] for break, damage, severe wear or teeth deletion. Replace if any defect is found.



Front Gear Case Motor Inspection

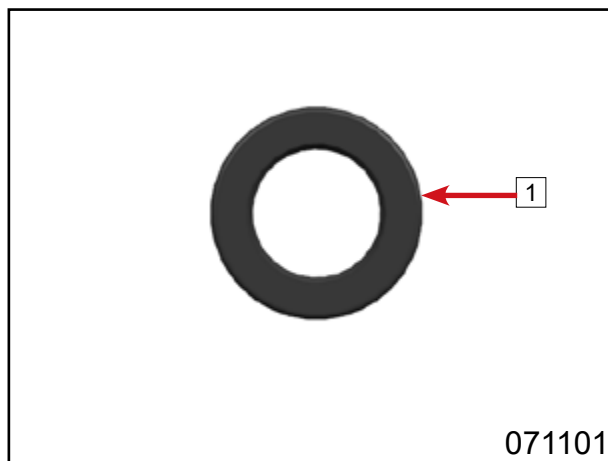
Remove front gear case motor [1]. Connect with power and turn on motor switch to check if it works. Replace with new parts if it doesn't.



Oil Seal Inspection

Remove all oil seals **1**. The removed oil seals are sorted as waste.

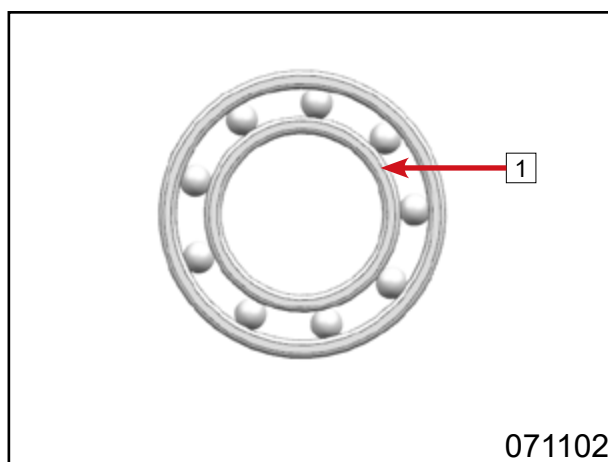
Inspect oil seals **1** lips and contact surfaces. Replace with new parts if any defect is found.



Bearing Inspection

Inspect if every bearing **1** clearance is appropriate, rotation is smooth, raceway, steel balls, needle roller and retainer are in good condition. Replace if any defect is found.

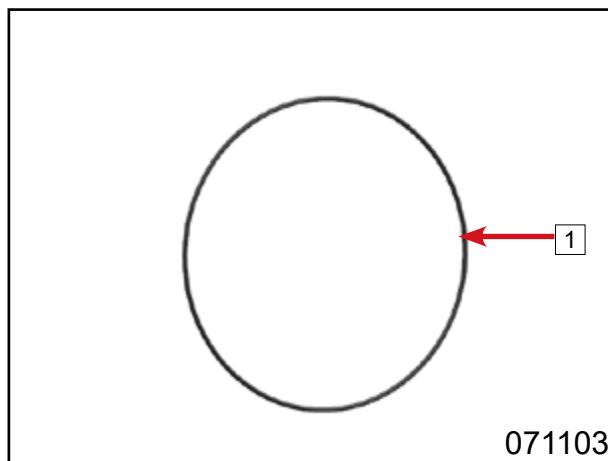
~~Use special tool: bearing puller to remove bearing during replacement.~~



O-seal Ring Inspection

Inspect every o-seal ring **1** if deformed, broken or damaged. Replace with new parts if any defect is found.

NOTE: Before installation, clean the gear case, gears and washers with kerosene or gasoline. The o-ring can't be cleaned by kerosene or gasoline. After cleaning, wipe with air-laid paper to make sure every part is clean before assembly.



7.4.9.1 Installation

Installation

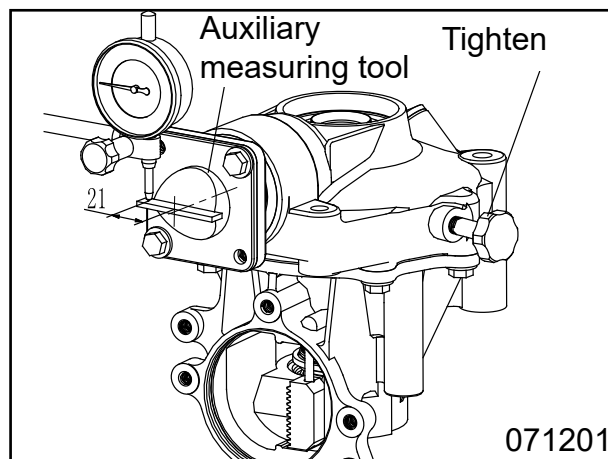
Reverse the removal procedures for installation.

Follow the drawing on the right to adjusting gear side clearance: Install auxiliary measuring tool and tighten the bolt (M14×1.25×60). Set the dial gauge. Make sure the gauge testing point is 21mm to the center. Turn the measuring tool to read the data.

Dial gauge data standard: 0.17~0.34

Adjusting washer thickness	0.1	0.3	0.5	0.9	0.92	0.94	0.96	0.98	1.00
----------------------------	-----	-----	-----	-----	------	------	------	------	------

NOTE: Measure until the adjustment is done. If the data is beyond the standard, repeat above procedures to make adjustments.



Tooth Contact

After backlash adjustment is carried out, the tooth contact must be checked. Pay attention to the following procedures:

Remove ring gear from crankcase.

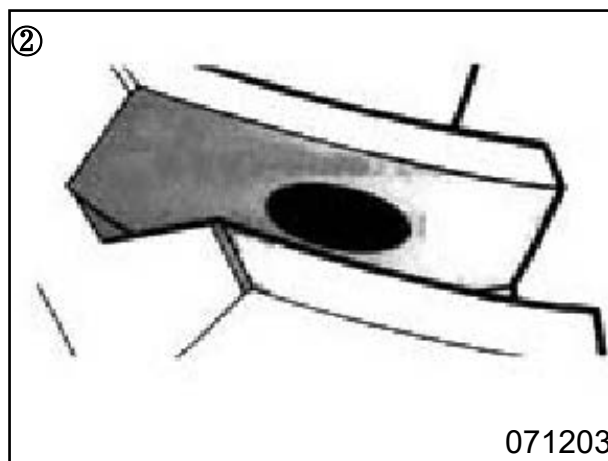
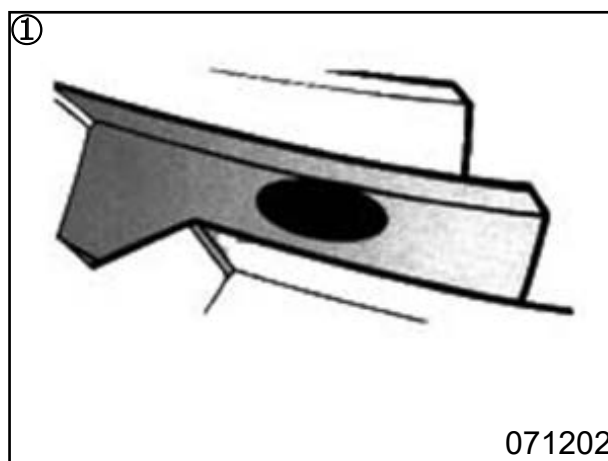
Clean and degrease drive pinion gear and ring gear teeth.

Apply a coating of machinist's layout dye or paste to several teeth of the driven gear.

Install ring gear.

Rotate the ring gear several turns in both directions. Remove drive pinion gear and ring gear, then inspect the coated teeth of the drive pinion gear. The teeth contact pattern should be as shown below.

Pattern 1	Contact at tooth top	Incorrect
Pattern 2	Contact at tooth middle	Correct
Pattern 3	Contact at tooth root	Incorrect



If gear tooth contact is found to be correct (pattern 2), continue the next step.
If gear tooth contact is found to be incorrect (pattern 1 and 3), the shim thickness between the drive pinion gear and ring gear must be changed and the tooth contact re-checked until correct.

Note: Clean the dye coated on the gear teeth after the tooth contact adjustment is finished.

Adjustment Steps

Tooth contact	Shim adjustment
Tooth contact pattern 1	Reduce shim thickness
Tooth contact pattern 3	Increase shim thickness

⚠ WARNING: Make sure to check the backlash after the tooth contact has been adjusted, since it may have changed. Adjust the tooth contact and backlash until they are both within specification. If the correct tooth contact cannot be maintained when adjusting the backlash, replace the drive gear and ring gear.

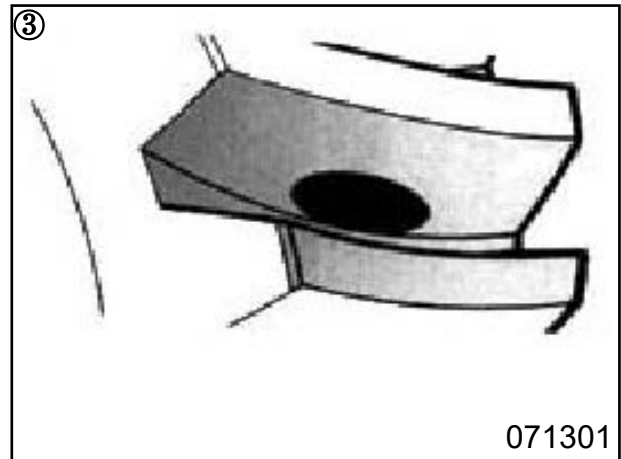
Drive Bevel Gear Assy Installation

- Install drive bevel gear [1].
- Install bearing [2].
- Install limit retainer [3].
- Install oil seal [4].
- Install input coupler [5].
- Install o-seal ring [6].
- Install nut washer [7].
- Install M14 input shaft nut [8].

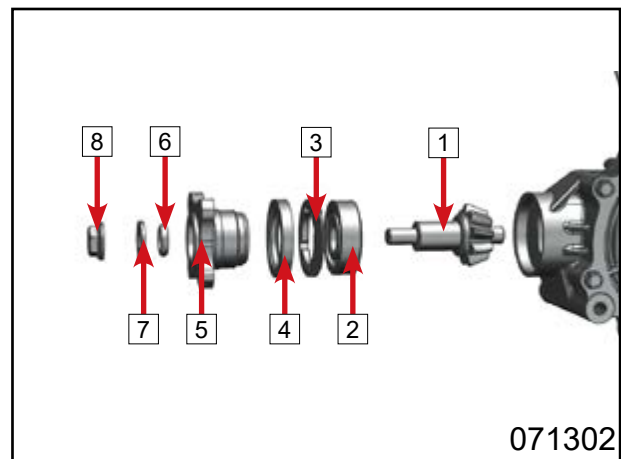
Tighten torque: 60~65N•m.

NOTE A: Before motor installation, set the motor to 2WD mode with special device or vehicle control circuit.

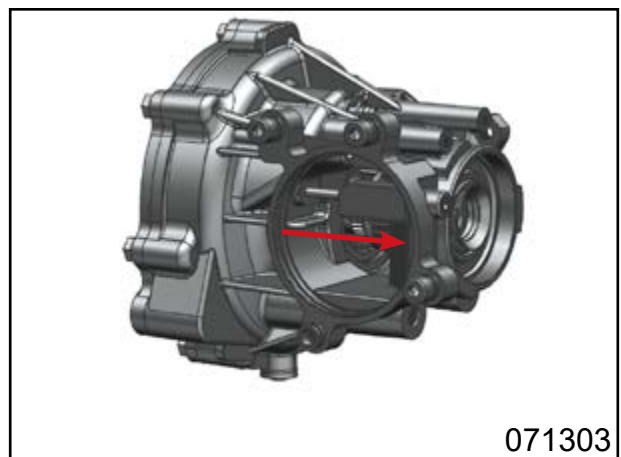
NOTE B: During installation, rack assy and spline bushing should be closed like what picture shows.



071301



071302



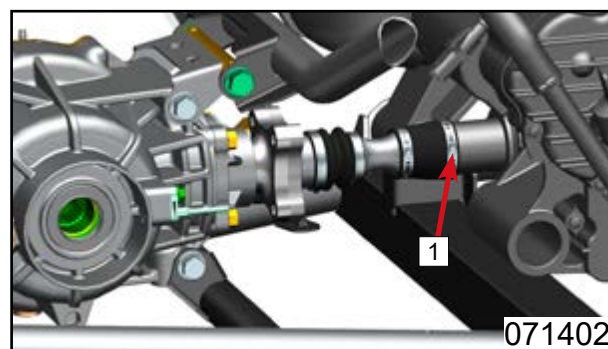
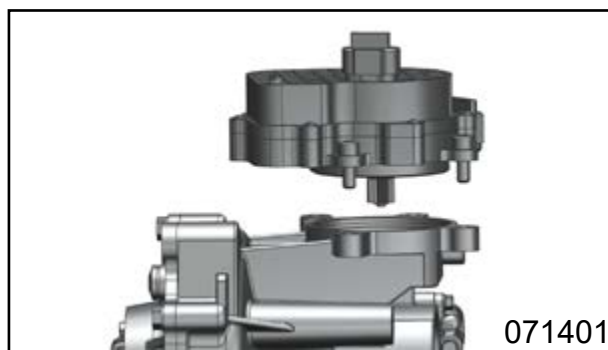
071303

NOTE: In the premise of NOTE A and B, install the motor with screws doweled during installation.

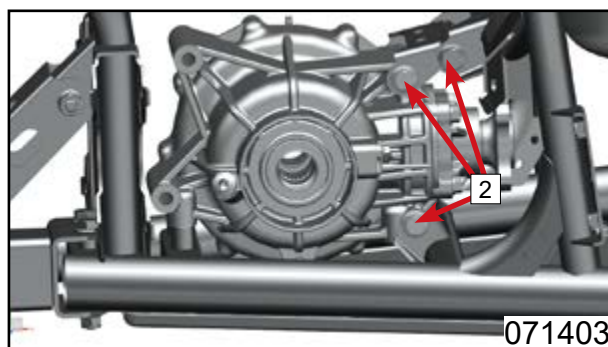
7.5 Rear Gear Case (Version 1)

Removal

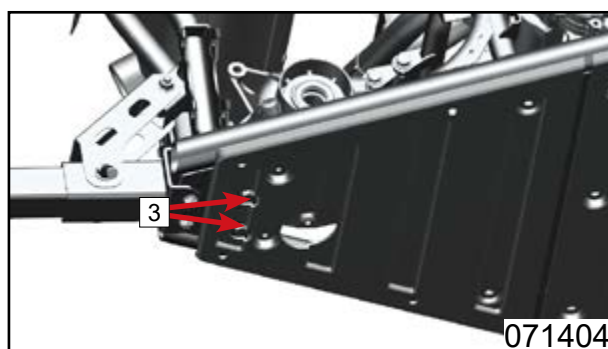
Loosen clamp [1].



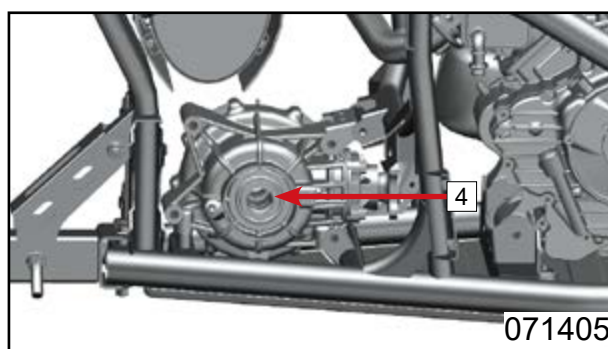
Remove three bolts [2].



Remove two bolts [3].



Remove rear gear case assy [4].



7.6 Rear Gear Case Disassembly (Version 1)

7.6.1 Rear Gear Case Cover

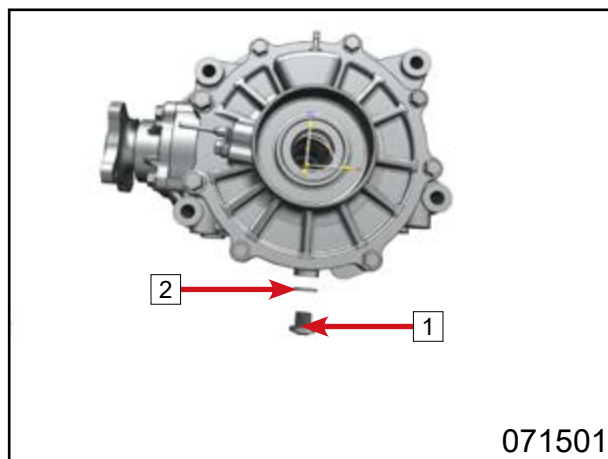
Removal

Put a pan under rear gear case.

Remove oil drain bolt [1].

Remove washer [2].

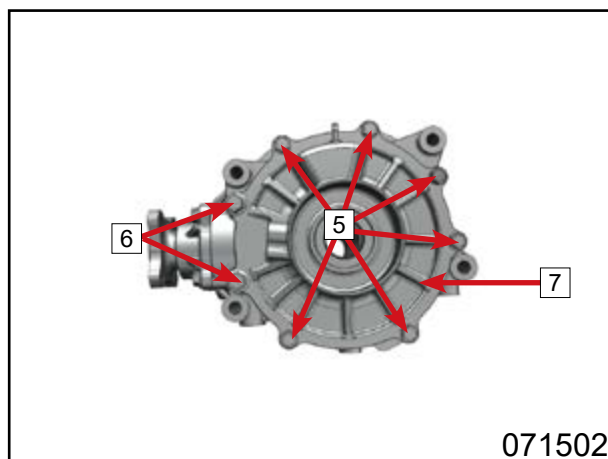
Drain oil.



Remove six M8 bolts [5].

Remove two M10 bolts [6].

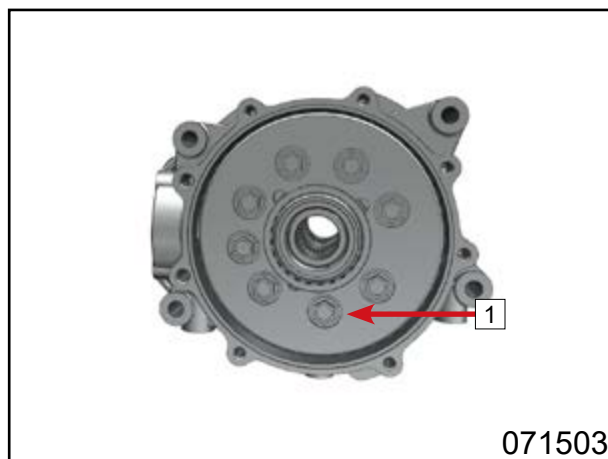
Remove rear gear case cover [7].



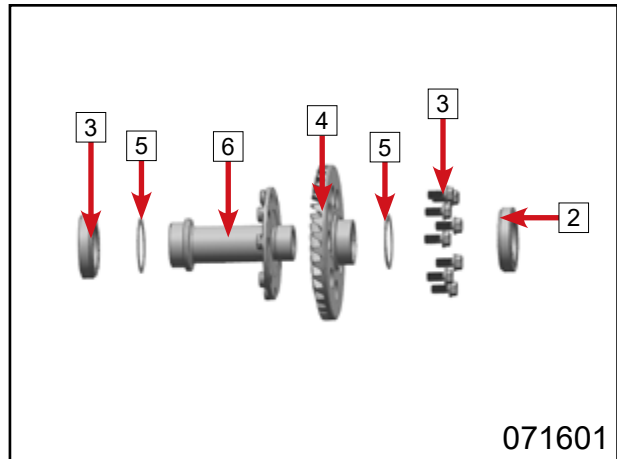
7.6.2 Driven Bevel Gear Assy

Removal

Remove driven bevel gear assy [1].

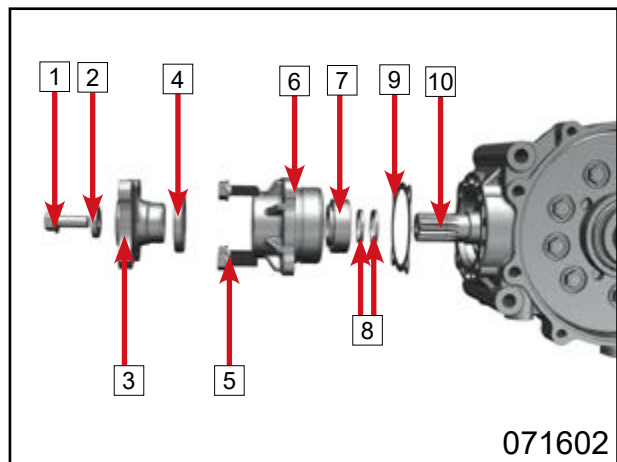


Remove eight M10 bolts [2].
Remove bearing [3].
Remove driven bevel gear [4].
Remove washer [5].
Remove mounting seat.

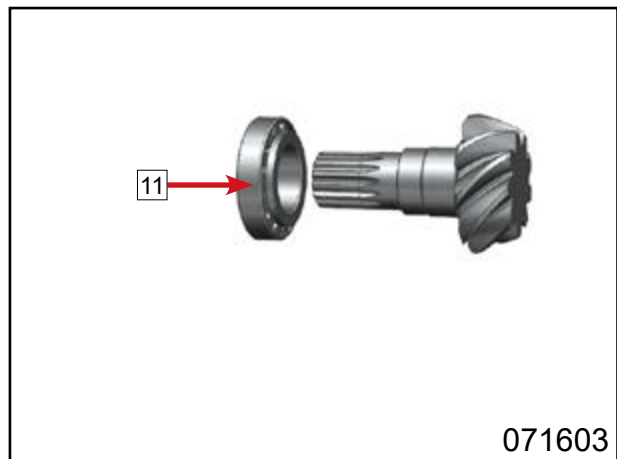


7.6.3 Drive Bevel Gear Assy Removal

Remove M10 bolt [1].
Remove washer [2].
Remove coupler [3].
Remove oil seal [4].
Remove four M8 bolts [5].
Remove bearing seat [6].
Remove bearing [7].
Remove adjusting washer [8].
Remove bearing seat washer [9].
Remove drive bevel gear assy [10].



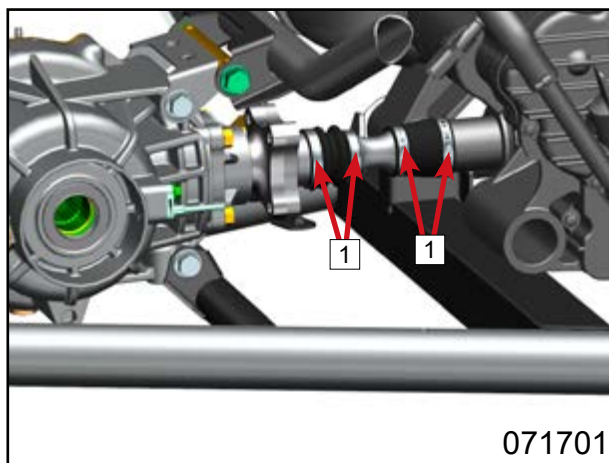
Remove bearing [11].



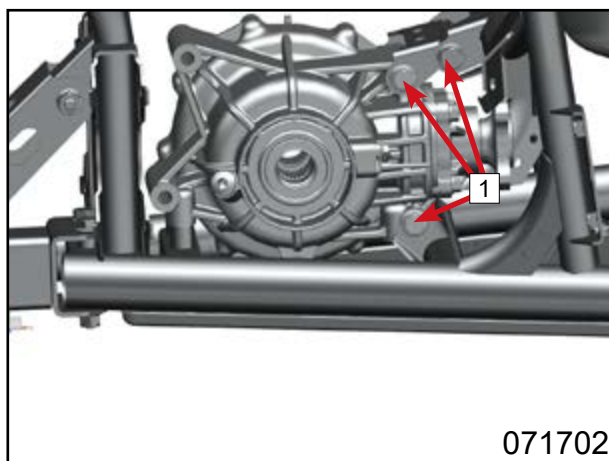
7.7 Rear Gear Case (Version 2)

Removal

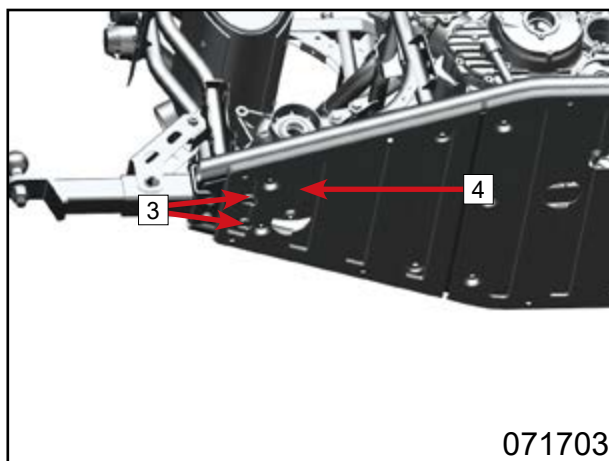
Loosen clamp **1**.



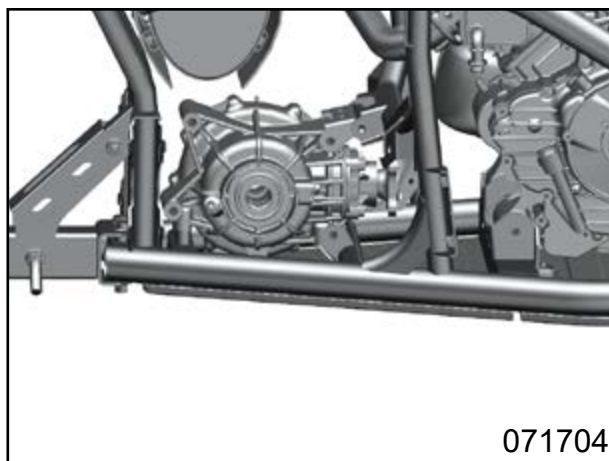
Remove three bolts **1**.



Remove bolts **3**.



Remove rear gear case assy.



7.8 Rear Gear Case Disassembly (Version 2)

7.8.1 Rear Gear Case Cover

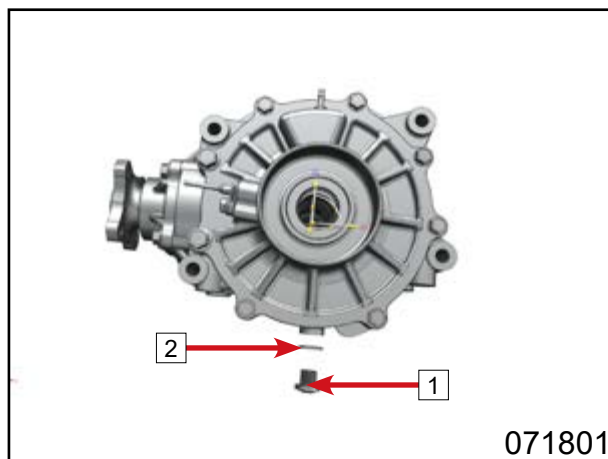
Removal

Put a pan under rear gear case.

Remove oil drain bolt [1].

Remove washer [2].

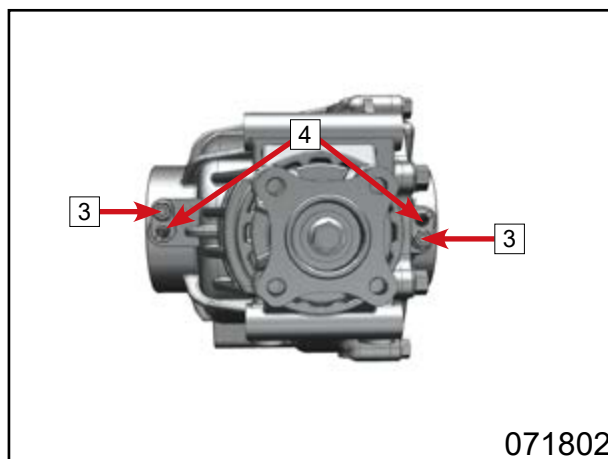
Drain oil.



071801

Remove M5 bolts [3].

Remove sensor [4].

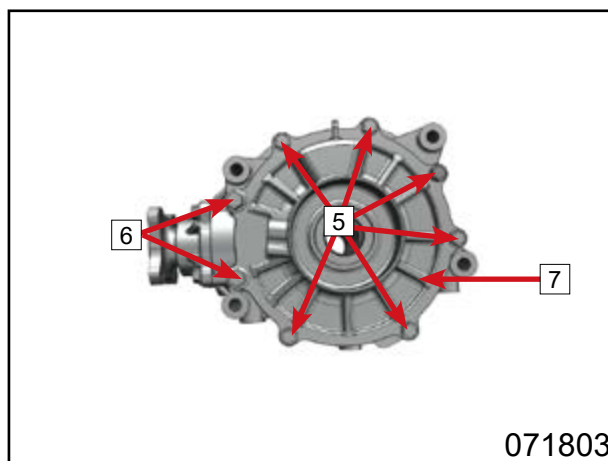


071802

Remove six M8 bolts [5].

Remove two M10 bolts [6].

Remove rear gear case cover [7].

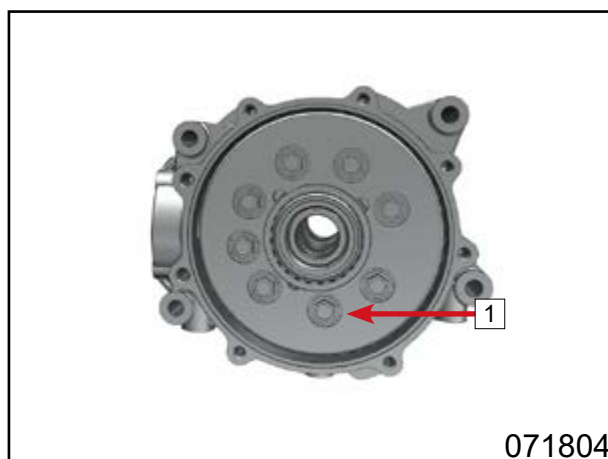


071803

7.8.2 Differential Assy

Removal

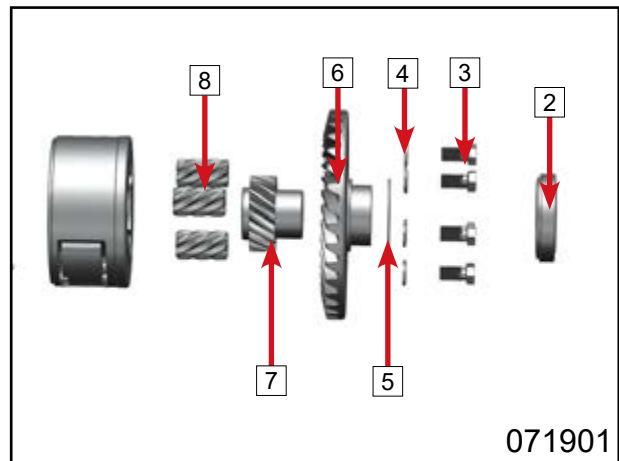
Remove differential assy [1].



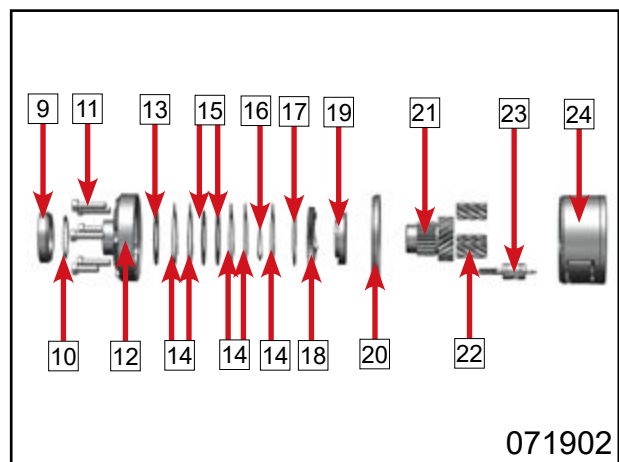
071804

07 Powertrain

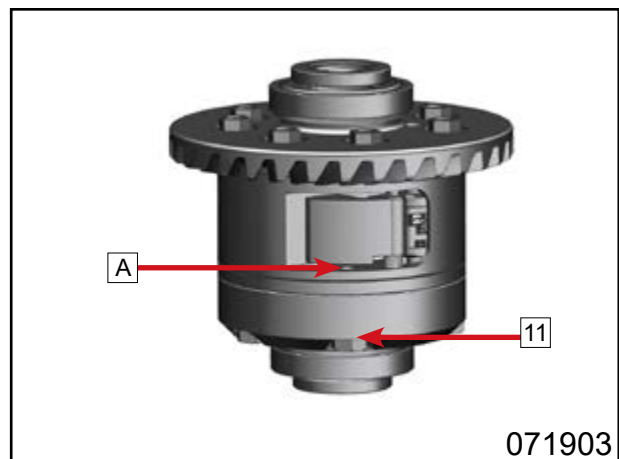
- Remove bearing [2].
- Remove eight M10 bolts [3] with washers [4].
- Remove washer [5].
- Remove driven bevel gear [6].
- Remove LH shaft gear [7].
- Remove LH planet gear [8].



- Remove bearing [9].
- Remove washer [10].
- Remove six M10 bolts [11].
- Remove RH cover [12].
- Remove inner teeth friction pad [13].
- Remove inner protruding friction pad [14].
- Remove outer teeth friction pad [13].
- Remove inner protruding friction pad [14].
- Remove washer [16].
- Remove inner protruding friction pad [14].
- Remove outer teeth friction pad smooth plate [17].
- Remove outer cam [18].
- Remove inner cam [19].
- Remove connecting plate [20].
- Remove RH shaft gear [21].
- Remove RH planet gear [22].
- Remove centrifugal shaft assy [23].
- Remove housing [24].



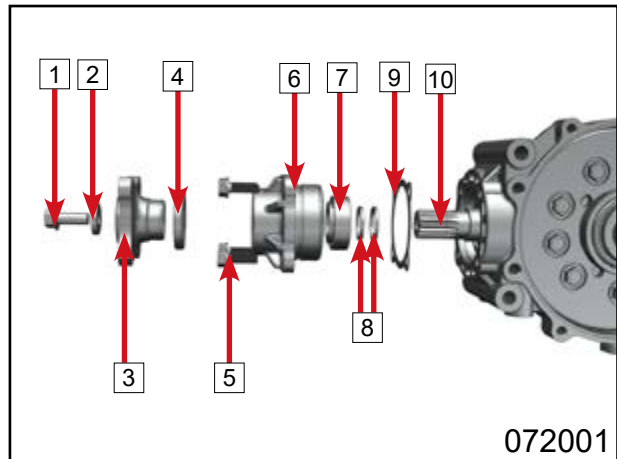
NOTE: During bolt [11] installation, install a M10×30 bolt at [A]. Do not mix the bolts. Otherwise, the differential may lose efficacy.



7.8.3 Drive Bevel Gear Assy

Removal

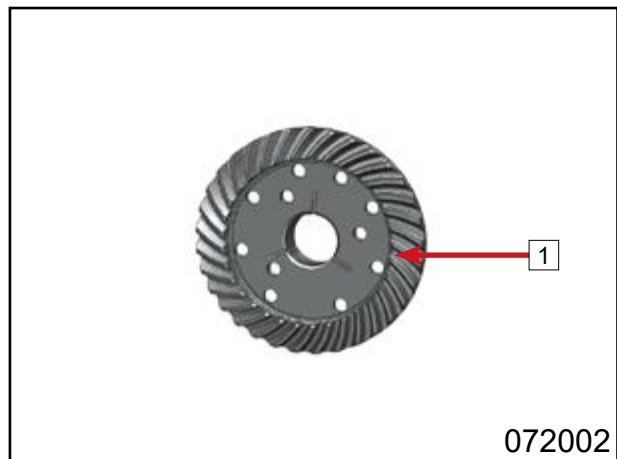
- Remove M14 bolt [1].
- Remove washer [2].
- Remove coupler [3].
- Remove oil seal [4].
- Remove four M8 bolts [5].
- Remove bearing seat [6].
- Remove bearing [7].
- Remove adjusting washer [8].
- Remove bearing washer [9].
- Remove drive bevel gear assy [10].



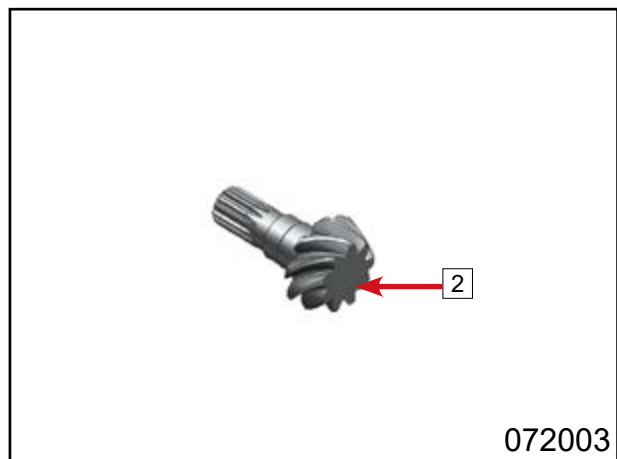
7.8.4 Rear Gear Case Inspection

Driven Bevel Gear Inspection

Inspect driven bevel gear [1] for teeth wear, cracks or damage. Replace if any defect is found.



Inspect drive bevel gear [2] for teeth wear, cracks or damage. Replace if any defect is found.



Inspect differential friction pads for severe wear, abnormal wear, cracks or damage. Replace if any defect is found.

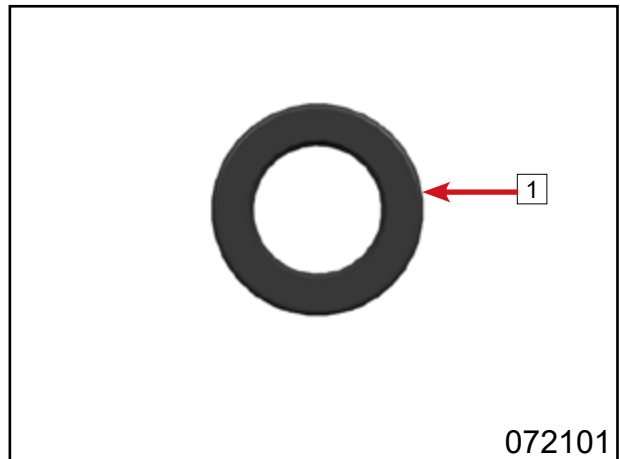
NOTE: Remove or install friction pads according to their sequences.



Oil Seal Inspection

All oil seals **1** are removed and sorted as waste. Replace with new ones during installation.

Inspect oil seal **1** lip and jointing surface for damage. Replace if any defect is found.

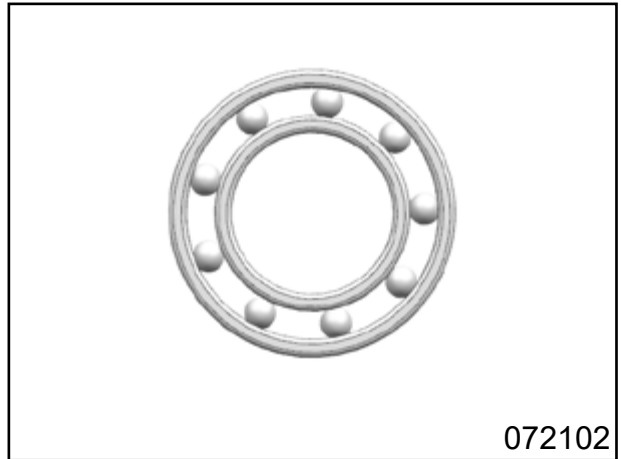


072101

Bearing Inspection

Inspect if every bearing clearance is appropriate, rotation is smooth, raceway, steel balls, needle roller and retainer are in good condition. Replace if any defect is found.

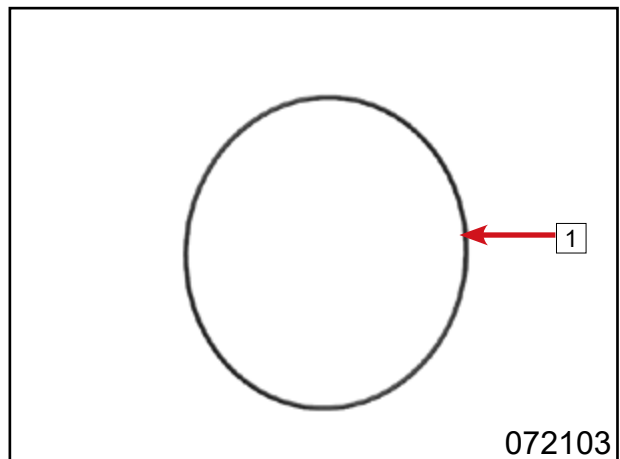
~~Use special tool to remove bearing during bearing replacement.~~



072102

O-seal Ring Inspection

Inspect every o-seal ring **1** if deformed, broken or damaged. Replace with new parts if any defect is found.



072103

**Inspect housing for cracks or damage.
Replace if any defect is found.**

7.8.4.1 Installation

Installation

Reverse the removal procedures for installation.

Rear Gear Case Bevel Gear Clearance Adjustment

Follow the drawing on the right to adjusting gear side clearance: Install auxiliary measuring tool and tighten the bolt (M14×1.25×60). Set the dial gauge. Make sure the gauge testing point is 21mm to the center. Turn the measuring tool to read the data.

Dial gauge data standard: 0.17~0.34

Adjusting washer thickness	0.1	0.3	0.5	0.9	0.92	0.94	0.96	0.98	1.00
----------------------------	-----	-----	-----	-----	------	------	------	------	------

NOTE: Measure until the adjustment is done. If the data is beyond the standard, repeat above procedures to make adjustments.

Tooth Contact

After backlash adjustment is carried out, the tooth contact must be checked. Pay attention to the following procedures:

Remove ring gear from crankcase.

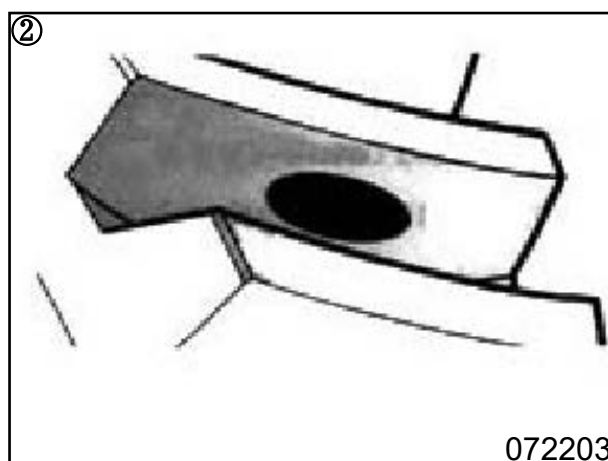
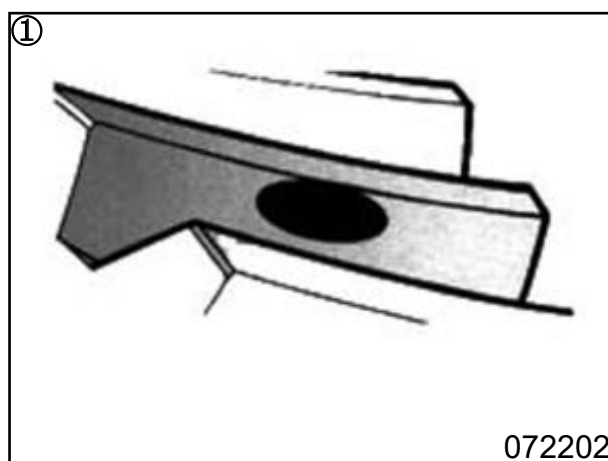
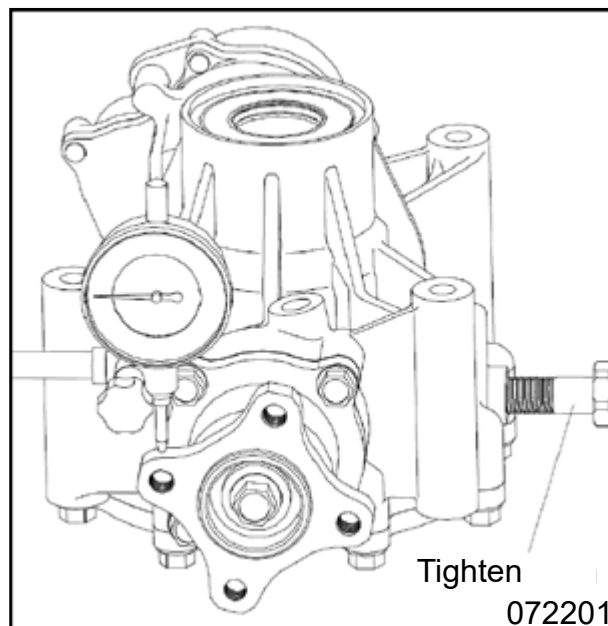
Clean and degrease drive pinion gear and ring gear teeth.

Apply a coating of machinist's layout dye or paste to several teeth of the driven gear.

Install ring gear.

Rotate the ring gear several turns in both directions. Remove drive pinion gear and ring gear, then inspect the coated teeth of the drive pinion gear. The teeth contact pattern should be as shown below.

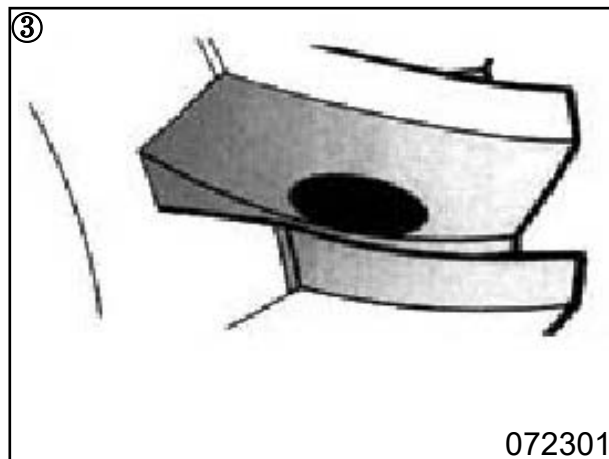
Pattern 1	Contact at tooth top	Incorrect
Pattern 2	Contact at tooth middle	Correct
Pattern 3	Contact at tooth root	Incorrect



If gear tooth contact is found to be correct (pattern 2), continue the next step.

If gear tooth contact is found to be incorrect (pattern 1 and 3), the shim thickness between the drive pinion gear and ring gear must be changed and the tooth contact re-checked until correct.

Note: Clean the dye coated on the gear teeth after the tooth contact adjustment is finished.



Adjustment Steps

Tooth contact	Shim adjustment
Tooth contact pattern 1	Reduce shim thickness
Tooth contact pattern 3	Increase shim thickness

⚠ WARNING: Make sure to check the backlash after the tooth contact has been adjusted, since it may have changed. Adjust the tooth contact and backlash until they are both within specification. If the correct tooth contact cannot be maintained when adjusting the backlash, replace the drive gear and ring gear.

08 Brake System

8.1 Brake Caliper	08-2
8.2 Brake Disc and Mounting Seat.....	08-3
8.3 Brake Fluid	08-3
8.4 Brake Pedal	08-5
8.5 Parking Brake	08-5

8.1 Brake Caliper

Removal - Front

Remove wheel (refer to 09 chapter).

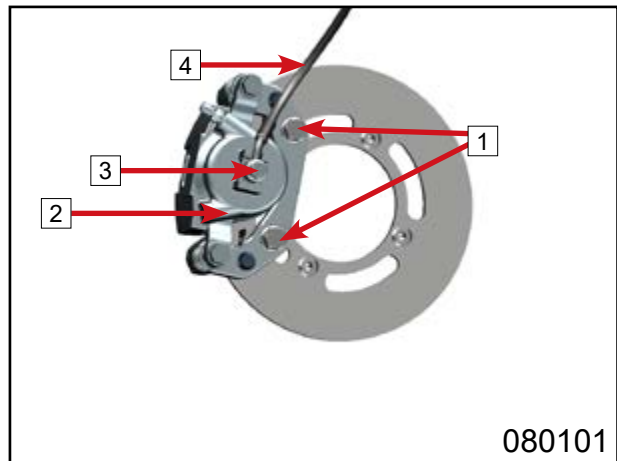
Remove two bolts [1].

Remove front RH brake caliper [2].

Remove banjo bolt [3].

Remove brake fluid hose [4].

Front LH brake caliper follows the same removal procedures.



080101

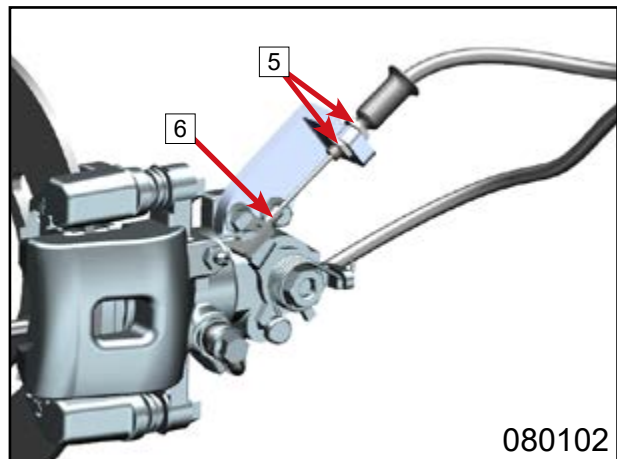
Removal - Rear

Remove wheel (refer to 09 chapter)

Loosen two nuts [5].

Remove joint [6].

Remove brake cable.



080102

Remove two bolts [7].

Remove rear RH brake caliper [8].

Remove banjo bolt [9].

Remove brake fluid hose [10].

Rear LH brake caliper follows the same removal procedures.

Inspection

Inspect the brake friction pad thickness.

Brake pad minimum thickness $A \geq 2 \text{ mm}$.

Replace if less than minimum thickness.

Inspect brake pad for damage or cracks.

Replace if necessary.

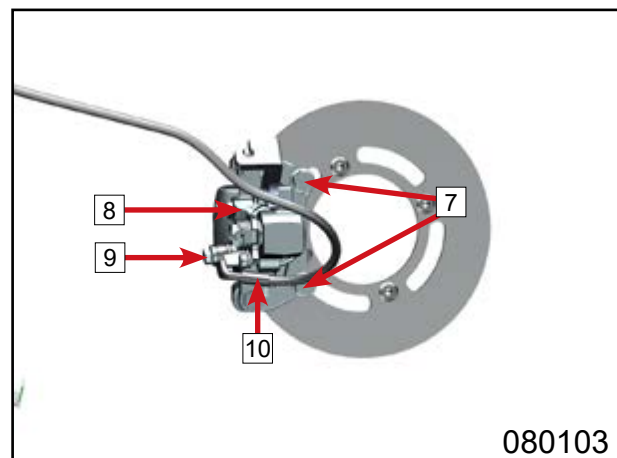
⚠ WARNING: Brake pad damage will reduce braking effect, which can cause accidents. If the brake pad is too thin, steel bracket will rub the brake disc, which will severely reduce the braking effect and damage the brake disc. Inspect brake pad periodically.

NOTE: Replace brake pads in pair.

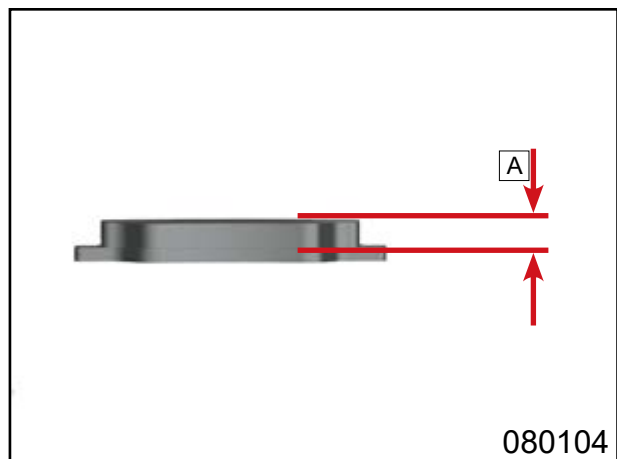
Inspect brake caliper for damage or cracks. Replace if necessary.

Installation

Reverse the removal procedures for installation.



080103



080104

8.2 Brake Disc and Hub

Removal

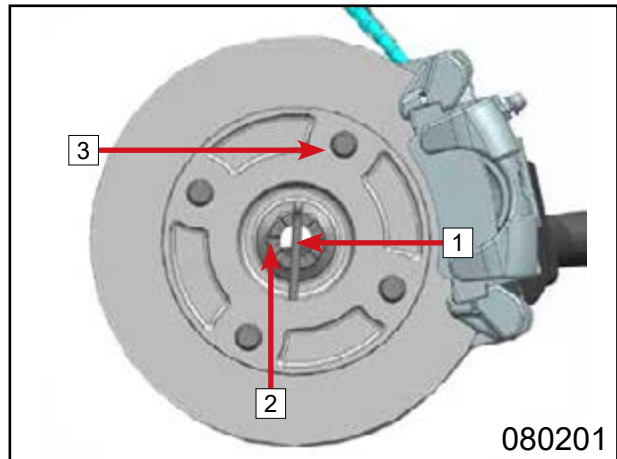
Remove wheel (refer to 09 chapter).

Remove brake caliper.

Remove retainer [1].

Remove M30 nut [2].

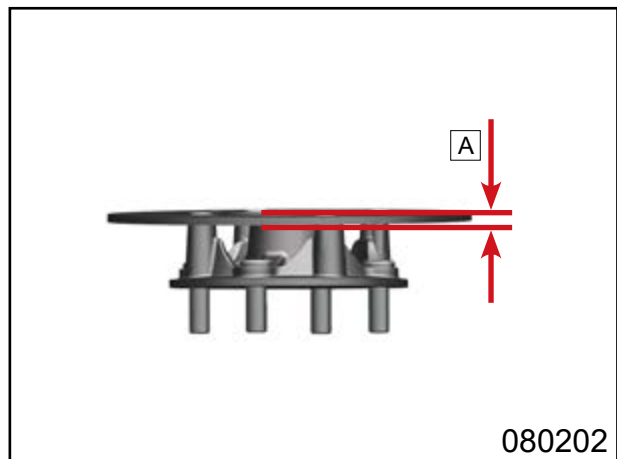
Remove brake disc and hub [3].



Inspection

Inspect brake disc surfaces for wear or damage. Replace if necessary.

Replace brake disc if the thickness [A] is less than 4.0 mm.



Replacement

Remove four front brake disc M8 inner hex bolts [4].

Replace brake disc.

Install brake disc M8 inner hex bolts.

Brake disc bolt tighten torque:
25N•m~30N•m

Installation

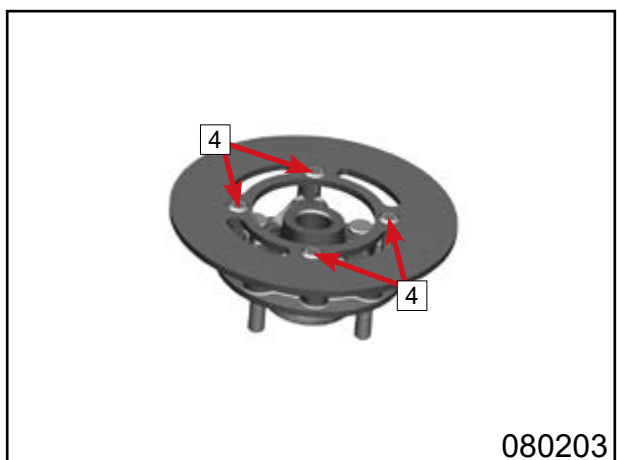
Reverse the removal procedures for installation.

8.3 Brake Fluid

Removal

Remove brake fluid from the reservoir (refer to 07 chapter).

NOTE: Brake fluid has strong water absorption feature. If water enters into brake fluid, it will cause the boiling point depression and brake failure. Thus, the brake fluid storage should be sealed and away from the humid environment. The brake fluid can not be used if polluted.



Inspection

Brake fluid level should be between upper line and lower line.

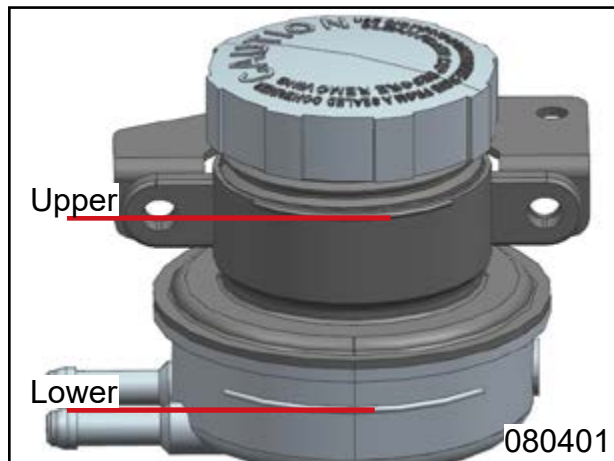
Add brake fluid if the level is below or near the lower line.

Reduce brake fluid if the level is above or near the upper line.

NOTE: Brake fluid will reduce the braking effect after using for a long time. Replace the brake fluid according to the maintenance schedule.

NOTE:

1. Do not mix dirt and water with brake fluid when adding.
2. Use CFMOTO recommended brake fluid in case of chemical changes.
3. Contact with brake fluid may irritate the skin.
4. Do not let the brake fluid contact painted parts. The brake fluid will corrode the paint.
5. Flush with water if brake fluid spills.
6. Do not leave the brake fluid reservoir cap open for a long time.



Brake Fluid Replacement and Brake System Bleeding

Please use CFMOTO recommended brake fluid for replacement.

Brake fluid type: DOT4

If equipped with bleeding device, follow the user manual to operate.

If not, bleed the brake system according to the following procedures:

Remove anti-dust cap from the bleeder

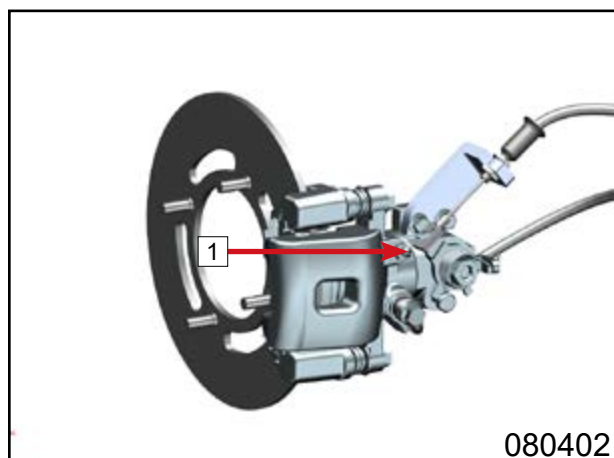
Connect a hose at the brake caliper bleed screw with the other side into a clean container. Make sure the hose is fastened on bleed port 1.

Press brake pedal slowly and hold it.

Loosen bleed screw, tighten it immediately and allow the brake pedal to return.

NOTE: Keep the fluid level more than a half from the upper line in the reservoir during bleeding.

NOTE: Do not release brake pedal before tightening bleed screw. Otherwise, there will be air inside the master cylinder.



Repeat the procedures until there is clean brake fluid in the hose and the fluid does not have air.

Tighten the bleed screw and keep the fluid level according to requirement after system bleeding or fluid replacement.

Inspect brake effect after operation to make sure the brake function works and brake pedal free play is qualified.

Repeat the procedures as necessary until all brake lines and calipers do not have air.

Installation

Reverse the removal procedures for installation.

8.4 Brake Pedal

Removal

Remove two retainers [1].

Remove bushing [2].

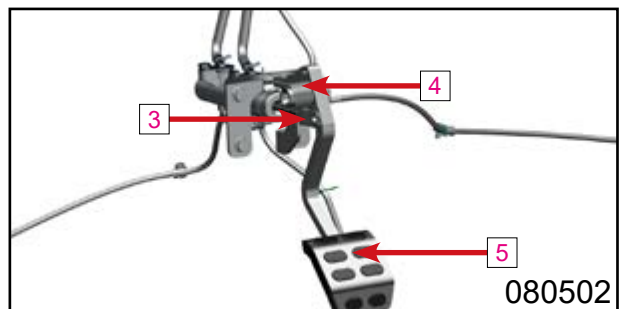
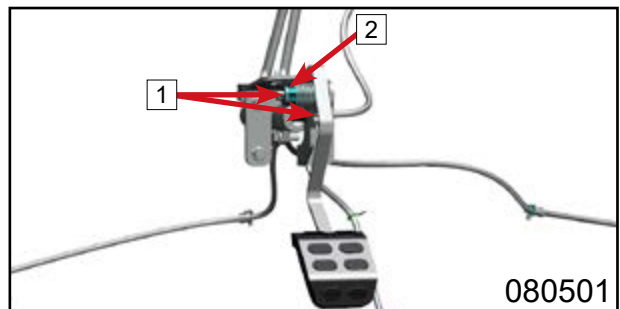
Remove pushrod pin [3].

Remove foot brake return spring [4].

Remove brake pedal [5].

Installation

Reverse the removal procedures for installation.



8.5 Parking Brake

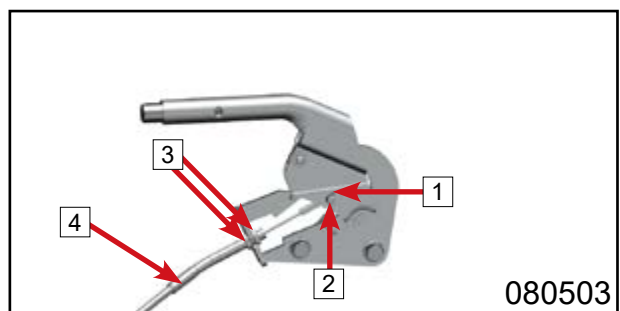
Removal

Remove retainer [1].

Remove pin [2].

Loosen two lock nuts [3].

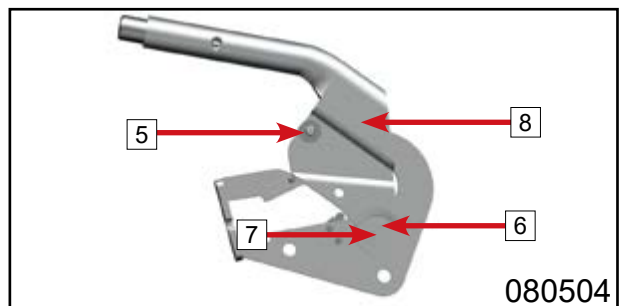
Remove parking cable [4].



Remove washer [5].

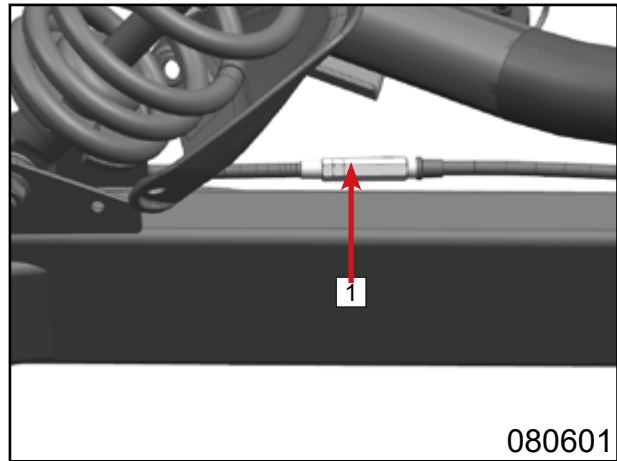
Remove washer [6] and hand lever pin shaft [7].

Remove hand brake assy [8].



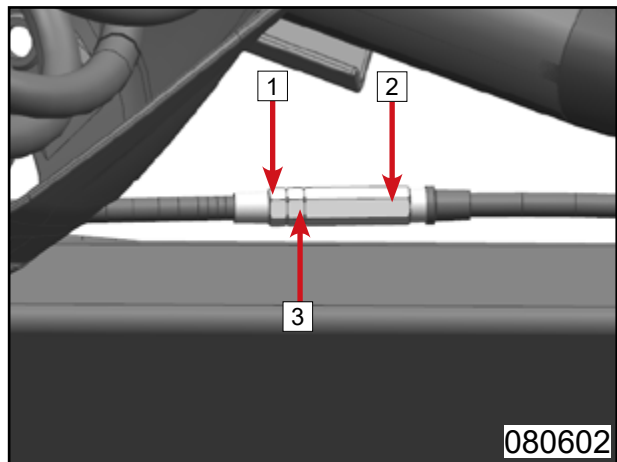
Parking Brake Performance Inspection

The vehicle is fully loaded and stays on a hill with a slope of 12%. If it slips from the slope, tighten brake cable and adjust it to the desired position. Put the vehicle on level ground, release hand brake. The vehicle can be pushed without load. If there is any braking drag, loosen the hand brake until it is appropriate. Repeat above steps until the parking brake performance is proper.



Parking Brake Adjustment

The hand brake has an automatic compensatory feature. It is not necessary to adjust it, but after operating the system for a long time, the brake cable could get longer, at which time it should be adjusted. Loosen lock nut **1** and **3**. Rotate the adjusting tube **2** to adjust the brake cable until it is at the desired tension. Tighten lock nut **1** and **3**.



Installation

Reverse the removal procedures for installation.

09 Suspension System

9.1 Tire	09-2
9.2 Rim Bracket	09-5
9.3 Shock Absorber (Status 1)	09-6
9.4 Shock Absorber (Status 2)	09-8
9.5 Front Swing Arm.....	09-10
9.6 Rear Suspension	09-11
9.6.1 Rear Swing Arm Rod	09-11
9.6.2 Rear Sway Bar.....	09-11
9.6.3 Rear Swing Arm	09-11

 **DANGER:** Operation must be made on the level ground during suspension maintenance. Make sure the vehicle is supported stably. Any part of body is not allowed to put under tires, in case it drops down to cause injury.

9.1 Tire

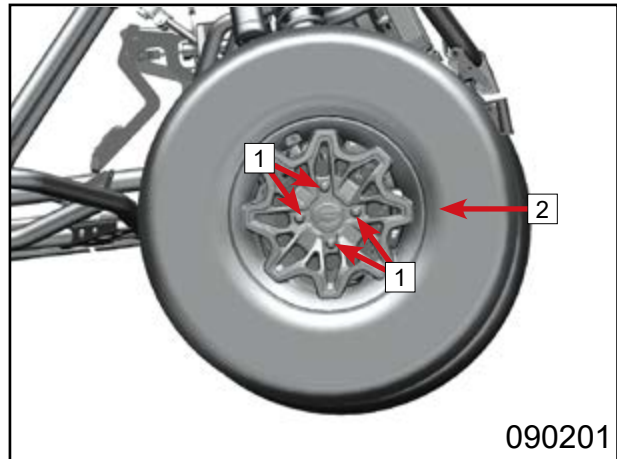
Removal

Remove four M12 wheel nuts [1].

Remove tire [2].

Inspection

⚠ DANGER: Operation must be made on the level ground during suspension maintenance. Make sure the vehicle is supported stably. Any part of body is not allowed to put under tires, in case it drops down to cause injury.



Put tire into water to see if there are bubbles. If yes, the tire is broken and needs to be replaced.

Inspect tires for cut, cracks or other damages. Replace with new tires if any defect occurs.

If the tread pattern is inlaid by stones or other foreign objects, use tool to remove them.

⚠ DANGER: Tire burst will cause vehicle out of control, which causes accidents. In order to ensure safety, please replace the damaged or worn tires immediately.

⚠ WARNING: Using tires and rims that are not approved or recommended by CFMOTO will affect the performance and safety of the vehicle. Please use CFMOTO approved or recommended tires and rims.

⚠ WARNING: New tires have poor grip will cause accidents. Please do break-in according to the prescribed mileage. The new tire tread is coated with release glue, so it does not have the ability to completely grip. The first 300km must be modeled in a moderate manner at different angles, so that the entire tread is rubbed against the ground.

⚠ DANGER: The front and rear tire must use the same tread pattern, otherwise, vehicle will be out of control. Replace the tire immediately if aging or damaged.

09 Suspension System

Tire status 1

29×9.00

29×11.00

Pressure:

Item			Standard Value	Service Limit
Front wheel	Rim jump	Longitude	/	0.5mm
		Transverse	/	0.5mm
	Tire	Remaining groove	/	3.0mm
		Pressure(US)	Recommended by manufacture: 100kPa(1.01kgf/cm ²) 14.5PSI	110kPa(1.12kgf/cm ²) 16PSI
		Pressure(EU167)		150kPa(1.53kgf/cm ²) 22PSI

Item			Standard Value	Service Limit
Rear wheel	Rim jump	Longitude	/	0.5mm
		Transverse	/	0.5mm
	Tire	Remaining groove	/	3.0mm
		Pressure(US)	Recommended by manufacture: 110kPa(1.12kgf/cm ²) 16PSI	124kPa(1.26kgf/cm ²) 18PSI
		Pressure(EU167)		150kPa(1.53kgf/cm ²) 22PSI

Tip: when vehicle load exceeds 195kg, the tire pressure is adjusted to the limit value.

Tire status 2

27×9.00

27×11.00

Pressure:

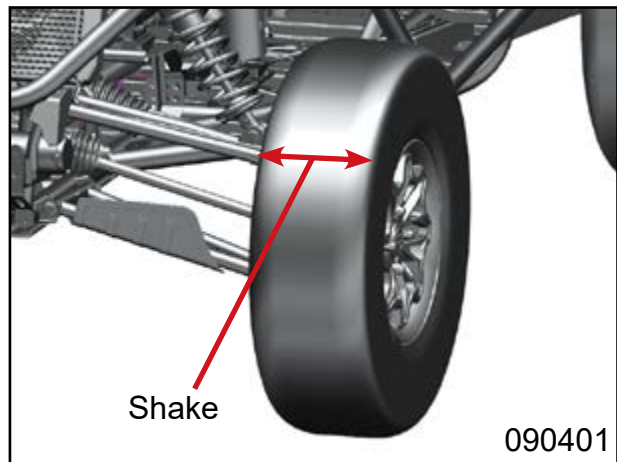
Item			Standard Value	Service Limit
Front wheel	Rim jump	Longitude	/	0.5mm
		Transverse	/	0.5mm
	Tire	Remaining groove	/	3.0mm
		Pressure(US)	Recommended by manufacture: 100kPa(1.01kgf/cm ²) 14.5PSI	110kPa(1.12kgf/cm ²) 16PSI
		Pressure(EU167)		150kPa(1.53kgf/cm ²) 22PSI

Item			Standard Value	Service Limit
Rear wheel	Rim jump	Longitude	/	0.5mm
		Transverse	/	0.5mm
	Tire	Remaining groove	/	3.0mm
		Pressure(US)	Recommended by manufacture: 110kPa(1.12kgf/cm ²) 16PSI	124kPa(1.26kgf/cm ²) 18PSI
		Pressure(EU167)		150kPa(1.53kgf/cm ²) 22PSI

Tip: when vehicle load exceeds 195kg, the tire pressure is adjusted to the limit value.

CFMOTO

Position the vehicle on a level ground.
Elevate the front part of the vehicle with tools. Make sure no other force on the wheel. Shake front wheel to check for free play or looseness. If any free play or looseness is found, inspect swing arms, axle, rim bolts and nuts. Tighten them if necessary. If free play or looseness still exists, inspect bearing, swing arm bushings and ball joint pin. Replace if necessary.

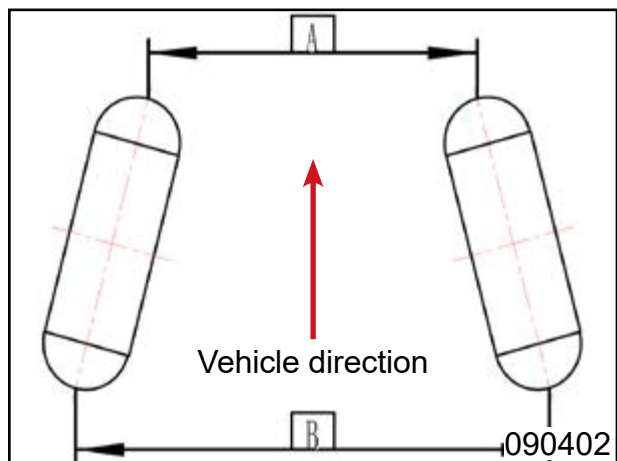


Wheel Toe-in

Position the vehicle on a level ground to measure the wheel toe-in.

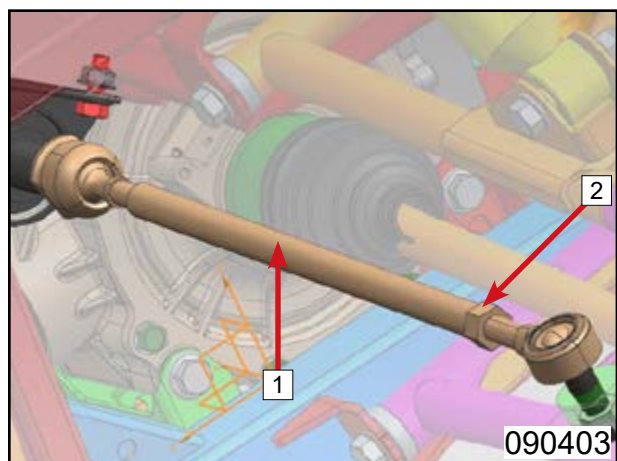
The vehicle running direction is A, the wheel rear side is B.

Toe-in: $B-A= 5\text{mm}\sim 10\text{mm}$



If the measurement is out of specification, adjust the lock nut [2] of steering rod [1].

After toe-in adjustment, drive the vehicle slowly. Make sure the steering wheel can control the vehicle running direction effectively.

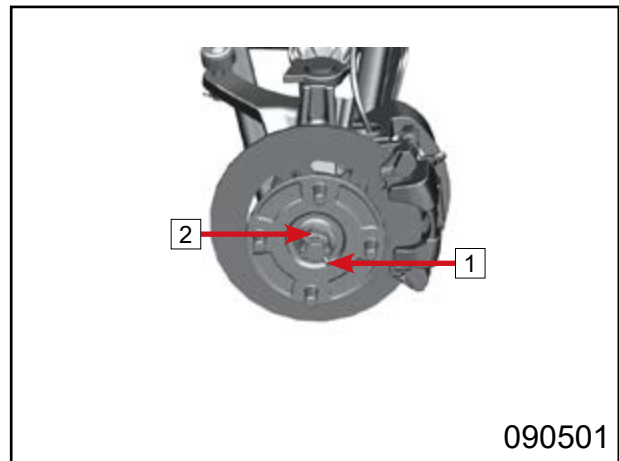


9.2 Rim Bracket

Removal

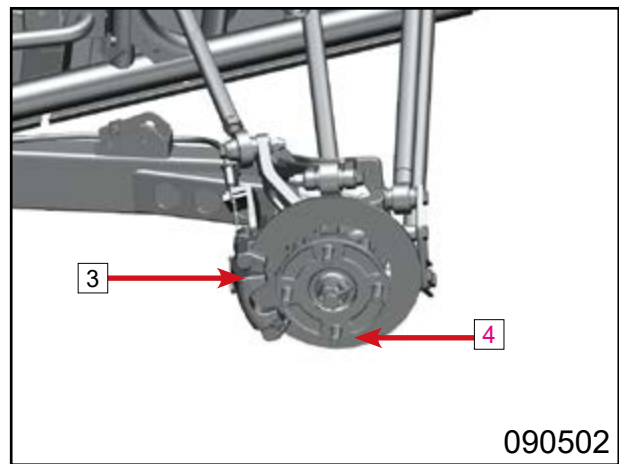
Remove pin [1].

Remove hex slotted flange nut [2].



Remove brake caliper [3] (refer to 08 chapter).

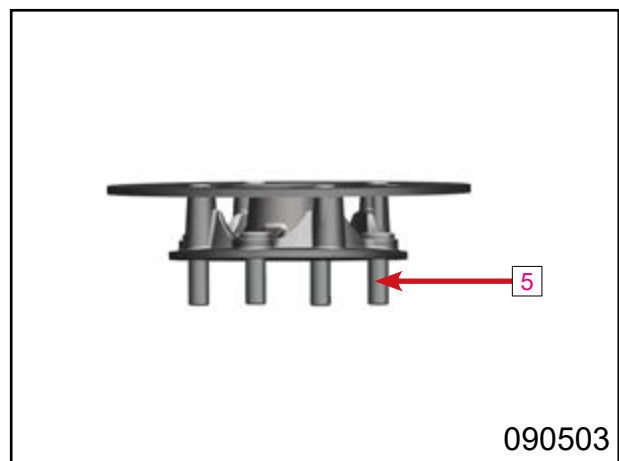
Remove rim bracket [4].



Inspection

Inspect rim bracket bolts [5] for looseness.

Replace rim bracket if loose.



Installation

Reverse the removal procedures for installation.

Hex slotted flange nut tighten torque:
220N•m~250N•m

9.3 Shock Absorber

9.3.1 Front Shock Absorber

Removal

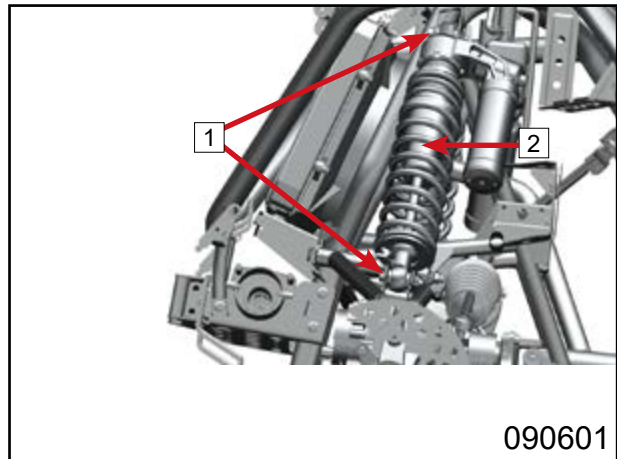
Remove two nuts [1].

Remove front shock absorber [2].

Inspection

Inspect shock absorber for cracks or damage. Replace if necessary.

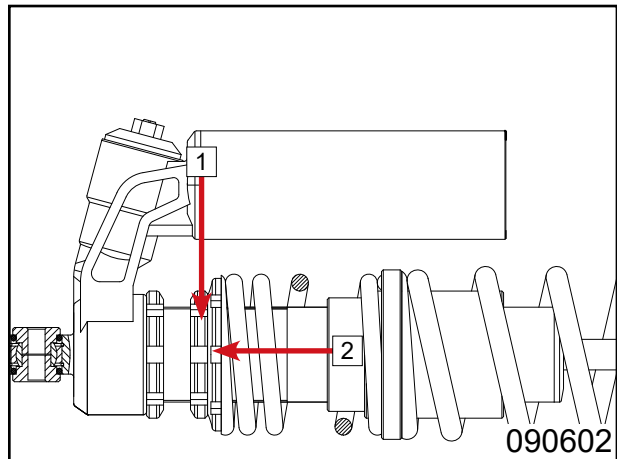
Clean the dirt on shock absorber.



Adjustment

Loosen lock nut [1] with shock absorber wrench.

Adjust adjusting nut [2] with shock absorber wrench.



Adjust the shock absorber according to the load.

“S” direction is to increase the resistance.

“F” direction is to decrease the resistance.

Shock Absorber Specification:

Rebound resistance [3] (adjustable): **19±3** gear

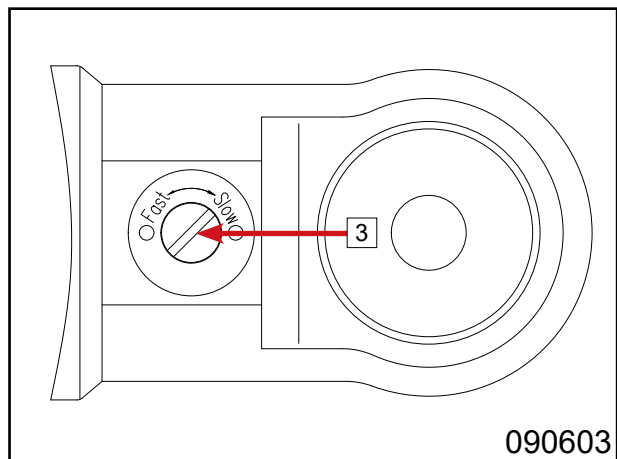
Delivery state: **13th** gear

Compression resistance (A): **18±2** gear

Delivery state: **9th** gear

Compression resistance (B): **18±2** gear

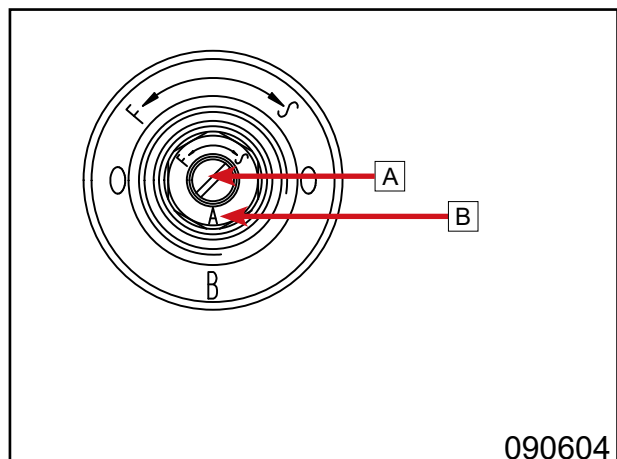
Delivery state: **9th** gear



Adjustment: Compression resistance is divided into A and B. Adjust A first during usage. If A is at the maximum gear, then it is allowed to adjust B.

Installation

Reverse the removal procedures for installation.



09 Suspension System

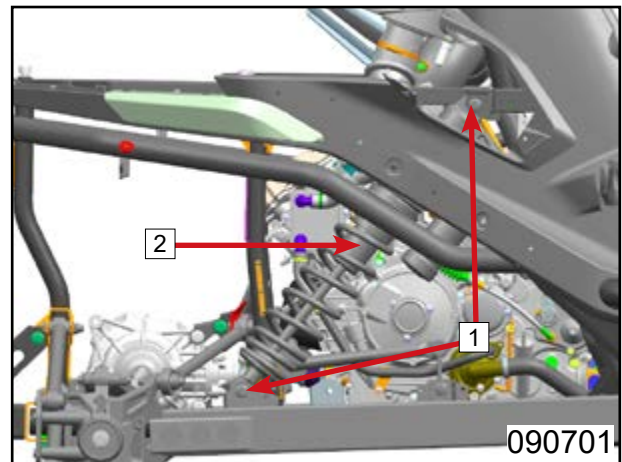
9.3.2 Rear Shock Absorber

Removal

Remove CVT deco guard.

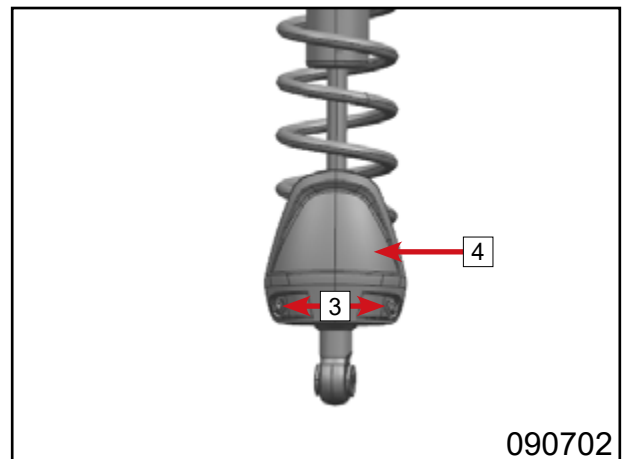
Remove two bolts and nuts [1].

Remove rear shock absorbers [2].



Remove two bolts [3].

Remove rear shock absorber fender [4].



Inspection

Inspect shock absorber appearance for cracks or damage.

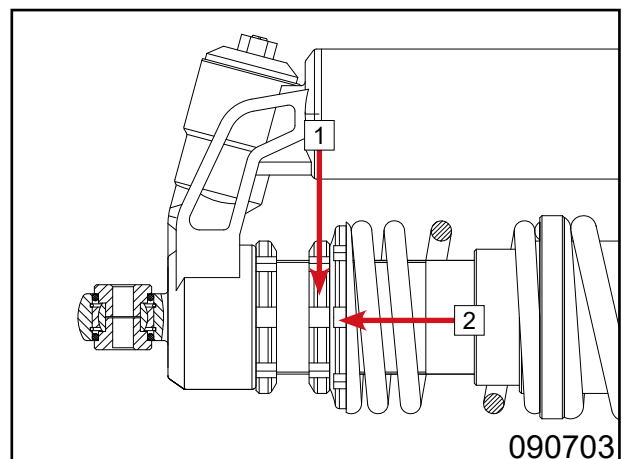
Inspect shock absorbers for leaking.

Clean dirt on shock absorbers after running the vehicle.

Shock Absorber Adjustment

Loosen lock nut [1] with shock absorber wrench.

Adjust adjusting nut [2] with shock absorber wrench.



Adjust the shock absorber according to the load.

“S” direction is to increase the resistance.

“F” direction is to decrease the resistance.

Shock Absorber Specification:

Rebound resistance [3] (adjustable): **19±3** gear

Delivery state: **12th** gear

Compression resistance (A): **18±2** gear

Delivery state: **13th** gear

Compression resistance (B): **18±2** gear

Delivery state: **13th** gear

Adjustment: Compression resistance is divided into A and B. Adjust A first during usage. If A is at the maximum gear, then it is allowed to adjust B.

Installation

Reverse the removal procedures for installation.

9.4 Front Swing Arm

Removal

Remove three pins [1].

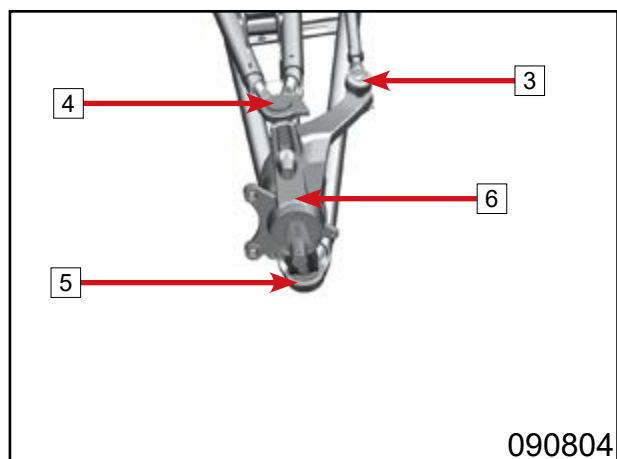
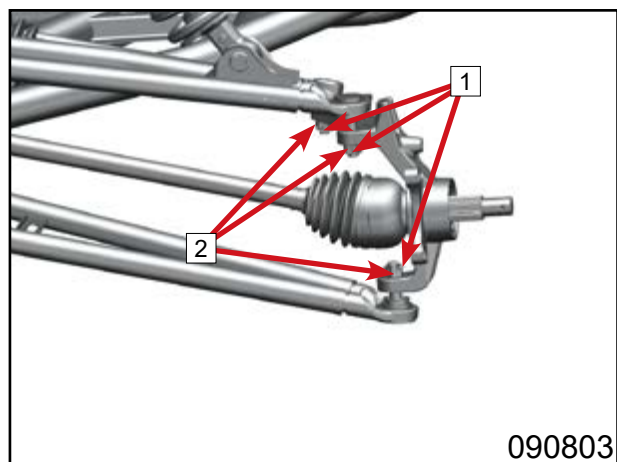
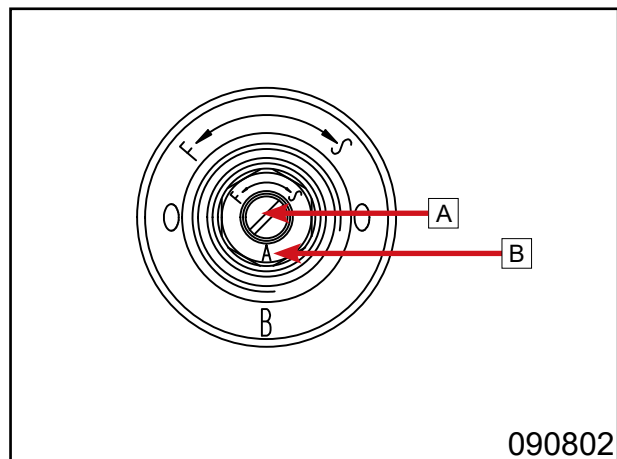
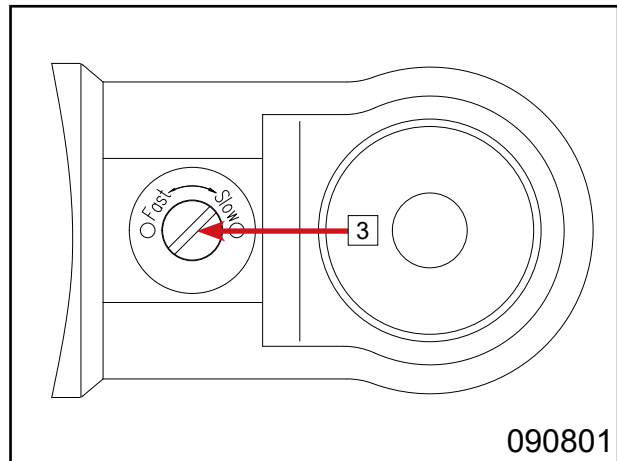
Remove three M12 slotted flange nuts [2].

Remove steering rod [3].

Remove upper swing arm [4].

Remove lower swing arm [5].

Remove steering knuckle [6].



09 Suspension System

Remove bolt [7].

Remove LH upper swing arm [8].

Remove LH lower swing arm [9].

Front RH swing arm follows the same removal procedures.

Inspection

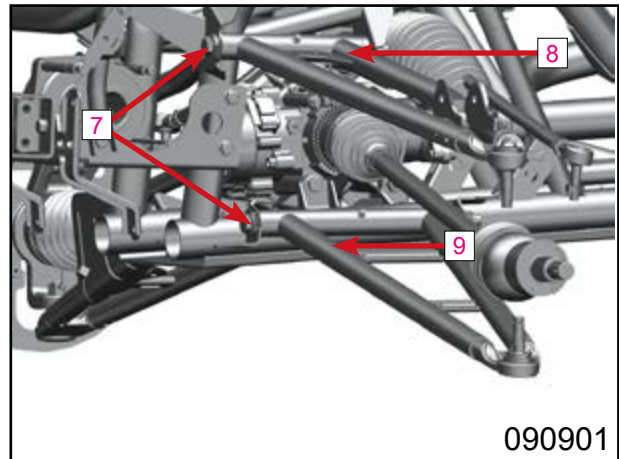
Inspect swing arms for cracks or damage.
Replace if necessary.

Inspect swing arm for smooth movement.
Add grease through grease nozzle if blocking or stuck.

Inspect steering knuckle for dirt or rust.
Replace if necessary.

Installation

Reverse the removal procedures for installation.



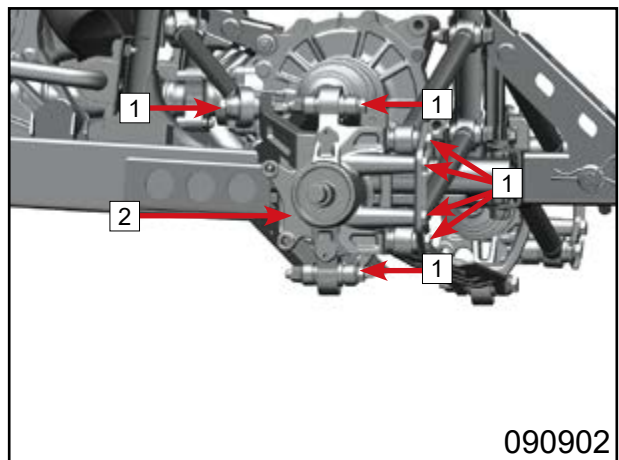
9.5 Rear Suspension

9.5.1 Rear Swing Arm Rod

Removal

Remove seven bolts [1].

Remove steering knuckle [2].

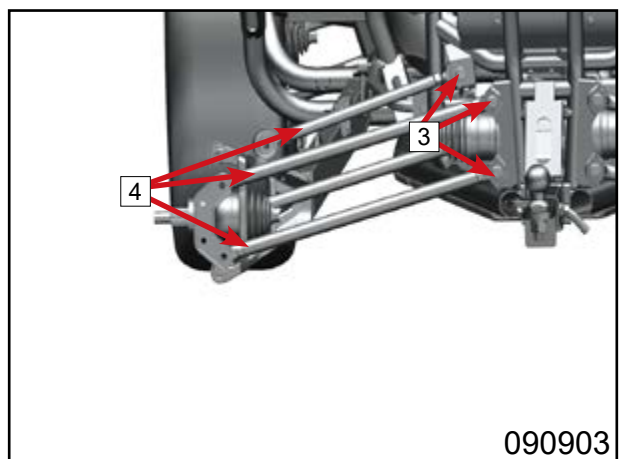


Remove bolts [3].

Remove three LH rear swing arm rods [4].

Installation

Reverse the removal procedures for installation.



9.5.2 Rear Sway Bar

Removal

Remove nut [1].

Remove ball pin [2].

Remove nut [3].

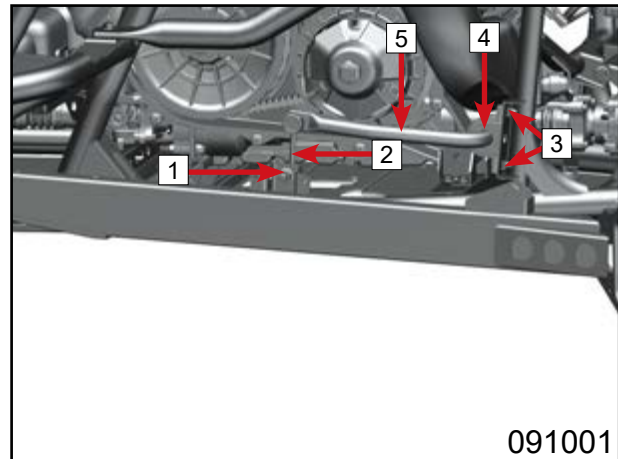
Remove rear LH wheel shaft cover [4].

Rear RH wheel shaft cover follows the same removal procedures.

Remove rear sway bar [5].

Installation

Reverse the removal procedures for installation.



9.5.3 Rear Swing Arm

Removal

Remove nut [1].

Remove bolt [2].

Remove rear LH swing arm assy [3].

Rear RH swing arm assy follows the same removal procedures.

Installation

Reverse the removal procedures for installation.

Inspection

Inspect every rod for cracks or erosion.

Replace if necessary.

Inspect swing arms for smooth movement.

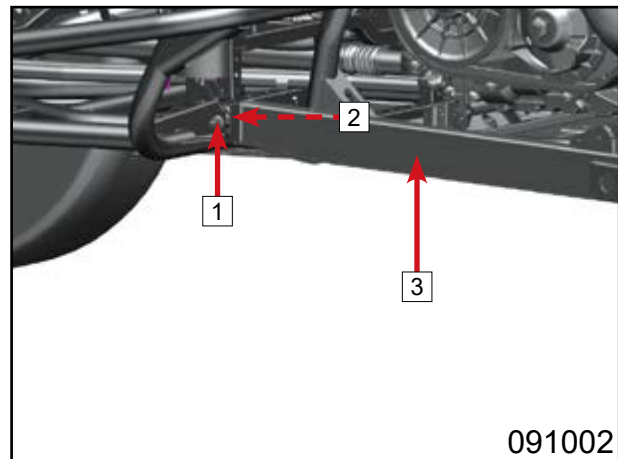
Add grease through grease nozzle if blocking or stuck.

Inspect steering knuckle for dirt or rust.

Replace if necessary.

Installation

Reverse the removal procedures for installation.



10 Steering System

10.1 Steering System	10-2
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10.1.2 Steering Column and EPS	10-2
10.1.3 Steering Motor	10-3
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10.3.2 EPS Fault Analysis and Troubleshooting.....	10-9

10.1 Steering System

10.1.1 Steering Wheel

Removal

Remove steering wheel deco cover [1].



Remove nut [2].

Remove steering wheel [3].

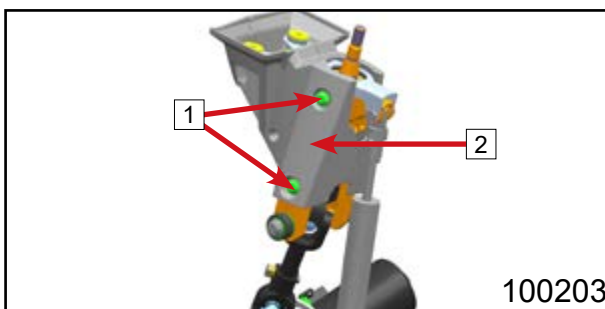


10.1.2 Steering Column and EPS

Remove two inner hex bolts [1].

Remove dashboard LH guard [2].

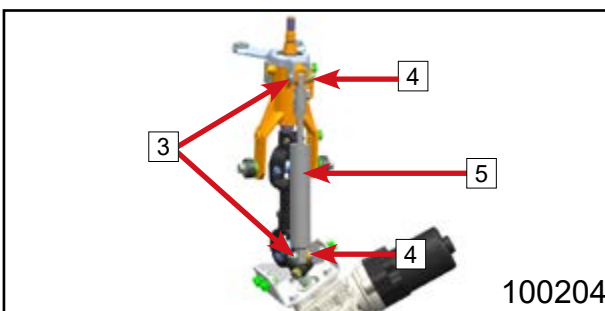
Dashboard RH guard follows the same removal procedures.



Remove gas spring lock bolts [3].

Remove nuts [4].

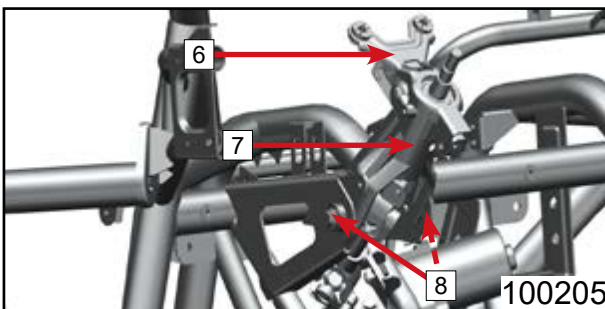
Remove gas spring [5].



Remove dashboard bracket [6].

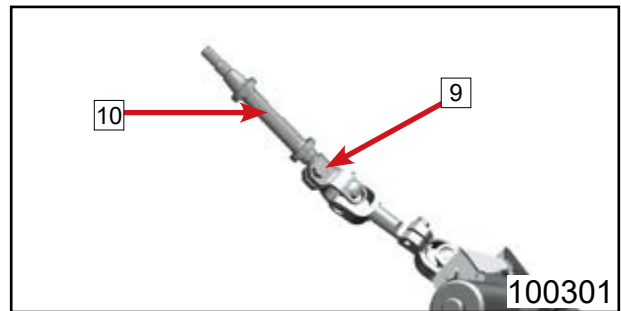
Loosen two bolts [7].

Remove steering wheel bracket [8].

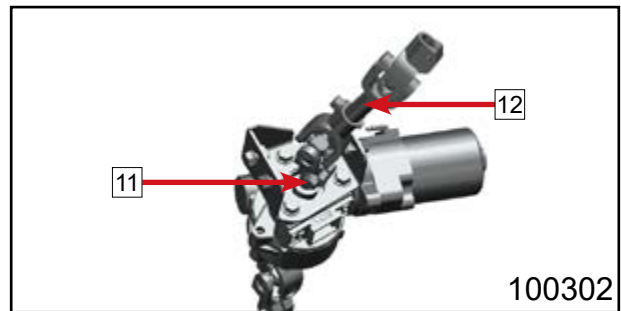


10 Steering System

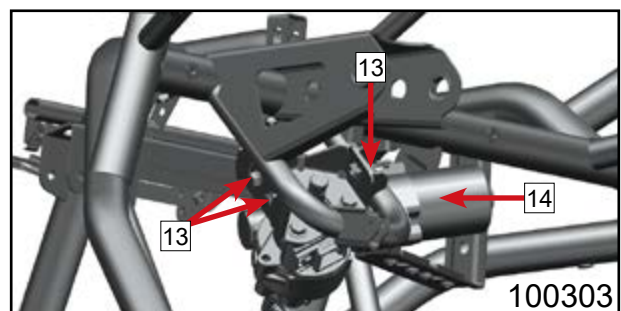
Loosen bolt [9].
Remove steering column [10].



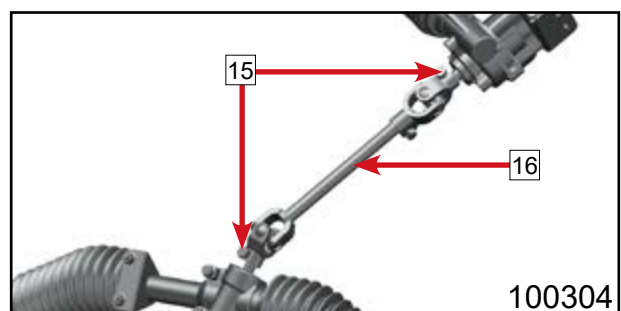
Remove bolt [11].
Remove upper steering universal shaft
assy [12].



Unplug connectors.
Remove three bolts [13].
Loosen EPS [14].



Loosen two bolts [15].
Remove steering universal shaft assy [16].



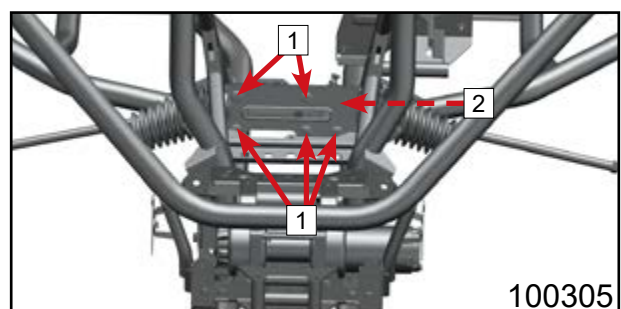
10.1.3 Steering Motor

Removal

Remove steering knuckle nuts (refer to 09
chapter).

Remove five nuts [1].

Remove steering motor assy [2].



Inspection

Position the vehicle on level ground. Turn the steering wheel slowly to inspect for smooth movement.

Inspect main cable and wires for interference if there is blocking or stuck feeling. If not, inspect steering column ends for interference and steering universal shaft assy for damage.

NOTE: Make sure of smooth steering. Otherwise, the steering wheel may lose its control, which causes accidents.

Position the vehicle on level ground. Shake the steering wheel to check its degree of shakiness.

If shakiness is large, make sure if it is due to looseness of steering column or other parts. Inspect gas spring for clearance and bolts for tightening. Operate if necessary. If it is caused by steering column shaking, enlarge the tighten torque of steering column lock nuts or disassemble column for service.

Adjust gas spring until the steering wheel is at the appropriate position for driver.

Installation

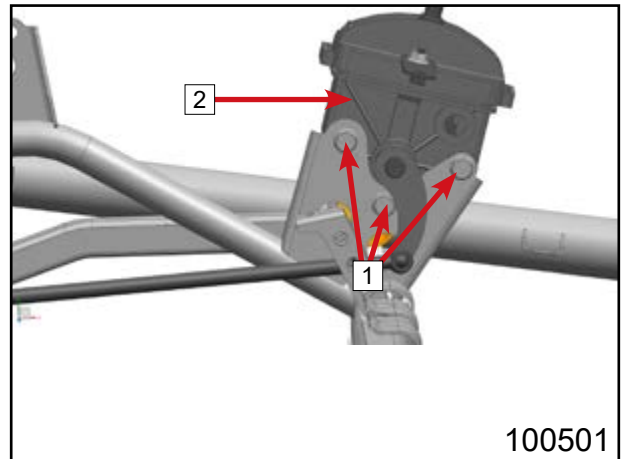
Reverse the removal procedures for installation.

10.2 Gearshift Assy

Removal

Remove three bolts [1].

Remove gearshift assy [2].

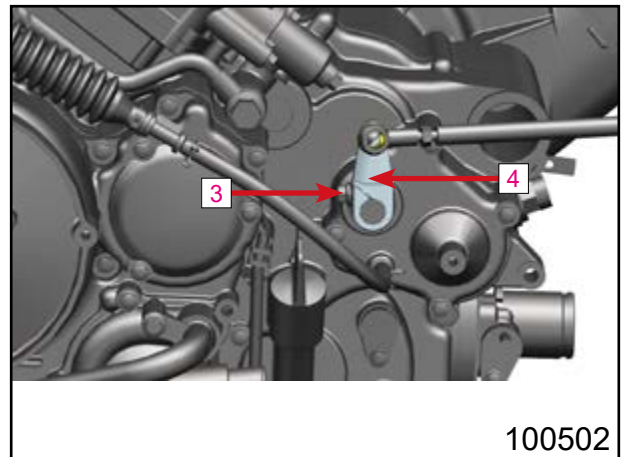


Loosen bolt [3].

Remove gearshift rod [4].

Inspection

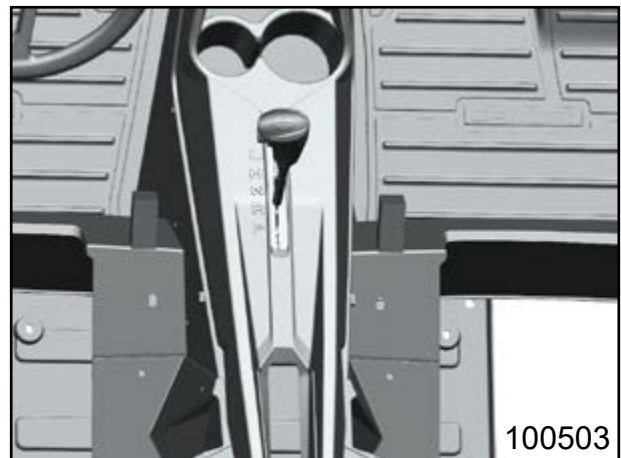
Inspect shift lever for smooth movement.
Adjust it according to following procedures if not smooth.



Adjustment

Adjust shift lever.

Shift lever at N gear.



Loosen two nuts [5]. Adjust shift rod repeatedly until it is at N gear.

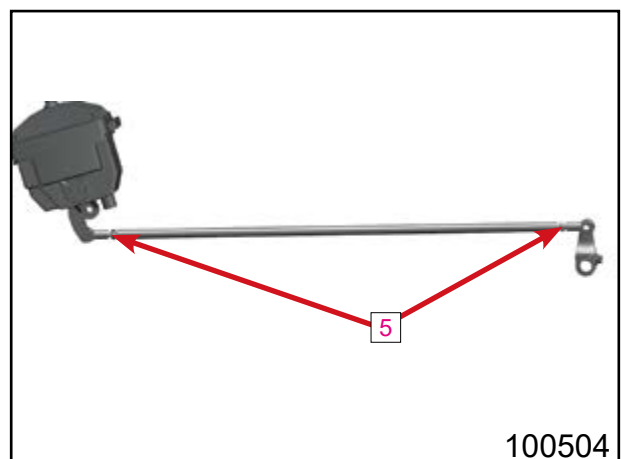
Tighten two nuts [5].

Shift the lever at R, P, H and L gear respectively. Repeat above procedures to make adjustment.

After adjustment, start the engine and test the gearshift function to make sure it is qualified.

Installation

Reverse the removal procedures for installation.



10.3 EPS

EPS (electric power steering) system controls the motor based on the speed and the torque of the steering wheel, providing corresponding assistance to help the driver complete the steering. The system consists of a steering shaft assembly and a controller (ECU). Because the system adopts the speed induction type, it can provide obvious help when the car speed is low, and reduce the fatigue strength of the driver.

Removal

Remove body covering parts (refer to 07 chapter).

Unplug connectors between EPS and controller.

Remove three bolts [1].

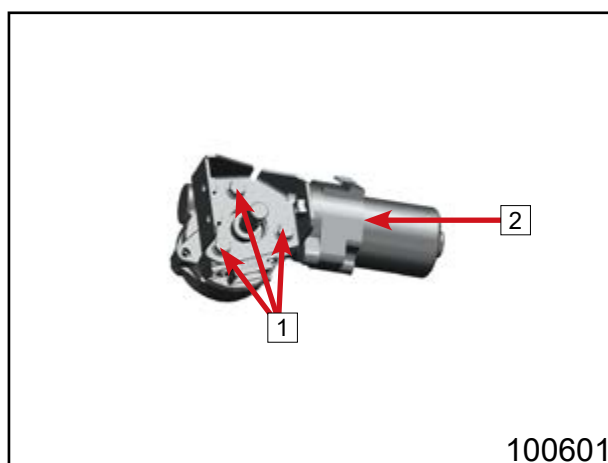
Remove EPS assy [2].

Installation

Reverse the removal procedures for installation.

EPS fuse location refers to 12 Electrical System chapter.

NOTE: After installation, make sure of smooth steering and same steering angle for both sides.



Item	Specification
Operating voltage range	DC 10.6V~16V
Quiescent current	500mA Max
Maximum power supply current	25A
Maximum motor current	45A
Operating temperature range	-40°C~+85°C
Storage temperature range	-40°C~+125°C

Motor type:	Brush DC motor
Rated power	380W
Rated voltage	DC12V
Rated current	40A
Rated torque	4N•m

EPS Operation System

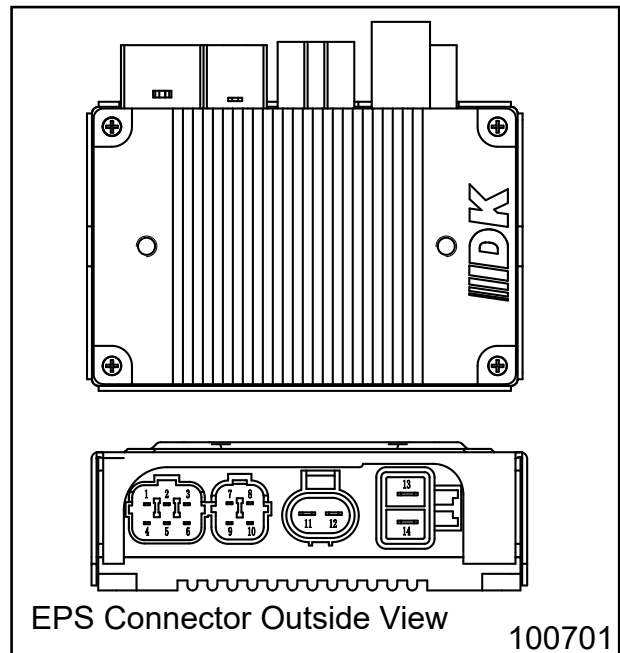
If the vehicle is equipped with the EPS system:

1. Turn on power switch, EPS indicator light will be lighted.
2. Start engine, EPS indicator light goes off and EPS starts working.

NOTE: There is no part in EPS system that allows users to disassemble for repair. If malfunction occurs and it isn't due to wires connection, please contact local distributor or manufacturer for operation.

EPS Pin Function:

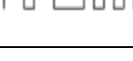
1. Ground wire
2. Engine RPM signal
3. Ignition signal
4. Speed signal
5. Fault signal output
6. K line
7. Sensor positive pole +(5V)
8. Ground wire
9. Sensor secondary moment
10. Sensor main moment
11. Power positive pole
12. Power negative pole
13. Motor positive pole
14. Motor negative pole



10.3.1 EPS failure code table

When malfunction occurs, the EPS indicator light will flicker. Do not turn off the power, please observe the flicker frequency and record flicker regular pattern in one period. Then scan Malfunction failure code table to get and diagnose which malfunction it is.

Failure codes come from the EPS indicator light flicker frequency. Every failure code is made of Double-digit, which showed by long-bright times and short-bright times. The long-bright times is tens digit and the short-bright times is units digit. The long-bright time is 2 seconds. The short-bright time is 1 second, and interval is 1 second. Repeat the process after indicator light is off for 3 seconds.

Code	Wave form	Diagnosis	Solution
21		Main sensor disconnection	Check sensor wiring
22		Main sensor output abnormal (Voltage too high or too low)	
23		Vice-sensor disconnection	
24		Vice-sensor output abnormal (Voltage too high or too low)	
25		Difference of main torque and Vice torque too big	
26		Main torque sensor phase compensation deviation over limit	Replace ECU
32		Motor power-assistance abnormal	Check and fix motor wiring contact status. If still not work, replace the ECU.
33		Controller current over limit	Replace ECU
34		Motor unilateral no power-assistance	
35		Current sensor null offset too big	
36		Motor wire break	Check the motor wire

10.3.2 EPS Fault Analysis and Troubleshooting

No.	Failure Phenomenon	Probable Reason	Troubleshooting
1	Steering without assistance	1. Connectors of wire is bad contact 2. The fuse blew out 3. Relay damage 4. The controller, motor or sensor is damaged	1. Check whether wire connectors are fully inserted 2. Replace the fuse(30A) 3. Replace the relay 4. Contact with suppliers and replace it
2	Power don't weighs the same for left and right	1. The median output voltage have deviation 2. Controller, motor or sensor is damaged	1. Unplug motor connectors,loosen the sensor adjustment screw,adjust the sensor position to keep the voltage in 1.65V±0.05V 2. Contact with suppliers and replace it
3	When system is on, the steering wheel swings on both sides	1. Motor is mounted backwards 2. Controller or sensor is damaged	1. Exchange the position of (thick line) red line and black line at the motor terminal 2. Contact with suppliers and replace it
4	Steering becomes heavy	1. Battery power loss 2. Motor damage (power reduction) 3. Air pressure of the tires (front) is insufficient.	1. Charge 2. Contact with suppliers and replace it 3. Inflate tires
5	System has noise	1. Motor damage 2. Gap of lower steering shaft assembly or mechanical steering assembly is too large 3. Installation of lower steering shaft assembly or mechanical steering assembly is not stable.	1. Replace 2. Replace 3. Check whether the installation screw is tight, reinforcement

11 Cooling System

11.1 Cooling System..... 11-2

11.2 Fan Motor 11-3

11.3 Radiator Fan Inspection..... 11-4

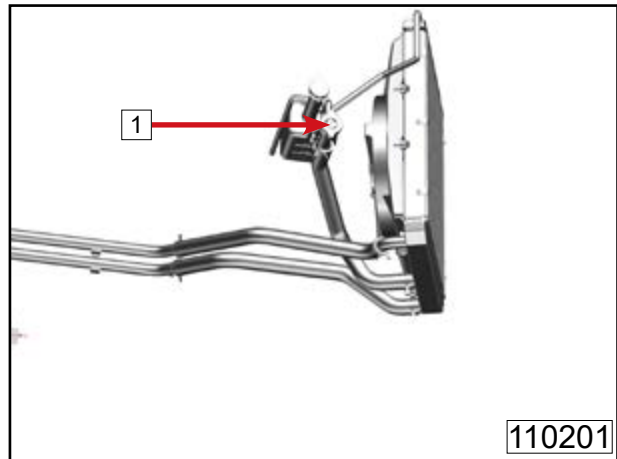
11.4 Cooling System Sealing..... 11-6

11.5 Coolant 11-7

11.1 Cooling System

Removal

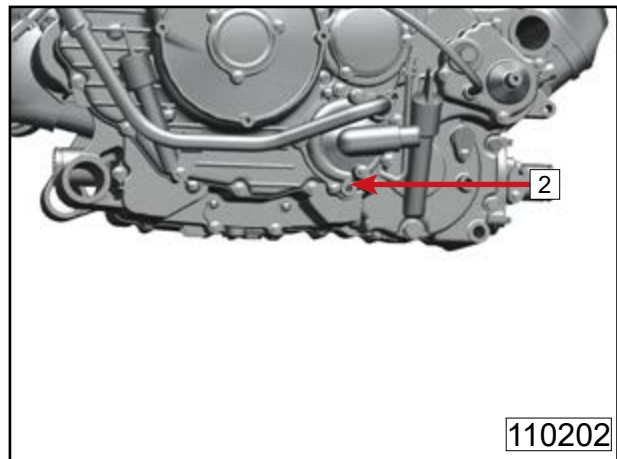
Remove radiator cover [1].



Place a container under the engine water pump.

Remove drain bolt [2].

Drain coolant.



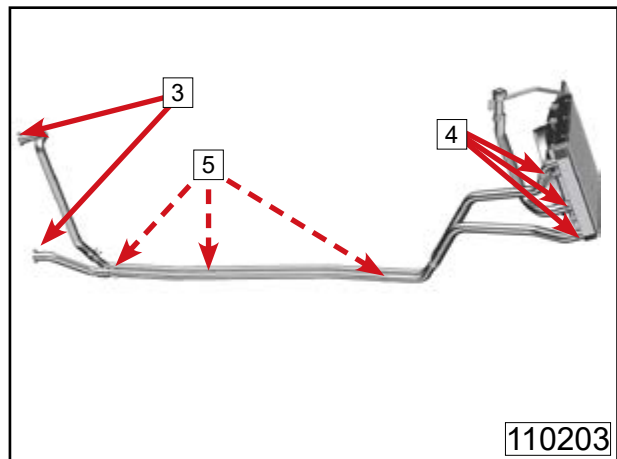
Remove coolant reservoir (refer to chapter 06).

Remove radiator water inlet pipe (refer to chapter 06).

Loosen two steel clamps [3].

Loosen three water pipe clamps [4].

Remove water pipe clasps [5].



Remove two bolts [6].

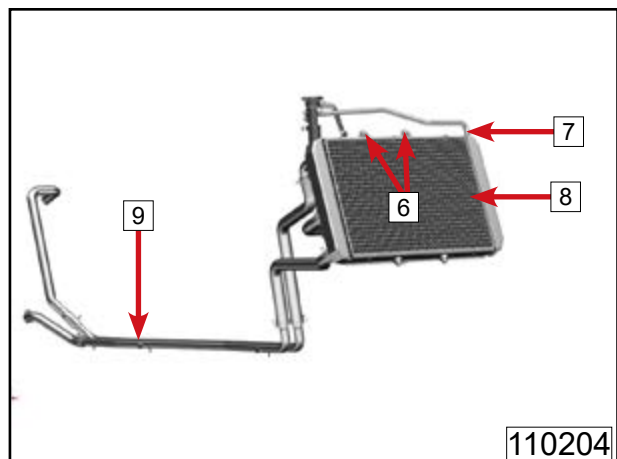
Loosen clamp [7].

Remove radiator [8].

Remove water pipe [9].

Installation

Reverse the removal procedures for installation.



11.2 Fan Motor

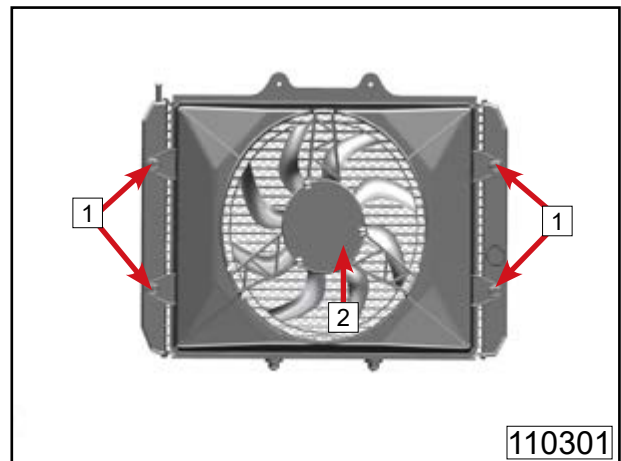
Removal

Remove four bolts [1].

Remove fan [2].

Installation

Reverse the removal procedures for installation.

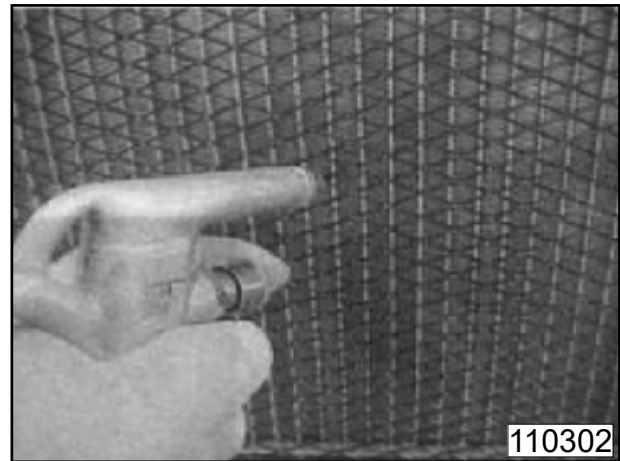


Inspection

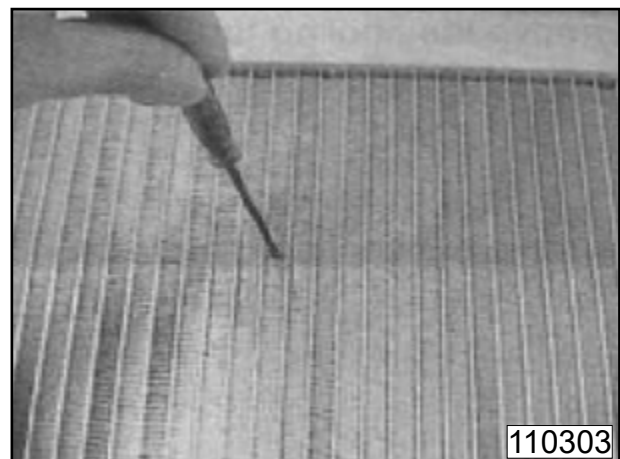
Inspect the radiator fin to see jammed or damaged. Use compressed air or low pressure water to clean the muds or other dirt.

NOTE:

It is not recommended to use high pressure water to clean radiator fin. If so, the radiator fin may be damaged, which affects the cooling function.

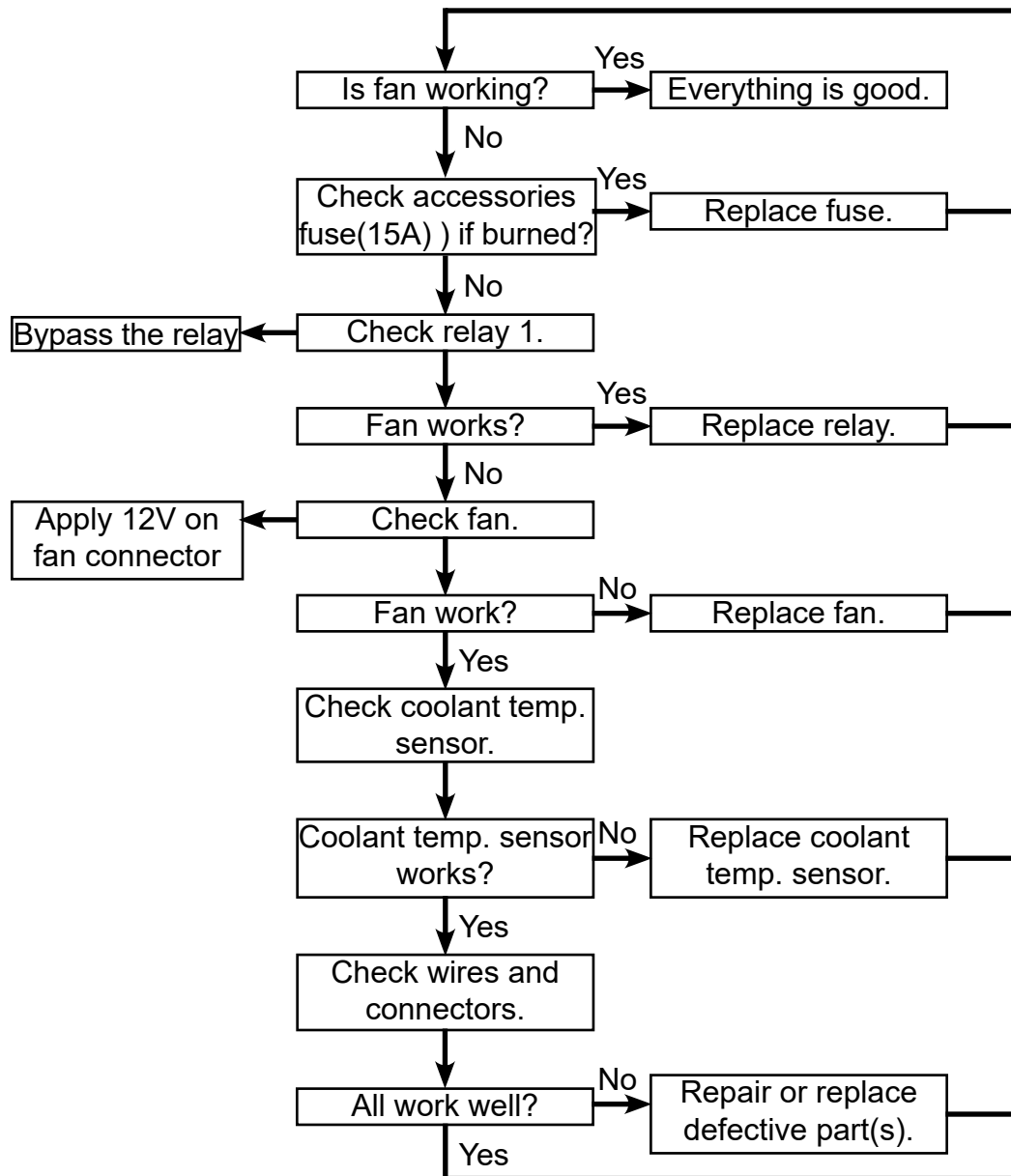


Use screw driver to fix radiator fin.



11.3 Radiator Fan Inspection

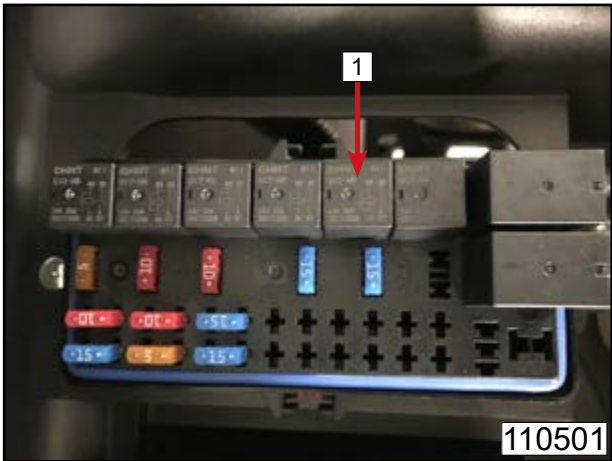
Use the following troubleshooting chart to solve the problem.



Radiator Fan Relay

Relays 1 Installation

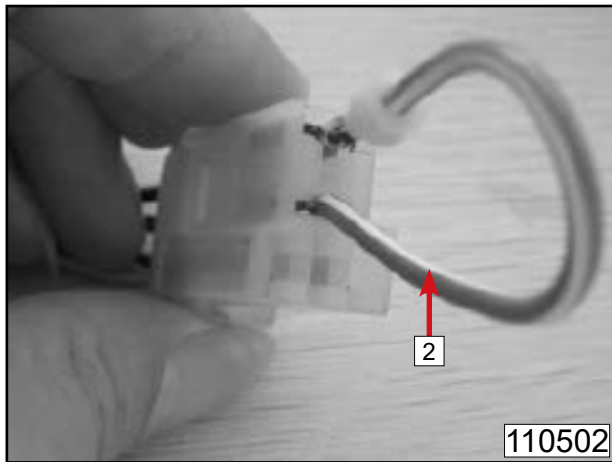
NOTE: Relay can be inverted by 180° to ensure installation and working. Ensure to align tabs of relay with terminals of fuse holder when installation.



Relay Function Inspection

The easiest way to check the relay is to remove it and bypass it with a jumper. If the radiator fan is activated, replace the relay.

See illustration on the right to find where to bypass the relay.



Relay Continuity Test

Remove relay.
Use multimeter and select the Ω position.
Probe relay as follows:

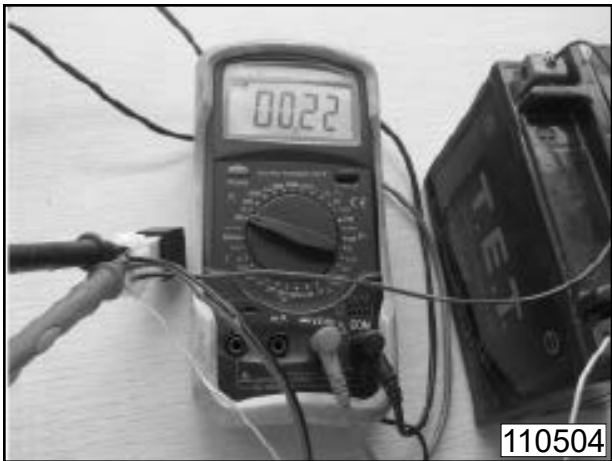
Terminals		Resistance
30	87	Open circuit (OL)



Connect battery as follows:

Terminals		Resistance
30	87	Open circuit (OL)

If relay fails during test, replace it.



11.4 Cooling System Sealing

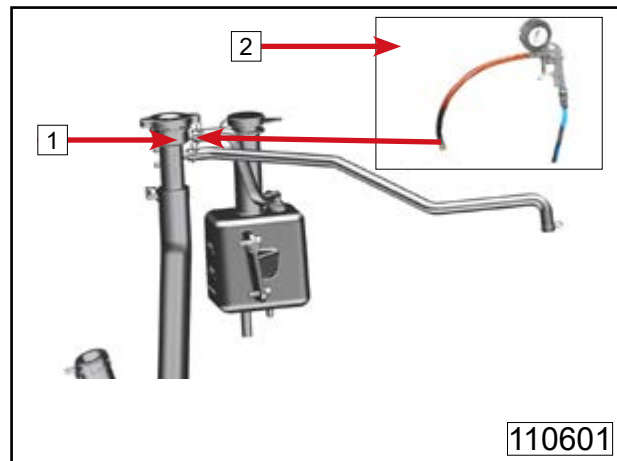
Inspection

Install tester [2] on reservoir tank connector [1].

⚠ CAUTION: Never open radiator cap before engine cools down, in case of being burnt by high temperature vapor.

Blow 0.15Mpa dry compressed air for 30s. If the pressure decreases in 30s, it means there is leakage in cooling system. Inspect the whole system and replace the faulty parts.

NOTE: Cover a cloth on radiator cap when removing the tester, in case coolant spills out.



Inspect radiator pipe for damage or cracks. Rubber hoses become aged because of being heated or long-time use. Pipes may break during heating process. Inspect pipes for cracks or damage by pinching it. Replace if any defect is found.

Inspect cooling system pipe clamps for tightness. Tighten or replace with new parts if loosen.

Inspect water pump, pipes and jointing areas for leaking. Replace if necessary.

11.5 Coolant

Open radiator cap. Add coolant until there is no bubble inside the exceeded coolant from outlet port.

Loosen air relief bolt **1** on engine (just several threads) until coolant overflows from the hole on exhaust bypass. Tighten the air relief bolt.

After full filling the coolant, install radiator cap. Make sure the coolant lever inside the reservoir tank is between UPPER line and LOWER line. Install reservoir cap. Start the engine until thermostat works. Shut down engine.

Wait until engine cools down, check the coolant level inside radiator and reservoir tank. Add coolant if necessary.

If the level is below the LOWER line, add coolant until the level reaches UPPER line. If the level is above UPPER line, drain the redundant coolant.

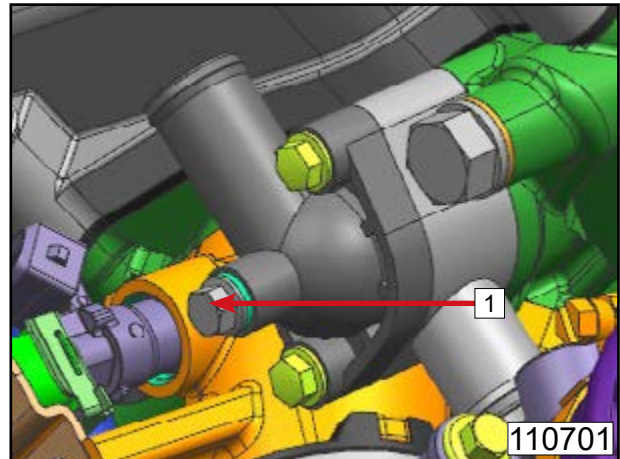
Recommended Coolant:

Coolant normal concentration of CFMOTO:

Anti-freezing agent: 50%

Water: 50%

Recommended anti-freezing agent level: 35°C
(The freezing resistance temperature of coolant is different with different mixing ratio. Please adjust the mixing ratio according to the minimum temperature in the area where the vehicle is used.)



NOTE: Never open the radiator cap until the engine cools down to avoid burns caused by liquid coolant.

NOTE: Do not use only antifreeze or tap water in cooling system. Tap water contains minerals and tends to produce contaminants in cooling system during usage. In cold season, pure water can cause system damage or thicken the coolant, which decreases cooling efficiency. For aluminum engines, it is strongly recommended to adhere to ethylene glycol coolant containing corrosion inhibitives.

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12 Electrical System

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12.1 Diagnosis Tool

Tool: PDA

Function:

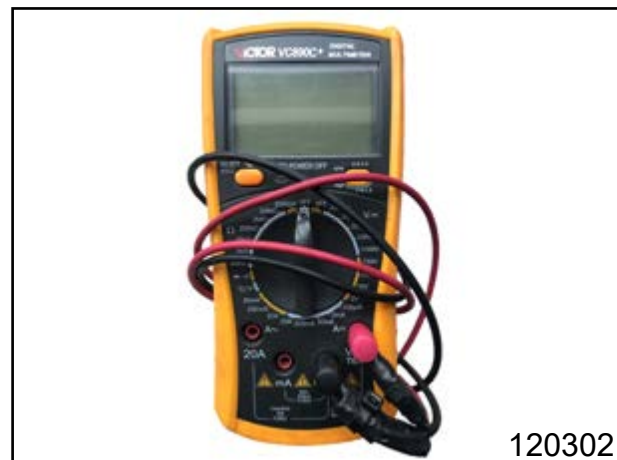
Read/clear EFI system fault codes, observe data stream.



Tool: Digital Multimeter

Function:

Measure voltage, current and resistance and other parameters in EFI system.



12.2 Signal and Illumination System

12.2.1 Battery

⚠ CAUTION:

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.
7. Keep batteries out of reach of children.

Shut down all electrical devices and engine during removal.

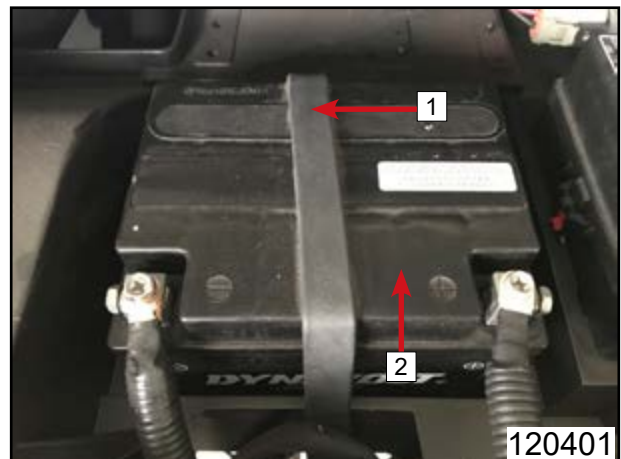
Removal

Remove strip [1].

Remove lock bolt and battery negative cable.

Remove lock bolt and battery positive cable.

Remove battery [2].



12.2.2 Battery Charging

⚠ CAUTION:

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.

Charging

Shut down all 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.

12.2.3 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.

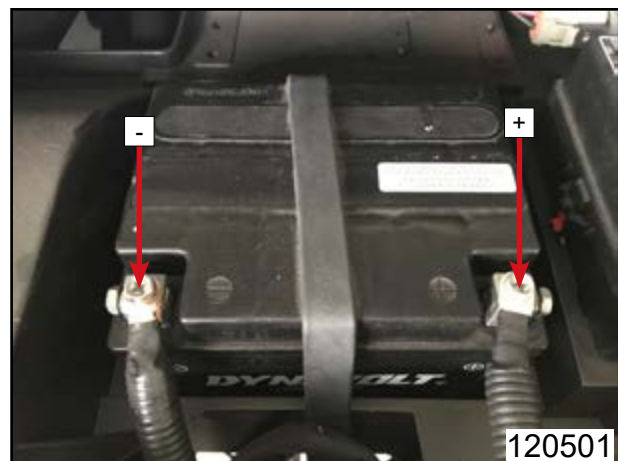
Inspect engine electronic winding.

If more than specification:

Replace regulator.

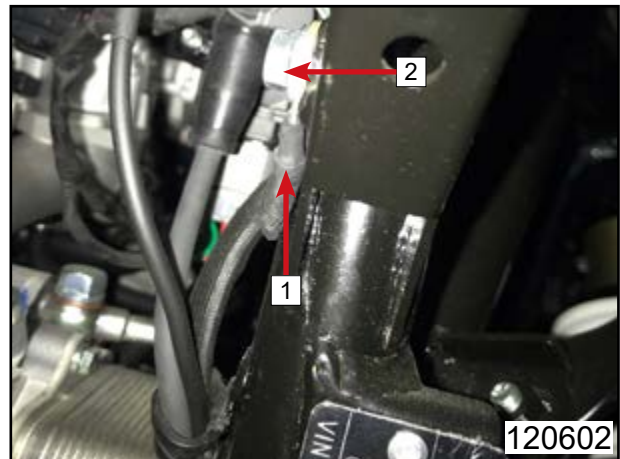
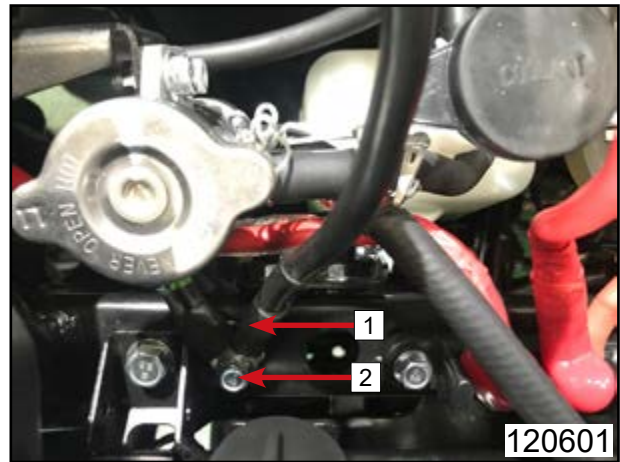
Installation

Reverse the removal procedures for installation.



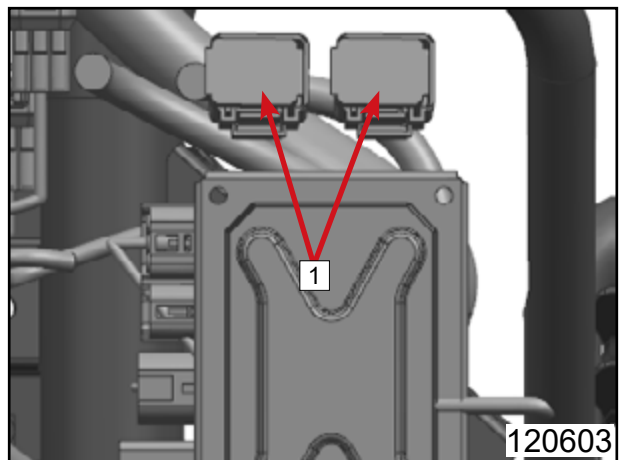
12.3 Earth Wire Inspection

Shut down all electrical devices and engine.
Inspect earth wire [1] for normal function.
Inspect bolt [2] for looseness.



12.4 Fuse

Main fuse [1] 40A (wire color: R and R/W)
EPS fuse [1] 40A (wire color: R/W and R/W)



12.5 Light Maintenance Information

Pre-cautions

⚠ CAUTION:

1. Headlight is a high watt light. The temperature is very high when it is on. Make operation until the light totally cools down.
2. Temperature alarm switch inspection uses fire source and high temperature liquid. Do not place combustible material nearby and pay attention not to get burnt.
3. The headlight temperature will be very high when it is on. If use bare hands or with dirty gloves to touch the bulb. It may be covered with oil dirt, which leads to heat point, bulb deformation and damage.
4. Be careful when replacing the bulb. Do not replace the bulb when the light is on. Turn off the ignition and wait for the bulb totally cools down. Wear clean gloves on during replacement to avoid dirty oil on glass. Use clean cloth with alcohol or lacquer thinner to clean the oil on bulb.
5. Check the battery performance if use the battery for inspection.

Maintenance standard

Item Standard		Standard
Fuse	Main	40A
	Secondary	5A×1 10A×2 15A×4 40A×1
Light and bulb	Headlight	30W (High-beam) 14.2W (Low-beam) 3.5W (position light) 23W (turn light)
	Brake light	4.5W
	Signal indicator	LCD+LED
	Rear license light	H2 W5W bulb

12.6 Illumination Inspection

Turn ON ignition switch.

Turn on the headlight switch.

Inspect the headlight is on or not.

1. ON: Normal

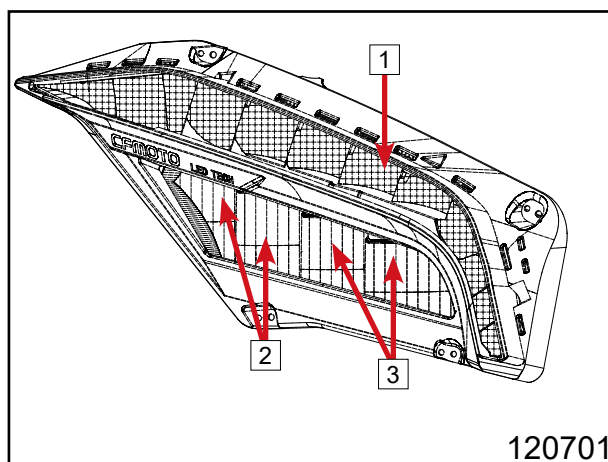
2.OFF:

(1) Main cable open or shortcut

(2) Fuse burnt

(3) Switch damaged

(4) Relay damaged or bad contact



120701

1	DRL/position light/turn light	
2	Low-beam light	3 High-beam light

12.7 Light Removal and Installation

12.7.1 Headlight Assy

Headlight assy removal refers to 06 chapter.

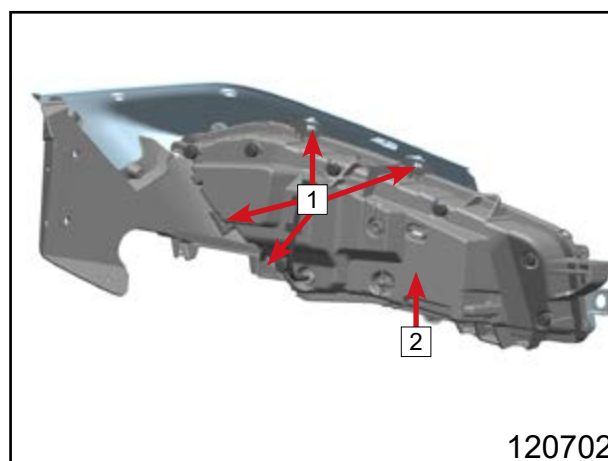
Remove four self-tapping screws [1].

Remove headlight [2].

Installation

Reverse the removal procedures for installation.

LH and RH headlight uses the same removal&installation procedures.



120702

12.7.2 Tail Light Assy

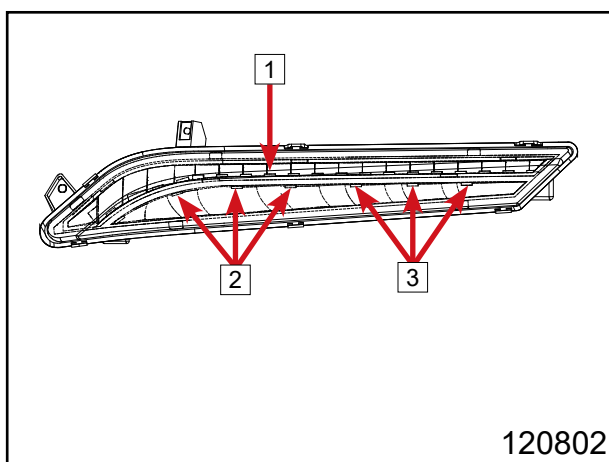
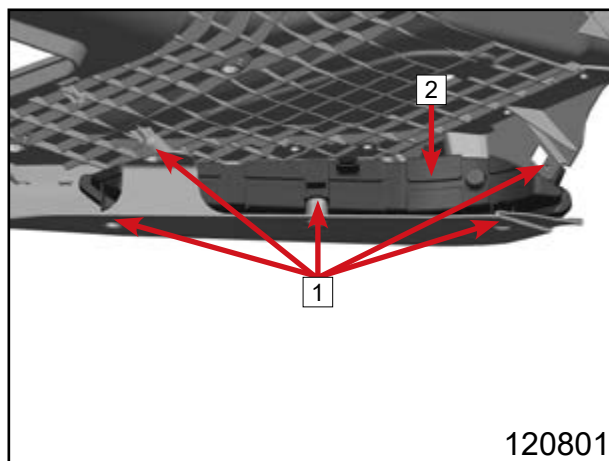
Remove self-tapping screws [1].

Remove tail light assy [2].

Installation

Reverse the removal procedures for installation.

NOTE: The headlight and tail light are consisted of LED lights. When the light damages, replace the whole set.



1	Position light	2	Turn light(EU)	3	Brake light
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12.8 Horn

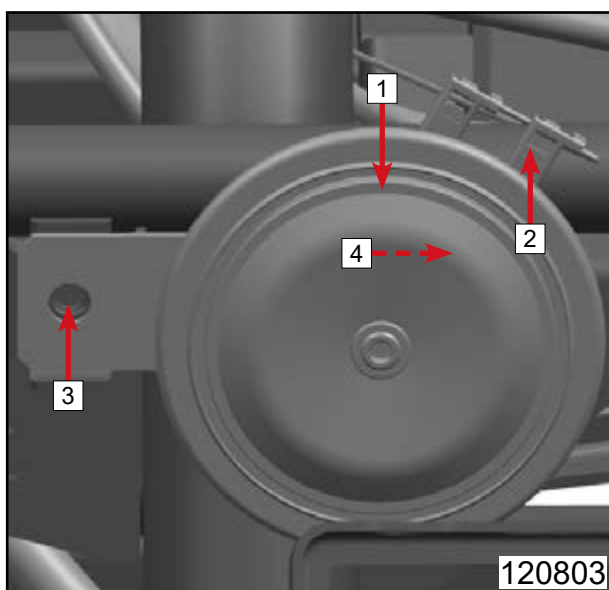
Inspection

Remove horn.

Connect horn with 12V battery to inspect horn for normal performance.

Replace if any defect is found.

If the horn sound quality isn't good, turn the adjusting screw to achieve the best sound quality.



1	Horn	2	Wire connector
3	Bolt	4	Adjusting screw

12.9 Switches

Unplug connectors between switches and main cable. Inspect switch performance.

Stop switch						
Color Function	R Gr	Y	B	Gr B	B Br	Gr B
						
						



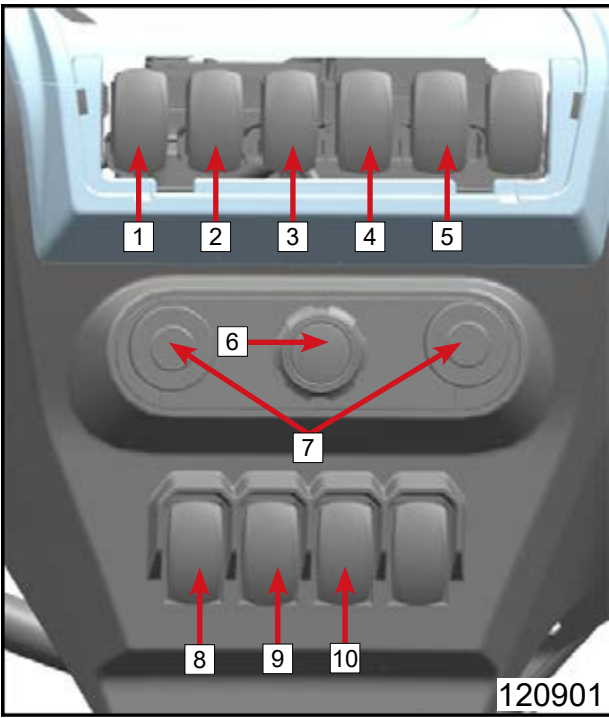
Illumination switch						
Color Function	B Br	Br	B Br	W L	B Br	G B
						
						
						



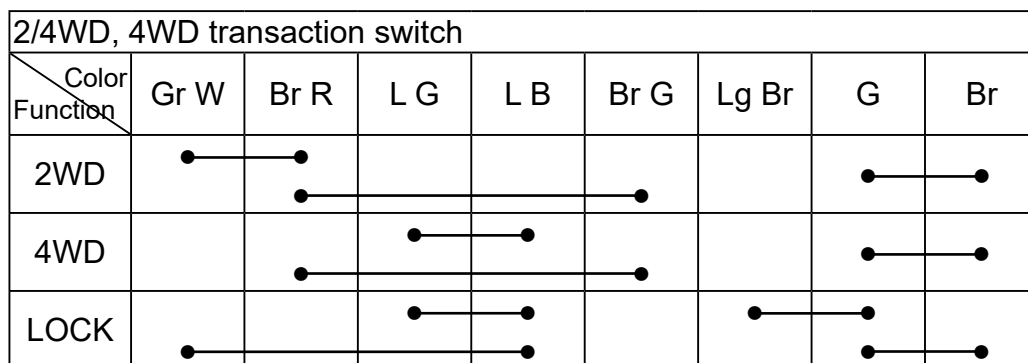
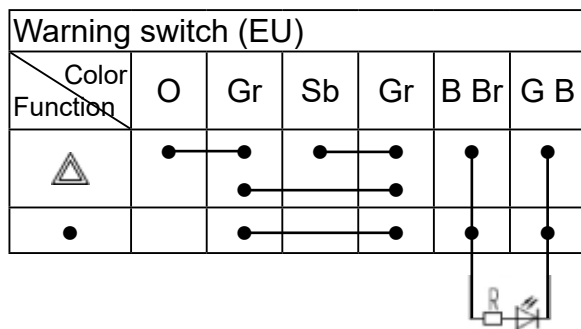
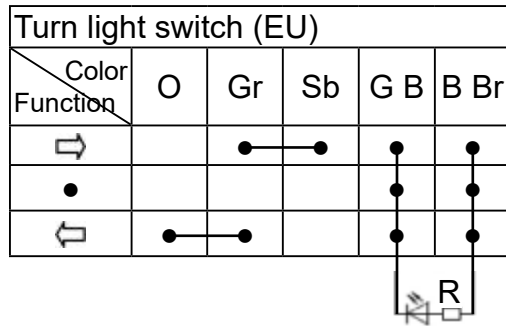
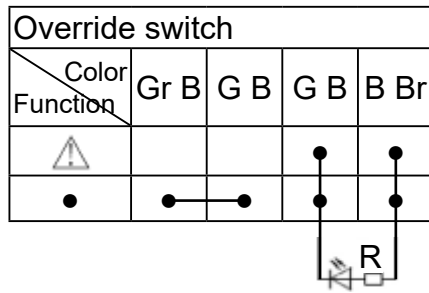
Dimmer switch				
Color Function	W	W L	L	G B B Br
				
				



Horn switch			
Color Function	Lg	B Br	G B B Br
			
			



1	Stop switch	2	Illumination switch	3	Dimmer switch
4	Horn switch	5	Override switch	6	Ignition switch lock
7	DC outlet/USB connector	8	2WD, 4WD switch	9	Turn light switch (EU)
10	Warning switch (EU)				



12.10 Ignition Switch Lock

Removal

Remove upper dashboard panel refer to 06 chapter.

Remove ignition switch lock 1 by rotating it counter-clockwise.

Inspection

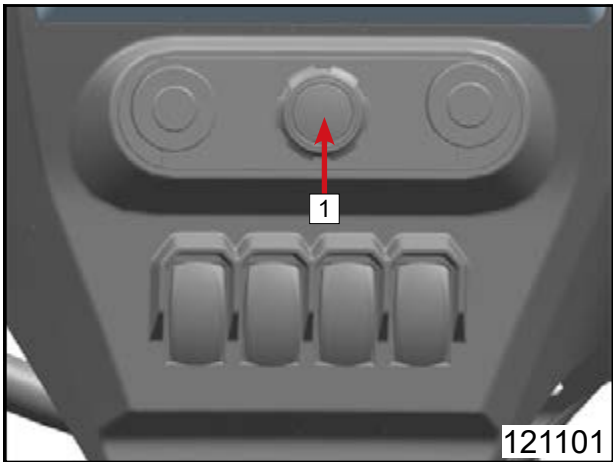
Follow the tables below to inspect ignition switch lock performance.

●—● means the connection is normal.

Color Function	R	B	Y	Gr R
OFF				
ON	●—●			
START	●—●		●—●	

Installation

Reverse the removal procedures for installation.



12.11 Winch Control Switch

Unplug winch control lever and winch control seat connectors.

Inspect switch performance.

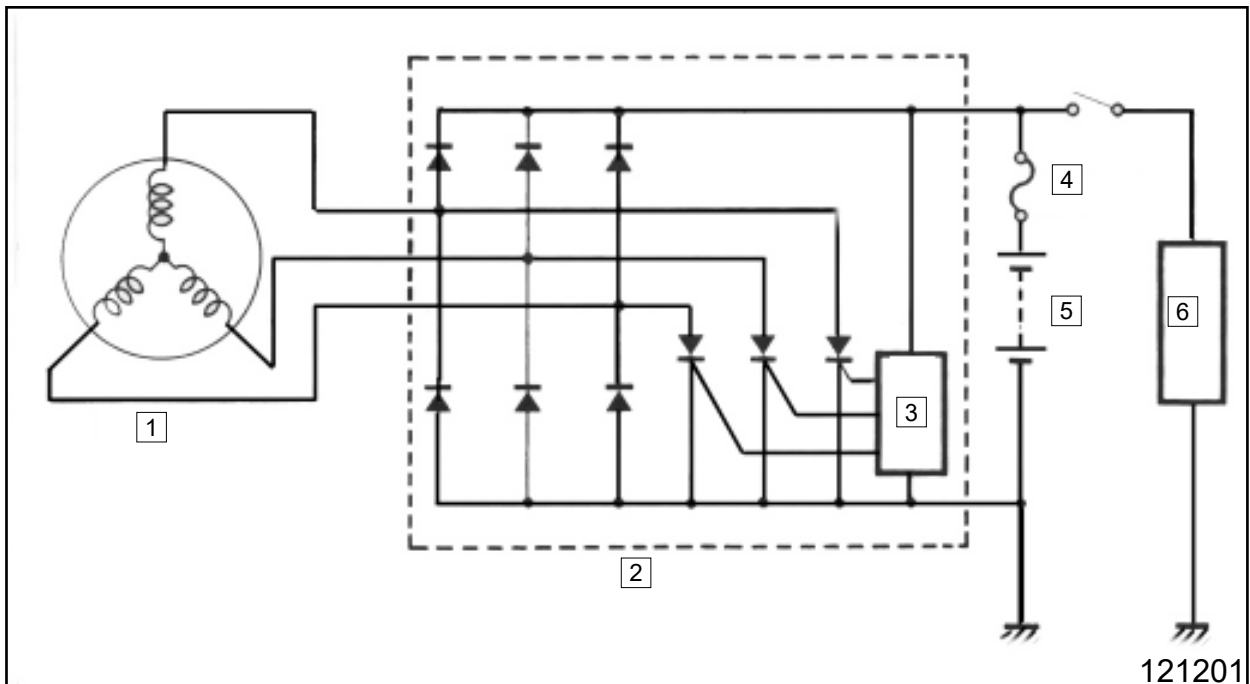
Winch control lever			
Color Function	B	R	G
IN		●—●	
OUT	●—●		



Winch control lever

12.12 Charging System

12.12.1 Charging system wiring



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

Magneto Coil Resistance

Measure resistance between 3-phase magneto stator coil.

If the resistance is out of specification, replace with a new stator.

Check for the insulation between stator coil and core.

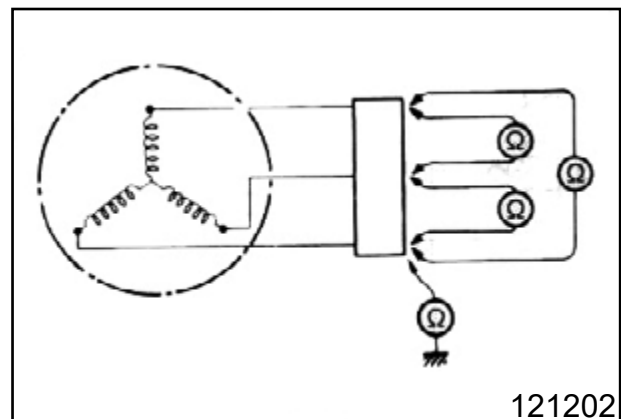
Turn multimeter to $1 \times 10\Omega$

MAG Coil Resistance:

$0.5\Omega \sim 1.5\Omega$ (Yellow-Yellow)

Resistance between Stator Coil and Core:

$\infty\Omega$ (Yellow-Ground)



Resistance measurement

MAG Non-loaded Performance

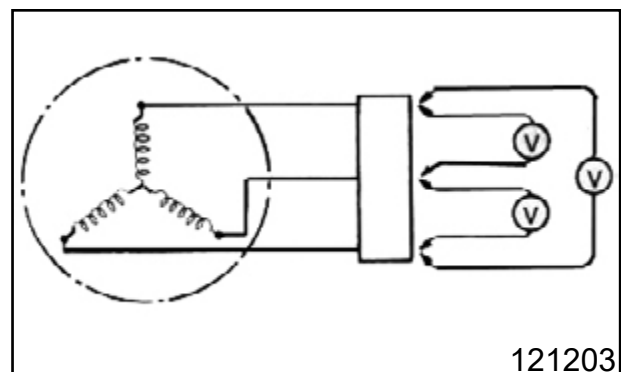
Start the engine and allow it run at 5000r/min. Use multimeter to measure the voltage between 3 output lines.

If the reading is below specification, replace with a new magneto.

Turn Multimeter to **V(AC)**.

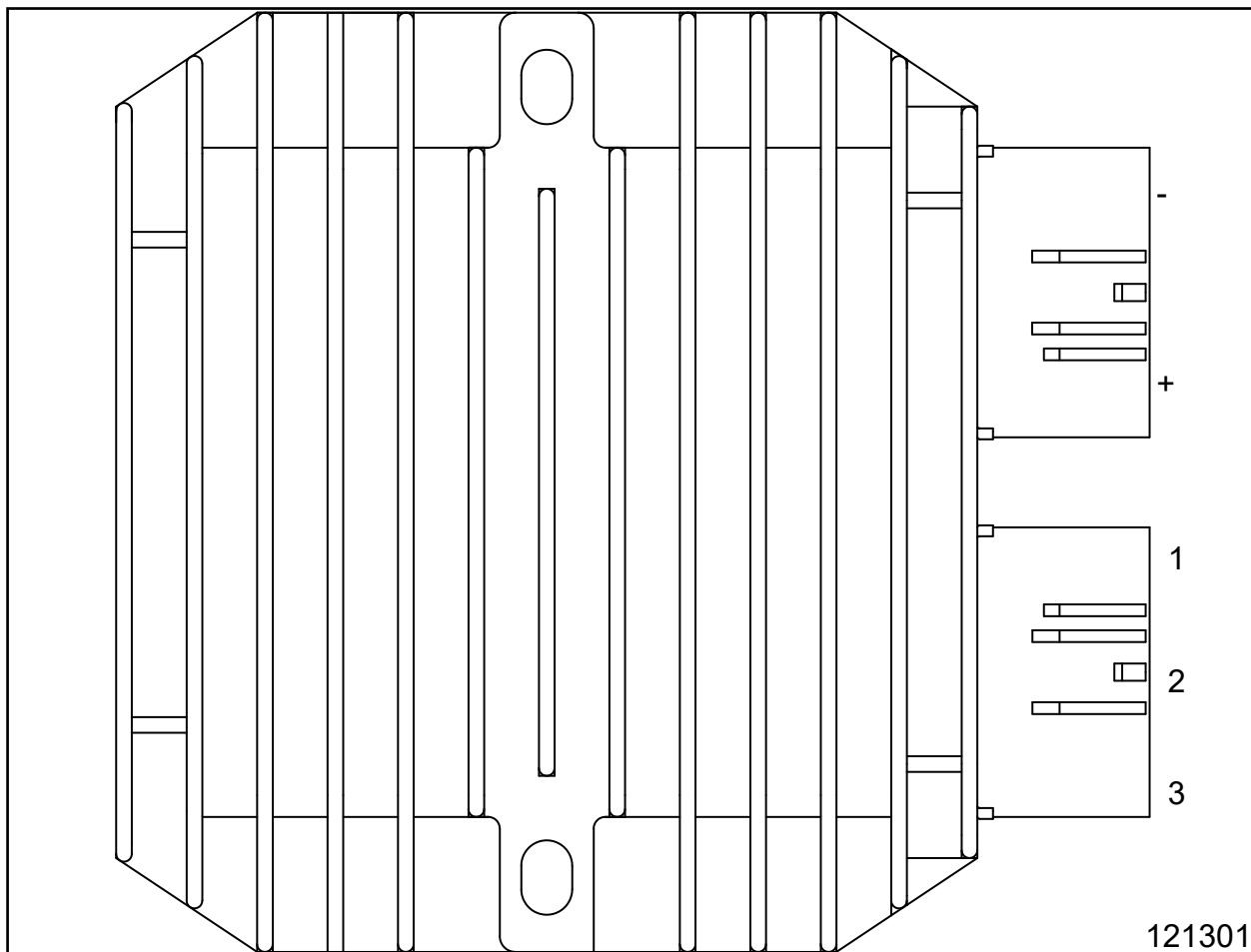
Voltage between Output Lines When MAG Non-loaded:

$>75V(AC)$ at 5000r/min



Voltage measurement

Regulator



Use multimeter to measure resistance between connectors. Replace the regulator If any data is beyond standard.

After engine works and battery is full charged, if the voltage between positive and negative terminal exceeds 15V or is lower 12V, replace with a new regulator.

(+)						
(-)		1	2	3	(-)	(+)
	1		∞	∞	100~800	∞
	2	∞		∞	100~800	∞
	3	∞	∞		100~800	∞
	(-)	∞	∞	∞		∞
	(+)	100~800	100~800	100~800	100~800	

12.12.2 STARTER RELAY

Put DC12V between positive and negative terminal. Use multimeter to check connection between 2 contacts.

If multimeter clicks, there is connection.

If DC12V is removed, no connection between contacts.

If both above 2 items are proved, it indicates the replay is good. Turn multimeter to DIODE.

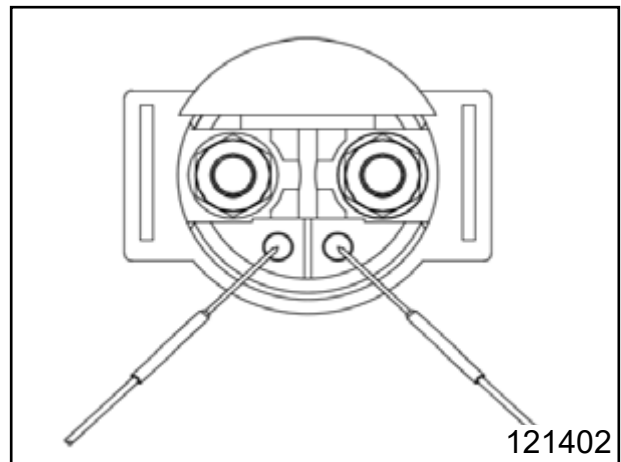
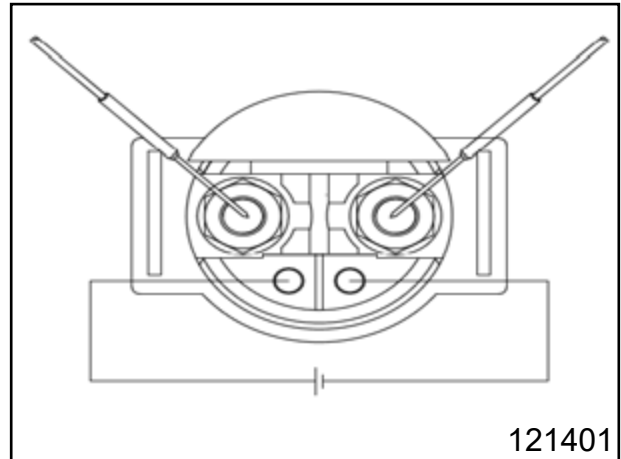
NOTE: The voltage loaded between terminals can not exceed 2 minutes. Otherwise, starter relay may overheat or burn.

Use multimeter to measure the start relay coil resistance.

If the resistance is out of standard, replace with a new one.

Turn multimeter to $1 \times 10\Omega$

Start auxiliary relay resistance: $3\Omega \sim 5\Omega$



12.12.3 Start Auxiliary Relay, Fuel Pump Relay

Put 12V between auxiliary starter relay positive and negative terminal. Use multimeter to check the continuity between A and B.

Turn multimeter to DIODE.

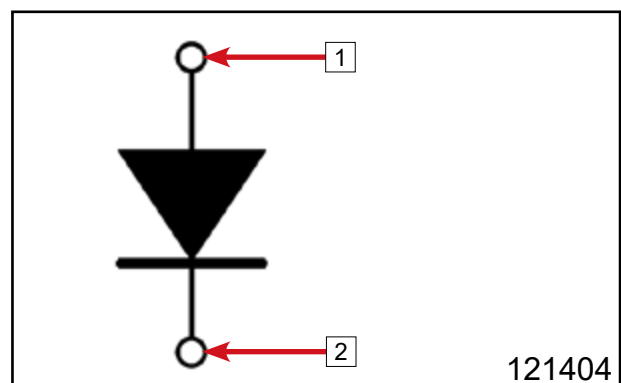
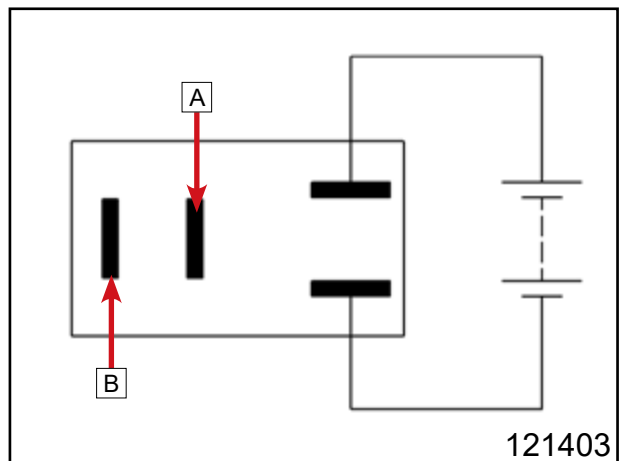
If multimeter clicks, it indicates there is connection between A and B.

If 12V is removed, no connection remains between contacts.

If both above 2 items are proved, it indicates the replay is good.

Turn multimeter to $1 \times 100\Omega$ to measure the relay resistance.

Auxiliary starter relay resistance: $90\Omega \sim 100\Omega$



1 Ground 2 Battery positive pole

12.12.4 Engine Starting Note

Properly route according to starting schematic diagram.

Before start engine, check if all parts are installed correctly. EFI parts connection refers to EFI section.

Check air intake system.

Check fuel system to ensure there is no block or leaks. Clean if blocked to make sure the fuel tail is OK. Reconnect the leaking area to make sure there is no leaking.

Measure fuel pressure with fuel pressure gauge.

**Pressure in fuel pump outlet:
330kPa $\pm$ 5kPa**

Shift gear in Neutral.

Check EFI with PDA for fault. Eliminate the trouble according to DTC (Diagnostic Fault code).

Turn on ignition switch and press start switch for (3~5)s.

After engine starts, warm up until idle speed is stable and check it.

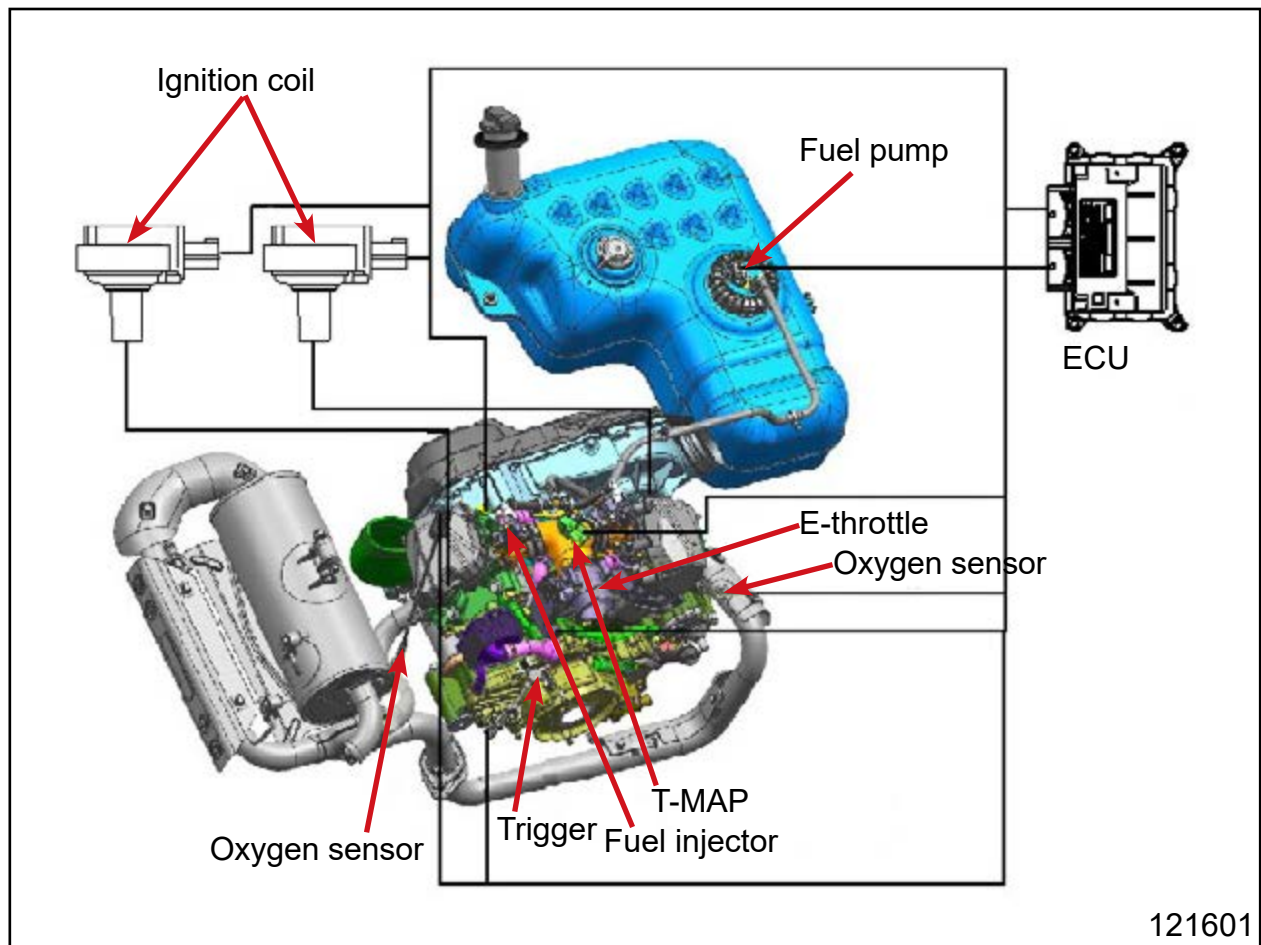
Idle Speed: 1300r/min $\pm$ 130r/min



Fuel gauge

12.13 EFI system

12.13.1 EFI structure



12.13.2 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 and temperature information)

TPS (load, load range, speed information)

Trigger (crankshaft information)

Coolant temp. sensor (engine temp.)

Speedometer sensor (output shaft RPM information)

Phase sensor (gear information)

Oxygen sensor (air factor= $\lambda > 1$ or < 1)

12.13.3 ECU

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

12.13.4 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)

• **Throttle Valve** (Provide engine with intake air)

12.13.5 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.

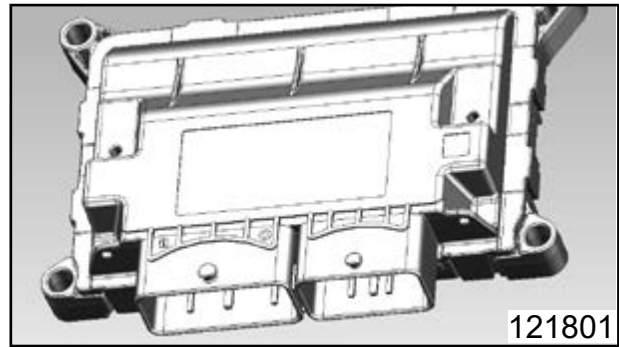
Fuel line removal and fuel filter replacement should be practiced by a professional person in a well-ventilated place.

- 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.

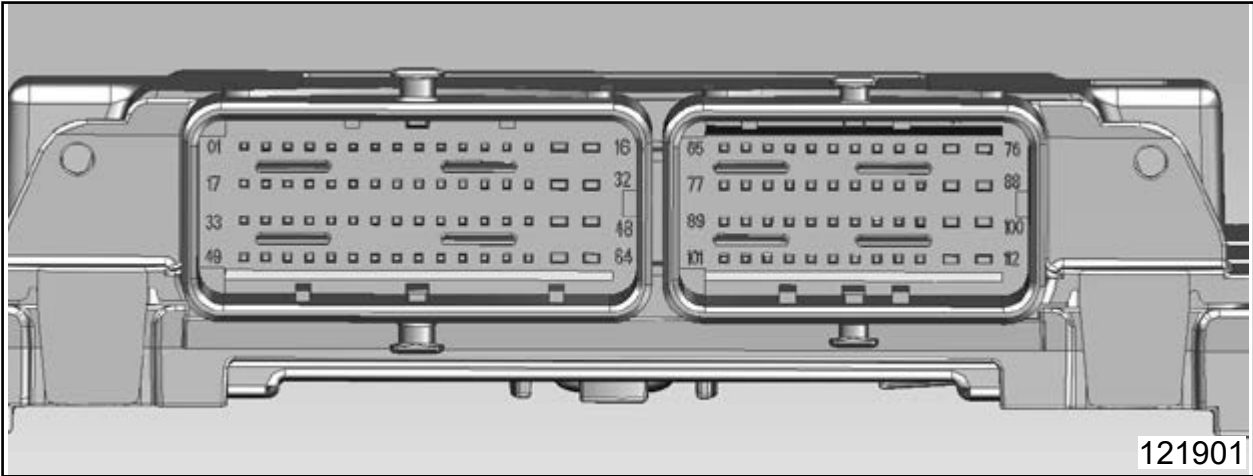
12.14 Structure and Performance of EFI Parts

12.14.1 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:**



Pin	Function	Pin	Function	Pin	Function
1	CAN high	39	Null	77	TPS 1
2	Null	40	Null	78	TPS 2
3	Null	41	Fuel pump relay	79	Null
4	Null	42	Headlight relay	80	Sensor 1 ground
5	Main relay	43	Oxygen sensor 2 ground	81	Null
6	4WD diff-lock switch	44	Mode switch	82	MIL
7	Pedal 1 ground	45	Override pedal sensor 1	83	Null
8	Null	46	Null	84	Sensor ground
9	Null	47	Null	85	Air intake pipe sensor ground
10	Speed input	48	Oxygen sensor heating 2	86	TPS ground
11	Seat belt switch	49	Null	87	Throttle actuator B
12	Null	50	Null	88	Null
13	Null	51	Null	89	Null
14	Override switch	52	Null	90	Null
15	Interruptible battery 1	53	Null	91	Air intake pressure sensor
16	Interruptible battery 2	54	Null	92	Null
17	CAN low	55	Null	93	Null
18	K_line	56	Fan control 1	94	Null
19	Null	57	Null	95	Null
20	Uninterrupted battery	58	Starter motor control relay	96	Engine RPM sensor A
21	Oxygen sensor 2	59	Pedal 2 ground	97	Engine RPM sensor B
22	Null	60	Null	98	Null
23	Brake switch	61	Null	99	Ignition coil 2
24	Low speed switch	62	Null	100	Ignition coil 1
25	Brake light switch	63	ECU ground 2	101	Engine temp. sensor
26	Null	64	ECU ground 1	102	Air intake temp. sensor
27	Neutral gear switch	65	Null	103	Null
28	Null	66	Null	104	Oxygen sensor 1
29	Reverse gear switch	67	Null	105	Null
30	Override pedal sensor 2	68	Fuel injector 1	106	P gear switch
31	Null	69	Null	107	TPS 5V power
32	Null	70	Null	108	Null
33	Null	71	Null	109	Air intake pipe sensor 5V power
34	Engine RPM output	72	Fuel injector 2	110	Null
35	Ignition switch	73	Oxygen sensor heating 1	111	ECU ground 4
36	Pedal 2 5V power	74	Null	112	ECU ground 3
37	Pedal 1 5V power	75	Throttle actuator A		
38	Null	76	Null		



ECU pin view

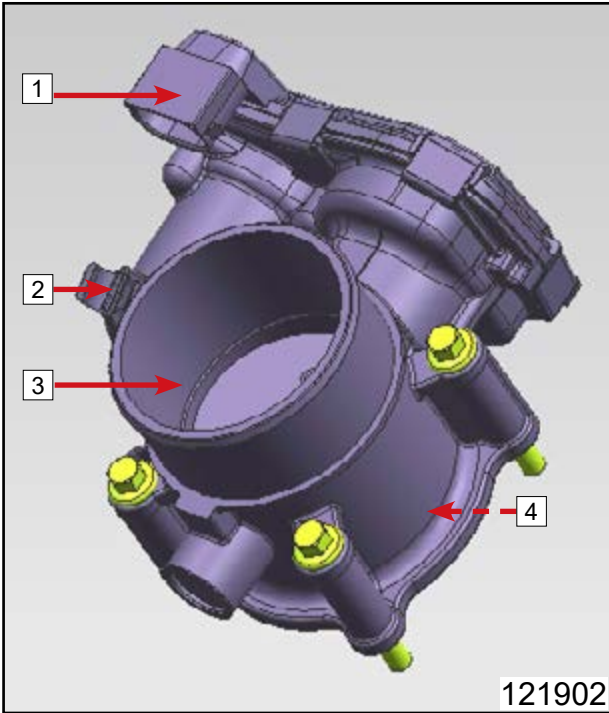
Limit Data:

Item		Value			Unit
		Min.	Standard	Max.	
Battery voltage	Normal	9.0	14.0±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		-30		60	°C
Storage temperature		-40		90	°C

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

12.14.2 Throttle Assy

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.



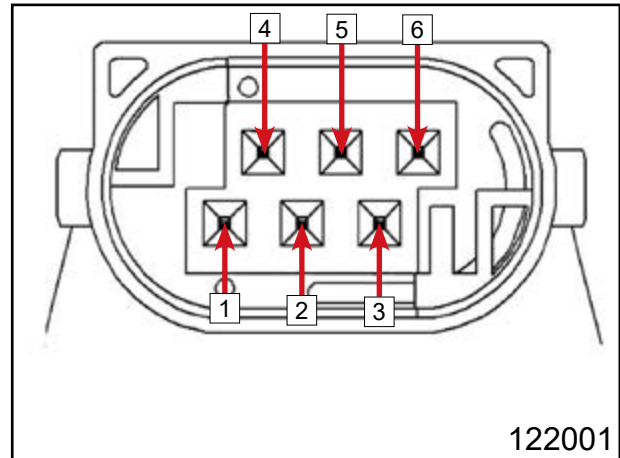
Throttle assy

1	TPS	3	To air filter
2	Motor	4	To air intake pipe

12 Electrical System

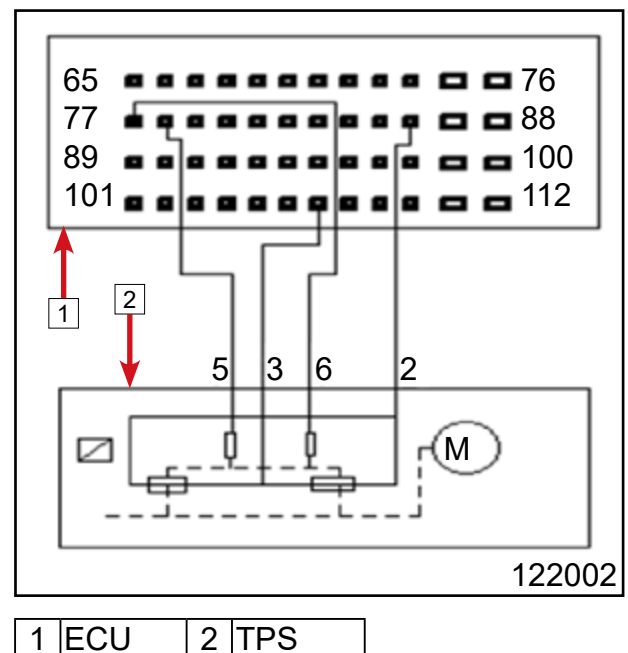
TPS

- 1#: Throttle control actuator motor negative
- 2#: TPS ground
- 3#: TPS power
- 4#: Throttle control actuator motor positive
- 5#: TPS 2
- 6#: TPS 1



TPS connector

Circuit connecting with ECU.

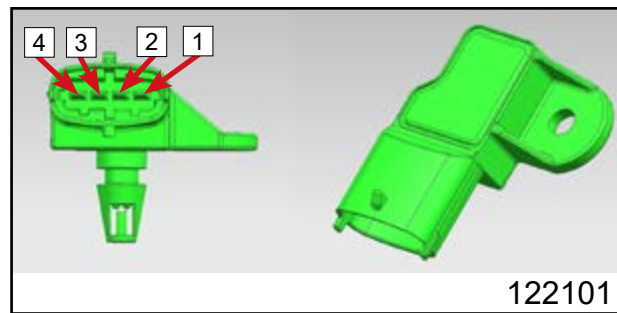


12.14.3 T-MAP

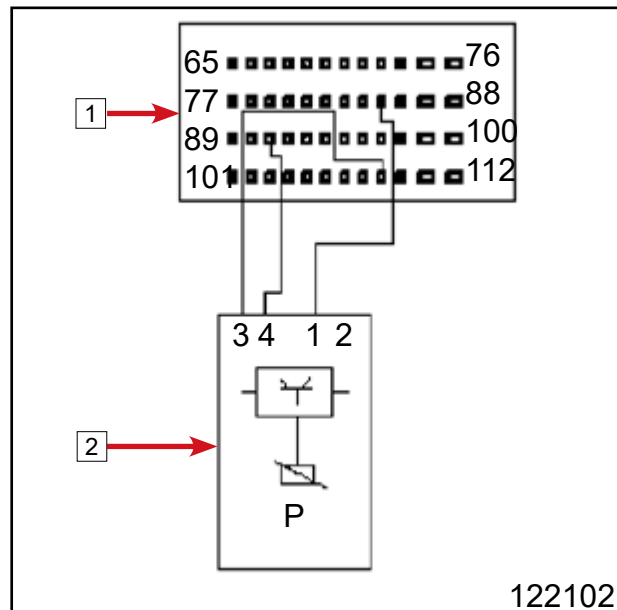
This sensor monitor intake air pressure, which provides the engine load signal to ECU.

Pin function:

1. Ground
2. Air intake temp. signal
3. To 5V power
4. Air intake pressure signal

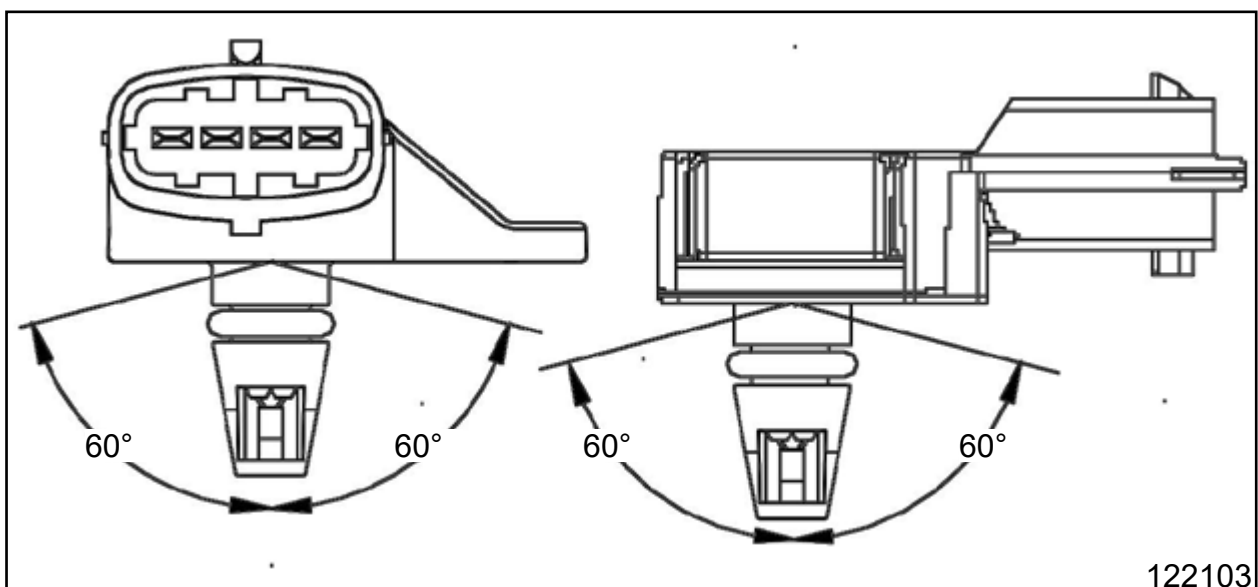


Circuit connecting with ECU.

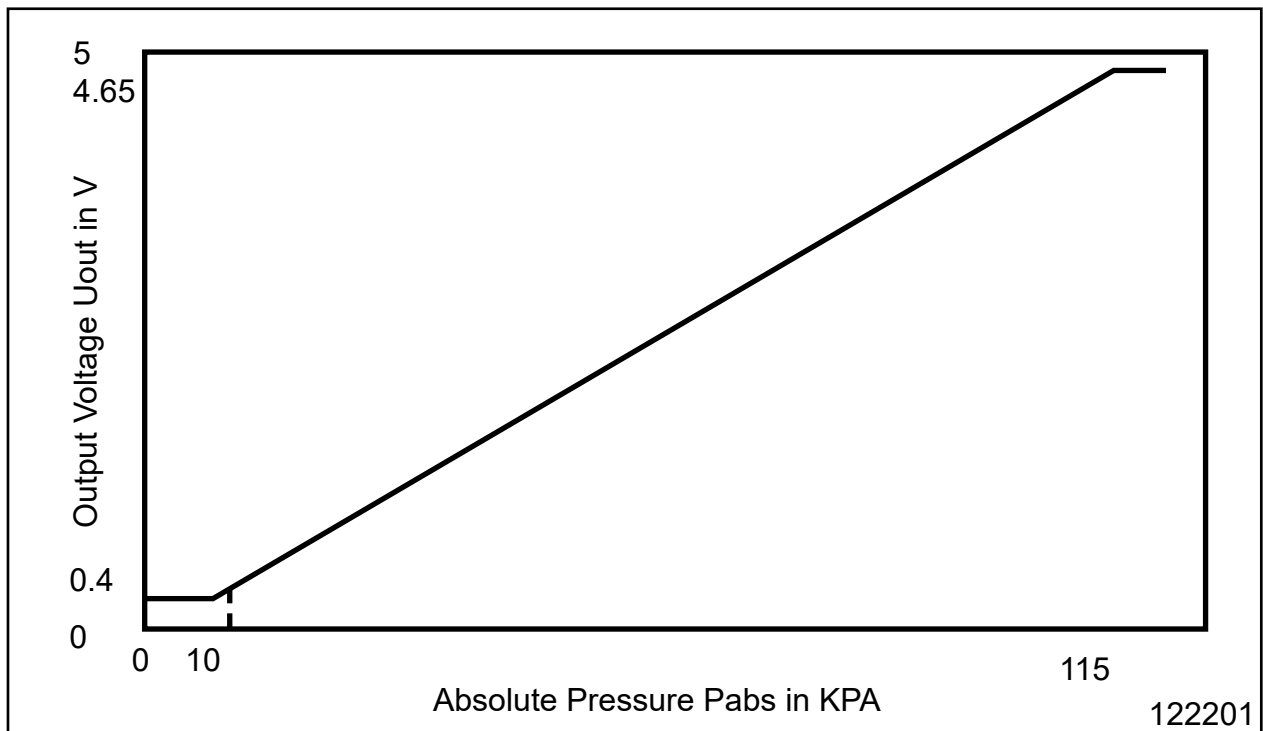


1	ECU	2	Air intake pressure sensor
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The picture below shows the allowable mounting range, which ensures that condensation does not form inside the sensor, as the condensation damages pressure sensitive elements within the sensor.



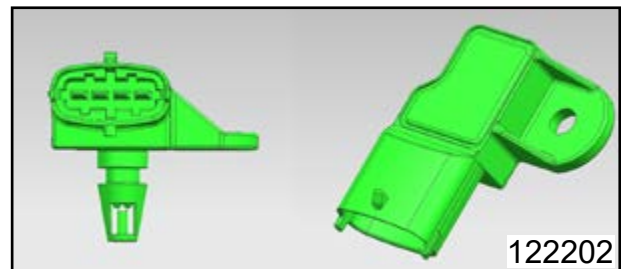
The relationship between output voltage and pressure.
Pressure range: 10kPa~115kPa



12.14.4 Air Intake Temp. Sensor

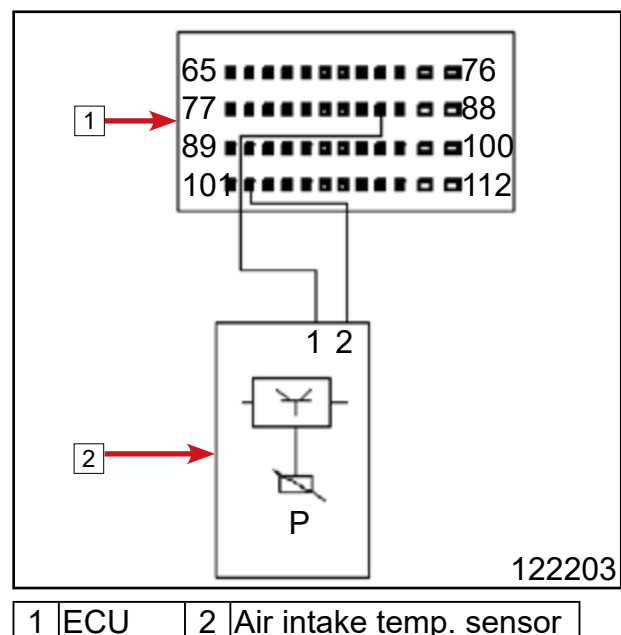
This sensor is an NTC thermo resistance. The resistance is getting higher with coolant temperature, but not in linear relationship.

Air pressure sensor and temp. sensor are sealed together.

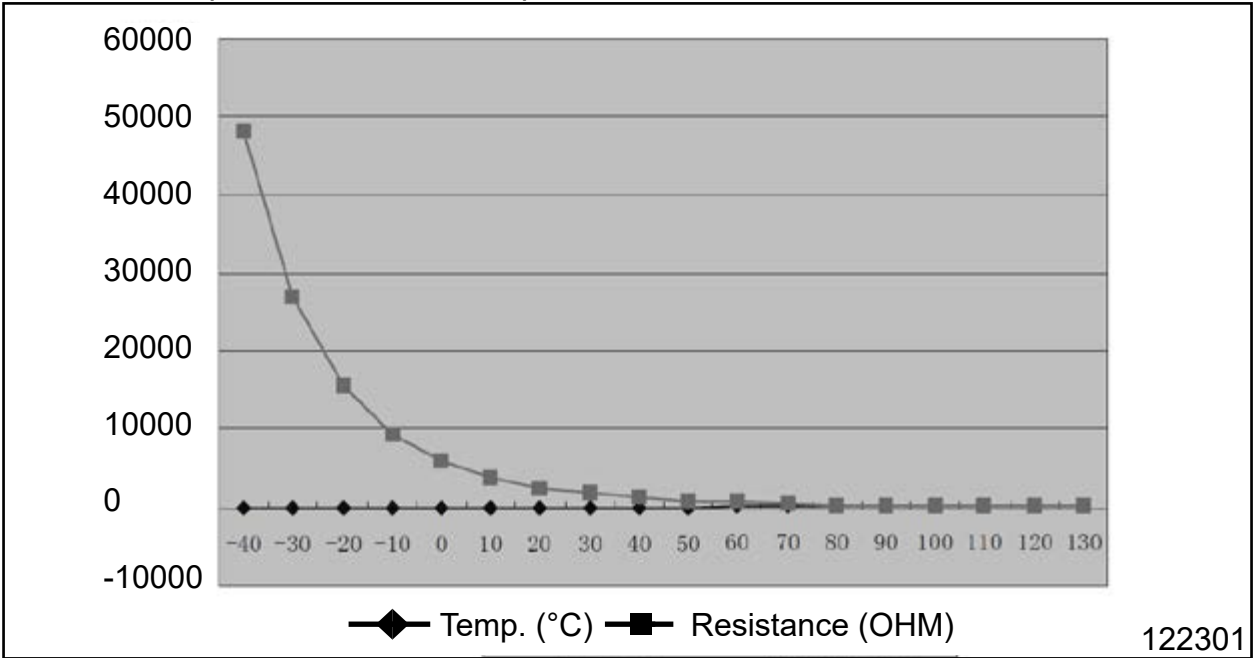


Air intake temp. sensor

Circuit connecting with ECU.



The relationship between sensor temperature and resistance.



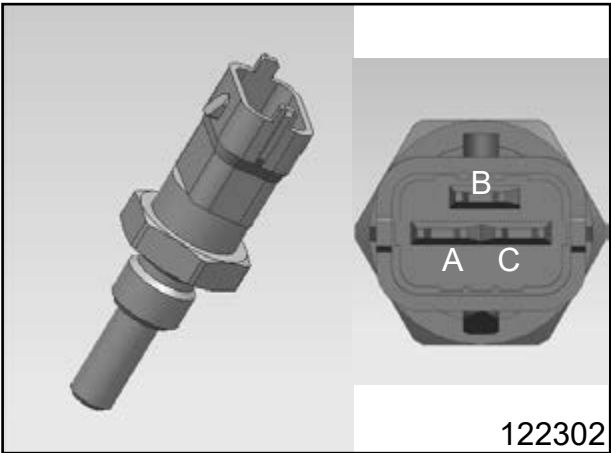
12.14.5 Coolant Temp. Sensor

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

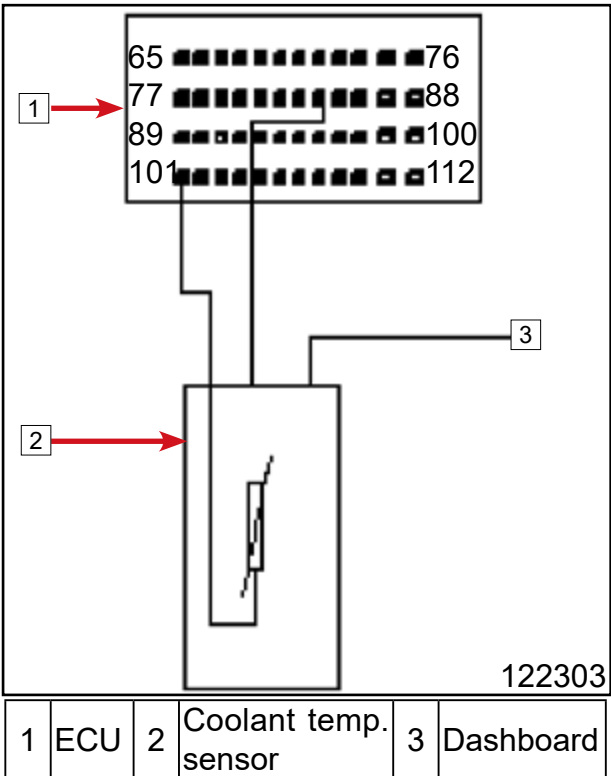
One group of parameters is sent to ECU to monitor engine temperature condition, One group is sent to dashboard to monitor coolant temperature condition.

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

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



Circuit connecting with ECU.



Coolant Temp. Sensor Inspection

Measure resistance between pin A and C with multimeter:

ECU resistance (A-C)	
Temp. °C	Resistance(Ω)
-20±0.1	13.71~16.49
25±0.1	1.825~2.155
80±0.1	0.303~0.326
110±0.1	0.1383~0.1451

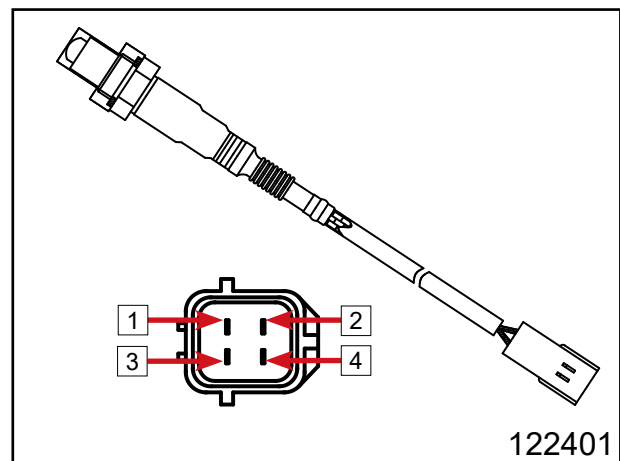
If the resistance is beyond standard, the sensor is damaged. Replace with new one. Measure sensor pin B resistance with multimeter:

Temp. °C	Resistance(Ω)
50±0.2	176-280
80±0.2	63.4-81.4
110±0.2	24.6-30.6

If the resistance is beyond standard, the sensor is damaged. Replace with new one.

12.14.6 Oxygen Sensor

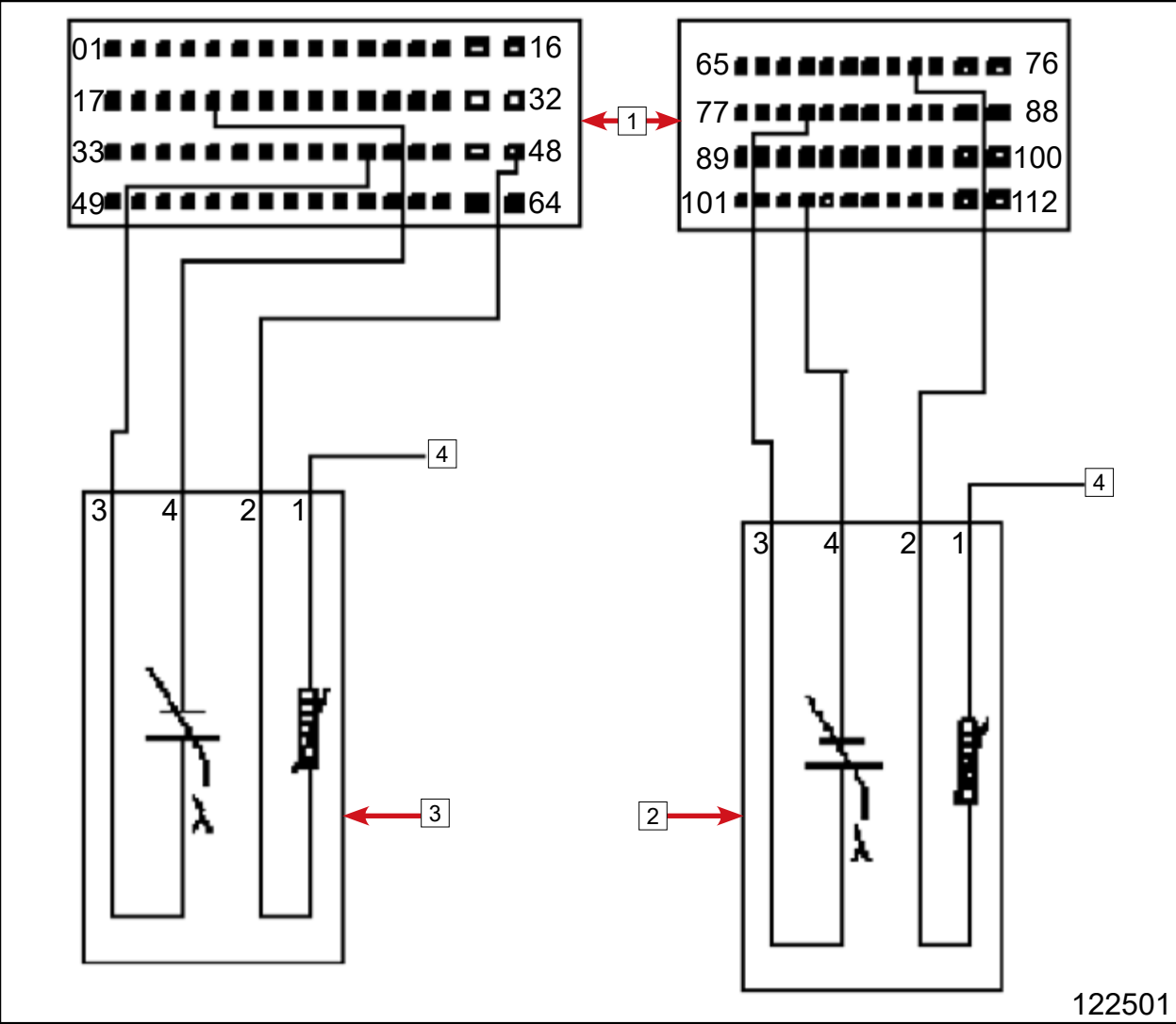
This sensor is used in closed-loop feedback controlled fuel injection to improve the air-to-fuel ratio accuracy and control the emission. It's located in the exhaust stream to measure the amount of oxygen in exhaust and send the signal to ECU, which can revise the fuel injector output, so as to reduce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



Pin Function:

- 1: output signal voltage +.
- 2: output signal voltage -.
- 3: to heated power -.
- 4: to heated power +.

Circuit connecting with ECU.



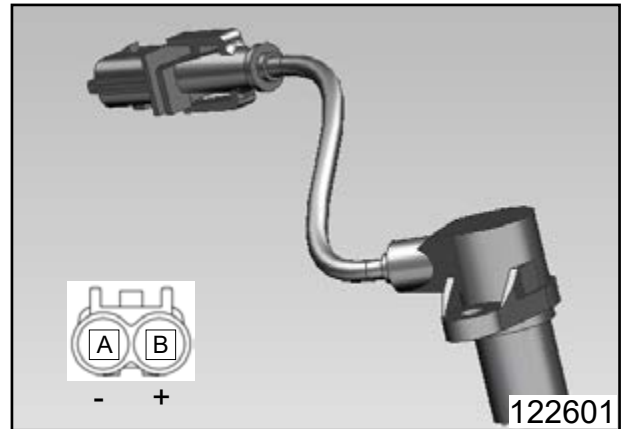
1	ECU	3	Oxygen sensor 2
2	Oxygen sensor1	4	+12V

Oxygen sensor characteristic table

Item	Specification	
Exhaust air temp. (°C)	350	850
Voltage (mV) at $\lambda=0.97$ (CO=1%)	840±70	710±70
Sensor voltage (mV) at $\lambda=1.10$	20±50	55±30
Sensor inner resistance (kΩ)	≤1.0	≤0.1
Response time (ms) (600mV to 300mV)	≤150	≤150
Response time (ms) (300mV to 600mV)	≤150	≤150

12.14.7 Trigger

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



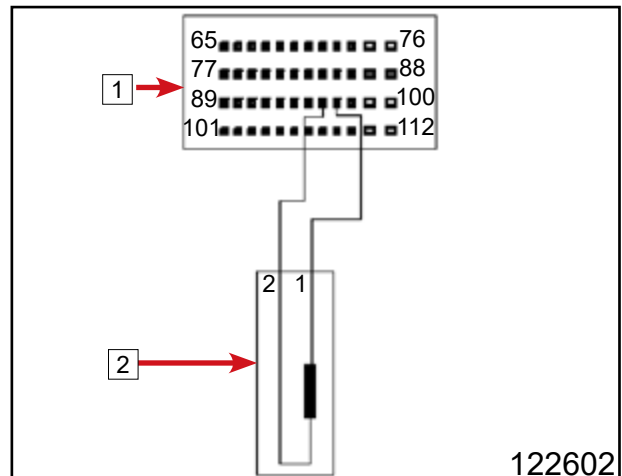
Circuit connecting with ECU.

Trigger Resistance Measurement

Set multimeter to $1 \times 2k\Omega$.

Trigger coil resistance: $950\Omega \pm 50\Omega (20^\circ\text{C})$

Replace a new one when resistance is beyond value range.



1 ECU 2 Trigger

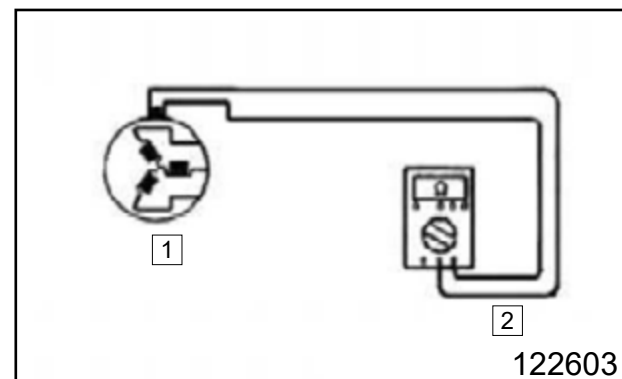
Trigger Peak Voltage Measurement

Connect multimeter and peak voltage adapter as shown as right picture

+Probe: Green (B) wire

-Probe: Blue (A) wire

NOTE: Refer to owner's manual when using peak value voltage adapter.



1 Magneto 2 Trigger resistance

Set multimeter to ACV.

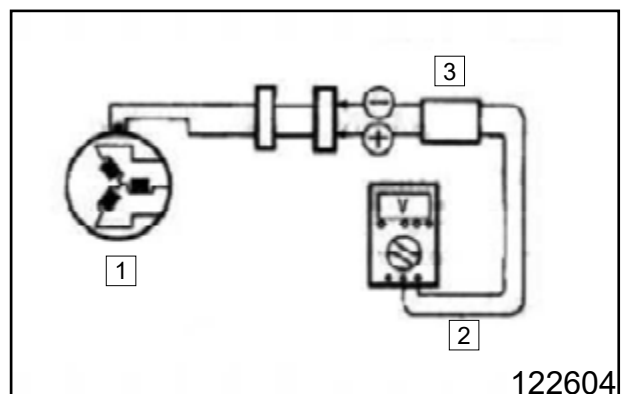
Set engine to Neutral gear, turn ON ignition switch.

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: $\geq 3V$ (200r/min)

Replace a new one when peak value voltage is beyond above value range.



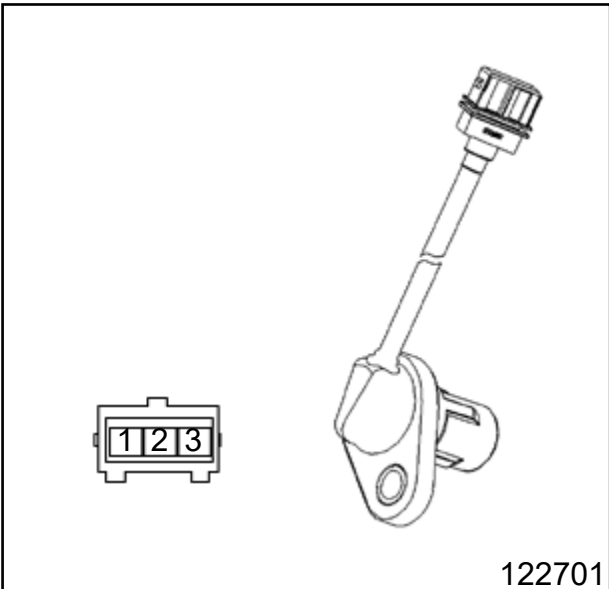
1 Magneto 2 Gauge 3 Peak voltage

12.14.8 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.

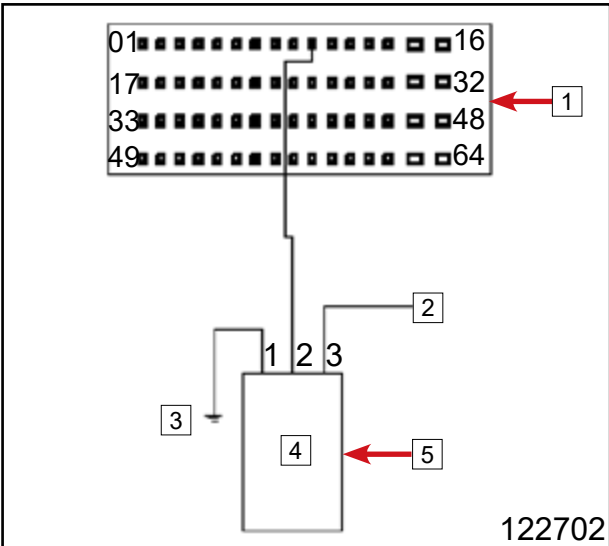
Pin Function:

- 1 to ground.
- 2: output voltage signal (>80% of input voltage).
- 3: battery+DC12V.



Speed sensor

Circuit connecting with ECU.



1	ECU	3	Ground	5	Speed sensor
2	+12V	4	Haul switch		

Speed Sensor Inspection

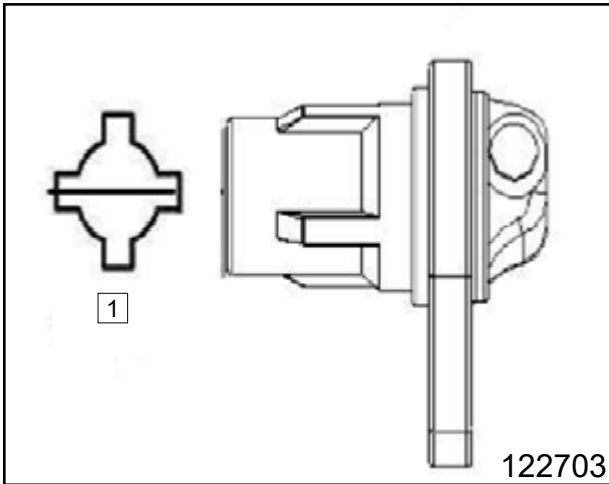
Ground pin 1. Connect pin 3 with +12V power.

Fix the gear **5mm** away from the speed sensor as the picture shows.

Turn multimeter to DCV.

Slowly rotate 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.



1 Gear

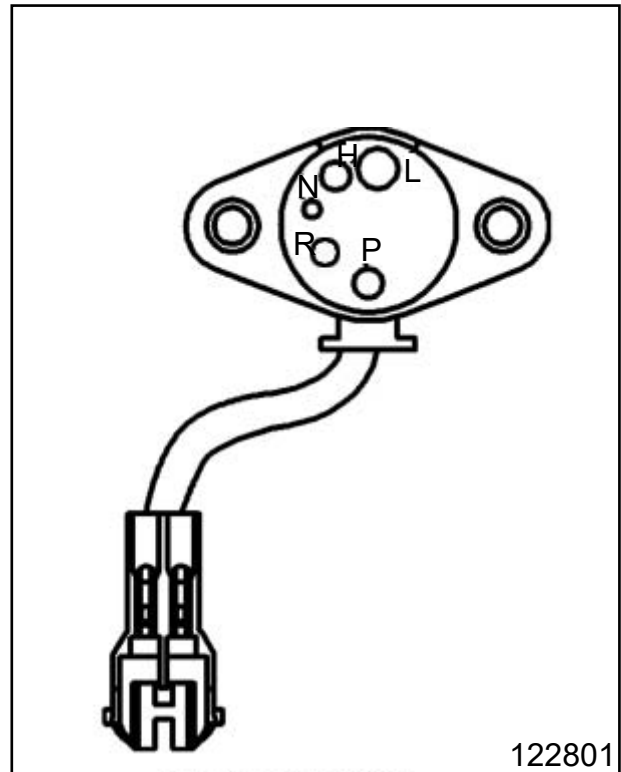
12.14.9 Gear Sensor

This sensor is used to provide the gear position signal for meter display.

Pin function:

L(Low gear)
H(High gear)
N(Neutral gear)
R (Reverse gear)
P(Parking gear)

When each pin at a certain gear position, there is connection between this pin and engine. Otherwise, no connection exists.



Gear sensor

WARNING when driving in reverse

- When driving in reverse, gear sensor sends the reverse signal to ECU and dashboard. ECU will limit the vehicle speed in response to the reverse signal.

12.14.10 Fuel Pump

This fuel pump assembly includes fuel pump, plastic support, preliminary filter, fine filter and pressure regulator. It supplies fuel for engine under a certain pressure and flow.

Pins and Function:

1 to ground.

2 to fuel pump relay output.

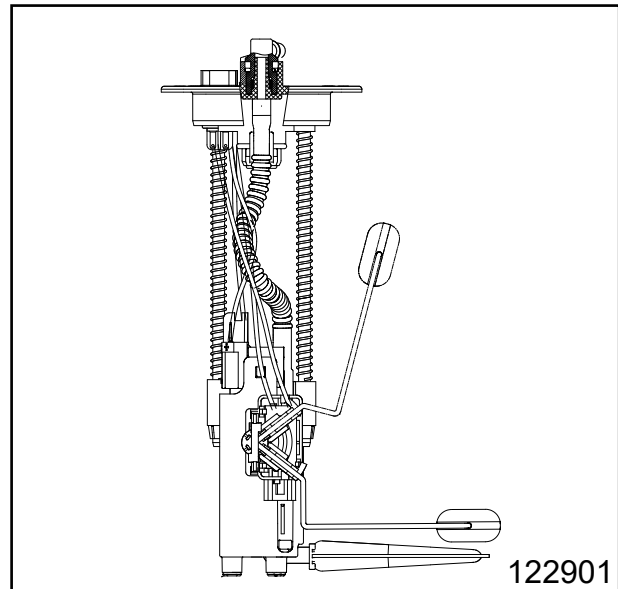
Parameters:

Pressure regulator opening pressure:

330±5KPa

Flow: Higher than 35L/h

- This fuel pump is located in fuel tank;
- Don't operate the fuel pump in dry condition to prevent damage.
- Always handle the fuel pump gently. Never drop the fuel pump.



Fuel pump

Fuel Pressure Measurement

Connect the fuel pressure gauge with fuel outlet and tighten the joint with a clamp to prevent fuel leaks.

Route according to the circuit.

Turn ON both ignition switch and stop switch. At this moment, fuel pump will operate for 5 seconds. After the fuel pump stops running, fuel pressure should reach to standard value. Otherwise, replace the fuel pump assy.

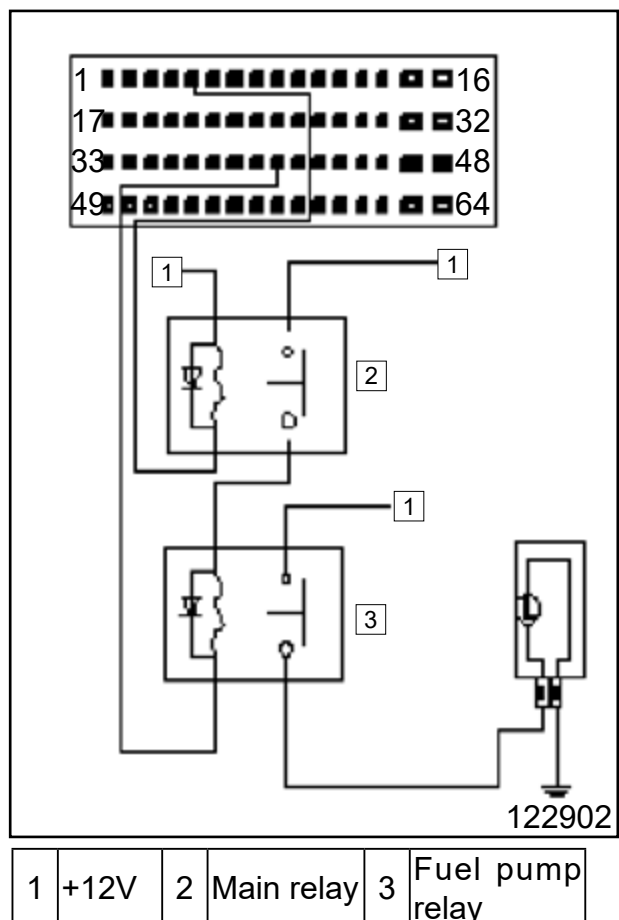
After the engine stops, fuel pressure should be kept **0.25MPa** for more than 5 minutes. Otherwise, replace the fuel pump assy.

Pressure Relief in Fuel System:

In EFI model, pressure in fuel system is very high, as well as in fuel hoses. Even though the engine is not started, pressure in fuel system remains high. Therefore, it's not recommended to remove fuel hoses before pressure relief.

Follow the procedure below to perform pressure relief:

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



12.14.11 Fuel Injector

One end of fuel injector is installed on fuel injector seat, and the other attaches to the injector cap. 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 join is installed.

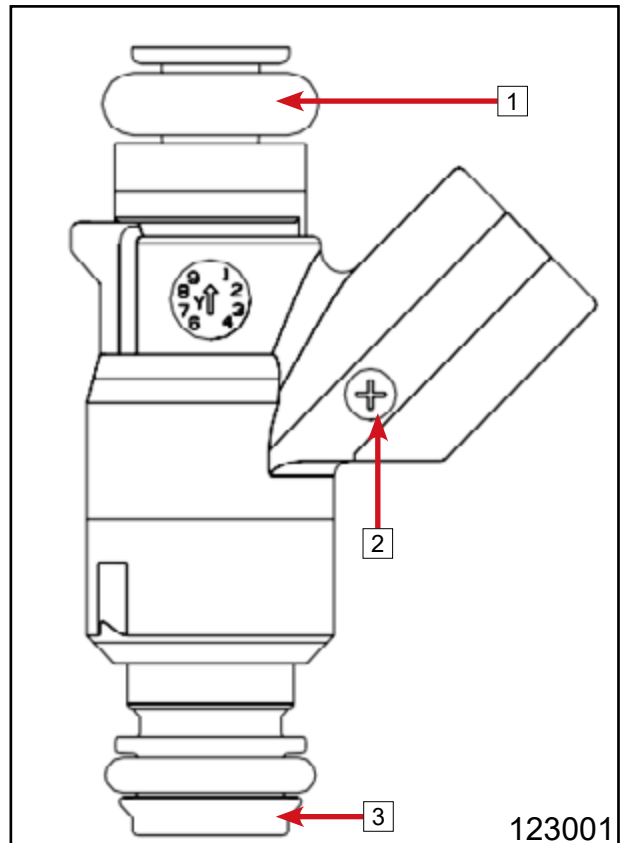
Pin function:

Connector with mark "+": to main relay output terminal.

Connector of first cylinder fuel injector without mark: to ECU pin 68.

Connector of second cylinder fuel injector without mark: to ECU pin 72.

Fuel injector resistance: $12\Omega \pm 1\Omega (20^{\circ}\text{C})$



Fuel injector

1	Cap	2	Mark "+"	3	Connect fuel injector seat
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Circuit connecting with ECU.

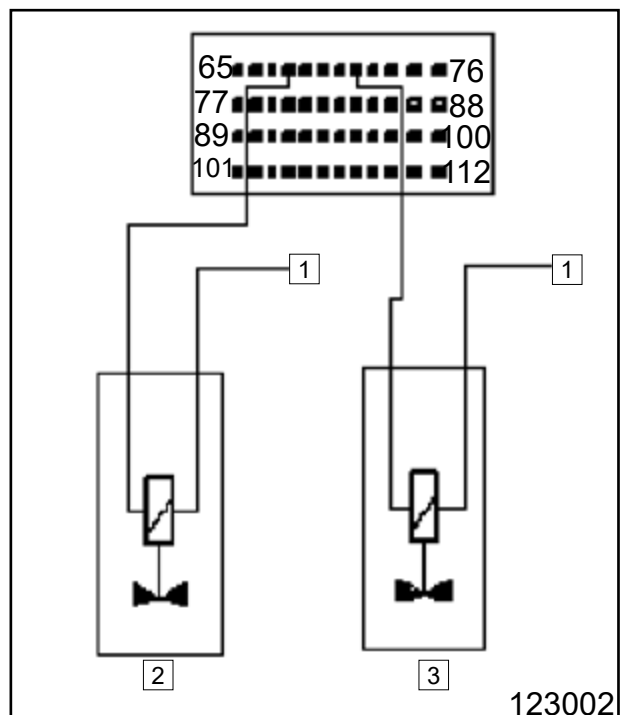
Fuel Injector Installation

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

Replace o-rings during fuel injector removal and installation.

Perform pressure relief before fuel injector removal if necessary.

Inspect the fuel injector for sealing after installation to ensure there is no leaking.



1	Main relay	2	Fuel injector 1	3	Fuel injector 2
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12.14.12 Ignition Coil

Ignition coil transforms the low voltage of primary coil to high voltage of secondary coil by sparking from spark plug and igniting the mixture of air and fuel in cylinder

Pin function:

Ignition coil pin 1 of first cylinder connects ECU pin 100.

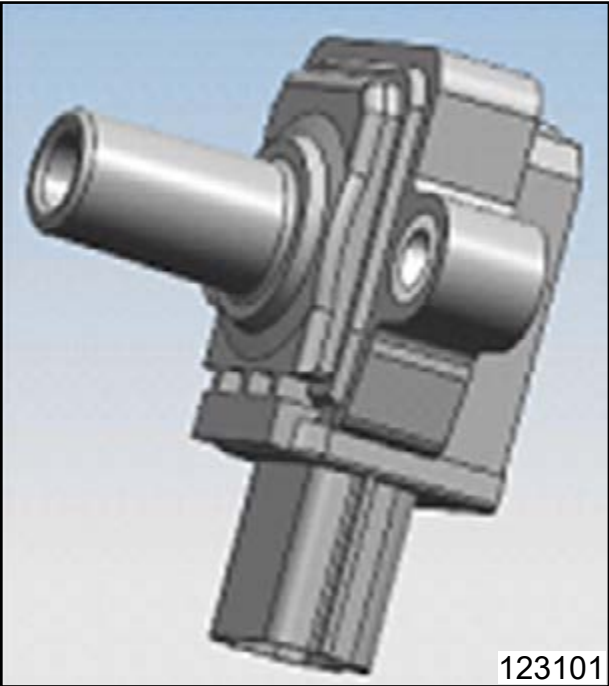
Ignition coil pin 2 of first cylinder connects power +12V.

Ignition coil pin 3 of first cylinder grounds.

Ignition coil pin 1 of second cylinder connects ECU pin 99.

Ignition coil pin 2 of second cylinder connects power +12V.

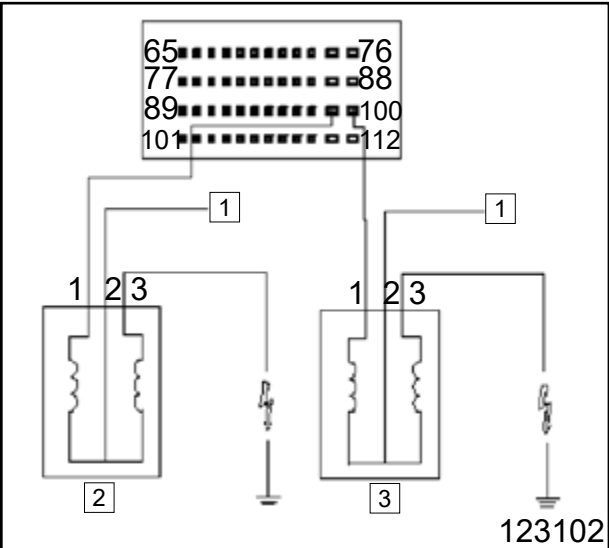
Ignition coil pin 3 of second cylinder grounds.



123101

Ignition Coil

Circuit connecting with ECU.



1	+12V	2	Ignition coil 2	3	Ignition coil 1
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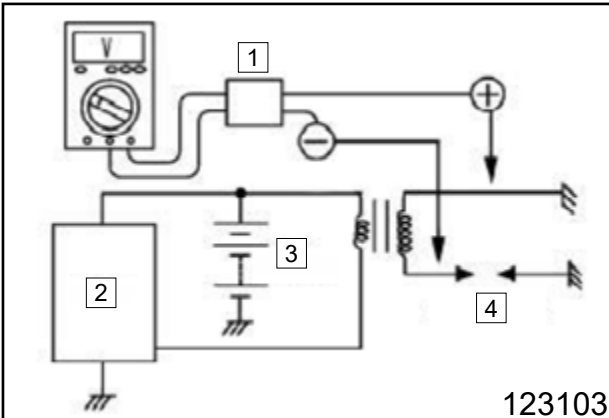
Secondary Ignition Voltage Measurement

Connect with engine according to EFI wiring diagram.

Connect the peak voltage tester according to the right diagram.

Start the engine.

Secondary ignition voltage should be >15000V.



1	Gauge	3	Battery
2	ECU	4	Spark plug

Ignition coil parameter chart table:

Item		Value			Unit
		Min	Standard	Max	
Stated Voltage			14		V
Running 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
Current			7		A

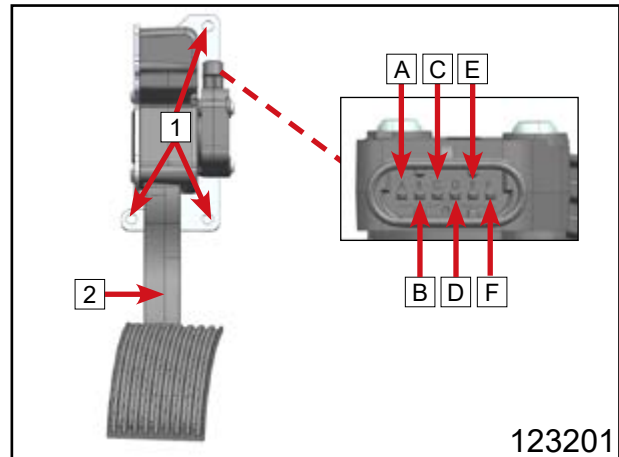
12.15 Electrical Throttle Pedal

Unplug all connectors before removing electrical throttle pedal.

Remove three bolts [1].

Remove throttle pedal [2].

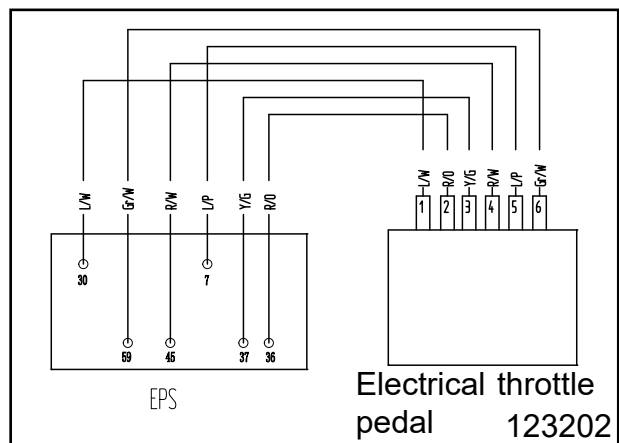
NOTE: Check whether the pedal is installed in place. There is no foreign body to block it. And it can rotate in certain angles.



Pin functions:

- A. APS1
- B. GND1
- C. VCC1(+5V)
- D. VCC2(+5V)
- E. GND2
- F. APS2

Circuit connecting with ECU.



Electrical Throttle Pedal Inspection

Check circuit and connectors connection.

Pedal at 0°:

Voltage of analog signal output 1: $0.75V \pm 0.1V$

Voltage of analog signal output 2: $0.375V \pm 0.1V$

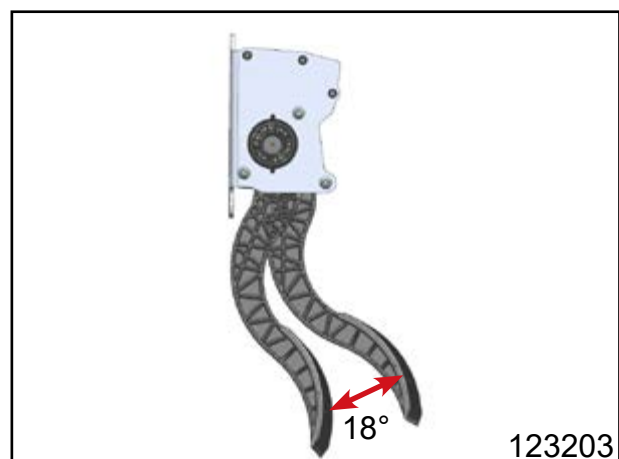
Pedal reaches limit position:

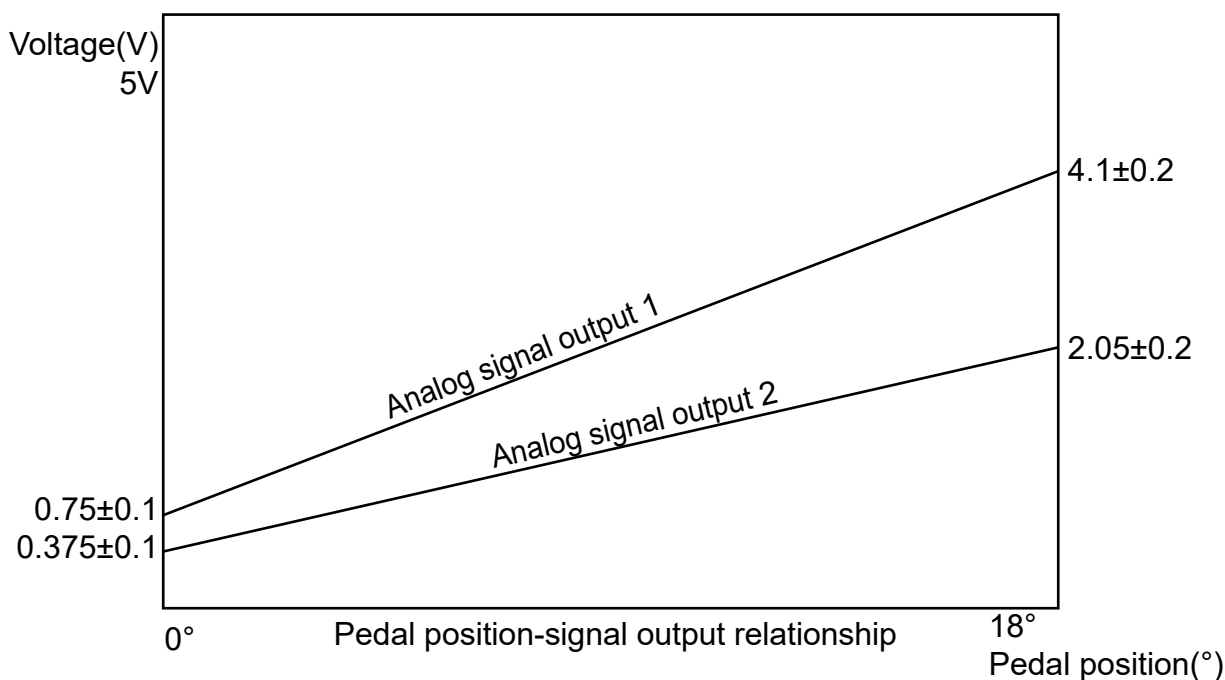
Voltage of analog signal output 1: $4.1V \pm 0.2V$

Voltage of analog signal output 2: $2.05V \pm 0.2V$

Installation

Reverse the removal procedures for installation.





12.16 EFI Self-diagnosis

The ECU constantly monitor sensors, actuators and circuits, MIL and battery voltage, etc, the ECU itself, and inspects 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 fault code in the RAM memory.

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

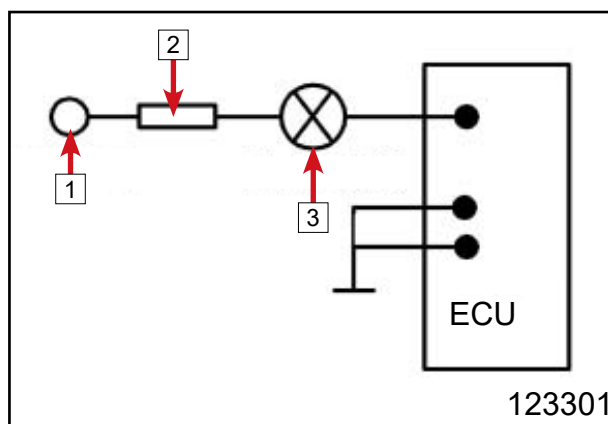
When servicing, using PDA and MIL, the defective parts can be promptly found to improve the service efficiency and quality.

EFI system is mainly diagnosed by MIL and PDA.

12.16.1 Malfunction Indicating Lamp (MIL)

The MIL stays on when a fault has occurred. A code will display on the LCD screen.

The right picture is the MIL connection circuit. The current in pin 82 to ECU should be less than 0.1 A.



1	+12V power	2	Resistance	3	Diode
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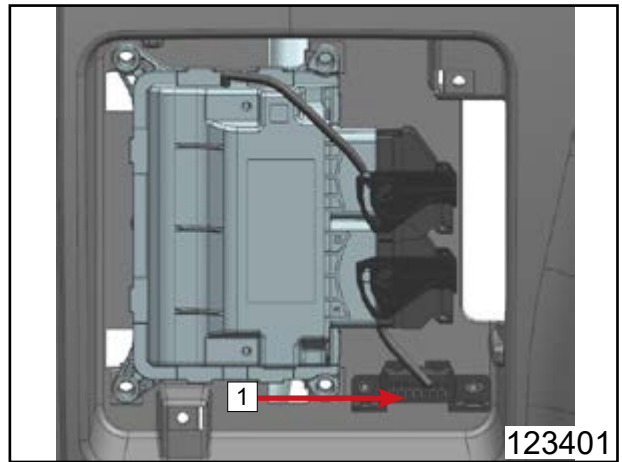
12.16.2 Diagnosis Tool and Connector

OBD diagnosis connector 1 is located behind passenger cushion.

There are 16 pins on diagnosis tool, which connects to OBD diagnosis connector.

The picture refers to operation panel of PDA. When it comes to detailed keys operation and function, refer to PDA manual.

NOTE: Super OBD Adapter JCY-0108 is required to communicate with the ECU on this model.



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:

1. Version Information Display

PDA can display engine, ECU hardware and software information.



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

2. 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.

3. 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.

4. 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.

5. Actuator Test Function

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

12.17 Fault Diagnosis

12.17.1 Engine Body

Trouble	Reason	Solution
Engine cannot start	Inspect the electrical system	
	• Fuse melted	Inspect or replace
	• Battery low	Inspect or charge
	• Cable problem	Inspect or replace
	Inspect the spark plug	
	• Ignition coil bad connection	Inspect or replace
	• High voltage bad connection	Inspect or replace
	• RPM sensor trouble	Inspect or replace
	• Magneto trouble	Adjust or replace
	• Spark plug clearance not fit	Clean or replace
	• Spark plug dirty	Dry or replace
	• Spark plug too wet	
	Inspect fuel supply system	
	• Canister	Repair and replace
	• Fuel pump leaking or bad effect	Inspect or replace
	• Fuel line leaking	Inspect the fuel tank
	• Fuel low	Replace
	• Injector jammed	Replace
	4. Inspect cylinder pressure	Replace
	• Cylinder wearing	Replace
	• Piston ring wearing	Replace
	• Gasket leaking	Repair or replace
	• Valve conducting pipe wearing	Replace
	• Valve seat bad sealing	Tighten
	• Valve wearing	Inspect or replace
	• Spark plug loose	Adjust
	• Starting RPM low	Adjust
	• Valve TDC wrong	Clean or replace
	• Valve clearance not fit	Shift to N gear
	5. Idle by pass valve jammed	Inspect
	6. Not in N gear	
	7. Fault code	
Engine hard to start	1. Idle valve bad	See engine
	2. TPS not in 0	See engine
	3. Adjust the throttle cable	
	4. Engine pressure low	
	5. Inspect the spark plug	Inspect the reason
	• Spark plug bad	
	• Spark plug setting bad	
	• Spark plug damage	
	• Spark plug dirty	
	6. Fuel low or pressure low	Replace the parts
	7. CAPS or cable bad	

Trouble		Reason	Solution
Engine overheat		1. Coolant level low 2. Cooling system got bubble 3. Water temp sensor problem 4. Thermostat problem(Not open in high heat) 5. Inspect the leaking hole to see leaking 6. Inspect the pipe and clamp • Pipe cracked or getting old • Clamp getting loose 7. Water pump impeller broken 8. Water pump gasket leaking 9. Cylinder head gasket leaking 10. Water pump cover drain bolt gasket leaking. 11. Water pump gear wearing cause coolant not enough. 12. Water pump shaft jammed	Fill Drain and refill Replace Replace Replace the water seal Replace Tighten Replace Tighten or replace Replace Tighten or replace Replace Replace the bad parts
	Lubrication	Oil wasting high/Oil pressure low or no oil pressure 1. Inspect the engine oil level to see the crankcase and oil seal leaking. • Crankcase damage leaking • Crankcase bolt loose • Sealing ring/O-ring/Gasket cracked, old or damaged • Piston ring damaged(Blue smoke) • Piston ring damaged(Pressure low) • Valve oil seal damaged. Lip crack ed or old. 2. Oil filter jammed 3. Inspect the oil drain bolt • Case bottom bevel bolt loose • Oil drain bolt loose or without washer 4. Oil leaking 5. Oil strainer jammed 6. Inspect the oil pump • Oil pump rotor wearing • Wasted oil or air inlet cause the oil pump jammed. • Oil pump gear damaged. • Use wrong oil	Replace and reassemble Tighten Replace Replace Replace Replace the oil seal Replace the filter and oil Tighten Tighten or install washer Replace the oil seal Clean and replace Replace Replace Replace Use recommend oil
	Oil getting white	1. Leaking indicator shows the oil mixed with water 2. Cylinder gasket damaged or leaking. 3. Cylinder head bolt loose. 4. Oil has dust inside	Replace oil seal and water seal. Tighten or replace Tighten and replace the oil Replace damaged parts(Including filter and oil)

12 Electrical System

Trouble		Reason	Solution
CVT	Abnormal accelerate	1. Belt getting narrow 2. Inspect the main sliding wheel • Rolling ball wearing • Main roller track wearing 3. Drive/Driven pulley axial sliding not smooth 4. Driven pulley spring too strong 5. Driven pulley clutch shoe/Surface wearing 6. Drive/Driven pulley groove damaged. 7. Connect the PDA to find trouble 8. Valve clearance not fit 9. Pressure low 10. Spark plug bad ignition	Replace Replace Replace Clean or replace Replace Replace Adjust Replace
	Top speed low	Inspect "Bad accelerate" 1~3 CVT got dirty. Drive pulley jammed Driven pulley spring bad or damaged	Clean and replace Clean and replace Replace
	Shifting not smooth	1. Inspect the Shifting mechanism • Inspect "Bad accelerate" 1~2 2. Inspect the driven pulley • Driven pulley spring bad or damaged • Clutch shoe or surface got damaged	Replace Replace
	Belt burnt	1. Inspect the CVT cooling pipe • CVT room too hot • Main stable wheel impeller jammed 2. Inspect the wheel groove surface • Groove got dirty • CVT case got water in.	Clean Clean Clean and replace the belt Clean and replace the belt
	Drive belt trouble	Wearing too much Belt specification wrong Belt got wearing Belt cracked and reach the life period Groove got oil dirty Drive or driven pulley got damaged by stone Belt getting old	Replace Replace Replace Clean and replace the belt Clean Clean or replace Replace

Trouble		Reason	Solution
Engine noise or shocked	Cylinder head noise	1. Valve clearance not fit 2. Tensioner bad 3. Chain conductor wearing 4. Chain getting longer or sprocket wearing 5. Sprocket bolt loose 6. Valve rocker arm or camshaft wearing. 7. Camshaft TDC wrong.	Adjust or replace Replace Replace Replace Tighten Adjust or replace Adjust or replace
	Crankshaft noise	1. Main bearing damaged 2. Connecting rod bearing damaged 3. Magneto bolt getting loosed 4. Left crankcase cover bearing damaged	Replace Replace Tighten or replace Replace
	Case noise	1. Oil leaking 2. Gear teeth damaged	Replace,tighten and fill Replace
	CVT idle noise	1. Driven pulley sliding shaft sleeve jammed or wearing. 2. Inspect the drive slide wheel 3. Roller ball wearing 4. Drive slide wheel track wearing 5. Drive slide wheel track wearing 6. Nylon part damaged 7. Axial sliding jammed 8. Drive wheel nut loose	Replace the driven pulley Replace at same time Replace Replace Replace at same time Clean or replaced Tighten
	CVT noise	1. Inspect "Idle noise" 1~3 2. Drive pulley wet and dirt 3. Drive/Driven pulley nut loose 4. Driven pulley slide shoe surface damaged 5. Belt or wheel damaged by other trash.	Clean or drain Tighten Replace Clean or replace
	CVT Drive pulley shock	1. Drive pulley nut loose 2. Drive slide wheel sleeve clearance large. 3. Roller ball lost or wearing 4. Washer not in position	Tight Replace Replace at same time Reassemble or replace
	CVT driven pulley shock	Driven bearing sleeve clearance too large	Replace

12.18 Fault Code Table

No.	Code	Statement
1	P062912	Fuel Pump "A" Control Circuit High
2	P062811	Fuel Pump "A" Control Circuit Low
3	P062713	Fuel Pump "A" Control Circuit /Open
4	P026212	Cylinder 1 Injector Circuit High
5	P026111	Cylinder 1 Injector Circuit Low
6	P020113	Injector Circuit/Open – Cylinder 1
7	P026512	Cylinder 2 Injector Circuit High
8	P026411	Cylinder 2 Injector Circuit Low
9	P020213	Injector Circuit/Open – Cylinder 2
10	P003212	O2 Sensor Heater Control Circuit High Bank 1 Sensor 1
11	P003111	O2 Sensor Heater Control Circuit Low Bank 1 Sensor 1
12	P003013	O2 Sensor Heater Control Circuit Bank 1 Sensor 1
13	P005212	O2 Sensor Heater Control Circuit High Bank 2 Sensor 1
14	P005111	O2 Sensor Heater Control Circuit Low Bank 2 Sensor 1
15	P005013	O2 Sensor Heater Control Circuit Bank 2 Sensor 2
16	P069212	Fan 1 Control Circuit High
17	P069111	Fan 1 Control Circuit Low
18	P048013	Fan 1 Control Circuit
19	P065012	MIL Control Circuit High
20	P065011	MIL Control Circuit Low
21	P065013	MIL Control Circuit Open
22	P010817	Manifold Absolute Pressure/Barometric Pressure Circuit High
23	P010716	Manifold Absolute Pressure/Barometric Pressure Circuit Low
24	P011817	Engine Coolant Temperature Sensor 1 Circuit High
25	P011716	Engine Coolant Temperature Sensor 1 Circuit Low
26	P011317	Intake Air Temperature Sensor 1 Circuit High
27	P011216	Intake Air Temperature Sensor 1 Circuit Low
28	P056317	System Voltage High
29	P068816	ECM/PCM Power Relay Sense Circuit/Open
30	P068829	ECM/PCM Power Relay Sense Circuit/Open
31	P050100	Vehicle Speed Sensor "A" Range/Performance
32	P013217	O2 Sensor Circuit High Voltage Bank 1 Sensor 1
33	P013116	O2 Sensor Circuit Low Voltage Bank 1 Sensor 1
34	P013029	O2 Sensor Circuit Bank 1 Sensor 1
35	P013413	O2 Sensor Circuit No Activity Detected Bank 1 Sensor 1
36	P015217	O2 Sensor Circuit High Voltage Bank 2 Sensor 1
37	P015116	O2 Sensor Circuit Low Voltage Bank 2 Sensor 1
38	P015029	O2 Sensor Circuit Bank 2 Sensor 1
39	P015413	O2 Sensor Circuit No Activity Detected Bank 2 Sensor 1
40	U007388	Control Module Communication Bus Off
41	P064100	Sensor Reference Voltage "A" Circuit/Open
42	P065100	Sensor Reference Voltage "B" Circuit/Open
43	P057129	Brake Switch "A" Circuit
44	P05711C	Brake Switch "A" Circuit
45	P213800	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation

No.	Code	Statement
46	P012317	Throttle/Pedal Position Sensor/Switch "A" Circuit High
47	P012216	Throttle/Pedal Position Sensor/Switch "A" Circuit Low
48	P012129	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance
49	P022317	Throttle/Pedal Position Sensor/Switch "B" Circuit High
50	P022216	Throttle/Pedal Position Sensor/Switch "B" Circuit Low
51	P022129	Throttle/Pedal Position Sensor/Switch "B" Circuit Range/Performance
52	P210612	Throttle Actuator Control System Forced Limited Power
53	P210619	Throttle Actuator Control System Forced Limited Power
54	P210692	Throttle Actuator Control System Forced Limited Power
55	P210613	Throttle Actuator Control System Forced Limited Power
56	P156800	Idle Speed Contr.Throttle Pos. mechanical Malfunction
57	P154500	Throttle Pos.Contr. Malfunction
58	P155900	Idle Speed Contr.Throttle Pos. Adaptation Malfunction
59	P154522	Throttle Pos.Contr. Malfunction
60	P154521	Throttle Pos.Contr. Malfunction
61	P157900	Idle Speed Contr.Throttle Pos. adaptation not started
62	P156400	Idle Speed Contr.Throttle Pos. Low Voltage During Adaptation
63	P156500	Idle Speed Control Throttle Position lower limit not attained
64	P155929	Idle Speed Contr.Throttle Pos. Adaptation Malfunction
65	P212317	Throttle/Pedal Position Sensor/Switch "D" Circuit High
66	P212216	Throttle/Pedal Position Sensor/Switch "D" Circuit Low
67	P213829	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation
68	P212817	Throttle/Pedal Position Sensor/Switch "E" Circuit High
69	P212716	Throttle/Pedal Position Sensor/Switch "E" Circuit Low
70	P133600	Torque limit active in level 1
71	P060696	function monitoring: fault of ECU ADC - Null Load Test Pulse
72	P060697	function monitoring: fault of ECU ADC - test voltage
73	P060647	function monitoring: fault of ECU monitoring modul error
74	P060617	Reported OverVoltage of VDD5
75	P060616	Reported UnderVoltage of VDD5
76	P060649	Diagnostic fault check to report "WDA active"
77	P060648	Diagnostic fault check to report "WDA active" due to errors in query-/response communication
78	P060691	Diagnostic fault check to report "WDA active" due to overvoltage detection
79	P060694	ECM/PCM Processor
80	P060692	ECM/PCM Processor
81	P210629	Throttle Actuator Control System Forced Limited Power
82	P060664	ECM/PCM Processor
83	P060661	Safety monitoring function error (Ignition angle signal, wiring harness or ECU error)
84	P060667	ECM/PCM Processor
85	P060696	function monitoring: fault of ECU ADC - Null Load Test Pulse
86	P06061C	ECM/PCM Processor
87	P060600	ECM/PCM Processor
88	P060662	ECM/PCM Processor
89	P060663	Safety monitoring function error (SSM system monitoring error)

12.18.1 Diagnosis by Fault Code

Instruction:

1. Make sure the fault is stable at the moment. Or, it may cause wrong diagnosis.
2. The AVO meter mentioned below is digital AVO meter. Do not use analog style meter to test the electrical parts.
3. When diagnosing the vehicle with anti-theft system, if the “Next Step” is “Replace ECU”, program the ECU after replacement.
4. If the fault code shows the some electrical voltage low. It means short to the ground or open to the ground. If the voltage high. That means may short to power. If fault code shows some wiring trouble. Means open or different troubles in wirings.

Diagnosis help:

1. If the fault code cannot clean up, this trouble is stable
If it happens occasionally. Please check the connector if loose.
2. Do not ignore the vehicle maintenance information. Cylinder pressure mechanical timing effect.
3. Replace ECU for testing
If the fault code can be cleaned. That means the trouble part is located in ECU. If the code still cannot be cleaned. Replace into the original ECU and test again.

Fault code: P003013 Oxygen sensor heating control circuit defective

No.	Operation procedure	Result	Next step
1	Improper connection or bad contact for connectors.	Yes	Reconnect
		No	Next step
2	Open circuit of oxygen sensor heating control circuit pin.	Yes	Service cable
		No	Next step
3	Oxygen sensor heating control circuit VIO doesn't connect main relay.	Yes	Service cable
		No	Next step
4	Sensor damaged.	Yes	Replace sensor
		No	Next step
5	Open circuit or inner circuit damaged between ECU and oxygen sensor heating circuit.	Yes	Service ECU
		No	Diagnose

Fault code: P003111 Oxygen sensor heating control circuit low voltage

No.	Operation procedure	Result	Next step
1	Oxygen sensor heating control circuit pin short to ground.	Yes	Service cable
		No	Next step
2	Oxygen sensor heating control circuit VIO short to ground.	Yes	Service cable
		No	Next step
3	Short to ground between ECU and oxygen sensor heating control circuit.	Yes	Service ECU
		No	Diagnose

Fault code: P003212 Oxygen sensor heating control circuit high voltage

No.	Operation procedure	Result	Next step
1	Oxygen sensor heating control circuit pin short to power.	Yes	Service cable
		No	Next step
2	Short to power between ECU and oxygen sensor heating control circuit pin short.	Yes	Service ECU
		No	Diagnose

Fault code: P011716 Engine Coolant Temperature Sensor 1 Circuit Low

No.	Operation procedure	Result	Next step
1	Connect PDA and turn ignition switch to "ON". Do not start engine. Check if "coolant temperature sensor value" of data flow is lower than coolant minimum temperature. Or use multimeter to measure the voltage between coolant temperature sensor signal port and ground to check if it is close to or equals to 5V.	Yes	Next step
2	Turn ignition switch to "OFF" to check if it has improper connection or bad contact.	Yes	Service cable
		No	Next step
3	Sensor damaged.	Yes	Replace sensor
		No	Next step
4	Short to ground between ECU and coolant temperature sensor signal pin.ECU	Yes	Service ECU
		No	Diagnose

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Fault code: P011817 Coolant temperature sensor high voltage

No.	Operation procedure	Result	Next step
1	Connect PDA and turn ignition switch to "ON". Do not start engine. Check if "coolant temperature sensor value" of data flow is lower than coolant minimum temperature. Or use multimeter to measure the voltage between coolant temperature sensor signal port and ground to check if it is close to or equals to 5V.	Yes	Next step
2	Turn ignition switch to "OFF" to check if it has improper connection or bad contact.	Yes	Reconnect
		No	Next step
3	Sensor signal port short to power or open circuit.	Yes	Service cable
		No	Next step
4	Open circuit between sensor and ground.	Yes	Service cable
		No	Next step
5	Sensor damaged.	Yes	Replace sensor
		No	Next step
6	Short to power/open circuit/inner circuit damaged between ECU and coolant temperature sensor signal pin.	Yes	Service ECU
		No	Diagnose

Fault code: P012129 TPS 1 signal abnormal

No.	Operation procedure	Result	Next step
1	Check if the cable has good connection.	Yes	Next step
		No	Reconnect
2	Connect PDA and turn ignition switch to "ON". Clear fault codes. Respectively step throttle pedal rapidly and slowly for several times to check if fault codes appear or not.	Yes	Next step
		No	End
3	Remove TPS connector of the cable to check if impedance of TPS 1 signal is within the reasonable range.	Yes	Next step
		No	Service or replace cable
4	Remove TPS connector of the cable to check if impedance between TPS 1 signal and other signals is within the reasonable range.	Yes	Replace throttle
		No	Service or replace cable
5	Clear fault codes. Turn ignition switch to "OFF", then turn to "ON". Wait for one minute to complete throttle self-learning, then step throttle pedal several times to check if fault codes appear again or not.	Yes	Diagnose
		No	End

Fault code: P012317 TPS signal circuit high voltage

No.	Operation procedure	Result	Next step
1	Check if the cable has good connection.	Yes	Next step
		No	Reconnect
2	Remove TPS connector to check if ECU throttle signal pin is short to power or has open circuit.	Yes	Inspect and service cable
		No	Next step
3	Sensor damaged.	Yes	Replace sensor
		No	Next step
4	Short to power/open circuit/inner circuit damaged between ECU and TPS sensor circuit.	Yes	Service ECU
		No	Diagnose

Fault code: P013029 Oxygen sensor signal abnormal

No.	Operation procedure	Result	Next step
1	Connect PDA and turn ignition switch to "ON" position.		Next step
2	Read and save fault freeze frame data.		Next step
3	Do not disconnect oxygen sensor connector. Measure the voltage of cable 1 (white, heating circuit to power) at the oxygen sensor side to check if it is 12V.	Yes	Next step
		No	Inspect cable and connector
4	Do not disconnect oxygen sensor connector. Measure the voltage of cable 2 (white, heating circuit to ground) at the oxygen sensor side to check if it is 12V.	Yes	Next step
		No	Inspect cable and connector
5	Do not disconnect oxygen sensor connector. Measure the voltage between cable 4 (black, oxygen sensor signal cable) and cable 3 (grey, oxygen sensor signal to ground) at the oxygen sensor side to check if it is approximately 0.45V.	Yes	Next step
		No	Inspect cable and connector
6	Start the vehicle. Idle it until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector. Measure the voltage between cable 4 (black, oxygen sensor signal to power) and cable 3 (gray, oxygen sensor signal to ground) at the oxygen sensor side to check if it varies between 0V and 1V.	Yes	Next step
		No	Replace sensor
7	Start the vehicle. Idle it until coolant temperature reaches normal value. Disconnect oxygen sensor connector. Check if it is short circuit between cable 2 (white, heating circuit to ground) and cable 4 (black, oxygen sensor signal to power).	Yes	Replace sensor
		No	Diagnose
8	Connect oxygen sensor connector. Repeat step 5 and 6 to check if the voltage varies between 0.44V and 0.46V, 0V and 1V respectively.	Yes	End
		No	Diagnose

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Fault code: P013116 Oxygen sensor signal circuit low voltage

No.	Operation procedure	Result	Next step
1	Connect PDA and turn ignition switch to "ON" position.		Next step
2	Read and save fault freeze frame data.		Next step
3	Do not disconnect oxygen sensor connector. Measure the voltage between cable 4 (black, oxygen sensor signal to power) and cable 3 (gray, oxygen sensor signal to ground) at the oxygen sensor side to check if it is approximately 0.45V.	Yes	Next step
		No	Inspect cable and connector
4	Start the vehicle. Idle it until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector. Measure the voltage between cable 4 (black, oxygen sensor signal to power) and cable 3 (gray, oxygen sensor signal to ground) at the oxygen sensor side to check if it varies between 0V and 1V.	Yes	Next step
		No	Replace sensor
5	Disconnect oxygen sensor connector. Use multimeter to check if it is short circuit between cable 3 (gray, oxygen sensor signal to ground) and cable 4 (black, oxygen sensor signal to power).	Yes	Replace sensor
		No	Diagnose
6	Connect oxygen sensor connector. Repeat step 3 and 4 to check if the voltage varies between 0.44V and 0.46V, 0V and 1V respectively.	Yes	End
		No	Diagnose

Fault code: P026111 First cylinder control circuit short to ground

Fault code: P026212 First cylinder control circuit short to power

No.	Operation procedure	Result	Next step
1	Injector circuit short to ground.	Yes	Service cable
		No	Next step
2	Injector circuit VIO short to ground.	Yes	Service cable
		No	Next step
3	Injector control pin of ECU short to ground.	Yes	Service ECU
		No	Diagnose

Fault code: P048013 Fan relay control circuit signal abnormal (low speed)

No.	Operation procedure	Result	Next step
1	Improper connection or bad contact for connectors.	Yes	Reconnect
		No	Next step
2	Fan relay circuit signal port open circuit.	Yes	Service cable
		No	Next step
3	Fan relay breaks down (fuse burnt or damaged).	Yes	Service cable
		No	Next step
4	Open circuit or inner circuit damaged between ECU and fan relay pin.	Yes	Service ECU
		No	Diagnose

Fault code: P013217 Oxygen sensor signal circuit high voltage

No.	Operation procedure	Result	Next step
1	Connect PDA and turn ignition switch to "ON" position.		Next step
2	Read and save fault freeze frame data.		Next step
3	Do not disconnect oxygen sensor connector. Measure the voltage of cable 1 (white, heating circuit to power) at the oxygen sensor side to check if it is 12V.	Yes	Next step
		No	Inspect cable and connector
4	Do not disconnect oxygen sensor connector. Measure the voltage of cable 2 (white, heating circuit to ground) at the oxygen sensor side to check if it is 12V.	Yes	Next step
		No	Inspect cable and connector
5	Do not disconnect oxygen sensor connector. Measure the voltage between cable 4 (black, oxygen sensor signal to power) and cable 3 (gray, oxygen sensor signal to ground) at the oxygen sensor side to check if it is approximately 0.45V.	Yes	Next step
		No	Replace sensor
6	Start the vehicle. Idle it until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector. Measure the voltage between cable 4 (black, oxygen sensor signal to power) and cable 3 (gray, oxygen sensor signal to ground) at the oxygen sensor side to check if it varies between 0V and 1V.	Yes	Next step
		No	Replace sensor
7	Disconnect oxygen sensor connector. Use multimeter to check if it is short circuit between cable 1 (white, heating circuit to ground) and cable 4 (black, oxygen sensor signal to power).	Yes	Replace sensor
		No	Next step
8	Connect oxygen sensor connector. Repeat step 5 and 6 to check if the voltage varies between 0.44V and 0.46V, 0V and 1V respectively.	Yes	End
		No	Diagnose

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Fault code: P013413 Oxygen sensor circuit signal defective

No.	Operation procedure	Result	Next step
1	Connect PDA and turn ignition switch to "ON" position.		Next step
2	Read and save fault freeze frame data.		Next step
3	Do not disconnect oxygen sensor connector. Measure the voltage of cable 1 (white, heating circuit to power) at the oxygen sensor side to check if it is 12V.	Yes	Next step
		No	Inspect cable and connector
4	Do not disconnect oxygen sensor connector. Measure the voltage of cable 2 (white, heating circuit to ground) at the oxygen sensor side to check if it is 12V.	Yes	Next step
		No	Inspect cable and connector
5	Do not disconnect oxygen sensor connector. Use multimeter to check if cable 4 (black, oxygen sensor signal to power) is open circuit.	Yes	Inspect cable and connector
		No	Next step
6	Do not disconnect oxygen sensor connector. Use multimeter to check if cable 3 (gray, oxygen sensor signal to ground) is open circuit.	Yes	Inspect cable and connector
		No	Next step
7	Disconnect oxygen sensor connector and remove oxygen sensor. Wait until the oxygen sensor cools down to room temperature(1). Use multimeter to measure the resistance between cable 1 (white, heating circuit to power) and cable 2 (white, heating circuit to ground) to check if it is larger than 15Ω.	Yes	Replace sensor
		No	Next step
8	Do not disconnect oxygen sensor connector. Measure the voltage between cable 4 (black, oxygen sensor signal to power) and cable 3 (gray, oxygen sensor signal to ground) at the oxygen sensor side to check if it is approximately 0.45V.	Yes	Next step
		No	Replace sensor
9	Start the vehicle. Idle it until coolant temperature reaches normal value. Use red pen of multimeter to measure cable 4 (black, oxygen sensor signal to power) and black pen to measure cable 3 (gray, oxygen sensor signal to ground) to check if the voltage is between 0V and 1V.	Yes	Next step
		No	Replace sensor
10	Connect oxygen sensor connector. Repeat step 8 and 9 to check if the voltage varies between 0.44V and 0.46V, 0V and 1V respectively.	Yes	End
		No	Diagnose

(1)The oxygen sensor resistance measurement must be done until it cools down to room temperature. Because the resistance relates to temperature.

Fault code: P020113 First cylinder injector signal defective

No.	Operation procedure	Result	Next step
1	Improper connection or bad contact for connectors.	Yes	Reconnect
		No	Next step
2	Open circuit of injector.	Yes	Service and replace cable or injector
		No	Next step
3	Injector VIO open circuit or injector damaged.	Yes	Service and replace cable or injector
		No	Next step
4	Open circuit or inner circuit damaged between ECU and injector control pin.	Yes	Service ECU
		No	Diagnose

Fault code: P022216 TPS 2 signal circuit low voltage

No.	Operation procedure	Result	Next step
1	Check if the cable has good connection.	Yes	Next step
		No	Reconnect
2	Connect PDA and turn ignition switch to "ON". Clear fault codes. Respectively step throttle pedal rapidly and slowly for several times to check if fault codes appear or not.	Yes	Next step
		No	End
3	Remove TPS connector of the cable to check if TPS 2 signal is open circuit or short to ground.	Yes	Service or replace cable
		No	Next step
4	Turn ignition switch to "ON" to check if the power supply is normal or not.	Yes	Replace throttle
		No	Service or replace cable
6	Clear fault codes. Turn ignition switch to "OFF", then turn to "ON". Wait for one minute to complete throttle self-learning, then step throttle pedal several times to check if fault code appears again or not.	Yes	Diagnose
		No	End

Fault code: P062713 Fuel pump relay circuit defective

No.	Operation procedure	Result	Next step
1	Improper connection or bad contact for connectors.	Yes	Reconnect
		No	Next step
2	Open circuit of fuel pump relay control circuit	Yes	Service cable
		No	Next step
3	Open circuit of fuel pump relay control circuit VIO	Yes	Service cable
		No	Next step
4	Fuel pump relay fuse burnt or damaged	Yes	Service fuse
		No	Next step
5	Open circuit or inner circuit damaged between ECU and fuel pump control pin.	Yes	Service ECU
		No	Diagnose

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Fault code: P056317 Battery high voltage

No.	Operation procedure	Result	Next step
1	Connect PDA and turn ignition switch to "OFF". Use multimeter to measure battery voltage to see if it is too high.	Yes	Next step
2	Check if engine grounding point breaks down or not.	Yes	Service
		No	Next step
3	Magneto regulator damaged. It can not control the generating capacity effectively.	Yes	Service regulator
		No	Diagnose

Fault code: P057129 Brake switch signal circuit defective or out-of-step correlation

No.	Operation procedure	Result	Next step
1	Check if brake pedal cable has good connection or not.	Yes	Next step
		No	Reconnect
2	Check if brake signal is open circuit, short to ground or short to power.	Yes	Service or replace cable
		No	Next step
3	Connect PDA and adapter.		Next step
4	Turn ignition switch to "ON". Use two multi-meters to measure the voltage between brake switch signal and ground as well as the voltage between brake light signal and ground, to check if the value is 5V and 0V respectively.	Yes	Next step
		No	Adjust or replace brake pedal
5	Step the brake pedal slowly to watch if values of both multimeter changes at the same time or not.	Yes	Next step
		No	Adjust or replace brake pedal
6	Clear fault codes. Start the engine until idling. Continuously step and loose brake pedal 25 times to check if fault codes appear again or not.	Yes	Diagnose
		No	End

Fault code: P062811 Fuel pump relay circuit low voltage

No.	Operation procedure	Result	Next step
1	Fuel pump relay circuit short to ground.	Yes	Service cable
		No	Next step
2	Fuel pump control pin of ECU short to ground.	Yes	Service ECU
		No	Diagnose

Fault code: P069111 Fan relay control circuit low voltage (low speed)

No.	Operation procedure	Result	Next step
1	Fan relay control circuit short to ground.	Yes	Service cable
		No	Next step
2	Fan relay control circuit pin of ECU short to ground.	Yes	Service ECU
		No	Diagnose

Fault code: P069212 Fan relay control circuit high voltage (low speed)

No.	Operation procedure	Result	Next step
1	Fan relay control circuit short to power.	Yes	Service cable
		No	Next step
2	Fan relay control circuit pin of ECU short to power.	Yes	Service ECU
		No	Diagnose

Fault code: P133600 Electrical throttle safety monitoring torque limitation

No.	Operation procedure	Result	Next step
1	Connect PDA and adapter. Turn ignition switch to "ON".		Next step
2	Clear fault codes. Check again if it is stable state fault.	Yes	Step 3
		No	Next step
3	Start the engine. Step throttle pedal several times at neutral gear to check if fault codes appear again or not.	Yes	Replace ECU
		No	End
4	Turn ignition switch to "ON". Wait for one minute to complete throttle self-learning, then start the engine. Step throttle pedal several times at neutral gear to check if fault codes appear again or not.	Yes	Diagnose
		No	End

12.18.2 Fault Diagnosis by Engine Problems

Before trouble diagnosis by engine problems, initial checking should be done as follows.

1. Confirm if trouble light is ok.
2. Confirm there's no fault code record by PDA checking.
3. Confirm there's really trouble existing complained by end-users.

Then check the following points.

- (1) Check fuel hoses if any fuel leakage.
- (2) Check vacuum pipes if any broken, twist or improper connection.
- (3) Check intake manifold if any blocked, air leakage or damaged.
- (4) Check high-tension cable if any damaged, aging; or ignition order is correct.
- (5) Check wiring close to ground if it's clean and firm.
- (6) Check connector of all sensors and actuator if any loose or improper connection.

Important note: In case there are some problems as above-mentioned, then removal work should be done firstly, then go to next diagnosis.

Diagnosis helps:

1. Confirm engine without any trouble record.
2. Confirm there's really trouble existing.
3. During checking, do not neglect vehicle periodic maintenance, cylinder pressure, valve timing, fuel supply and so on.
4. Replace ECU to test.

In case trouble disappears, then it's a problem of ECU. If trouble still exists, then assemble original ECU and check other points.

Frequent troubles list:

- When starting engine, engine cannot rotate or rotate slowly.
- When starting engine, starter motor can rotate but cannot start engine.
- Difficult to start warm or hot engine.
- Difficult to start cold engine.
- RPM is ok, but difficult to start engine.
- Starting is ok, but idle speed is unstable at any time.
- Starting is ok, but idle speed is unstable during engine warm-up period.
- Starting is ok, but idle speed is unstable after engine warm-up.
- Starting is ok, idle speed is unstable or engine stop when switch on some lights or other electric components.
- Starting is ok, but too high idle speed.
- RPM cannot go up or engine stop when acceleration.
- Slow acceleration.
- Insufficient power and bad performance when acceleration.

(1) When starting, engine cannot rotate or rotate slowly.

Possible causes: 1. Battery; 2. Starter motor; 3. Wiring or ignition switch; 4. Engine mechanical part.

General operation procedures:

Item No.	Operation procedures	Result	Then
1	Use multimeter to measure voltage between positive and negative terminals of battery, normal value should be 8~12V when starting engine.	Yes	Next step
		No	Replace battery
2	Keep ignition switch on starting position, then use multimeter to measure voltage of positive terminal of starter motor. Normal value should be more than 8V.	Yes	Next step
		No	Repair or replace wiring
3	Remove starter motor and check if any open circuit or blocked by bad lubrication	Yes	Repair or replace starter motor
		No	Next step
4	If trouble only exists in winter, then resistance of starter motor is too big by unsuitable engine oil.	Yes	Change good engine oil
		No	Next step
5	Check if mechanical resistance is too big inside engine	Yes	Check resistance inside engine
		No	Repeat above procedures

(2) When starting, starter motor can rotate but engine cannot be started.

Possible causes: 1. No fuel inside fuel tank; 2. Fuel pump; 3. Trigger; 4. Ignition coil; 5. Engine mechanical part.

General operation procedures:

Item No.	Operation procedures	Result	Then
1	Switch on ignition switch(repeat several times if necessary) or start engine and use fuel pressure meter to measure fuel pressure of fuel pump. Correct value should be around 330kPa.	Yes	Next step
		No	Check fuel supply system
2	Use PDA to see RPM data, and start engine to check if any RPM signal output.	Yes	Next step
		No	Check RPM sensor wiring
3	Disconnect high-tension cable and connect spark plug, keep spark plug 5mm away from engine body, then start engine to check if any white/blue spark occurs.	Yes	Next step
		No	Check ignition system

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Item No.	Operation procedures	Result	Then
4	Check cylinder pressure if it's enough or not	Yes	Remove engine mechanical trouble
		No	Next step
5	Connect PDA and switch on ignition to check ECU-20 and 35 pin if it is powered normally; Check ECU-63, 64, 111 and 112 pin if it is connected to ground normally.	Yes	Use PDA to diagnose
		No	Check and repair wiring circuit

(3) Difficult to start hot or warm-up engine

Possible causes: 1. Fuel with water; 2. Fuel pump; 3. Water temperature sensor; 4. Ignition coil.

General operation procedures:

Item No.	Operation procedures	Result	Then
1	Connect fuel pressure meter and start engine to measure fuel pressure if it's around 330kPa.	Yes	Next step
		No	Check and repair fuel supply system
2	Disconnect high-tension cable and connect spark plug, keep spark plug 5mm away from engine body, then start engine to see if there's blue and white spark.	Yes	Next step
		No	Check and repair ignition system
3	Disconnect connector of water temperature sensor and start engine, check if engine can be started successfully. (or use a 300Ω resistant to connect water temperature sensor connector and check if engine can be started successfully.	Yes	Check and repair wiring or replace sensor
		No	Next step
4	Check fuel quality and if it's caused only after filling fuel.	Yes	Change fuel
		No	Next step
5	Connect PDA and switch on ignition to check ECU-20 and 35 pin if it is powered normally; Check ECU-63, 64, 111 and 112 pin if it is connected to ground normally.	Yes	Use PDA to diagnose
		No	Check & repair wiring

(4) Difficult to start cold engine

Possible causes: 1. Fuel with water; 2. Fuel pump; 3. Water temperature sensor; 4. Injector; 5. Ignition coil; 6. Throttle body and air by-pass valve; 7. Engine mechanical part

General operation procedures:

Item No.	Operation procedures	Result	Then
1	Use fuel pressure meter and start engine to measure if fuel pressure is around 330kPa.	Yes	Next step
		No	Check and repair fuel supply system
2	Disconnect high-tension cable and connect spark plug, keep it 5mm away from engine body, then start engine to check if there's blue and white spark.	Yes	Next step
		No	Check and repair ignition system
3	Disconnect connector of water temperature sensor, start engine and check if it can be started successfully (or use 2500Ω resistant to connect sensor and check if engine can be started successfully.	Yes	Check and repair wiring or sensor
		No	Next step
4	Open throttle very slowly to check if it can be started easily.	Yes	Clean throttle body and air by-pass valve
		No	Next step
5	Remove injector and use special cleaning equipment to check if any leakage or blocked	Yes	Replace injector
		No	Next step
6	Check fuel quality and if it is caused just after filling fuel	Yes	Change fuel
		No	Next step
7	Check cylinder pressure if it is enough or not.	Yes	Remove engine mechanical problem
		No	Next step
8	Connect PDA and switch on ignition to check ECU-20 and 35 pin if it is powered normally; Check ECU-63, 64, 111 and 112 pin if it is connected to ground normally.	Yes	Use PDA to diagnose
		No	Check and repair wiring

(5) RPM is ok, but difficult to start engine at any time.

Possible causes: 1. Fuel with water; 2. Fuel pump; 3. Water temperature sensor; 4. Injector; 5. Ignition coil; 6. Throttle body and air by-pass valve; 7. Intake manifold; 8. Ignition timing; 9. Spark plug; 10. Engine mechanical part

General operation procedures:

Item No.	Operation procedures	Result	Then
1	Check air filter if any blocked, or intake manifold if any blocked or leakage	Yes	Check and repair intake manifold
		No	Next step

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Item No.	Operation procedures	Result	Then
2	Use fuel pressure meter and start engine to check if fuel pressure is around 330kPa.	Yes	Next step
		No	Check and repair fuel supply system
3	Disconnect spark plug cap and connect spark plug, keep it 5mm away from engine body, then start engine to check if there's blue and white spark.	Yes	Next step
		No	Check and repair ignition system
4	Check spark plug if it is under technical specifications.	Yes	Next step
		No	Adjust or replace
5	Disconnect water temperature sensor connector and start engine to check if it can be started successfully.	Yes	Check and repair wiring or replace sensor
		No	Next step
6	Open throttle very slowly to check if engine can be started easily.	Yes	Clean throttle body
		No	Next step
7	Remove injector and use special cleaning equipment to check if any leakage or blocked.	Yes	Replace injector
		No	Next step
8	Check fuel quality and if it is caused just after filling fuel.	Yes	Change fuel
		No	Next step
9	Check cylinder pressure if it is enough.	Yes	Remove engine mechanical part
		No	Next step
10	Check ignition timing if it is ok.	Yes	Next step
		No	Check and repair ignition timing
11	Connect PDA and switch on ignition to check ECU-20 and 35 pin if it is powered normally; Check ECU-63, 64, 111 and 112 pin if it is connected to ground normally.	Yes	Use PDA to diagnose
		No	Check and repair wiring

(6) Starting is ok, but idle speed is unstable at any time

Possible causes: 1. Fuel with water; 2. Injector; 3. Spark plug; 4. Throttle body; 5. Intake manifold; 6. Air by-pass valve; 7. Ignition timing; 8. Spark plug; 9. Engine mechanical part

General operation procedures:

Item No.	Operation procedures	Result	Then
1	Check air filter if any blocked, or intake manifold if any air leakage.	Yes	Check and repair intake manifold system
		No	Next step

Item No.	Operation procedures	Result	Then
2	Check if air by-pass valve is blocked	Yes	Clean or replace
		No	Next step
3	Check spark plug if it's under technical specifications.	Yes	Next step
		No	Adjust or replace
4	Check throttle body and by-pass air pipe if any carbon deposit.	Yes	Clean
		No	Next step
5	Remove injector and use special cleaning equipment to check if any leakage, blocked or incorrect fuel flow and so on.	Yes	Replace
		No	Next step
6	Check fuel quality and judge it's caused just after filling fuel.	Yes	Change fuel
		No	Next step
7	Check cylinder pressure if it's not enough.	Yes	Remove mechanical problem
		No	Next step
8	Check mechanical ignition timing if it's under technical specifications.	Yes	Next step
		No	Check and repair ignition timing
9	Connect PDA and switch on ignition to check ECU-20 and 35 pin if it is powered normally; Check ECU-63, 64, 111 and 112 pin if it is connected to ground normally.	Yes	Use PDA to diagnose
		No	Check and repair wiring

(7) Starting is ok, but idle speed is unstable during engine warming-up.

Possible causes: 1. Fuel with water; 2. Water temperature sensor; 3. Spark plug; 4. Throttle body and by-pass air pipe; 5. Intake manifold; 6. Air by-pass valve; 7. Engine mechanical part

General operation procedures:

Item No.	Operation procedures	Result	Then
1	Check air filter if any blocked or intake manifold any leakage	Yes	Check air filter and intake manifold
		No	Next step
2	Check spark plug if it's under technical specifications.	Yes	Next step
		No	Adjust or replace
3	Remove air by-pass valve and check throttle body, air by-pass valve and idle by-pass pipe if any carbon deposit.	Yes	Clean it
		No	Next step
4	Remove water temperature sensor and start engine to check if engine can keep stable idle during warming-up.	Yes	Check wiring or replace sensor
		No	Next step
5	Remove injector and use special cleaning equipment to check if any leakage, blocked or incorrect fuel flow and so on.	Yes	Replace
		No	Next step

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Item No.	Operation procedures	Result	Then
6	Check fuel quality and if it's caused just after filling fuel.	Yes	Change fuel
		No	Next step
7	Check cylinder pressure if it's out of range.	Yes	Remove engine mechanical problem
		No	Next step
8	Connect PDA and switch on ignition to check ECU-20 and 35 pin if it is powered normally; Check ECU-63, 64, 111 and 112 pin if it is connected to ground normally.	Yes	Use PDA to diagnose
		No	Check and repair wiring

(8) Starting is ok, but idle speed is unstable after engine warming up.

Possible causes: 1. Fuel with water; 2. Water temperature sensor; 3. Spark plug; 4. Throttle body and idle by-pass pipe; 5. Intake manifold; 6. Air by-pass valve; 7. Engine mechanical part

General operation procedures:

Item No.	Operation procedures	Result	Then
1	Check air filter if any blocked, and intake manifold if any leakage.	Yes	Check&repair air filter &intake manifold
		No	Next step
2	Check spark plug if it's under technical specifications.	Yes	Next step
		No	Adjust or replace
3	Remove air by-pass valve, check throttle body, air by-pass valve and it pipe if any carbon deposit.	Yes	Clean it
		No	Next step
4	Disconnect connector of water temperature sensor and start engine to see if any unstable idle during warming up	Yes	Check & repair wiring or replace sensor
		No	Next step
5	Remove injector and use special cleaning equipment to check if any leakage, blocked or incorrect fuel flow and so on.	Yes	Replace it
		No	Next step
6	Check fuel quality if it's caused just after filling fuel.	Yes	Change fuel
		No	Next step
7	Check cylinder pressure if it's out of range.	Yes	Remove mechanical problem
		No	Next step
8	Connect PDA and switch on ignition to check ECU-G1, F1, P4 and O4 pin if it is powered normally; Check ECU-Q2, H3 and C3 pin if it is connected to ground normally.	Yes	Use PDA to diagnose
		No	Check & repair wiring
9	Turn off ignition, and switch on ignition to restart engine after 3 seconds.	Yes	
		No	Check & repair wiring

(9) Starting is ok, but idle speed is unstable or killed off when lights (or other electrical components) switched on.

Possible causes: 1. Air by-pass valve; 2. Injector

General operation procedures:

Item No.	Operation procedures	Result	Then
1	Remove air by-pass valve, check throttle body, air by-pass valve and its pipe if any carbon deposit.	Yes	Clean it
		No	Next step
2	Check engine output power if it is too big when switching on electric components. And use PDA to check advanced ignition angle, fuel spray width and air intake flow.	Yes	Operate step 4
		No	Next step
		Yes	Replace it
3	Remove injector and use special cleaning equipment to check if any leakage, blocked or incorrect fuel flow and so on.	No	Next step
4	Connect PDA and switch on ignition to check ECU-20 and 35 pin if it is powered normally; Check ECU-63, 64, 111 and 112 pin if it is connected to ground normally.	Yes	Use PDA to diagnose
		No	Check&repair wiring

(10) Starting is ok, but idle speed is too high.

Possible causes: 1. Throttle body and idle pipe; 2. Injector seat; 3. Air by-pass valve; 4. Water temperature sensor; 5. Ignition timing

General operation procedures:

Item No.	Operation procedures	Result	Then
1	Check throttle cable if it is blocked or too tight.	Yes	Adjust
		No	Next step
2	Check air intake system and injector seat if any leakage	Yes	Check&repair air intake system
		No	Next step
3	Remove air by-pass valve, check throttle body, air by-pass valve and its pipe if any carbon deposit.	Yes	Clean it
		No	Next step
4	Disconnect connector of water temperature sensor and start engine to check if idle speed is too high.	Yes	Check&repair wiring or replace sensors
		No	Next step
5	Check ignition timing if it is under technical specifications.	Yes	Next step
		No	Check & repair ignition timing
6	Turn off ignition, switch on ignition after 3 seconds and restart engine.	Yes	
		No	Check & repair wiring
7	Connect PDA and switch on ignition to check ECU-20 and 35 pin if it is powered normally; Check ECU-63, 64, 111 and 112 pin if it is connected to ground normally.	Yes	Use PDA to diagnose
		No	Check & repair wiring

(11)RPM cannot go up or engine stop when acceleration

Possible causes: 1. Fuel with water; 2. Air intake sensor and TPS; 3. Spark plug; 4. Throttle body and its idle pipe; 5. Intake manifold; 6. Air by-pass valve; 7. Injector; 8. Ignition timing; 9. Exhaust pipe

General diagnosis procedures:

Item No.	Operation procedures	Result	Then
1	Check air filter if any blocked, and intake manifold if any leakage.	Yes	Check&repair air intake system
		No	Next step
2	Use fuel pressure meter and start engine to measure fuel pump pressure. Normal value should be around 330kPa (3.30Bar)	Yes	Next step
		No	Check&repair fuel supply system
3	Check spark plug if it's under technical specifications.	Yes	Next step
		No	Adjust or replace
4	Remove air by-pass valve, check throttle body, air by-pass valve and its pipe if any carbon deposit.	Yes	Clean it
		No	Next step
5	Check air intake temperature sensor, TPS and its wiring if it is ok.	Yes	Next step
		No	Check&repair wiring or replace sensor
6	Remove injector and use special cleaning equipment to check if any leakage, blocked or incorrect fuel flow and so on.	Yes	Replace it
		No	Next step
7	Check fuel quality and if it's caused just after filling fuel.	Yes	Change fuel
		No	Next step
8	Check ignition order and ignition timing if it is under technical specifications.	Yes	Next step
		No	Check&repair ignition timing
9	Check exhaust pipe if any leakage or blocked.	Yes	Next step
		No	Repair & replace exhaust pipe
10	Connect PDA and switch on ignition to check ECU-20 and 35 pin if it is powered normally; Check ECU-63, 64, 111 and 112 pin if it is connected to ground normally.	Yes	Use PDA to diagnose
		No	Check&repair wiring

(12) Slow acceleration

Possible causes: 1. Fuel with water; 2. Air intake pressure sensor and TPS; 3. Spark plug; 4. Throttle body and its idle pipe; 5. Intake manifold; 6. Air by-pass valve; 7. Injector; 8. Ignition timing; 9. Exhaust pipe

General operation procedures:

Item No.	Operation procedures	Result	Then
1	Check air filter if any blocked, and intake manifold if any leakage.	Yes	Check&replace air intake system
		No	Next step
2	Use fuel pressure meter and start engine to measure fuel pump pressure. Normal value should be around 330kPa (3.30Bar)	Yes	Next step
		No	Check&repair fuel supply system
3	Check spark plug if it's under technical specifications.	Yes	Next step
		No	Adjust or replace
4	Remove air by-pass valve, check throttle body, air by-pass valve and its pipe if any carbon deposit.	Yes	Clean it
		No	Next step
5	Check air intake temperature sensor, TPS and its wiring if it is ok.	Yes	Next step
		No	Check&repair wiring or replace sensor
6	Remove injector and use special cleaning equipment to check if any leakage, blocked or incorrect fuel flow and so on.	Yes	Replace it
		No	Next step
7	Check fuel quality and if it's caused just after filling fuel.	Yes	Change fuel
		No	Next step
8	Check ignition order and ignition timing if it is under technical specifications.	Yes	Next step
		No	Check&repair ignition timing
9	Check exhaust pipe if any leakage or blocked.	Yes	Next step
		No	Repair or replace exhaust pipe
10	Connect PDA and switch on ignition to check ECU-20 and 35 pin if it is powered normally; Check ECU-63, 64, 111 and 112 pin if it is connected to ground normally.	Yes	Use PDA to diagnose
		No	Check&repair wiring

(13) Power not enough when acceleration and bad performance

Possible causes: 1. Fuel with water; 2. Air intake pressure sensor and TPS; 3. Spark plug; 4. Ignition coil; 5. Throttle body and its idle pipe; 6. Intake manifold; 7. Air by-pass valve; 8. Injector; 9. Ignition timing; 10. Exhaust pipe

General operation procedures:

12 Electrical System

Item No.	Operation procedures	Result	Then
1	Check if any clutch slippery, or tire pressure too low, or brake too tight, or tire size incorrect and so on.	Yes	Repair
		No	Next step
2	Check air filter if any blocked, and intake manifold if any leakage.	Yes	Check&repair air intake system
		No	Next step
3	Use fuel pressure meter and start engine to measure fuel pump pressure. Normal value should be around 330kPa (3.30Bar)	Yes	Next step
		No	Check&repair fuel supply system
4	Disconnect high-tension cable, and connect spark plug, keep it 5mm away from engine body to check if spark is ok.	Yes	Next step
		No	Check&repair ignition system
5	Check spark plug if it's under technical specifications.	Yes	Next step
		No	Adjust or replace
6	Remove air by-pass valve, check throttle body, air by-pass valve and it pipe if any carbon deposit.	Yes	Clean it
		No	Next step
7	Check air intake temperature sensor, TPS and its wiring if it is ok.	Yes	Next step
		No	Check&repair wiring or replace sensor
8	Remove injector and use special cleaning equipment to check if any leakage, blocked or incorrect fuel flow and so on.	Yes	Replace it
		No	Next step
9	Check fuel quality and if it's caused just after filling fuel.	Yes	Change fuel
		No	Next step
10	Check ignition order and ignition timing if it is under technical specifications.	Yes	Next step
		No	Check&repair ignition timing
11	Check exhaust pipe if any leakage or blocked.	Yes	Next step
		No	Repair or replace exhaust pipe
12	Connect PDA and switch on ignition to check ECU-20 and 35 pin if it is powered normally; Check ECU-63, 64, 111 and 112 pin if it is connected to ground normally.	Yes	Use PDA to diagnose
		No	Check&repair wiring