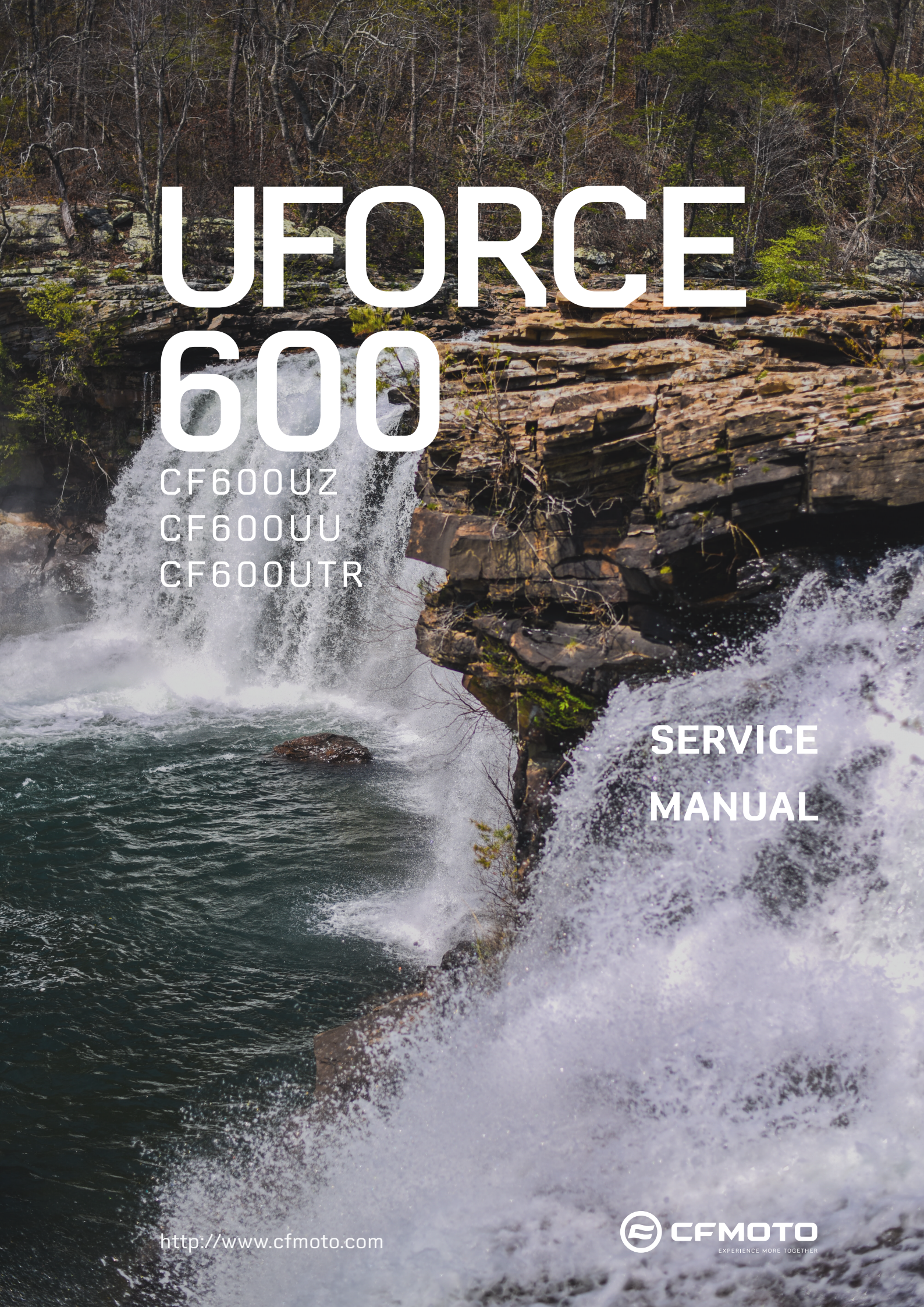

UFORCE 600

CF600UZ
CF600UU
CF600UTR

SERVICE MANUAL

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EXPERIENCE MORE TOGETHER

Edition NO. : 20220718
Edition item: CF600UZ CF600UU CF600UTR(5ASV-00WX01-01)SM-20220718

FOREWORD INDEX

This manual introduces CF600UZ CF600UU CF600UTR maintenance information, removal & installation procedure, inspection & adjustment methods, trouble shooting and technical specifications in detail. There are illustrations to guide your operations.
Please read this manual carefully and maintain the vehicle according to the standard operation method, which can effectively prolong parts service life, improve the engine performance and the reliability of the vehicle.

Part 1: Chapter 1, 2 and 3 introduce safety information, general information and maintenance information.
Part 2: Chapter 4 to 12 introduce parts removal, inspection, repair and installation procedures of each system, and points for attention as well;
Appendix: Special tool, 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.

This manual is applicable to the following vehicle:
CF600UZ CF600UU CF600UTR

INDEX

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 diagrams to guide 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 are highlighted in bold text.

⚠WARNING: 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 below explanations carefully. It explains the meaning 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: Prompts that make the process simpler or clearer.

DANGER, WARNING AND CAUTION 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, electrical, and safety knowledge, or ask a senior mechanic for help.

1.4 Operation Notice

For some procedures, special tools are needed. These tools can be purchased according to their part number.
During installation, some parts (like seal parts, o-rings, cotter pins, etc.) cannot be reused and have to be replaced with a new one. Follow the instructions when applying thread locker to screws.
For parts that will be reused after removal, clean them thoroughly and inspect for damage or cracks. Replace if damaged.
Ensure vehicle is tested for safety after repair or maintenance.

1.5 General Precaution

1.5.1 Avoid Carbon Monoxide Poisoning

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

1.5.2 Avoid Corrosion Injury by Electrolyte

⚠WARNING:
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

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

1.5.4 Avoid Scald

⚠WARNING: Engine and muffler temperatures are still high when the engine is just stopped. Avoid getting burned. Do not touch the engine until it completely cools down. Do not remove radiator cap when the engine is hot.

1.5.5 Avoid Toxic Coolant

⚠WARNING:
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 Explode and Fire

⚠WARNING:
1. Gasoline is highly flammable. Keep gasoline away from sparks. Vaporized gasoline is also explosive. Fuel and operate the 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

⚠WARNING:
1. Be careful not to get pinched by the turning parts, like wheels, axles, and clutch.
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 genuine CFMOTO parts, lubricants and service products.
2. Store the removed components separately in order for correct installation.
3. Clean mud, dust before servicing.
4. Replace removed washers, 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 parts after removal. Apply lubricants on the surface of moving parts.
7. If you do not know the length of screws, install the screws one by one and make sure they are screwed with the same depth.
8. Pre-tighten the bolts, nuts and screws, then torque them to 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 can not 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 right direction. When assembling open type or double-side dust-proof bearings, install with the manufacturer's mark outward.
14. Install the elastic circlips properly. Turn the circlip after assembling to make sure it has been installed into the slot.

⚠CAUTION:

15. After assembling, check that all 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 side of 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 gaskets and residue off the engine casings before assembling. Remove scratches on the joint faces by polishing evenly with a polish stone.

21. Do not twist or bend cables. 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 movable components inside the engine, such as the piston, piston rings, cylinder, crankshaft, gears and etc. During initial use period, proper run-in for every critical component is necessary. Break-in can help engine components match to each other and adjust working conditions. A new engine with careful treatment will have better efficient performance and a longer service life.

Recommended break-in period: First **320km**

0~320km: Do not operate continuously at more than 50% throttle position. Cool down the engine for 5~10 minutes after every hour of operation. Avoid sudden acceleration. Vary the throttle position slowly and smoothly.

NOTE:
1. Maintain and repair with regular procedures during break-in period.
2. After break-in, check and maintain the engine before normal use.

1.8 Warranty

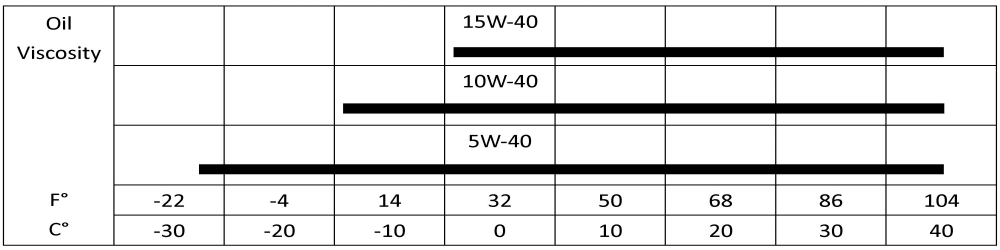
Maintenance procedures specified in the schedule are only allowed to be carried out in CFMOTO authorized service stations. Otherwise, warranty and warranty rights will be effected.

Refer to the Warranty manual for detailed information.

1.9 Fuel, 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 5W-40 for 4-stroke engines. Changing engine oil viscosity to 10W-40 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.

Gearcase oil: SAE 80W/90 GL-5

Coolant: Antifreeze with appropriate anti-corrosion and rust-proof properties. Therefore, the engine coolant contains antifreeze. Frozen temperature is lower than environment temperature (Typically -5 °C or lower).

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

NOTE: CFMOTO recommends to use - 35°C antifreeze, anti-corrosion and high boiling coolant.

Use only spare parts and accessories approved or recommended by CFMOTO. Any loss caused by using non-CFMOTO parts, CFMOTO shall not be responsible.

For lastest information about vehicle use, please visit CFMOTO official website:
http://www.cfmoto.com

1.10 Images

The pictures in this service manual may include optional tools. Parts may have been removed or not shown in the picture for better display and illustration. Not all instructions may be required for part removal, so please note the text before proceeding.
Numbers in the corner of the pictures in this service manual are only for CFMOTO internal use.

2.1 Unit Conversion Table and Symbols

Unit Conversion Table

Item	Unit conversion
Pressure	1kgf/cm²=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=1cm3=1cc
	1L=1000cm3
Force	1kgf=9.80665N
Length	1in=25.4mm

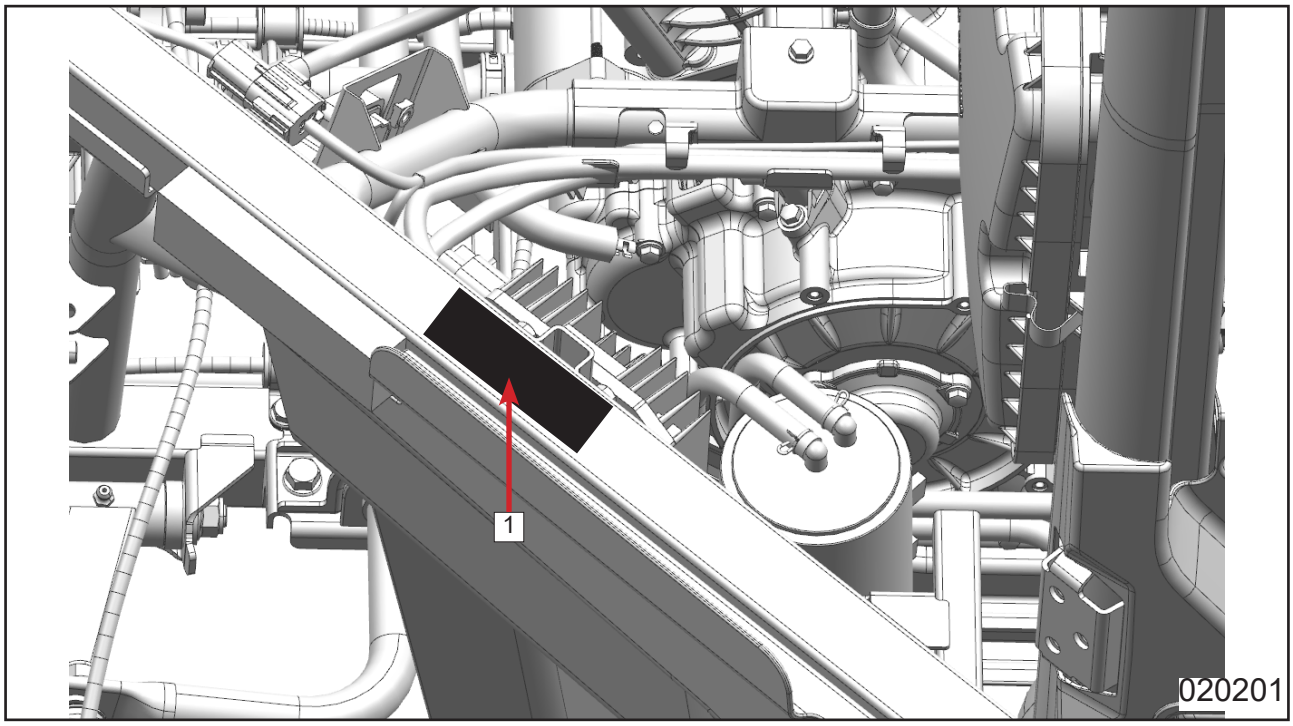
Symbols

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

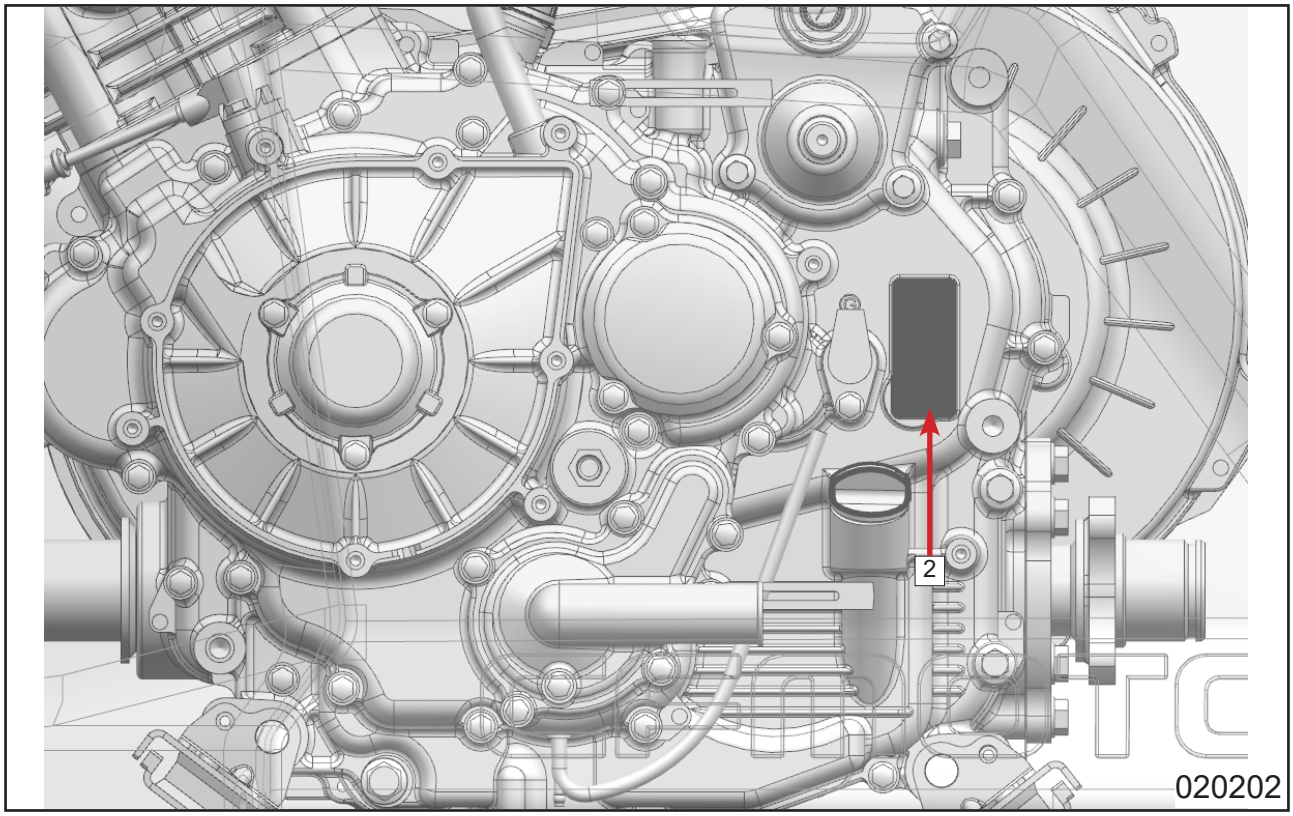
2.2 Identification Number Locations

Model: CF600UU；CF600UTR

1. VIN:
2. EIN:



1	VIN Location



2	EIN - PTO

2.3 Main Specification Chart

Vehicle	Specification	
Model	CF600UU	CF600UTR
Length×width×height (mm)	2820×1470×1950	2920×1470×1895
Wheelbase	1950mm	
Min. ground clearance (without load)	270mm	
Dry weight	615kg	
Passengers	Two people (driver included)	
Max. cargo load allowed	250kg	
Max. load allowed	483kg	
Recommended Towing Capacities: Towing Hitch Weight Trailer and Cargo Weight	 68kg 680kg	 40kg 400kg
Frame type	Steel tube	

Engine		Specification
Model		191S
Type		Single cylinder, 4-stroke, water-cooled, 4 valves, SOHC
Bore×Stroke		91mm×89.2mm
Displacement		580cc
Compression ratio		10.68：1
Min. no-load stabilized speed (idling)		1500r/min±150r/min
Physical size Length(mm)×Width(mm)×Height(mm):		622×537×514
Net weight		64.5kg
Output style		Front and rear shaft
Engine output rotating direction		Clockwise (rear view)
Electrical system	Ignition method	ECU
	Spark plug	DCPR8E(NGK)
	Magneto	VAC 3-phase, outer rotor flywheel
	Starting method	Electric start
EFI system	ECU	Bosch
	Injectors	Bosch
	Idle speed	1500r/min±150r/min
Lubrication system	Lubrication method	Pressure + splash
	Oil pump	Rotor motor
	Filter style	Full flow cartridge filter
	Engine oil	SAE15W-40/SJ or higher
	Transmission oil	75W/90 GL-5
Cooling system	Cooling type	Closed-circuit coolant radiator
	Coolant	-35°C Anti-freeze mix
Throttle	Valve diameter	40mm
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	0.675~3.021	
	Gear ratios	Final	1.333
		Secondary	1.952
		Speed gears L gear: 2.533, H gear: 1.350, R gear: 2.071	
		Total ratio: L gear: 6.595, H gear: 3.514, R gear: 5.392	
	Axle ratios	Front axle	33/9
		Rear axle	33/9

Fuel System	Specification
Fuel type	EPA: 87 octane or higher unleaded gasoline EU167: E10/95 or higher unleaded gasoline
Fuel tank capacity	35L
Reserve fuel indicator	Flash at approximately 5L
Fuel pump	300kPa ± 10 kPa
Fuel filter	15-micron, inline type

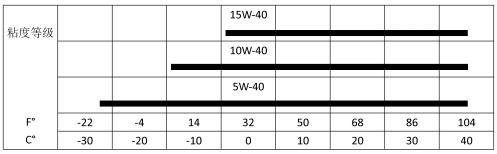
Steering system	Specification	
Min. turning radius	4750mm	
Turning angle	Inside	39.5°
	Outside	29°

Brake system	Specification
Front	Dual Hydraulic Disc
Rear	Dual Hydraulic Disc
Parking	Mechanical parking/hydraulic parking

Suspension system	Specification	
	CF600UU	CF600UTR
Type	**Front: Dual swing arm independent** 200mm travel	
	Rear: Dual swing arm independent 200mm travel	
Shock absorber	Front: Oil / Spring Pre-load Adjustable Rear: Oil / Spring Pre-load Adjustable	
Standard spring pre-load setting	Front: 46mm Rear: 45mm	

Wheel/Tire	Specification	
	CF600UU	CF600UTR
Front tire	25×8.00 R12 6PR(60J)	25×8-12 6PR 60G
Rear tire	25×10.00 R12 6PR(68J)	25×10-12 6PR 70G
Wheel bolt pattern	M10×1.25-7H	M10×1.25-7H
Wheel nut pattern	M10×1.25-7H	M10×1.25-7H

2.4 Specifications for Service

Lubrication system		
Item	Standard	
Engine oil capacity	Replace oil and oil filter	2900mL(crankcase)
	Total capacity	3000mL(crankcase)
Recommended engine oil		Use of any oil other than those recommended may cause serious engine damage. CFMOTO recommends the use of 5W-40 for 4-stroke engines. Changing engine oil viscosity to 10W-40 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 pressure	Engine RPM 1500r/min and oil temperature 90°C, oil pressure should be between 200kPa to 400kPa. Typical is 240kPa.	
	Engine RPM 8000r/min and oil temperature 90°C, oil pressure should be between 600kPa to 700kPa. Typical is 600kPa.	
Front gear case oil	Total capacity	250 mL
	Recommended oil	SAE 80W-90 GL-5
Rear gear case oil	Total capacity	400 mL
	Recommended oil	SAE 80W-90 GL-5

Battery / Charging			
Item		Standard	
Battery	Type	DYNAVOLT: GHD30HL-BS	
	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,5000r/min	
	Charging voltage	13.5V~15.0V at 5000r/min	
	Regulator type	3-phase supply / 12Vdc power output	

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		110 kPa±15 kPa(1.1kgf/c2)	
Coolant temperature sensor temperature vs resistance	Coolant temperature (°C)	Resistance B terminal-Earth (Ω)	Resistance A-C terminals (kΩ)
	-20	——	13.71~16.94
	25	——	1.825~2.155
	50	176~280	——
	80	63.4~81.4	0.303~0.326
	110	24.6~30.6	0.138~0.145
Coolant capacity	System(except reservoir)	3.6L	
	Reservoir	0.59mL(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	70kPa	--
	Rear tire pressure	100kPa	--

Brakes		
Item	Standard	Service limit
Brake Fluid	DOT 4	--
Brake disc thickness - Front	5.0mm	4.0mm
Brake disc wear value - Front	1.0mm	
Brake pedal free play	60mm~70mm	——
Brake disc thickness - Rear	5.0mm	4.0mm
Brake disc wear value - Rear	1.0mm	

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	10A×3 15A×4 40A×1
Lights	Headlight	28.7W (High-beam) 14.5W(Low-beam) 12W (position light) 5.4W (turn light)
	Brake light	4W
	Indicators	LCD+LED
	Rear license light	H2 W5W bulb

CVT / Transmission				
Item	**Standard - mm**		**Limit**	**Remark**
Drive belt width	35.9		33.5	
Clearance between shifting fork and groove	0.07~0.22		0.45	
Shifting fork moving thickness	5.8~5.9		5.7	
H/L sliding fork groove width	6.05~6.15		6.25	
Output main gear sliding groove width	6.05~6.15		6.25	
Shifting drum groove width	8.02~8.12			
Shifting fork pin diameter	7.90~7.95		7.83	
Shifting gear hole diameter	25~25.021		25.025	
Reverse dual gear hole diameter	25~25.021		25.025	
Shifting main shaft diameter	φ30	28.980~29.993	29.970	
	φ17	16.983~16.994	16.978	
Driven shaft diameter	φ15	14.983~14.994	14.978	
	φ17	16.983~16.994	16.978	
	φ20	19.980~19.993	19.974	
Drive bevel gear shaft diameter	φ17	16.983~16.994	16.978	
	φ25	24.980~24.993	24.974	
Reverse dual gear shaft diameter	φ20	19.980~19.993		

Valve / Camshaft / Rocker Arm / Cylinder Head				
Item	**Standard - mm**		**Limit**	**Remark**
Valve diameter	IN	φ33	——	
	EX	φ29	——	
Valve thickness	IN & EX	1	0.5	
Valve clearance (Cold engine)	IN	0.08~0.12	——	
	EX	0.12~0.18	——	
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)		0.005	0.06	
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	33: 200N~235N 23: 530N~587N	——	
Cam height	IN	32.971~33.011	32.871	
	EX	32.985~33.025	32.865	
Camshaft journal diameter	φ35	34.959~34.975	34.95	
	φ22	21.959~21.980	21.95	
Camshaft mating hole inner diameter	φ35	35.007~35.025	35.04	
	φ22	22.012~22.025	22.04	
Camshaft 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 bottom flatness	0.03		0.05	
Cylinder head cover joint surface flatness	0.08		0.10	
Cylinder head flatness	0.03		0.05	

Cylinder / Piston / Piston Ring / Connecting Rod / Crankshaft				
Item	**Standard - mm**		**Limit**	**Remark**
Cylinder compression pressure	1000kPa		——	
Piston and cylinder clearance	0.030~0.050		0.10	
Piston diameter	90.95~90.97		90.85	Above 8mm from piston bottom
Cylinder inner diameter	90.99~91.01		——	
Cylinder upside and bottom flatness	0.03		0.05	
Piston ring free gap	1st	Around 11.7	8.9	
	2nd	Around 12	9.5	
Piston ring close gap	1st	0.25~0.40	1.5	
	2nd	0.35~0.45	1.5	
	Oil	0.2~0.7	1.5	
Piston ring/groove clearance	1st	0.02~0.06	0.15	
	2nd	0.02~0.06	0.15	
	Oil	0.03~0.15	0.25	
Piston ring thickness	1st	1.17~1.19	——	
	2nd	1.47~1.49	——	
	Oil	2.37~2.47	——	
Piston ring/groove thickness	1st	1.21~1.23	——	
	2nd	1.51~1.53	——	
	Oil	2.50~2.52	——	
Piston pin hole inner diameter	22.004~22.010			
Piston pin hole diameter	21.995~22.000		21.980	
Connecting rod small end inner diameter	22.01~22.02		22.06	
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 clearance	0.1~0.45		0.7	
Connecting rod big end thickness	22.95~23.00			
Cranksahft runout	0~025		0.055	
Connecting rod journal diameter	36.992~36.996		36.068	
Connecting rod bearing hole	37.006~37.028		37.06	
Connecting rod bearing clearance	0.01~0.032		0.065	
Crankshaft main journal diameter	41.955~41.970		41.935	
Crankcase main bearing hole diameter	41.980~42.000		42.10	
Crankshaft main journal radial clearance	0.045~0.01		0.08	
Crankshaft axial clearance	0.05~0.45		0.6	

Oil Pump		
Oil pump rotor	Clearance between inner and outer rotor	0.07mm~0.15mm
	Clearance between outer rotor and bore	0.03mm~0.10mm
	Rotor end clearance	0.023mm~ 0.055mm

2.5 Fastener Torque Tables

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	Mounting bolt 2, engine	M12×1.25×180	1	
2	Mounting bolt 1, engine	M10×1.25×20	4	
3	Bolt, shock absorber damper	M10×1.25×55	4	
4	Bolt, shock absorber damper	M8×40	8	
5	Upper mounting bolt, muffler	M10×1.25×70	1	40~50
6	Lower mounting bolt, muffler	M8×65	1	30~40
7	Nut, muffler joint	M8×20	2	25~35
8	Bolt, rear gear case upper bracket	M10×1.25×20	2	
9	Bolt, air filter	M6×12	4	≤6
10	Bolt, CVT housing	M6×12	4	≤6
11	Bolt, LH deflector	M6×16	2	≤6
12	Bolt, RH deflector	M6×16	2	≤6
13	Mounting nut, front shock absorber	M10×1.25×55	4	
14	Mounting nut, front A-arm	M10×1.25	4	40~50
15	Upper mounting nut, rear shock absorber	M10×1.25×60	2	40~50
16	Upper mounting nut, rear shock absorber	M10×1.25×55	2	40~50
17	Upper mounting nut, rear A-arm	M10×1.25	2	40~50
18	Lower mounting nut, rear A-arm	M10×95	4	40~50
19	Nut, rear axle seat	M10×120	4	40~50
20	Hex slotted flange nut	M20×1.5	4	220~250
21	Nut, rim	M10×1.25	16	70~80
22	Bolt, front brake caliper	M10×1.25×30	4	40~50
23	Bolt, rear brake caliper	M10×1.25×25	4	40~50
24	Bolt, brake disc	M8×20	16	30~35
25	Nut, steering rod ball pin	M10×1.25	2	40~50
26	Nut, steering motor	M12×1.25	2	70~80
27	Lock bolt, steering universal joint	M8×30	6	25~35
28	Adjusting nut, steering rod	M14×1.5	2	
29	Bolt, cab	M10×1.25×45	8	40~50
		M10×1.25×35	4	40~50
30	Bolt, front gear case	M10×1.25×130	2	50~60
31	Bolt, rear gear case	M10×1.25×120	2	50~60
		M10×1.25×140	1	50~60
32	Screw, front drive shaft	M10×1.25×25	8	40~50
33	Screw, rear drive shaft	M10×1.25×25	4	40~50
34	Bolt, seat belt	M12×30	4	40~50
35	Bolt, seat belt	M11×30	4	40~50

Torque Table - Engine Components

Item	Qty	Type (mm)	Torque (N·m)	Remark
Bolt M14×1.5	4	M14×1.5	40	
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	
Nut M8×12.5 (MAG crankcase)	1	M8×12.5	20	
Restriction plug	1	R21/8	20	Apply thread locker
Screw $R_2$1/8 (PTO crankcase oil trail)	1	R21/8	20	Apply thread locker
Screw M4×10 (crankshaft thrust washer lock screw)	2	M4×1	3	Apply thread locker
Nut M6 (PTO crankcase)	4	M6	10	
Bolt (MAG crankcase cover)	2	M5×10	6	Apply thread locker
Bolt M12×1.25×35 (magneto rotor)	1	M12×1.25	70	
Adjusting nut, valve clearance	8	M6	12	
Bolt, timing sprocket	2	M8	30	Apply thread locker
Screw plug, tensioner	2	M6×5	5	
Bolt, cylinder	8	M10	20,60	Two-step torque procedure
Nut M8 (air exhaust)	4	M8	13	
Spark plug	2	M12×1.25	20	
Stud M8×42 (air exhaust)	4	M8×42	25	Apply thread locker
Screw plug M12×1.5 (cylinder head)	1	M12×1.5	20	
Self-tapping screw ST4.8×13 (thermostat cap)	2	ST4.8×13	5	
Bolt, 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	Three-step torque procedure
Nut, drive pulley	1	M20×1.5	180	Left-hand thread
Bolt, drive pulley	1	M12×1.5	60	Left-hand thread
Nut, drive shaft (CVT driven pulley)	1	M22×1.5	150	
Lock nut, bevel gear	1	M27×1.5	145	
Bolt M8×28 (drive bevel gear bearing seat)	4	M8×28	30	
Bolt M8×25 (drive bevel gear bearing press plate)	4	M8×25	15	
Retainer, front output shaft bearing	1	M55×1.5	80	Apply thread locker
Bearing limit nut M65×1.5	1	M65×1.5	110	Apply thread locker
Bolt M8×28 (driven bevel gear bearing seat)	4	M8×28	25	
Screw T25 (shift drum)	1	M5×8	6	
Gearshift spring seat	1	M12×1	20	
Bolt M5×16 (oil pump)	3	M5×16	7	Apply thread locker
Bolt 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 (thermostat cap on cylinder 1)	2	M6×45	6	
Bolt M6×25 (tensioner, thermostat cap on cylinder 2)	6	M6×25	6	
Water temp. 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 Rocker arm 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, ect.

Name	Specification	Use position	Remark
Oil	SAE 10W-40 SAE 5W-40 SAE 15W-40 API level: SJ or higher (See chapter 02-6 for more details)	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# MoS2 lithium grease	Oil seal lip, O-ring and other sealing material surface and sealed bearing.	
Coolant	-35°C high level anti-corrosion, anti-freeze, high boiled point coolant	Cooling system, water seal installation	Capacity depends on cooling system
Flat surface sealant		Magneto stator wire rubber sleeve and left crankcase cover. Crankcase and cylinder body. Water seal and water pump and washer.	
Thread locker		Screws	
648 Cylinder locking glue		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(+)			

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	-	
►	Air filter / Air box and connections	-	Pre-Ride	-	Visually inspect. Replace filter when dirty.
►	Air box sediment tube	-	Pre-Ride	-	Inspect. If deposits are visible, clean intake tubes, air box, and replace air filter.
►	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.
►	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.
	Engine hoses, gaskets and seals	20	-	200 (320)	Inspect for leaks.

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	10h	Monthly	100 (160)	Inspect pad thickness.
	Battery	20h	--	200 (320)	Check terminals. Clean and test battery condition as necessary.
	Engine hoses, gaskets and seals	20h	-	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.
►	CVT air intake filter screen / filter	50h	--	500 (800)	Clean filter screen or filter, replace with new one if necessary.
►	General lubrication	50h	3M	500 (800)	Lubricate all grease points, pivots, cables, etc.
►	Front gear case oil	100h	12M	1000 (1600)	Inspect level. Change yearly if hours or distance interval is not met.
►	Rear gear case oil	100h	12M	1000 (1600)	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 and A-arm bushings. Replace A-arm bushings if worn or loose.
►	Rear suspension	50h	6M	500 (800)	Lubricate. Check fasteners and A-arm bushings. Replace A-arm bushings if worn or loose.

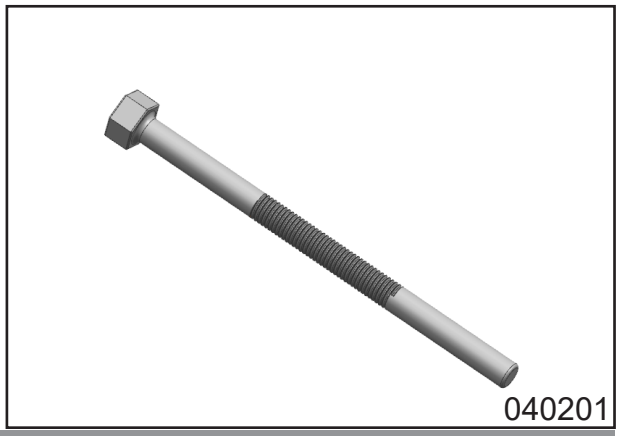
Item		Periodic Maintenance Intervals (Perform at the interval that arrives first)			
		Hour	Calendar	Miles (km)	Remarks
►	Gear shift	50h	1M	500 (800)	Inspect, lubricate, adjust as necessary.
► ■	Throttle body / throttle cable	50h	6M	500 (800)	Inspect. Clean carbon deposits. Inspect cable and lubricate frequently if subjected to severe use.
► ■	CVT drive belt	100h	12M	1000 (1600)	Inspect. Replace as necessary. See dealer for service.
■	CVT drive and driven pulleys	100h	12M	1000 (1600)	Clean and Inspect pulleys. Replace worn parts. See dealer for service.
	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.
■	Graphite seal ring on the exhaust pipe	100h	24M	2000 (3200)	Inspect; Replace if worn or fouled.
►	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.

Item		Periodic Maintenance Intervals (Perform at the interval that arrives first)			
		Hour	Calendar	Miles (km)	Remarks
► ■	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.
	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.

4.1 CVT Special Tool

Drive Pulley Removal Tool

0JY0-050000-922-002



Driven Pulley Disassembly Tool (to dissemble driven pulley)

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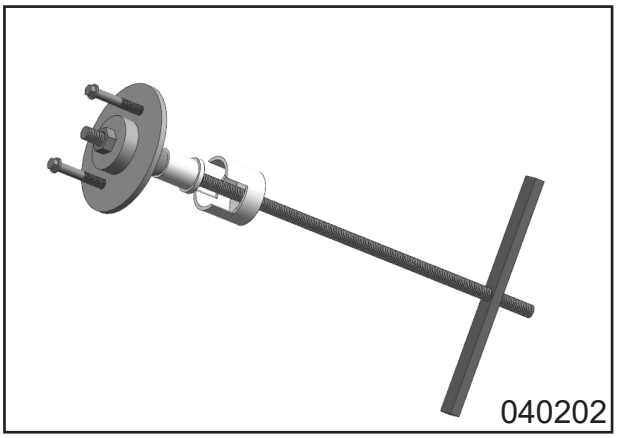

Drive Pulley Holding Wrench

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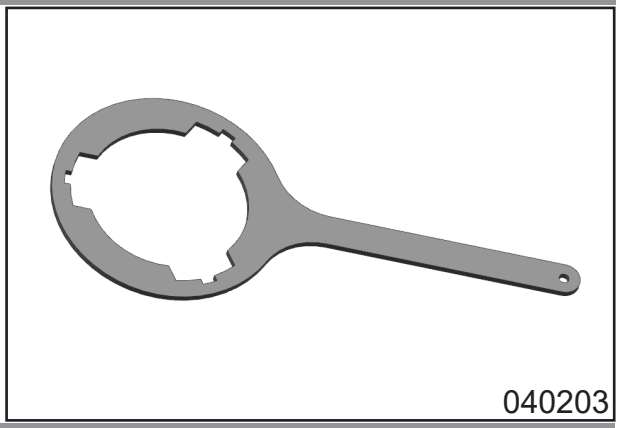

Driven Pulley Holding Wrench

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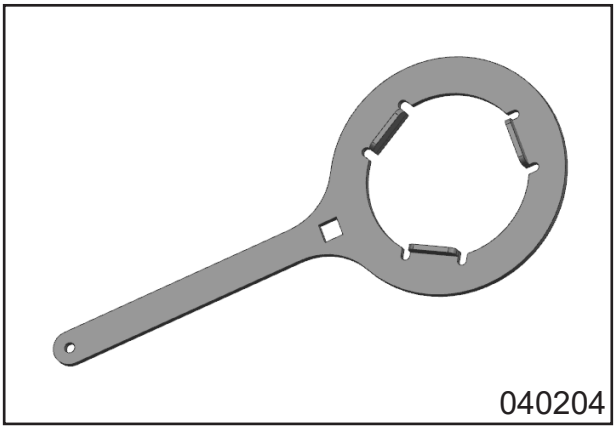

Driven Pulley Fixed Sheave and Sliding Sheave Separating Tool

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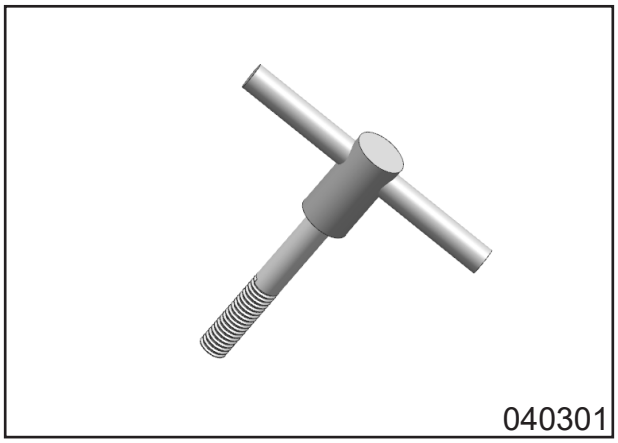

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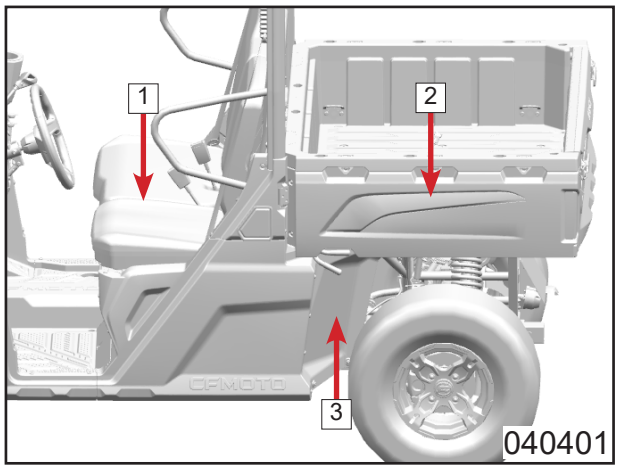
4.2 CVT Removal

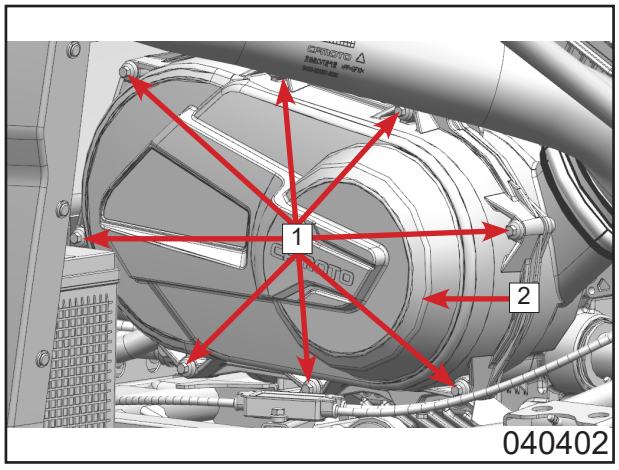
4.2.1 Preliminary Work

Remove seat [1] and storage box.
Lift up rear cargo box [2].
Remove LH rear fender [3].



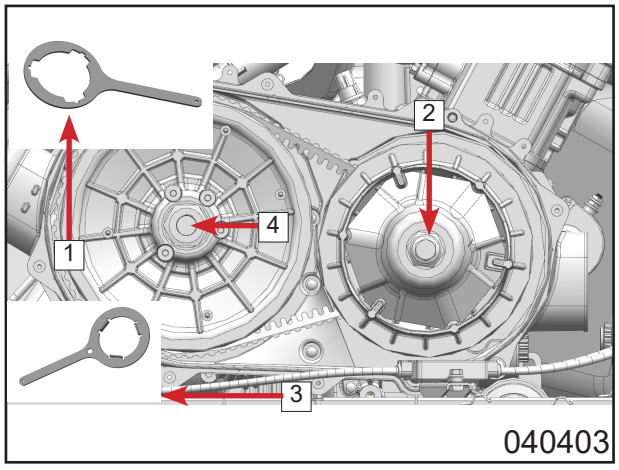
4.2.2 CVT Cover

Remove CVT cover bolt kits [1].
Remove CVT cover [2].
Remove seal ring from CVT cover.



4.2.3 CVT Drive Pulley Separation

Use special tool: drive pulley holding wrench [1] to fix drive pulley.
Remove drive pulley bolt [2] (left-hand thread).
Use special tool: Driven Pulley Holding Wrench [3] to fix driven pulley.
Remove driven pulley nut [4].



4.2.4 CVT Drive Pulley, Driven Pulley and Drive Belt

Use special tool: drive pulley holding wrench [1] to fix drive pulley.
Use special tool: drive pulley removal tool [2] (left-hand thread) to remove drive pulley.
Remove drive pulley [3], driven pulley [5] and drive belt [4] together.

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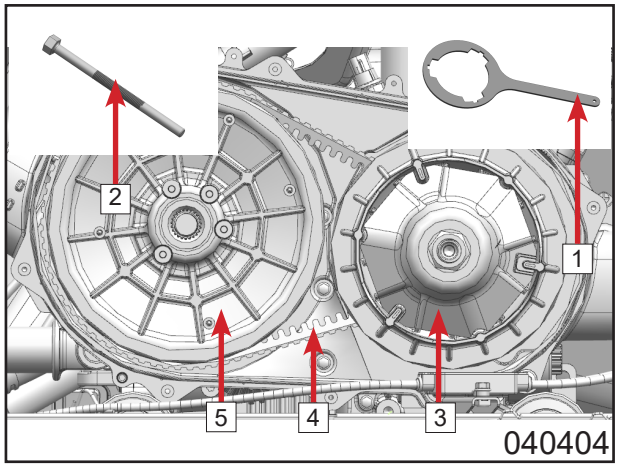
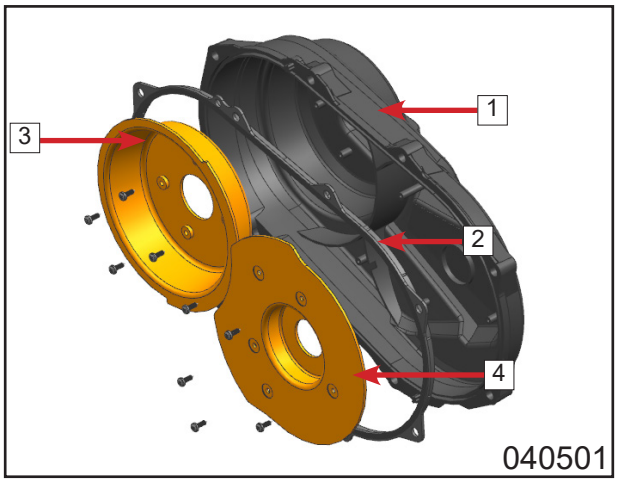


4.3 CVT Parts Inspection

4.3.1 CVT Cover

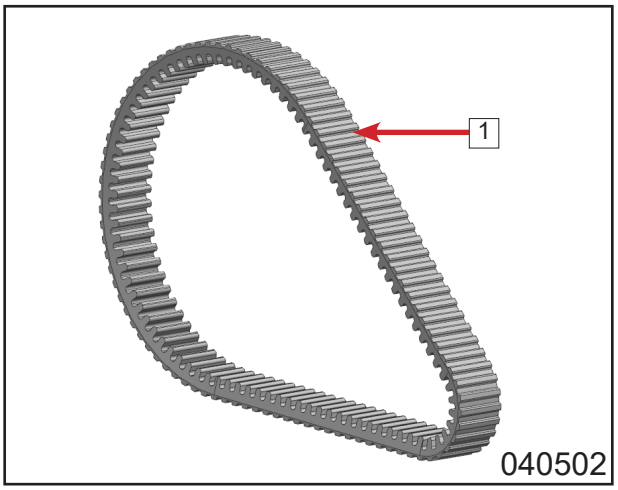
Inspect CVT cover [1] for cracks or damage. Replace if it does.
Inspect CVT cover seal ring [2] for aging, damage or other defects. Replace if it does.
Inspect front heat insulator [3], rear insulator [4] for damage. Replace heat insulator with the CVT cover [1] together if damaged.



4.3.2 Drive Belt

Inspect drive belt for oil contamination or damage. Inspect belt contact surface for cracks or damage.
Measure belt width using a vernier caliper. Replace with a new belt if damaged or beyond service limit.
Drive belt service limit: 33.5 mm

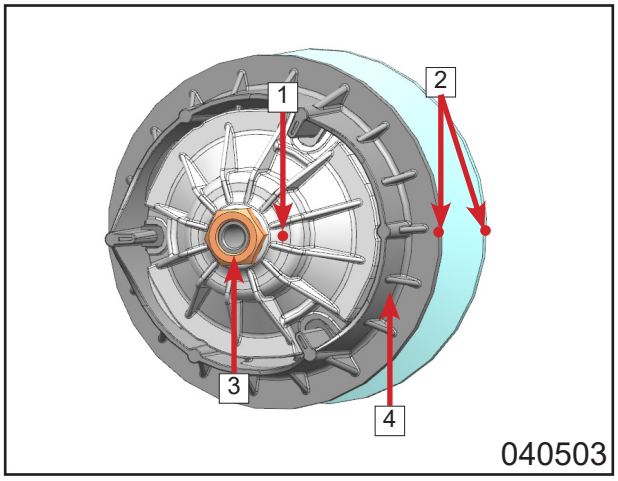
NOTE: Clean the belt and pulleys thoroughly if oil and grease adheres to belt surface.



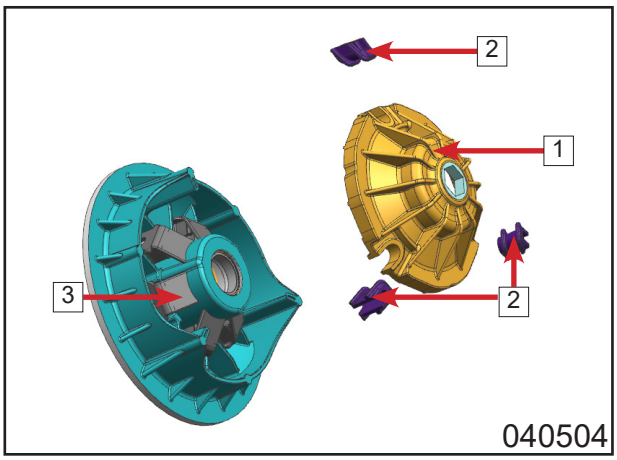
4.3.3 Drive Pulley

Disassembly

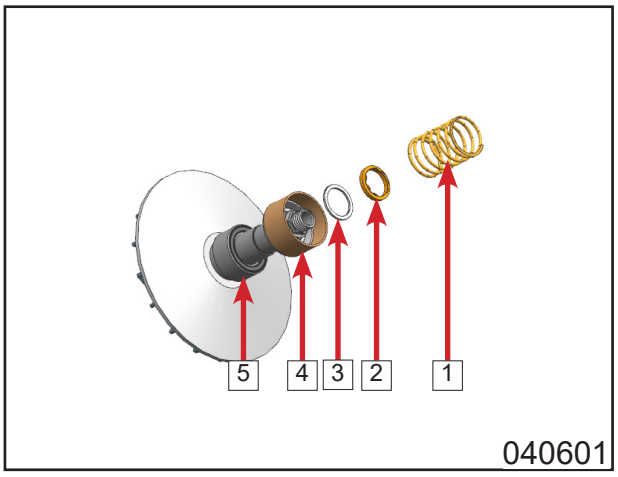
Before disassembling the driven pulley, mark the ramp plate [1] and the drive pulley sheaves [2] for reassembly.
Remove the drive pulley nut [3] (left-hand thread).
Remove drive pulley moving sheave assembly [4].



Remove ramp plate [1].
Remove ramp sliders [2].
Remove weight sliders [3].



Remove drive pulley spring [1].
Remove nylon washer [2].
Remove steel washer [3].
Remove spring seat [4].
Remove overriding clutch assembly [5]



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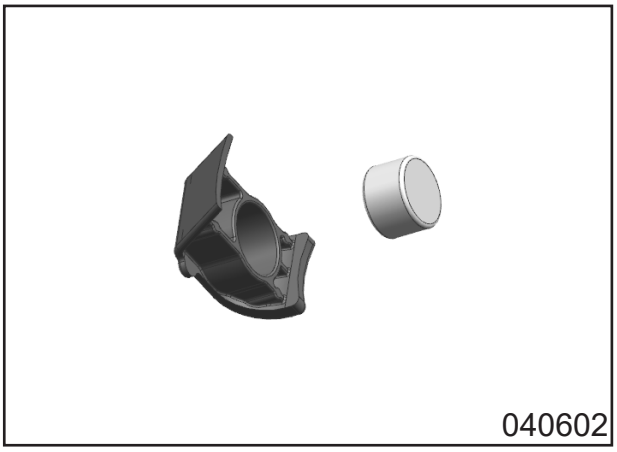
Slider Inspection

Inspect every weight slider and sliding surface for damage or wear. Replace all sliders if any defect or excessive wear is found.

NOTE: Weight sliders must be replaced as a whole set.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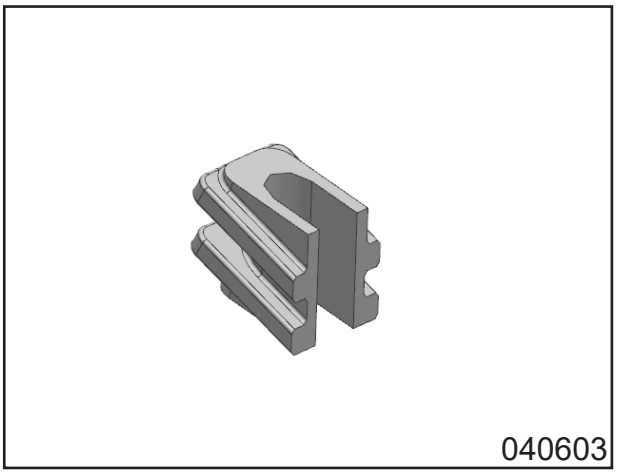
Inspect the ramp sliders for wear or damage. Replace all sliders if any defect or excessive wear is found.(It is recommended to replace as a set.)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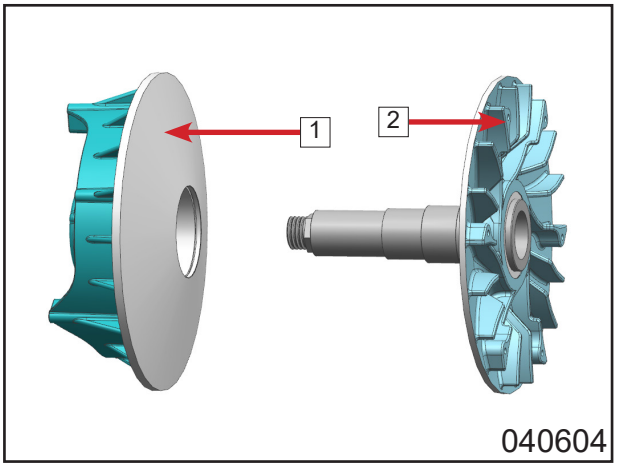
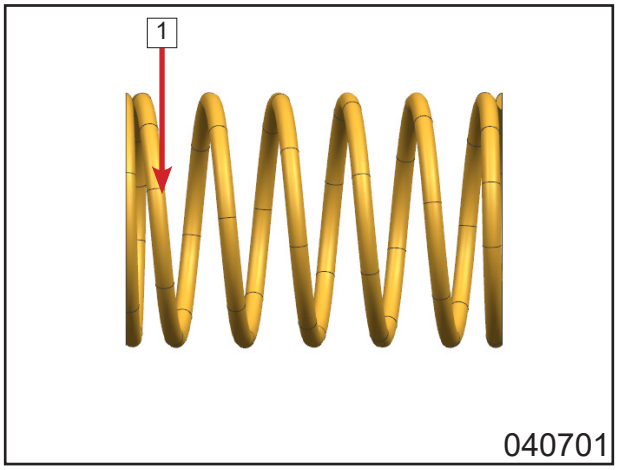
Drive Pulley Stationary Sheave and Moving Sheave Inspection

Inspect drive pulley stationary sheave [2] and moving sheave [1] surfaces for wear, grooves or damage. Replace if necessary.

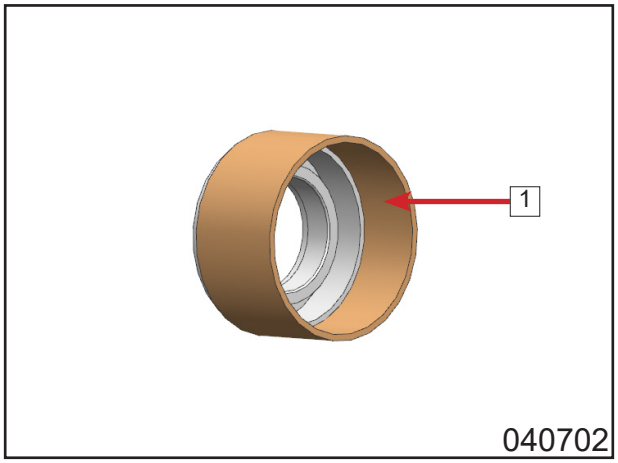


040604

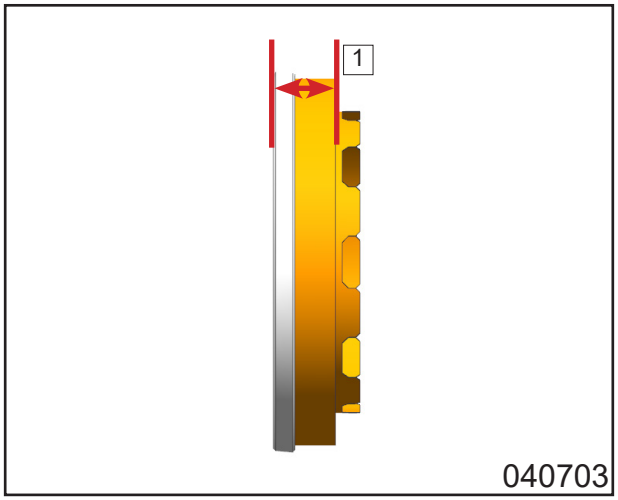
Drive Pulley Spring Inspection
Inspect the drive pulley spring 1 for deformation or cracks.



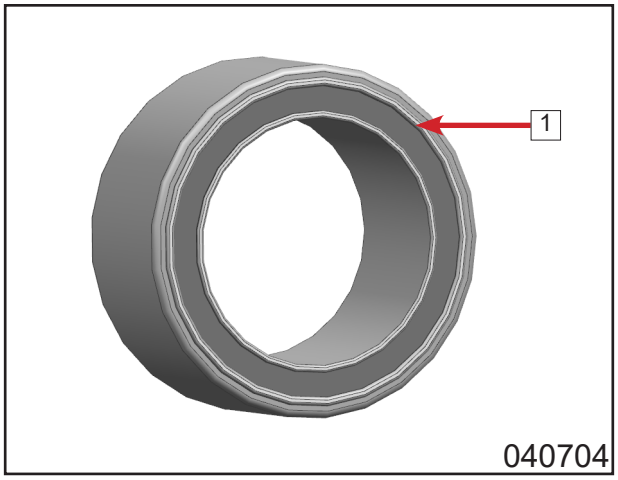
Spring Seat Inspection
Inspect the spring seat 1 for damage. Replace it if necessary.



Steel Washer and Nylon Washer Inspection
Measure thickness of the adjusting washers with a vernier caliper. Replace the washers if beyond service limit.
Adjusting washer thickness: 5mm~6mm



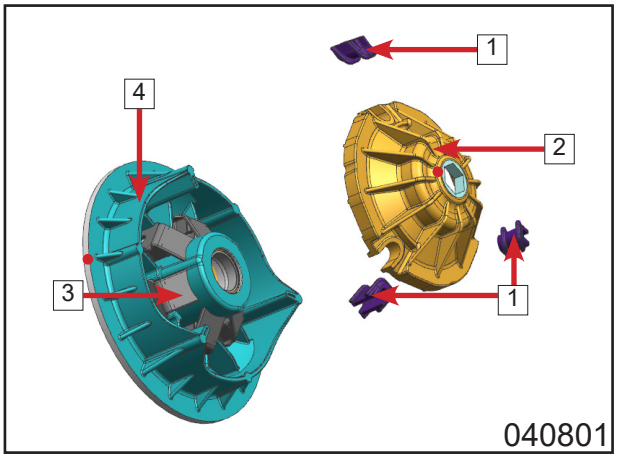
Overriding Clutch Assy Inspection
Inspect overriding clutch assy 1 for smooth rotation. Replace if locked or rotation is not smooth.



Assembly

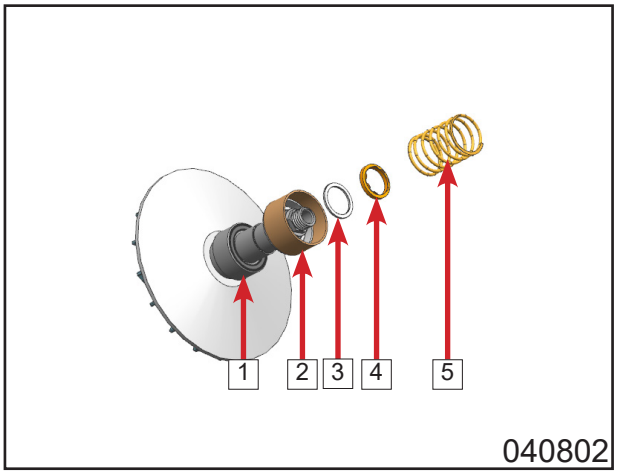
Install sliders [1] on ramp plate [2].
Install weight sliders [3] into drive pulley moving sheave [4].
Install ramp plate [2] onto the drive pulley moving sheave [4].

NOTE: Align the marks made on the ramp plate and drive pulley moving sheave. Make sure the marks are on the same line.



040801

Install overriding clutch [1].
Install spring seat [2].
Install steel washer [3].
Install nylon washer [4].
Install drive pulley spring [5].

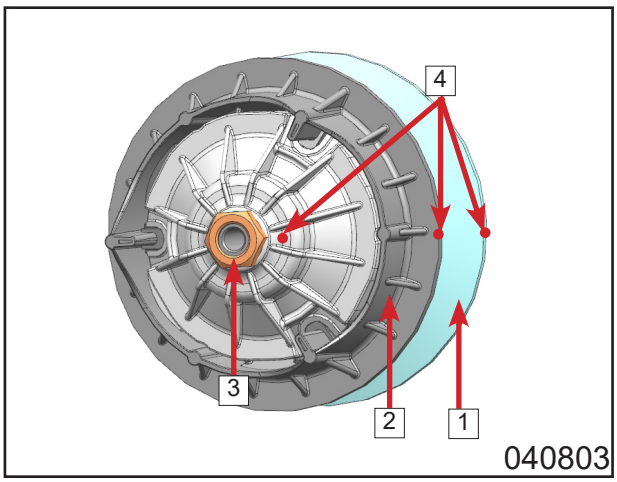


040802

Place the drive pulley stationary sheave [1] on a work bench.
Install the moving sheave assembly [2] onto the stationary sheave [1].
Press down the drive pulley ramp plate [2], then install drive pulley nut [3] (left-hand thread) and tighten to 180~216N·m.

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

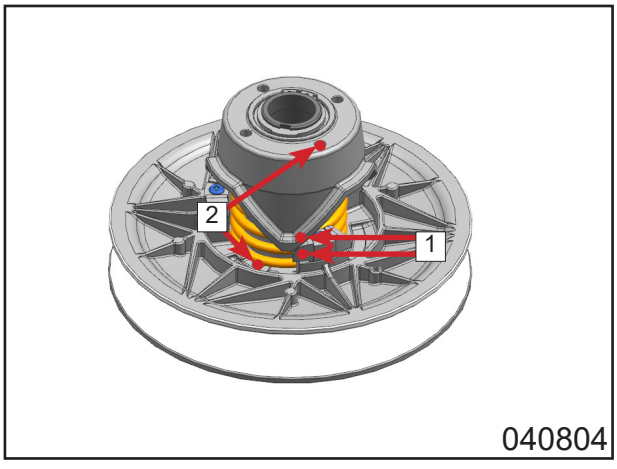
NOTE: When compressing drive pulley moving plate [2], align the inner hex hole to the drive pulley stationary sheave mounting hex.



040803

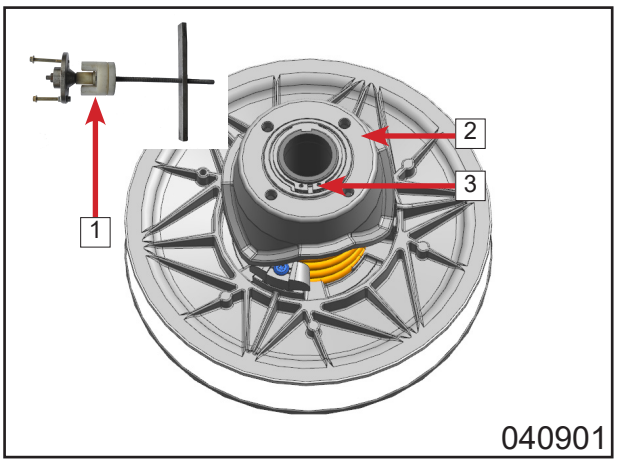
4.3.4 Driven Pulley
Disassembly

NOTE: Before disassembling driven pulley, mark the spring seat mounting holes and cam plate/ramp slider alignment for reassembly.



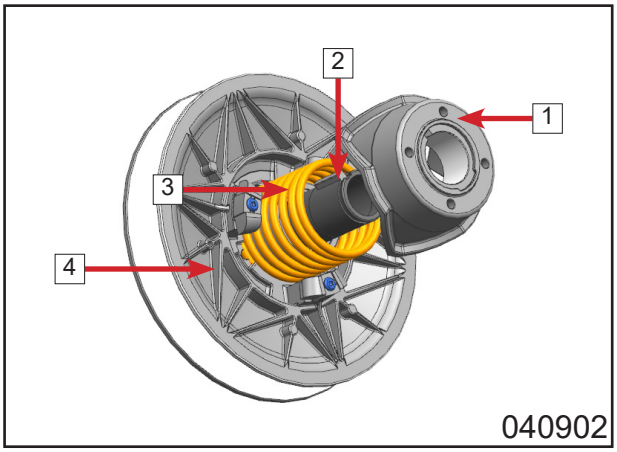
040804

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.



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

NOTE: Before disassembling driven pulley, mark the spring seat mounting holes and cam plate/ramp slider alignment for reassembly.

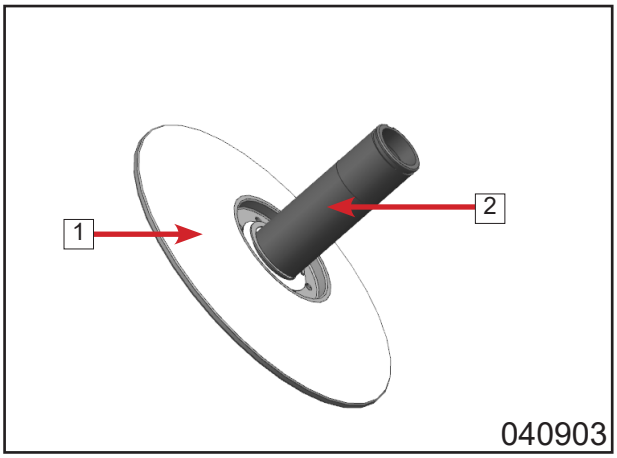


Inspection
Driven Pulley Fixed Sheave

Inspect driven pulley fixed sheave surface [1] for wear, damage or other defects. Replace as necessary.
Inspect shaft sleeve [2] for wear or other defects. Replace if necessary.

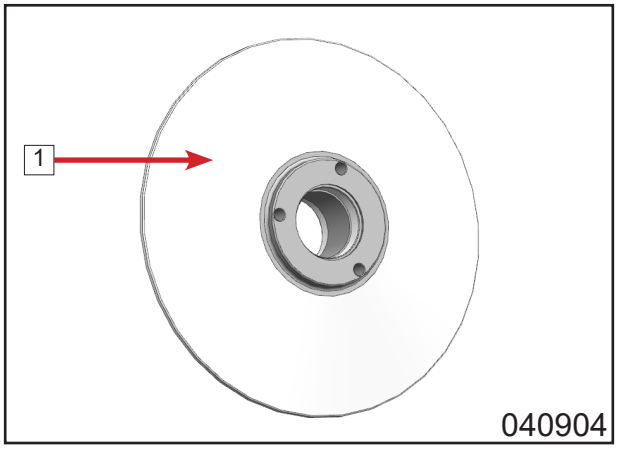
NOTE: Clean before inspection.

NOTE: Driven pulley sheaves are precisely matched. Only replace as a set.

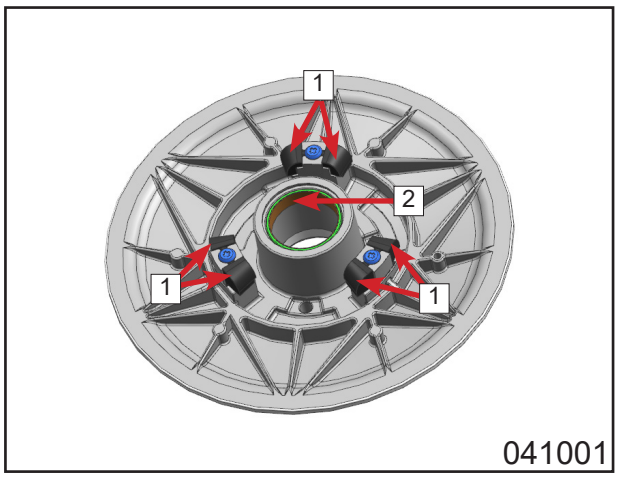


Driven Pulley Sliding Sheave

Inspect surface [1] for wear, damage or other defects. Replace if necessary.



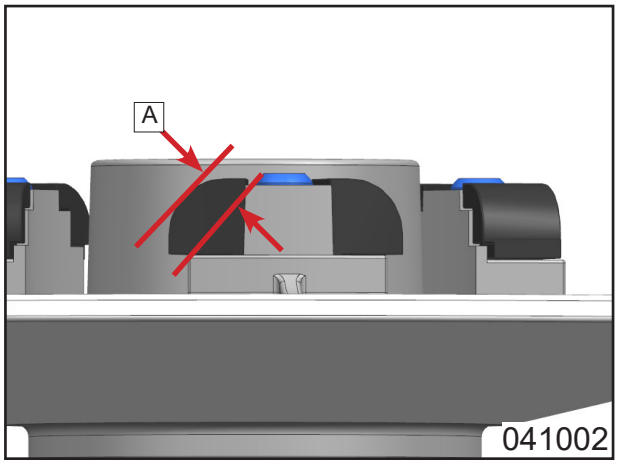
Inspect driven pulley sliders for wear or other defects. Replace if beyond value [A]. Inspect sliding sleeve bushing [2] for wear or damage. Replace if severely worn.



041001

NOTE: Clean before inspection.

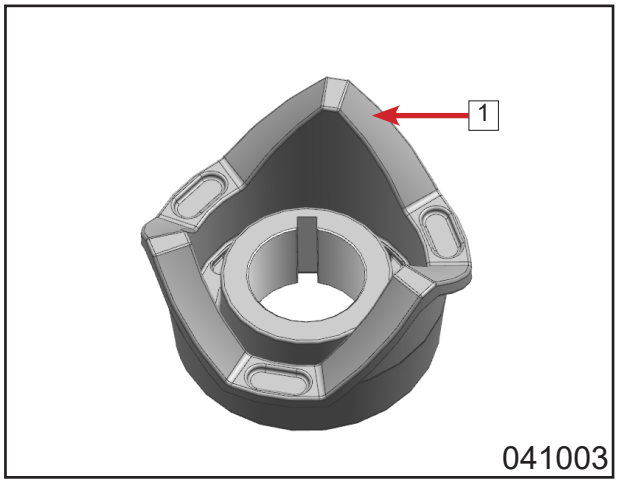
Slider wear limit: [A] ≥1.5mm



041002

Cam Plate Inspection

Inspect cam plate contact surfaces [1] for wear or other defects. Replace if necessary.

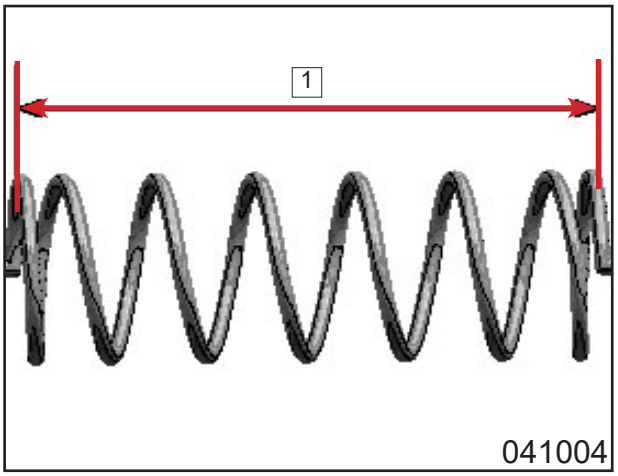


041003

Spring Inspection

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

Driven spring free length [1] service limit: 214mm

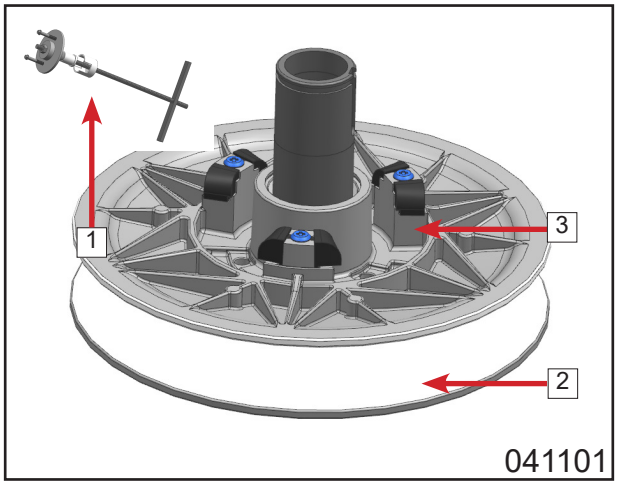


041004

Assembly

Install sliding sheave [3] onto fixed sheave [2].

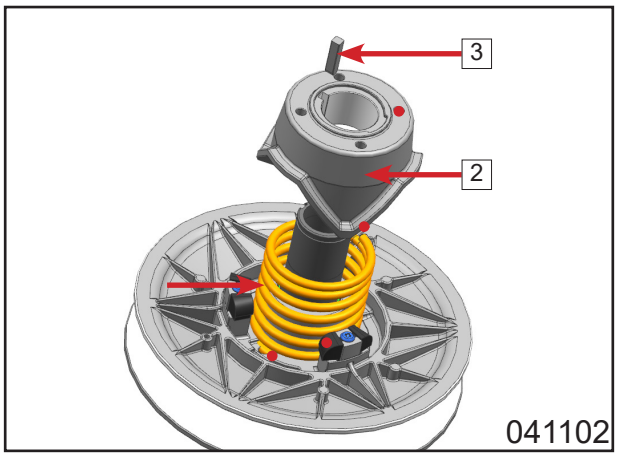
Use special tool: Driven Pulley Disassembly Tool. Place the assembly onto the special tool.



Install driven pulley spring [1] and seat each end into the sliding sheave and cam plate holes according to the marks made during disassembly.

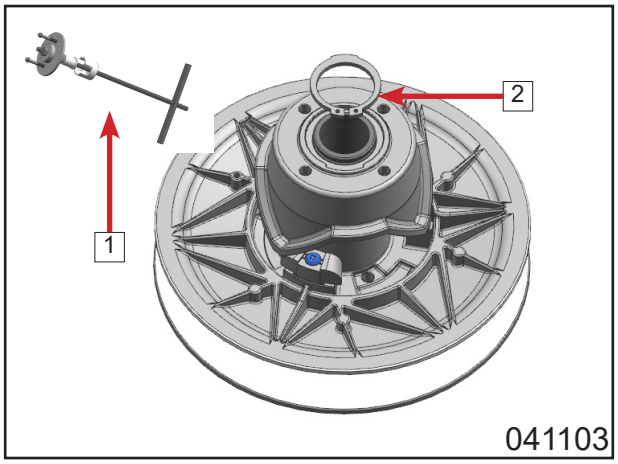
Install and align cam plate [2] according to the marks during removal. The marks on sliders should be aligned with those on cam plate.

Install shaft key [3].



Use special tool: Driven Pulley Disassembly Tool [1] to compress cam plate and driven pulley spring onto the stationary shaft.

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



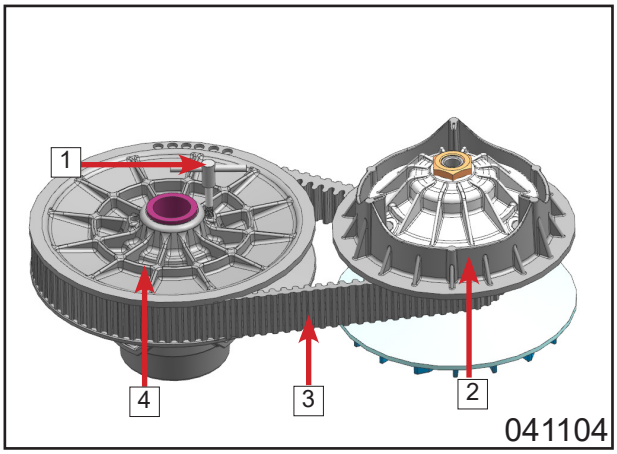
4.4 CVT Installation

4.4.1 Drive Pulley, Driven Pulley and Drive Belt Assembly

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

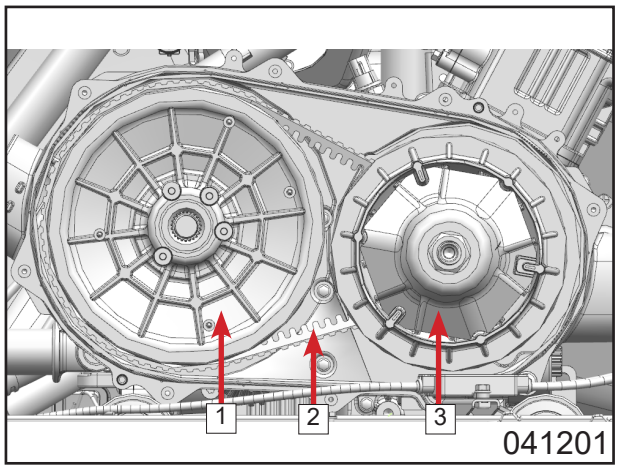
Put drive belt [3] around the drive pulley [2] and driven pulley [4].

NOTE: Clean the belt thoroughly if oil stain and grease adheres to belt surface.



4.4.2 Drive Pulley, Driven Pulley and Drive Belt

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



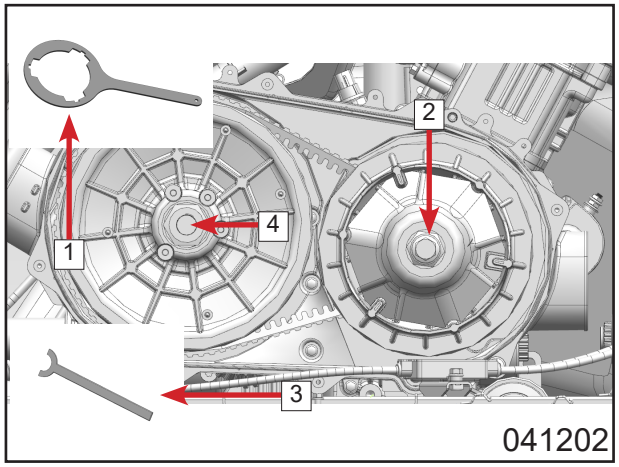
Use special tool: Drive Pulley Holding Wrench [1] to fix drive pulley. Install drive pulley bolt [2] (left-hand thread) and torque to specification.

Drive pulley bolt torque: 60N m

Use special tool: Driven Pulley Holding Wrench [3] to fix driven pulley.

Apply 243 thread locker on 3~5 threads of driven pulley nut [4]. Install nut and torque to specification.

Driven pulley nut torque: 150~180N m

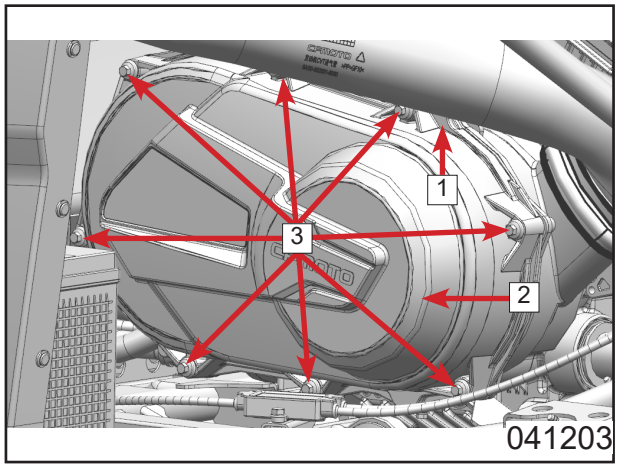


4.4.3 CVT Cover

Install seal ring on the CVT cover [1].

Install CVT cover [1].

Install CVT cover bolts [2].

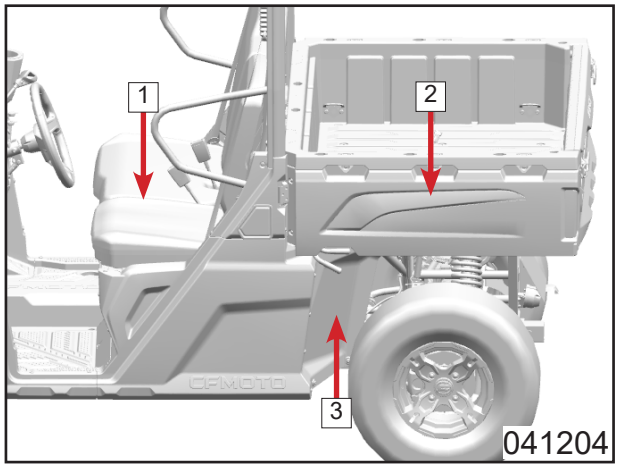


4.4.4 CVT Surrounding Parts

Install seat [1] and storage box.

Put down rear cargo box[2].

Install LH rear fender [3]..



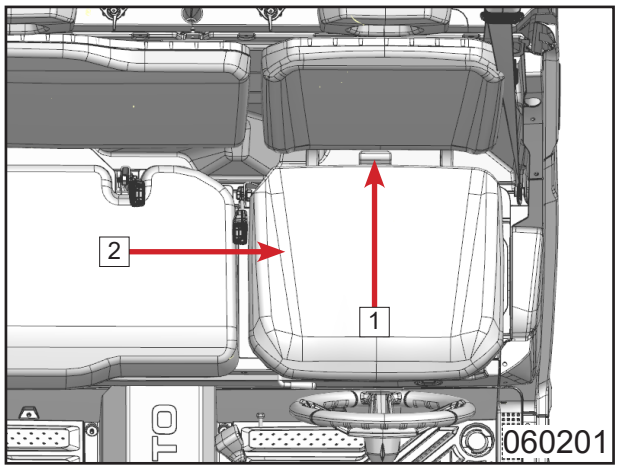
6.1 Seat

6.1.1 Driver Seat

Removal

Unlock hook 1.

Lift driver seat 2 for removal.

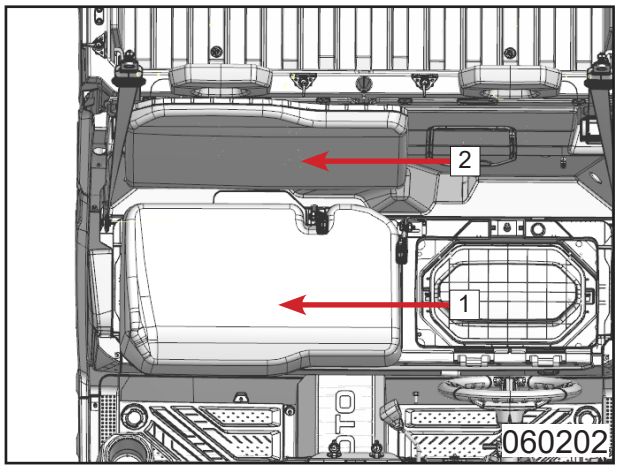


6.1.2 Passenger Seat

Removal

Remove passenger seat 1 directly.

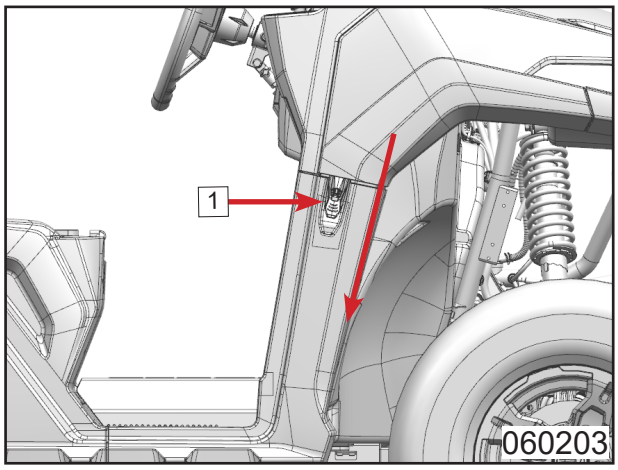
Remove passenger backrest 2 directly.



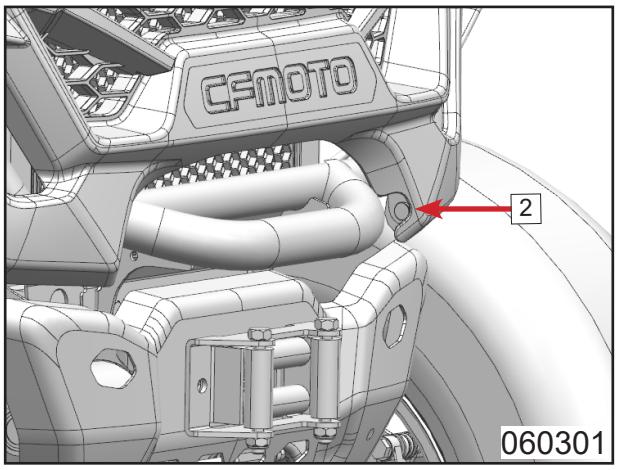
6.2 Hood

Removal

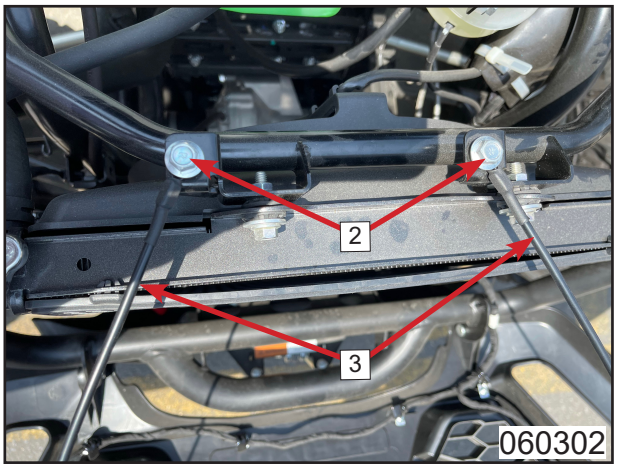
Pull open underneath rubber hooks 1



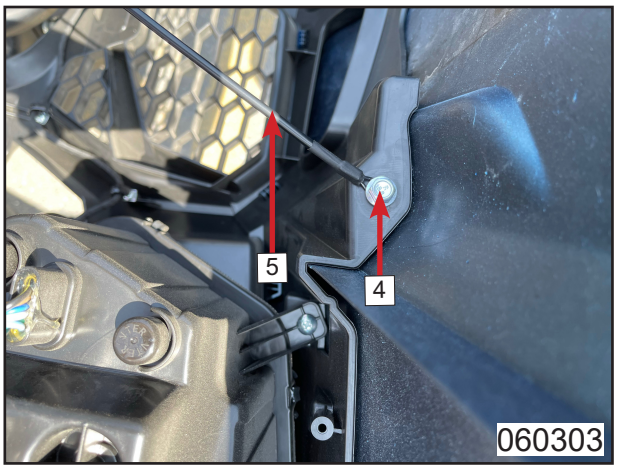
Remove bolt [2].



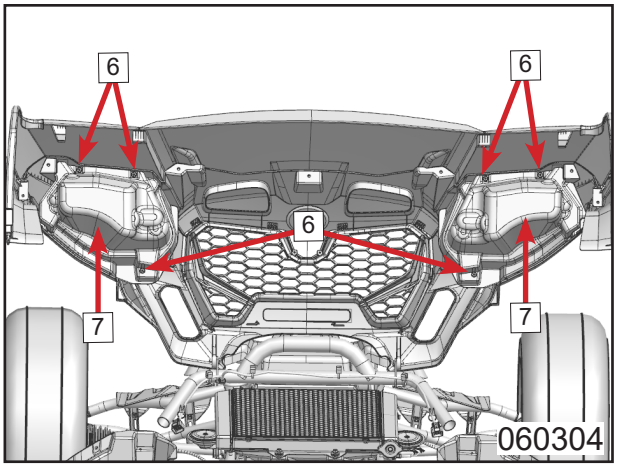
Remove bolts [2].
Loose hood stay ropes [3].



Remove bolt [4].
Remove hood stay rope [5].



Lift hood.
Remove bolts [6].
Remove headlight guards [7].
Unplug headlight connectors.

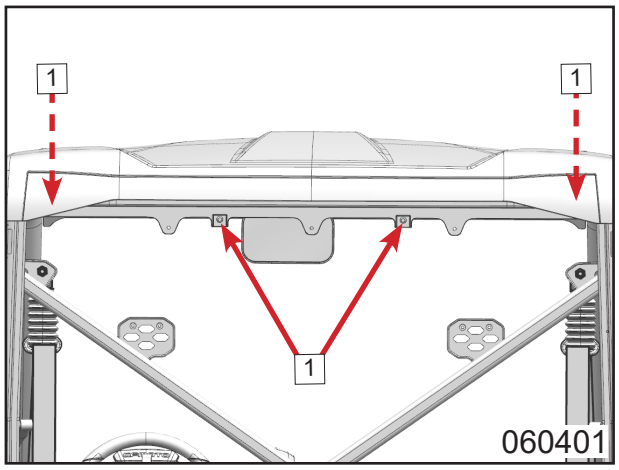


6.3 Top Roof and Cab Assembly

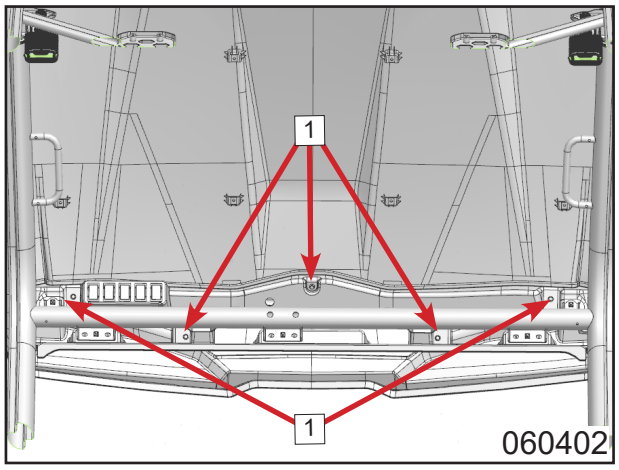
6.3.1 Top Roof

Removal

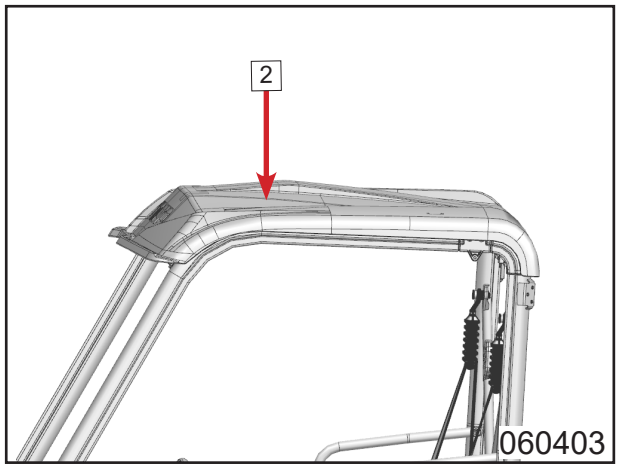
Remove bolts [1].



Remove bolts [1].

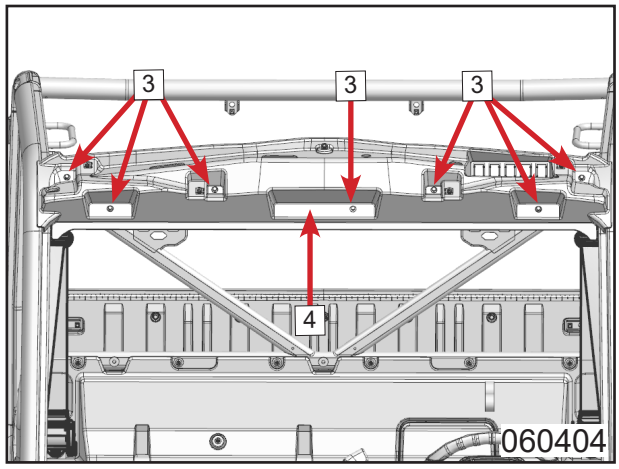


Remove top roof.



Remove bolts [3].

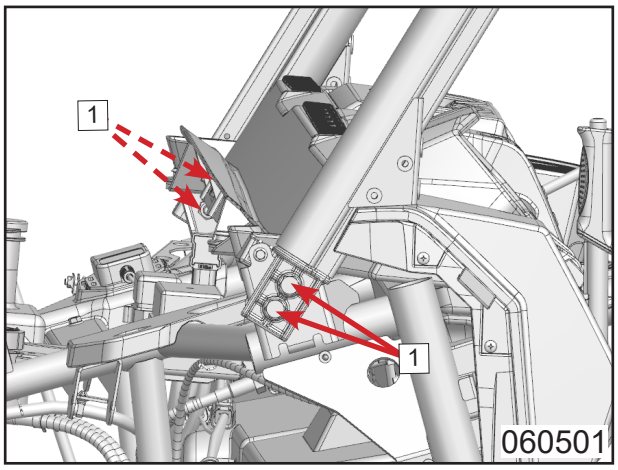
Remove top roof bracket [4].



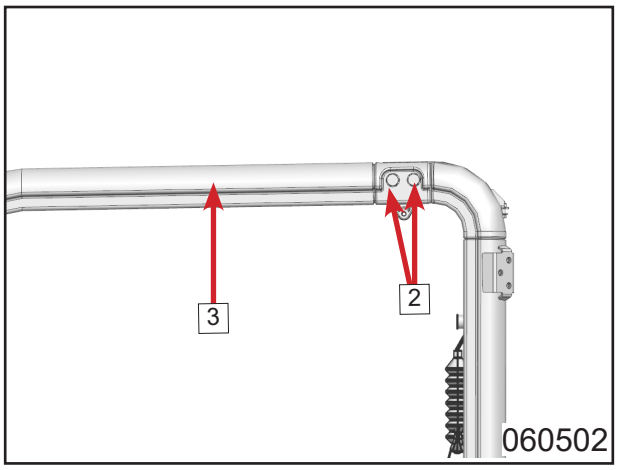
6.3.2 Cab

Removal

Remove bolts [1].



Remove bolts [2] on both sides of cab.
Remove cab [3].

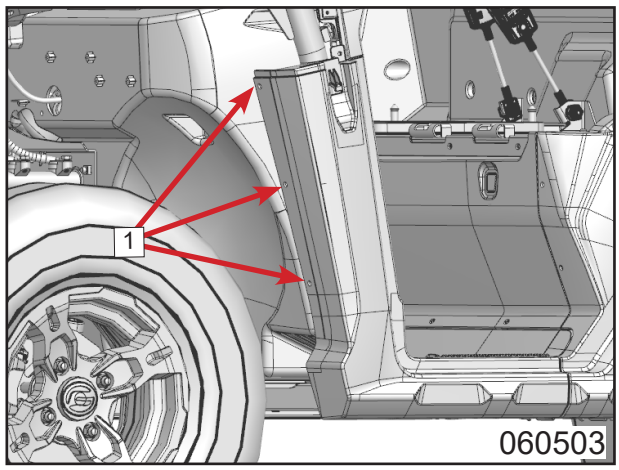


6.4 Side Panels

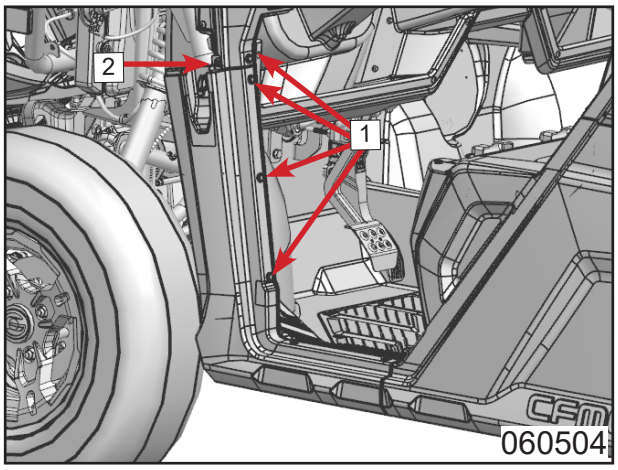
6.4.1 Front Side Panels

Removal

Remove expansion screws [1].

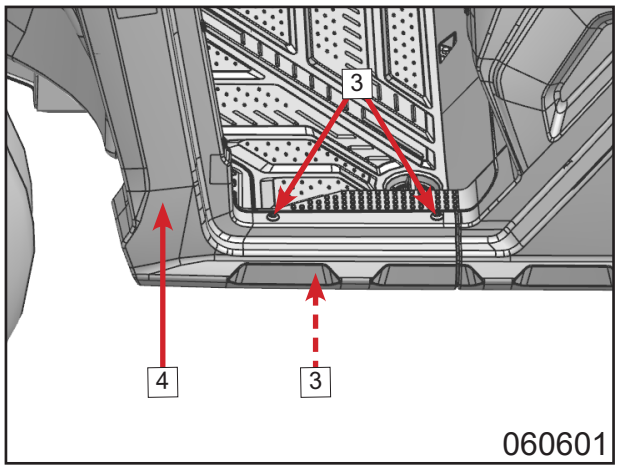


Remove expansion screws [1].
Remove inner hex bolts [2].



Remove inner hex bolts [3].
Remove LH side panel [4].

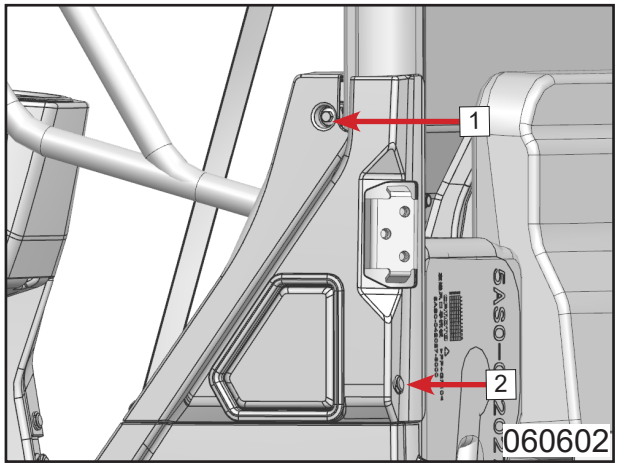
RH side panel refers to same removal procedures.



6.4.2 Rear Upper Panels

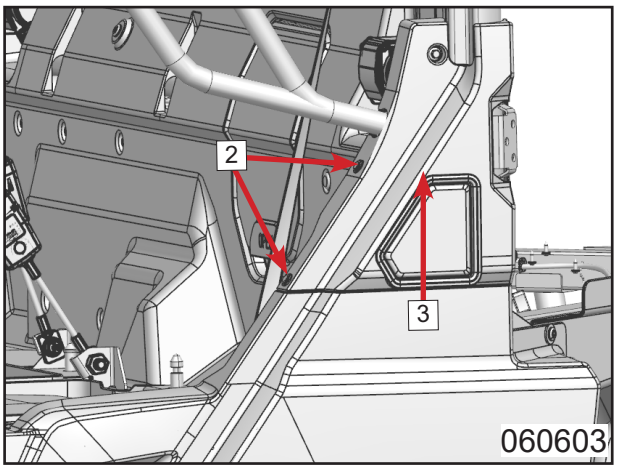
Removal

Lift cargo box.
Remove bolt [1].
Remove expansion screw [2].



Remove expansion screws [2].
Remove rear LH upper panel [3].

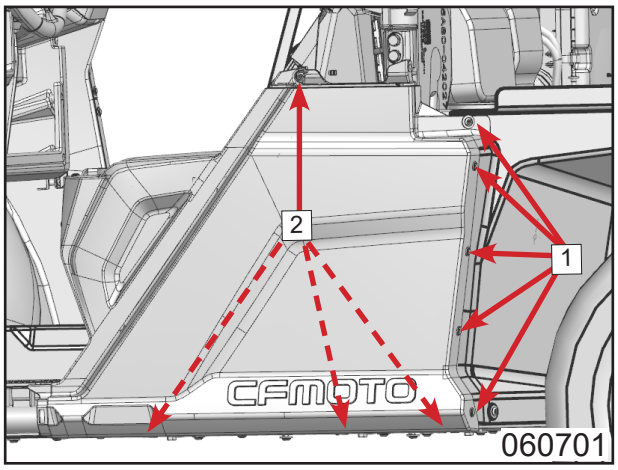
Rear RH upper panel refers to same removal procedures.



6.4.3 Rear Side Panels

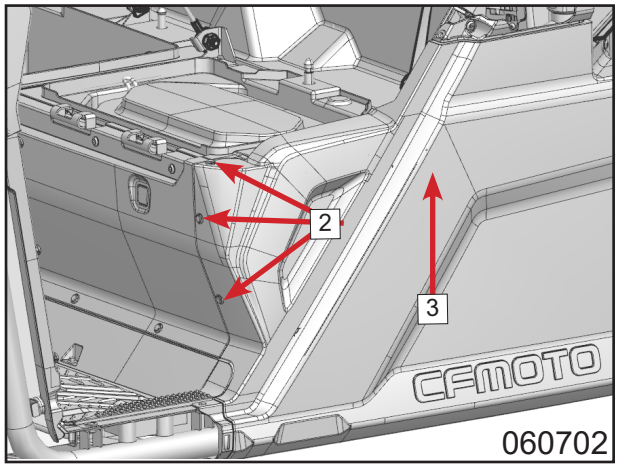
Removal

Remove inner hex bolts 1.
Remove expansion screws 2.



Remove expansion screws 2.
Remove rear LH side panel 3.

Rear RH side panel refers to same removal procedures.
Remove fuel tank cap before rear RH side panel removal.
After panel removal, install fuel tank cap to avoid dirt into tank.

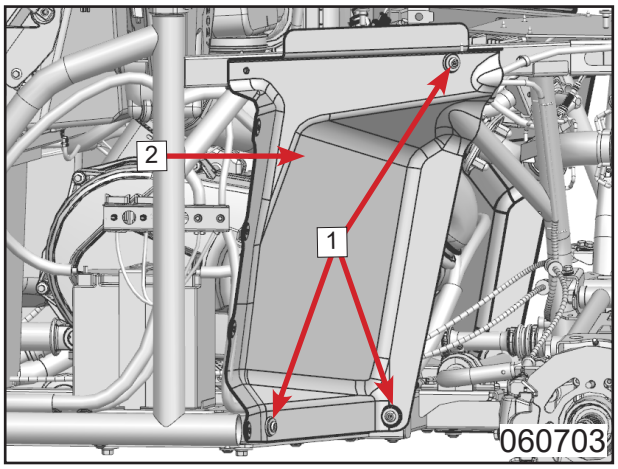


6.4.4 Rear Fenders

Removal

Remove inner hex bolts 1.
Remove rear LH fender 2.

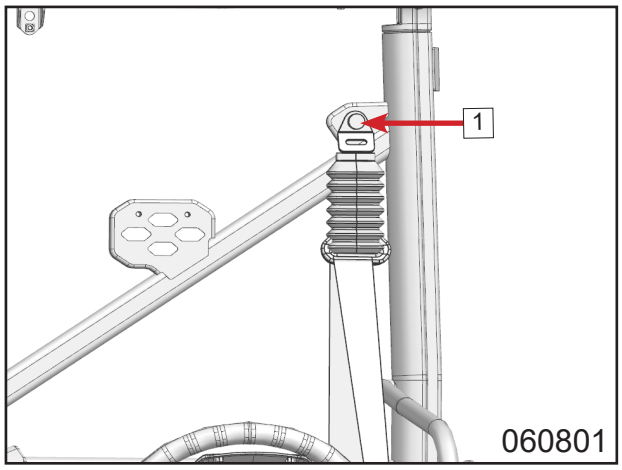
Rear RH fender refers to same removal procedures.



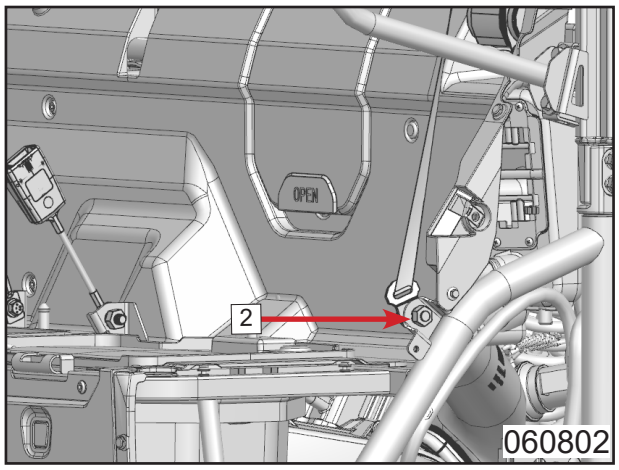
6.5 Seat Belt

Removal

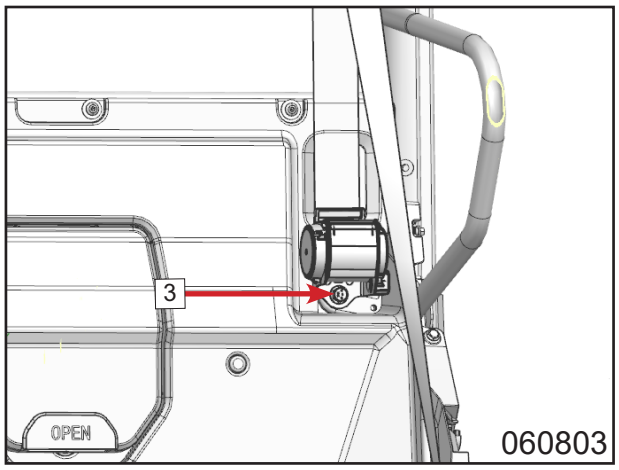
Remove bolt [1] with nut and washer.



Remove bolt [2] with nut and washer.

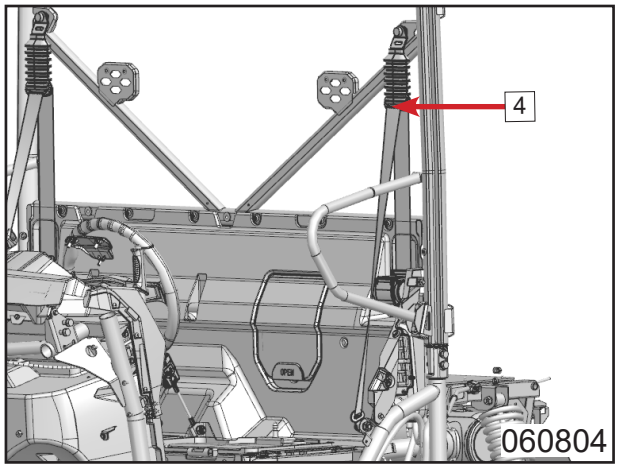


Remove bolt [3] with nut and washer.



Remove seat belt assembly [4] on left side.

Seat belt assembly on right side refers to same removal procedures.

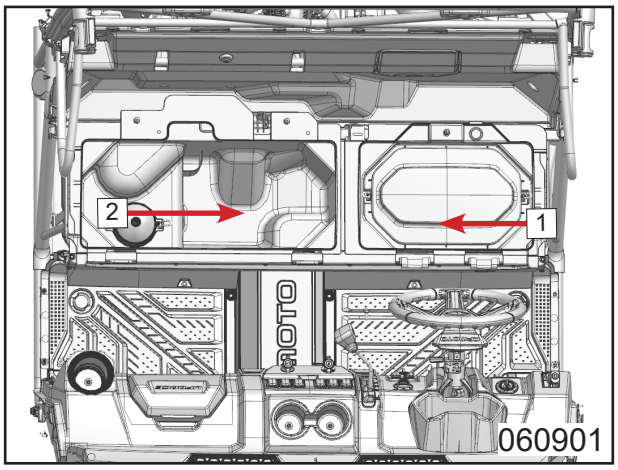


6.6 Storage Boxes underneath Seats

Removal

Remove storage box [1] underneath driver seat.

Remove storage box [2] underneath passenger seat.

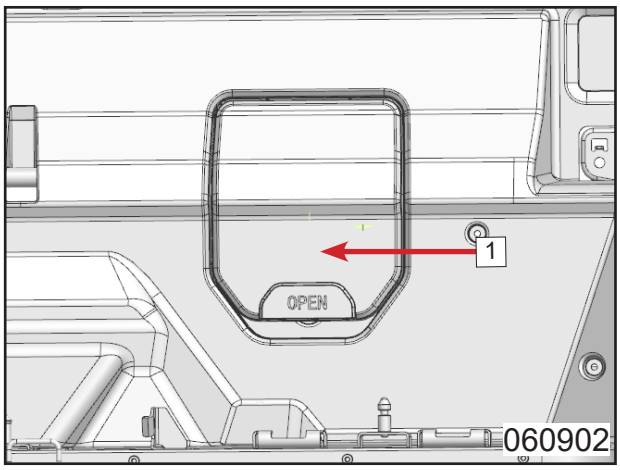


6.7 ECU Cover

Remove driver seat.

Refer to 6.1.1 Driver Seat section for removal.

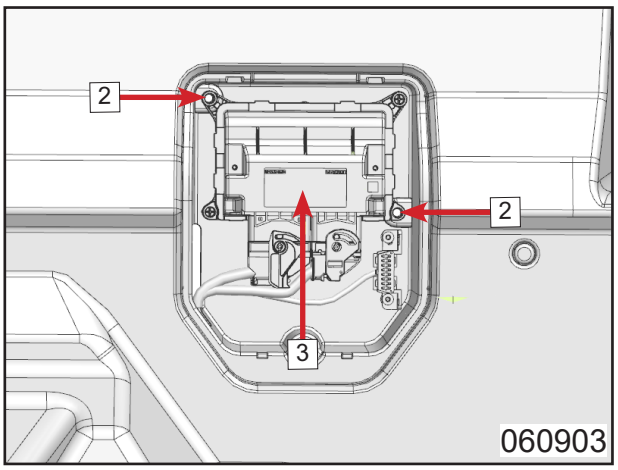
Open ECU cover [1].



Remove bolt [2].

Unplug connector.

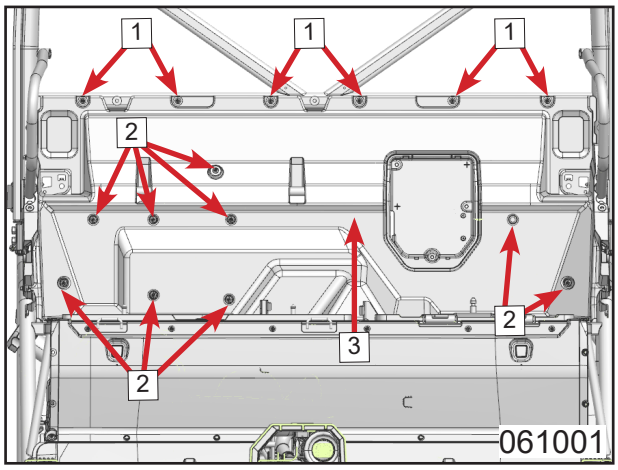
Remove ECU[3].



6.8 Seat Rear Guard Board

Removal

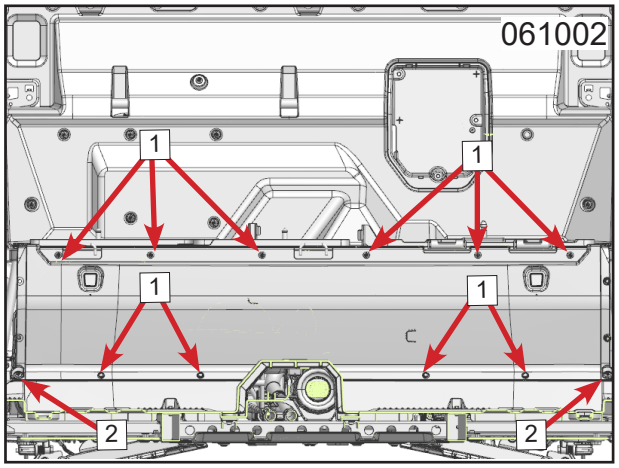
Remove inner hex bolts [1] and washers.
Remove inner hex bolts [2].
Remove seat rear guard board [3].



6.9 Seat Front Lower Guard Board

Removal

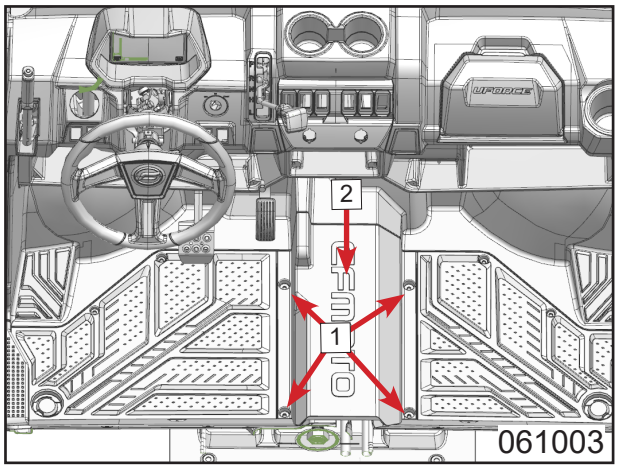
Remove expansion screws [1].
Remove seat front lower guard board [2].



6.10 Pedal Service Plate

Removal

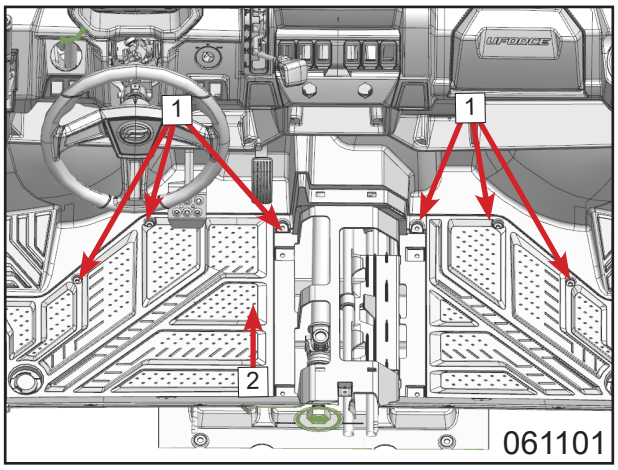
Remove bolts [1].
Remove pedal service plate [2].



6.11 Pedals

Removal

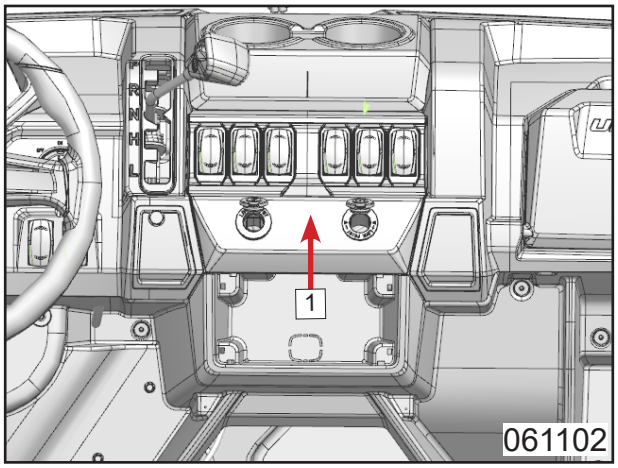
Remove bolts [1].
Remove pedals [2].



6.12 Switch Panel

Removal

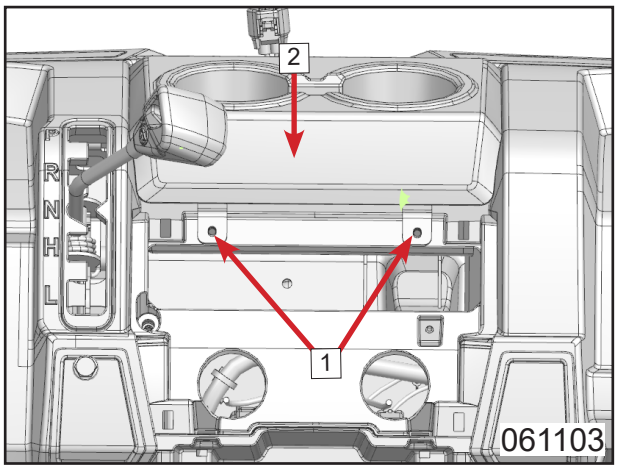
Unplug switch connectors.
Remove switch panel [1].



6.13 Center Storage Box

Removal

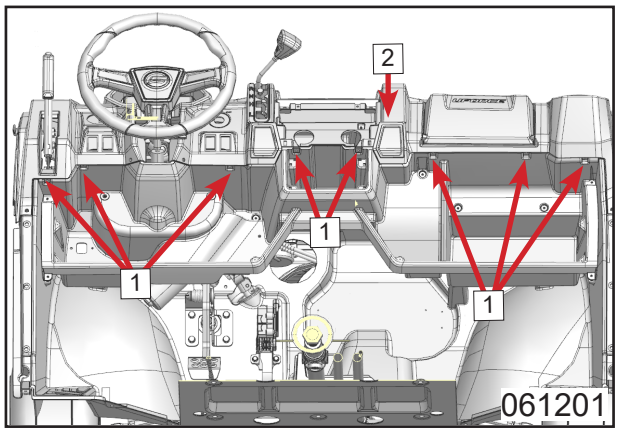
Remove bolts [1].
Remove center storage box [2].



6.14 Dashboard Upper Assembly

Removal

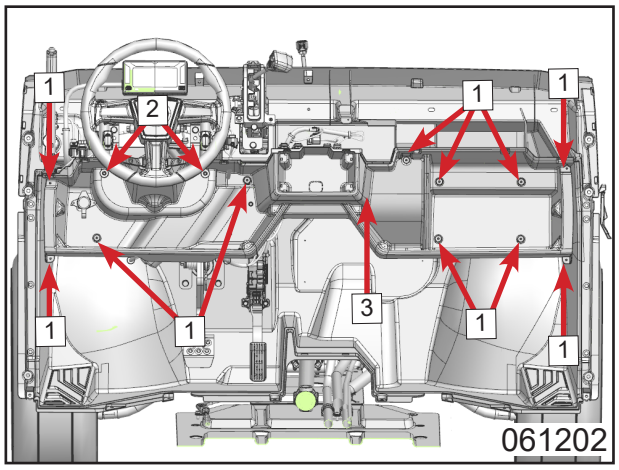
Remove dashboard guard.
Unplug front top cover connectors.
Remove steering system ball end.
Remove inner hex bolts [1].
Remove dashboard upper assembly [2].



6.15 Dashboard Lower Assembly

Removal

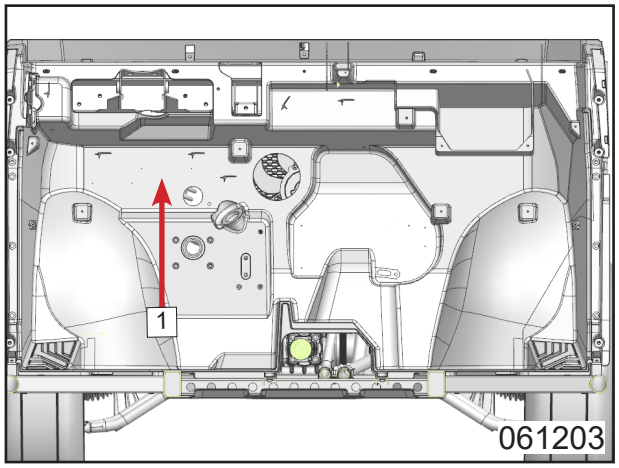
Remove bolts [1].
Remove bolts [2].
Remove dashboard lower assembly [3].



6.16 Front Fender

Removal

Remove EPS steering system (refer to Chapter 10).
Remove electrical throttle pedal.
Remove brake pedal.
Remove parking lever.
Remove gearshift assembly.
Remove front fender [1].

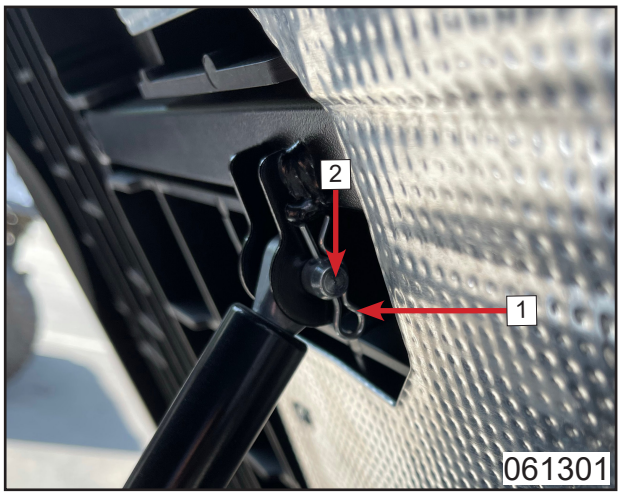


6.17 Rack

6.17.1 Gas Spring

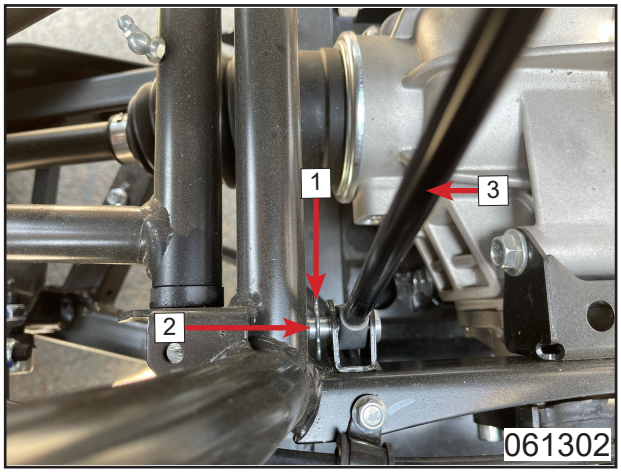
Removal

Remove cotter pin [1].
Remove gas spring lock pin shaft [2].



NOTE: There needs to be another person to stabilize the rack. Then do the following procedures.

Remove cotter pin [1].
Remove gas spring lock pin shaft [2].
Remove gas spring [3].

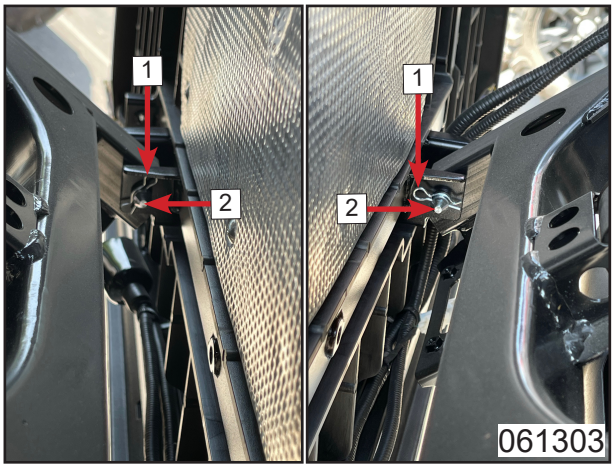


6.17.2 Cargo Box

Removal

Remove cotter pins [1] on both sides of rack.
Remove gas spring lock pin shafts [2] on both sides of rack.
Remove cargo box.

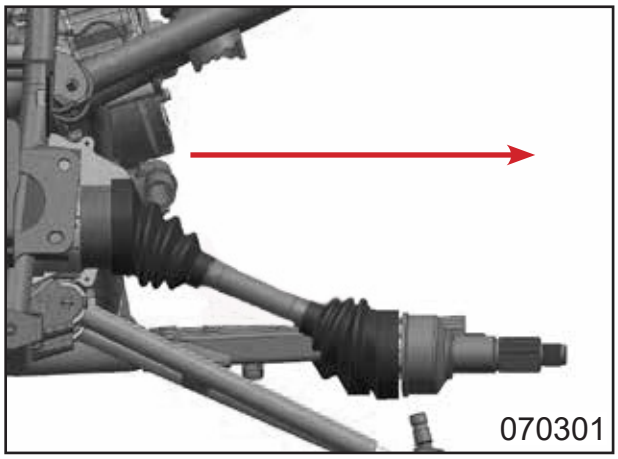
NOTE: Please work in pairs when removing cargo box.



7.1 CV Drive Shafts

Removal

Remove wheels (refer to Chapter 09).
Remove shock absorbers (refer to Chapter 09).
Remove brake calipers (refer to Chapter 08).
Remove LH and RH steering knuckles (refer to Chapter 09).



Pull out CV drive shaft in the horizonal direction.
Other CV drive shafts refer to same removal procedures.

7.2 CV Drive Shafts Inspection and Maintenance

7.2.1 CV Drive Shafts Inspection

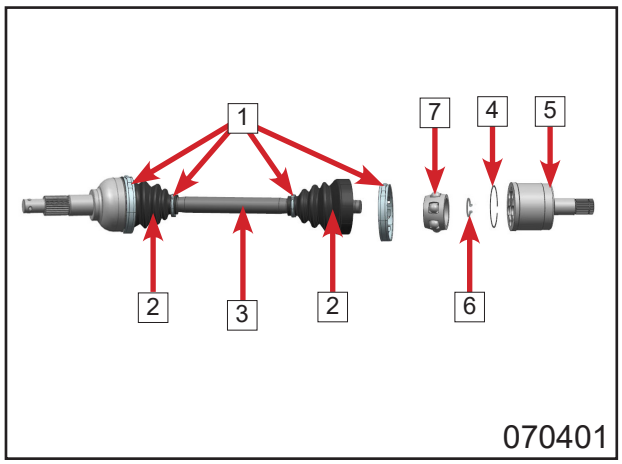
1. Both sides of CV drive shafts should rotate freely. Disassemble to inspect or replace with new parts if any defect, like being stuck, discrete rotation or noise, is found.
2. Inspect the clearance between fixed end dust boot universal shaft and middle spline. Replace with new parts if the clearance is too large.
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.

7.2.2 Shaft Cage Dust Boot

Remove clamps [1].
Pull dust boots [2] towards middle shaft [3].
Remove circlip [4].
Remove housings [5].
Remove circlip [6].
Remove universal shaft assembly [7].
Remove dust boots [2].
Replace with new dust boots during installation.



Installation

Reverse the removal procedures for installation.

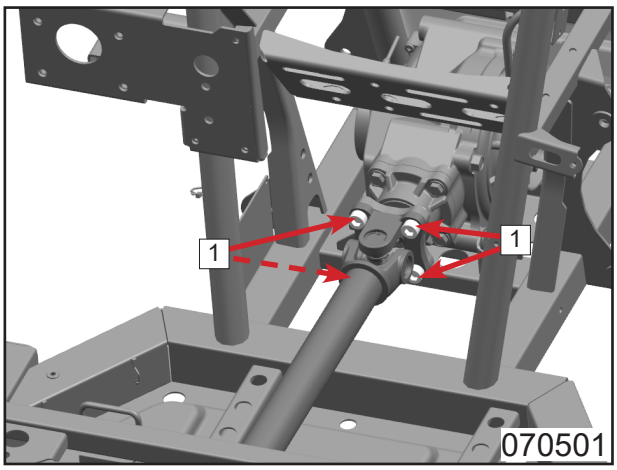
NOTE: Inject MoS2 lithium grease on universal joint during drive shaft installation.
Fill 45g±5g grease in fixed end cage universal joint, 50g±5g grease in fixed end seal enclosure, 65g±10g grease in axial movement cage universal joint for front gear case and 110g±10g for rear gear case.

7.3 Drive Shafts

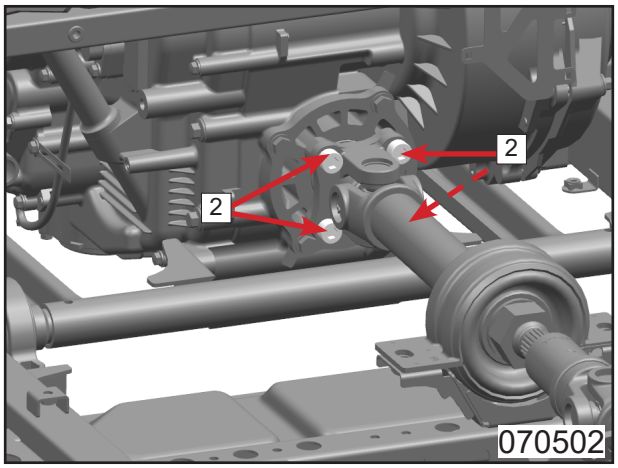
7.3.1 Front Drive Shaft Removal

Remove front gear case (refer to Front Gear Case Removal section in Chapter 07).

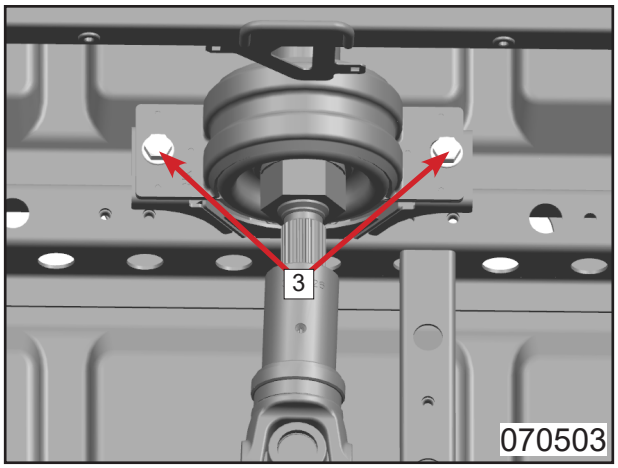
Remove bolts [1] on front gear case side.



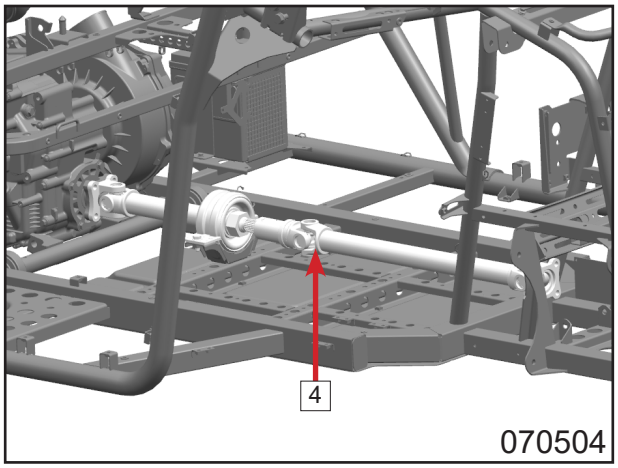
Remove bolts [2] on engine side.



Remove bolts [3].



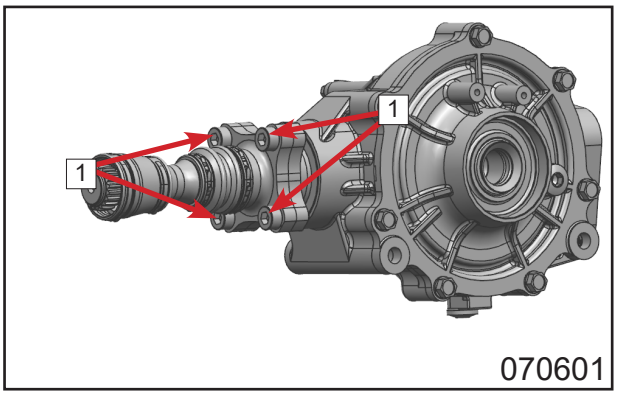
Remove front drive shaft [4].



7.3.2 Rear Drive Shaft Removal

Remove rear gear case (refer to Rear Gear Case Removal section in Chapter 07).

Remove four bolts 1 on rear gear case side.



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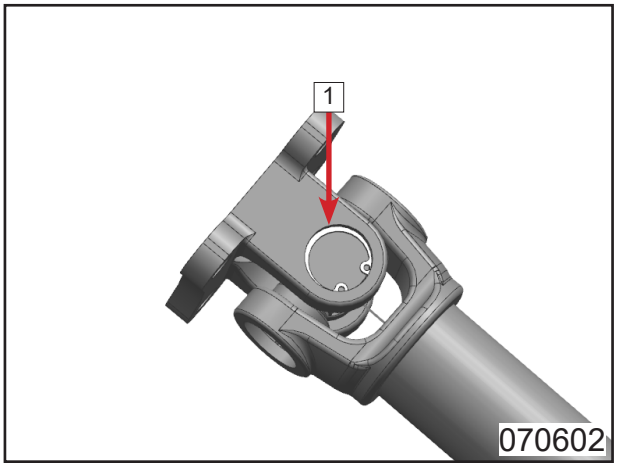
7.3.3 Drive Shafts Inspection

Front drive Shaft

NOTE: If any defect is found, like the clearance is too large, universal shaft is severely worn or blocked, disassemble and replace the defective parts. If not, it is not necessary to disassemble.

Remove circlip 1 with nipper pliers.

Follow same procedures to remove other three circlips.



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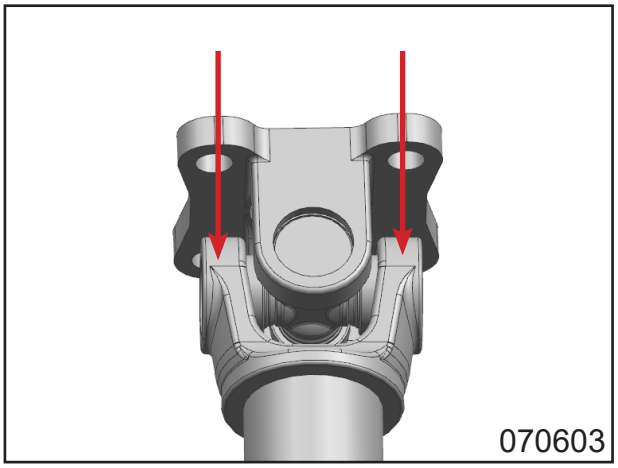
Compress universal shaft with appropriate tool.

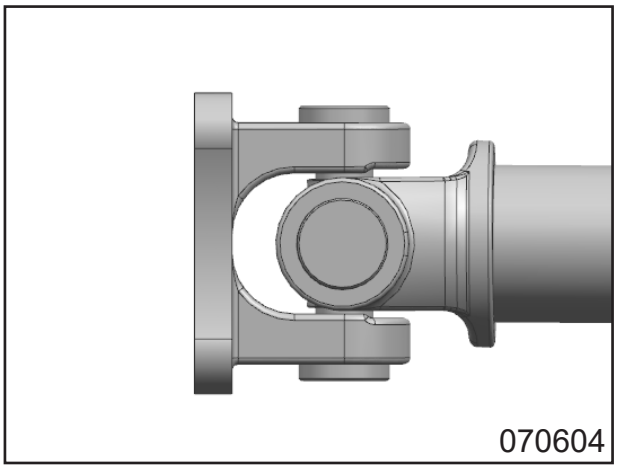
Use hydraulic device to compress the tool.


070603

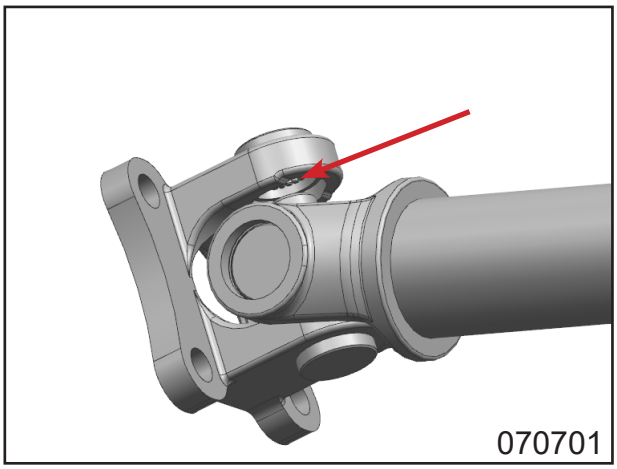
Compress to the limit position.

Turn shaft and compress the other side.

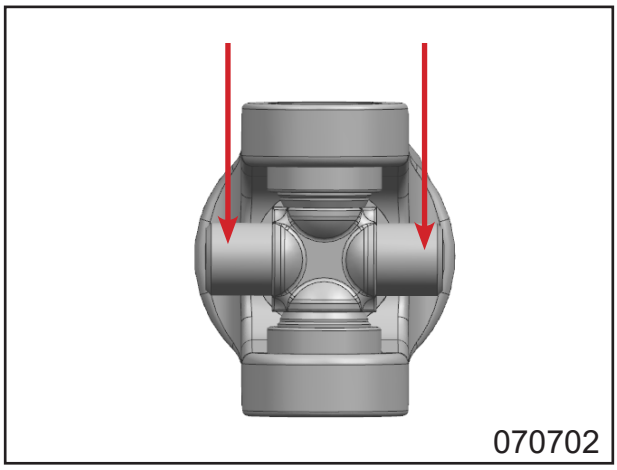
Make sure universal shaft caps protrude on both sides.


070604

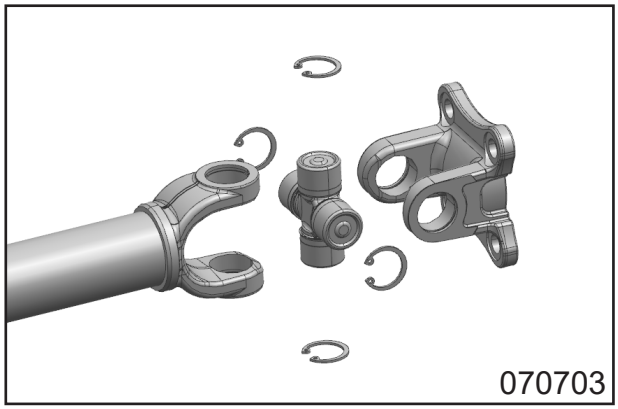
Insert M8 washer into gap.
Compress the side with washer.
Shaft cap protrudes much more then remove yoke.



Use the same way to compress and remove universal shaft.

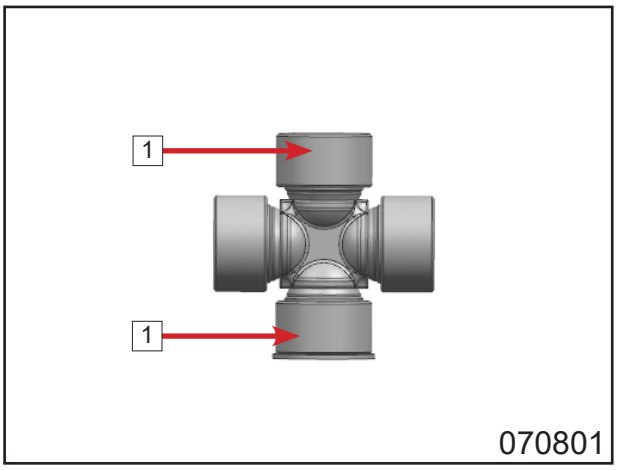


1. Inspect front drive shaft universal shafts on both sides. Replace if necessary.
2. Inspect front drive shaft middle spline. Replace if necessary.

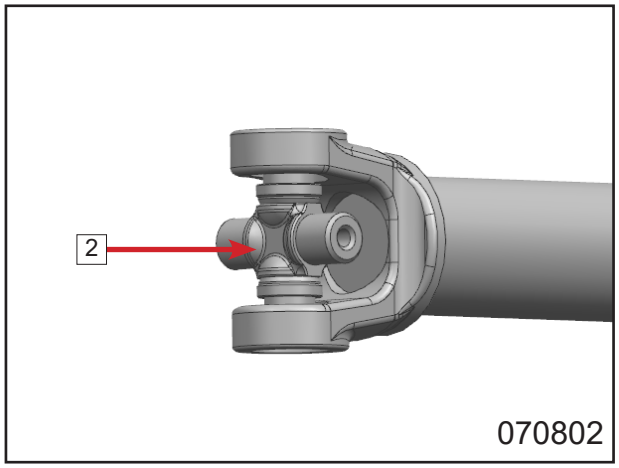


Assembly

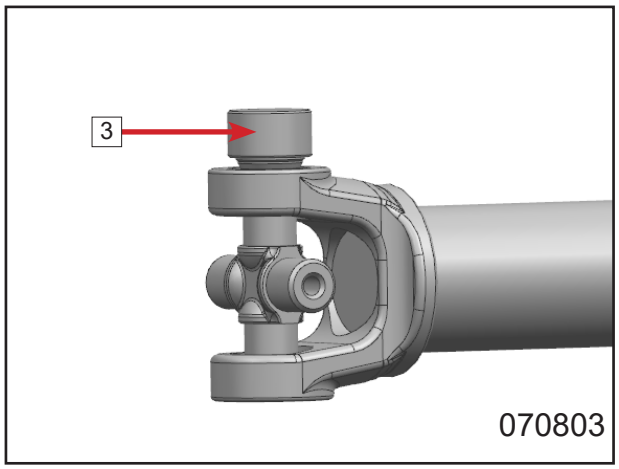
Remove universal shaft caps in the symmetric direction.



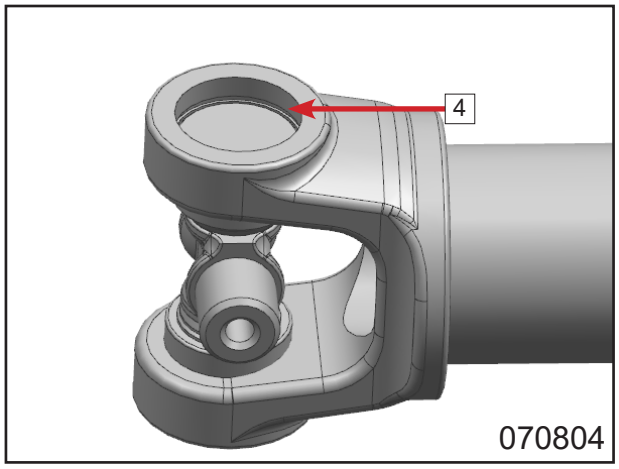
Put universal shaft 2 in yoke.



Put shaft caps 3 and compress them to the position of circlips.

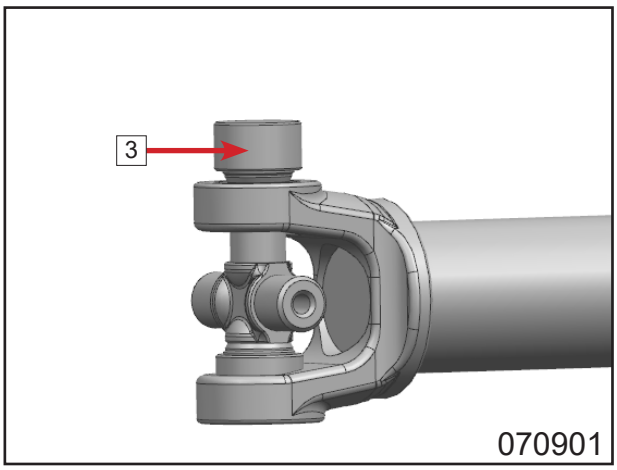


The position of circlip 4.

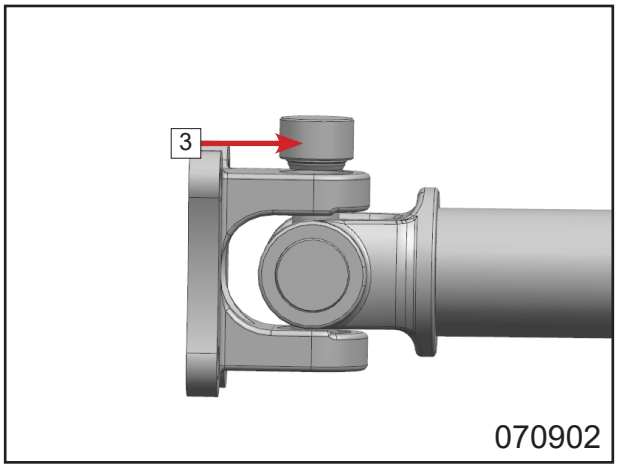


Compress universal shaft caps 3 in the symmetric direction.
After installation, it may be stuck or the rotation isn't flexible, which is normal.

NOTE: The removed universal shaft caps can't be reused.



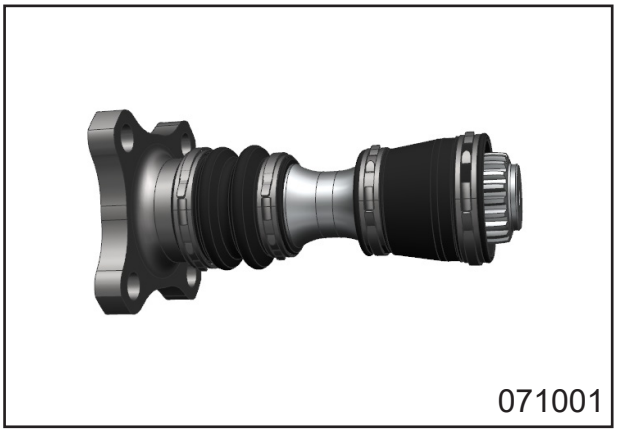
Follow the same procedures to compress other shaft caps 3.
After installation, apply grease into oil injection hole.



Rear Drive Shaft

1. Inspect rear drive shaft dust boots on both sides. Replace if necessary.
2. Inspect shaft spline for abnormal wear or damage. Replace if any defect is found.

NOTE: Apply 15~18g grease on rear drive shaft spline during installation.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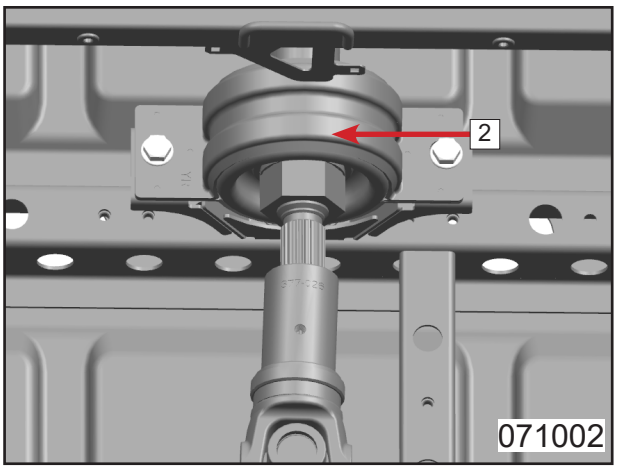
There is maintenance-free rubber ring 2 in drive shaft middle bearing.

Replace whole assembly if noise or deformation is found in middle bearing.

Inspect other drive shafts for noise or deformation.



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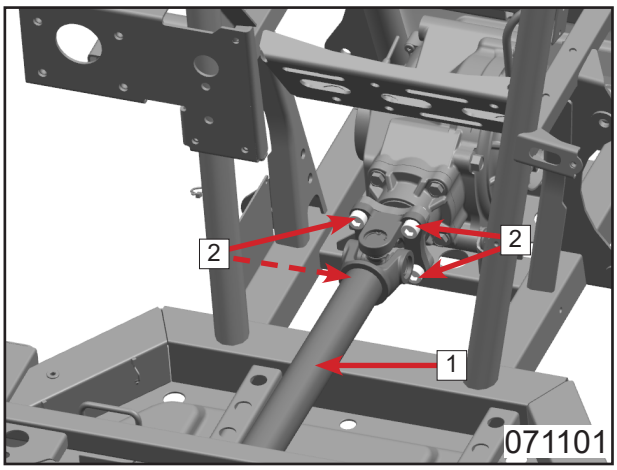
7.3.4 Drive Shafts Installation

Front Drive Shaft

Install drive shaft 1.

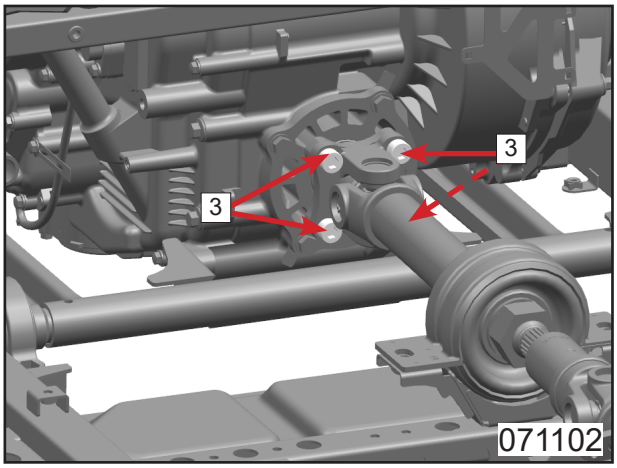
Install bolts 2 on front gear case side (not entirely tightened).



Install bolts 3 on engine side and tighten all bolts.

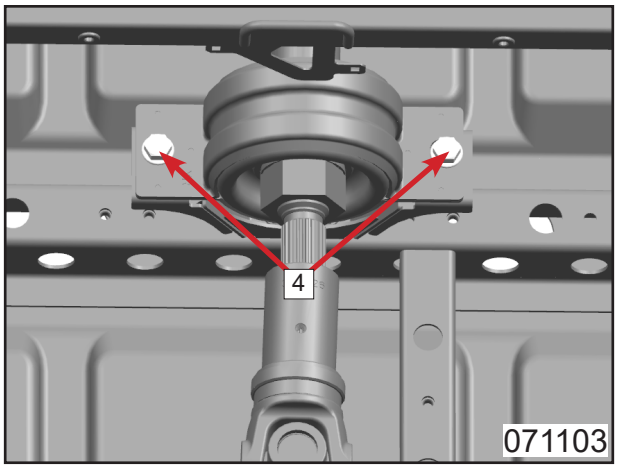
Tighten torque: 40N•M

NOTE: Pre-tighten the bolts and tighten them in criss-cross way.



Install bolts 4.

Tighten torque: 40N•M



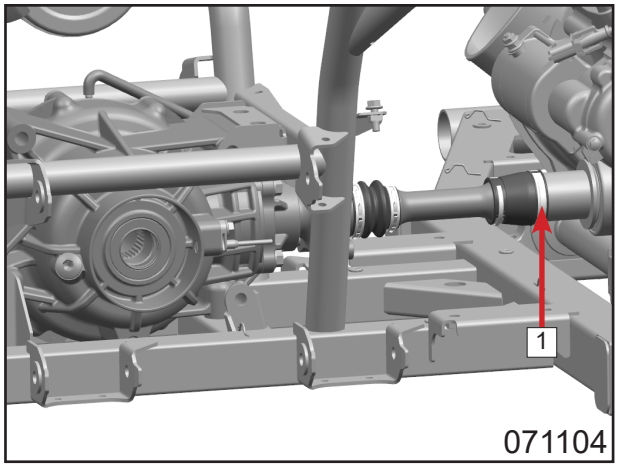
Rear Drive Shaft

Install rear gear case assy (refer to Rear Gear Case section in Chapter 07).

Tighten clamp 1.

NOTE: Apply 15~18g grease on rear drive shaft spline during installation.

NOTE: Replace dust boot if any defect is found.



7.4 Gear Cases

7.4.1 Maintenance Information

Lubrication Schedule				
Item	Specification	Capacity	Interval	
Front gear case	SAE80W-90 GL-5	0.25L	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. 2. Front or rear gear case noise. 3. Engine power cannot be transmitted to wheels.	A. Bearing damaged B. Gear clearance too large or too small 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.

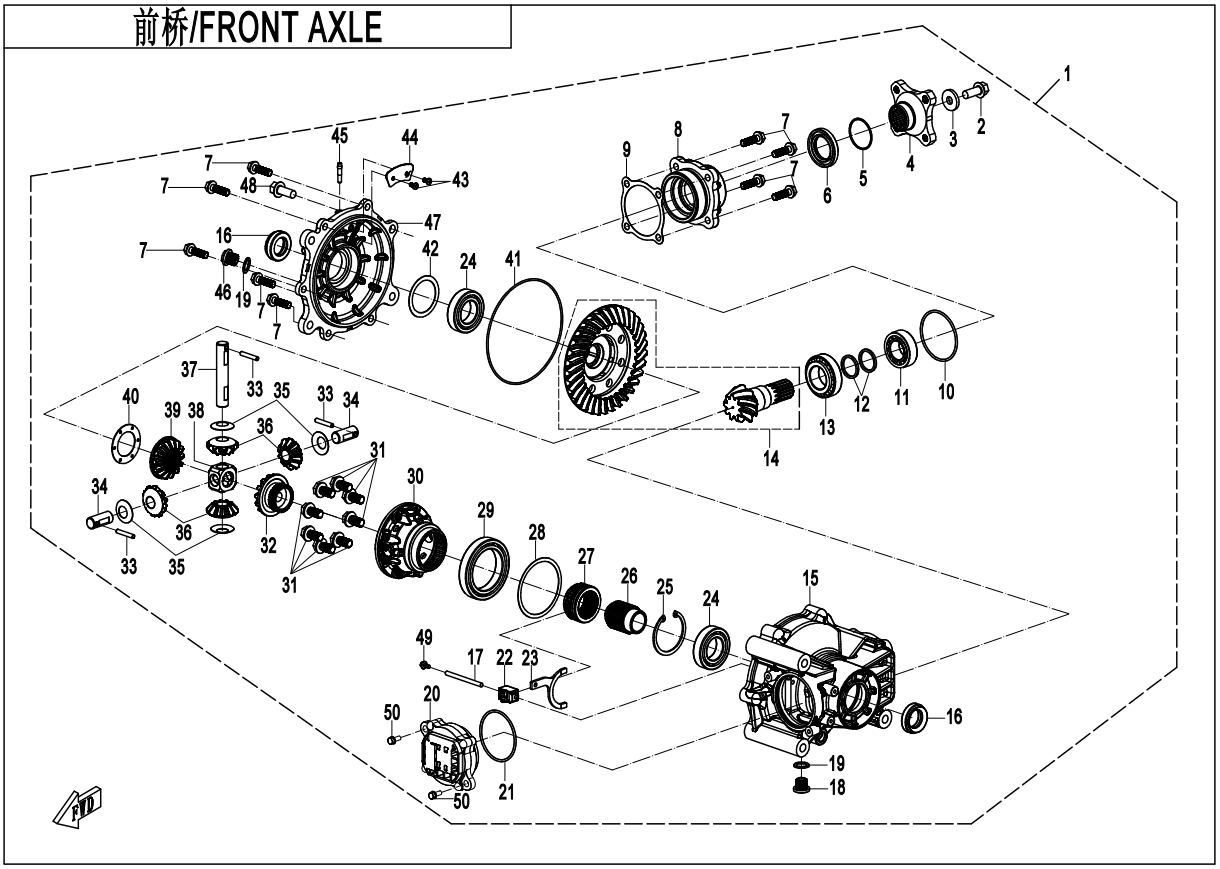
3. Inspect the lubricating oil leakage.

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.



1	前桥总成	18	磁性放油螺栓	35	减磨垫
2	螺栓	19	垫片 14	36	差速器中间齿轮
3	垫圈	20	前桥电机总成	37	行星齿轮轴
4	连接盘	21	O 形密封圈 67.5×2	38	十字套
5	O 形密封圈	22	拨块组合	39	差速器从动齿轮
6	油封	23	拨叉	40	齿轮垫片
7	螺栓	24	滚动轴承 30×55×13	41	O 形密封圈 130×2
8	轴承座	25	孔用弹性挡圈	42	调整垫圈 54.5×43
9	安装距调整垫圈	26	花键套	43	螺钉
10	O 形密封圈 55×2.5	27	花键拨套	44	挡油板
11	圆锥滚子轴承	28	调整垫圈 79.5×68	45	通气管接头
12	调整垫圈 32×25.4	29	滚动轴承	46	螺栓
13	圆锥滚子轴承	30	差速器壳体	47	前桥箱盖
14	前桥锥齿轮组合	31	组合螺栓	48	螺栓
15	前桥箱体	32	半轴齿轮	49	内六角圆柱端紧定螺钉
16	油封	33	圆柱销	50	螺钉
17	销轴	34	短行星齿轮轴		

7.5 Front Gear Case

Front Gear Case Removal

Remove wheels (refer to Chapter 09).

Remove brake calipers (refer to Chapter 08).

Remove steering knuckles (refer to Chapter 09).

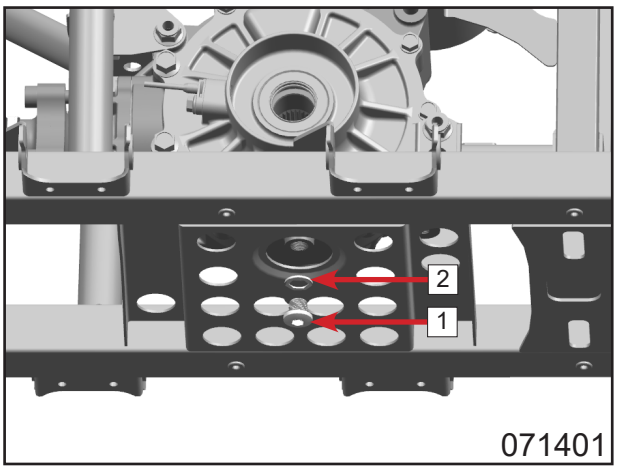
Remove CV drive shafts (refer to 7.1 CV drive shafts section).

Place a container under front gear case.

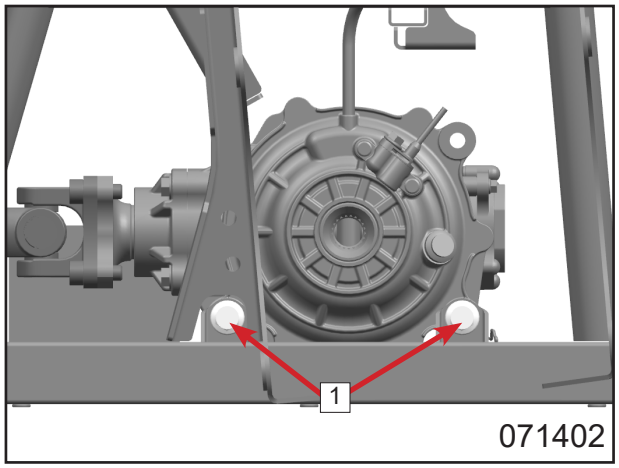
Remove drain bolt 1.

Remove washer 2.

Drain gear case oil.

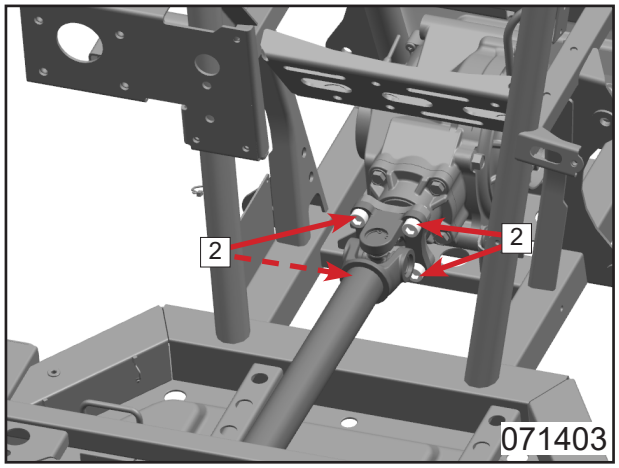


Remove two bolts 1 .



Remove four bolts 2 .

Remove front gear case.

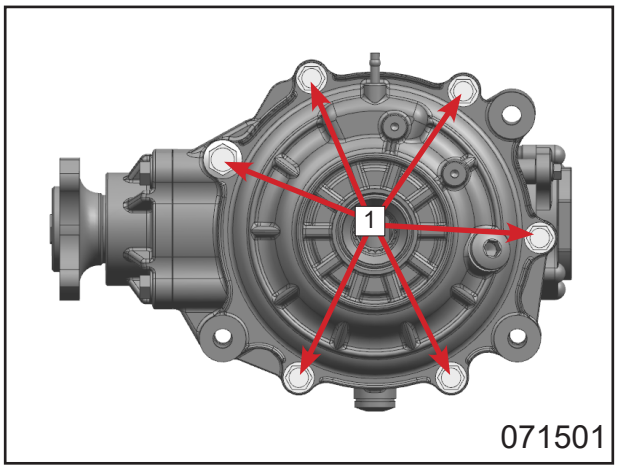


071104

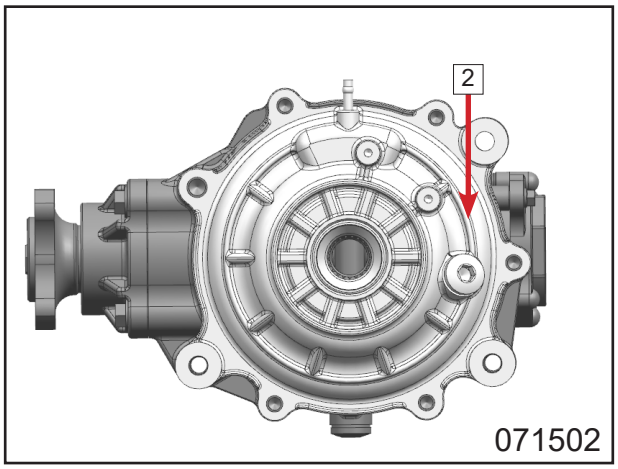
7.5.1 Front Gear Case Disassembly

Front Gear Case Cover

Remove eight M8 bolts [1].

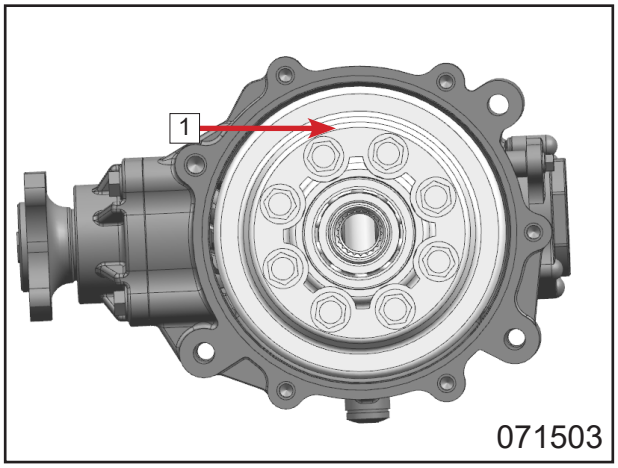


Remove front gear case cover [2].



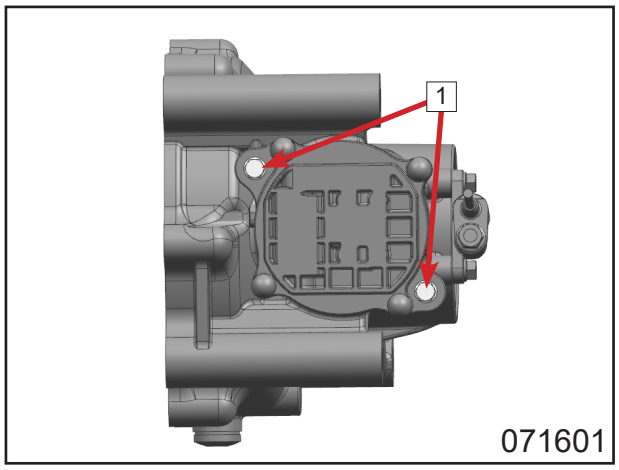
Differential Assembly

Remove differential assembly [1].

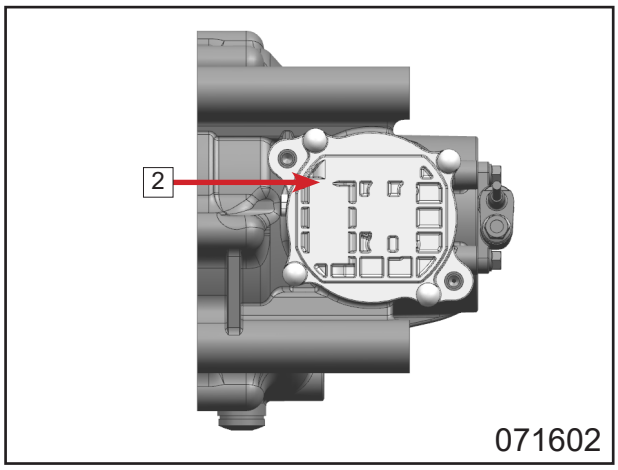


Front Gear Case Motor

Remove bolts 1.

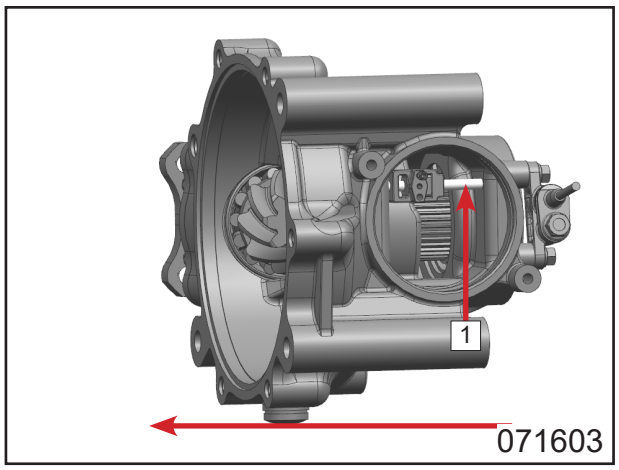


Remove motor 2.

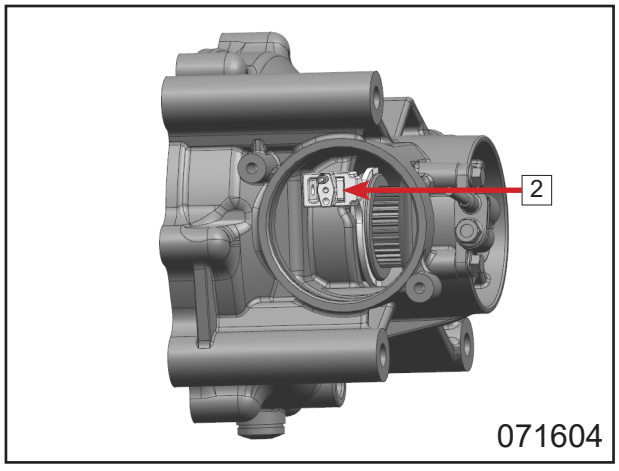


Fork Assembly

Turn the pin shaft 1 towards arrow direction shown in the pic to remove it.

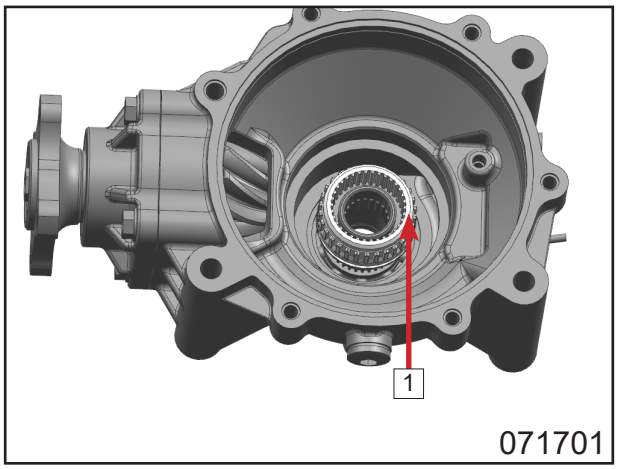


Remove fork and block assembly 2.

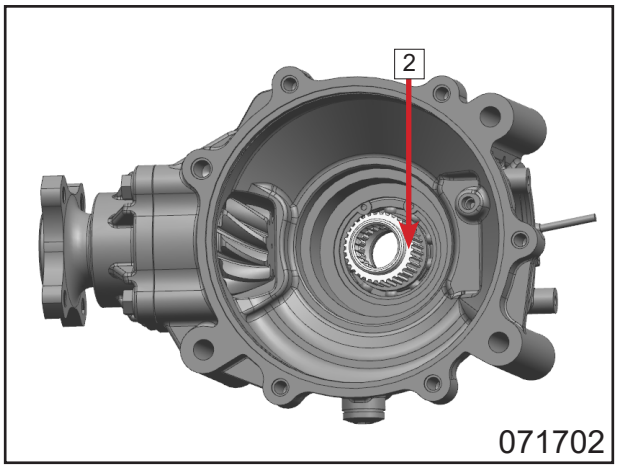


Spline Bushing Assembly

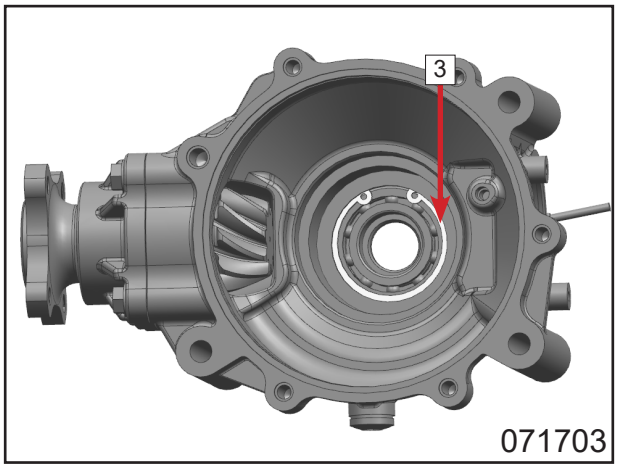
Remove spline bushing [1].



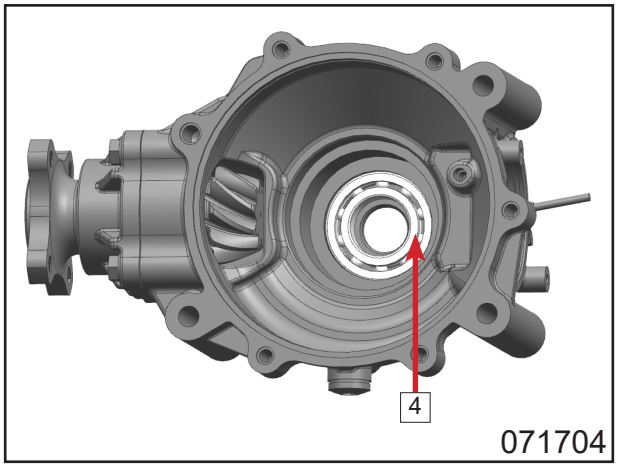
Remove spline bushing [2].



Remove circlip [3].



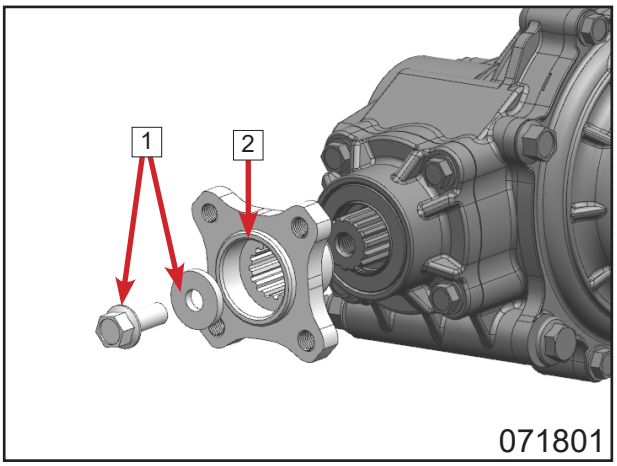
Remove bearing [4] by bearing puller.



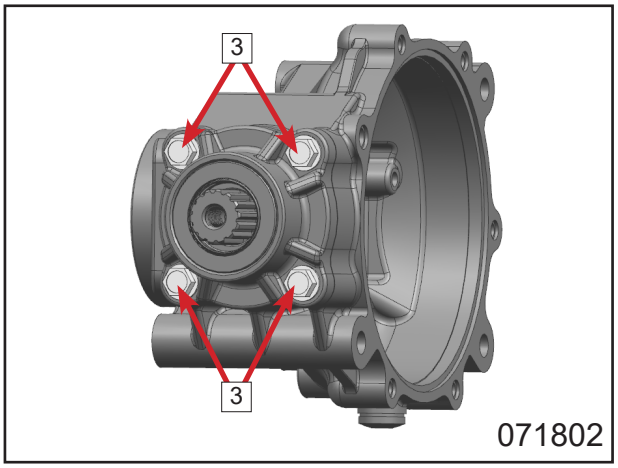
Front Gear Case Input Shaft

Remove bolt 1 and washer.

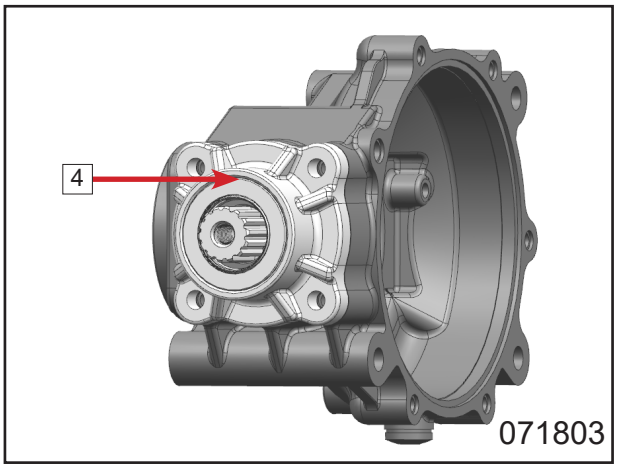
Remove coupler 2.



Remove bolts 3.



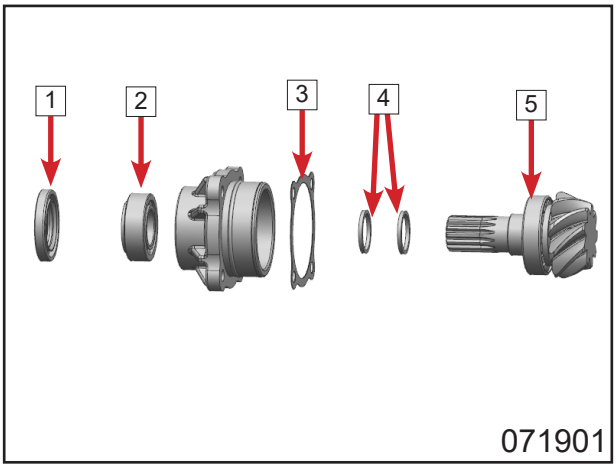
Remove front gear case input shaft 4.



7.5.2 Front Gear Case Input Shaft Disassembly

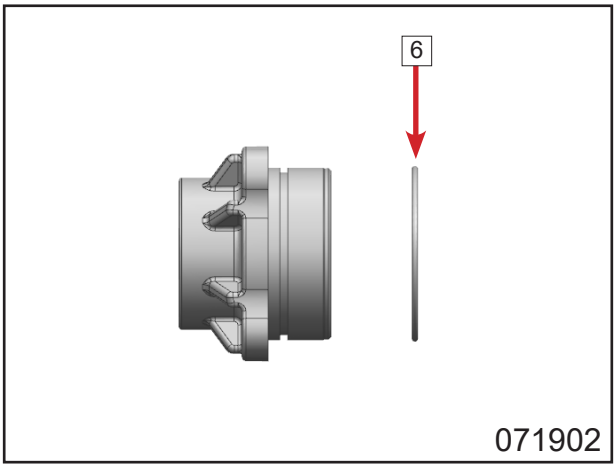
Turn drive bevel gear to check if it rotates smoothly before disassembly.
If smooth, it is not necessary to disassemble.
If stuck or other defect is found, disassemble as following procedures.

Remove oil seal [1].
Remove washer [6].
Remove bearing [2] by bearing puller.
Remove adjusting washers [3].
Remove input shaft assembly [5].
Remove seal ring [4].



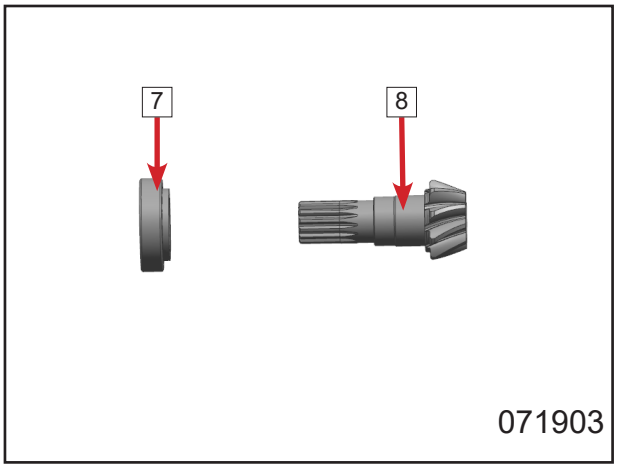
071901

Inspect seal ring. Replace with new one if any defect is found.
Remove seal ring [6].



071902

Remove bearing [7] by bearing puller.
Remove drive bevel gear [8].

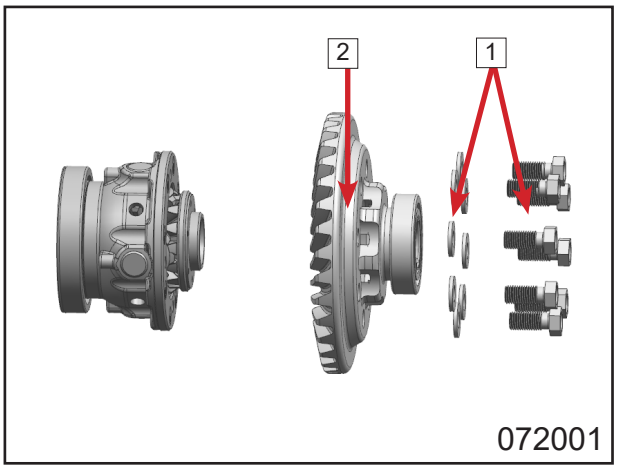


071903

7.5.3 Differential Disassembly

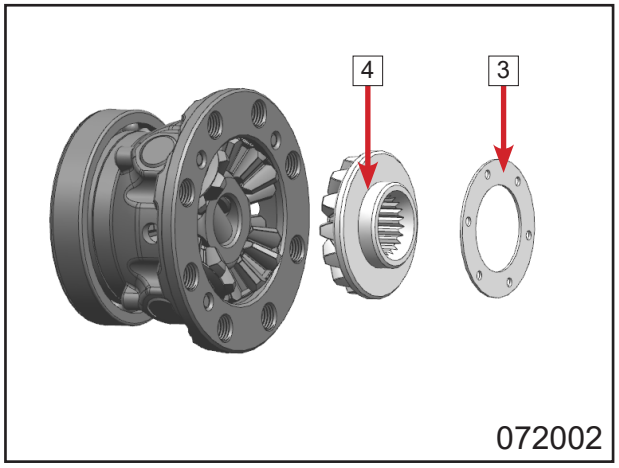
Remove bolt kits 1.

Remove front gear case driven bevel gear 2.



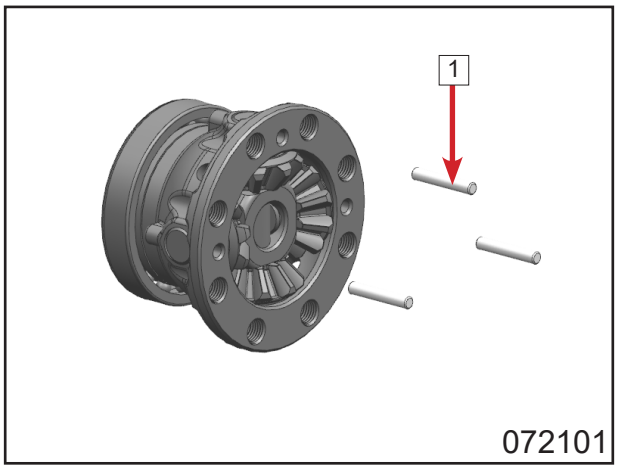
Remove gear washer 3.

Remove RH shaft gear 4.

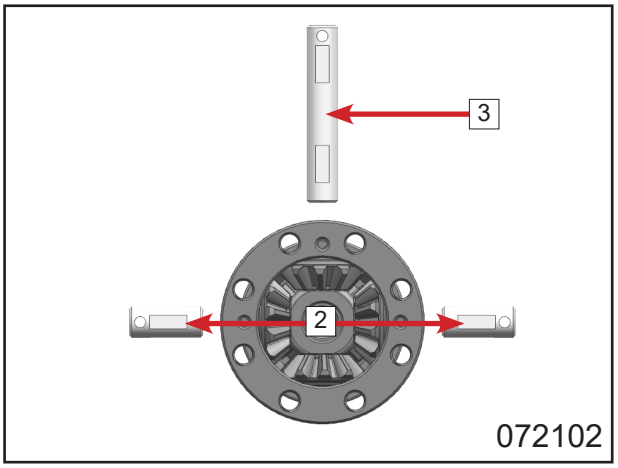


Planet Gear Disassembly

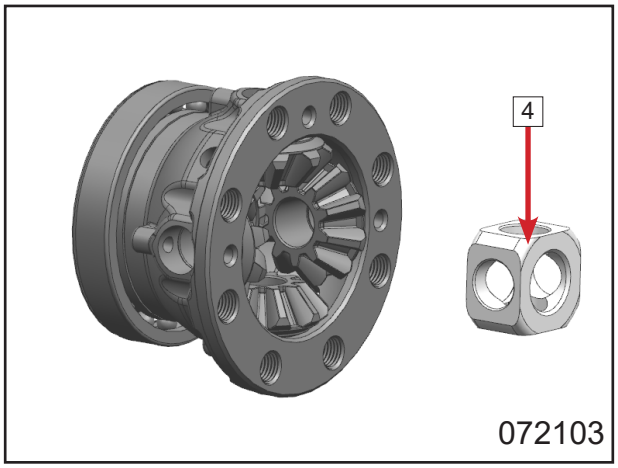
Remove pin shafts [1].



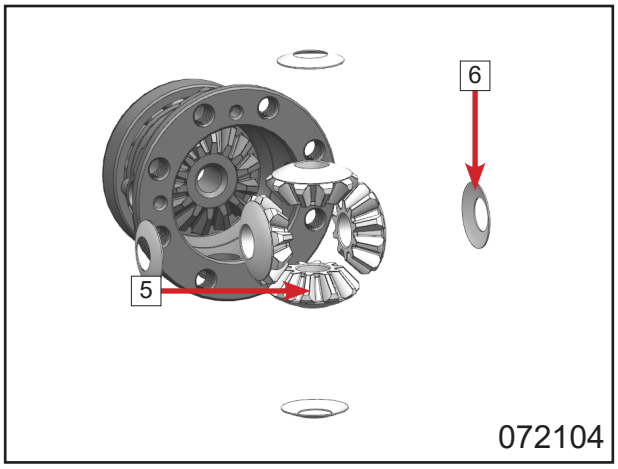
Remove short planet gear shaft [2].
Remove planet gear shaft [3].



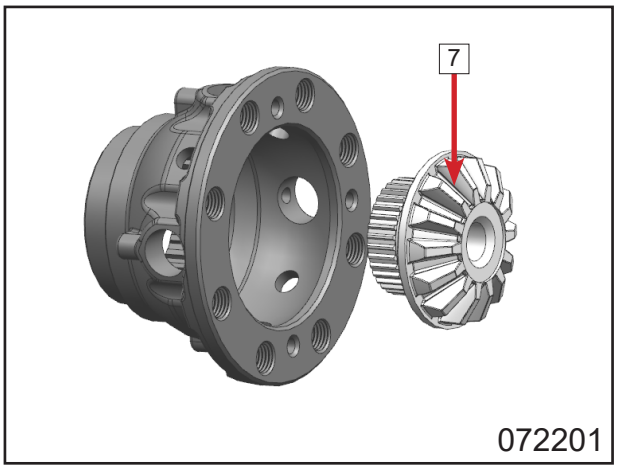
Remove cross bushing [4].



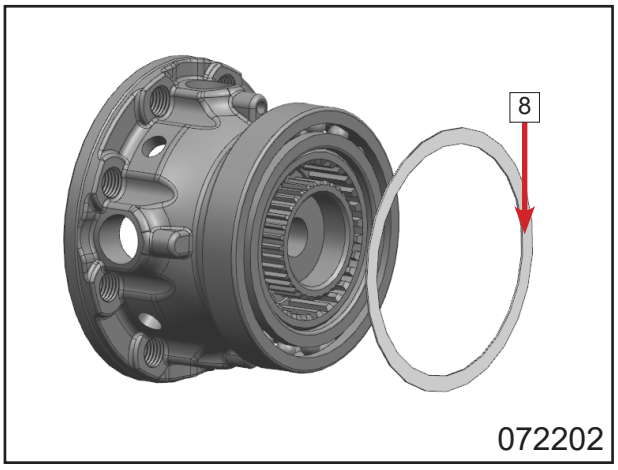
Remove middle gears [5].
Remove middle gear washers [6].



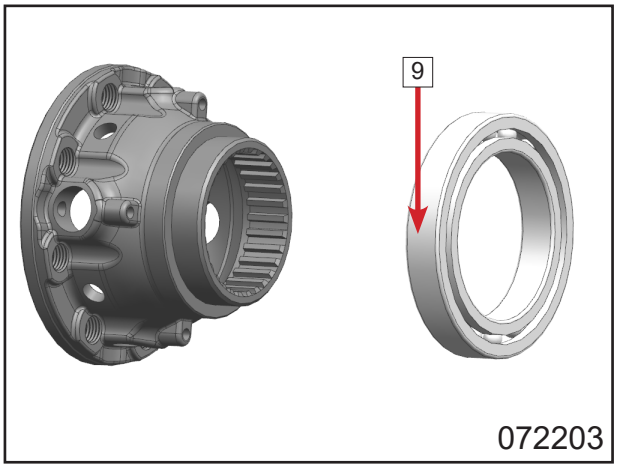
Remove shaft gear.



Remove washer [1].



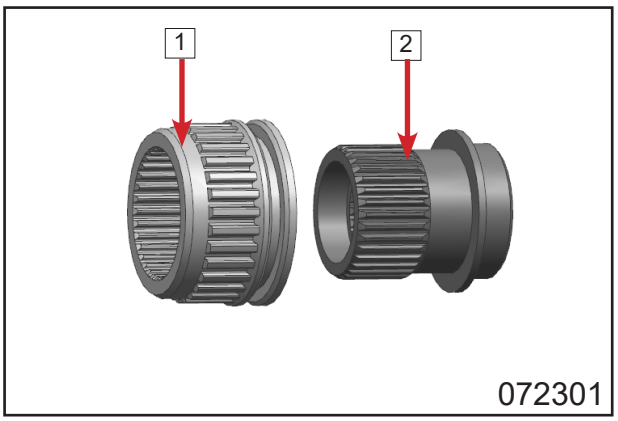
Inspect bearing for severe or abnormal wear. If not, it is not necessary to remove bearing.
Remove bearing [9] by bearing puller.



7.5.4 Gear Case Parts Inspection

Spline Bushing Assy

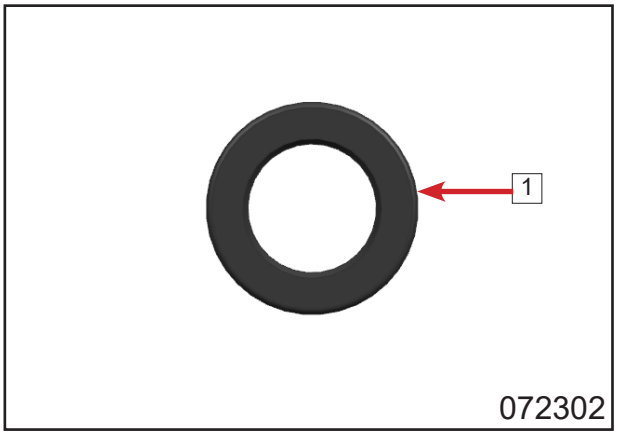
Inspect spline bushing [1] and bushing [2] for break, damage, severe wear or teeth deletion. Replace if any defect is found.



Oil Seal

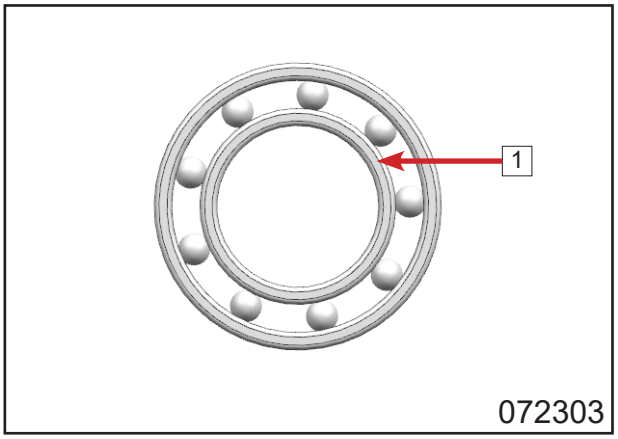
Remove all oil seals [1]. The removed oil seals are sorted as waste. Replace with new parts.

Inspect oil seal [1] for proper seal lip, good conjunction or damage. Replace if any defect is found.



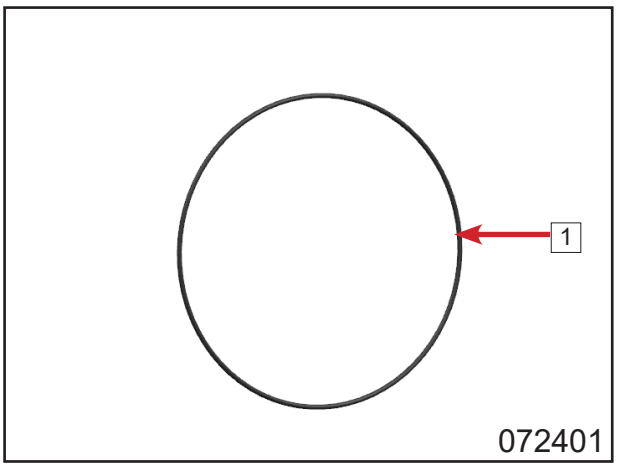
Bearing

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.



O-seal Ring

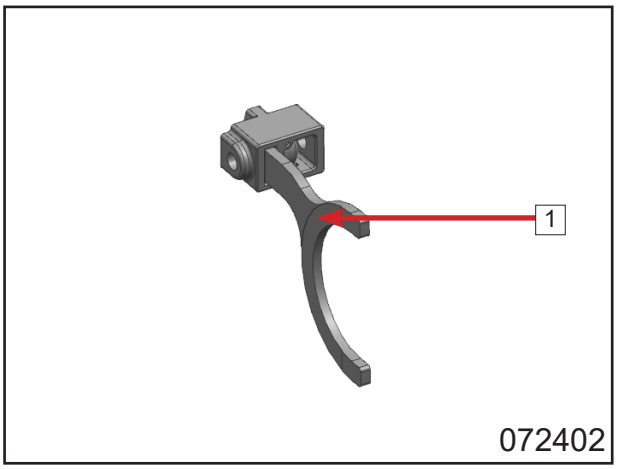
Inspect every o-seal ring [1] if deformed, broken or damaged. Replace with new parts if any defect is found.



⚠ WARNING: 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.

Rack Assy

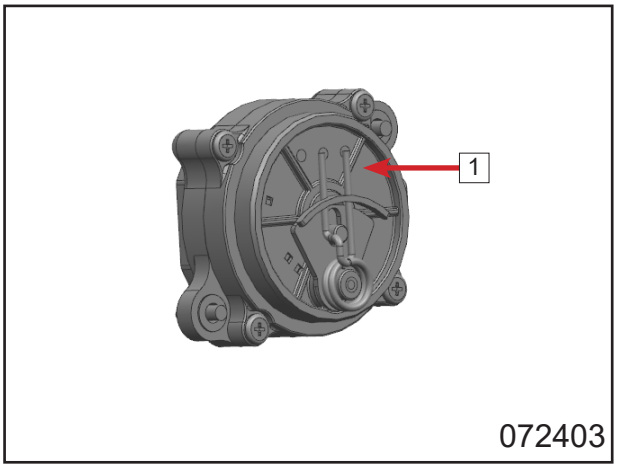
Inspect rack assy [1] for break, damage, severe wear or teeth deletion. Replace if any defect is found.



Front Gear Case Motor

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.

Inspect front gear case motor [1] output teeth for damage, cracks or severe wear. Replace if any defect is found.



Motor Inspection

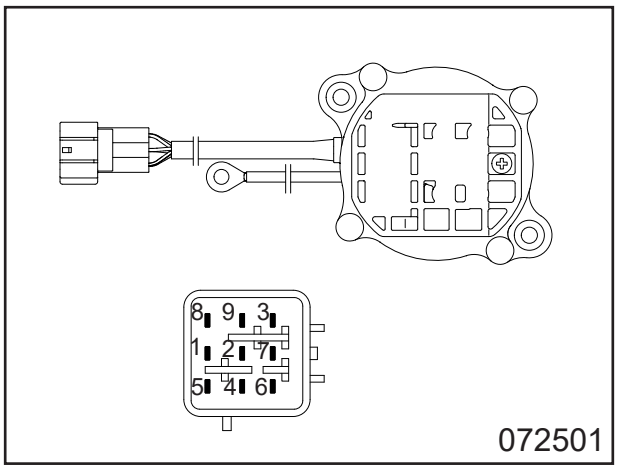
Motor diagram

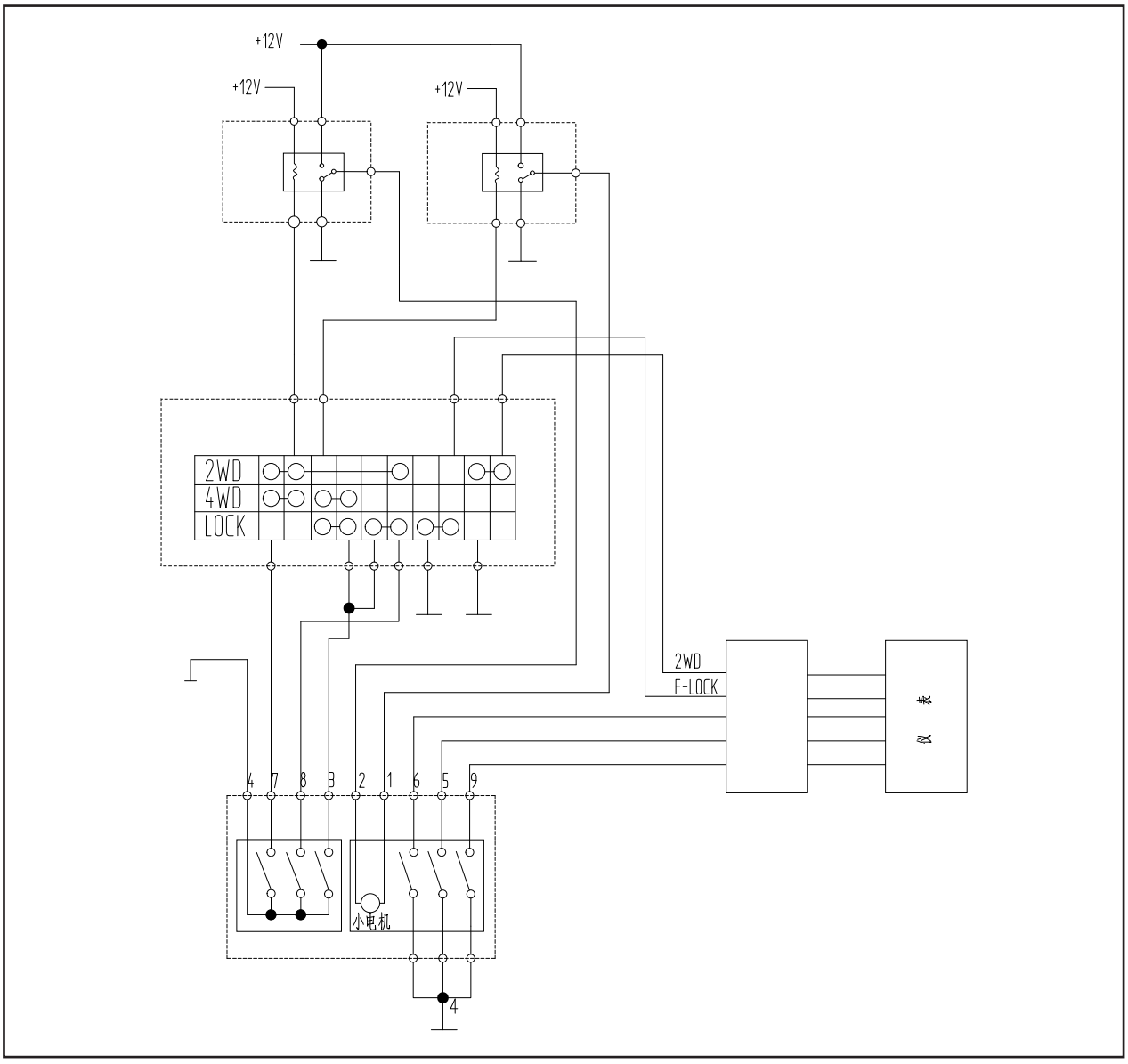
2WD/4WD, 4WD diff-lock contact condition

2WD	1-2, 3-4-5
4WD	1-2, 4-8-9
4WD diff-lock	1-2, 4-6-7

Dashboard contact condition

	2WD	4WD	4WD diff-lock
5	Ground	Break	Break
6	Break	Break	Ground
9	Break	Ground	Break



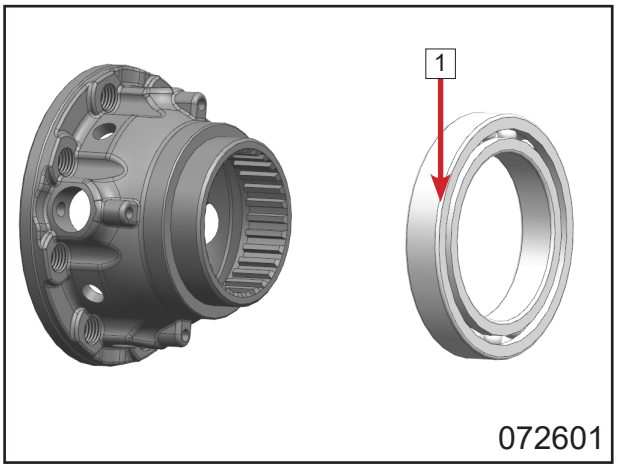


7.6 Front Gear Case Assembly

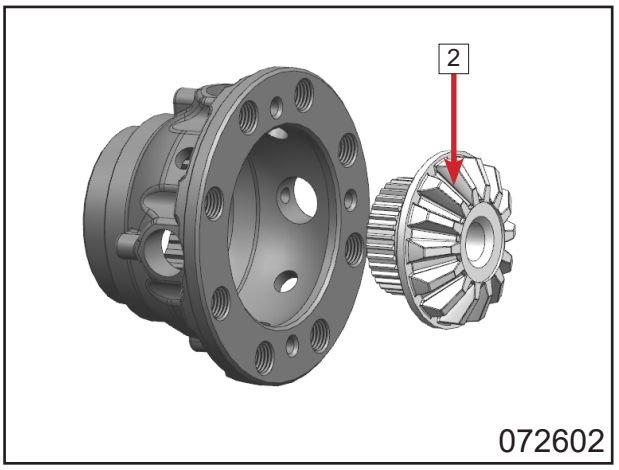
7.6.1 Differential Assembly

Install bearing 1 by hydraulic compress device.

If bearing isn't replaced, skip this step.



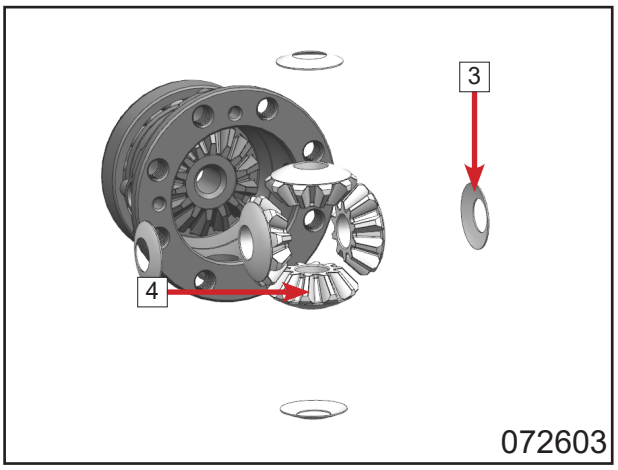
Install shaft gear 2.



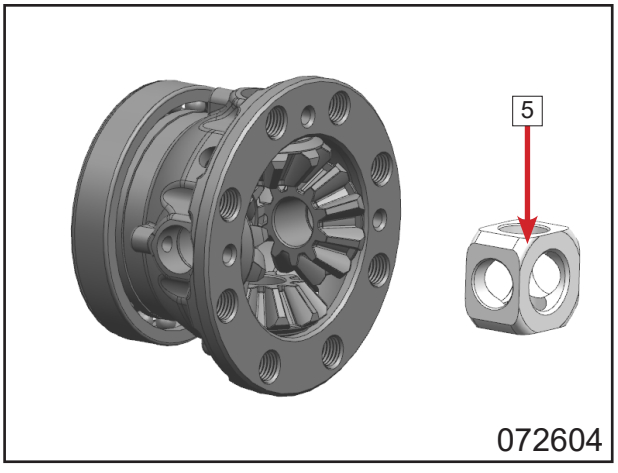
Install differential middle gear 4.

Install middle gear washers 3.

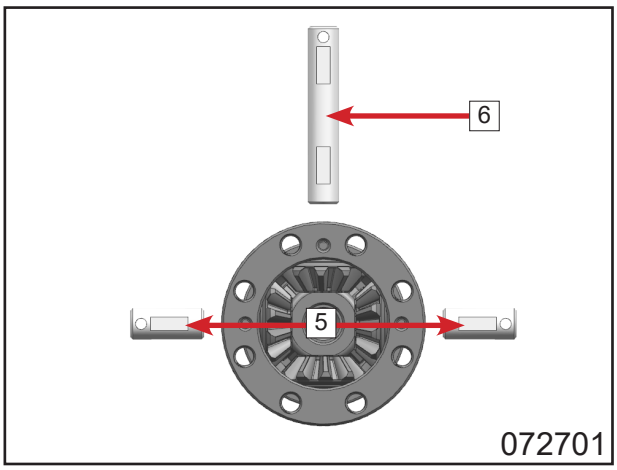
NOTE: Inspect middle gear washer 3 for deformation or severe wear before installation. Replace if any defect is found.



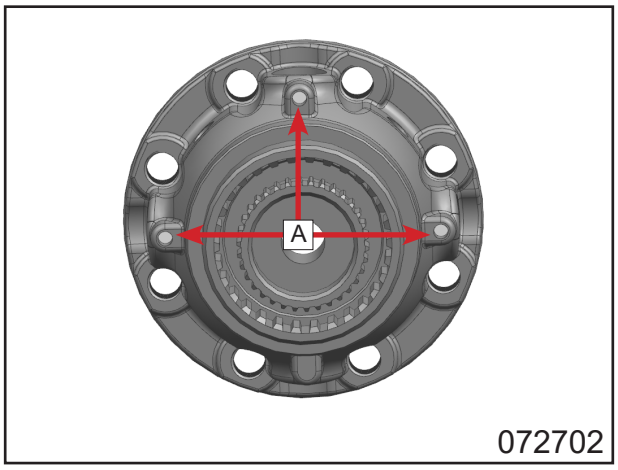
Make sure differential middle gear align with middle gear washer holes, then install cross bushing 5.



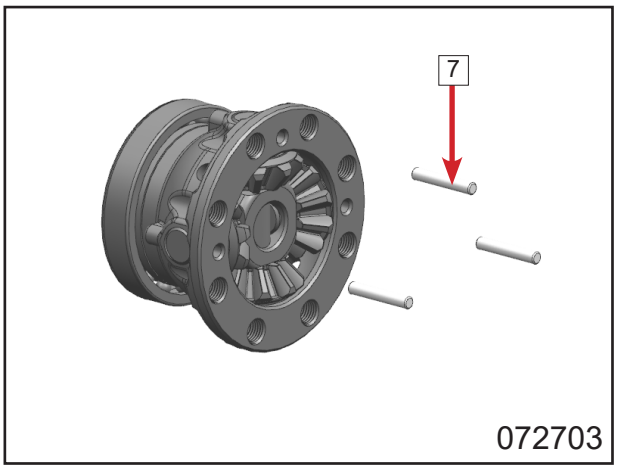
Install short planet gear shafts [5].
Install planet gear shaft [6].



NOTE:
Check pin positions [A] on differential housing. Holes in symmetry direction are for short planet gear shafts, other is for planet gear shaft.

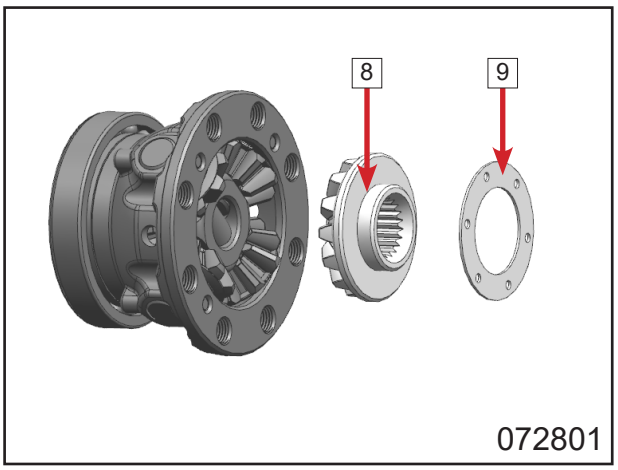


Install pins [7].

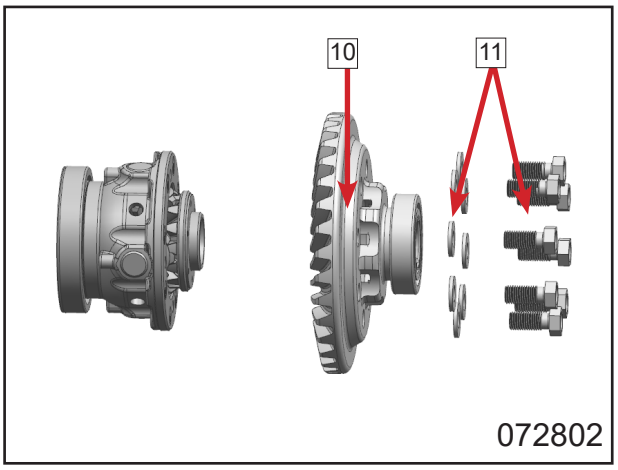


Check if it rotates freely after assembly.
If ratation of middle gear isn't smooth, remove pins, planet gear shaft, short planet gear shafts, middle gear and cross bushing.
Inspect differential middle gear for severe wear. If not, follow the above procedures for assembling.

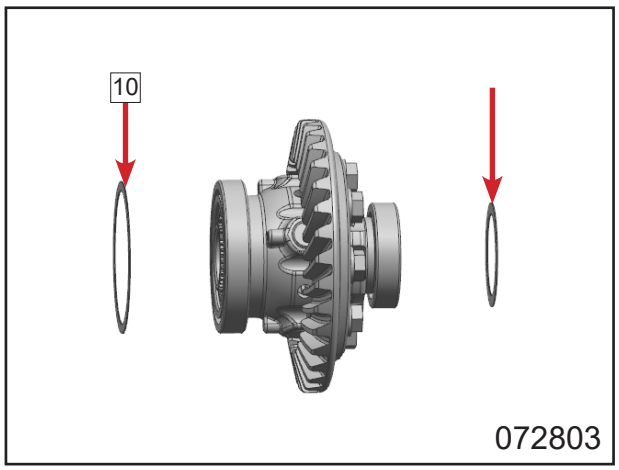
Install RH shaft gear [8].
Install gear washer [9].



Install front gear case driven bevel gear[10].
Install bolt kits [11] with thread locker.
Tighten torque: 60N•M



After assembling, inspect if rotation is smooth. If it is stuck or there is noise, remove related parts, adjust washer thickness and reinstall.

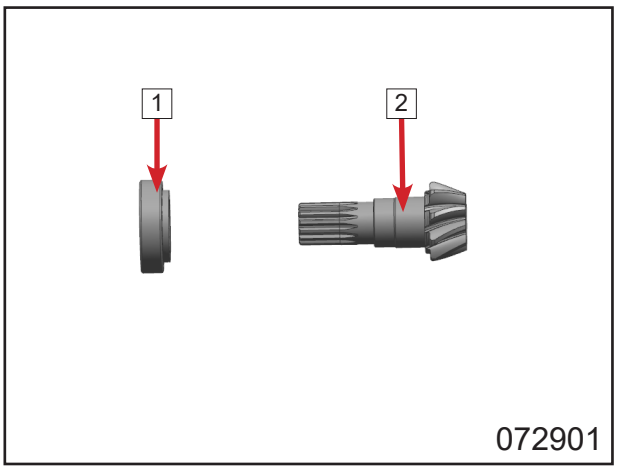


7.6.2 Front Gear Case Drive Bevel Gear Assembly

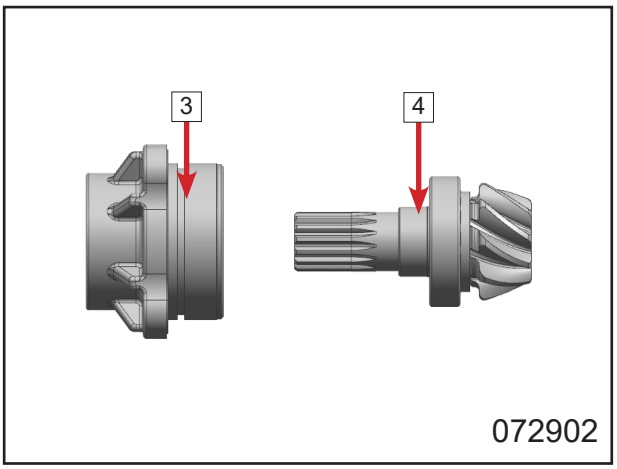
If drive bevel gear isn't removed, skip this step.

Inspect drive bevel gear teeth for abnormal or severe wear before assembling.

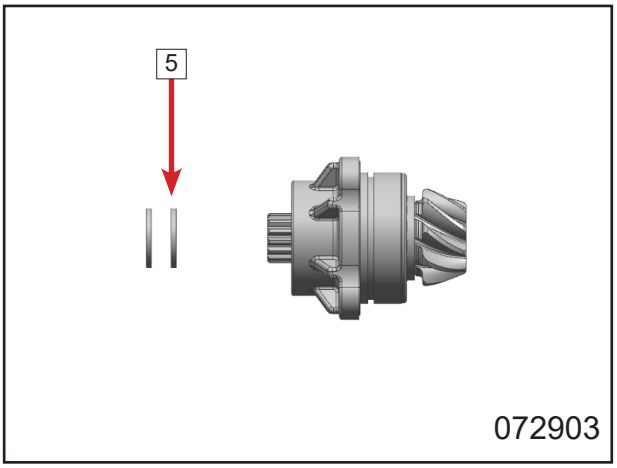
Compress bearing 1 on drive bevel gear 2.



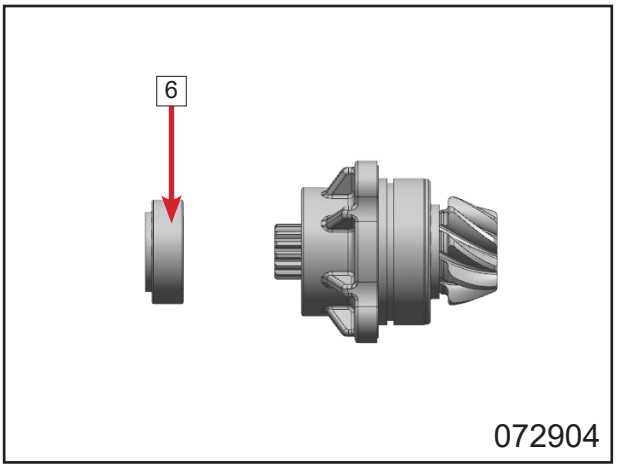
Insert input shaft assembly 3 into bearing seat 4.



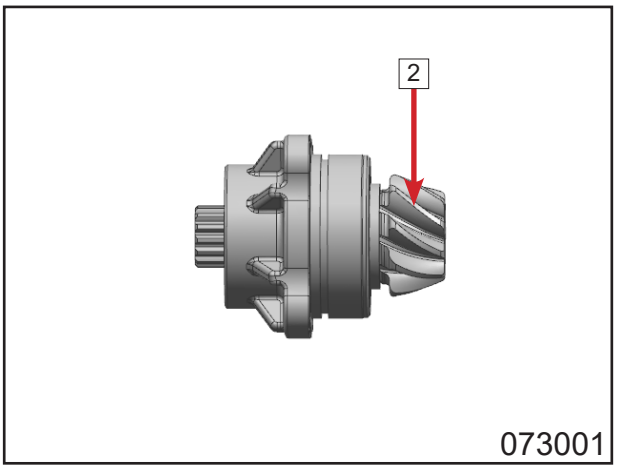
Install adjusting washers 5.



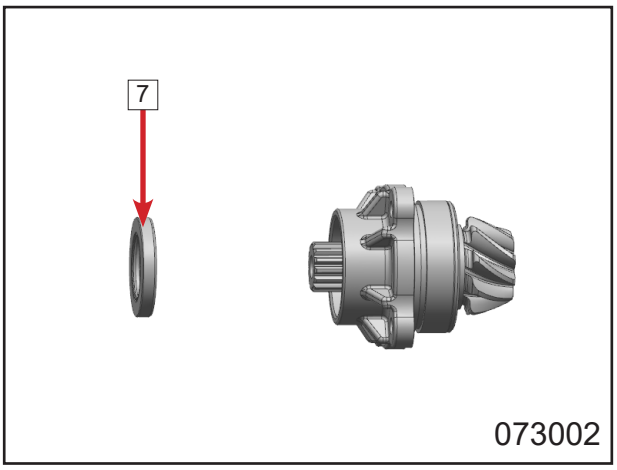
Install bearing 6.



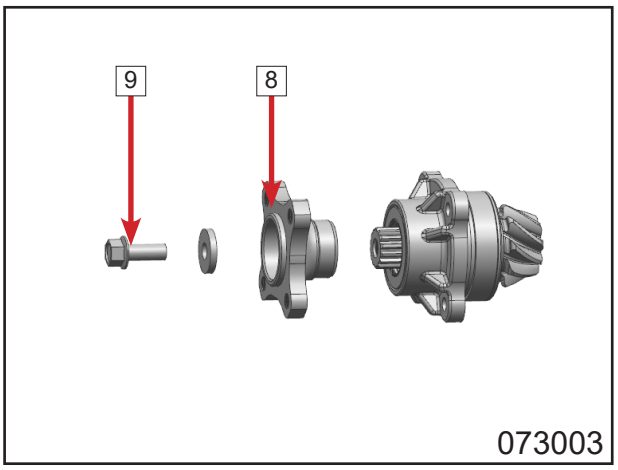
After assembling, inspect drive bevel gear [2] if it rotates smoothly. If it is stuck or there is noise, remove bearing, adjust washer thickness and reinstall.
When gear rotation is smooth, proceed next step.



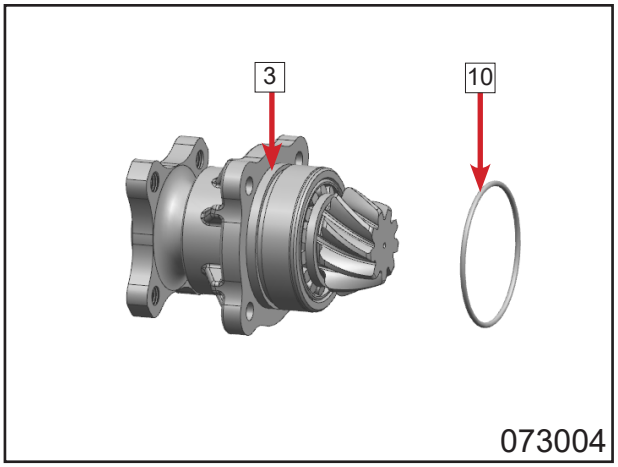
Apply grease on oil seal [7] and install it.



Install coupler [8].
Install bolt and washer [9] with thread locker.
Tighten torque: 75N•M

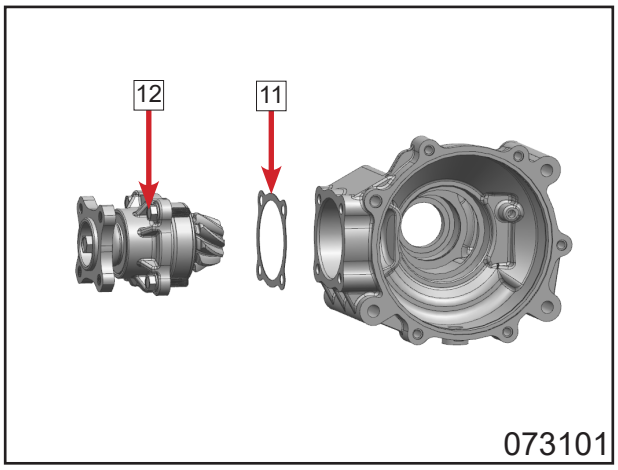


Install seal ring [10] into groove of bearing seat.



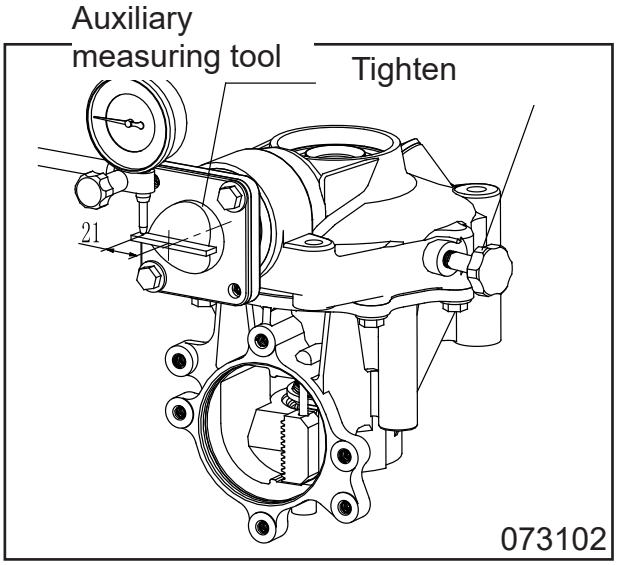
Install adjusting gaskets 11.
Install drive bevel gear assembly 12;
Tighten torque: 25N•M

After assembling, inspect drive bevel gear 1 if it rotates smoothly. If it is stuck or there is noise, adjust gaskets.



Front 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 (M14X1.25X60). 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.

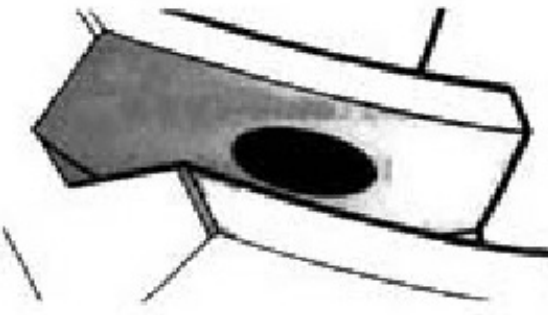
Rotate the ring gear several turns in both directions. Remove drive pinion gear and ring gear, then inspect the coated teeth of the drive pinion gear. The teeth contact pattern should be as shown below.

①

073201

Pattern 1	Contact at tooth top	Incorrect
Pattern 2	Contact at tooth middle	Correct
Pattern 3	Contact at tooth root	Incorrect

②



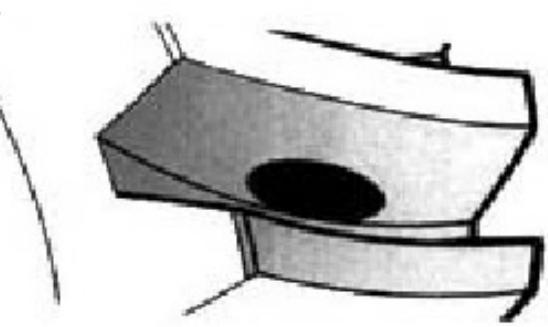
073202

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.

③



073203

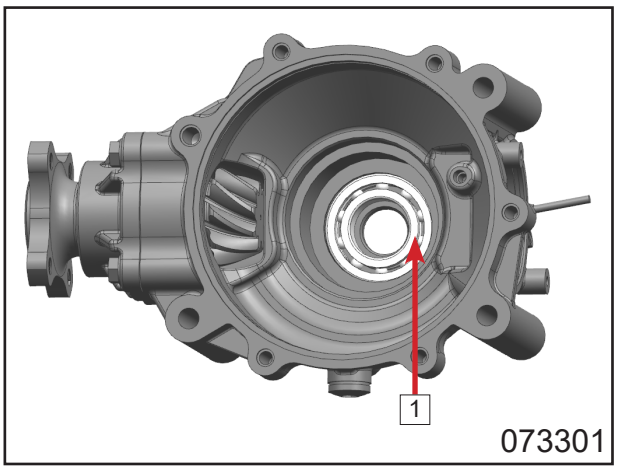
Adjustment Steps

Tooth contact	Shim adjustment
Tooth contact pattern 1	Reduce shim thickness
Tooth contact pattern 3	Increase shim thickness

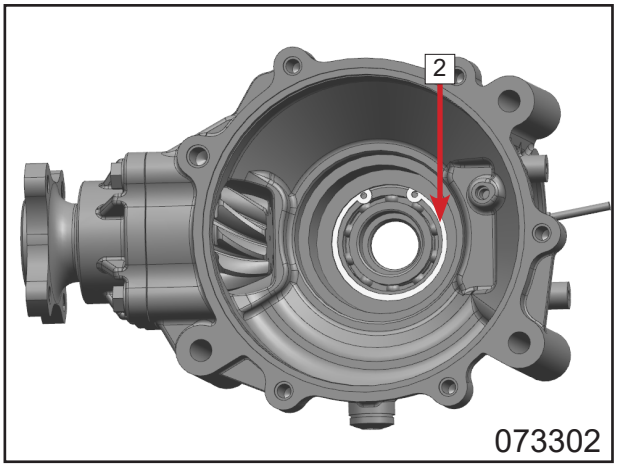
⚠WARNING: Make sure to check the backlash after the tooth contact has been adjusted, since it may have changed. Adjust the tooth contact and backlash until they are both within specification. If the correct tooth contact cannot be maintained when adjusting the backlash, replace the drive gear and ring gear.

7.6.3 Spline Bushing Assembly

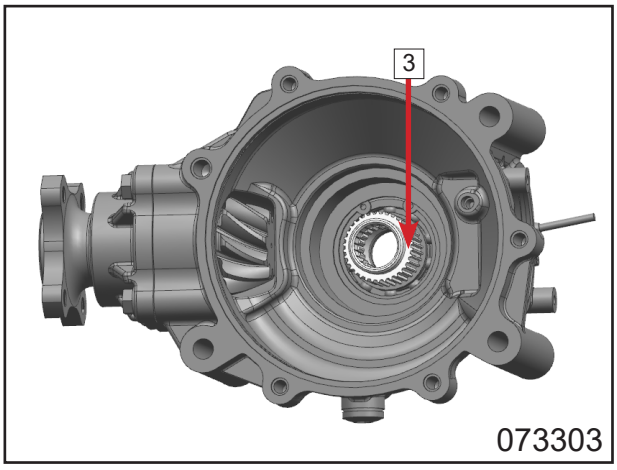
Install bearing [1].



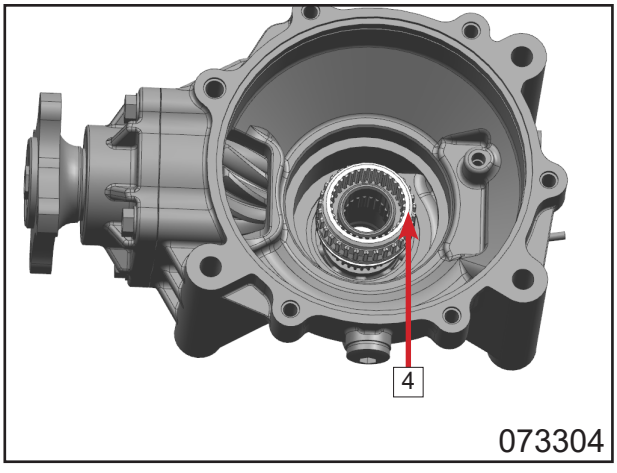
Install circlip [2].



Install spline bushing [3].

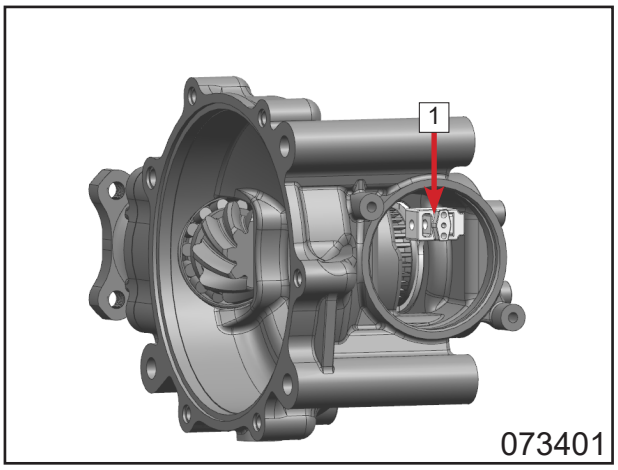


Install spline bushing [4].

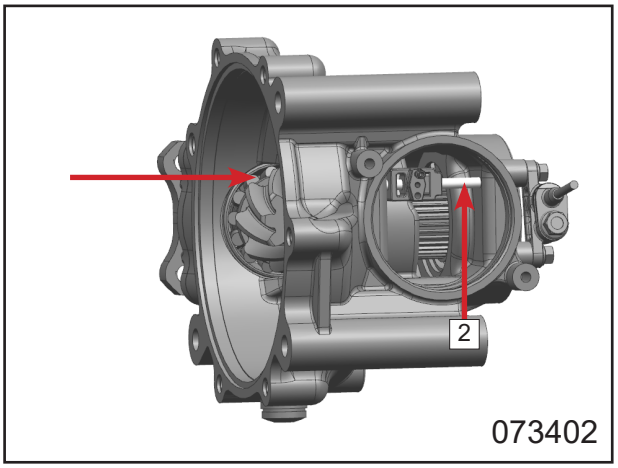


7.6.4 Front Gear Case Motor Installation

Install rack [1] on spline bushing.

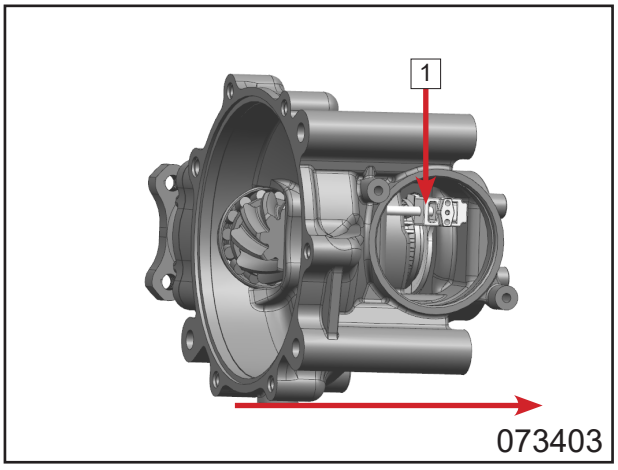


Insert pin [2] from inside gear case.



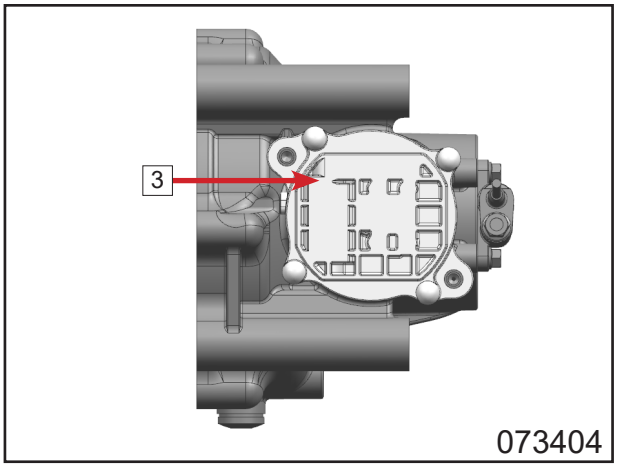
NOTE A: Before motor installation, set the motor to 2WD mode with special device or vehicle control circuit.

NOTE B: During installation, rack assembly [1] and spline bushing should be closed like what picture shows.

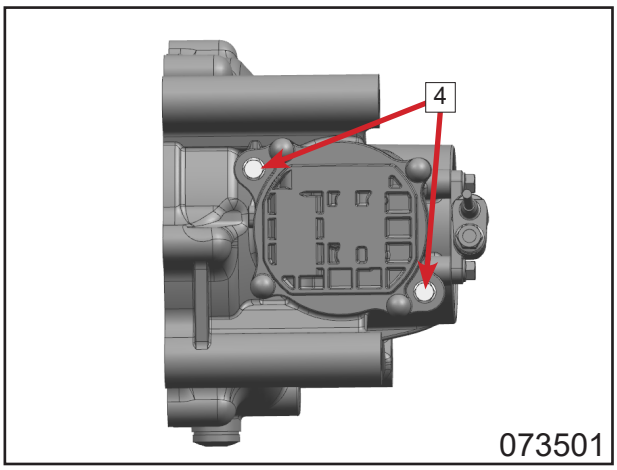


Install motor [3].

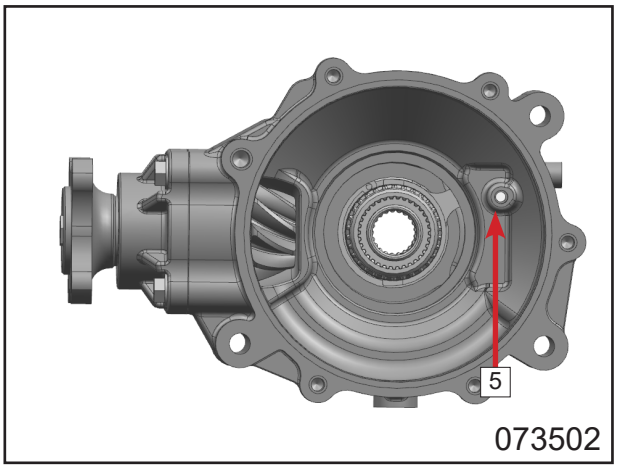
NOTE: In the premise of NOTE A and B, install the motor with screws doweled during installation.



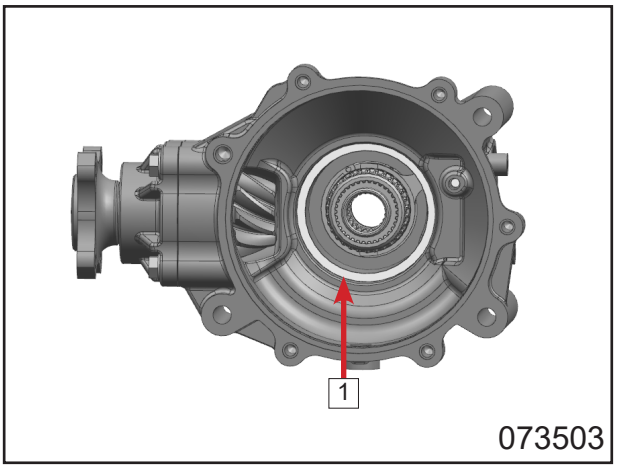
Install bolts [4].
Tighten torque: 8 N•M



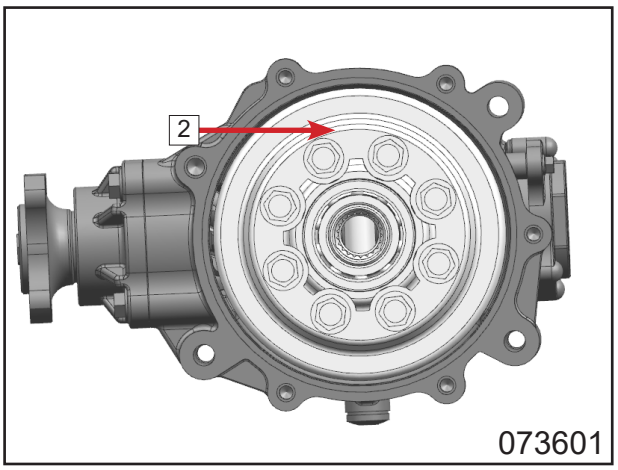
Install inner hex screw [5].
Tighten torque: 10 N•M



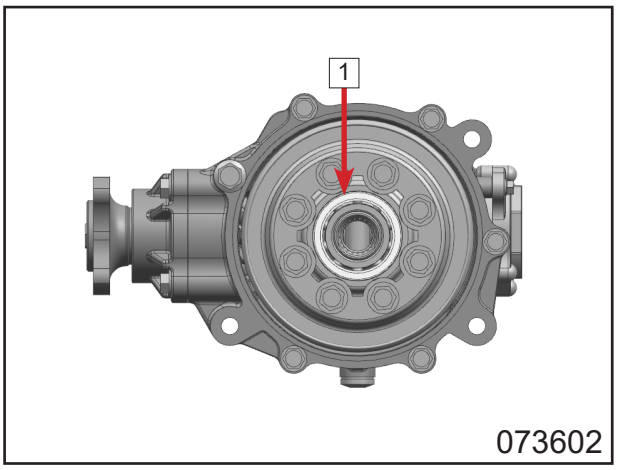
Differential Installation
Install adjusting washer [1].



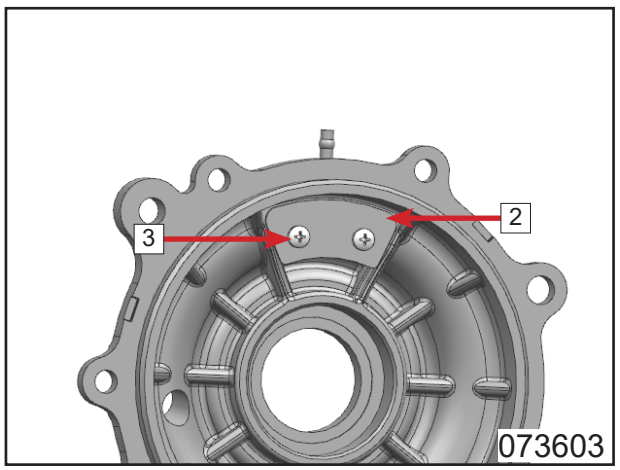
Install assembled differential [2] into housing.
After assembling, inspect drive bevel gear [2] for smooth rotation or noise.



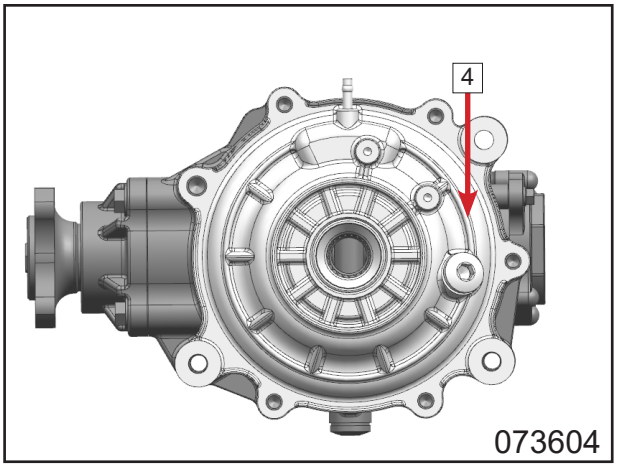
7.6.5 Gear Case Cover Installation
Install washer [1].



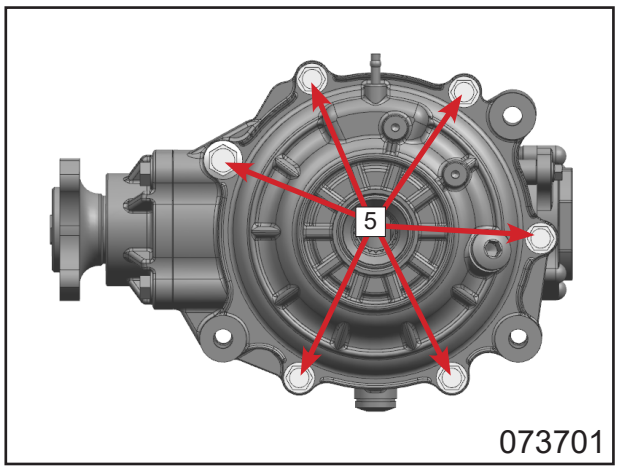
Install oil guard [2].
Install screws [3].



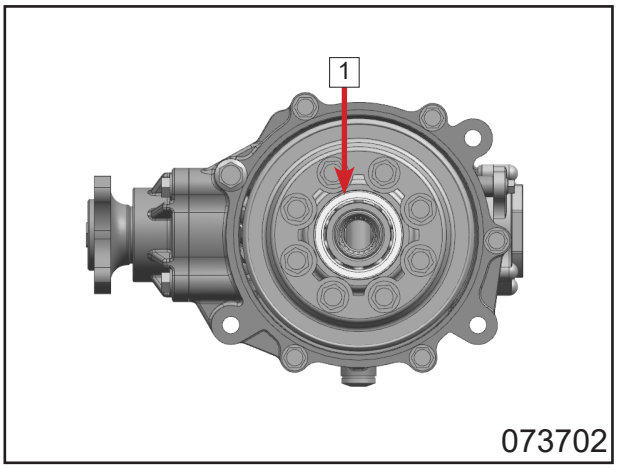
Install gear case cover [4].



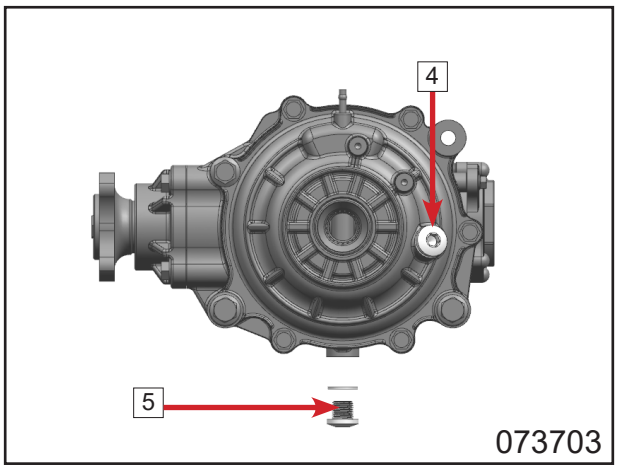
Install bolts [5].
Tighten torque: 40 N•M

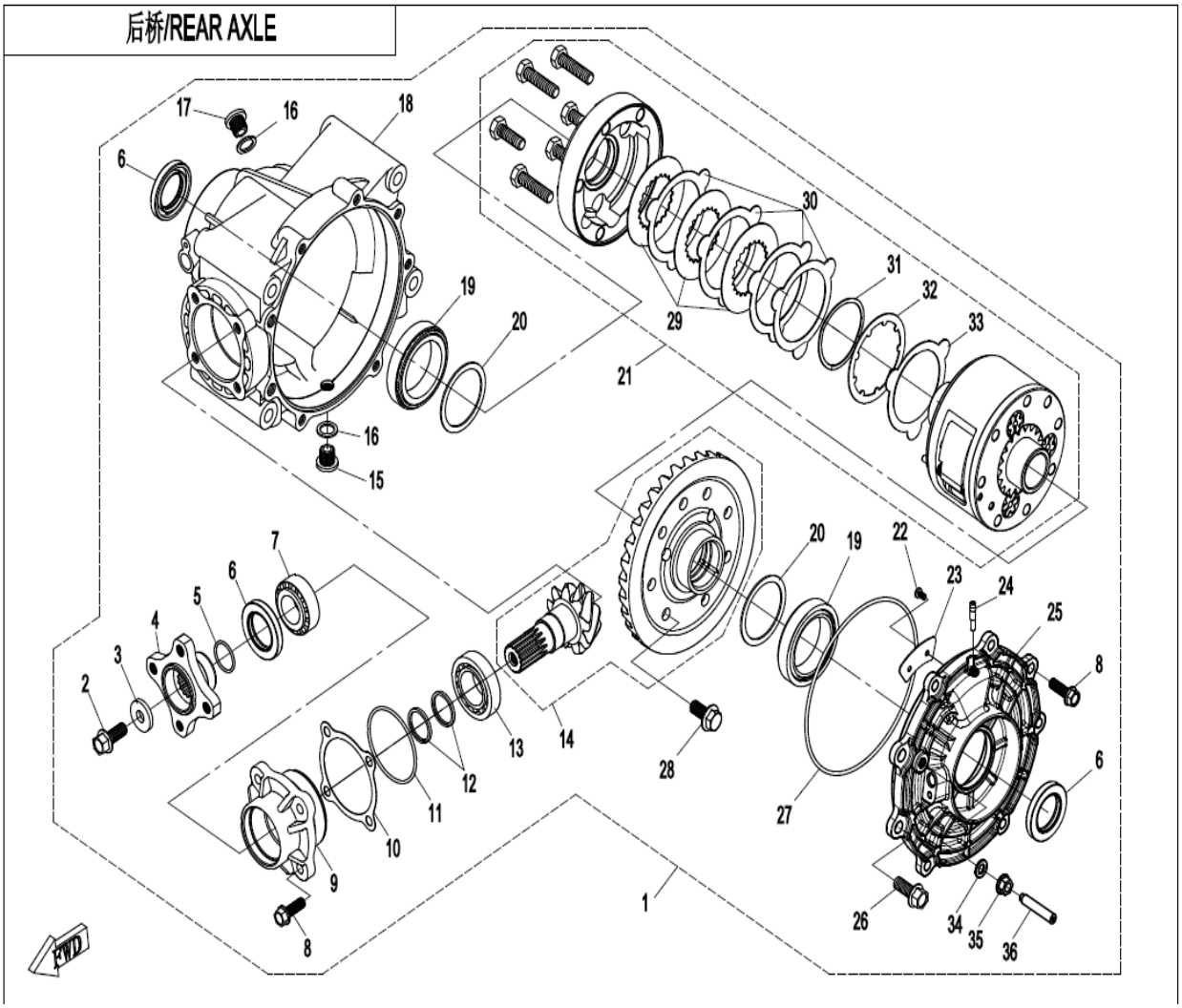


After assembling, inspect drive bevel gear [2] for smooth rotation or noise. Adjust washer [1] and check drive bevel gear again if any defect is found.

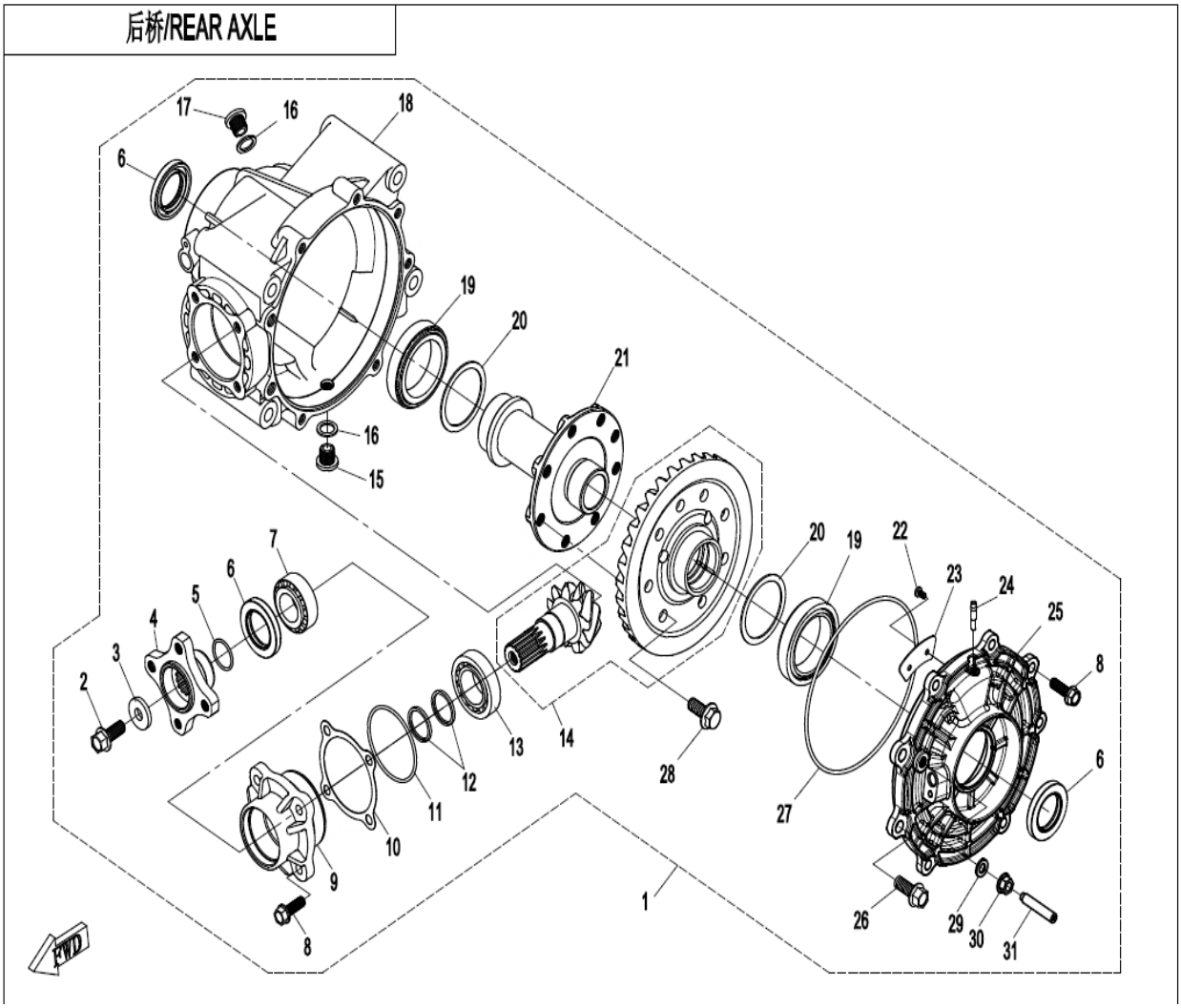


Install oil filler bolt [4].
Install oil drain bolt [5].
Tighten torque: 25 N•M





1	后桥总成	14	后桥锥齿轮组件	27	O 形密封圈
2	螺栓	15	磁性放油螺栓	28	组合螺栓
3	垫圈	16	垫片 14	29	内齿摩擦片
4	连接盘	17	螺栓	30	外齿摩擦片
5	O 形密封圈	18	后桥箱体	30	外齿摩擦片
6	油封	19	圆锥滚子轴承	31	波形垫
7	圆锥滚子轴承	20	调整垫圈 61×50.5	32	内突起摩擦片
8	螺栓	21	自动锁差速器总成	33	外齿摩擦片光片
9	轴承座	22	螺钉	34	垫片
10	安装距调整垫圈	23	挡油板	35	螺母
11	O 形密封圈 55×2.5	24	通气管接头	36	内六角头螺栓
12	调整垫圈 32×25.4	25	后桥箱盖		
13	圆锥滚子轴承	26	螺栓		

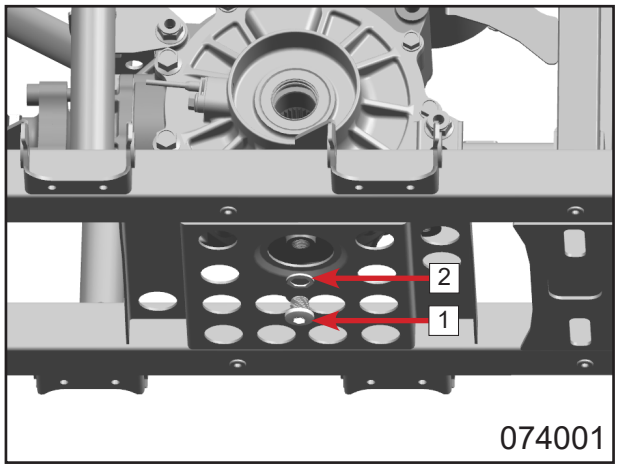


1	后桥总成	12	调整垫圈 32×25.4	23	挡油板
2	螺栓	13	圆锥滚子轴承	24	通气管接头
3	垫圈	14	后桥锥齿轮组件	25	后桥箱盖
4	连接盘	15	磁性放油螺栓	26	螺栓
5	O 形密封圈	16	垫片 14	27	O 形密封圈
6	油封	17	螺栓	28	组合螺栓
7	圆锥滚子轴承	18	后桥箱体	29	垫片
8	螺栓	19	圆锥滚子轴承	30	螺母
9	轴承座	20	调整垫圈 61×50.5	30	内六角头螺栓
10	安装距调整垫圈	21	安装座	31	波形垫
11	O 形密封圈 55×2.5	22	螺钉		

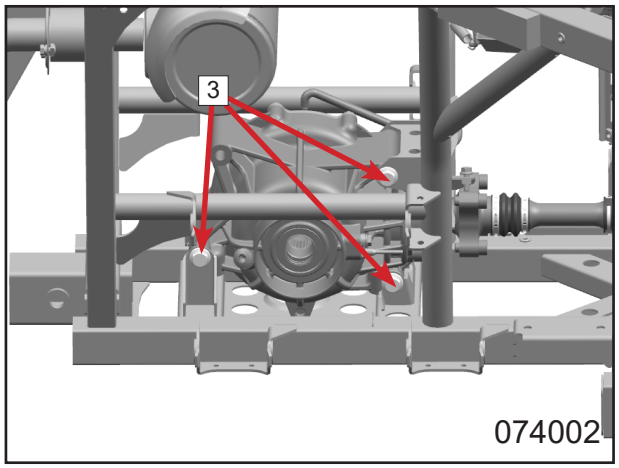
7.7 Rear Gear Case

7.7.1 Rear Gear Case Removal

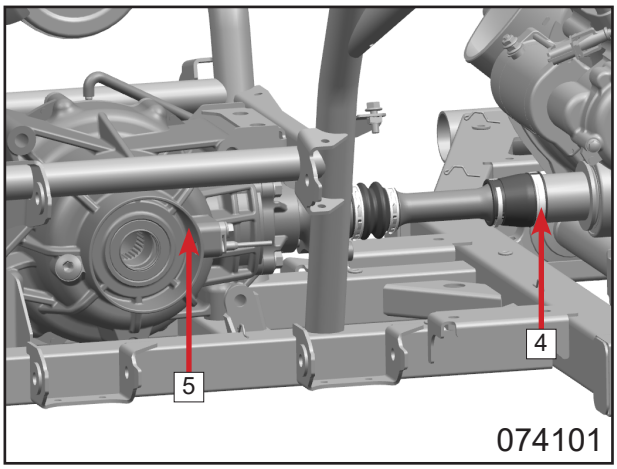
Remove wheels (refer to Chapter 09).
Remove brake calipers (refer to Chapter 08).
Remove steering knuckles (refer to Chapter 09).
Remove CV drive shafts (refer to 7.1 CV drive shafts section).
Place a container under rear gear case.
Remove drain bolt [1].
Remove washer [2].
Drain gear case oil.



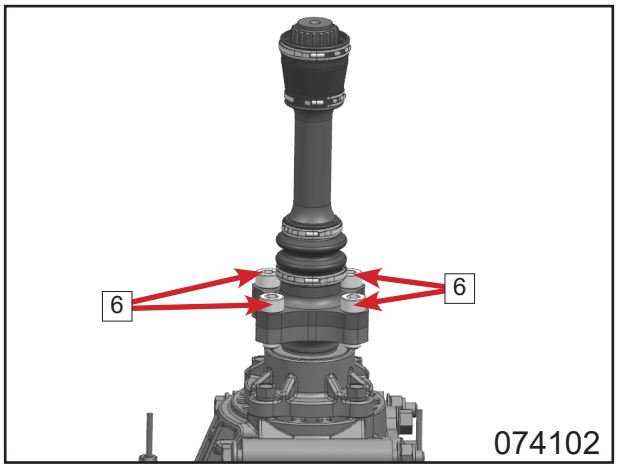
Remove three bolts [3] and nuts.



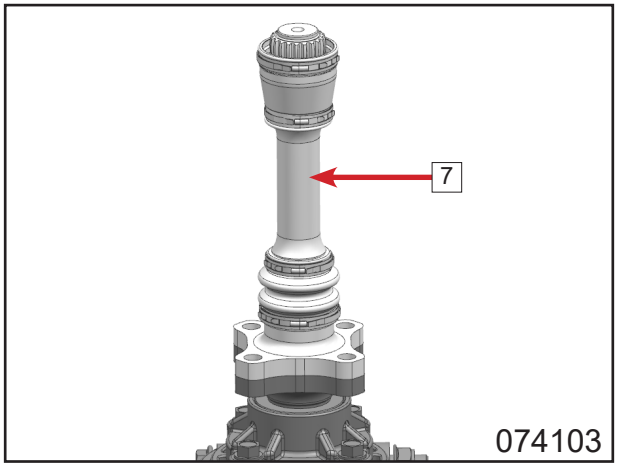
Loosen clamp [4].
Remove rear gear and rear drive shaft assembly [5].



Remove bolts [6].



Remove rear drive shaft [7].

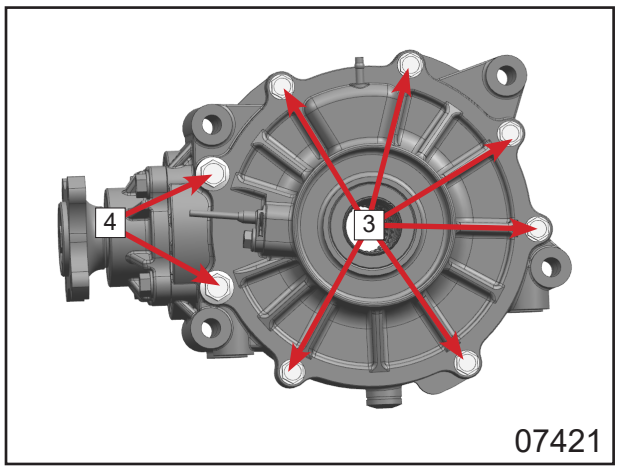


7.7.2 Rear Gear Case Disassembly (Version 1)

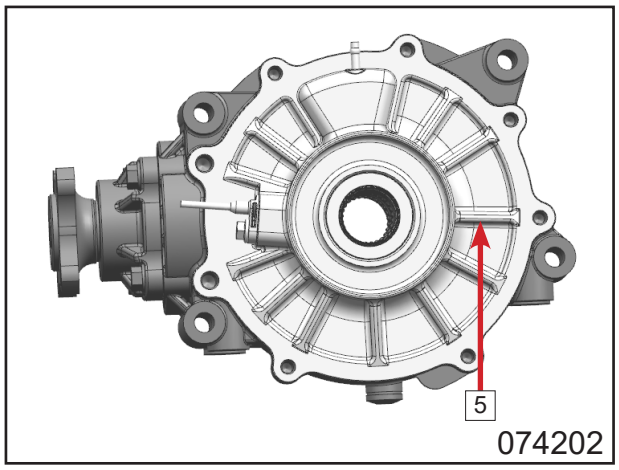
Rear Gear Case Cover

Remove six M8 bolts [3].

Remove two M10 bolts [4].

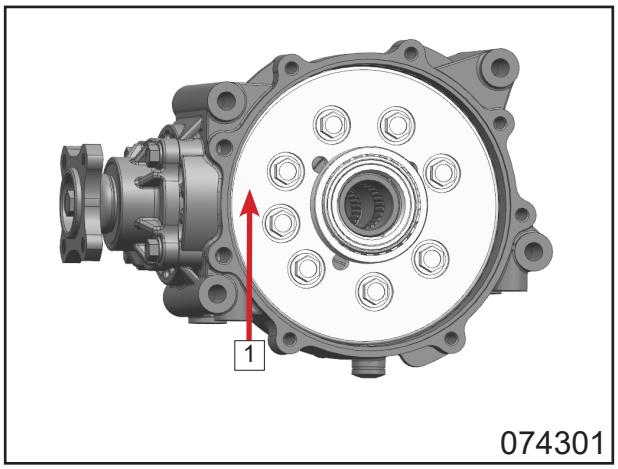


Remove rear gear case cover [5].

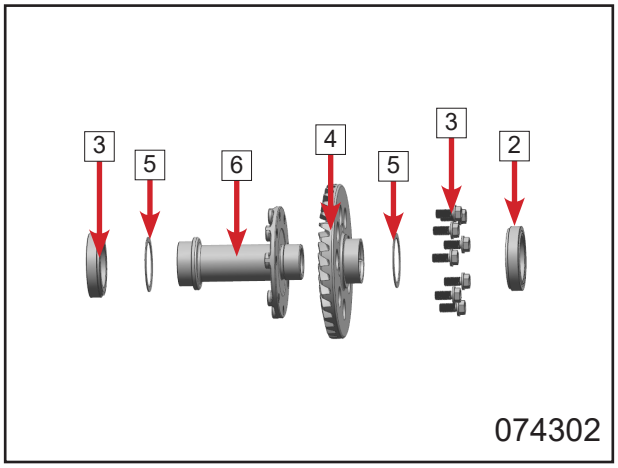


Driven Bevel Gear Assembly

Remove driven bevel gear assembly [1].

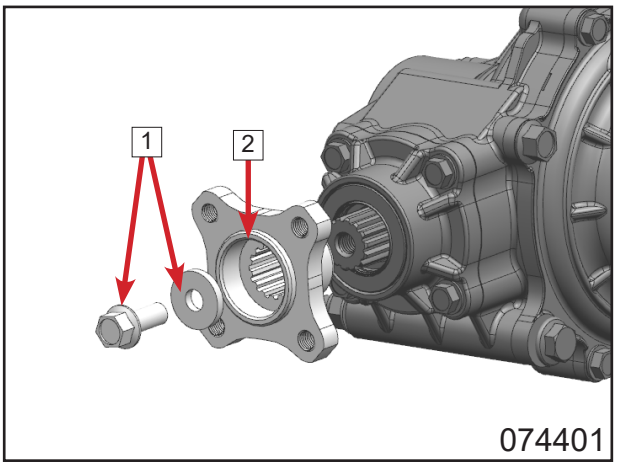


Remove eight M10 bolts [2].
Remove bearing [3].
Remove driven bevel gear [4].
Remove washers [5].
Remove mounting seat.

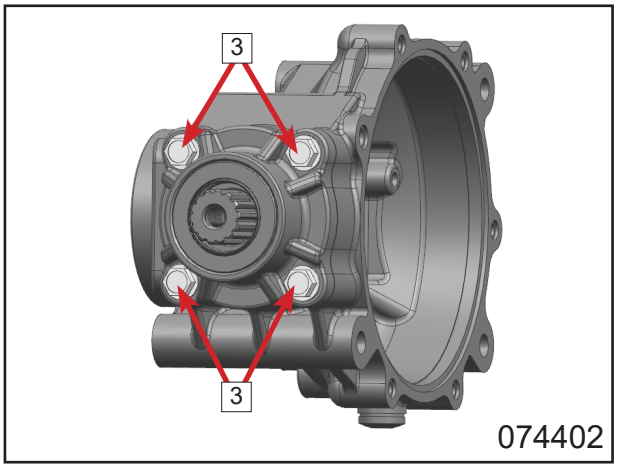


7.7.3 Rear Gear Case Drive Bevel Gear Disassembly

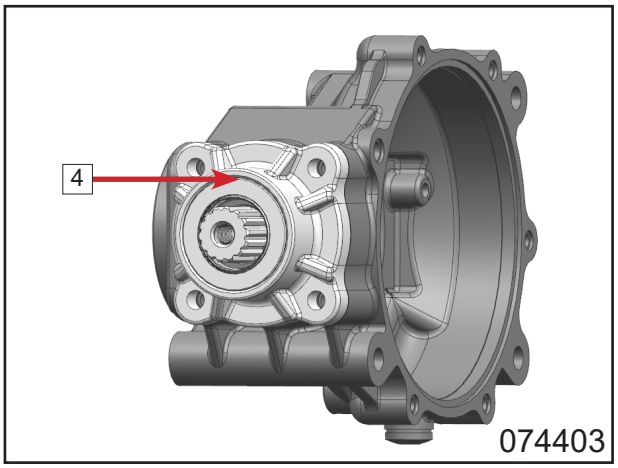
Remove bolt and washer 1.
Remove coupler 2.



Remove bolts 3.



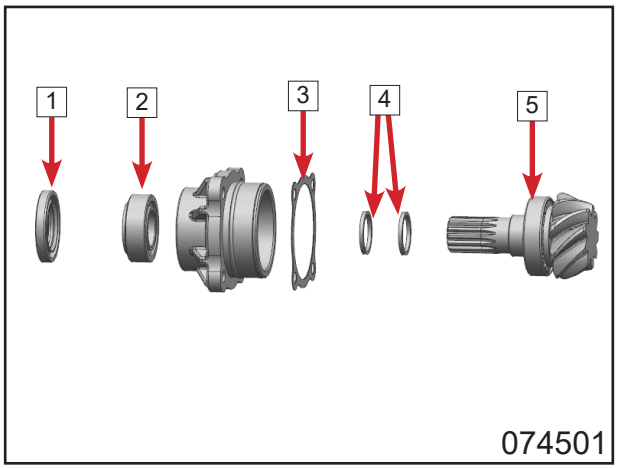
Remove input shaft 4.



7.7.4 Input Shaft Disassembly

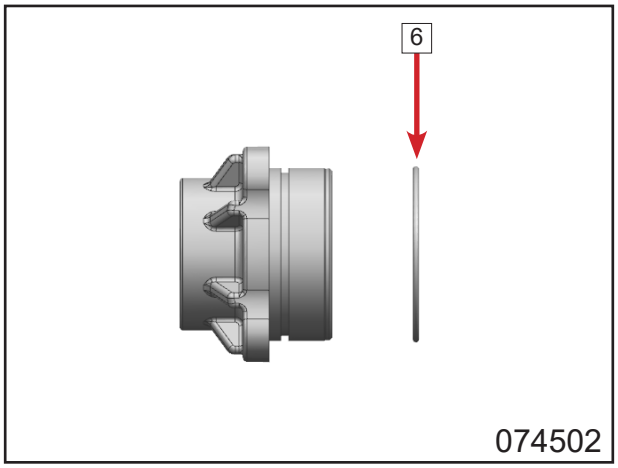
Remove rear drive bevel gear and inspect for smooth rotation.
It's not necessary to disassembly if it rotates smoothly.
If any defect is found, disassemble input shaft.

Remove oil seal 1.
Remove bearing 2 by bearing puller.
Remove washer 3.
Remove adjusting washers 4.
Remove input shaft 5.



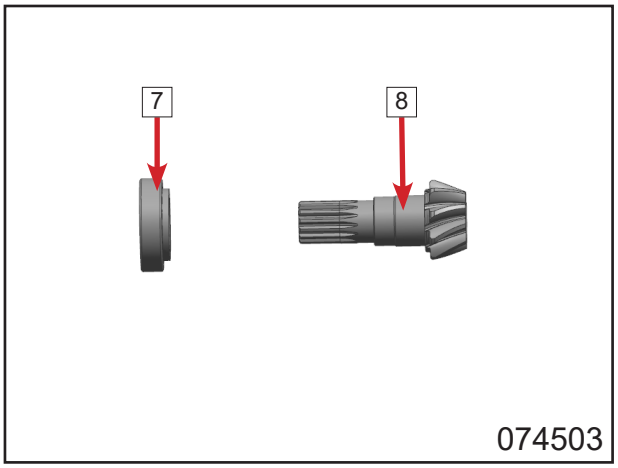
074501

Inspect seal ring for defects. Replace if necessary.
Remove seal ring 6.



074502

Remove bearing 7 by bearing puller.
Remove drive bevel gear 8.



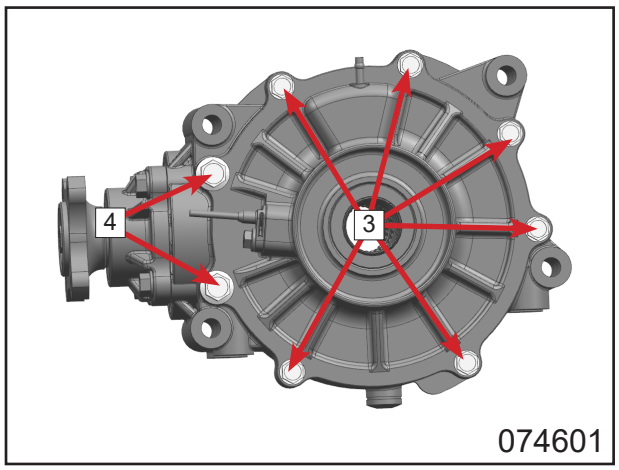
074503

7.7.5 Rear Gear Case Disassembly (Version 2)

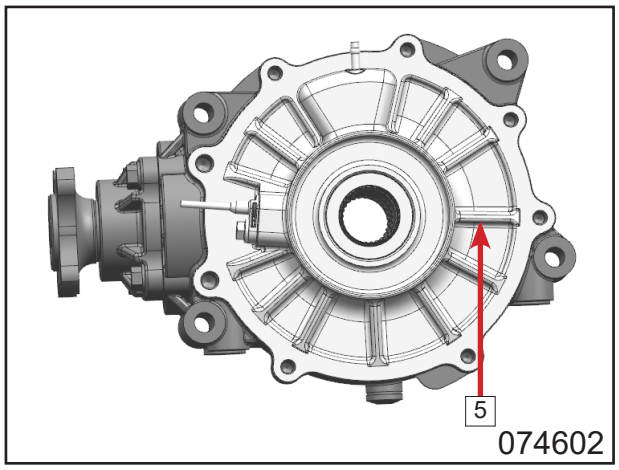
Rear Gear Case Cover

Remove six M8 bolts [3].

Remove two M10 bolts [4].

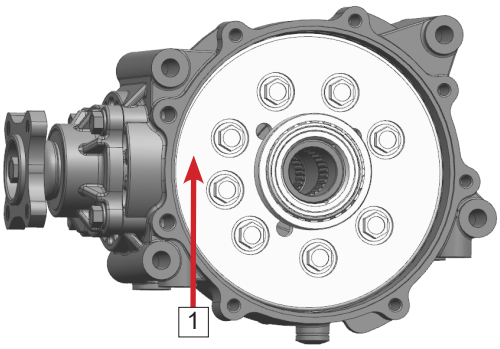


Remove rear gear case cover [5].



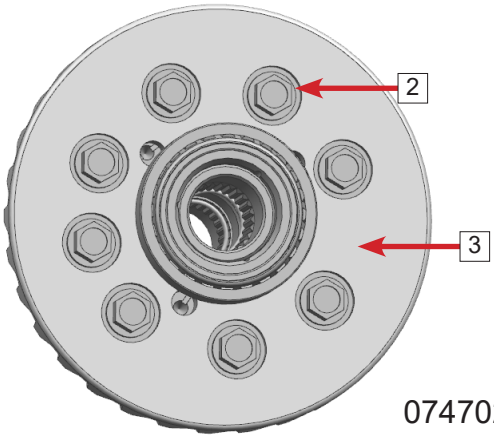
7.7.6 Differential Disassembly

Remove differential assembly 1.



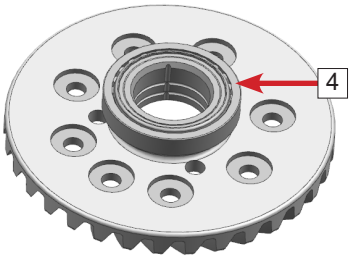
074701

Remove eight bolt kits 2.
Remove driven bevel gear 3.



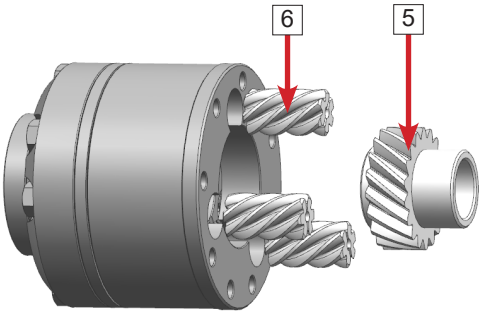
074702

Inspect bearing for abnormal or severe wear.
Bearing 4 can be removed by bearing puller.



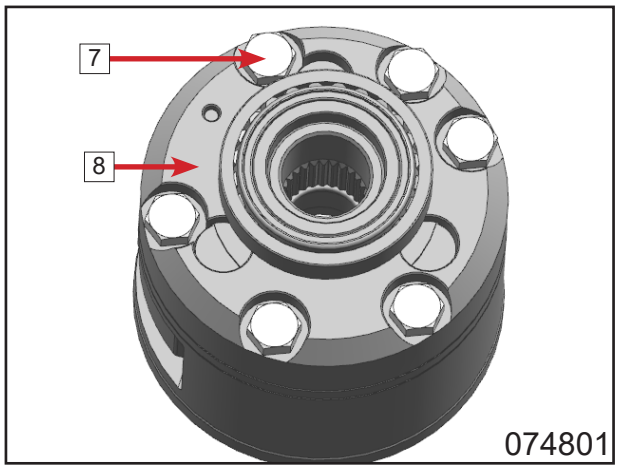
074703

Remove LH shaft gear 5.
Remove LH planet gear 6.

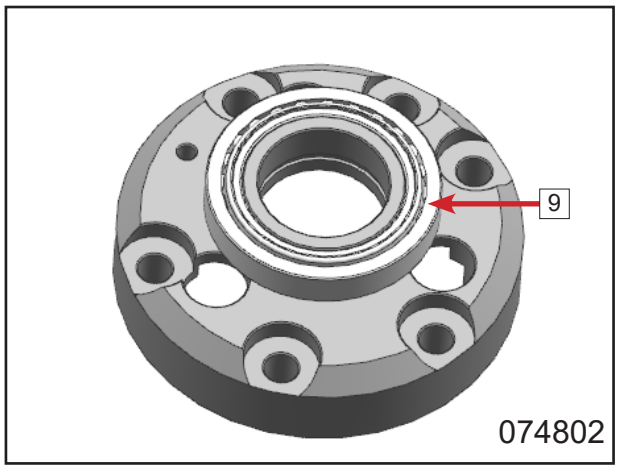


074704

Remove bolts [7].
Remove cover [8].

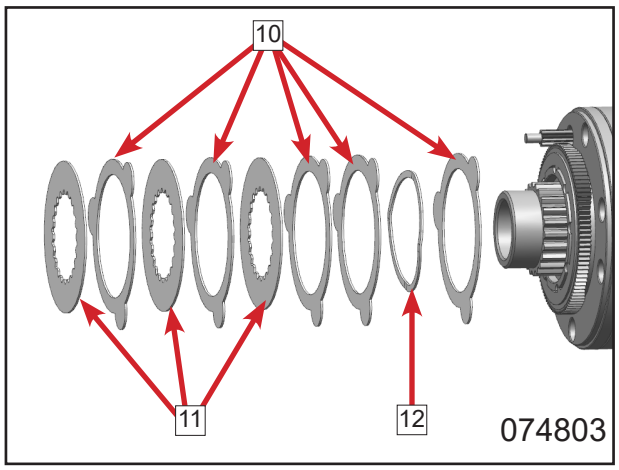


Inspect bearing for abnormal or severe wear.
Bearing [9] can be removed by bearing puller.

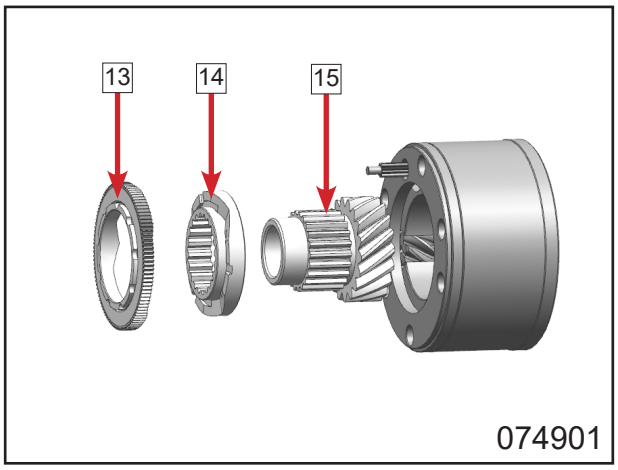


Remove inner protruding friction pads [10].
Remove outer teeth friction pads [11].
Remove gasket [12].

NOTE: After differential cover removal, bind friction pads by tie-bands in sequence.



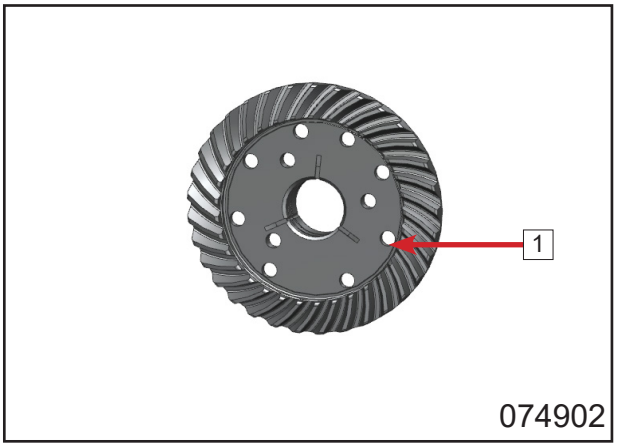
Remove outer cam 13.
Remove inner cam 14.
Remove RH shaft gear 15.



7.7.7 Rear Gear Case Inspection

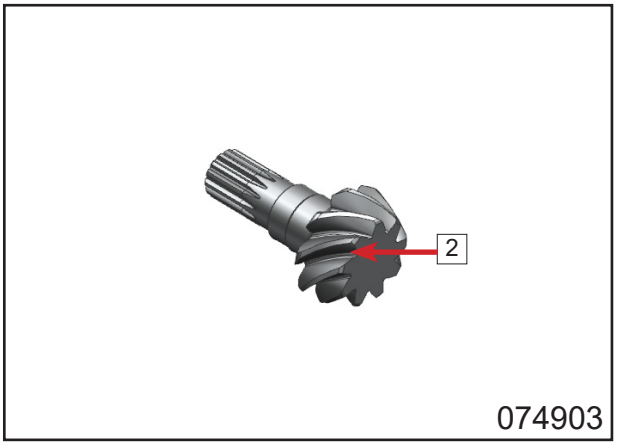
Driven Bevel Gear Inspection

Inspect driven bevel gear 1 for teeth wear, cracks or damage. Replace if any defect is found.



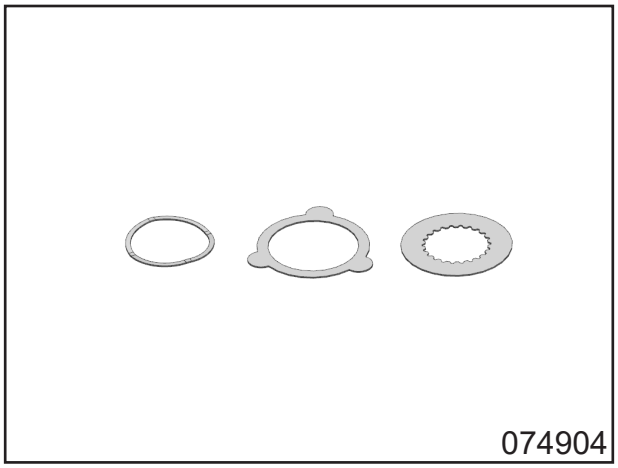
Drive Bevel Gear Inspection

Inspect drive bevel gear 2 for teeth wear, cracks or damage. Replace if any defect is found.



Differential friction Pads Inspection

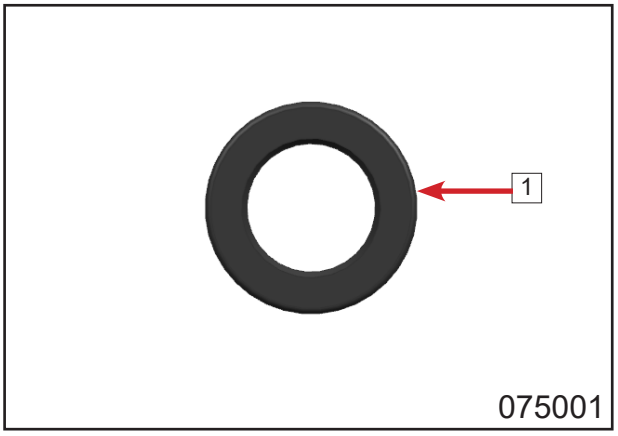
Inspect differential friction pads for severe wear, abnormal wear, cracks or damage. Replace if ant defect is found.



Oil Seal

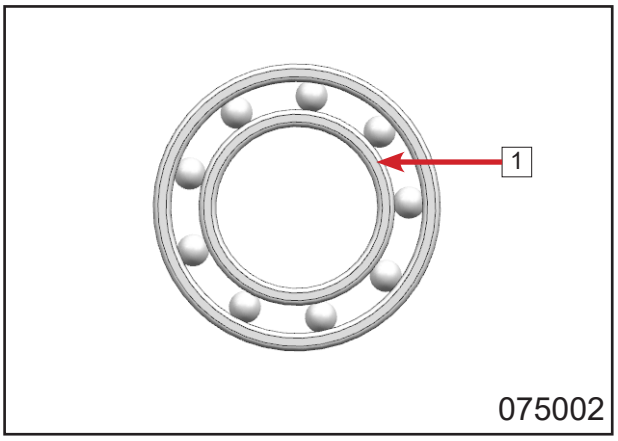
All oil seals [1] are removed and sorted as waste. Replace with new ones during installation.

Inspect oil seal [1] lip and jointing surface for damage. Replace if any defect is found.



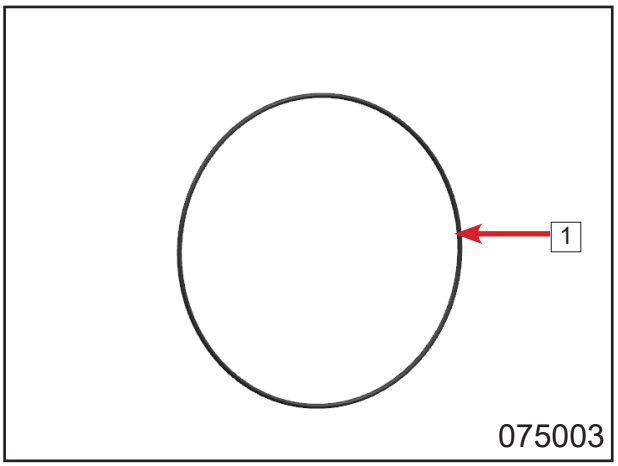
Bearing

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.



O-seal Ring

Inspect every o-seal ring [1] if deformed, broken or damaged. Replace with new parts if any defect is found.

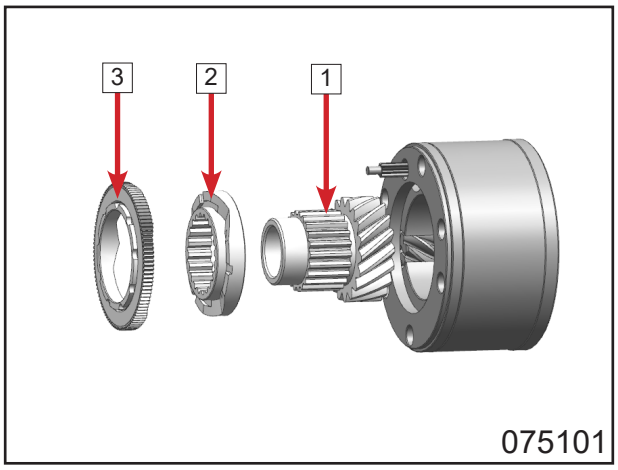


Inspect housing for cracks or damage. Replace if any defect is found.

7.8 Rear Gear Case Assembly

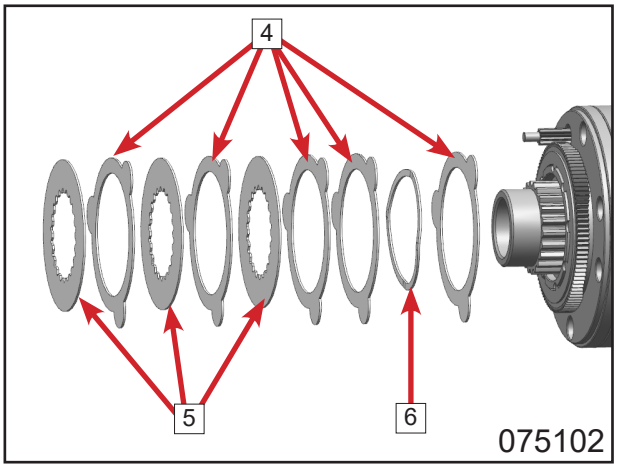
7.8.1 Differential Assembly

Install RH shaft gear [1].
Install inner cam [3].
Install outer cam [2].

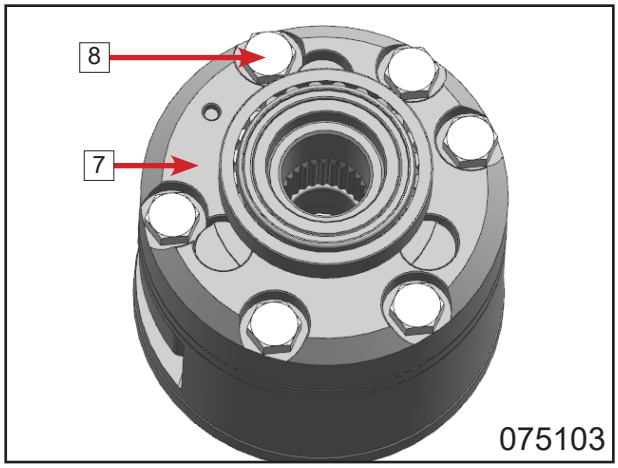


Install inner protruding friction pad [4], outer teeth friction pad [5] and gasket [6] one by one in sequence.

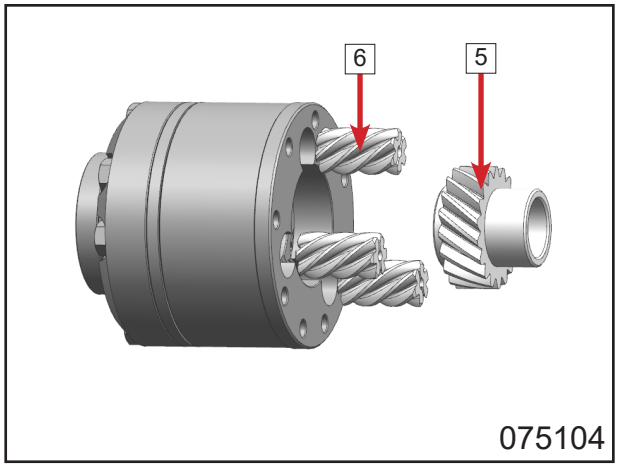
NOTE: The sequence of each friction pad shall not be confused.



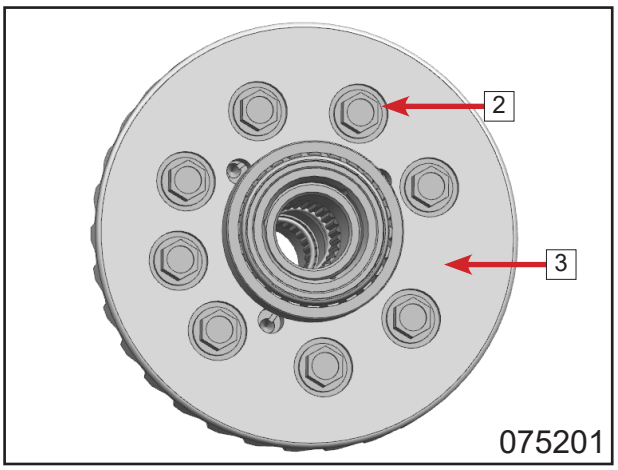
Install cover [7].
Install bolts [8] with thread locker.
Tighten torque: 45 N•M



Install LH shaft gear [5].
Install LH planet gear [6].



Install driven bevel gear [3].
Install eight bolt kits [2] with thread locker.
Tighten torque: 60 N•M

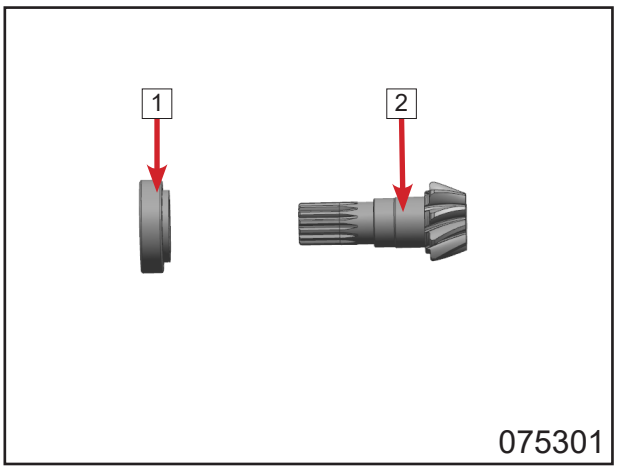


7.8.2 Rear Gear Case Drive Bevel Gear Assembly

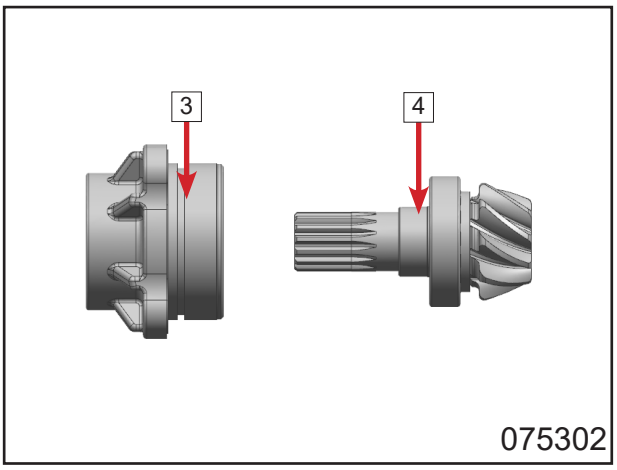
If drive bevel gear isn't removed, skip this step.

Inspect drive bevel gear teeth for abnormal or severe wear before assembling.

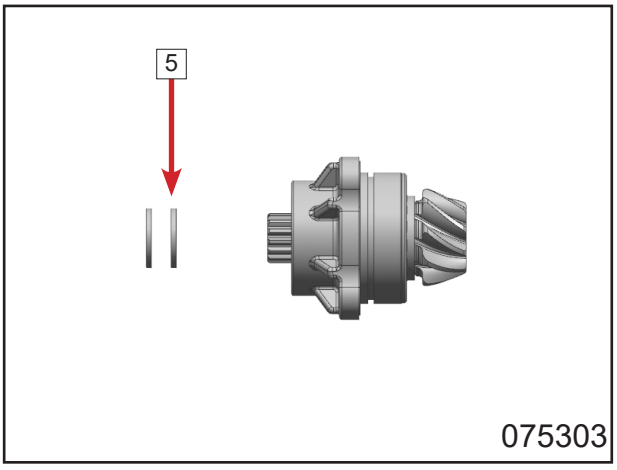
Compress bearing [1] on drive bevel gear [2].



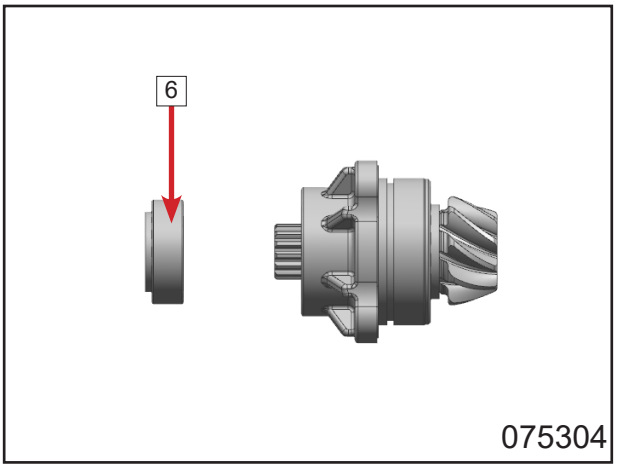
Insert input shaft assembly [3] into bearing seat [4].



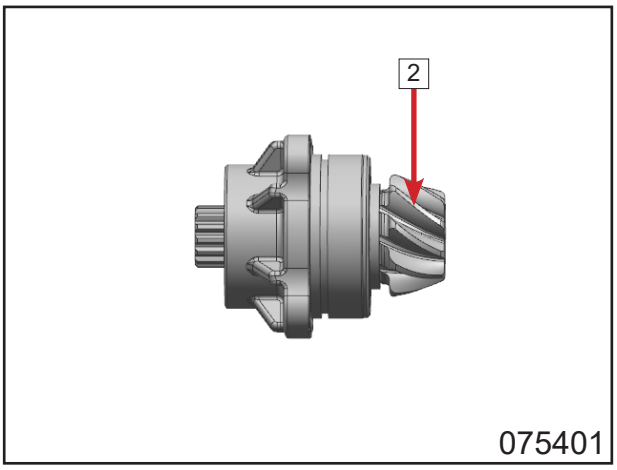
Install adjusting washers [5].



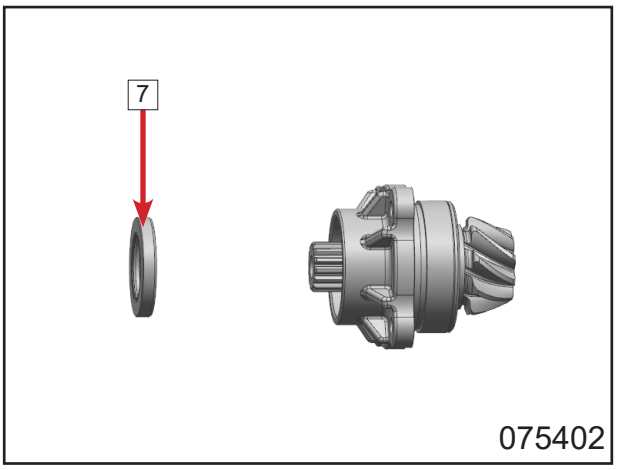
Install bearing [6].



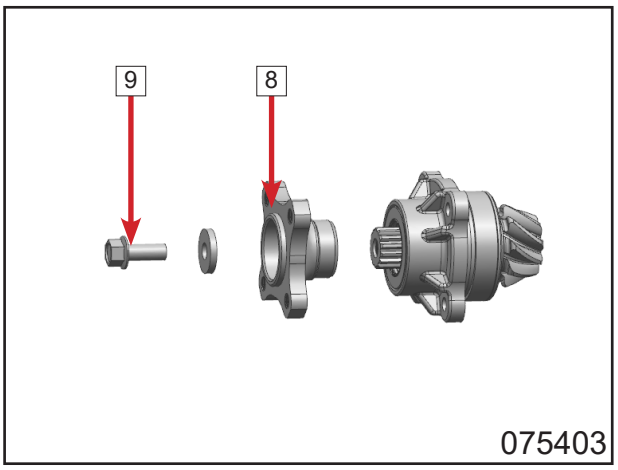
After assembling, inspect drive bevel gear [2] if it rotates smoothly. If it is stuck or there is noise, remove bearing, adjust washer thickness and reinstall.
When gear rotation is smooth, proceed next step.



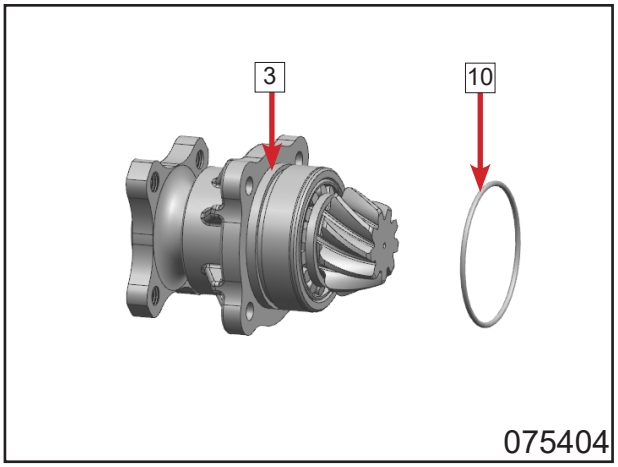
Apply grease on oil seal [7] and install it.



Install coupler [8].
Install bolt and washer [9] with thread locker.
Tighten torque: 75N•M

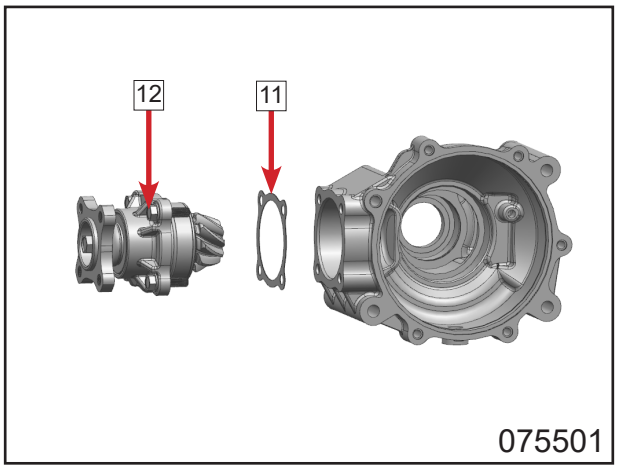


Install seal ring [10] into groove of bearing seat.



Install adjusting gaskets [11].
Install drive bevel gear assembly [12];
Tighten torque: 25N•M

After assembling, inspect drive bevel gear [1] if it rotates smoothly. If it is stuck or there is noise, adjust gaskets.



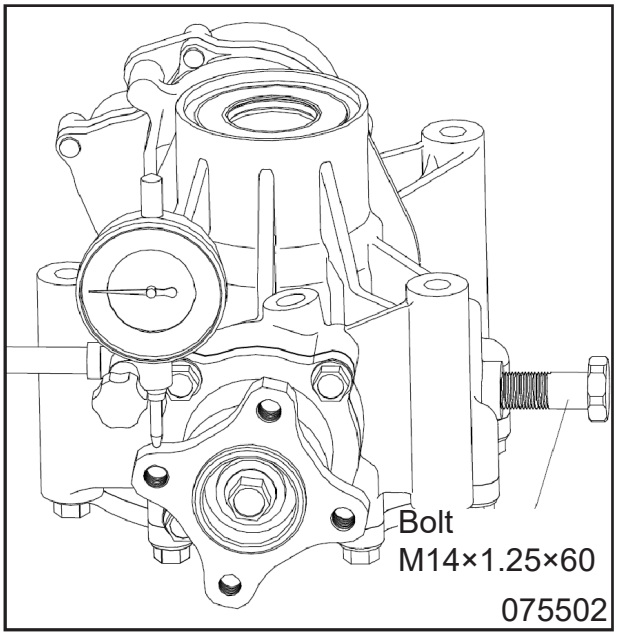
Rear Gear Case Bevel Gear Clearance Adjustment

Follow the drawing on the right to adjusting gear side clearance: Install auxiliary measuring tool and tighten the bolt (M14X1.25X60). 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:

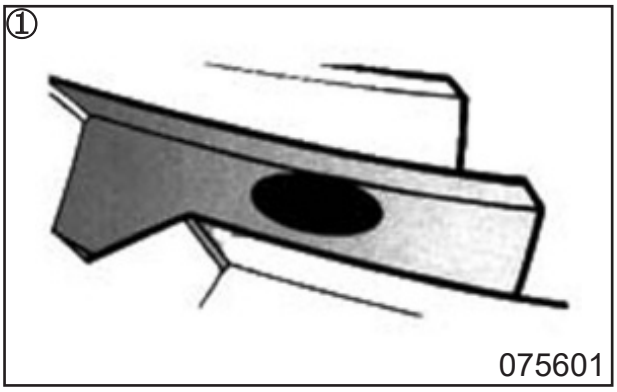
Remove ring gear from crankcase.

Clean and degrease drive pinion gear and ring gear teeth.

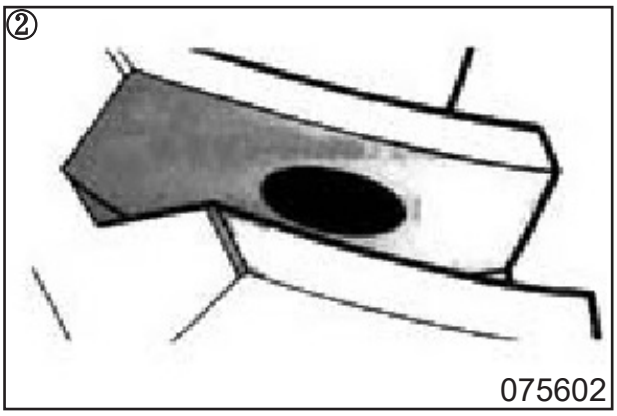
Apply a coating of machinist's layout dye or paste to several teeth of the driven gear.

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.



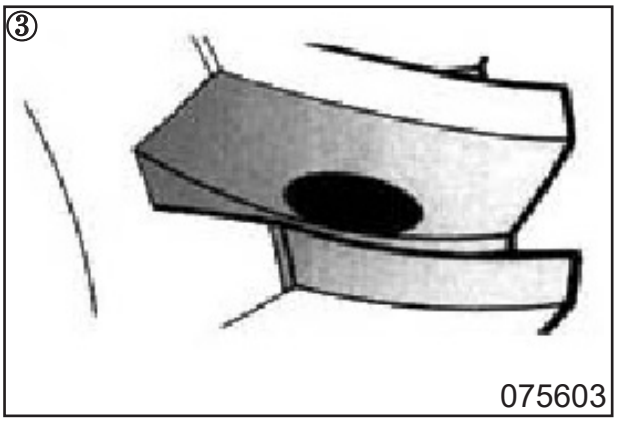
Pattern 1	Contact at tooth top	Incorrect
Pattern 2	Contact at tooth middle	Correct
Pattern 3	Contact at tooth root	Incorrect



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.



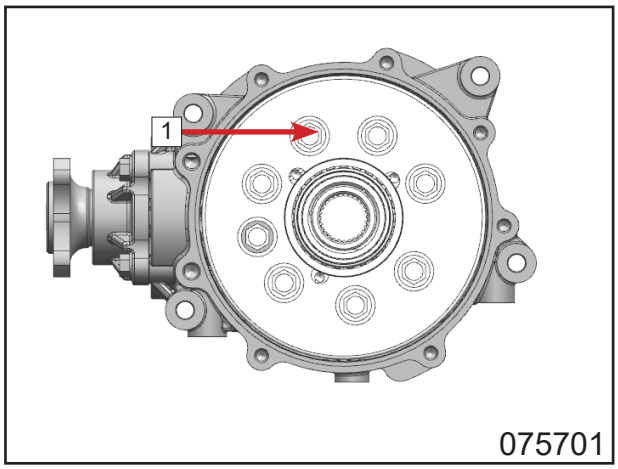
Adjustment Steps

Tooth contact	Shim adjustment
Tooth contact pattern 1	Reduce shim thickness
Tooth contact pattern 3	Increase shim thickness

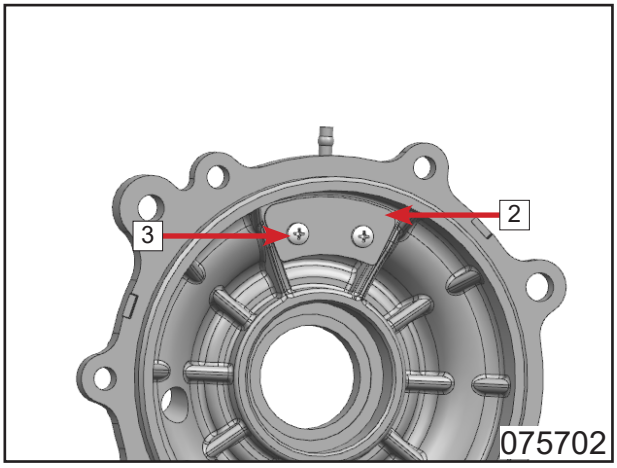
⚠WARNING: Make sure to check the backlash after the tooth contact has been adjusted, since it may have changed. Adjust the tooth contact and backlash until they are both within specification. If the correct tooth contact cannot be maintained when adjusting the backlash, replace the drive gear and ring gear.

7.8.3 Gear Case Cover Installation

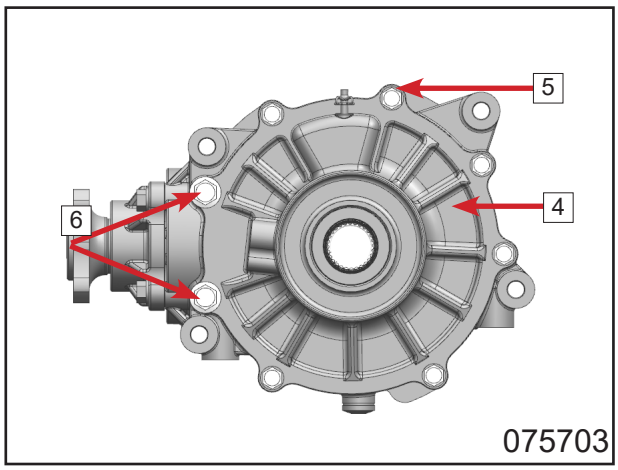
Install assembled differential [1] into housing.
After assembling, inspect drive bevel gear for smooth rotation or noise.



Install oil guard [2].
Install screws [3].

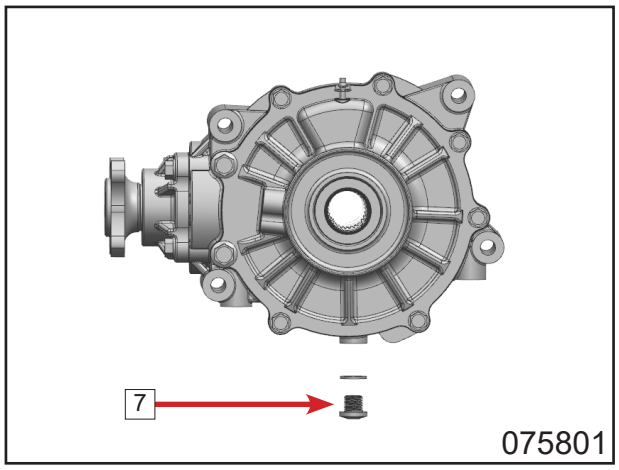


Install case cover [3].
Pre-tighten six bolts[5] in criss-cross way.
Install bolts [6].
Apply thread locker when installing bolts.
Bolt [5] tighten torque: 25N•M
Bolt [6] tighten torque: 40N•M

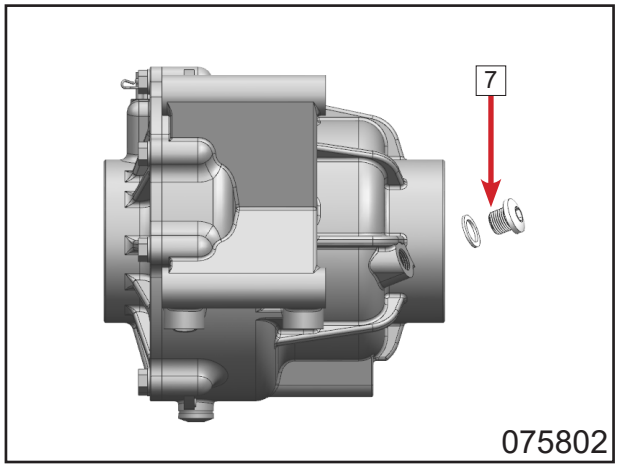


Inspect drive bevel gear for smooth rotation after assembling.

Install rear gear case oil drain bolt [7] and washer.
Tighten torque: 25N•M



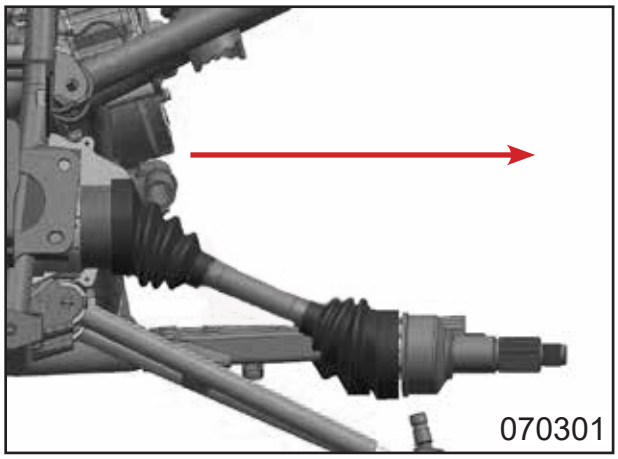
Install oil filler bolt [8] and washer.
Tighten torque: 25N•M



7.1 CV Drive Shafts

Removal

Remove wheels (refer to Chapter 09).
Remove shock absorbers (refer to Chapter 09).
Remove brake calipers (refer to Chapter 08).
Remove LH and RH steering knuckles (refer to Chapter 09).



Pull out CV drive shaft in the horizonal direction.
Other CV drive shafts refer to same removal procedures.

7.2 CV Drive Shafts Inspection and Maintenance

7.2.1 CV Drive Shafts Inspection

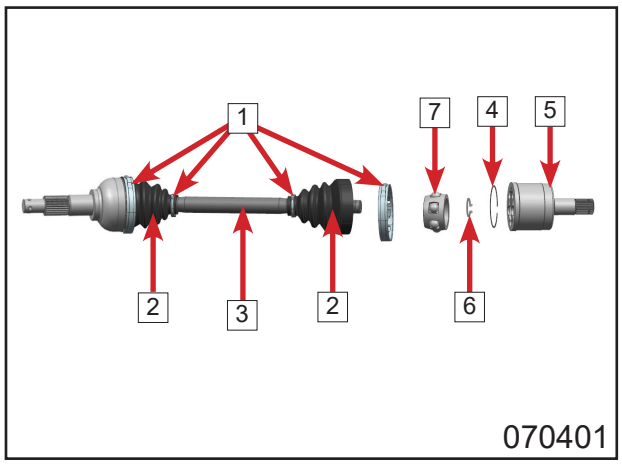
1. Both sides of CV drive shafts should rotate freely. Disassemble to inspect or replace with new parts if any defect, like being stuck, discrete rotation or noise, is found.
2. Inspect the clearance between fixed end dust boot universal shaft and middle spline. Replace with new parts if the clearance is too large.
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.

7.2.2 Shaft Cage Dust Boot

Remove clamps [1].
Pull dust boots [2] towards middle shaft [3].
Remove circlip [4].
Remove housings [5].
Remove circlip [6].
Remove universal shaft assembly [7].
Remove dust boots [2].
Replace with new dust boots during installation.



Installation

Reverse the removal procedures for installation.

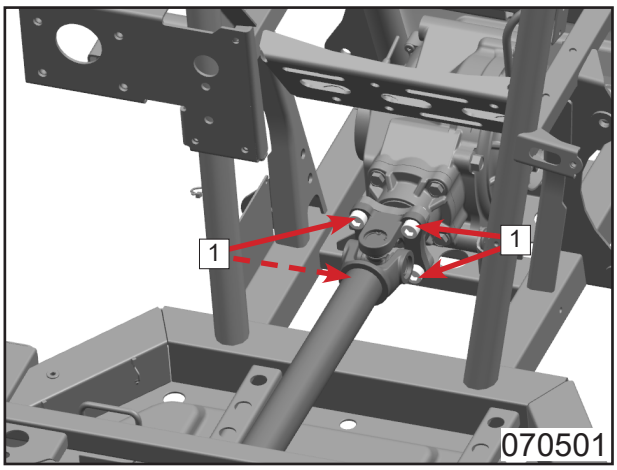
NOTE: Inject MoS2 lithium grease on universal joint during drive shaft installation.
Fill 45g±5g grease in fixed end cage universal joint, 50g±5g grease in fixed end seal enclosure, 65g±10g grease in axial movement cage universal joint for front gear case and 110g±10g for rear gear case.

7.3 Drive Shafts

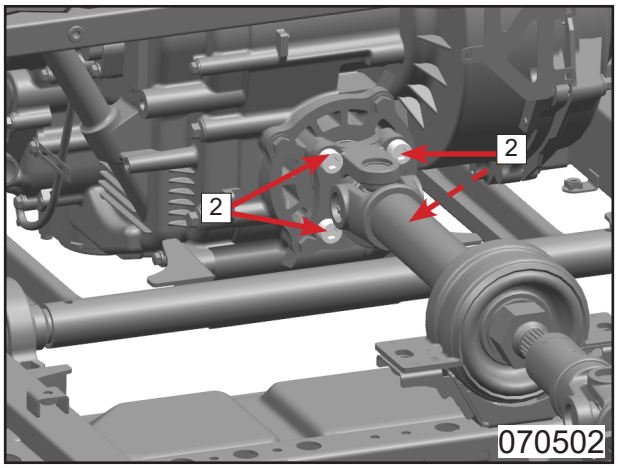
7.3.1 Front Drive Shaft Removal

Remove front gear case (refer to Front Gear Case Removal section in Chapter 07).

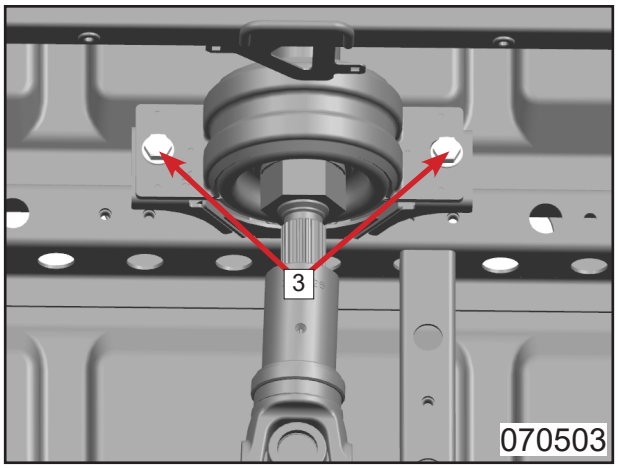
Remove bolts [1] on front gear case side.



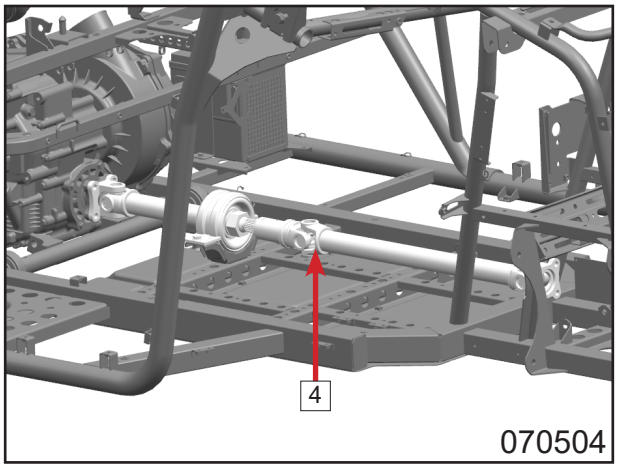
Remove bolts [2] on engine side.



Remove bolts [3].



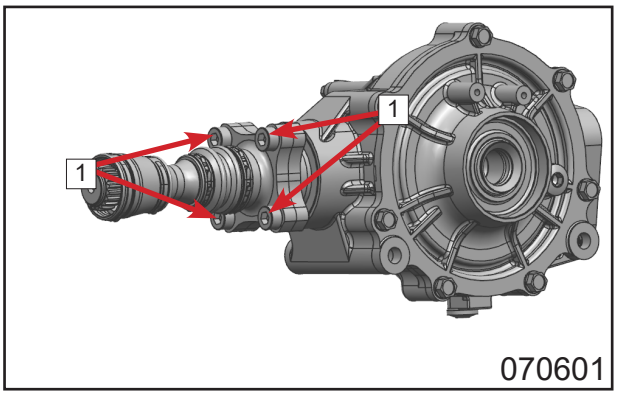
Remove front drive shaft [4].



7.3.2 Rear Drive Shaft Removal

Remove rear gear case (refer to Rear Gear Case Removal section in Chapter 07).

Remove four bolts 1 on rear gear case side.



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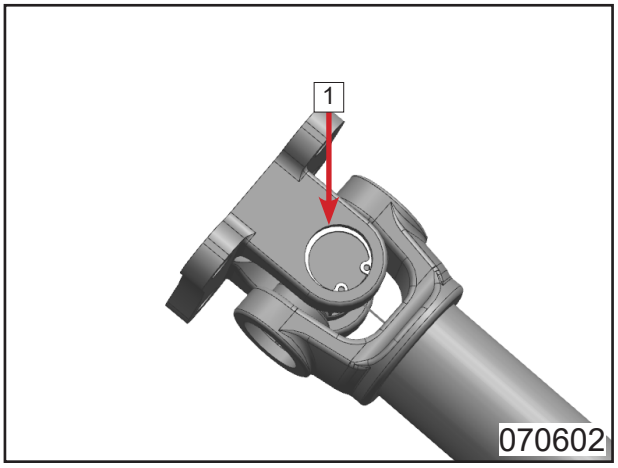
7.3.3 Drive Shafts Inspection

Front drive Shaft

NOTE: If any defect is found, like the clearance is too large, universal shaft is severely worn or blocked, disassemble and replace the defective parts. If not, it is not necessary to disassemble.

Remove circlip 1 with nipper pliers.

Follow same procedures to remove other three circlips.



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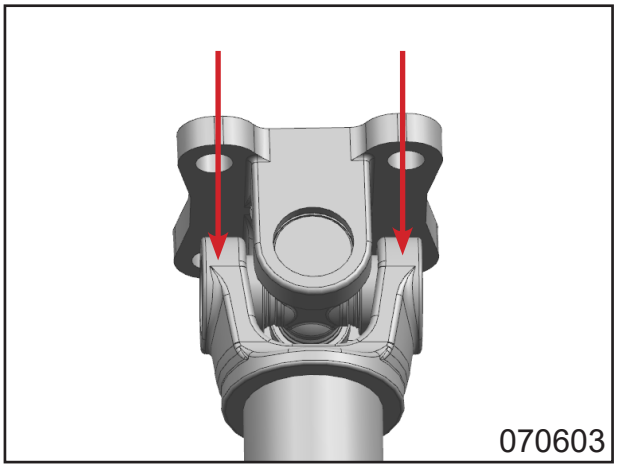
Compress universal shaft with appropriate tool.

Use hydraulic device to compress the tool.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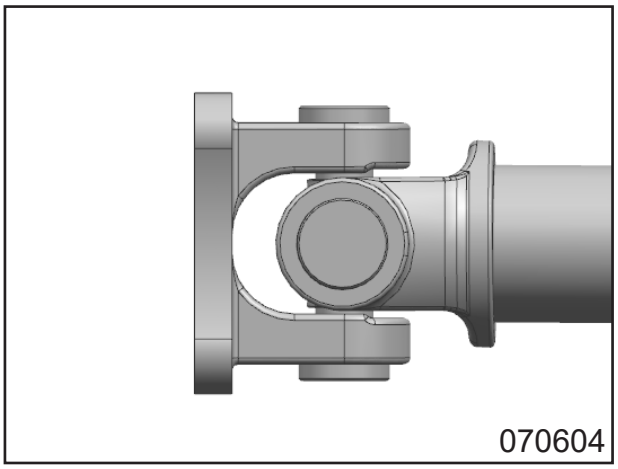
Compress to the limit position.

Turn shaft and compress the other side.

Make sure universal shaft caps protrude on both sides.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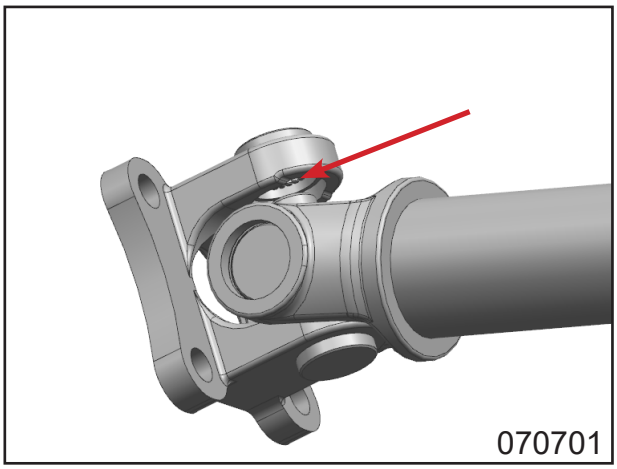
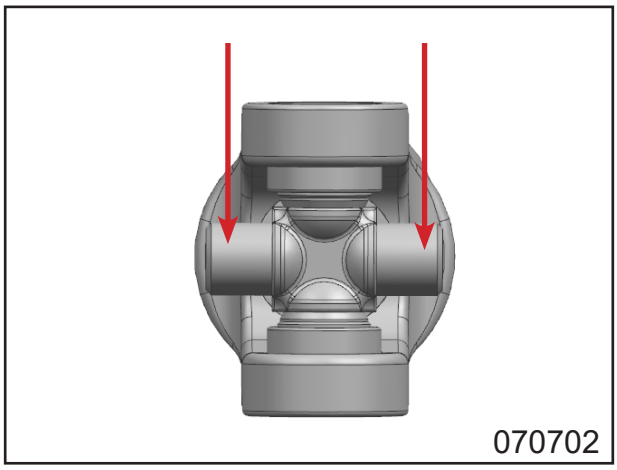
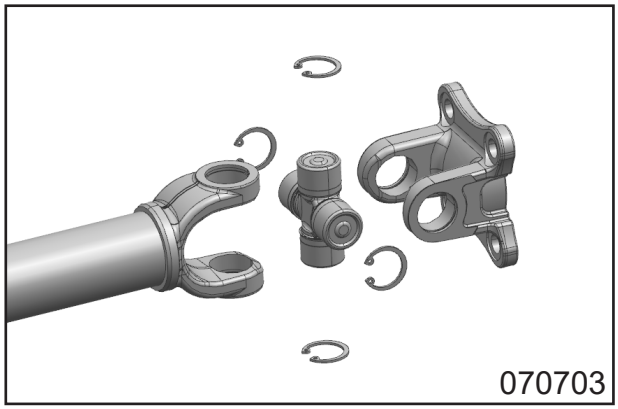
Insert M8 washer into gap.
Compress the side with washer.
Shaft cap protrudes much more then remove yoke.



Use the same way to compress and remove universal shaft.

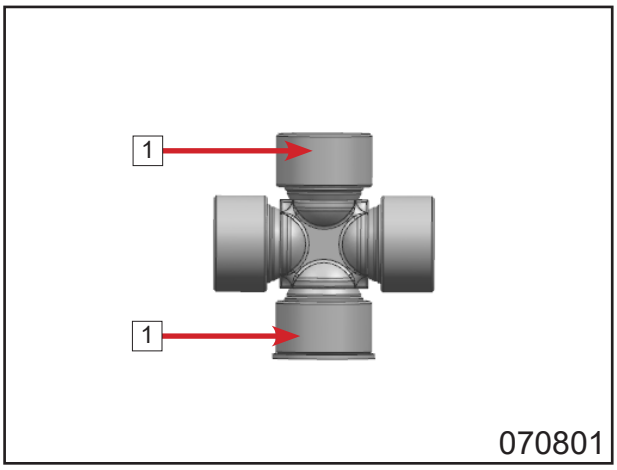


1. Inspect front drive shaft universal shafts on both sides. Replace if necessary.
2. Inspect front drive shaft middle spline. Replace if necessary.

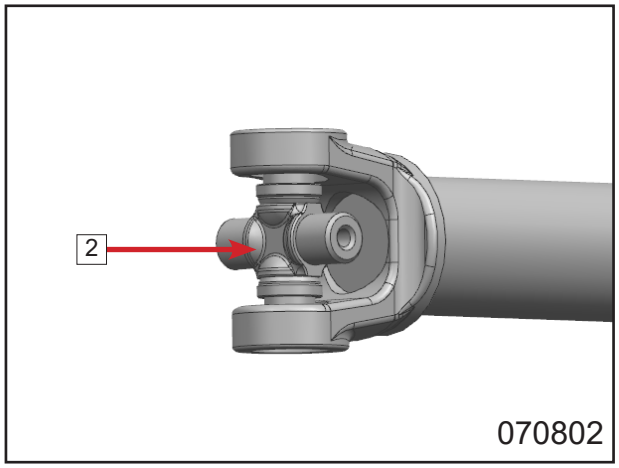


Assembly

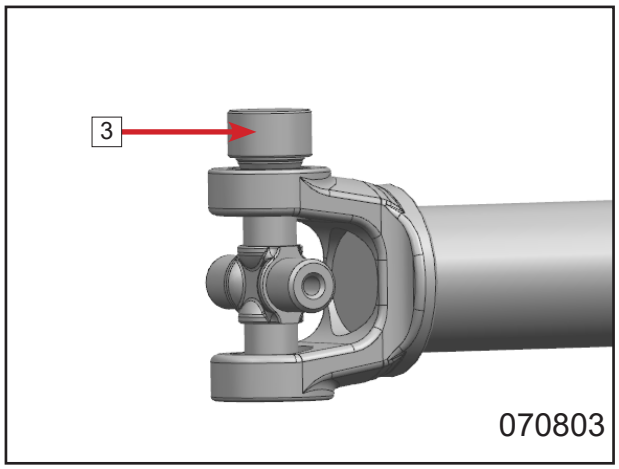
Remove universal shaft caps in the symmetric direction.



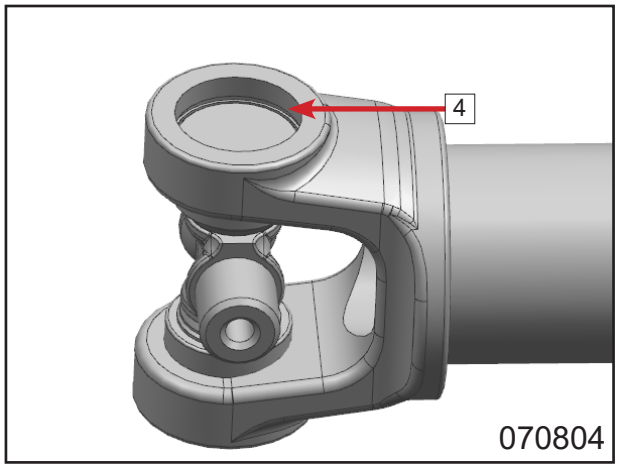
Put universal shaft 2 in yoke.



Put shaft caps 3 and compress them to the position of circlips.

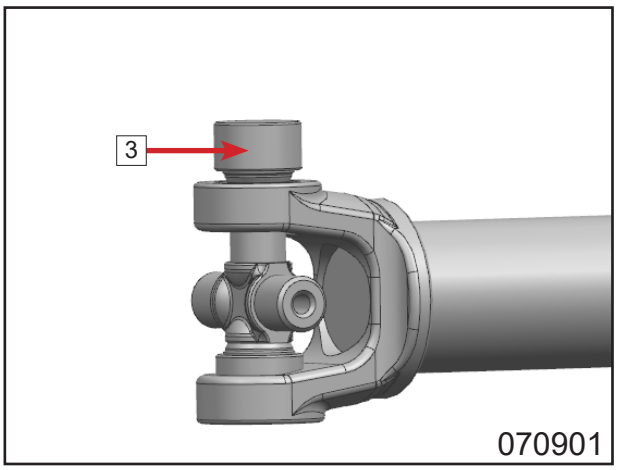


The position of circlip 4.

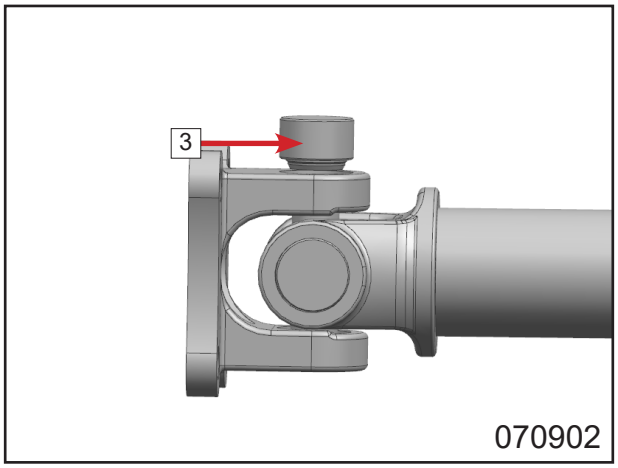


Compress universal shaft caps 3 in the symmetric direction.
After installation, it may be stuck or the rotation isn't flexible, which is normal.

NOTE: The removed universal shaft caps can't be reused.



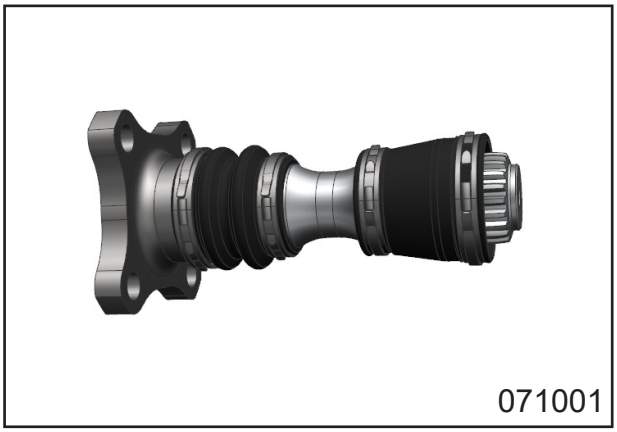
Follow the same procedures to compress other shaft caps 3.
After installation, apply grease into oil injection hole.



Rear Drive Shaft

1. Inspect rear drive shaft dust boots on both sides. Replace if necessary.
2. Inspect shaft spline for abnormal wear or damage. Replace if any defect is found.

NOTE: Apply 15~18g grease on rear drive shaft spline during installation.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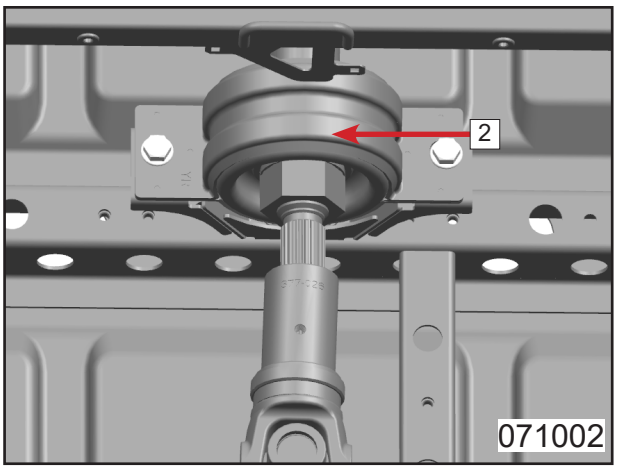
There is maintenance-free rubber ring 2 in drive shaft middle bearing.

Replace whole assembly if noise or deformation is found in middle bearing.

Inspect other drive shafts for noise or deformation.



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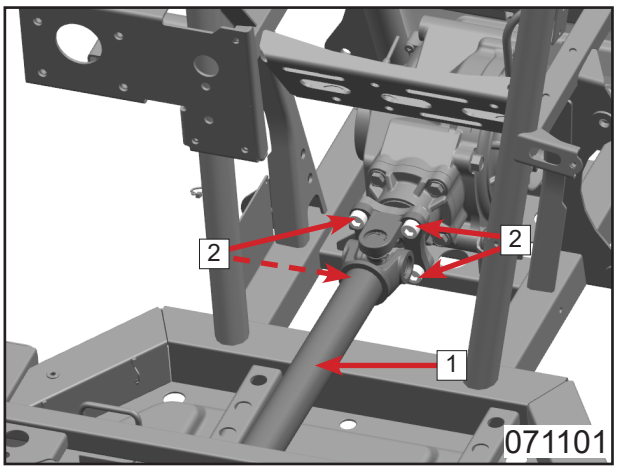
7.3.4 Drive Shafts Installation

Front Drive Shaft

Install drive shaft 1.

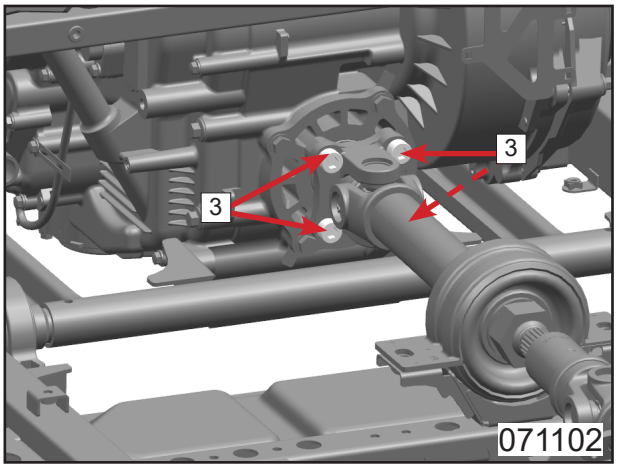
Install bolts 2 on front gear case side (not entirely tightened).



Install bolts 3 on engine side and tighten all bolts.

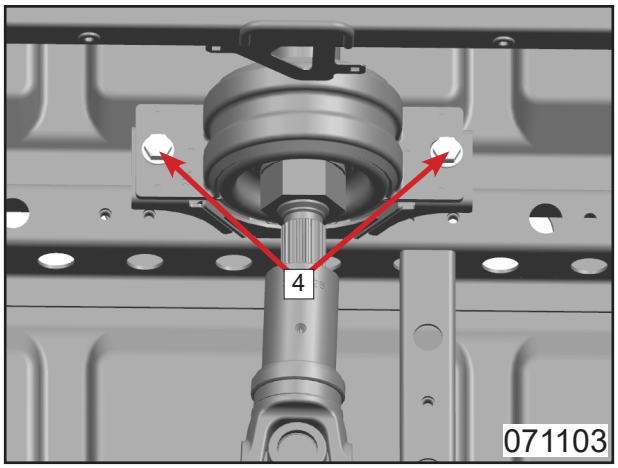
Tighten torque: 40N•M

NOTE: Pre-tighten the bolts and tighten them in criss-cross way.



Install bolts 4.

Tighten torque: 40N•M



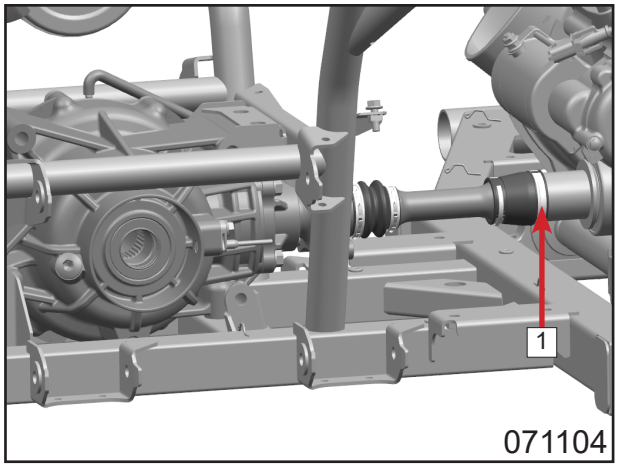
Rear Drive Shaft

Install rear gear case assy (refer to Rear Gear Case section in Chapter 07).

Tighten clamp 1.

NOTE: Apply 15~18g grease on rear drive shaft spline during installation.

NOTE: Replace dust boot if any defect is found.



7.4 Gear Cases

7.4.1 Maintenance Information

Lubrication Schedule				
Item	Specification	Capacity	Interval	
Front gear case	SAE80W-90 GL-5	0.25L	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. 2. Front or rear gear case noise. 3. Engine power cannot be transmitted to wheels.	A. Bearing damaged B. Gear clearance too large or too small 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.

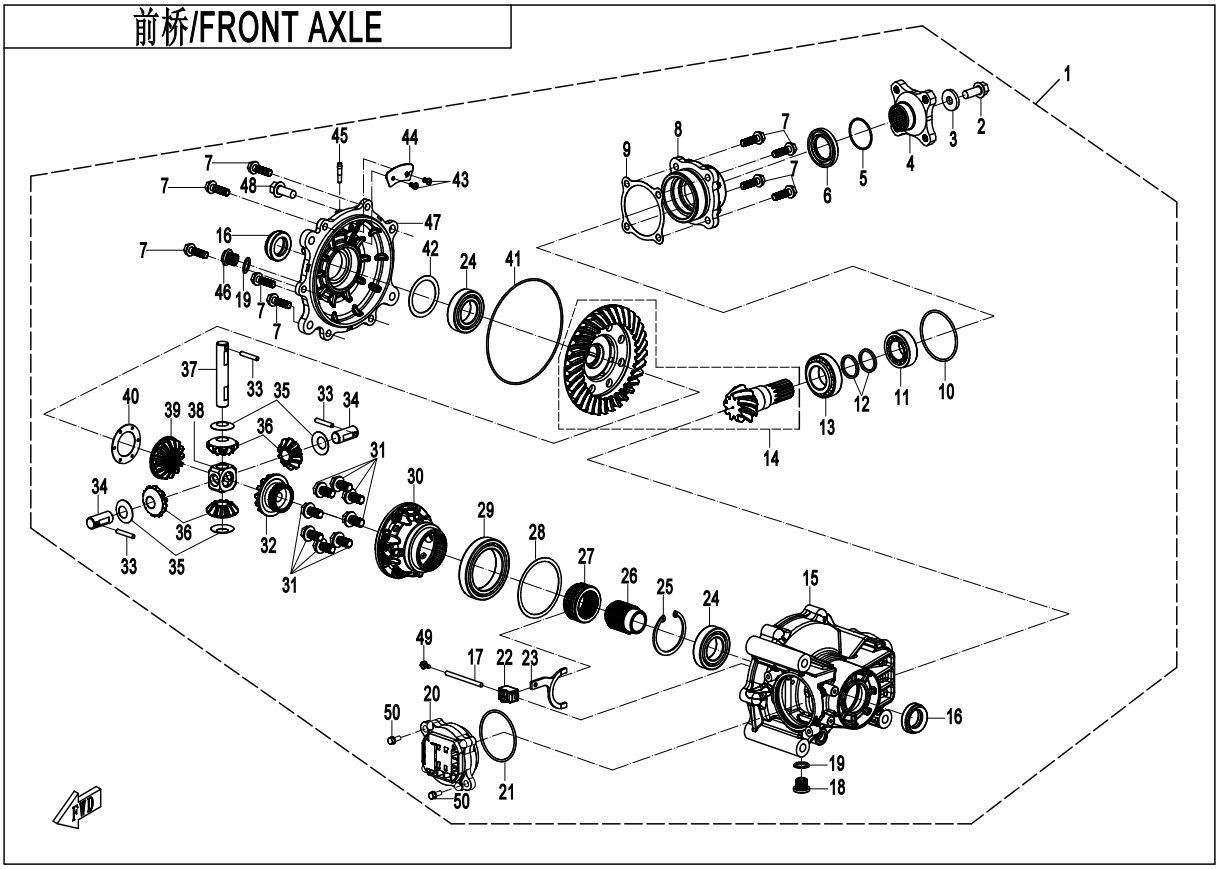
3. Inspect the lubricating oil leakage.

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.



1	Front gear case assembly	18	Drain bolt	35	Wearing ring
2	Bolt	19	Gasket 14	36	Center gear, differential
3	Washer	20	Front gear case motor assy	37	Planet gear axle
4	Coupler	21	O-ring 67.5×2	38	Cross bushing
5	O-ring	22	Block assy	39	Driven gear, differential
6	Oil seal	23	Fork	40	Gear washer
7	Bolt	24	Bearing 30×55×13	41	O-ring 130×2
8	Bearing seat	25	Circlip	42	Adjusting washer 54.5×43
9	Adjusting washer	26	Drive clutch cover	43	Screw
10	O-ring 55×2.5	27	Spline bushing	44	Oil baffle
11	Bearing	28	Adjusting washer 79.5×68	45	Joint, breather hose
12	Adjusting washer 32×25.4	29	Bearing	46	Bolt
13	Bearing	30	Differential housing	47	Front gear case cover
14	Bevel gear assy, front gear case	31	Bolt kit	48	Bolt
15	Front gear case	32	Gear, CV shaft	49	Inner hex screw
16	Oil seal	33	Pin	50	Screw
17	Pin shaft	34	Planet gear shaft, short		

7.5 Front Gear Case

Front Gear Case Removal

Remove wheels (refer to Chapter 09).

Remove brake calipers (refer to Chapter 08).

Remove steering knuckles (refer to Chapter 09).

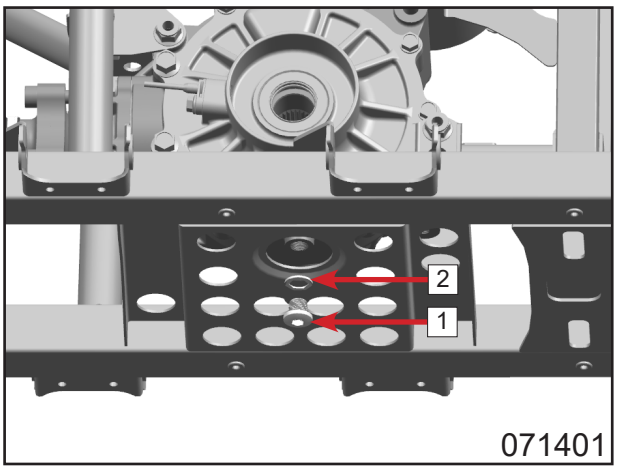
Remove CV drive shafts (refer to 7.1 CV drive shafts section).

Place a container under front gear case.

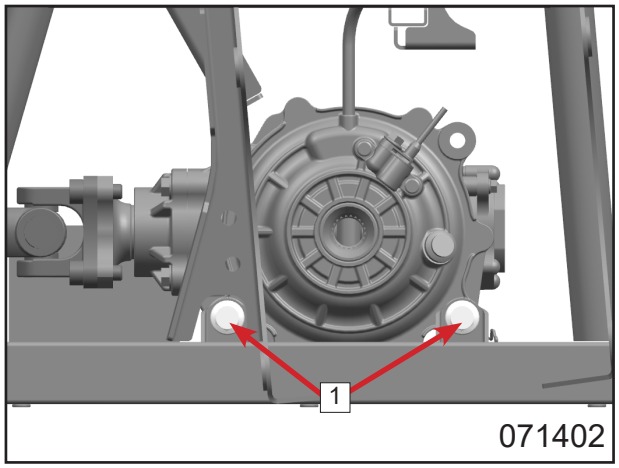
Remove drain bolt 1.

Remove washer 2.

Drain gear case oil.

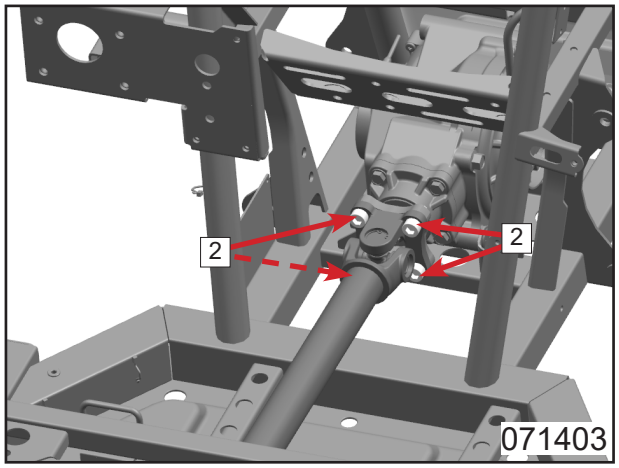


Remove two bolts 1 .



Remove four bolts 2 .

Remove front gear case.



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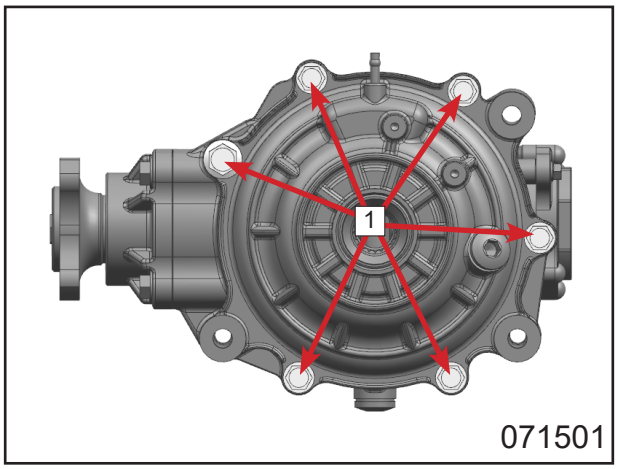
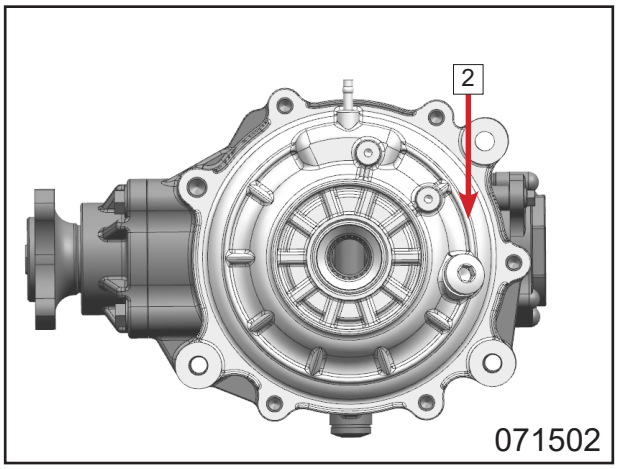
7.5.1 Front Gear Case Disassembly

Front Gear Case Cover

Remove eight M8 bolts [1].

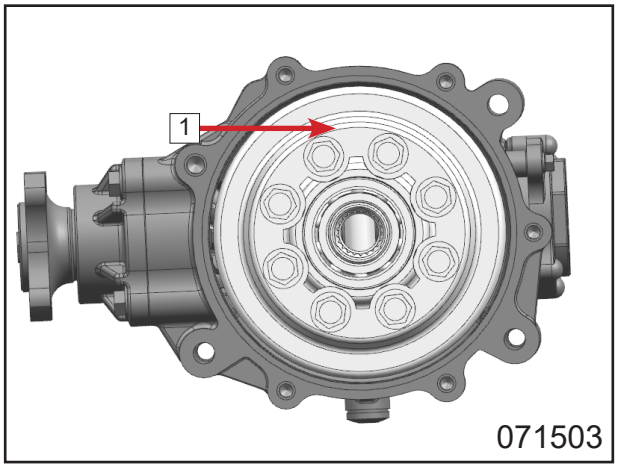


Remove front gear case cover [2].



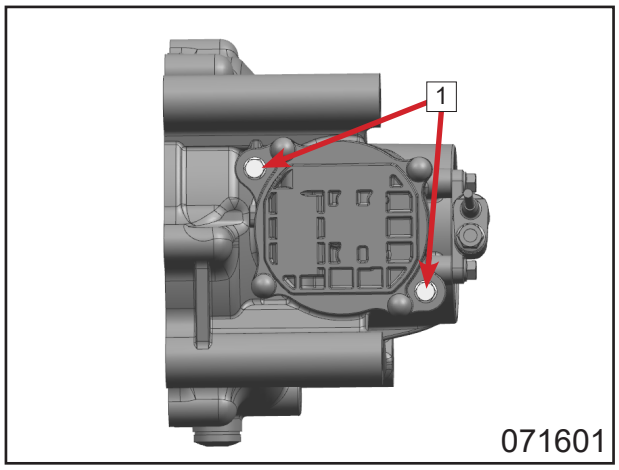
Differential Assembly

Remove differential assembly [1].

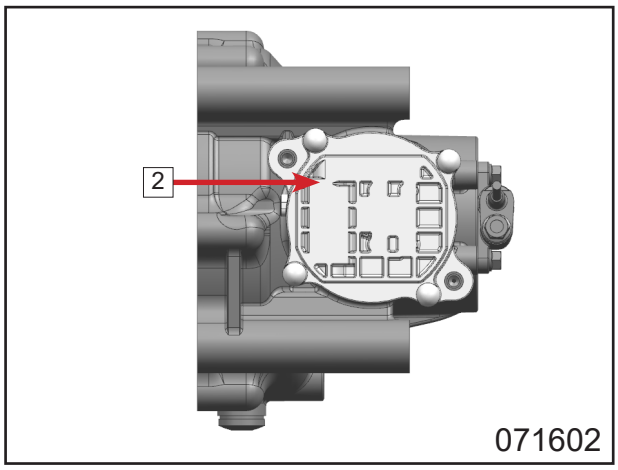


Front Gear Case Motor

Remove bolts 1.

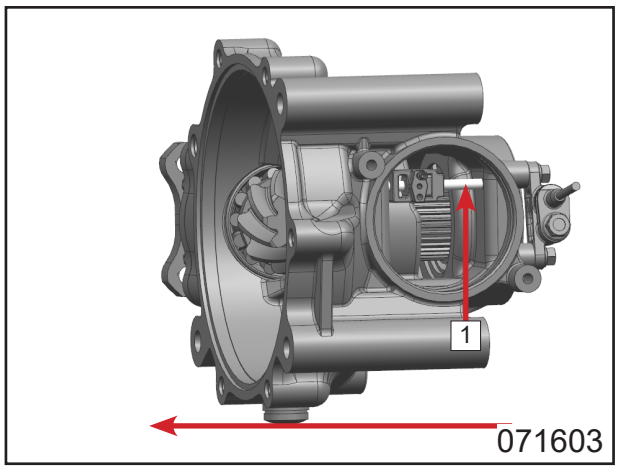


Remove motor 2.

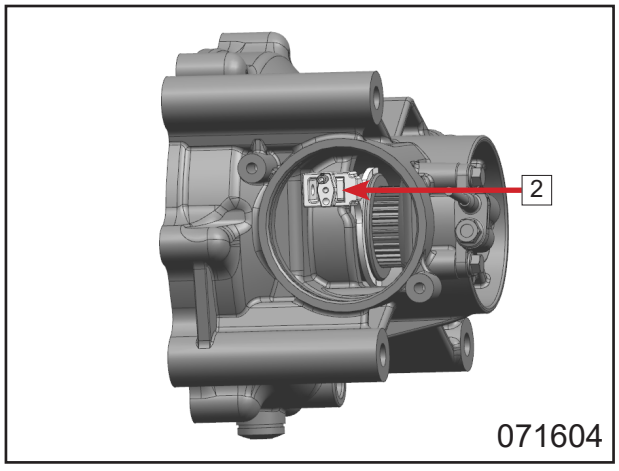


Fork Assembly

Turn the pin shaft 1 towards arrow direction shown in the pic to remove it.

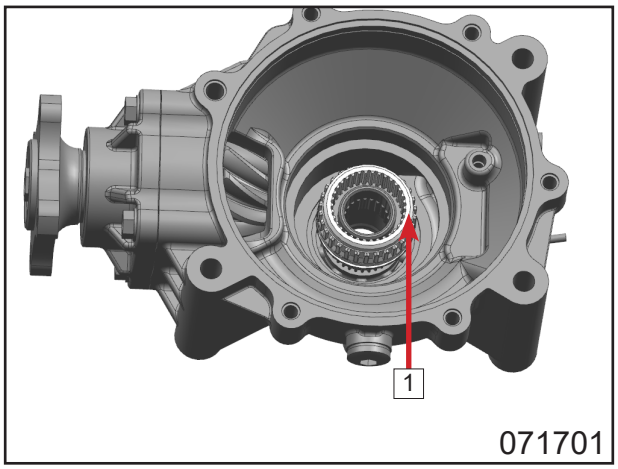


Remove fork and block assembly 2.

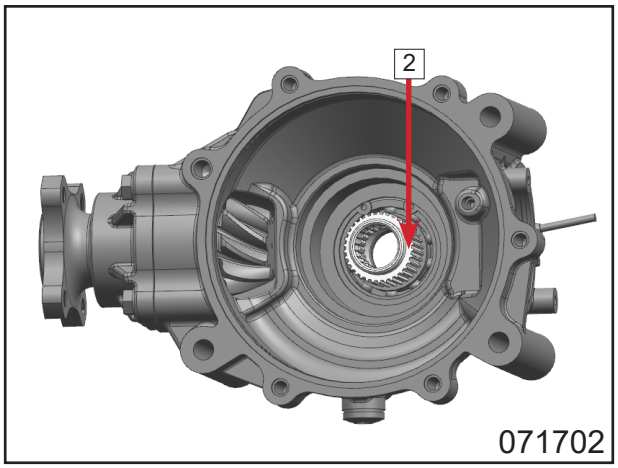


Spline Bushing Assembly

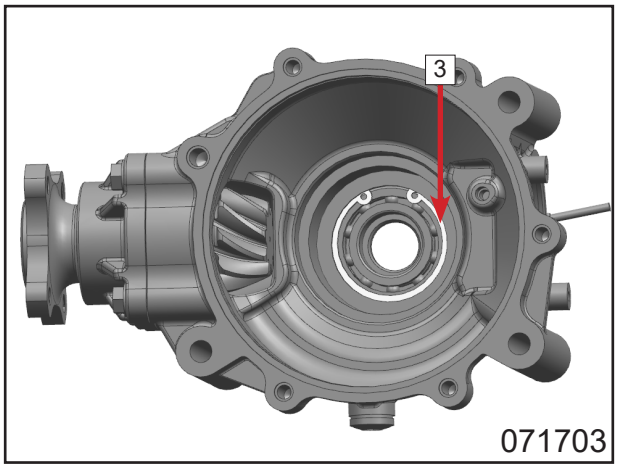
Remove spline bushing [1].



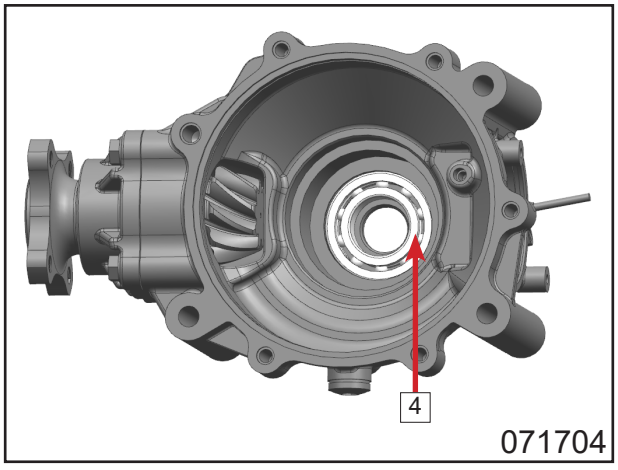
Remove spline bushing [2].



Remove circlip [3].



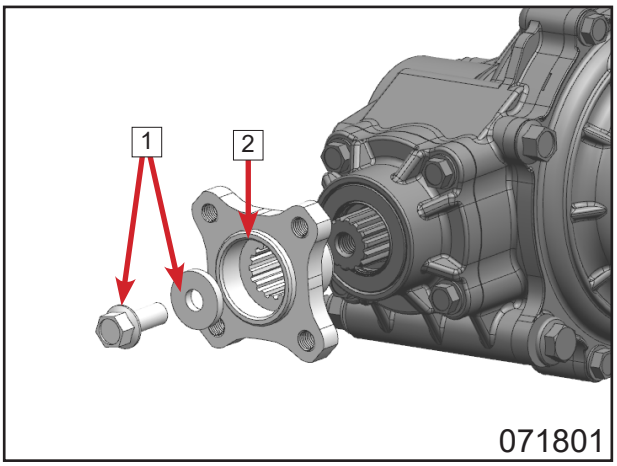
Remove bearing [4] by bearing puller.



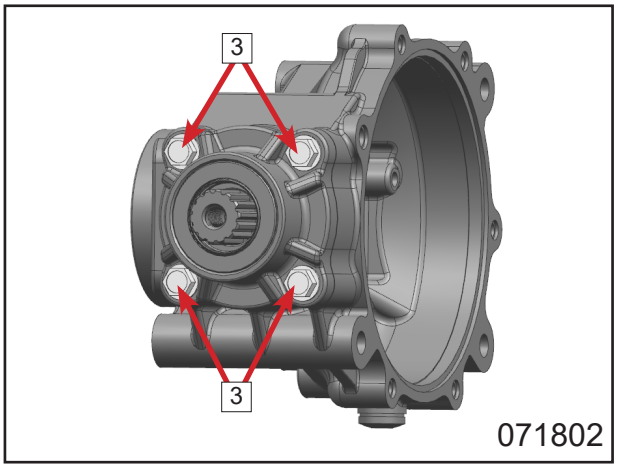
Front Gear Case Input Shaft

Remove bolt 1 and washer.

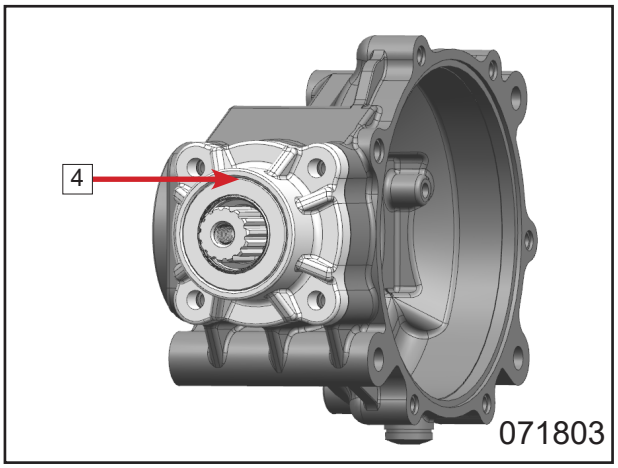
Remove coupler 2.



Remove bolts 3.



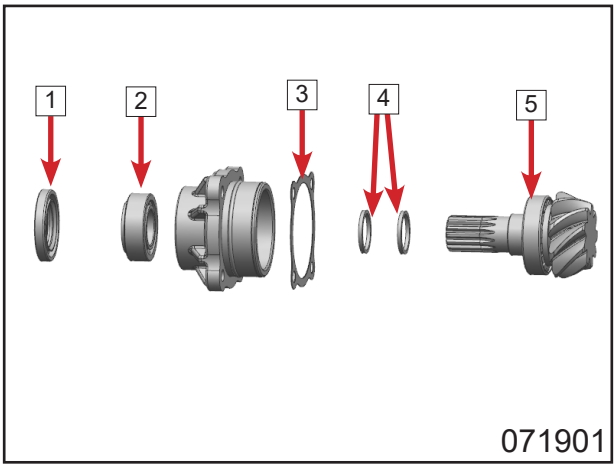
Remove front gear case input shaft 4.



7.5.2 Front Gear Case Input Shaft Disassembly

Turn drive bevel gear to check if it rotates smoothly before disassembly.
If smooth, it is not necessary to disassemble.
If stuck or other defect is found, disassemble as following procedures.

Remove oil seal [1].
Remove washer [6].
Remove bearing [2] by bearing puller.
Remove adjusting washers [3].
Remove input shaft assembly [5].
Remove seal ring [4].



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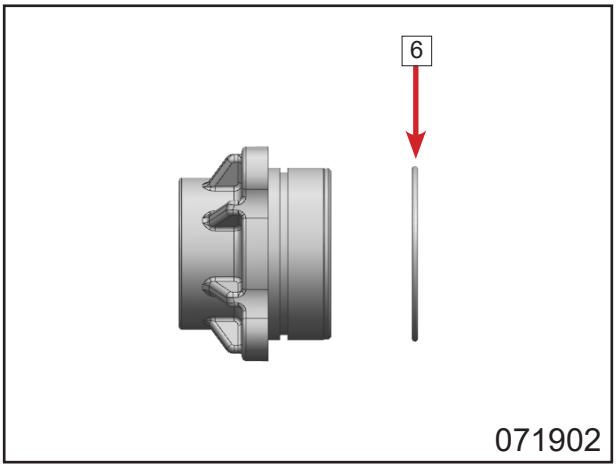
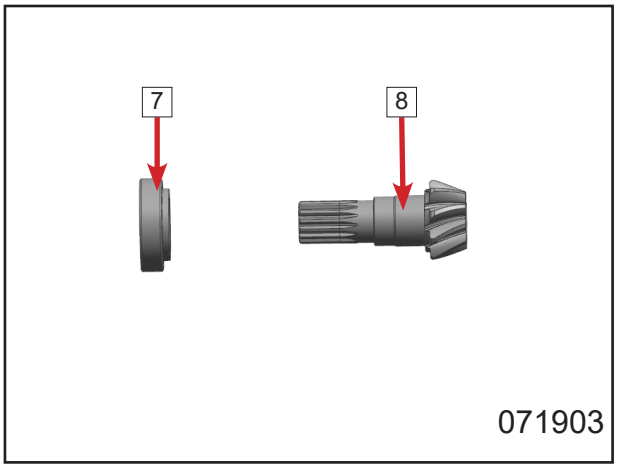
Inspect seal ring. Replace with new one if any defect is found.
Remove seal ring [6].



071902

Remove bearing [7] by bearing puller.
Remove drive bevel gear [8].

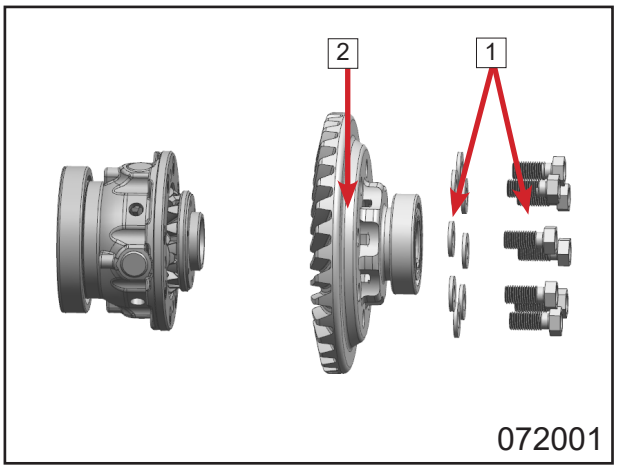


071903

7.5.3 Differential Disassembly

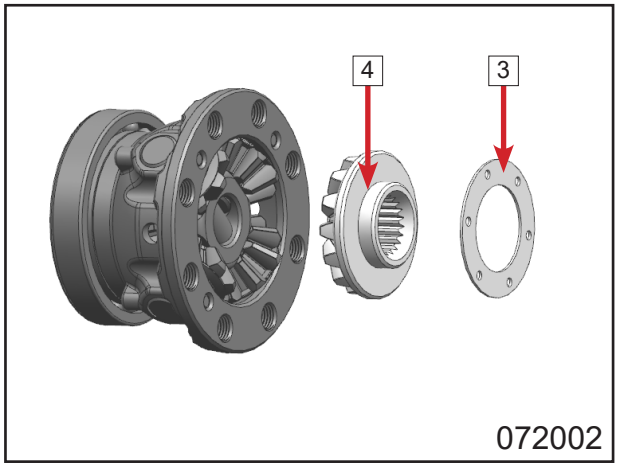
Remove bolt kits 1.

Remove front gear case driven bevel gear 2.



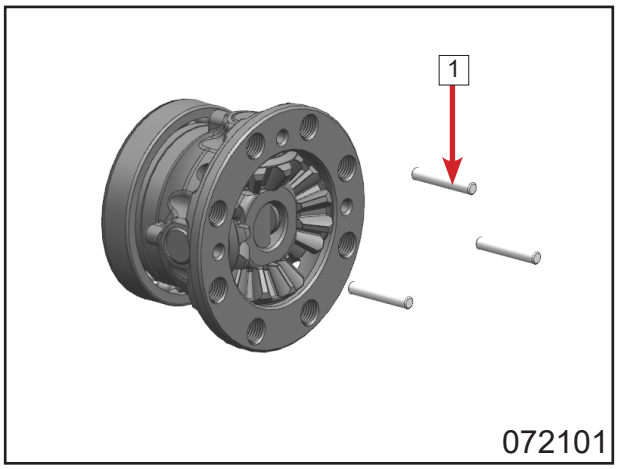
Remove gear washer 3.

Remove RH shaft gear 4.

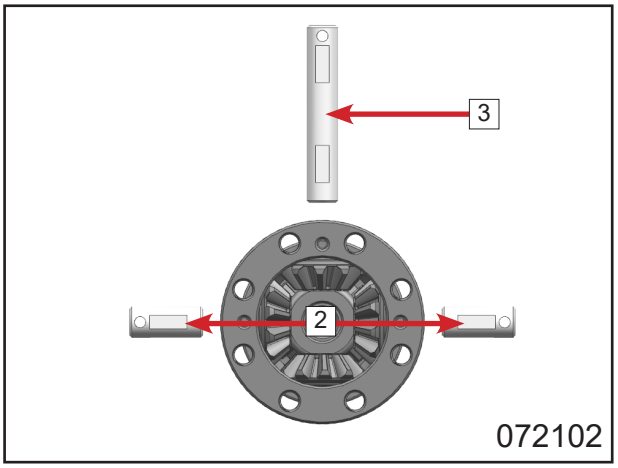


Planet Gear Disassembly

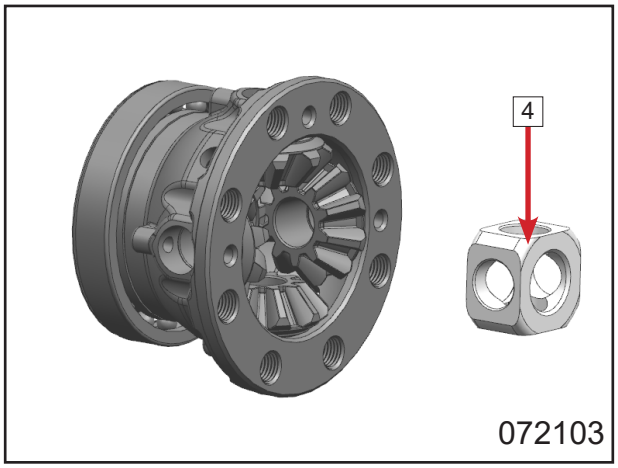
Remove pin shafts [1].



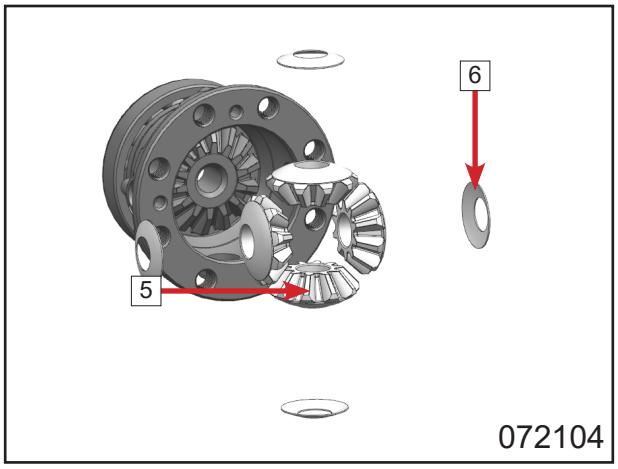
Remove short planet gear shaft [2].
Remove planet gear shaft [3].



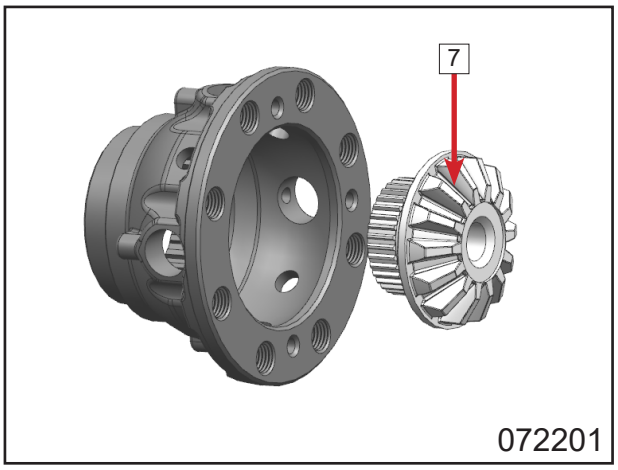
Remove cross bushing [4].



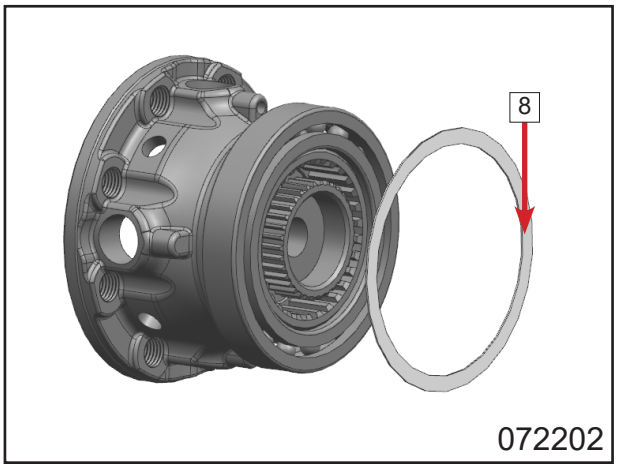
Remove middle gears [5].
Remove middle gear washers [6].



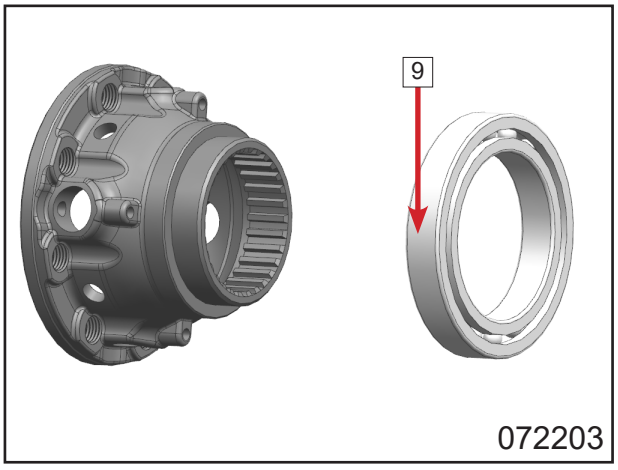
Remove shaft gear.



Remove washer [1].



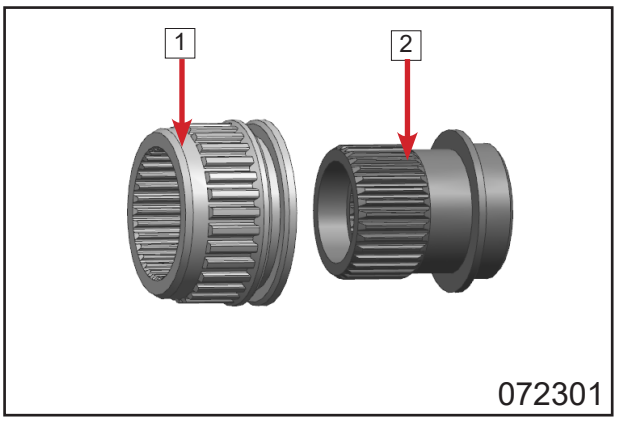
Inspect bearing for severe or abnormal wear. If not, it is not necessary to remove bearing.
Remove bearing [9] by bearing puller.



7.5.4 Gear Case Parts Inspection

Spline Bushing Assy

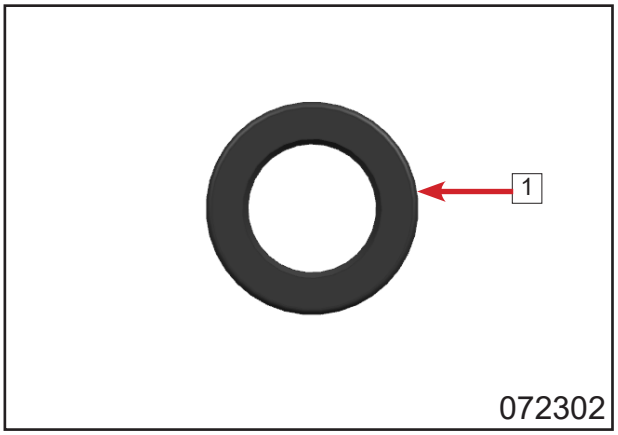
Inspect spline bushing [1] and bushing [2] for break, damage, severe wear or teeth deletion. Replace if any defect is found.



Oil Seal

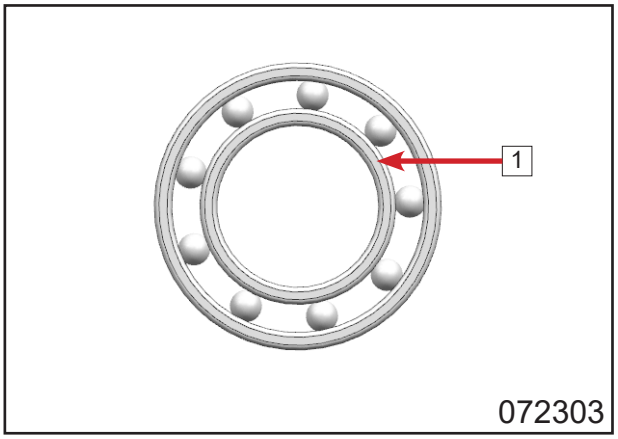
Remove all oil seals [1]. The removed oil seals are sorted as waste. Replace with new parts.

Inspect oil seal [1] for proper seal lip, good conjunction or damage. Replace if any defect is found.



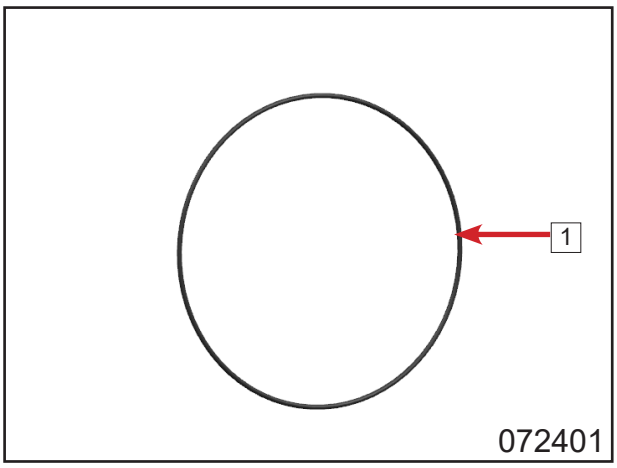
Bearing

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.



O-seal Ring

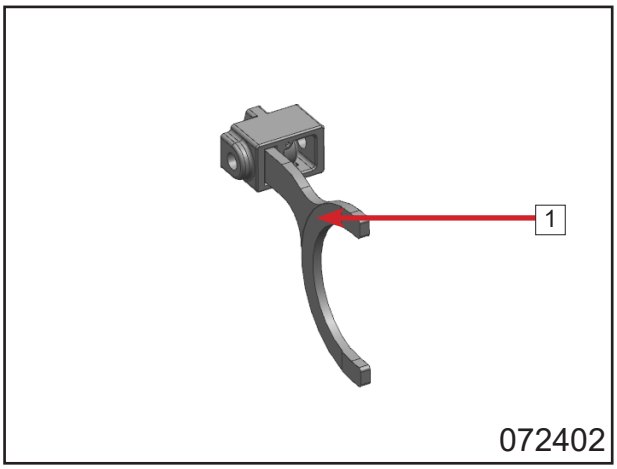
Inspect every o-seal ring [1] if deformed, broken or damaged. Replace with new parts if any defect is found.



⚠ WARNING: 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.

Rack Assy

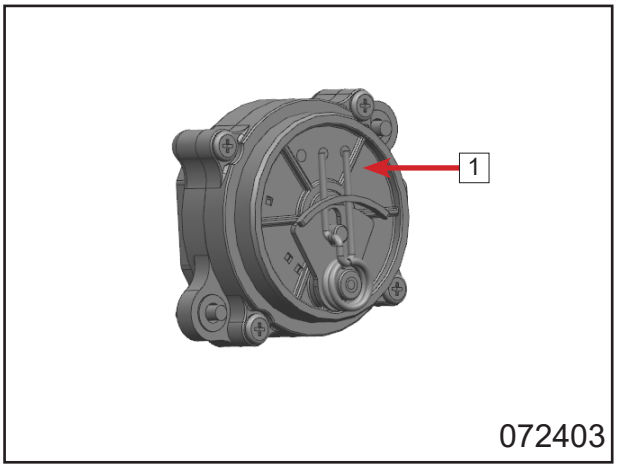
Inspect rack assy [1] for break, damage, severe wear or teeth deletion. Replace if any defect is found.



Front Gear Case Motor

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.

Inspect front gear case motor [1] output teeth for damage, cracks or severe wear. Replace if any defect is found.



Motor Inspection

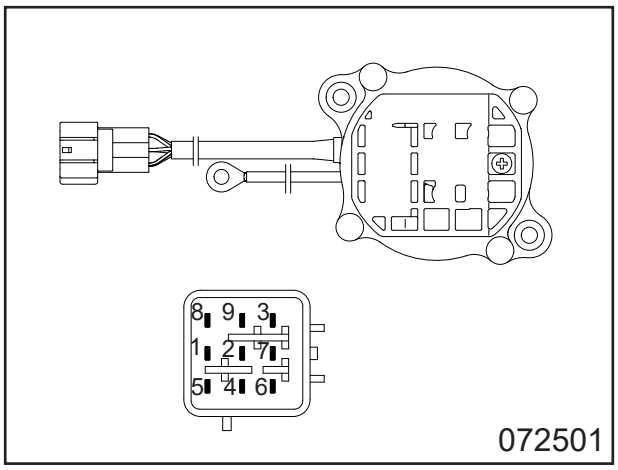
Motor diagram

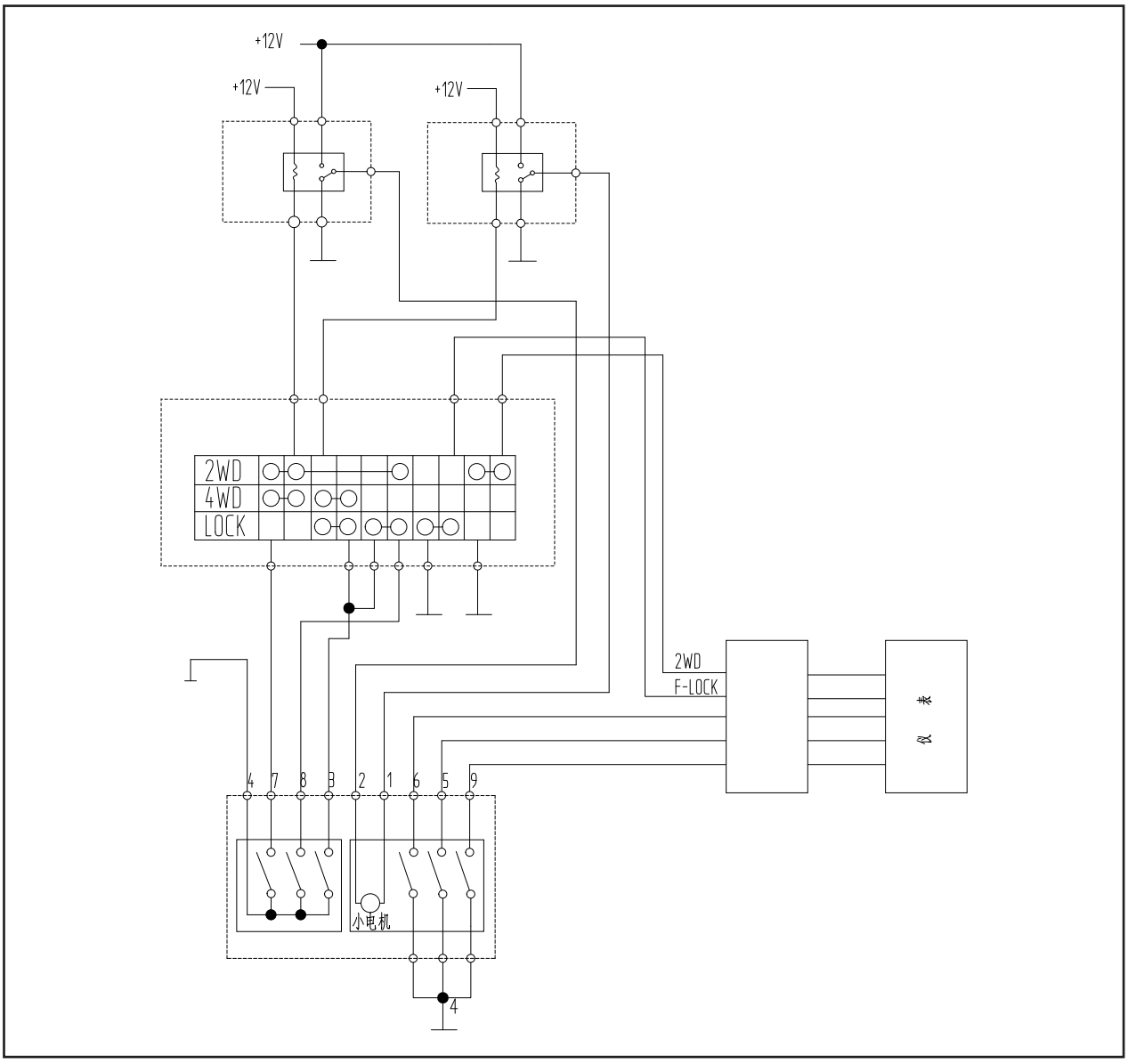
2WD/4WD, 4WD diff-lock contact condition

2WD	1-2, 3-4-5
4WD	1-2, 4-8-9
4WD diff-lock	1-2, 4-6-7

Dashboard contact condition

	2WD	4WD	4WD diff-lock
5	Ground	Break	Break
6	Break	Break	Ground
9	Break	Ground	Break



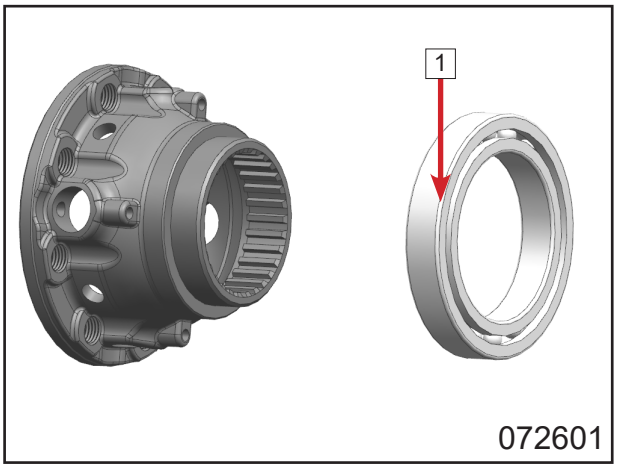


7.6 Front Gear Case Assembly

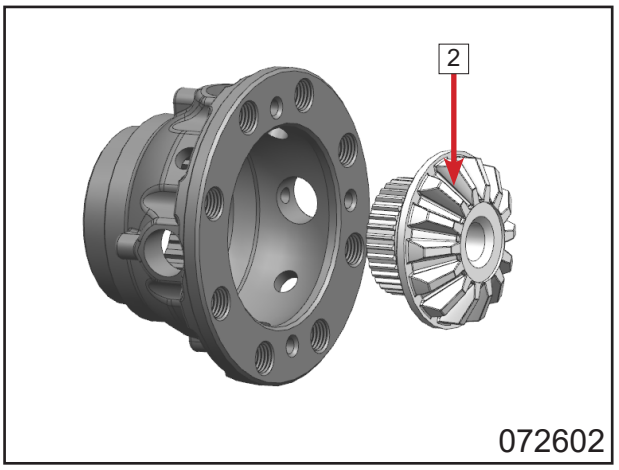
7.6.1 Differential Assembly

Install bearing 1 by hydraulic compress device.

If bearing isn't replaced, skip this step.



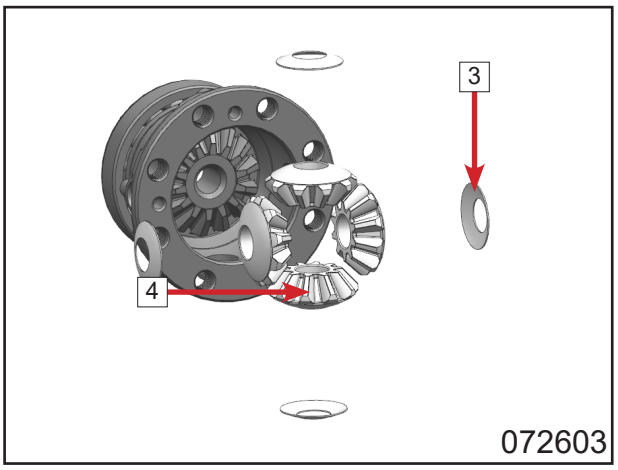
Install shaft gear 2.



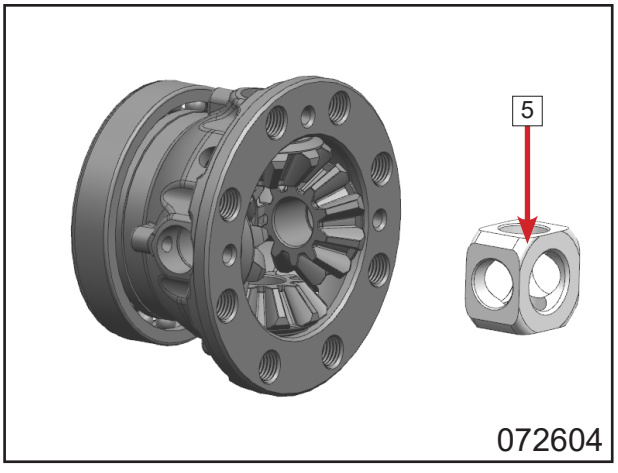
Install differential middle gear 4.

Install middle gear washers 3.

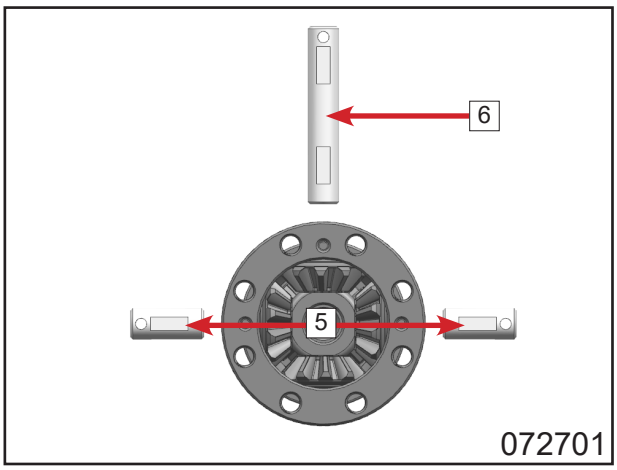
NOTE: Inspect middle gear washer 3 for deformation or severe wear before installation. Replace if any defect is found.



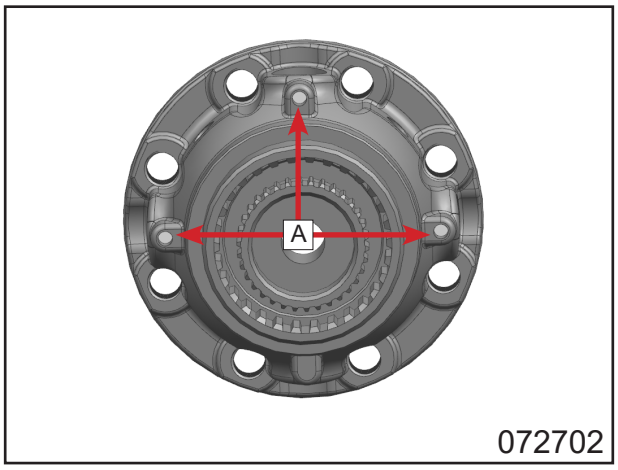
Make sure differential middle gear align with middle gear washer holes, then install cross bushing 5.



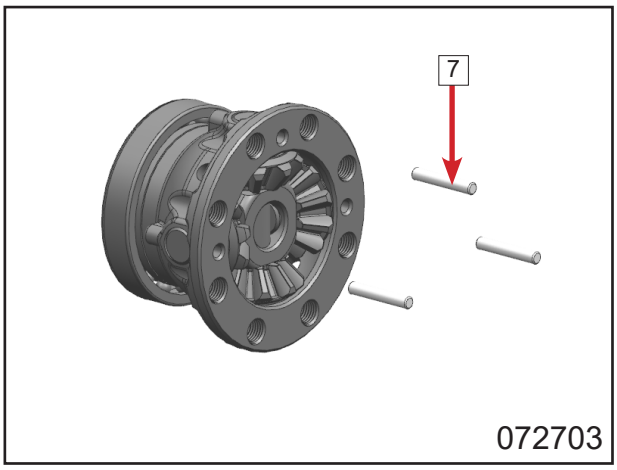
Install short planet gear shafts [5].
Install planet gear shaft [6].



NOTE:
Check pin positions [A] on differential housing. Holes in symmetry direction are for short planet gear shafts, other is for planet gear shaft.

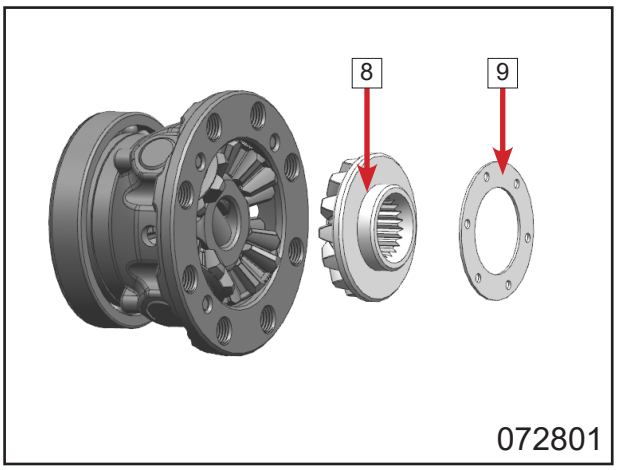


Install pins [7].

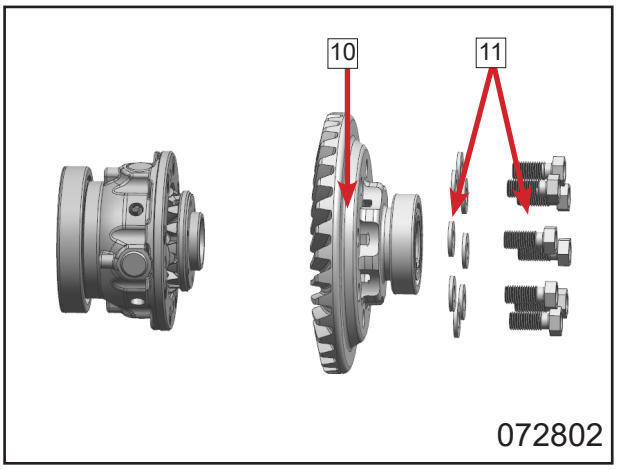


Check if it rotates freely after assembly.
If ratation of middle gear isn't smooth, remove pins, planet gear shaft, short planet gear shafts, middle gear and cross bushing.
Inspect differential middle gear for severe wear. If not, follow the above procedures for assembling.

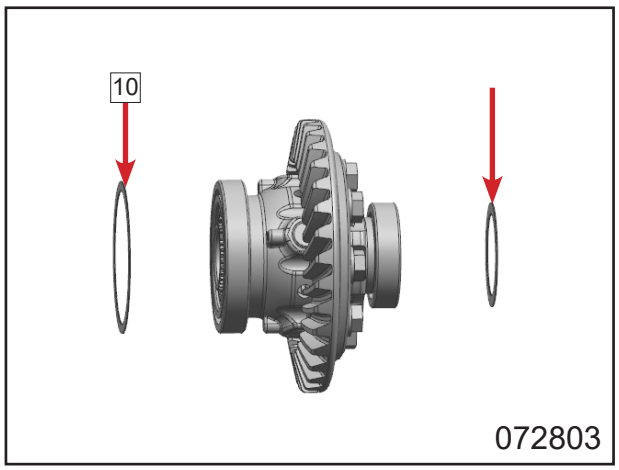
Install RH shaft gear [8].
Install gear washer [9].



Install front gear case driven bevel gear[10].
Install bolt kits [11] with thread locker.
Tighten torque: 60N•M



After assembling, inspect if rotation is smooth. If it is stuck or there is noise, remove related parts, adjust washer thickness and reinstall.

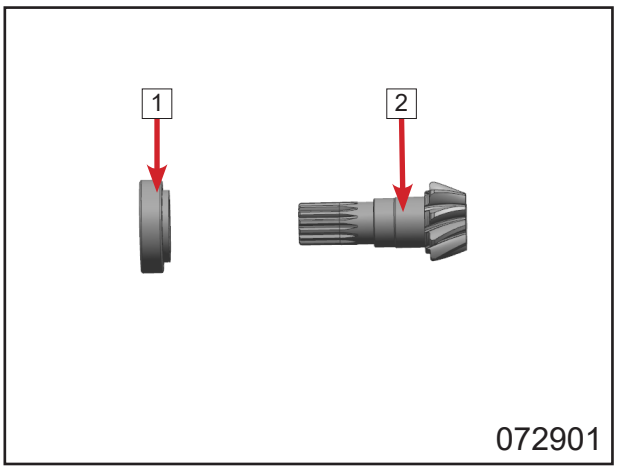


7.6.2 Front Gear Case Drive Bevel Gear Assembly

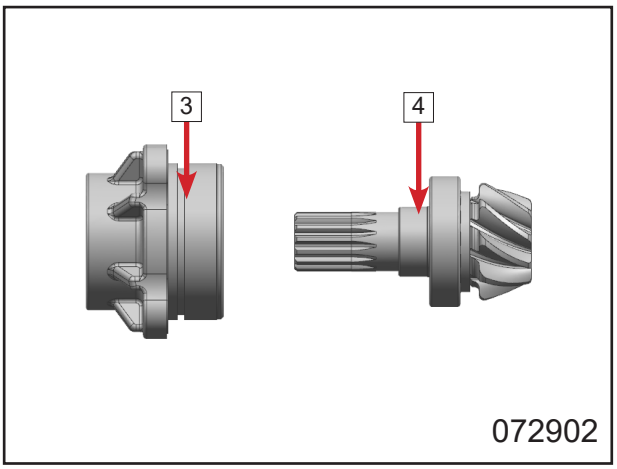
If drive bevel gear isn't removed, skip this step.

Inspect drive bevel gear teeth for abnormal or severe wear before assembling.

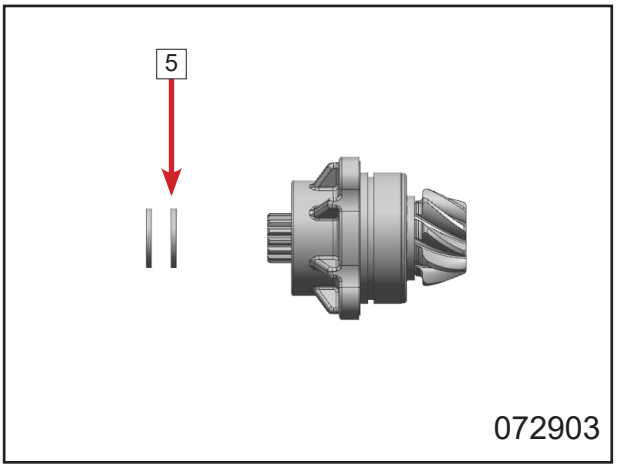
Compress bearing 1 on drive bevel gear 2.



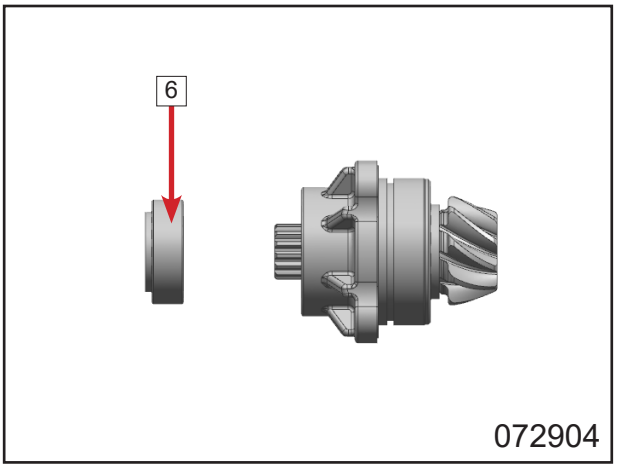
Insert input shaft assembly 3 into bearing seat 4.



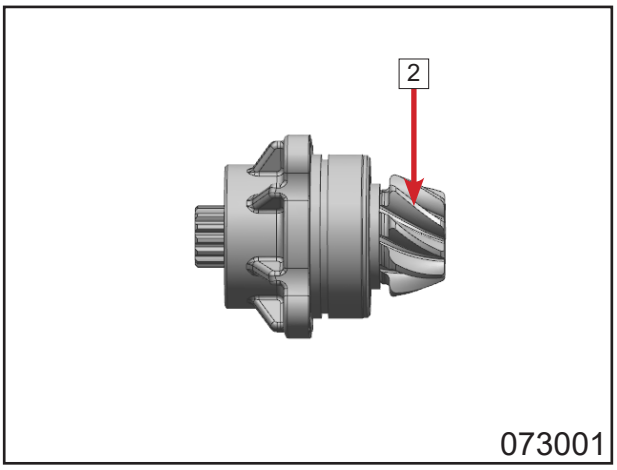
Install adjusting washers 5.



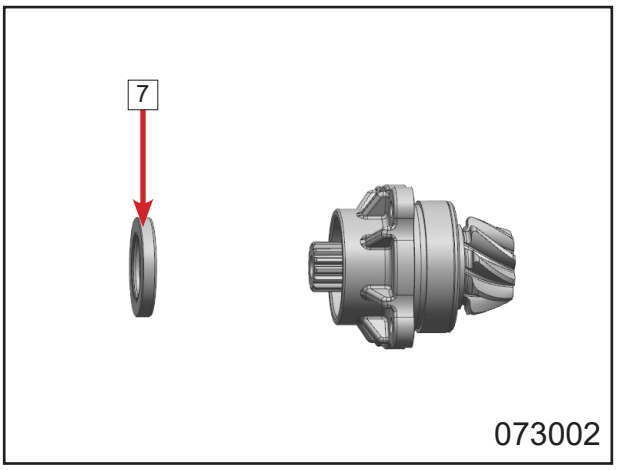
Install bearing 6.



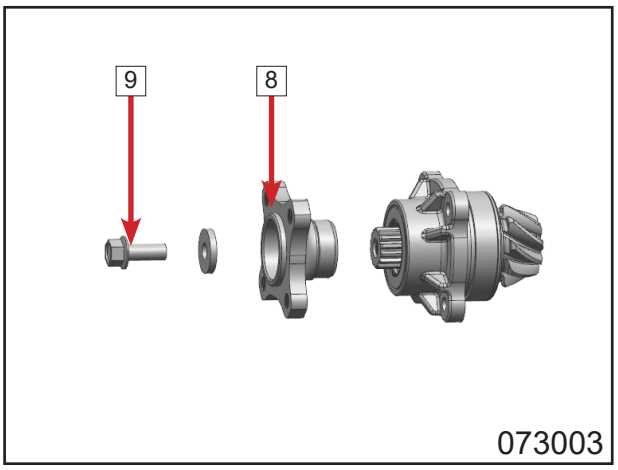
After assembling, inspect drive bevel gear [2] if it rotates smoothly. If it is stuck or there is noise, remove bearing, adjust washer thickness and reinstall.
When gear rotation is smooth, proceed next step.



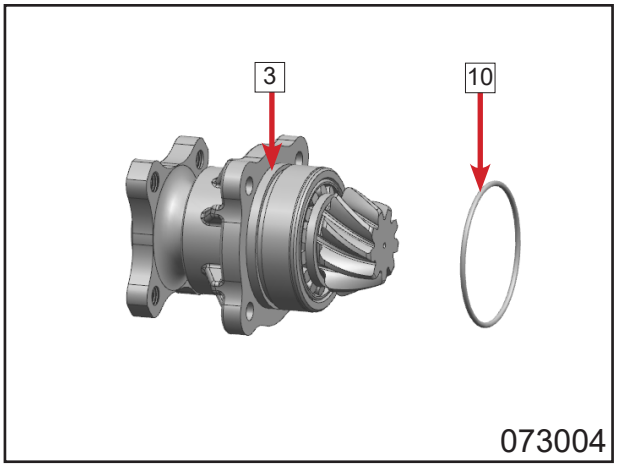
Apply grease on oil seal [7] and install it.



Install coupler [8].
Install bolt and washer [9] with thread locker.
Tighten torque: 75N•M

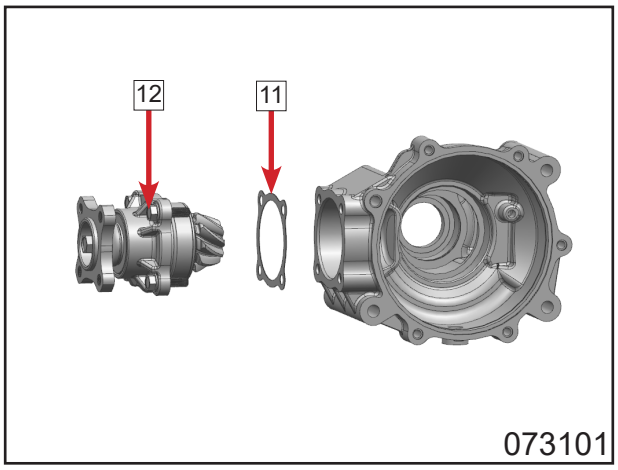


Install seal ring [10] into groove of bearing seat.



Install adjusting gaskets [11].
Install drive bevel gear assembly [12];
Tighten torque: 25N•M

After assembling, inspect drive bevel gear [1] if it rotates smoothly. If it is stuck or there is noise, adjust gaskets.



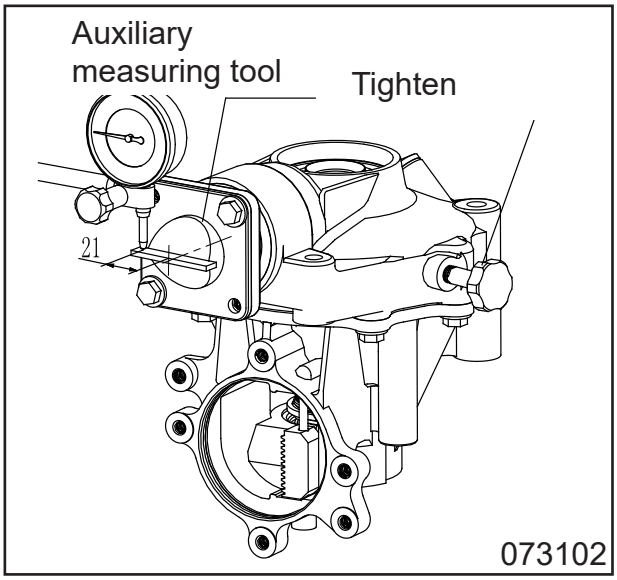
Front Gear Case Bevel Gear Clearance Adjustment

Follow the drawing on the right to adjusting gear side clearance: Install auxiliary measuring tool and tighten the bolt (M14X1.25X60). 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.

①

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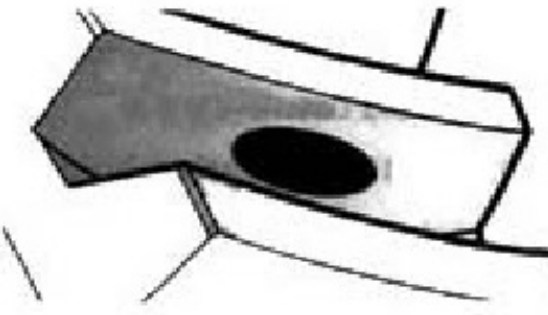
Pattern 1	Contact at tooth top	Incorrect
Pattern 2	Contact at tooth middle	Correct
Pattern 3	Contact at tooth root	Incorrect

②



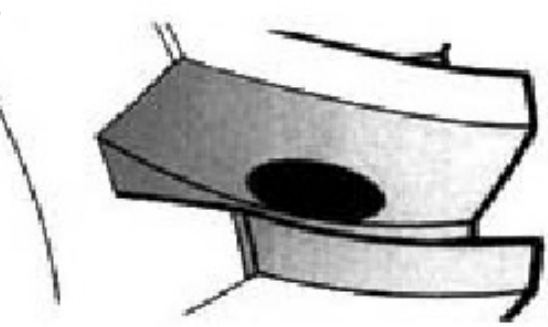
073202

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.

③



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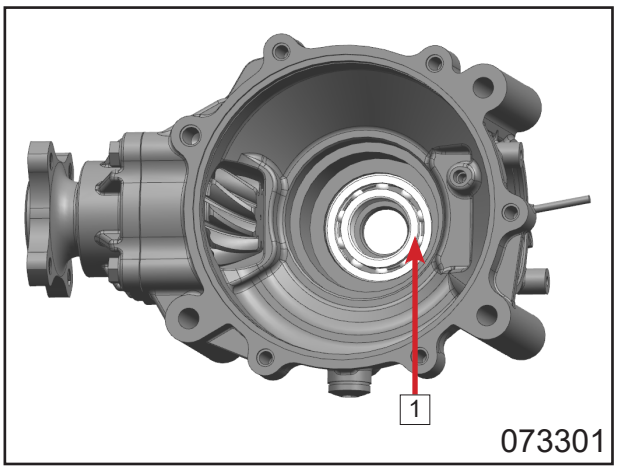
Adjustment Steps

Tooth contact	Shim adjustment
Tooth contact pattern 1	Reduce shim thickness
Tooth contact pattern 3	Increase shim thickness

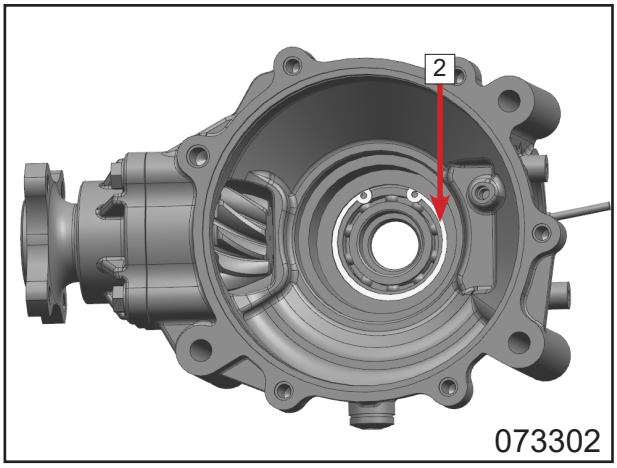
⚠WARNING: Make sure to check the backlash after the tooth contact has been adjusted, since it may have changed. Adjust the tooth contact and backlash until they are both within specification. If the correct tooth contact cannot be maintained when adjusting the backlash, replace the drive gear and ring gear.

7.6.3 Spline Bushing Assembly

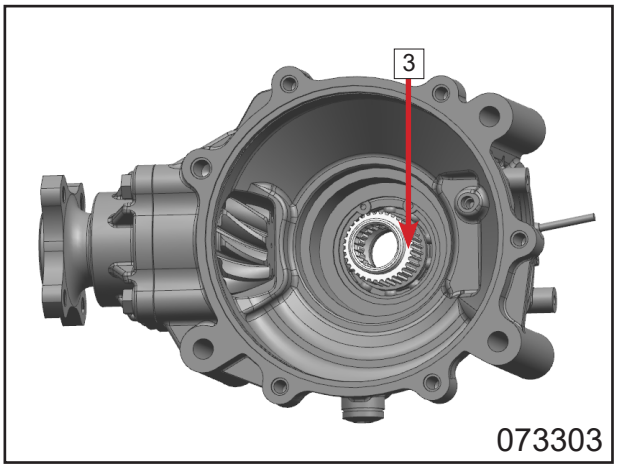
Install bearing [1].



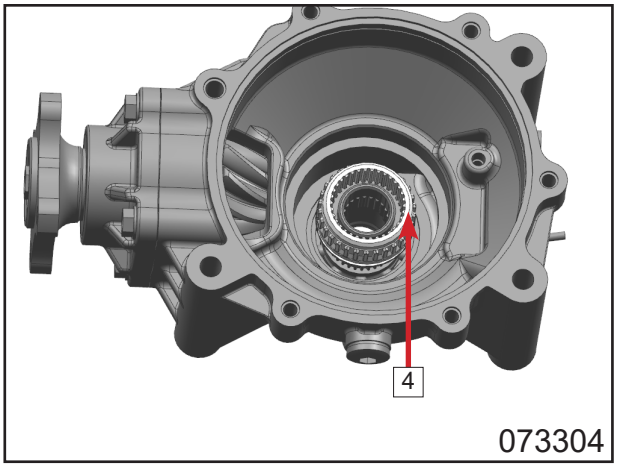
Install circlip [2].



Install spline bushing [3].

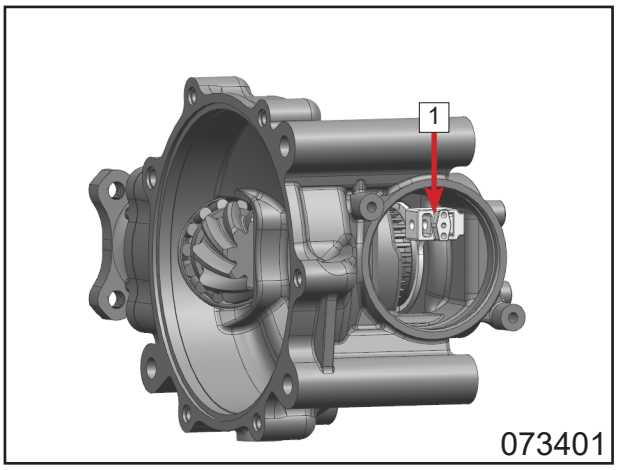


Install spline bushing [4].

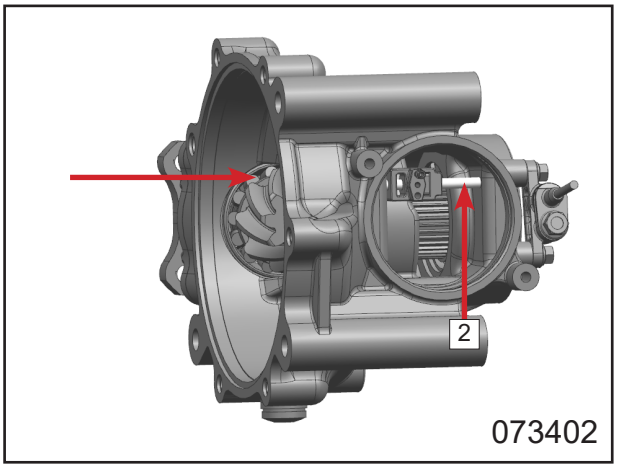


7.6.4 Front Gear Case Motor Installation

Install rack [1] on spline bushing.

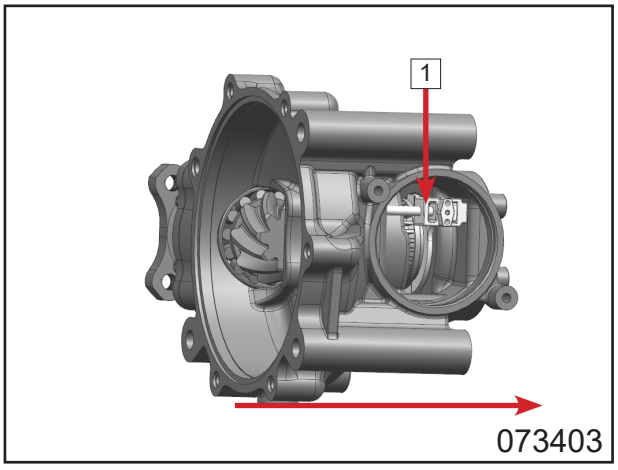


Insert pin [2] from inside gear case.



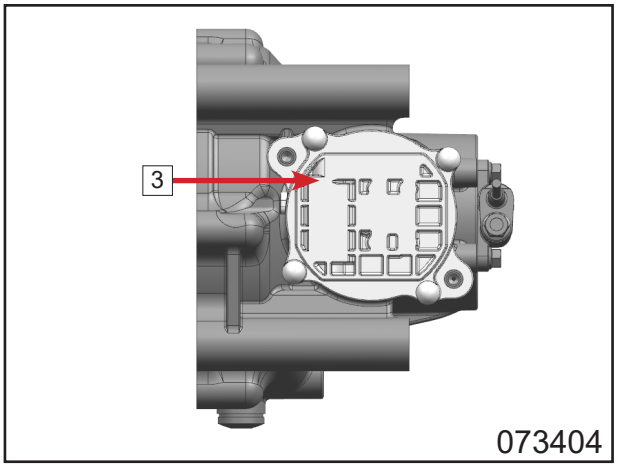
NOTE A: Before motor installation, set the motor to 2WD mode with special device or vehicle control circuit.

NOTE B: During installation, rack assembly [1] and spline bushing should be closed like what picture shows.

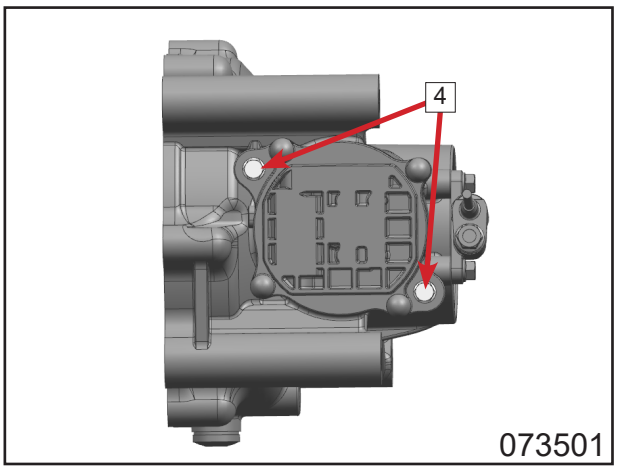


Install motor [3].

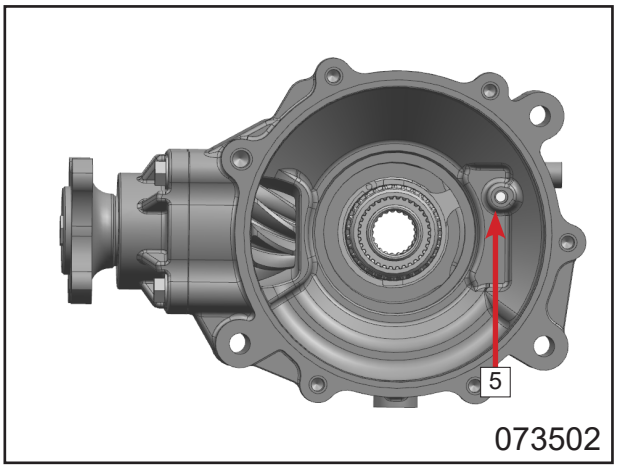
NOTE: In the premise of NOTE A and B, install the motor with screws doweled during installation.



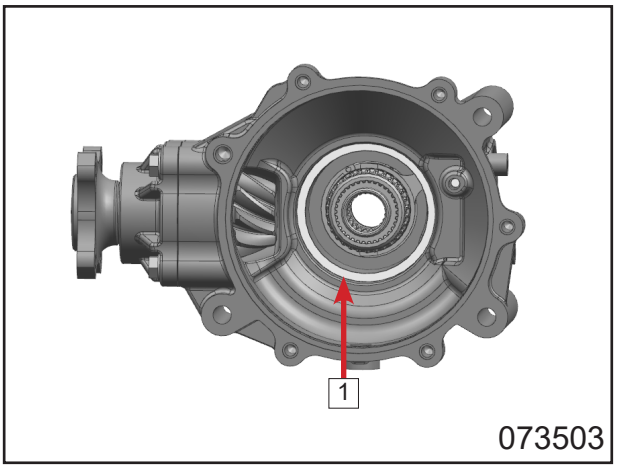
Install bolts [4].
Tighten torque: 8 N•M



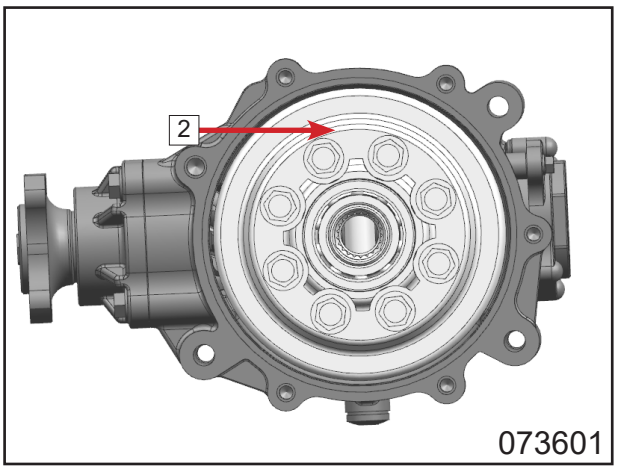
Install inner hex screw [5].
Tighten torque: 10 N•M



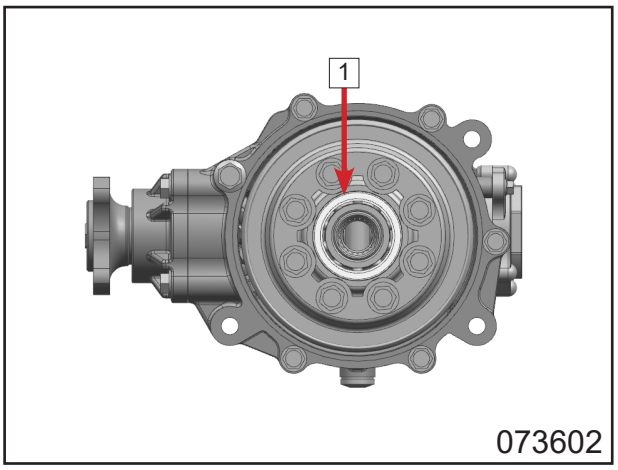
Differential Installation
Install adjusting washer [1].



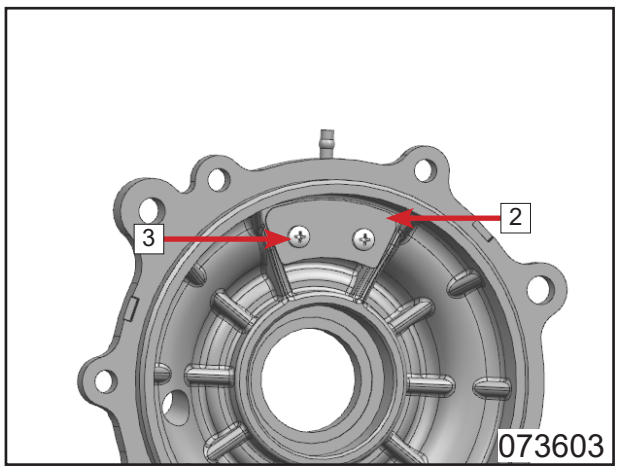
Install assembled differential [2] into housing.
After assembling, inspect drive bevel gear [2] for smooth rotation or noise.



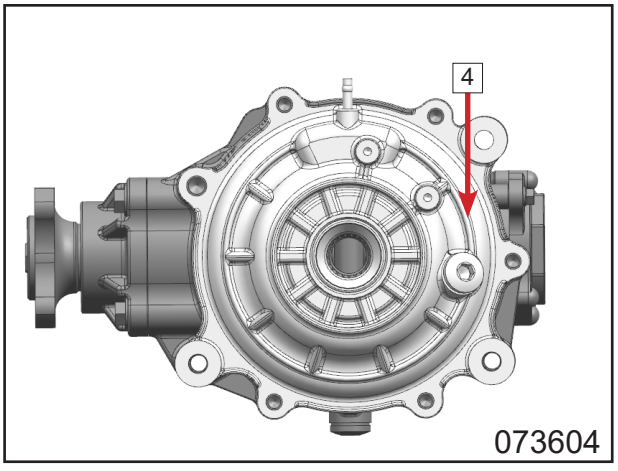
7.6.5 Gear Case Cover Installation
Install washer [1].



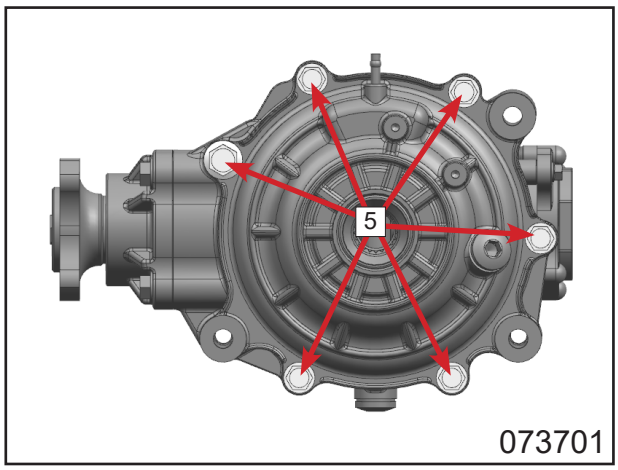
Install oil guard [2].
Install screws [3].



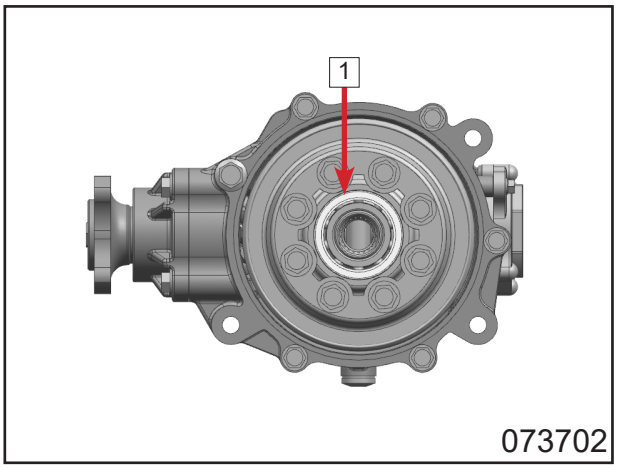
Install gear case cover [4].



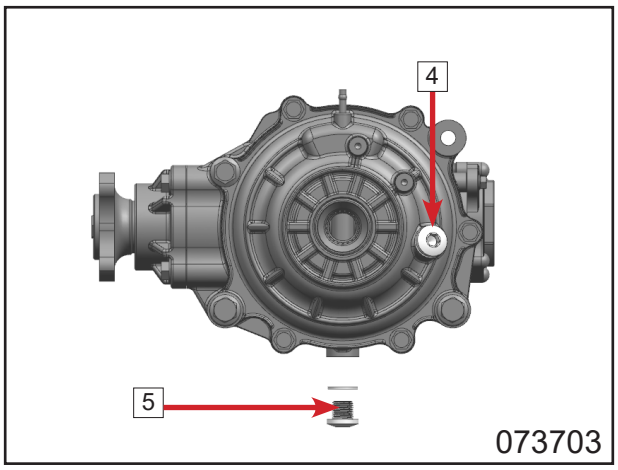
Install bolts [5].
Tighten torque: 40 N•M

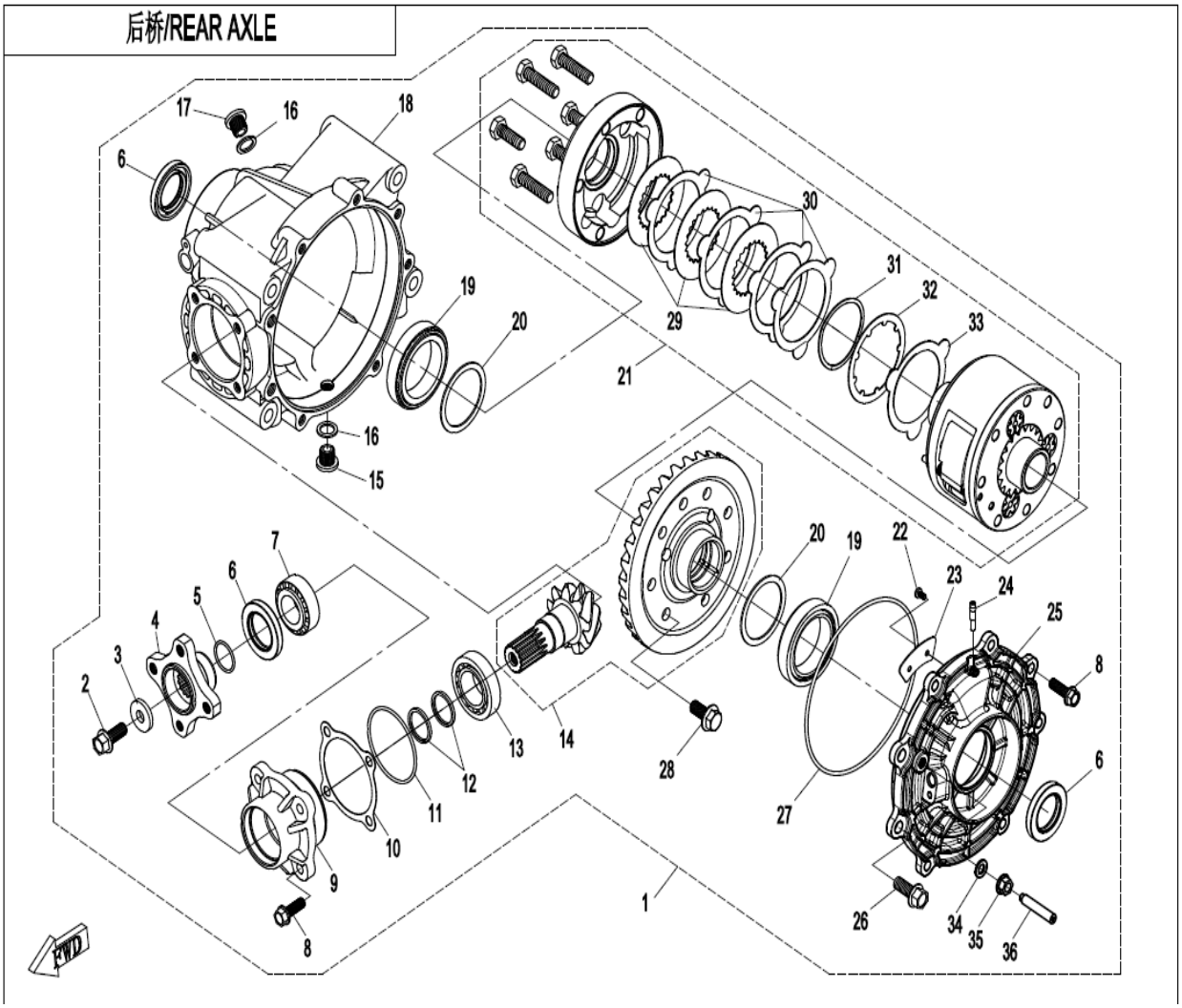


After assembling, inspect drive bevel gear [2] for smooth rotation or noise. Adjust washer [1] and check drive bevel gear again if any defect is found.

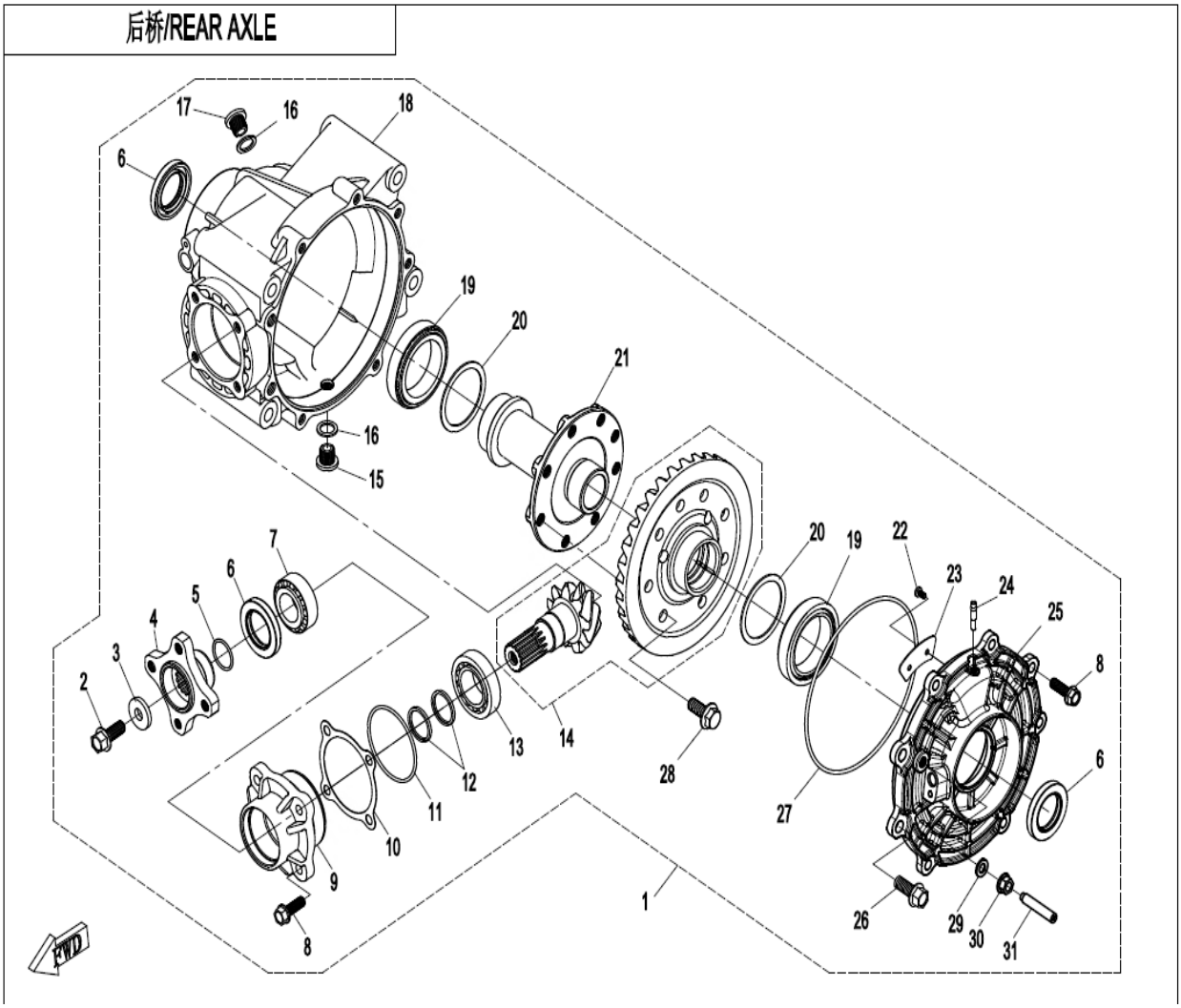


Install oil filler bolt [4].
Install oil drain bolt [5].
Tighten torque: 25 N•M





1	Rear gear case assy	14	Bevel gear assy, rear gear case	27	O-ring
2	Bolt	15	Drain bolt	28	Bolt kit
3	Washer	16	Gasket 14	29	Friction disc, inner gear
4	Coupler	17	Bolt	30	Friction disc, outer gear
5	O-ring	18	Rear gear case	30	Friction disc, outer gear
6	Oil seal	19	Bearing	31	Gasket
7	Bearing	20	Adjusting washer 61×50.5	32	Friction disc, inner
8	Bolt	21	Automatic lock differential assy	33	Polished section, friction disc
9	Bearing seat	22	Screw	34	Gasket
10	Adjusting washer	23	Oil guard	35	Nut
11	O-ring 55×2.5	24	Joint, breather hose	36	Inner hex screw
12	Adjusting washer 32×25.4	25	Rear gear case cover		
13	Bearing	26	Bolt		

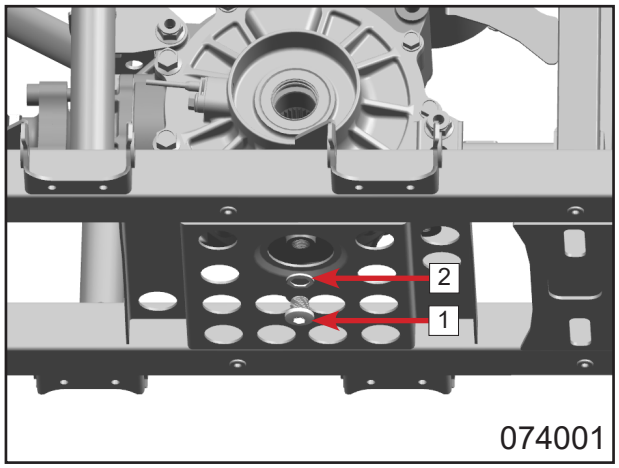


1	Rear gear case assy	12	Adjusting washer 32×25.4	23	Oil guard
2	Bolt	13	Bearing	24	Joint, breather hose
3	Washer	14	Bevel gear assy, rear gear case	25	Rear gear case cover
4	Coupler	15	Drain bolt	26	Bolt
5	O-ring	16	Gasket 14	27	O-ring
6	Oil seal	17	Bolt	28	Bolt kit
7	Bearing	18	Rear gear case	29	Washer
8	Bolt	19	Bearing	30	Nut
9	Bearing seat	20	Adjusting washer 61×50.5	30	Nut
10	Adjusting washer	21	Mounting base	31	nner hex screw
11	O-ring 55×2.5	22	Screw		

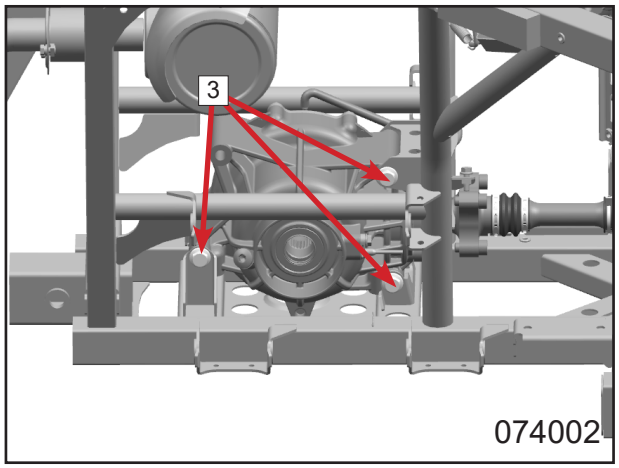
7.7 Rear Gear Case

7.7.1 Rear Gear Case Removal

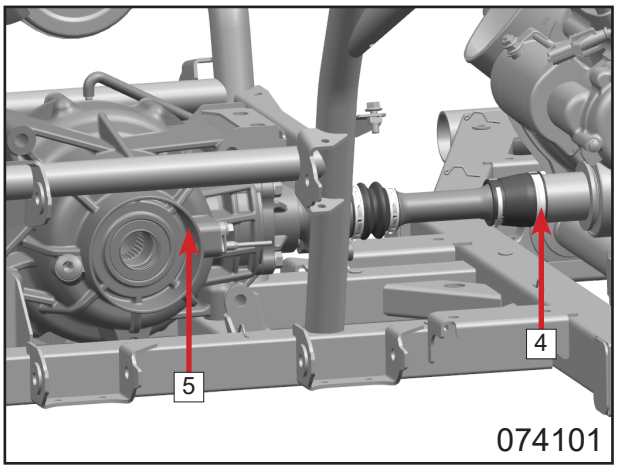
Remove wheels (refer to Chapter 09).
Remove brake calipers (refer to Chapter 08).
Remove steering knuckles (refer to Chapter 09).
Remove CV drive shafts (refer to 7.1 CV drive shafts section).
Place a container under rear gear case.
Remove drain bolt [1].
Remove washer [2].
Drain gear case oil.



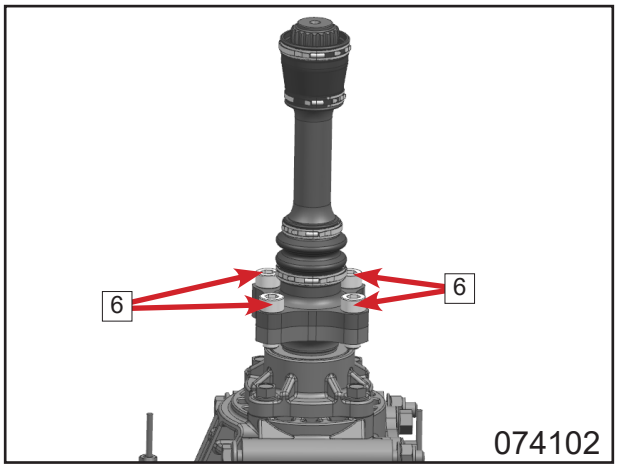
Remove three bolts [3] and nuts.



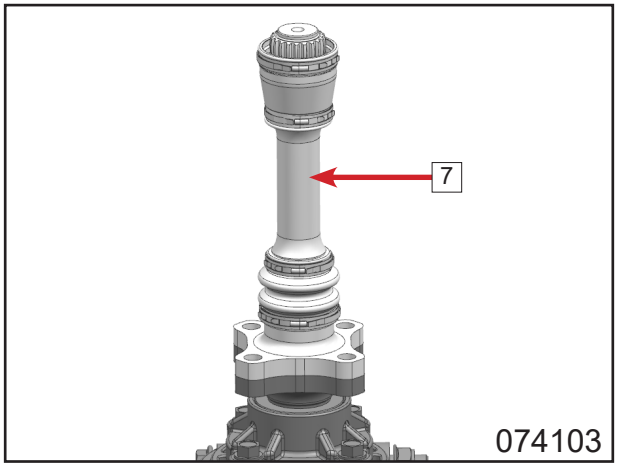
Loosen clamp [4].
Remove rear gear and rear drive shaft assembly [5].



Remove bolts [6].



Remove rear drive shaft [7].

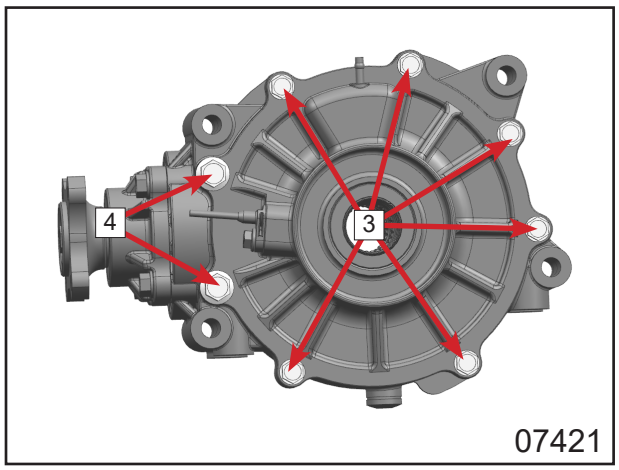


7.7.2 Rear Gear Case Disassembly (Version 1)

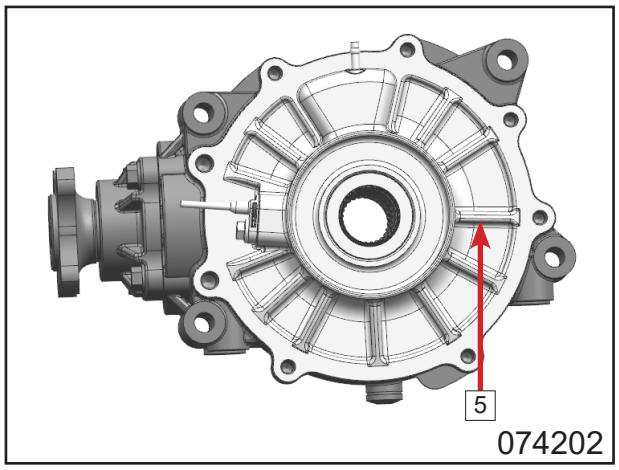
Rear Gear Case Cover

Remove six M8 bolts [3].

Remove two M10 bolts [4].

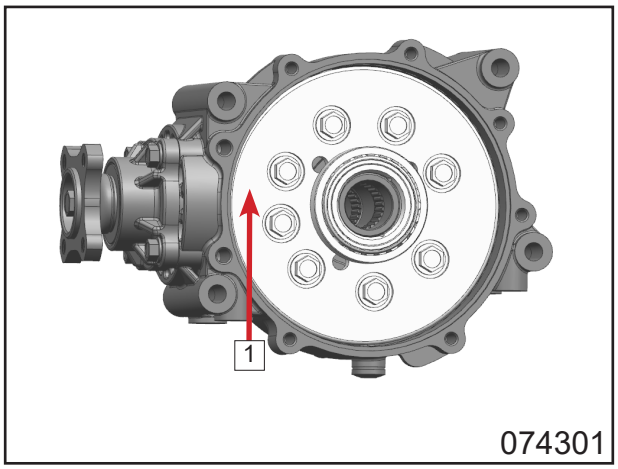


Remove rear gear case cover [5].

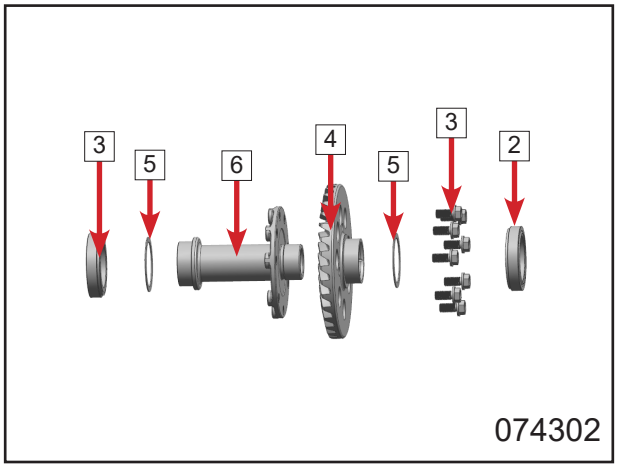


Driven Bevel Gear Assembly

Remove driven bevel gear assembly [1].

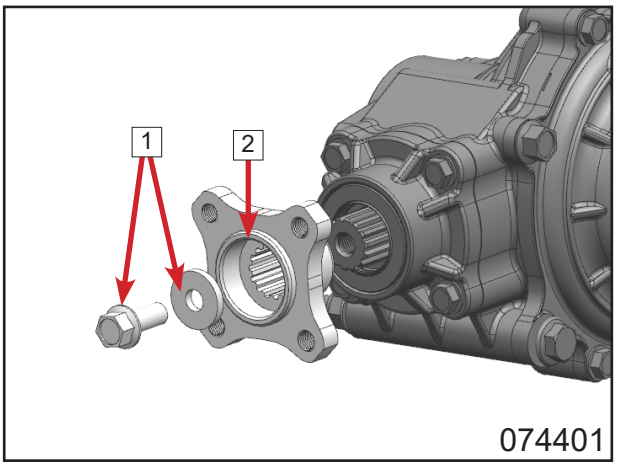


Remove eight M10 bolts [2].
Remove bearing [3].
Remove driven bevel gear [4].
Remove washers [5].
Remove mounting seat.

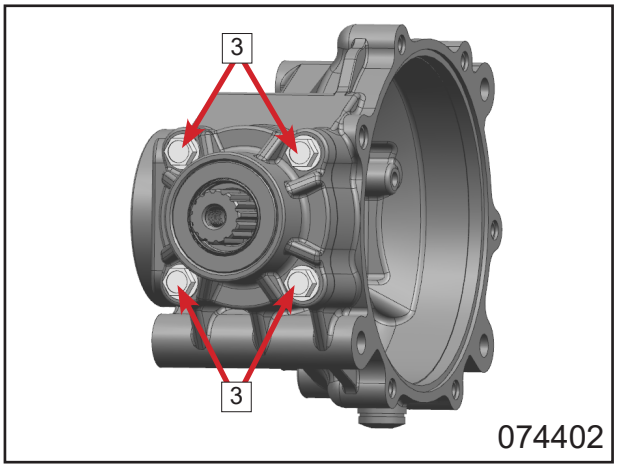


7.7.3 Rear Gear Case Drive Bevel Gear Disassembly

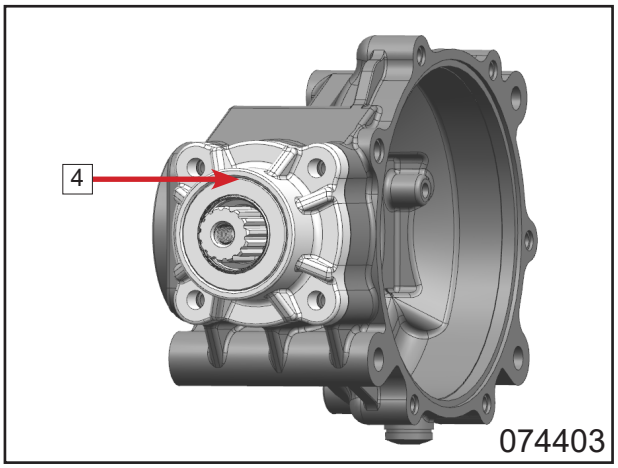
Remove bolt and washer 1.
Remove coupler 2.



Remove bolts 3.



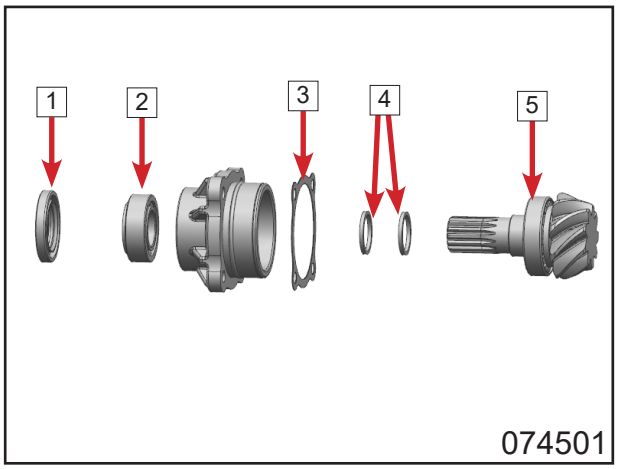
Remove input shaft 4.



7.7.4 Input Shaft Disassembly

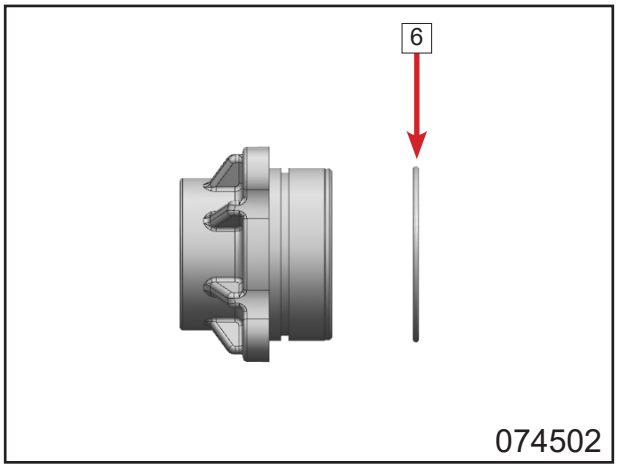
Remove rear drive bevel gear and inspect for smooth rotation.
It's not necessary to disassembly if it rotates smoothly.
If any defect is found, disassemble input shaft.

Remove oil seal 1.
Remove bearing 2 by bearing puller.
Remove washer 3.
Remove adjusting washers 4.
Remove input shaft 5.



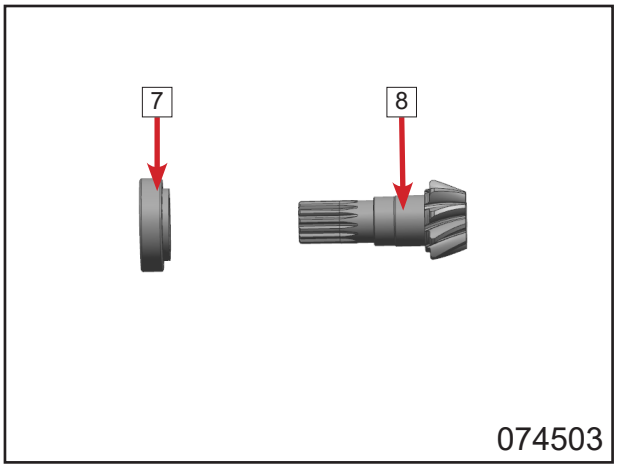
074501

Inspect seal ring for defects. Replace if necessary.
Remove seal ring 6.



074502

Remove bearing 7 by bearing puller.
Remove drive bevel gear 8.



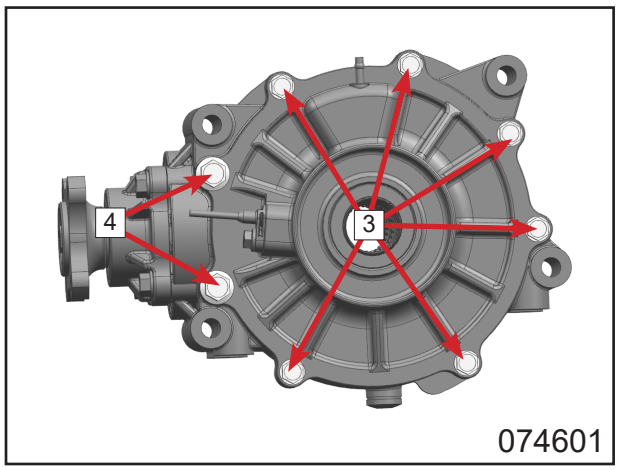
074503

7.7.5 Rear Gear Case Disassembly (Version 2)

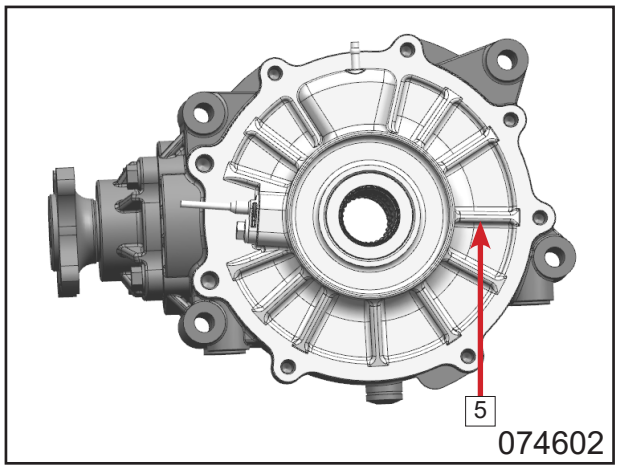
Rear Gear Case Cover

Remove six M8 bolts [3].

Remove two M10 bolts [4].

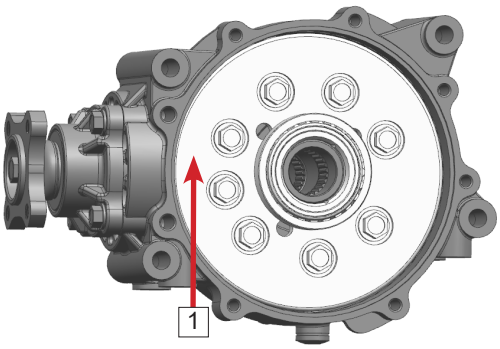


Remove rear gear case cover [5].



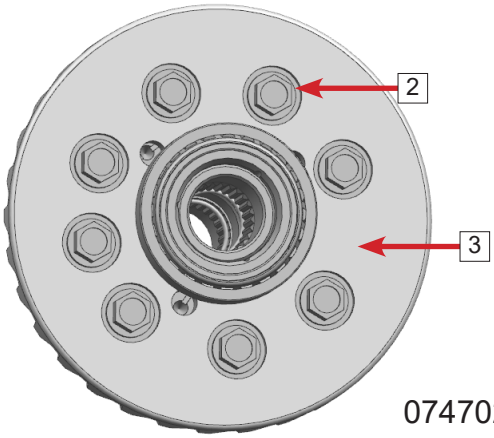
7.7.6 Differential Disassembly

Remove differential assembly 1.



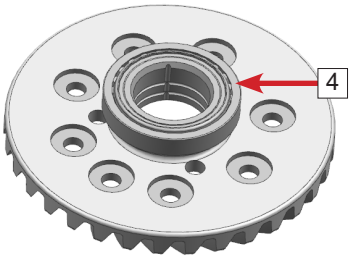
074701

Remove eight bolt kits 2.
Remove driven bevel gear 3.



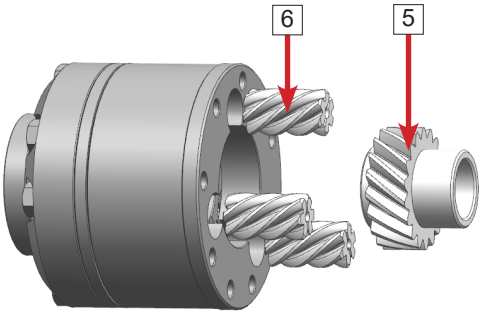
074702

Inspect bearing for abnormal or severe wear.
Bearing 4 can be removed by bearing puller.



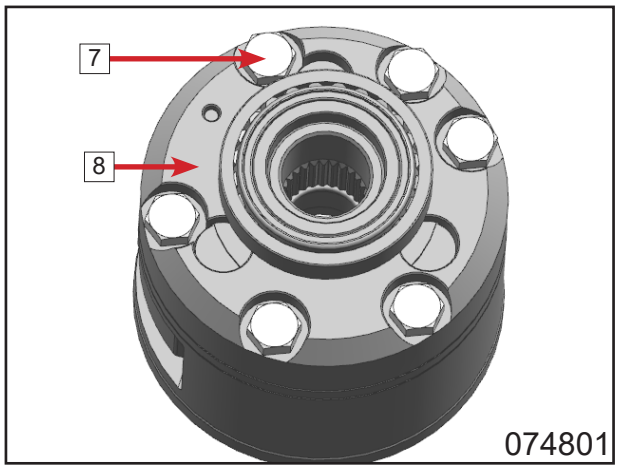
074703

Remove LH shaft gear 5.
Remove LH planet gear 6.

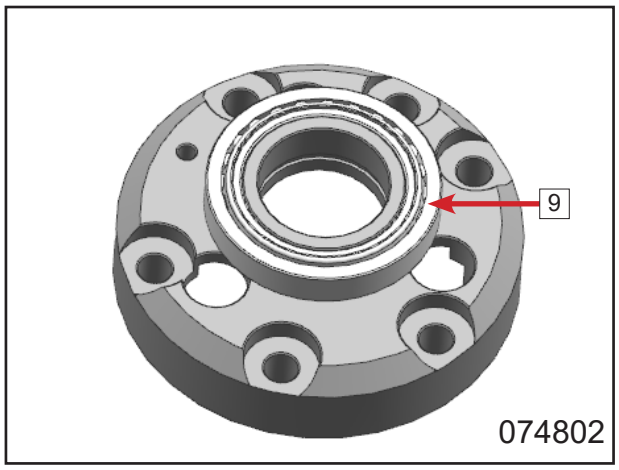


074704

Remove bolts [7].
Remove cover [8].

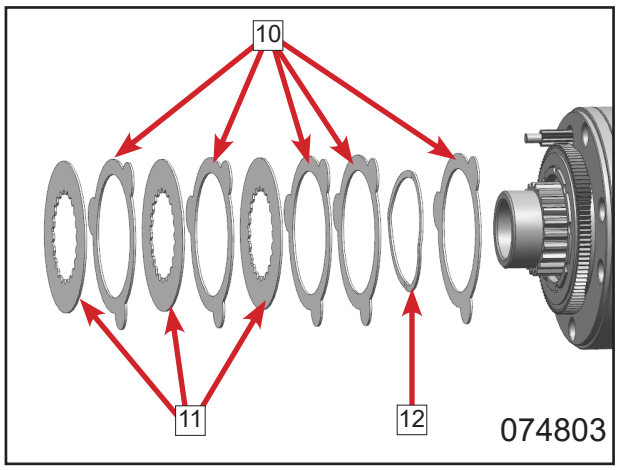


Inspect bearing for abnormal or severe wear.
Bearing [9] can be removed by bearing puller.

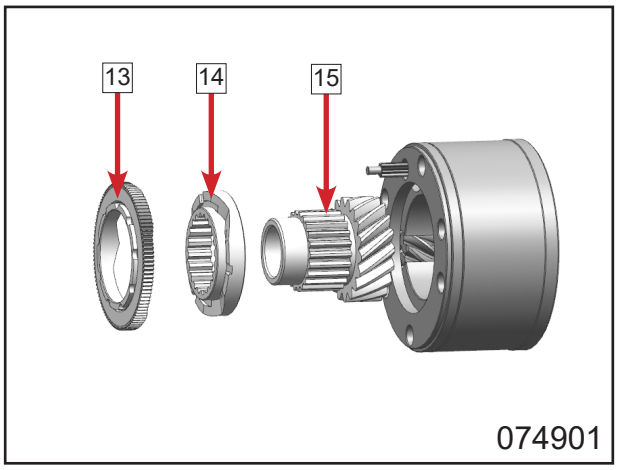


Remove inner protruding friction pads [10].
Remove outer teeth friction pads [11].
Remove gasket [12].

NOTE: After differential cover removal, bind friction pads by tie-bands in sequence.



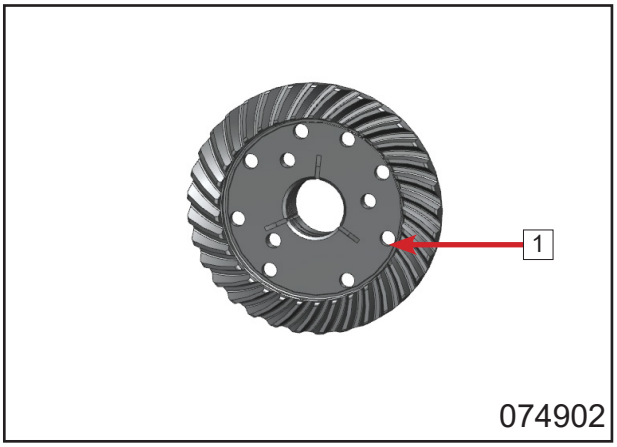
Remove outer cam 13.
Remove inner cam 14.
Remove RH shaft gear 15.



7.7.7 Rear Gear Case Inspection

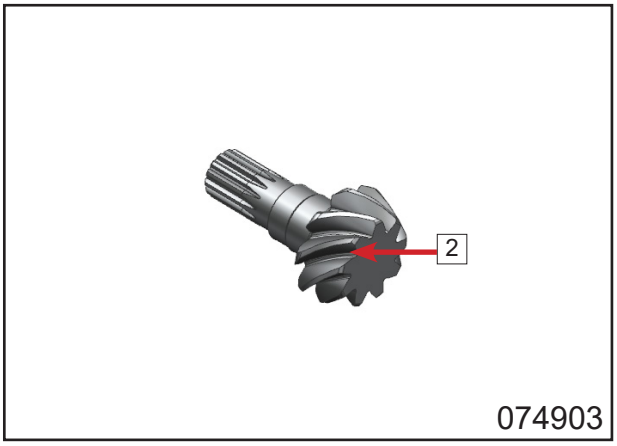
Driven Bevel Gear Inspection

Inspect driven bevel gear 1 for teeth wear, cracks or damage. Replace if any defect is found.



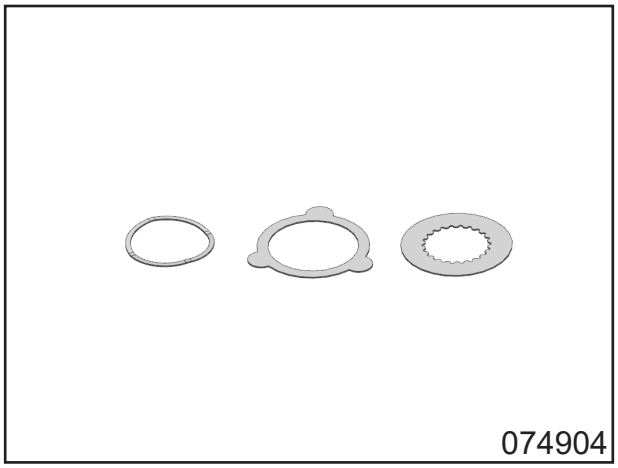
Drive Bevel Gear Inspection

Inspect drive bevel gear 2 for teeth wear, cracks or damage. Replace if any defect is found.



Differential friction Pads Inspection

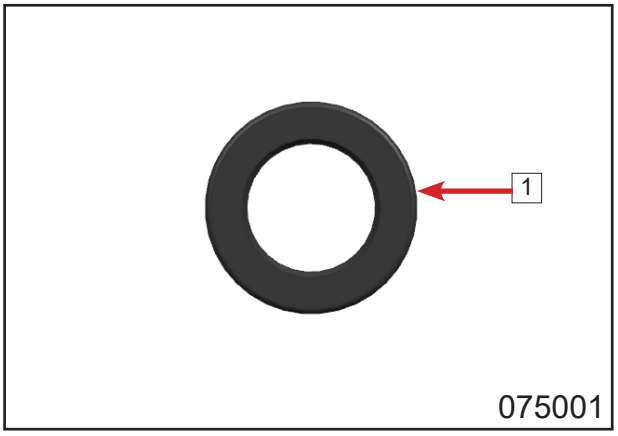
Inspect differential friction pads for severe wear, abnormal wear, cracks or damage. Replace if ant defect is found.



Oil Seal

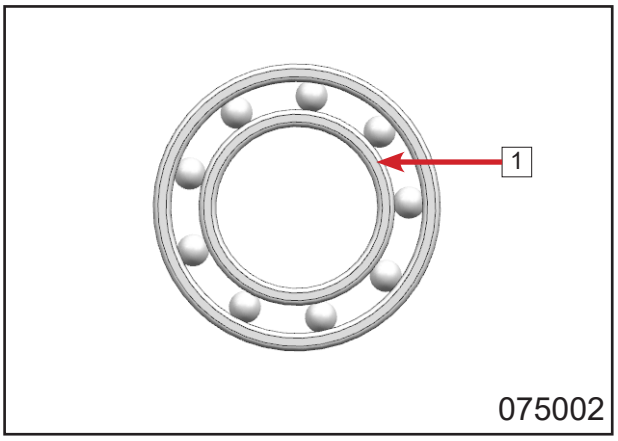
All oil seals [1] are removed and sorted as waste. Replace with new ones during installation.

Inspect oil seal [1] lip and jointing surface for damage. Replace if any defect is found.



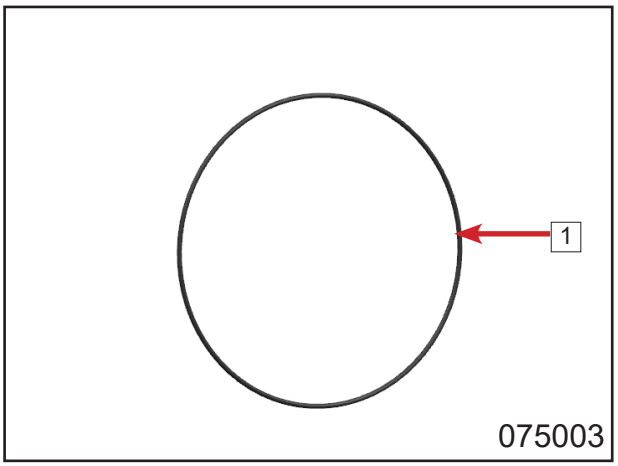
Bearing

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.



O-seal Ring

Inspect every o-seal ring [1] if deformed, broken or damaged. Replace with new parts if any defect is found.

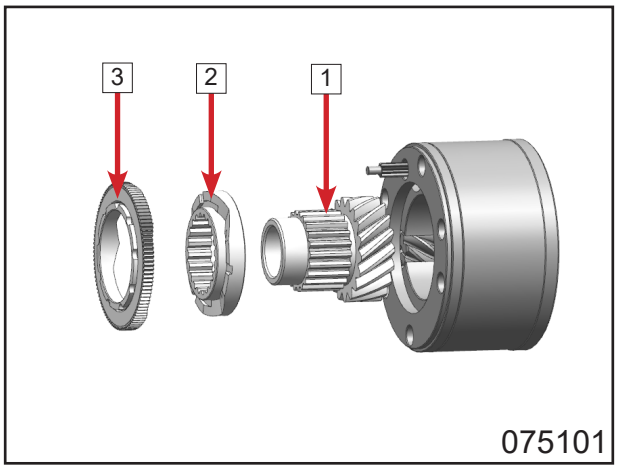


Inspect housing for cracks or damage. Replace if any defect is found.

7.8 Rear Gear Case Assembly

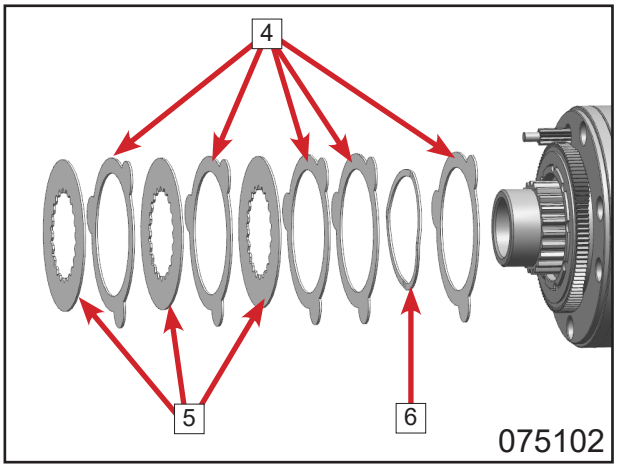
7.8.1 Differential Assembly

Install RH shaft gear [1].
Install inner cam [3].
Install outer cam [2].

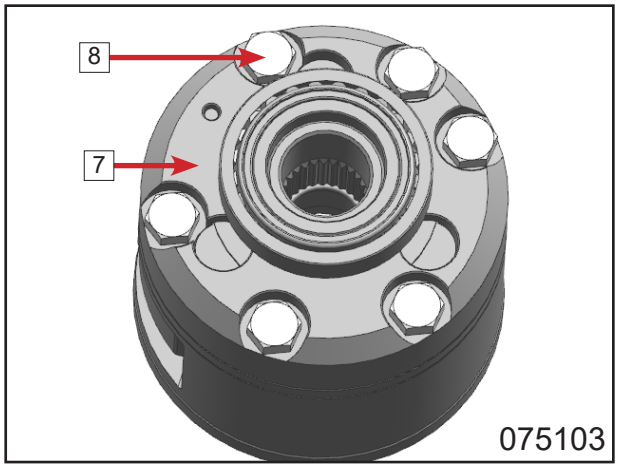


Install inner protruding friction pad [4], outer teeth friction pad [5] and gasket [6] one by one in sequence.

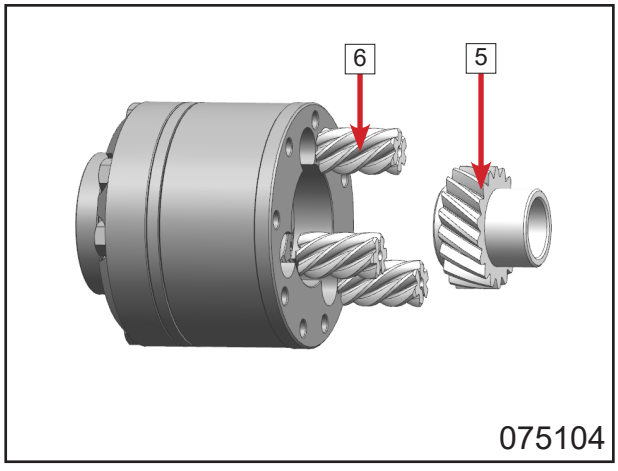
NOTE: The sequence of each friction pad shall not be confused.



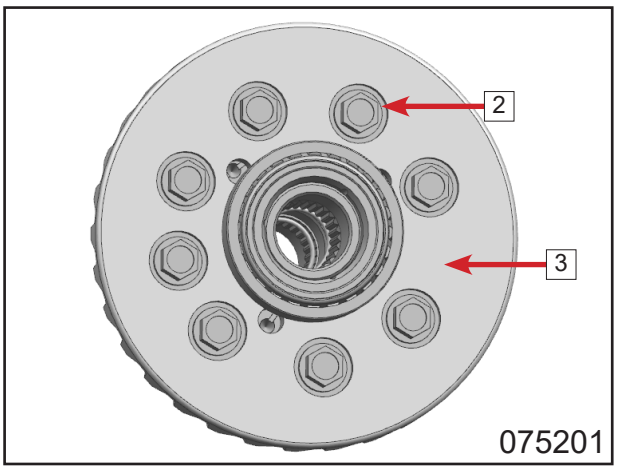
Install cover [7].
Install bolts [8] with thread locker.
Tighten torque: 45 N•M



Install LH shaft gear [5].
Install LH planet gear [6].



Install driven bevel gear [3].
Install eight bolt kits [2] with thread locker.
Tighten torque: 60 N•M

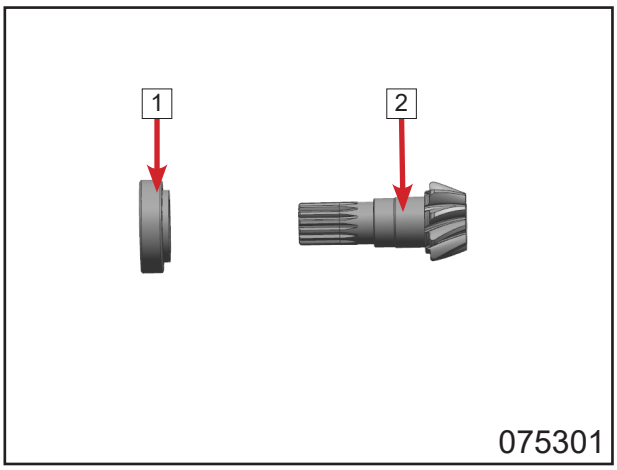


7.8.2 Rear Gear Case Drive Bevel Gear Assembly

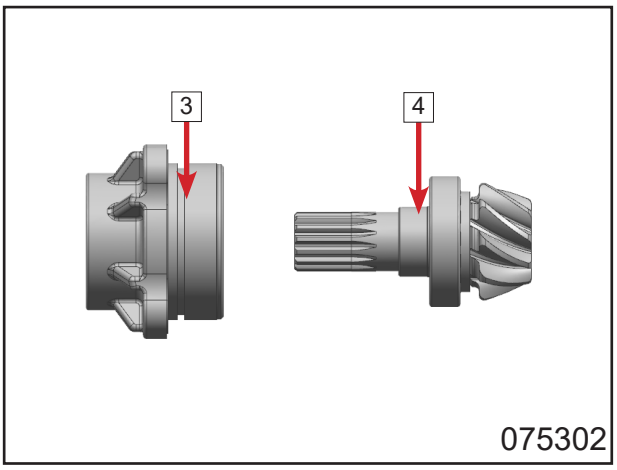
If drive bevel gear isn't removed, skip this step.

Inspect drive bevel gear teeth for abnormal or severe wear before assembling.

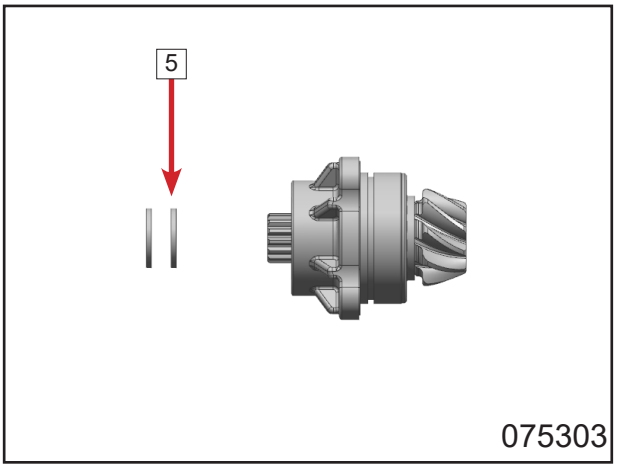
Compress bearing [1] on drive bevel gear [2].



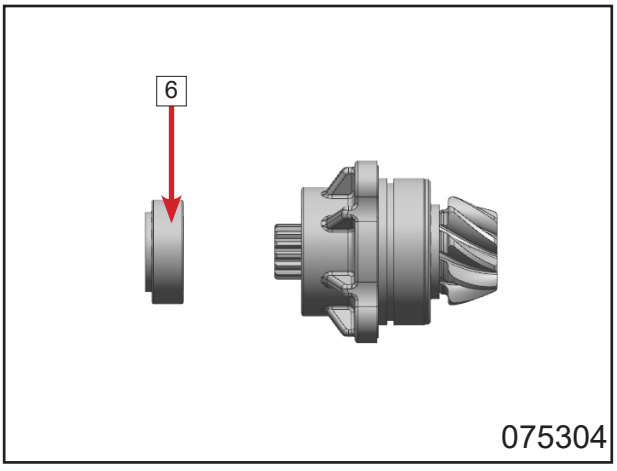
Insert input shaft assembly [3] into bearing seat [4].



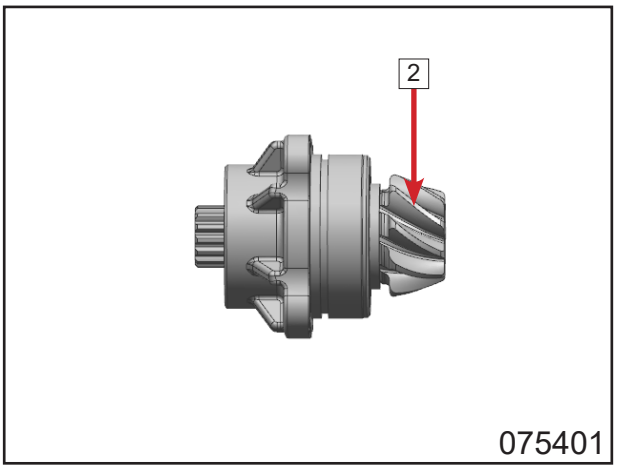
Install adjusting washers [5].



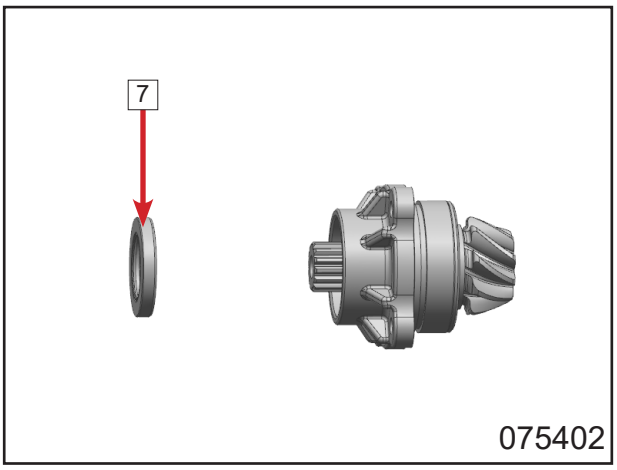
Install bearing [6].



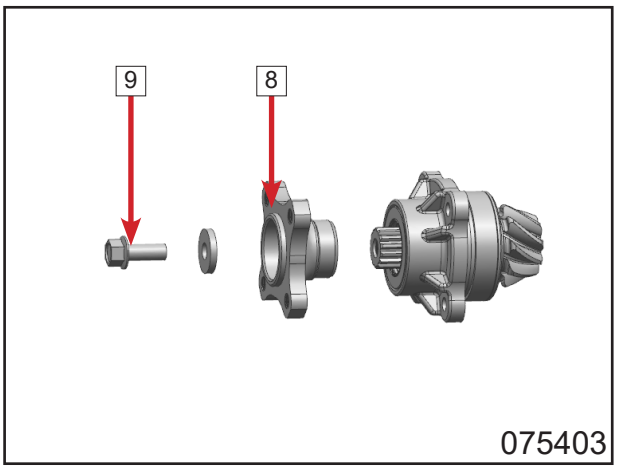
After assembling, inspect drive bevel gear [2] if it rotates smoothly. If it is stuck or there is noise, remove bearing, adjust washer thickness and reinstall.
When gear rotation is smooth, proceed next step.



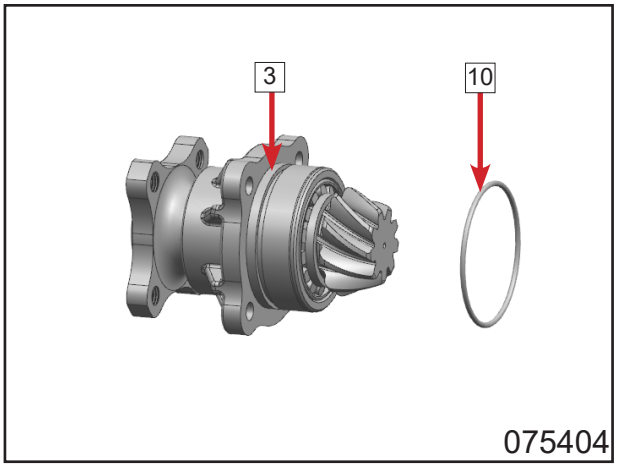
Apply grease on oil seal [7] and install it.



Install coupler [8].
Install bolt and washer [9] with thread locker.
Tighten torque: 75N•M

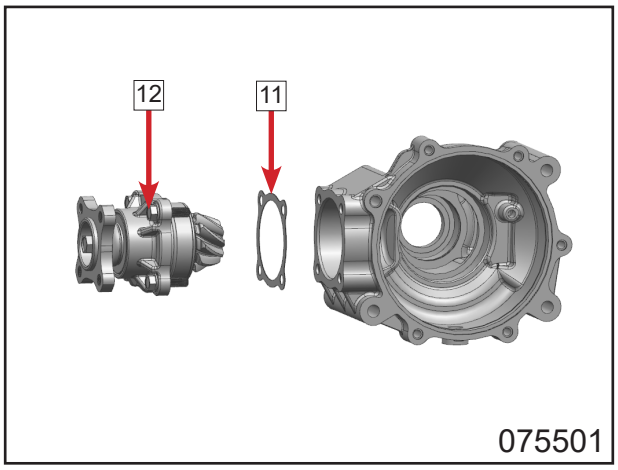


Install seal ring [10] into groove of bearing seat.



Install adjusting gaskets [11].
Install drive bevel gear assembly [12];
Tighten torque: 25N•M

After assembling, inspect drive bevel gear [1] if it rotates smoothly. If it is stuck or there is noise, adjust gaskets.



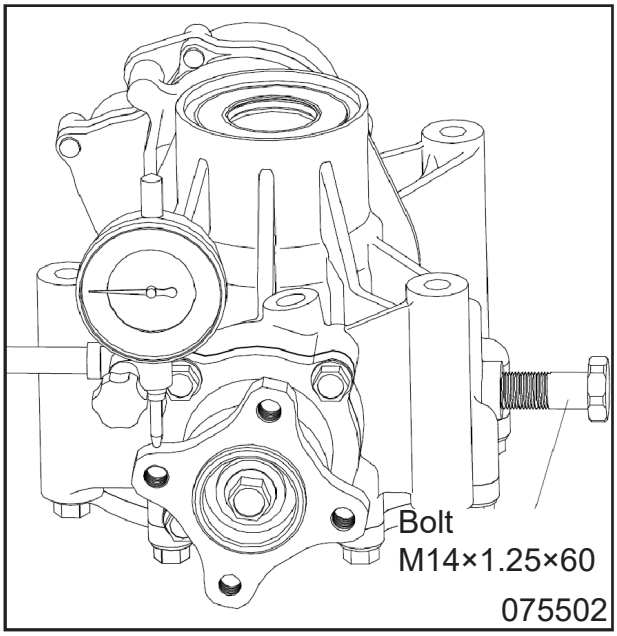
Rear Gear Case Bevel Gear Clearance Adjustment

Follow the drawing on the right to adjusting gear side clearance: Install auxiliary measuring tool and tighten the bolt (M14X1.25X60). 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:

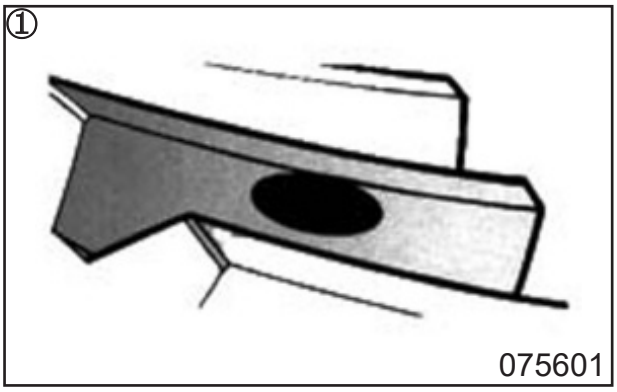
Remove ring gear from crankcase.

Clean and degrease drive pinion gear and ring gear teeth.

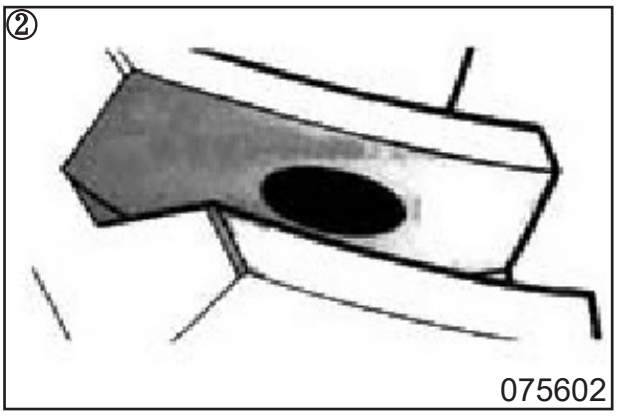
Apply a coating of machinist's layout dye or paste to several teeth of the driven gear.

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.



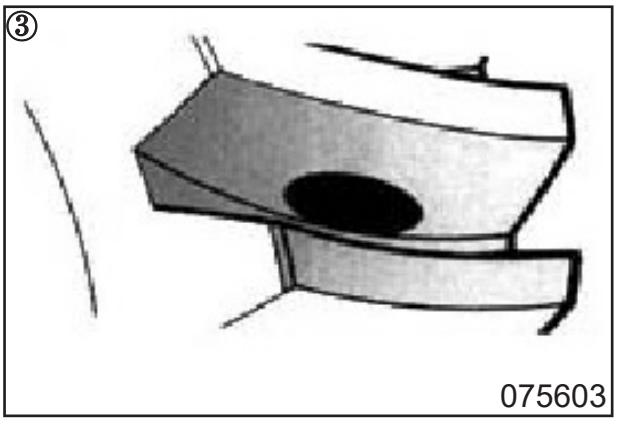
Pattern 1	Contact at tooth top	Incorrect
Pattern 2	Contact at tooth middle	Correct
Pattern 3	Contact at tooth root	Incorrect



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.



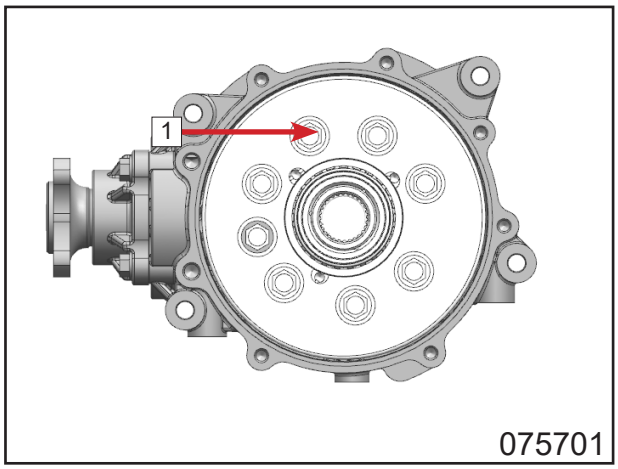
Adjustment Steps

Tooth contact	Shim adjustment
Tooth contact pattern 1	Reduce shim thickness
Tooth contact pattern 3	Increase shim thickness

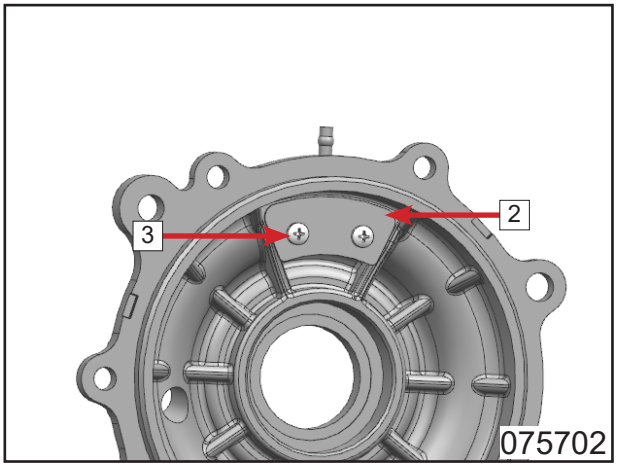
⚠WARNING: Make sure to check the backlash after the tooth contact has been adjusted, since it may have changed. Adjust the tooth contact and backlash until they are both within specification. If the correct tooth contact cannot be maintained when adjusting the backlash, replace the drive gear and ring gear.

7.8.3 Gear Case Cover Installation

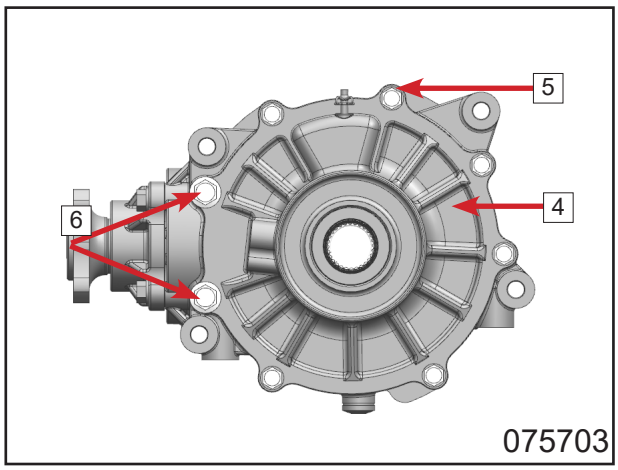
Install assembled differential [1] into housing.
After assembling, inspect drive bevel gear for smooth rotation or noise.



Install oil guard [2].
Install screws [3].

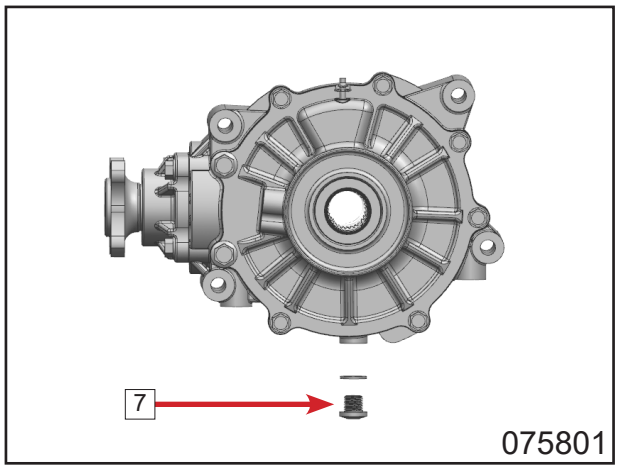


Install case cover [3].
Pre-tighten six bolts[5] in criss-cross way.
Install bolts [6].
Apply thread locker when installing bolts.
Bolt [5] tighten torque: 25N•M
Bolt [6] tighten torque: 40N•M

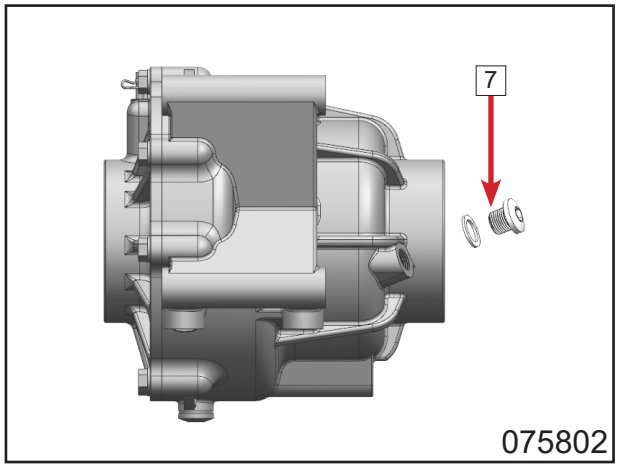


Inspect drive bevel gear for smooth rotation after assembling.

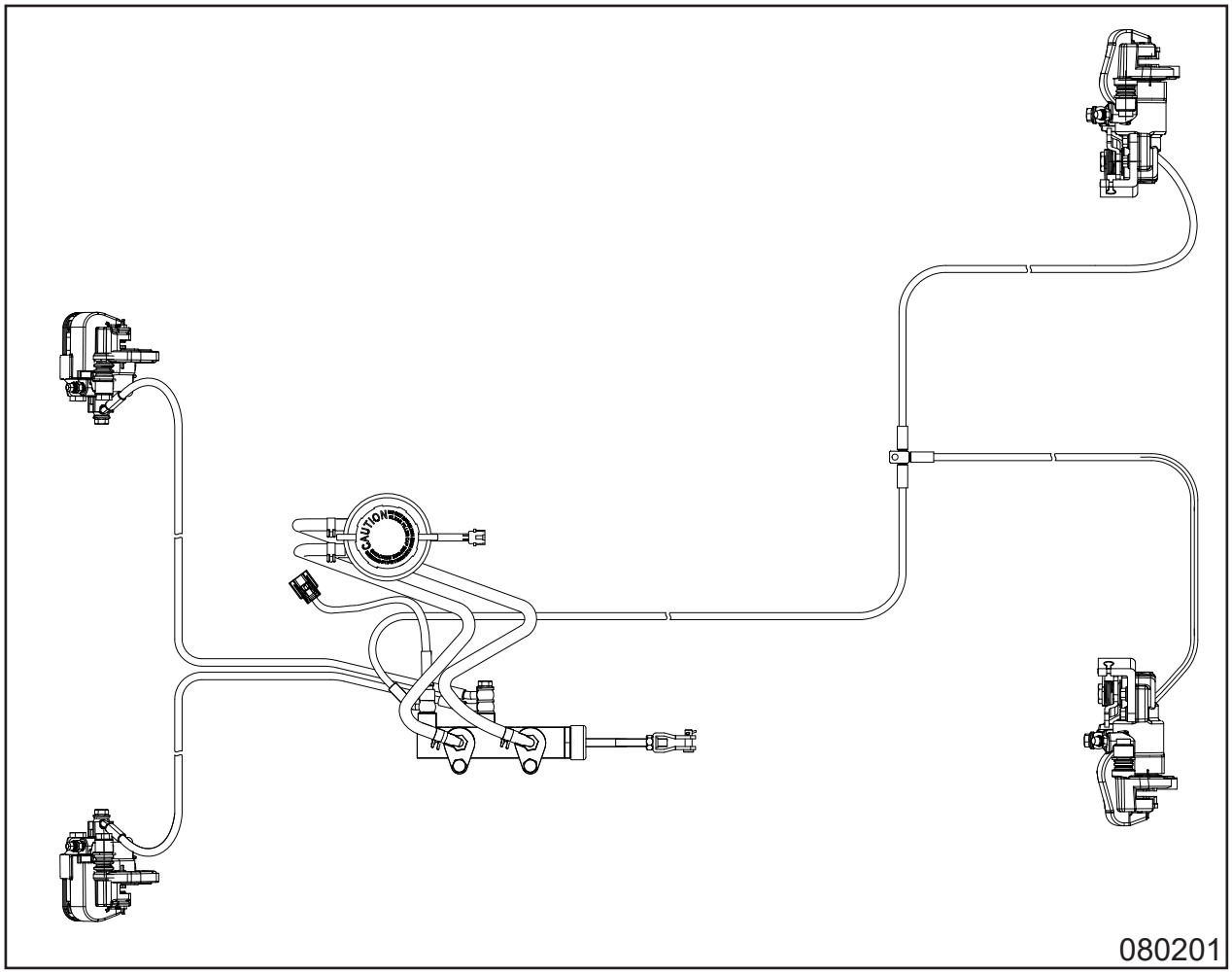
Install rear gear case oil drain bolt [7] and washer.
Tighten torque: 25N•M



Install oil filler bolt [8] and washer.
Tighten torque: 25N•M



8.1 Brake System View



8.2 Brake Noise Troubleshooting

Reason	Method
Dirt or dust on brake pads or brake discs	Remove brake pads or brake discs to clean. Do not use corrosive clean liquid. Replace if necessary.
Brake pads interfere brake disc: Improper adjustment To much brake fluid in reservoir Master cylinder piston not return Driver improper operation (ride the brake)	 Adjust brake pads Make sure the brake fluid level is between upper and lower line Check master cylinder piston function Train driver for safety use
Brake disc severely worn	Replace
Brake disc loosen	Inspect and service. Replace if necessary. Install new parts and torque to specification

⚠ WARNING: Once open a new bottle of brake fluid, properly deal with the rest according to local regulations. Do not store or use brake fluid more than a full bottle. Brake fluid has strong water absorption feature. If water enters into brake fluid, it will cause the boiling point depression and brake failure.

8.3 Brake System

8.3.1 Brake Calipers

Removal

Remove bolts [1].

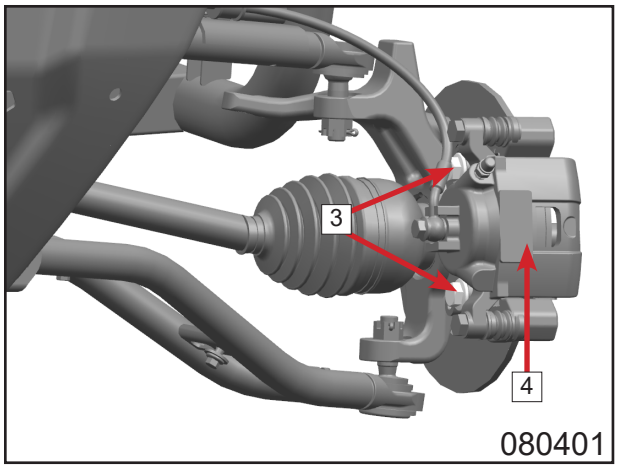
Loosen front LH brake caliper [2].

Front RH brake caliper refers to same procedures.

Remove bolts [3].

Remove rear LH brake caliper [4].

Rear RH brake caliper refers to same procedures.



Inspection

Inspect the brake friction pad thickness.

Brake pad minimum thickness [A] ≥ 2 mm.

Replace if less than minimum thickness.

Inspect brake pad for damage or cracks.

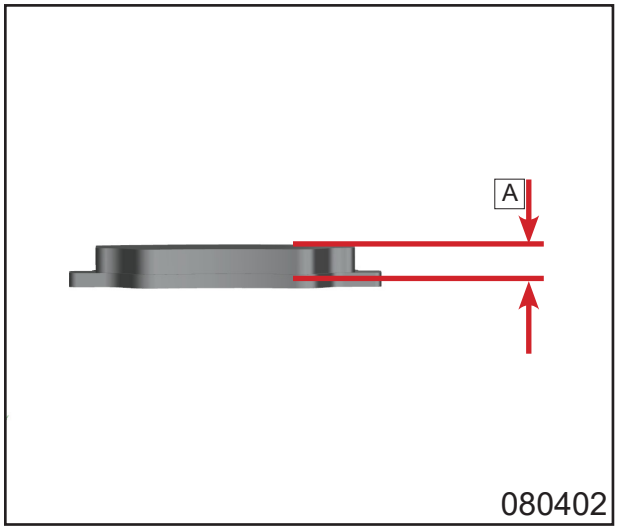
Replace if any defect is found.

⚠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 crack.

Replace if any defect is found.



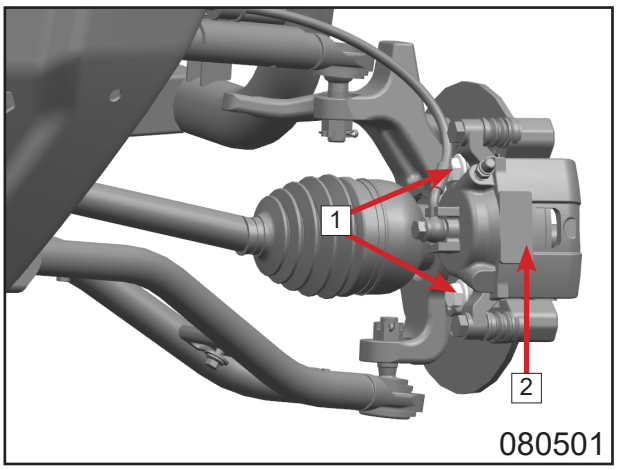
Installation

Reverse the removal procedures for installation.

Installation
Put brake caliper on brake disc.
Align brake caliper with steering knuckle.
Pre-tighten bolts [1].

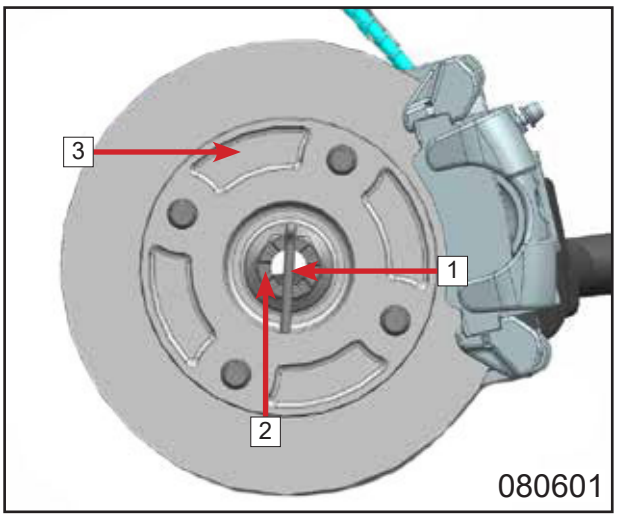
Brake caliper bolt torque: 40N·m~50N·m

Other calipers follow same procedures.



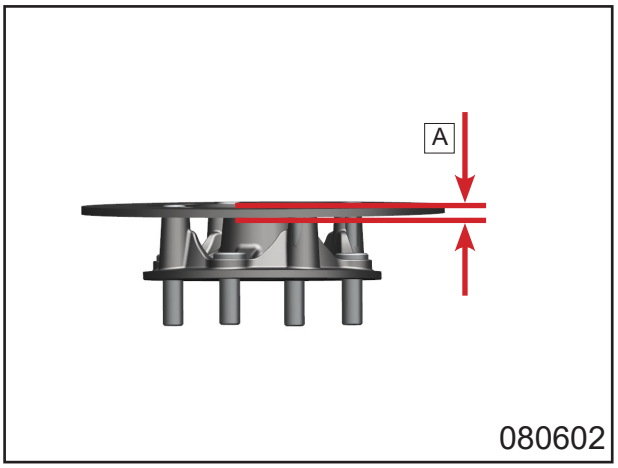
8.3.2 Brake Disc and Mounting Seat Removal

Remove front wheel (refer to Chapter 09).
Remove cotter pin 1.
Remove M30 nut and washer 2.
Remove brake disc and mounting seat 3.



Inspection

Inspect brake disc sliding surface for wear or damage. Replace if necessary.
Replace brake disc if the thickness A is less than 4.0 mm.

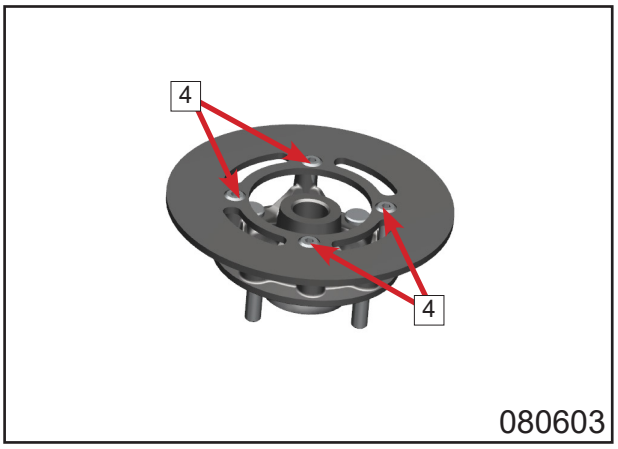


Replacement

Remove four M8 front brake disc inner hex bolts 4.
Replace brake disc.
Install M8 front brake disc inner hex bolts.
Front brake disc bolt tighten torque: 25N•m~30N•m

Installation

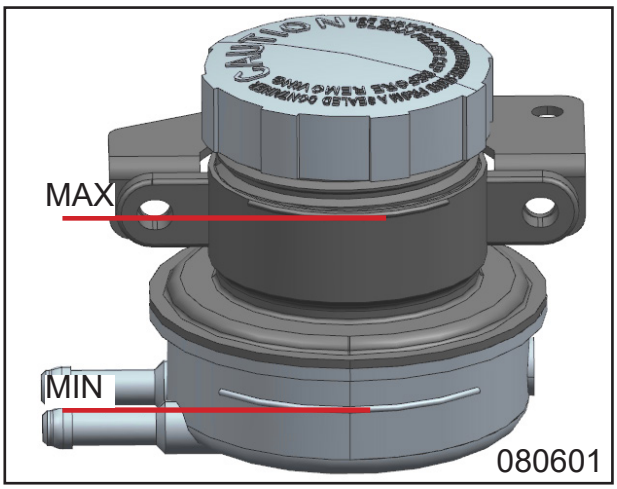
Reverse the removal procedures for installation.



8.4 Brake Fluid

Removal

Remove brake fluid reservoir (refer to chapter 07).



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.

Please use CFMOTO recommended brake fluid for replacement.
Brake fluid type: DOT4

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.

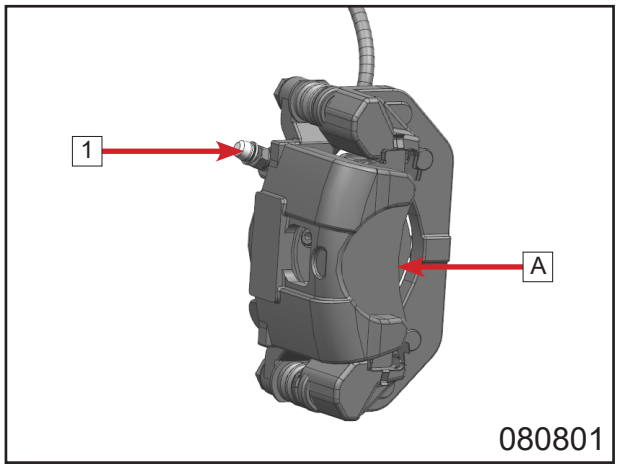
NOTE: Brake fluid will reduce the braking effect after using for a long time. Replace the brake fluid according to maintenance schedule.

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 with the painted parts, because the brake fluid will corrode the paint.
5. Flash with water if brake fluid spills.
6. Do not open the brake fluid reservoir cap for a long time.

Brake Fluid Replacement and Brake System Deflation

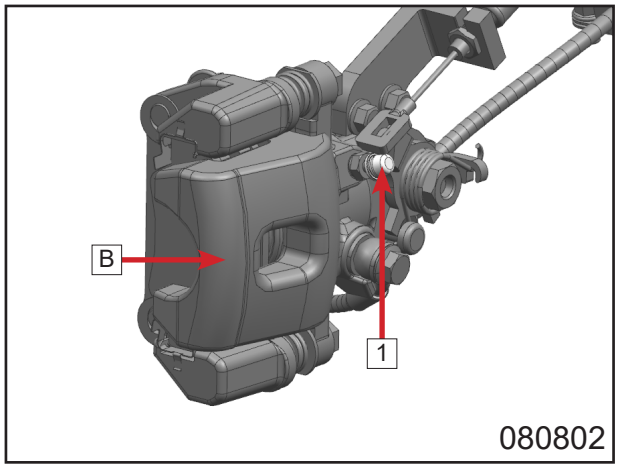
NOTE: When deflate brake system or replace brake fluid, operate the brake caliper which is the farthest one from master cylinder.

If equipped with exhaust device, follow the user manual to operate.
If not, exhaust brake system according to the following procedures:
Remove anti-dust cap:
Connect a hose with brake caliper bleed screw with the other side into a clean container. Make sure the hose is fastened on exhaust port [1].
Press brake pedal slowly and hold for a while.
Loosen bleed screw, tighten it immediately and make brake pedal return.



[A]: **Front brake caliper**

[B]: **Rear brake caliper**



NOTE: Make sure the fluid level is more than a half and under upper line in brake fluid reservoir during exhausting.

NOTE: Do not release brake pedal before tightening bleed screw. Otherwise, there will be air inside master cylinder.

Tighten the bleed screw and keep the fluid level according to requirement after system deflation or fluid replacement.
Inspect brake effect after operation to make sure the brake function works and brake pedal free play is qualified.
Repeat above procedures if the brake effect is bad.

Installation
Reverse the removal procedures for installation.

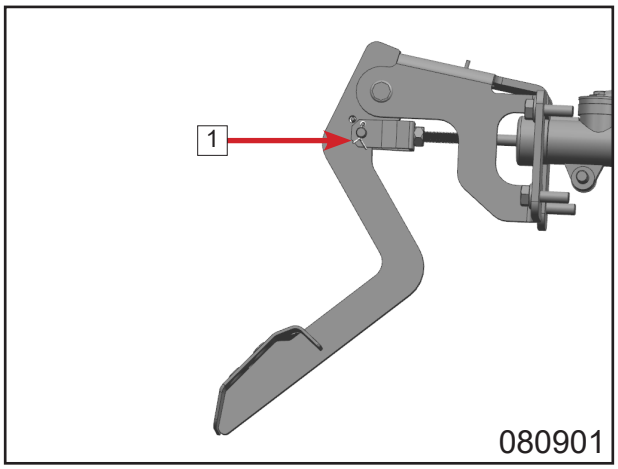
8.5 Brake Pedal

When foot brake is too soft or brake pedal doesn't return, remove brake pedal for inspection.

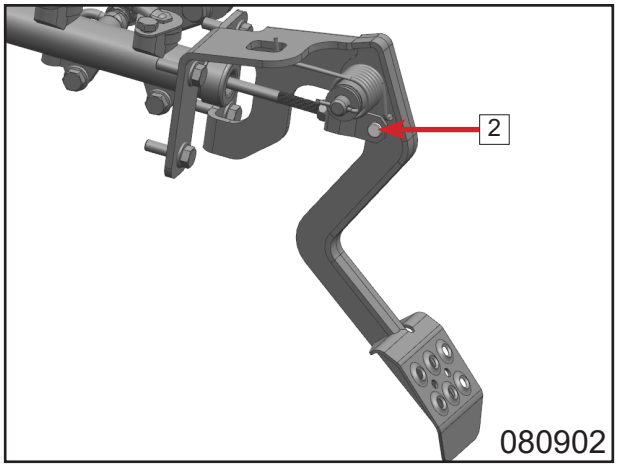
If foot brake is good, inspect pedal for damage or other defects. It is not necessary to maintain brake pedal if no defect is found.

Removal

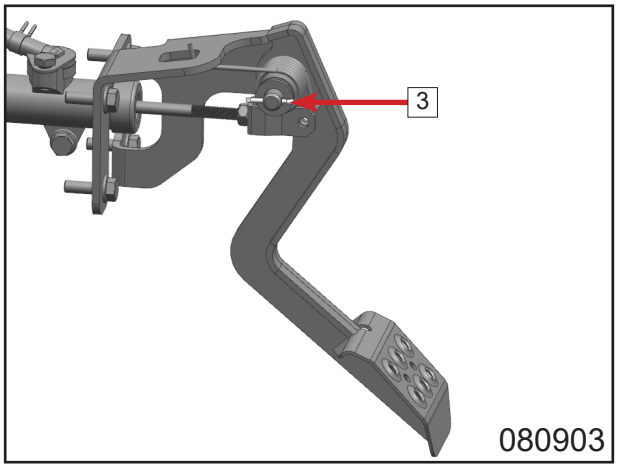
Remove latch 1.



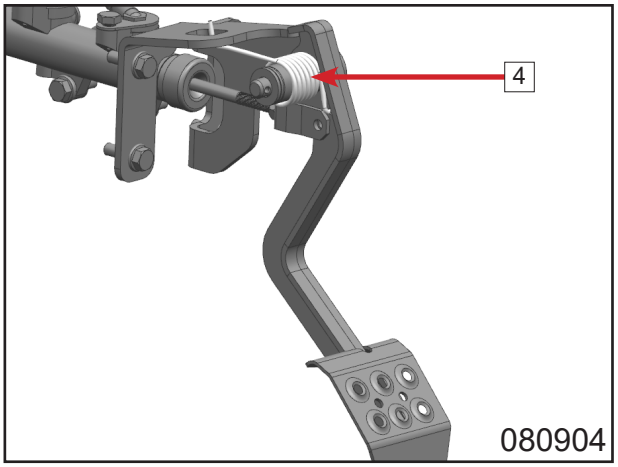
Remove pin shaft 2.



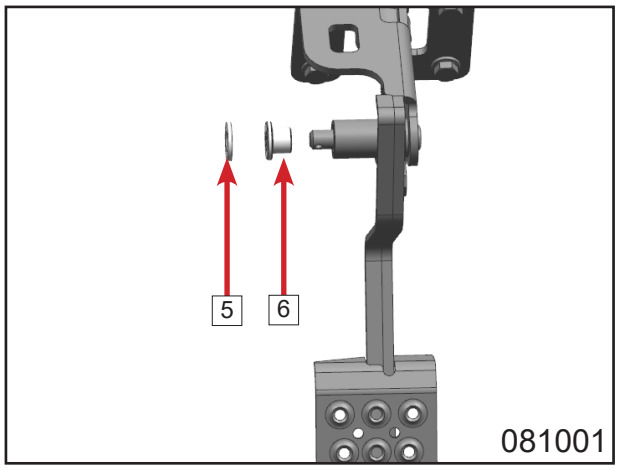
Remove latch 3.



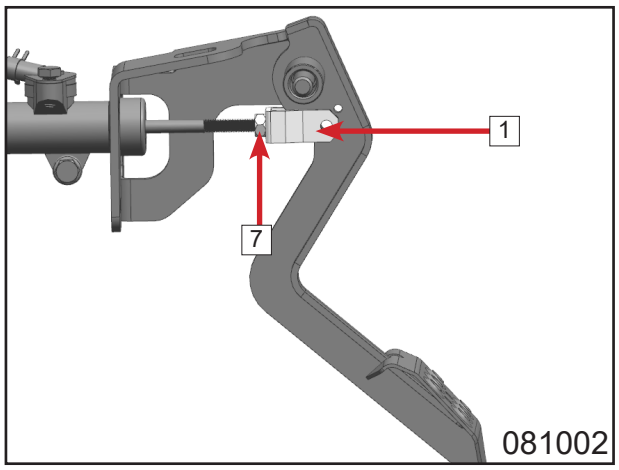
Remove foot brake return spring 4.



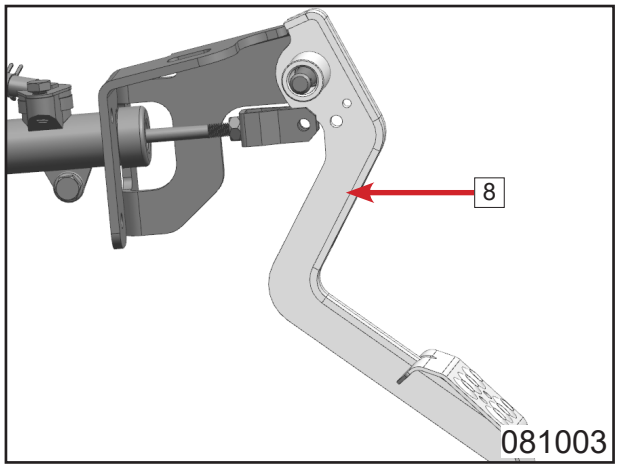
Remove washer 5.
Remove bushing 6.



Rotate out nut 7.
Separate piston from pedal 8.



Remove pedal 8.

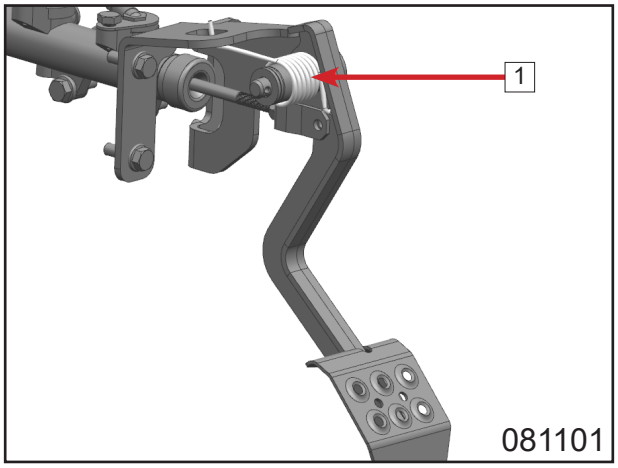


Installation
Reverse the removal procedures for installation.

Inspection

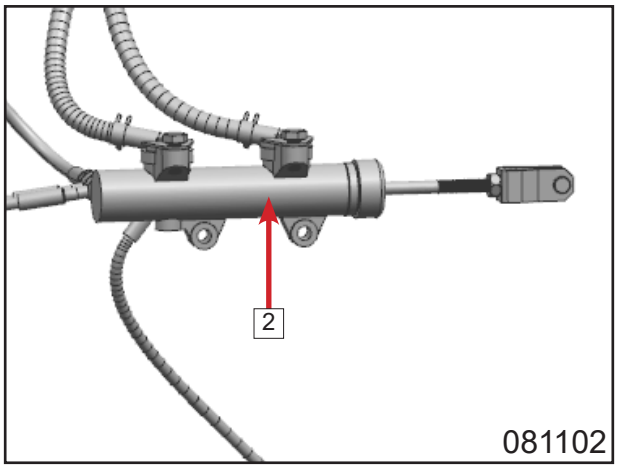
Press foot brake pedal repeatedly after installation to check its performance.

If pedal can not return properly, inspect foot brake return spring [1] . Replace if necessary.

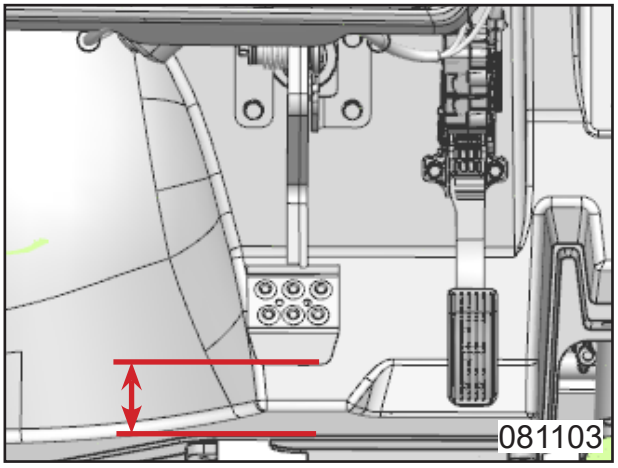


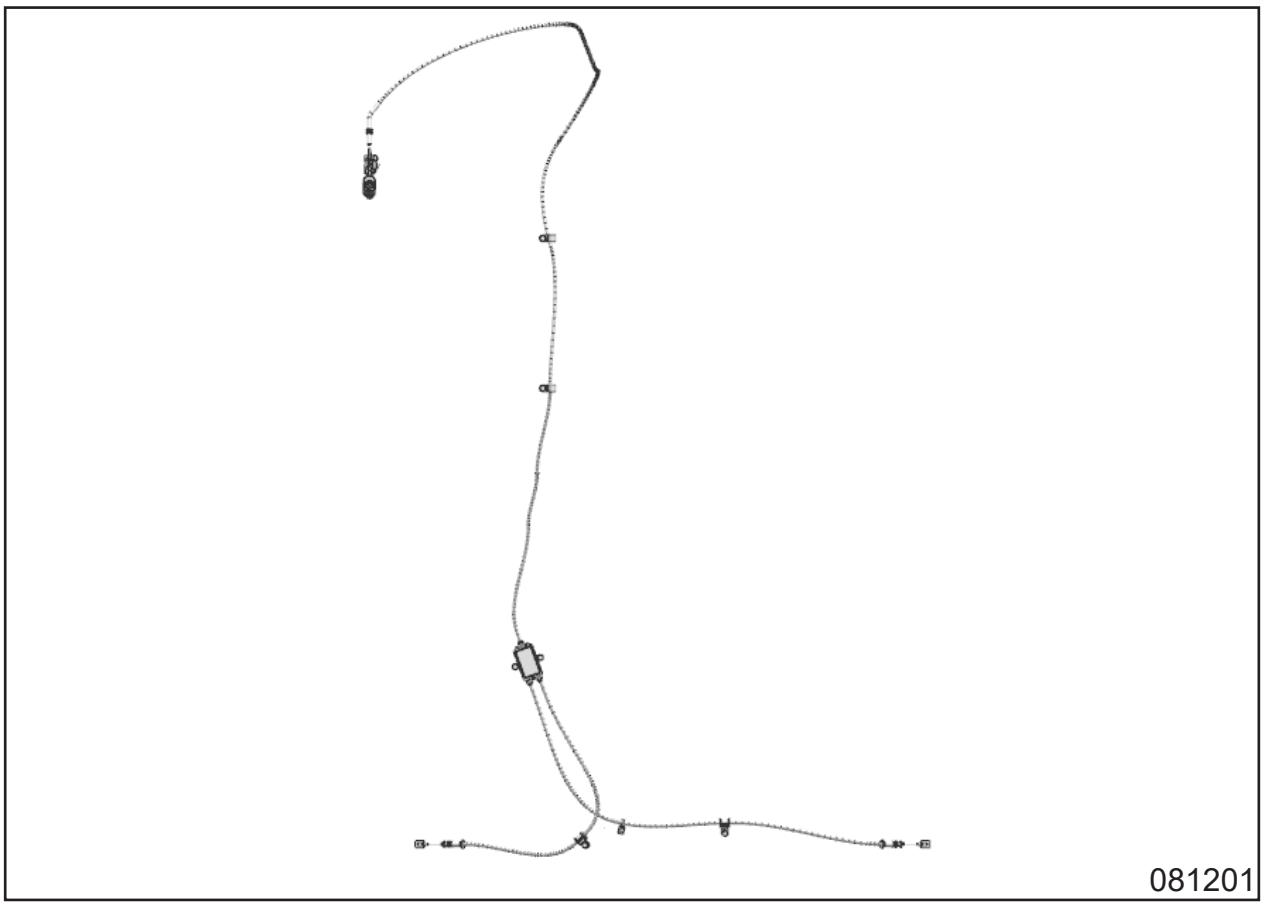
If brake performance is still not qualified after return spring replacement, inspect brake fluid reservoir for level or leakage. Deflate brake system.

If bake performance is still not qualified even though brake fluid is enough and system is deflated, replace master cylinder [2] .



After brake pedal installation, make sure the height between pedal and skid plate is 85mm~90mm.





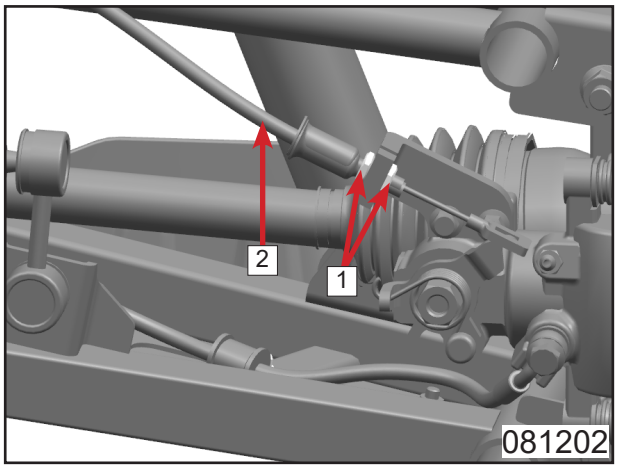
8.6 Parking System

Removal

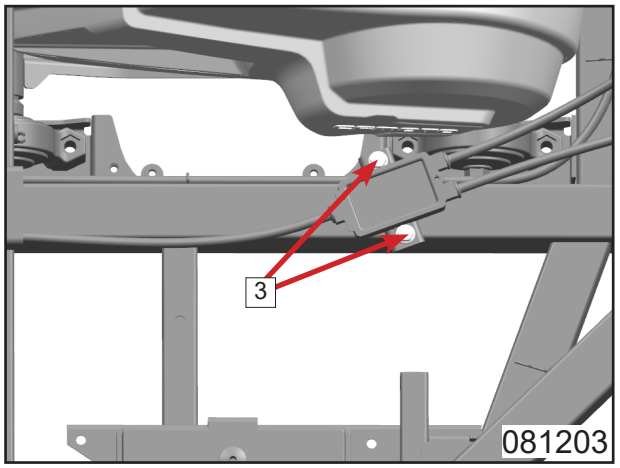
Loosen two nuts [1].

Loosen LH parking cable joint [2].

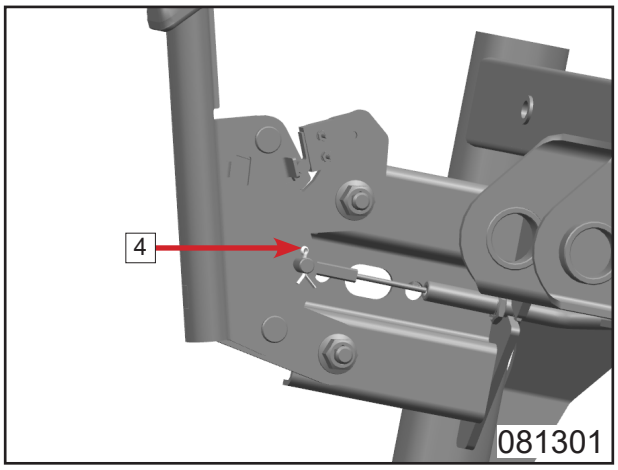
RH parking cable joint refers to same procedures.



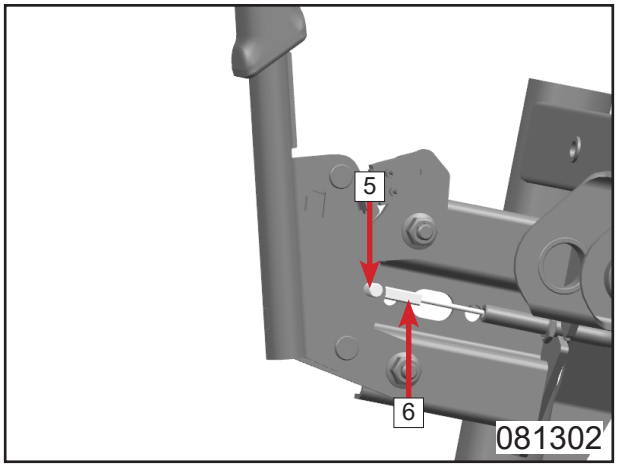
Remove bolts [3].



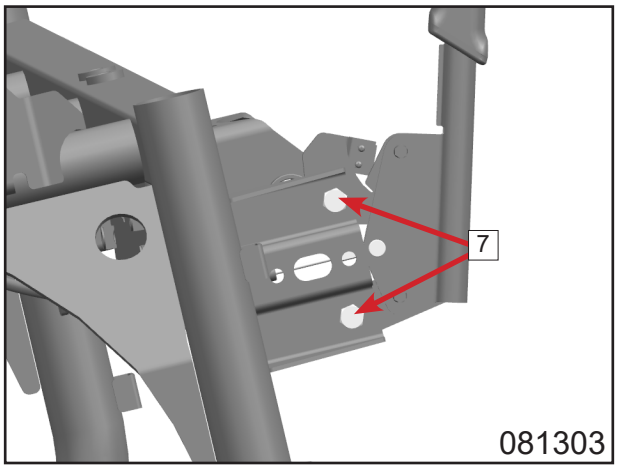
Remove latch [4].



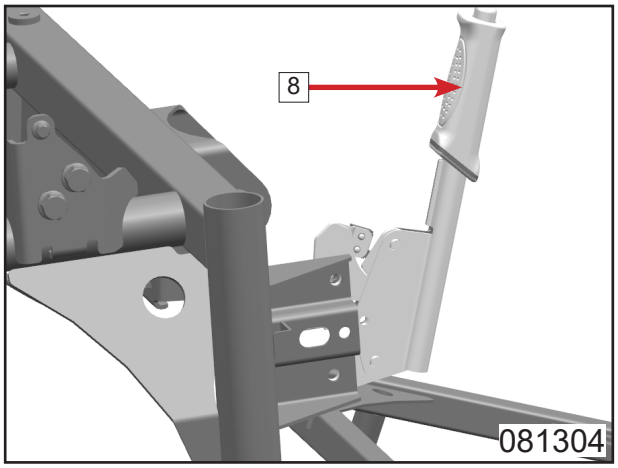
Remove pin shaft [5].
Loosen parking cable [6].



Remove bolts [7].



Remove parking lever [8].



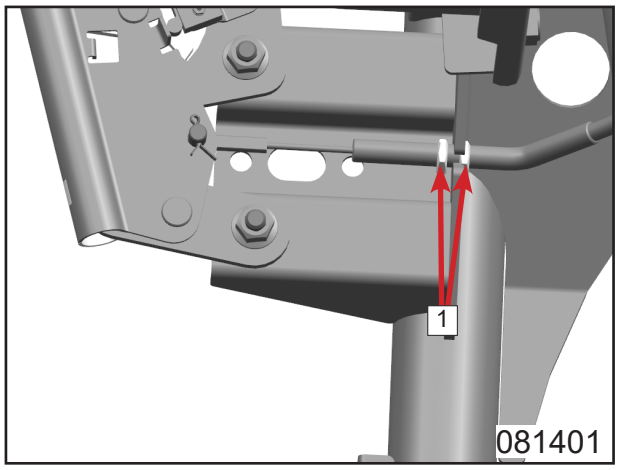
Installation
Reverse the removal procedures for installation.

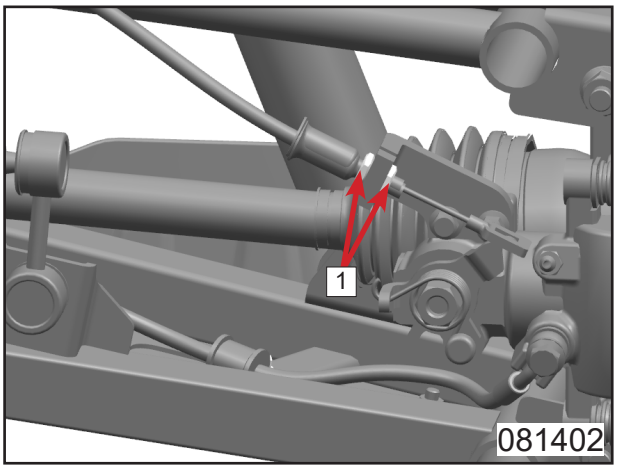
Inspection

Inspect parking brake performance after installation.

Adjust nuts 1 on hand brake and brake caliper if brake performance isn't qualified.

Repeat above steps until the parking brake performance is proper.

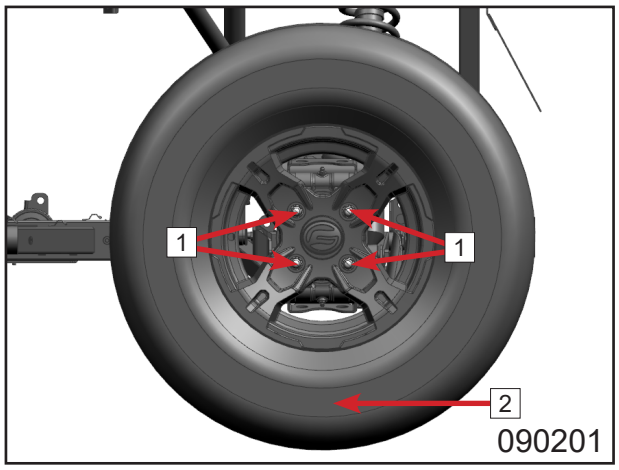




9.1 Tire

Removal

Remove four 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 thread 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.

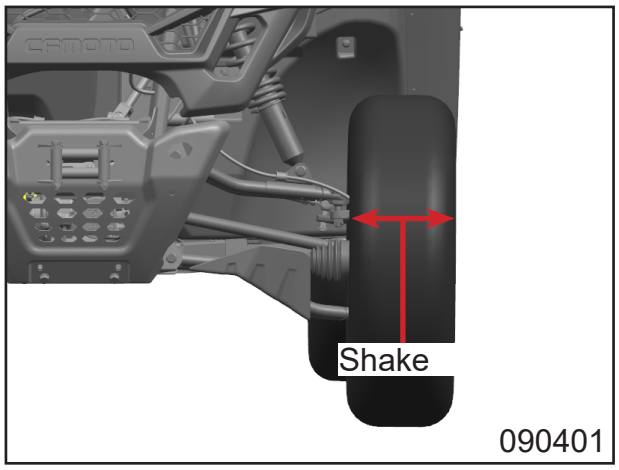
Tire status
25x8.0
25x10.0

Pressure:

Item			Standard Value	Service Limit
Front wheel	Rim jump	Longitude	/	0.5mm
		Transverse	/	0.5mm
	Tire	Remaining groove	/	3.0mm
		Pressure(US)	70kPa (10.2PSI)	Load over 195kg: 80kPa (11.6PSI)

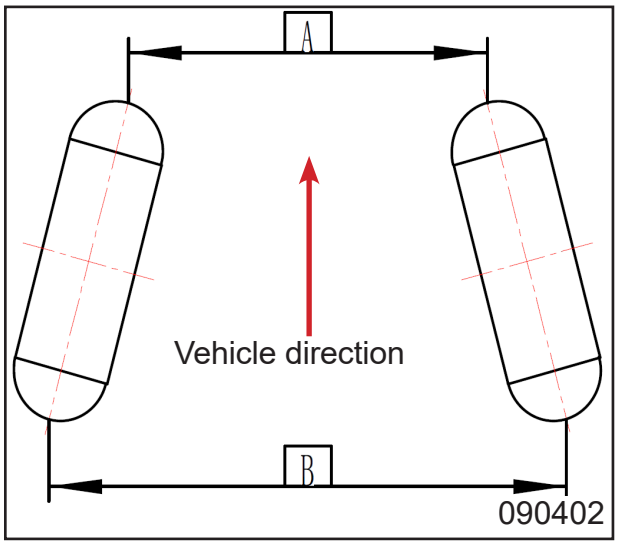
Item			Standard Value	Service Limit
Rear wheel	Rim jump	Longitude	/	0.5mm
		Transverse	/	0.5mm
	Tire	Remaining groove	/	3.0mm
		Pressure	100kPa(14.5PSI)	Load over 195kg: 120kPa (17.4PSI)

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.



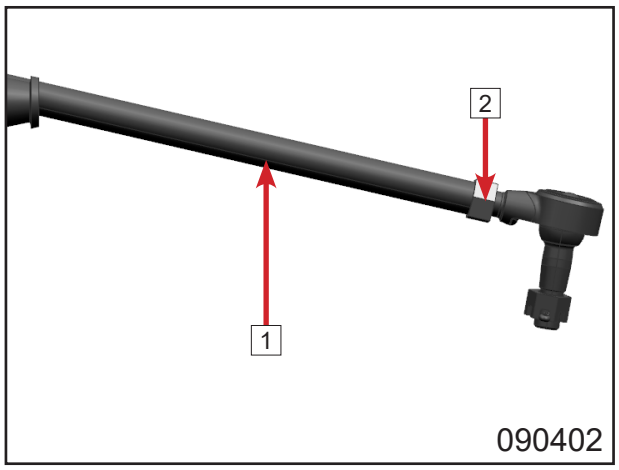
9.2 Wheel Toe-in

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 mm~10 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.



9.3 Rim Brackets

9.3.1 Front Rim Bracket

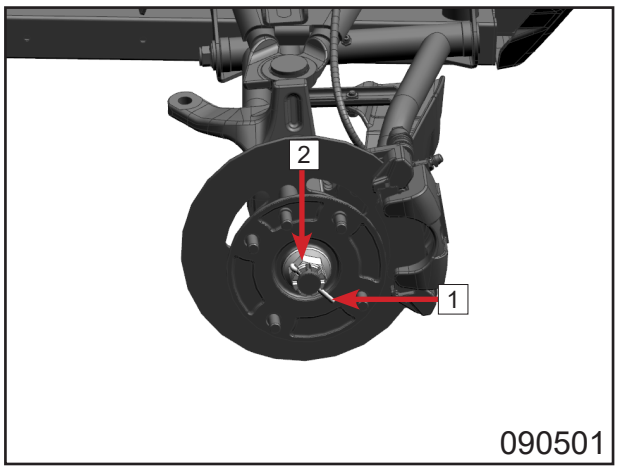
Remove tires (refer to 9.1 section).

Removal

Remove cotter pin [1].

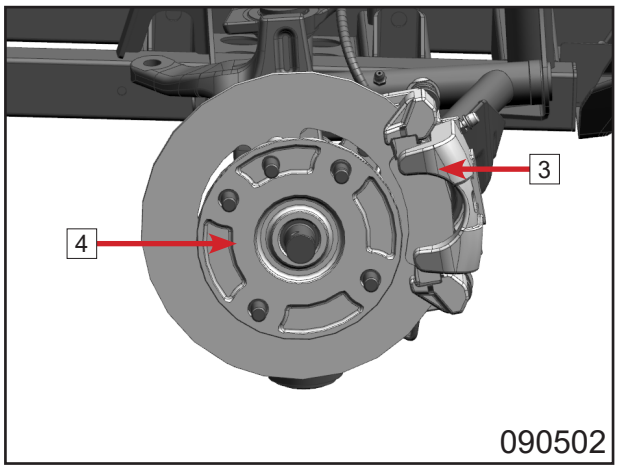
Remove hex slotted nut [2].

Rim nut torque: 70N·m~80N·m



Remove brake caliper [3] (refer to Chapter 08).

Remove front rim bracket [4].



9.3.2 Rear Rim Bracket

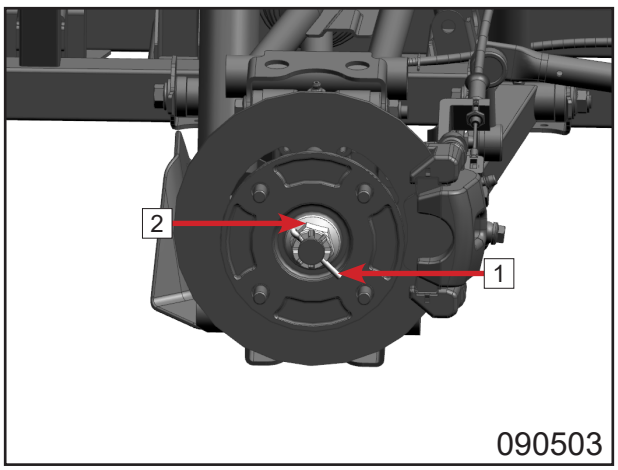
Remove tires (refer to 9.1 section).

Removal

Remove cotter pin [1].

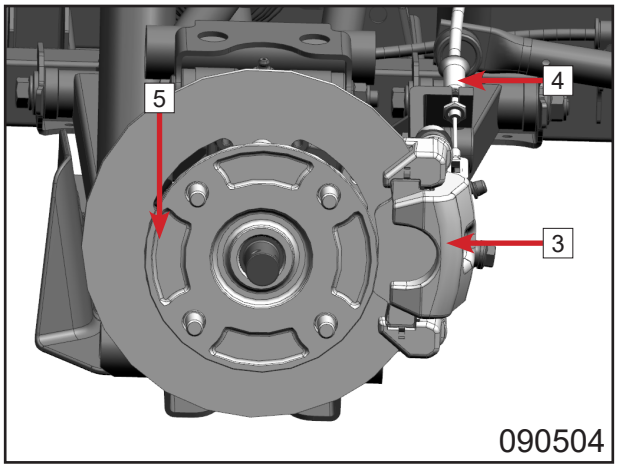
Remove hex slotted nut [2].

Rim nut torque: 70N·m~80N·m

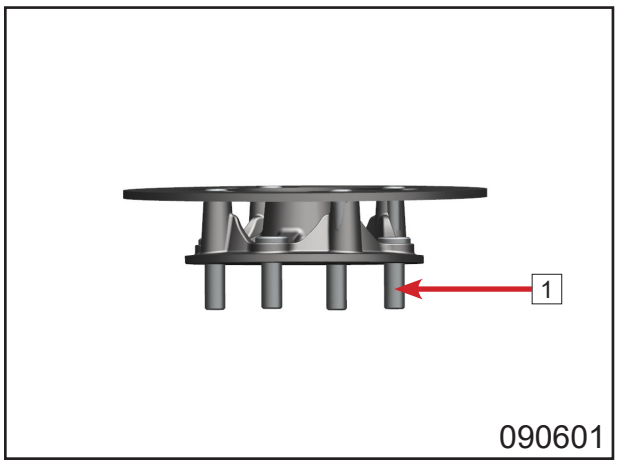


Remove brake caliper [3] and parking brake cable [4](refer to Chapter 08).

Remove front rim bracket [5].



Inspection
Inspect rim bracket bolts 1 for looseness. Replace if necessary.



Installation
Reverse the removal procedures for installation.

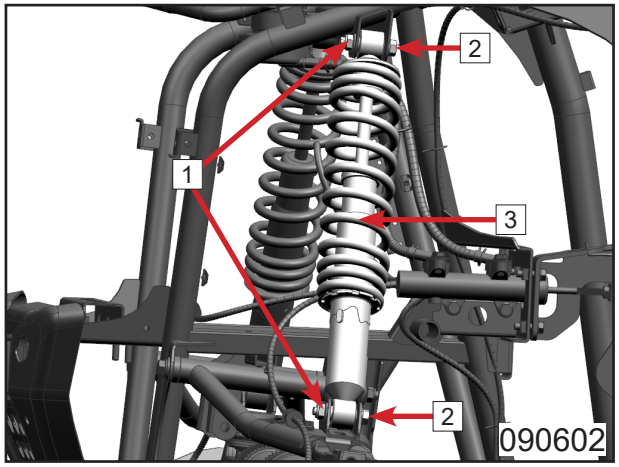
NOTE: The removed cotter pin can not be reused. Replace with new one during installation.

9.4 Shock Absorbers

9.4.1 Front Shock Absorber

Remove tires (refer to 9.1 section).
Removal
Remove two nuts 1.
Remove bolts 2.
Remove front shock absorber 3.

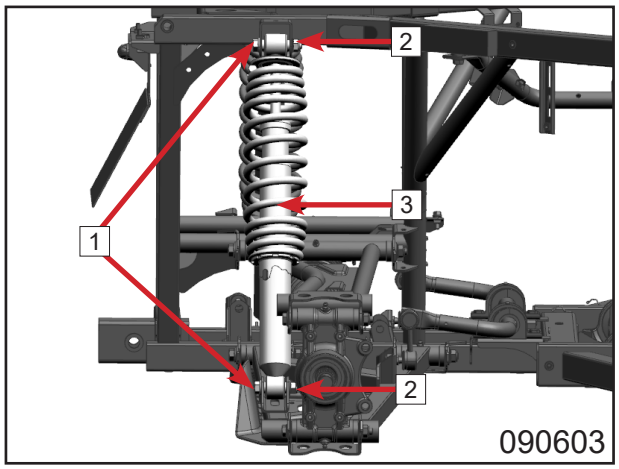
Shock absorber nut torque: 40N·m~50N·m



9.4.2 Rear Shock Absorber

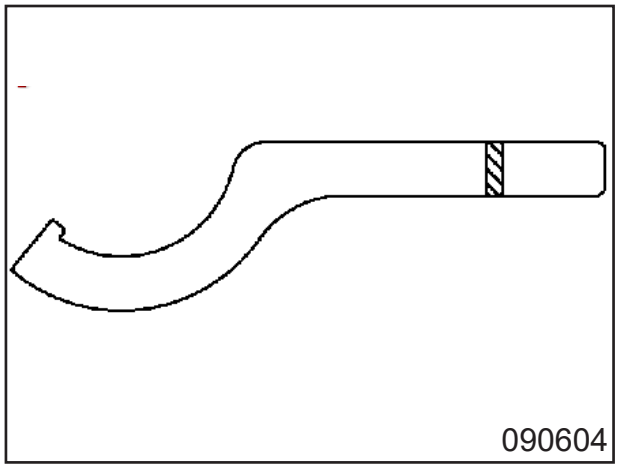
Remove tires (refer to 9.1 section).
Removal
Remove two nuts 1.
Remove bolts 2.
Remove rear shock absorber 3.

Shock absorber nut torque: 40N·m~50N·m

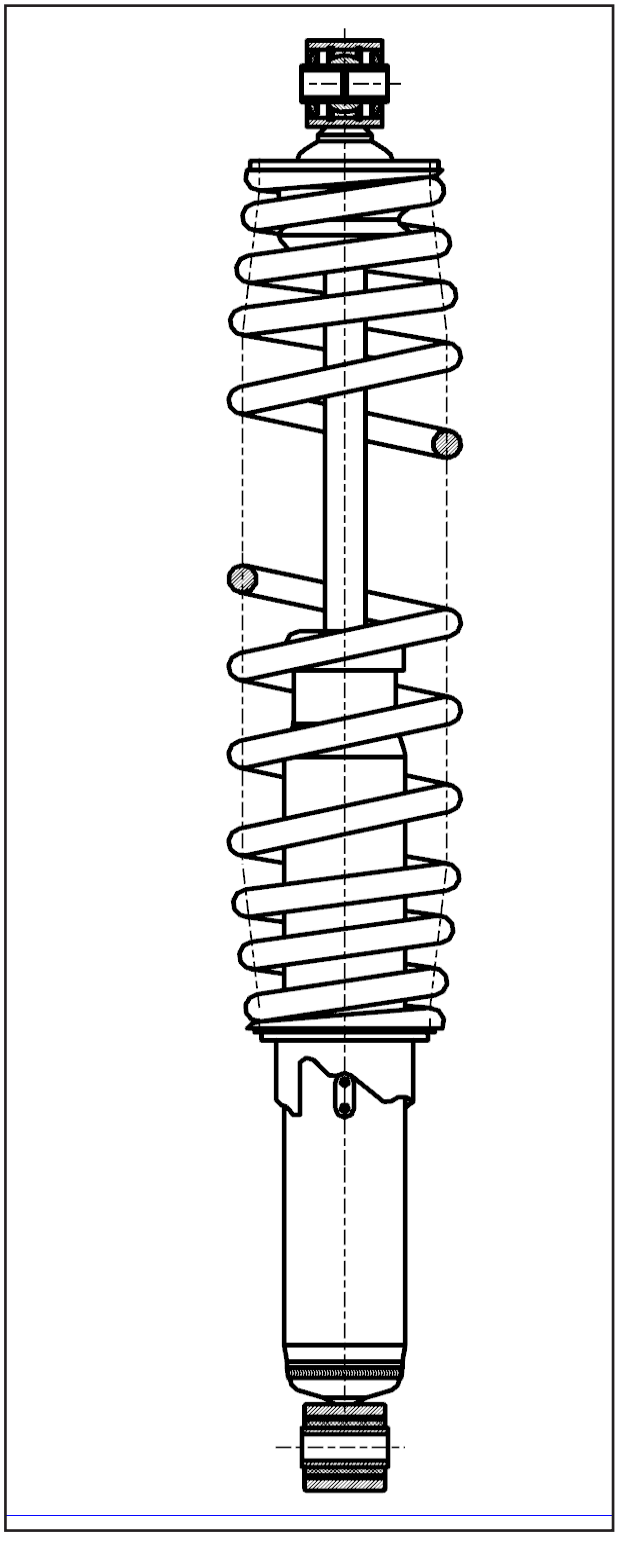


Inspection
Inspect shock absorber appearance for cracks or damage. Replace if any defect is found.
Clean the dirt on shock absorber.

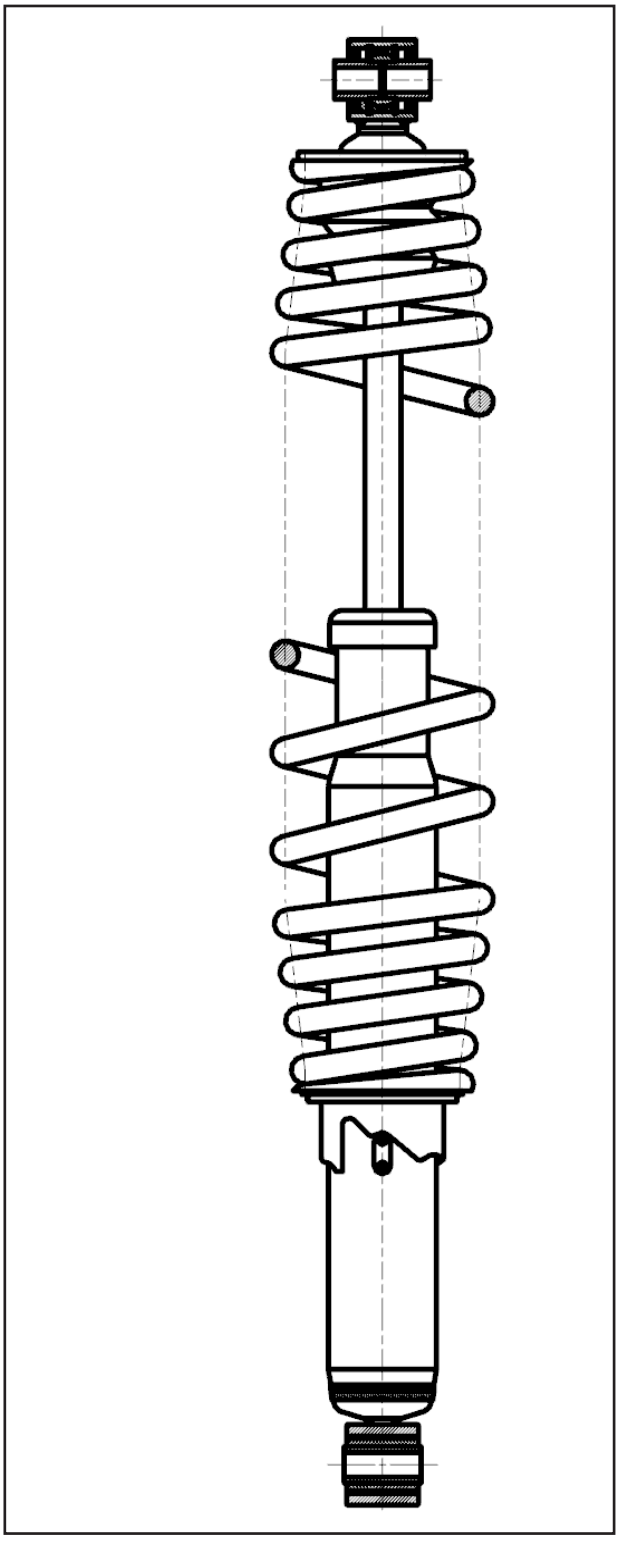
Shock Absorber Adjustment
Turn the adjusting retainer on shock absorber with absorber wrench.
Front shock absorber factory setting: 2nd gear
Rear shock absorber factory setting: 2nd gear



Front Shock Absorber



Rear Shock Absorber

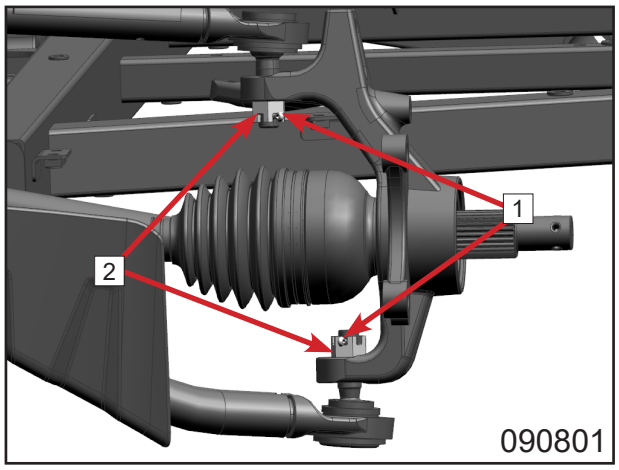


9.5 Front Swing Arm

Removal

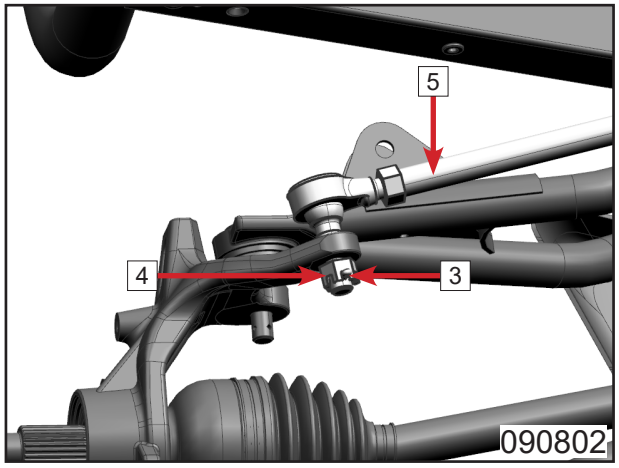
Remove cotter pins 1.
Remove slotted nuts 2.

Nut torque: 40N·m~50N·m

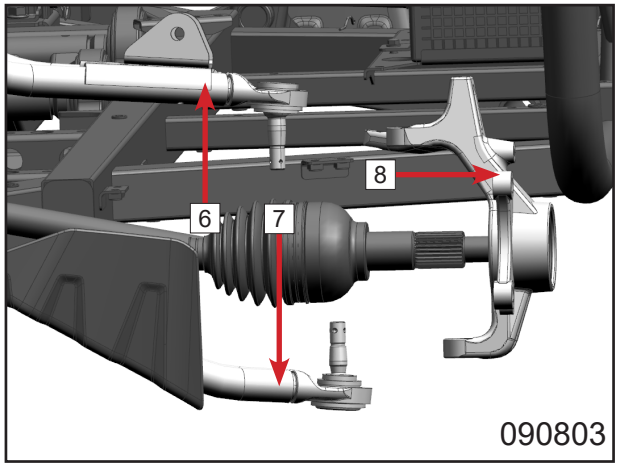


Remove cotter pins 3.
Remove slotted nuts 4.
Remove steering tie rod 5.

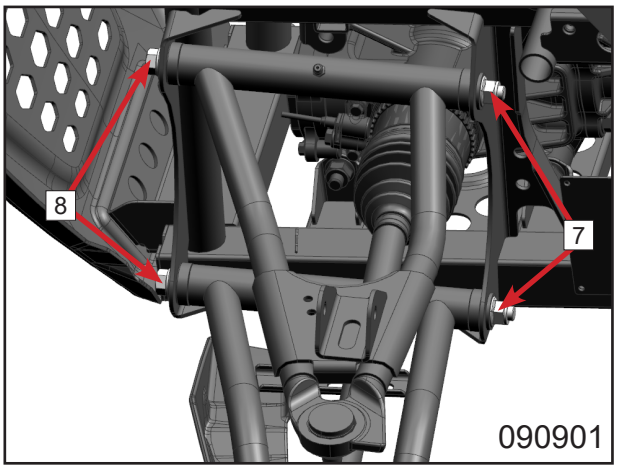
Nut torque: 40N·m~50N·m



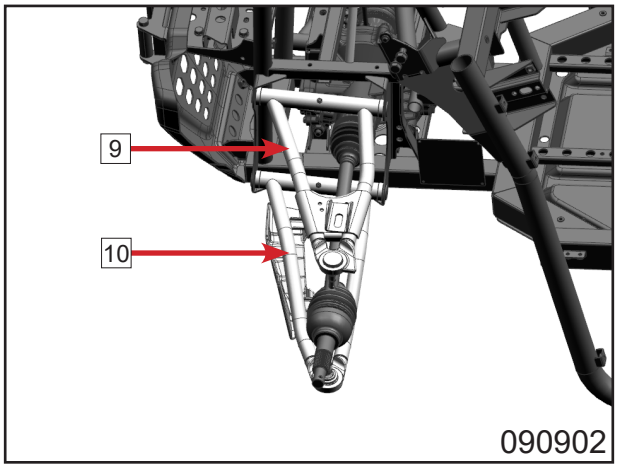
Loosen upper swing arm 6.
Loosen lower swing arm 7.
Remove steering knuckle 8.



Remove nuts [7] .
Remove bolts and washers [8] .

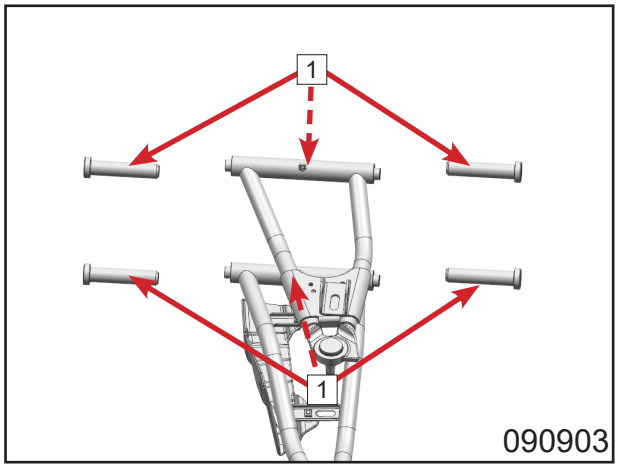


Remove front LH upper swing arm [9] .
Remove front LH lower swing arm [10] .
Front RH swing arms refer to same removal procedures.



Inspection

Inspect swing arm for cracks or damage. Replace if any defect is found.
Inspect if swing arm movement is smooth or not.
Add grease from nozzle if there is stuck or blocking feeling. (Refer to Maintenance Schedule.)
Inspect swing arm if it is stable or shaky. Replace bushings [1] if swing arm shakes. If swing arm still shakes after bushing replacement, replace swing arm.
Inspect steering knuckle for dirt or rust. Replace if any defect is found.



Installation

Reverse the removal procedures for installation.

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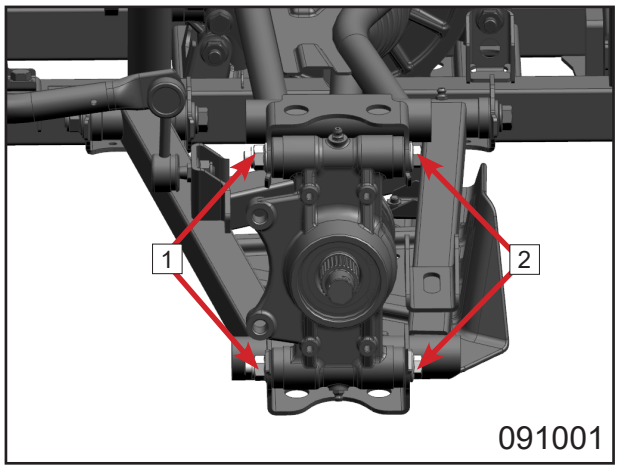
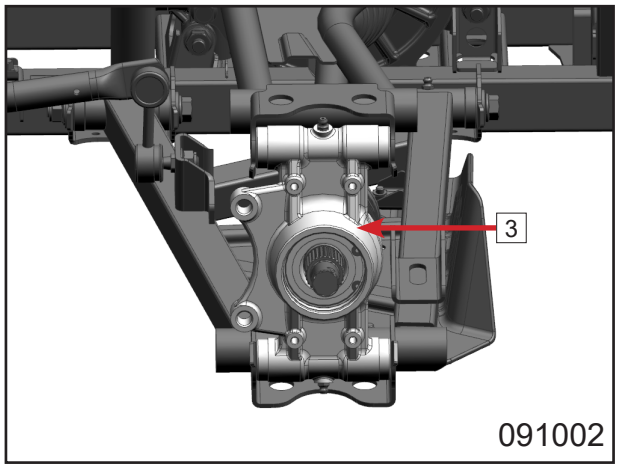
9.6 Rear Swing Arm

Removal

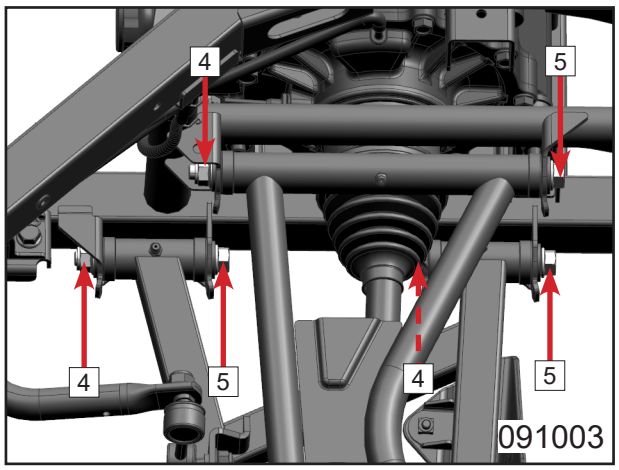
Remove nuts 1 .
Remove bolts 2 .



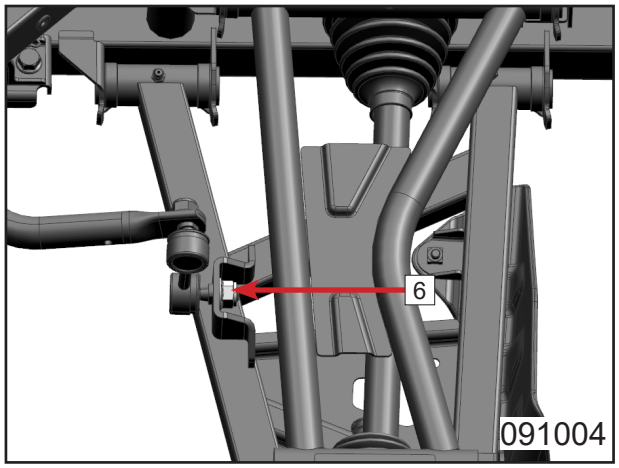
Remove steering knuckle 3.



Remove nuts 4 .
Remove bolts 5 .



Remove nuts 6 .

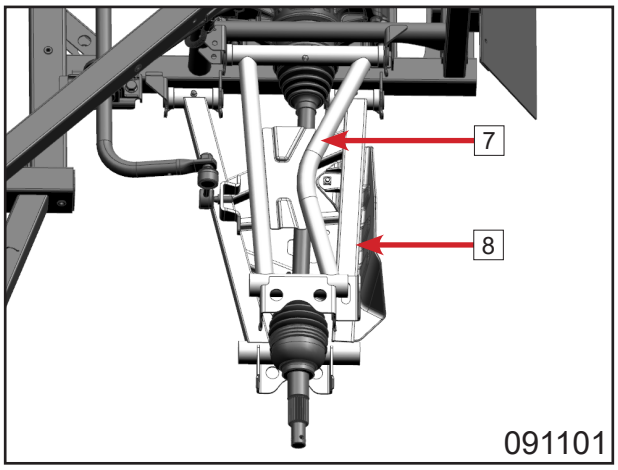


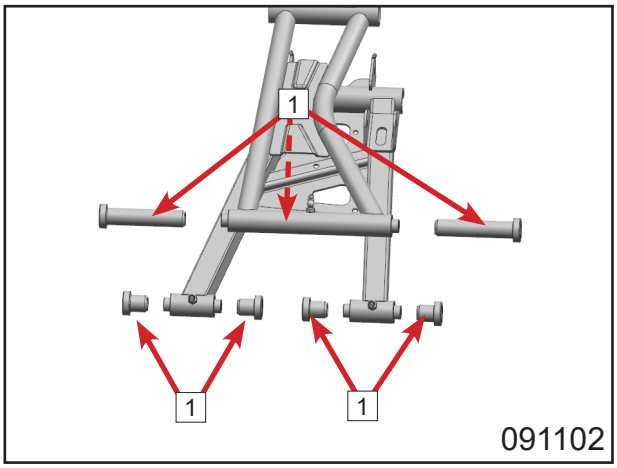
Remove rear LH upper swing arm [7] .
Remove rear LH lower swing arm [8] .

Rear RH swing arms refer to same removal procedures.

Inspection
Inspect swing arm for cracks or damage. Replace if any defect is found.
Inspect if swing arm movement is smooth or not.
Add grease from nozzle if there is stuck or blocking feeling. (Refer to Maintenance Schedule.)
Inspect swing arm if it is stable or shaky. Replace bushings [1] if swing arm shakes. If swing arm still shakes after bushing replacement, replace swing arm.
Inspect steering knuckle for dirt or rust. Replace if any defect is found.

Installation
Reverse the removal procedures for installation.

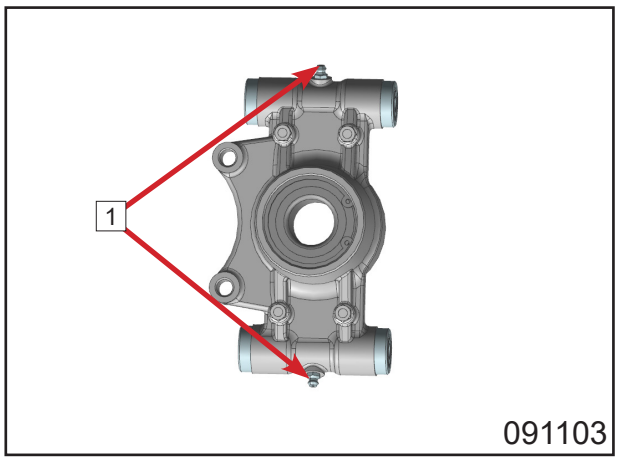




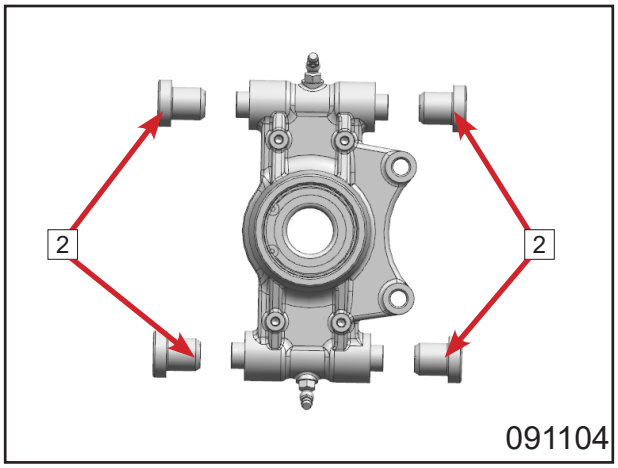
9.7 Steering Knuckles

Inspection
Inspect steering knuckles for moisture, dirt, rust or wear. Replace if any defect is found.

Add grease from nozzle[1]. (Refer to Maintenance Schedule.)

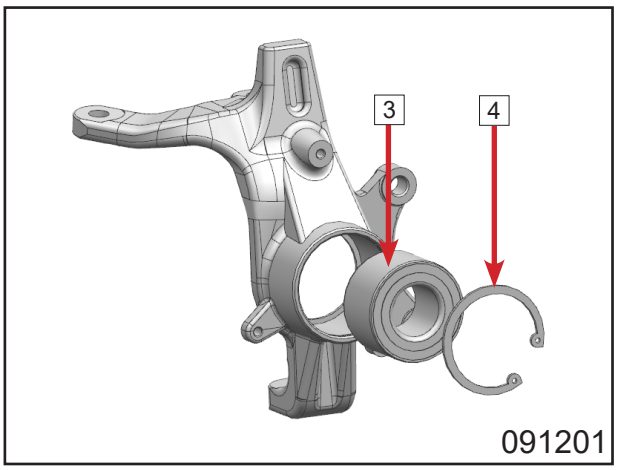


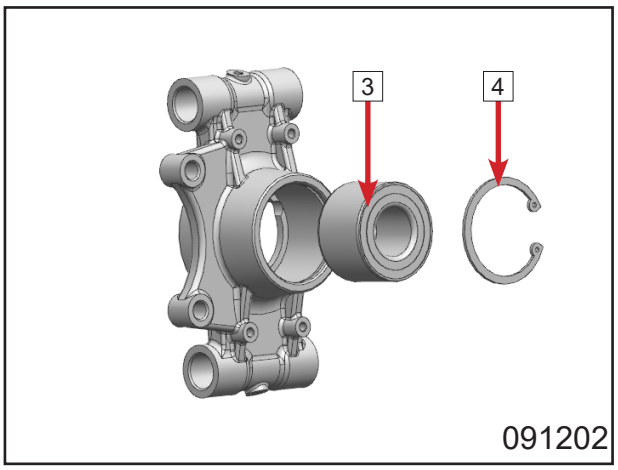
If steering knuckle shakes or bushings are damaged or cracked, replace steering knuckle bushings [2].
Old bushings can't be reused after removal.



Inspect bearing 3 for damage or other defects. If yes, remove circlip 4 and replace bearing.

NOTE: Steering knuckle bearings need professional device to compress them.

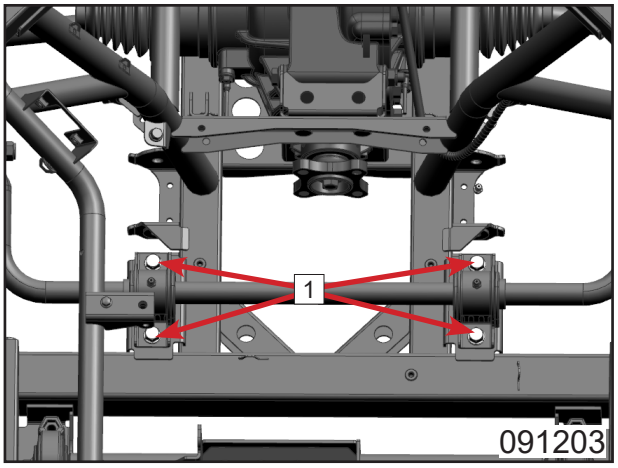




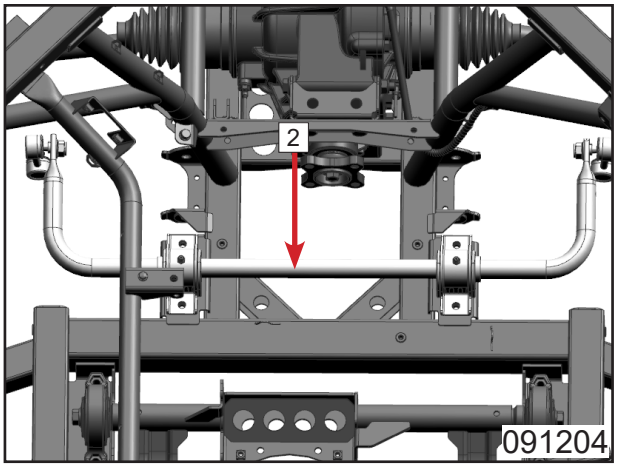
9.8 Rear Sway Bar

Removal

Remove bolts 1.



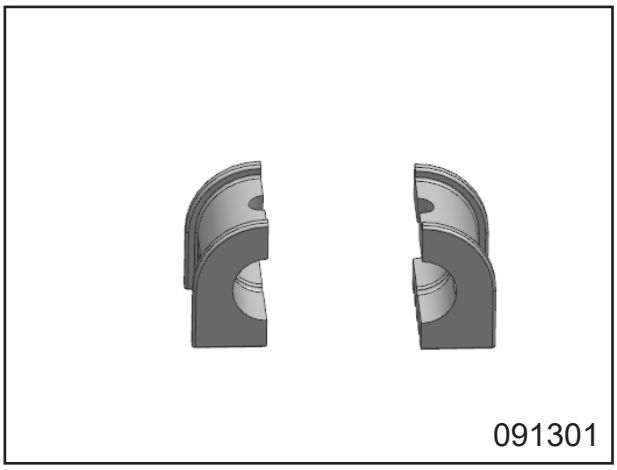
Remove rear sway bar 2.



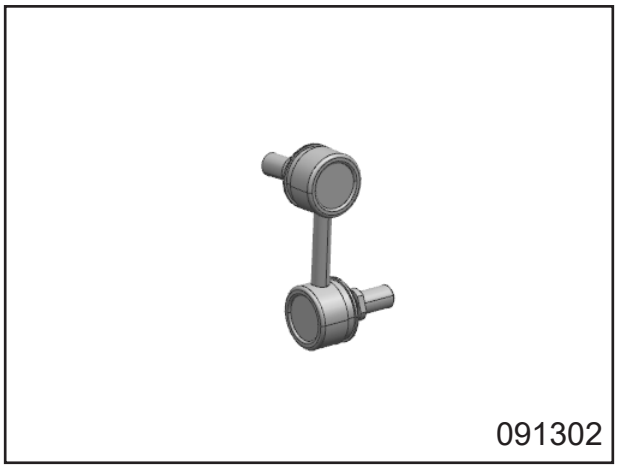
Inspection
Inspect sway bar for cracks, rust or wear. Replace if any defect is found.

Inspect sway bar seats. Replace if damage, cracks or other defect is found.

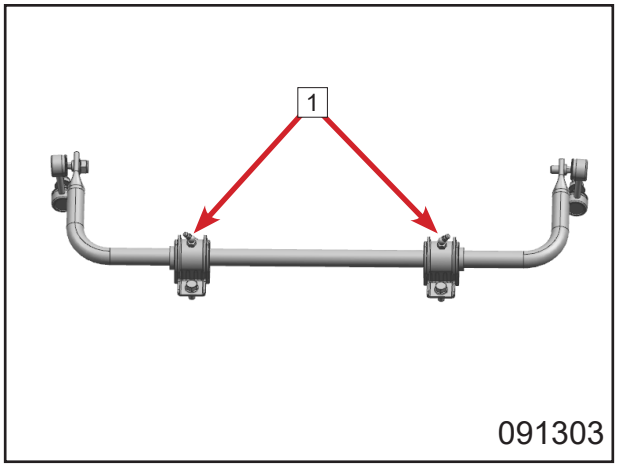
Inspect sway bar supporting seats lubrication. Add grease if necessary.


091301

Inspect ball pin assembly for smooth performance. Replace if necessary.
Inspect ball pin dust boot for cracks or other defects. Replace if necessary.


091302

Installation
Add grease from nozzle 1. (Refer to Maintenance Schedule.)
Reverse the removal procedures for installation.



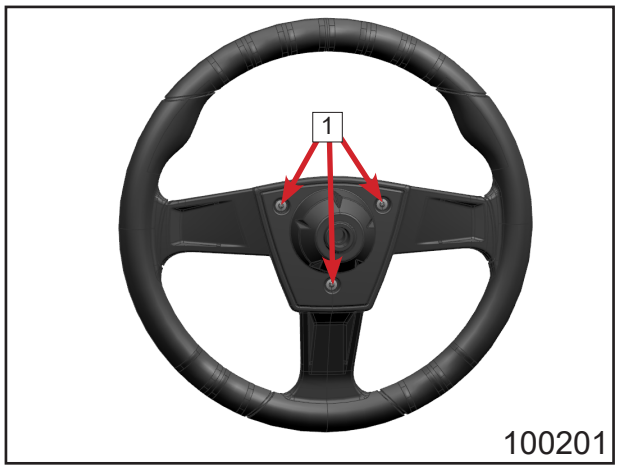
091303

10.1 Steering System

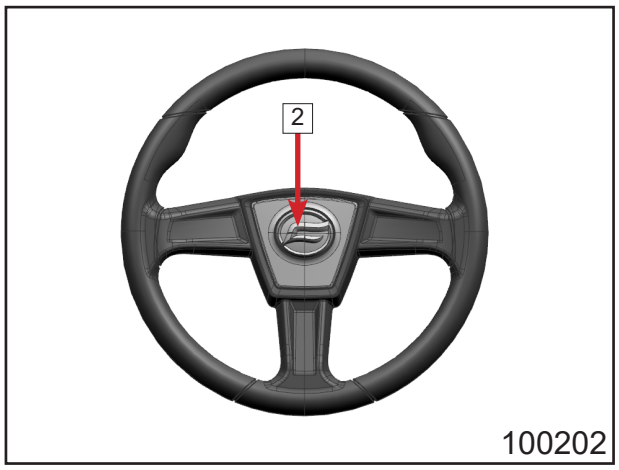
10.1.1 Steering Wheel

Removal

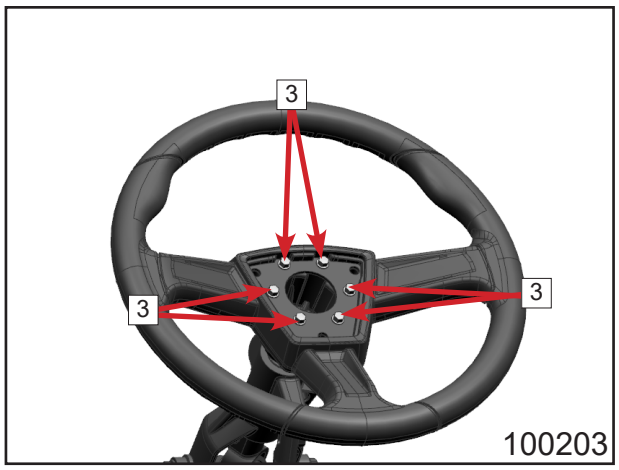
Remove screws 1.



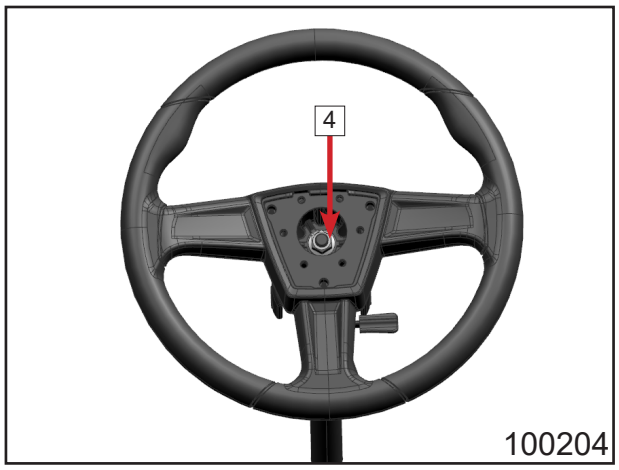
Remove steering wheel deco cover 2 .



Remove bolts 3 .



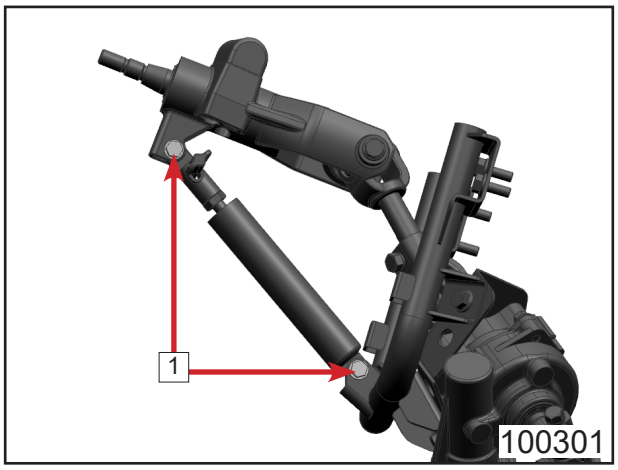
Remove nut 4 .



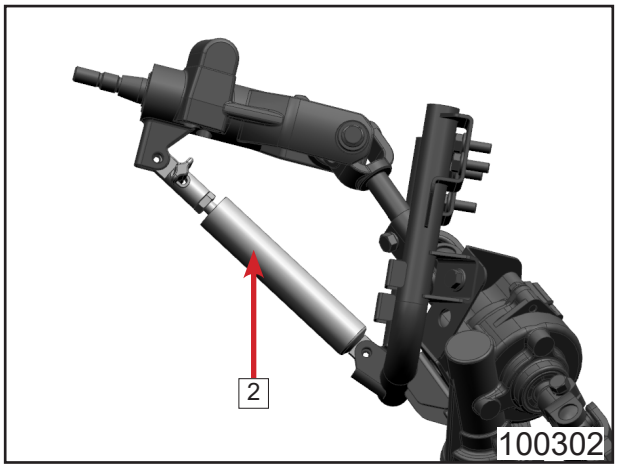
10.1.2 Gas Spring Assy

Removal

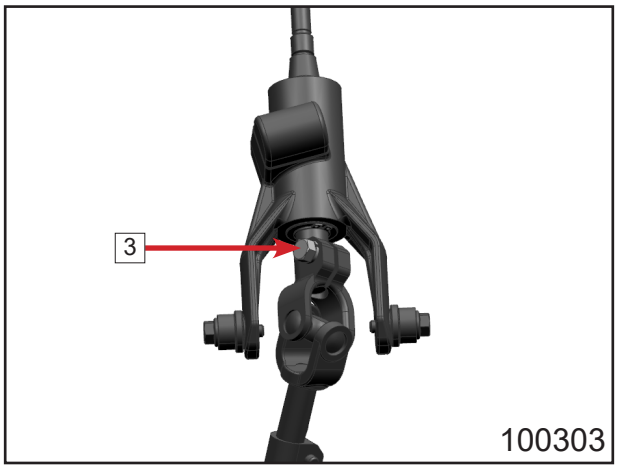
Remove bolt and nut 1 .



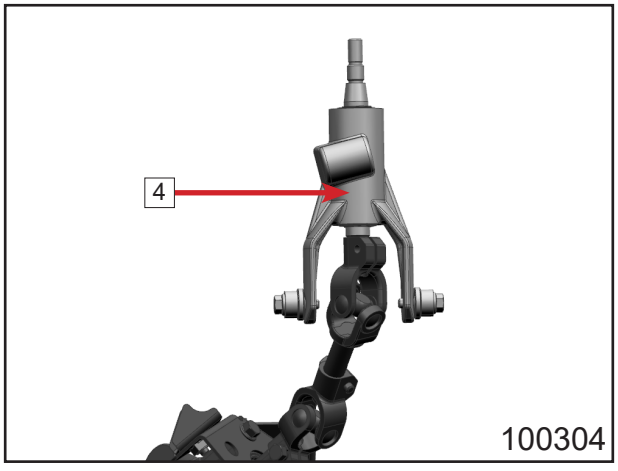
Remove gas spring assy 2 .



Remove bolt 3 .



Remove steering wheel bracket 4 .

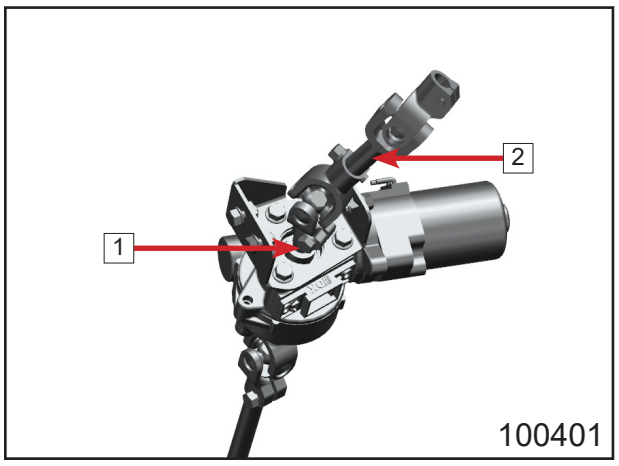


10.1.3 Upper Steering Universal Shaft Assy

Removal

Remove bolt and washer 1 .

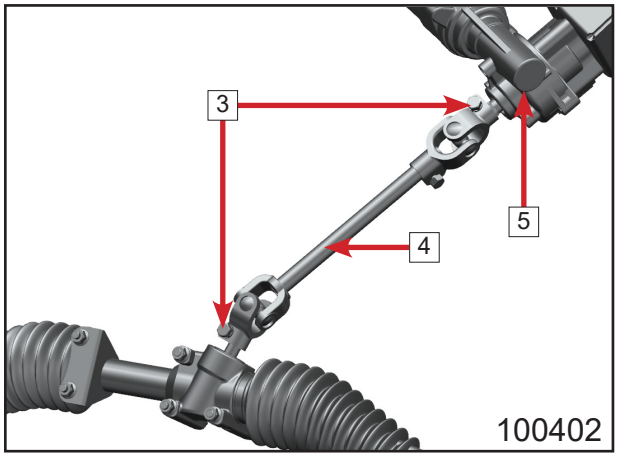
Remove upper steering universal shaft assy 2 .



Loosen two bolts 3 .

Remove steering universal shaft assy 4 .

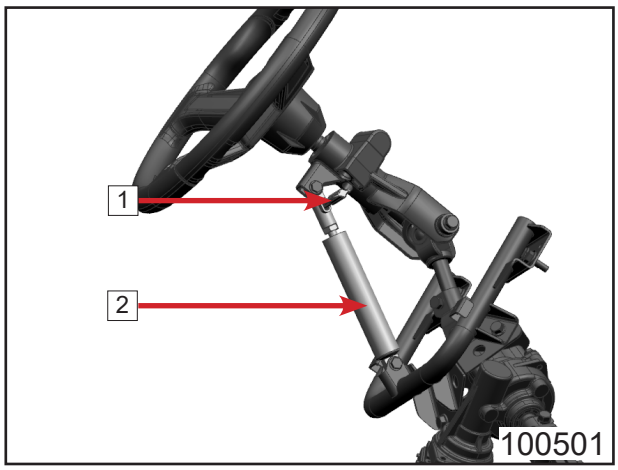
Remove EPS 5 .



10.2 Steering System Adjustment

10.2.1 Steering Wheel Height Adjustment

Turn gas spring wrench [1] up and down to adjust gas spring [2] height. Thus, adjust the height of steering wheel. Adjust to comfortable position.



10.2.2 Steering Column and Steering Wheel Inspection

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.

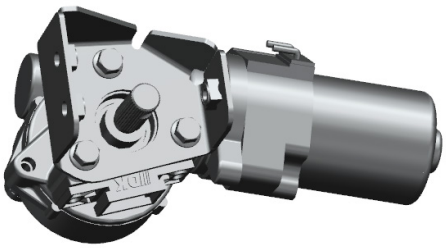
Position the vehicle on level ground. Turn the steering wheel slowly to inspect for smooth movement.

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.

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.



100601

EPS fuse location refers to Chapter 12 Electrical System.

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

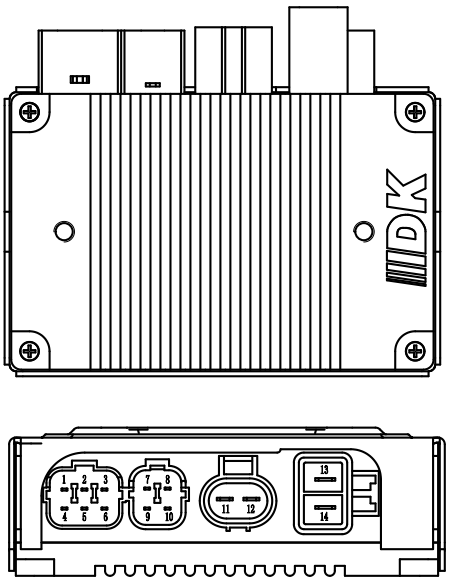
If the vehicle is equipped with the EPS system:

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

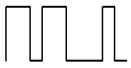
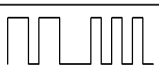
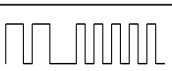


EPS Connector Outside View

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

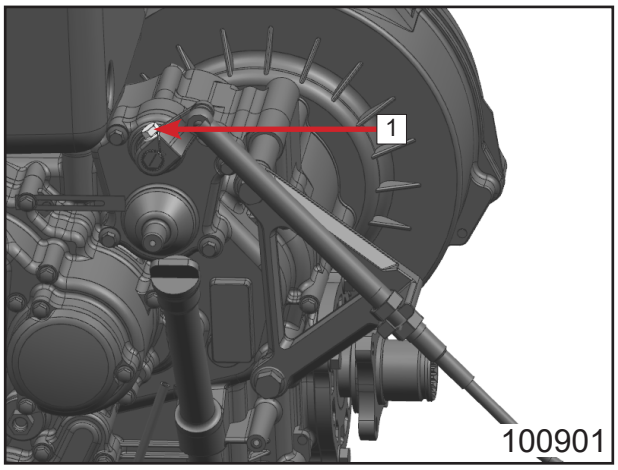
EPS Fault Analysis and Troubleshooting

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

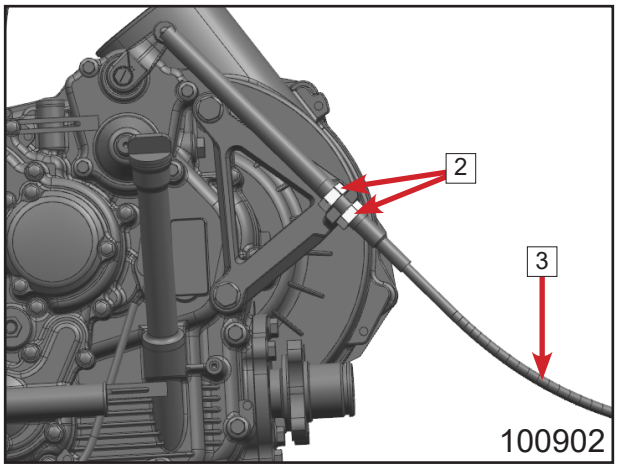
10.4 Gearshift Assy

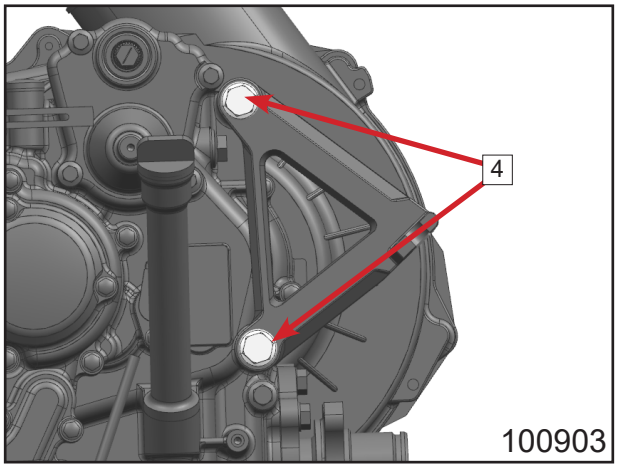
Removal

Remove bolt 1.

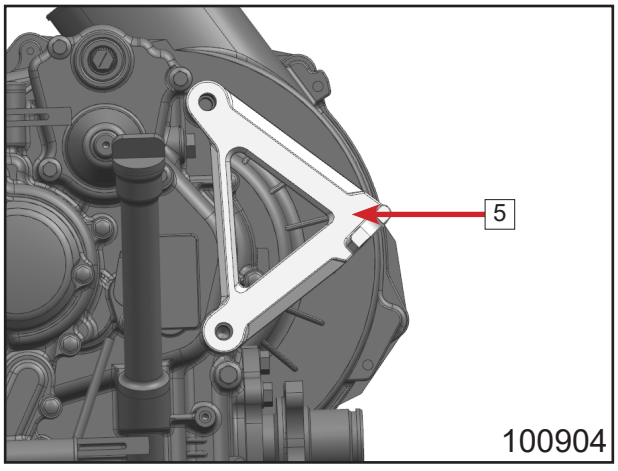


Remove adjusting nut 2 .
Loosen gearhsift cable 3 .



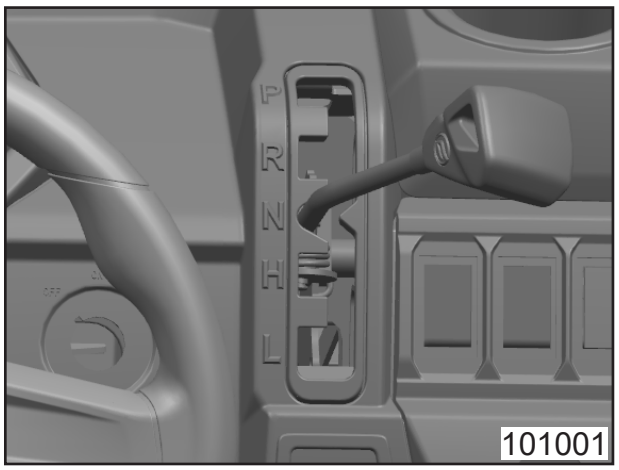


Remove gearshift cable lower bracket 5 .



Inspection

Inspect shift lever for smooth movement. Adjust it according to following procedures if not smooth.



Adjustment

Adjust shift lever.

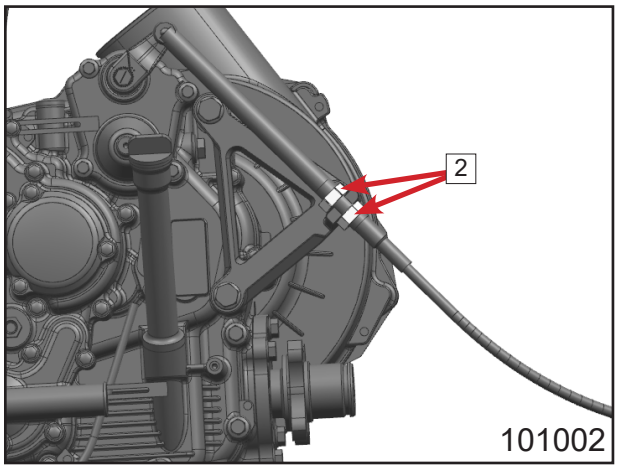
Shift lever at N gear.

Loosen two nuts 2. Adjust shift rod repeatedly until it is at N gear.

Tighten two nuts 2.

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.



11.1 Coolant Specification

Mix ratio 1:1

Item	Capacity
Cooling system (without reservoir tank)	3.6 L
Coolant replacement (without reservoir tank)	3.5 L
Reservoir tank	0.3~0.59

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.)

⚠WARNING: Make sure radiator cools down when making operations on it.

⚠WARNING: Never remove pressure cap when engine is at high temperature to avoid burns.

⚠WARNING: Never open the radiator cap until the engine cools down to avoid burns caused by liquid coolant.

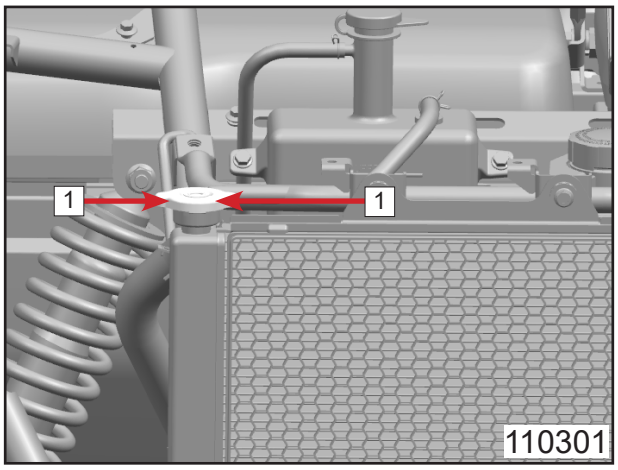
⚠CAUTION: Do not use pure antifreeze or water in cooling system. Pure water contains minerals and tends to produce contaminants in cooling system during usage. In cold season, pure water can cause system damage or thicken the coolant, which decreases cooling efficacy. For aluminum engines, it is strongly recommended to adhere to ethylene glycol coolant containing preservatives.

11.2 Cooling System

Removal

Before making operations on cooling system, make sure radiator cools down to avoid burns.

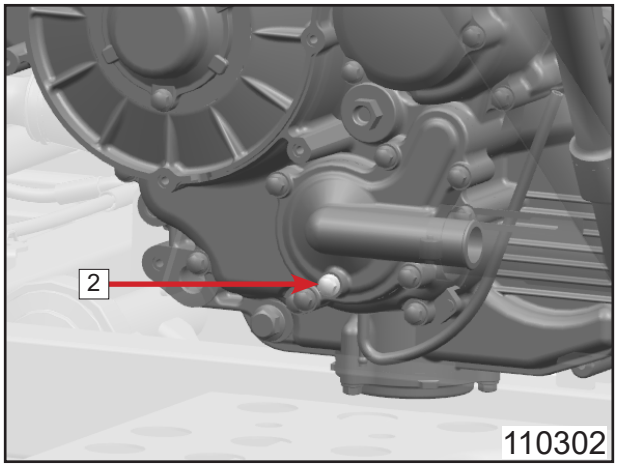
Open radiator cap 1.



Place a container under the engine water pump.

Remove drain bolt 2.

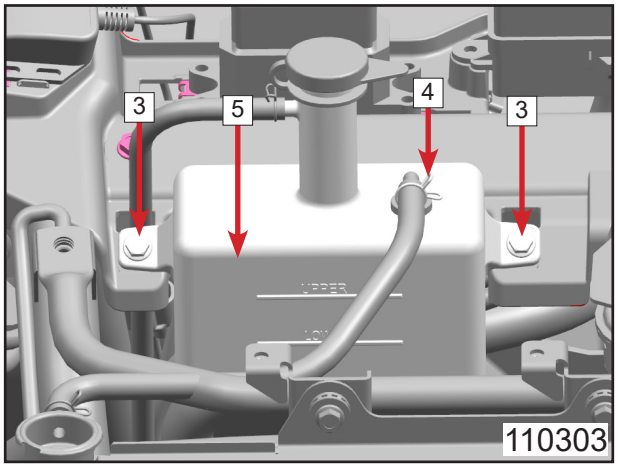
Drain coolant. (Water pump maintenance refers to Chapter 05 Water Pump.)



Remove bolts 3.

Remove clamp 4.

Remove reservoir tank 5.

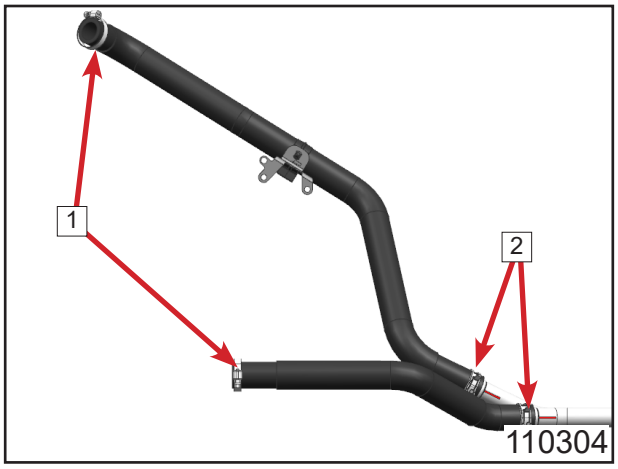


11.3 Cooling Pipes

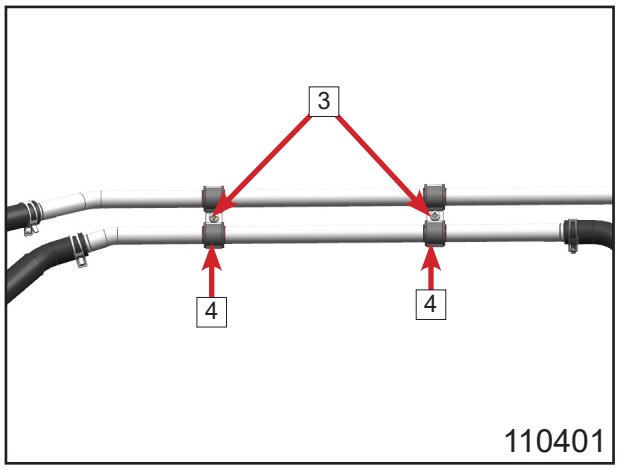
Removal

Loosen steel clamps 1.

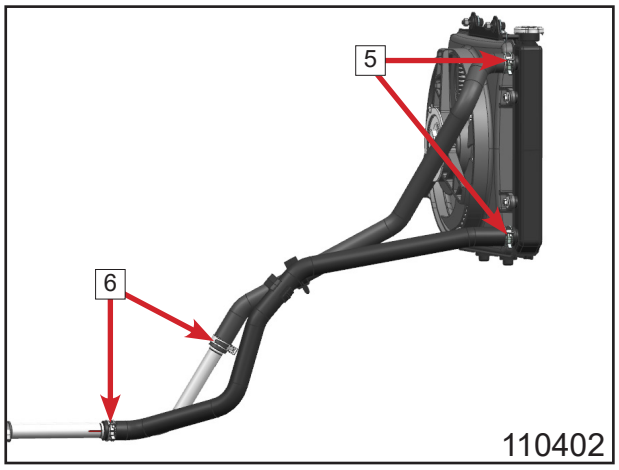
Loosen water pipe clamps 2.



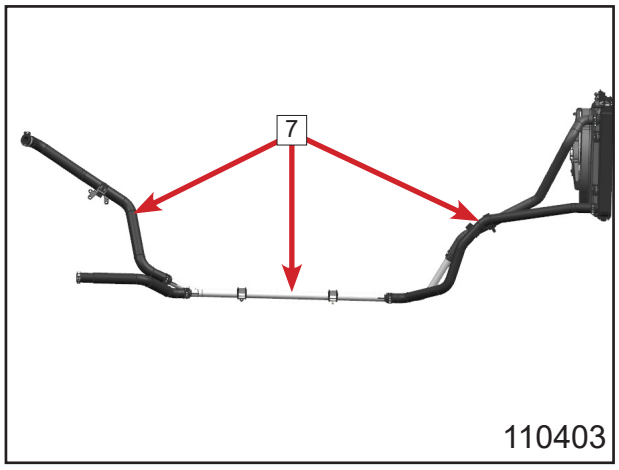
Remove bolts [3].
Remove water pipe clamps [4].



Loosen steel clamps [5].
Loosen water pipe clamps [6].

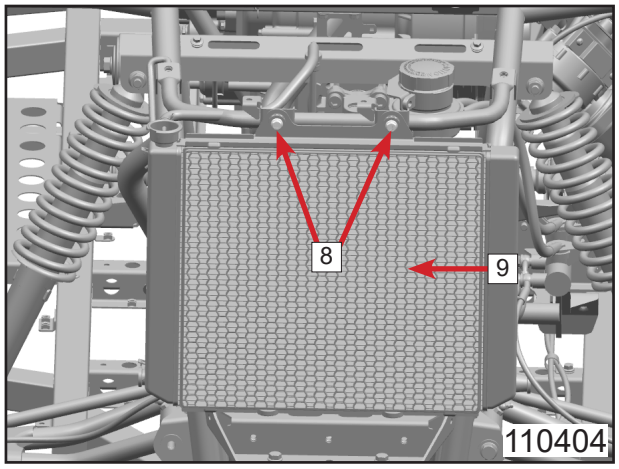


Remove water pipes [7].



Remove two bolts [8].
Remove radiator [9].

Installation
Reverse the removal procedures for installation.



11.4 Fan Motor

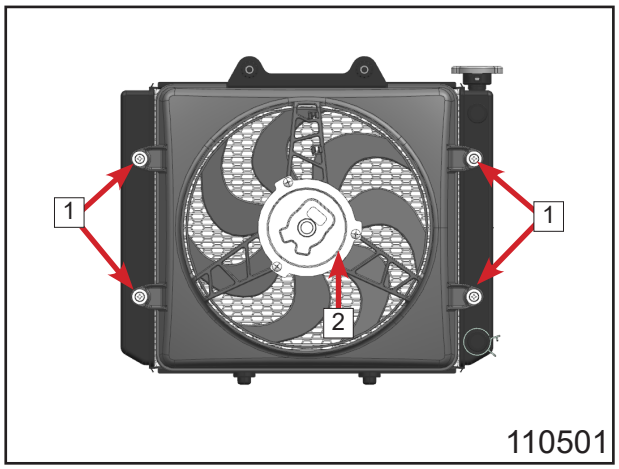
emoval

Remove four bolts 1.

Remove fan 2.

Installation

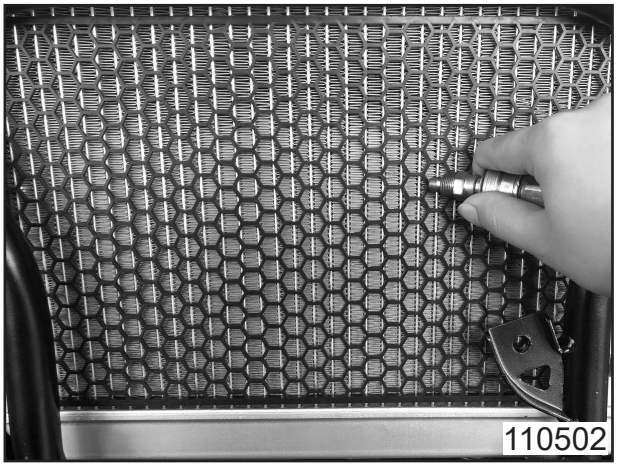
Reverse the removal procedures for installation.



Inspection

Inspect the radiator fin to see jammed or damaged. Use compressed air or low pressure water to clean the muds or other dirt.

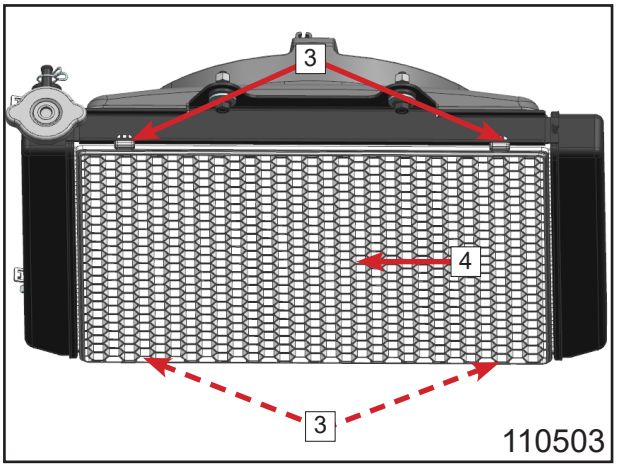
NOTE: Do not clean radiator when the temperature is still high. Operate until radiator cools down.



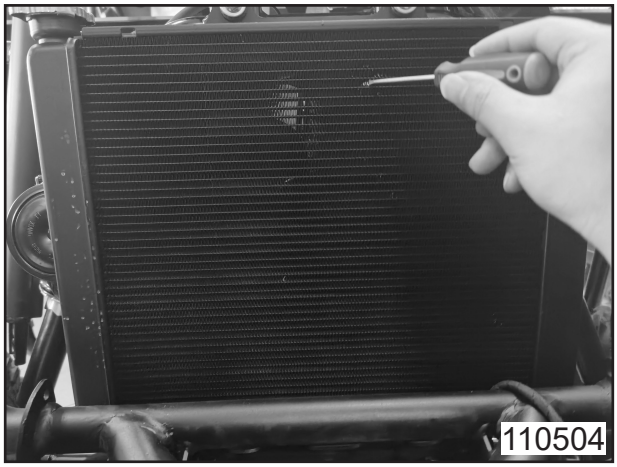
NOTE: It is not recommended to use high pressure water to clean radiator fin. If so, the radiator fin may be damaged, which affects the cooling function.

NOTE: If deposits, suck as dirt, dust or leaves, store on radiator fin, it affects the cooling function.

There two hooks 3 on the top and bottom. Unplug hooks and remove radiator guard 4.

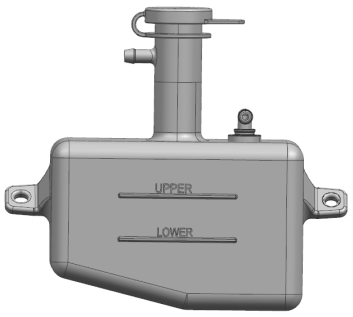


Use screw driver to fix radiator fin.



Reservoir Tank

Inspect reservoir tank for cracks or damage. Replace if any defect is found.
Inspect reservoir tank hose for cracks or damage. Replace if any defect is found.



110601

Water Pipe Clamp

Inspect water pipe clamp for wear, deformation or cracks. Replace if any defect is found.

110602

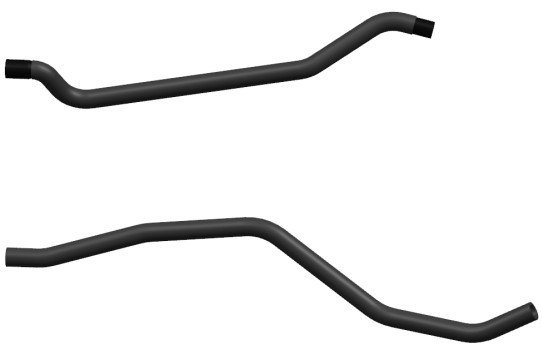
Clamp

Inspect clamp for wear, deformation or cracks. Replace if any defect is found.

110603

Water Inlet and Outlet Pipe

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.



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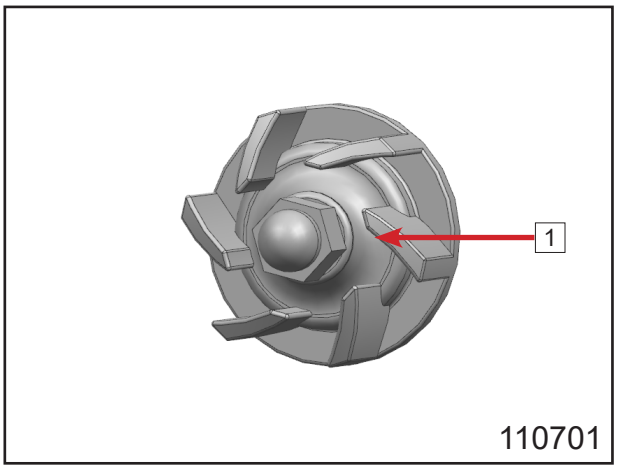
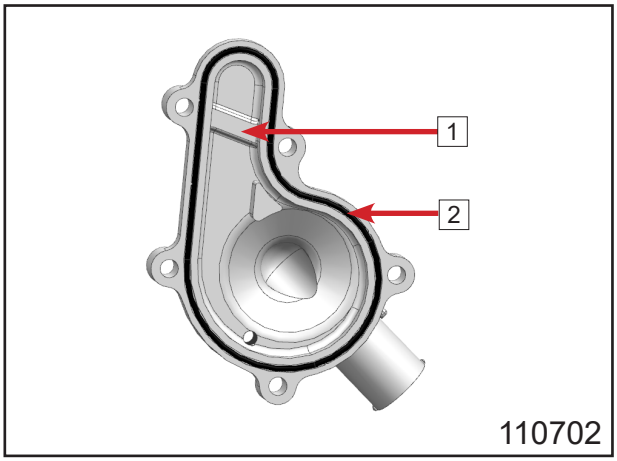
Water Pump Inspection
(Water pump removal refers to Chapter 05 Water Pump Removal section.)

Water Pump Impeller
Inspect water pump impeller 1 for damage. Replace if any defect is found.



Water Pump Cover
Inspect water pump cover 1 for cracks or damage. Inspect sealing surface for sinks or budges. Replace if any defect is found.
Inspect water pump seal ring 2 for damage, cracks or deformation. Replace if any defect is found.



11.5 Radiator Fan Inspection

Fan Motor Inspection

When fan function is abnormal, check fan motor circuit, grounding, fuses and relays.

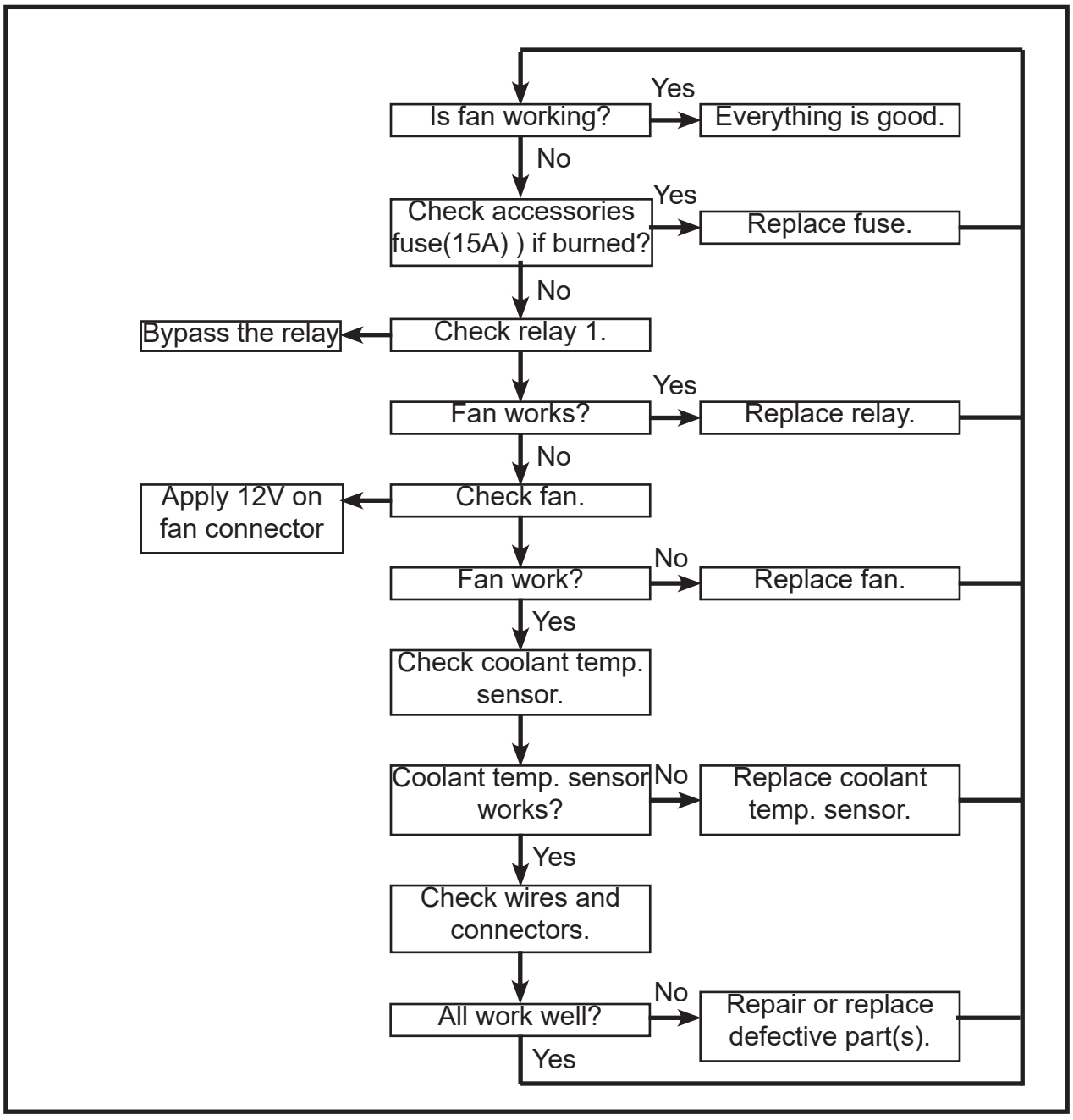
If fan rotates while sensor wires are disconnected, but it doesn't work when engine is overheating, check coolant temperature sensor and connectors.

Engine Coolant Temperature Sensor

Coolant temperature sensor is installed on thermostat cap, which is to measure temperature of coolant. It is a NTC thermo resistance. The resistance becomes lower when the air temperature becomes higher, but it is not a liner relationship (details refer to Chapter 12 Electrical System).

Coolant passes through thermostat housing and sensor probe, which changes resistance values. The signal transfers to ECU. It is processed by the ECU and compared to the program to determine fuel and ignition requirements during operation. The ECU also uses this signal to determine when to activate the cooling fan during operation.

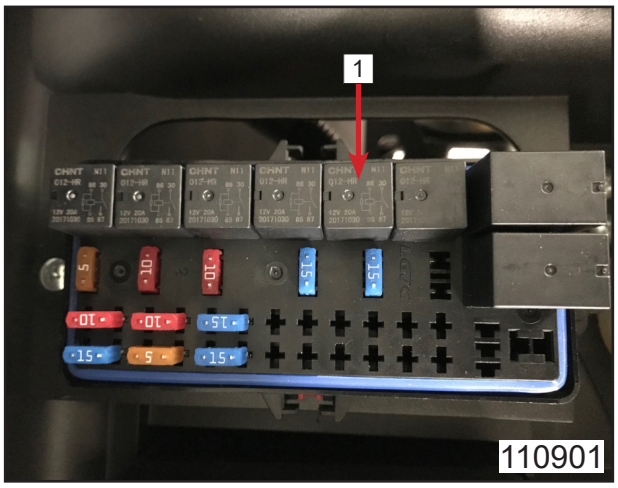
Use the following troubleshooting chart to solve the problem.



Radiator Fan Relay

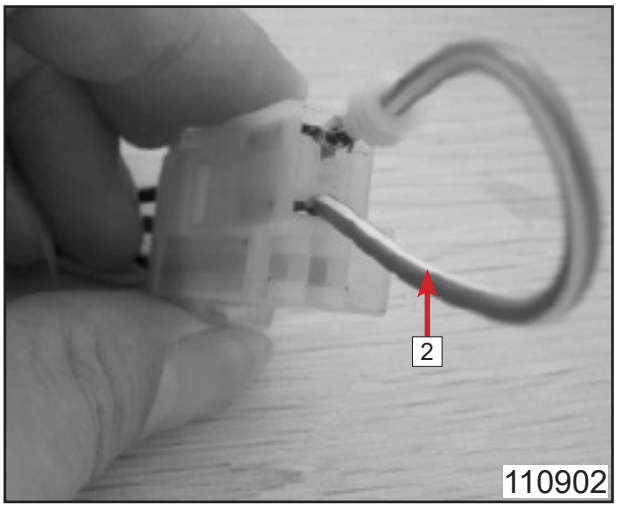
Relay [1] Installation

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

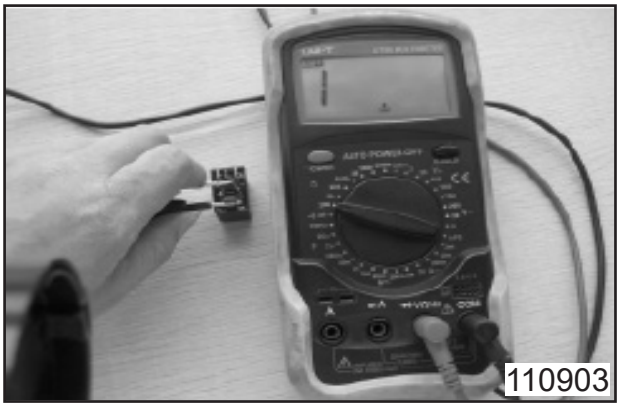
The easiest way to check the relay is to remove it and bypass it with a jumper [2].
If the radiator fan is activated, replace the relay.
See illustration on the right to find where to bypass the relay.



Relay Continuity Test

Remove relay.
Use multimeter and select the Ω position.
Probe relay as follows:

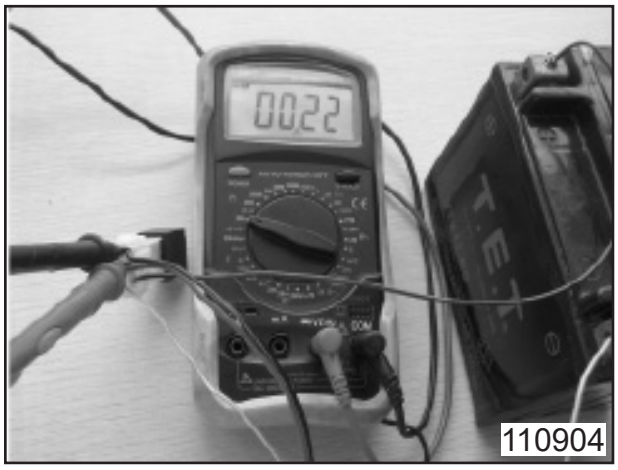
Terminals		Resistance
30	87	Open circuit (OL)



Connect battery as picture shows:

Terminals		Resistance
30	87	Open circuit (OL)

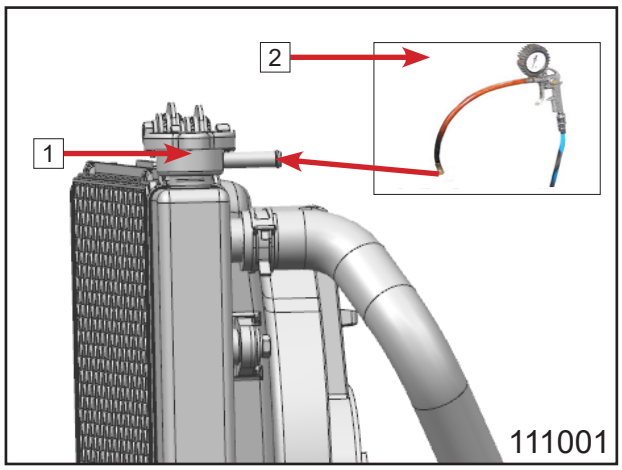
If relay fails during test, replace it.



11.6 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 0.15±0.015Mpa 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.

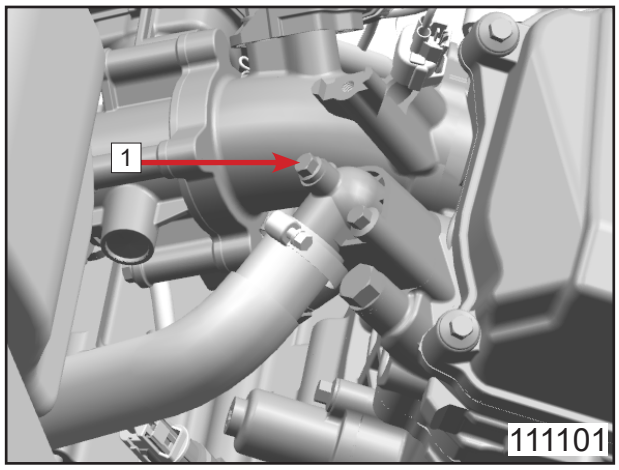
Inspect radiator pipe for damage or cracks. Rubber hoses become aged because of being heated or long-time use. Pipes may break during heating process. Inspect pipes for cracks or damage by pinching it. Replace if any defect is found.

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.

11.7 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.

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

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

⚠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.

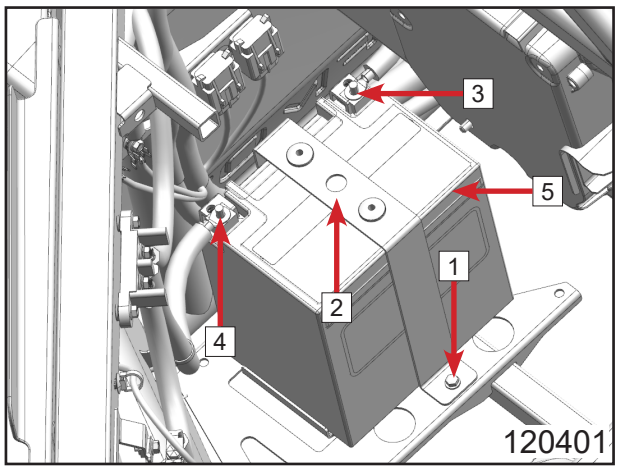
Battery Charging

⚠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.

Shut down all electrical devices and engine during removal.

Removal

Remove lock bolt [3] and battery negative cable.
Remove lock bolt [4] and battery positive cable.
Remove bolt [1].
Remove battery strap [2].
Remove battery [5].



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.

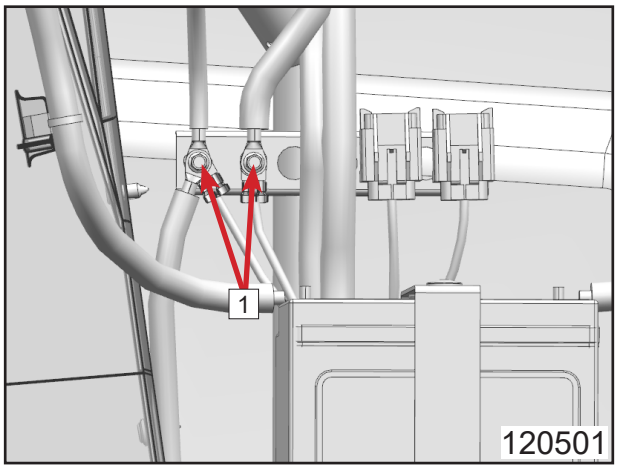
12.2.2 Charging Voltage Inspection

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.

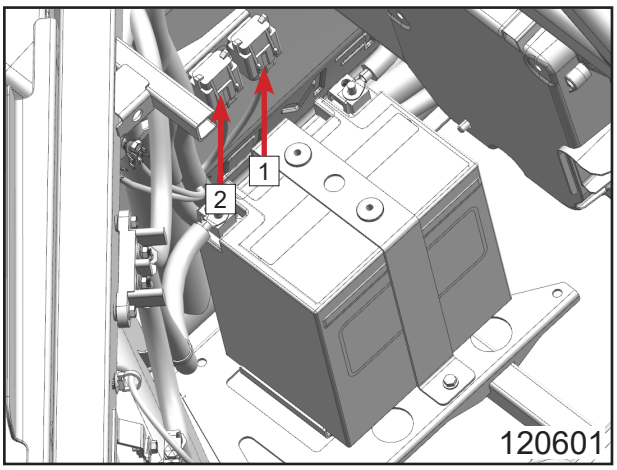


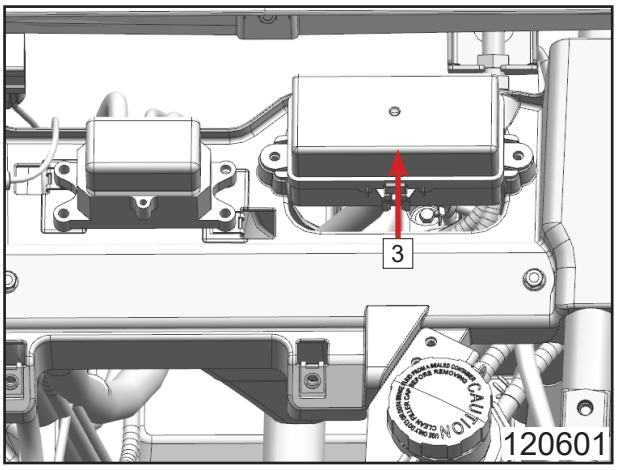
12.3 Earth Wire Inspection

Shut down all electrical devices and engine.
Inspect earth wire for normal function.
Inspect bolt 1 for looseness.

12.4 Fuse

1 EPS fuse 40A.
2 Main fuse 40A.
3 Fuse box





12.5 Light Maintenance Information

Pre-cautions

⚠CAUTION:
Headlight is a hight watt light. The temperature is very high when it is on. Make operation until the light totally cools down.
Temperature alarm switch inspection uses fire source and high temperature liquid. Do not place combustible material nearby and pay attention not to get burnt.
The headlight temperature will be very high when it is on. If use bear 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.
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.
Check the battery performance if use the battery for inspection.

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

12.7 Light Removal and Installation

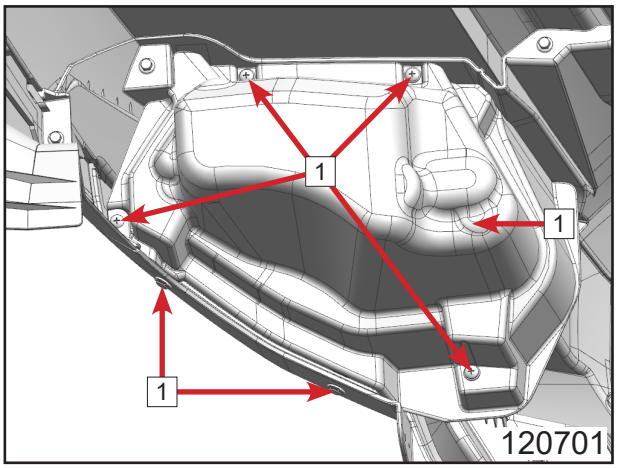
12.7.1 Headlight Assy

Lift up front guard plate.
Remove self-tapping screws 1.
Remove headlight 2.

Installation

Reverse the removal procedures for installation.

LH and RH headlight uses the same removal&installation procedures.



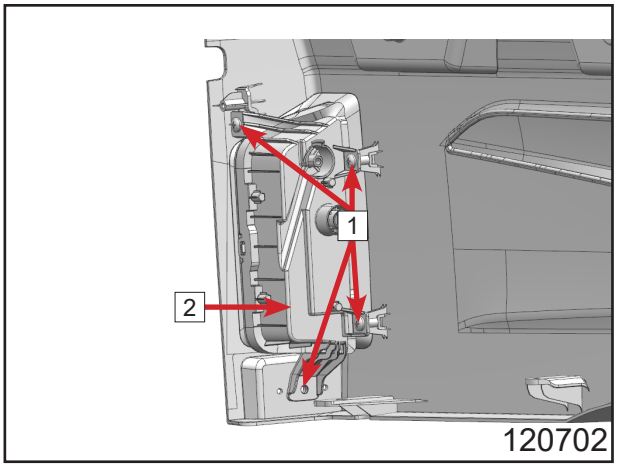
12.7.2 Tail Light Assy

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..



12.8 Horn

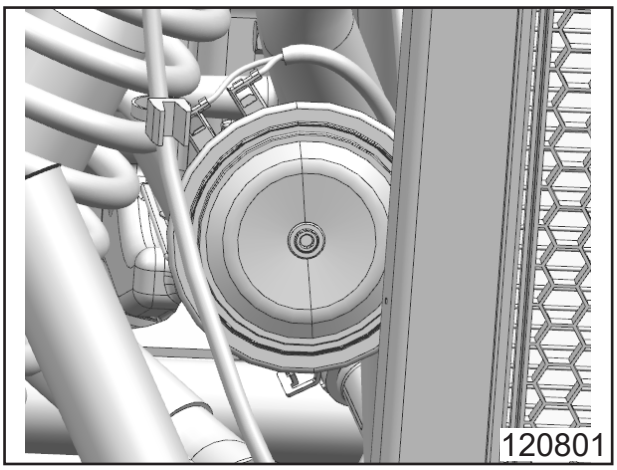
Inspection

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.



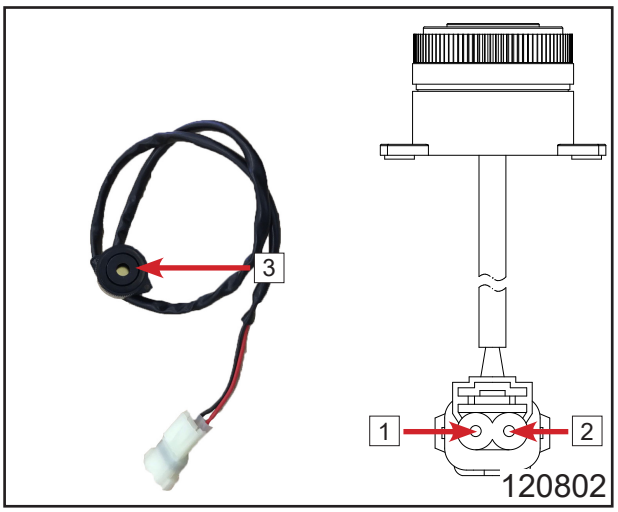
12.9 Alarm

The alarm locates under dashboard and besides dashboard cable.

EU 167: Alarming logic

	Oil pressure alarm	Coolant temp. alarm	RPM alarm
Condition	<0.06mpa	≥115°C	≥ 7000r/ min
Alarm	One short/ time	Two shorts/ time	Three short/time
Resolution	Adjust oil pressure to be proper range, then alarm disappear.	Stop vehicle, cooling the temperature to be normal state to eliminate the alarm.	Reduce the RPM to eliminate the alarm.

Signal source	Signal		
RPM (r/min)	≤1800	≤1800	>1800
Parking signal	Ground connection	Disconnect	Disconnect/ ground connection
Seat switch signal	Ground connection/ disconnect	Disconnect	Ground connection/ disconnect
Seat alarm	OPC	OPC	OPC
	OPC not work	OPC flash and alarm	OPC not work



1	Power+12V	2	Ground	3	Alarm

Removal

Remove dashboard guard(refer to 06 chapter).

Remove alarm connector.

Remove tie bands and alarm 3.

Inspection

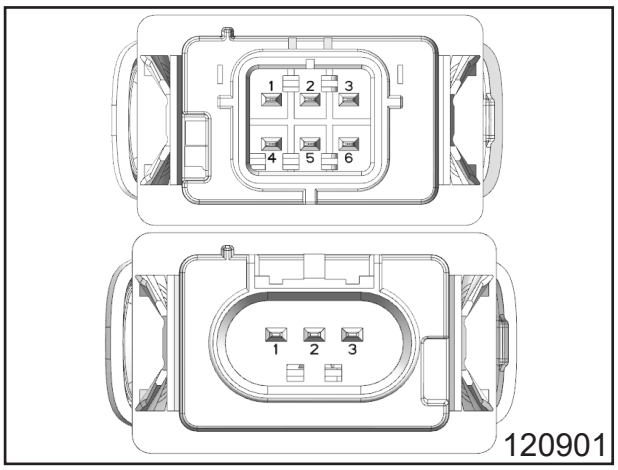
Connect alarm with 12V battery.

Check alarm performance.

Replace if any defect is found.

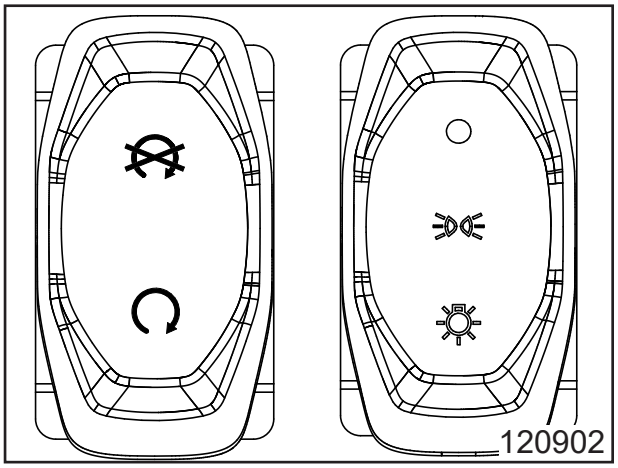
12.10 Switches

Unplug connectors between switches and main cable. Inspect switch performance.



Ignition Switch (EU)

Use \ Pin	1	2	3	4	5	6
					●	●
	●	●	●	●	●	●

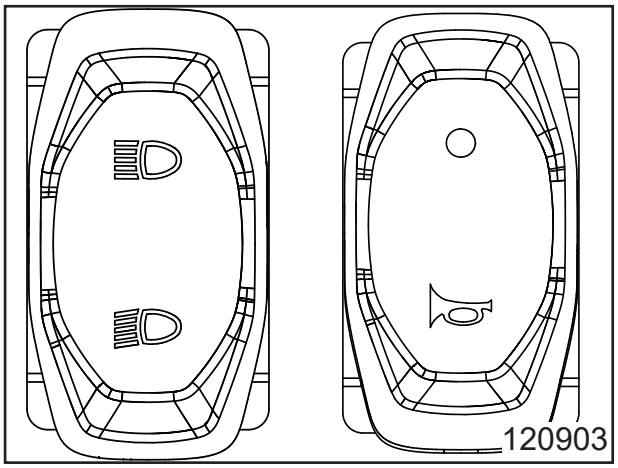


Illumination Switch

Use \ Pin	1	2	3	4	5	6
	●	●	●		●	●
		●	●		●	●
					●	●

Dimmer Switch

Use \ Pin	1	2	3	4	5	6
		●	●		●	●
	●	●		●	●	●

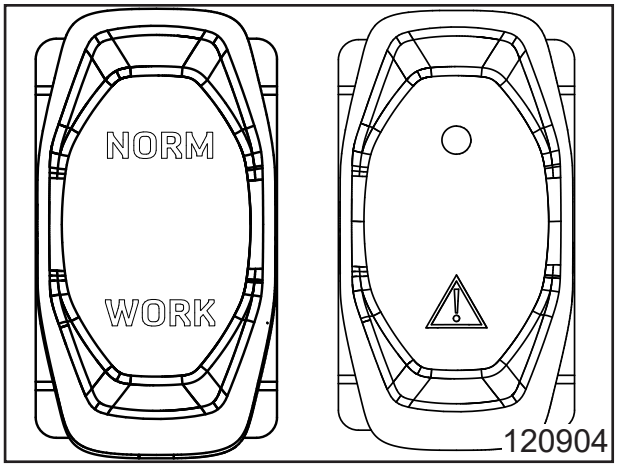


Horn switch

Use \ Pin	1	2	3	4	5	6
					●	●
	●			●	●	●

Mode Switch

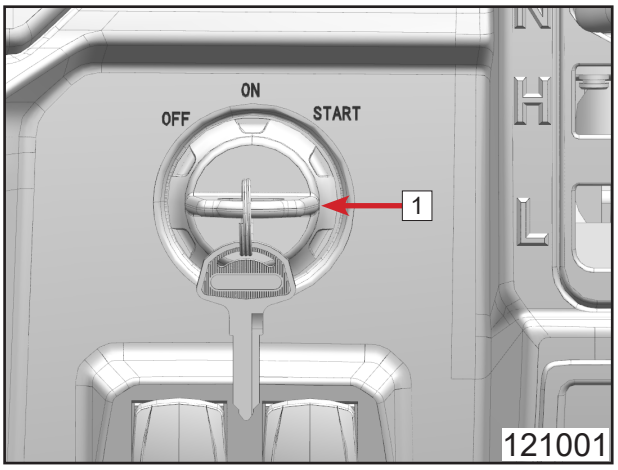
Use \ Pin	1	2	3
NORM	●		●
WORK	●	●	●



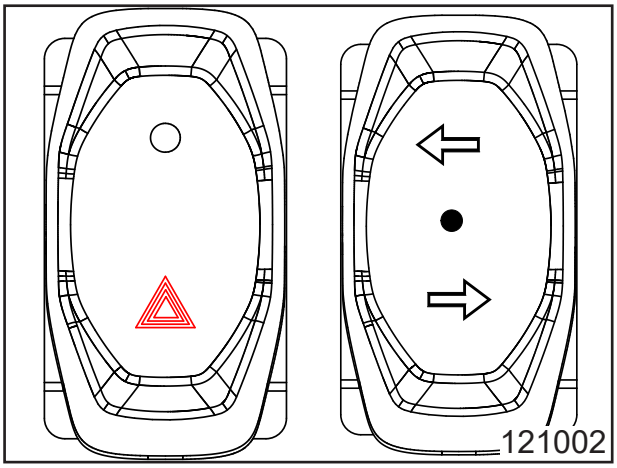
Over-ride Switch

Use \ Pin	1	2	3
	●		●
	●	●	●

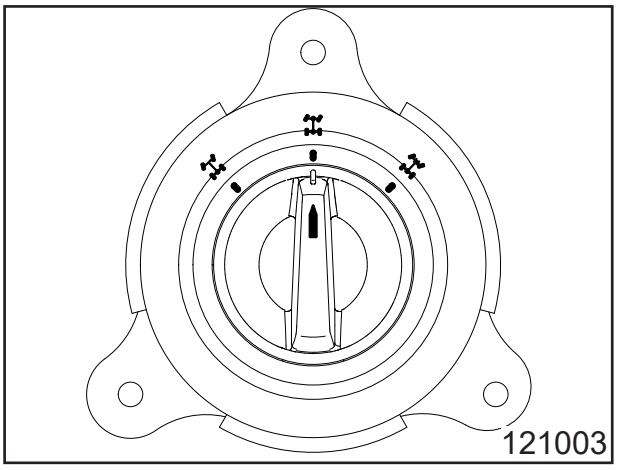
Ignition switch				
Color / Function	R	B	Y	Gr R
OFF				
ON	●	●		
START	●	●	●	●



Turn switch (EU)						
Pin / Use	1	2	3	4	5	6
⇨	●	●			●	●
●					●	●
⇦		●	●		●	●



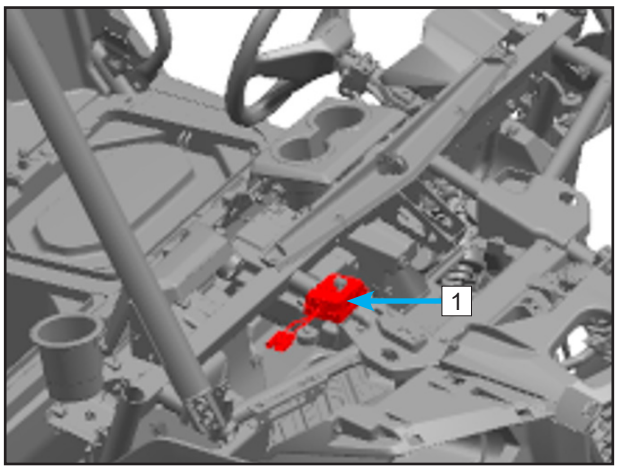
Warning switch (EU)						
Pin / Use	1	2	3	4	5	6
△	●	●		●	●	●
●					●	●



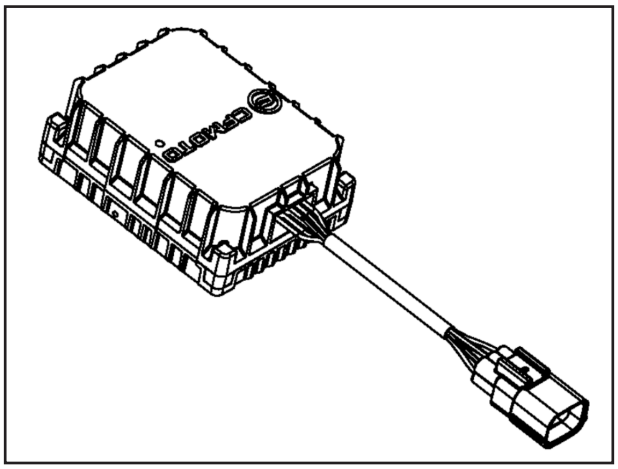
2/4WD, 4WD transaction switch (front gear case)									
Color / Function	L B	L G	Br R	Br G	Gr	Gr W	Lg Br	G	Lg W
2WD	●	●				●		●	●
4WD	●	●	●	●					
LOCK			●	●	●	●	●	●	

12.11 T-BOX

The vehicle is equipped with a T-BOX 1.

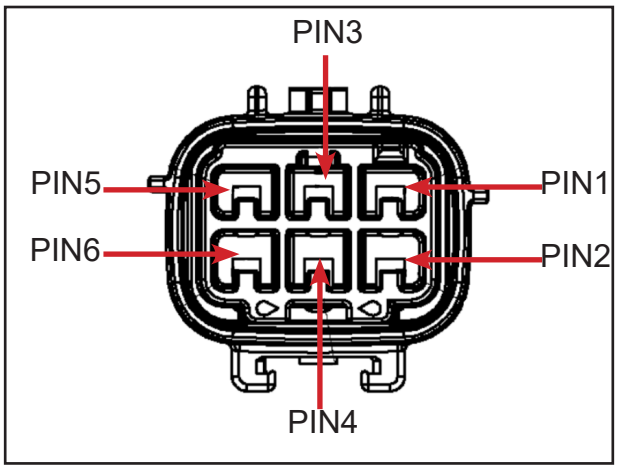


Indicator on or off	Corresponding device state	Remarks
Slow flash	PIN1	200mS on, 1800mS off
Slow flash	PIN2	1800mS on, 200mS off
Quick flash	PIN3	125mS on, 125mS off
Long light off		



Connector definition:

No.	PIN definition
PIN1	VBAT
PIN2	KL 15
PIN3	CAN H
PIN4	CAN L
PIN5	K_line
PIN6	GND



Troubleshooting:

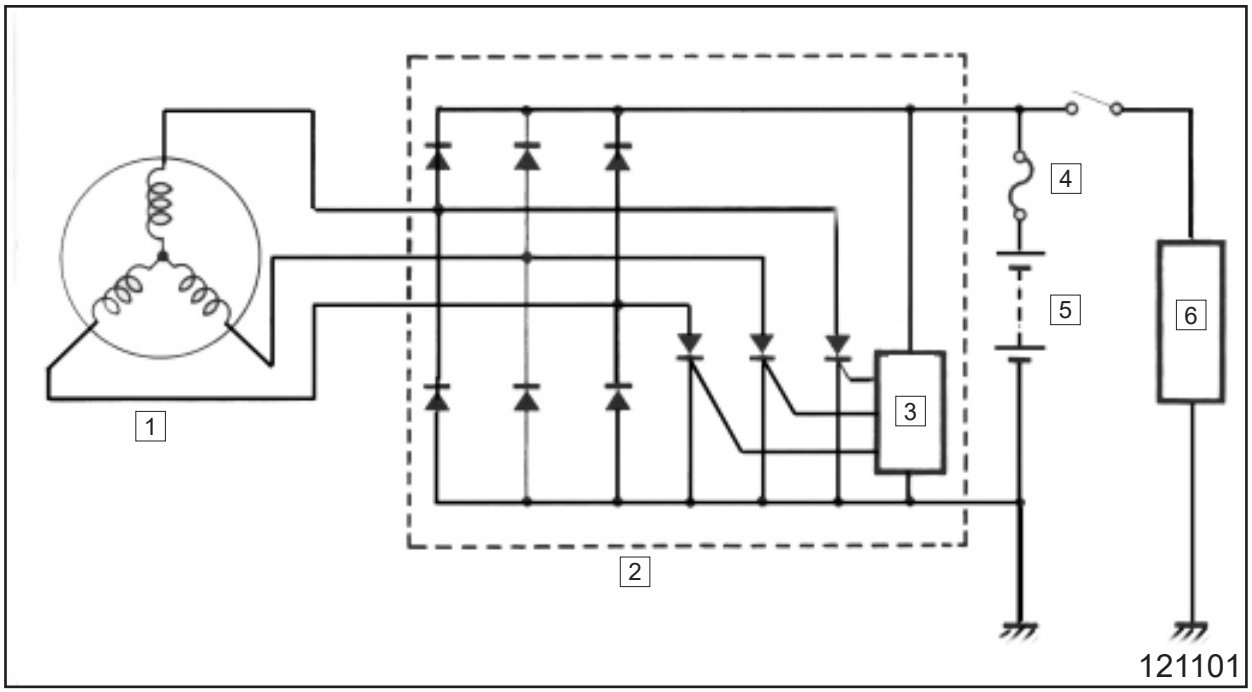
Fault	Possible causes	Solution
Terminal not online	Vehicle battery voltage is low.	Charge or change the battery
	Power cable fuse has blown.	Change the fuse
	The parameter is set wrong.	Ask the manufacturer to reset
	SIM card is out of service for the unpaid bill, or SIM card or does not support GPRS function.	Re-confirm that the SIM card is functioning properly
	The signal is weak because the 4G antenna is not connected properly.	Check the installation of the 4G antenna
	Terminal fault	Return to factory for service
Fail to locate	The vehicles are in underground garages, tunnels and other areas where GPS signal is weak.	Move to the open field
	Metal objects blocking around GPS antenna	Adjust the installation location of GPS antenna
	Antenna fault	Reinstall the GPS antenna
Incomplete CAN bus data	Cable bad contact	Re-plug the cable terminal or change it
	Terminal fault	Return to factory for service

T-BOX hardware fault codes

DTC display code	Fault attribute	Conditions for fault	Troubleshooting conditions	Possible fault causes	Maintenance suggestions
U011716	Sensor fault	Voltage < 9V, t > 30s	9.5V < Voltage < 18V, t > 500ms	Battery voltage too low	Change the battery or charge the starting battery
B111717	Voltage fault	Voltage>16V, t>100ms	Voltage back to normal 1 minute	Power supply interference/ Harness damage	Check the power cable or change the battery
B111716	Voltage fault	Voltage < 9V, t > 30s	Voltage back to normal 1 minute	Power supply interference/ Harness damage	Check the power cable or change the battery or charge the starting battery
U012187	Network fault	Message 0x12B not received within 100ms	Receive message 0x12B normally	Loose contact/ Harness interference	Check ABS and the circuit
U018087	Network fault	Message 0x210 not received within 1000ms	Receive message 0x210 normally	Loose contact/ Harness interference	Check ABS and the circuit
U014087	Network fault	Message 0x150 not received within 500ms	Receive message 0x150 normally	Loose contact/ Harness interference	Check ECU and the circuit
U015587	Network fault	Message 0x151 not received within 500ms	Receive message 0x151 normally	Loose contact/ Harness interference	Check the dashboard and the circuit
U007388	Network fault	CAN bus off detected (Controller enters Buss Off 8 times in a row.)	CAN bus off not detected	CAN bus short circuit	Check the bus connection
B1A4087	Hardware	KL30 is disconnected for over 1s when KL15 is powered on.	KL30 is connected for over 1s when KL15 is powered on.	Harness damage, intentional damage	Check the circuit

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.

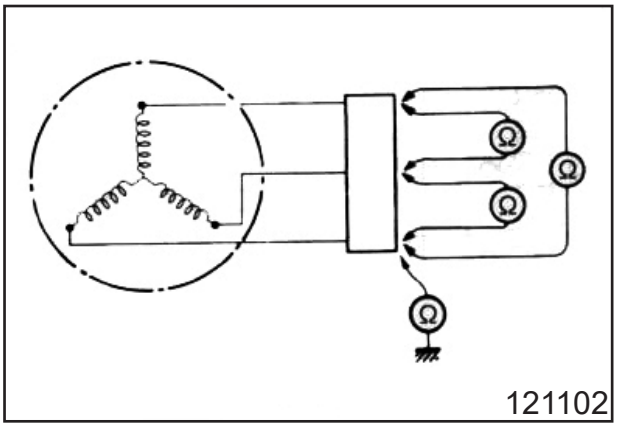
Turn multimeter to 1×10Ω

MAG Coil Resistance:

0.5Ω~1.5Ω (Yellow-Yellow)

Resistance between Stator Coil and Core:

∞Ω (Yellow-Ground)



Resistance measurement

MAG Non-loaded Performance

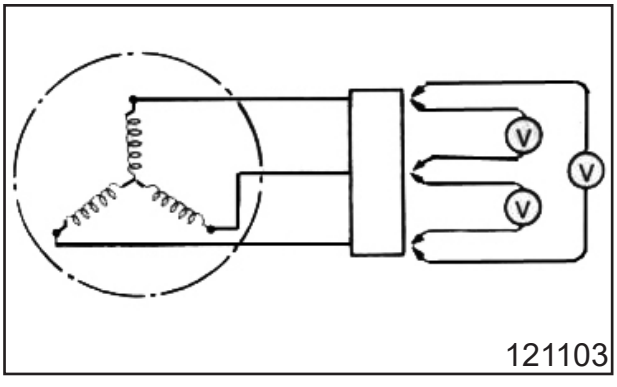
Start the engine and allow it run at 5000r/min. Use multimeter to measure the voltage between 3 output lines.

If the reading is below specification, replace with a new magneto.

Turn Multimeter to **V(AC)**.

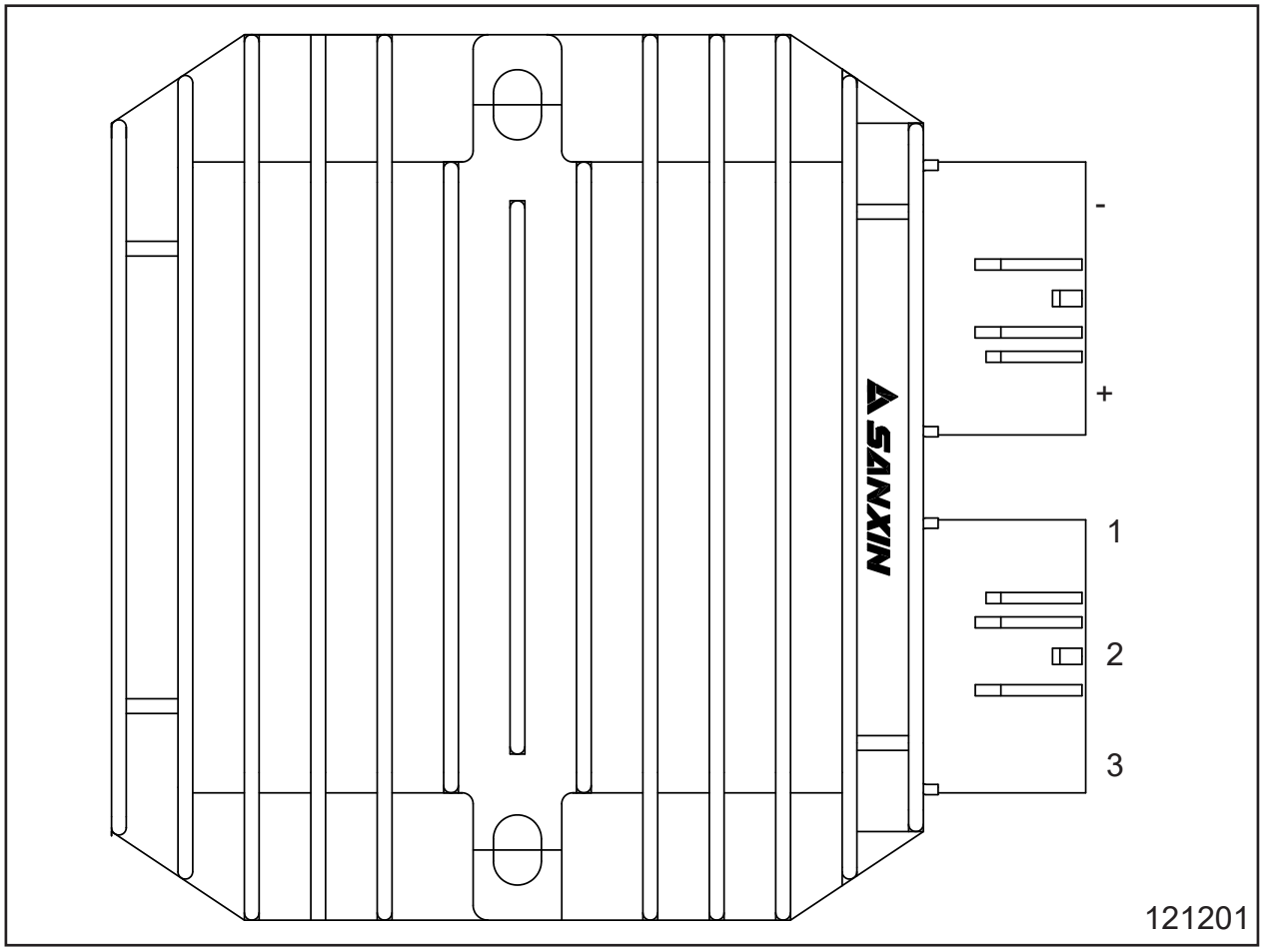
Voltage between Output Lines When MAG Non-loaded:

>75V(**AC**) at 5000r/min



Voltage measurement

Regulator



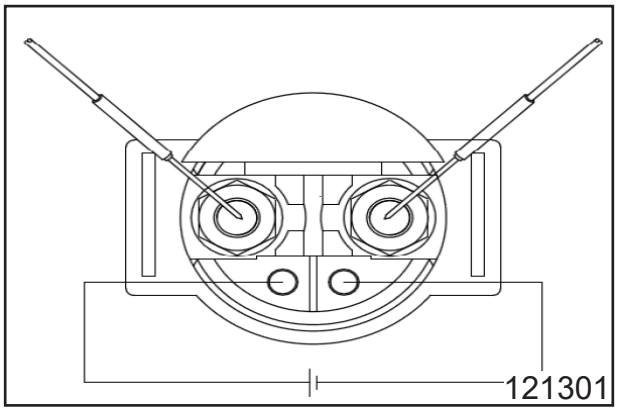
Use multimeter to measure resistance between connectors. Replace the regulator If any data is beyond standard.

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	

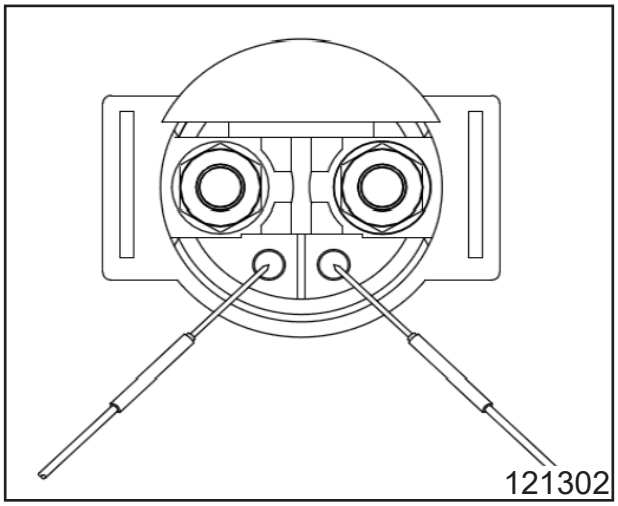
12.12.2 Starter Relay

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.



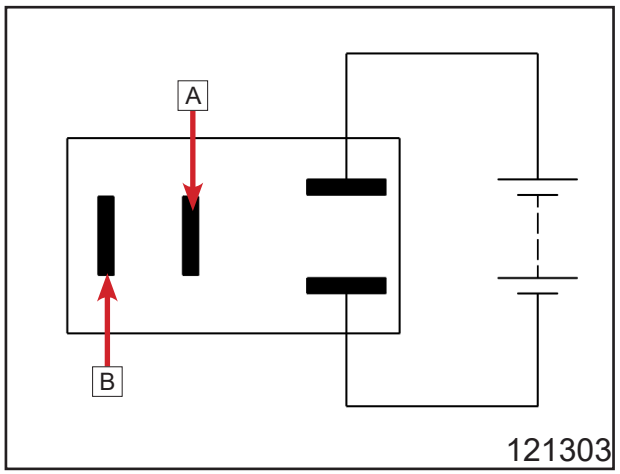
⚠CAUTION: The voltage loaded between terminals can not exceed 2 minutes. Otherwise, starter relay may overheat or burn.

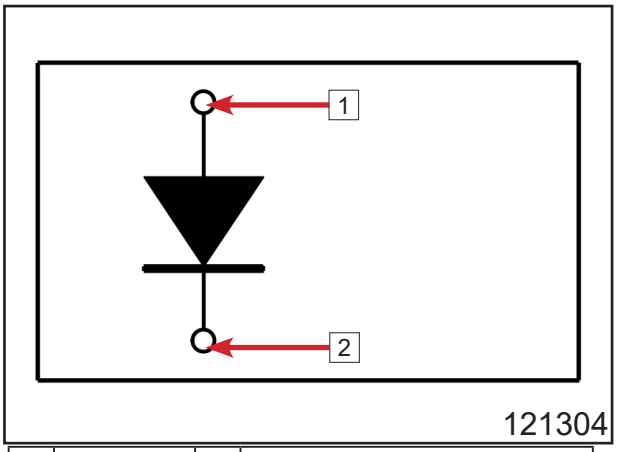
Use multimeter to measure the start relay coil resistance.
If the resistance is out of standard, replace with a new one.
Turn multimeter to 1X10Ω
Start auxiliary relay resistance: 3Ω~5Ω



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 1×100Ω to measure the relay resistance.
Auxiliary starter relay resistance: 90Ω~100Ω





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: 330±5kPa

Shift gear in Neutral.

Check EFI with PDA for fault. Eliminate the trouble according to DTC (Diagnostic Trouble Code).

Turn on ignition switch and press start switch for 3~5s.

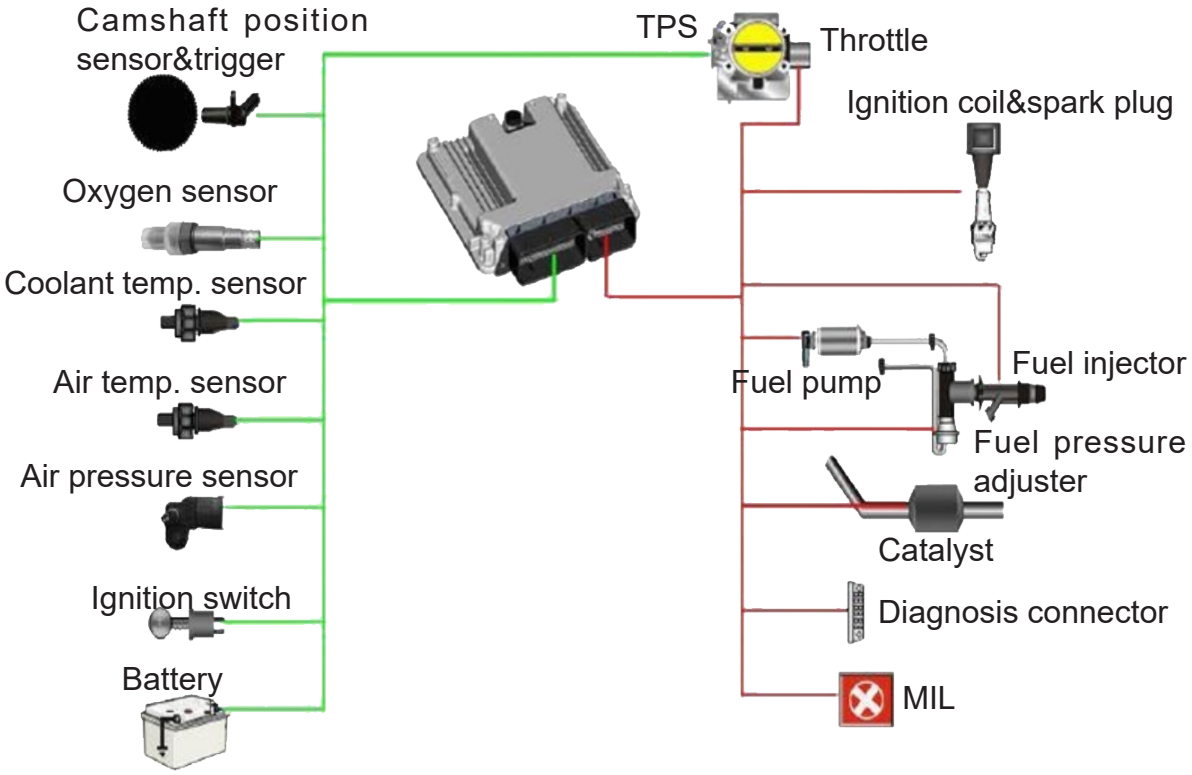
After engine starts, warm up until idle speed is stable and check it.

Idle Speed: 1500r/min±150r/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)
Camshaft position sensor (gear information)
Oxygen sensor (air factor= λ >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** (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.

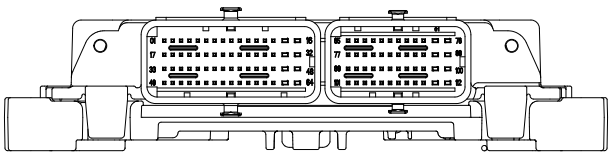
●Always remove cables and electrical control units which are connected with battery terminals.

●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 (Hign)	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	Oxygen sensor 1 ground
5	Main relay	43	Null	81	Null
6	Diff-lock switch	44	Mode switch	82	MIL
7	Pedal 1 ground	45	Throttle pedal sensor 1	83	Null
8	Null	46	Null	84	Sensor ground
9	Null	47	Null	85	T-MAP ground
10	Speed input	48	Null	86	TPS ground
11	Seat belt switch	49	Null	87	Throttle actuator B
12	Null	50	Null	88	Null
13	Parking switch	51	Null	89	Null
14	Override switch	52	Null	90	Null
15	Interruptible battery 1	53	Null	91	Intake air 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	Canister valve
19	Null	57	Null	95	Null
20	Uninterrupted battery	58	Starter control relay	96	Engine RPM sensor A
21	Null	59	Pedal 2 ground	97	Engine RPM sensor B
22	Null	60	Null	98	Null
23	Brake switch	61	Null	99	Null
24	L gear switch	62	Null	100	Ignition coil 1
25	Brake light switch	63	ECU ground 2	101	Coolant temp. sensor
26	Null	64	ECU ground 1	102	Intake air temp. sensor
27	N gear switch	65	Null	103	Null
28	Null	66	Null	104	Oxygen sensor 1
29	R gear switch	67	Null	105	Null
30	Throttle pedal sensor 2	68	Fuel injector 1	106	P/N gear switch
31	Null	69	Null	107	TPS 5V power
32	Null	70	Null	108	Null
33	Null	71	AIS solenoid valve	109	T-MAP 5V power
34	Engine RPM output	72	Null	110	Null
35	Ignition switch	73	Oxygen sensor heated1	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		

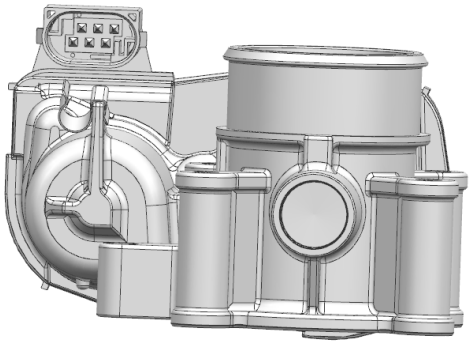
Limit data:

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		-40		70	°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 Valve Body

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



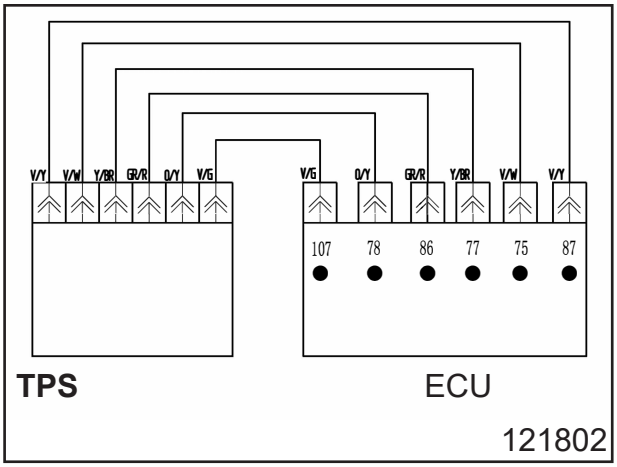
121801

TPS

Pin function:

1. Signal 1
2. Sensor power
3. Motor +
4. Signal 2
5. Motor -
6. Sensor ground

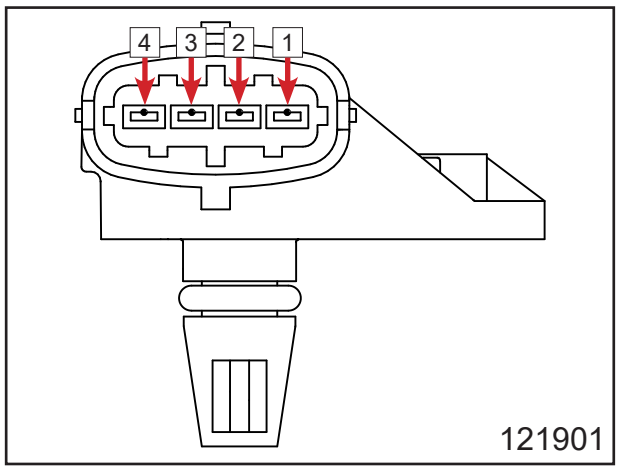
Circuit connecting with ECU.



121802

12.14.3 T-MAP

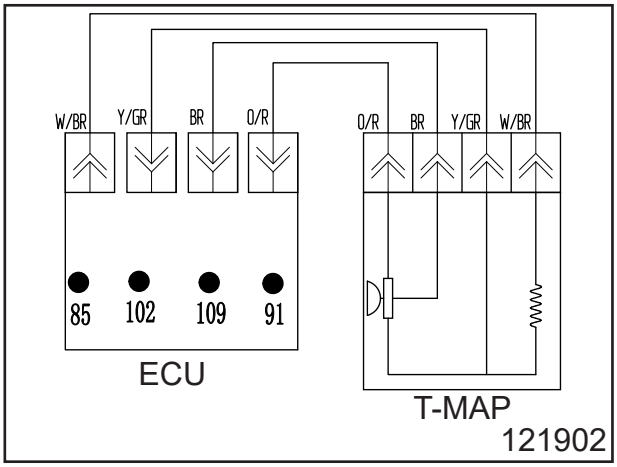
Intake air pressure sensor: this sensor monitor intake air pressure, which provides the engine load signal to ECU.
Intake air temp. sensor: This sensor is an NTC thermo resistance. The resistance is getting higher with coolant temperature, but not in linear relationship.
Air pressure sensor and temp. sensor are sealed together.



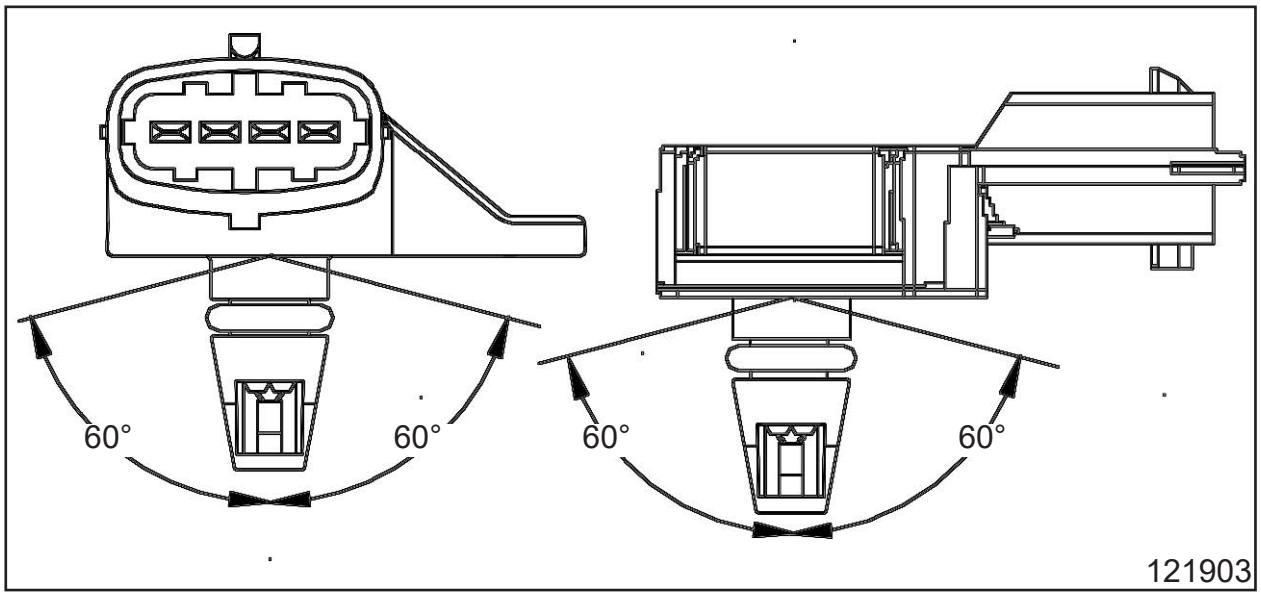
Pin function:

1. Ground
2. Intake air temp. signal
3. 5V power
4. Intake air pressure signal

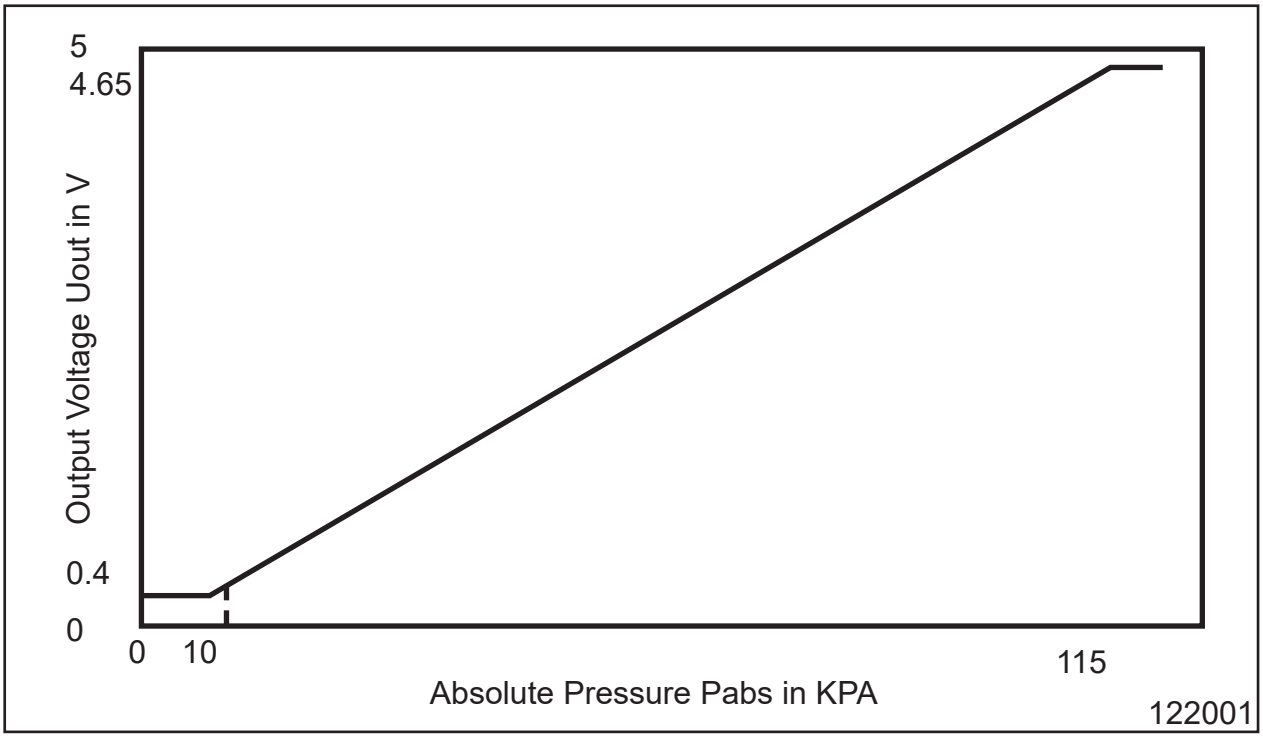
Circuit connecting with ECU.



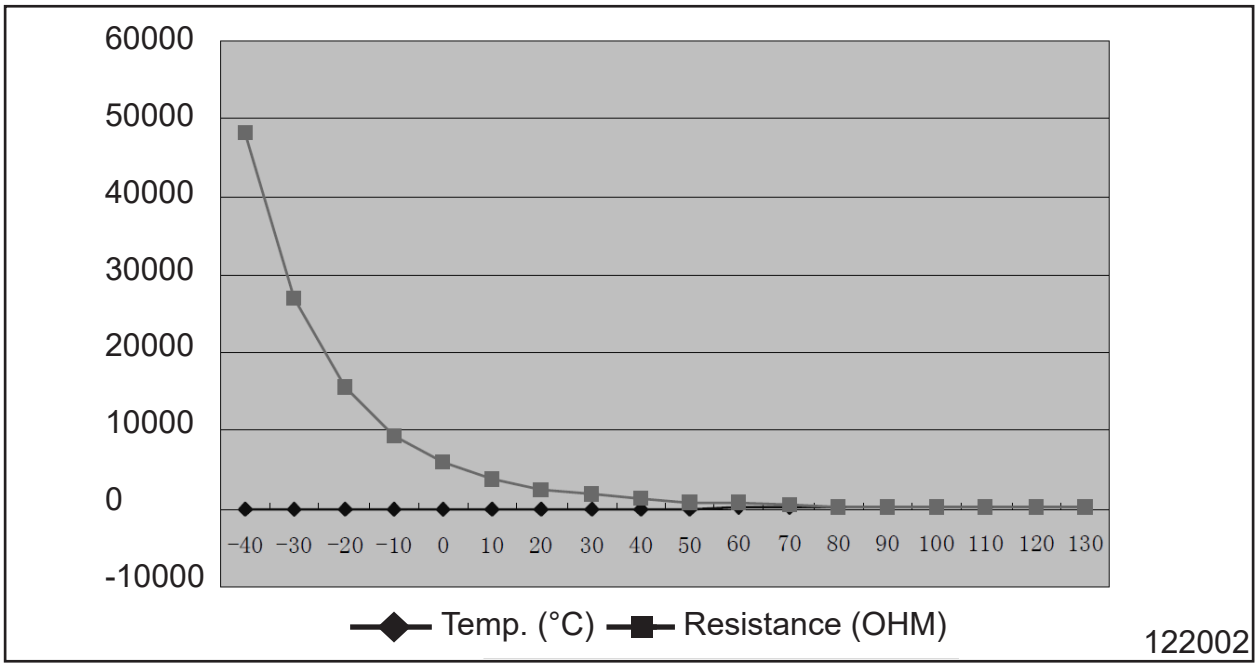
The picture below shows the allowable mounting range, which ensures that condensation does not form inside the sensor, as the condensation damages pressure sensitive elements within the sensor.



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



The relationship between sensor temperature and resistance.



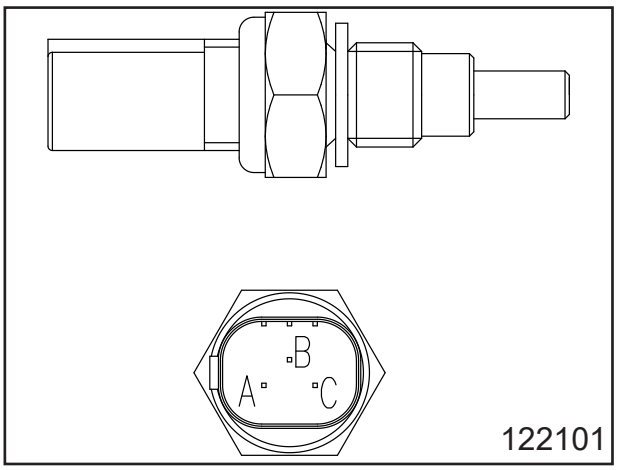
12.14.4 Coolant Temp. Sensor

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

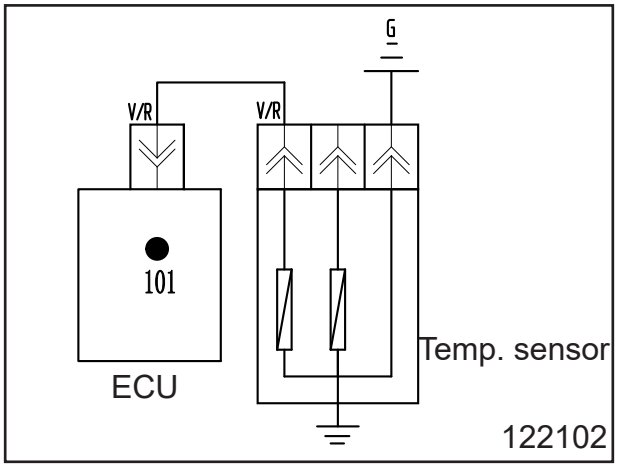
One group of parameters is sent to ECU to monitor engine temperature condition, One group is sent to dashboard to monitor coolant temperature condition.

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.

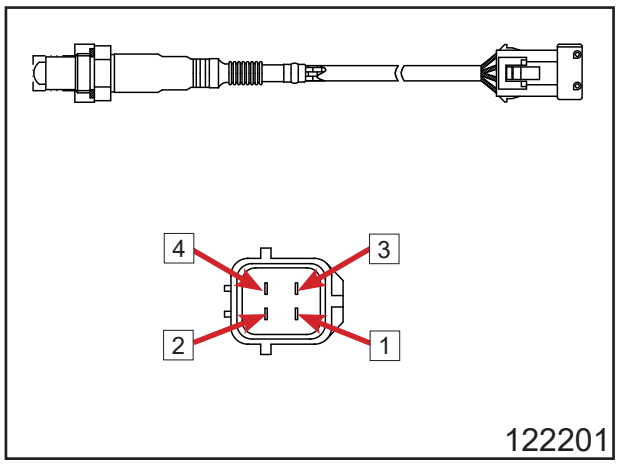
Measure sensor pin B resistance with multimeter:

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.

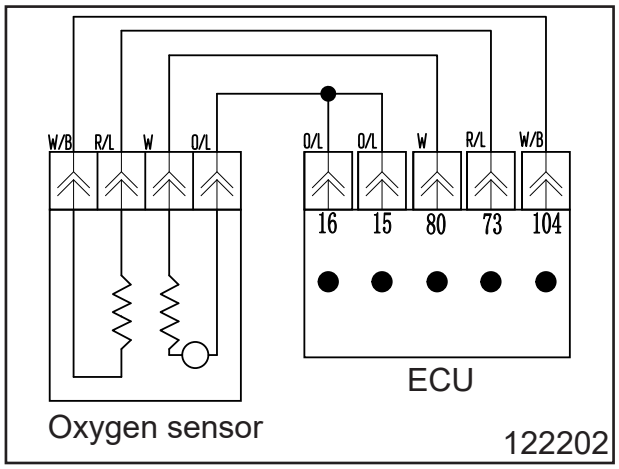
12.14.5 Oxygen Sensor

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



Pin Function:

1 to heated power +
2 to heated power -
3: output signal voltage -
4: output signal voltage +

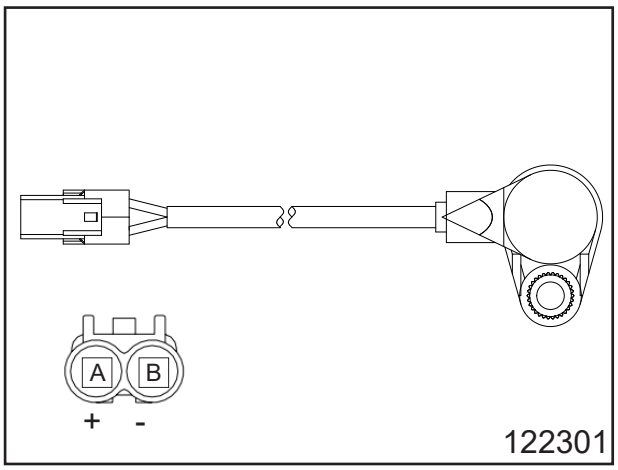


Oxygen sensor characteristic table

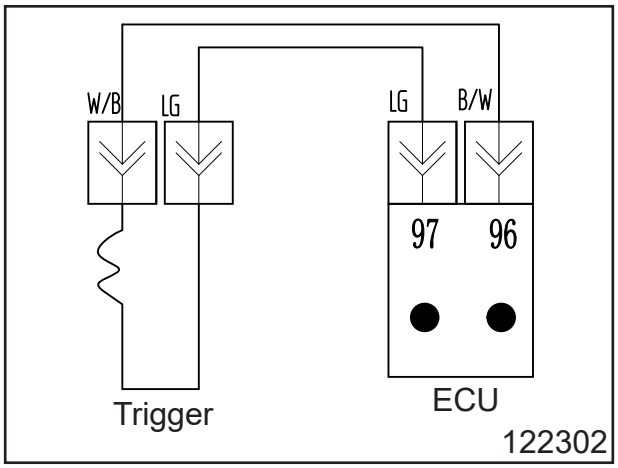
Item	Specification	
Exhaust air temp. (°C)	350	850
Voltage (mV) at λ=0.97(CO=1%)	800±55	700±70
Sensor voltage (mV) at λ=1.10	50±30	50±30
Sensor inner resistance (kΩ)	≤0.5	≤0.25
Response time (ms) (600mV to 300mV)	≤250	≤250
Response time (ms) (300mV to 600mV)	≤100	≤60

12.14.6 Trigger (RPM Sensor)

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 1×2kΩ.

Trigger coil resistance: 950±50Ω(20°C)

Replace a new one when resistance is beyond value range.

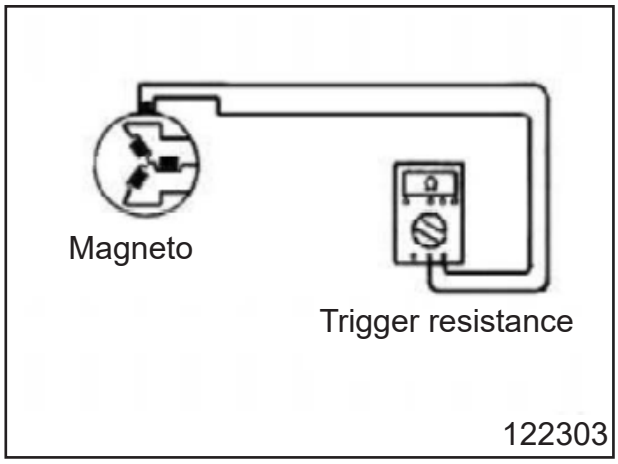
Trigger Peak Voltage Measurement

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.



Set multimeter to ACV.

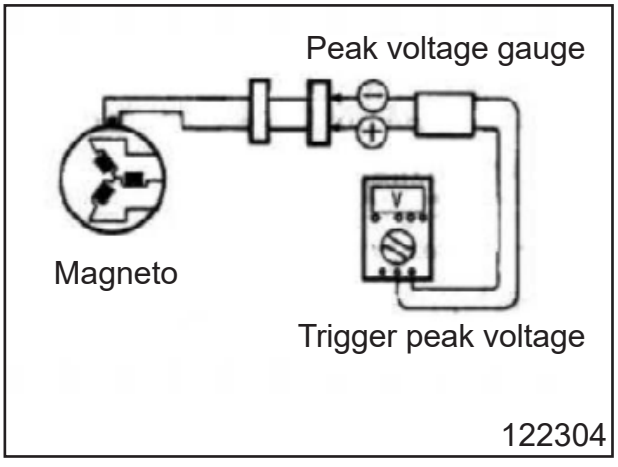
Set engine to Neutral gear, turn **ON** ignition switch.

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: **≥3V (200r/min)**

Replace a new one when peak value voltage is beyond above value range.

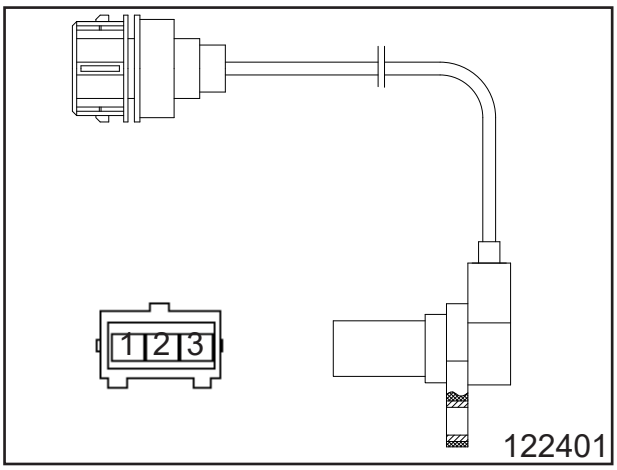


12.14.7 Speed Sensor

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

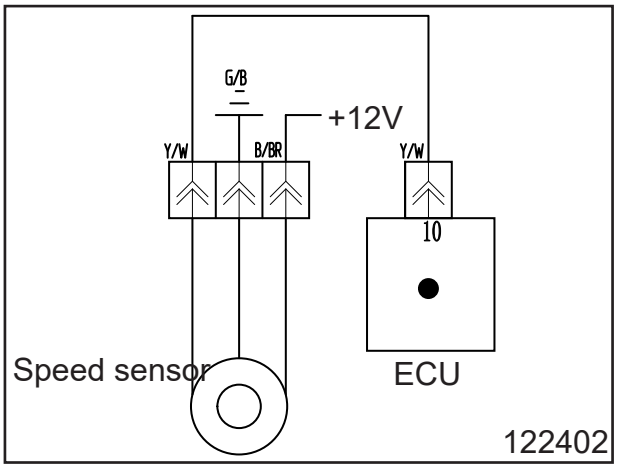
Pin Function:

1: To ground.
2: Output voltage signal (>80% of input voltage).
3: Battery+DC12V.



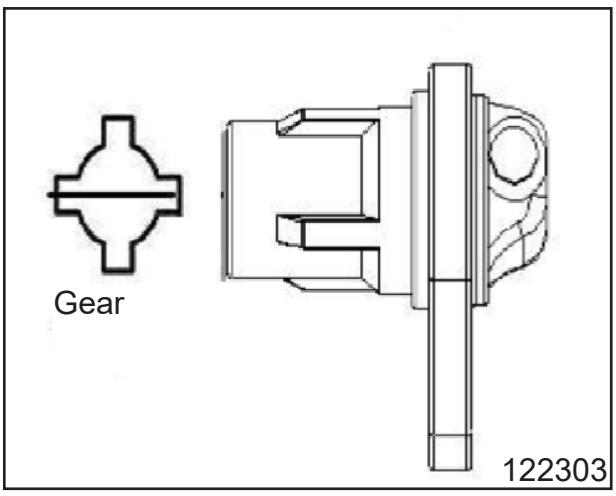
Speed sensor

Circuit connecting with ECU.



Speed Sensor Inspection

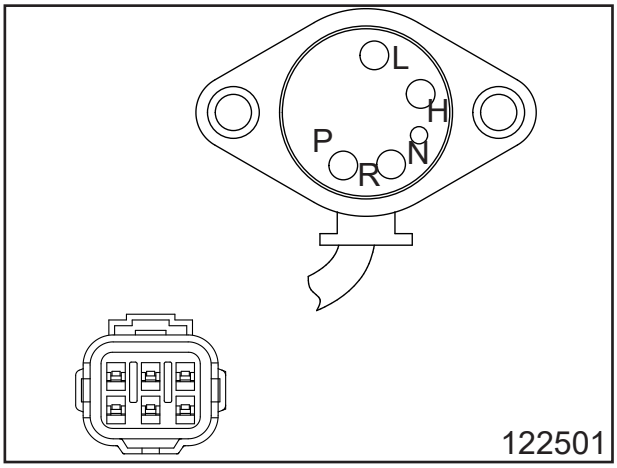
Ground pin 1. Connect pin 3 with +12V power.
Fix the gear **5mm** away from the speed sensor as the picture shows.
Turn multimeter to DCV.
Slowly rotate the gear and measure the voltage between pin 2 and pin 3 to determine that if the reading varies from 0V~12V
If the reading doesn't vary, it indicates the sensor is defective and needs to be replaced.



12.14.8 Gear Position 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)



Gear sensor

When each pin at a certain gear position,there is connection between this pin and engine. Otherwise, no connection exists.

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.

12.14.9 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.

Pin Function:

1: Fuel level sensor +
2: Fuel level sensor -
3: Fuel pump +
4: Fuel pump -

Parameters:

Pressure regulator opening pressure: 300kPa±10kPa

●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.

●The battery supplies power to the fuel pump through fuel pump relay. The relay circuit is connected only when vehicle starts and engine is running.

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.

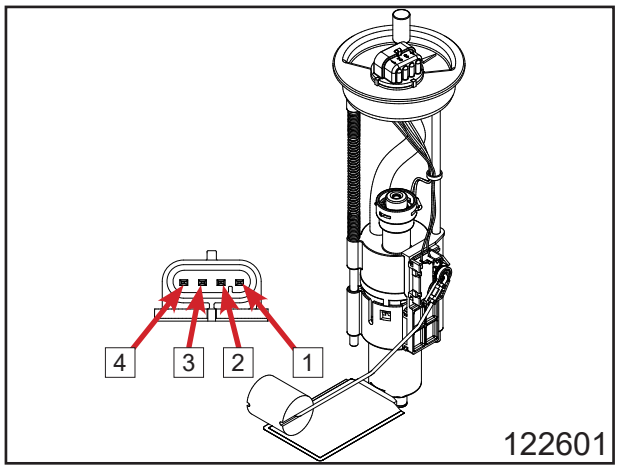
After the engine stops, fuel pressure should be kept 0.25MPa for more than 5 minutes. Otherwise, replace the fuel pump assy.

Pressure Relief in Fuel System:

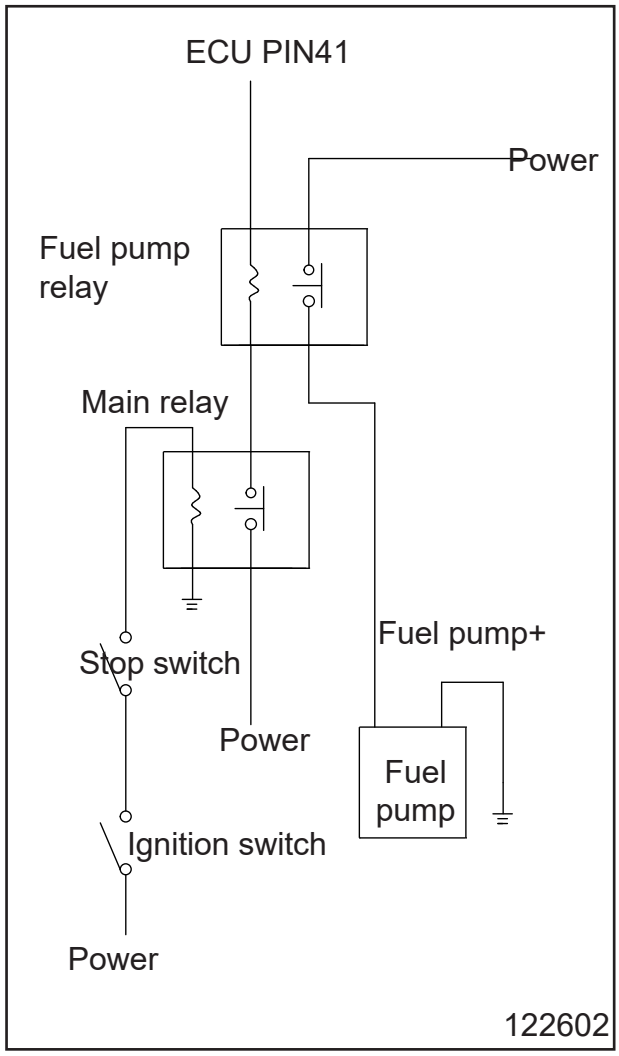
In EFI model, pressure in fuel system is very high, as well as in fuel hoses. Even though the engine is not started, pressure in fuel system remains high. Therefore, it's not recommended to remove fuel hoses before pressure relief.

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.

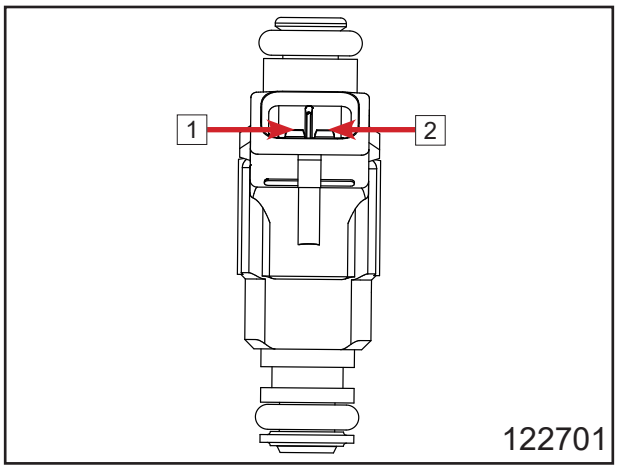


Fuel pump



12.14.10 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.

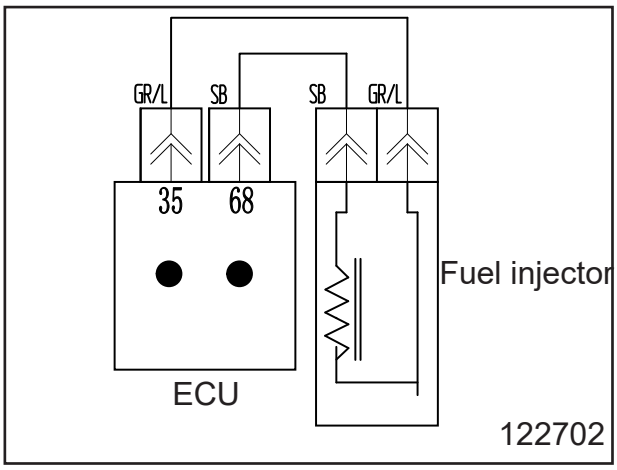


Pin function:

1: to ECU pin 35
2: to ECU pin 68

Fuel injector resistance: 12Ω±0.6Ω(20°C±2°C)

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.

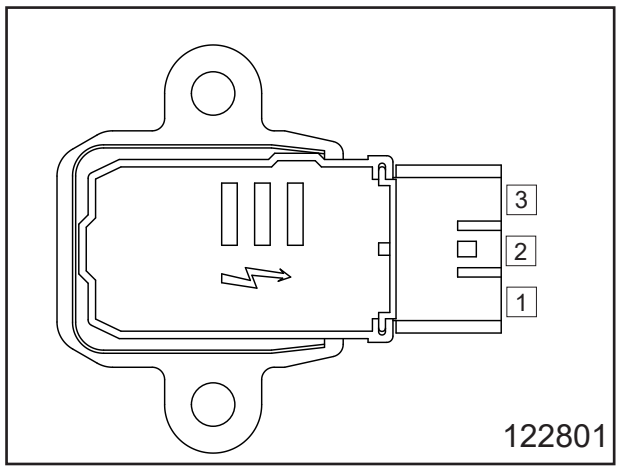
Inspect the fuel injector for sealing after installation to ensure there is no leaking.

12.14.11 Ignition Coil

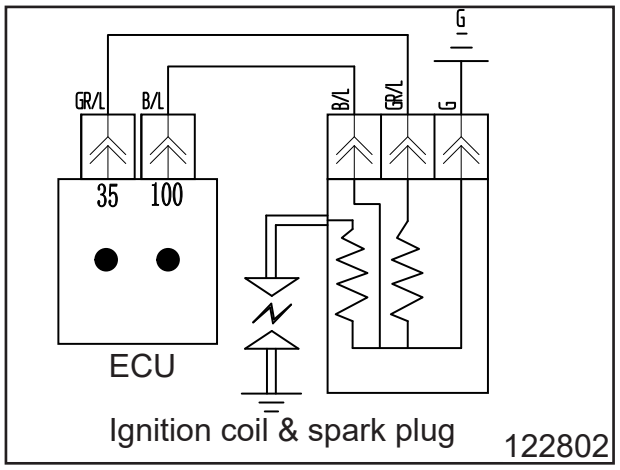
Ignition coil transforms the low voltage of primary coil to high voltage of secondary coil by sparking from spark plug and igniting the mixture of air and fuel in cylinder

Pin function:

1 to control signal
2 to power +12V
3 to ground

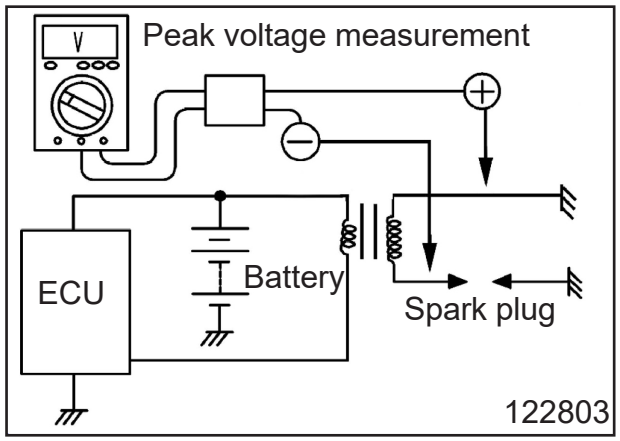


Circuit connecting with ECU.



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.



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 EFI Self-diagnosis

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

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

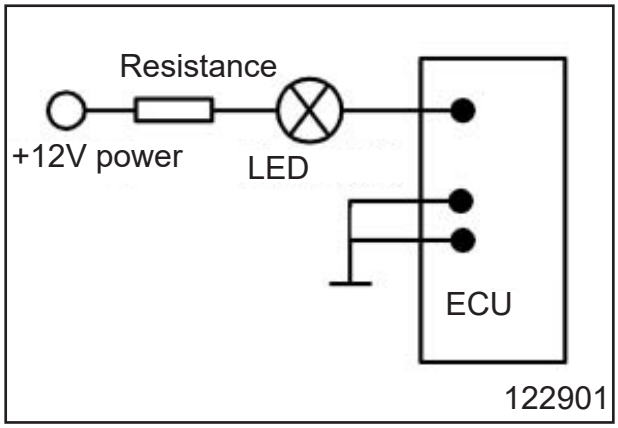
When servicing, using PDA and MIL, the defective parts can be promptly found to improve the service efficiency and quality.

EFI system is mainly diagnosed by MIL and PDA.

12.15.1 Malfunction Indicating Lamp (MIL)

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

The right picture is the MIL connection circuit. The current in pin 18 to ECU should be less than 0.1 A.



MIL Flash Principle:

If the ECU detects MIL is in flash code mode, MIL indicator flashes to show trouble code.

MIL in code-flashing mode without fault in memory:

From ECU formating, MIL is lightened for 4 seconds. After 1 second interval, MIL indicator flashes every 0.5s. It means there is no fault. MIL indicator goes off until engine starts and find RPM.

MIL in code-flashing mode with fault in memory:

From ECU formating, MIL is lightened for 4 seconds. After 1 second interval, MIL light flashes to display fault code. If all faults in memory are shown, MIL goes off and quites flash code mode.

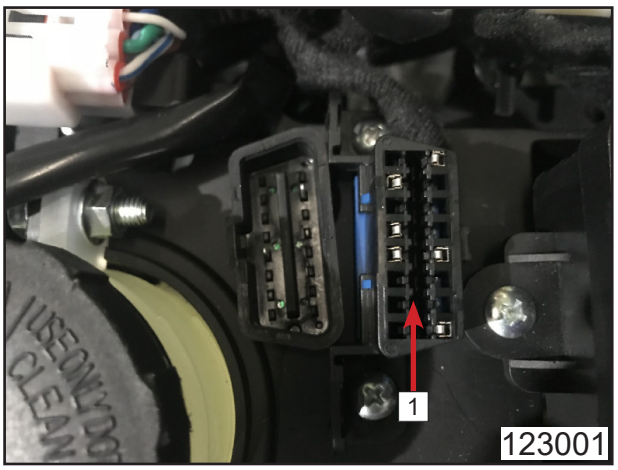
K-line should connect to ground in code-flashing mode.

Read the trouble information by flashing code:

Turn on ignition switch with K-line to ground for more than 2.5 seconds. If the ECU memory has trouble code, MIL indicator will display the code by flashing. Take P0203 as an example, its flashing method is: flashing 10 times-off-flashing twice-Off-flashing 10 times-Off-flashing three times.

12.15.2 Diagnosis Tool and Connector

OBD diagnosis connector [1] is located under front service cover.
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: Unplug k-line during diagnosis.

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

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

PDA Function:

1. Version Information Display

PDA can display engine, ECU hardware and software information.

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, wcanister control valve activation, MIL status.

5. Actuator Test Function

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

12.16 Fault Diagnosis

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	Inspect or replace
	● Spark plug clearance not fit	Adjust or replace
	● Spark plug dirty	Clean or replace
	● Spark plug too wet	Dry or replace
	Inspect fuel supply system	
	● Canister	
	● Fuel pump leaking or bad effect	Repair and replace
	● Fuel line leaking	Inspect or replace
	● Fuel low	Inspect the fuel tank
	● Injector jammed	Replace
	4. Inspect cylinder pressure	
	● Cylinder wearing	Replace
	● Piston ring wearing	Replace
	● Gasket leaking	Replace
	● Valve conducting pipe wearing	Replace
	● Valve seat bad sealing	Repair or replace
	● Valve wearing	Replace
	● Spark plug loose	Tighten
	● Starting RPM low	Inspect or replace
	● Valve TDC wrong	Adjust
	● Valve clearance not fit	Adjust
	5. Idle by pass valve jammed	Clean or replace
	6. Not in N gear	Shift to N gear
	7. Trouble code	Inspect
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	Fill
		2. Cooling system got bubble	Drain and refill
		3. Water temp sensor problem	Replace
		4. Thermostat problem(Not open in high heat)	Replace
		5. Inspect the leaking hole to see leaking	Replace the water seal
		6. Inspect the pipe and clamp	
		● Pipe cracked or getting o ld	Replace
		● Clamp getting loose	Tighten
		7. Water pump impeller broken	Replace
		8. Water pump gasket leaking	Tighten or replace
		9. Cylinder head gasket leaking	Replace
		10. Water pump cover drain bolt gasket leaking.	Tighten or replace
		11. Water pump gear wearing cause coolant not enough.	Replace
		12. Water pump shaft jammed	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	Replace and reassemble
		● Crankcase bolt loose	Tighten
		● Sealing ring/O-ring/Gasket cracked, old or damaged	Replace
		● Piston ring damaged(Blue smoke)	Replace
		● Piston ring damaged(Pressure low)	Replace the oil seal
		● Valve oil seal damaged. Lip crack ed or old.	Replace the filter and oil
		2. Oil filter jammed	
		3. Inspect the oil drain bolt	
		● Case bottom bevel bolt loose	Tighten
		● Oil drain bolt loose or without washer	Tighten or install washer
		4. Oil leaking	Replace the oil seal
		5. Oil strainer jammed	Clean and replace
		6. Inspect the oil pump	
		● Oil pump rotor wearing	Replace
		● Wasted oil or air inlet cause the oil pump jammed.	Replace
		● Oil pump gear damaged.	Replace
		● Use wrong oil	Use recommend oil
	Oil getting white	1. Leaking indicator shows the oil mixed with water	Replace oil seal and water seal.
		2. Cylinder gasket damaged or leaking.	Tighten or replace
		3. Cylinder head bolt loose.	Tighten and replace the oil
		4. Oil has dust inside	Replace damaged parts(Including filter and oil)

Trouble		Reason	Solution
CVT	Abnormal accelerate	1. Belt getting narrow	Replace
		2. Inspect the main sliding wheel	
		● Rolling ball wearing	Replace
		● Main roller track wearing	Replace
		3. Drive/Driven pulley axial sliding not smooth	Clean or replace
		4. Driven pulley sprint too strong	Replace
		5. Driven pulley clutch shoe/Surface wearing	Replace
		6. Drive/Driven pulley groove damaged.	Replace Replace
		7. Connect the PDA to find trouble	Adjust
		8. Valve clearance not fit	
		9. Pressure low	Replace
		10. Spark plug bad ignition	
	Top speed low	Inspect“Bad accelerate”1~3 CVT got dirty.	Clean and replace
		Drive pulley jammed	Clean and replace
		Driven pulley spring bad or damaged	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	Replace
		● Clutch shoe or surface got damaged	Replace
	Belt burnt	1. Inspect the CVT cooling pipe	
		● CVT room too hot	Clean
		● Main stable wheel impeller jammed	Clean
		2. Inspect the wheel groove surface	Clean and replace the belt
		● Groove got dirty	
		● CVT case got water in.	Clean and replace the belt
	Drive belt trouble	Wearing too much	Replace
		Belt specification wrong	Replace
		Belt got wearing	Replace
		Belt cracked and reach the life period	Clean and replace the belt
		Groove got oil dirty	Clean
		Drive or driven pulley got damaged by stone	Clean or replace
		Belt getting old	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

12.17 Fault Code Table

No.	Code	Statement
1	P010817	Manifold Absolute Pressure/Barometric Pressure Circuit High
2	P010716	Manifold Absolute Pressure/Barometric Pressure Circuit Low
3	P010C17	Mass or Volume Air Flow “B” Circuit Low
4	P010D16	Mass or Volume Air Flow “B” Circuit High
5	P011317	Intake Air Temperature Sensor 1 Circuit High
6	P011216	Intake Air Temperature Sensor 1 Circuit Low
7	P011817	Engine Coolant Temperature Sensor 1 Circuit High
8	P011716	Engine Coolant Temperature Sensor 1 Circuit Low
9	P068816	ECM/PCM Power Relay Sense Circuit/Open
10	P068829	ECM/PCM Power Relay Sense Circuit/Open
11	P065012	MIL Control Circuit High
12	P065011	MIL Control Circuit Low
13	P065013	MIL Control Circuit Open
14	P069212	Fan 1 Control Circuit High
15	P069111	Fan 1 Control Circuit Low
16	P048013	Fan 1 Control Circuit
17	P062912	Fuel Pump “A” Control Circuit High
18	P062811	Fuel Pump “A” Control Circuit Low
19	P062713	Fuel Pump “A” Control Circuit /Open
20	P045912	Evaporative Emission System Purge Control Valve Circuit High
21	P045811	Evaporative Emission System Purge Control Valve Circuit Low
22	P044413	Evaporative Emission System Purge Control Valve Circuit Open
23	P041212	Secondary Air Injection System Switching Valve “A” Circuit
24	P041411	Secondary Air Injection System Switching Valve “A” Circuit Shorted
25	P041313	Secondary Air Injection System Switching Valve “A” Circuit Open
26	P026212	Cylinder 1 Injector Circuit High
27	P026111	Cylinder 1 Injector Circuit Low
28	P020113	Injector Circuit/Open – Cylinder 1
29	P026512	Cylinder 2 Injector Circuit High
30	P026411	Cylinder 2 Injector Circuit Low
31	P020213	Injector Circuit/Open – Cylinder 2
32	P056317	System Voltage High
33	P056216	System Voltage Low
34	P05601C	System Voltage Not plausible
35	P050129	Vehicle Speed Sensor “A” Range/Performance
36	P064100	Sensor Reference Voltage "A" Circuit/Open
37	P065100	Sensor Reference Voltage "B" Circuit/Open
38	P057129	Brake Switch "A" Circuit
39	P05711C	Brake Switch "A" Circuit
40	P213800	Throttle/Pedal Position Sensor/Switch “D”/“E” Voltage Correlation
41	P012317	Throttle/Pedal Position Sensor/Switch "A" Circuit High
42	P012216	Throttle/Pedal Position Sensor/Switch "A" Circuit Low
43	P012129	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance

No.	Code	Statement
44	P022317	Throttle/Pedal Position Sensor/Switch "B" Circuit High
45	P022216	Throttle/Pedal Position Sensor/Switch "B" Circuit Low
46	P022129	Throttle/Pedal Position Sensor/Switch "B" Circuit Range/ Performance
44	P022317	Throttle/Pedal Position Sensor/Switch "B" Circuit High
45	P022216	Throttle/Pedal Position Sensor/Switch "B" Circuit Low
46	P022129	Throttle/Pedal Position Sensor/Switch "B" Circuit Range/ Performance
47	P210612	Throttle Actuator Control System Forced Limited Power
48	P210619	Throttle Actuator Control System Forced Limited Power
49	P210692	Throttle Actuator Control System Forced Limited Power
50	P210613	Throttle Actuator Control System Forced Limited Power
51	P156800	Idle Speed Contr.Throttle Pos. mechanical Malfunction
52	P154500	Throttle Pos.Contr. Malfunction
53	P155900	Idle Speed Contr.Throttle Pos. Adaptation Malfunction
54	P154522	Throttle Pos.Contr. Malfunction
55	P154521	Throttle Pos.Contr. Malfunction
56	P157900	Idle Speed Contr.Throttle Pos. adaptation not started
57	P156400	Idle Speed Contr.Throttle Pos. Low Voltage During Adaptation
58	P156500	Idle Speed Control Throttle Position lower limit not attained
59	P155929	Idle Speed Contr.Throttle Pos. Adaptation Malfunction
60	P212317	Throttle/Pedal Position Sensor/Switch “D” Circuit High
61	P212216	Throttle/Pedal Position Sensor/Switch “D” Circuit Low
62	P213829	Throttle/Pedal Position Sensor/Switch “D”/“E” Voltage Correlation
63	P212817	Throttle/Pedal Position Sensor/Switch “E” Circuit High
64	P212716	Throttle/Pedal Position Sensor/Switch “E” Circuit Low
65	P060694	ECM/PCM Processor
66	P060692	ECM/PCM Processor
67	P210629	Throttle Actuator Control System Forced Limited Power
68	P060664	ECM/PCM Processor
69	P060661	ECM/PCM Processor
70	P060667	ECM/PCM Processor
71	P06061C	ECM/PCM Processor
72	P060655	ECM/PCM Processor
73	P060600	ECM/PCM Processor
74	P060662	ECM/PCM Processor
75	P060696	function monitoring: fault of ECU ADC - Null Load Test Pulse
76	P060697	function monitoring: fault of ECU ADC - test voltage
77	P060647	function monitoring:fault of ECU monitoring modul error
78	P060617	Reported Over Voltage of VDD5
79	P060616	Reported Under Voltage of VDD5
80	P060649	Diagnostic fault check to report "WDA active"
81	P060648	Diagnostic fault check to report "WDA active" due to errors in query-/response communication
82	P060691	Diagnostic fault check to report "WDA active" due to over voltage detection

No.	Code	Statement
83	P003212	O2 Sensor Heater Control Circuit High Bank 1 Sensor 1
84	P003111	O2 Sensor Heater Control Circuit Low Bank 1 Sensor 1
85	P003013	O2 Sensor Heater Control Circuit Bank 1 Sensor 1
86	P013217	O2 Sensor Circuit High Voltage Bank 1 Sensor 1
87	P013116	O2 Sensor Circuit Low Voltage Bank 1 Sensor 1
88	P013029	O2 Sensor Circuit Bank 1 Sensor 1
89	P013413	O2 Sensor Circuit No Activity Detected Bank 1 Sensor 1
90	P005212	O2 Sensor Heater Control Circuit High Bank 2 Sensor 1
91	P005111	O2 Sensor Heater Control Circuit Low Bank 2 Sensor 1
92	P005013	O2 Sensor Heater Control Circuit Bank 2 Sensor 2
93	P015217	O2 Sensor Circuit High Voltage Bank 2 Sensor 1
94	P015116	O2 Sensor Circuit Low Voltage Bank 2 Sensor 1
95	P015029	O2 Sensor Circuit Bank 2 Sensor 1
96	P015413	O2 Sensor Circuit No Activity Detected Bank 2 Sensor 1
97	U007388	Control Module Communication Bus Off
98	U014087	Lost Communication With Body Control Module
99	U012187	Lost Communication With Anti-Lock Brake System (ABS) Control Module

12.17.1 Diagnosis by trouble code

Instruction:

1. Make sure the trouble 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 trouble 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 trouble code shows some wiring trouble. Means open or different troubles in wirings.

Diagnosis help:

1. If the trouble 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 trouble 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 P005013 Oxygen sensor heating control circuit open

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 P005111 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 Coolant temperature sensor 1 circuit low 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	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

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 P015029 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

Fault code: P013116 P015116 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 Fuel injector control circuit low voltage
Fault code: P026212 Fuel injector control circuit high voltage

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 P015217 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

Fault code: P013413 P015413 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 Fuel injector 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 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

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: P060694 Electrical throttle safety monitoring function defective

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

12.17.2 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, it can't rotate or rotate slowly.

Possible defective parts: 1. Battery, 2. Starter motor, 3. Wirings harness or ignition switch, 4. Engine mechanism part.

General diagnosis procedures

Item	Procedures	Results	Next
1	Use multi-meter to check battery voltage if voltage is between 8V~12V or not when engine starts.	YES	Next Step
		NO	Replace battery
2	Turn on ignition switch, stop switch and side stand switch to check if the voltage of ECU pin 35 is 12V.	YES	Next Step
		NO	Repair switches or change harness
3	Keep ignition switch "on", use multi-meter to check if voltage of starting motor anode is over 8V.	YES	Next Step
		NO	Repair switches or change harness
4	Remove starting motor and check its working status, especially whether there was broken circuit or jammed by bad lubrication.	YES	Repair or replace starting motor
		NO	Next Step
5	If error only occur in Winter, check if starter motor resistance is too big caused by improper oil used.	YES	Change to proper lubricant
		NO	Next Step
6	Check if mechanical resistance is too big inside engine.	YES	Check resistance inside engine
		NO	Repeat above procedures

(2) When starting engine, it can rotate but cannot start.

Possible defective parts: 1. No fuel in fuel tank, 2. Fuel pump, 3. Pick up, 4. Ignition coil, 5. Mechanical parts of engine

General diagnosis procedures:

Item	Procedures	Results	Next
1	Connect fuel pressure gauge, turn on ignition switch or start engine, check if fuel pressure is around 300kpa.	YES	Next Step
		NO	Repair fuel supply system
2	Connect PDA, check if there's signal of RPM data after starting engine.	YES	Next Step
		NO	Check and repair RPM sensor circuit
3	Disconnect high-tension cable, connect spark plug and set its electrode 5mm to engine body, then start engine to check if blue and white spark appears.	YES	Next Step
		NO	Check and repair ignition system
4	Test cylinder pressure and check if pressure is enough	YES	Eliminate engine mechanical failures
		NO	Next step
5	Use PDA to test, turn on ignition switch, check if power supply of ECU pin 35 and pin 20 are normal. Check if pin 63, pin 64, pin 111 and pin 112 works normally.	YES	Use PDA to check
		NO	Repair related circuit

(3) Difficult to start hot engine.

General failure part: 1. Water in fuel tank, 2. Fuel pump, 3. Coolant temp. sensor, 4. Ignition coil.

General diagnosis procedures:

Item	Procedures	Results	Next
1	Connect fuel pump gauge, start engine, check if pressure is around 300kpa.	YES	Next Step
		NO	Repair fuel supply system
2	Disconnect high-tension cable, connect spark plug and set its electrode 5mm to engine body, then start engine to check if blue and white spark appears.	YES	Next Step
		NO	Repair ignition system
3	Disconnect coolant temp. sensor connector and start engine to check if engine can start (or use one 300ohm resistance to replace coolant temp. sensor).	YES	Repair wiring or replace sensor
		NO	Next step
4	Check whether the failure happens right after filling fuel oil.	YES	Change fuel
		NO	Next Step
5	Use PDA to test, turn on ignition switch, check if power supply of ECU pin 35 and pin 20 are normal. Check if pin 63, pin 64, pin 111 and pin 112 works normally.	YES	Use PDA to check
		NO	Repair related circuit

(4) Difficult to start cold engine.

General failure part: 1. Water in fuel tank, 2. Fuel pump, 3. Engine coolant temp. sensor, 4. Fuel injector, 5. Ignition coil, 6. Throttle body and by-pass, 7. Mechanical parts of engine

General diagnosis procedures:

Item	Procedures	Results	Next
1	Connect fuel pump gauge ,start engine, check if pressure is around 300kpa.	YES	Next Step
		NO	Replace battery
2	Disconnect high-tension cable, connect spark plug and set its electrode 5mm to engine body, then start engine to check if blue and white spark appears.	YES	Next Step
		NO	Repair switches or change harness
3	Disconnect coolant temp. sensor connector and start engine to check if engine can start (or use one 2500ohm resistance to replace coolant temp. sensor).	YES	Next Step
		NO	Repair switches or change harness
4	Slightly draw throttle cable and check if engine could start easily.	YES	Repair or replace starting motor
		NO	Next Step
5	Disassemble injector and use special tool to check if there is leakage or block.	YES	Change to proper lubricant
		NO	Next Step

6	Check whether the failure happens right after filling fuel.	YES	Check resistance inside engine
		NO	Repeat above procedures
7	Check if cylinder pressure is insufficient.	YES	Eliminate engine mechanic failures
		NO	Next step
8	Use PDA to test, turn on ignition switch, check if power supply of ECU pin 35 and pin 20 are normal. Check if pin 63, pin 64, pin 111 and pin 112 works normally.	YES	Use PDA to check
		NO	Check circuit

(5) Difficult to start in any conditions.

General failure part: 1, Water in fuel tank, 2. Fuel pump, 3. Coolant temp. sensor, 4. Fuel injector, 5. Ignition coil, 6. Throttle body and by-pass, 7. Air intake pipe, 8. Ignition TDC, 9. Spark plug, 10. Mechanical part of engine.

General diagnosis procedures:

Item	Procedures	Results	Next
1	Check if air filter is blocked or air intake pipe leaks	YES	Repair air intake system
		NO	Next step
2	Connect fuel pump gauge ,start engine, check if pressure is around 300kpa.	YES	Next Step
		NO	Repair fuel Supply system
3	Disconnect high-tension cable, connect spark plug and set its electrode 5mm to engine body, then start engine to check if blue and white spark appears.	YES	Next Step
		NO	Repair ignition System
4	Check if spark plug is suitable for requirement(including its type and clearance).	YES	Next Step
		NO	Adjust or replace
5	Disconnect coolant temp. sensor connector and start engine to check if engine can start.	YES	Repair circuit or replace sensor
		NO	Next Step
6	Slightly draw throttle cable and check if engine could start easily.	YES	Clean throttle body and bypass
		NO	Next Step
7	Disassemble injector and use special tool to check if there is leakage or blocked.	YES	Replace injector
		NO	Next step
8	Check whether the failure happens right after filling fuel.	YES	Change fuel
		NO	Next step
9	Check if cylinder pressure is insufficient.	YES	Eliminate mechanical failures
		NO	Next step
10	Check if ignition TDC complies with standard regulation.	YES	Next step
		NO	Adjust ignition TDC
11	Use PDA to test, turn on ignition switch, check if power supply of ECU pin 35 and pin 20 are normal. Check if pin 63, pin 64, pin 111 and pin 112 works normally.	YES	Use PDA to check
		NO	Repair related circuit

(6) Normal starting, but unstable idle speed.

General failure part: 1, Water in fuel tank, 2. Fuel pump, 3. Coolant temp. sensor, 4. Fuel injector, 5. Ignition coil, 6. Throttle body and by-pass, 7. Air intake pipe, 8. Ignition TDC, 9. Spark plug, 10. Mechanical part of engine.

General diagnosis procedures:

Item	Procedures	Results	Next
1	Check if air filter is blocked or air intake pipe leaks	YES	Repair air intake system
		NO	Next step
2	Check if air control valve is blocked.	YES	Clean or replace
		NO	Next Step
3	Check if spark plug is suitable for requirement (including its type and clearance).	YES	Next Step
		NO	Adjust or replace
4	Check if there is carbon deposit inside throttle body and air control valve.	YES	Clean
		NO	Next Step
5	Disassemble injector and use special tool to check if there is leakage or blocked or wrong fuel flow.	YES	Replace
		NO	Next Step
6	Check whether the failure happens right after filling fuel.	YES	Change fuel
		NO	Next Step
7	Check if cylinder pressure is insufficient.	YES	Eliminate mechanical failures
		NO	Next step
8	Check if ignition TDC complies with standard regulation.	YES	Next step
		NO	Repair ignition TDC

(7) Normal start, but unstable idle speed during engine warming.

General failure part: 1. Water in fuel tank, 2. Engine coolant temperature sensor, 3. Spark plug, 4. Throttle body and by-pass, 5. Air intake pipe, 6. Air control valve, 7. Mechanical part of engine

General diagnosis procedures:

Item	Procedures	Results	Next
1	Check if air filter is blocked or air intake pipe leaks.	YES	Repair air intake system
		NO	Next step
2	Check if spark plug is suitable for requirement (including its type and clearance).	YES	Next Step
		NO	Adjust or replace
3	Check if there is carbon deposit inside throttle body and air control valve.	YES	Clean
		NO	Next Step
4	Disconnect coolant temp. sensor connector and start engine to check idle speed is stable or not.	YES	Repair circuit or replace sensor
		NO	Next Step
5	Disassemble injector and use special tool to check if there is leakage or blocked or wrong fuel flow.	YES	Replace
		NO	Next Step
6	Check whether the failure happens right after filling fuel.	YES	Change fuel
		NO	Next Step
7	Check if cylinder pressure is insufficient.	YES	Eliminate mechanical failures
		NO	Next Step

8	Use PDA to test, turn on ignition switch, check if power supply of ECU pin 35 and pin 20 are normal. Check if pin 63, pin 64, pin 111 and pin 112 works normally.	YES	Use PDA to check
		NO	Repair related circuit

(8) Normal starting, but unstable idle speed after engine warming.

General failure part: 1. Water in fuel tank, 2. Engine coolant temperature sensor, 3. Spark plug, 4. Throttle body and by-pass, 5. Air intake pipe, 6. Air control valve, 7. Mechanical part of engine

General diagnosis procedures:

Item	Procedures	Results	Next
1	Check if air filter is blocked or air intake pipe leaks.	YES	Repair air intake system
		NO	Next step
2	Check if spark plug is suitable for requirement (including its type and clearance).	YES	Next Step
		NO	Adjust or replace
3	Check if there is carbon deposit inside throttle body and air control valve	YES	Clean
		NO	Next Step
4	Disconnect coolant temp. sensor connector and start engine to check idle speed is stable or not.	YES	Repair circuit or replace sensor
		NO	Next Step
5	Disassemble injector and use special tool to check if there is leakage or blocked or wrong fuel flow.	YES	Replace
		NO	Next Step
6	Check whether the failure happens right after filling fuel	YES	Change fuel
		NO	Next step
7	Check if cylinder pressure is insufficient.	YES	Eliminate mechanical failures
		NO	Next step
8	Check if ignition TDC complies with standard regulation.	YES	Next step
		NO	Repair ignition TDC

(9) Normal start, but unstable idle speed or engine stops when it is electronic loaded (e.g. headlight is on).

General failure part: 1. Air control valve, 2. Fuel injector

General diagnosis procedures:

Item	Procedures	Results	Next
1	Disassemble air control valve and check if there is carbon deposit inside throttle body, idle adjustment and by-pass	YES	Clean related parts
		NO	Next step
2	Check if output power increases when lighting, by using PDA to test if ignition advance angle, fuel spray and air intake volume is normal	YES	To steep 4
		NO	Next step
		NO	Repair air intake System
3	Disassemble injector and use special tool to check if there is leakage or blocked or wrong fuel flow	YES	Replace injector
		NO	Next Step
4	Use PDA to test, turn on ignition switch, check if power supply of ECU pin 35 and pin 20 are normal. Check if pin 63, pin 64, pin 111 and pin 112 works normally.	YES	Use PDA to check
		NO	Repair related circuit

(10) Normal start, but idle speed is too high

General failure part: 1. Throttle body and by-pass, 2. Fuel injector seat, 3. Air control valve, 4. Coolant temp. sensor, 5. Ignition TDC

General diagnosis procedures:

Item	Procedures	Results	Next
1	Check if throttle cable is jammed or too tight.	YES	Adjust
		NO	Next step
2	Check if there's leakage between air intake pip and injector seat.	YES	Repair air intake system
		NO	Next step
3	Remove air control valve and check if there s carbon deposit inside throttle body, air control valve and by-pass.	YES	Clean related Parts
		NO	Next Step
4	Remove coolant temp. sensor connector, start engine to check if idle speed is too high.	YES	Repair circuit or replace sensor
		NO	Next Step
5	Check if ignition TDC complies with standard regulation.	YES	Next Step
		NO	Repair ignition TDC

(11) RPM cannot increase or engine stops when accelerating.

General failure part: 1. Water in fuel tank, 2. TPS, 3. Spark plug, 4. Throttle body and by-pass, 5. Air intake pipe, 6. Air control valve, 7. Fuel injector, 8. Ignition TDC, 9. Exhaust pipe

General diagnosis procedures:

Item	Procedures	Results	Next
1	Check if air filter is blocked.	YES	Repair air intake system
		NO	Next step
2	Connect fuel pressure gauge, start engine to check if pressure is around 300kpa at idle.	YES	Next Step
		NO	Repair fuel supply system
3	Check if spark plug is suitable for requirement (including its type and clearance).	YES	Next Step
		NO	Adjust or replace
4	Remove air control valve and check if there is carbon deposit inside throttle body, air control valve and by-pass.	YES	Clean related parts
		NO	Next Step
5	Check if TPS and its circuit is normal.	YES	Next Step
		NO	Repair circuit or replace TPS
6	Disassemble injector and use special tool to check if there is leakage or blocked.	YES	Replace
		NO	Next step
7	Check whether the failure happens right after filling fuel.	YES	Change fuel
		NO	Next step
8	Check if ignition TDC and TDC order comply with standard regulation.	YES	Next step
		NO	Adjust ignition TDC
9	Check if exhaust gas exhale smoothly.	YES	Next step
		NO	Repair or replace exhaust pipe

(12) Low acceleration.

General failure part: 1. Water in fuel tank, 2. TPS, 3. Spark plug, 4. Throttle body and by-pass, 5. Air intake pipe, 6. Air control valve, 7. Fuel injector, 8. Ignition TDC, 9. Exhaust pipe

General diagnosis procedures:

Item	Procedures	Results	Next
1	Check if air filter is blocked.	YES	Repair air intake system
		NO	Next step
2	Connect fuel pressure gauge, start engine to check if pressure is around 300kpa at idle.	YES	Next Step
		NO	Repair fuel supply system
3	Check if spark plug is suitable for requirement (including its type and clearance).	YES	Next Step
		NO	Adjust or replace
4	Remove air control valve and check if there is carbon deposit inside throttle body, air control valve and by-pass.	YES	Clean related parts
		NO	Next Step
5	Check if TPS and its circuit is normal.	YES	Next Step
		NO	Repair circuit or replace TPS
6	Disassemble injector and use special tool to check if there is leakage or blocked.	YES	Replace
		NO	Next step
7	Check whether the failure happens right after filling fuel.	YES	Change fuel
		NO	Next step
8	Check if ignition TDC and TDC order comply with standard regulation.	YES	Next step
		NO	Adjust ignition TDC
9	Check if exhaust gas exhale smoothly.	YES	Next step
		NO	Repair or replace exhaust pipe

(13) Difficult to accelerate and bad performance.

General failure part: 1. Water in fuel tank, 2. TPS, 3. Spark plug, 4. Ignition coil, 5. Throttle body and by-pass, 6. Air intake pipe, 7. Air control valve, 8. Injector, 9. Ignition TDC, 10. Exhaust pipe

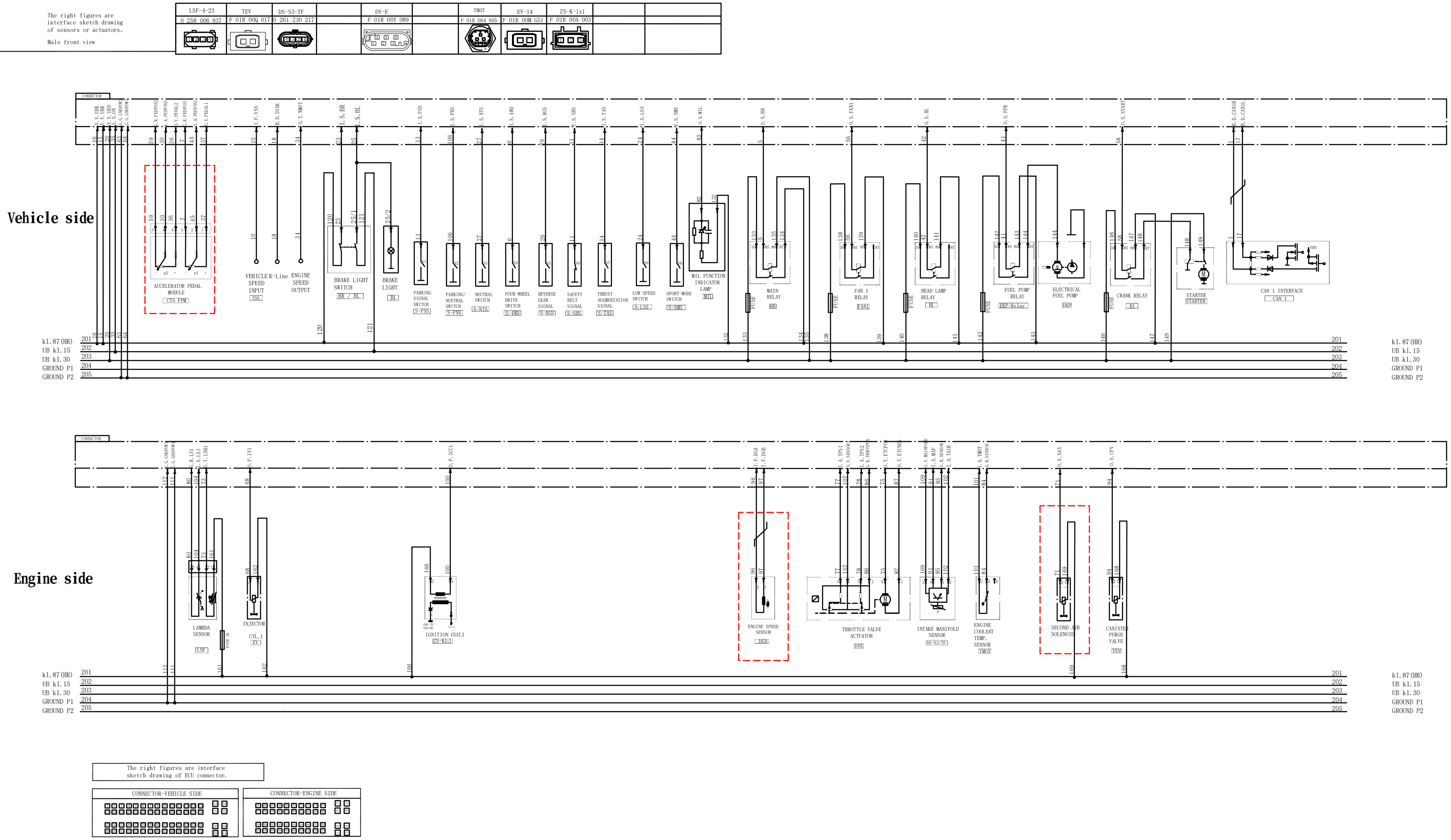
General diagnosis procedures:

Item	Procedures	Results	Next
1	Check if clutch sliding, low tire pressure, bad brake or wrong tire size.	YES	Repair
		NO	Next step
2	Check if air filter is blocked.	YES	Repair air intake system
		NO	Next step
3	Connect fuel pressure gauge, start engine to check if pressure is around 300kpa at idle.	YES	Next Step
		NO	Repair fuel supply system
4	Disconnect high-tension cable, connect spark plug and set its electrode 5mm to engine body,then start engine to check if spark is strong enough.	YES	Next step
		NO	Repair ignition system

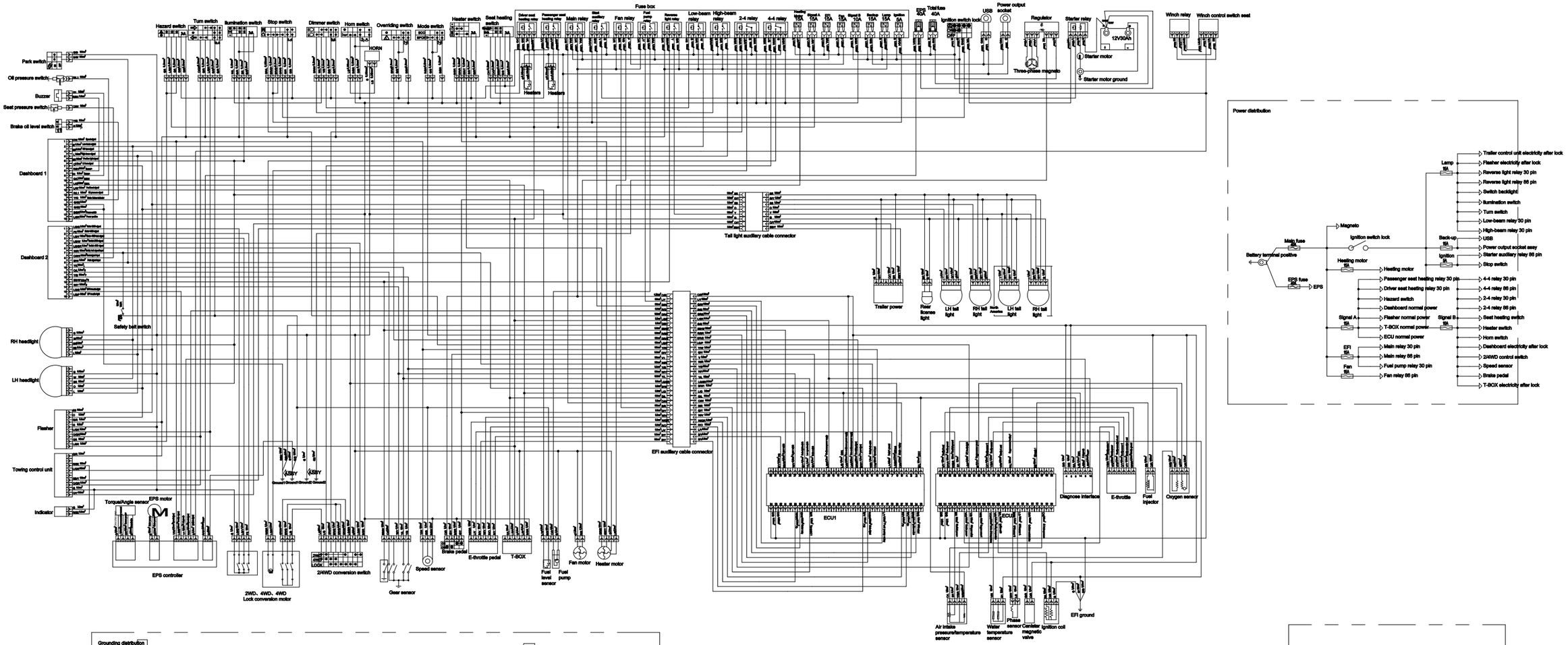
5	Check if spark plug is suitable for requirement (including its type and clearance).	YES	Next Step
		NO	Adjust or replace
6	Remove air control valve and check if there is carbon deposit inside throttle body, air control valve and by-pass.	YES	Clean related Part
		NO	Next step
7	Check if TPS and its circuit is normal.	YES	Next step
		NO	Repair circuit or Replace sensor
8	Disassemble injector and use special tool to check if there is leakage or blocked.	YES	Replace
		NO	Next step
9	Check whether the failure happens right after filling fuel.	YES	Change fuel
		NO	Next step
10	Check if ignition TDC complies with standard regulation.	YES	Next step
		NO	Repair ignition TDC
11	Check if exhaust gas exhale smoothly.	YES	Next step
		NO	Repair or replace

Appendix A

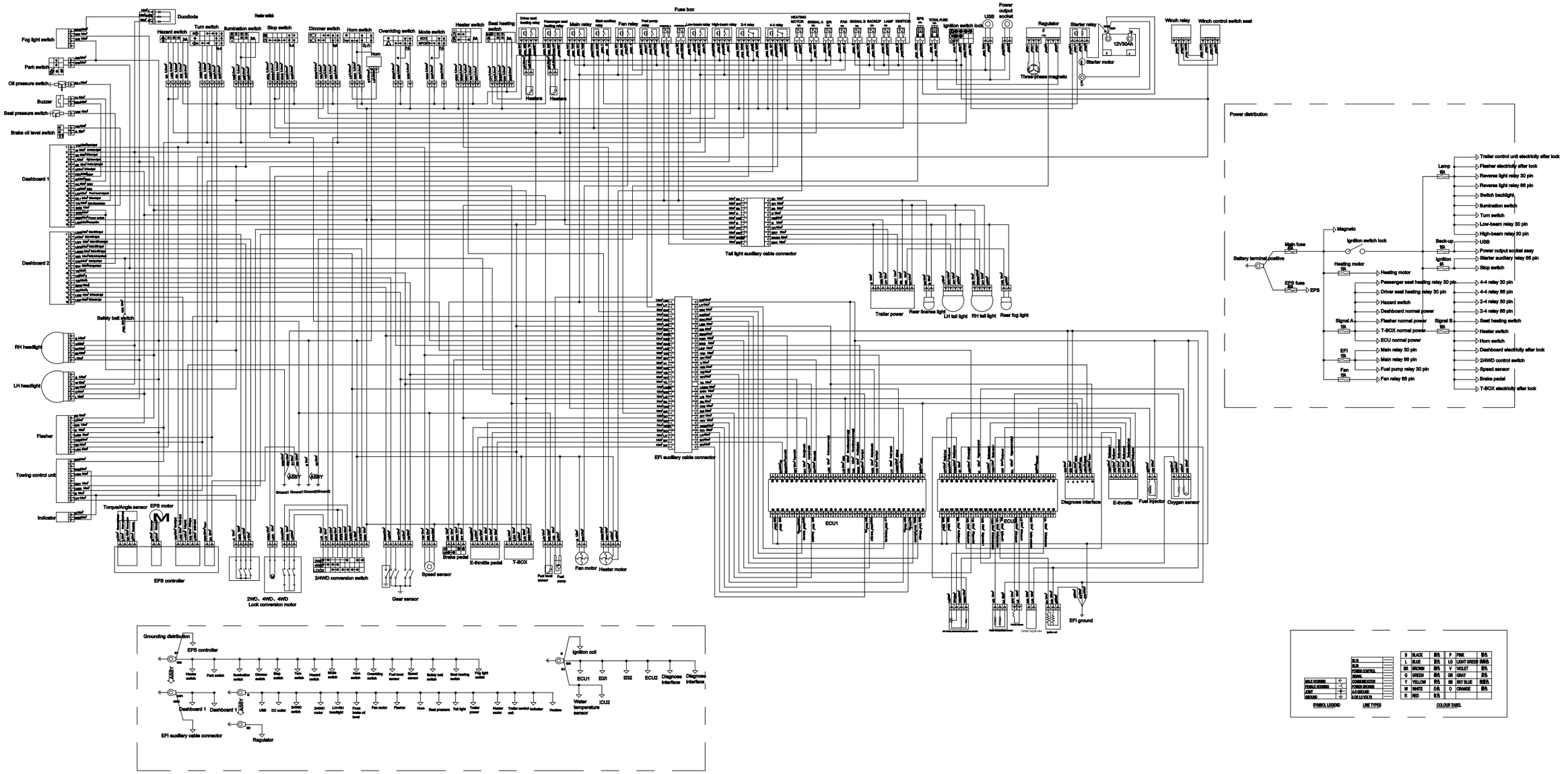
PIN-NO.	SIGNAL	FUNCTION
VEHICLE SIDE		
1	B-D-CAN1H	CAN1H
2	NC	
3	NC	
4	NC	
5	O-S-HR	MAIN RELAY
6	I-S-4WD	FOUR-WHEEL DRIVE SWITCH
7	G-R-PEDPOS1	GROUND FOR PEDAL 1
8	NC	
9	NC	
10	I-F-VSS	VEHICLE SPEED INPUT
11	I-S-SBS	SAFETY BELT SWITCH
12	NC	
13	I-S-PSS	PARKING SIGNAL SWITCH
14	I-S-TAS	THRUST AUGMENTATION SWITCH
15	V-V-UBR	SWITCHED BATTERY VOLTAGE
16	V-V-UBR	SWITCHED BATTERY VOLTAGE
17	B-D-CAN1L	CAN1L
18	B-D-DIAK	K-LINE
19	NC	
20	V-V-UBD	CONTINOUS SUPPLY VOLTAGE
21	NC	
22	NC	
23	I-S-BR	BRAKE SWITCH
24	I-S-LSS	LOW SPEED SWITCH
25	I-S-BL	BRAKE SWITCH LIGHT
26	NC	
27	I-S-NTS	NEUTRAL SWITCH SIGNAL
28	NC	
29	I-S-RGS	REVERSE GEAR SWITCH
30	I-A-PEDPOS2	ACCELERATOR PEDAL SENSOR2
31	NC	
32	NC	
33	NC	
34	O-T-NMOT	ENGINE SPEED OUTPUT
35	I-S-ON	IGNITION SWITCH 点火开关
36	O-V-SENSOR2	SENSOR SUPPLY FOR PEDAL 2
37	O-V-SENSOR1	SENSOR SUPPLY FOR PEDAL 1
38	NC	
39	NC	
40	NC	
41	O-S-FPR	FUEL PUMP RELAY
42	O-S-HL	HEAD LAMP RELAY
43	NC	
44	I-S-SMS	SPORT-MODE SWITCH
45	I-A-PEDPOS1	ACCELERATOR PEDAL SENSOR1
46	NC	
47	NC	
48	NC	
49	NC	
50	NC	
51	NC	
52	NC	
53	NC	
54	NC	
55	NC	
56	O-S-FAN1	FAN RELAY CONTROL 1
57	NC	
58	O-S-START	CRANK RELAY
59	G-R-PEDPOS2	GROUND FOR PEDAL2
60	NC	
61	NC	
62	NC	
63	G-G-GNDPOW2	ECU MAIN GROUND 2
64	G-G-GNDPOW1	ECU MAIN GROUND 1
ENGINE SIDE		
65	NC	
66	NC	
67	NC	
68	O-P-IV1	INJECTOR1(CYL.1)
69	NC	
70	NC	
71	O-S-SAS	SECOND AIR SOLENOID
72	NC	
73	O-T-LSH1	LAMBDA SENSOR HEATING1
74	NC	
75	O-T-ETCPOS	THROTTLE ACTUATOR
76	NC	
77	I-A-TPS1	THROTTLE POSITION SENSOR 1
78	I-A-TPS2	THROTTLE POSITION SENSOR 2
79	NC	
80	G-R-LS1	GROUND FOR LAMBDA
81	NC	
82	O-S-MIL	MIL FUNCTION INDICATOR LAMP
83	NC	
84	G-R-SENSOR	GROUND FOR SENSOR
85	G-R-SENSOR1	GROUND FOR MANIFOLD
86	G-R-THROTPOS	GROUND FOR THROTTLE
87	O-T-ETCNEG	THROTTLE ACTUATOR
88	NC	
89	NC	
90	NC	
91	I-A-MAP	INTAKE MANIFOLD PRESSURE
92	NC	
93	NC	
94	O-S-CPV	CANISTER PURGE VALVE
95	NC	
96	I-F-DGA	ENGINE SPEED SENSOR A
97	I-F-DGB	ENGINE SPEED SENSOR B
98	NC	
99	NC	
100	O-P-ICC1	IGNITION COIL1
101	I-A-TMOT	ENGINE COOLANT TEMP SENSOR
102	I-A-TAIR	INTAKE AIR TEMPERATURE SENSOR
103	NC	
104	I-A-LS1	LAMBDA SENSOR1
105	NC	
106	I-S-PNS	PARKING/NUETRAL SWITCH
107	O-V-SENSOR1	SENSOR SUPPLY FOR THROTTLE
108	NC	
109	O-V-MAINFOLD	SENSOR SUPPLY FOR MAINFOLD
110	NC	
111	G-G-GNDPOW4	ECU MAIN GROUND 4
112	G-G-GNDPOW3	ECU MAIN GROUND 3



Appendix B
EU 167



Appendix B
LOF



MALE HOUSING	←
FEMALE HOUSING	≺
JOINT	┼
GROUND	⏚

SYMBOL LEGEND

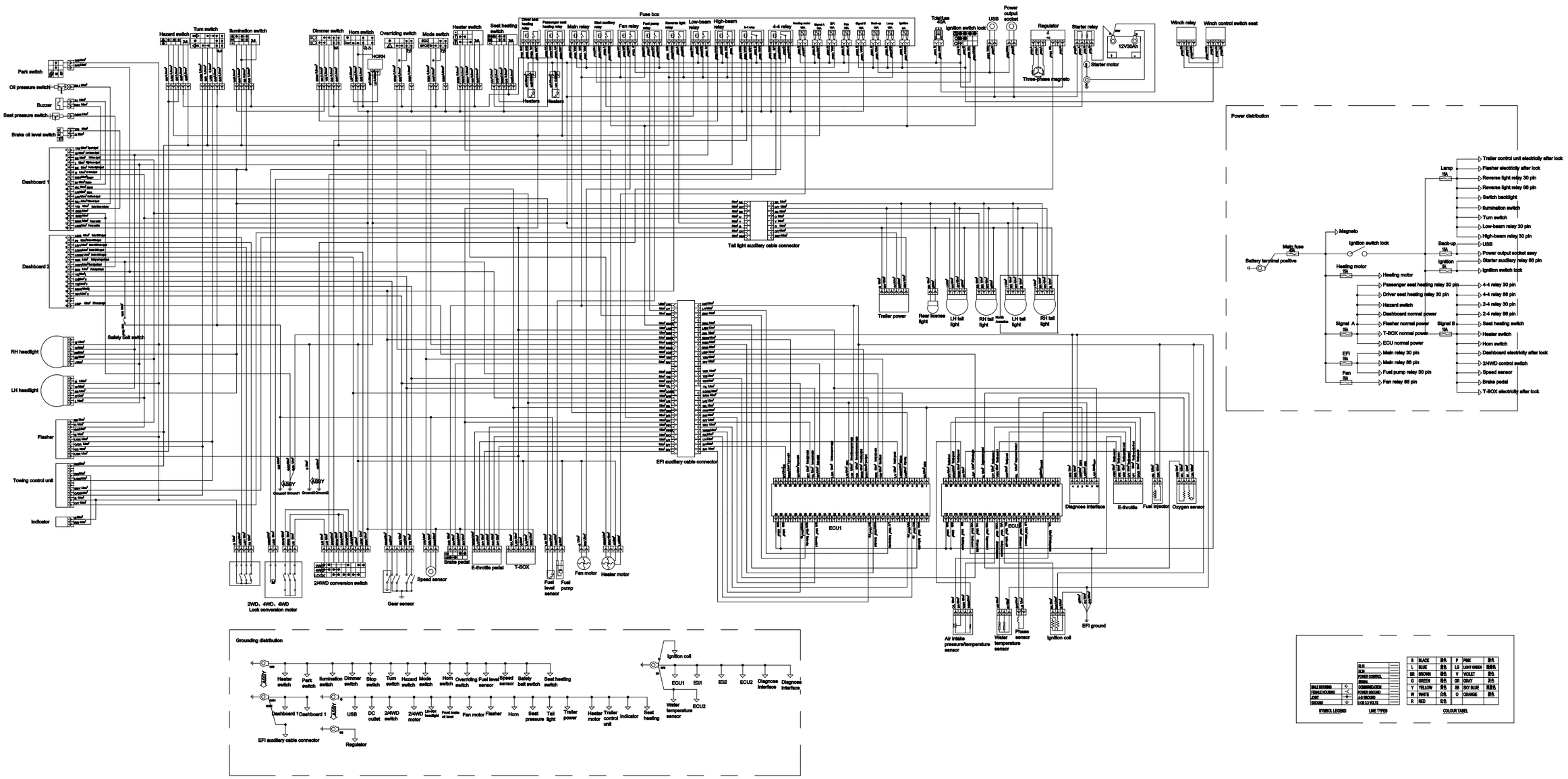
KL15	—
KL30	—
POWER CONTROL	—
SIGNAL	—
COMMUNICATION	—
POWER GROUND	—
A-D GROUND	—
5 OR 3.3 VOLTS	—

LINE TYPES

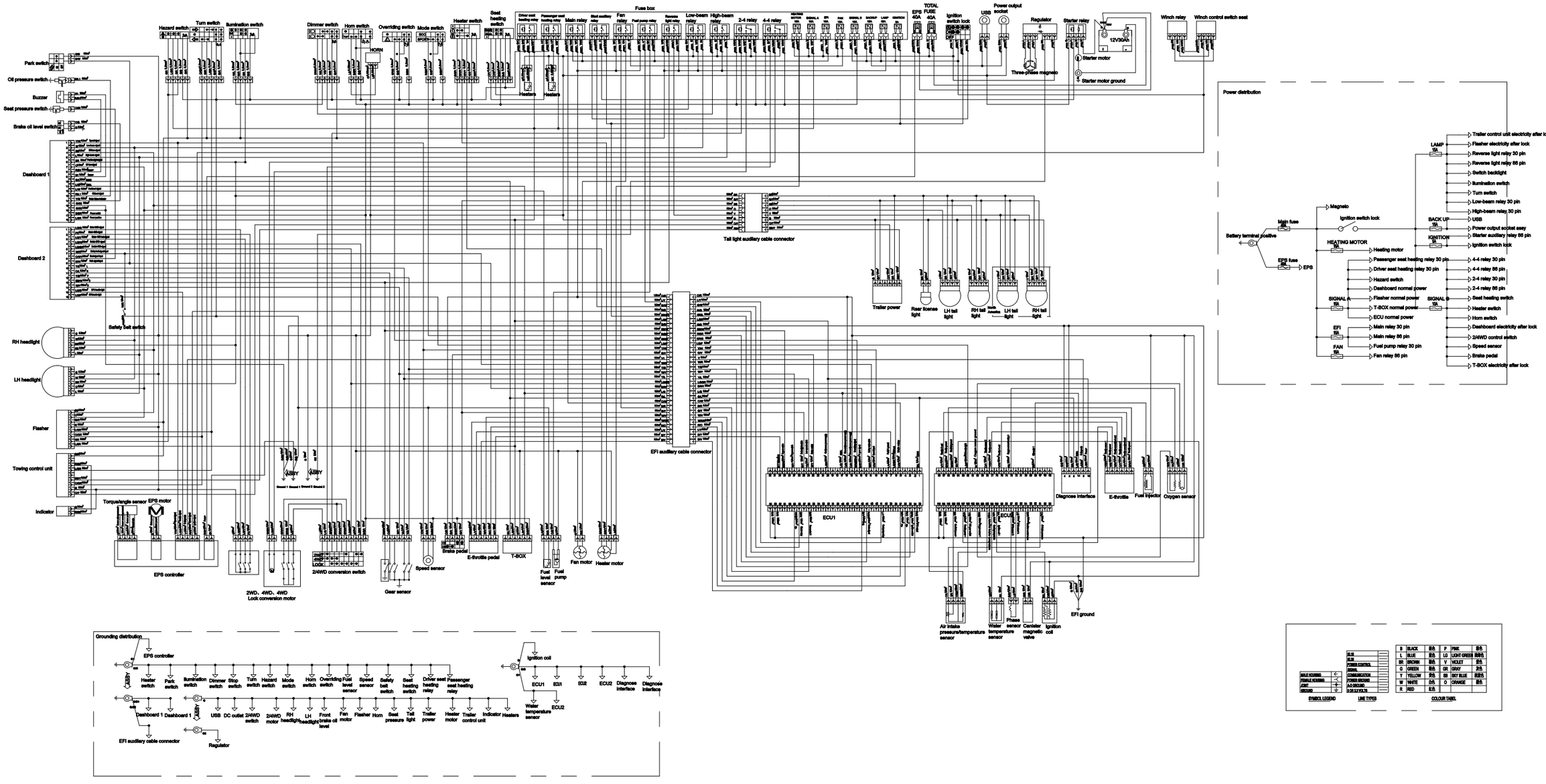
B	BLACK	黑色	P	PINK	粉色
L	BLUE	蓝色	LG	LIGHT GREEN	浅绿色
BR	BROWN	棕色	V	VIOLET	紫色
G	GREEN	绿色	GR	GRAY	灰色
Y	YELLOW	黄色	SB	SKY BLUE	浅蓝色
W	WHITE	白色	O	ORANGE	橙色
R	RED	红色			

COLOUR TABEL

Appendix B
North America and international status (low-level configuration)



Appendix B
North America and international status (advanced configuration)



SYMBOL LEGEND	LINE TYPES	COLOUR TABEL					
MALE HOUSING	ALM	B BLACK 黑色	P PINK 粉色
FEMALE HOUSING	ALM	L BLUE 蓝色	LG LIGHT GREEN 浅绿色
JOINT	POWER CONTROL	BR BROWN 棕色	V VIOLET 紫色
GROUND	SIGNAL	G GREEN 绿色	GR GRAY 灰色
	COMMUNICATION	Y YELLOW 黄色	SB SKY BLUE 浅蓝色
	POWER GROUND	W WHITE 白色	O ORANGE 橙色
	A/D GROUND	R RED 红色	
	9.0V,13.5V,16.7V		