



MASSIMO

T-BOSS 760



SERVICE MANUAL

⚠ WARNING



Operating this ATV if you are under the age of 16 increases your chance of severe injury or death.

NEVER operate this ATV if you are under age 16.

Not designed for use on race tracks or rental services. Use of vehicle in an unintended manner can result in injury, property or personal damages. Such activities are not covered by warranty. © Massimo Motor, LLC

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⚠ WARNING



RISK of ROLLOVER even on flat terrain

ROLLOVERS could result in DEATH or SERIOUS INJURY

AVOID sudden sharp turns

AVOID steep inclines

AVOID riding across slopes

CHAPTER 1 GENERAL INFORMATION

WARNING

The parts of different types/ variants/ versions maybe un-interchangeable, even some parts have almost same appearance. Always refer to Parts Manual of each UTV model for spare parts information and service.

1.1 IMPORTANT INFORMATION

1.2 V.I.N AND ENGINE SERIAL NUMBER

1.3 VEHICLE DIMENSIONS

1.1 IMPORTANT INFORMATION

PREPARATION FOR REMOVAL PROCEDURES

1. Remove all dirt, mud, dust and foreign material before removal and disassembly.
2. Use proper tools and cleaning equipment.
3. When disassembling the machine, always keep mated parts together. This includes gears, cylinders, pistons and other parts that have been "mated" through normal wear. Mated part must always be reused or replaced as an assembly.
4. During machine disassembly, clean all parts and place them in trays in the order of disassembly. This will speed up assembly and allow for the correct installation of all parts.
5. Keep all parts away from any source of fire.

REPLACEMENT PARTS

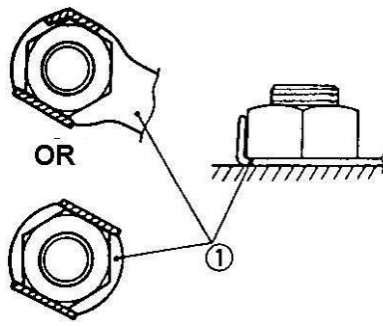
Use only genuine parts for all replacements. Use recommended oil and grease for all lubrication jobs. Other brands may be similar in function and appearance, but inferior in quality.

GASKETS, OIL SEALS AND O-RINGS

1. Replace all gaskets seals and O-rings when overhauling the engine. All gasket surfaces, oil seal lips and O-rings must be cleaned.
2. Properly oil all mating parts and bearings during reassembly. Apply grease to the oil seal lips.

LOCK WASHERS/PLATES AND COTTER PINS

Replace all lock washers/plates and cotter pins after removal. Bend lock tabs along the bolt or nut flats after the bolt or nut has been tightened to specification.



BEARINGS AND OIL SEALS

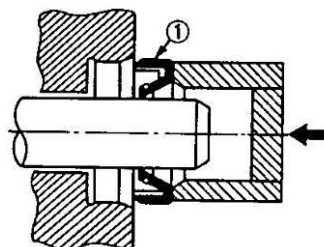
Install bearings and oil seals so that the manufacturer's marks or numbers are visible. When installing oil seals, apply a light coating of lightweight lithium base grease to the seal lips. Oil bearings liberally when installing, if appropriate.

① oil seal

CAUTION:

Do not use compressed air to spin the bearings dry. This will damage the bearing surfaces.

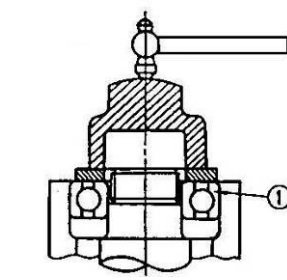
① Bearing



CIRCLIPS

1. Check all circlips carefully before reassembly. Always replace piston pin clips after one use. Replace distorted circlips. When installing a circlip ①, make sure that the sharp-edged corner ② is positioned opposite the thrust ③ it receives. See sectional view.

④ Shaft



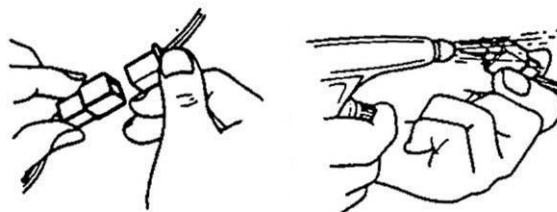
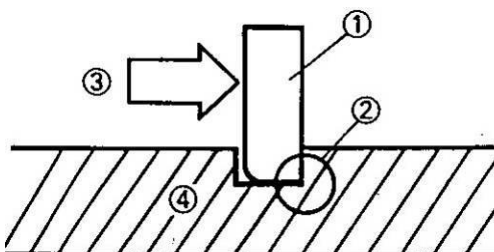
CHECKING OF CONNECTIONS

Dealing with stains, rust, moisture, etc. on the connector.

1. Disconnect:
 - Connector
2. Dry each terminal with an air blower.
3. Connect and disconnect the connector two or three.
4. Pull the lead to check that it will not come off.
5. If the terminal comes off, bend up the pin ① and reinsert the terminal into the connector.
6. Connect:
 - Connector

NOTE:

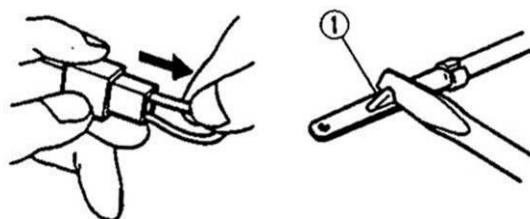
The two connectors "click" together.



7. Check for continuity with a tester.

NOTE:

- If there is no continuity, clean the terminals.
- Be sure to perform the steps 1 to 7 listed above when checking the wire harness.
- Use the tester on the connector as shown.



⚠ WARNING

Never run an engine in an enclosed area. Carbon monoxide exhaust gas is poisonous and can cause severe injury or death. Always start engines outdoors.

Gasoline is extremely flammable and explosive under certain conditions. Battery electrolyte is poisonous. It contains sulfuric acid. Serious burns can result from contact with skin, eyes or clothing. Always keep alert and wear protection..

Exhaust system components are very hot during and after use of UTV. Never service when the engine is warm or hot. Escaping steam from cooling system or hot oil from the machine can cause severe burns. The engine must be cool before service.

Crate of the UTV and parts in the UTV maybe have sharp edge, always pay attention and wear protection.

CONVERSION TABLE**How to use the CONVERSION TABLE**

Use this table to convert METRIC unit data to IMPERIAL unit data.

Ex.

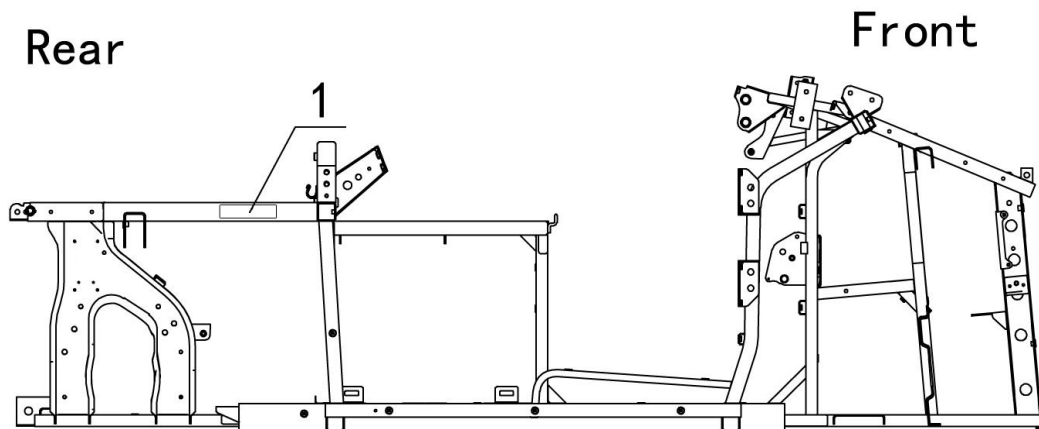
METRIC		MULIPLIER		IMP
**mm	x	0. 3937	=	**in
**cm	x	0.03937	=	**in

CONVERSION TABLE

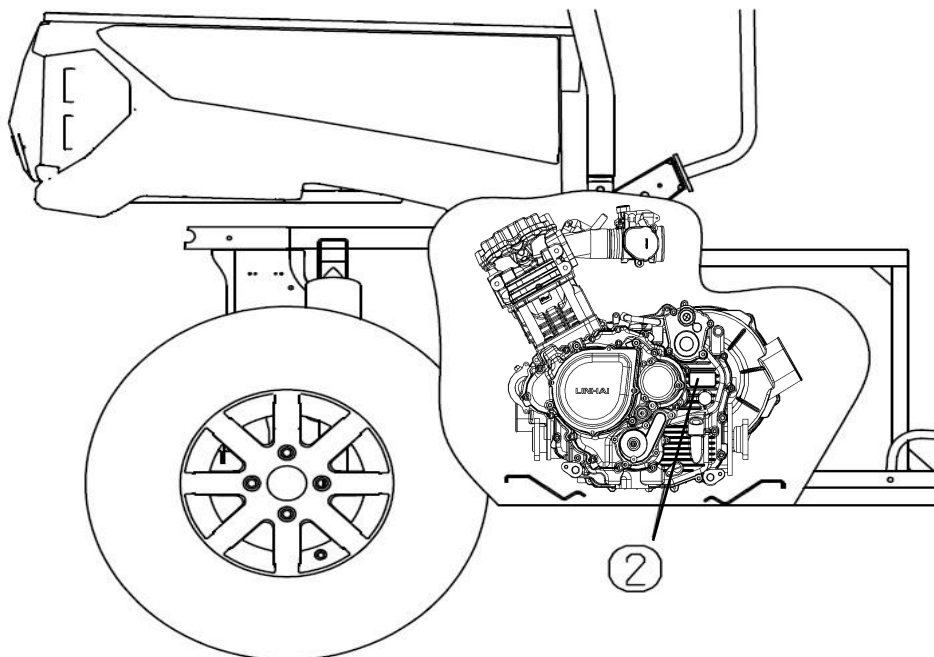
METRIC TO IMP			
	Known	Multiplier	Result
Torque	m • kg	7.233	ft • lb
	m • kg	86.794	ln • lb
	cm • kg	0.0723	ft • lb
	cm • kg	0.8679	ln • lb
Weight	kg	2.205	lb
	g	0.03527	oz
Distance	km/h	0.6214	mph
	km	0.6214	mi
	m	3.281	ft
	m	1.094	yd
	cm	0.3927	in
	mm	0.03927	in
Volume/ Capacity	cc(cm ³)	0.03527	oz(IMP liq.)
	cc(cm ³)	0.06102	cu • in
	lit(liter)	0.8799	qt (IMP liq.)
	lit(liter)	0.2199	gal(IMP liq.)
Miscellaneous	kg/mm	55.997	lb/in
	kg/cm ²	14.2234	psi(lb/in ²)
	Centigrade	9/5(°C)+32	Fahrenheit(° F)

1.2 V.I.N AND ENGINE SERIAL NUMBER

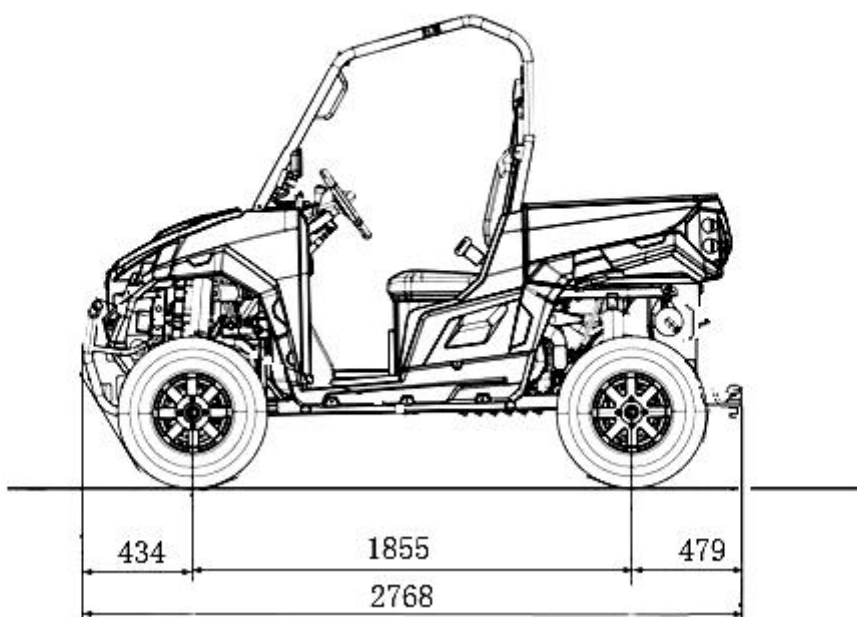
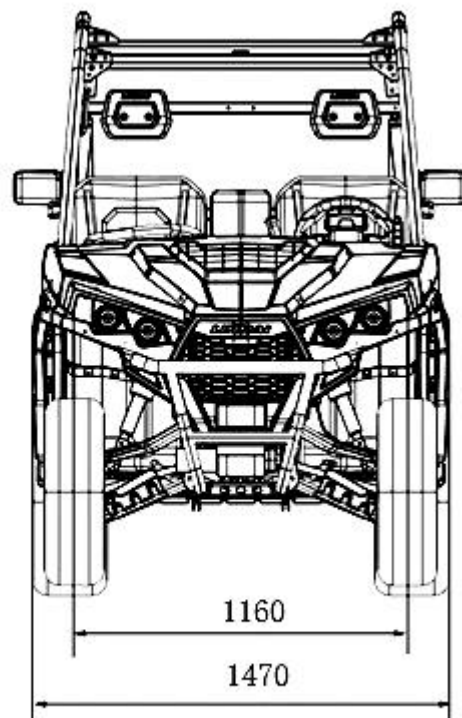
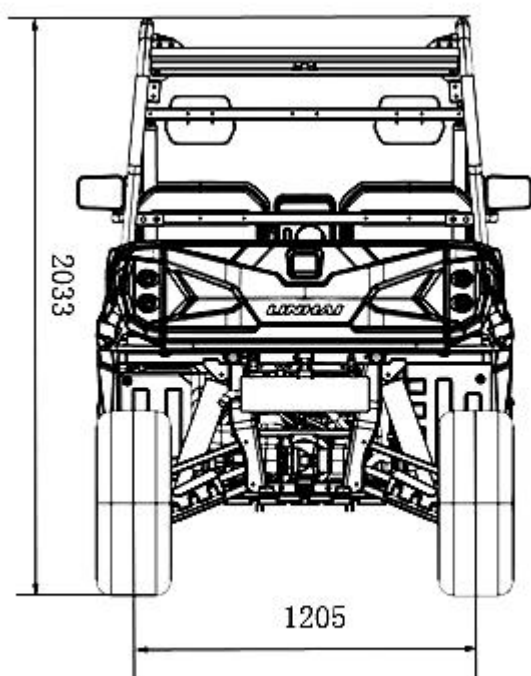
The vehicle identification number ① is stamped into the rear right of the frame tube.



The engine serial number ② is stamped into left side of engine crankcase.



1.3 VEHICLE DIMENSIONS



[illegible]

CHAPTER 2 MAINTENANCE

WARNING

The parts of different types/ variants/ versions maybe un-interchangeable, even some parts have almost same appearance. Always refer to Parts Manual of each UTV model for spare parts information and service.

2.1 PERIODIC MAINTENANCE

2.2 THROTTLE PEDAL INSPECTION

2.3 CHOKE ADJUSTMETN

2.4 FUEL SYSTEM

2.5 TOE ALIGNMENT

2.6 BRAKING SYSTEM INSPECTION

2.7 SUSPENSION SPRING RPELOAD ADJUSTMENT

2.8 WHEELS

2.9 TIRE PRESSURE

3.0 FRAME, NUTS, BOLTS, FASTENERS

2.1 PERIODIC MAINTENANCE

GENERAL

CAUTION

Mark on the following chart

Due to the nature of the adjustments marked with a **D** on the following chart, it is recommended that service be performed by an authorized dealer.

- More often under severe use, such as dirty or wet conditions to purge water or dirt contamination from grease fittings and other critical components.

PERIODIC MAINTENANCE SCHEDULE

Careful periodic maintenance will help keep your vehicle in the safest, most reliable condition. Inspection, adjustment and lubrication intervals of important components are explained in the following chart on the following pages.

Maintenance intervals are based upon average riding conditions and an average vehicle speed of approximately 16km/h (10 miles per hour). Vehicles subjected to severe use, such as operation in wet or dusty areas, should be inspected and serviced more frequently.

Inspect, clean, lubricate, adjust or replace parts as necessary.

NOTE: Inspection may reveal the need for replacement parts. Always use genuine parts available from your dealer.

Service and adjustments are critical. If you are not familiar with safe service and adjustment procedures, have a qualified dealer perform these operations.

A = Adjust I = Inspect

C = Clean L = Lubricate

D = Drain R = Replace

T = Tighten to Correct Torque

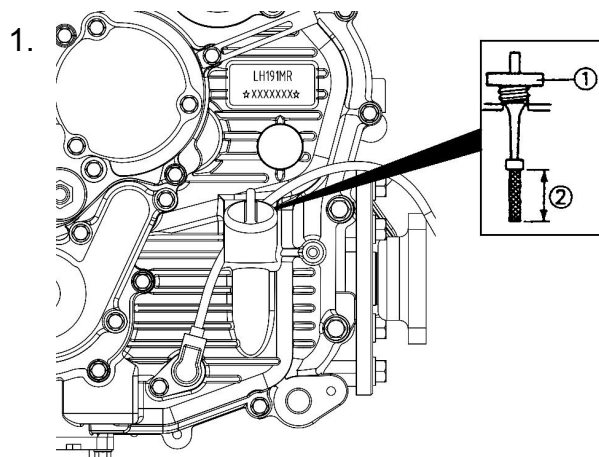
	Item	Hours	When	Remarks
●	Brake System	Pre-ride	Pre-ride	Pre-ride inspection item
	Accelerator pedal	Pre-ride	Pre-ride	Inspect –adjust, lubricate, replace if necessary; pre-ride inspection item
	Fuel System	Pre-ride	Pre-ride	Check for leaks at tank cap, lines, fuel valve, filter, and carburetor.
●	Tires	Pre-ride	Pre-ride	Inspect daily, pre-ride inspection item
●	Front and Rear Wheels/ Hubs	Pre-ride	Pre-ride	Pre-ride inspection item
●	Steering	Pre-ride	Pre-ride	Inspect daily, lubricate
D	Wheels bearings	10 hrs	Monthly	Check for looseness/ damage. Replace if damaged.
	Frame nuts, bolts fasteners	Pre-ride	Pre-ride	Pre-ride inspection item
●	Air Filter-Pre-Cleaner	Daily	Daily	Inspect-Clean
	Coolant/Level Inspection	Daily	Daily	Replace engine coolant every one year
●	Air Box Sediment Tube	Daily	Daily	Drain deposits whenever visible
	Headlamp Inspection	Daily	Daily	Check operation daily; apply dielectric grease to connector when replaced
	Tail/ indicator lamp inspection	Daily	Daily	Check operation daily; apply dielectric grease to socket when replaced
●	Air Filter-Main Element	Weekly	Weekly	Inspect –Replace if necessary
	Battery	20 hrs	Monthly	Check/clean Terminals; check fluid level
D	Brake pad wear	10 hrs	Monthly	Inspect periodically
●	Rear Gear case Oil	100 hrs	Monthly	Check monthly and change annually
●	Front Gear case Oil	100 hrs	Monthly	Check monthly and change annually
	Engine Cylinder Head and Cylinder Base Fasteners	25 hrs	3 months	Inspect (re-torque required at first service only)
●	General Lubrication	50 hrs	3 months	Lubricate all fittings, pivots, cables, etc.
●	Engine Oil-Level/Change	30 hrs	3 months	Check Level Daily; Break in Service at 1 month. Change oil more often in cold weather use.

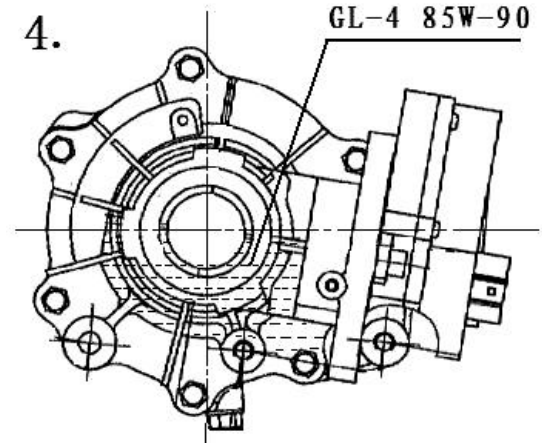
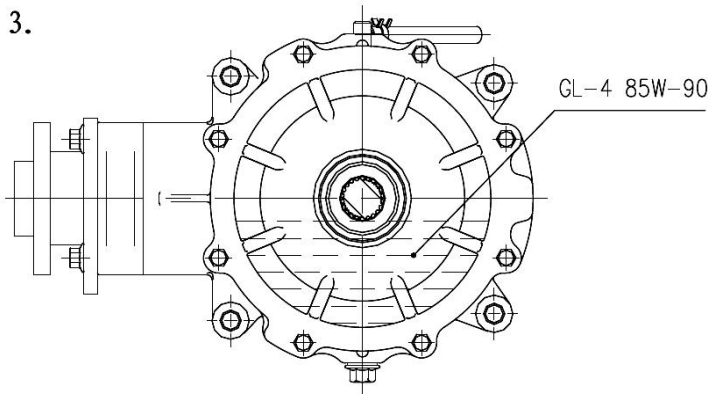
	Item	Hours	When	Remarks
●	Oil Filter	50 hrs	6 months	Inspect-clean
	Engine breather hose	100 hrs	6 months	Inspect
D	Throttle Cable/ Accelerator pedal	20 hrs	monthly	Inspect –adjust, lubricate, replace if necessary; pre-ride inspection item
	Coolant strength	100 hrs	6 months	Inspect strength seasonally
	Shift linkage	50 hrs	6 months	Inspect, adjust
D	Drive belt	50 hrs	6 months	Inspect, replace if necessary
D	Steering system	50 hrs	6 months	Check operation and for looseness, worn, damage, binding feeling / Adjust, repair, Replace if necessary. Check toe alignment /Adjust if necessary.
D	Toe adjustment	As required	As required	Periodic inspection, adjust when parts are replaced
D	Front Axle (CV Joints)	10 hrs	Monthly	Check for/ Axle boots/ looseness/ damage.
D	Rear Axle (CV Joints)	10 hrs	Monthly	Check for/ Axle boots/ looseness/ damage.
●	Front Prop Shaft & Shaft Yoke	50 hrs	6 months	Check for looseness/ damage.
●	Rear Prop Shaft, Shaft Yoke & Boots	50 hrs	6 months	Check for/ boots/ looseness/ damage.
●	Front Suspension	50 hrs	6 months	Inspect-lubricate, tighten fasteners
●	Rear Suspension	50 hrs	6 months	Inspect, tighten fasteners
	Spark Plug	100 hrs	12 months	Inspect-replace if necessary
D	Ignition Timing	100 hrs	12 months	Inspect and adjust as needed
D	Fuel System	50 hrs	6 months	Check for leaks at tank cap, lines, fuel valve, filter, and carburetor. Replace lines every one year
D	Fuel Filter	100 hrs	12 months	Replace annually
	Radiator	100 hrs	12 months	Inspect/clean external surface

	Item	Hours	When	Remarks
	Cooling System hoses	50 hrs	6 months	Inspect/replace if necessary
	Spark arrestor	10 hrs	monthly	Clean out-replace if necessary
D	Clutches (drive and driven)	25 hrs	3 months	Inspect, clean
	Engine mounts	25 hrs	3 months	Inspect
D	Valve clearance	100 hrs	12 months	Inspect/adjust
D	Brake fluid	200 hrs	24 months	Change every two years
	Idle Speed	As required	As required	Adjust
	Headlight Aim	As required	As required	Adjust if necessary

LUBRICATION RECOMMENDATIONS

	Item	Lube Rec	Method	Frequency
●	1. Engine Oil	SAE10W-50/SN	Add to proper level on dipstick	Check level daily
	2.Brake Fluid	DOT 3 Only	Maintain level Between fill lines. See "16. MAINTENANCE/ Brakes"	As require; change every two years or 200 hours
	3.Rear Gear case oil	SAE GL-4 85W/90	See "16.MAINTENANCE/ Rear Gear Case Lubrication"	Change annually or at 100 hours
	4.Front Gear case oil (only for 4WD Model)	SAE GL-4 85W/90	See "16.MAINTENANCE/ Front Gear Case Lubrication"	Change annually or at 100 hours





	Item	Lube Rec	Method	Frequency
●	5.Steering system	Grease	Lubricate the pivoting and sliding parts	Every 3 months or 50 hours
●	6.Tie rods	Grease	Grease	Semi-annually
●	7.Shift Linkages	Grease	Locate fittings and Grease	Semi-annually
●	8.Front Wheel bearings	Inspect	Inspect and replace bearings if necessary	Semi-annually
●	9.Ball joints	Grease	Inspect, Locate fittings and Grease, or replace it if necessary	Semi-annually
●	10.Prop Shaft & Shaft Yoke, Spline Joint	Grease	Locate fitting and Grease	Semi-annually
●	11. Front/Rear A-arm pivot Shaft	Grease	Locate fitting on pivot shaft and grease with grease gun	Every 3 months or 50 hours
●	12.Throttle Cable	Grease M	Grease, inspect and replace it if necessary	Monthly or 20 hours
●	13. Accelerator pedal and brake pedal	Grease	Grease, inspect	Monthly or 20 hours
●	14.Rear Wheel Bearing	Inspect	Inspect and replace bearings if necessary	Semi-annually

NOTE:

1.More often under severe use, such as wet or dusty conditions.

2.Grease: Light weight lithium-soap grease.

3.Grease M: Molybdenum disulfide (MoS₂) grease (water resistant).

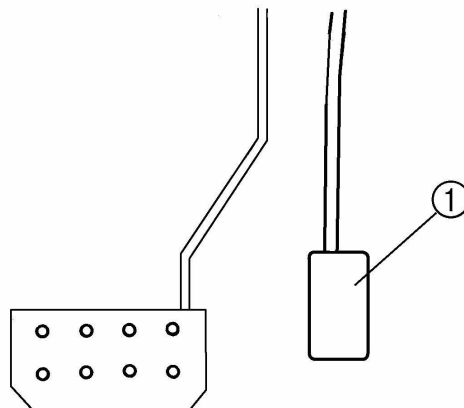
4. When suspension action becomes stiff or after washing.

5. Hours are based on 10 mph (16 Km/h) average.

2.2 THROTTLE PEDAL INSPECTION

THROTTLE FREEPLAY

If the throttle pedal has excessive play due to cable stretch or cable misadjustment, it will cause a delay in throttle speed. Also, the throttle may not open fully. If the throttle pedal has no play, the throttle may be hard to control, and the idle speed may be erratic. Check the throttle pedal play periodically in accordance with the Periodic Maintenance Chart and adjust the play if necessary.

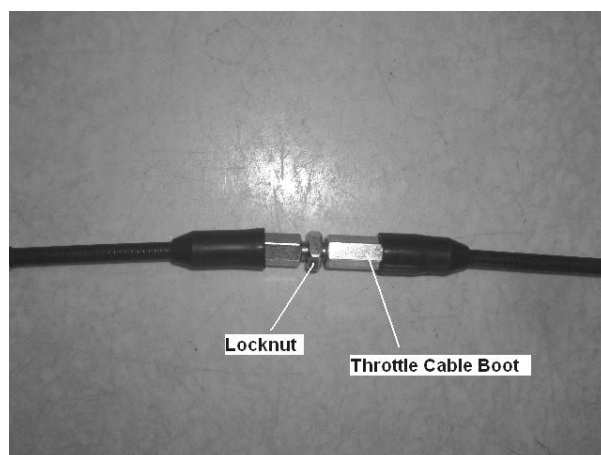


THROTTLE FREEPLAY INSPECTION

1. Apply the parking brake.
2. Put the gear shift lever in the N(Neutral) position.
3. Start the engine, and warm it up thoroughly.
4. Measure the distance the throttle pedal moves before the engine begins to pick up speed. Free play should be 1.5 – 3 mm.

Adjustment

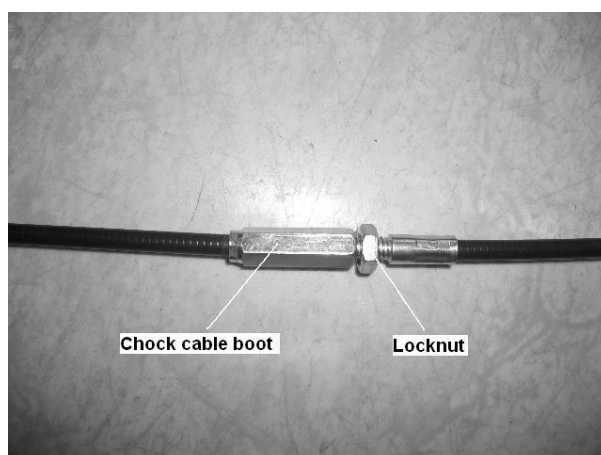
1. Slide the boot off inline cable adjuster sleeve. Loosen adjuster locknut.
2. Turn adjuster until 1.5 to 3 mm, freeplay is achieved pedal. NOTE: While adjusting freeplay, it is important you flip the throttle lever back and forth.
3. Tighten locknut.



2.3 CHOKE ADJUSTMETN

If the choke knob does not stay out when pulled, adjust the choke tension by tightening (clockwise) the chock cable boot until the choke slider freely but stays out when pulled.

If smooth choke operation is not obtainable, inspect choke cable for kinks or sharp bends in routing

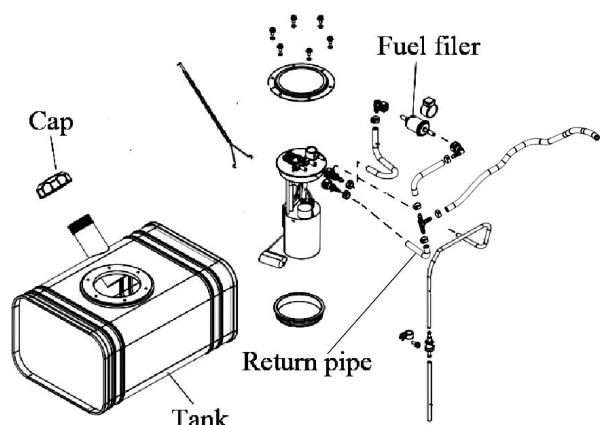


2.4 FUEL SYSTEM

EFI

⚠ WARNING

- ⚠ Always stop the engine and refuel outdoors or in a well ventilated area.
- ⚠ Do not smoke or allow open flames or sparks in or near the area where refueling is performed or where gasoline is stored.
- ⚠ Do not overfill the tank. Do not fill the tank neck.
- ⚠ If you get fuel in your eyes or if you swallow gasoline, see your doctor immediately.
- ⚠ If you spill fuel on your skin or clothing, immediately wash it off with soap and water and change clothing.
- ⚠ Never start the engine or let it run in an enclosed area. Fuel powered engine exhaust fumes are poisonous and can cause loss of consciousness and death in a short time.
- ⚠ Never drain the float bowl when the engine is hot. Severe burns may result.



FUEL LINES

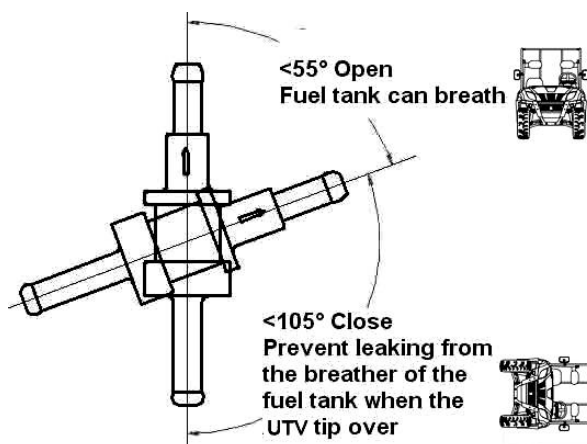
1. Check fuel lines for signs of wear, deterioration, damage or leakage. Replace if necessary.
2. Be sure fuel lines are routed properly and secured with cable ties.

CAUTION:

Make sure lines are not kinked or pinched.
Replace all fuel lines every two years.

VENT LINES AND ROLL OVER VALVE

1. Check fuel tank, oil tank, battery and transmission vent lines for signs of wear, deterioration, damage or leakage. Replace every two years.
2. Be sure vent lines are routed properly and secured with cable ties.



CAUTION: Make sure lines are not kinked or pinched.

NOTE: Make sure the ↑ mark on the roll over valve is upwards.

2.5 TOE ALIGNMENT

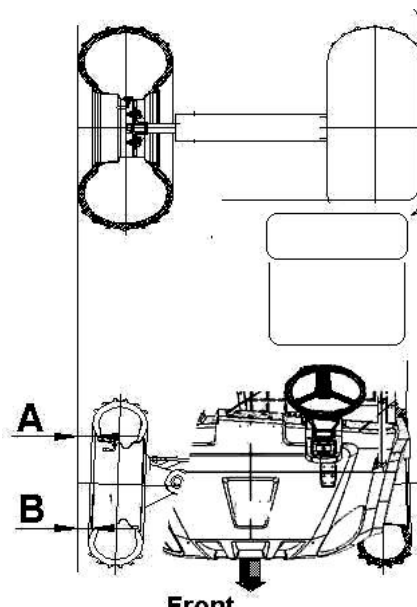
METHOD: STRAIGHTEDGE OR STRING

Be sure the steering wheel in a straight ahead position.

NOTE: String should just touch side surface of rear tire on each side of the UTV.

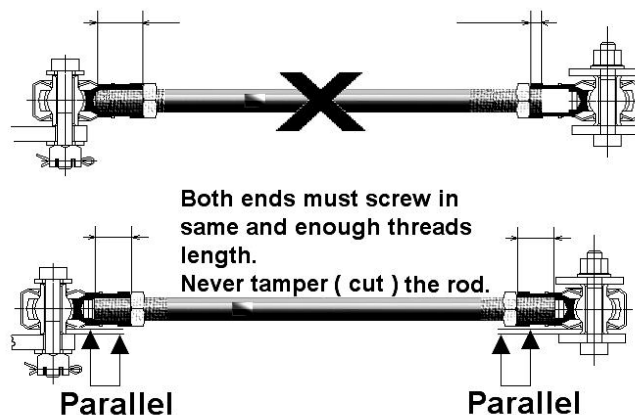
Measure from string to rim at front and rear of rim.

Rear rim measurement (A) should be 1/8" to 1/4" (3 to 6 mm) more than front rim measurement (B).



WARNING

Always pay attention to tie rods assembly, Both ends must screw in same and enough threads length.



2.6 BRAKING SYSTEM INSPECTION

The following checks are recommended to keep the braking system in good operating condition. Service life of braking system components depends on operating conditions. Inspect brakes in accordance with the maintenance schedule and before each ride

- Keep fluid level in the master cylinder reservoir to the indicated level on reservoir.
- Use DOT 3 brake fluid.

NOTE: Use new brake fluid or brake fluid from a sealed container to avoid contamination to system.

- Check brake system for fluid leaks.
- Check brake for excessive travel or spongy feel.



- Check friction pads for wear, damage and looseness.
- Check surface condition of the disc.

BRAKE PAD INSPECTION

Pads should be changed when friction material is worn to 3/64" (1mm).

HOSE/FITTING INSPECTION

Check braking system hoses and fittings for cracks, deterioration, abrasion, and leaks. Tighten any loose fittings and replace any worn or damaged parts.

ADJUSTING THE BRAKE PEDAL

Check the brake pedal free play. Free play should be 8 – 12mm. Out of specification → Adjust.

1. Loosen the locknut
2. Turn brake rod in or out until the correct free play is obtained.
Turning in: Free play is increased.
Turning out: Free play is decreased.
3. Tighten the locknut

ADJUSTING THE PARKING BRAKE

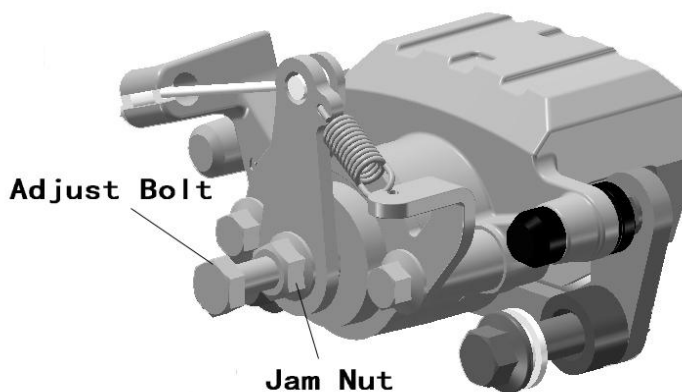
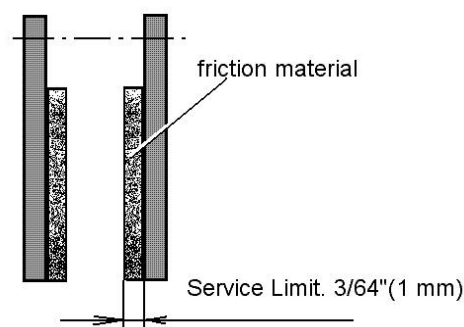
Although the parking brake has been adjusted at the factory, the brake should be checked for proper operation. The mechanical brake must be maintained to be full functional.

1. With the engine off, apply the parking brake lever and attempt to move the UTV.
2. If the rear wheels are locked, it is adjusted properly.
3. If the wheels are not locked, it must be adjusted.

To adjust (set up) the mechanical parking brake, use the following procedure

Note: The adjusting on the caliper is for the wear out of the pads.

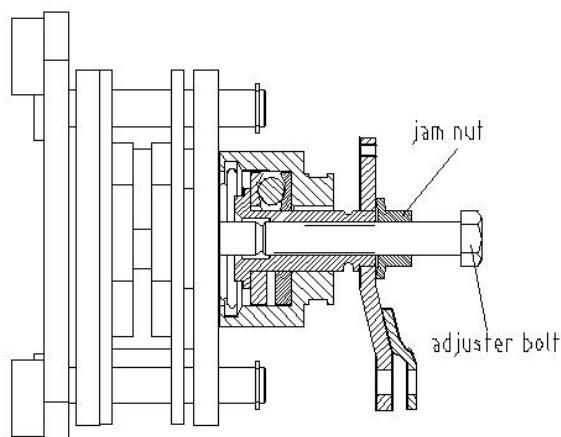
1. With the engine off, loosen the adjuster on the lever.
2. Loosen the jam nut of the adjuster on the caliper.
3. Turn the adjuster bolt CW (clockwise) by hand till the pad touch the brake disc, turn the adjuster bolt CCW (counterclockwise) by 1/4 to



one turn for 10 to 20mm free play at the end of the parking lever.

4. Tighten the jam nuts securely against the adjusters.
5. Make sure the rear wheels turns freely without dragging.
6. Turn the adjuster (the one on the lever) and apply the lever. While adjusting, it is important you apply the lever back and forth for operation, free play and the locking of the parking position.
7. Make sure the rear wheels turns freely without dragging and parking brake works properly.
8. Field test for parking. It must be capable of holding the laden UTV stationary on an 20% up and down gradient.

A temporary adjusting can also be done to the brake cable on the parking lever side by turn the adjuster (nut) directly. But the adjust range is limited. Always do the **procedure 1 to 8** when necessary.



2.7 SUSPENSION SPRING RPELOAD ADJUSTMENT

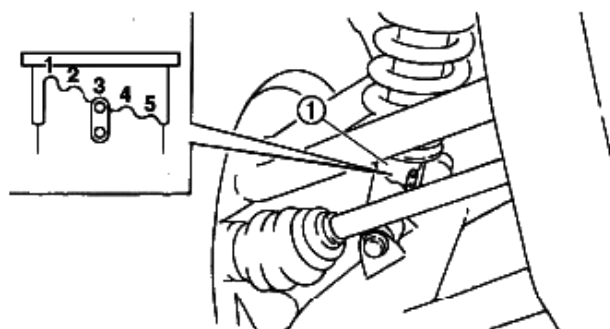
Operator weight and vehicle loading affect suspension spring preload requirements. Adjust if necessary.

FRONT SUSPENSION

Compress and release front suspension. Damping should be smooth throughout the range of travel. Check all front suspension components for wear or damage.

Inspect shock for leakage

Shock spring preload can be adjusted using the shock spanner wrench.



REAR SUSPENSION

Compress and release rear suspension. Damping should be smooth throughout the range of travel. Check all rear suspension components for wear or damage.

Inspect shock for leakage

Shock spring preload can be adjusted using the shock spanner wrench.

⚠ WARNING

Always adjust both shock absorber spring preload to the same setting. Uneven adjustment can cause poor handling and loss of stability.

Turn the adjuster ① to increase or decrease the spring preload.

Standard position: 3

Minimum (Soft) position: 1

Maximum (Hard) position: 5

2.8 WHEELS

Inspect all wheels for runout of damage.

Check wheel nuts and ensure they are tight.

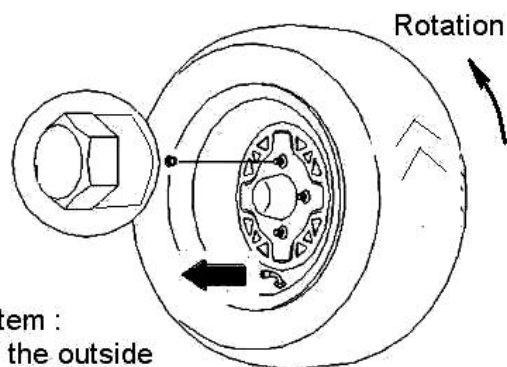
Do not over tighten the wheel nuts.

WHEEL REMOVAL

1. Stop the engine, place the transmission in gear and lock the parking brake.
2. Loosen the wheel nuts slightly.
3. Elevate the side of the vehicle by placing a suitable stand under the footrest frame.
4. Remove the wheel nuts and remove the wheel.

WHEEL INSTALLATION

1. With the transmission in gear and the parking Brake locked, place the wheel in the correct Position on the wheel hub. Be sure the valve stem is toward the outside and rotation arrows on the tire point toward rotation.
2. Attach the wheel nuts and finger tighten them. Install as shown at left for front or rear wheels.
3. Lower the vehicle to the ground.
4. Securely tighten the wheel nuts to the proper Torque listed in the table. On wheel nuts, Make sure tapered end of nut goes into taper on wheel.



Front and rear

Wheel Nut Torque Specifications

Bolt Size		Specification	
Front	M10X1.25	55Lbs.Ft	75Nm
Rear	M10X1.25	55Lbs.Ft	75Nm

CAUTION: If wheels are improperly installed it could affect Vehicle handling and tire wear.

2.9 TIRE PRESSURE**TIRE INSPECTION****CAUTION:**

- Maintain proper tire pressure. Refer to the warning tire pressure decal applied to the vehicle.
- Improper tire inflation may affect UTV maneuverability.
- When replacing a tire always use original equipment size and type and replace in pairs, especially in 4X4 model.
- The use of non- standard size or type tires may affect UTV handling and cause machine damage, especially in 4X4 model.

Tire Pressure Inspection	
Front	Rear
see detail on the mark of sidewall	see detail on the mark of sidewall

TIRE TREAD DEPTH

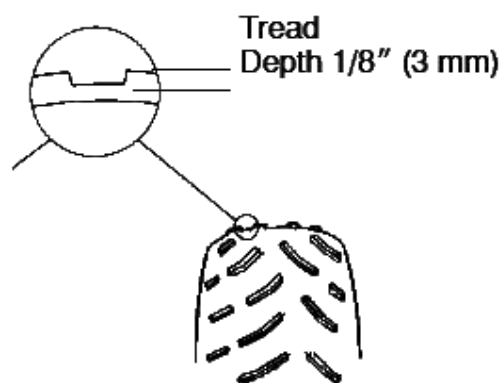
Always replace tires when tread depth is worn to 1/8" (3mm) or less.

⚠ WARNING

Operating an UTV with worn tires will increase the possibility of the vehicle skidding easily with possible loss of control.

Worn tires can cause an accident.

Always replace tires when the tread depth measures 1/8" (3mm) or less.

**3.0 FRAME , NUTS, BOLTS, FASTENERS**

Periodically inspect the tightness of all fasteners in accordance with the maintenance schedule. Check that all cotter pins are in place. Refer to specific fastener torques listed in each chapter.

[illegible]

CHAPTER 3 ENGINE

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3.1 Service information

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Unit conversion table

Item	Conversion
Pressure	$1\text{kgf/cm}^2=98.0665\text{kPa}$ $1\text{kPa}=1000\text{Pa}$ $1\text{mmHg}=133.322\text{Pa}=0.133322\text{kPa}$
Torque	$1\text{kgf} \cdot \text{m}=9.80665\text{N} \cdot \text{m}$
Volume	$1\text{mL}=1\text{cm}^3=1\text{cc}$ $1\text{L}=1000\text{cm}^3$
Force	$1\text{kgf}=9.80665\text{N}$

DANGER/WARNING/CAUTION

Please read the following notification carefully which emphasize the special meaning of DANGER, WARNING and CAUTION. Always pay attention to these notifications when servicing the engine.

DANGER: indicates a high risk which should be alert to.

WARNING: indicates a moderate risk which should be alert to.

CAUTION: indicates a minor risk which should be paid attention to.

However, DANGER, WARNING and CAUTION notification included in this service manual don't cover all the potential risk in the engine operation and repair. Therefore, mechanics should be equipped with knowledge of basic mechanical safety beside the notification of DANGER and WARNING. If you are not confident to complete the whole repair, please refer to the senior mechanic for support.

3.1.1 General precautions

Warning: Proper service and repair procedures are important for the safety of the service mechanic and the safety and reliability of the vehicle.

- When two or more persons working together, pay attention to the safety of each other.
- When it is necessary to run the engine indoors, make sure that exhaust gas is forced out doors.
- When working with toxic or flammable materials, make sure that the area you work in is well ventilated and that you follow all of the manufacturer's instruction.
- Never use gasoline as a cleaning solvent.
- To avoid getting burned, do not touch the engine, engine oil, radiator, and exhaust system until they have cooled.
- After servicing the fuel, oil, engine coolant, exhaust or brake system, check all of the lines, and fittings related to the system for leaks.
- In order to protect the environment, do not unlawfully dispose of motor oil, engine coolant or parts no longer used.

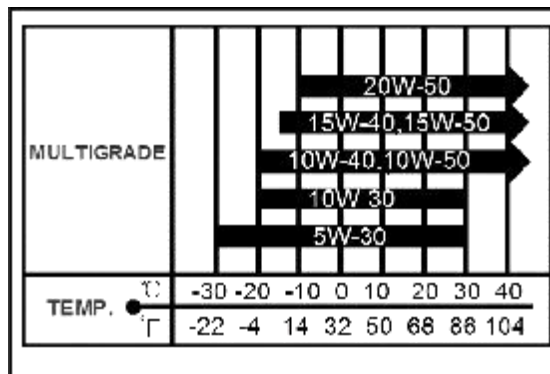
Warning :

- If parts replacement is necessary, replace the parts with LINHAI genuine parts or their equivalent.
- When removing parts that are to be reused, keep them arranged in an orderly manner so that they may be reinstalled in proper order.
- Be sure to use special tools when instructed.
- Make sure that all parts used in reassembly are clean. Lubricate them when specified.
- Use the specified lubricate, bonds, or sealants.
- When tightening bolts, screws and nuts, tighten the larger sizes first. Always tighten the nuts and bolts from the inside working out, diagonally and to the specified torque.
- Use a torque wrench to tighten fasteners to the specified torque. Wipe off grease and oil if a thread is smeared with them.
- After removing the parts, need to double check them, cleaning all the parts before measure.
- After reassembling, check parts for tightness and proper operation.
- Never reuse an oil seal, O-ring, gasket, self-locking nut, locking washer, cotter pin, snap ring, and other specified parts, be sure to remove them with new ones.

3.1.2 FUEL, OIL AND ENGINE COOLANT RECOMMENDATION

FUEL: Use unleaded gasoline that is Graded 92 octane or higher.

ENGINE OIL: Use 4-stroke motor oil, the oil need to meet API service Classification SG or higher. If engine oil with a SAE 15W-40 is not available, choose from the right chart according to the environmental temperature.



ENGINE COOLANT: Since antifreeze also has corrosion and rust-inhibiting properties, engine coolant contains antifreeze, and the freezing point should be below the atmospheric temperature like 5°C.

Recommended coolant type: -35°C anti-frozen, antisepsis, high-boil coolant.

Danger: Keep the engine coolant properly and do not drink it as it is poisonous

Warning: Do not mix other brand engine coolant together.

3.1.3 Engine running-in

As the engine has a lot of relative motions parts, such as pistons, piston rings, cylinder blocks and inter-meshing gears, thus, good operation at the beginning is necessary. It helps a good adaptation to each part, adjust working gap, and make a smooth friction surface to bear heavy load. Recommended running-in time: 20 hours, see detailed specification below:

0 ~ 10 hours

Avoid continuous operation above half-throttle or vary the speed of the vehicle from time to time. Do not operate it at one set throttle position. Allow a cooling-off period of 5 to 10 minutes after every hour of operation. Avoid acceleration heavily. The accelerator should be changed smoothly, avoid changing heavily from small to bigger

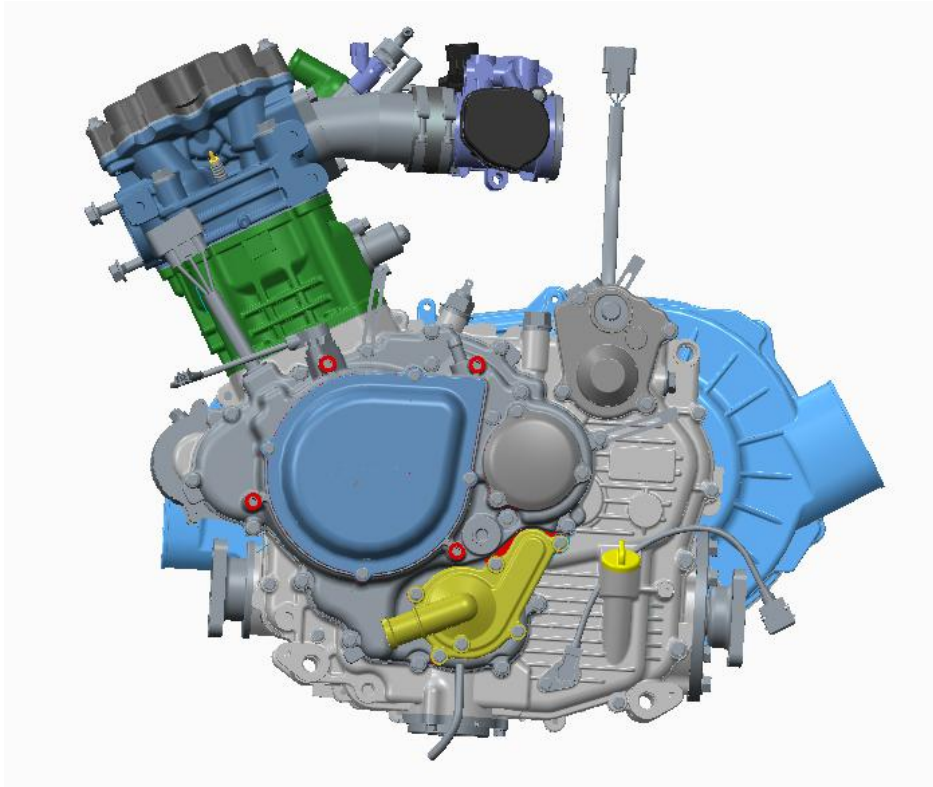
10 ~ 20 hours

Avoid prolonged operation above three-quarter throttle. Allow using freely but not full throttle.

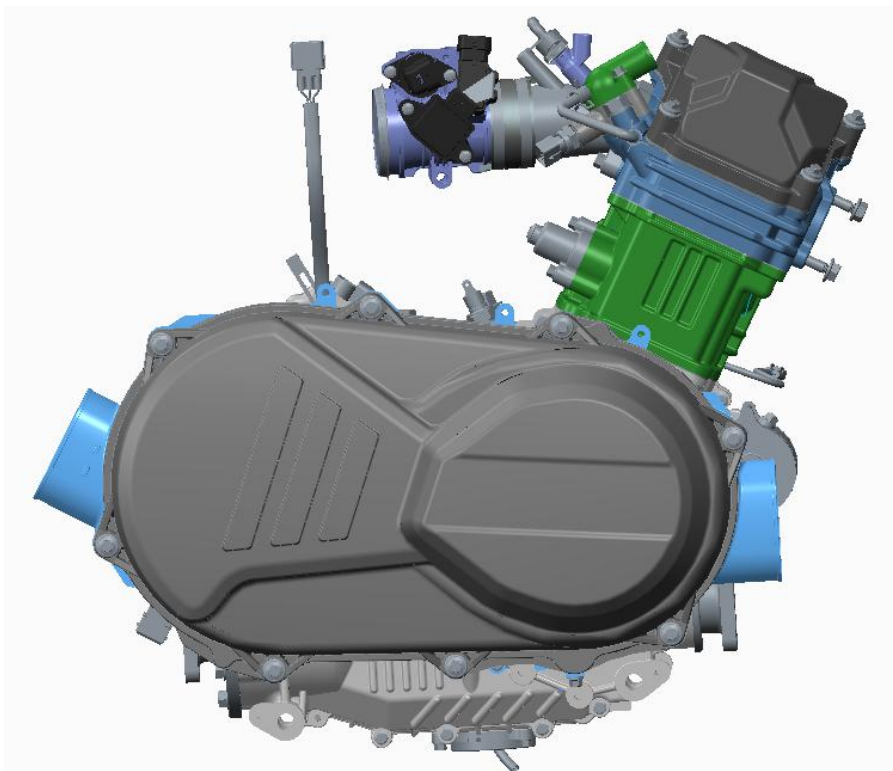
CAUTION : Maintain and repair as regular procedures during break-in period;
After break-in, do not forget to check and maintain the engine before normal use.

3.1.4 ENGINE SHAPE & LOCATION OF ENGINE IDENTIFICATION NUMBER(EIN)

Location of Engine identification
number



Engine left side



Engine Right side

3.1.5 ENGINE GENERAL INFORMATION

NO.	ITEM			TYPE/SPECIFICATION
1	Type			Single-cylinder, liquid-cooled, 4-stroke, SOHC
2	Bore × Stroke			91mm×90mm
3	Displacement			585.3mL
4	Compression ratio			10.68:1
5	Low idling speed(Idling)			1450r/min±100r/min
6	Starting			Electric
7	Electric al system	ignition type/ ignition timing		ECU / BTDC10°1500r/min
		Spark plug/Electrode gap		DPR8EA-9NGK/0.8mm～0.9mm
		Magneto type/ Power		Permanent Magnet AC Type
8	Combustion system	Combustion chamber		Triangular combustion chamber
		Throttle body type		D42
		Ai r filter type		Sponge, Paper filter
		Gasoline		RQ-92
9	Valves system	Valves type		SOHC/ Timing chain drive
10	Lubrication System	Lubrication type		Pressure and splash
		Oil pump type		Rotor drive
		Oil filter type		Paper type, replaceable
		Engine oil type		SAE10W/50/SN
11	Cooling system	Cooling type		Liquid-cooled/close-loop cooling
		Coolant type		—35℃anti-corrosion and anti-freezing
12	Drive train system	Transmission type		CVT+ Gearshift
		Reducer gear		Two forward gear, one reverse gear, one park
		Gearshift methods/ orders		Manual operation/L-H-N-R-P
		CVT ratio range		3.106～0.677
		Gearshi ft ratio	Final ratio Secondary ratio	1.333（24/18, bevel gear） 1.952(41/21),
			Variable gear Total ratio	L:2.53(38/15); H: 1.35(27/20) ; R:2.07(29/14) L:6.595; H: 3.514; R:5.392
13	Overall size			L（mm）×W（mm）×H（mm）: 621×515×506
14	Dry weight			62kg
15	Output type			Front/Rear shaft drive
16	Rotation of engine output			When forward, clockwise(rear view)

Valves &Cylinder Head

(mm)

Item	Standard value		Service limit	Remarks
Dia. Of valve neck	Intake valve	Φ 33	—	
	Exhaust valve	Φ 29	—	
Thickness of valve neck	Intake/Exhaust	1	0.5	
Valve clearance(cold engine)	Intake	0.06 ~ 0.08	—	
	Exhaust	0.08 ~ 0.10	—	
Inner dia. Of valve guide	Intake/Exhaust	5.000 ~ 5.012	5.045	
Outer dia. of valve stem	Intake	4.96 ~ 4.975	4.93	
	Exhaust	4.95 ~ 4.965	4.93	
Gap between valve guide and stem	Intake	0.020 ~ 0.047		
	Exhaust	0.030 ~ 0.057		
Valve stem roundness (diameter difference)		0.006	0.06	
Valve end run-out	Intake/Exhaust	0.03	0.05	
Valve length	Intake	90		
	Exhaust	89		
valve plate cone run-out	Intake/Exhaust	0.03	0.05	
Width of valve seat seal	Intake	1.5±0.15	1.7	
	Exhaust	1.7±0.15	1.8	
Valve spring free length	Intake/Exhaust	40	38.2	
Elasticity of valve spring	Intake/Exhaust	33:200N ~ 235N 23:530N ~ 587N		
Cam length	Intake	32.971 ~ 33.011	32.871	
	Exhaust	32.985 ~ 33.025	32.865	
Camshaft shaft neck	Φ 35	34.959 ~ 34.975	34.95	
	Φ 22	21.959 ~ 21.980	21.95	
Gap between outer dia. of camshaft and holes	Φ 35	34.993 ~ 35.025	35.04	
	Φ 22	22.012 ~ 22.025	22.04	
Gap between outer dia. of camshaft and holes	Φ 35	0.018 ~ 0.066	0.09	
	Φ 22	0.032 ~ 0.066	0.09	
Axial clearance of	0.12 ~ 0.28			
Camshaft run-out			0.10	
Bore diameter of rocker	Intake/Exhaust	12.000 ~ 12.025	12.03	
Dia. of rockshaft	Intake/Exhaust	11.973 ~ 11.984	11.96	
Fit gap between	Intake/Exhaust	0.016 ~ 0.045	0.07	
Axial gap between	Intake/Exhaust	0.06 ~ 0.34		
Flatness of cylinder head bottom surface	0.03		0.05	
Flatness of cylinder head cover combination	0.08		0.10	

Cylinder, Piston, Piston Ring & Crankshaft

(mm)

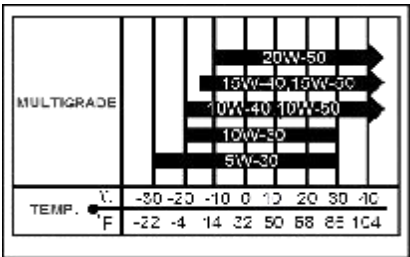
Item	Standards			Service limit	Remarks
Cylinder compression	1000kPa			————	
Piston/Cylinder clearance	0.030~0.050			0.10	
Dia. of Piston	90.95mm~90.979 mm down along to the piston			90.85	
Inner diameter of cylinder	90~91.015			————	
Flatness of cylinder top and bottom surface	0.03			0.05	
Free open of piston ring	1 st ring	R	round 11.7	8.9	
	2 nd ring	R	round12	9.5	
Gap of piston ring	1 st ring		0.25 ~ 0.40	0.15	
	2 nd ring		0.30 ~ 0.45	0.15	
	Oil ring		0.2~0.7	0.15	
Height of piston ring	1 st ring		0.02 ~ 0.06		
	2 nd ring		0.02 ~ 0.06		
	Oil ring		0.03 ~ 0.15		
Height of piston ring	1 st ring		1.17 ~ 1.19	————	
	2 nd ring		1.47 ~ 1.49	————	
	Oil ring		2.37 ~ 2.47		
Width of piston ring	1 st ring		1.21 ~ 1.23	————	
	2 nd ring		1.51 ~ 1.53	————	
	Oil ring		2.50~2.52	————	
Inner diameter of piston pin hole	22.004~22.010				
Diameter of piston pin	21.991~22.000			21.980	
Inner diameter of small end of connecting rod	22.01~22.02			22.06	
Gap of piston/piston pin	0.004~0.015			0.08	
Small end hole of connecting rod / gap of piston pin	0.010~0.025			0.08	
Side gap of big end of connecting rod	0.1~0.45			0.7	
Thickness of big end of connecting rod	22.95~23.00				

To Be **Continue** (mm)

Item	Standards	Service limit	Remarks
Crankshaft beat	0~0.025	0.055	
Connecting rod bearing journal	36.992~36.996	36.068	
Connecting rod bearing bore	37.006~37.028	37.06	
Gap of connecting rod bearing	0.01~0.032	0.065	
Main journal	41.955~41.970	41.935	
Case main bearing bore	41.980~42.000	42.10	
Gap of main bearing	0.045~0.01	0.08	
Gap of crankshaft axial direction	0.05~0.45	0.6	

3.1.6 MAINTENANCESPECIFICATIONS

Lubrication System

Item		Standards	Service Limit
Engine Oil Capacity	Oil Change	2600mL (without oil filter replacement)	—
	Oil Change	2700mL (with oil filter replacement)	
	Oil Capacity	3000mL	—
Recommended engine oil (see original) Grade/TEMP 		·Special for four stroke motorcycle SAE-15W/40 if it's not available, select alternative according to the following specifications. ·API classifications: SG or higher ·SAE classifications: according to the left chart.	
Oil Pump Rotor	Clearance Between Inner and Outer Rotor	0.1mm ~ 0.15mm	0.2mm
	Clearance Between Outer Rotor and Case	0.08mm ~0.15mm	0.2mm
	Oil Pump Rotor End Clearance	0.1mm~0.15 mm	0.2mm
	Engine oil pressure	1500r/min, 90℃, 200kPa~400kPa, general 240kPa 6000r/min, 90℃, 600kPa~700kPa, general 600kPa	

COOLING SYSTEM

Item		Standards		Service Limit
Thermostat	Opening temperature	65℃±2℃		
	Fully opening	85℃		
	Travel when fully opening	When 85℃, ≥5mm		
Radiator cap opening pressure		110 kPa±15kPa(1.1kgf/cm ²)		
Relations between water temp and resistant of water temp. sensor	Water temperature (℃)	Resistant of B terminal(Ω)	Resistant of A,C Terminal(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	
Working temp. of thermo switch	OFF-ON	Around 89℃		
	ON-OFF	Around 82℃		
Coolant type		-35℃ anti-freezing, anti –corrosive and high boiling point		

Clutch +Transmission mechanism

(mm)

Item	Standards		Service limit	Remarks
Belt width	35.2		33.5	
Free length of driven pulley spring	238.5		214	
Hole dia. of driven pulley collar	38.10~38.14		38.30	
Clearance between gearshift fork and engagement groove	0.10~0.35		0.45	
Thickness of gearshift fork	5.8~5.9		5.7	
Groove width of high/low sliding	6.05~6.15		6.25	
Output gear groove width of driven shaft	6.05~6.15		6.25	
Groove width of gearshift drum	8.05~8.10			
Dia. of gearshift pawl pin	7.90~7.95		7. 83	
Hole dia. of gear box	25~25.021		25.025	
Hole dia. of Reverse gear transition	25~25.021		25.025	
Dia. of main shaft	Φ 30	28.980~29.993	29. 970	
	Φ 17	16.983~16.994	16.978	
Dia. of secondary shaft	Φ 15	14.983~14.994	14.978	
	Φ 17	16.983~16.994	16.978	
	Φ 20	19.980~19.993	19.974	
Dia. of drive bevel gear shaft	Φ 17	16.983~16.994	16.978	
	Φ 25	24.980~24.993	24.974	
Dia. of reverse intermediate gear	Φ 20	19.980~19.993		

Air Intake System

Item	Standards
Throttle Body Part NO.	1BK-13520-00
Fuel Injector Part NO.	1BK-13510-00
Idle Speed	1500 r/min±100r/min

Electric system

Item		Standards	Remarks
Spark plug	Type	DPR8EA-9 (NGK)	
	Gap of Spark plug	0.8mm ~ 0.9mm	
Characteristic		> 8mm, under 0.1MPa	
Resistance of ignition coil	Primary	0.74Ω ~ 0.78Ω	
	Secondly	10.1Ω ~ 11.1kΩ	
Resistance of magneto coil		0.5Ω ~ 1.5Ω	
Resistance of speed sensor (trigger)		900Ω ~ 1000Ω	
Voltage without load (cold engine)		> 50V(AC), 5000r/min	
Max. output power of magneto		320W, 5000r/min 460W/5000r/min	
Stable voltage		13.5V ~ 15V	
Secondly voltage of ignition coil		≥ 25kV	
Peak voltage of Trigger coil		Peak voltage ≥ 3V, 200r/min	
Resistance of starter relay coil		3Ω ~ 5Ω	
Resistance of auxiliary relay coil		90Ω ~ 100Ω	

3.1.7 Engine tightening Torque list

Item	Qty	Dia. Of thread(mm)	Torque (N·m)	Remarks
Oil drain boltM12×1.5	1	M12×1.5	28~32	
OIL PASSAGE BOLT M14×1.5(left case)	2	M14×1.5	32~36	
Plug screw, oil passage pressing plate (left case)	4	M6×12	8~12	Thread locker glue
Primary screen cover bolt	3	M6×20	8~12	Thread locker glue
Oil pressure switch	1	M10×1	12~15	Thread locker glue
ScrewR21/8(CVT oil passage)	1	R21/8	18~22	Apply seal gum
Bolt, CVT air intake plate	4	M6×12	8~12	Thread locker glue
CVT cover screw Plug screw(left crankcase cover)	8	M6	6~8	
Relief valve(left crankcase cover)	1	M20×1.5	28~32	
Bolt of wiring clamber (left crankcase cover)	1	M6×10	8~12	Thread locker glue
Screw of oil seal plate(left crankcase cover)	3	M6×8	8~12	
Adjust nut, valve clearance	8	M6	8~12	
Bolt, timing sprocket	2	M6×10	8~12	
Bolt, decompressor, starter	1	M8×32	28~32	
Bolt, cylinder	4	M10	40~45	
Bolt, cylinder installation	2	M6×132	8~12	
Plug, spark	1	M12×1.25	18~20	
Sensor, water TEMP	1	M12×1.5	16~20	
StudboltM8×42 (exhaust port)	2	M8×42	20~25	Thread locker glue
Nut, thrustM8 (exhaust port)	2	M8	13	

Item	Qty	Dia. Of thread(mm)	Torque (N·m)	Remarks
Plug,ScrewM12×1.5	1	M12×1.5	28~32	
BoltM6×45(thermostat cap)	2	M6×45	6~10	
Injector seat installation bolt	2	M8×25	20~25	
Bolt COMP. Cylinder head cover	4	M6	6~8	
Thread tension plate pin	1	M8	22~28	Thread locker glue
Bolt, magneto stator	3	M6×30	8~12	Thread locker glue
Bolt,overriding clutch COMP	6	M8×20	28~32	Thread locker glue
Bolt, drive pulley(CVT drive pulley)	1	M12×1.5-LH	55~60	
Screw, CVT driven pulley	1	M20×1.5	110~120	Thread locker glue
Lock nut, drive bevel gear	1	M22×1	140~150	
Bolt(bearing seat,drive bevel gear)	4	M8×28	38~42	
Screw (bearing holder, drive bevel gear)	4	M8×25	15~20	
Stopper nut (driven bevel gear)	1	M65×1.5	100~120	Thread locker glue
Bolt(bearing seat,driven bevel gear)	4	M8×28	38~42	
Nut, Driven Bevel Gear	1	M16×1.5	140~160	
Nut, Front output shaft	1	M14×1.5	95~100	
Bolt, gear orientation	1	M14×1.5	38~42	Thread locker glue
Bolt, oil pump cover	3	M5×16	6~8	Thread locker glue
Bolt, oil guard	2	M6×12	8~12	Thread locker glue
Magnetor Rotor nut	1	M16×1.5	160~170	Thread locker glue

3.1.8 Engine Service Tools

Measurement Tools

Measurement Tools			
No.	Description	Specification	Purpose
1	Vernier Caliper	0-150mm	For measuring the length and thickness
2	Micrometer	0-25mm	For measuring outer diameters of rocker arm, valve stem and camshaft
3	Micrometer	25-50mm	For measuring the max. lift of camshaft
4	Micrometer	75-100mm	For measuring piston skirt
5	Cylinder Gauge		For measuring cylinder bore diameter
6	Small Bore Gauge	10-34mm	For measuring inner gauge of rocker arm, piston pin bore, connecting rod small end bore
7	Dial Indicator	1/100	For measuring the play
8	Straightedge Gauge		Plane measuring
9	Feeler Gauge		Plane and valve clearance measuring
10	Fuel Level Gauge		For measuring the carburetor fuel level
11	Thickness Gauge		For measuring the clearance
12	Spring Balance		For measuring the spring tension
13	Tachometer		For measuring engine speed
14	Oil Pressure Gauge		For measuring oil pressure
15	Compression Gauge & Adapter		For measuring cylinder compression
16	Radiator Cap Tester		For measuring radiator cap opening pressure
17	Ohmmeter		For measuring resistance and voltage
18	Ammeter		For measuring current/switches
19	Thermometer		For measuring liquid temperature
20	Timing Light		For checking the ignition timing
21	Torque Wrench		For measuring the tightening torque
General-purpose and Auxiliary Tools			
22	Alcohol Burner		Heating up
23	Magnetic Stand		For micrometer
24	Slab		Auxiliary tool for measuring
25	V-block		For measuring the play
26	Tweezer		For installation of valve cotter
27	Circlip Pliers		For removal and installation of circlips
28	Long Nose Pliers		For removal and installation of retainers
29	Impact Driver		For removal of cross-headed bolts

Special Tools

No.	Description	Specifications	Purpose
1	Rotor assy puller	1BE-85610-00	Remove magneto rotor
2	Bearing retainer, nut wrench	LH188MR FZ/24	Removal of Front output shaft Bearing retainer
3	Bearing limit nut, nut wrench	LH188MR FZ/25	For removing Bearing limit nut
4	Drive pulley puller	1BX-17653-00	Removal of drive pulley
5	Driven pulley expander	1BX-17654-00	Removal/installation of drive belt
6	Driven pulley spring compressor	1BA-17730-00 FZ/1	Disassemble driven pulley
7	The tool for one way clutch of drive pulley	1BA-17628-00 FZ/1	Assemble one way clutch of drive pulley

Materials for Operation and Fixing

Materials for engine operation engine oil, grease and coolant. Fixing materials include sealant, thread locker, etc.

Description	Type	Application Area	Remark
Lubricating Oil/Engine Oil	4-stroke motor oil SAE15W-40 Or SAE10W-40 API : SG or higher	Cylinder rotating parts, sliding parts Inner crankcase rotating parts, sliding parts Cylinder head rotating parts, sliding parts Refer to Engine Lubrication System (→5-99)	capacity 2600ml (for changing oil) 2700ml (for replacing filter) 3000ml (for engine repairing)
Molybdenum lubrication oil		piston pin 、 valve stem 、 valve oil seal 、 camshaft	
Grease	#3 MoS2 Lithium Base Grease	Oil seal, O-ring and other rubber seals. Sealed bearing	
Coolant	-35℃ antifreeze, corrosion-resistant, high boiling point coolant	Cooling system、 Water- seal	Capacity according to radiator and water hose system
Joint Face Sealant		Crankcase splitting surfaces, contact surface between crankcase and cylinder,	
Thread Locker		Thread Parts	See 3.1.7

3.2 INSPECTION ANDADJUSTMENT

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3.2.1 Period maintenance table

Engine maintenance is a periodic job, careful periodic maintenance is very important, will assure your vehicle having a good performance, reliability, economy and durability. Details are explained in below 191MS engine periodic maintenance chart.

ATTENTION : Maintenance intervals in the following chart are based upon average riding conditions. Vehicles subjected to severe use must be inspected and serviced more frequently

A: Adjust C: Clean I: Inspect L: Lubricate R: Replace		10 hours or 300km					
		20 hours or 750km					Remark
		Every 50 hours or 1500km					
		Every 100 hours or 3000km or 1 year					
		Every 200 hours or 6000km or 2years					
Engine	Facilitating Conditions & abnormal sound	I		I	I		
	Exhaust condition		I	I	I		No black smoke or blue smoke
	Valve setting		I, A		I, A		In: 0.06mm~0.08mm Out: 0.08mm~0.10mm
	Idle speed	I		I			1500 r/min±100r/min
Spark Plug			I		I	R	No carbon deposition, electrode gap: 0.8mm~0.9mm
Air Filter			C	R			
CVT system	CVT Belt			I	R		Replace every 2000km
	Primary Pulley, Driven pulley				I, C		
Engine oil, filter			R		R		
Throttle Body		I			I, L		
Cooling System	Water volume	I		I			
	Water pipe	I			I		
	Radiator valve opening pressure	I		I	I		0.75 kg/cm~1.05kg/cm
	Replace coolant	Replace every 2 years					

3.2.2 Procedure of Maintenance & Adjustment

This section describes the maintenance procedures for each item mentioned in the periodic maintenance chart.

3.2.3 Valve clearance

Inspect initially at 20-hour break-in and every 40 hours or every 1000km thereafter. Inspect the clearance after removing cylinder head

Excessive valve clearance results in valve noise and insufficient valve clearance results in valve damage and reduced power.

Check the valve clearance at the period indicated above and adjust the valve clearance to specification, if necessary.

- Remove CVT case cover (1);
- Remove RPM sensor(2) of left crankcase cover;
- Remove cylinder head cover (3);
- Turn the crankshaft until the line(4) of T. D.C. on rotor is aligned with mark (5) of inspection hole on left crankcase..
- Insert feeler gauge to check the clearance between the valve stem end and the adjust bolt on the rocker arm.

Valve clearance Intake valve

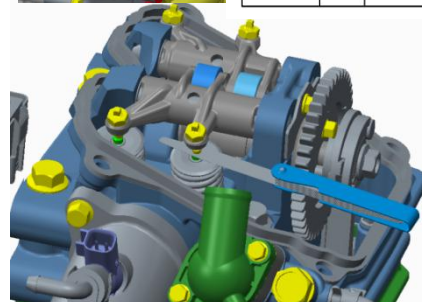
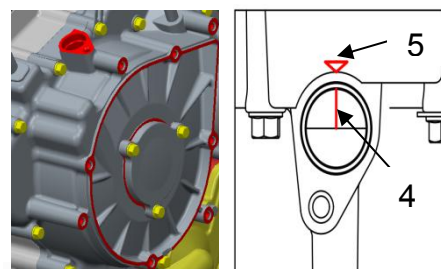
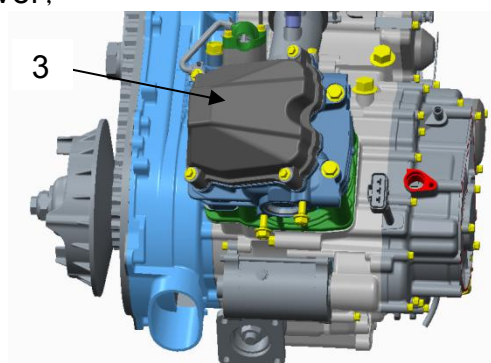
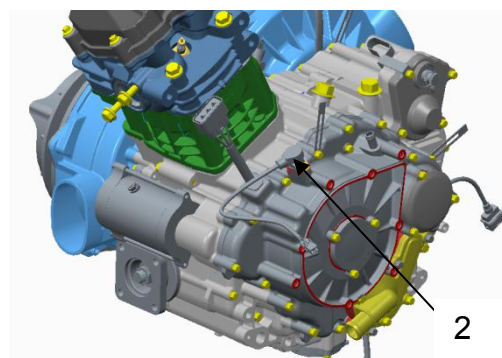
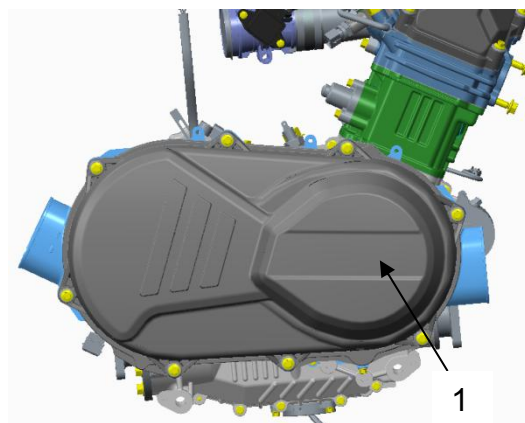
0.06mm~0.08mm

(When cold) Exhaust valve

0.08mm~0.10mm

Attention:

- The valve clearance must be adjusted when the engine is cold.
- Adjust the valve clearance when the piston is at the Top Dead Center (T.D.C.) on the compression stroke.



- If the clearance is incorrect, bring it into the specified range using the special tool.

Loosen valve adjust bolt and nut, insert a feeler gauge between the valve stem end and valve adjusting bolt (0.06mm thickness for intake valve, 0.08mm thickness for exhaust valve), tighten valve adjust bolt, make sure it slightly contacts the feeler gauge, tighten bolt and nut.

● Take out the feeler gauge, measure the clearance. If the clearance is incorrect, repeat the above steps until the proper clearance is obtained.

Locknut: 12N·m

Tools: Valve adjuster

Feeler gauge Material: Thread Locker

Caution:

Securely tighten the locknut after completing adjustment

3.2.4 ENGINE IDLESPEED

Inspect initially at 20 hours run-in and every 50 hours or 1500km thereafter.

- Install cylinder head, speed sensor
- Start the engine and warm it up for several minutes, measure engine speed with a tachometer.

Engine idle speed: 1500r/min $\pm$ 100r/min

Tool: Tachometer

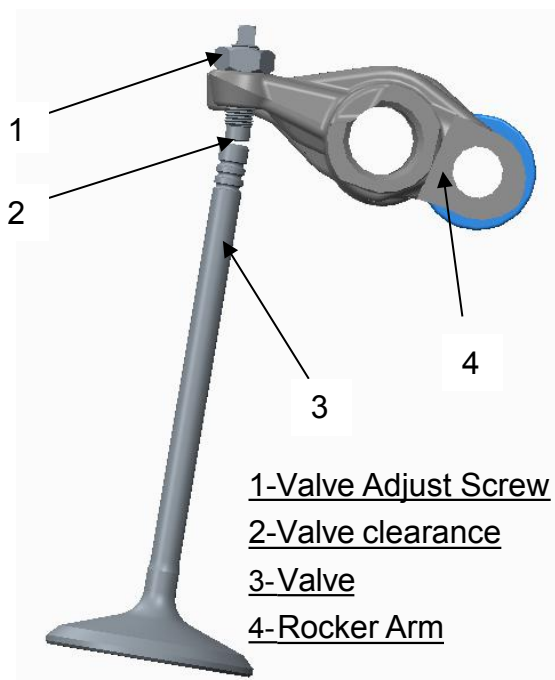
3.2.5 SPARKPLUG

Inspect initially at 20 hours run-in and every 100 hours or 3000km thereafter.

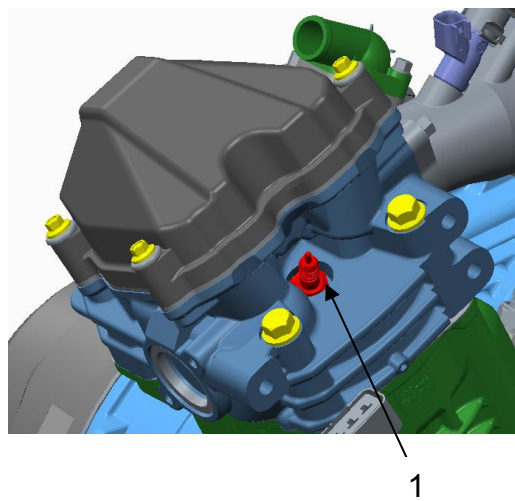
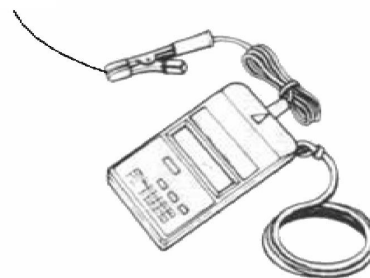
- Remove the spark plug (1) with a special tool;

Specification: DPR8EA-9(NGK)

- Spark plug inspection : If the electrode is extremely worn or burnt, or spark plug has a broken insulator, damaged thread, etc, replace the spark



Ignition Coil



plug with a new one

In case of carbon deposit, clean with a proper tool.

SPARK PLUG GAP: Measure the spark plug gap with a feeler gauge.

Out of specification: Adjust

Spark plug gap: 0.8mm~0.9mm

Caution:

Check the thread size and reach when replacing the spark plug. If the reach is too short, carbon will be deposited on the screw portion of the spark plug hole and engine damage may result

● Spark plug installation

Caution:

To avoid damaging the cylinder head threads; first, tighten the spark plug with fingers, and then tighten it to the specified torque using the spark plug wrench.

Tightening Torque: 18~20N.m

Tool: Spark Plug Wrench

Feeler Gauge

3.2.6 AIR FILTER

Inspect every 20 hours or 750km, clean it if necessary. Change it every 1500km

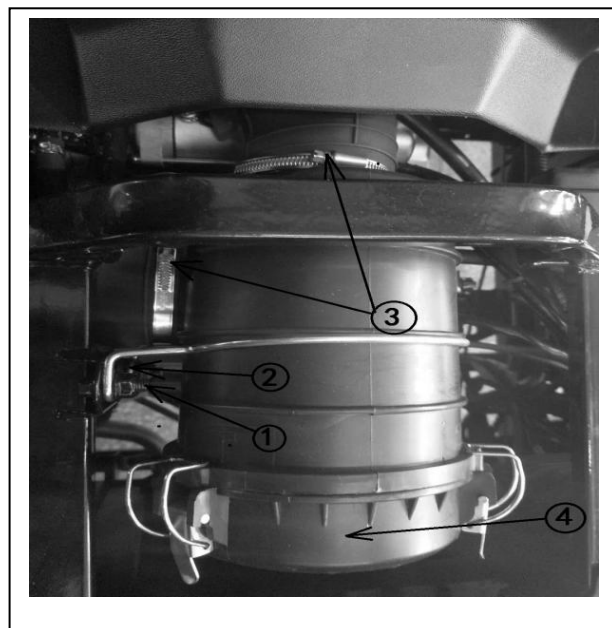
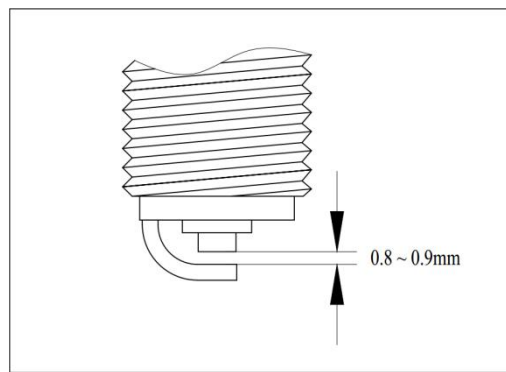
If the air cleaner is clogged with dust, intake resistance will be increased, with a resultant decrease in power output and an increase in fuel consumption. Check and clean the air filter as following:

Remove 2 nuts ① and 2 bolts ② fixing clamp③ .

Note:

Be careful not to drop the o-ring into the air filter box that is attached to the air filter top cover.

Loosen ② clamps ③ , remove top cover ④ and separate filter element ⑤ .



Use high-pressure air to clean the filter element and replace it if necessary.

Warning:

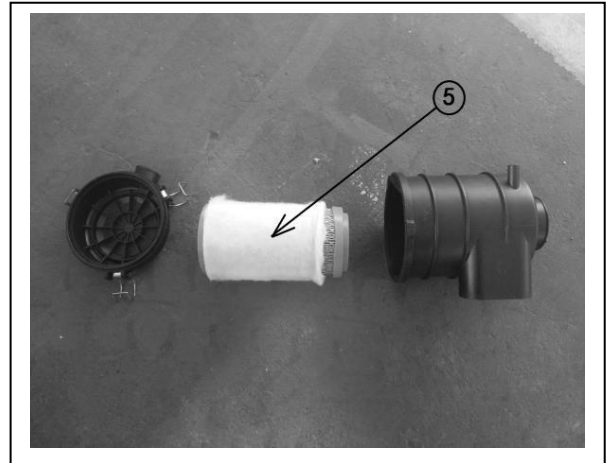
Never use with gasoline or low flash point solvents to clean the filter element.

Inspect the filter element for tears. Torn element must be replaced.

Warning: Never use with gasoline or low flash point solvents to clean the filter element.

● Inspect the filter element for tears, torn element must be replaced.

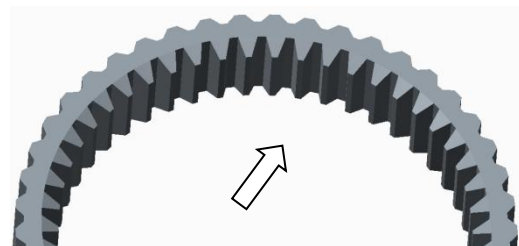
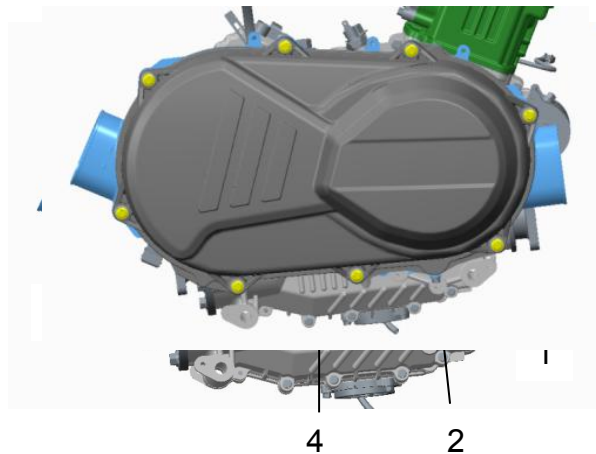
Note: Make sure that the air filter element is in good condition at all times. The surest way to accelerate engine wear is to operate the engine without the element or with torn element. If driving under dusty conditions, clean the air filter element more frequently.



3.2.7 Drive belt, CVT

Removal

- Remove CVT cover.
- Loosen primary bolt(1) and gasket(2), take drive disk.
- Loosen / driven pulley nut (3).
- Remove / driven pulley together with drive belt.
- Remove drive belt (4) from / driven wheel.

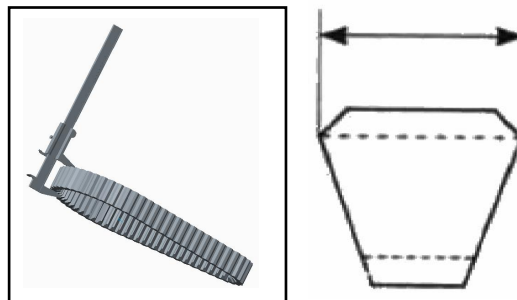


Inspection

- Inspect CVT friction disk for wear and damage. If any cracks or damages are found, replace CVT with a new one.
- Inspect drive belt for wear and damage. If any cracks or damages are found, replace drive belt with a new one.
- Inspect drive belt for width, if width is out of service limit, replace drive belt with a new one.

Service Limit: 33.5mm

Tool: Vernier Caliper



Installation

Reverse the removal procedure for installation. Pay attention to the following:

- Insert drive belt with a special tool, as low as possible, between secondary sliding sheave and primary fixed sheave:
- Hold / driven wheel with a special tool and tighten the nut to the specified torque.

Nut, / driven pulley: 110~120N. m

- Install driving pulley and bolt. Hold the driving pulley with a special tool and tighten the bolt to the specified torque.

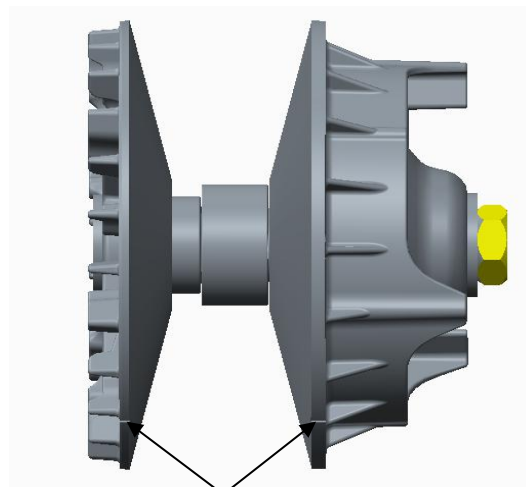
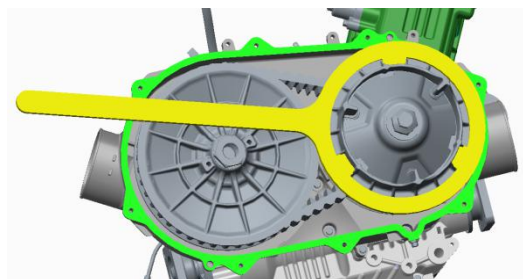
Bolt, drive pulley: 55~60N. m

Caution: Fit the drive belt with the arrow on the drive belt points towards normal turning direction.

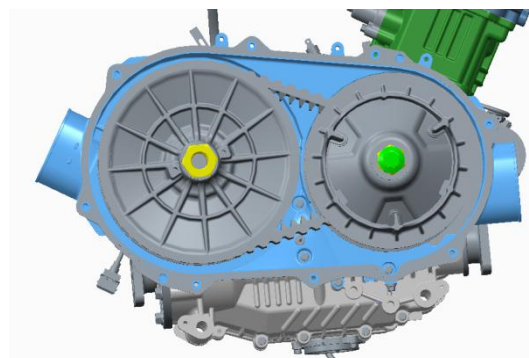
- Screw off Driven pulley Expander, turn driving pulley, until the drive belt is properly seated.

Warning :
The drive belt contact surface of the driven face should be thoroughly cleaned.

- Install CVT cover



sign



3.2.8 Inspection of Lubrication System

Replace engine oil and oil filter initially at 20 hours or 750km and every 100 hours or 3000km thereafter.

Check Engine Oil Level

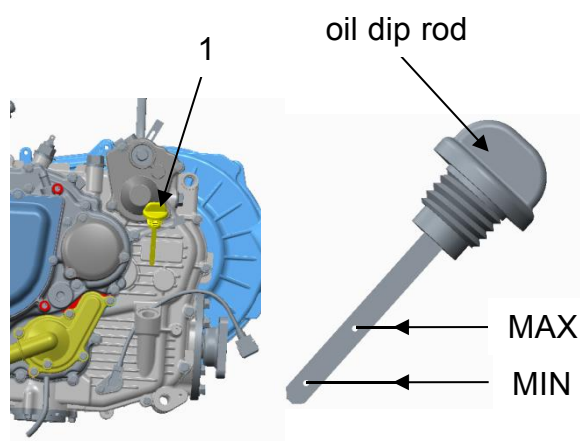
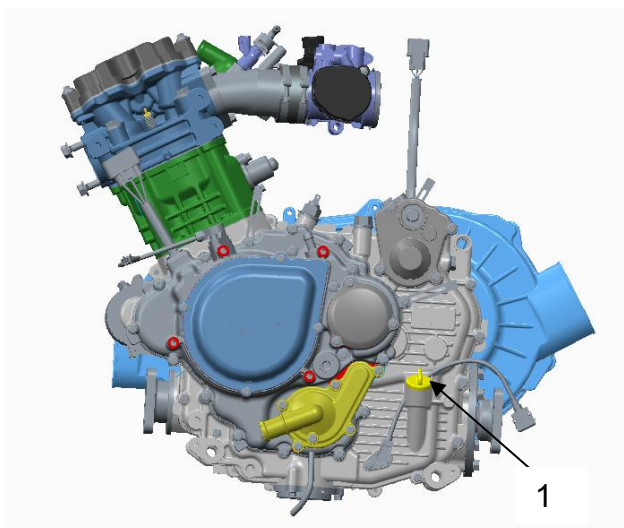
- Keep the engine in a plan position
- Remove oil dip rod(1)

- Clean oil dip rod, insert oil dip rod but do not tighten it.
- Take out oil dip rod and check if oil is between upper and lower limit.
- If the engine oil is insufficient, fill more oil until the sufficient oil is obtained.

Engine oil: SAE15W/40 SG or higher

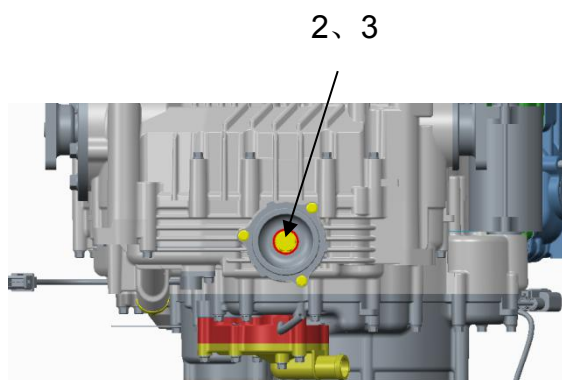
Note :

Keep the engine in a plan position Do not tighten oil dip rod when measuring oil level.



Replace Engine Oil

- Remove oil dip rod (1), drain bolt (2) and washer (3);
- Drain out the engine oil while the engine is still warm.
- Clean oil dip rod, drain bolt and washer with solvent.
- Install washer and drain bolt;
Drain Bolt: 28~32N. m
- Fill engine oil (about 2700mL)



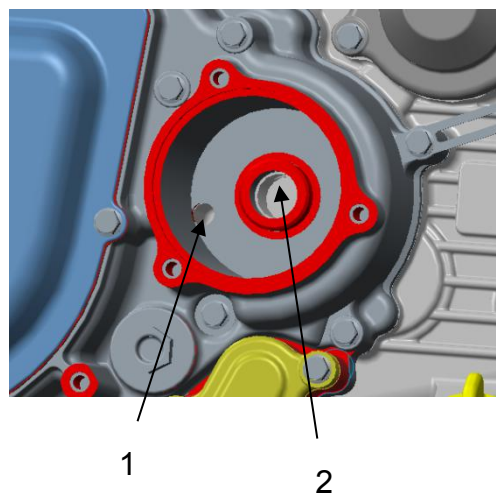
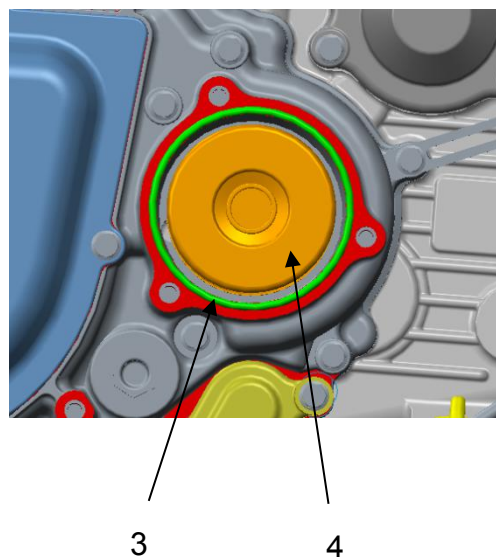
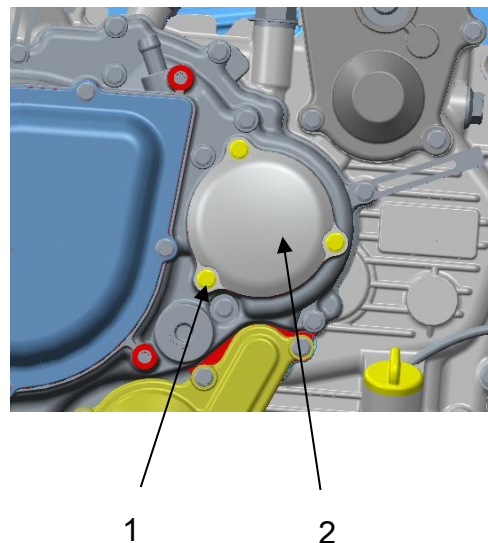
- Install oil dip rod, start the engine and allow it to run for several minutes at idling speed.
- Turn off the engine and wait for about 3 minutes, and then check the oil level on the dipstick.

Caution :

The engine oil should be changed when the engine is warm. If the oil filter should be replaced, replace engine oil at the same time.

Replacing Oil Filter

- Remove relative parts (see Replacing Engine Oil)
- Remove oil filter cover bolt (1) and filter cover(2)
- Remove O ring (3) , then oil filter(4)



Oil Filter Element Inspection

Check and clean the engine oil filter inlet 1 and outlet area 2 for dirt and other contaminations.

Oil Filter Element Installation

Install a **NEW** o-ring on oil filter cover,
Apply engine oil on o-ring and the end of
filter;
Install the element into oil filter bore;
Install the element into oil filter bore, bolt.
Torque screws to:8~12N. m

3.2.9 Inspection of Cooling System

Check initially at 50 hours or 1500km,
replace coolant every 2 years
Check radiator, reservoir tank and water
hoses.

Leakage or Damage——Replace

Inspection of engine coolant

Check coolant level by observing the up-
per and the lower limit on the reservoir
tank. If the level is below lower limit, fill
coolant until the level reaches the upper
limit.

Replacing Coolant

- Remove radiator cap (1) and reservoir tank cap (2)
- Place a pan below water pump, and drain coolant by removing drain plug (3) and water hose (4)
- Drain coolant from reservoir tank.

Warning:

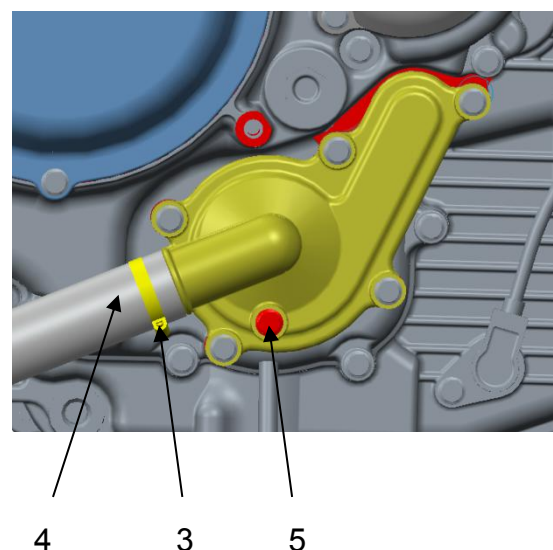
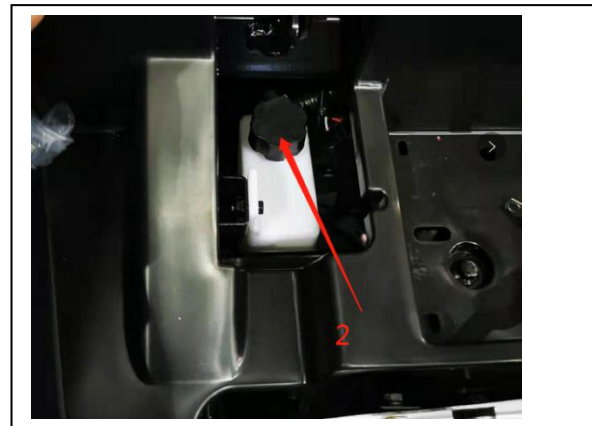
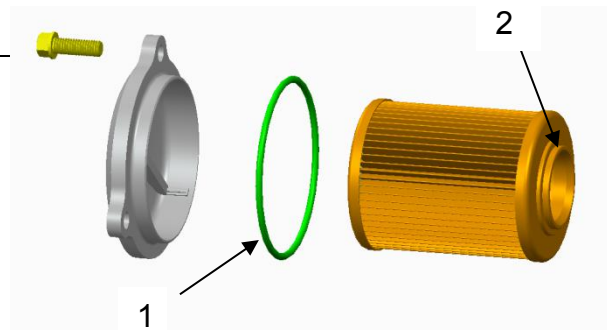
Do not open radiator cap when engine is hot, you may be injured by escaping hot liquid or vapor.

Engine coolant is harmful. If coolant splashes in your eyes or clothes, thoroughly wash it away with water and consult a doctor. If coolant is swallowed, induce vomiting and get immediate medical attention.

Keep coolant away from reach of children.

- Clean radiator with fresh water, if necessary.

- Connect water hose (4), and tighten



clamp (3) securely

- Fill the fresh specified coolant into the radiator
- Loosen bleed bolt (5), on water pump, when coolant flow from bleed bolt, tighten the bolt. Install radiator cap (1) securely after filling coolant.
- Start the engine and keep it running for several minutes. After warm up and cooling down the engine, open radiator cap and check coolant. Fill the specified coolant until the level is between the upper and lower lines on the reservoir tank.

Caution :

Repeat the above procedures several times and make sure the radiator is filled with coolant and air is discharged.

- Fill coolant into the reservoir tank till between upper and lower limit. Install reservoir tank cap.

Warning : Never mix with other brand

Inspection of Radiator Hose

Perform inspection every 40 hours or 3000km

Check radiator hose and clamp, leakage or damage----- Replace.

3.2.10 Inspection of cylinder pressure

Cylinder pressure can reflect the inner cylinder working status. Check cylinder pressure is necessary.

Cylinder pressure: 1000kPa

A lower cylinder pressure may be caused by:

- Excessive wear of cylinder
- Wear of piston or piston ring
- Piston ring jam in groove
- Poor closure of valve seat

- Damaged cylinder gasket or other defects

Note :

When cylinder pressure is too low, check the above items.

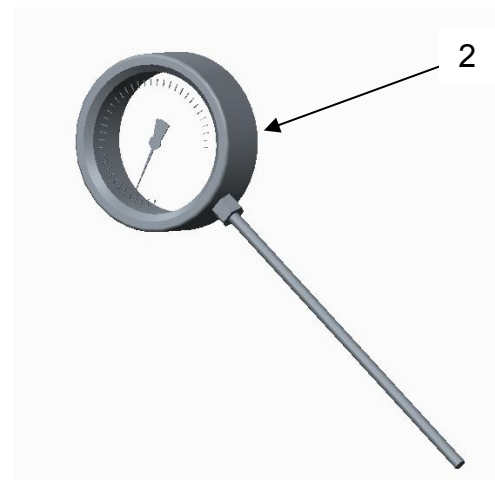
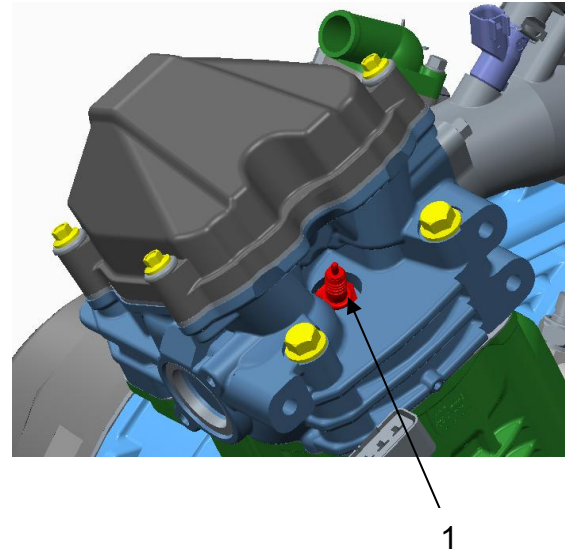
Testing Cylinder Pressure

Note:

Before testing of cylinder pressure, make sure that cylinder head bolts are tightened to the specified torque and valve clearance has been properly adjusted.

- Warm up the engine before testing
- Make sure battery is fully charged
- Remove spark plug 1
- Install cylinder pressure gauge 2 in spark plug hole
- Keep throttle full open
- Press start button crank the engine a few seconds. Record the maximum reading of cylinder pressure.

Tools: Cylinder Pressure Gauge



3.3 Engine Removal, Inspection & Installation

3.3.1 Removal/Installation Orders and the Page Numbers table..... 3-29

3.3.2 Engine Removal..... 3-31

3.3.3 Engine Inspection.....3-41

3.3.4 Engine Installation.....3-78

3.3 Engine Removal, Inspection & Installation

3.3.1 Engine Removal/Installation Orders and the Relative Page Numbers

Item	Description	Disassembly	Inspection/Maintenance	Assembly	Remarks
Engine Front Side ↓	Spark Plug	3-31	3-20	3-88	
	Cylinder Head Cover	3-31	3-41	3-88	
	Timing Chain Tensioner	3-31	3-41	3-87	
	Start decompression COMP	3-31	3-41	3-87	
	Timing driven sprocket	3-32	3-41	3-87	
	Camshaft	3-32	3-42	3-86	
	Cylinder Head	3-32	/	3-86	
	Rocker arm	3-32	3-43	3-86	
	Rocker arm shaft	/	3-43	3-86	
	Valve Spring	3-44	3-45	3-51	
	Valve	3-45	3-46	3-50	
	Valve Guide	3-47	3-47		
	Guide chain plate	3-32	3-52	3-84	
	Cylinder	3-32	3-52	3-84	
	Piston	3-33	3-53	3-84	
Engine Right Side ↓	CVT Cover	3-33	3-55	3-88	
	Primary Sheave/Secondary Sheave/Drive Belt	3-33	3-56	3-83	
	CVT case	3-34	3-62	3-83	
Engine Left Side ↓	Chain holder, Tension plate	3-34	3-62	3-83	
	Timing Chain	3-34	3-62	3-83	
	Starting Motor	3-34	/	3-83	
	Sector Gear	3-35	3-62	3-80	
	Water Pump	3-35	3-63	3-82	
	Cap	3-36	/	3-82	
	Oil filter	3-36	3-63	3-82	
	Left Crankcase Cover/Magneto Stator	3-36	3-63	3-81	
	Magneto Rotor	3-36	3-63	3-81	
	Starting Driven Gear	3-37	3-64	3-80	
	Starting Dual Gear	3-37	3-65	3-80	
	Oil pump drive gear/Oil pump dual gear	3-37	3-65	3-80	

To be continue

Item	Description	Disassembly	Inspection/Maintenance	Assembly	Remarks
 Engine Center	Gear Position Bolt	3-37	/	3-80	
	Right Crankcase /Crankcase inspection	3-38	3-66	3-79	
	Front Output Shaft Components/ Driven Bevel Gear Components	3-38	3-70	3-79	
	Bevel Gear Components	3-39	3-71	3-79	
	Transmission Main Shaft	3-39	3-72	3-78	
	Shift Drum / Shift Fork COMP	3-39	3-73	3-78	
	Drive countershaft	3-39	3-73	3-78	
	Crankshaft	3-40	3-76	3-79	
	Balance Shaft	3-40	3-77	3-79	
	Oil Pump	3-40	3-77	3-80	
	Filter Net	3-40	/	3-80	
	Left Crankcase	/	3-66	/	

Notes: Arrowhead direction is for engine removal orders. Reverse the direction for assembly and installation.

3.3.2 Engine Removal

Preparation before engine removal

- Prepare a proper tray used for load of components
- Prepare necessary removal and assembly tools
- Drain up engine oil (see 5.2.8)
- Drain up coolant (see 5.2.9)

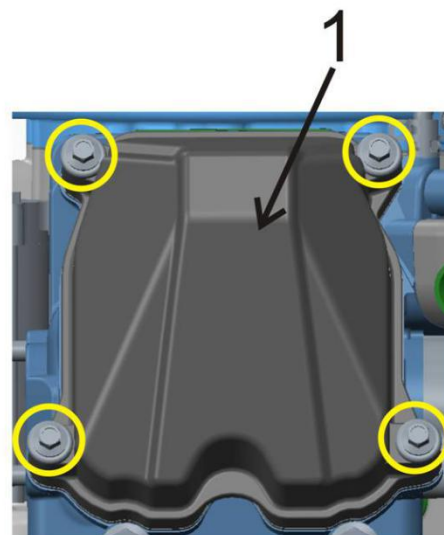
Engine Front Side

Spark Plug

- Remove spark plug with special wrench (see 5.2.5)

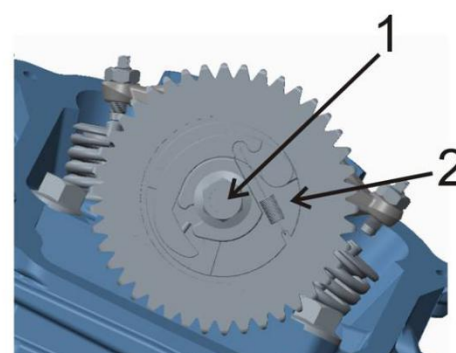
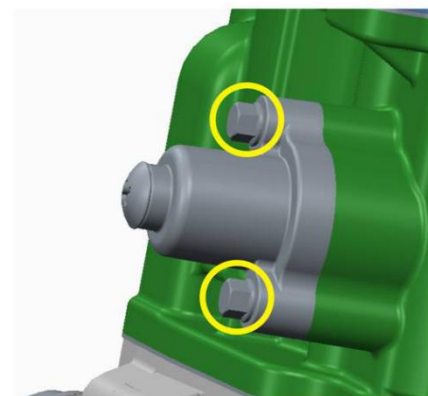
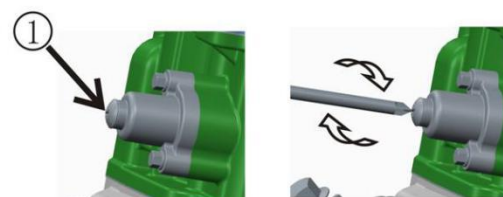
Cylinder Head Cover

- Remove 4 bolts of cylinder head cover.
- Remove cylinder head cover (1)



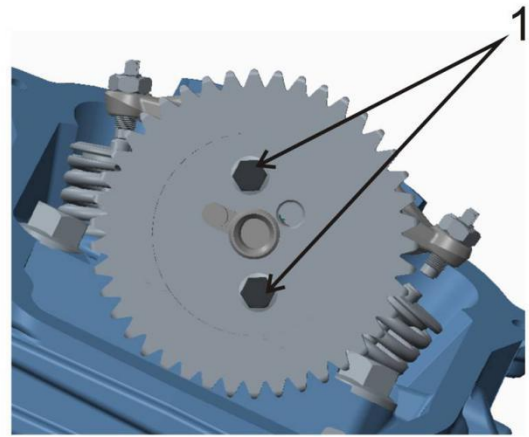
Timing Chain Tensioner

- Remove screw plug ①, insert a flat screwdriver into slot of timing chain tensioner adjuster, turn it clockwise to lock tensioner spring;
- Remove tensioner fix bolt
- Remove tensioner and gasket

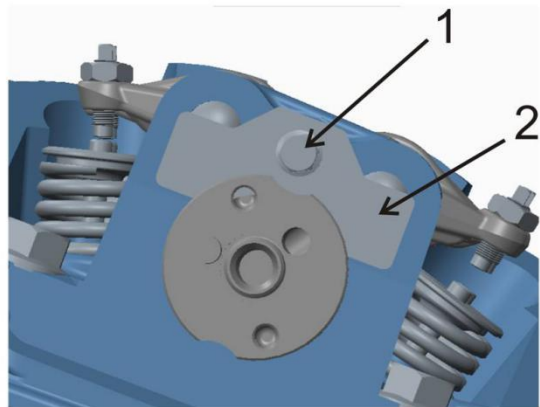


Start decompression COMP

- Remove bolt (1), Remove Start decompression COMP(2)

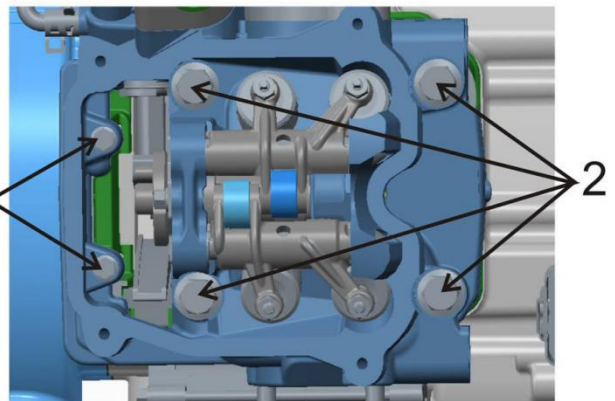
**Timing driven sprocket**

- Loosen two bolts (1) of timing driven sprocket
- Remove timing driven sprocket

**Camshaft, rocker arm**

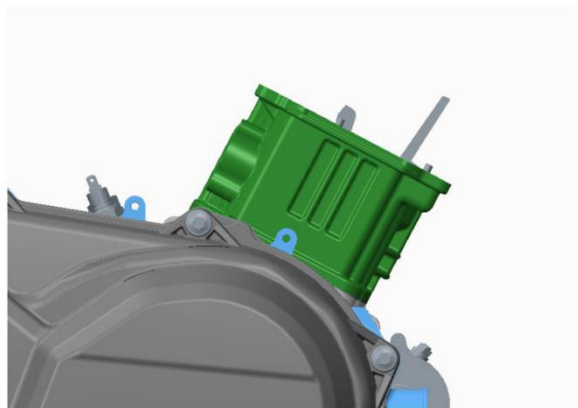
- Loosen bolt(1)
- Remove camshaft holder
- Remove rocker arm shaft, Remove rocker arm
- Remove camshaft

Note: Turn camshaft to Free State.

**Cylinder Head, Guide Chain Plate**

- Remove 2 bolts (1) of cylinder head
- Remove 4 cylinder head bolts 2 diagonally
- Remove cylinder head
- Remove guide chain plate
- Remove dowel pin and cylinder head gasket

Note: Take care not to drop dowel pin into crankcase



Cylinder

- Remove cylinder

Piston

Put a clean rag under piston so as not to drop piston pin circlip into crankcase.

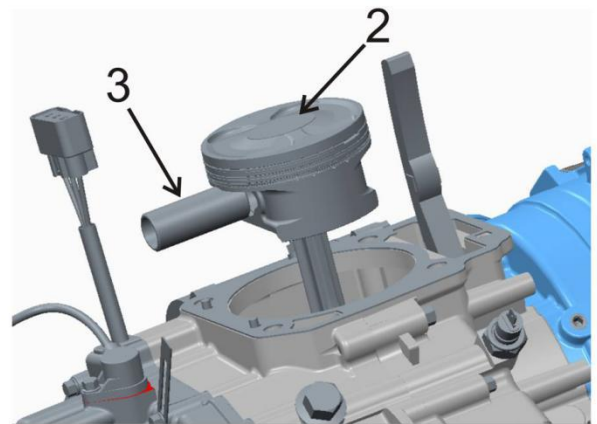
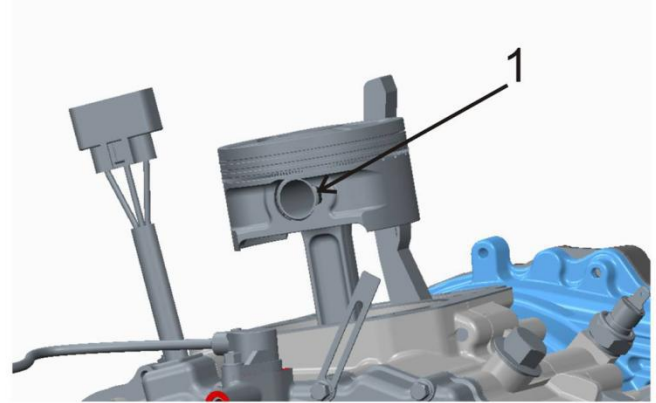
Warning: Piston pin circlip is spring-loading

- Remove piston pin circlip (1) and discard it.

Note: No need to remove two piston pin circlip

Remove piston pin circlip (1) from piston pin hole (connecting rod hole)

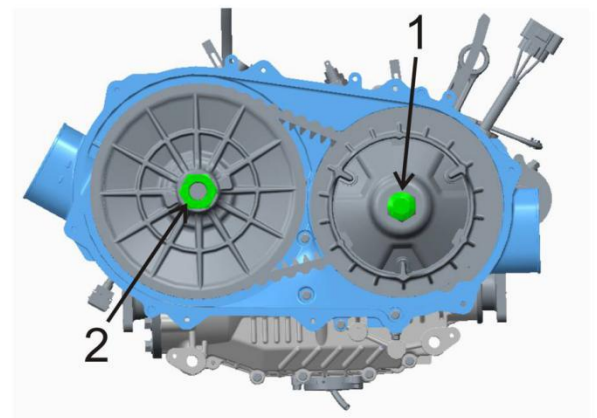
Remove piston (2) from connecting rod

**Engine Right Side****CVT Cover**

- Remove CVT cover (see 5.2.7)

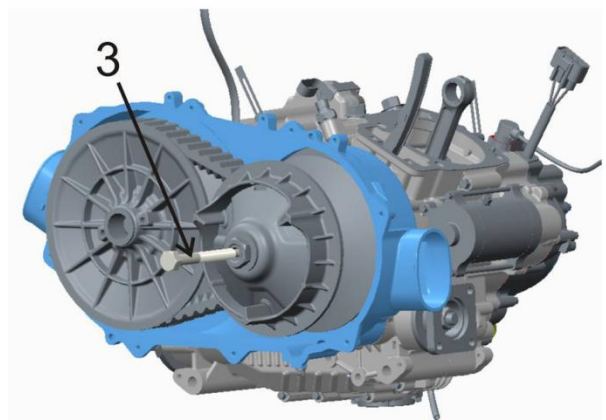
Driving pulley / driven pulley / Drive Belt

- Remove drive bolt (1) clockwise and driven screw (2) anticlockwise

**Drive pulley / driven pulley / Drive Belt**

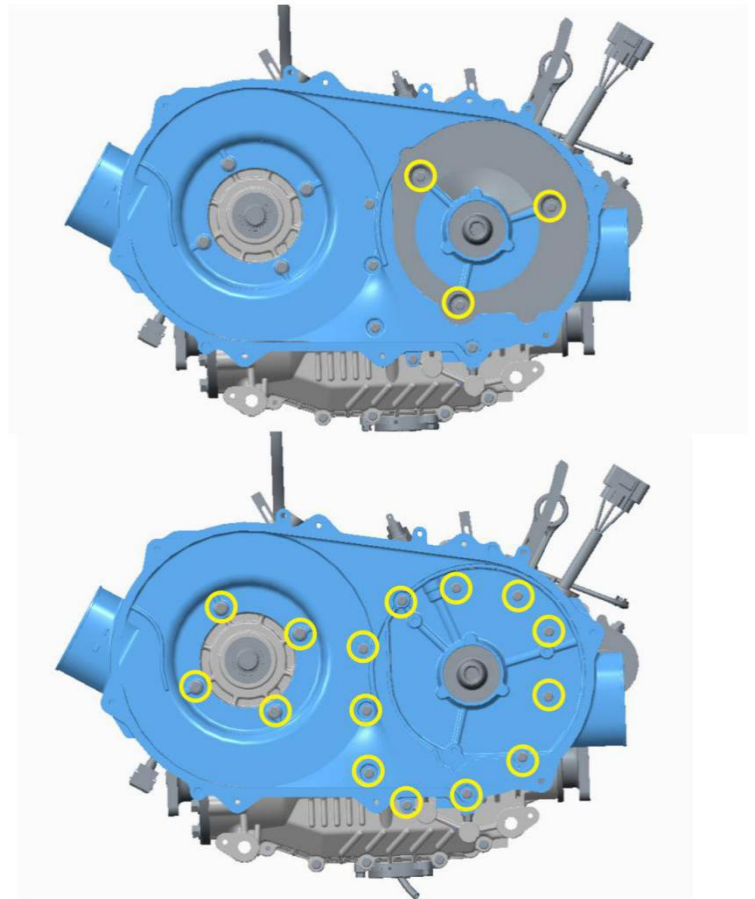
- Remove drive pulley with special tools
- Remove drive pulley / driven pulley / drive belt

Tool: Drive pulley puller (3)
(1BX-17653-00)

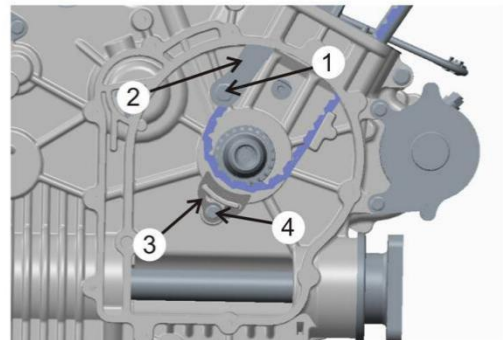


CVT Case

- Remove bolt of air intake plate
Remove air intake plate
- Remove bolt of CVT case
- Remove CVT case
- Remove dowel pin
Remove paper gasket and discard it.

**Chain holder, Tension plate**

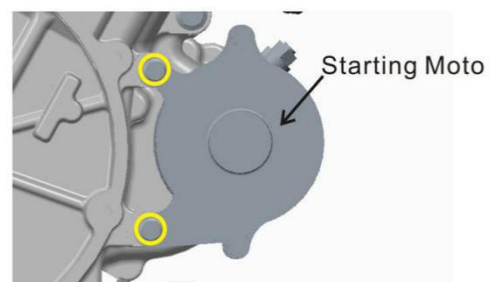
- Remove bolt 1 of tension plate
Remove tension plate2
- Remove bolt 4 of chain holder
Remove chain holder3

**Timing Chain**

- Remove timing chain from crankshaft sprocket

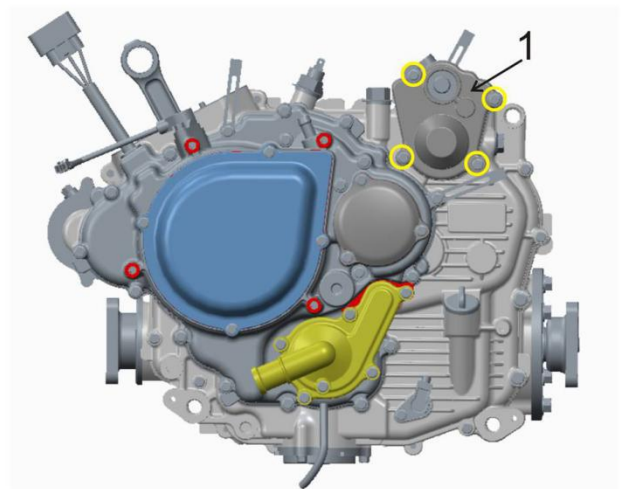
**Starting Motor**

- Remove 2 bolts of starting motor
- Remove starting motor

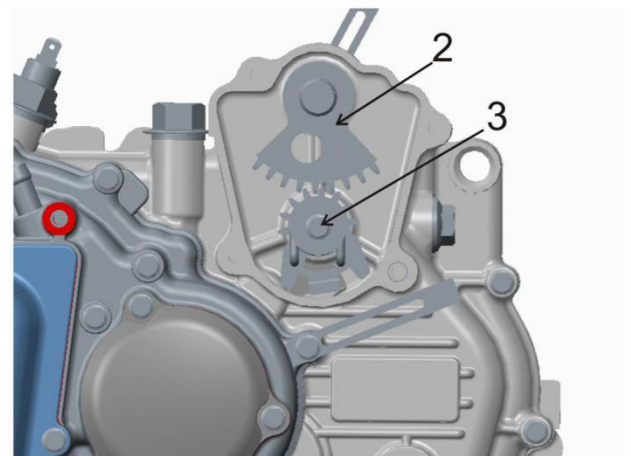


Sector Gear

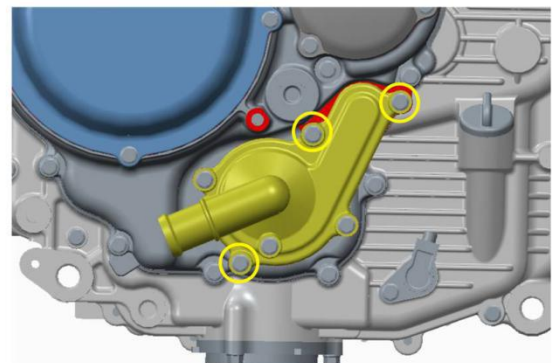
- Remove 4 bolts of sector gear housing cover
- Remove sector gear housing cover1



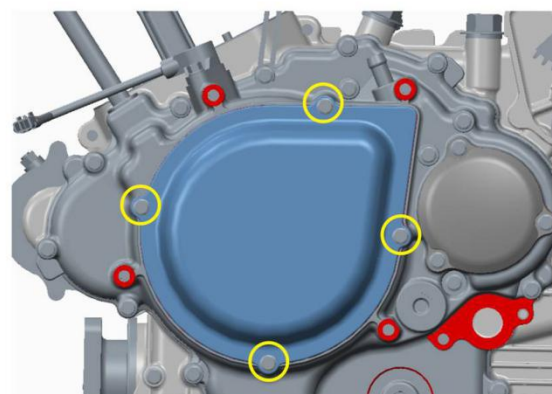
- Remove dowel pin and gasket
- Remove drive sector gear
- Loosen bolt 3, remove driven sector gear

**Water Pump**

- Screw out bolt of water pump
- Remove water pump

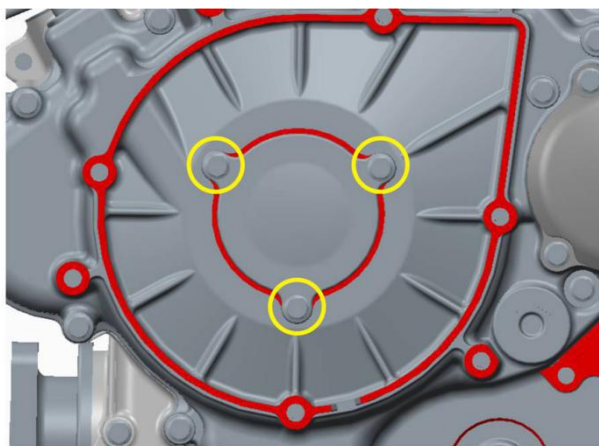
**Side Cover**

- Remove 4 bolts, remove Side Cover

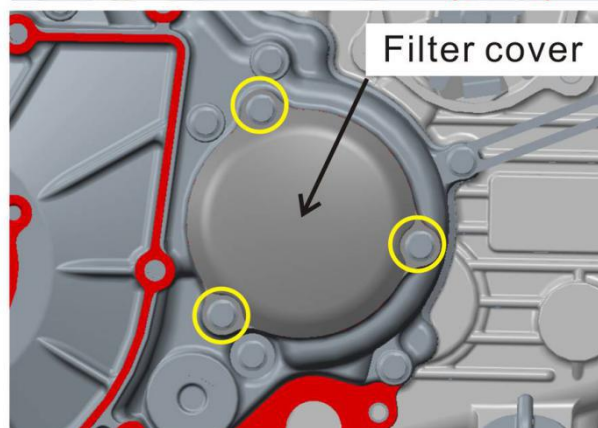


Cap

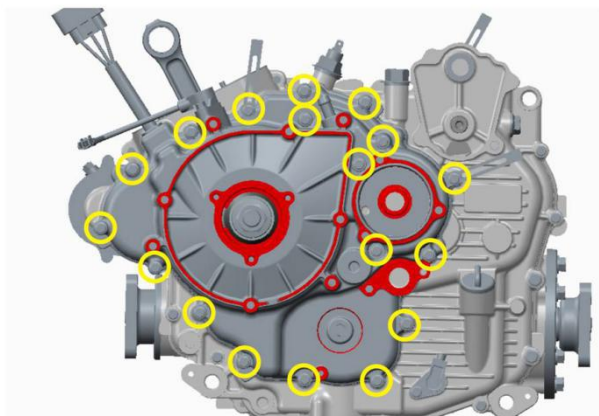
- Remove 3 bolts, remove cap

**Oil Filter**

- Screw out 3 bolts of filter cover
- Remove filter cover, O ring
- Remove oil filter

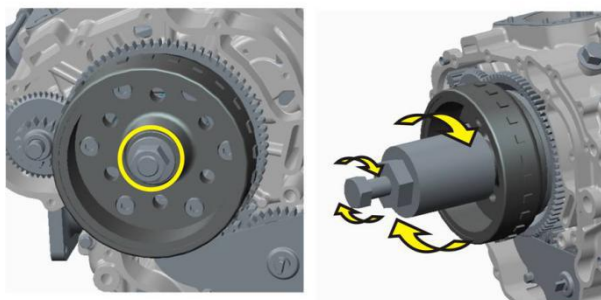
**Left Crankcase Cover/Magneto Stator**

- Remove bolts of left
- Remove left crankcase cover
- Remove dowel pin and gasket

**Magneto Rotor**

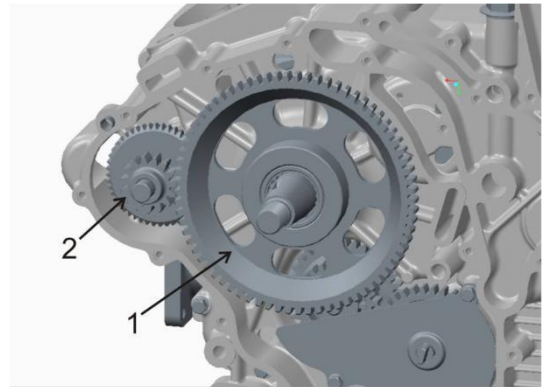
- Remove nut of Magneto Rotor
- Install special tool to rotor thread
Remove rotor and woodruff key

Tool: Rotor assy puller
(1BE-85610-00)

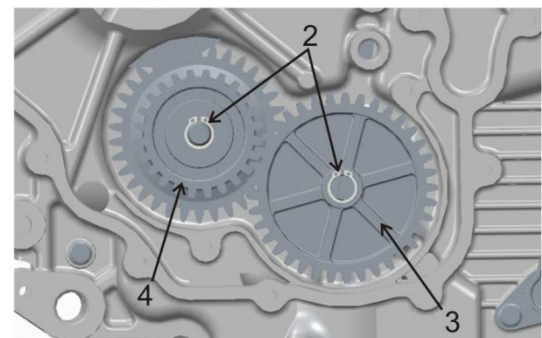
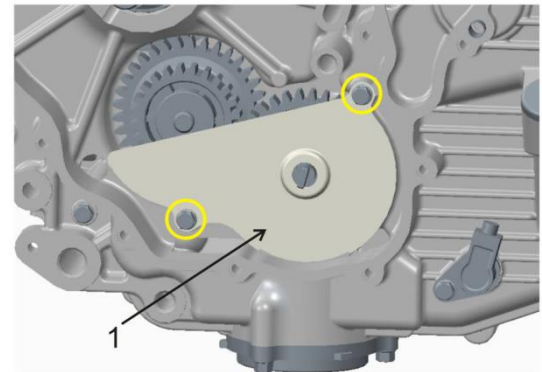


Starting Driven Gear/Starting Dual Gear

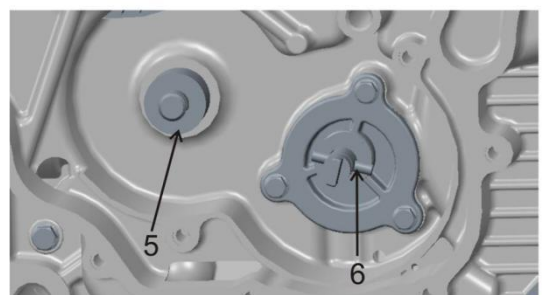
- Remove starting driven gear 1 and needle bearing
- Remove starting dual gear 2 and shaft

**Oil pump drive gear/Oil pump dual gear**

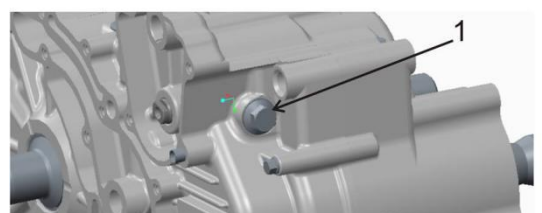
- Remove oil guard bolt
- Remove oil guard(1)
- Remove two Circlip (2) by circlip plier
- Remove oil pump drive gear (3), oil pump dual gear (4) and gasket



- Remove needle bearing(5)
- Remove pin shaft (6),gasket

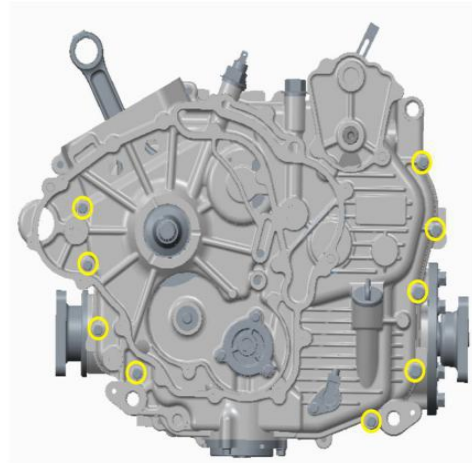
**Engine Center****Gear position bolt**

- Remove gear position bolt(1)
- Remove spring and steel ball

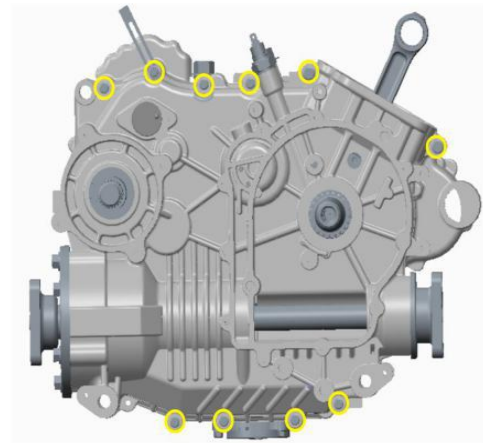


Right Crankcase

- Remove left crankcase bolts



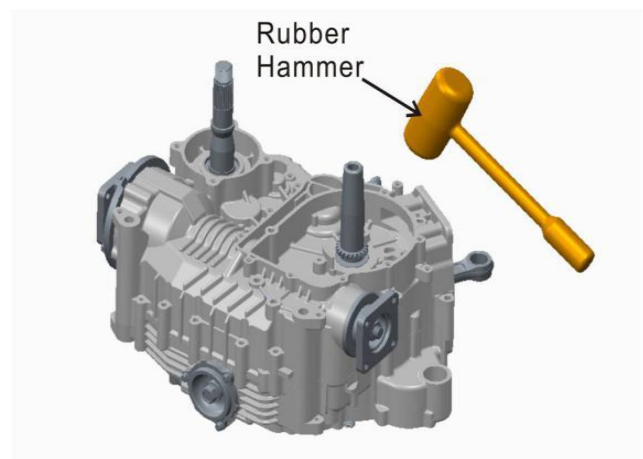
- Remove right crankcase bolts



- Separate crankcase carefully with rubber hammer knocking the case

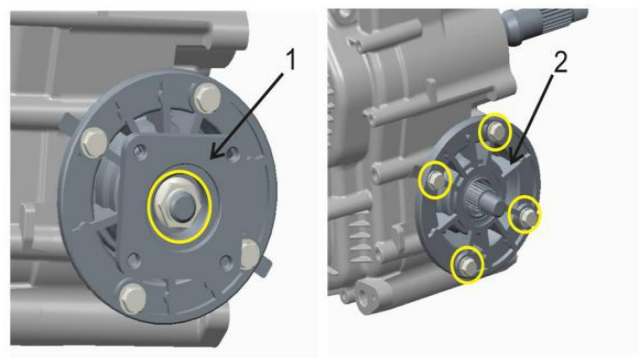
Caution:

Do not damage the seal surface of right/left crankcase when separating Crankshaft should remain in the left crankcase half.

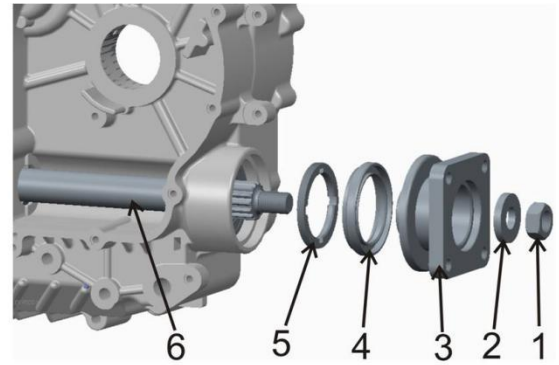


Front Output Shaft, Driven Bevel Gear

- Remove nut of Real output coupler(1)
- Remove bevel gear cover bolt
- Remove driven bevel gear(2)

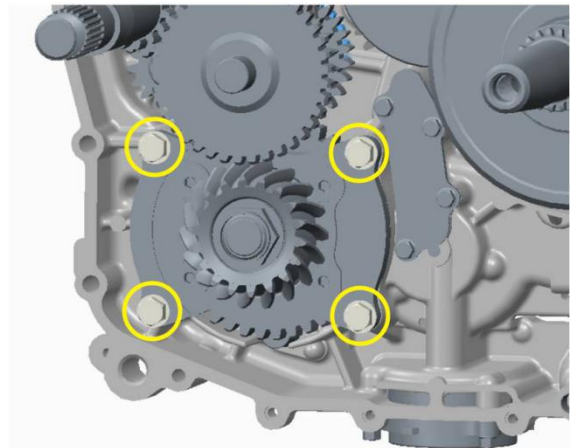


- Remove nut 1 , gasket 2 , front output coupler3,oilseal4,front output shaft bearing ring5(LH)
- Remove Front Output Shaft6



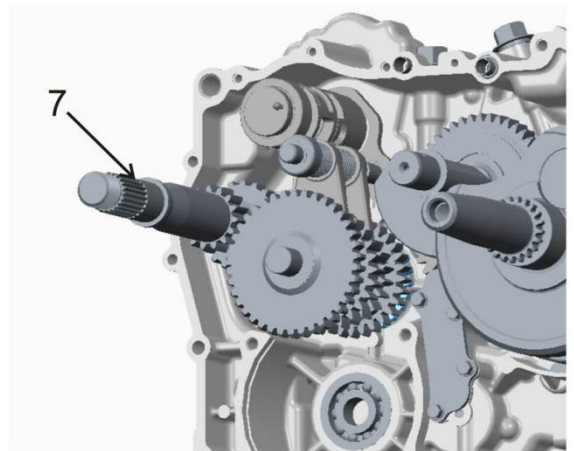
Drive Bevel Gear

- Screw out driven bevel gear bearing seat bolt
- Remove driven bevel gear from left crankcase



Transmission Main Shaft

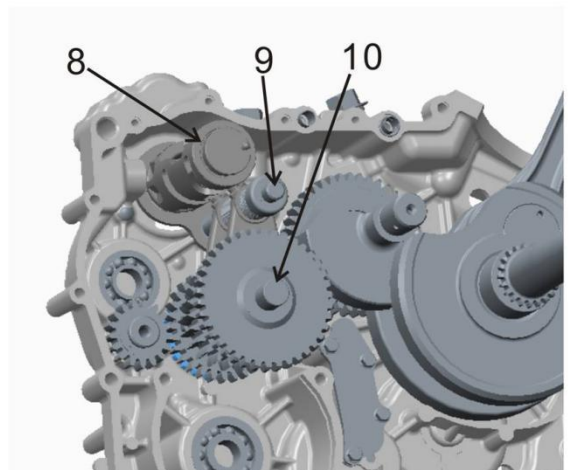
- Remove transmission main shaft7



Shift Drum, Shift Fork, Drive countershaft

- Remove shift drum 8, shift fork 9, and drive countershaft10

Note: Shift drum, shift fork and drive countershaft should be removed together.

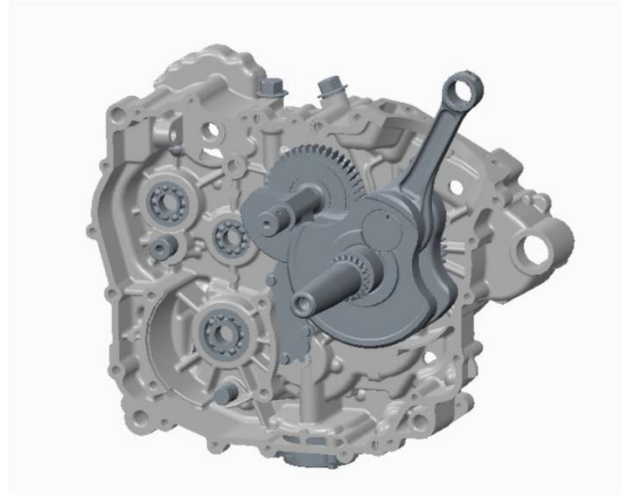


Crankshaft

- Remove crankshaft from left crankcase

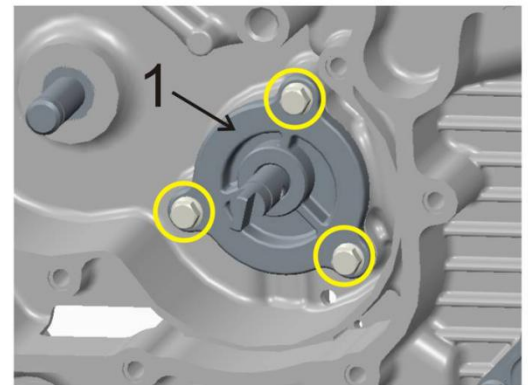
Balance Shaft

- Remove balancer shaft from left crankcase

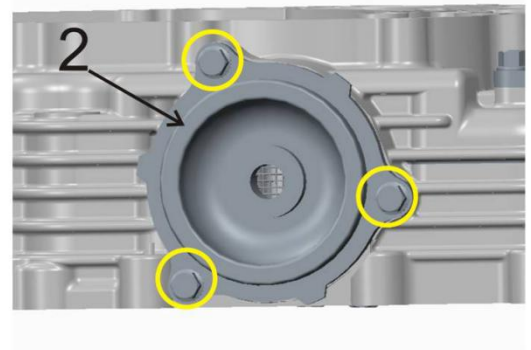
**Oil pump**

- Screw out oil pump bolt
- Remove oil pump(1)

Note: Oil pump bolt size M5 X 16

**Filter Net**

- Screw out the bolt
- Remove filter cap(2)
- Remove filter net



3.3.3 Engine Inspection

Cylinder Head Cover

Check if any scratch is on the cap.

Check is any crack, crush or hardening on the sealer ring. If so, change accordingly.

1. Cylinder Head Cover
2. Cylinder Head Cover Seal Ring



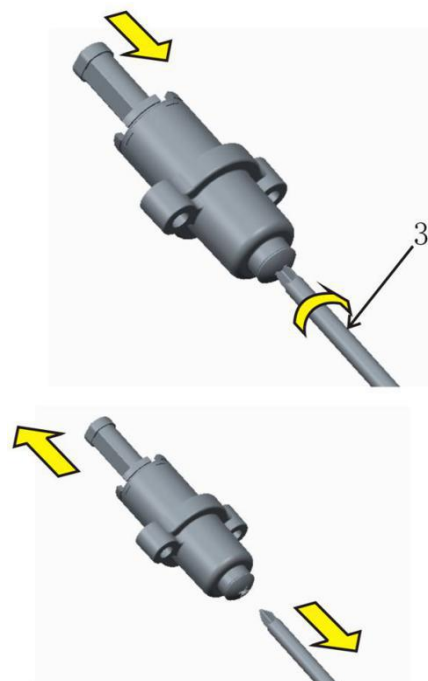
Timing Chain Tensioner

● Check tensioner for any damage or poor Function. Damage, poor function: Replace

● Performance stability inspection methods

■ Insert screw driver 3 into the slotted end of adjusting screw, turn it clockwise to loosen the tension and release the screw-driver

■ Move the screw driver and let go of the arm slowly, ensuring the arm snaps back smoothly. If not, replace the chain tensioner with a new one.



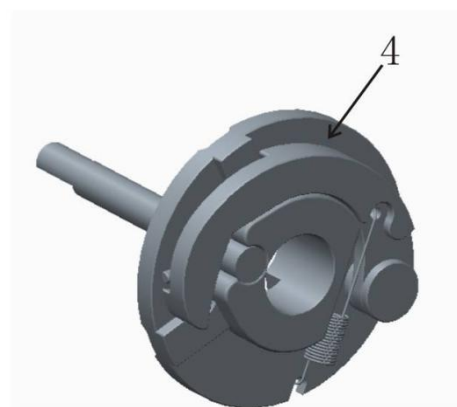
Start decompression COMP

● Check if any crack is on the reducer. If any, change a new one.

● Move pressure reducing arm 4. Check if pressure-reducing rocker arm and camshaft can move flexibly and return automatically.

Timing Driven sprocket

● Check any scratch or damage on camshaft timing chain wheel. If the gear is scratched or damaged, change a new one completely (including camshaft timing chain wheel and timing chain).



Camshaft Inspection

- Check any scratch, abrasion, crack or other damage on each camshaft and journal.
- Check journal dia. And height of camshaft by micrometer

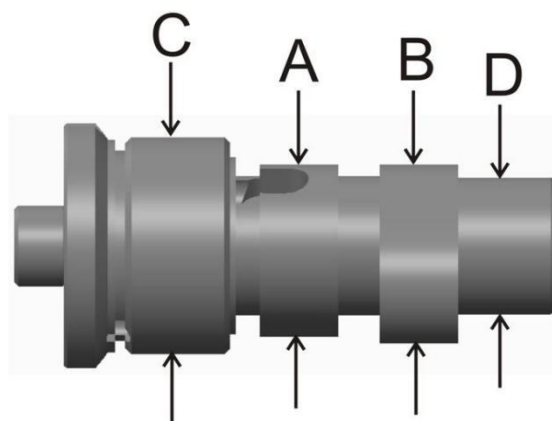
Camshaft	
Cam(intake)	
New part	32.985mm~33.025 mm
Maintenance limit	32.865 mm
Cam(exhaust)	
New part	32.971mm~33.011mm
Maintenance limit	32.871 mm

Camshaft journal(timing chain side)	
New part	34.959mm~34.975 mm
Maintenance limit	34.950 mm
Camshaft bearing shaft (ignition plug side)	
New part	21.959mm~21.980 mm
Maintenance limit	21.950 mm

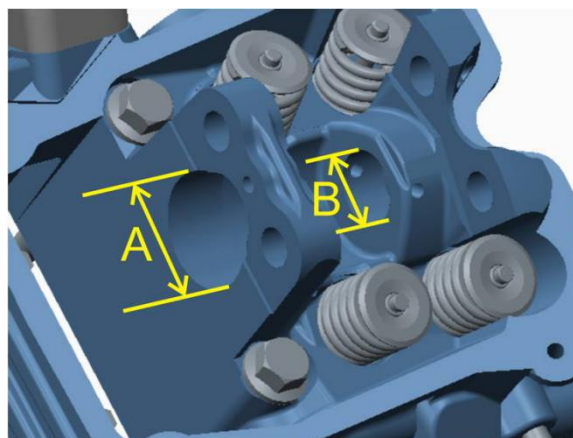
- Test tolerant clearance of camshaft sides and cylinder cap

Camshaft bearing hole(timing chain side)	
New part	35.007mm~35.025 mm
Maintenance limit	35.040 mm
Camshaft bearing hole(spark plug side)	
New part	22.012mm~22.025 mm
Maintenance limit	22.040 mm

If parameters are beyond standards, change the parts.



- A. Cam(exhaust valve)
- B. Cam(intake valve)
- C. Camshaft journal(timing chain side)
- D. Camshaft journal(ignition plug side)

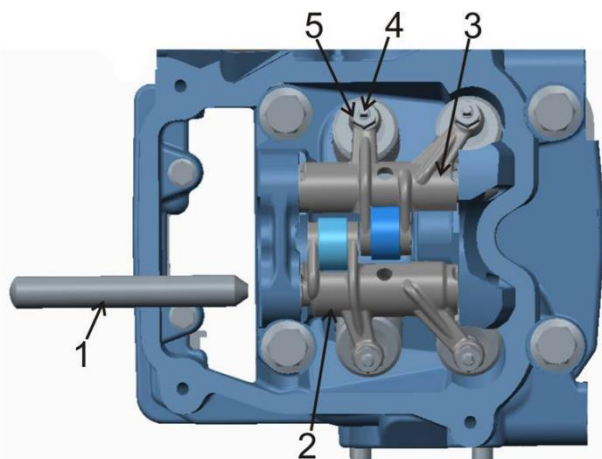


- A. Camshaft bearing hole(timing chain side)
- B. Camshaft bearing hole(spark plug side)

Cylinder head cover Remove rocker arm

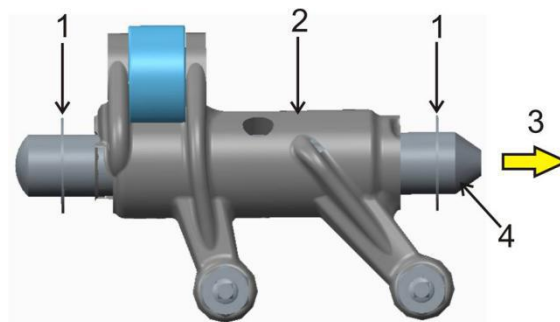
- Remove rocker arm shaft(1)
- Remove rocker arm(intake and exhaust)
Including adjusting screw and nut.

- 1.Rocker shaft
- 2.Exhaust rocker arm
- 3.Intake rocker arm
- 4.Adjusting screw
- 5.Nut



- Remove washer(1).

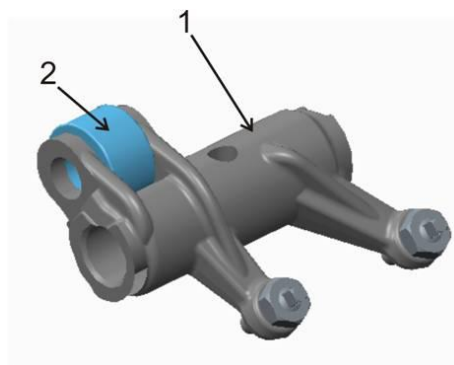
CAUTION: Pay attention not to lose thrust washers or drop them into the timing chain compartment.



1. Washers
2. Rocker Arm, Exhaust
3. Cylinder Head Spark Plug Side
4. Big Taper to Spark Plug Side

Rocker Arm Inspection

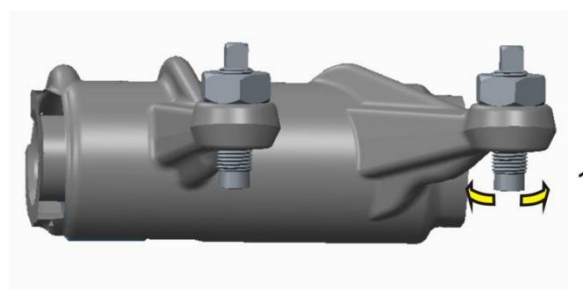
- Inspect each rocker arm for cracks and scored friction surfaces. If any, replace rocker arm assembly.
- Check the rocker arm rollers for free movement, wear and excessive radial play. Replace rocker arm assembly if necessary.
- Check rocker arm bore diameter. If Diameter is out of specification, change rocker arm assembly.



1. Rocker Arm, Exhaust
2. Roller
- A. Bore for Rocker Arm

Rocker Arm Bore Diameter	
New	12.000mm~12.018mm (0.4724in~0.4731in)
Service Limit	12.030mm (0.4736in)

- Check adjustment screws for free movement, cracks and/or excessive play.



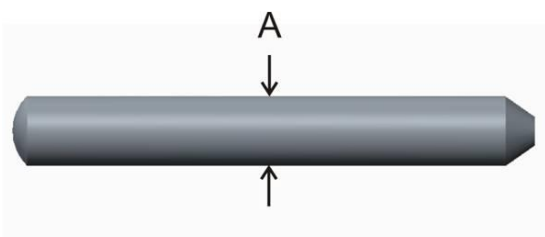
Rocker Arm Shaft

- Check for scored friction surfaces; if any, replace parts.
- Measure rocker arm shaft diameter.

Rocker Arm Shaft Diameter	
New	11.973mm~11.984mm
Service Limit	11.960mm

Any area worn excessively will require parts replacement.

1. Free Movement of Adjustment



- A. Measure rocker arm shaft diameter here

Valve Spring Removal

- Use valve spring compressor clamp to

compress valve spring

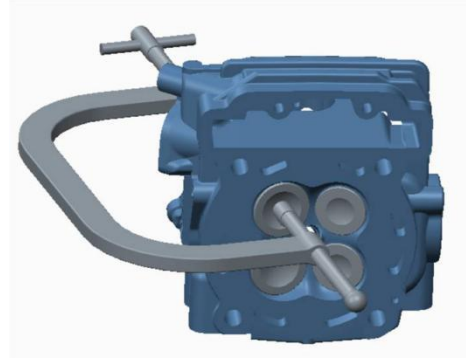
WARNING

Always wear safety glasses when disassembling valve springs. Be careful when unlocking valves. Components could fly away because of the strong spring preload

Valve Spring Compressor Clamp

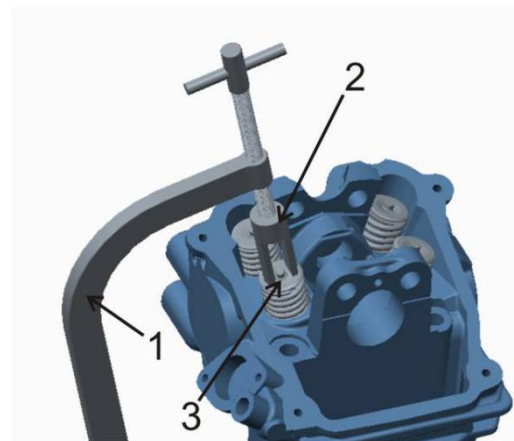


Valve Spring Compressor Cup



Align valve spring compressor clamp with the center of Valve

- Remove valve lock clips.
- Withdraw valve spring compressor, valve spring retainer and valve spring.



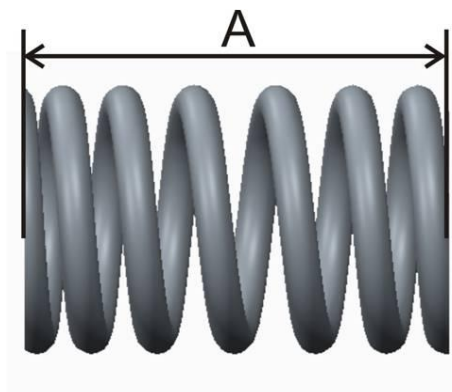
1. Valve Spring Compressor Clamp
2. Valve Spring Compressor Cup
3. Valve lock clip

Valve Spring Inspection

- Check valve spring for visible damages, If any, replace valve spring.
- Check valve spring for free length and straightness.

Valve Spring Free Length	
Normal New	40 mm
Service Limit	38.2 mm

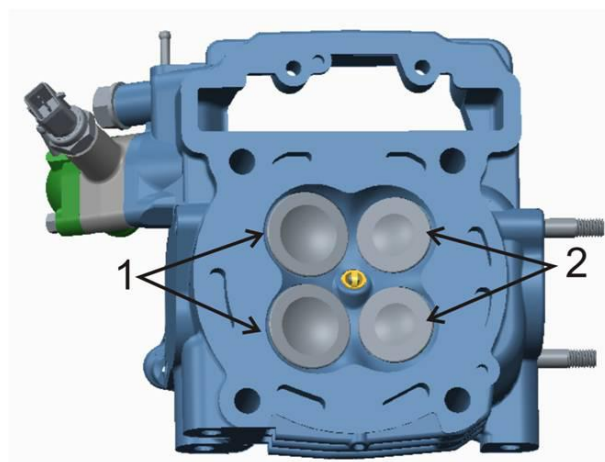
Replace valves springs if not within specifications.



A. Valve Spring Length

Valve Removal

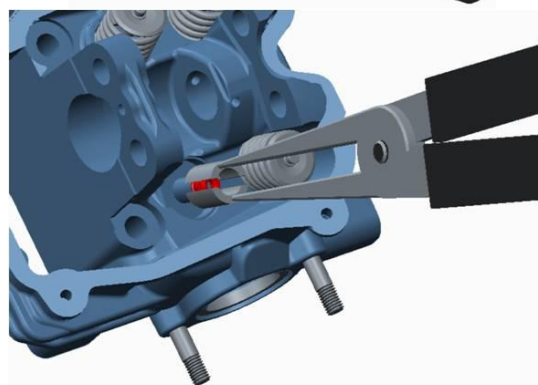
- Push valve stem, then pull valves(intake and exhaust)out of valve guide.



1. Intake Valve 33mm

2. Exhaust Valve 29mm

- Remove valve stem seal with Snap-on plier and discard it.



1. Plier

2. Valve Stem Seal

Valve Inspection

Valve Stem Seal

Always install new seals whenever valves are removed

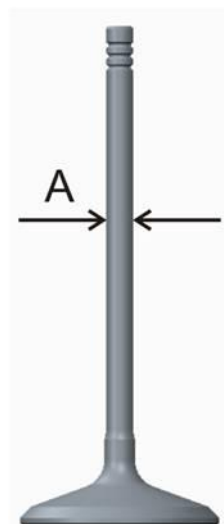
Valve

● Inspect valve surface, check for abnormal stem wear and bending. If out of specification, replace by a new one.

Valve Out of Round (Intake and Exhaust Valves)	
New	0.005 mm
Service limit	0.06 mm

Valve Stem and Valve Guide Clearance

● Measure valve stem and valve guide in three places using a micrometer and a small bore gauge.



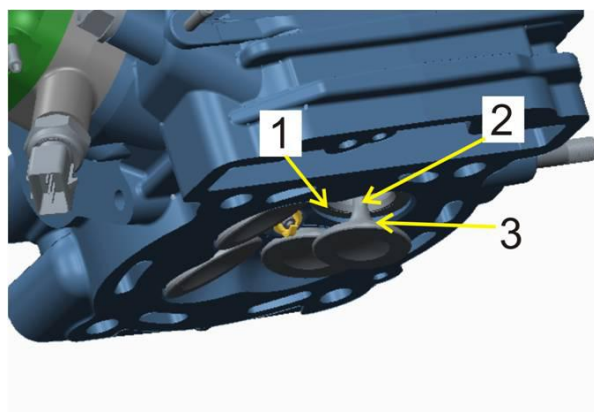
A. Valve Stem Diameter

Change valve if valve stem is out of specification or has other damages such as wear or friction surface.

Valve Stem Diameter	
Exhaust Valve	
New	4.95mm~4.965 mm
Service limit	4.930 mm
Intake Valve	
New	4.96mm~4.975 mm
Service limit	4.930 mm

Replace valve guide if valve guide is out of Specification or has other damages, such as wear or friction surface

Valve Guide Diameter (Intake and Exhaust Valves)	
New	5.000mm~5.012 mm
Service limit	5.045 mm



1. Valve Seat
2. Exhaust Valve Contaminated Area
3. Valve Face (Contact Surface to Valve Seat)

Valve Face and Seat

- Check valve face and seat for burning or pitting and replace valve or cylinder head if there are signs of damage.
- Ensure to seat valves properly. Apply some lapping compound to valve face and work valve on its seat with a lapping tool (see Valve Guide Procedure below).
- Measure valve face contact width.

NOTE: The location of contact area should be in center of valve seat.

- Measure valve seat width using a caliper.

Valve Seat Contact Width	
Exhaust Valve	
NEW	1.20mm ~ 1.40mm
Service limit	1.80 mm
Intake Valve	
New	1.10mm ~ 1.30mm
Service limit	1.70 mm

If valve seat contact width is too wide or has dark spots, replace the cylinder head.

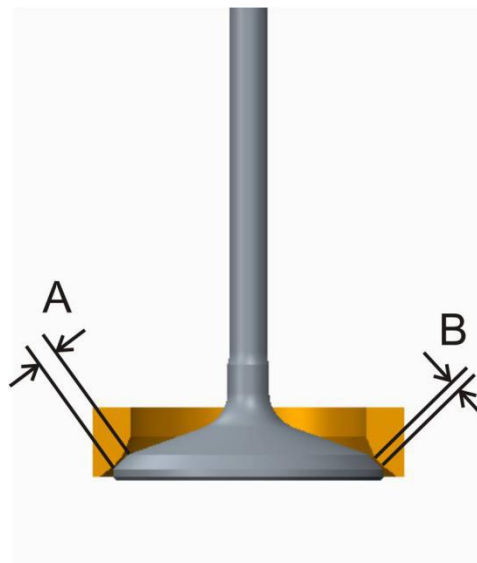
Valve Guide Removal

NOTE: Clean valve guide area from contamination before removal.

- Use valve guide remover and a hammer, drive the valve guide out of cylinder head.

Valve Guide Inspection

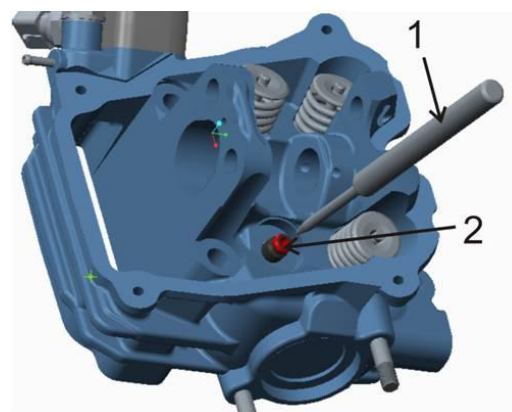
Always replace valve stem seals whenever valve guides are removed.
Clean the valve guide bore before reinstalling the valve guide into cylinder head.



A. Valve Contact Surface Width
B. Valve Seat Contact Width



Valve Guide Remover



1. Valve Guide Remover
2. Valve Guide

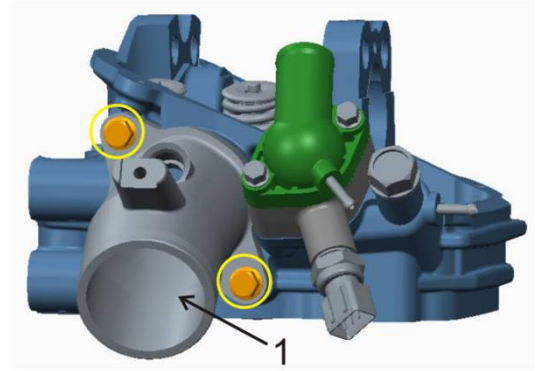
Injector Seat

- Unscrew the set bolt and remove the injector seat(1)

Injector Seat Inspection

- Inspect Injector Seat for cracks or other damage.

Check the seal for wear or excessive using. Replace it if necessary.



Water Temperature Sensor and Thermostat

- Unscrew the Thermostat bolt, remove the Thermostat Cover, Thermostat, Thermostat Seat and Water Temperature Sensor.

- Water Temperature Sensor Inspection (Check 5. 4. 6)

- Thermostat Inspection (Check 3.4.7)



Cylinder Head Installation

Valve Guide Installation

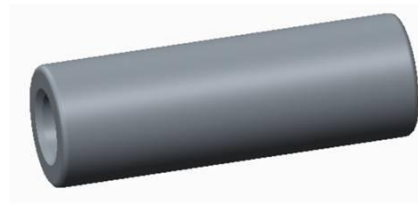
For installation, reverse the removal procedure. Pay attention to the following details.

- Use valve guide installer to install valve guide.

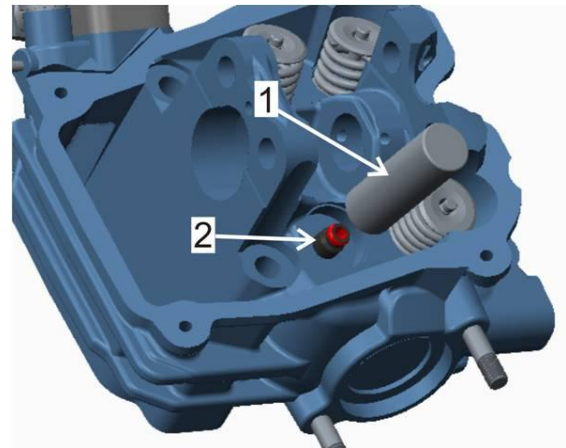
NOTE: Apply loctite (antiseize lubricant) on valve guide prior to install it into the cylinder head.

- Push valve guide in the cold cylinder head as per following illustration.

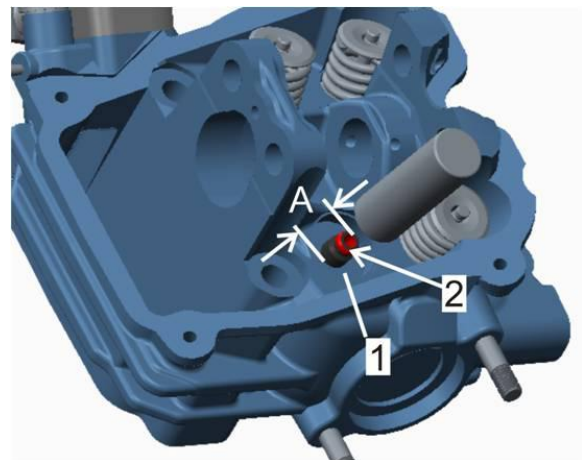
Valve Guide (Measurement "A")	
NEW	14.70mm~15.30 mm



Valve Guide Installer



1. Valve Guide Installer
2. Valve Guide



1. Thrust Surface of Cylinder Head
 2. Valve Guide
- A. Measurement from Thrust Surface to Valve Guide Top

- Valve guide to be adjusted in diameter by using a reamer.

Valve Guide Diameter (Intake and Exhaust Valves)	
New	5.000mm~5.012 mm

NOTE: Ensure to turn reamer in the right direction. Use cutting oil and make brakes to clean reamer/valve guide from metal shavings.

- Apply some lapping compound to valve face and work valve on its seat with a lapping tool.

NOTE: Ensure to seat valves properly. Apply marking paste to ease checking contact pattern.

- Repeat procedure until valve seat/valve face fits together.

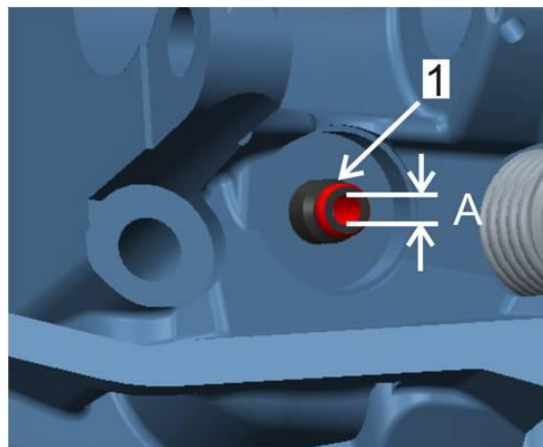
Note: Clear up the abradant.

Valve Installation

For installation, reverse the removal procedure(Check 5-45).Pay attention to the following details.

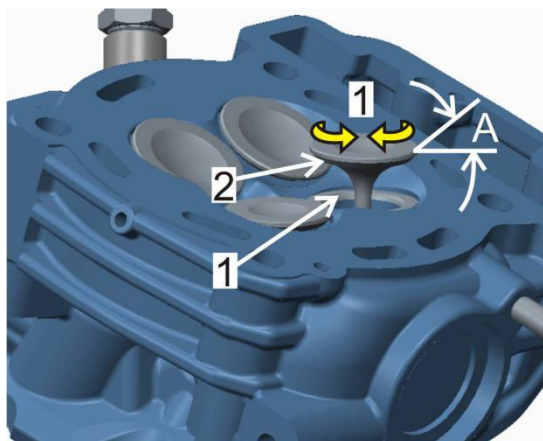
- Install a **NEW** valve stem seal. Make sure thrust washer is installed before installing seal.
- Apply engine oil on valve stem and install it.

CAUTION: Be careful when valve stem is passed through sealing lips of valve stem seal.



1. Valve Guide

A. Valve Guide Diameter

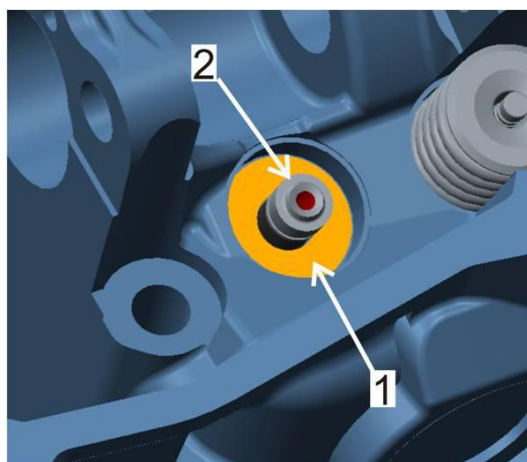


1. Valve Seat

2. Valve Face(contact surface to valve seat)

3. Turn valve while pushing against cylinder head

A. Valve Seat Angle45



1. Valve Spring Lower Seat

2. Sealing Lips of Valve Stem Seal

Valve Spring Installation

For installation, reverse the removal procedure(Check 5-45). Pay attention to the following details.

- Colored area of the valve spring must be placed on top.
- To ease installation of cotteners, apply oil or grease on them so that they remain in place while releasing the spring.

NOTE: Valve cotter must be properly engaged in valve stem grooves.

- After spring is installed, ensure it is properly locked by tapping on valve stem end with a soft hammer so that valve opens and closes a few times.

CAUTION: An improper locked valve spring will cause engine damage.

Rocker Arm Installation

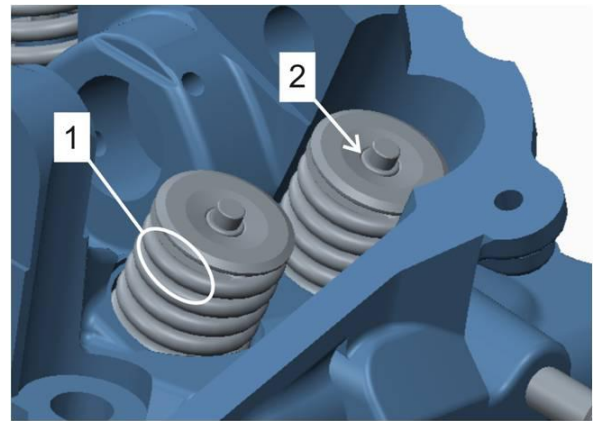
NOTE: Use the same procedure for exhaust and intake rocker arm.

- Apply engine oil on rocker arm shaft.
 - Install the rocker arm shaft with the chamfered edge first and use following procedure.
- 1、 Insert a rocker arm pin through rocker arm pin bore.
 - 2、 Install a thrust washer then proper rocker arm(exhaust side)or (intake side).
 - 3、 Push in rocker arm shaft until its chamfer reaches the end of rocker arm bore.
- Place the other thrust washer and push rocker arm shaft to end position.

Thermostat Installation

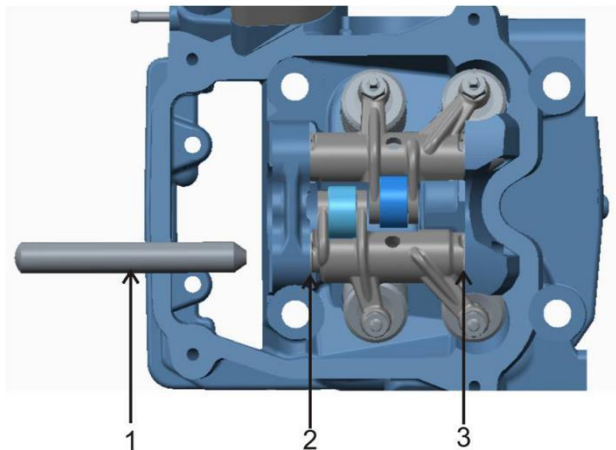
- Install the Thermostat seat(1), Thermostat(2),Thermostat cover (3) and two bolts (4)

Note: Don't miss to install the "O" seal ring



1. Position of the ValveSpring

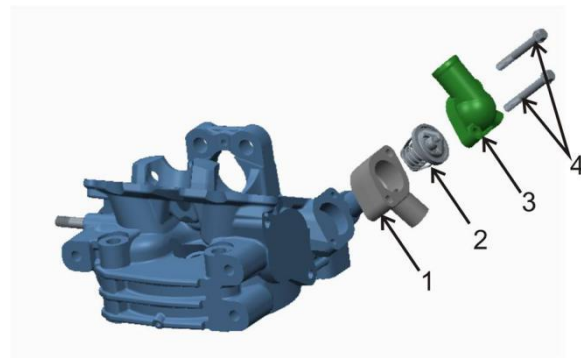
2. Valve Cotter



1. Rocker Arm

2. Thrust Washer(Timing Chain Side)

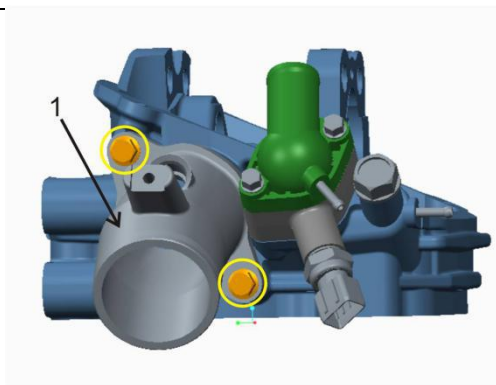
3. Thrust Washer(Spark Plug Side)



Injector Seat Installation

- For installation, reverse the removal procedure (Check 3-48).

Note: Don't miss to install the seal ring.



1 .Injector Seat

Upper Guide Chain Inspection

- Inspect Upper guide chain, check for abnormal wear, cracks and rubber fall off. If out of specification, replace by a new one.

Cylinder Body Inspection

Cylinder Body Distortion

- Check the planeness of gasket surface, total 7 point to inspect with a straight edge and thickness gauge. Take clearance readings from several places. If any clearance reading is out of the service limit, replace with a new cylinder body.

Cylinder Body Distortion Service Limit:

0.05mm

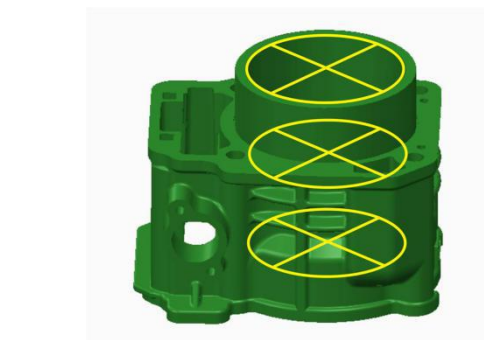
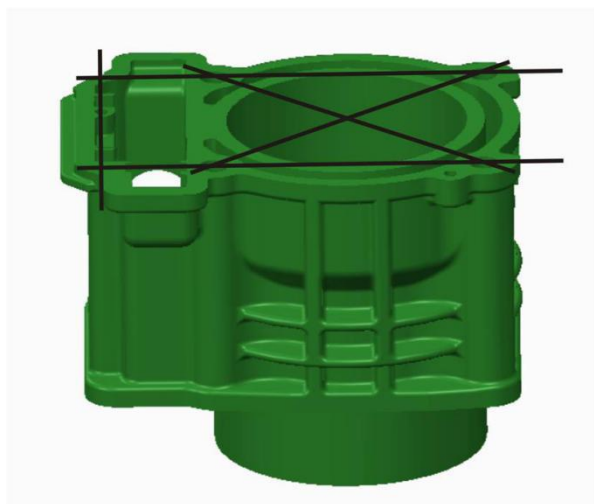
Tool: Thickness Gauge, straight edge

Cylinder Body Inner Diameter Inspection

- Check the scoring or other damages in the inner wall of Cylinder Body, Replace it if necessary.
- Measure the diameter of bore by Inner diameter gauge from upper, middle and lower places of cylinder inner diameter to check with two mutual vertical directions.

Standard Cylinder Bore: 91.0-91.015mm

Tool: Inner diameter gauge



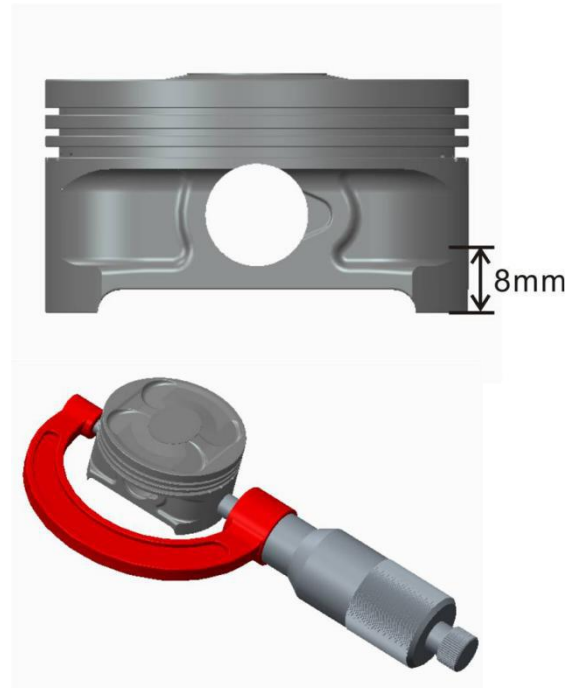
Piston**Piston Diameter**

● Inspect piston for cracks or other damage. Replace piston and piston ring if necessary.

● Vertical measure the piston on the 8mm direction between piston pin by micrometer

Replace piston if out of service limit.

Piston Parameter	
New	90.950mm~90.970 mm
Service Limit	90.85 mm

**Piston Ring Groove Clearance**

● Measure the one-sided clearance of piston 1 and 2 by Straight edge, if out of service limit, replace piston and piston ring.

Service limit (Clearance)

Piston ring1: 0.15mm

Piston ring 2: 0.15mm

Service limit (Width)

Piston ring 1: 1.21mm~1.23mm

Piston ring 2: 1.51mm~1.53mm

Oil ring: 2.50mm~2.52mm

Service limit (Thickness)

Piston ring 1: 1.17mm~1.19mm Piston

ring 2: 1.47mm~1.49mm

Tool: Straight edge

Micrometer(0~25mm)



Piston ring free gap and piston ring end gap

● Using a feeler gauge measure each ring free gap, place the ring in the cylinder To measure the ring end gap, If the clearance is too large, the piston and piston rings should be replaced.

Piston ring free gap (service limit)

Piston ring 1: 8.9mm

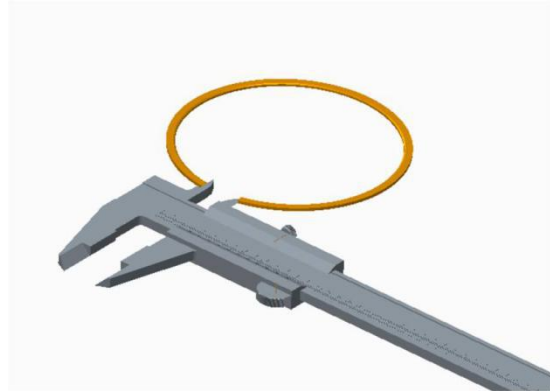
Piston ring 2: 9.5mm

Piston ring end gap (service limit)

Piston ring 1: 1.5mm

Piston ring 2: 1.5mm

Tool: Vernier caliper. Feeler gauge



Piston Pin and Pin Bore

● To measure the inner diameter of Piston pin bore by Bore dial indicator.

To measure the outer diameter of Piston pin by micrometer

If out of service limit, replace Piston and Piston pin



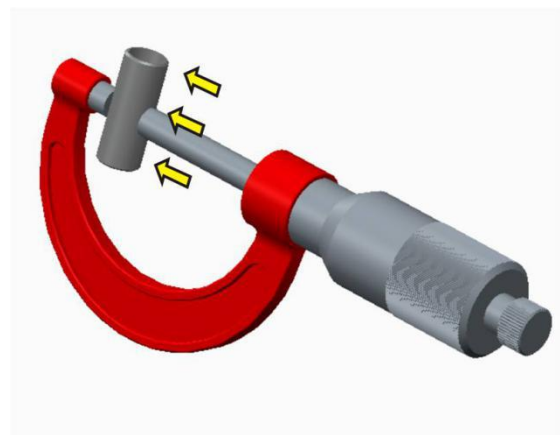
Piston Pin Bore(service limit): 22.02mm

● To measure the outer diameter of Piston Pin in three difference positions by micrometer.

Piston Pin outer diameter(service limit): 21.980mm

Tool: Inner diameter gauge(18mm~35mm)

Micrometer(0~25mm)

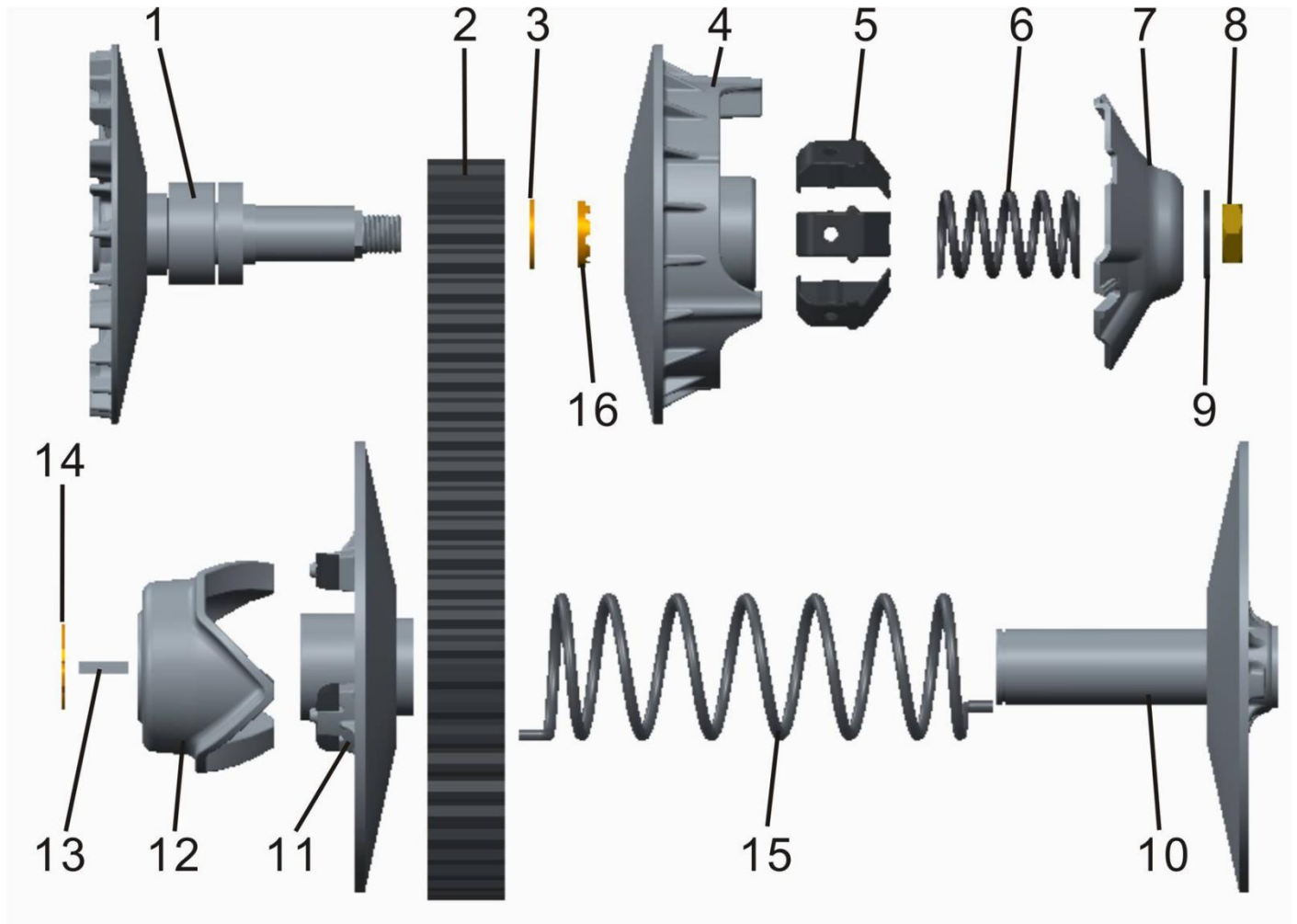


CVT Cover

- Inspect CVT Cover for cracks. Replace a new CVT Case if necessary
- Inspect seal ring of CVT Cover for ageing, damage. Replace a new one if necessary



Drive Pulley, Driven Pulley, Drive Belt

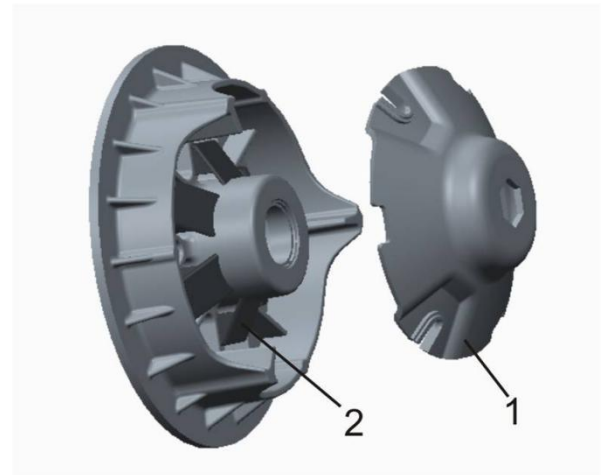


- 1 、 Drive Pulley Fixed Sheave
- 2 、 Drive Belt
- 3、 Adjusting Washer
- 4、 Spring, Drive Pulley
- 5、 Drive Pulley Sliding Sheave
- 6、 Centrifugal weight
- 7、 Cam
- 8、 Nut
- 9 、 Washer

- 10 、 Driven Pulley Fixed Sheave
- 11 、 Driven Pulley Sliding Sheave
- 12、 Spring holder
- 13 、 Locating pin
- 14 、 Circlip
- 15 、 Spring
- 16 、 Washer

Drive Pulley

- Loosen Drive Pulley Nut, remove, CVT, Drive pulley fixed And Sliding Sheave
- Remove the Cam (1) and Centrifugal Weight (2)



Centrifugal Weight Inspection

- Inspect Centrifugal Weight and Sliding surface for wear or damage, Replace a set of centrifugal weight if abnormal

Note: Centrifugal Weight should be replaced by complete set.

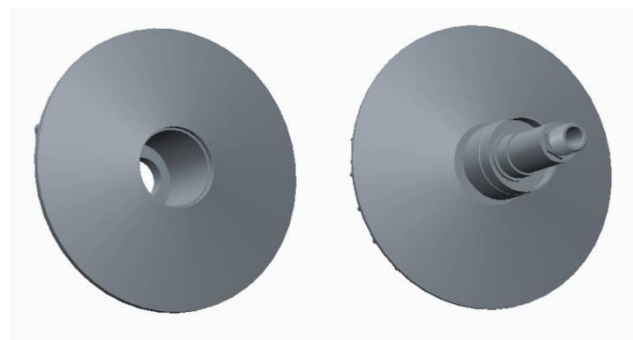


Drive Pulley Fixed and Sliding Sheave Inspection

- Inspect the abnormal conditions of drive surface for multistep wear or other damage. Replace it if abnormal
- Inspect one-way clutch if equipped. Replace it if abnormal

Drive Pulley Installation

To install it as contrary process of removal

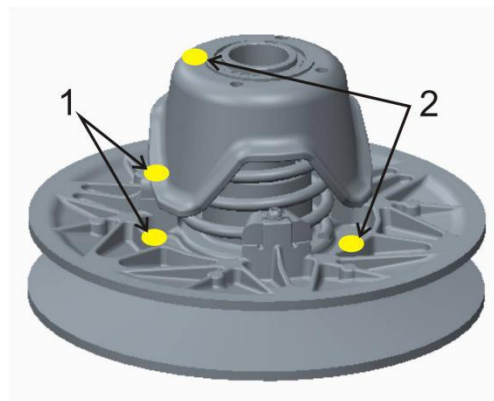


Note: The nut washer should be stucked in the hexagon shaft to stand-still locking.

Driven Pulley

Disassembly

NOTE: Before disassembly, mark on the spring installation holes and cam feet to sliders positions.

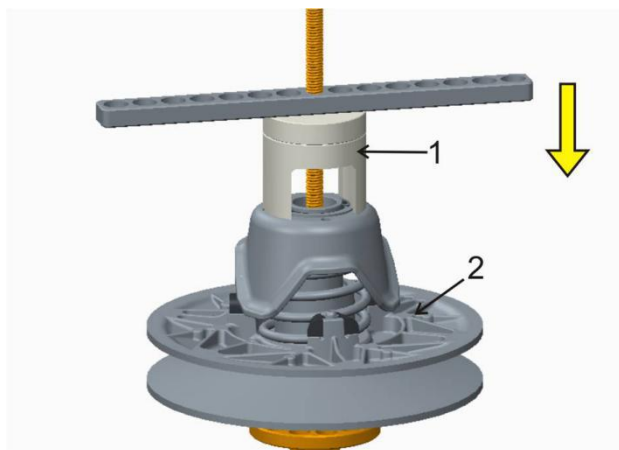


1. Cam and slider marks

2. Spring Installation Holes Marks

● As the illustration shows, place driven pulley on the special tool base.

Special tool: Driven pulley spring compressor
(1BA-17730-00 FZ/1)

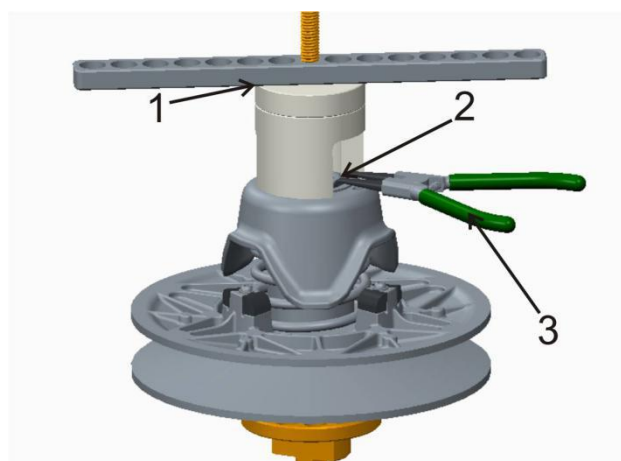


1. Driven Pulley Spring Compressor

2. Driven Pulley

● Turn special tool handle to compress the cam and spring. Using a circlip remover(a plier),remove circlip.

Note: Use special tool to remove circlip in order to avoid any wounding if spring seat flying up.

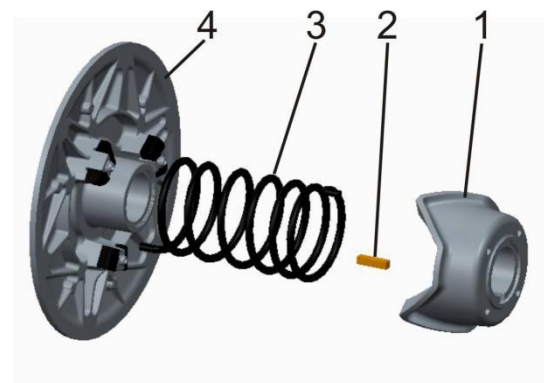
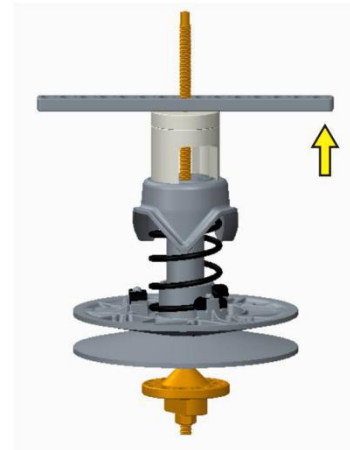


1. Driven Pulley Spring Compressor

2. Circlip

3. Circlip Remover

- Slowly loosen tool handle to release the spring tension and remove the special tool;
- Remove cam;
- Remove guide pin;
- Remove spring and sliding sheave of driven pulley.



1. Cam
2. Guide Pin
3. Spring
4. Sliding Sheave of Driven Pulley

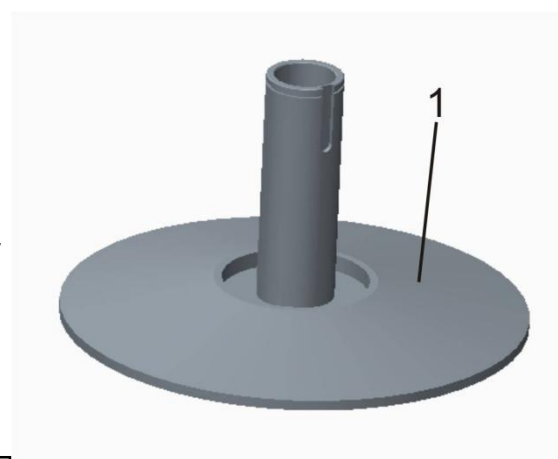
Driven Pulley Inspection

Driven Pulley Fixed Sheave Inspection

- Check driven pulley faces for any abnormal conditions, such as heavy wear or visible damage. Replace if necessary.

NOTE: Clean fixed sheave of driven pulley before inspection.

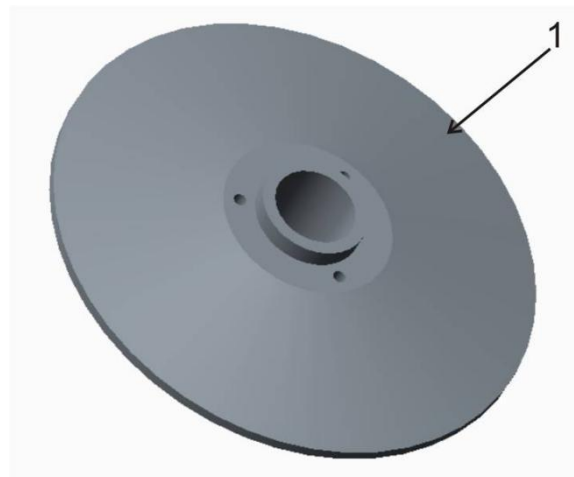
NOTE: Driven pulley assembly is precisely matched. If only fixed sheave or sliding sheave is replaced, the vibration may increase. It's recommended to replace both when necessary.



1. Drive Face of Fixed Sheave

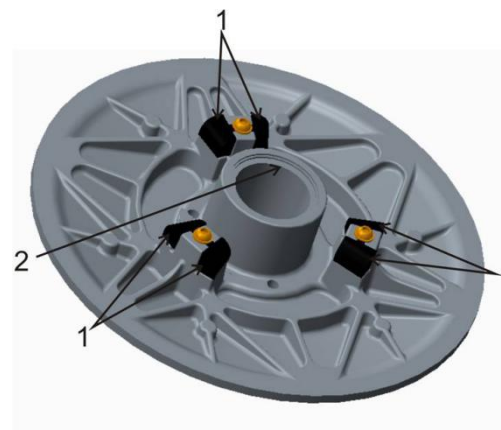
Driven Pulley Sliding Sheave Inspection

● Inspect the drive face of sliding sheave for heavy wear and damage. Replace it if necessary.



1. Drive Face of Sliding Sheave

● Inspect the 3 sliders on driven pulley for wear and other damages. If the worn thickness is over the measurement illustrated in the following figure, replace all 4 sliders at the same time.

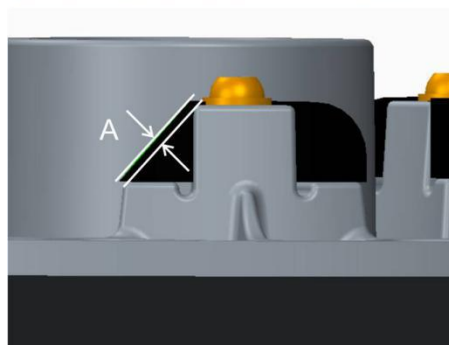
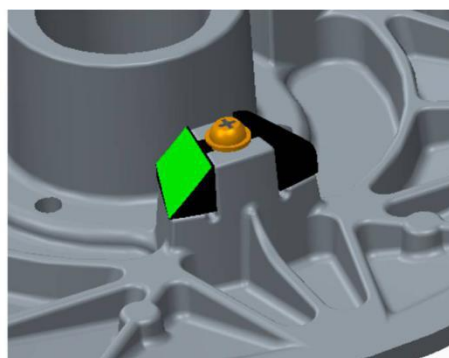


1. Slider

2. Sliding Sleeve

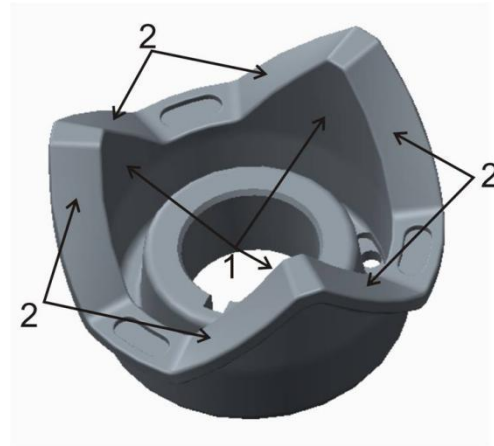
NOTE: Clean the sliding sheave before inspection

$A \geq 1.5\text{mm}$



Cam Inspection

- Check spring cam sliding face for wear and other damages. Replace if necessary.

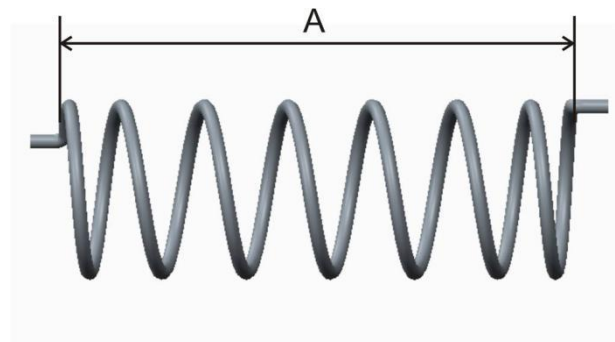


1. Cam
2. Sliding Face

Driven Pulley Spring Inspection

- Check spring free length. If it is shorter than limit length, replace it.

Spring free limit length A: 214.0mm.



1. Spring

Driven Pulley Assembly

Reverse the disassembly procedure for driven pulley assembly.

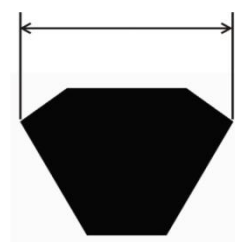
NOTE: Special tool is also required in driven pulley assembly.

Drive Belt

- To inspect Belt for greasy dirt
 - To inspect Belt for cracks and damage
 - To measure width of belt by vernier caliper
- Replace a new one if any damage or out of Service limit

Drive Belt service limit: 33.5mm

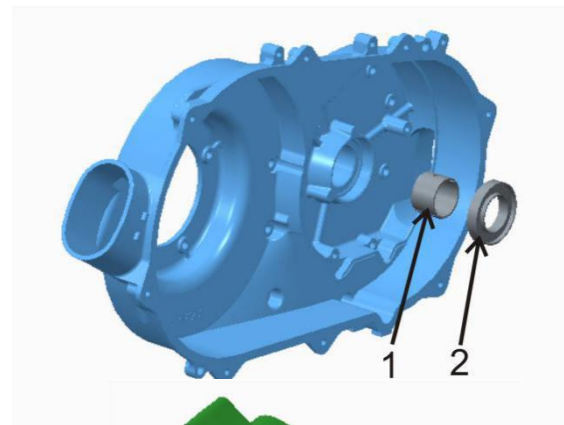
Tools: Vernier Caliper



Caution: Clean the Drive belt if any greasy dirt or lubricating oil.

CVT Case Inspection

- Inspect Bearing Sleeve (1) and Oil seal (2). Replace it if necessary



Lower Timing Chain Guide Inspection

- To inspect the lower timing chain guide for damage or ageing. Replace it if necessary



Tensioner Plate Inspection

- To inspect tensioner plate for damage or ageing. Replace it if necessary.



Timing Chain Inspection

- To inspect the radial clearance of timing Chain.
- To inspect timing chain for excessive wear. Replace timing chain and timing chain sprocket if excessive wear or damage

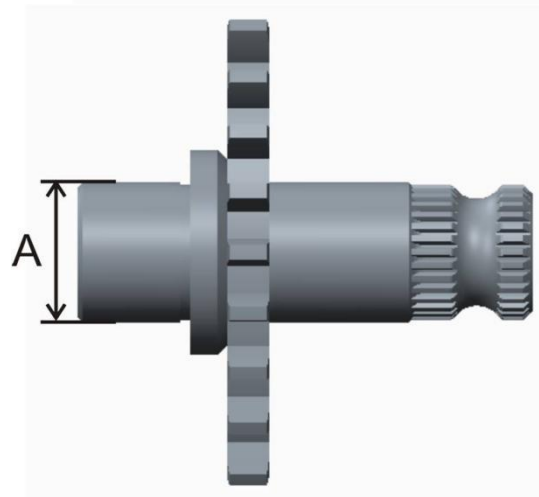


Gearshift Sector Gear Inspection

Gearshift, Drive Sector Gear

- To inspect drive sector gear for cracks or other defects. Replace it if necessary.
- To measure Gear shaft diameter (A) for cracks or other defects. Replace it if out of service limit.

Service limit: 14.976mm~14.994mm



Gearshift driven sector gear inspection

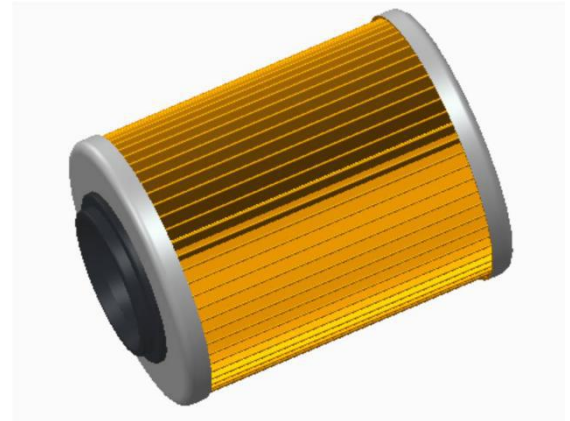
- To inspect driven sector gear for damage or abnormal Replace it if necessary.

Oil filter

- To replace a new oil filter

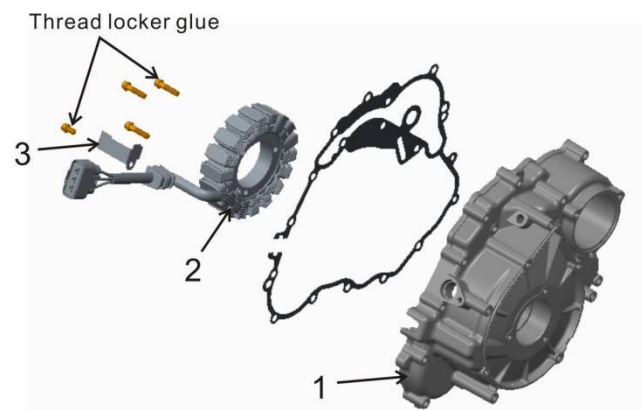
Note: Replace a new oil filter after Disassemble each time.

- Periodic replacement oil filter base on requirements of Maintenance period.

**Crankcase (LH)Cover**

- To inspect magneto coil(2) for damage or Short circuit, Replace it if abnormal.
- Smear Thread-locking Adhesives on bolts and fasten base on standard torque while assembling.

Torque:10N. m

**Magneto rotor**

- Remove the set bolt of overrun clutch by wrench



- To inspect the overrun clutch roller and Cam for wear or damage. Replace it if defected.

- To install the overrun clutch as right direction.

Note: To confirm the direction of “A” is right while Assemble the overrun clutch into magneto rotor.

- Smear lubricating oil on the overrun clutch

- Tighten the bolt after smear thread-locking adhesives by Wrench as standard torque.

Bolt Torque: 30N • m

Accessory: Thread-locking adhesives

- Install driven gear

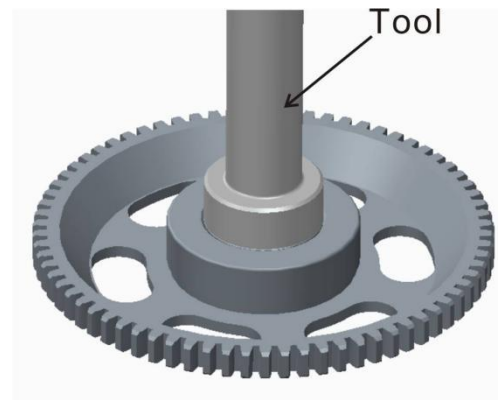
- Driven gear will be locked if turn it as the direction of arrow by “B” indicated. Otherwise, it is smooth running.

- Turning the driven gear bearing. Replace it if not well running.

- Remove driven gear bearing by special tools

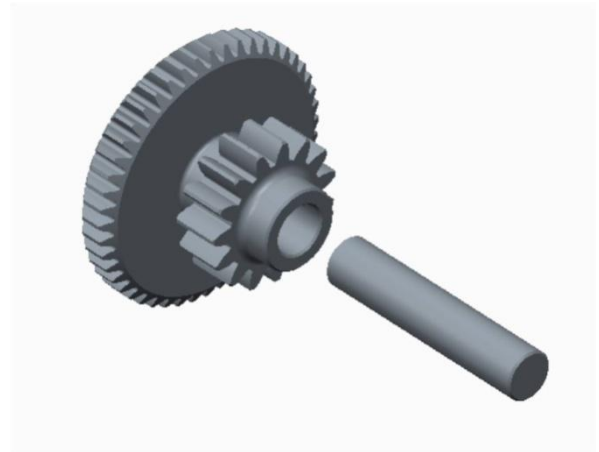
- Install the driven gear bearing by special tools

Tool: Bearing installation &removal tool



Dual Gear

● To inspect the dual gear surface for scratch or bump against. Replace it if abnormal.

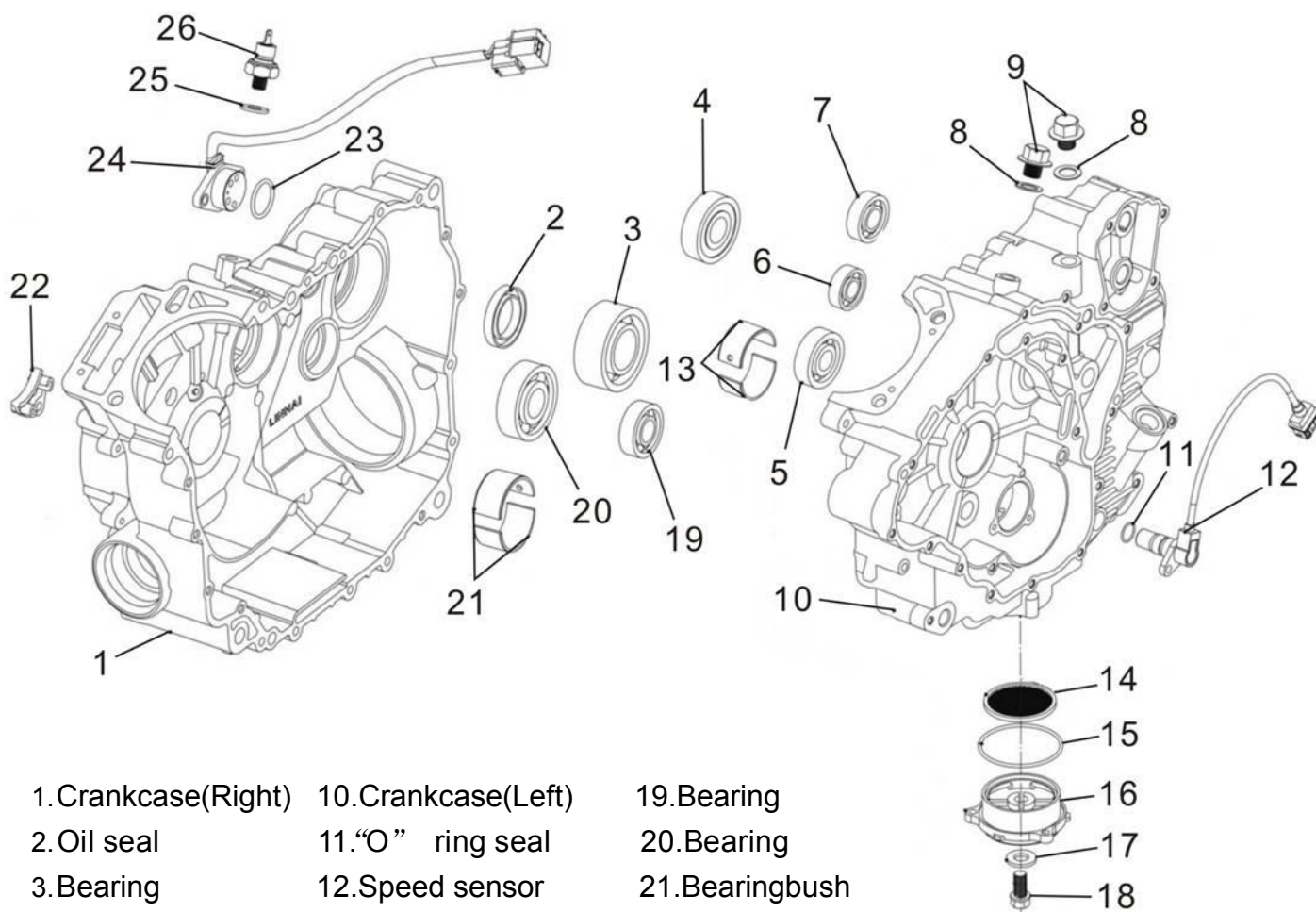
**Oil Pump Transmission Gear**

● To inspect the gear surface for scratch, bump against or plastic ageing. Replace it if abnormal

**Oil Pump Dual Gear**

● To inspect the gear surface for scratch, bump against or plastic ageing. Replace it if abnormal





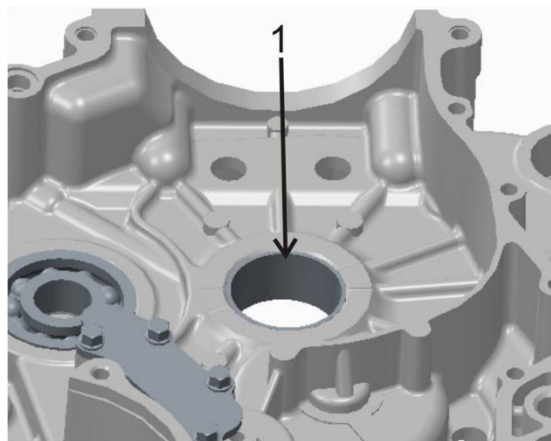
- | | | |
|--------------------|------------------------|-----------------------------|
| 1.Crankcase(Right) | 10.Crankcase(Left) | 19.Bearing |
| 2.Oil seal | 11.“O” ring seal | 20.Bearing |
| 3.Bearing | 12.Speed sensor | 21.Bearingbush |
| 4.Bearing | 13.Bearing bush | |
| 5.Bearing | 14.Oilstrainer | 22.Lower timing chain guide |
| 6. Bearing | 15.“O”ring seal | 23.“O” ring seal |
| 7. Bearing | 16. Oil strainer cover | 24.Gearshift sensor |
| 8.Copper spacer | 17.Copper spacer | 25.Spacer |
| 9. Bolt | 18.DrainBolt | 26.Oil pressure sensor |

Crankcase inspection

- Check crankcase halves for cracks or other damage. Replace if necessary.
- Measure plain bearing inside diameter and compare to magneto and CVT side journal diameter of crankshaft (refer to CRANKSHAFT). Replace if the measurements are out of specification.

Plain bearing inside diameter

Service limit	42.100mm
---------------	----------



1、 Plain bearing bore diameter

Plain Bearing Replacement

Plain Bearing Removal

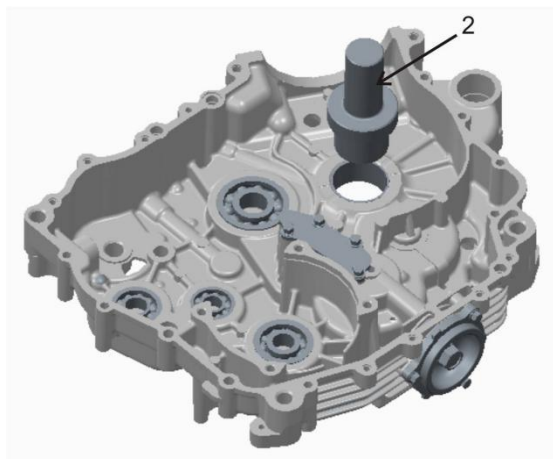
Caution: Always support crankcase halves properly when ball bearings or plain bearings are removed .Damages to crankcase halves may occur if this procedure is not performed correctly.

NOTE: Always use a press for removal of plain bearing. Remove plain bearing with the proper plain bearing remove/installer.

● Carefully push the plain bearings out from the crankcase half inside towards the outside.

NOTE: Place the proper crankcase support sleeve under crankcase halves before removing plain bearing

NOTE: During disassembly ,do not damage the sealing surface of the crankcase halves.



2. Plain bearing remover/installer

Plain Bearing Installation

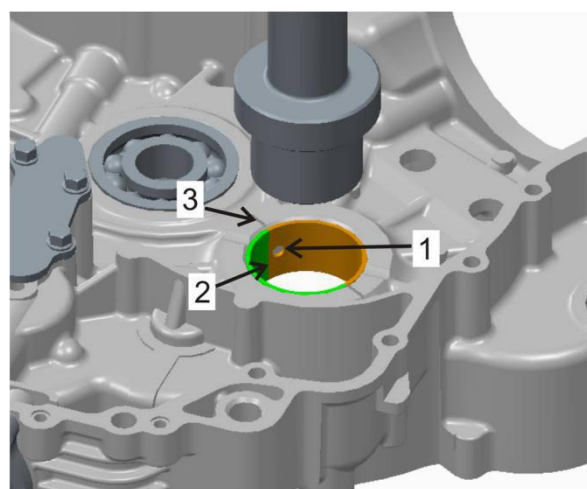
NOTE: Crankcase and plain bearing must be installed as a pair as shown in the following table:

Crankcase	Plain Bearing
A	Red
B	Blue

CAUTION: Unless otherwise instructed, never use hammer to install ball bearings or plain

Install plain bearings with the proper plain bearing remover/installer in a cool crankcase. Do not lubricate plain bearing and /or crankcase for installation.

NOTE: Place proper crankcase support sleeve under the crankcase before installing the plain bearings (refer to bearing



- Carefully press-in the plain bearings in the same direction as during installation, from then crankcase inside towards the outside.

During installation, make sure not to damage the 3 sealing surface of the crankcase.

CAUTION: Mark position of oil bore on crankcase and on plain bearing remover/installer .Align mark on plain bearing remover/installer with mark on crankcase. Wrong oil bore will stop supply to plain bearing and will cause engine damaged.

Ball Bearing and oil sealing Inspection

- To inspect the ball bearing for oil clearance, sound or turning stationarity after Cleaned and lubricated the ball bearing. Replace it if abnormal by special tools.

- To inspect all oil sealing for wear, cracks. Replace it if abnormal by special tool

- To remove and inspect the gearshift sensor (24) for break over performance by multi meter. Replace it if abnormal

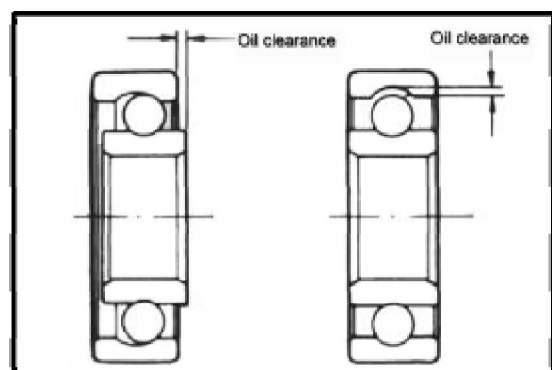
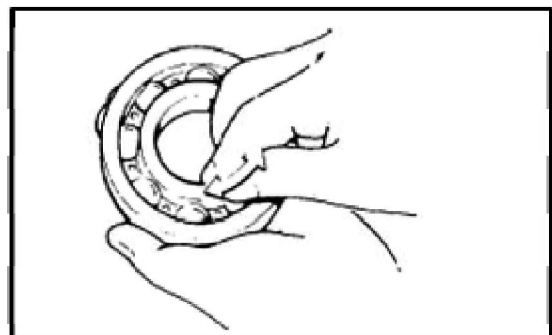
- To remove and clean the drain bolt(18) and Oil strainer(14)

- To install bearing, oil seal by special tools. Bearing with lubricating oil, Oil seal lips with lubricating grease

Note: To inspect running performance after bearing has been installed

- Install new “ O ” ring “O” ring with lubricating grease

- Install gearshift sensor(24)and speed sensor(12).



- Install spacer(17) and drain bolt(18), tighten it as standard torque.

Torque(Drain Bolt):30N • m

Tool: Bearing remover and installer

Multimeter

Drive Bevel Gear

- To protect the drive bevel gear shaft by one clean duster cloth and clamp by vise
- Loosen the Drive Bevel Gear Nut (3),remove Drive Bevel Gear(4) and Adjusting spacer(5).

- To inspect Drive Bevel Gear(4)and Output Driven Gear (2) for rust, cracks, wear. Replace it if necessary.

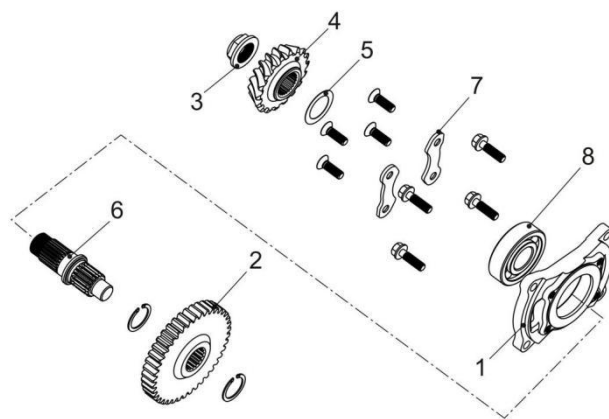
- To inspect Bearing(8)for turning. Replace it if abnormal.

- To adjust Adjusting Spacer(5) if replace any one of Crankcase(Right),Drive Bevel Gear (4),Drive Bevel Gear cover(1). Detail to check Bevel Gear adjusting method

- To tighten Nut(3)by standard torque and with lubricating oil on bearing (8) before install.

Service Limit(Drive Bevel Gear Tight Nut): 140~150N.m

Note: Drive Bevel Gear (4) and Driven Bevel Gear should be together replaced.



- 1- Drive Bevel Gear Cover
- 2- Output Driven Gear Bear
- 3- Drive Bevel Gear Nut
- 4- Drive Bevel Gear
- 5- Adjusting spacer
- 6- Drive Bevel Gear Shaft
- 7- Bearing Plate
- 8- Bearing

Front Output Shaft

● To inspect Bearing (7) for wear or well running. To inspect Oil seal (5) for damage. Replace if abnormal.

● To inspect Bearing(7) for lubrication oil and Oil seal (5)lips for grease before install output shaft

● To tighten Bearing Stop Nut(6) with thread glue as standard torque

Bearing Stop Nut Torque:78~82N·m

Front Output Shaft Nut Torque:95~100N·m

Driven Bevel Gear

● To remove Nut(4),Gasket (19),Coupler (16) and Oil seal(17)

● To proper protect the thread of Driven Bevel gear by protector, fixed bevel gear cover(15),Push out the Driven bevel gear.

● Put one clean duster cloth ①, under the bevel gear cover, to remove the Bearing stop nut(11) and Bearing By special wrench ②

● To inspect Driven Bevel Gear(9)for crack, wear. Replace it if necessary.

● To inspect bearing(10)and (12) for well running. Replace it If not

● To install by use new oil seal(17)and “O” ring seal(13)

● To adjust Adjusting Spacer(14) if replace any one of Crankcase(Right),Driven Bevel Gear (9),Driven Bevel Gear cover(15). Detail to check Bevel Gear adjusting method

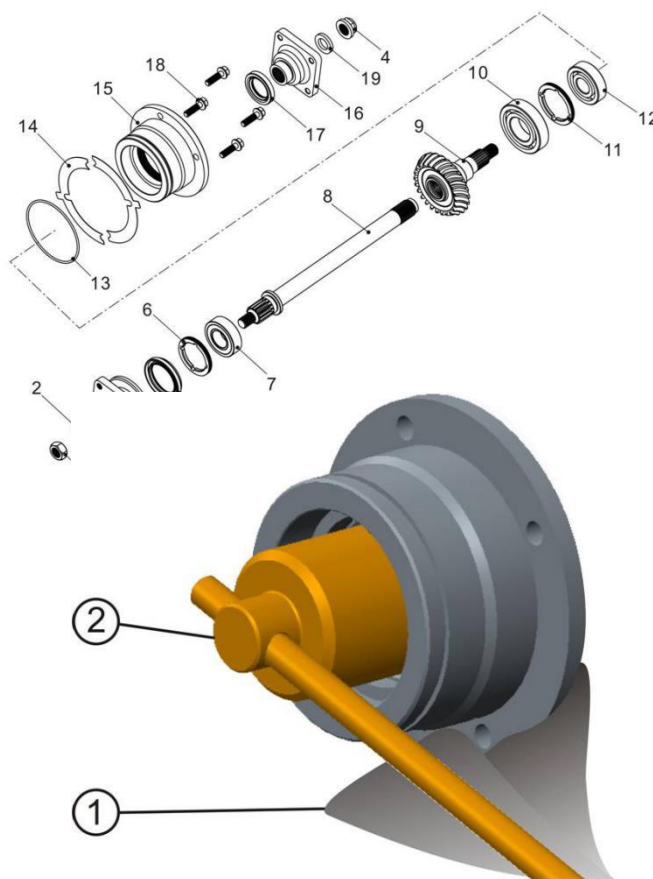
● To tighten stop Nut(11) with thread glue by standard torque and with lubricating oil on Bearing (10) ,Bearing (12),Oil seal(17) and “O” ring seal before install.

BearingStopNutTorque: 100~120N.m

Driven Bevel Gear Nut Torque: 140~160N. m

Bevel Gear Spacer Adjusting Method

● To adjust spacer ① and ② if replace any one of Crankcase, Bevel gear or Bevel Gear Cover.



Bevel Gear Adjustment

Caution: Keep the Gear backlash and contact surface within the proper scope in order to best match the bevel gear mesh

Measure Bevel Gear Backlash

● To install Drive and Driven Bevel Gear on the Crankcase.

To tighten the Drive Bevel Gear by straight Screwdriver ③ with duster cloth ② into the Speed sensor hole ①

● To install special tool ③ and dial indicator ④

Tool: Bevel Gear backlash measuring tool
Dial indicator

a=46mm

● To measure backlash by running the Driven Bevel Gear shaft.

Note: Four points to measure on the mutual vertical direction.

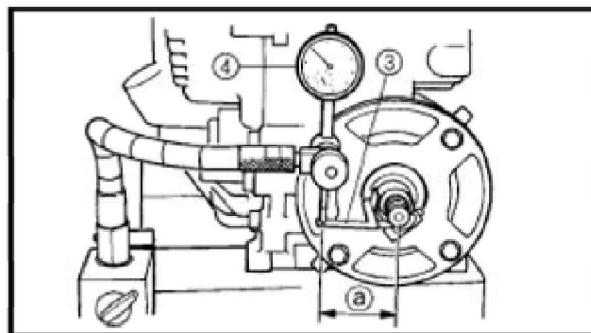
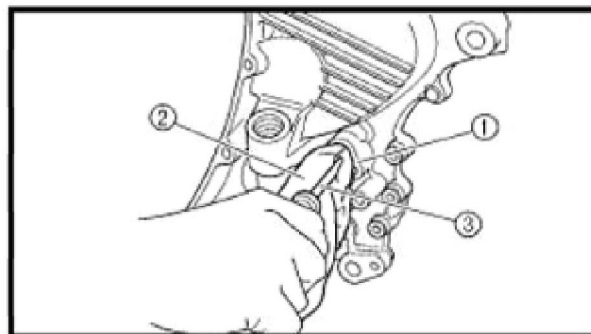
● To adjust spacer thickness if out of service limit. Remeasure the backlash of Bevel Gear till to accord with service limit.

Bevel Gear backlash service limit:

0.1mm~0.2mm

Adjustment Method:

Measured Backlash	Washer Thickness Adjustment
<0.1mm	Reduce washer thickness
0.1~0.2m	Correct
>0.2mm	Increase washer thickness



Gear Surface Contact Inspection

To inspect Gear surface contact after backlash adjusted. Detail as follows:

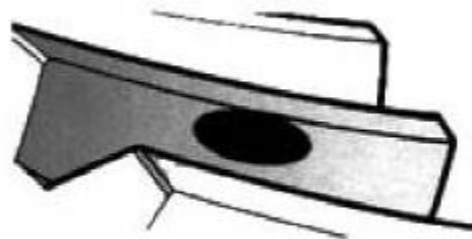
- Remove Drive and Driven Bevel Gear Shaft from Crankcase.
- Clean splodge and grease for each gears of Drive and Driven Bevel Gear.
- With dyestuff for each gears surface of Driven Bevel gear
- To install Drive and Driven Bevel Gear
- Running the Driven Bevel Gear from front and back direction.
- To inspect dyestuff of Bevel Gears after removed Drive and Driven Bevel Gear.

① Top contacted on the Gear Surface	Improper
② Middle contacted on the Gear Surface	Proper
③ Bottom contacted on the Gear Surface	Improper

- If it is proper gear contact surface ②, move to next Step.
- If it is improper gear contact surface ① and ③, adjust spacer thickness of Bevel Gear and recheck till to accord with standard requirement.

Adjusting Method	
Gear Contact Surface	Adjusting spacer thickness
Gear Contact Surface ①	Reduce spacer thickness
Gear Contact Surface ③	Increase spacer thickness

①



②



③



Drive Shaft Inspection

- To inspect gear surface for hard spot, damage, excessive wear. Replace it if necessary.

Drive layshaft Combination

- To remove the layshaft as picture



- To inspect gear surface for hard spot, damage, excessive wear.

To inspect bearing and bush for damage or wear. Replace it if necessary.

Note: Rear Retainer couldn't reuse after removed. Must to be replaced by new one

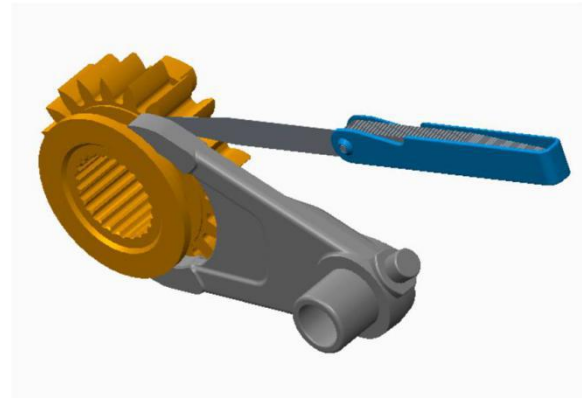
**Shift Drum, Shifting Fork**

- To inspect shifting fork clearance as picture indication: Check fit clearance by feeler gauge. Replace shifting fork, or gears, or together replacement if clearance out of service limit

Shifting fork standard gap:

0.10mm~0.35mm

Service limit:0.45mm



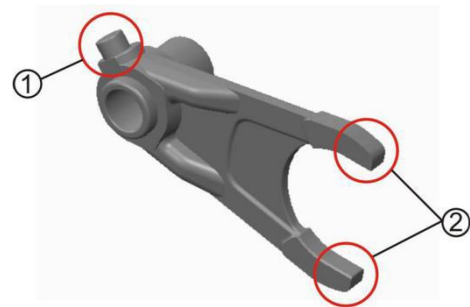
- To measure the width of shifting fork slot by vernier caliper
Standard values: 6.05mm~6.15mm



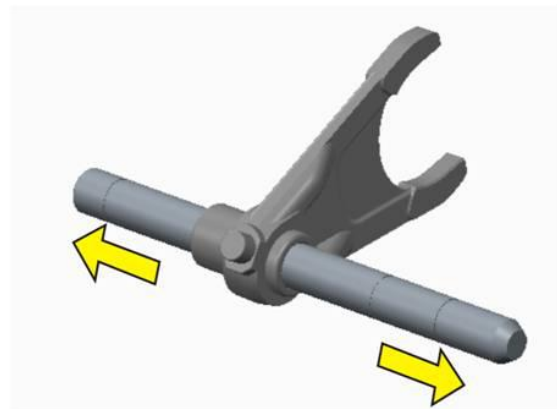
- To measure the thickness of shifting fork by vernier caliper
Standard values: 5.80mm~5.90mm



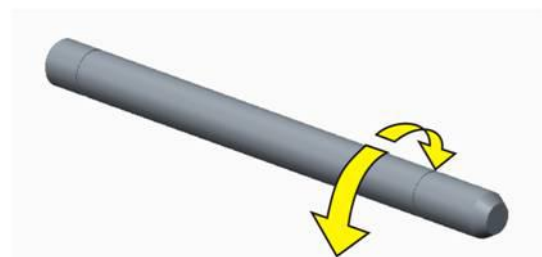
- To inspect shifting fork ① and ② for damage, curve. Replace it if with defects.



- Install shift fork on the shift fork rod to move it by left and right. If not smooth. Replace it.



- To roll the shift fork rod on the slab. Replace it if curve



Caution: Don't try to straightening the Shift fork rod.

● To inspect the shift fork spring for broken, damage. Replace it if any defects.

● To inspect Shift Drum Cam for crack, wear. Replace it if any defects.

Installation

Reverse process for installation and removal. Attention as follows:

Note:

With right installation process to install the new retainer
To install it base on picture indication
Gears or shaft should be installed with engine lubrication oil

Caution:

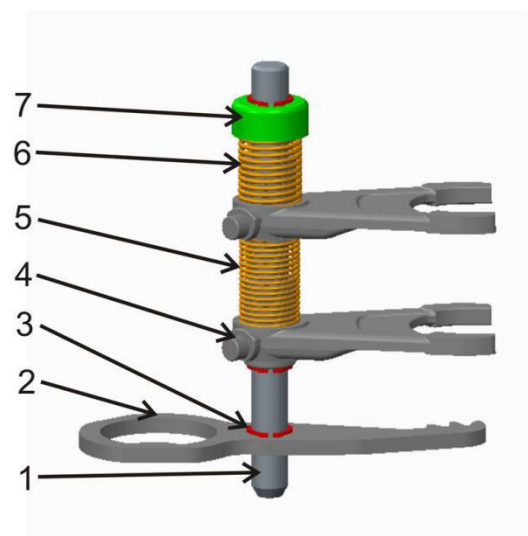
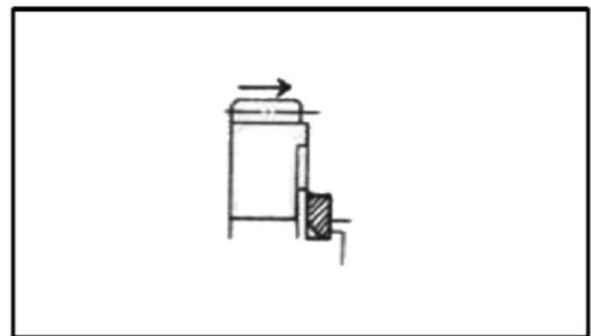
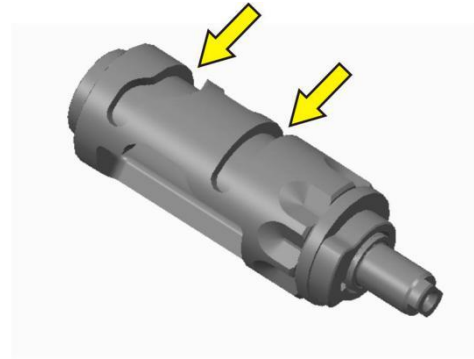
Retainer ring couldn't reuse if removed it from shaft Install a new one.

Don't too wide open when install retainer ring.

To confirm the retainer ring has been fully installed after assembled.

● Don't reverse install the shift fork and spring when assemble the shift fork.

1. Shift fork, shaft.
2. Parking Arm;
3. Retainer ring
4. shift fork
5. Thin shift fork spring
- 6 Thick shift fork spring
- 7.Springseat



Crankshaft Inspection

NOTE: Check each bearing journal of crank-shaft for scoring, scuffing, cracks and other signs of wear.

NOTE: Replace the crankshaft if the gears are worn or otherwise damaged.

CAUTION: Components with less than the service limit always have to be replaced. Otherwise severe damage may be caused to the engine.



Connecting Rod Small End Inner Diameter

● To measure connecting rod small end inner Diameter by bore dial indicator. Replace it if out of service limit

Service limit: 22.060mm

Tool: Bore dial indicator(18mm~35mm)

Crankshaft Axial Play

NOTE: Axial play of crankshaft needs to be measured before splitting the crankcase.

● Use dial gauge to measure crankshaft axial play at MAG side.

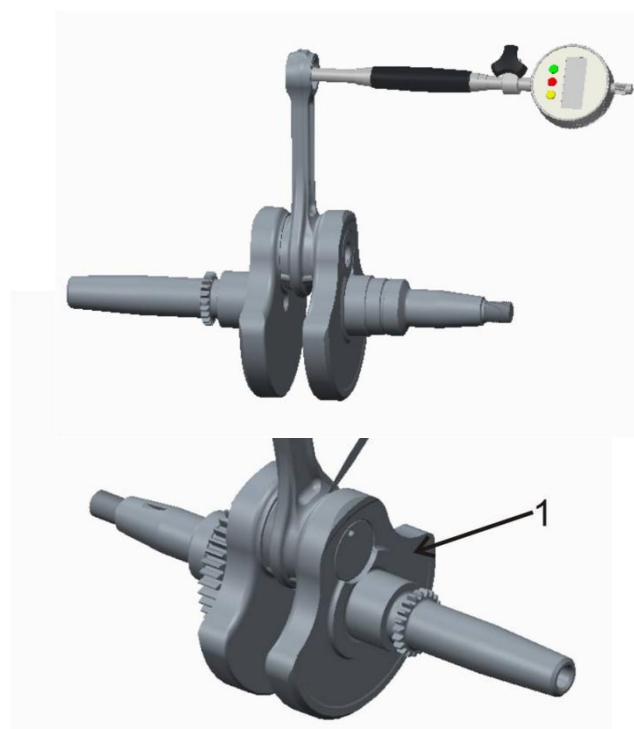
Crankshaft Axial Play	
New	0.050mm~0.450mm
Service Limit	0.6mm

If play is out of specification, replace crankcase and/ or crankshaft.

Connecting Rod Big End Axial Play

● Using a feeler gauge, measure the distance between butting face of connecting rods and crankshaft counterweight.

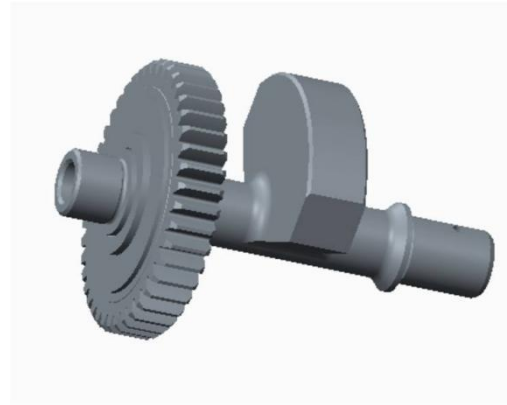
Connecting Rod Big End Axial Play	
New	0.130mm~0.350mm
Service Limit	0.7mm



- 1.Crank shaft
- 2.Connecting Rod
- 3.Gauge

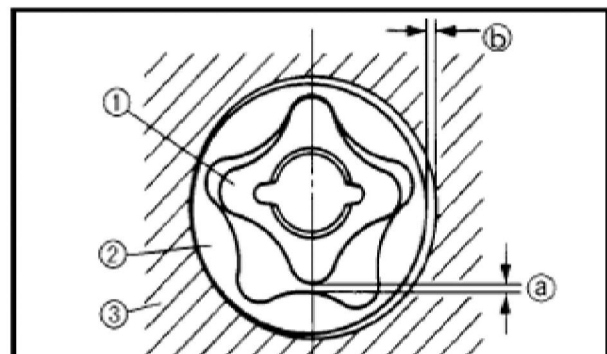
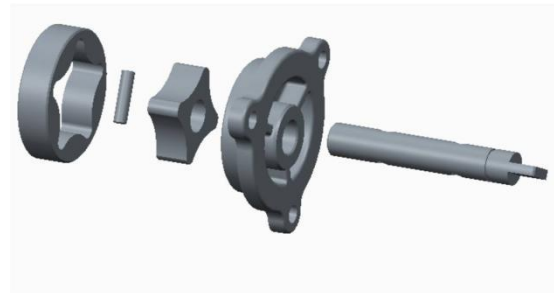
Balance Shaft

- To inspect balance shaft and balance shaft gear Replace it if damage.
- To inspect balance shaft gears for crack, scratch or others. Replace it if damage



Oil Pump Inspection

- To inspect all parts of Oil Pump. Replace it if any defects.
- To measure bottom clearance (a) (clearance between inner and outer rotor) and backlash(b) (clearance between outer rotor and crankcase), Replace oil pump if out of service limit



Bottom Clearance standard value:
0.1mm ~ 0.15mm

Limit value: 0.2mm

Backlash Standard value:
0.08mm ~ 0.15mm

Limit value: 0.2mm

3.3.4 Engine Installation

The installation essentially the reverse of the removal procedure, special attention as follows:

Note: Clean all parts before install.
Without any cracks for all parts before install. All motion parts should with lubrication oil before install Oil seal lips and O ring seal with lubrication grease

Caution: Without any grease in belt, drive and driven pulley

Middle parts of Engine Installation

Crankcase (right), Front output shaft, Driven Bevel Gear

● To install Crankcase(right), Front output shaft, Driven Bevel Gear and fasten bolt as standard torque, Detail as picture indication.

Front output shaft nut(1)

standard torque: 95~100N. m

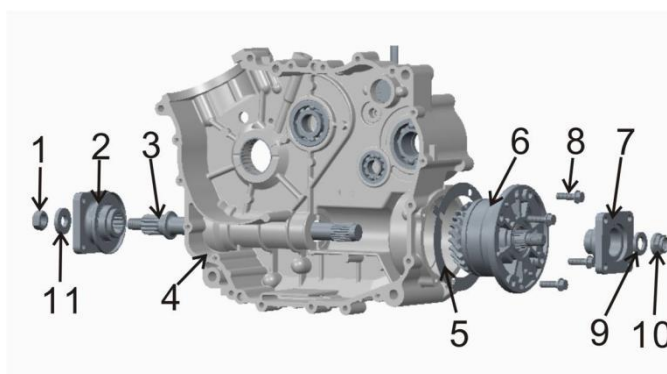
Driven Bevel Gear Seat erection bolt (8) standard torque: 40N. m

Shifting Drum, Shifting fork, Drive layshaft

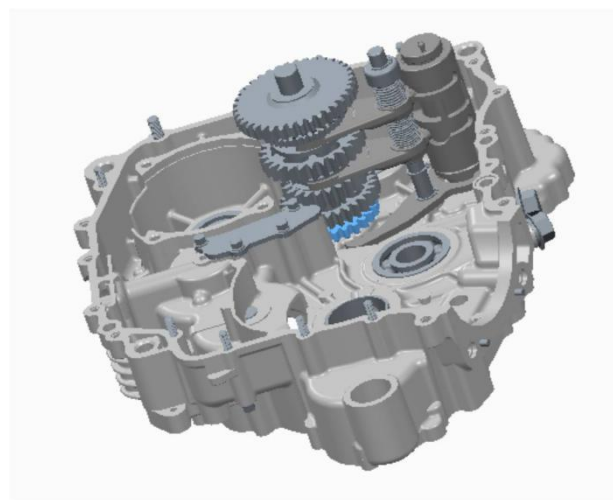
● Insert the shifting fork into the sliding sleeve, then install the drive layshaft, shifting fork, shifting drum into crankcase(left)

Main Shaft

● Install the Mail Shaft



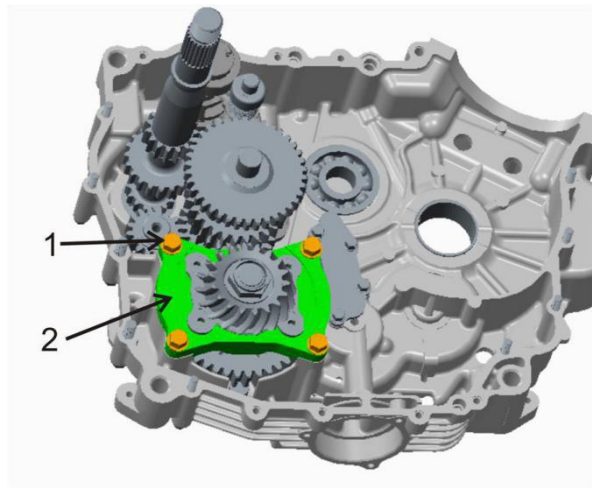
- | | |
|-----------------------|----------------------|
| 1. Nut | 5. Adjusting Spacer |
| 2. Land | 6. Driven Bevel Gear |
| 3. front output shaft | 7. Coupler |
| 4. Crankcase(right) | 8. Bolt |
| 9. Washer | 10. Nut |
| 11. Washer | |



Drive Bevel Gear

- Install Drive Bevel (2) and tighten 4 bolts (1)

Erection Bolt torque (M8X 28):40N. m



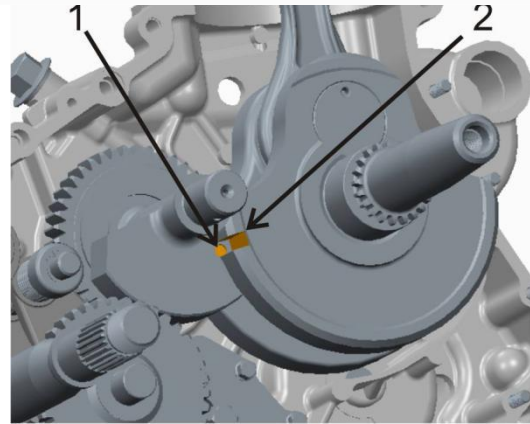
Balance Shaft, Crankshaft, Connection rod

Install balance shaft

- Turn the balance shaft into proper position(as picture indication), install into crankshaft

- Keep a strip of straight line for marks on crankshaft, oil bore of balance shaft neck

Running the crankshaft and balance shaft to inspect whether match for balance shaft bore and gap of crankshaft. If not, reinstall



1. Balance shaft bore 2.Crankshaftgap

Crankcase (right)

- Wipe Sealant on the crankcase(left) junction surface

Note: Sealant should be uniformity and continuous threadiness

- Install three locating pin and “O” ring seal as picture indicated

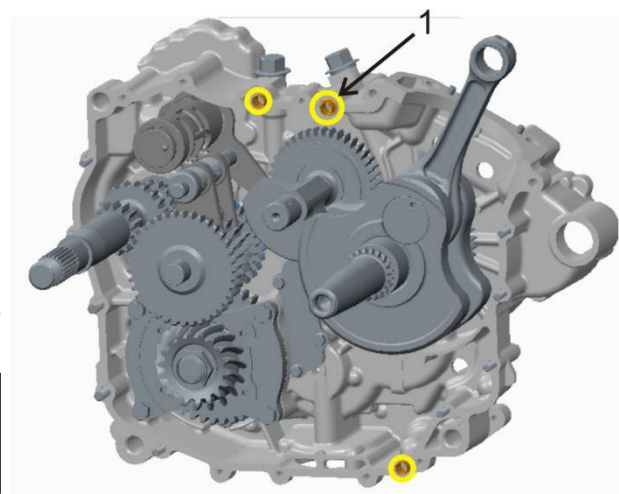
- Mould assembling, light touch to well done by rubber hammer

- Tighten the bolt as standard torque

Torque:M6: 10N • m

M8:25N • m

Note: opposite angles cross and grading to tighten the bolt.



Gears Set Bolt

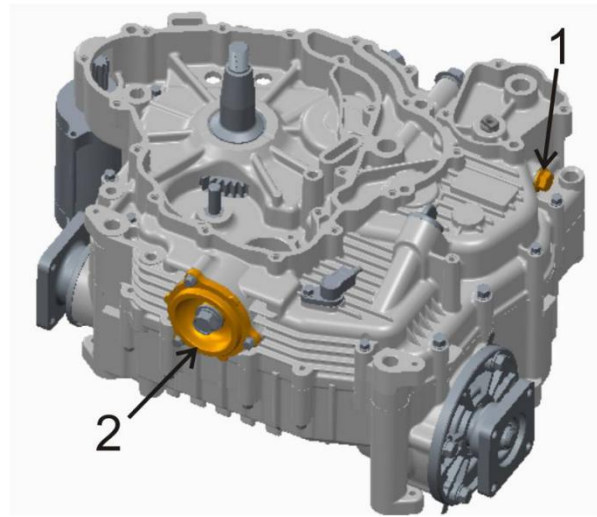
- Put in steel ball, install the set bolt(1), tighten It as standard torque

Standard torque: 40N • m

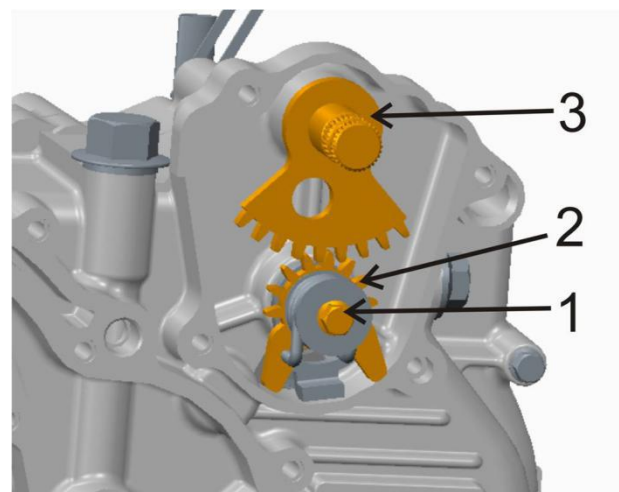
Primary Strainer

- Install primary strainer and cover(2)
- Tighten bolt as standard torque

Standard torque: 8N • m

**Shift Sector Gear**

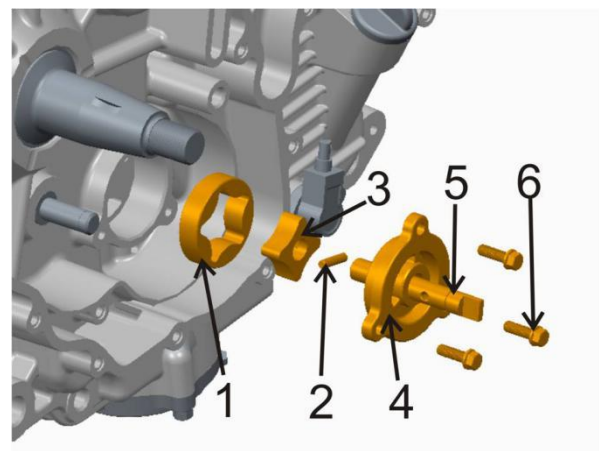
- Install shift sector gear, tighten bolt
- Install locating pin and gasket
- Close the shift cover. Tighten bolt
- To inspect gears for smooth changing or others. If not, recheck all parts and install again.



- 1 .Bolt
- 2 .Shifting Drive Sector Gear
- 3 .Shifting Driven Sector Gear

**Engine (left parts) Installation
Oil Pump**

- Install oil pump as right picture indication
 - Tighten bolt
 - Inspect oil pump for smooth running that hold by pliers. Replace and reinstall it if not
- Standard Torque : 7N • m



1. Outer rotor, Oil pump
2. Roller pin
3. Inner rotor, Oil pump
4. Oil Pump
5. Oil pump shaft
6. Bolt

Oil Pump driving gear, Oil pump dual gear

- Install dual gear and driving gear.
- Install circlip by circlip plier

Note: Don't open when install, and the new circlip have to be used.

- Install oil baffle plate, tighten bolt as standard torque.

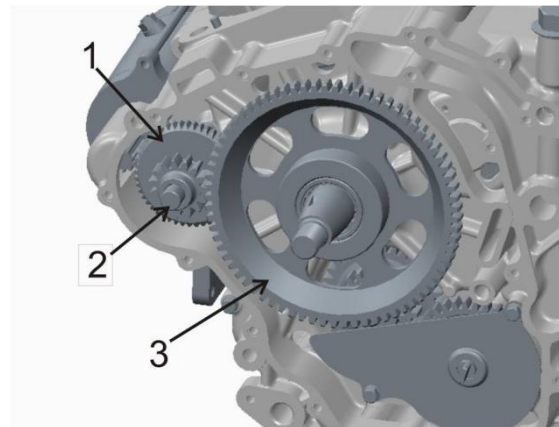
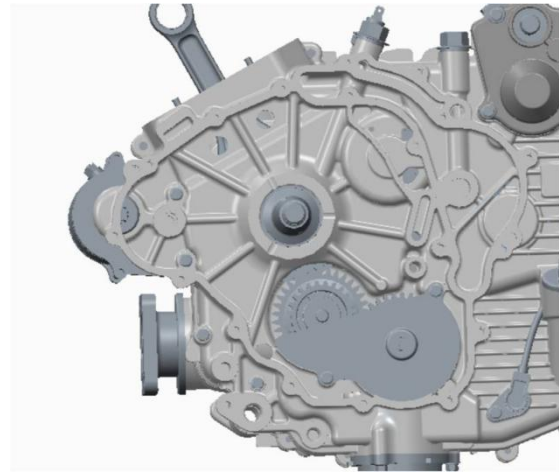
Torque: 8N • m

Dual gear

- Install dual gear(1) and dual gear shaft (2)

Driven gear

- Install driven gear(3)

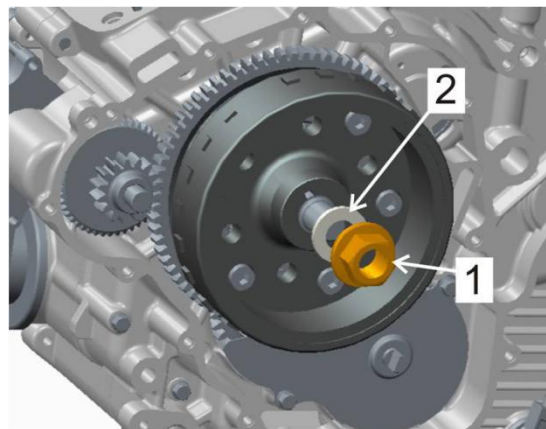


Magnetor Rotor Combination

- Install woodruff key into crankshaft key groove
- Install Magnetor Rotor Combination
- Install Nut (1) and Washer (2)

Standard Torque : 160~170N • m

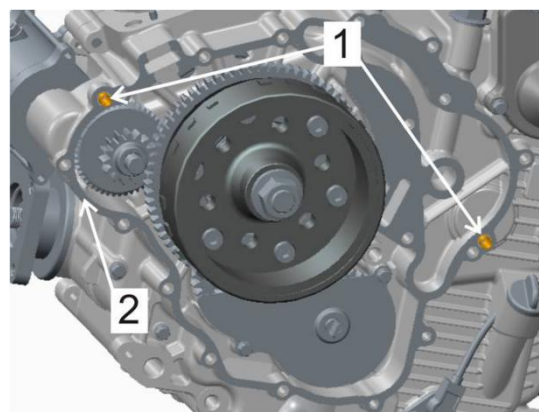
Caution: Clean out grease on the surface of Magnetor Rotor and Crankshaft Conical surface by noncombustible materials and keep drying.



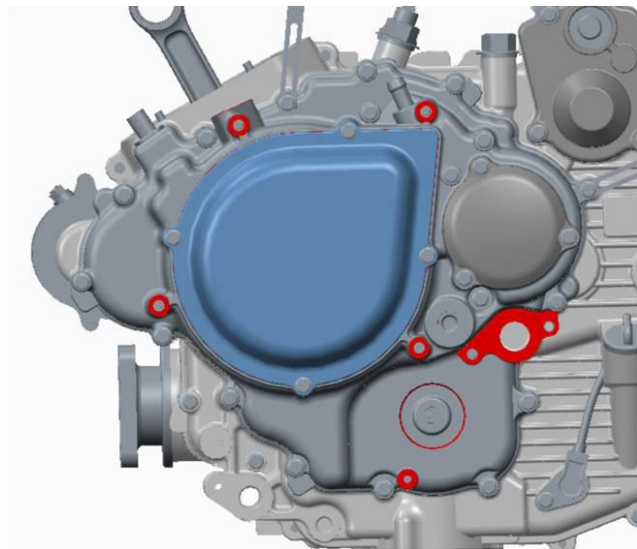
Left Crankcase

- Install Locating Pin(1) and sealing gasket(2)

Note: Use new sealing gasket



- Install left crankcase
- Install left crankcase fastening bolt



Shaft Sleeve, Blanking Cap

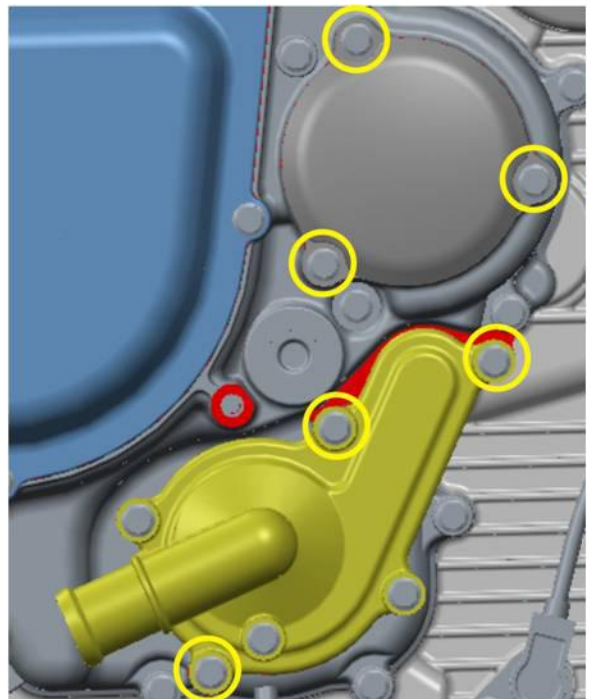
- Install shaft sleeve
 - Install blanking cap and tighten bolt.
- Installation keeps the Reverse procedure with removal

Oil filter

- Install new oil filter and O ring seal, tighten bolt.

Water Pump

- Install water pump and tighten bolt.



Starting motor

- Install starting motor, tighten fixed bolt

Engine right side**Upper guide chain**

- Install upper guide chain

NOTE: Hook up timing chain to prevent it from falling into crankcase

Lower timing chain guide

Install Lower timing chain guide

Tensioner plate

- Install tensioner plate, tighten bolt

CVT case

- Install dowel pin 6, gasket 3 and gasket 9, install CVT case to the right crankcase.

- Install bolt 2, bolt 7 and bolt 10

- Install guide 13 and screw 4

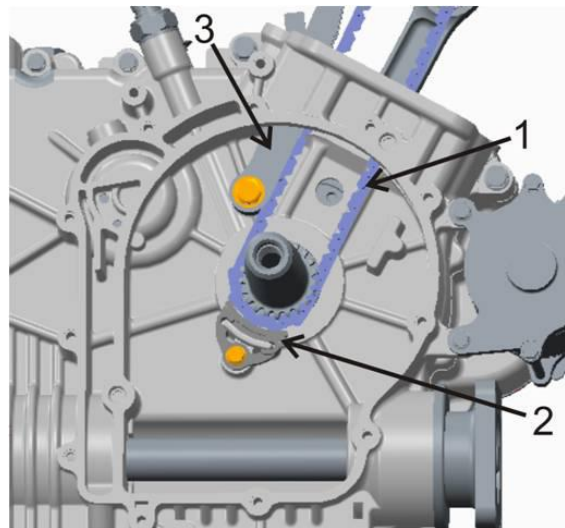
Drive pulley, driven pulley, drive belt

- Use special tool to open fixed plate and sliding plate
- Install drive belt on drive pulley and driven pulley

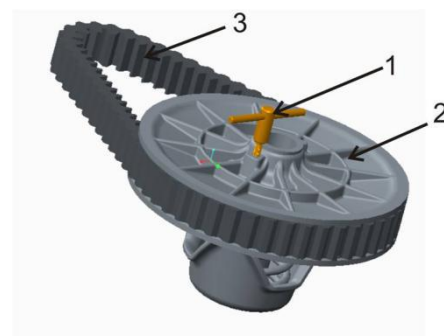
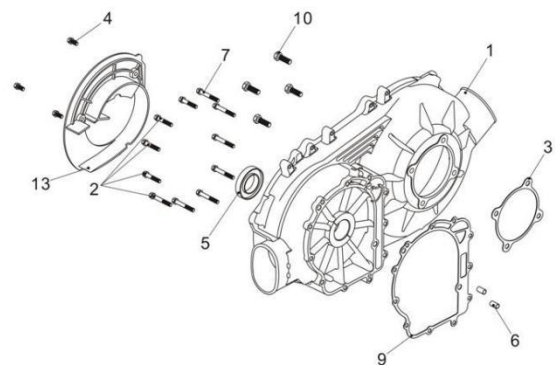
WARNING:

Drive belt contact surface should be free from any grease or oil.

Tool: Driven pulley expander
(1BX-17654-00)



1. Upper Guide Chain
2. Lower Timing Chain Guide
3. Tensioner plate



1. driven pulley expander
2. driven pulley
3. Drive belt

- Install CVT assy and tighten bolt and nut to the specified torque

NOTE: Install bolt of primary sheave anticlockwise. Install nut of secondary sheave clockwise.

Drive pulley bolt tightening torque:

55~60N. m

Driven pulley nut tightening torque:

110~120N. m

Engine top side

Piston

- Install the piston rings in the order of oil ring, ②ring, ①ring.
- the first member to go to the oil ring groove is spacer①, after placing the spacer fit the two side rails②.

WARNING: When installing the spacer ①, do not overlap its two ends in the groove.

- Install the second ring A and the first ring B.

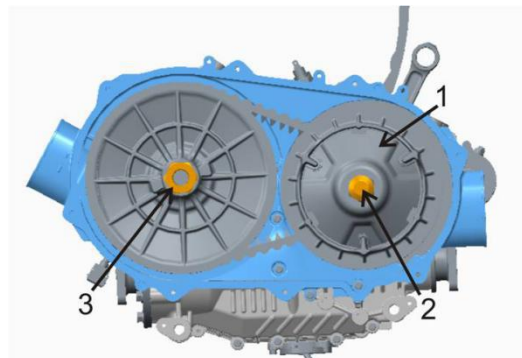
NOTE:

Ring 1 and ring 2 differ in shape.
Ring 1 and ring 2 marks "N and TOP"
The marks should be face up when installing

- After installing, inspect the smoothness of piston ring moving.

- The gaps of three rings should tagger 120° , and the gaps should not face the axial direction of piston pin or the main push surface of piston.

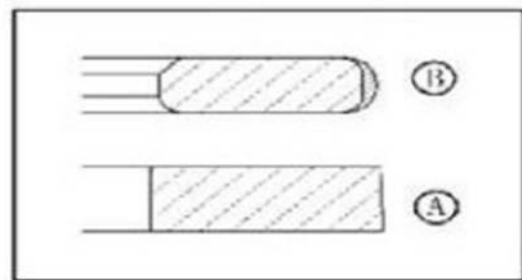
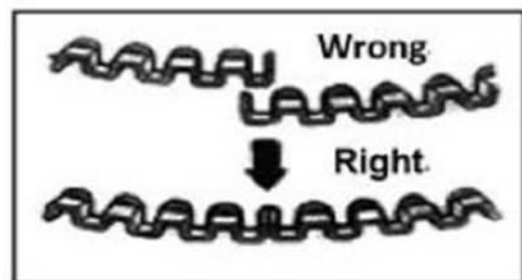
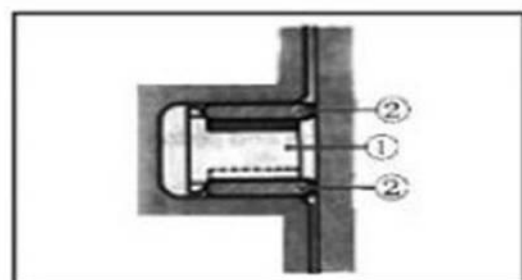
1. Do not face to the main push surface of piston.
2. Do not face to the axial direction of piston pin.



1. CVT assy

2. Bolt

3. Nut



- Apply a light coat of moly oil to the piston pin.
- Install piston pin into holes of piston and connecting rod small end

NOTE: When installing the piston, the “▲” mark on piston top is located to the intake side. The cylinder block and piston must be mounted in pairs. Piston I with cylinder 1 and Piston II with cylinder 2.

NOTE: Piston and cylinder should be installed according to grouping pairing

- place a clean rag beneath piston and install piston pin circlip ①;

NOTE: While rotating crankshaft, pull the cam chain upward, or the chain will be caught between sprocket and crankcase.

- Install the dowel pins and the new cylinder gasket.

WARNING: Use a new cylinder gasket to prevent oil leakage

Cylinder

- Apply engine oil to piston skirt and cylinder wall.
- Hold each piston ring with proper position, insert piston into the cylinder.

NOTE: Pull timing chain from chain cavity, and then install cylinder properly.

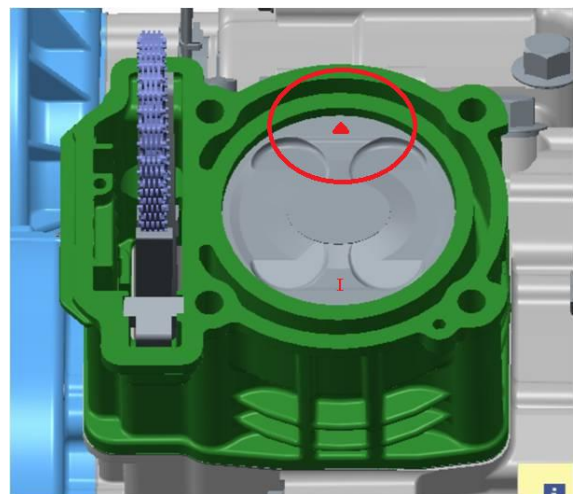
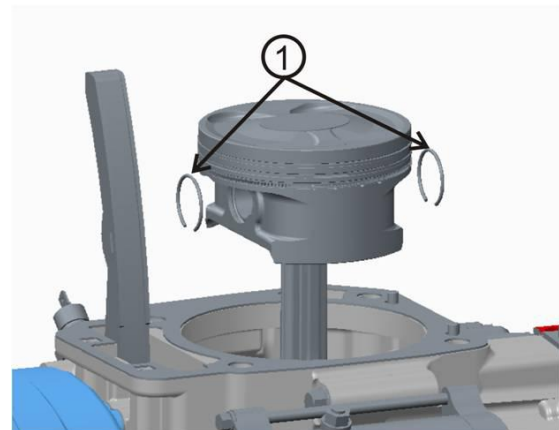
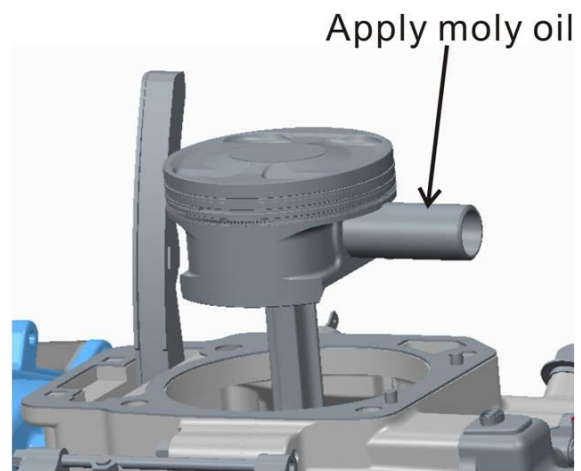
NOTE: Piston and cylinder should be installed according to grouping pairing

Chain Guide

- Install chain guide 2
- Install dowel pin 1 and new cylinder gasket 3

WARNING: Use new cylinder gasket to prevent oil leakage.

- Rotating crankshaft, and rotate the piston to upper dead center of crankshaft



1. Dowel pin 2. Chain guide
3. Cylinder gasket

Cylinder head

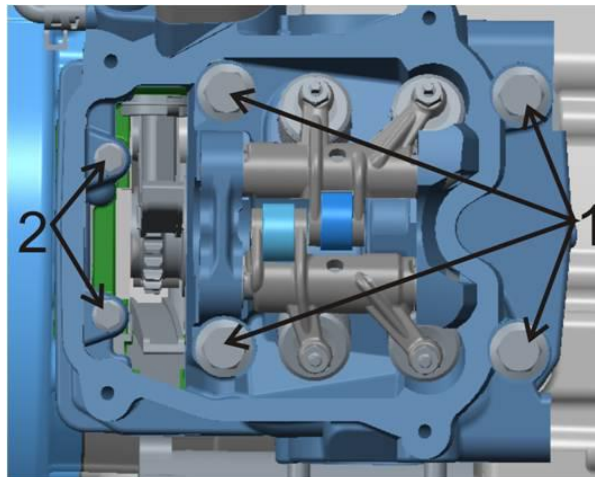
- Install cylinder head, tighten bolts diagonally to the specified torque.

Cylinder head cover bolt tightening torque:

Initial: 20N. m

Final: 40~45N. m

- Install boltM6

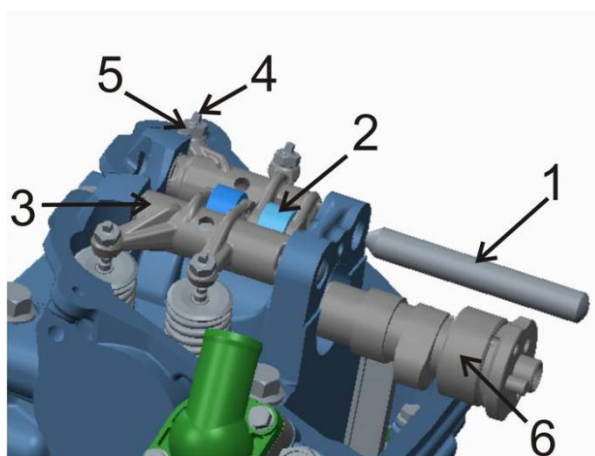


1. Cylinder head cover bolt M10

2. Nut M6

Camshaft, Rocker Arm

- Install camshaft
- Install rocker arm
- Install rocker shaft



1. Rocker arm 4. Adjusting screw

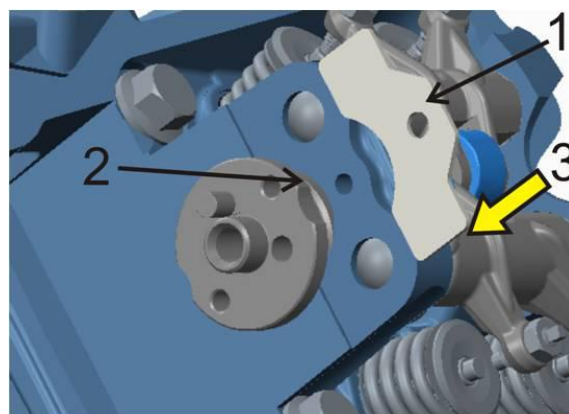
2. Exhaust rocker 5. Nut

3. Intake rocker 6. Camshaft

- Install camshaft holder into the groove of camshaft.

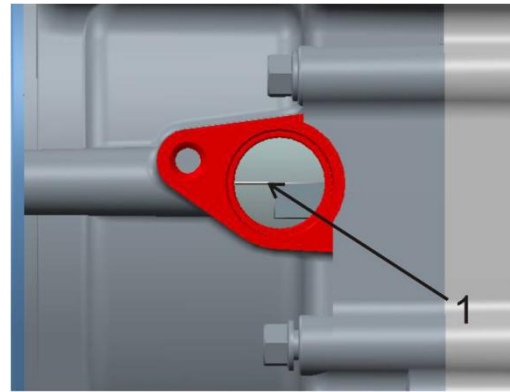
- Tighten bolt

1. The position of camshaft holder
2. The locating groove of camshaft
3. The moving direction



Timing Driven Sprocket

● Remove speed sensor and align the carved line of magneto and mark of left cover. If not alignment, rotate camshaft and make them be aligned.



1 .carved line of magneto

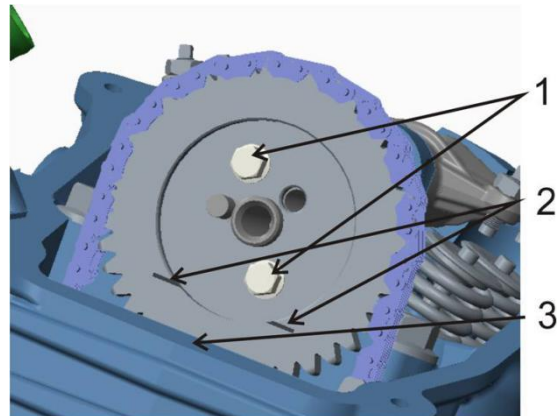
● Install timing driven sprocket, make the carved line of sprocket and the contact surface of cylinder head cover be parallel

● Hitch timing chain

● Tighten the fastening bolt to the specified torque

NOTE: make sure to apply screw locker on the fastening bolt of chain sprocket

Specified torque: 15N. m



1 .chain sprocket fastening bolt

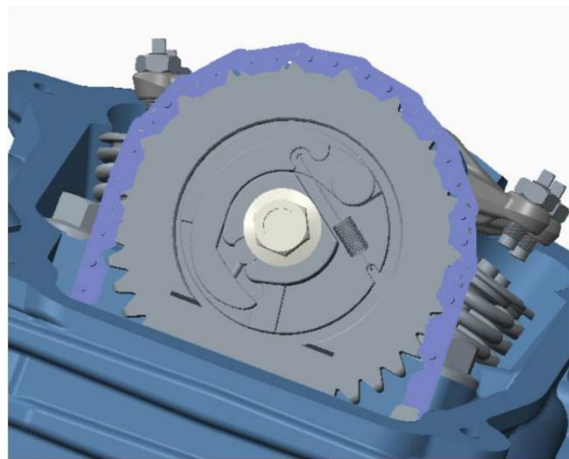
2 .carved of timing chain sprocket

3 .the contact surface of cylinder head cove

Decompressor Starter

● Install decompressor starter
● Tighten the bolt to the specified torque

Decompressor starter bolt
specified torque: 30N. m



Timing Chain Tensioner

- Insert flat head screw driver into the end of tensioner groove, rotate clockwise and lock tensioner spring

- Install timing chain tensioner and new seal gasket (1)
- Install fixed bolt (2) and fasten it to the specified torque

Chain tensioner bolt specified torque:
10N. m

- after installing tensioner, use flat head screw driver to rotate it anticlockwise and make the spring press the tensioner adjuster to compress timing chain.

- Install new gasket 3
- Install tensioner screw to the specified torque;

Tensioner screw specified torque:
8N. m

Cylinder Head Cover

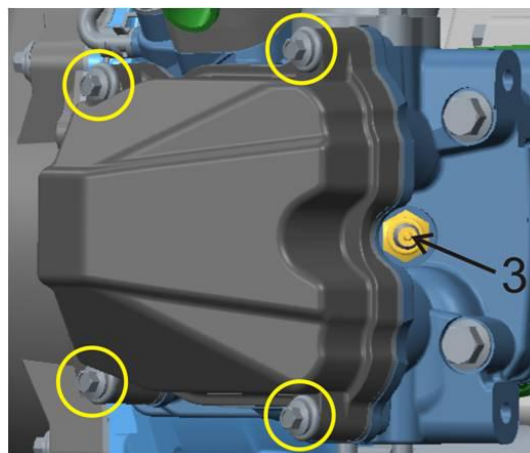
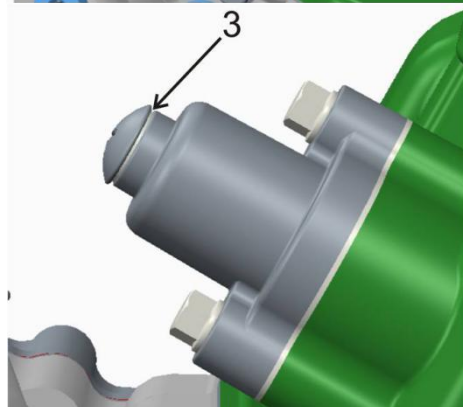
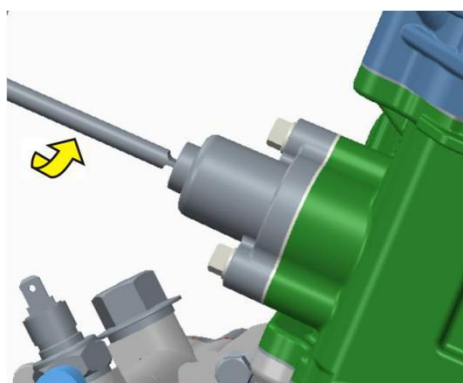
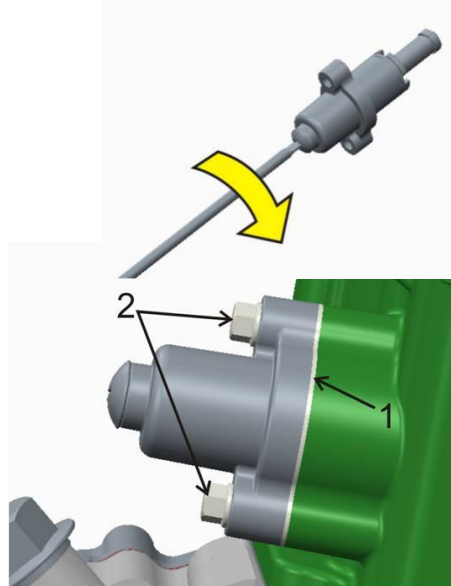
- Put rubber ring on cylinder head cover
- install cylinder head cover
- tighten bolt

Spark plug

- install and tighten spark plug(3)

CVT cover

- install CVT cover and tighten bolt

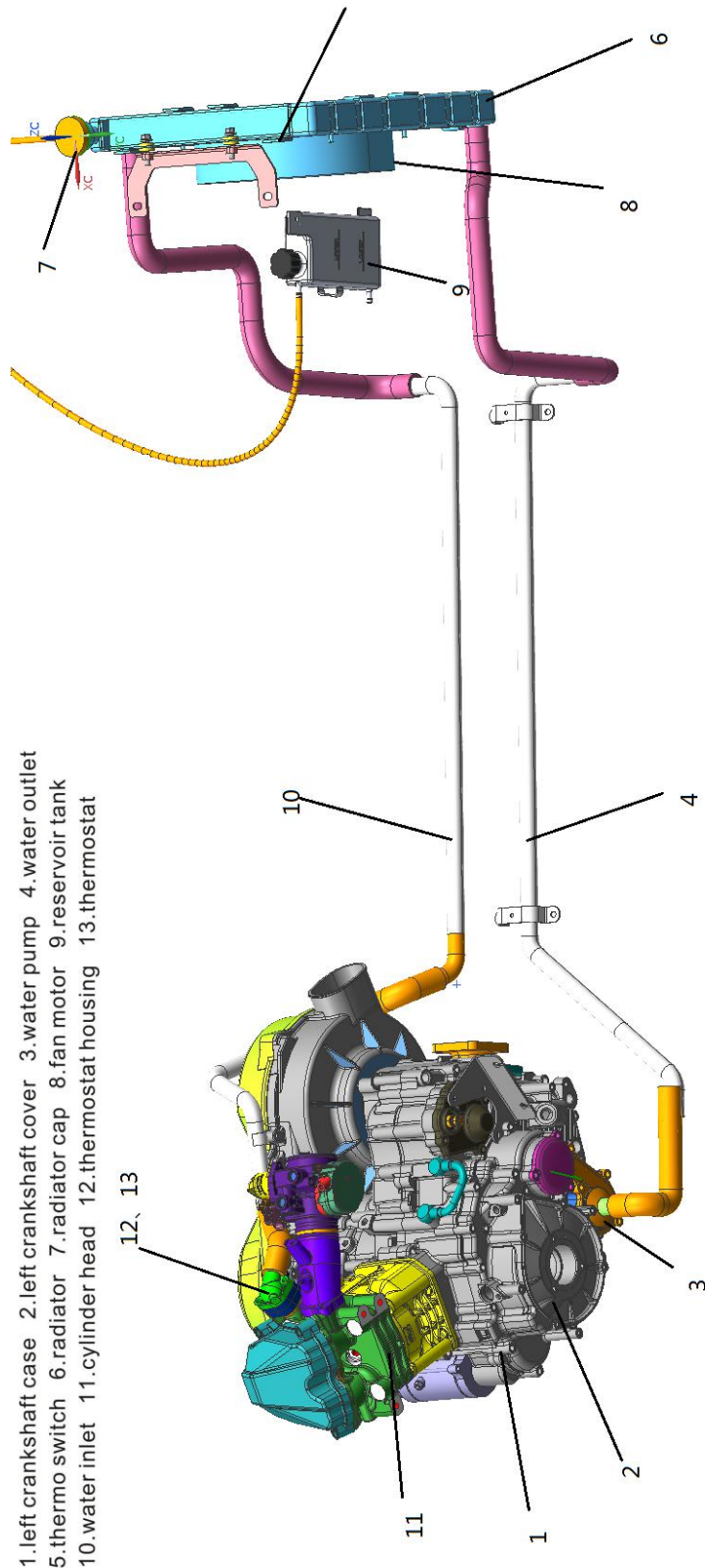


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3.4 Cooling and lubrication system

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3.4.1 Engine cooling system chart



3.4.2 Engine Coolant

The cooling used in cooling system is mixture of 50% distilled water and 50% ethylene glycol antifreeze. This 50:50 mixture provides the optimized corrosion resistance and the fine heat protection. The coolant will protect the cooling system from freezing at temperature above -30°C , the mixing ratio of coolant should be increased to 55% or 60% according to the figure on the right.

WARNING:

Use high quality ethylene glycol base antifreeze and mixed with distilled water. Never mix alcohol base antifreeze and different brands of antifreeze

The ratio of antifreeze should not be more than 60% or less than 50%

Do not use anti-leak additive

DANGER:

DO NOT open radiator cap when the engine is still hot. Or you may be injured by scalding fluid or steam;

Coolant is harmful. DO NOT swallow or stain your skin or eyes with coolant. In case of accidental swallow or stain, flush with plenty of water and consult the doctor immediately;

Keep coolant away from reach of children.

3.4.3 Inspection of cooling circuit

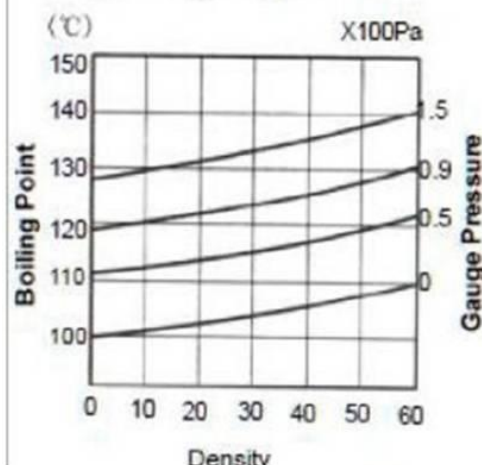
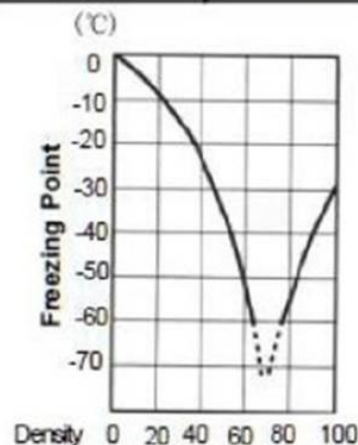
- Remove radiator ① and connect tester

②

DANGER: DO NOT open the radiator when the engine is still hot, or you may be injured by scalding fluid steam.

- Give a pressure of 105kPa, and check if the cap hold the pressure for at least 10 seconds

Anti-Freeze Density	Freezing Point
50%	-30°C
55%	-40°C
60%	-55°C



WARNING: When removing the radiator cap tester put a rag on the filler to prevent splash of coolant DO NOT allow a pressure to exceed the radiator cap release pressure.

WARNING: When removing the radiator cap tester put a rag on the filler to prevent splash of coolant DO NOT allow a pressure to exceed the radiator cap release pressure.

● If the pressure drops during 10 seconds, it indicates that there is leakage with the cooling system. In this case, check the complete system and replace the leaking parts or components.

3.4.4 Inspection and cooling of Radiator and Water Hoses Radiator Cap

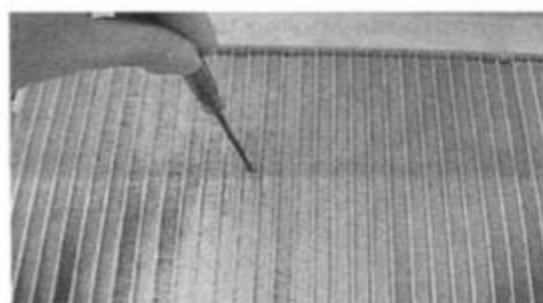
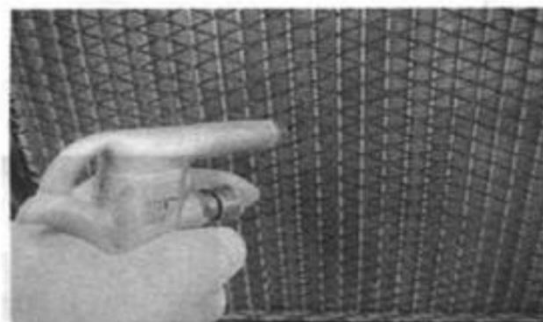
- Remove radiator cap①
- Install radiator cap to cap tester②
- slowly increase pressure to 108kPa and if the cap hold the pressure for at least 10 seconds
- If the cap cannot meet the pressure requirement, replace it.

Radiator Cap Valve Opening Pressure
Standard: 108kPa

Tool: Radiator Cap Tester

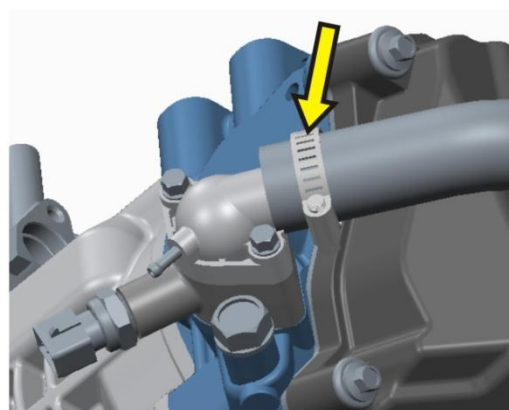
Radiator Inspection and Cleaning

- Remove dirt or trash from radiator with compressed air
- Correct the radiator fins with a small screwdriver



Radiator Hose Inspection

- Check radiator hoses leakage or damage. If the hoses are leakage and damaged, replace them
- Check tightening of clamps. Replace the clamps if necessary
- After inspection and cleaning of radiator and hoses, check coolant level. Fill coolant if necessary



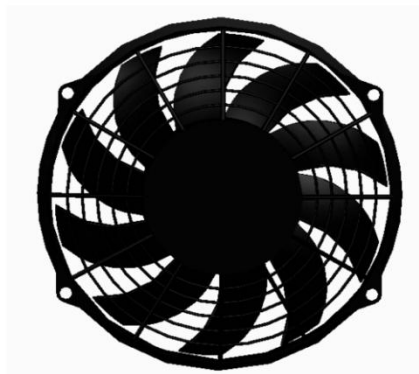
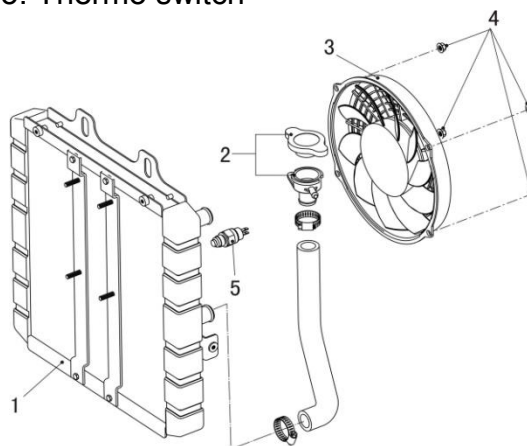
3.4.5 Inspection of Fan Motor

- Remove fan motor from radiator
- Turn the vanes and check if they can turn smoothly
- Check fan motor. Make sure that the battery applies 12 volts to the motor and the motor will run at full speed while the ammeter will indicate the ampere not more than 5A. If the motor does not work or the ampere exceeds the limit, replace the motor
- Installation: Apply a little thread locker to the bolts and tighten to the specified torque.

Fan Motor Bolt Tightening Torque:

10N • m

1. Radiator;
2. Radiator Cap;
3. Fan Motor;
4. Mounting Nut;
5. Thermo switch



Inspection of Thermo switch

- Remove thermo switch
- Check the thermo switch for closing or opening by testing it at the bench as illustrated. Connect the thermo switch to the circuit tester, place it in a vessel with engine oil. Place the vessel above a stove.
- Heat the oil to raise the temperature slowly and take the reading thermostat ②, when the thermo switch closes and opens.

Tool: ammeter Thermo switch

Operating Temperature:

Standard: (OFF-ON): Approx. 88°C

(ON-OFF): Approx. 82°C

WARNING:

Avoid sharp impact on thermo switch.
Avoid contact of thermo switch with thermometer or vessel.

- Installation: Use a new O-ring ③ and tighten the thermo switch to the specified torque;

Thermo switch Tightening Torque: 17N · m

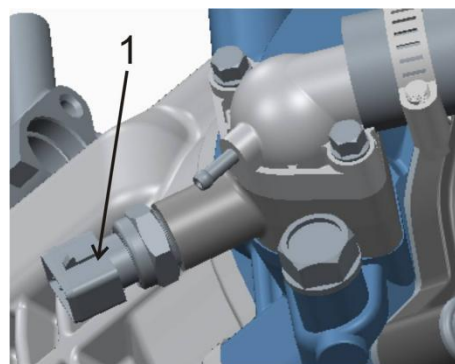
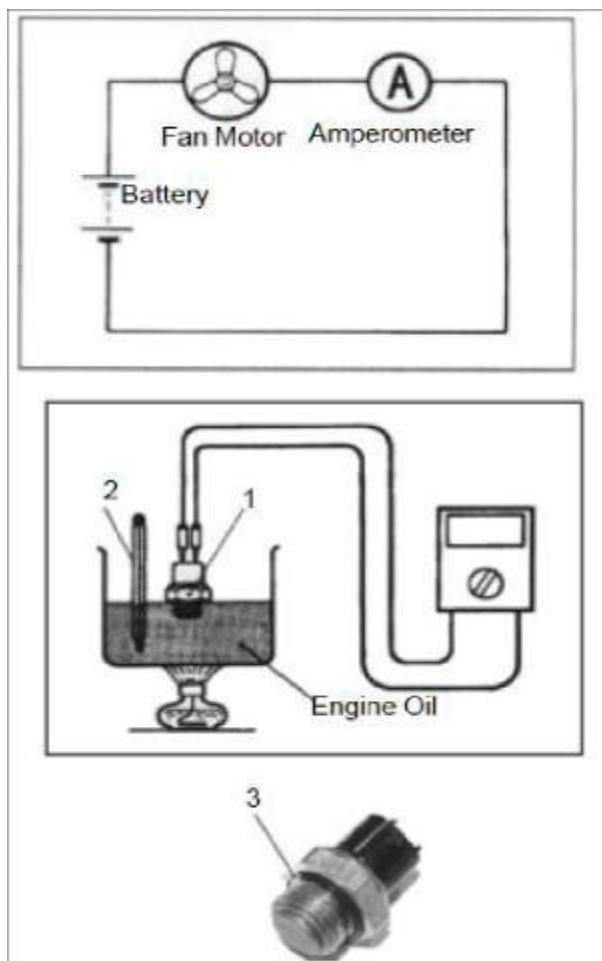
- Check coolant level after installation of thermo switch. Fill coolant if necessary

3.4.6 Inspection of Water tem-

perature Sensor

- Place a rag under water temperature sensor 1 and remove it from cylinder head
- Check the resistance of water temperature sensor as illustrated on the right. Connect the temperature sensor 2 to the circuit tester, place it in a vessel with engine oil. Place the vessel above a stove

Tool: ohmmeter, thermometer



- Heat the oil raise the temperature slowly and take the reading from ohmmeter ④ and thermometer ③

Resistance and Water Temperature

Temperature (°C)	50	80	100	120
Resistance (Ω)	154±16	52±4	27±3	16±2

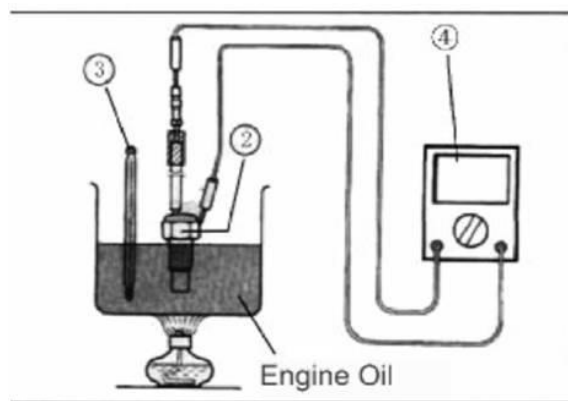
- Installation: Apply a little thread locker and install it to the cylinder head by tightening to the specified torque

Water temperature Sensor Tightening

Torque: 16N · m

WARNING:

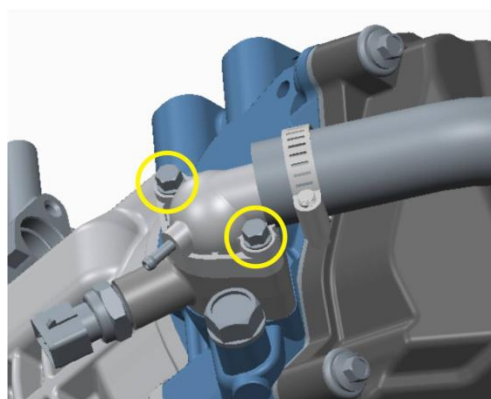
Avoid sharp impact on temperature sensor; Avoid contact of temperature sensor with thermometer or vessel



- After installation, check the coolant level. Fill coolant if necessary

3.4.7 Inspection of Thermostat

- Remove thermostat housing
- Remove thermostat
- Check thermostat pellet for cracks. If necessary, replace it.
- Test the thermostat according to the following steps:
 - ☆ Pass a string between thermostat flange as illustrated on the right



☆ Immerse the thermostat in a beaker with water. Make sure the thermostat is in the suspended position without contact to the vessel. Heat the water by placing the beaker above a stove and observe the temperature rise on a thermometer

☆ Take the temperature reading from thermometer when the thermostat valve opens.

Thermostat Valve Opening

Temperature: $71^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Tool: Thermometer

☆ Keep heating the water to raise the water temperature. When the water temperature reaches the specified valve, the thermostat valve should have been lifted by 3.5-4.5mm

☆ If thermostat valve opening temperature or thermostat valve lift does not reach the standards, replace it.

● Install thermostat: reserve the removal procedure for installation

☆ Apply coolant to the rubber seal of thermostat

☆ Install thermostat housing. Tighten to the specified torque:

Tightening Torques: $10\text{N} \cdot \text{m}$

3.4.8 Water Pump

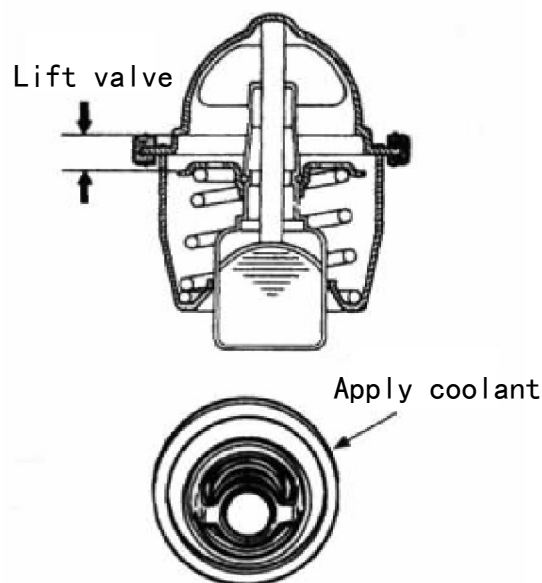
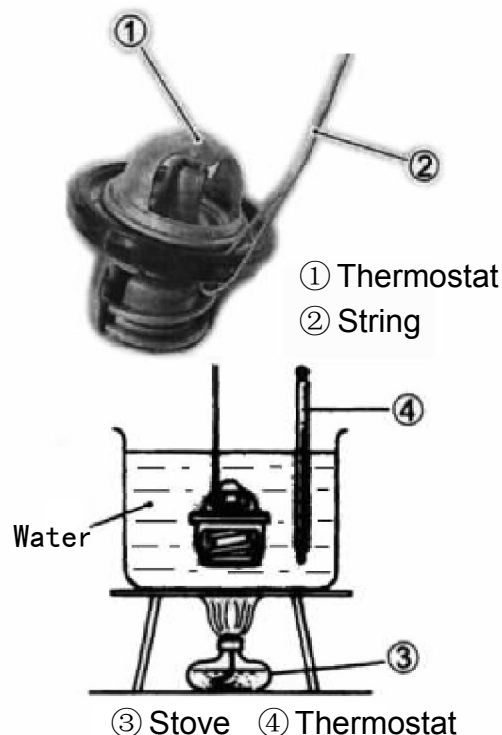
Water pump cover

Water pump is on engine left crank- shaft cover

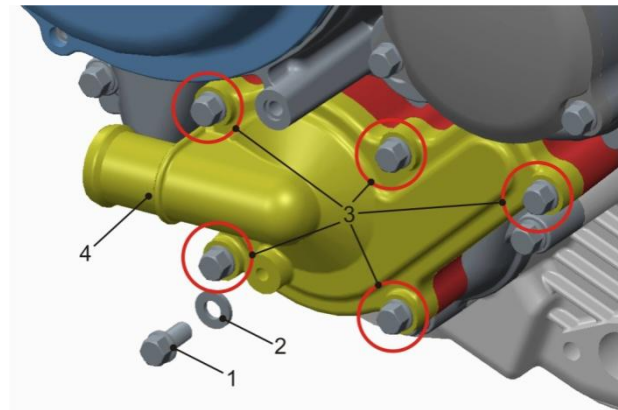
Removal and Disassembly

WARNING:

When engine is hot, do not remove radiator cap or loose coolant discharge plug screw to prevent from injury.



- Drain coolant
- Remove radiator water outlet from water pump cover
- Remove mounting bolt from water pump cover
- Remove water pump



Illustration

1. coolant drain plugs crew
2. Seal gasket
3. bolt
4. water pump cover

Inspection of water pump cover

- Check water pump cover seal gasket, if necessary, replace it

Installation of water pump cover

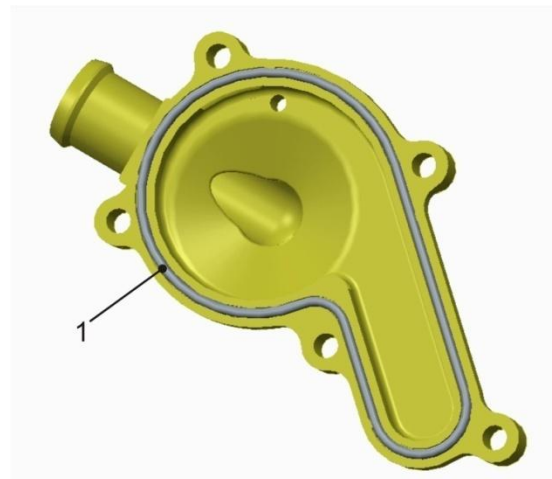
- Install water pump cover reverse the removal procedure for installation

Water Pump Cover Bolts Tightening Torque:
6N.m

WARNING:

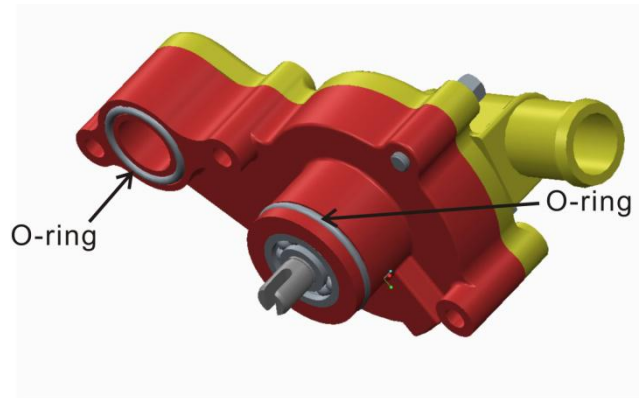
Install seal gasket in the groove of water pump cover correctly to prevent from leakage.

- Tighten mounting bolts diagonalcross.



- Check impeller for smooth turning
- install the new O-ring

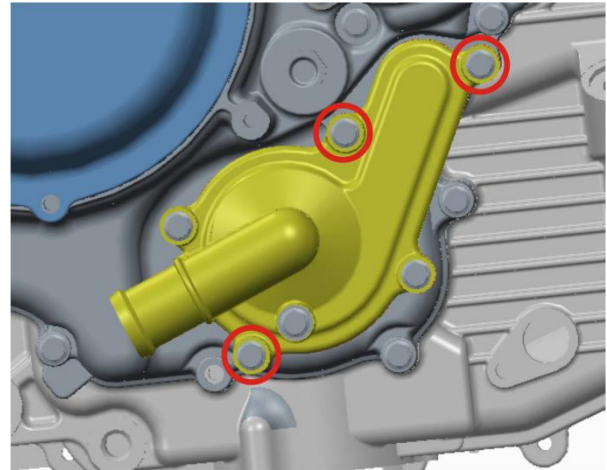
Use the new O-ring to prevent leakage;
Apply grease to O-ring



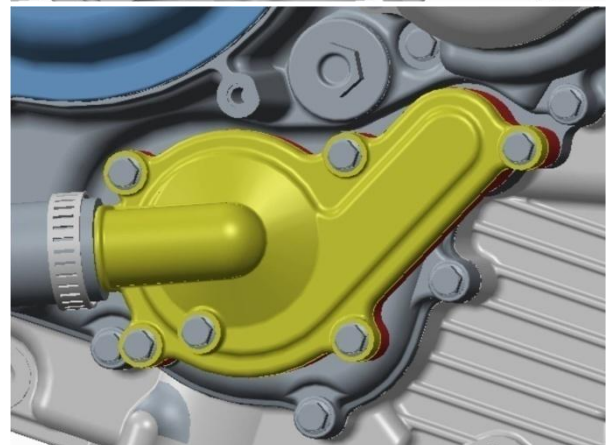
- Install water pump and tighten the bolts and bleed bolt

Water pump bolts tightening torque:

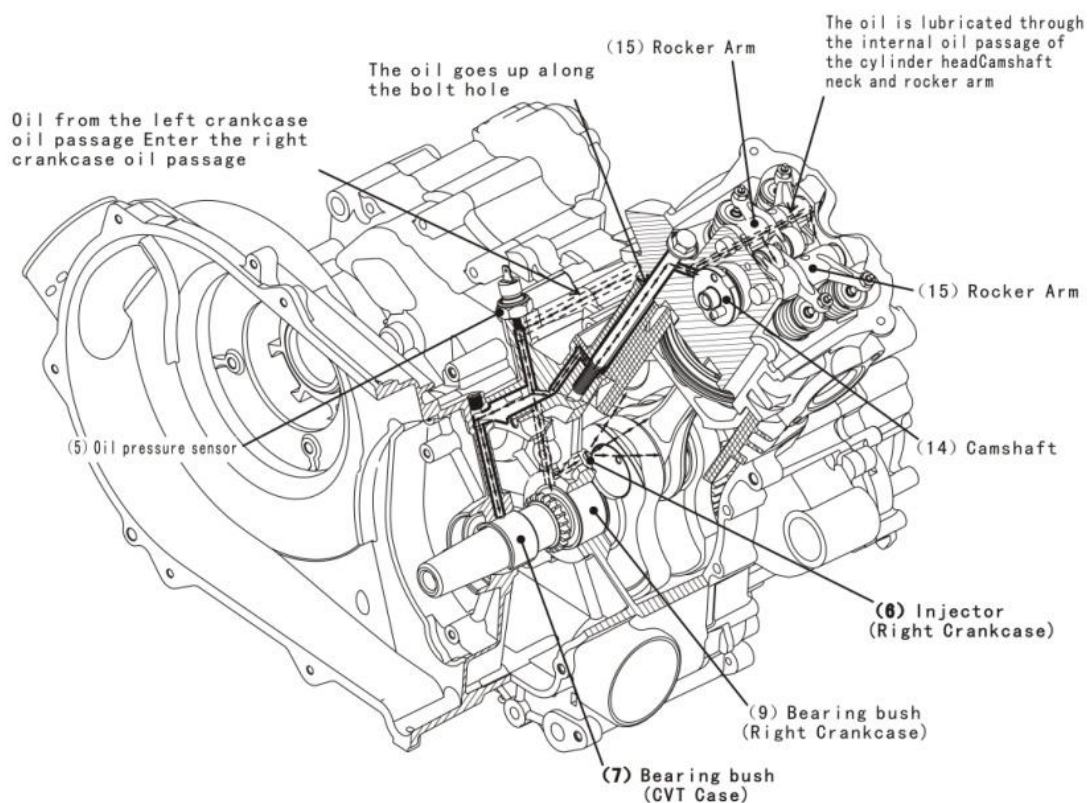
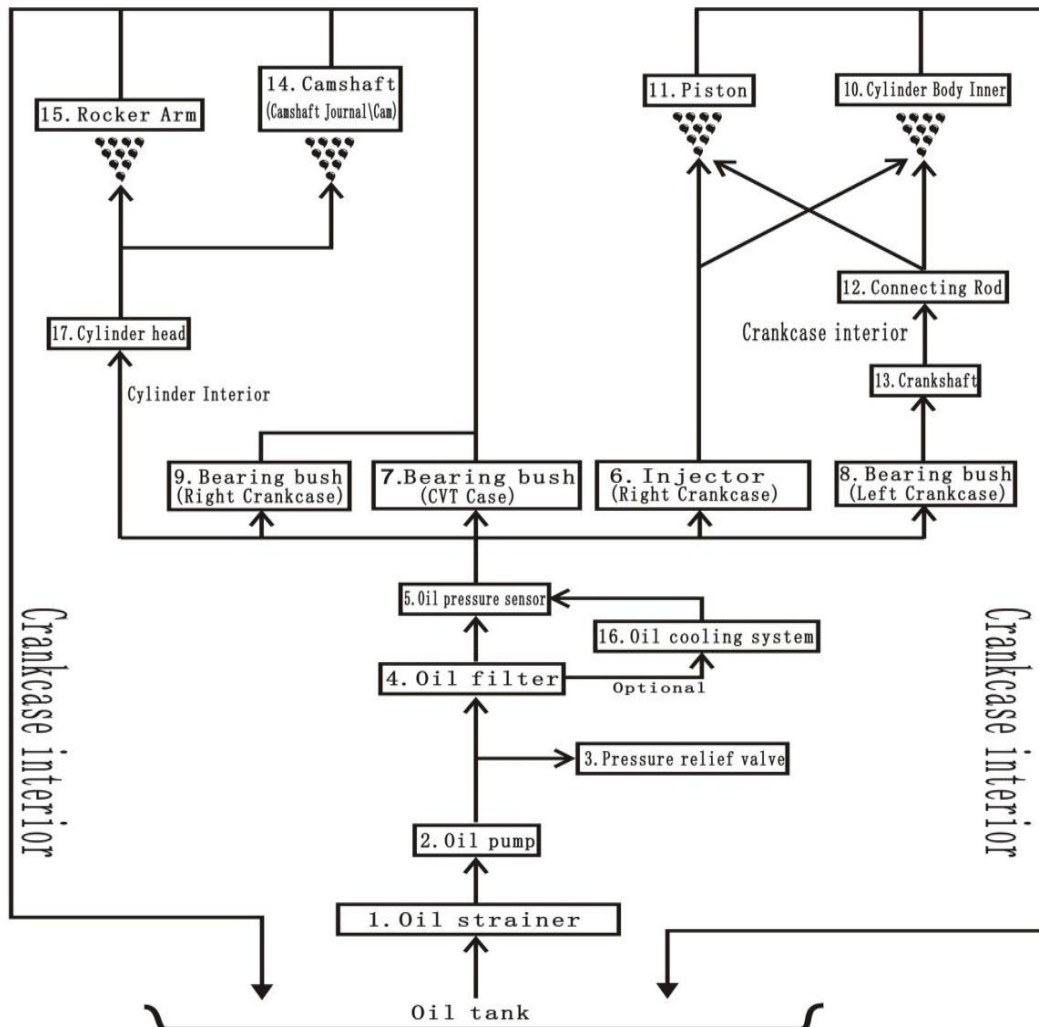
10N • m

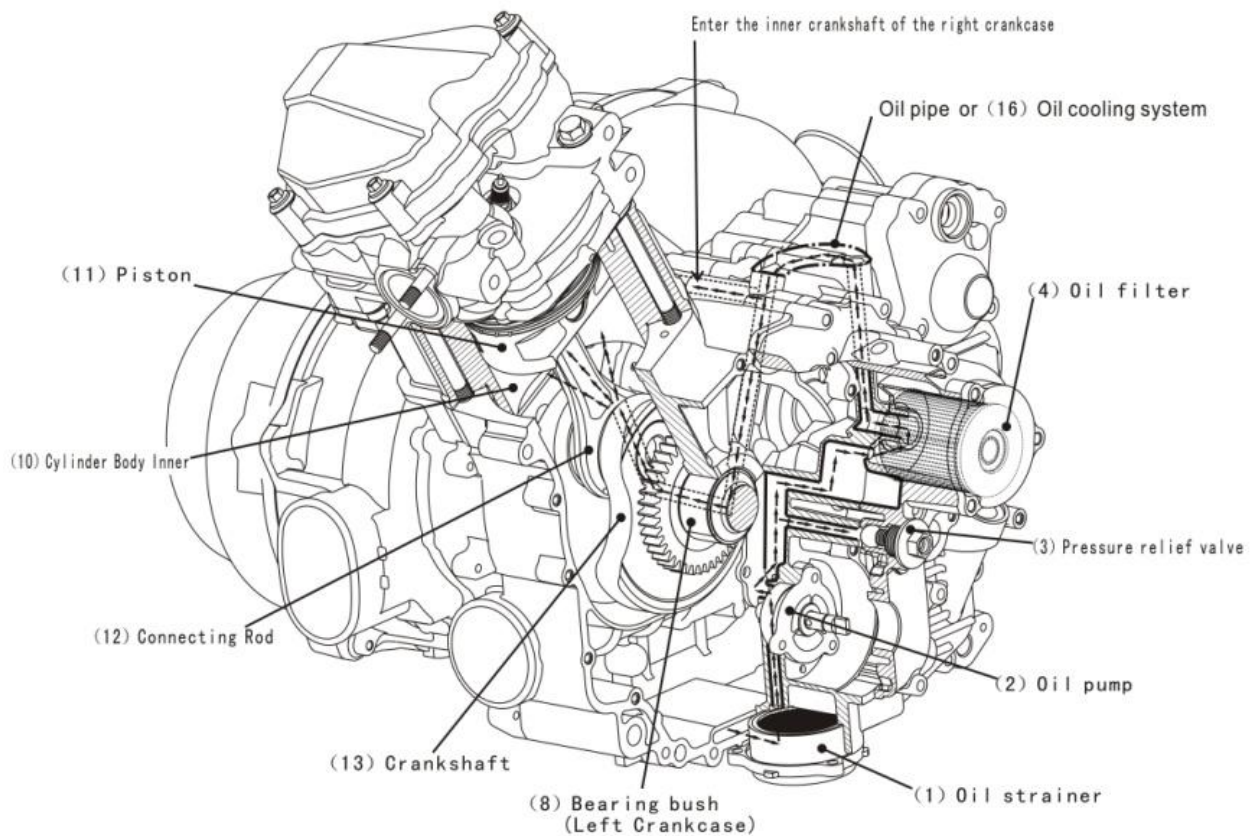


- Connect water tubes
- Inject coolant



3.4.9 Inspection of Engine Lubrication System





Add oil to the engine parts (piston, cylinder body, camshaft and so on) which run at high speed.

Engine lubrication should be special oil.
Engine oil is not only used as lubrication, but also used to wash, rustproof, seal and cool.

3.4.10 Inspection of Lubrication system

(Refer to 5.2.8 inspection of lubrication system)

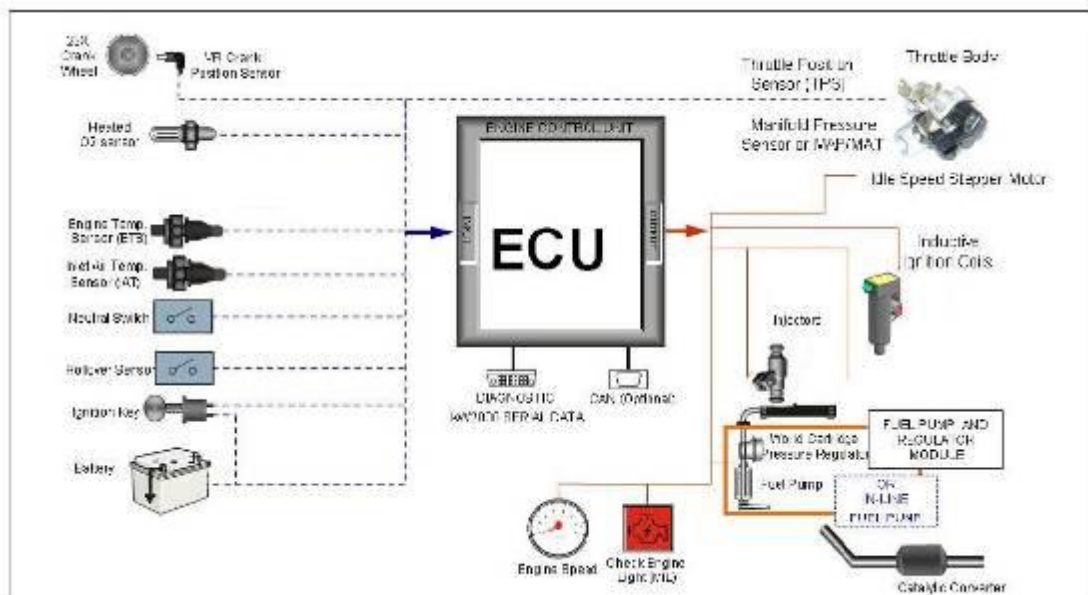
3.4.11 Inspection of engine oil pump

(Refer to 3-77)

3.5 FUEL INJECTION SYSTEM

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Below shows the layout of typical EMS for engine. The solid lines in the figure 1 below indicate the output signals from the Engine Controller and the dotted lines indicate the input signals to the controller from various sensors and switches.



3.5.1 ECU

3.5.1.1 Description & Working Principle

The ECU continuously monitors the operating conditions of the engine through the system sensors. It also provides the necessary computation, adaptability, and output control in order to minimize the tailpipe emissions and fuel consumption, while optimizing vehicle drivability for all operating conditions. The ECU also provides diagnosis when system malfunctions occur.

3.5.1.2 Appearance

The MT05 ECU has a polyester header, with an aluminum base plate. below shows the top and bottom view of the MT05 ECU.



3.5.1.3 Handling – DOs & DONTs

ACTION	REASON
DO NOT: Place the ECU close to the exhaust pipe or Engine when removed	High temperature might reduce the life of the ECU and also can damage the ECU

DO NOT: Place the ECU close to or pour water, oil or any other liquids.	ECU is susceptible to water and liquids
DO NOT: Allow mud or other debris to accumulate on the surface of the ECU	Having mud or debris accumulated on the ECU casing reduces its heat dissipation efficiency.
DO NOT: Apply any voltage relative to any point to the ECU	Drastically affects the performance of the ECU and may lead to ECU damage
DO NOT: Clean ECU with any solvent or any corrosive liquid	Can damage the housing of the ECU
DO: Take extreme care that water droplets or excess moisture should not fall on ECU connectors	ECU connectors can get short and may lead to ECU damage
DO: Clean the ECU with a moist cloth and keep it dry	Prevents ECU damage

3.5.1.4 Installation requirements

The ECU shall be mounted using M5 machined screws with a torque of 3.9Nm $\pm$ 10%. The mounting surface should also be flat to avoid subjecting the base plate to unnecessary force and warping the PCB.

3.5.1.5 Power Requirements

Power Supply: The controller's power supply module will power up the microprocessor if the battery voltage is greater than 6.3 Volts. The power on is controlled by the controller hardware only.

Operating Range: All planned functions are executed in this range. Battery and/or Ignition voltage: 9.0 to 16V DC

Power Off: The controller will turn its power off when the ignition voltage: < 6.2 VDC. The controller prepares for entry into Power Down mode. The preparation involves storing important information into EEPROM.

Reset: During reset, all outputs shall be set to a predefined state. The controller shall monitor itself for proper operation and enter reset should any internal errors be detected. The controller shall then restart normal operations after the computer has properly reset

Over Voltage: the controller will survive no permanent damage if the ignition voltage does not exceed 26V for more than 1 minute

Reverse Voltage: The controller will survive with no permanent damage: Battery and/or Ignition voltage < -13V DC for 1 minute

3.5.1.6 Temperature Requirements

Storage: The controller shall suffer no damage as a result of being stored at temperatures of -40 °C or +105 °C continuously for 168 hours. If the storage temperature is not as extremely high as +105 °C or as extremely low as -40 °C, the ECU could be stored for longer time without damage.

Operating: The controller shall operate in the ambient temperature from -20 °C to +85 °C.

5.5.1.7 Maintenance service and Repair

ECU is a non-serviceable part. Once there are problems, it's important to first determine

if the problem is caused by software/calibration. If it is caused by software/calibration, please refer to software/calibration reflashing procedure. In the event of ECU hardware failure or malfunction (during warranty period only) the ECU should be sent back to the vehicle manufacturer giving complete details of the ECU Part No, Serial number, Vehicle Model & Make, manufacturing Date, Total kms run on the vehicle, Location of use, Vehicle No, Date of return.

3.5.2 INJECTOR

3.5.2.1 Appearance

The figure below shows the standard Multec 3 Fuel Injector appearance



3.5.2.2 Seal rings

Seal rings for injectors (refer to Figure 12) are made to withstand temperatures ranging from -40°C to 150°C (-40 to 302°F) without leakage or seeping. They must also be resistant to varying amounts of fuel additives to fuel (i.e., ethanol, etc.). The following are currently available seal rings designs. Please contact a Delphi representative if the specific sealing requirements are not met by these designs:

Injector to fuel rail seal ring

- Dimensions:
- ID. : 6.35 mm
- OD. : 14.85 mm
- Cross-section: 4.25 mm
- Materials
- Viton GLT (blue color). For low temperature applications
- Viton A (black). All other applications.

Injector to manifold

- Dimensions:
- ID: 9.61 mm
- OD: 14.49 mm
- Cross-section: 2.44 mm
- Materials:
- Viton A (black or brown other applications.)

3.5.2.3 Seal rings replacement

... Lubricate the seal rings with an approved lubricant or equivalent. The lubricant application process must prevent lubricant from contacting the director plate, which could possibly restrict the injector flow.

... It is preferred to not reuse the seal rings when re-installing an injector. If re-use is necessary, carefully inspect each seal ring for any signs of damage, as even minor defects can lead to fuel / vacuum leakage. Always install injectors and seal rings using

the recommended service procedures to avoid the possibility of a safety hazard.

When installing seal rings to the injector inlet, take extra care not to damage the seal on the injector top flange.

3.5.2.4 Lubricant Recommendation

Lubrication should be applied to the O-rings only for ease of injector installation. The table 4 is a list of lubricant oils that were tested and approved for O-ringlubrication. These lubricants have shown to have no effect on injector performance (plugging, sticking).

Lubrication Recommendation		Table: 6
Lubricant Name	Supplier	Viscosity (cSt) @ 40 °C
Spindura 10	Equilon	10
Spindura 22	Equilon	21
DTE-24	Mobil	32
DTE-25	Mobil	46
DTE-26	Mobil	68
Norpar 15	Exxon / Mobil	<1
Drawsol 60	DA Stewart	1-2
NocoLube AW 46	NOCO Energy	46
NocoLube AW 32	NOCO Energy	32
Advantage Spindle Oil	Advantage Lubrication Specialties	10

3.5.2.5 Over-Voltage

The Multec 3 injectors and the Multec 3.5 injectors can withstand a voltage of 26v for a maximum of one minute at a duty cycle of 100 ms pulse width and 200 ms period. The injector will be pressurized with calibration test fluid at normal operating pressure during the test. This will not result in any permanent physical damage to the injector or coil assembly, or any degradation in electrical performance.

3.5.2.6 Temperature Requirements:

Typical injector temperature environments are defined below. The Multec 3 injectors and the Multec 3.5 injectors will not experience any loss of the ability to comply with the flow tolerance requirements after exposure to the following temperature environments. Also, they will not experience unacceptable external leakage, any type of physical degradation, or loss of service life during or after being exposed to these ambient conditions.

Normal Operating Temperature Range: - 30 to 125C

Extreme Operating Temperature Range (some performance degradation): - 40to 150C

Storage Temperature Range: -60 to 60C

3.5.2.7 Fuel Contamination

The injector fuel inlet filter protects the fuel injector from initial build fuel contamination as well as from fuel system assembly contamination. Filtration is extremely important because particle contaminants can cause an injector to stick open, flow shift or tip leak. The injector inlet filter is not a serviceable component and is designed only to trap potential built-in contamination between the chassis fuel filter and injector.

3.5.2.8 Wire Routing

Electrical wiring to the injector should be routed so that conductors are protected from excessive heat, damage, and wear.

Avoid unnecessary handling(disconnecting and connecting) of the electrical connector.

3.5.2.9 Handling - DOs & DONTs

ACTION	REASON
--------	--------

DO NOT: Re-use injector seal rings if at all possible. If no other choice exists, take extra care in inspecting the seal rings for damage.	Leakage.
DO NOT: Dip injector tips into lubricants.	Can plug injector spray orifices.
DO NOT: Cycle injector repeatedly without fuel pressure.	Damage to internal mechanical components.
DO NOT: Pulse (actuate) a suspected high leak rate injector (leak >50 sccm air)	Can dislodge internal contamination if
DO NOT: Allow water to enter fuel system from air lines, etc. during leak checks.	Can damage injectors.
DO NOT: Contact or apply load to the injector tip for installation.	Apply load to 45 deg angle on nylon over mold see
DO NOT: Pound injectors into manifold during assembly to engine.	Can damage injectors or seal rings.
DO NOT: Apply excessive side loads to electrical connectors.	May cause loss of electrical continuity.
DO NOT: Use any dropped unit.	Internal damage may have occurred.
DO NOT: Store injectors, rails, or subassemblies including engines on which the injectors have been installed in an unprotected environment.	External contamination can damage the injector electrically and/or mechanically.
DO NOT: Use the injector as a handle.	Do not use the injector to lift assemblies
DO NOT: Rack, stage, or handle parts in a manner that allows contact between parts.	Damage will occur.
DO NOT: Remove packing in a way that allows contact between parts.	Damage could occur due to contact between parts
DO NOT: Tap on fuel injectors to correct any malfunction..	Can damage injector.
DO NOT: Replace the injector with other part number not recommended for this application	Will severely affect the performance of the injector
DO: Take extra care when installing new fuel seal ring over injector inlet flange.	Prevent tearing seal ring during installation
DO: Use proper lubricants on seal ring surfaces to install injector in engine. Minimize time between applying lubricant and inserting injector /rail.	Avoid damage to seal ring during installation. Avoid contamination at seal.
DO: Pulse (actuate) stuck closed or tip-leak suspected injector (Actuate consists of one pulse<5 sec duration at 9 to 15V).	To verify the injector failure
DO: Pulse (actuate) injectors prior to a dry fuel system leak test at engine/vehicle assembly to reseal injector valves.	Injector valves may not reseal without fuel after shipping and handling resulting in false leakage.
DO: Avoid any liquid contamination in the injector area.	Coil could short circuit.
DO: Use care during connection of harness to injector.	Avoid terminal damage.
DO: Use recommended terminal lubricant on mating connector.	Minimize potential for terminal fretting corrosion.
DO: Return any dropped, damaged, or suspect material with a tag that describes the problem.	Ensure fast and correct diagnosis of root cause.

3.5.2.10 Installation guide lines

Follow these guidelines to prevent damage to the injector and it's electrical interface during the replacement or re-installation process.

... Lubrication: Apply a light coating of lubricant to the lower injector seal ring. ISO 10 light mineral oil or equivalent is recommended.

... The preferred technique is to apply the lubricant to the sockets the injectors are being installed into, rather than directly to the seal ring itself. This will help minimize the possibility of injector contamination.

... Avoid applying lubricant over the director plate holes – this may restrict injector flow. Do not dip the injector tip in lubricant.

... All Multec 3 and Multec 3.5 injectors come from the factory with the seal rings

attached. The re-use of seal rings is not preferred when replacing an injector. If an injector is to be re-used, and no new seal rings are available, take care to inspect each seal ring for signs of damage. Even minor defects in the seal ring can lead to leakage. Take extra care in installing seal ring over flange of injector inlet.

.. Carefully installing the harness connector will prevent terminal damage. Listen for a positive audible click from the connector retention device — this ensures that it is fully engaged.

.. Avoid unnecessarily disconnecting/reconnecting the harness connector.

.. Wires routed in a manner that can allow them to become pinched between components can result in a short circuit and a stuck open injector.

.. For injectors that require orientation for spray pattern, do not rotate the injector in the fuel rail assembly to install the injector electrical connector. This may dislodge the retaining clip, and result in improper spray orientation

3.5.2.11 Replacement Techniques

The following procedure outlines standard Multec 3 and Multec 3.5 Fuel Injectors removal and replacement.

Warning: The injector and all associated hardware may be extremely hot.

.. Shut off ignition.

.. Disconnect negative battery cable to avoid possible fuel discharge if an accidental attempt is made to start the engine.

.. Disconnect the electrical connector from the injector wiring harness.

.. Relieve fuel pressure

.. Remove the retaining clip from the fuel injector.

.. Remove the fuel line connection from the injector

.. Carefully clean debris from the interface surfaces. Do not damage seal mating surfaces.

.. Remove the injector from the manifold

.. Apply a light coating of a lubricant to both the upper and lower injector seal ring of the replacement injector.

.. Install the new injector into the manifold. Check that the injector is installed in the original orientation to maintain proper spray targeting, and that the retaining clip is properly seated on the injector and the fuel line

.. Install the retaining clip after connecting the fuel line

.. Tighten the injector mounting to the desired torque as mentioned in the manufacturer manual

.. Tighten the fuel line

.. Re-install the injector electrical connector

.. Check for fuel leaks with the key “on” and the engine “off”

.. Start engine and verify proper operation

3.5.2.12 Interchange ability

The injector should be replaced in service only with an equivalent injector of the same part number. On occasion, a new part number may supersede part numbers. Consult the appropriate vehicle service manual and part number guide for the latest replacement injector part number information.

3.5.2.13 Plugging

Fuel deposits cause plugging resulting in flow shifts over the life of the injector.

Fuel varnish or gumming, a type of injector deposit, is created when certain types of fuel are heated by high injector tip temperatures at soak (no fuel flow). Deposit build up in the director holes causes the flow shifts

.. Plugging can cause flow restrictions, frictional changes and the collection of other particles attracted by the tacky surface. The flow restrictions can degrade emissions and drivability.

.. Other fuel and environmental conditions may cause crystal or corrosion growth in

the injector and cause a flow shift.

.. Oxidation stability of the gasoline affects the potential for deposit formation and must be controlled by the fuel supplier.

.. Increased levels of detergent additives reduce the rate of injector plugging.

.. In case of plugging of injector follow the injector cleaning procedure mentioned in the section below

3.5.2.14 Cleaning Procedure

.. Electrically disable the fuel pump by removing the fuel pump connection.

.. Relieve the fuel pressure in the system and disconnect the fuel connection at the injector. Plug the fuel feed line.

.. Injector cleaner with the specific ratio of the cleaner and gasoline to be mixed in the Injector cleaning tank.

.. Connect the injector-cleaning tank to injector in the vehicle.

.. Pressurize the injector-cleaning tank to system pressure.

.. Start and idle the engine for 15- 20 minutes.

.. Disconnect the injector-cleaning tank from the system and install the fuel pump connections. Connect the fuel feed line to injector.

.. Start and idle the vehicle for an additional 2 minutes to ensure the residual injector cleaner is flushed from system.

3.5.3 Throttle Body Assembly (with stepper motor)

3.5.3.1 Description and Working Principle

The Throttle Body Assembly is an interactive system comprised of the following subsystems: the main casting body, bearing system, shaft and valve system, return spring system, cable interface system, throttle position sensing system, and the bypass air control system. The subsystems interact and support each other to provide all the functional requirements, which are mentioned below -

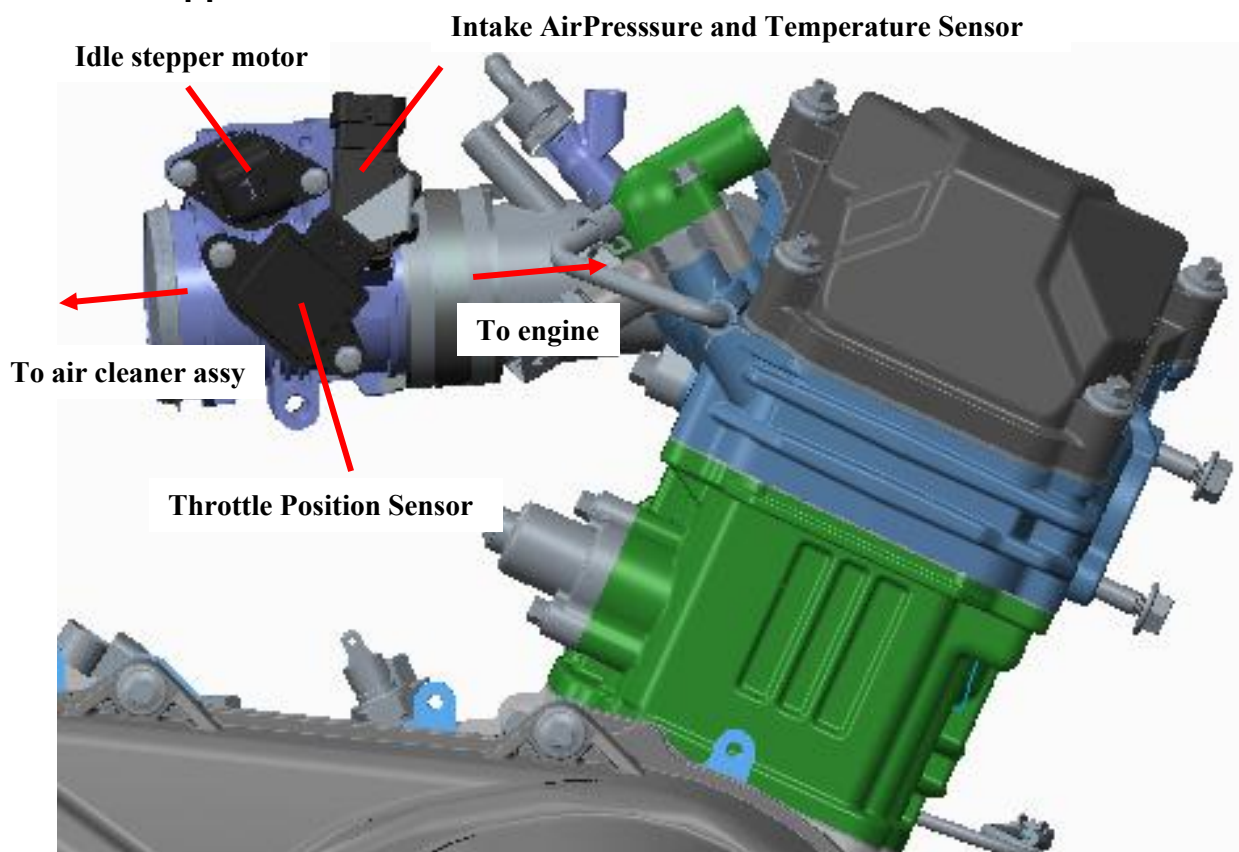
.. Control intake air flow

.. Control idle air flow

.. Sense throttle position - Provide position feedback to Engine Controller

.. Provide reactionary force to the throttle

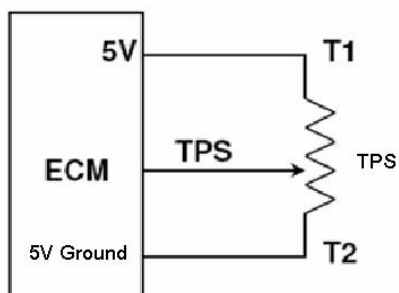
3.5.3.2 Appearance



3.5.3.3 Technical Parameters

Throttle Position Sensor:

- .. Reference voltage: 5 ± 0.1 VDC
- .. Resistance between T1 and T2: $3k \sim 12k\Omega$



Idle Air Control Valve:

- .. Operating voltage: $7.5 \sim 14.2$ VDC
- .. Solenoid resistance: $53\Omega \pm 10\%$
- .. Solenoid inductance: $33mH \pm 20\%$

3.5.3.4 Operating Conditions

Normal Operating Temperature: $-30 \sim 120^\circ\text{C}$

3.5.3.5 Throttle Body Removal

- .. Disconnect negative terminal of the battery
- .. Disconnect electric lead wire of throttle position sensor coupler, stepper motor coupler and MAP/MAT sensor coupler (if this sensor is mounted on the throttle body)
- .. Disconnect accelerator cable from throttle body

- .. Remove air cleaner outlet hose and throttle body outlet hose

3.5.3.6 Cleaning Procedure

If there is cover on the bottom, it may be removed and cleaned using carburetor cleaner (3M make recommended). Once the throttle body cover is removed, spray the throttle-body cleaner inside the shipping air passage, and use the brushes to gently dislodge the dirt, gum and varnish that are present. Do not let the by pass holes be blocked by dirt or foreign particles.

3.5.3.7 Throttle Body Installation

Reverse the procedure for installation noting the following:

- .. Adjust accelerator cable play
- .. Check to ensure that all removed parts are back in place.
- .. Reinstall any necessary part which have not been reinstalled

3.5.3.8 Precautions

- .. Do not submerge TPS in any cleaning fluid.
- .. Always open the throttle valve using the throttle cable or lever.
- .. Do not hold the valve at opening position by inserting tools or any sticks into the bore. The valve may be warped and the bore may be scratched. This type of damage may keep the throttle from opening easily or fully closing.

3.5.3.9 Handling - DOs & DONTs

ACTION	REASON
DO: Use care during assembly of harness to throttle body.	Avoid terminal damage.
DO: Avoid any liquid contamination in the throttle body area.	Ensure proper operation.
DO: Unload and install units one at a time from packing trays.	Damage may be done to critical components.
DO: Return any dropped, damaged, or suspect material with a tag that describes the problem. (Only warranty cases)	Ensure fast and correct diagnosis of root cause.
DO: Remove and discard protective caps just before assembling mating components.	Protects system from contamination, which can prevent proper operation.
DO: clean the by pass passage after removing bottom cover	To ensure good idle stability
DO NOT: Use any dropped or impacted unit.	Internal damage may have occurred or emissions settings may have been upset.
DO NOT: Store units without protective caps in place.	Contamination may impair correct operation.
DO NOT: Ship or store near saltwater without protection.	Corrosion buildup may impact proper operation.
DO NOT: Exposed to environmental conditions (Moisture) prior to complete vehicle installation.	Corrosion buildup may impact proper operation.
DO NOT: Apply any voltage other than system voltage for testing.	Damage could occur
DO NOT: Apply excessive band clamp loading	Damage could occur.
DO NOT: Remove packing in a way that allows contact between parts.	Minimum air leakage could be affected and/or other damage could occur.
DO NOT: Release the throttle cam abruptly from any position without the throttle linkage attached.	Damage could occur.
DO NOT: Let the by pass holes be blocked by dirt or foreign particles.	This could effect idle stability
DO NOT: Rake, stage, or handle parts in a manner that allows contact between parts.	Damage will occur.

3.5.4 Engine Cool ant Temperature Sensor

3.5.4.1 Description and Working Principle

This sensor is used in water cooled engines. It provides a resistance that varies as a function of temperature within prescribed tolerance limits. The sensor has a

negative temperature coefficient of resistance. This is a non-serviceable part.

3.5.4.2 Appearance



3.5.4.3 Installation Requirements

Dynamic Torque Requirement: The sensor shall be hand into the application and then driven by a driver with a maximum no load speed of 400 rpm or installed to the desired torque by a hand torque wrench (5/8" hex). The recommended installation torque is:

- Minimum: 20 N·m
- Maximum: 25 N·m

Static Torque Requirement: The torque required to remove the sensor from the mating hole shall be within 200% of the installation torque mentioned above.

3.5.4.4 Operating Environment

This device is intended for use in engine coolant and air cooled applications and shall withstand such an under hood environment.

Normal Operating Temperature: -40°C ~ 135°C (continuously).

Relative Humidity: 0 to 100% RH.

Typical Pressure: When installed at the minimum torque the sensor shall be capable of sealing engine coolant with a positive pressure of 206.8 kPa (30 psi) at 135°C applied to the probe tip end of the sensor.

Extreme Operating Environment: Maximum temperature excursion to 150°C for 1 hour.

3.5.4.5 Storage Environment

Storage temperature: -40°C to 120°C for an indefinite duration

Transport at altitudes to: 13,700 m for an indefinite duration Electrical Environment

Typical Voltage: The sensor circuit operates with a DC voltage reference of 5 ± 0.1 VDC.

Maximum Excitation Current: The sensor calibration shall not be affected by a current source of less than 1 mA at all temperatures.

3.5.4.6 Sample Cleaning

When necessary the samples may be cleaned in isopropyl alcohol for one minute with mating connectors in place and then air-dried

3.5.5 Intake Air Pressure and Temperature Sensor(MAP&MAT)

3.5.5.1 Description and Working Principle

This sensor has two functions. The first is the intake manifold air temperature, it provides a resistance that varies as a function of temperature within prescribed tolerance limits. The second is the intake manifold air pressure; it provides a voltage varies as the intake air pressure.

3.5.5.2 Appearance



The appearance of the MAP&MAT Sensor is shown as above.

3.5.5.3 Operating Environment

.. This device is intended for use in inlet manifold for sensing air temperature and pressure which shall withstand such an under hood environment.

.. Pressure Range: 20~102kPa

.. Temperature Range: -40~105°C

.. Relative Humidity: 0 to 100% RH.

.. Extreme Operating Environment: Maximum temperature excursion to 125°C for 2 hours.

3.5.5.4 Storage Environment

.. Storage temperature: -50°C to 150°C for an indefinite duration

3.5.5.5 Electrical Environment

.. Typical Voltage: The sensor circuit operates with a DC voltage reference of 5 ± 0.1 VDC.

3.5.5.6 Sample Cleaning

.. When necessary the samples may be cleaned in isopropyl alcohol or gasoline for one minute with mating connectors in place and then air-dried

3.5.6 Oxygen Sensor

3.5.6.1 Description and Working Principle

This sensor is a device for monitoring the residual oxygen in the exhaust of an internal combustion engine. It consists of the wide range sensor and stoichiometric sensor. Usually we use stoichiometric sensor on the small engine. It is the feedback element for engine closed loop control.

3.5.6.2 Appearance

The appearance of the Engine Oxygen Sensor is shown as below



3.5.6.3 Technical Parameters

- .. A/F ratio rich threshold: >750 mVDC
 - .. A/F ratio lean threshold: <120 mVDC
 - .. Heater power: 7.0W
- (These parameters as above are measured basing on 450°C (engine dyno), typically on 70% duty at 10Hz and under 13.5V)
- .. Heater part resistance: $9.6 \pm 1.5\Omega$
- (This parameter is measured basing on 21°C)
- .. Operating temperature range: $260\text{--}850^{\circ}\text{C}$

3.5.6.4 Fuel Quality Requirements

- .. $\text{Pb} \leq 0.005\text{g/L}$
- .. $\text{P} \leq 0.0002\text{g/L}$
- .. $\text{S} \leq 0.04\%$ (weight proportion)x
- .. $\text{MMT} \leq 0.0085\text{g/L}$
- .. $\text{Si} \leq 4\text{ppm}$

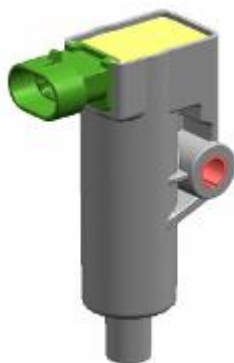
3.5.7 Ignition Coil

3.5.7.1 Description and Working Principle

This coil provides energy to the spark plug in the combustion chamber. The coil itself doesn't have a driver. The high voltage tower of the coil is connected to the spark plug using a high voltage cable assembly. This is a non-serviceable component.

3.5.7.2 Appearance

The appearance of the Ignition coil is shown as below.



3.5.7.3 Technical Parameters

- .. Input voltage: 9~14VDC
- .. Output voltage: $\sim 25\text{--}30\text{KV}$
- .. Operating temperature: $-30 \sim 110^{\circ}\text{C}$
- .. Storage temperature: $-40 \sim 155^{\circ}\text{C}$

Mounting Torque: 8.8~11.8Nm

3.5.7.4 Installation requirements

The vehicle frame provides the mounting surface and mounting holes.

Mount coil close to the spark plug and keep the plug wire length very short (less than 6").

Mount coil away from any pick coil device. Especially, a VR type Crank / Cam sensor. Keep a Min distance of 150 mm (around 6") between coil and any VR sensor device.

Never route the coil C- wire with the same bundle as the Crank sensor wires.

There is around 200 V peak potential between C- wire and engine ground. This voltage potential could cause a noise on sensor cables.

3.5.7.5 DOs and DONTs

ACTION	REASON
DO NOT: Install the low voltage connectors with the power applied	This might cause an unwanted secondary firing, possibly leading to personal injury
DO NOT: Use a screw driver to assist in removing secondary boots from the secondary tower. Use tools designed for secondary removal.	It is possible to damage a secondary lead in such a manner that creates an electrical path to outside the system permitting improper system operation misfire, or even possible personal injury if arcing occurs.
DO NOT: Use parts that have been dropped or display physical damage	Damaged components can lead to premature failure.
DO NOT: Scratch or apply any non approved material to the surface of the high voltage tower which mates with the high voltage secondary leads.	This can jeopardize the seal integrity of the mating surfaces which in turn can create a secondary high voltage leak path.
DO NOT: Strike any part of the ignition system with a tool or other object.	This can lead to physical damage which can cause a system malfunction or failure.
DO NOT: Permit paint or other sprayed materials to be sprayed onto the electrical connectors.	Insulating type sprays can create a high resistance or open connection. And, a conductive type spray can create an electrical short condition.
DO NOT: Support the ignition system by the wiring harness or plug wire.	These leads are not designed to support the weight of the ignition system. It can create a poor electrical connection Or become disconnected allowing the system to fall and be subjected to physical damage
DO NOT: Pierce or probe the secondary leads.	This creates an electrical path to outside the system permitting improper system operation, misfire, or even possible personal injury if arcing occurs.
DO NOT: Operate without the spark plug attached	If a technician or mechanic comes in contact with the high voltage generated during operation, personal injury may occur. Or, if the engine is operated under this condition, unburned fuel may fill the converter area creating a potential hazard
DO NOT: Share ignition component wiring with other components, Dedicated wiring is required.	This prevents electrical cross talking between components which can lead to component malfunction.
DO NOT: Apply voltage to the ignition system other than vehicle system voltage for testing purposes.	This can cause reduced performance or an electrical malfunction of the ignition system
DO NOT: Use high impact tools to apply the sparkplug boot to the ignition secondary towers. Installation of the high voltage secondary leads by hand is preferred.	Damage to the coil tower, secondary boot, or mating connection surfaces might occur.
DO: Install the secondary leads before connecting the primary leads.	In the event the low voltage connection has been made and the power applied, unwanted secondary output might occur possibly resulting in injury, damage the ignition component, and test equipment

DO: Take care when working around the ignition system.	The high voltage produced by the coil secondary circuit can cause personal injury and/or damage test equipment
DO: Proper handling and shipping methods need to be in place to reduce the risk of damage due to impact, moisture, or contamination	Damaged components can lead to premature failure.
DO: Avoid unnecessary disconnecting and connecting of the electrical components.	The electrical connections are not designed for repeated connection and disconnection.
DO: Insure the low voltage connectors are entirely seated and the locking mechanism is engaged.	This prevents intermittent electrical connections leading to an improper ignition system operation.
DO: Use approved connector breakouts when testing the ignition system.	Connector and/or component damage may occur.
DO: Insure the appropriate seals are included in the connector system.	Liquid intrusion into the terminal connection area might occur causing an electrical intermittent or short condition. In the event of severe terminal corrosion, an open condition might occur.
DO: Operate with gasoline based internal combustion engines.	Other fuels or combustion designs may require additional design considerations
DO: The power feed line should be fused.	This could protect the system in the event of an electrical short
DO: The module heat sink and back plate must not be used as a connection point when jump starting the engine	The high level of voltage and current which the module could be subjected to, could cause module performance degradation or failure.
DO: Connection of the module back plate to vehicle ground is desirable whenever possible	This greatly reduce potential ground loops and acts as a heat transfer source from the module.
DO: The ignition system ground wire should be kept as short as possible. And, when permissible, should be grounded at the same engine block position as the engine controller	This would greatly reduce the possible of unwanted electrical ground loops.
DO: The electrical wiring to the ignition system should be routed so that the conductors are protected from excessive heat, damage, and wear.	Helps prevent electrical intermittent, open or shorted operating conditions.
DO: Ignition secondary leads should not be routed with the ignition primary harness or any other electrical harness.	Voltage spikes can be transmitted from the secondary cables into other leads which are in close. This could create a component performance degradation or failure condition
DO: Spark plug wires(secondary leads) & primary wiring: - must not contact sharp surface - must not be under tension between fixed points - must be clear of moving parts (belts, fan, etc...) - must be protected from or kept at least 125 mm away from radiant heat source exceeding 400 F. - must be protected from environmental damage (dirt, splash, oils, fluids, etc....) - must be retained, secured or insulated to prevent pinching, mis-routing, rattles, and squeaks	- Spark plug wires carry very high voltage (30,000 volt). If the secondary lead loses its dielectric characteristics thru being nicked, cut , chaffed, then an arc thru to a nearby ground could take place. This kind of condition could lead to misfire, no start, or premature failure of ignition system.
DO: Not all fasteners are designed for repeat use. Beware of fastener specifications. All harnesses should be supported within 6" of a mating connection.	Adequate retention force might not be achieved if the fastener is not designed to be reused. Mating connections are not designed to support the weight of the harness assembly
DO: For removing spark plugs follow the following steps: 1- Grasp the spark plug boot and gently rotate 90°; and then pull the spark plug boot and cable away from the spark plug 2- Before removing spark plug, brush or air blast dirt away from the well areas 3- Use correct size deep socket wrench to loosen each spark plug one or two turns	To remove spark plugs from Aluminum heads, allow the engine to cool. The heat of the engine, in combination with a spark plug that is still hot, may cause the spark plug threads to strip the cylinder head upon removal Use goggles to protect eyes from dirt when applying compressed air to spark plug wells
DO: Cleaning a spark plug could be done as follow: 1- wipe all spark plug surfaces clean....remove oil, water, dirt and moist residues. 2- If the firing end of spark plug has oily or wet	- Cleaning a spark plug will reduce the voltage required for an electrical arc(spark) across the electrodes - Cleaning & re-gapping will not restore a used spark plug to a new condition. It may be more economical

deposit, brush the spark plug in an approved, non-flammable and non-toxic solvent. Then dry the spark plug thoroughly with compressed air 3- Use a propane torch to dry wet-fuel fouled plugs. Allow the torch flame to enter up the center electrode insulator. Allow plug to cool down 4- If the spark plug threads have carbon & scale deposits, clean with wire brush, taking care not to injure the electrode or the insulator tip	and efficient to replace used sparkplugs with new plugs instead of cleaning. - Sooted plugs should be replaced - Do not cool by using water or any liquid - Clean threads permit easier installation and proper seating which will maximize transfer heat away from the plug
DO: Regap spark plugs to the exact measurement specified by the engine manufacturer to keep the best fuel economy and proper engine performance - Use round wire-type gauge for an accurate measure of gap on all used spark plugs - when gapping a spark plug only the side electrode is moved. The center electrode must not be moved	- Too wide a gap could cause the plug to misfire(higher required ignition voltage). - Too narrow of a gap could affect idle stability - A flat gauge can't accurately measure the spark plug on used plugs
DO: When replacing spark plugs with new ones, always use equivalent plugs with same heat range, thread, size, etc....	- Higher heat range plug(hotter plug) could lead to pre-ignition & possible piston damage - Lower heat range (colder plug) could lead to cold fouling & emission problem
DO: For installing spark plugs follow the following steps: 1- make sure the cylinder head threads and sparkplug threads are clean. Make sure the sparkplug thread is free of dings and burrs. If necessary, use a thread chaser and seat cleaning tool. 2- Make sure the spark plug gasket seat is clean, then thread the gasket to fit flush against the gasket seat. Tapered seat plugs do not require gaskets 3- Screw the spark plugs finger-tight into the cylinder head. Then, use a torque wrench to tighten spark plugs following manufacturer's recommendation). Torque is different for various plug type & cylinder head material	- If the thread is damage, it prevents a good heat transform from the shell to the cylinder head - Do not use any type of anti-seize compound on spark plug threads. Doing this will decrease the amount of friction between the threads. The result of the lowered friction is that when the spark plug is torqued to the proper specification, the sparkplug is turned too far into the cylinder head. This increases the likelihood of pulling or stripping the threads in the cylinder head - Over-tightening of a spark plug can cause stretching of the spark plug shell and could allow blow by to pass thru the gasket seal between the shell and insulator. Over-tightening also results in extremely difficult removal

3.5.8 Diagnostic Tools (Motor Scanner for MT05. 3)



1	[Left Arrow] Key	To return to the previous interface
2	[Up Arrow] Key	To move the cursor to upper item in the menu
3	[Down Arrow] Key	To move the cursor to down item in the menu
4	[Left Arrow] Key	To move the cursor to left item in the menu
5	[Right Arrow] Key	To move the cursor to right item in the menu
6	[Enter] Key	To confirm and execute this operation

3.5.8.1 Precautions

Motor-Scanner is a precision instrument and should be protected from vibration and impact.

If the unit does not run correctly or the screen is unstable when first turned on, disconnect it from the main lead and try again.

Make sure the DLC is always firmly inserted into the diagnostic socket.

Never test electrical signals that exceed the limit of specifications.

Test cannot be performed by the person who is driving the car.

This unit should be used and stored in the following conditions:

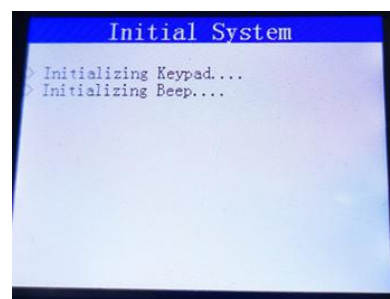
Ambient temperature: 0~50°C

Relative humidity: <90%

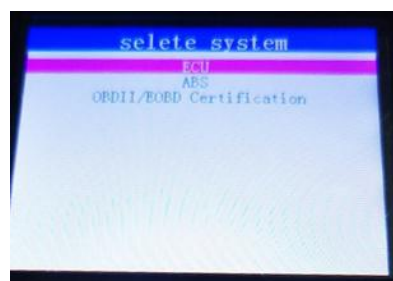
3.5.8.2 Preparations Connection

- Find the 6PIN diagnostic socket on the vehicle.
- Connect one end of the diagnostic main cable to the diagnostic socket on the vehicle. Turn on the key.

When power is on normally, the unit will display: ➡



Seconds later, the unit will display: ➡

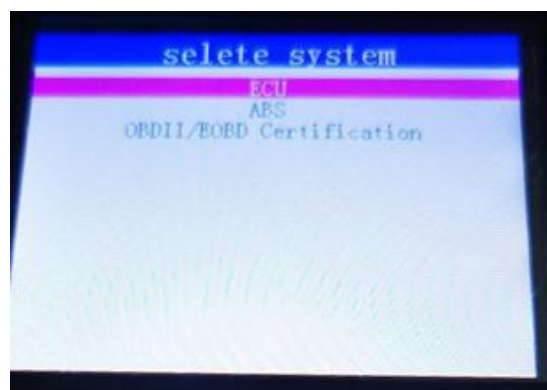


3.5.8.3 Functions

Motor-Scanner can be used to diagnose Engine Management System with functions: Read DTC, Clear DTC, Data Stream, Status Stream, and Record Data.

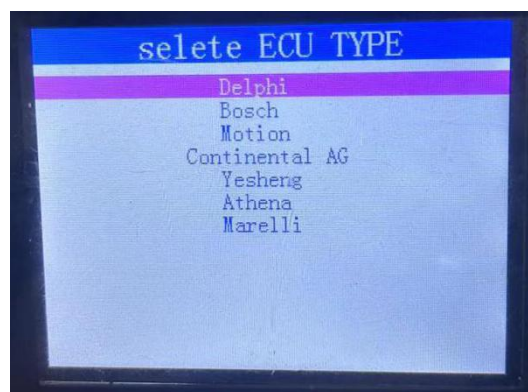
Operations

When the unit is powered up, the screen will display the interface as right. ➡

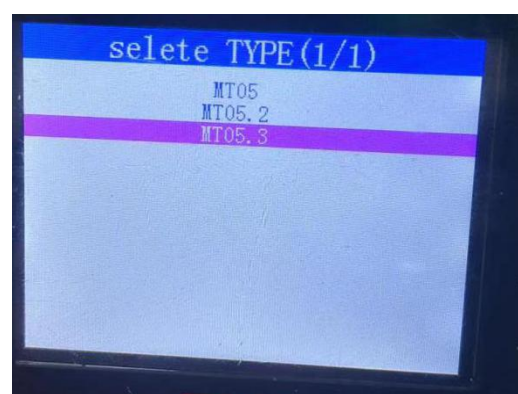


Here, we take diagnostic function for demonstration.

Select ECU and press  key, it will display an interface for EFI system selection, as shown right.



Select 'Delphi' and press  key, it will display information about the ECU version list, as shown right



Select 'MT05.3' and press  key, it will display information about function list, as shown right



Available functions are as follows:

- Read DTC
- Clear DTC

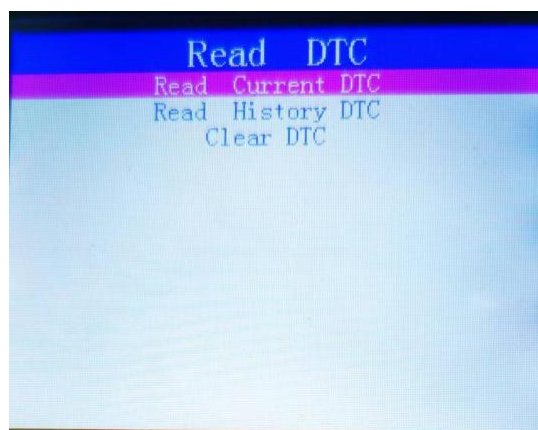
- Data Stream
- Record Data

Press  or  or  or  key to select function you needed, as shown right

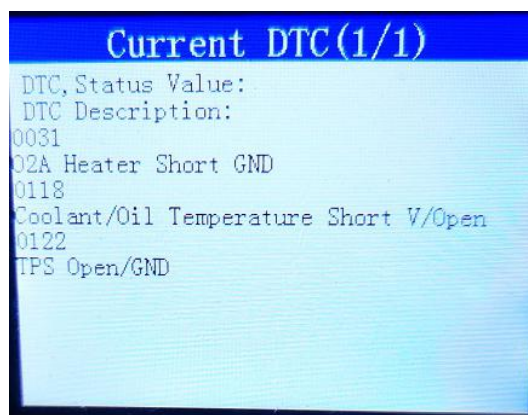


1. Read DTC

Select 'Read DTC' , and press , it will display function list as right.

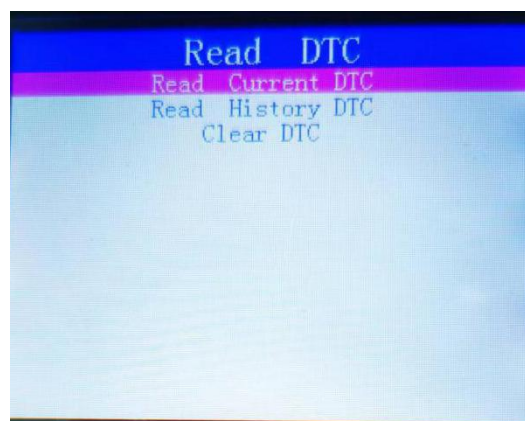


Select 'Read Current DTC' and press , If there are some malfunctions with the vehicle's EFI system, the screen will display fault information as right.

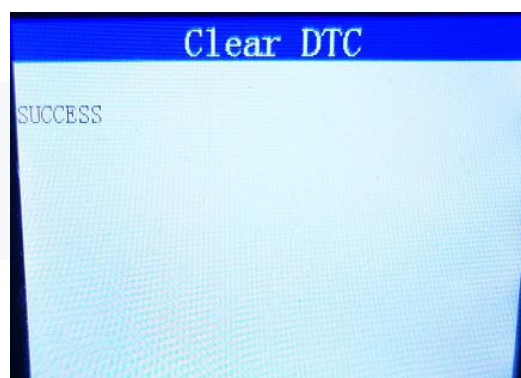


2. Clear DTC

Select 'Read DTC' , and press , it will display function list as right.



Press  key to select 'Clear DTC', the screen will display "SUCCESS", as shown right. This means the fault code has been removed successfully.

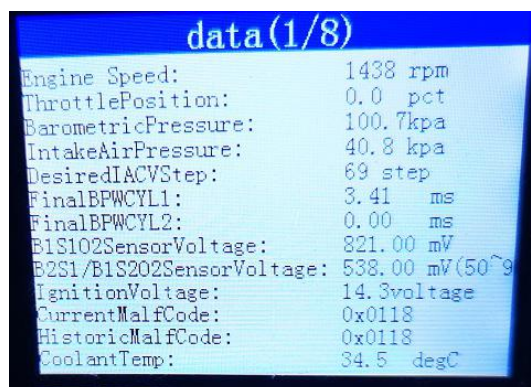


3. Data Stream

Select 'Read Date' , and press , it will display function list as right.



Select 'Display Date', and press , it will display Engine information as right.

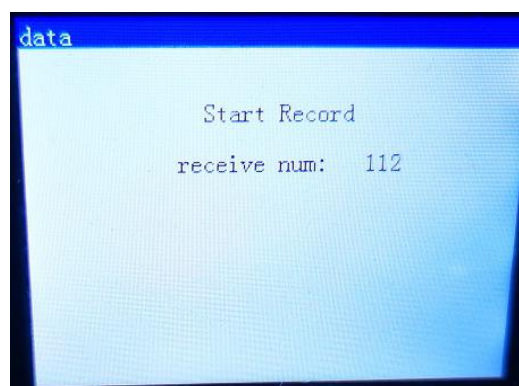


4. Data Record

Select 'Read Date' , and press , it will display function list as right.



Press  to select 'Record Data', it will display as right. (The recorded data can be used to analyze engine conditions)



3.5.8.4 ECU Malf Code

Malf code	Description
P0118	Coolant/Oil Temperature Sensor Circuit High Voltage or Open
P0117	Coolant/Oil Temperature Sensor Circuit Low Voltage
P0116	Coolant/Oil Temperature Sensor Signal Malfunction
P1116	Performance/Out of Range
P0336	CKP Sensor Noisy Signal
P0335	CKP Sensor No Signal
P2301	Cylinder 1 Ignition Coil "A" Short to High Voltage

P2300	Cylinder 1 Ignition Coil "A" Short to Low Voltage/Open
P0123	TPS Circuit Short to High Voltage
P0122	TPS Circuit Low Voltage to Open
P0459	CCP Short to High Voltage
P0458	CCP Short to Low/Open
P00D1	Cylinder 1 Sensor Heater Circuit Low Current (Heater failure)
P0232	Fuel Pump Relay Short to High Voltage
P0231	Fuel Pump Relay Short to Low Voltage/Open
P014D	Cylinder 1 Sensor Reaction Time From Thin to Thick Slow
P014C	Cylinder 1 Sensor Reaction Time From Thick to Thin Slow
P0601	ECM Read-Only Memory Check Error ECM
P0262	Cylinder 1 Fuel Injector Short to High Voltage
P0261	Cylinder 1 Fuel Injector Short to Low Voltage/Open
P3106	Steady State Intake Pressure Low
P0108	MAP Sensor Circuit High Voltage
P0107	MAP Sensor Circuit Low Voltage or Open
P0105	MAP Signal Stuck
P0114	ITA Signal Erratic change
P0113	IAT Circuit High Voltage or Open
P0112	IAT Circuit Low Voltage
P0111	IAT Signal Stuck
P0650	MIL Circuit Malfunction
P2195	Cylinder 1 Sensor PE Thin
P0132	O2S 1 Circuit High Voltage
P0131	O2S 1 Circuit Low Voltage
P0300	Misfire incident detected
P0301	Cylinder 1 Misfire
P0031	Cylinder 1 O2S Sensor Heater Short to Low Voltage/Open
P0032	Cylinder 1 O2S Sensor Heater Short to High Voltage

P0563	System Voltage High
P0562	System Voltage Low
P0500	VSS No Signal
P2257	Secondary Air Supply Valve Open/Short to Low Voltage
P2258	Secondary Air Supply Valve Short to High Voltage
P0850	Park Neutral Switch Error
P1693	Tachometer Circuit Low Voltage
P1694	Tachometer Circuit High Voltage
P0505	Idle Speed Control Error

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3.6 Troubleshooting

Complaint	Symptom and Possible Causes	Remedy
Engine will not start or is hard to start	Compression is Too Low	
	1. Worn cylinder	Replace
	2. Worn piston ring	Replace
	3. Leakage with cylinder gasket	Replace
	4. Wear valve guide or improper valve seating	Replace or repair
	5. Loose spark plug	Tighten
	6. Slow cranking of starting motor	Check electrical part
	7. Faulty valve timing	Adjust
	8. Improper valve clearance	Adjust
	No Sparking from Spark Plug	
Engine stalls easily or has unstable idle speed	1. Fouled spark plug	Clean or Replace
	2. Wet sparkplug	Clean and dry or replace
	3. Defective ignition coil	Replace
	4. Open or short circuit with pickup coil	Replace
	5. Faulty generator	Replace
	No Fuel Reach Into Carburetor	
	1. Clogged fuel tank vent tube	Clean or Replace
	2. Clogged or faulty fuel valve	Clean or Replace
	3. Faulty carburetor needle valve	Replace
	4. Clogged fuel hose	Replace
Engine stalls easily or has unstable idle speed	5. Clogged fuel filter	Clean or Replace
	Transfer is not in Neutral position	Set to Neutral position
	1.Improper valve clearance	Adjust
	2.Improper valve seating	Replace or Correct
	3.Faulty valve guide	Replace
	4.Worn rocker arm or rocker arm shaft	Replace
	5.Fouled spark plug	Replace
	6.Improper spark plug gap	Replace or Adjust
	7.Faulty ignition coil	Replace
	8. Clogged idle-vale inlet & exhaust pipe	Adjust Fuel level
	9.Faulty magneto	Replace

Complaint	Symptom and Possible Causes	Remedy
Poor engine running in high-speed range	1. Weak valve spring 2. Worn camshaft 3. Fouled spark plug 4. Insufficient spark plug gap 5. Improper valve timing 6. Faulty ignition coil 7. Weak high pressure oil pump, resulting in poor fuel supply 8. Dirty air filter	Replace Replace Clean or replace Adjust or replace Adjust Replace Adjust or replace Clean or replace
Exhaust smoke is dirty or thick	1. Excessive engine oil 2. Worn piston ring 3. Worn valve guide 4. Scored or scuffed cylinder wall 5. Worn valve stem 6. Worn valve stem oil seal	Check oil level and drain Replace Replace Replace Replace Replace
Engine lacks power	1. Improper valve clearance 2. Weak valve spring 3. Improper valve timing 4. Worn cylinder 5. Worn piston ring 6. Improper valve seating 7. Fouled spark plug 8. Improper spark plug gap 9. Clogged carburetor jet 10. Improper fuel level in fuel chamber 11. Dirty air filter 12. Worn rocker arm or rocker arm shaft 13. Air leakage from air intake pipe 14. Excessive engine oil	Adjust Replace Adjust Replace Replace Replace or Correct Clean or replace Clean or replace Clean or replace Adjust fuel level Clean or replace Replace Tighten or replace Check oil level and drain
Engine overheats	1. Carbon deposit on piston top 2. Insufficient or excessive engine oil 3. Faulty oil pump 4. Clogged oil passage 5. Air leakage from air intake pipe 6. Incorrect engine oil 7. Faulty cooling system(see5.2.9)	Clean Check level, add or drain Replace Clean Tighten or replace Change engine oil

Complaint	Symptom and Possible Causes	Remedy
Engine is noisy	Valve Chatter - Excessive valve clearance - Worn or broken valve spring - Worn rocker arm or camshaft	Adjust Replace Replace
	Noise from Piston - Worn piston - Worn cylinder - Carbon deposit in combustion - Worn piston pin or pinhole - Worn piston ring or piston ring groove	Replace Replace Clean Replace Replace
	Noise from Timing chain - Stretched chain - Worn sprocket wheel - Faulty chain tensioner	Replace chain & sprocket Replace chain & sprocket Repair or replace
	Noise from Clutch - Worn or damaged crankshaft spline - Worn inner race spline	Replace Replace
	Noise from Crankshaft - Worn or burnt crank pin bearing - Excessive thrust clearance	Replace Replace
	Noise from CVT - Worn or slipping drive belt - Worn rollers in primary sheave	Replace Replace
	Noise from Transmission - Worn or damaged gear - Worn or damaged input or output shafts - Worn bearing	Replace Replace Replace
Slipping Clutch	- Worn or damaged clutch shoes - Weakened clutch shoe spring - Worn clutch housing - Worn or slipping drive belt	Replace Replace Replace Replace

CHAPTER 4 CHASSIS

WARNING

The parts of different types/ variants/ versions maybe un-interchangeable, even some parts have almost same appearance. Always refer to Parts Manual of each UTV model for spare parts information and service.

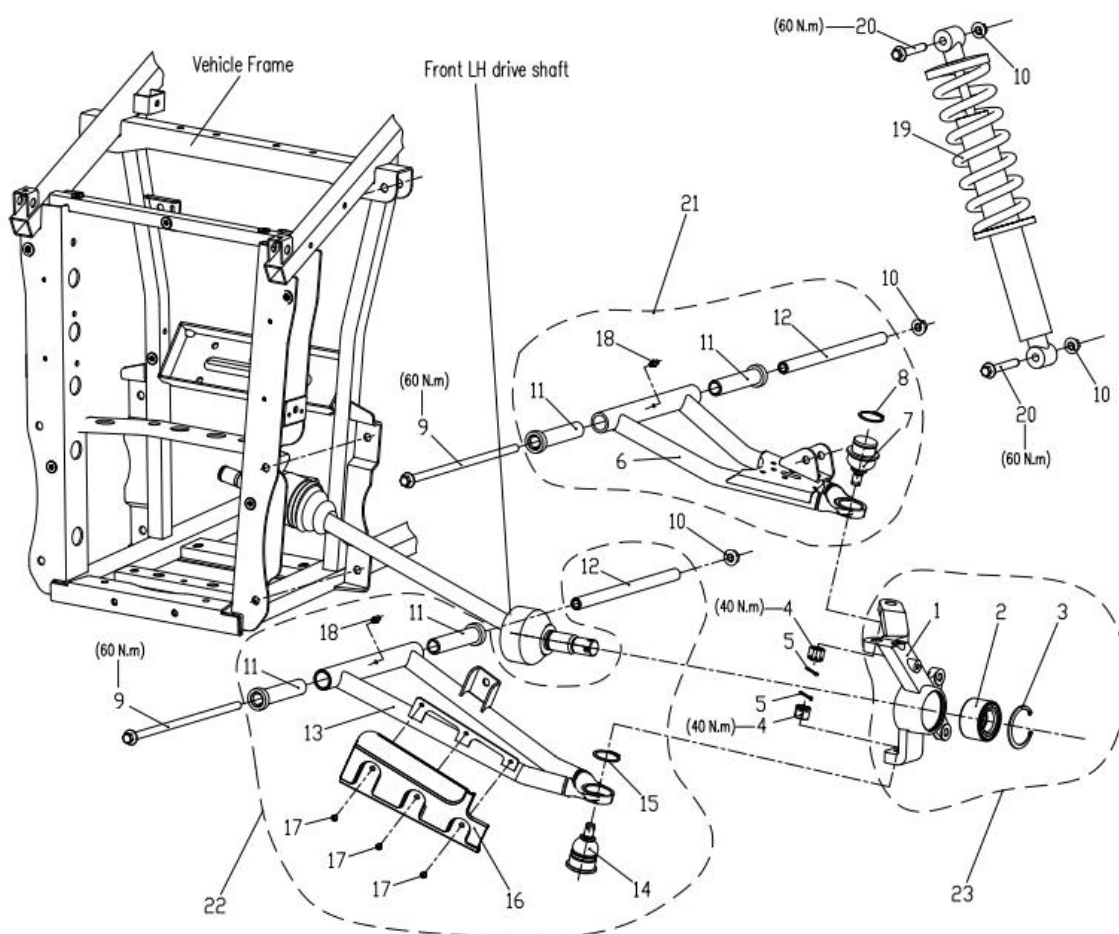
4.1 FRONT A-ARM REPLACEMENT

4.2 REAR A-ARM REPLACEMENT

4.3 REAR STABILIZER BAR REMOVAL/INSTALLATION

4.4 BOX REMOVAL/INSTALLATION

4.5 STEERING ASSEMBLY REMOVAL/INSTALLATION

4.1 FRONT A-ARM REPLACEMENT

- | | | |
|--------------------------------|-----------------------------------|---------------------------|
| 1. Carrier Bearing,Front,Lh; | 2. Bearing; | 3. Circlip 55 |
| 4. Nut M12×1.25; | 5. Pin 3.2×22; | 6. Arm Upper Frt Lh |
| 7. Ball Joint,Upper; | 8. Circlip 32; | 9. Scr Hxfl,Frt Arm |
| 10. Nut M10; | 11. Bushing,Long; | 12. Shaft Pivot |
| 13. Arm Lwr Frt Lh; | 14. Ball Joint,Lwr; | 15. Circlip 34 |
| 16. Cover, Arm Lwr Frt Lh; | 17. Screw M5X10; | 18. Grease Fitting M6 |
| 19. Front Shock Absorber Assy; | 20. Bolt M10X1.25X57; | 21. Arm Upper Frt Lh Assy |
| 22. Arm Lwr Frt Lh Assy; | 23. Carrier Bearing Wheel Lh Assy | |

1. Elevate and safely support vehicle with weight removed from front wheel(s).

2. Remove the wheel nuts and wheel.

NOTE: To ease the removal of the spindle bolt, remove the hub cap and loosen the spindle bolts before removing the wheel.

3. Remove the brake caliper. Suspend the brake caliper from the frame with a wire.

NOTE: Do not let the brake caliper hang from the brake line or damage may occur.

4. Remove the spindle nut, and washer. Remove the hub assy by sliding it off of the shaft.

5.Remove cotter pin from ball joint stud at wheel end of A- arm and loosen nut until it is flush with end of stud.

6.Using a soft face hammer, peen nut to loosen A- arm from bolt. Remove nut and A-arm from hub strut assembly.

7.Loosen and remove two bolts on A-arm, and remove A-arm.

8.Examine A-arm bushing. Replace if worn or tore. Discard hardware.

9.Install new A-arm assembly onto vehicle frame. Install new bolts and new nuts.

NOTE:

Tighten the nuts only finger-tighten at this time. They will be tightened to the final torque after the front wheels are installed and the vehicle is on the ground.

 WARNING

DO NOT reuse old bolts. Serious injury or death could result if fasteners come loose during operation.

10.Attach A-arm to strut assembly. Tighten ball joint nut to 25 ft. lbs. (35Nm). If cotter pin holes are not aligned, tighten nut slightly to align. Install a new cotter pin with open ends toward rear of machine. Bend both ends in opposite directions around nut.

11. Re-install the hub assy. Install washer, and the spindle nut to 103 ft.lbs (140Nm). Aim the gap of the shaft for use the chisel to hit the nut until it locked.

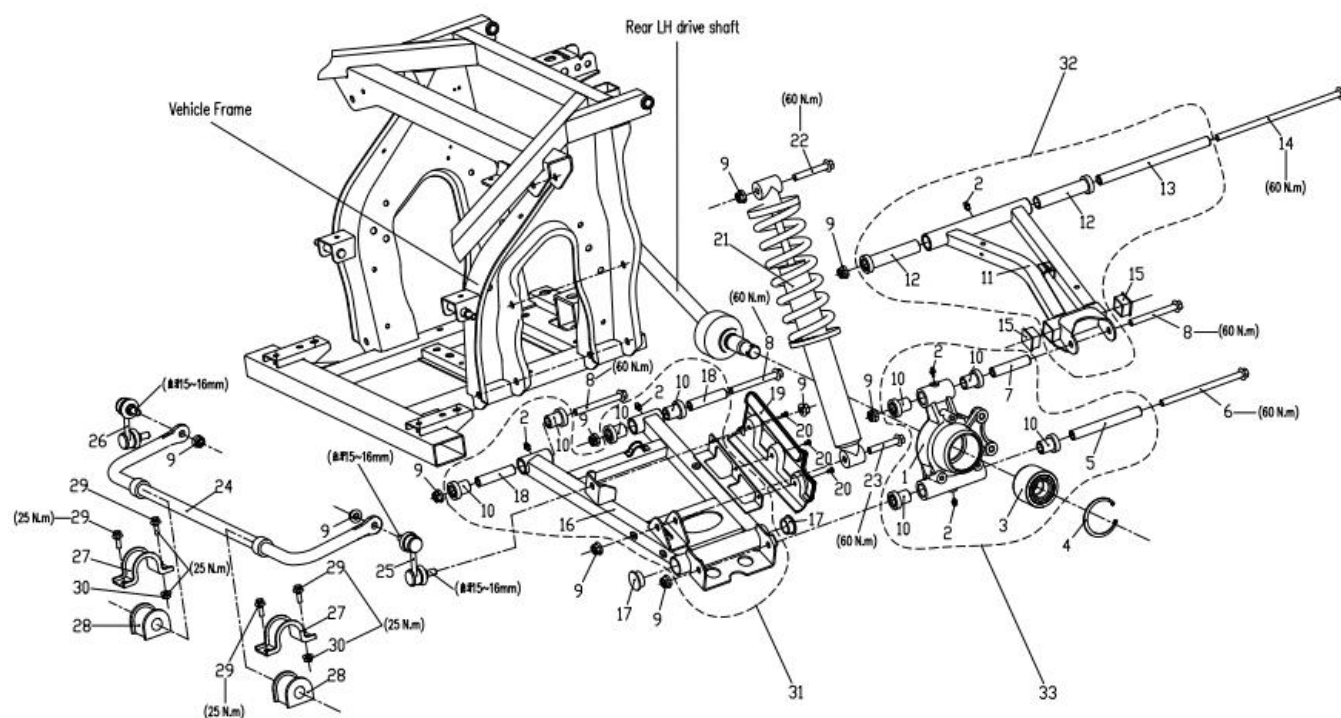
12.Install the brake caliper. Apply Loctite™ 243 to screw threads of the bolts and torque bolts to 18ft. lbs. (25Nm).

13.Install the wheel and torque nuts to 55ft. lbs. (75Nm).

14.lower the vehicle to the ground. Apply Loctite™ 243 to screw threads of the A arm bolts and torque bolts to 37-44 ft. lbs. (50-60Nm).

 WARNING

Upon A-arm installation completion, test vehicle at low speeds before putting into regular service.

4.2 REAR A-ARM REPLACEMENT

- | | | |
|--|-------------------------------|------------------------------|
| 1. Carrier Bearing Wheel Rear Lh; | 2. Grease Fitting M6; | 3. Bearing |
| 4. Circlip 63; | 5. Shaft Pivot ,Lwr; | 6. Scr Hxfl,Rear Arm,Lwr |
| 7. Shaft Pivot ,Upper; | 8. Bolt M10X1.25X90; | 9.Nut M10 |
| 10. Bushing,Short; | 11. Arm Upper Rear Lh; | 12. Bushing,Long |
| 13. Shaft,Rear Upper Arm; | 14. Scr Hxfl, Rear Upper Arm; | 15. Square Rubber Plug |
| 16. Arm Lwr Rear Lh; | 17. Plug; | 18. Shaft,Rear Lwr Arm |
| 19. Cover, Arm Lwr Rear Lh; | 20. Screw M5X10; | 21. Rear Shock Absorber Assy |
| 22. Bolt M10X1.25X62.5; | 23. Bolt M10X1.25X57; | 24. Stabilizer Bar |
| 25. Ball Pin, Lh; | 26. Ball Pin, Rh; | 27. Bracket Stabilizer |
| 28. Bushing Stabilizer; | 29. Bolt M8X20; | 30. Nut M8 |
| 31. Arm Lwr Rear Lh Assy; | 32. Arm Upper Rear Lh Assy; | |
| 33. Carrier Bearing Wheel Rear Lh Assy | | |

1. Elevate and safely support vehicle with weight removed from the rear wheel(s).

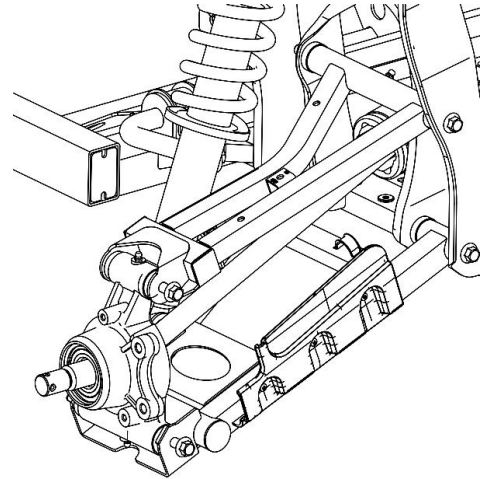
2. Remove the wheel nuts and wheel.

NOTE: To ease the removal of the spindle bolt, remove the hub cap and loosen the spindle bolts before removing the wheel.

3. Remove the brake caliper. Suspend the brake caliper from the frame with a wire.

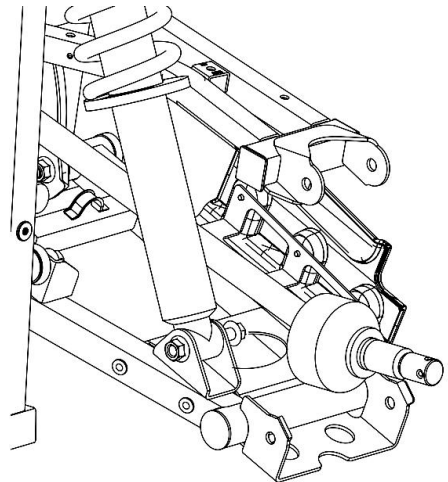
NOTE: Do not let the brake caliper hang from the brake line or damage may occur.

4. Remove the spindle nut, and washer. Remove the hub assy by sliding it off of the shaft.

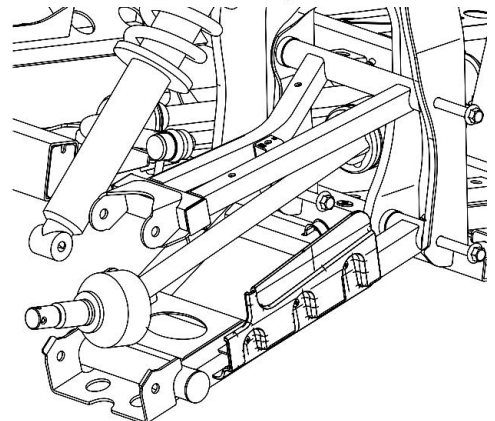


5. Loosen two bolts that secure the rear knuckle to the A-arm. Remove the rear knuckle assembly by sliding it off of the shaft.

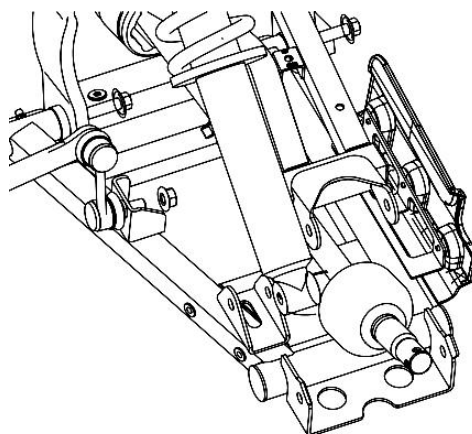
6. Remove the bolt that secures the shock and coil to the lower A-arm.



7. Loosen two bolts that secure the A-arm to frame by alternating each about 1/3 of the way until A-arm can be removed. Perform this procedure on the upper A-arm.



8. Examine the A-arm bushing and A-arm shaft. Replace if worn. Discard hardware.



9. Remove the bottom stabilizer bar nut.

10. Loosen two bolts that secure the A –arm bushing to frame by alternating each about 1/3 of the way until the A-arm can be removed. The lower A-arm should now be free to remove.

11. Insert new A-arm bushings and new A-arm shaft into new A-arm.

12. Install new A-arm assembly onto vehicle frame. Apply Loctite™ 242 to screw threads of the A arm bolts and torque bolts to 44 ft. lbs. (60Nm).

⚠ WARNING

DO NOT reuse old bolts. Serious injury or death could result if fasteners come loose during operation.

13. Attach A-arm to rear knuckle. Tighten upper and lower bolts to 44 ft. lbs. (60Nm).

14. Install the shock and tighten shock bolt to 44 ft. lbs. (60Nm).

15. Install the stabilizer and tighten nut.

16. Re-install the hub assy. Install washer, and the spindle nut to 103 ft.lbs (140Nm). Aim the gap of the shaft for use the chisel to hit the nut until it locked.

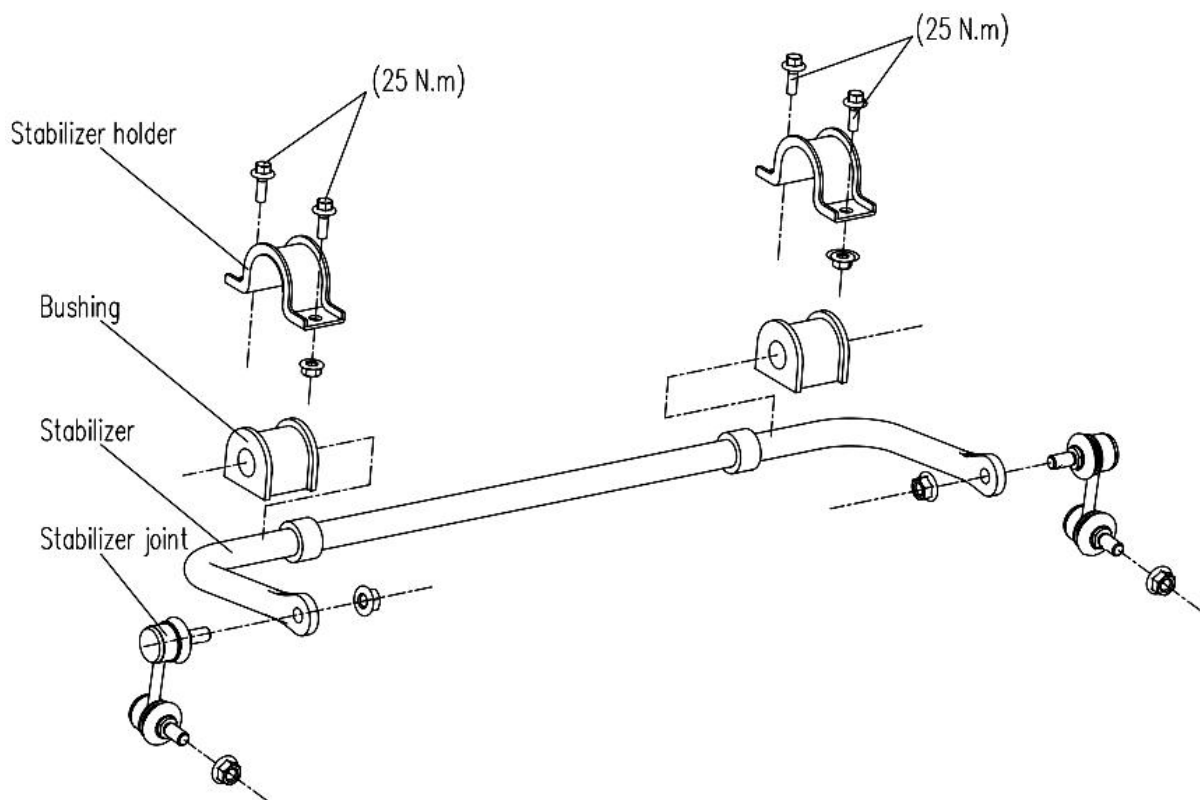
17. Install the brake caliper. Apply Loctite™ 243 to screw threads of the bolts and torque bolts to 18ft. lbs. (25Nm).

18. Install the wheel and torque nuts to 55ft. lbs. (75Nm).

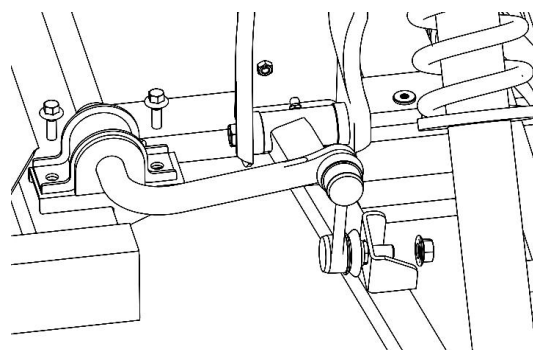
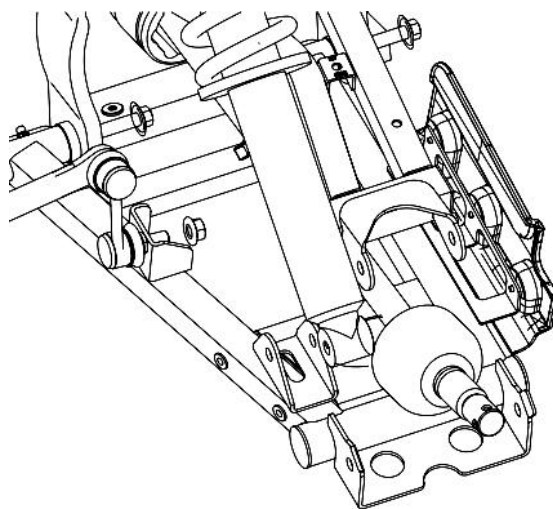
19. lower the vehicle to the ground. Apply Loctite™ 243 to screw threads of the A arm bolts and torque bolts to 44 ft. lbs. (60 m).

⚠ WARNING

Upon A-arm installation completion, test vehicle at low speeds before putting into regular service.

4.3 REAR STABILIZER BAR REMOVAL/INSTALLATION

1. Elevate and safely support vehicle with weight removed from the rear wheel(s).
2. Remove the rear wheel to gain access to the stabilizer bar, each side.
3. Remove the stabilizer bar nut from the lower A-arm, each side.
4. Remove the two bolts that secure the stabilizer bar to the main frame, each side.
5. Remove the stabilizer from the frame.
6. Inspect the stabilizer bar. Inspect the bushings and replace if needed.
7. Inspect the stabilizer joint and replace if needed.
8. Reverse the procedure for installation. Torque the stabilizer bolts to 18.5 ft.lbs (25 Nm).



4.4 BOX REMOVAL/INSTALLATION

Box Removal

1. Disconnect taillight transition line at lower right of the Box from the wiring harness.
2. Lift the box into the dump position.
3. Remove the box shock pin from the frame.
4. Remove the shocks from the shock brackets. Let the shocks fully extend.

CAUTION: Safely support the box during the rest of the removal process. The box is not as stable with the shocks removed.

5. Remove the cotter pin from the hinge pin.
6. Remove the hinge pin.

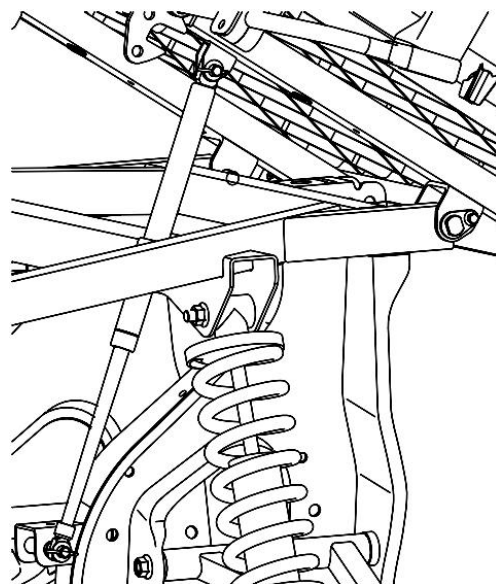
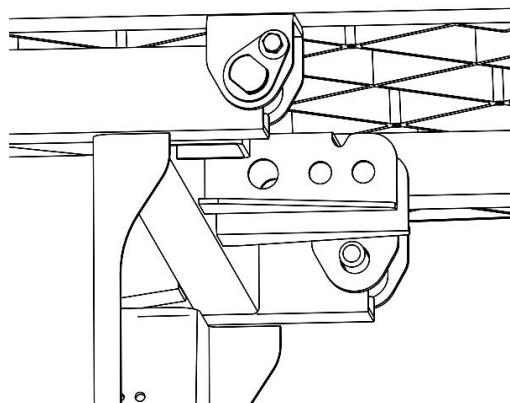
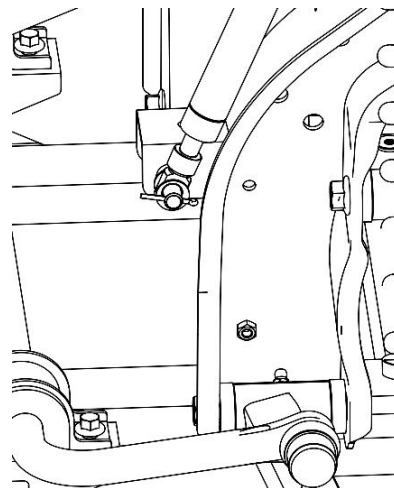
CAUTION: Safely support the box during the rest of the removal process. The box is not as stable with the hinge pin removed.

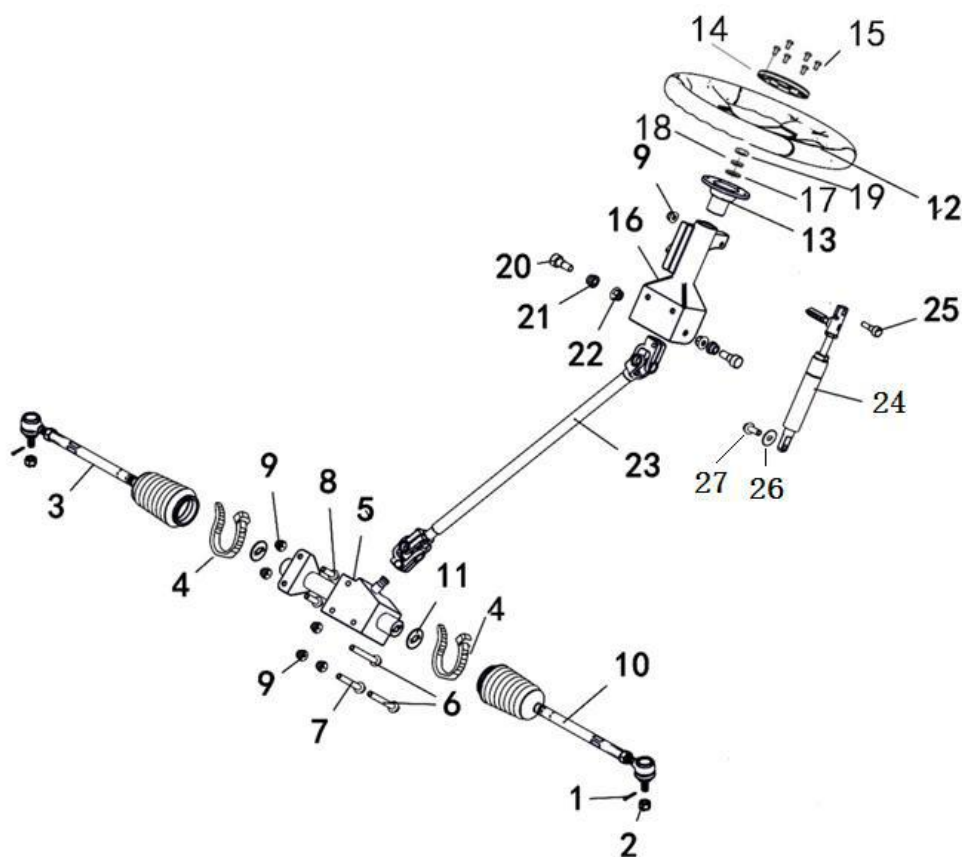
7. With the hinge pins removed, remove the box from the frame. Two people maybe needed to remove the bed from the frame.

CAUTION: Use caution when removing the box. It is recommended to have two people to carefully remove the box from the frame.

Box Installation

1. Place the box onto the frame. Align the hinges of the box with the frame.
2. Install the box hinges.
3. Secure the box hinges with the bolts.
4. With the hinges installed, decompress the box shocks and place them into the shock brackets on the frame.
5. Secure the box shocks with the shock pin.
6. Lower the box and secure the latch.
7. Connect taillight transition line to the wiring harness.



4.5 STEERING ASSEMBLY REMOVAL/INSTALLATION

- | | | |
|-------------------------------|--------------------------------|---|
| 1. Pin 2.5×25; | 2. Nut M10X1.25; | 3. Tie |
| 4. Steering Tie-Rod,Rh; | 5. Steering Motor; | 6. Bolt M8X90 |
| 7. Bolt M8X90; | 8. Bolt M8X20; | 9. Nut M8 |
| 10. Steering Tie-Rod,Lh; | 11. Steering Tie-Rod,Lh; | 12. Steering Wheel |
| 13. Steering Wheel Holder; | 14. Steering Wheel Holder; | 15. Screw M5X10 |
| 16. Steering Column Assy.; | 17. Washer 12; | 18. Washer Spring 12 |
| 19. Nut M12; | 20. Shoulder Bolt M10×1.25×30; | 21. Bushing For Adjustable Steering Wheel |
| 22. Nut M10; | 23. SHAFT STEERING; | 24. Adjustment Cylinder |
| 25. Shoulder Bolt M8×1.25×30; | 26. Washer 6; | 27. Bolt M6X12 |

1. With the steering wheel cover bolts removed, remove the steering wheel cover and the steering wheel.
2. With the steering wheel holder nut removed, remove the steering wheel holder.
3. Remove the steering column bolts.
4. Remove the upper of the steering column.
5. Remove the cotter pins and the tie rod end bolts (both sides).
6. With the cover bolts removed, remove the steering assy and the lower of the steering column.
7. Reverse the procedure for installation.

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CHAPTER 5 FINAL DRIVE

WARNING

The parts of different types/ variants/ versions maybe un-interchangeable, even some parts have almost same appearance. Always refer to Parts Manual of each UTV model for spare parts information and service.

- 5.1 WHEEL, HUB, AND SPINDLE TORQUE TABLE
- 5.2 FRONT HUB EXPLODED VIEW
- 5.3 FRONT HUB REMOVAL/INSPECTION
- 5.4 FRONT HUB INSTALLATION
- 5.5 FRONT HUB BEARING REPLACEMENT
- 5.6 FRONT DRIVE AXLE REMOVAL/ INSPECTION
- 5.7 FRONT DRIVE AXLE INSTALLATION
- 5.8 FRONT DRIVE AXLE DISASSEMBLY/ INSPECTION
- 5.9 FRONT DRIVE AXLE ASSEMBLY
- 5.10 REAR HUB EXPLODED VIEW
- 5.11 REAR HUB AND KNUCKLE REMOVAL/INSPECTION
- 5.12 REAR HUB AND KNUCKLE INSTALLATION
- 5.13 REAR DRIVE SHAFT REMOVAL
- 5.14 REAR DRIVE SHAFT INSTALLATION
- 5.15 REAR GEARCASE EXPLODED VIEW
- 5.16 REAR GEARCASE DISASSEMBLY
- 5.17 REAR GEARCASE ASSEMBLY
- 5.18 FRONT GEARCASE EXPLODED VIEW
- 5.19 FRONT GEARCASE DISASSEMBLY
- 5.20 FRONT GEARCASE ASSEMBLY

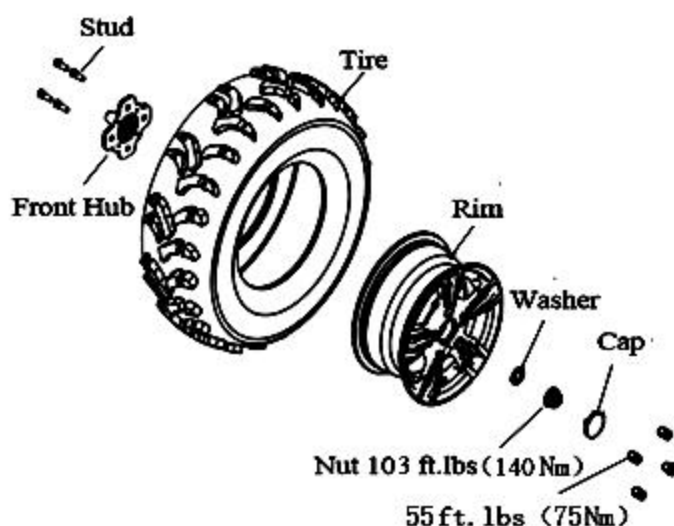
5.1 WHEEL, HUB, AND SPINDLE TORQUE TABLE

Item	Specification
Front Wheel Nuts	55 Ft.Lbs 75 Nm
Rear Wheel Nuts	55 Ft.Lbs 75 Nm
Front Hub Nut on Spindle/ outer CV joint	103 Ft.Lbs 140 Nm
Rear Hub Retaining Nut	103 Ft.Lbs 140 Nm

Refer to exploded views and text for torque values of other fasteners.

CAUTION: Locking nuts, and bolts with pre-applied locking agent should be replaced if removed. The self-locking properties of the nut or bolt are reduced or destroyed during removal.

5.2 FRONT HUB EXPLODED VIEW



5.3 FRONT HUB REMOVAL/INSPECTION

1. Elevate front end and safely support machine under footrest/frame area.

CAUTION: Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

2. Check bearings for side play by grasping the tire/Wheel firmly and checking for movement.

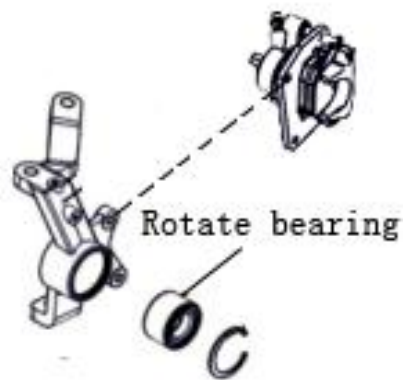
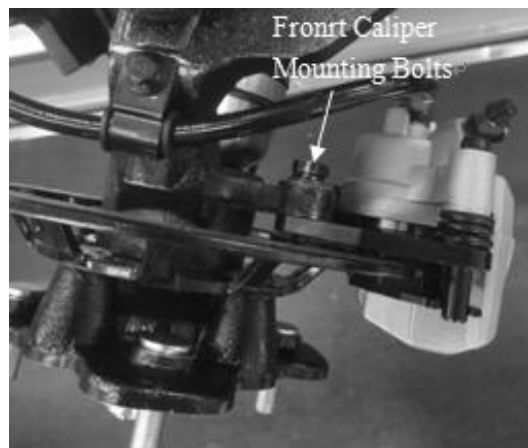


3. Grasp the top and bottom of the tire. The tire should rotate smoothly without binding or rough spots.
4. Remove wheel nuts and wheel.
5. Remove the two brake caliper mounting bolts.

CAUTION: Do not hang the caliper by the brake line. Use wire to hang the caliper to prevent possible damage to the brake line.

6. Remove front spindle nut, and washer.
7. Remove front hub assembly.

8. Rotate each bearing by hand and check for smooth rotation. Visually inspect bearing for moisture, dirt, or corrosion, or roughness is evident.

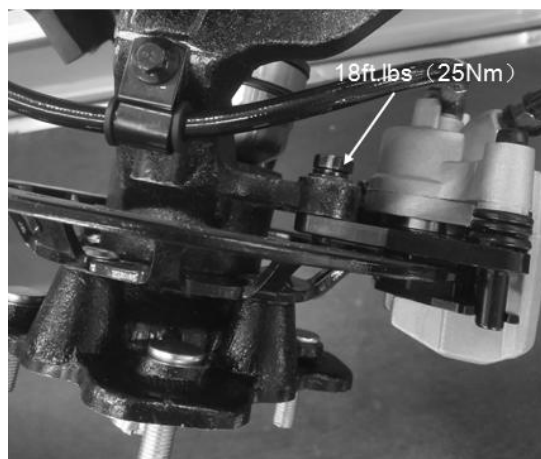
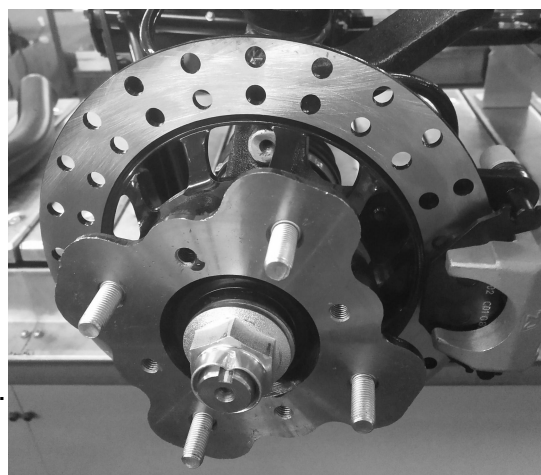


5.4 FRONT HUB INSTALLATION

1. Inspect the hub strut bearing surface for wear or damage.
2. Apply grease to drive axle spindle.
3. Install spindle through the backside of the hub strut. Install the hub onto the spindle.
4. Install spindle nut and tighten to 103 ft.lbs (140Nm).
5. Knock on the edge of the spindle nut, so that it can be clamped into the limit slot.
6. Install brake caliper using new bolts. (Apply Loctite™ 243 to threads) Tighten bolts to 18 ft.lbs (25Nm)

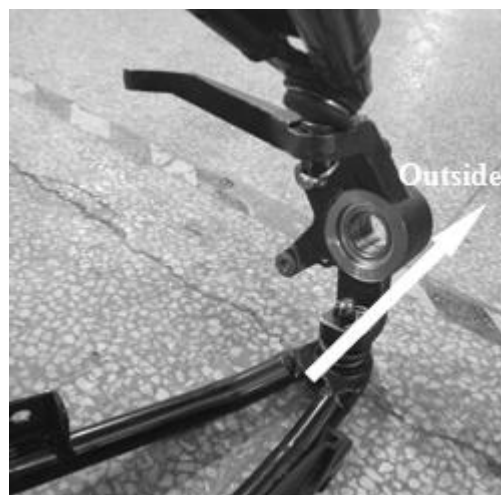
CAUTION: New bolts have a pre-applied locking agent which is destroyed bolts upon removal. Always use new brake caliper mounting bolts upon assembly.

7. Install wheel and wheel nuts and tighten evenly in a cross pattern to specified torque.



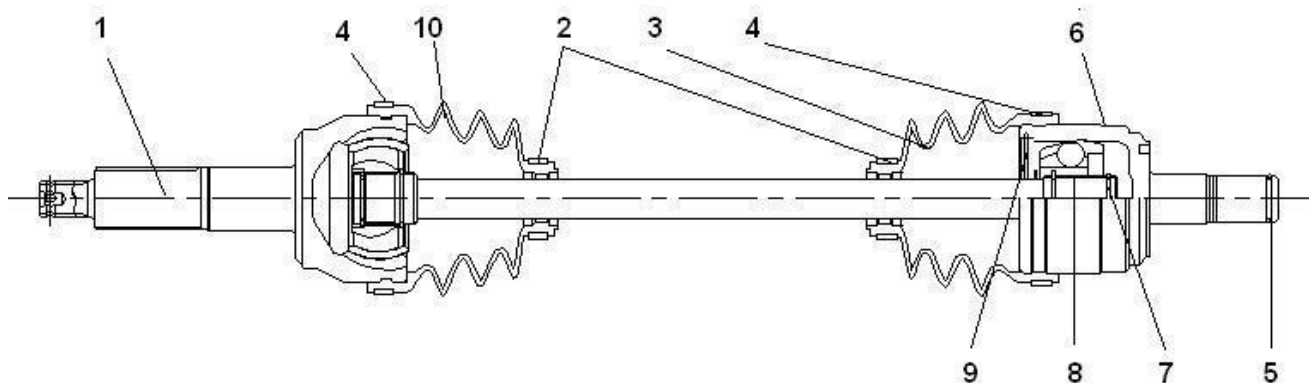
5.5 FRONT HUB BEARING REPLACEMENT

1. Remove outer snap ring.
 2. From the back side, tap on the outer bearing race with a drift punch in the reliefs as shown.
 3. Drive bearing out evenly by tapping on outer race only. Once bearing is at bottom of casting, support casting on outer edges so bearing can be removed.
 4. Inspect bearing.
- NOTE:** Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. While rotating bearings by hand, inspect for rough spots, discoloration, or corrosion. The bearings should turn smoothly and quietly, with no detectable up and down movement and minimal movement sideways between inner and outer race.
5. Inspect bearing housing for scratches, wear or damage. Replace new if damaged.



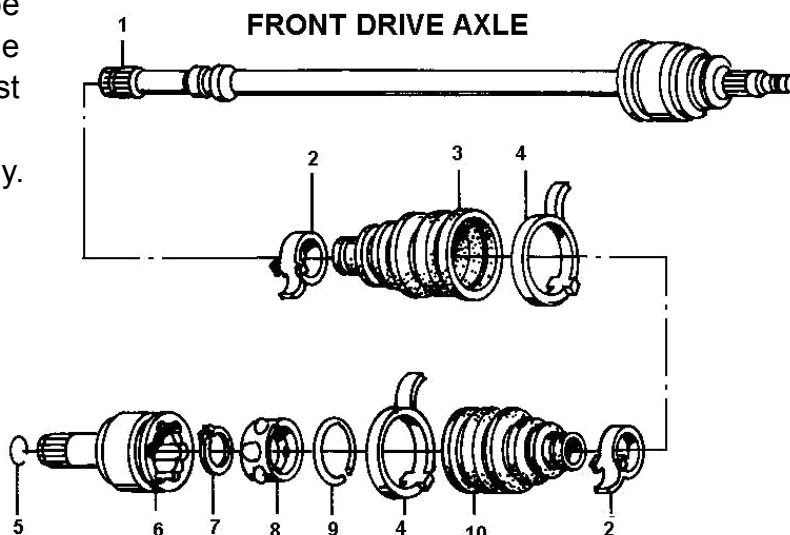
5.6 FRONT DRIVE AXLE REMOVAL/INSPECTION

FRONT DRIVE AXLE



NOTE: The outer CV joint cannot be disassembled or repaired, if damage or faulty the drive axle assembly must be replaced.

1. Drive Axle/Outer CV Joint Assembly.
2. Boot Band "A".
3. Outer Board Boot.
4. Boot Band "B".
5. Stopper Ring
6. Plunging Joint
7. Circlip
8. Bearing
9. Stopper Ring
10. Inboard boot.



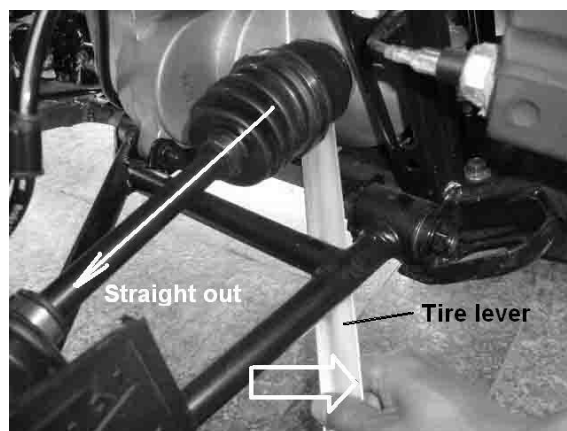
NOTE: Always order and replace 6 and 8 together.

REMOVAL

1. Place the vehicle on level ground and set the parking brake, Block the rear wheels so the vehicle will not roll in either direction.
2. Remove the front wheels, steering tie rods, disconnect the A arm on the ball joint end as described in this Chapter and Chapter 4.

CAUTION : To avoid damage to the front gearcase oil seal, hold the front drive shaft horizontal and straight out from the front differential during removal.

3. Hold the drive shaft straight out.
4. Place a tire lever between the inner CV joint and the differential housing, with a small piece of wood against the housing to help get "leverage" and protect the casting. "pop" the in inner CV joint out from the front gearcase.



INSPECTION

NOTE: The boots are subjected to a lot of abuse if the vehicle is ridden in rough terrain. If the boots are damaged and left un-repaired, the driveshaft joints will fail prematurely by allowing the joint to be exposed to dirt, mud and moisture. This also allows the loss of critical lubrication.

1. Check the rubber boots for wear, cuts or damage and replace if necessary as described under the Disassembly / Assembly procedure in this chapter.

2. Move each end of the drive shaft in a circular motion (and also a reciprocate for inner one) and check the drive shaft joints for excessive wear or play.
3. This inner CV joint (inboard pivot joint) can be serviced if there is wear or play. The outer CV joint (outboard pivot joint) cannot be serviced if worn or damaged and if necessary, the drive shaft assembly must be replaced.

5.7 FRONT DRIVE AXLE INSTALLATION

CAUTION : To avoid damage to the front gearcase oil seal and the strut oil seal, hold the front drive shaft horizontal and straight into the strut during installation.

1. Hold the drive shaft straight in from the front differential.
2. Push the drive shaft straight into the front differential and push it in all the way until it bottoms out. If necessary, carefully tap on the outer end of the drive shaft with a rubber mallet or soft-faced mallet.
3. After the drive shaft is installed, pull the inner CV joint a little to make sure the drive shaft stopper ring has locked into the front differential side gear groove.
4. Carefully install the outer CV joint (spindle) into the strut, install the front hub and wheel.
5. Install the ball joint on the A arm, the steering tie rods, the hubs and the wheels as described in this Chapter and Chapter 4.



5.8 FRONT DRIVE AXLE DISASSEMBLY/ INSPECTION

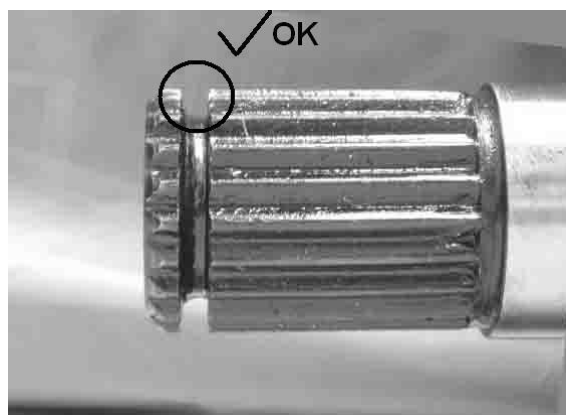
INNER CV JOINT DISASSEMBLY

NOTE: The outer CV joint cannot be disassembled or repaired, if damaged or faulty the drive axle assembly must be replaced.

1. Open the clamps on both boot band "A" and "B" on the inner CV joint, then remove boot band "B". Discard the boot band, it cannot be reused.
2. Carefully slide the boot (A) onto the drive axle and off the inboard joint.
3. Wipe out all of the molybdenum disulfide grease within the inboard joint cavity.
4. Remove the stopper ring from the inboard joint.
5. Remove the inner CV joint.
6. Remove the circlip and slide off the bearing assembly. Be careful not to drop any of the steel balls from the bearing cage.
7. Slide the inner CV off the drive axle and discard the boot band "A", it cannot be reused.
8. If the outboard boot requires replacement, perform the following:
 - a. Open the clamps on both boot bands "A" and "B" on the outer CV joint, then remove boot band "B". Discard the boot band, it cannot be reused.
 - b. Slide the outboard boot off the drive axle and discard the boot band "A", it cannot be reused.
9. Inspect the drive axle as described in this chapter.

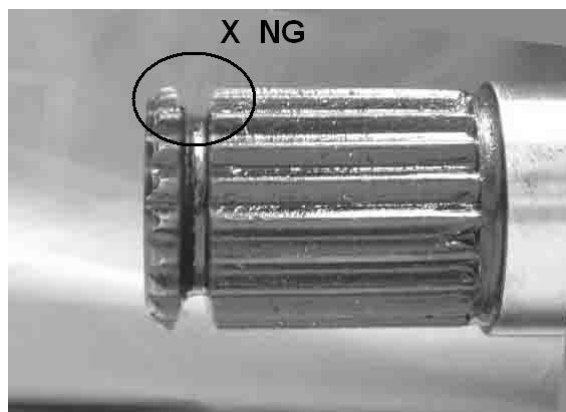
**INNER CV JOINT INSPECTION**

1. Clean the bearing assembly in solvent and thoroughly dry.
2. Inspect the steel balls, bearing case and the bearing race for wear or damage.
3. Check for wear or damage to the inner splines of the bearing race.
4. If necessary, disassembly the bearing assembly for further inspection. Carefully remove the steel balls from the bearing cage then remove the bearing race from the bearing cage.
5. If any of the components of the bearing assembly are damaged, replace the entire assembly as no replacement parts are available.
6. Clean the inner CV joint in solvent and

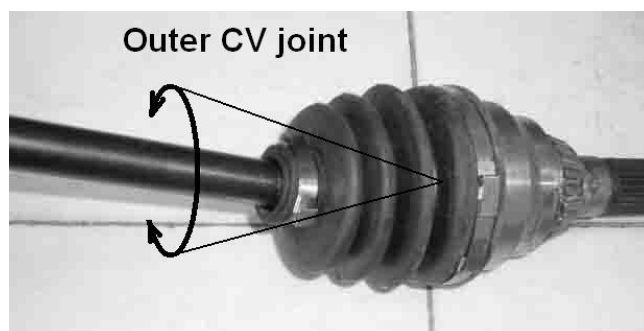
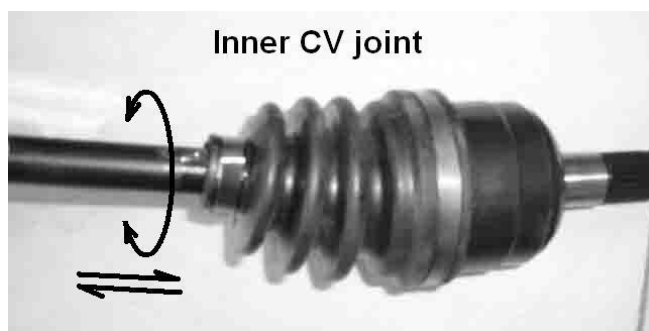


thoroughly dry.

7. Inspect the interior of the inboard joint where the steel balls ride. Check for wear or damage and replace the joint if necessary.
8. Inspect the snap ring groove on the inboard joint for wear or damage.
9. Inspect the splines on the inner CV joint for wear or damage.
10. Check the stopper ring in the end of the inboard joint. Make sure it seats in the groove correctly, if damage the ring must be replaced. See right picture.
11. Inspect the exterior of the inner CV joint for cracks or damage, replace if necessary. Check the movement of the joint for excessive play or noise by moving the drive axle in a circular and reciprocate direction.
12. Inspect the drive axle for bending, wear or damage.
13. Inspect the inner end splines, the outer end splines and the front hub cotter pin hole for wear or damage. If any of these areas are worn or damaged, replace the drive axle.



Check the movement of the joint

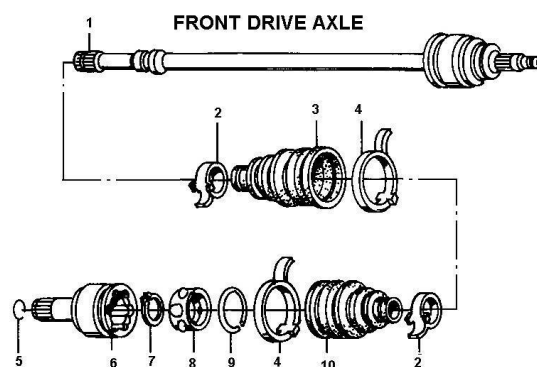


NOTE: Inner CV joint must be replaced with the bearing as an assembly.

5.9 FRONT DRIVE AXLE ASSEMBLY

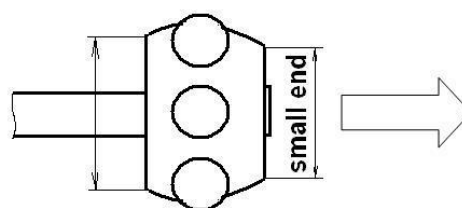
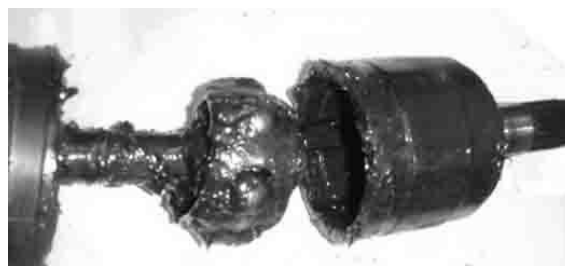
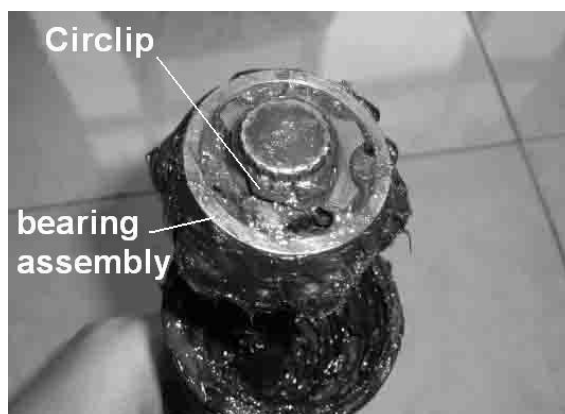
1. The rubber boots are not identical and must be installed on the correct joint. The boots are marked as follows:
 - a. Inner CV joint boot : "inner",
 - b. Outer CV joint boot: "outer".
2. If the outboard boot was removed, install a new boot onto the drive axle at this time.

NOTE: Position the new boot bands with their



tabs facing toward the rear of the vehicle.

3. Install two new small boot bands onto the drive axle.
4. Install the inboard boot and move the small boot band onto the boot. Bend down the tab on the boot band and secure the tab with the locking clips and tap them with a plastic hammer. Make sure they are locked in place.
5. If the bearing assembly was disassembled, assemble the bearing as follows:
 - a. Position the bearing race and install the race into the bearing case. Align the steel ball receptacles in both parts.
 - b. Install the steel balls into their receptacles in the bearing case.
 - c. Pack the bearing assembly with molybdenum disulfide grease. This will help hold the steel balls in place.
6. Position the bearing assembly with the small end of the bearing going on first and install the bearing onto the drive axle.
7. Push the bearing assembly on until it stops, then install the circlip. Make sure the circlip seats correctly in the drive axle groove.
8. Apply a liberal amount of molybdenum disulfide grease to the bearing assembly. Work the grease in between the balls, the race and the case. Make sure all voids are filled with grease.
9. Apply a liberal amount of molybdenum disulfide grease to the inner surfaces of the inboard joint.
10. Install the inboard joint over the bearing assembly and install the stopper ring. Make sure it is seated correctly in the inboard joint groove.
11. After the stopper ring is in place, fill the inboard joint cavity behind the bearing assembly with additional molybdenum disulfide grease.
12. Pack each boot with the following amounts of molybdenum disulfide grease:
 - a. Inboard boot: 35-55grams (1.2-1.9oz.).
 - b. Outboard boot: 30-50grams (1.1-1.8oz.).
13. Move the inboard boot onto the inner CV joint.



14. Move the inboard joint on the drive axle.

NOTE: Position the new boot bands with their tabs facing toward the rear of the vehicle .

15. Move the small boot band onto the boot.

Bend down the tab on the boot band and secure the tab with the locking clips and tap them with a plastic hammer. Make sure they are locked in place.

16. Install the large boot bands onto each boot.

CAUTION: It is critical to avoid undue stress on the rubber boots after the drive axle is installed and the vehicle is run. Don't twist the boot, and always set the both ends in designed position.

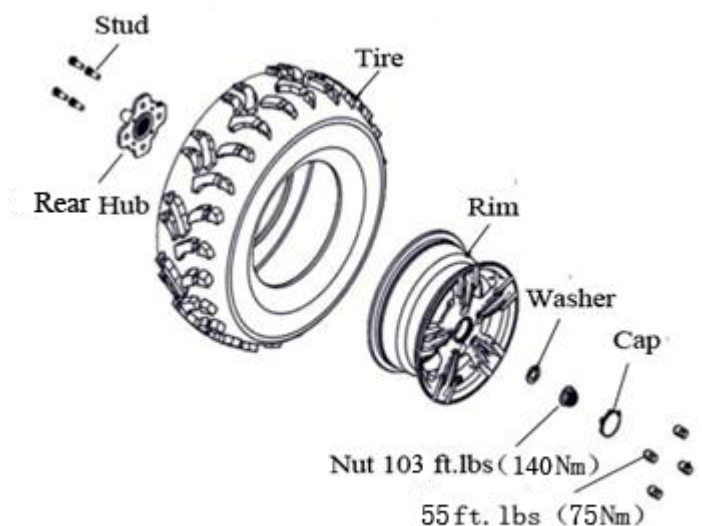
17. Secure all large boot bands. Bend down the tab on the boot band and secure the tab with the locking clip and tap them with a plastic hammer. Make sure they are locked in place.

18. If removed, install the stopper ring and make sure it is seated correctly in the drive axle groove.

19. Apply molybdenum disulfide grease to the end splines.



5.10 REAR HUB EXPLODED VIEW



5.11 REAR HUB AND KNUCKLE REMOVAL/INSPECTION

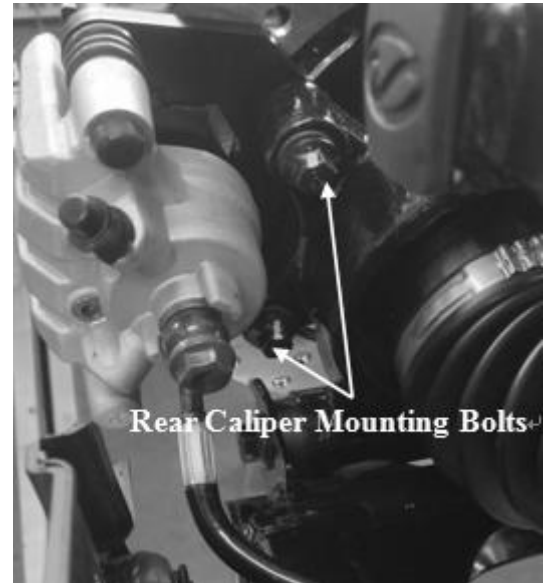
1. Elevate rear end and safely support machine under main frame area.

CAUTION: Serious injury may result if machine tips or falls. Be sure machine is secure before beginning this service procedure. Wear eye protection when removing bearings and seals.

2. Check bearings for side play by grasping the tire/Wheel firmly and checking for movement. Grasp the top and bottom of the tire. The tire should rotate smoothly without binding or rough spots.
3. Remove wheel nuts and wheel.
4. Remove the two brake caliper attaching bolts.

CAUTION: Do not hang the caliper by the brake line. Use wire to hang the caliper to prevent possible damage to the brake line.

5. Remove rear spindle nut, and washer.
6. Remove the upper and lower control arm bolts.
7. Slide the rear hub and knuckle from the rear drive axle.
8. Inspect the rear hub and knuckle assembly by hand for smoothness and side to side movement, replace as needed.

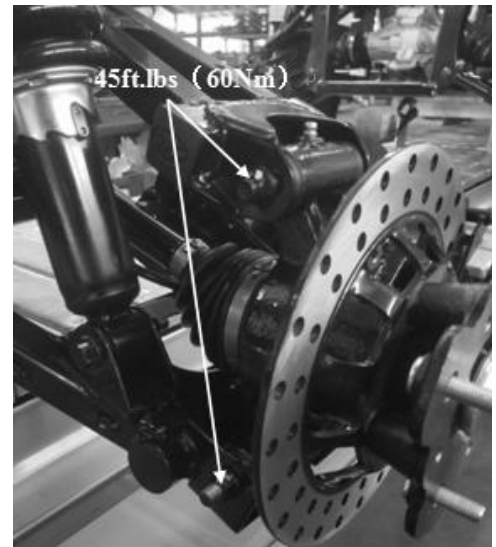


5.12 REAR HUB AND KNUCKLE INSTALLATION

1. Start the rear hub and knuckle assembly onto the drive shaft.
2. Align the bottom of knuckle and lower control arm. Secure with the lower control arm bolt.
3. With the driveshaft placed in the knuckle, align the knuckle with the top control arm. Secure with the upper control arm bolt.
4. Torque the top and bottom A-arm bolts as shown in the photo.

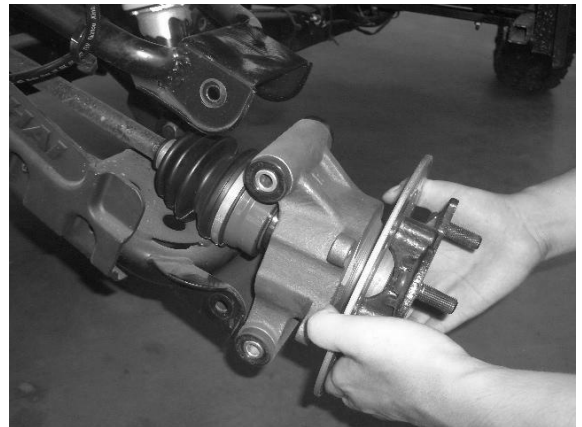


5. Install the washer and the new spindle nut.
6. Lower the vehicle. Torque the spindle nut to 103 ft.lbs. (140 Nm).
7. Knock on the edge of the spindle nut, so that it can be clamped into the limit slot.
8. Install brake caliper using new bolts. (Apply Loctite™ 243 to threads) Tighten bolts to 18 ft.lbs (24 Nm).
9. Install the wheel and wheel nuts. Torque wheel nuts to 55 ft.lbs. (75 Nm).



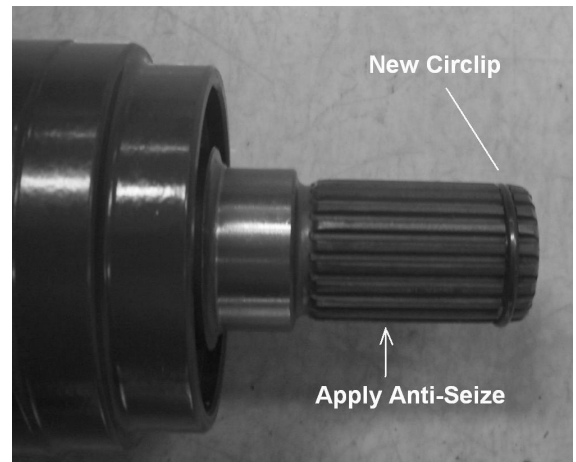
5.13 REAR DRIVE SHAFT REMOVAL

1. Repeat of the steps in the “REAR HUB AND KNUCKLE REMOVAL” section.
2. Slide the rear drive axle out of the knuckle by pulling the hub and knuckle assembly outward and down.
3. Pull the rear drive axle straight out of the frame. Use short sharp jerks to free the circlip from the gearcase. The circlip holds the axle in the gearcase.
4. Inspect the axle splines and CV boots for any damage.



5.14 REAR DRIVE SHAFT INSTALLATION

1. Install a new circlip onto the rear drive shaft. Apply Anti-Seize Compound onto the rear driveshaft splines (both ends).

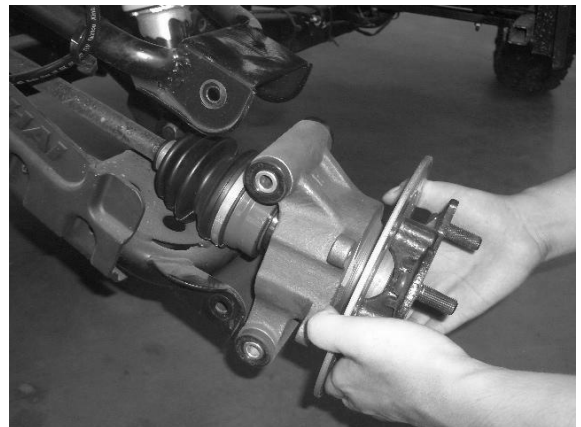


2. Reinstall the rear driveshaft into the rear gearcase. Be sure the circlip is securely fit into the rear gearcase. Use a rubber mallet to tap on the outboard end of the driveshaft if necessary.



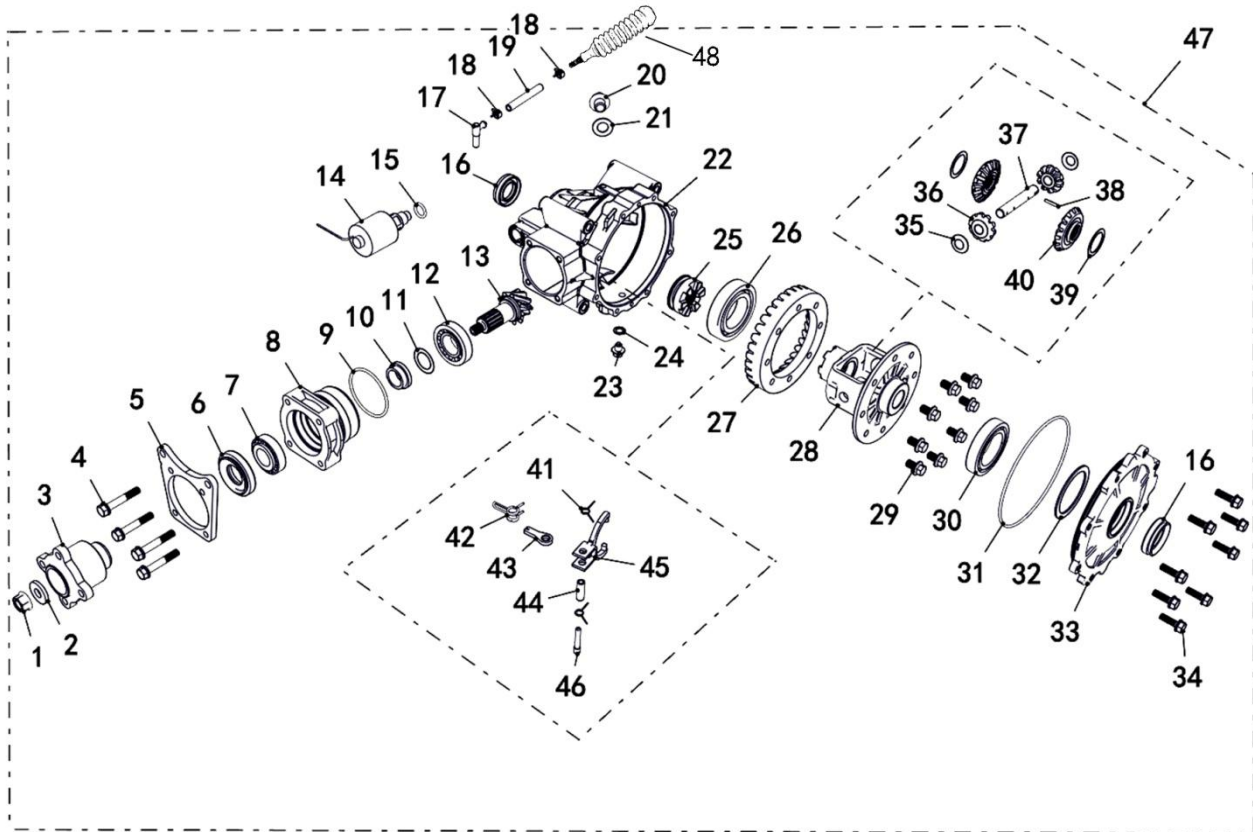
3. Slide the rear drive axle into the knuckle.

4. Lift knuckle into place and install bolt to upper and lower control arm. Torque bolt to 45 ft.lbs (60 Nm).
5. Install the washer and the new spindle nut.
6. Lower the vehicle. Torque the spindle retaining nut to 103 ft.lbs. (140 Nm).
7. Knock on the edge of the spindle nut, so that it can be clamped into the limit slot.
8. Install brake caliper using new bolts. (Apply Loctite™ 243 to threads) Tighten bolts to 18 ft.lbs (24 Nm)
9. Install the wheel and wheel nuts. Torque wheel nuts to 55ft.lbs. (75 Nm).



5.15 REAR GEARCASE EXPLODED VIEW

REAR GEARCASE EXPLODED VIEW



1	Nut, Rear Output Shaft	1	25	Clutch Gear	1
2	Washer, Rear Output Shaft Nut	1	26	Bearing 6210	1
3	Coupler, Rear Axle	1	27	Bevel Gear -Driven	1
4	Bolt M8×50	4	28	Diff Case	1
5	Mount Bracket-Parking Braking	1	29	Hexagon Flange Bolt M10×1.25×16	8
6	Oil Seal 35×61×9	1	30	Bearing 110	1
7	Bearing 30205	1	31	O-Ring 151×3	1
8	Bevel Gear Bearing Housing	1	32	Adjusting Shim	AR
9	O-Ring 69×3	1	33	Rear Axle Box Cover	1
10	Bearing Sleeve	AR	34	Bolt M8×25	8
11	Adjusting Shim,Bevel Gear -Driving	1	35	Wearing Ring	2
12	Bearing 30206	1	36	Planetary Gear	2
13	Bevel Gear -Driving	1	37	Gear Shaft	1
14	Diff Solenoid	1	38	Pin 4×30	1
15	O-Ring 17×3	1	39	Side Gear Thrust-Washer	2
16	Oil Seal 30×50×13.5	2	40	Diff Side Gear	2
17	Vent Nozzle	1	41	Shift Return Spring	2
18	Clip	2	42	Shift Lever Spring	1
19	Vent Pipe	1	43	Shift Lever	1
20	Bolt M18×1.25	1	44	Shift Bar	1
21	Washer 18	1	45	Shift Yoke	1
22	Gear Case,Rear Axle	1	46	Shift Pin	1
23	Drain Plug	1	47	Rear gearcase	1
24	Washer	1	48	Breathing airbag	1

5.16 REAR GEARCASE**DISASSEMBLY**

Important: Before starting any operation on the gearbox, make sure that never clean the gearbox with a high pressure water jet.

The pinion gear assembly (A) is NOT intended to be disassembled from the case, as it requires special tooling in order to properly reassemble. If there is any damage to the pinion gear, bearings or case, the assembly must be replaced. Pinion and ring gear shimming information is NOT provided due to manufacturing requirement.

1.remove the breathing airbag(NO.48).

→Fig 0

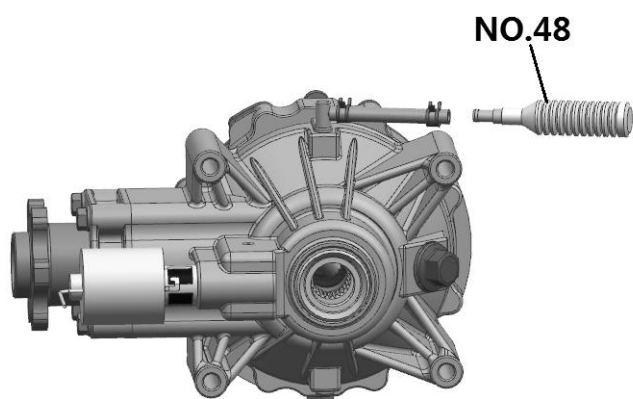


Fig 0

2.Remove the oil drain plug (NO.23) and let the oil drain from the gearbox.

Important: Clean the plug carefully. Replace the sealing washer (NO.24) before it's assembled. →Fig 1

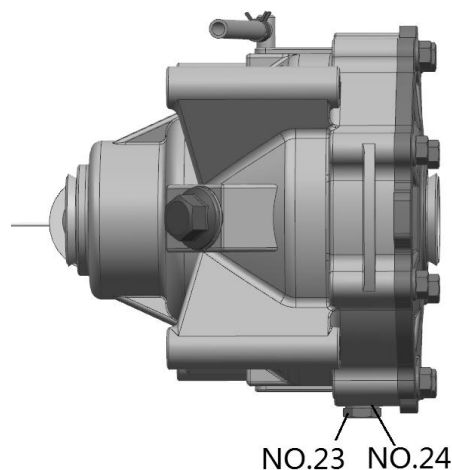


Fig 1

3.Remove the differential solenoid (NO.14) from the gearcase cover if servicing the solenoid, shift lever, shift lever spring, or shift yoke. If none of these items are being serviced. The solenoid can remain installed in the gearcase cover. →Fig 1

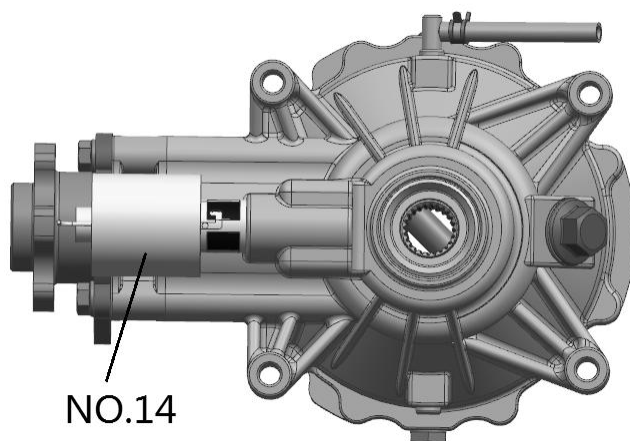


Fig 2

4.Remove the Bolts M8 × 50 (NO.4), Remove assembly (A). →Fig 3

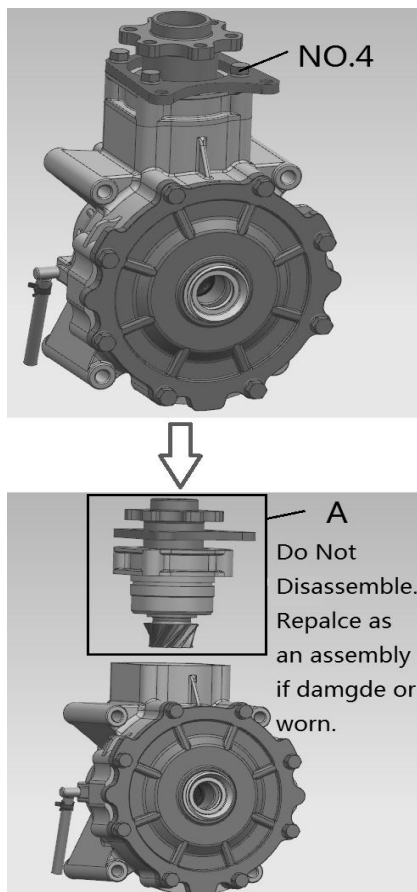


Fig 3

5. Remove Bolts M8 × 25 (NO.34) that secure the housing. →Fig 4

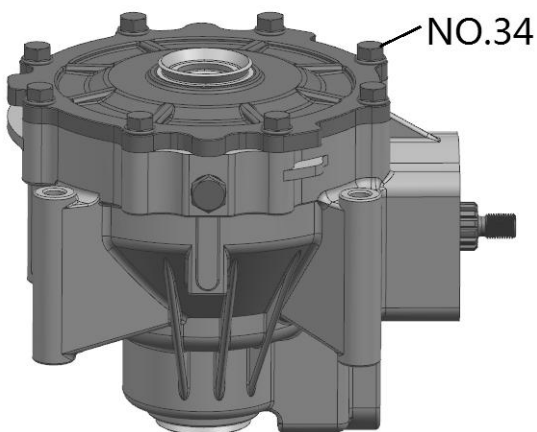


Fig 4

6. Remove the differential assembly (B) from the housing.. →Fig 5

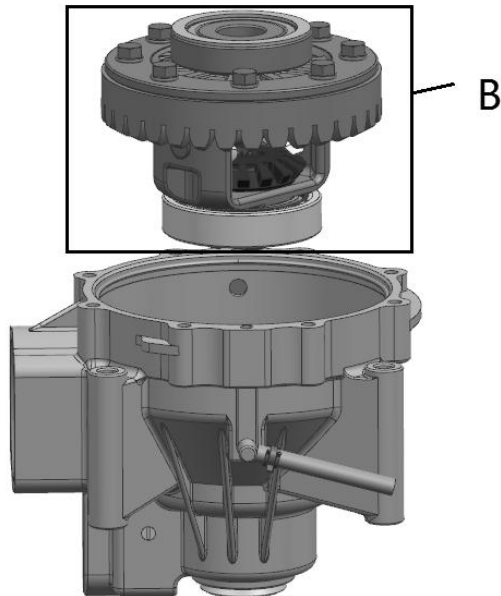


Fig 5

7. Remove the shims from the differential assembly. Be sure to keep the shims together for reassembly. →Fig 6

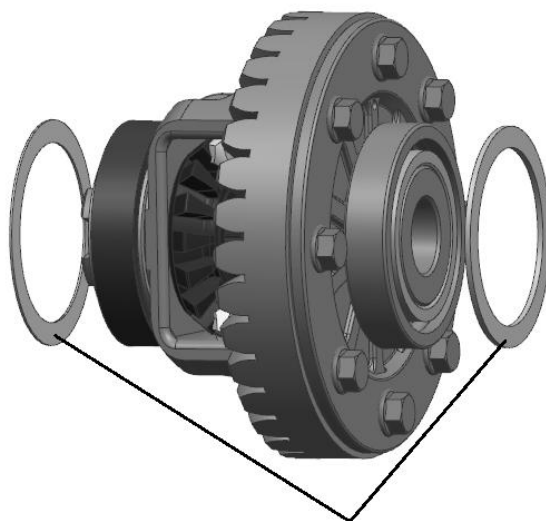


Fig 6

8. Inspect the bevel gear for chipped, worn, or broken teeth.

Important: Do not disassemble the differential assembly (B). Replace as an assembly if damaged or worn. →Fig 7

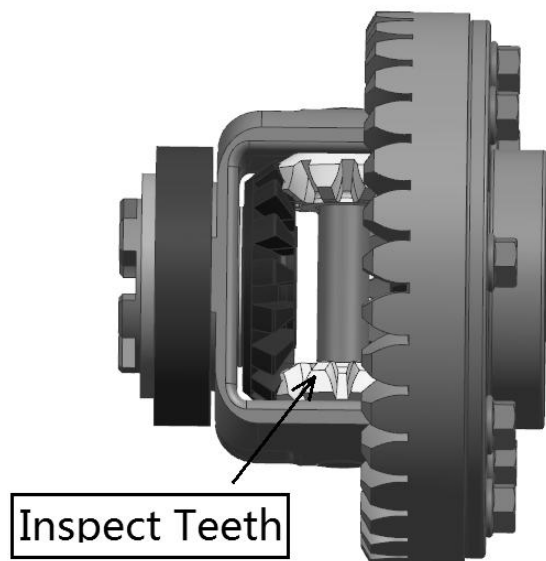


Fig 7

NOTE: The PINION GEAR ASSY (A) AND THE DIFFERENTIAL ASSEMBLY (B) MUST BE REPLACED SIMULTANEOUSLY,NOT SEPARATELY.

9.Remove the clutch gear (NO.25) from the gearcase cover. →Fig 8

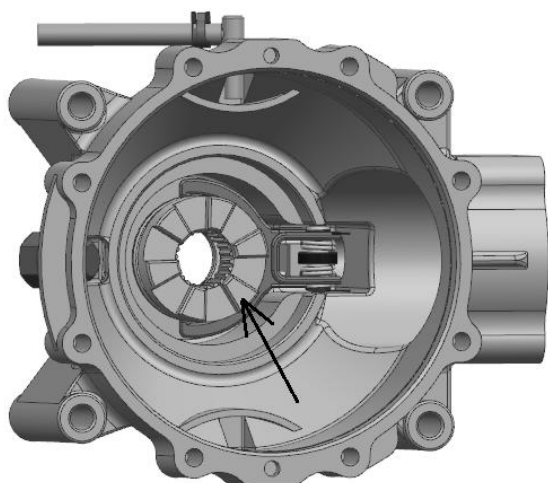


Fig 8

10.Inspect the shift lever (NO.43), shift level spring (NO.42), shift return spring (NO.41), and shift yoke (NO.45) for excessive wear or damage. If disassembly is required proceed to the next step. If no disassembly is required proceed to “Rear Gearcase Assembly.” →Fig 9

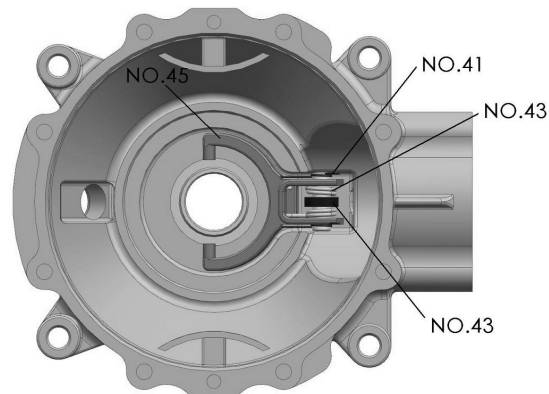


Fig 9

11.Loosen the lock shift pin (NO.46). →Fig 10

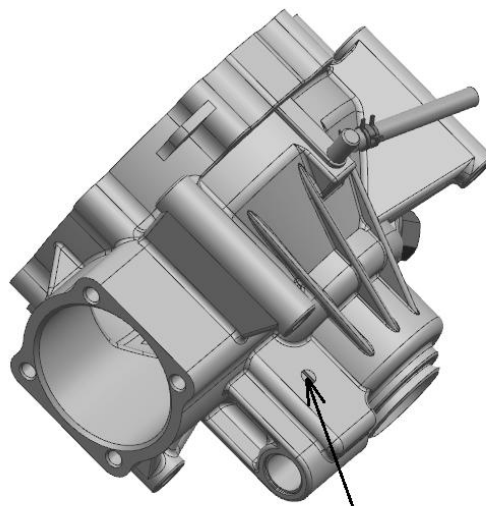


Fig 10

12.Remove the pin from the gearcase cover. →Fig 11

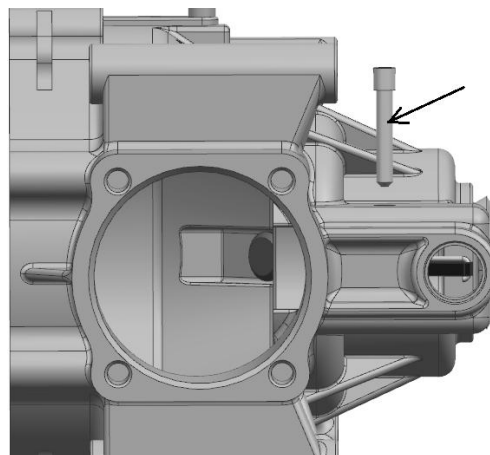


Fig 11

13.Carefully remove the shift yoke

assembly from the gearcase cover. →Fig 12

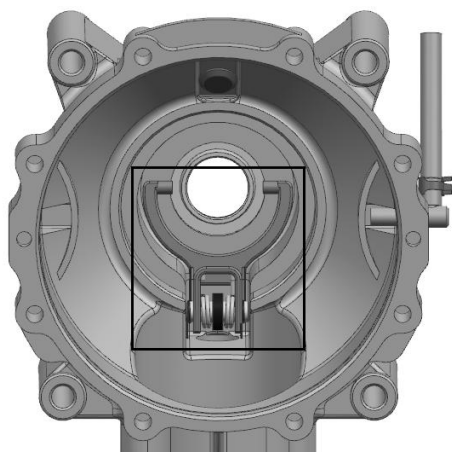


Fig 12

14.Inspect the shift lever (NO.43), shift level spring (NO.42), shift return spring (NO.41), shift yoke(NO.45), and lock shift bar (NO.44), Inspect the components for excessive wear or damage and replace as needed. →Fig 13

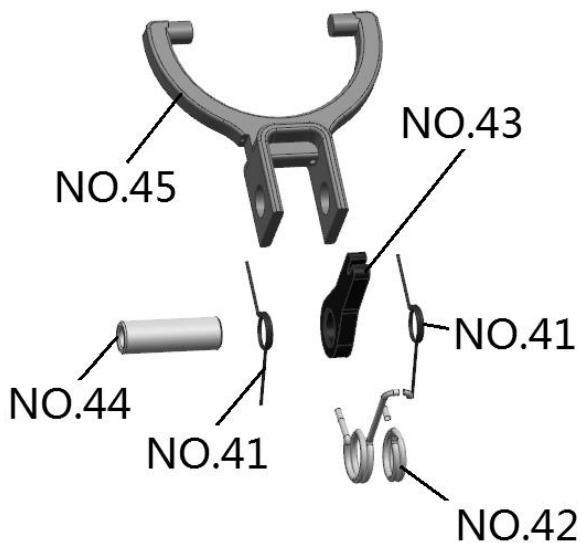


Fig 13

5.17 REAR GEARCASE

ASSEMBLY

Important: Before starting any operation on the gearbox, to ensure that the surface of all parts is clean.

1.NOTE: The pinion gear assembly is NOT intend to be disassembled from the case, as it requires special tooling in

order to properly reassemble. If there is any damage to the pinion gear, bearings or case, the assembly must be replace.

→Fig14

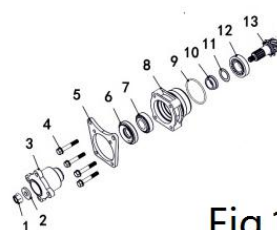


Fig 14

Do Not Disassemble
Replace as an assembly if
damaged or worn

2.Replace the Oil Seal 30 × 50 × 13.5(NO.16) located in the main gearcase and gearcase cover

→Fig 15

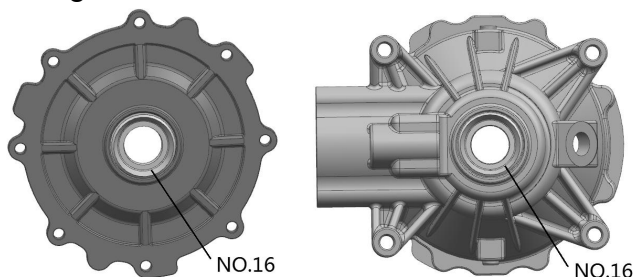


Fig 15

3.Replace all worn components.

4.If previously removed; assembly the shaft lever, shift lever spring, shift return springs, shift yoke, and lock pin bushing. →Fig 13

5.Carefully install the shift yoke assembly into the gearcase cover.→Fig 12

6.Install the lock shift (NO.46) pin and tighten. →Fig 11

7.Install the clutch gear (NO.25) and the original shims into the gearcase.→Fig 16

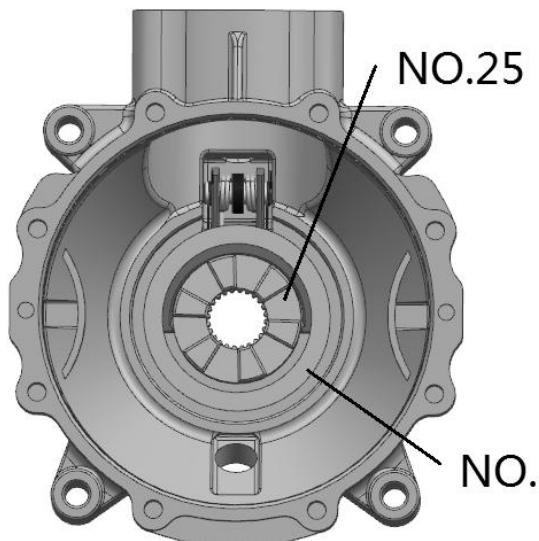


Fig 16

8.Install the differential assembly into the carrier housing. →Fig 17

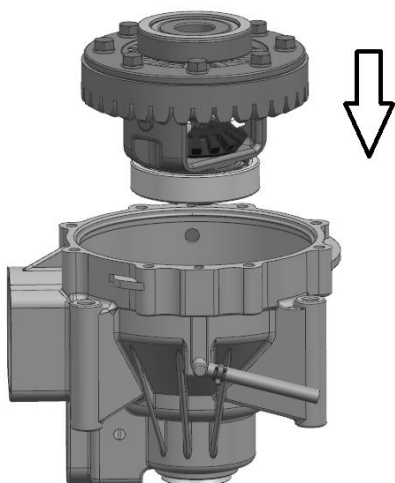


Fig 17

9.Install the original shims(NO.32) and the new O-ring(NO.31) onto the Rear Axle Box Cover(NO.33), then assemble the Rear Axle Box Cover(NO.33) and install the bolts that secure the cover to the housing. Torque the bolts in a criss cross pattern to **25-30Nm**.

→Fig 18

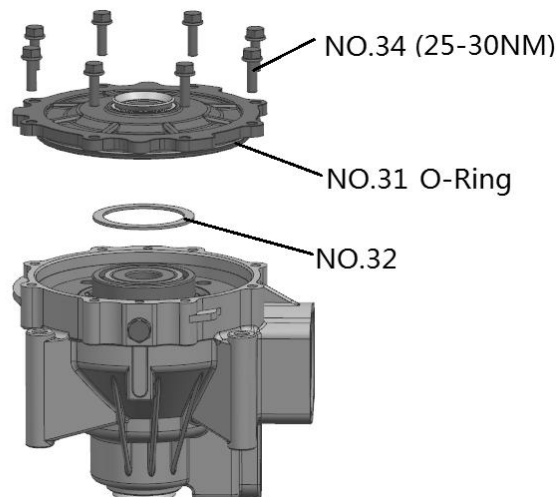


Fig 18

10.Install the pinion gear assembly. Torque the bolts in a criss cross pattern to **25-30Nm**.

→Fig 19

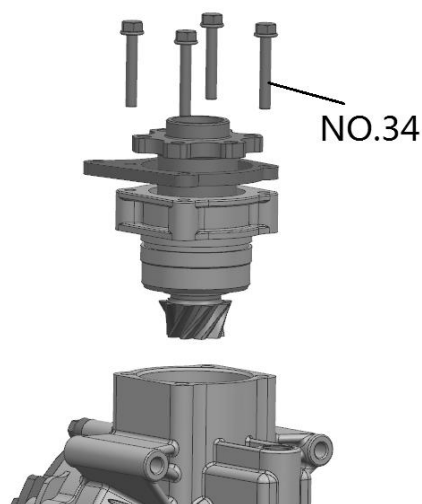


Fig 19

11.If previously removed, install the Diff Solenoid (NO.14) into the carrier cover. Torque solenoid to **40-55Nm**. →Fig 20

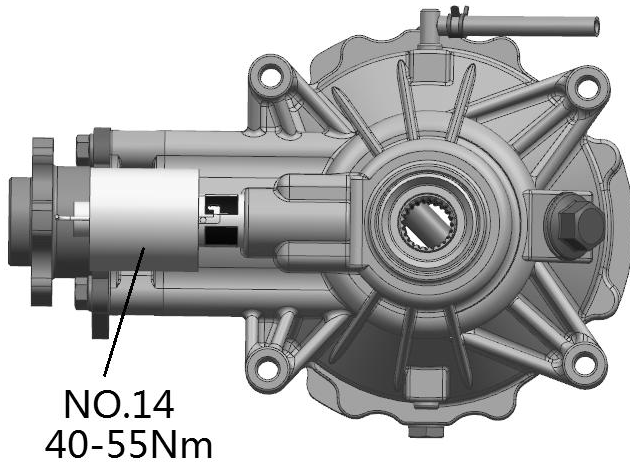


Fig20

12. Mount the oil drain bolt (NO.23) and washer (NO.24). Add $250 \pm 25\text{mL}$ oil(85W/90GL-4). Fig 21

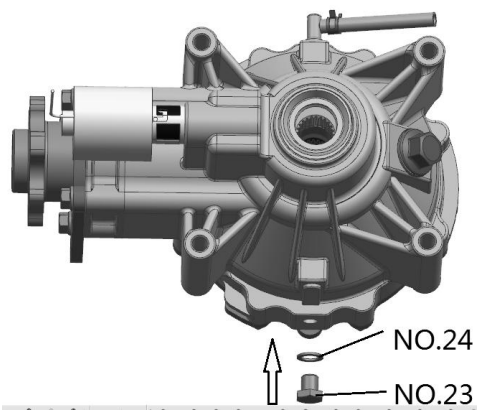


Fig21

13. Assemble the breath airbag(NO.48).
→Fig 22

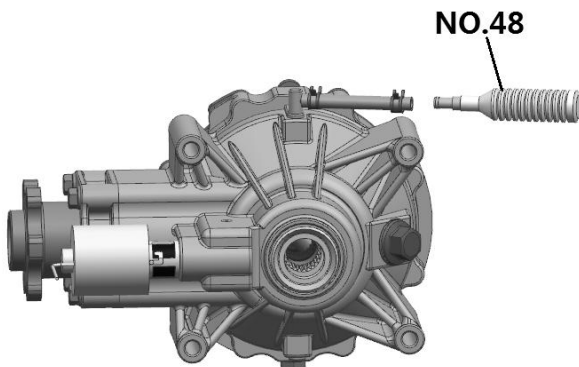
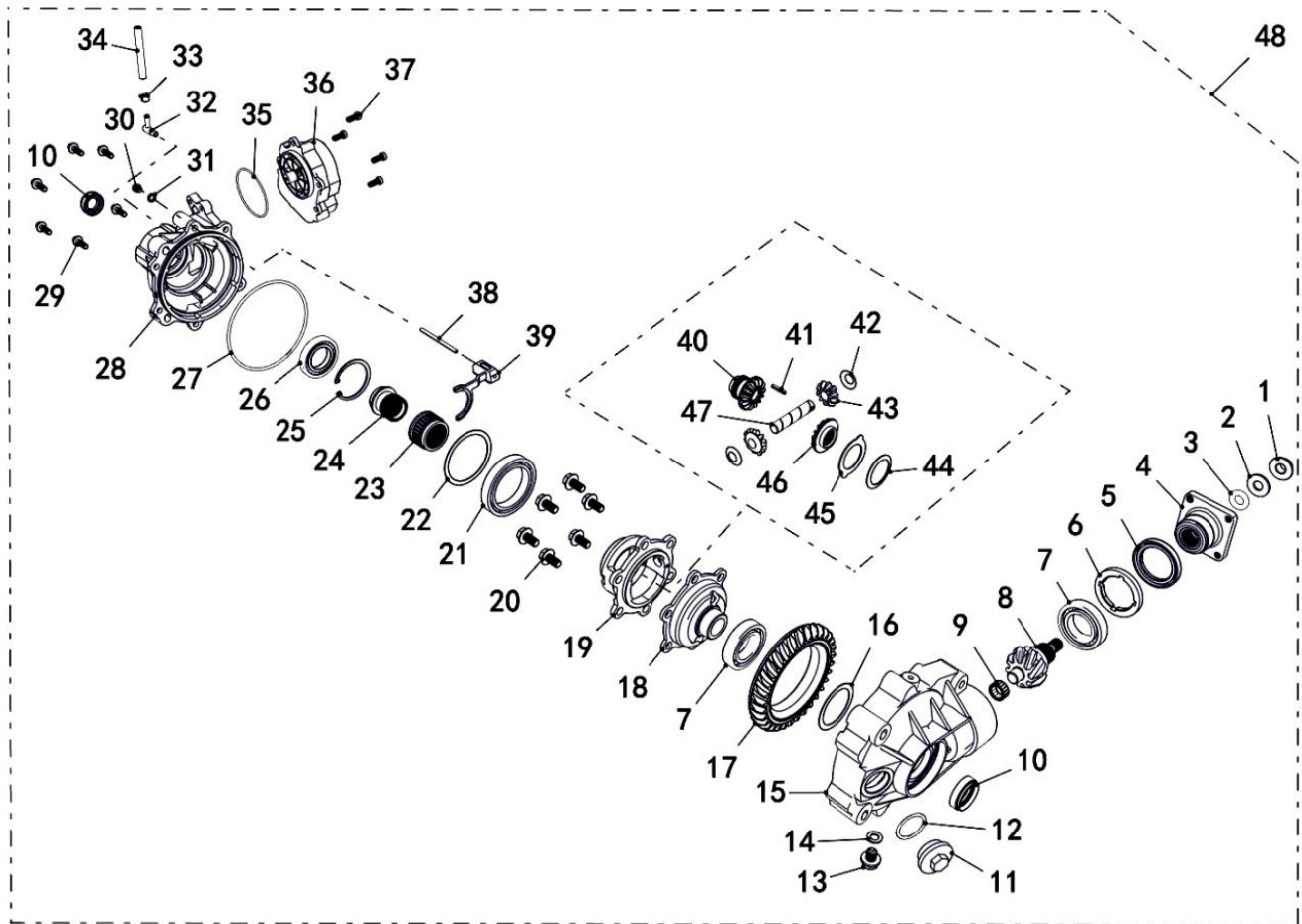


Fig22

5.18 FRONT GEARCASE EXPLODED VIEW

FRONT GEARCASE EXPLODED VIEW



1	Nut, Front Output Shaft	1	26	Bearing 16007	1
2	Washer, Front Output Shaft Nut	1	27	O-Ring 141×2.4	1
3	O-Ring	1	28	Gear Case, Front Axle	1
4	Coupler, Front Axle	1	29	Bolt M8×25	6
5	Oil Seal 48×65×9	1	30	Screw M8×8	1
6	Bearing Retainer	1	31	Washer 8	1
7	Bearing 6007	2	32	Vent Nozzle	1
8	Bevel Gear -Driving	1	33	Clip	1
9	Needle Bearing	1	34	Vent Pipe	1
10	Oil Seal 24×38×8	2	35	O-Ring 81.2×1.9	1
11	Fill Plug	1	36	Gear Motor	1
12	O-Ring 30.5×3	1	37	Screw M8×20	4
13	Drain Bolt	1	38	Pin Shaft	1
14	Washer 10	1	39	Shift Fork	1
15	Front Axle Box Cover	1	40	Drive Gear	1
16	Adjusting Shim(61×48)	as needed	41	Pin 5×25	1
17	Bevel Gear -Driven	1	42	Wearing Ring	2
18	Top Bracket,Differential Gear	1	43	Gear(Center), Differential	2
19	Bracket,Differential	1	44	Washer	1
20	Bolt M10×1.25×20	6	45	Shim	1
21	Bearing 61912	1	46	Driven Gear	1
22	Adjusting Shim(83×71)	as needed	47	Gear Shaft	1
23	Drive Clutch	1	48	Front Axle	1
24	Drive Clutch Cover	1	49		
25	Circlip 62	1	50		

5.19 FRONT GEARCASE DISASSEMBLY

Important: Before starting any operation On the gearbox make sure GEAR MOTOR (NO.36) is protected (if mounted). Never clean the gearbox with a high pressure water jet.

→Fig 0.

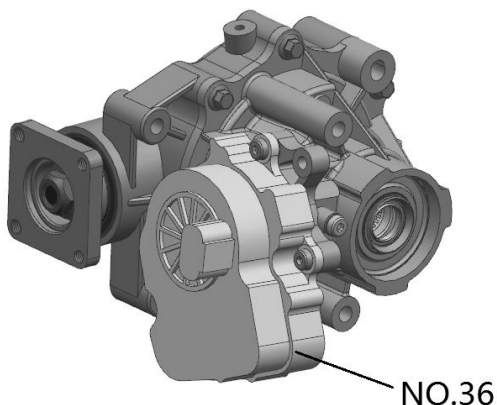


Fig 0

1. Remove the DRAIN BOLT (NO.13) and let the oil drain from the gearbox.

Important: Clean the plug carefully and Replace WASHER 10 (NO.14) before Its assembled. →Fig 1.

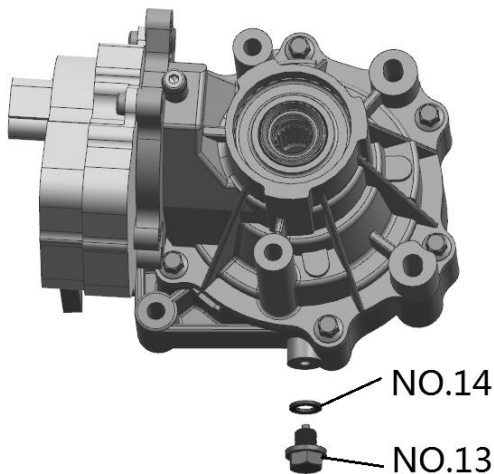


Fig 1

2. Remove the NUT (NO.1) and the washer (NO.2).

→Fig 2

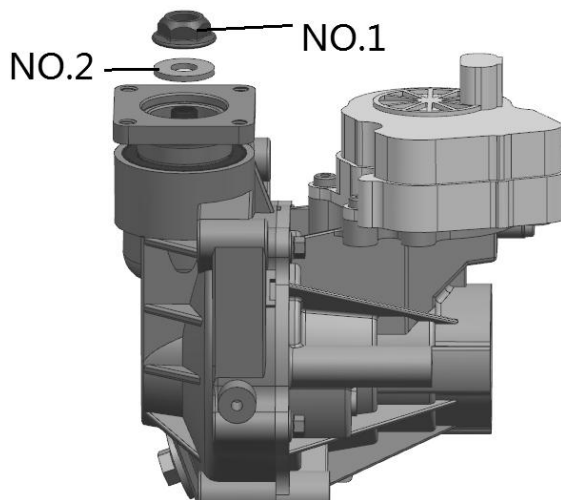


Fig 2

3. Remove the O-RING (NO.3) .

→Fig 3.

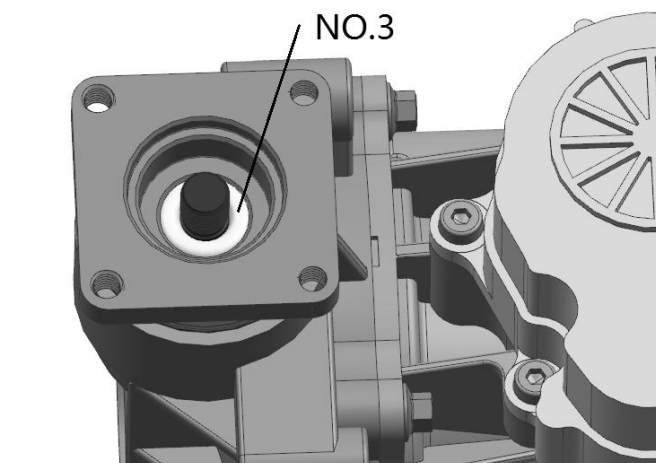


Fig 3

4. Remove the COUPLER (NO.4).

→Fig 4.

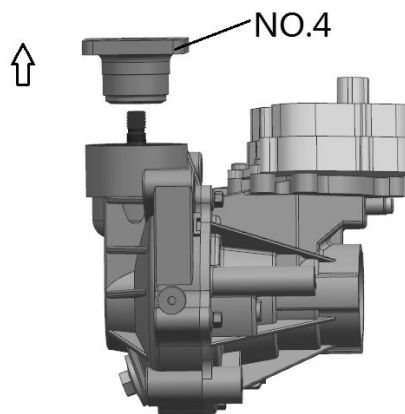


Fig 4

5. Remove the OIL SEAL (NO.5) and replace with a new seal.
→Fig 5.

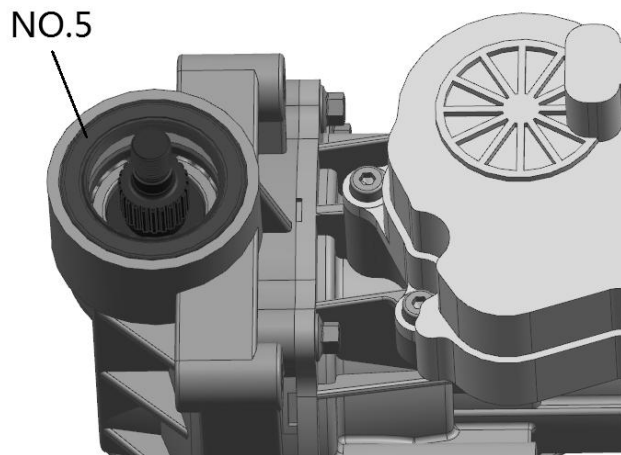


Fig 5

6. Remove the four SCREW (NO.37).
→Fig 6.

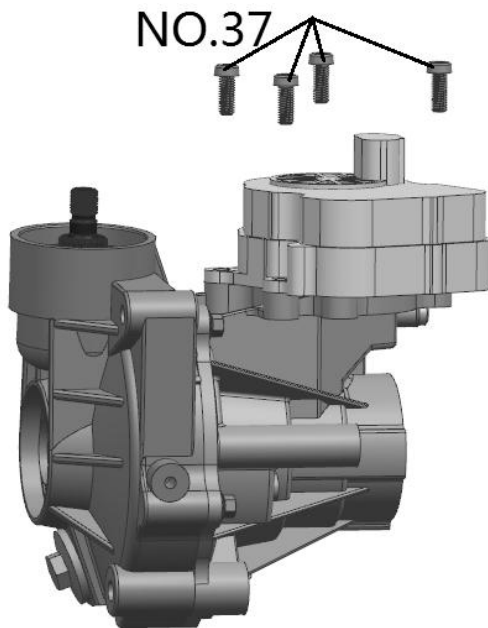


Fig 6

7. Remove the GEAR MOTOR (NO.36).
→Fig 7.

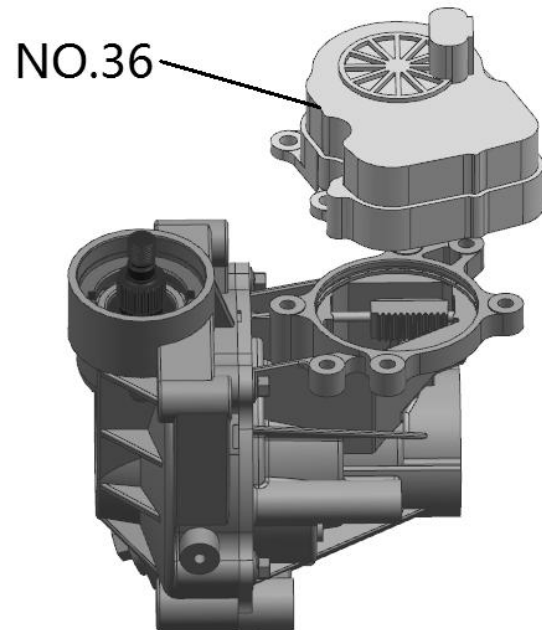


Fig 7

8. Remove the six bolts M8 X L28 (NO.29).
→Fig 8.

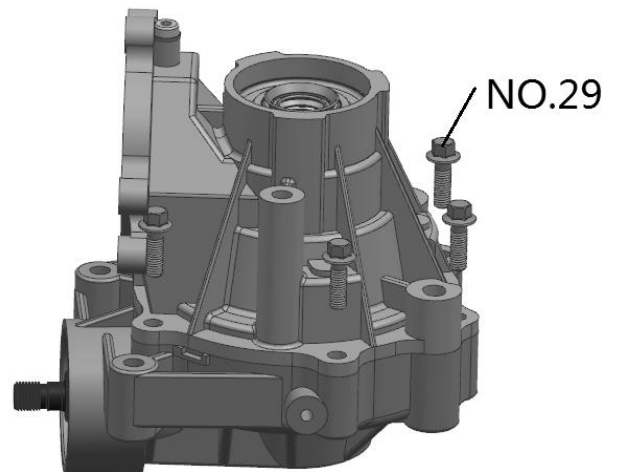


Fig 8

9. Remove the GEAR CASE ASSY, FRONT AXLE (NO.28) and CASE COVER ASSY, FRONT AXLE (NO.15).
→Fig 9.

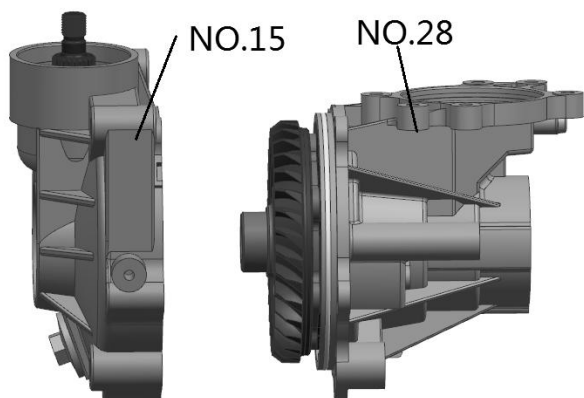


Fig 9

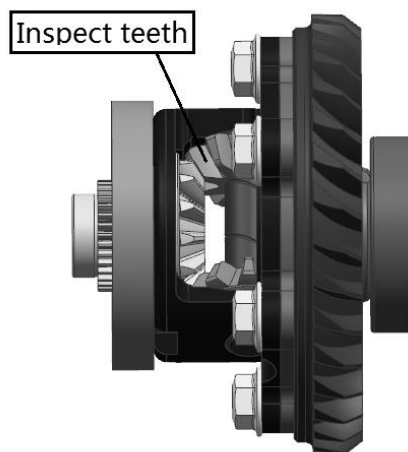


Fig 11

10. Remove the DIFFERENTIAL GEAR ASSY **A** from the housing.

→Fig 10

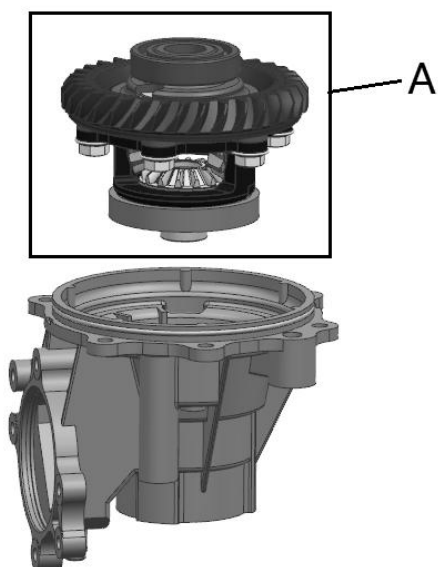


Fig 10

11. Inspect the bevel gear for chipped, worn or broken teeth.

NOTE: The DIFFERENTIAL GEAR ASSY (A) is NOT intended to be disassembled, as it requires special tooling in order to properly reassemble. If there is any damage to the gear, bearings or others, the assembly must be replaced.

→Fig 11

12. Remove the shims from the differential assembly. Be sure to keep the shims together for reassembly.

→Fig 12.

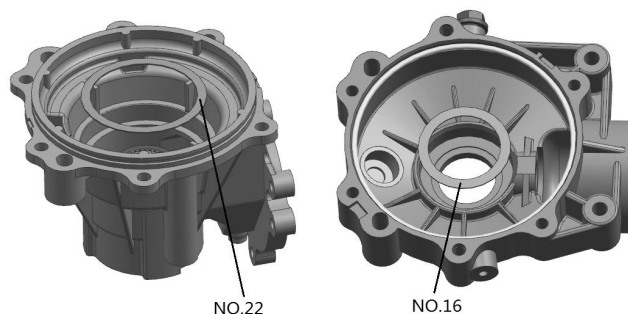


Fig 12

12. Remove the SCREW (NO.30) and the WASHER (NO.31).

→Fig 13.

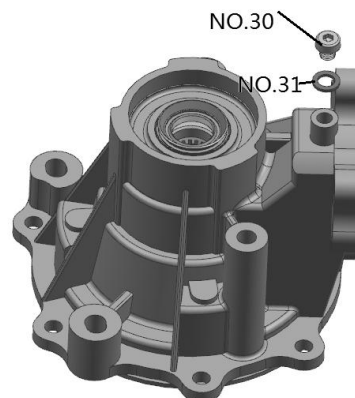


Fig 13

- 13.** Remove the PIN SHAFT (NO.38), SHIFT FORK (NO.39).

→Fig 14

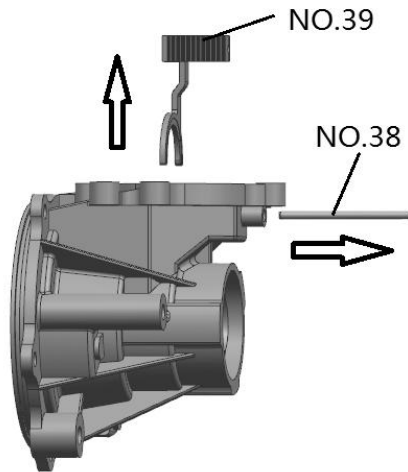


Fig 14

- 14.** Remove the DRIVE CLUTCH (NO.23).

→Fig 15.

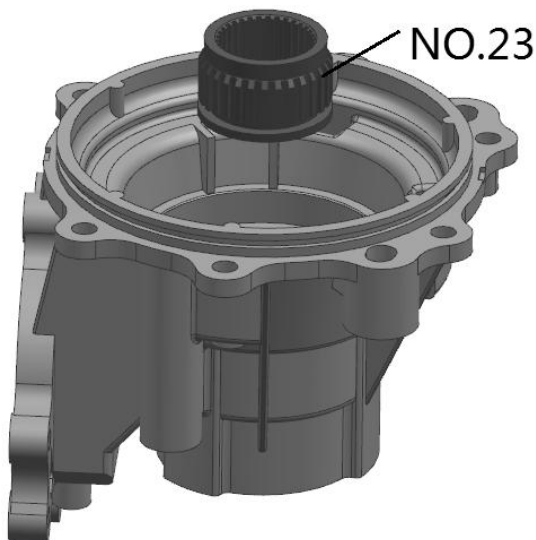


Fig 15

- 15 .** Inspect the bearing (NO.26). If the bearing was damaged, remove the RETAINER (NO.25) first, and then remove the bearing (NO.26).

→Fig 16.

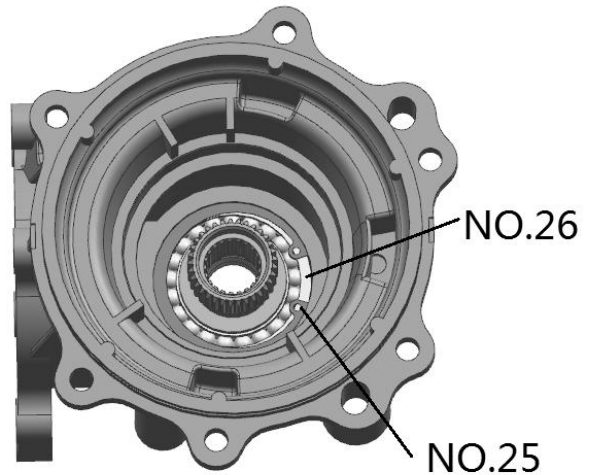


Fig 16

- 16.** Remove the DRIVE CLUTCH COVER (NO.24).

→Fig 17.



Fig 17

- 18.** Remove the OIL SEAL (NO.5).

→Fig 18.

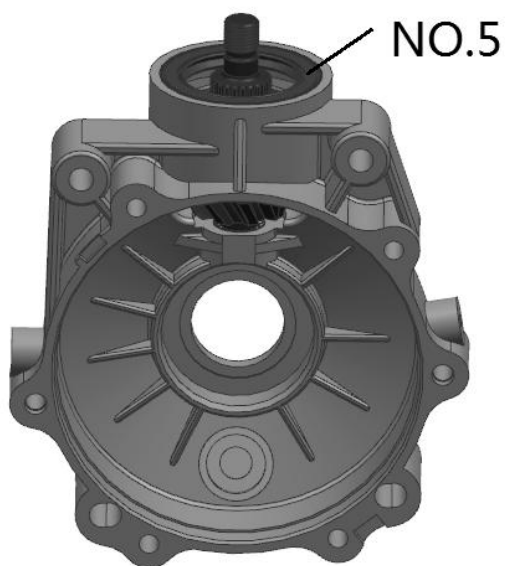


Fig 18

- 19 . Remove the BEARING RETAINER (NO.6) with special tool.
→Fig 19.

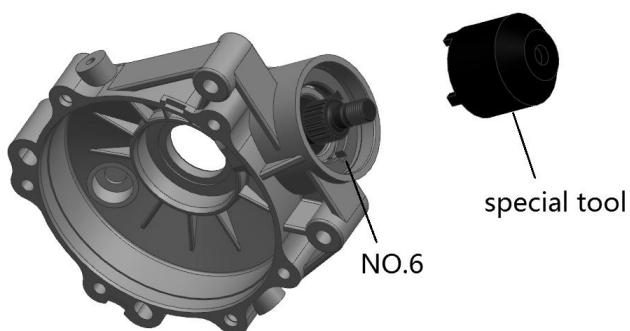


Fig 19

20. Remove the DRIVE PINION GEAR B.
→Fig 20.

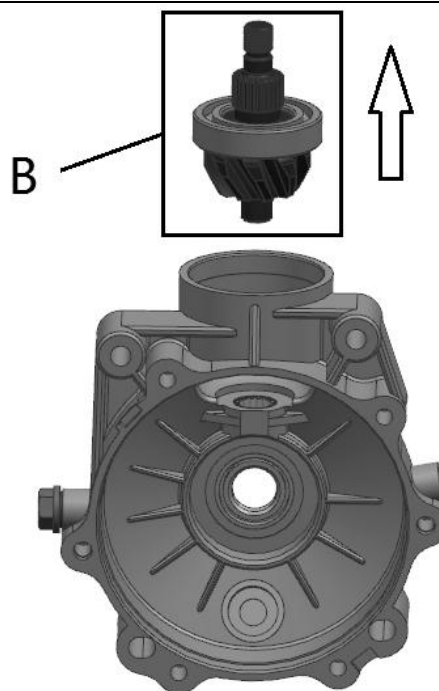


Fig 20

NOTE: The DIFFERENTIAL GEAR ASSY (A) AND THE DRIVE PINION GEAR B MUST BE REPLACED SIMULTANEOUSLY, NOT SEPARATELY.

5.20 FRONT GEARCASE

ASSEMBLY

Note: Grease all seals and O-rings with all season Grease upon assembly

1. Mount the drive clutch cover (NO.24).
→Fig 1

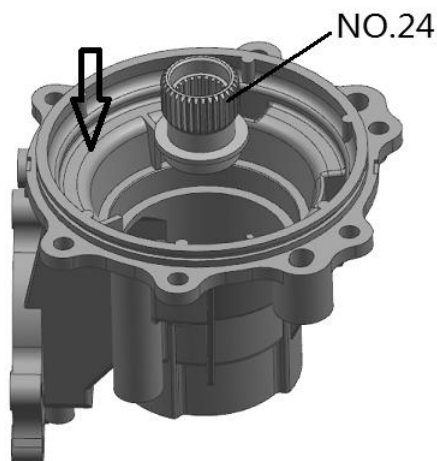


Fig 1

2. Mount the retainer 62 (NO.25) .
→Fig 2.

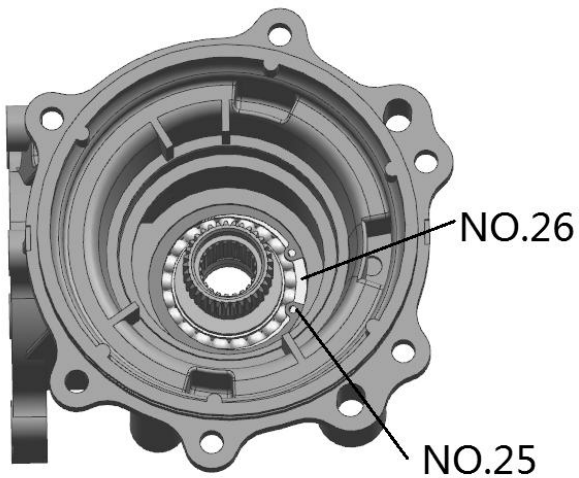


Fig 2

3. Mount the drive clutch (NO.23).
→Fig3.

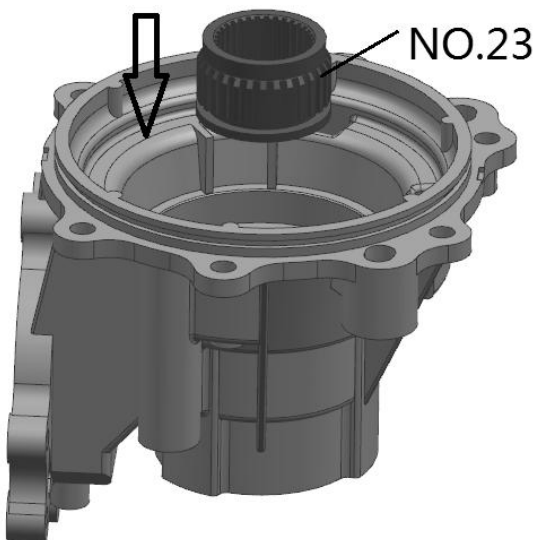


Fig 3

4. Mount the pin shaft (NO.38) and the shift fork (NO.39) .
→Fig 4.

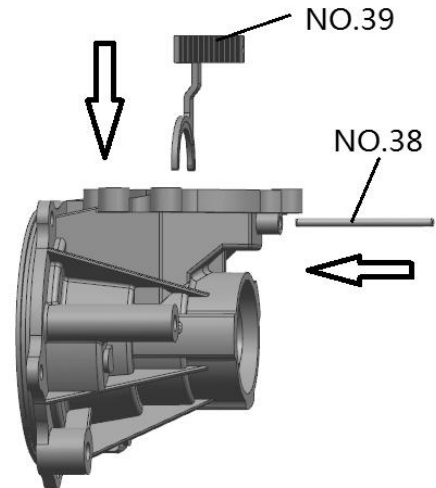


Fig 4

5. Install the screw (NO.30) and washer (NO.29), then mount the screw (NO.30) .
→Fig 5.

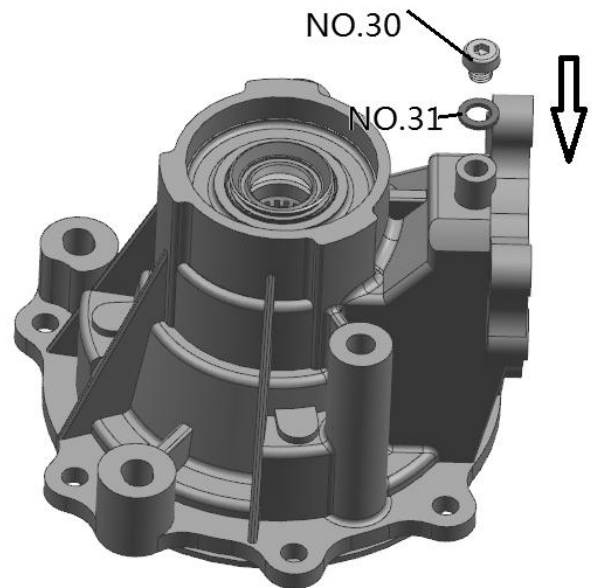


Fig 5

6. Mount the adjust shim (NO.22).
→Fig 6.

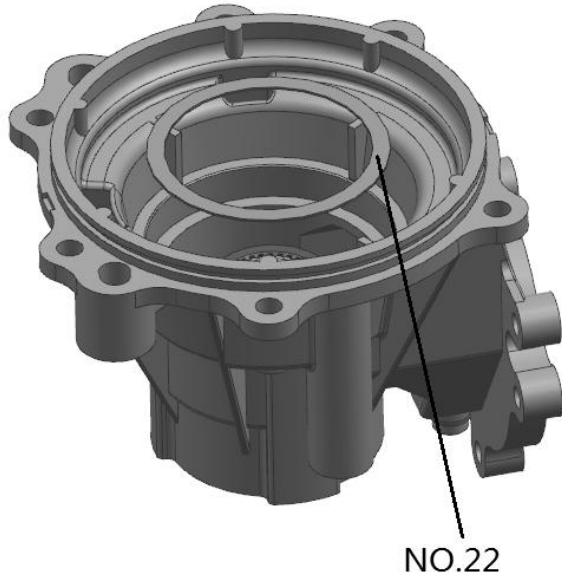


Fig 6

7. Install the DIFFERENTIAL GEAR ASSY **A** into the carrier housing.
→Fig 7

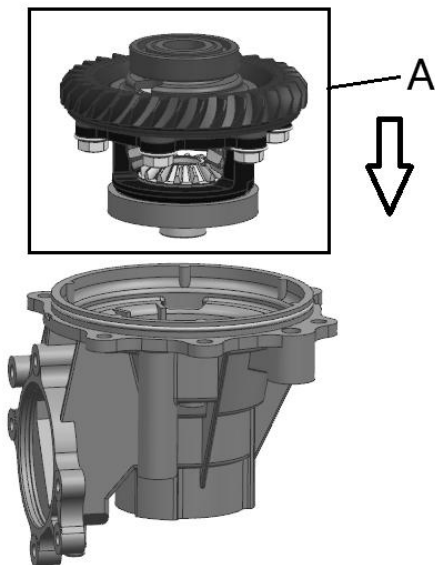


Fig 7

8. Install the DRIVE PINION GEAR **B** and install the BEARING RETAINER (NO.6) with special tool
→Fig 8.

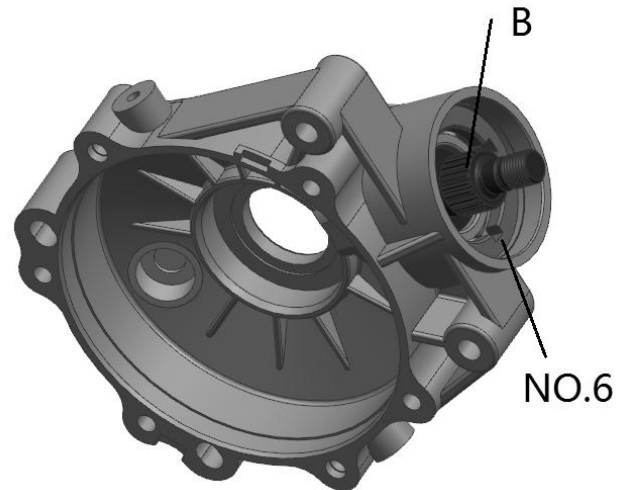


Fig 8

9. Install a new OIL SEAL (NO.5)
→Fig 9

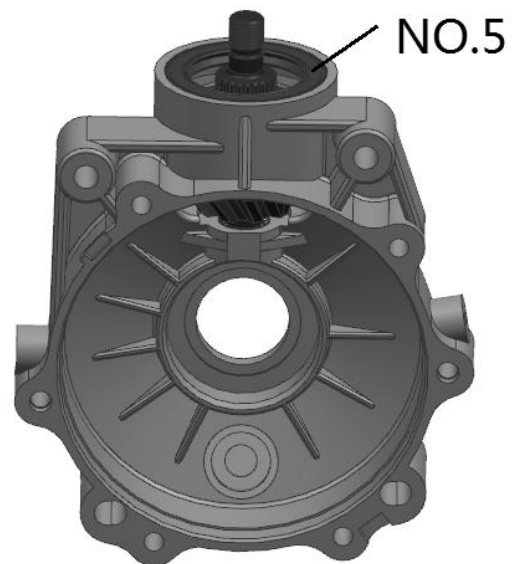


Fig 9

10. Mount the adjust shim (NO.16).
→Fig 10

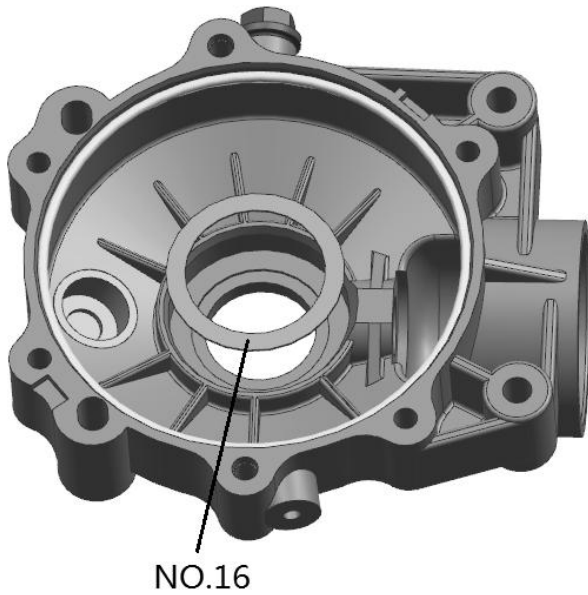


Fig 10

11. Assemble the gearcase halves and install the bolts (NO.29) that secure the cover to the housing. Torque the bolts in a criss cross pattern to 20~25Nm. →Fig 11

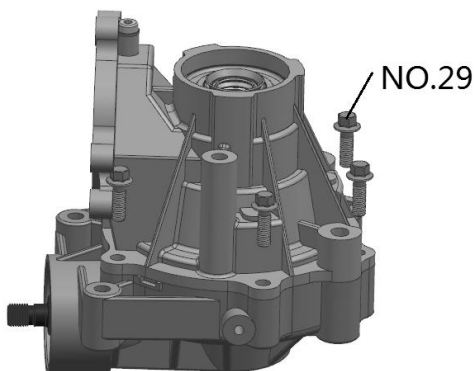


Fig 11

12. Mount the gear motor **A**.

Important: Before assemble the gear motor (NO.36), make sure that the shift fork (NO.39) is in their correct position as shown. →Fig 12.

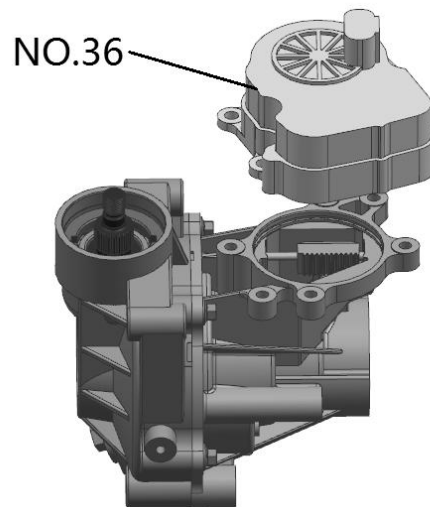
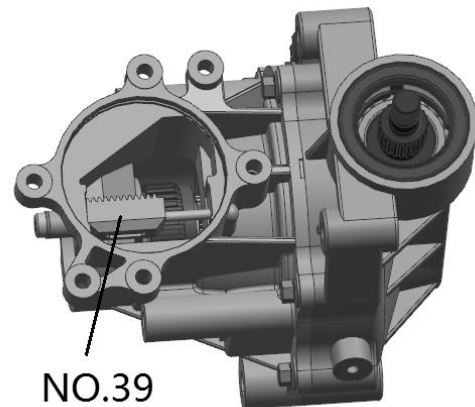


Fig 12

13. Mount the four screws (NO.37) . →Fig 13.

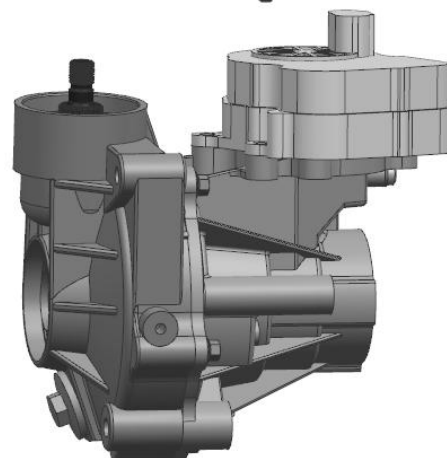


Fig 13

14. Mount the coupler (NO.4) .
→Fig 14

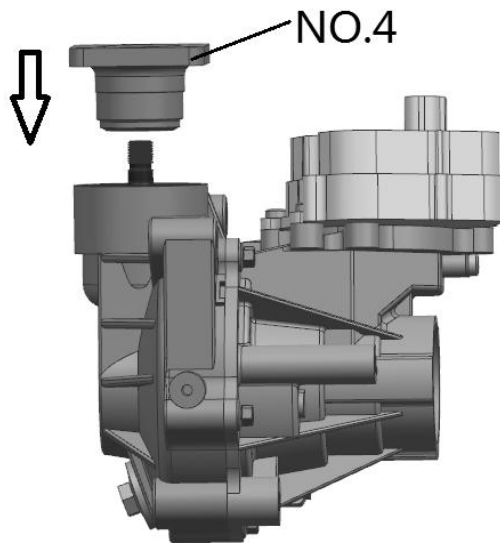


Fig 14

15. Mount the O-ring(NO.3).
→Fig 15

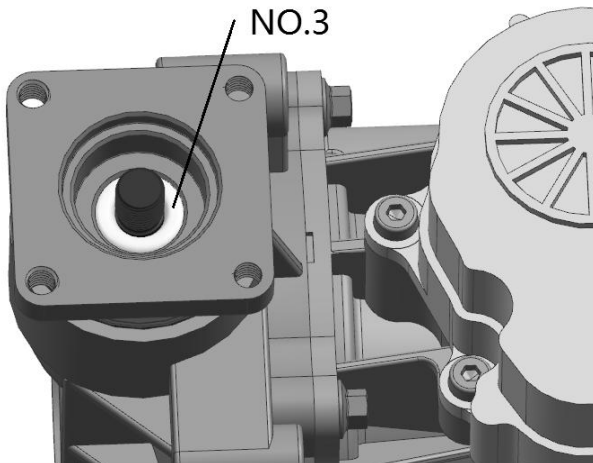


Fig 15

16. Apply some Loctite 263 thread locker on screw thread, mount the nut(NO.3), tighten it to a torque of 50~60Nm.
→Fig 16.

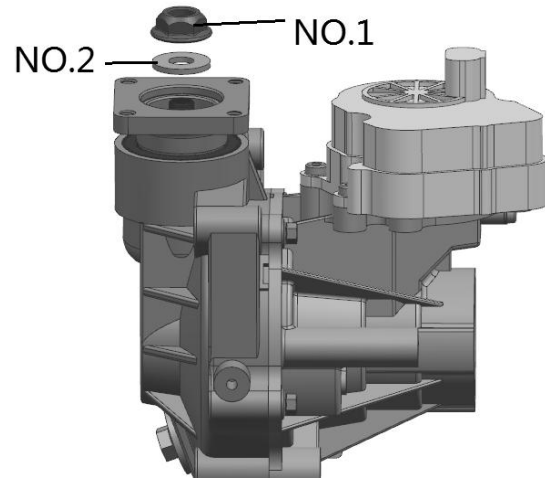


Fig 16

17. Add 200-250mL oil(85W/90GL-4).

NOTES

[illegible]

CHAPTER 6 BRAKES

WARNING

The parts of different types/ variants/ versions maybe un-interchangeable, even some parts have almost same appearance. Always refer to Parts Manual of each UTV model for spare parts information and service.

NOTE: Also See Chapter 2 for Maintenance Information.

6.1 SPECIFICATIONS

6.2 TORQUE

6.3 BRAKE SYSTEM SERVICE NOTES

6.4 BURNISHING PROCEDURE

6.5 BRAKE BLEEDING-FLUID CHANGE

6.6 PARKING BRAKE AND BRAKE LINE INSPECTION

6.7 PARKING BRAKE ADJUSTMENT

6.8 PARKING BRAKE REAR CALIPER REMOVAL/INSTALL

6.9 FRONT PAD INSPECTION / REMOVAL / REPLACEMENT

6.10 FRONT DISC INSPECTION / REMOVAL / REPLACEMENT

6.11 FRONT CALIPER REMOVAL/ INSPECTION / INSTALLATION

6.12 REAR BRAKE PAD REMOVAL/ INSPECTION / INSTALLATION

6.13 REAR CALIPER REMOVAL/ INSPECTION/ INSTALLATION

6.14 REAR BRAKE DISC INSPECTION / REMOVAL / REPLACEMENT

6.1 SPECIFICATIONS

Front Brake Caliper		
Item	Standard	Service Limit
Brake Pad Friction material Thickness	0.157"/ 5.5mm	0.04"/ 1mm
Brake Disc Thickness	0.150- 0.164"/3.810- 4.166mm	0.140"/ 3.556mm
Brake Disc Thickness Variance Between Measurements	-	0.002 "/ .051m m
Brake Disc Runout	-	0.005 "/ .127mm
Rear Brake Caliper		
Item	Standard	Service Limit
Brake Pad Friction material Thickness	hydraulic 0.157"/ 5.5mm	0.04"/ 1mm
	Hydraulic with mechanics park 0.236"/ 6mm	
	mechanics park 0.197"/ 5mm	
Brake Disc Thickness	0.177-0.187"/4.496-4.750m m	0.167"/4.242mm
Brake Disc Thickness Variance Between Measurements	-	0.002 "/ 0.051mm
Brake Disc Run out	-	0.005 "/ 0.127mm

6.2 TORQUE

Item	Torque (ft. lbs. except where noted*)	Torque (Nm)
Front Caliper Mounting Bolts	18.0	25
Rear Caliper Mounting Bolts	18.0	25
Front Brake Disc	18.0	25
Rear Brake Disc	18.0	25
Park Brake Mouting Bolts	33	45
Banjo Bolt	15.0	21

6.3 BRAKE SYSTEM SERVICE NOTES

- It is strongly recommended always change the caliper and (or) the master cylinder as an assembly. The parts inside maybe not interchangeable due to different brake manufactures and (or) different brake type.
- Do not over – fill the master cylinder fluid reservoir.

- Make sure the brake lever and pedal returns freely and completely.
- Check and adjust master cylinder reservoir fluid level after pad service.
- Make sure atmospheric vent on reservoir is unobstructed.
- Adjust foot brake after pad service.
- Test for brake drag after any brake system service and investigate cause if brake drag is evident.
- Make sure caliper moves freely on guide pins (where applicable) .
- Inspect caliper piston seals for foreign material that could prevent caliper pistons from returning freely.
- Perform a brake burnishing procedure after install new pads to maximize service life.
- Do not lubricate or clean the brake components with aerosol or petroleum products. Use only approved brake cleaning products.

6.4 BURNISHING PROCEDURE

Brake pads (both hydraulic and mechanical) must be burnished to achieve full braking effectiveness. Braking distance will be extended until brake pads are properly burnished. To properly burnish the brake pads, use the following procedure.

1. Choose an area large enough to safely accelerate the UTV to 50 km/h (30 mph) and to brake to a stop.
2. Using hi gear, accelerate to 50 km/h (30 mph); then compress brake lever (pedal) to decelerate to 0-8km/h (5 mph).
3. Repeat procedure on each brake system 20 times until brake pads are burnished.
4. Adjust the mechanical parking brake (if necessary).)
5. Verify that the brake light illuminates when the hand lever is compressed or the brake pedal is depressed.

WARNING

Failure to properly burnish the brake pads could lead to premature brake pad wear or brake loss. Brake loss can result in severe injury.

6.5 BRAKE BLEEDING-FLUID CHANGE

NOTE: When bleeding the brakes or replacing the fluid always start with the caliper farthest from the master cylinder.

CAUTION:

Always wear safety glasses.

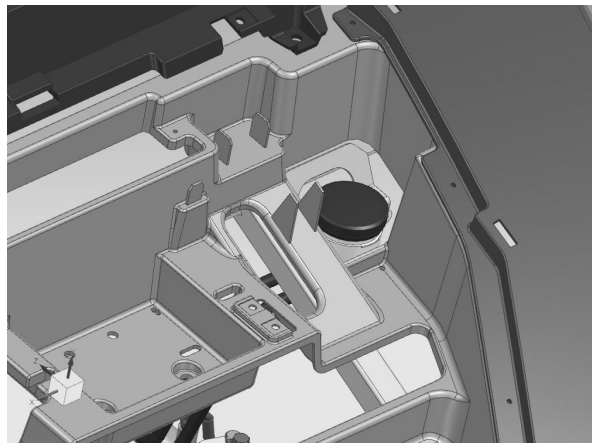
CAUTION:

Brake fluid is highly corrosive. Do not spill brake fluid on any surface of the UTV.

This procedure should be used to change fluid or bleed brakes during regular maintenance.

1. Clean reservoir cover thoroughly.

2. Remove cover from reservoir.



3. If changing fluid, remove old fluid from reservoir with a brake fluid pump or similar tool.

4. Add brake fluid up to the indicated MAX level on the reservoir.

DOT 3 Brake Fluid

5. Begin bleeding procedure with the caliper that is farthest from the master cylinder. Install a box end wrench on the caliper bleeder screw.

Attach a clean, clear hose to the fitting and place the other end in a clean container. Be sure the hose fits tightly on the fitting.

6. Slowly pump foot pedal until pressure builds and holds.

7. Hold brake pedal on to maintain pedal pressure, and open bleeder screw. Close bleeder screw and release foot pedal.

NOTE: Do not release foot pedal before bleeder screw is tight or air may be drawn into master cylinder.

8. Repeat procedure until clean fluid appears in bleeder hose and all air has been purged. Add fluid as necessary to maintain level in reservoir.

CAUTION:

Maintain at least 1/2 "(13mm) of brake fluid in the reservoir to prevent air from entering the master cylinder.

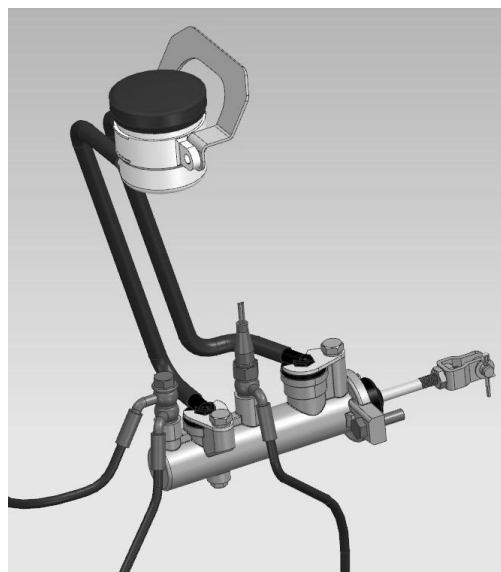
9. Tighten bleeder screw securely and remove bleeder hose.

10. Repeat procedure steps 5- 9 for the remaining calipers.

11. Add brake fluid to MAX level inside reservoir.

Master Cylinder Fluid Level

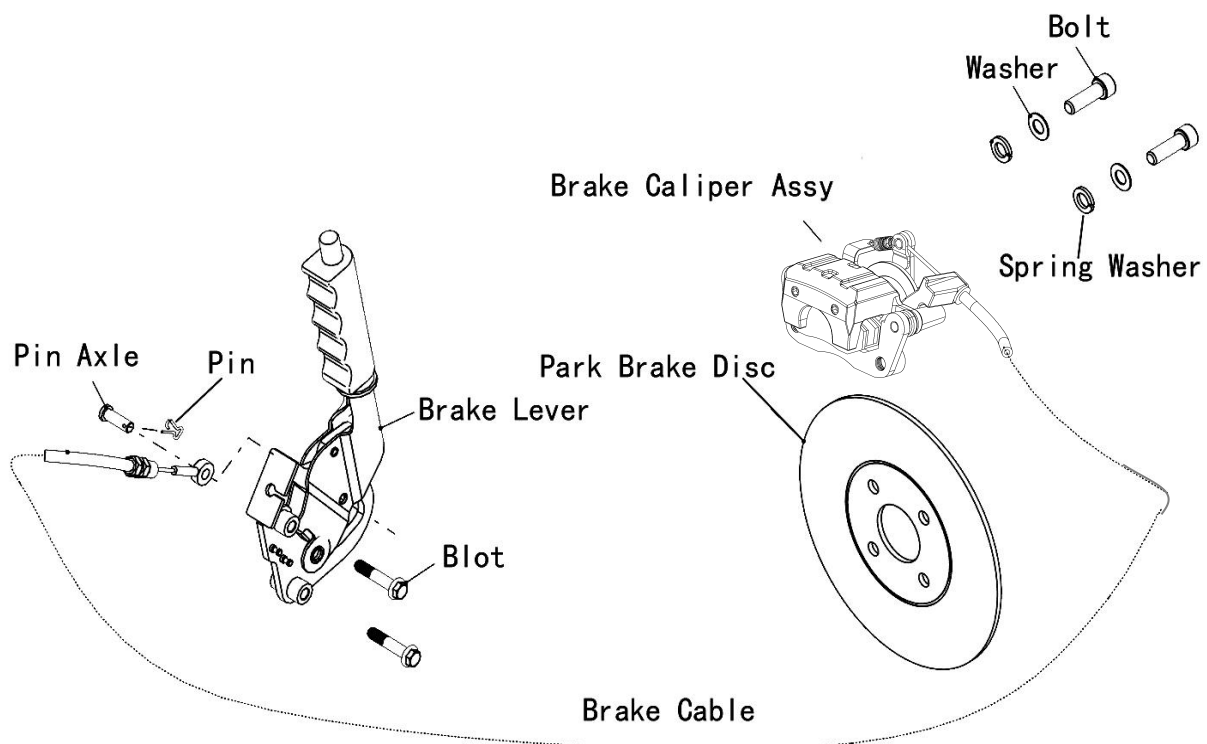
Between the MIN line and the MAX line of reservoir.



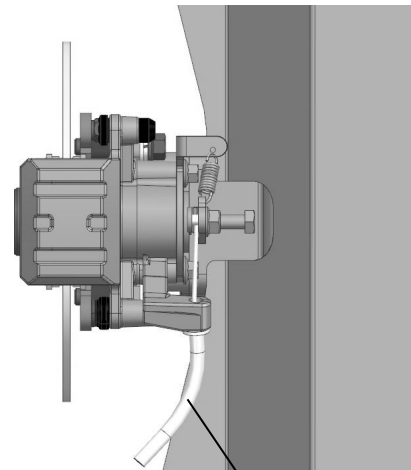
12. Install master cylinder reservoir cover.
13. Field test machine at low speed before putting into service. Check for proper braking action and pedal reserve. With pedal firmly applied, pedal reserve should be no less than 1/2 " (13mm).
14. Check brake system for fluid leaks and inspect all hoses and lines for wear or abrasion. Replace hose if wear or abrasion is found.

6.6 PARKING BRAKE AND BRAKE LINE INSPECTION

1. Inspect the spring on the parking brake lever assembly.



2. Inspect the parking brake cable at the parking brake lever assembly on the brake caliper.



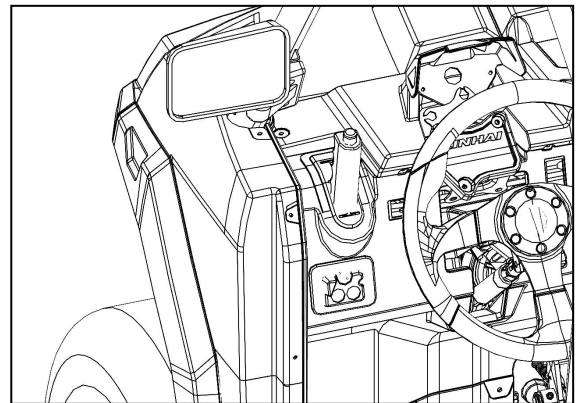
Parking Brake Cable

3. Inspect the brake lines and brake line connections for possible leaks or loose lines.

6.7 PARKING BRAKE ADJUSTMENT

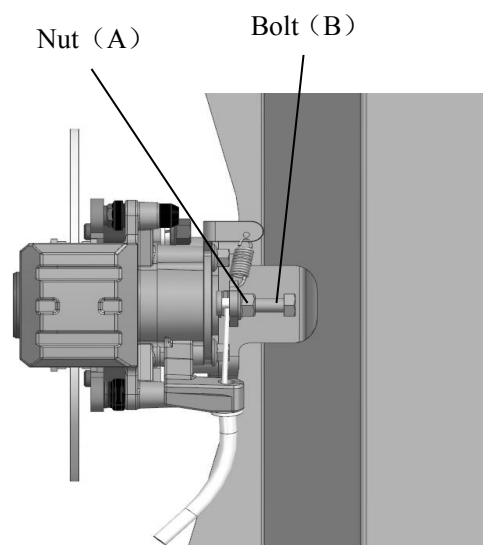
Parking Brake Inspection

1. Push the parking brake up with your hand.
2. After 2 to 4 clicks of lever travel, the vehicle should not roll while parked.
3. If the vehicle moves, adjustment is necessary.
4. Adjust the parking brake where the cable attaches to the lever assembly on the rear brake caliper.



Parking Brake Adjustment

1. Place the vehicle in neutral on a flat level surface.
2. Carefully lift the rear of the vehicle off the ground and stabilize on jack stands.
3. Loosen the jam nut (A) on the rear caliper adjustment bolt (B).
4. Tighten the adjustment bolt (B) until the rear tire will not rotate.
5. Back the adjustment bolt (B) out 1/4 turn.
6. Tighten the jam nut (A) while holding the adjustment nut (B) in place.



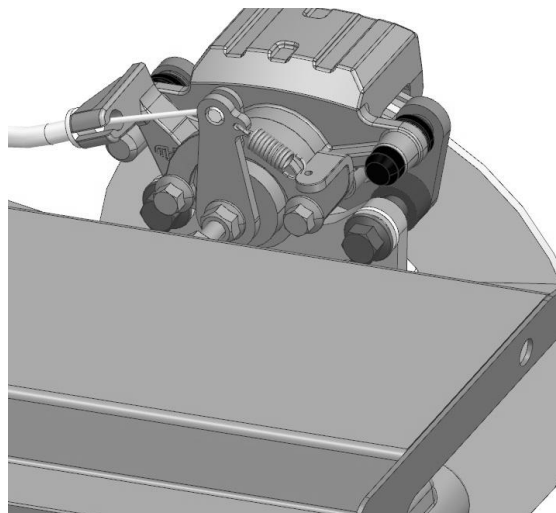
6.8 PARKING BRAKE REAR CALIPER REMOVAL / INSTALL

Park Brake Caliper Disassembly / Pad

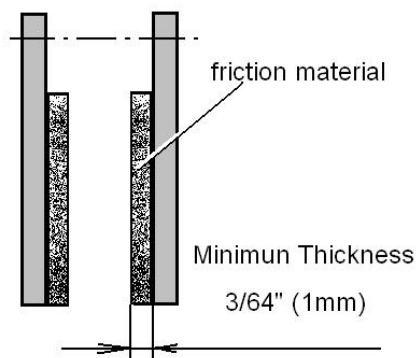
Inspection

NOTE: Do not get oil, grease, or fluid on the park brake pads. Damage to the pads may cause the pads to function improperly.

1. Loosen the two brake caliper bolts in equal increments. Remove the bolts from the bracket and lift park brake assembly out.

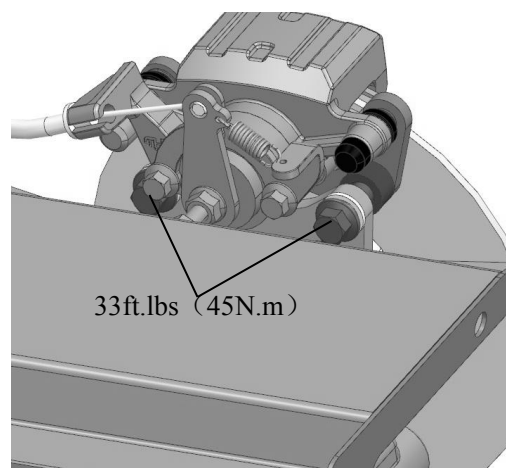


2. Measure the thickness of the caliper parking brake pads. Replace pads if worn beyond the service limit.
Service Limit 0.3/64"(1 mm)



Park Brake Caliper Installation

1. Install the park brake assembly into place.
Tighten the two bolts in increments for proper installation.
2. Torque the two bolts to 33ft.lbs. (45 N.m).
3. Test the park brake for proper function.



6.9 FRONT PAD REMOVAL / INSPECTION / INSTALLATION

NOTE: The brake pads should be replaced as a set.

REMOVAL

1. Elevate and support front of UTV safely.

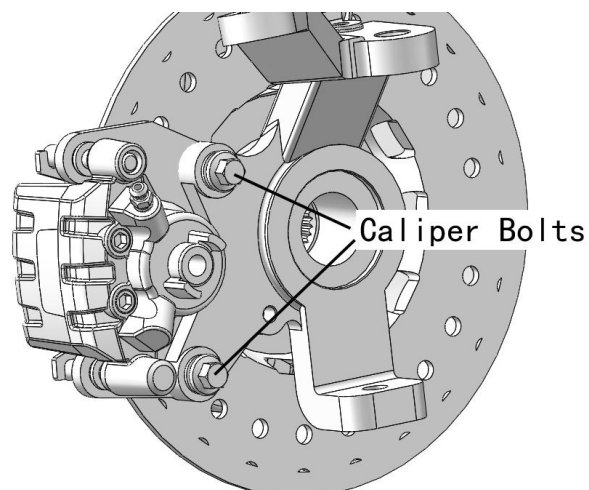
CAUTION:

CHAPTER 6 BRAKES

T-Boss760 SERVICE MANUAL23.0

Use carefully when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

2. Remove the front wheel.



3. Remove the two caliper bolts and caliper from mounting bracket.

4. Push caliper piston into caliper bore slowly using a C-clamp or locking pliers with pads installed.

NOTE: Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.

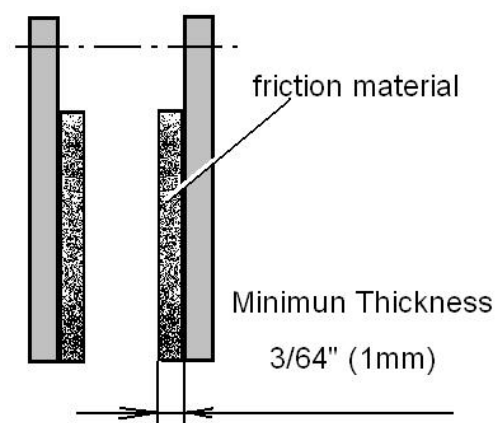
5. Push mounting bracket inward and slip outer brake pad past edge. Remove inner pad.



INSPECTION

Measure the thickness of the pad friction material. Replace pads if worn beyond the service limit.

Service Limit 0.3/64"(1 mm)



INSTALLATION

1. Lubricate mounting bracket pins with a light film of All Season Grease, and install rubber dust boots.
2. Compress mounting bracket and make sure dust boots are fully seated. Install pads with friction material facing each other. Be sure pads and disc are free of dirt or grease.
3. Install caliper on hub strut, and torque mounting bolts.

Front Caliper Mounting Bolts

Torque 18 ft. lbs. (25 Nm)

4. Slowly pump the brake lever until pressure has been built up. Maintain at least 1/2 "(13 mm) of brake fluid in the reservoir to prevent air from entering the brake system.
5. Install the adjuster screw and turn clockwise until stationary pad contacts disc, then back off 1/2 turn (counter clockwise).
6. Be sure fluid level in reservoir is up to MAX line inside reservoir and install reservoir cap.

Master Cylinder Fluid

Up to MAX line inside reservoir

7. Install wheels and torque wheel nuts.
8. It is recommended that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise. Start machine and slowly increase speed to 30 mph. Gradually apply brakes to stop machine. Repeat procedure 10 times.



6.10 FRONT DISC INSPECTION / REMOVAL / REPLACEMENT

INSPECTION

1. Visually inspect the brake disc for nicks, scratches, or damage.
2. Measure the disc thickness at 8 different points around the pad contact surface using a 0-1" micrometer and a dial indicator. Replace disc if worn beyond service limit.

Brake Disc Thickness

New 0.150-0.164" (3.810 - 4.166 mm)

Service Limit 0.140" (3.556 mm)

Brake Disc Thickness Variance



**Service Limit 0.002 " (0.051 mm)
difference between measurements**

3. Mount dial indicator as shown to measure disc runout on the dial indicator. Replace the disc if runout exceeds specifications.

Brake Disc Runout

Service Limit 0.005" (0.127 mm)



REMOVAL/ REPLACEMENT

1. Removal caliper and hub. Apply heat to the hub in the area of the brake disc mounting bolts to soften the bolt locking agent.
2. Remove bolts and disc.
3. Clean mating surface of disc and hub.
4. Install new disc on hub and tighten to specified.

CAUTION:

Always use new brake disc mounting bolts.

**Front Brake Disc Mounting Bolt Torque :
18 ft. lbs. (25 Nm)**



6.11 FRONT CALIPER REMOVAL/ INSPECTION / INSTALLATION

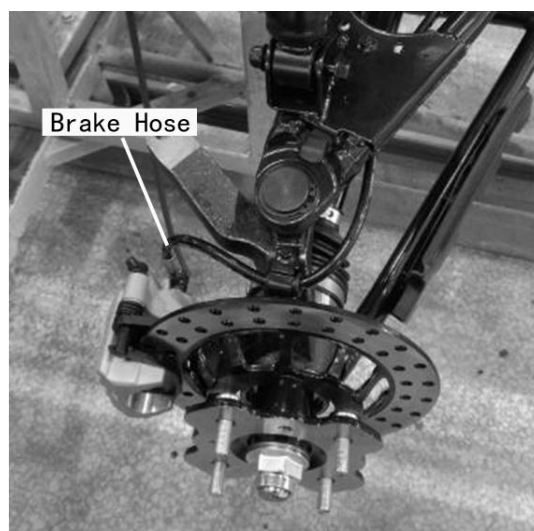
CAUTION:

The caliper is a non-serviceable component; it must be replaced as an assembly.

NOTE: If any special service needed, contact the UTV manufacture via the agent for the parts and special instruction.

REMOVAL

1. Remove wheel, remove caliper from the strut.
2. Loosen and remove brake hose to caliper. Place a container under caliper to catch fluid draining.



INSPECTION

Inspect caliper body for nicks, scratches or worn. Replace caliper as an assembly if any problem exists.

INSTALLATION

1. Install caliper on hub strut, Apply Loctite™ 243 to screw threads and Install new bolts.

Front Caliper Mounting Bolt Torque

18 ft. lbs. (25 Nm)

2. Install brake hose and tighten to specified torque.

Banjo Bolt Torque: 15 ft. lbs. (21 Nm)

NOTE: If new brake pads are installed, it is recommended that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise. Start machine and slowly increase speed to 30 mph. Gradually apply brakes to stop machine. Repeat procedure 10 times.

6.12 REAR BRAKE PAD REMOVAL/ INSPECTION / INSTALLATION

NOTE: The brake pads should be replaced as a set.

REMOVAL

1. Elevate and support rear of UTV safely.

CAUTION:

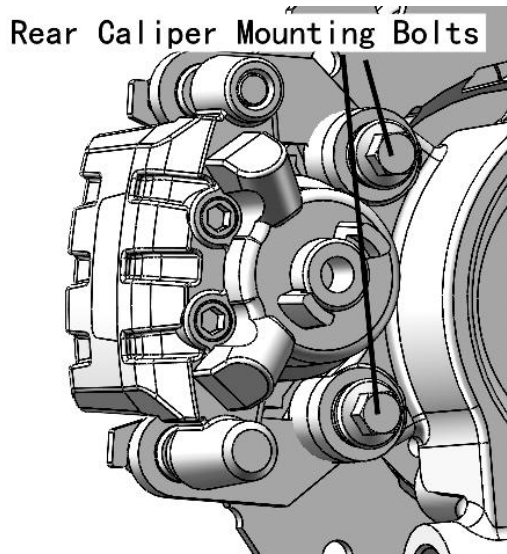
Use carefully when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

2. Remove the rear wheel.
3. Remove the two caliper bolts and lift caliper off of disc.

NOTE: When removing caliper, be careful not to damage brake line. Support caliper so as not to kink or bend brake line.

4. Push caliper piston into caliper bore slowly using a C-clamp or locking pliers with pads installed.

NOTE: Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.

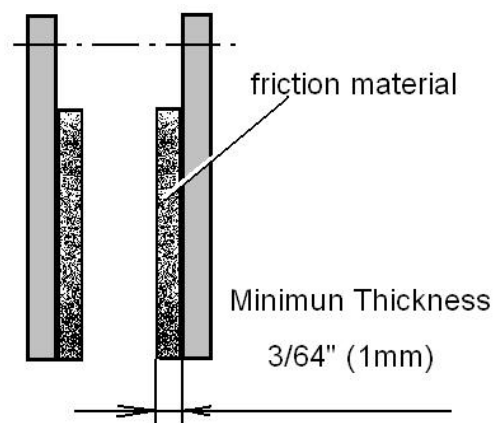


5. Remove the brake pads.
6. Clean the caliper with brake cleaner or alcohol.

INSPECTION

Measure the thickness of the pad friction material.
Replace pads if worn beyond the service limit.

Service Limit 0.3/64"(1 mm)



INSTALLATION

1. Install new pads in caliper body.
2. Install caliper and torque mounting bolts.
Brake Caliper Torque: 18 ft. lbs. (25 Nm)
3. Turn adjuster screw back in finger tight using a hex wrench.
4. Slowly pump the brake lever until pressure has been built up. Maintain at least 1/2 "(13 mm) of brake fluid in the reservoir to prevent air from entering the brake system.
5. Install wheels, burnishing procedure should be performed.

6.13 REAR CALIPER REMOVAL/ INSPECTION/ INSTALLATION

CAUTION:

The caliper is a non-serviceable Component; it must be replaced as an assembly.

NOTE: If any special service needed, contact the UTV manufacture via the agent for the parts and special instruction.

CAUTION:

Use carefully when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

1. Safely support the rear of the machine.
2. Use a wrench to remove the brake line. Place a container to catch brake fluid draining from brake lines.
3. After the fluid has drained into the container, remove the caliper mounting bolts and remove



caliper.

4. Remove brake pad as described above.
5. Inspect surface of caliper for nicks, scratches or damage and replace if necessary.
6. Install brake pads in caliper body with friction material facing each other, with the spacer between the pads. Install retaining pin through outer pad, pad spacer and inner pad.
7. Install caliper and torque mounting bolts to 18 ft.lbs. (25 Nm).
8. Install brake hose and tighten to specified torque.

Banjo Bolt Torque: 15 ft. lbs. (21 Nm)

9. Bleed.
10. Field test unit for proper braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when lever is released. If the brake drags, recheck assembly and installation.
11. Install the rear wheel and wheel nuts. Carefully lower the vehicle.

NOTE: If new brake pads are installed, it is recommended that a burnishing procedure be performed after installation of new brake pads to extend service life and reduce noise.

6.14 REAR BRAKE DISC INSPECTION / REMOVAL / REPLACEMENT

INSPECTION

1. Visually inspect the brake disc for nicks, scratches, or damage.
2. Measure the disc thickness at 8 different points around the pad contact surface using a 0-1" micrometer and a dial indicator. Replace disc if worn beyond service limit.

Brake Disc Thickness

New 0.177-0.187" (4.496 - 4.750 mm)

Service Limit 0.167" / 4.242 mm

Brake Disc Thickness Variance

Service Limit 0.002 " (0.051 mm)

difference between measurements

3. Mount dial indicator as shown to measure disc runout on the dial indicator. Replace the disc if runout exceeds specifications.

Brake Disc Runout**Service Limit 0.005" (0.127 mm)****REMOVAL/ REPLACEMENT**

1. Removal wheel/ hub and caliper.
2. Remove bolts and disc from the flange.
3. Clean mating surface of disc and hub.
4. Install new disc on flange.

Tighten to specified.

Rear Brake Disc Mounting Bolt Torque :
18 ft. lbs. (25 Nm)

CAUTION:

Always use new brake disc mounting bolts.

[illegible]