WORKCROSS
Maintenance Manual

Shandong Odes Industrial Co., Ltd.

Foreword

This manual contains such content as introductions on overhaul, maintenance, dismantling, assembling, troubleshooting and service data of UTV650/800/1000.

This manual will help you know the vehicle beter so that you can assure your customers of fast and reliable service.

This manual has been prepared on the basis of the latest specifications at the time of publication.If modifications have been made sine then,differences may exist between the content of this manual and the actual vehicle.

Illustrations in this manual are used to show the basic principles of operation and work procedures.They may not represent the actual vehicle exactly in detail.

Manufacturer reserves the right of no prior notice on product improvement or modification. Repair and maintenance shall be carried out according to actual situation of vehicle.

WARNING

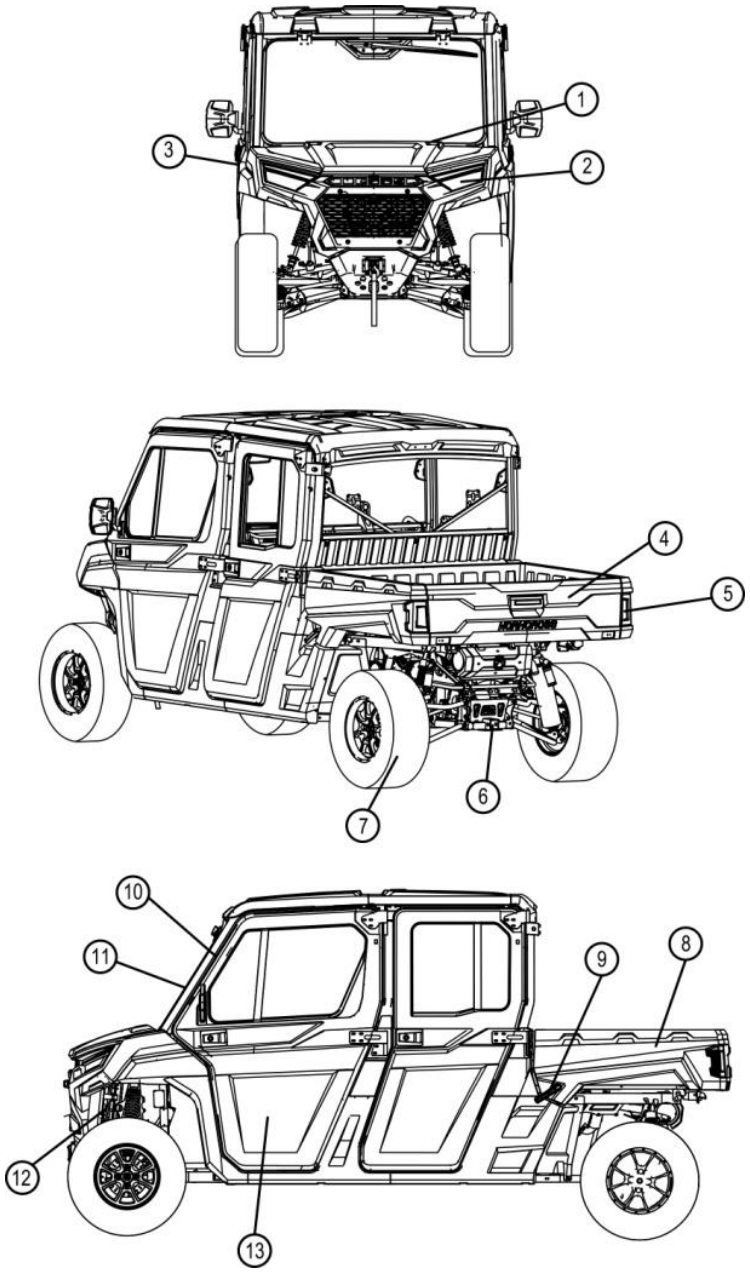
Inexperienced mechanics or mechanics without the proper tools and equipment may not be able to properly perform the services described in this manual.
Improper repair may result in injury to the mechanic and may render the vehicle unsafe for the rider.

1. GENERAL INFORMATION

UTV1000 VEHICLE APPEARANCE

Vehicle left-hand view

CAUTION: Because our products are available in single row and double row, the models below may differ from the vehicle you own. Please compare it with your car according to the actual situation.



1.Console

2.Headlights

3.Fuel Cap

4.Tailgate

5.Taillights

6.Receiver Hitch

7.Wheel/Tire

8.Cargo Box

9.Cargo Box Release Lever

10.Cab Frame

11.Windshield

12.Radiator/AC Condenser

13.Door

MARKER INFORMATIVENESS

Numbers of frame (or VIN code), engine and transmission case are major information numbers of aside-by-side vehicle. When ordering components or authorizing special services, these numbers are able to assist distributors to serve you better.

side-by-side vehicle mark information is shown as follows:

Figure 1.1.1.

The rack number (or VIN code) is printed on the right main pipe.

Figure 1.1.2.

Serial number of engine is stamped on the left side of crank case.

Figure 1.1.3

Serial number of transmission case is stamped at the rear of right gear shift rocker arm.

Figure 1.1.4

A metal nameplate should be installed on the rear main beam to indicate the main technical parameters. The manufacturer and delivery date of the vehicle.

Figure 1.1.1

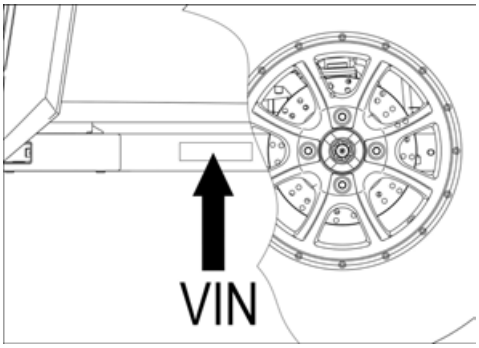


Figure 1.1.2

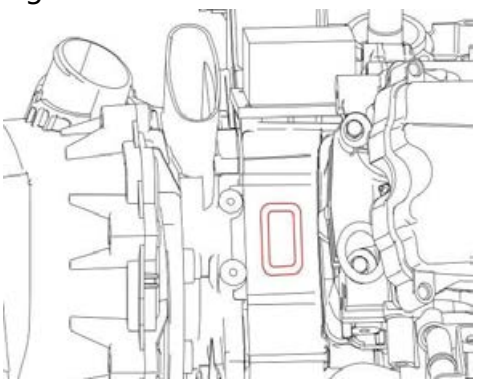


Figure 1.1.3

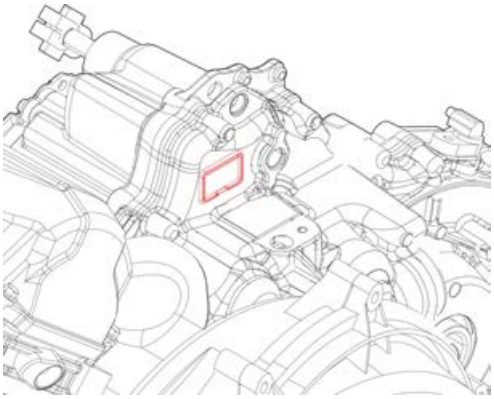
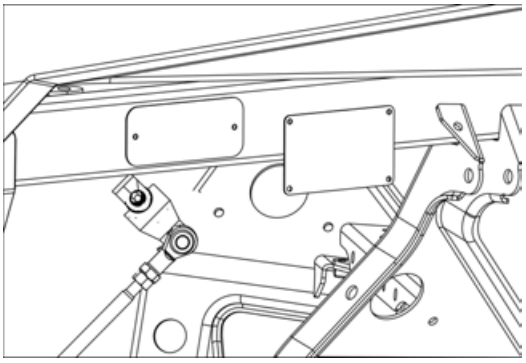


Figure 1.1.4



PRECAUTIONS

1. Do not make engine under operation at a closed place or place with poor ventilation for a long time.
2. If engine stops operation, please do not touch it or silencer to avoid burning.
3. Due to high corrosiveness, battery fluid (dilute sulphuric acid)) may cause burns to skin and eyes. In case of splashing it to skin, please clean it with water and see the doctor immediately. In case of splashing it to clothes, please wash it with water immediately. Keep battery fluid far away from Children.
4. Cooling liquid is toxic. Do not drink it or splash it to skin, eyes and clothes. once splashing it to skin, please wash it with a lot of soapy water. In case of splashing it to eyes, please wash eyes immediately and see the doctor. In case of drinking cooling liquid, resulting in vomit, please see the doctor. Keep cooling liquid far away from children.
5. Wear proper working suit, boots and hat. If necessary, please wear long-sleeve working suit and gloves for operation.
6. Gasoline is highly inflammable. No smoking or firing. At the same time, fire sparks shall be avoided. Vaporized gasoline is explosive as well. Operation shall be carried out at places with good ventilation.
7. Battery may produce explosive hydrogen in charging. Please ensure charging at places with good ventilation.
8. Use legal parts, lubricating oil and lubricating grease.
9. Before overhauling, please clean soil and dust.
10. Keep accessories of each part well for correct assembly.
11. Replace dismantled gasket, O-shaped ring, piston pin retainer and cotter pin.
12. Retainer of rubber ring may be deformed after dismantling. So, please do not use loose and soft retainer.
13. Please wash and dry dismantled parts. Use lubricant on the surface of moving parts. For correct installation, please measure data well in dismantling process.
14. If do not know length of screw, please install screws one by one to ensure their corresponding depth.
15. Pre-tighten bolts and nuts and then tighten them with designated torque from the big to the small and from the inside to the outside.
16. Check whether rubber parts are aged. If necessary, replace them. Keep rubber parts far away from grease.
17. If necessary, special tools can be used.
18. Rotate inside and outside races of bearing to ensure flexibility of balls.
    a) If axial or radial resistance is too large, please replace it. If there is concave-convex on the surface, please use oil for washing. If no effect is achieved with washing, please replace it.
    b) If bearing cannot be clamped tightly in pressing into machine or axle, please replace bearing.

19. Please install a side dust proof bearing at correct direction. In installation of open or double-face dust proof bearing, pay attention to that marks of manufacturer shall be outward.
20. In cleaning and drying bearing, please keep bearing support still. Before installation, please carry out lubrication with oil or lubricating oil.
21. Please correct install elastic retaining ring. Assembling after opening can ensure installation of snap ring into slot.
22. After assembly, please check whether all parts are of perfect tightening and flexible movement.
23. Brake fluid and coolant may damage shell and plastic and rubber parts. In case of being splashed by them, please use water for washing.
24. In installing pipeline, please insert them to bottom of connecting pipeline. In installing pipe clamp, please install them to groove if there is. As for pipeline or pipe clamp that cannot be tightened, please replace them.
25. Do not mix soil or dust into engine and/or hydraulic braking system.
26. Before installation, please clean gasket and spacer of engine shell. Use oil stone to polish scratch of joint face evenly.
27. Do not twist or bend too much cable. Twisted or damaged cables may cause inflexible operation.
28. In assembling protective caps of parts, insert cap into groove if any.

Engine running-in steps

Though quality material has been used for motorcycle manufacturing and all components are conforming to high quality standard, all components and parts shall subject to running-in process before engine reaching maximum load. The reason behind this is that cooperation of components has not reached the best status after their assembling. This leads to damping force of engine and unnecessary mechanical loss. The ideal cooperation can be reached after operation for some time. In this case, mechanical loss can be minimized, reaching the best status and bringing the output power to maximum value. As a result, engine performance directly relates to initial maintenance. Regulation of running-in process is shown as follows:

- Please follow the restriction requirements for engine speed in the running-in period below:

The first 150km	Below 5000 rpm
Till 800km	Below 5500 rpm
Till 1600km	Below 6500 rpm
Above 1600km	Below 8500 rpm

- Do not fully open the accelerator before the reading of the odometer reaching 1000km. Attention: the speed shall not exceed 6500 rpm no matter what in running-in period.

- During the running-in period, the engine shall not work at the same speed with the same gear position for a long time. Try to shift gear position and speed to facility running-in of components.

- After 1000km of operation, transmission and crank cases shall be cleaned thoroughly.

TECHNICAL SPECIFICATIONS

Item		Parameter	
Dimensions		Long	Short
Overall length		3866mm	3041mm
Overall width		1663mm	1663mm
Overall height		2090mm	2090mm
Wheelbase		2970mm	2145mm
Ground clearance		310mm	310mm
Engine			
Type	650cc	Two-cylinder, 4-stroke,SOHC, water cooling,	
	800cc	Two-cylinder, 4-stroke,SOHC, water cooling,	
	1000cc	Two-cylinder, 4-stroke,SOHC, water cooling,	
Number of valves		8(mechanical adjustment)	
Cylinder diameter	650cc	82mm	
	800cc	91 mm	
	1000cc	91 mm	
Piston stroke	650cc	61.5 mm	
	800cc	61.5 mm	
	1000cc	75mm	
Compression ratio	650cc	10.3：1	
	800cc	10.3：1	
	1000cc	10.5：1	
Displacement	650cc	649cc	
	800cc	800cc	
	1000cc	976cc	
Maximum power	650cc	39.5kw/6300rpm	
	800cc	44Kw/6000rpm	
	1000cc	63.7kw/6500rpm	
Maximum torque	650cc	62N.m/5300rpm	
	800cc	73N.m/5000 rpm	
	1000cc	101N.m/5500rpm	
Idle speed	650cc	1250rpm	
	800cc	1250rpm	
	1000cc	1250rpm	
Lubrication	Type	Wet tank lubrication, oil filters can be changed	
	Oil pressure	0.18-0.3MPa at 1250rpm	
	Type of oil	SAE10W-40 SJ	
	Oil quantity	2200mL	
	Replacement of capacity	1850mL	
Fuel	Type	Unleaded gasoline only 93# or higher	
	Fuel pressure	350 KPa	
	Fuel tank capacity	43L	

Valve clearance	Intake		0.05 to 0.09mm
	Exhaust		0.10 to 0.15mm
Spark plug	Type/manufacturer		DCPR8E / NGK
	Gap		0.7 to 0.9mm
Transmission type			CVT(Continuously Variable Transmission)
Continuously variable ratio			0.71 to 3.1
Drive belt width	Service limit		30.00mm
Gearbox type			Dual range(H/L) with park, neutral and reverse
Gearbox oil	Capacity	650cc	420mL(GL-4-90)
		800cc	420mL(GL-4-90)
		1000cc	450mL(GL-4-90)
Gear ratio	H	650cc	3.183
		800cc	
		1000cc	
	L	650cc	7.841
		800cc	
		1000cc	
	R	650cc	6.919
		800cc	
		1000cc	
Capacity of cooling liquid	Type		Ethyl glycol/water mix(-35℃)
	Maximum load		Long 8500mL/ Short 7200mL
	Capacity of water tank		800ml
Cooling liquid temperature thermostat	Valve opening		76℃
	Fan opening		82℃
Tire			
Type			Tubeless
Pressure			97 to 110KPa
Size Front			AT26/27/28×9–14
Size Rear			AT26/27/28×11–14
Brake			
System			Front and rear unified
Type Front			Dual disc brake
Type Rear			Dual disc brake
Operation			Foot
Suspension and shock absorber			
Front suspension			Double wishbone
Rear suspension			Double wishbone
Front shock absorber			Coil spring / oil damper/Airbag shock absorption
Front shock absorber travel			185mm

Rear shock absorber		Coil spring / oil damper/Airbag shock absorption
Rear shock absorber travel		177mm
Drive train		
Front differential		Shaft driven/single auto-lock differential
Front differential ratio		3.6:1
Rear axle		Shaft driven/single differential
Rear axle ratio		3.6:1
Front differential oil capacity		250mL(GL-4-90)
Rear differential oil capacity		1500mL(GL-4-90)
Electrical		
Ignition system		EFI-DELPHI
Battery	Type	Maintenance Free
	Voltage	12V
	capacity	45AH

TIGHTENING TORQUE

Locking devices (e.g.: locking tabs, elastic stop nuts ,self-locking fasteners ,etc.) must be installed or replaced with new ones, where specified. If the efficiency of a locking device is impaired, it must be renewed.

In order to avoid a poor assembling, tighten screws, bolts or nuts in accordance with the following recommended torque value:

Grade	Torque (N·m)					
	M6	M8	M10	M12	M14	M16
4.6	4～5	10～12	20～25	36～45	55～70	90～110
5.6	5～7	12～15	25～32	45～55	70～90	110～140
6.8	7～9	17～23	33～45	58～78	93～124	145～193
8.8	9～12	22～30	45～59	78～104	124～165	193～257
10.9	13～16	30～36	65～78	110～130	180～201	280～330
12.9	16～21	38～51	75～100	131～175	209～278	326～434

Grade	Torque (lbf.ft)					
	M6	M8	M10	M12	M14	M16
4.6	3～3.7	7.4～8.6	14.8～18.5	26.6～33.2	40.6～51.7	66.4～81.2
5.6	3.7～5.2	8.9～11.1	18.5～23.6	33.2～40.6	51.7～66.4	81.2～103.3
6.8	5.2～6.6	12.5～17	24.4～33.2	42.8～57.6	68.6～91.5	107～142.4
8.8	6.6～8.6	16.2～22.1	33.2～43.5	57.6～76.8	91.5～121.8	142.4～189.7
10.9	9.6～11.8	22.1～26.6	48～57.6	81.2～95.9	132.8～148.3	206.6～243.5
12.9	11.8～15.5	28～37.6	55.4～73.8	96.7～129.2	154.2～205.2	240.6～320.3

CAUTION

Be sure to use the proper tightening torque for the proper strength grade. Always torque screws, bolts and / or nuts in a criss-cross sequence.

	Bolt length comparison table							
Length(mm)	12	14	16	20	25	30	35	40
Length(in)	0.47	0.55	0.63	0.79	0.98	1.18	1.38	1.57
Length(mm)	45	50	55	60	65	70	75	80
Length(in)	1.77	1.97	2.17	2.36	2.56	2.76	2.95	3.15
Length(mm)	85	90	95	100	105	110	115	120
Length(in)	3.35	3.54	3.74	3.94	4.13	4.33	4.53	4.72
Length(mm)	125	130	135	140	145	150	155	160
Length(in)	4.92	5.12	5.31	5.51	5.71	5.91	6.1	6.3
Length(mm)	165	170	175	180	185	190	195	200
Length(in)	6.5	6.69	6.89	7.09	7.28	7.48	7.68	7.8

As for important tightening torques , please refer to following standards.

Installation location	Specifications (mm)	Torque N.m(lbf.ft)
Fastening bolt of engine	M10	70(51.6)
Fastening nut of suspension arm	M10	70(51.6)
Bolt of rear shock absorber	M10	80(59)
Bolt of front shock absorber	M10	80(59)
Fastening nut of wheel rim	M10	80(59)
Nut of wheel hub	M18	250(184.5)
Bolt of rear brake/stop pump (calipers)	M10	80(59)
Rear Brake / Brake disc bolts	M8	26(19.2）
Bolt of front brake/stop pump (calipers)	M8	26(19.2)
Front Brake / Brake disc bolts	M6	15(11)
Lock nut of steering rod	M8	40(29.5)
Bolt of exhaust pipe	M6	15(11)
Spark plug	M10	20(14.8)
Adjusting nut of valve clearance	M6	12(8.9)
Main pulley bolt	M12	100(73.8)
Driven pulley bolt	M10	60(44.3）
Magneto flywheel bolt	M16	150(110.7)
Magneto stator bolt	M6	12.5(9.2)
One way bolt	M8	30(22.1)
Engine oil drain plug	M10	20(14.8)
Gearbox oil drain plug	M12	20(14.8)
Decompression valve plug	M22	20(14.8)
Cylinder head bolt	M6	15(11）
Connecting rod bolt	M8	50(36.9)
Timing chain wheel bolt	M8	30(22.1)

2. PERIODIC MAINTENANCE

MAINTENANCE SCHEDULE

In order to maintain the best performance and economical performance of vehicles, suggestions on intervals for necessary regular maintenance are listed. Following maintenance is calculated in km, mile and hour based on firstly appeared data.

However, keep in mind that if the vehicle isn’ t used for a long period of time, the month maintenance intervals should be followed.

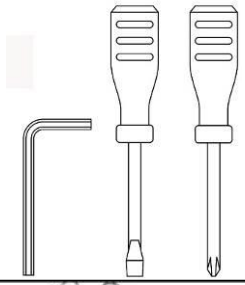
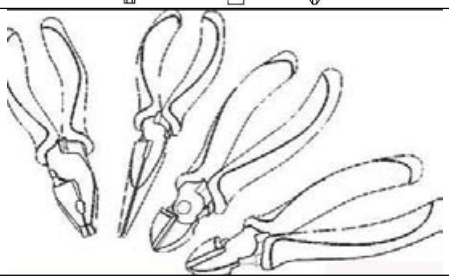
Items marked with an asterisk should be performed by a dealer as they require special tools and technical skills.

In case of complicated road conditions, regular maintenance shall be carried for vehicles.

ITEM	ROUTINE	Whichever Comes first ⇨		INTIAL			EVERY	
			month	1	3	6	6	12
			Km (mi)	320 (200)	1,200 (750)	2,400 (1,500)	2,400 (1,500)	4,800 (3,000)
			hours	20	75	150	150	300
Valves*	● Check vale clearance. ● Adjust if necessary.			O		O	O	O
Cooling system	● Check coolant leakage. ● Repair if necessary. ● Replace coolant every 24 months.			O	O	O	O	O
Spark plug	● Check condition. ● Adjust gap and clean. ● Replacement every 24 months			O	O	O	O	O
Air filter elements	● Clean. ● Replacement every 24 months			Every 20-40 hours (More often in wet or dusty areas.)				
Crankcase breather system*	● Check breather hose for cracks or damage. ● Replace if necessary.					O	O	O
Exhaust system*	● Check for leakage. ● Tighten if necessary. ● Replace gasket(s) if necessary.					O	O	O
Fuel line*	● Check fuel hose for cracks or damage.. ● Replacement fuel hose every 48 months ● Replacement fuel filter every 24 months					O	O	O
Engine oil	● Replace (Check oil level every month) .			O		O	O	O
Engine oil filter	● Replace.			O		O		O
Differential and gearbox oil	● Check oil level/oil leakage. ● Replacement every 24 months.			O				O
ITEM	ROUTINE	Whichever	month	INTIAL 1	INTIAL 3	INTIAL 6	EVERY 6	EVERY 12

		Comes first ⇨	Km (mi)	320 (200)	1,200 (750)	2,400 (1,500)	2,400 (1,500)	4,800 (3,000)
			hours	20	75	150	150	300
Brake*	●Check operation/brake pad wear/fluid leakage. ●Brake fluid needs to be above the lowest position. ●Correct if necessary. Replace pads/disk if worn to the limit.			O	O	O	O	O
Accelerator pedal*	●Check operation and free play.			O	O	O	O	O
Wheels*	●Check balance/damage/ run out ●Repair if necessary.			O		O	O	O
Wheel bearings*	●Check bearing assemblies for looseness or damage.. ●Replace if damaged.			O		O	O	O
Front and rear Suspension*	●Check operation and for leakage. ●Correct if necessary.					O		O
Steering system*	●Check operation and for looseness/Replace if damage. ●Check toe-in/Adjust if necessary.			O	O	O	O	O
Rear knuckle pivots and suspension arms*	●Lubricate with lithium-soap-based grease.					O	O	O
Drive shaft universal joint*	●Lubricate with lithium-soap-based grease.					O	O	O
Engine mount*	●Check for cracks or damage. ●Correct bolt tightness.					O	O	O
Front and rear axle boots*	●Check operation. ●Replace if damage.			O				O
Stabilizer bushings*	●Check for cracks or damage.					O	O	O
Fittings and fasteners*	●Check all chassis fittings and fasteners. ●Correct if necessary.			O	O	O	O	O
Battery	●End connection			O		O	O	O
Lamp and steering indication	●Operation			O	O	O	O	O

Preparation of tools for routine maintenance of vehicle

General tool	Name	Operation
	**Electronic runner, Spanner**	**Be use to disassemble and tighten bolts**
	**Hexagon socket wrench, Screwdriver**	**Be use to remove cover bolts and screws**
	**Pliers**	**Be use to tighten component**

AIR CLEANER

In case of driving in dusty environment, air filter shall be cleaned regularly. It is of great possibility to accelerate wear to engine if there is not filtering element or worn filtering element is used. So, please keep air filter under good conditions all the time. If vehicle is used in dusty area, inspect more frequently than specified in MAINTENANCE SCHEDULE.

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. never remove or modify any component in the air filter housing. The engine management system is calibrated to operate specifically with these components. Otherwise, engine performance degradation or damage can occur.Check and clean the air cleaner element in the following manner:

Replacing the Air Filter

NOTE: Never modify the air intake system. Otherwise, engine performance degradation or damage can occur. The engine is calibrated to operate specifically with these components.

Air Filter Replacement Guideline Air filter replacement should be adjusted according to riding conditions as it is critical to ensure proper engine performance and life span.

Air filter replacement frequency must be increased for the following dusty conditions:

-Driving on dry sand

-Riding on dry dirt covered surfaces

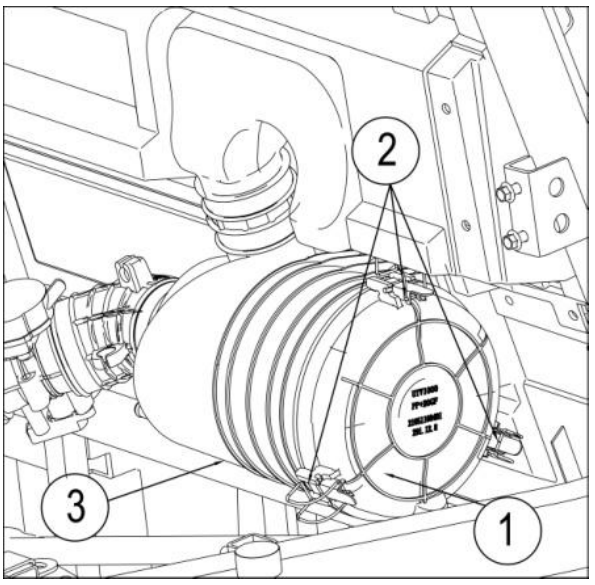
-Riding on dry gravel roads or similar conditions.

NOTE: Riding in a group in these conditions would increase even more the air filter replacement requirement.

Removing the Air Filter

Tilt cargo box.

Unlatch air filter cover and remove air filter.



RH SIDE OF VEHICLE, UNDER CARGO BOX

1. Air filter cover
2. Latches
3. Duck bill valve

The filter fits tightly over the outlet tube and there will be some initial resistance. Gently move the end of the filter back and forth to break the seal, then rotate while pulling straight out. Avoid knocking the filter against the housing. Replace air filter if clogged. Always use the recommended air filter or an equivalent.

Cleaning the Duckbill Valve

Visually check and physically squeeze the duckbill valve. Make sure the valve is flexible and not inverted, damaged or plugged.

Installing the Air Filter

Insert the filter carefully. Seat the filter by hand, making certain it is inserted completely into the air cleaner housing. Apply pressure by hand at the outer rim of the filter, not the flexible center. Secure air filter cover with latches.

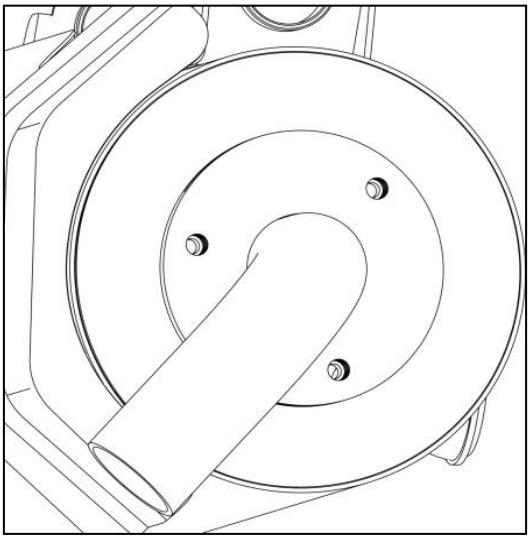
Cleaning the Duckbill Valve Visually check and physically squeeze the duckbill valve.

Make sure the valve is flexible and not inverted, damaged or plugged.Installing the Air Filter Insert the filter carefully. Seat the filter by hand, making certain it is inserted completely into the air cleaner housing. Apply pressure by hand at the outer rim of the filter, not the flexible center.Secure air filter cover with latches.

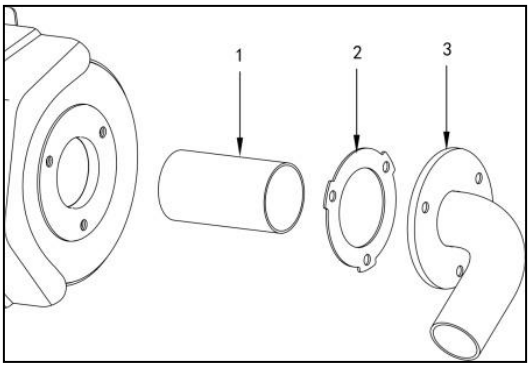
EXHAUST SYSTEM

Cleaning and Inspecting the Muffler Spark Arrester

CAUTION: Never perform this operation immediately after the engine has been running as exhaust system is very hot. Remove and discard tail pipe fasteners.



Remove exhaust tail pipe, gasket (discard) and spark arrestor.



Remove carbon deposits from the spark arrester using a brush.

NOTICE: Use a metallic soft brush and be careful to avoid damaging spark arrestor mesh.

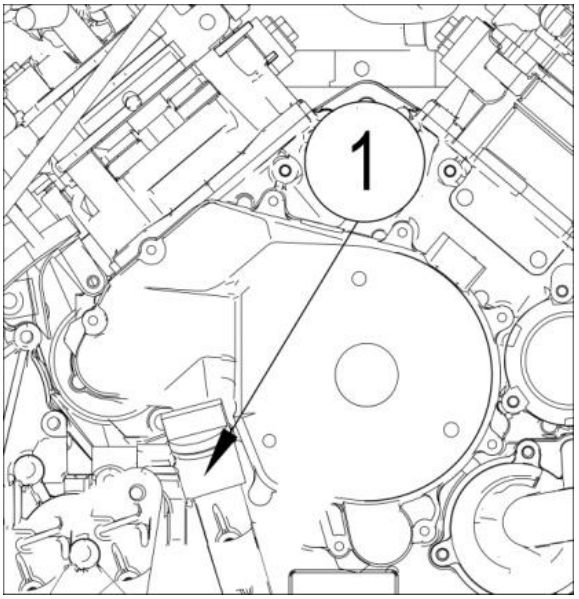
LUBRICATION SYSTEM

Verifying the Engine Oil Level

NOTICE Operating the engine with an improper level may severely damage engine. With vehicle on a level surface and engine cold, check the oil level as follows:

1. Open cargo box.

2. Remove dipstick and wipe it clean.



RH SIDE OF ENGINE

1. Dipstick

3. Reinstall dipstick, screw in it completely.

4. Remove dipstick and check oil level. It should be near or equal to the upper mark.

TYPICAL

1.Full

2.Add

3.Operating range

To add oil, remove the dipstick. Place a funnel into the dipstick tube to avoid spillage.

Add a small amount of recommended oil and recheck oil level.

Repeat the above procedures until oil level reaches the dipstick's upper mark.

NOTE: Do not overfill. Wipe off any spillage.

Properly tighten dipstick.

Close cargo box.

Changing the Engine Oil

Oil change and oil filter replacement should be done with a warm engine.

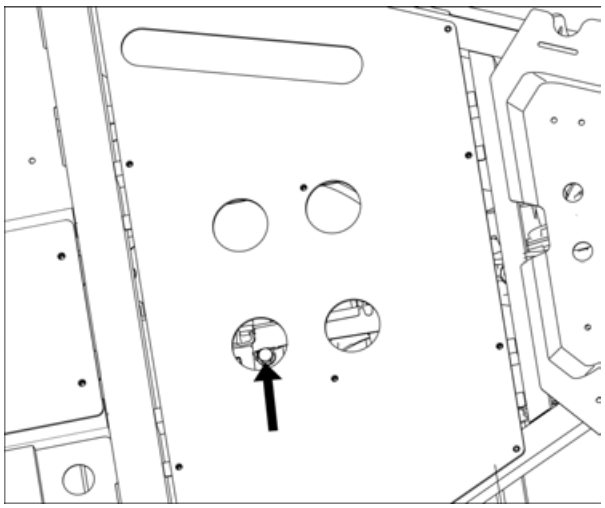
CAUTION The engine oil can be very hot. Wait until engine oil is warm.

Ensure vehicle is on a level surface.

Remove dipstick.

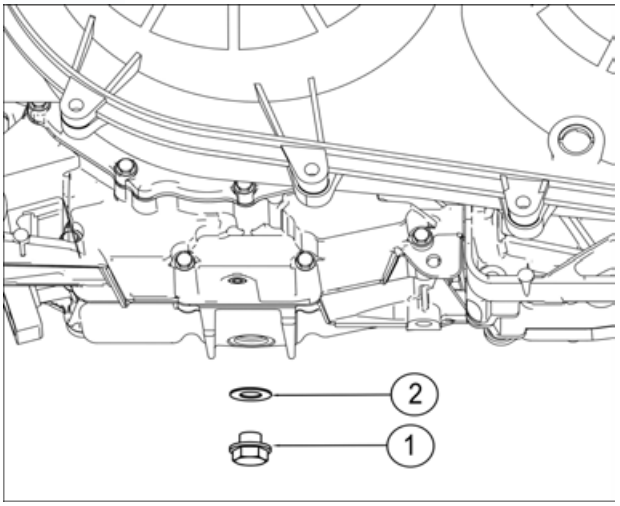
Place a drain pan under the engine drain plug area.

Unscrew magnetic drain plug and discard the gasket ring.



Clean the drain plug area. Unscrew magnetic drain plug and discard the gasket ring.

Wait a while to allow oil flow out of gearbox.



1.Magnetic drain plug

2.Gasket ring

Allow oil to drain completely from the crankcase. Clean the magnetic drain plug from metal shavings and residue. Presence of debris gives an indication of internal engine damage.

Install a NEW gasket ring on the magnetic drain plug.

NOTICE Never use the gasket ring a second time. Always replace by a NEW one.

Tighten magnetic drain plug to the specification.

TIGHTENING TORQUE	
Magnetic drain plug	30 Nm + 2Nm (22 lbfoft + 1 lbfoft)

Replace oil filter. Refer to REPLACING THE ENGINE OIL FILTER in this subsection.

Refill engine with recommended engine oil.

ENGINE OIL CAPACITY
2L (2.11 gt (U.S. liq.)

RECOMMENDED ENGINE OIL	
SEASON	TYPE
Summer	XPS 4-STROKE SYNTH. BLEND OIL (P/N 293 600 121)
Winter	XPS 4-STROKE SYNTHETIC OIL(P/N 293 600 112)

If recommended XPS oil is not available, use a 4-stroke SAE 5W40 engine oil that meets or exceeds the requirements for API service classification SM, SL or SJ. Always check the API service label certification on the oil container, it must contain at least one of the above standards.

After filling, check the oil level, refer to VERIFYING THE ENGINE OIL LEVEL in this subsection.

Start engine and let it idle for a few minutes. Ensure oil filter and drain plug areas are not leaking.

Stop engine.

Wait a while to allow oil to flow down to crankcase, then check oil level again. Dispose oil and filter as per your local environmental regulations.

Engine Oil Filter Replacement

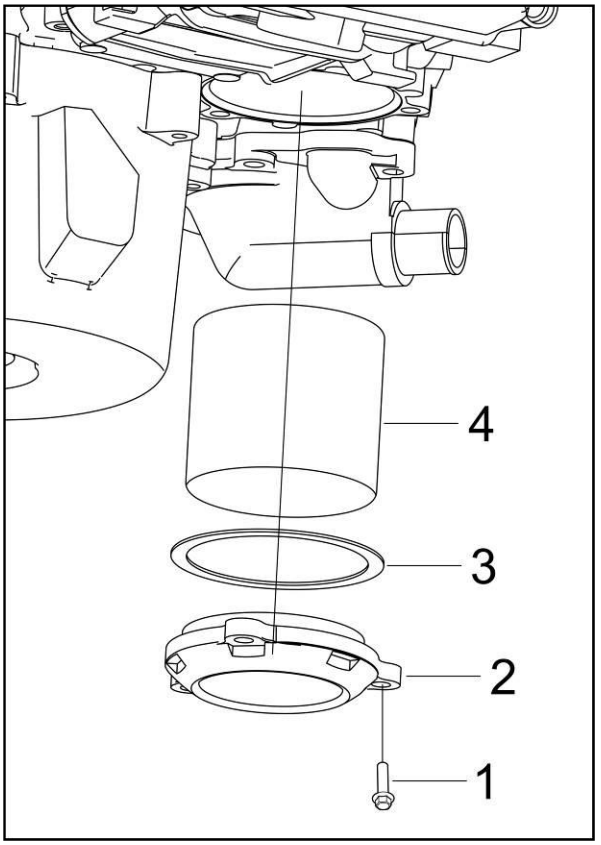
Oil Filter Access

Remove the engine service cover located on the rear upper bulkhead.

Removing the Oil Filter Clean oil filter area.

Remove:

1. Oil filter cover screws
2. Oil filter cover
3. O-ring
4. Oil filter.

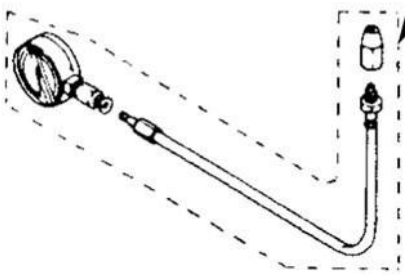


ENGINE COMPRESSION PRESSURE

The compression pressure reading of a cylinder is a good indicator of its internal condition. The decision to overhaul the cylinder is often based on results of a compression test.

Before measuring cylinder pressure, ensure installation and tightening of cylinder cap bolt with designated torque and reasonable clearance of valve.

Standard cylinder pressure: 0.9～1.2Mpa



Too low cylinder pressure may cause the following:

- Excessive wear to cylinder;
- Wear to piston or piston ring;
- Blockage of piston ring in groove;
- Close valve seat;
- Damage to cylinder lining or faults of other parts.

Measure engine compression pressure:

1. Warm up engine.
2. Ensure full charging of battery.
3. Remove the relevant plastic parts and accessories from the outside of the engine.
4. Dismantle spark plugs.
5. At spark plug hole, install cylinder pressure meter.
6. Press button of start for several seconds. Record indication of maximum cylinder pressure.

Check the engine oil pressure periodically. This will give a good indication of the condition of the moving parts. The engine oil pressure test should be done with a warm engine 90℃ and the recommended oil.

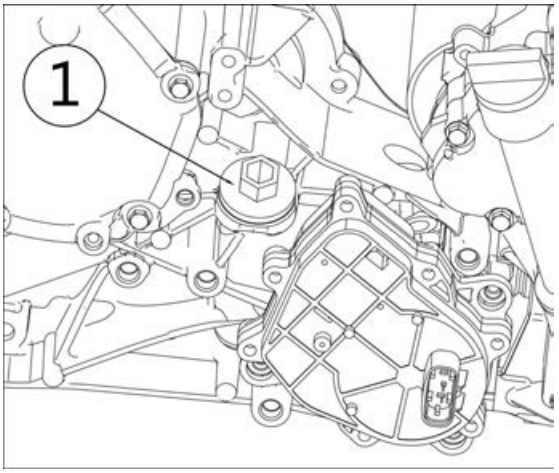
GEARBOX

Verifying the Gearbox Oil Level

Tilt the cargo box.

Unscrew and remove the gearbox oil dipstick wipe clean.

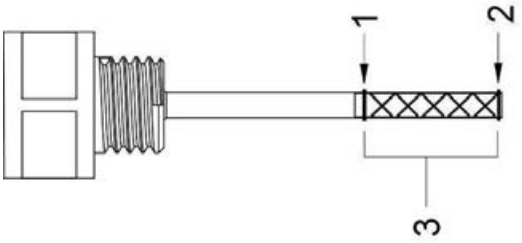
NOTICE: Pay attention not to loose O-ring on oil dipstick.



1.Gearbox oil dipstick

Reinstall dipstick, screw in it completely.

Remove dipstick again and check oil level. It should be near or equal to the upper mark.



1.MAX.
2.MIN.
3.Operating range

To add oil, place a funnel into the dipstick hole. Add a small amount of recommended oil and recheck oil level.

Repeat the above procedures until oil level reaches the dipstick's upper mark.

NOTICE: Operating the gearbox with an improper oil level may severely damage gearbox.

NOTE: Do not overfill. Wipe off any spillage.

Properly tighten oil dipstick.

Replace gearbox oil

Prior to change the gearbox oil, ensure vehicle is on a level surface, should be done with a warm engine.

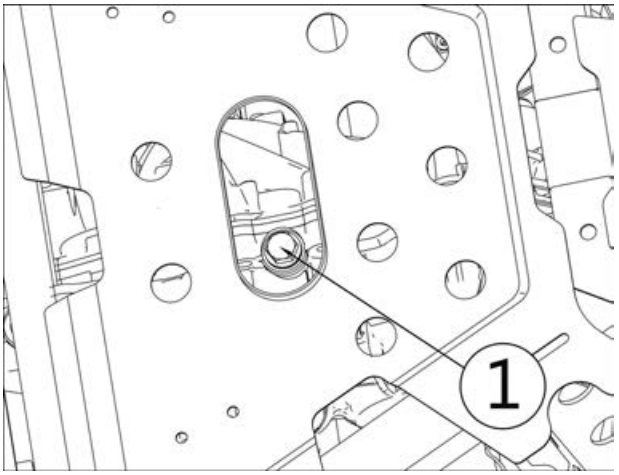
1. Ensure vehicle is on a level surface.
2. Drive vehicle for a few minutes.

3. Stop engine and wait a few minutes.
4. Remove engine shield
5. Remove the oil level check plug.
6. Place an oil pan under the gearbox case, and then drain oil completely by removing the drain plug.
7. Tighten the drain plug to 20 N.m.
8. Pour the specified oil(GL-4-90) about 420mL by syringe through the oil level check plug hole until the oil over flows.
9. Tighten the oil level check plug to 20 N.m.

⚠ WARNING

The gearbox oil can be very hot.

Place a drain pan under the gearbox drain plugarea.



1. Oil drain plug

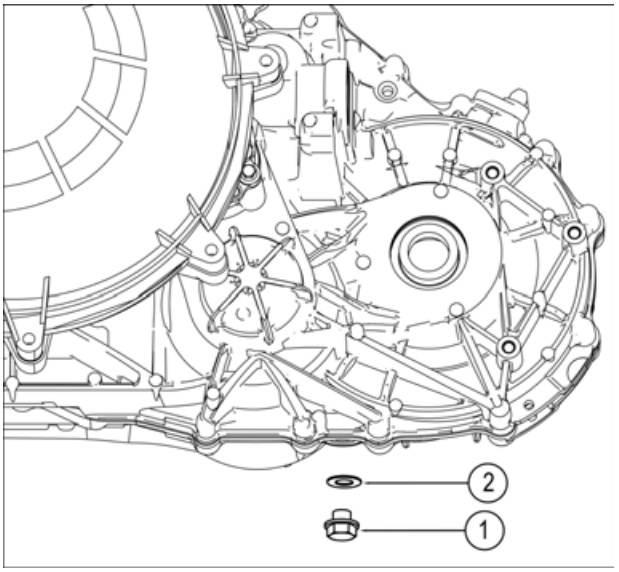
Clean drain plug area. Remove magnetic drain plug and discard sealing ring.

Clean drain plug area.

Remove oil dipstick.

NOTICE: Pay attention not to loose O-ring on oil dipstick.

Wait a while to allow oil flow out of gearbox.



1.Magnetic drain plug

2.Sealing ring

Dispose gearbox oil as per your local environmental regulations.

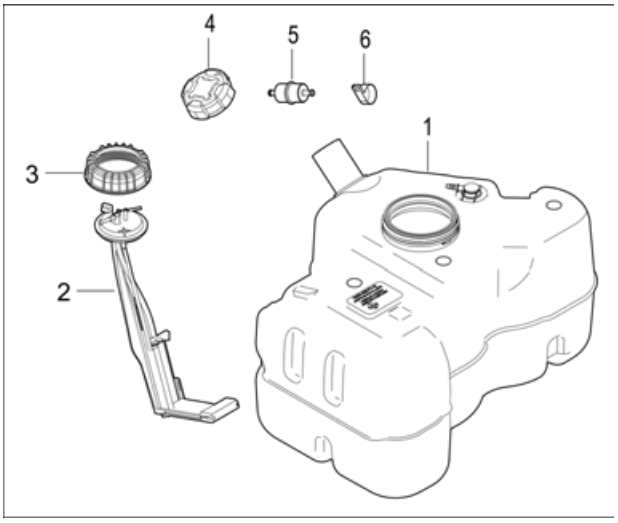
Inspection

Oil condition gives information about the teeth condition inside the gearbox. See TROUBLESHOOTING in the appropriate GEARBOX AND 4X4 COUPLING UNIT subsection.

Clean the magnetic drain plug from metal shavings and dirt. Presence of debris gives an indication of failure inside the gearbox. Check gearbox "to correct the problem. Replace O-ring of oil filler screw if brittle, hard or otherwise damaged.

Fuel oil system

Structure

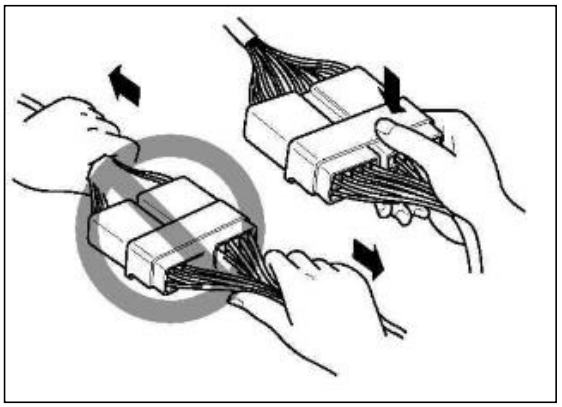


1. Fuel tank
2. Fuel
3. Fuel pump
4. Fuel tank cover
5. Fuel filter
6. Gasoline filter support

Dismantling

Fuel tank combination

Disconnect wire group plug-in of fuel sensor, separating fuel sensor from wire group. Note: Do not pull the plug directly when you pull it out. Press the plug by hand and pull it out at both ends.

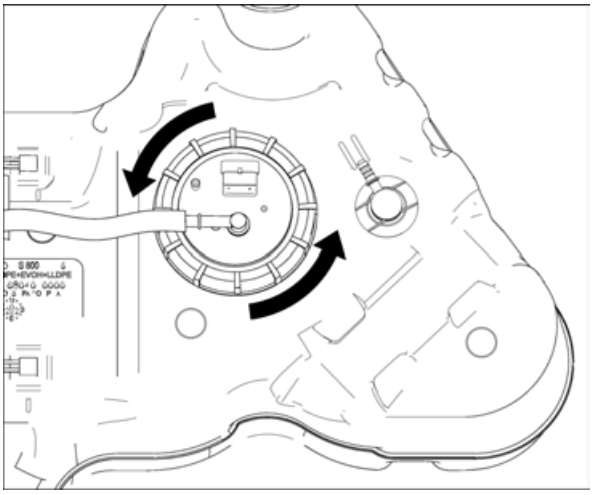


Warning: special attention should be paid to explosive gasoline

Unplug the tubing and tank vent after releasing the hose clamp , and then rotate the oil pump cap in the direction of the arrow. After completing the above steps, the oil pump can be removed from the tank for repair or replacement.

Note: ear clamp should not be used repeatedly; new clamp should be used upon installation.

When pulling out fuel pipe, attention should be paid to pressure inside fuel pipe, splash proof measures should be taken and vessel should be prepared to discharge fuel inside fuel pipe in advance.



TYPICAL - FUEL PUMP REMOVAL

Fuel pump retaining nut

1. Carefully pull out and rotate fuel pump as required. NOTICE Pay attention not to damage fuel sender and fuel pump prefilter.

2. Discard gasket ring.

3. Wipe off any fuel spillage.

Fuel Pump Installation

The installation is the reverse of the removal procedure. However, pay attention to the following. Rotate fuel pump during insertion as per removal procedure.

Attentions and Detection

FUEL SYSTEM

The fuel system of a fuel injection system holds much more a pressure than on carbureted vehicle. Prior to disconnecting a hose or to removing a component from the fuel system, follow the recommendation described here.

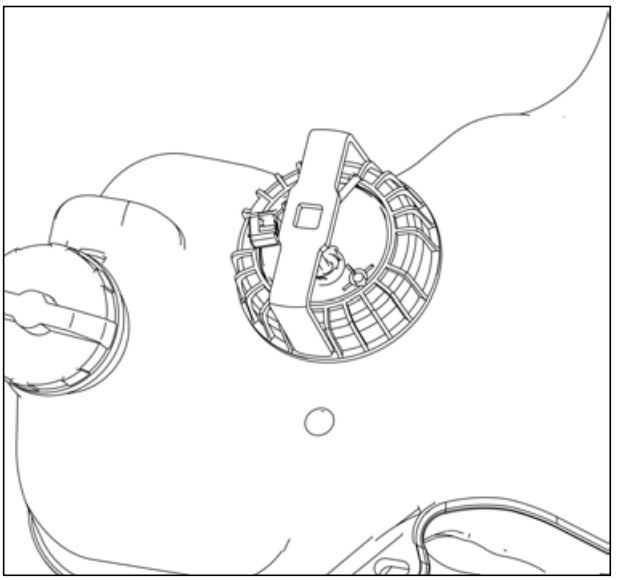
Fuel lines remain under pressure at all times. Always proceed with care and use appropriate safety equipment when working on pressurized fuel system. Wear safety glasses. Proceed with care when removing/installing pressure test equipment or disconnecting fuel line connections. Cover the fuel line connection with an absorbent shop rag. Slowly disconnect the fuel hose to minimize spilling. Wipe off any fuel spillage in the engine compartment. Do not allow fuel to spill on hot engine parts and/or electrical connectors. Never use a hose pincher on injection system high pressure hoses. Replace any damage or deteriorated fuel lines.

When the repair is completed, ensure that all hoses are connected and secured.

Always perform the fuel pressure test if any component has been removed. A pressure test must be done before turning the ignition key to ON and setting the engine stop switch to RUN. The fuel pump is activated each time in these conditions.

To locate a leak, pressurize the system. Check for leaking fuel or fuel odor. Spray soapy water on all hose connections and injectors. Air bubbles will show the leaking area.

Inspect the fuel lines, fuel tank, fuel tank cap for damage, clogging and leakage of fuel. If any damages are found, replace the defective parts with the new ones.



Use a special tool to tighten the oil pump cover with a torque of 75N.M; after tightening, visually inspect or check the base gasket by hand to ensure that the gasket is not folded or damaged.

FUEL PRESSURE TEST

The pressure test will show the available pressure at the fuel pump outlet. It validates the pressure regulator, the fuel pump and leaks in the system.

Before proceeding to the pressure test ensure the battery is fully charged. Battery voltage must be over 12 volts.

Ensure there is enough gas in fuel tank.

Disconnect outlet hose. Install fuel pressure gauge and T-fitting between disconnected hoses. Turn ignition key ON and set engine stop switch to RUN and observe fuel pressure. Turn ignition key off then back on. Repeat the test.

Standard fuel pressure: 350kpa.

A rapid pressure drop indicates leakage is from the fuel rail, If there is not leaking then replace fuel pump.

A slow pressure drop indicates leakage either from the fuel injector or from the fuel pressure regulator.

Check fuel injector and the fuel pressure regulator for leaks. If it is not leaking then replace fuel pump module.

If no leakage, start engine and observe fuel pressure.

The fuel pressure should be the same as above.

If pressure is within limits, fuel pump and the fuel pressure regulator are working adequately.

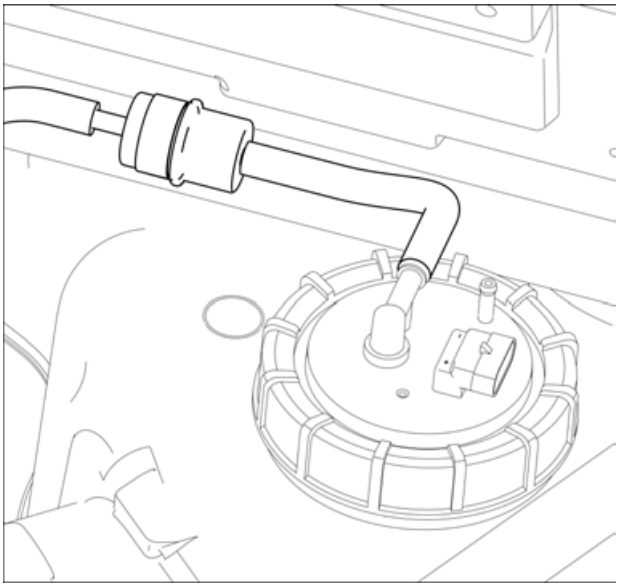
Remove pressure gauge from inlet hose. Reconnect inlet hose.

FUEL FILTER

Replace fuel filter as per amintenance schedule.

Filter Removal

Remove the clamp and pull down the hose. Remove the filter from the body.



Filter inspection

If fuel filter is suspected to be clogged, it may be checked as follows:

Using low compressed air, check if fuel filter is clogged. Air should flow easily through filter. In doubt, install a new filter.

Filter installation

Use arrow on filter to position it according to fuel flow.

FUEL PUMP

Fuel pump electrical test.

When turning ignition key ON, the fuel pump should run for 5 seconds to build up the fuel pressure in the system.

If the pump does not work, disconnect the

connector from the fuel pump.
Install a temporary connector to the fuel pump connector. Apply 12V to this test harness.

CAUTION

Running the fuel pump a few minutes with reverse polarity can damage the pump.
If pump does not run, replace a new pump.

Other wise, check fuse and if good, probe terminals of fuel pump connector on vehicle harness or its connector, Repair or replace appropriate part.

Fuel pump removal

Remove fuel pump outlet hose and harness.
Remove fuel pump retaining screws.
Gently push pump up.

While pulling out the fuel pump, pay attention to fuel sensor float arm. Float arm can get stuck and bend which can reduce the fuel sensor capabilities.

COOLING SYSTEM

Recommended Engine Coolant

NOTICE: Always use ethylene-glycol antifreeze containing corrosion inhibitors specifically, formulated for internal combustion aluminum engines.

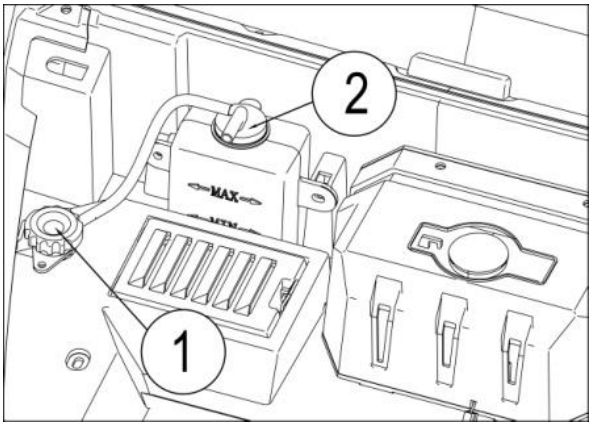
Verifying the Engine Coolant Level

⚠ WARNING

Check coolant level with engine cold.

⚠ WARNING

heck coolant level with engine cold. Never add coolant in cooling' system when engine is hot.



TYPICAL
1. Radiator cap
2. Engine coolant reservoir

1. Remove the radiator cap by applying. pressure and turning it counterclockwise.
Then drain the antifreeze from the engine.
Complete the radiator filling.
Check the level in the coolant reservoir and refill if necessary
Run engine at idle with the radiator cap off.
Slowly add coolant if necessary. At this point, wait until engine reaches normal operating temperature.

2.With vehicle on a level surface, liquid should be between MIN. and MAX. level marks of coolant reservoir.

NOTE: When checking level at temperature lower than 20℃ (689F), it may be slightly lower than MIN. mark.

NOTE: Ensure coolant reservoir hose is properly routed to avoid any interference when closing cover.

3.Ensure cooling system is full up to the MAX line.

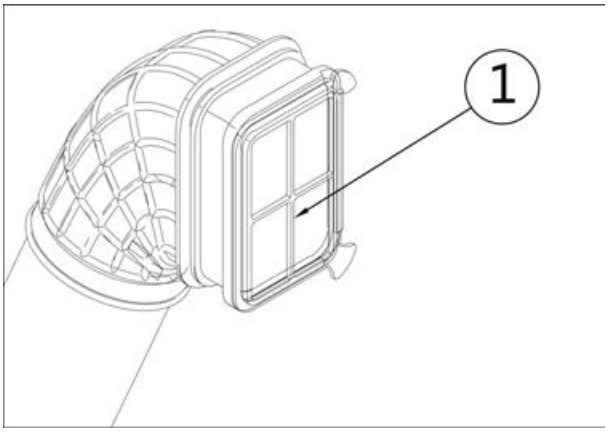
TRANSMISSION (CVT)

CVT Air Filter Cleaning

Removing the CVT Air Filter

Clean every 20-40 hours
(More often in wet or dusty areas.)

1. Tilt the cargo box.
2. Press the filter tabs to release it.



Cleaning the CVT Air Filter

1. Inspect filter and replace if damaged.
2. Gently clean using a solution of soft soap and water, then rinse filter.
3. Gently shake off excess water and allow filter to dry at room temperature.
4. Clean inside the CVT air inlet end.

Installing the CVT Air Filter

The installation is the reverse of the removal procedure.

Inspecting the Drive Belt

Inspect belt for cracks, fraying or abnormal wear. Replace if necessary.

Check drive belt width at cord level. Replace if it is out of specification

CVT Cover Removal

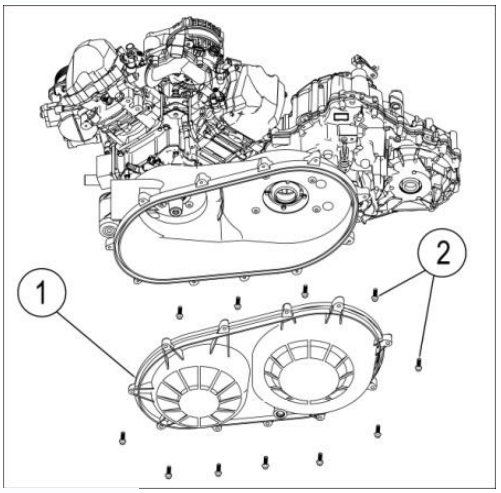
Remove the eleven CVT cover screws. Use tool included in tool kit.

NOTE: Remove the center top screw last to support the cover during removal.

NOTE: Do not use and impact tool to remove CVT cover screws.

Remove the CVT cover and its gasket.

Cleaning the CVT Air Inlet/Outlet



1. CVT cover
2. CVT cover screws

CVT COVER SCREWS	
Tightening torque	7N•m ± 0.8N•m (62 lbf•in ± 7lbf•in)

NOTICE: In case of a drive belt failure, the CVT, cover and air outlet must be cleaned.

ELECTRICAL SYSTEM

Inspecting the Battery

Visually inspect battery casing for cracks or other damage. If casing is damaged, replace battery and thoroughly clean battery rack with water and baking soda.

Inspect battery posts condition, battery

rack mounting, straps and strap attachment points. For battery testing, refer to CHARGING SYSTEM subsection.

Replacing the Spark Plug

Removing the Spark Plug

Unplua the spark plua cable.

Clean the spark plug area with pressurized air.

Unscrew spark plug.

Installing the Spark Plug.

Prior to installation make sure that contact surfaces of the cylinder head and spark plug are free of grime.

1. Using a wire feeler gauge, verify the electrode TD Specified in TECHNICAL SPECIFICA.

2. Apply anti seize lubricant over the spark plug threads to prevent possible seizure.

3. Hand screw spark plug into cylinder head, then tighten with a torque wrench and an appropriate socket.

TIGHTENING TOROUE	
Spark plug	20N.m ± 2 N.m (15bf.ft ±1 lb.ft)

DRIVE SYSTEM

Verifying the Front Differential Oil Level

Clean filler plug prior to checking oil level.

With vehicle on a level surface, check oil level by removing filler plug. Oil level must reach the lower edge.

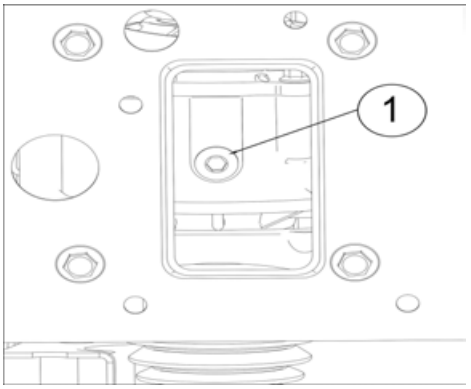
Reinstall filler plug with a new sealing ring.

TIGHTENING TOROUE	
Filler plug	16.5N.m ± 2.5 N.m (146bf.in ±22lbf.in)

Replacing the Front Differential Oil

Place vehicle on a level surface. Set transmission in park position.

From underneath of vehicle, clean drain plug area.

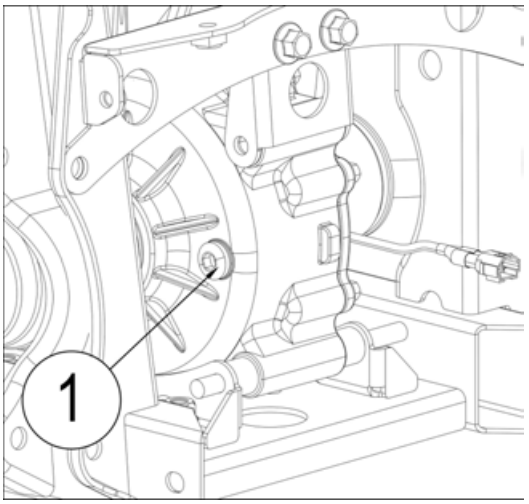


1. Drain plug access hole

Place a drain pan under the front differential.

Remove drain plug.

Unscrew filler plug.



1. Filler plug

Install drain plug.

TIGHTENING TORQUE	
Drain plug	2.7N.m±0.3N.m (24 lbf.in 3 lbf.in)

Reinstall filler plug with a new sealing ring.

TIGHTENING TORQUE	
Filler plug	16.5N.m±2.5N.m (146lbf.in 22lbf.in)

Inspecting the Drive Shaft Boot and Protector

Visually inspect each drive shaft boot for

grease leak, cracks or opening.
Check if the drive shaft boot protector are fixed firmly, not torn or otherwise damaged. Replace if necessary.

Inspecting the Drive Shaft Joint

Turn and move drive shaft to detect excessive play.

Inspecting the Propeller Shaft U-Joint

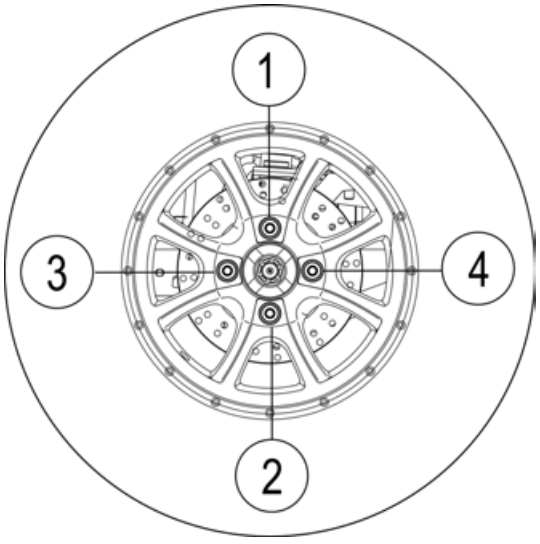
Check yoke U-joints for wear, backlash or axial play, replace if necessary.

WHEELS AND TIRES

Wheel Lua Nut Torgue Verification

Tighten wheel lug nuts to the specified torque using the illustrated sequence.

TIGHTENING TORQUE	
Wheel lug nuts	100N.m±10N.m (74 lbf.in 7 lbf.in)



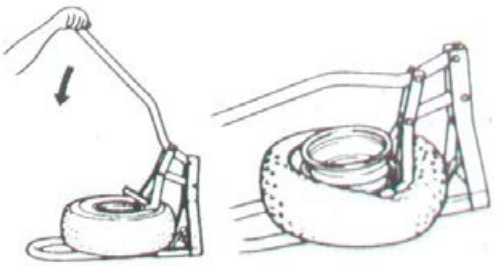
When the tires are replaced, never install a bias tire with a redial tire. such a combination could create handling and/or stability problems.
Dot mix tires of different size and/or design on the same axle.
Front and rear tire pairs must be the identical model and manufacturer.

For unidirectional tread pattern, ensure that the tires are installed in the correct direction of rotation.

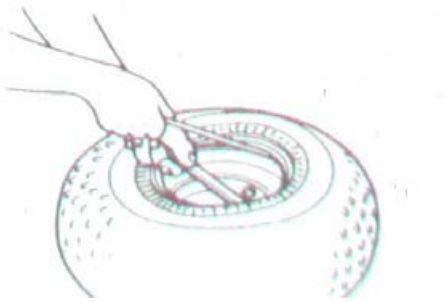
The radial tires must be installed as a complete set.
In dismantling tires, use special crowbar and rim protection device.

Tire replacement

Use jack to support vehicle and ensure its no dropping. Remove the wheels.
After removing the air valve cap, release the tire pressure by depressing the valve.
Dismount the bead from the rim completely.



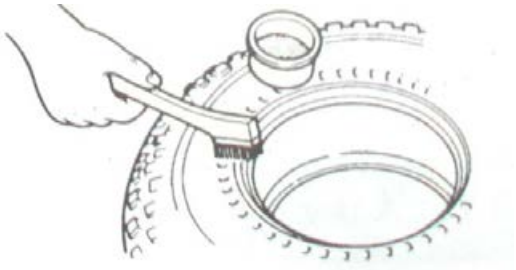
Separate the tire from the rim by using a set of tire levers and rim protectors.



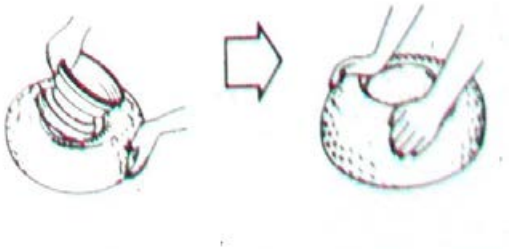
⚠ WARNING

When using the tire lever, do not scratch or hit the sealing portion of the wheel or it may cause air leakage.

Apply tire lubricant to the new tire bead and the flange of the rim. But never apply grease, oil or gasoline to the tire bead because they will deteriorate the tire.



Mount the new tire on the rim.

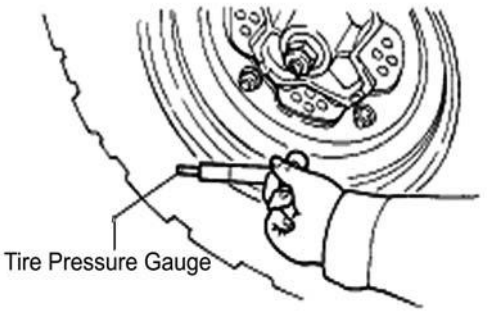


⚠ WARNING

When installing each tire, make sure the arrow on the tire points in the direction of rotation. Also make sure the outer side of the wheel rim is facing outward.

Inflate the tire to seat the tire bead.

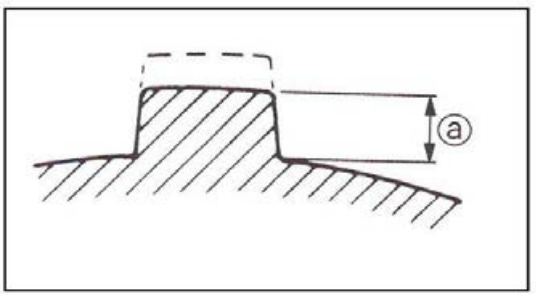
Check the rim line cast on the tire side walls. It must be equidistant from the wheel rim all the way around. If the distance between the rim line and the wheel rim varies this indicates that the bead is not properly seated. If this is so, deflate the tire completely, and unseat the tire bead on bosh sides. Then coat the bead with clean water and re-seat the tire.



Adjust the tire pressure to specification.

Tire thread

When the tire groove decreases to 6 mm (0.24 in) due to wear, replace the tire.



VALVE CLEARANCE

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

Check the intake and exhaust valve clearance at the distances indicated above and adjust the valve clearances to specification, if necessary.

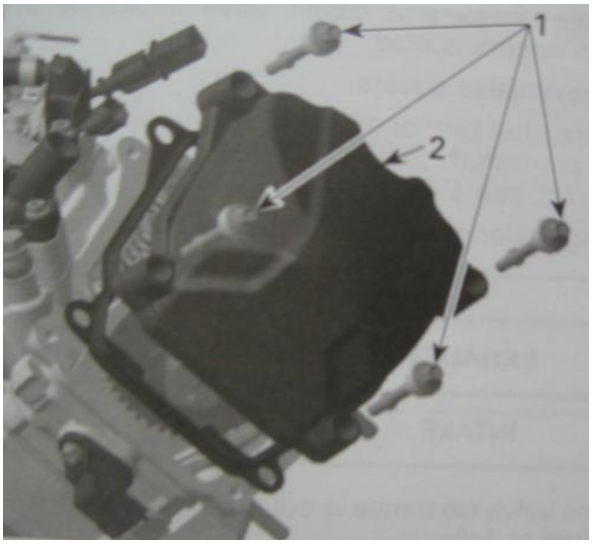
Valve clearance is to be checked when the engine is cold. The intake and exhaust val must be checked an adjusted when the pistor at TOP-DEAD –CENTER(TDC) on the compression stroke.

Remove left and right seats, gear shift han and engine shield.

Remove relevant accessories around an engi with relevant contents referring to Chapte Vehicle Dismantling

Remove spark plug cable and spark plug of b cylinders

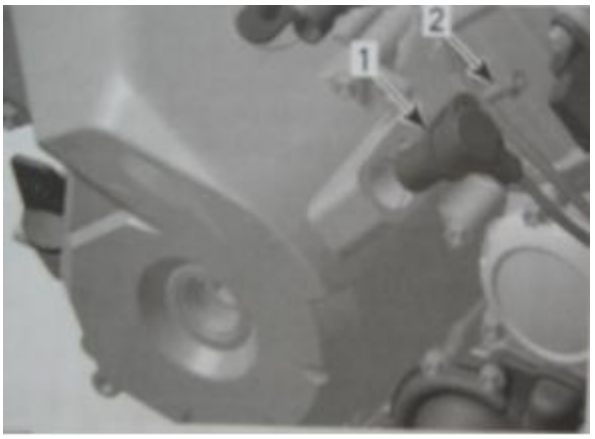
Remove the valve cover of both cylinders



1. Distance screws
2. Valve cover

Remove the plug screw and O-ring of magneto cover.

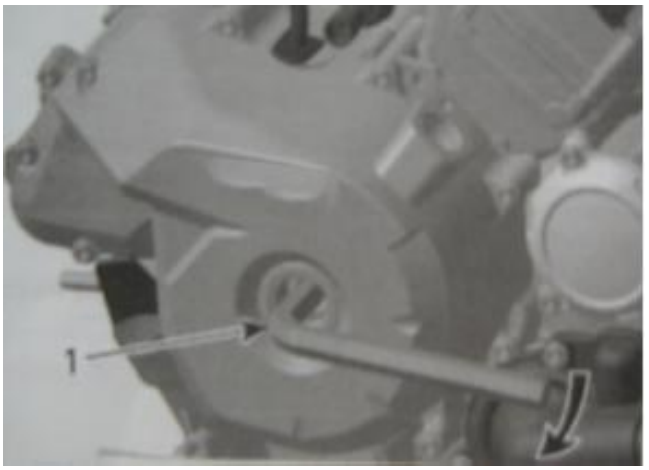
Remove the crankshaft position sensor.



1. Crankshaft position sensor
2. Screw

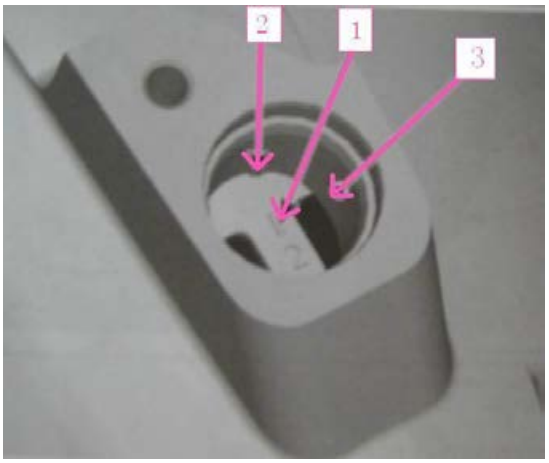
Valve clearance of cylinder 2

Use a 14 mm Allen key to turn crankshaft until piston 2, rear is at TDC ignition.



When rear piston is at TDC ignition, marks magneto flywheel "2" and on the magn cover are aligned.

1. Mark "2" on magneto flywheel
2. Notch on magneto cover
3. Crankshaft position sensor location



At TDC ignition, the printed marks on camshaft timing gear have to be parallel cylinder head base. If not, use Allen key to turn crankshaft 360°

1. Printed marks on camshaft timing gear
2. Cylinder head base

Insert the feeler gauge between the valve stem end and adjusting screw on the rocker arm to check the clearance.

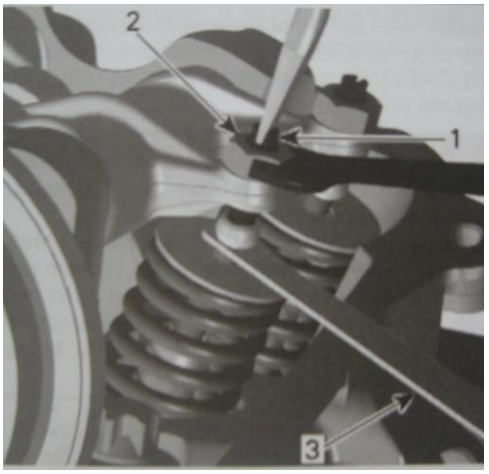
If the valve clearance is out of specification, adjust valves as follows.

Valve clearance	
Intake	0.05 to 0.09mm
Exhaust	0.10 to 0.15mm

Use mean valve of exhaust/intake to ensure a proper valve adjustment.

Hold the adjustment screw at the proper position and torque the locking nut.

Repeat the procedure for each valve.



1. Adjustment screw
2. Adjustment nut
3. Feeler gauge

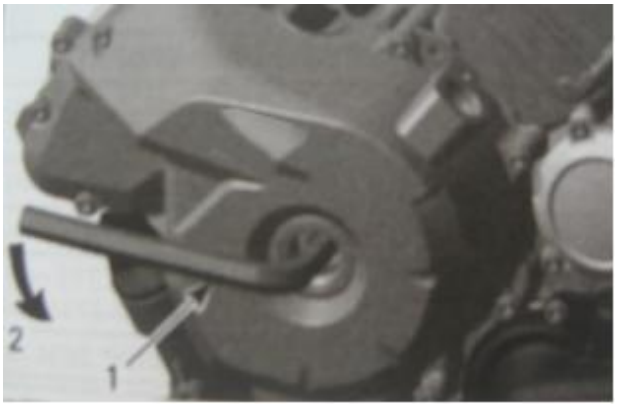
CAUTION: Securely tighten the lock nut after completing adjustment.

Valve clearance adjuster lock nut:12N.m

Valve clearance of cylinder 1

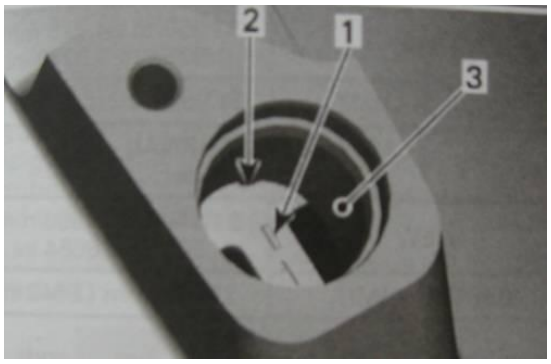
Using a 14 mm Allen key, turn crankshaft 280 °counterclockwise.

1. Allen key 14mm
2. Turn crankshaft 280°counterclockwise



Until marks on magneto flywheel "1" and magneto cover are aligned.

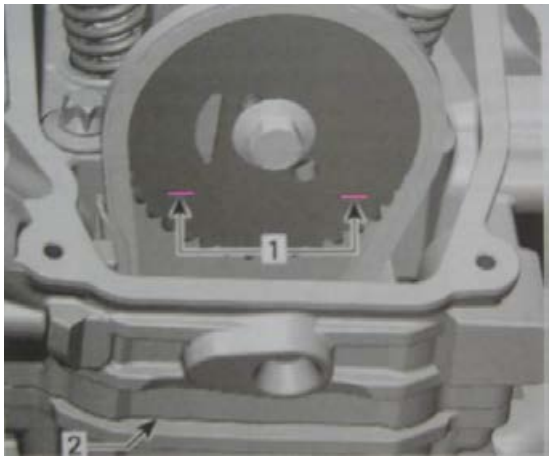
1. Mark "1" on magneto flywheel
2. Notch on magneto cover
3. Location of crankshaft position sensor



At TDC ignition, the printed marks on the camshaft timing gear have to be parallel to timing gear have to be parallel to per following illustration.

TYPICAL

1. Printed marks on camshaft timing gear
2. Cylinder head base



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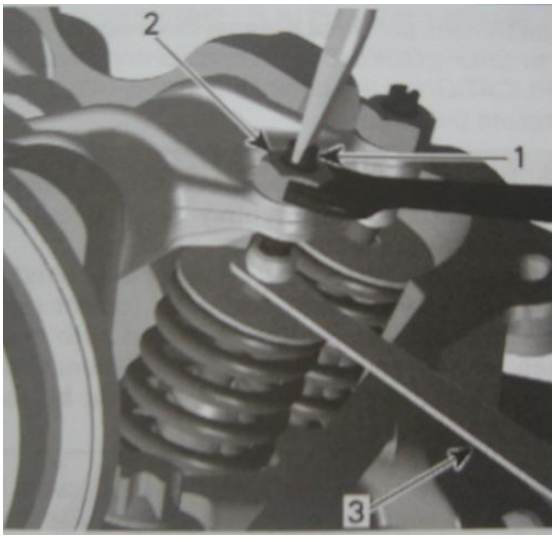


CAUTION: Securely tighten the locknut after completing adjustment.

Install the valve cover of both cylinders, spark plug cable and spark plug of both cylinders, the plug screw and O-ring of magneto cover and the crankshaft position sensor.

SPARK PLUG

In case of serious wear or burn to electrode or burn to insulator by spark plug or damage to thread etc, please replace it with new spark plug

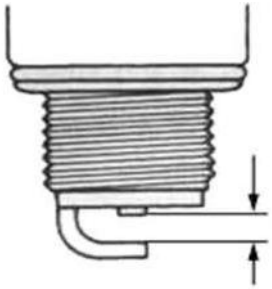
In case of carbon deposit, please use proper tools for cleaning.

Spark plug gap

Use clearance gauge to measure clearance of spark plug.

In case of exceeding designated range, then adjust the gap.

Spark plug gap: 0.7-0.9mm



Spark plug heat range

Check the spark plug heat range by observing the electrode color. If the electrode of the spark plug is appearing wet or dark color, replace the spark plug with a hotter type one. If it is white or appearing glazed, replace the spark plug with a colder type one.

Standard type: DCPR8E / NGK

Colder type: DCPR9E / NGK

Hotter type: DCPR7E / NGK

CAUTION: In order to avoiding damaging cylinder cap thread, firstly use hands to tighten spark plug and then use spark plug wrench to tighten cylinder cap with designated torque.

3.COOLING SYSTEM

Fault overhauling

1. If cover of radiator is open and temperature of cooling liquid is over 100℃, pressure of cooling liquid will be reduced rapidly and boiled. Vapor injection may cause danger and injuries. After drop of temperature of cooling liquid, use one cloth to cover the cover of radiator and then slowly open the cover. Cooling liquid can only be tested after complete cooling.
2. Cooling liquid is toxic. Do not drink it or splash it to skin, eyes or clothes. In case of splashing cooling liquid to your eyes, use clean water to wash your eyes completely and see the doctor. In case of splashing cooling liquid to your clothes, use soapy water to wash it rapidly. In case of drinking cooling liquid, vomit will be caused immediately. Please see the internist physician immediately. Store cooling liquid well and keep it out of reach of children.
2. Check whether soil of fins is blocked or damaged. Correct curved fins。 Use water and compressed air to clean soil. If damaged area reaches 20%, please replace radiator.
3. Pump overhauling can be carried out before dismantling engine.
4. Add cooling liquid to water tank. In addition to adding or exhausting cooling liquid, please do not open cover of radiator.
5. Do not splash cooling liquid to plastic parts. Once splashed, please use clean water for washing.
6. After dismantling cooling system, check leakage situation of joint.

Sharp rise of water temperature

- Faults of radiator cover
- There is air in cooling system.
- Faults of water pump
- Faults of thermostat (thermostat is not open)
- Blockage of radiator tube or cooling tube
- Damage or blockage to radiator
- Incomplete cooling liquid
- Failure or faults of fan motor

No rise or slow rise of water temperature.

- Faults of thermostat (thermostat is not closed)
- Faults of line of water temperature display

Leakage of cooling liquid

- Faults of water seal
- Aging, damage or improper sealing to O-shaped ring.
- Aging, damage or improper sealing to gasket
- Improper installation of pipe or hose
- Aging, damage or improper sealing to pipe and/or hose

! Warning

Never start engine without coolant. Some engine parts such as the rotary seal on water pump shaft can be damaged.

COOLING SYSTEM TEST

! WARNING

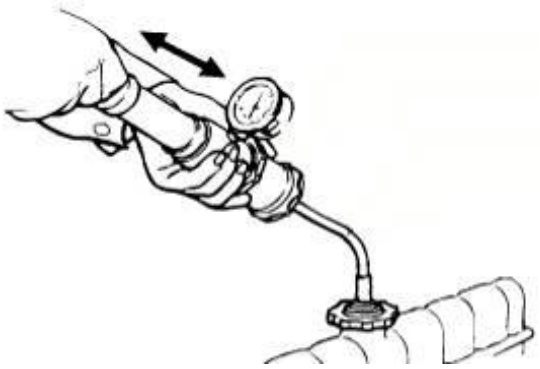
To avoid potential burns, do not remove the radiator cap or loosen the cooling drain plug if the engine is hot.

Open the upper cover of engine hood and remove the radiator cap.

Install the test cap and a small hose pincher on overflow hose.

Using pressure/ vacuum pump, pressurize system to 100 kPa.

Check all hoses, radiator and cylinder(s)/base for coolant leaks or air bubbles.

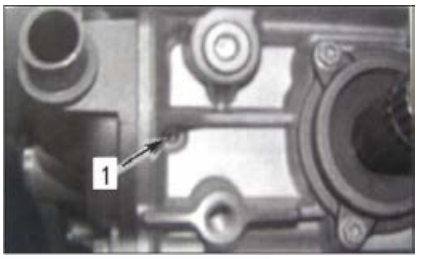


Inspection

Check general condition of hoses and clamps tightness.

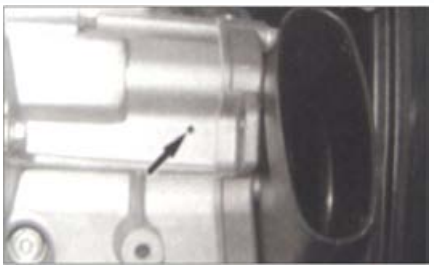
Check the leak indicator hole if there is oil or coolant.

NOTE: Flowing coolant indicates a defective rotary seal. Oil indicates a defective inner oil seal. If either seal is leaking, both seals must be replaced at same time. Refer to WATERPUMP SHAFT ANDSEAL in this section.



1.leak indicator hole

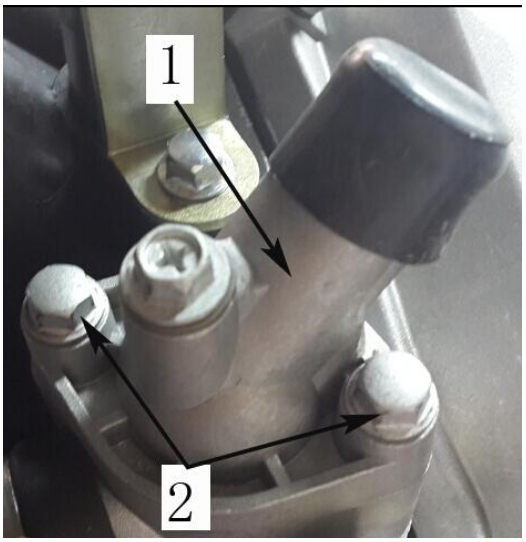
Another leak indicator hole is visible on the PTO side. It indicate if the PTO gasket is in good condition. If a liquid leaks by this hole, the PTO gasket replacement is necessary.



THERMOSTAT

The thermostat is a single action type. The thermostat is located on the top of cylinder head, on intake side.

Remove: thermostat housing screws and pull thermostat cover



1.Thermostat cover

2.Screws

thermostat with gasket out of the hole.

Thermostat Test

To check thermostat, put in water and heat water.

Thermostat should open when water temperature reaches 65℃(149°F).

Check if the gasket is brittle, hard or damaged. If so replace gasket.

Thermostat Installation

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

Install the thermostat cover then torque screws to 6N.m.

Check coolant level in radiator and coolant tank and top up if necessary.

Do not forget to bleed the cooling system. Refer to COOLANTREPLACEMENT.

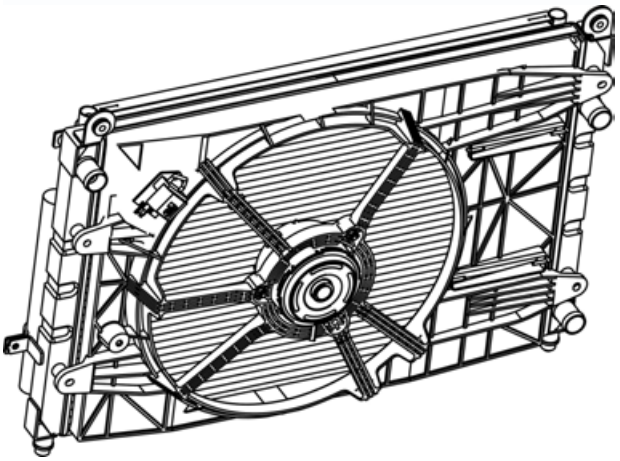
RADIATOR AND CAP

Using a pressure cap tester, check the efficiency of radiator cap. If the efficiency is feeble, install a new 100 kPa cap (do not exceed this pressure).

Radiator Inspection

Check radiating fins for clogging or damage.

Remove insects, mud or other obstructions with compressed air or low pressure water.



Radiator Removal

Drain cooling system.

Remove front fascia and radiator shroud.

Remove:

- Radiator inlet and radiator outlet hoses.
- Overflow hose.
- Remove radiator.

Radiator Installation

For installation, reverse the removal procedure.

Pay attention to the following detail.

Fill up the radiator. Refer to COOLANT REPLACEMENT, in this section.

Check for any coolant leakage from radiator and hoses.

COOLANT TANK

The coolant expands as the temperature (up to 100-110℃) and pressure rise in the system. If the limiting system working pressure cap is reached 110kPa, the pressure relief valve in the pressure cap is lifted from its seat and allows coolant to

flow through the overflow hose into the overflow coolant tank.

Tank Removal

Remove:

- The upper cover of engine hood.
- Coolant tank support bolt and.
- Overflow hose and clamp.

The installation is the reverse of the removal procedure.

RADIATOR FAN

Radiator Fan Removal

Remove radiator shroud.

Remove bolts.

Remove the radiator fan.

Radiator Fan Test

NOTE: The ECM controls the radiator fan via the input of the coolant temperature sensor (CTS). The radiator fan should turn on when coolant temperature reaches 83 ℃ and should turn off when the coolant cools down at 83℃.(181.4°F).

Connect the vehicle to B.U.D.S. Refer to ENGINE MANAGEMNT for procedure and connector location.

In ACTIVATION folder, press COOLANT FAN button.

If fan turns, check CTS, wiring harness and connectors. If all parts are good, replace the ECM.

If fan does not turn when COOLANT FAN button is pressed, use the following troubleshooting chart to resolve the problem.

WATER PUMP HOUSING

It is located on the engine MAG side.

Water Pump Housing Removal

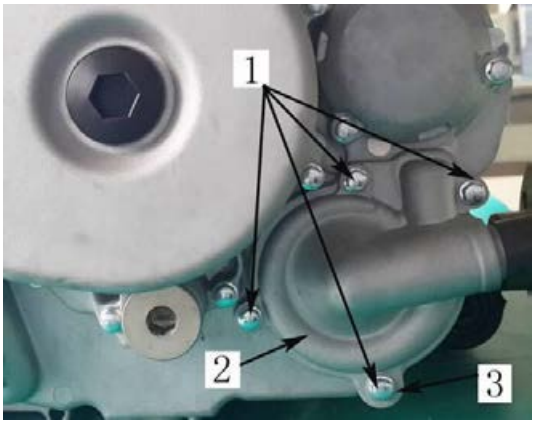
! WARNING

To avoid potential burns, do not remove the radiator cap or loosen the cooling drain plug if the engine is hot .

Drain cooling system.

Remove radiator outlet hose from water pump housing.

Remove screws retaining water pump housing.



1.Screws

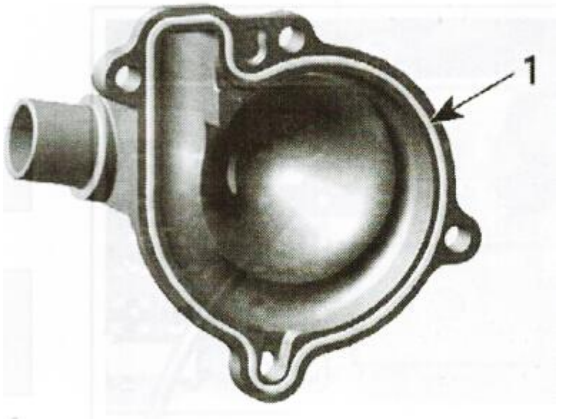
2.Water pump housing

3.Sealing ring

Pull water pump housing to remove it.

Water Pump Housing Inspection

Check if gasket is brittle, hard or damage and replace as necessary.



Water Pump Housing installation

The installation is the opposite of the removal procedure.

CAUTION: To prevent leaking, take care that the gasket is exactly in groove when you reinstall the water pump housing.

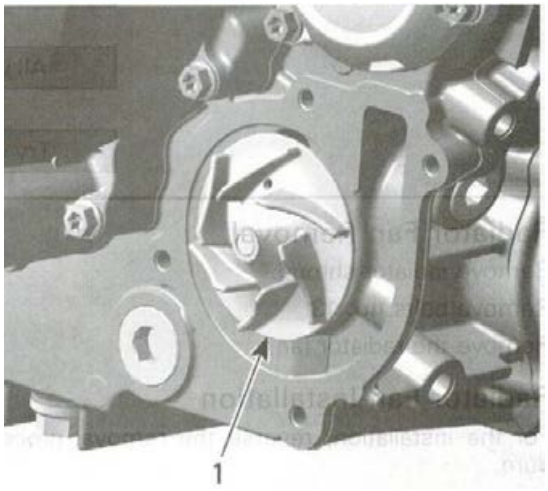
Tighten screws of water pump housing in a crisscross sequence.

WATER PUMP IMPELLER

Impeller Removal

Remove water pump housing.

Unscrew impeller.



1.Impeller

CAUTION:

Water pump shaft and impeller have right-hard threads. Remove by turning counterclockwise and install by turning clockwise.

Check impeller for cracks or other damage.

Replace impeller if damaged.

Impeller Installation

The installation is the opposite of the removal procedure. Be careful not damage impeller wings during installation.

WATER PUMP SHAFT AND SEALS

Shaft/Seal Removal

NOTE: It is not required to split crankcase to replace the water pump shaft and seals, but engine removal is necessary.

Drain engine oil.

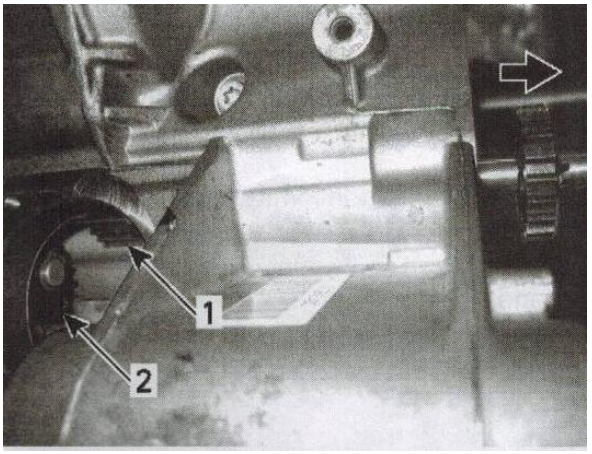
Remove engine from vehicle. Refer to ENGINE REMOVAL AND INSTALLATION section.

Detach gearbox from engine.

Remove engine drive shaft and engine PTO cover.

Remove water pump housing and impeller. See procedures in this section.

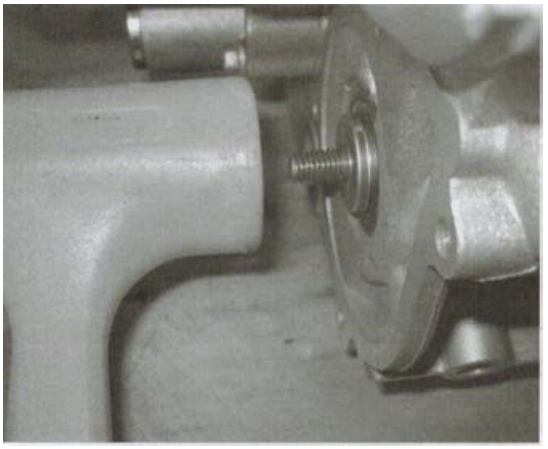
Pull out water pump gear to disengage the inner drive gear.



1.water pump gear

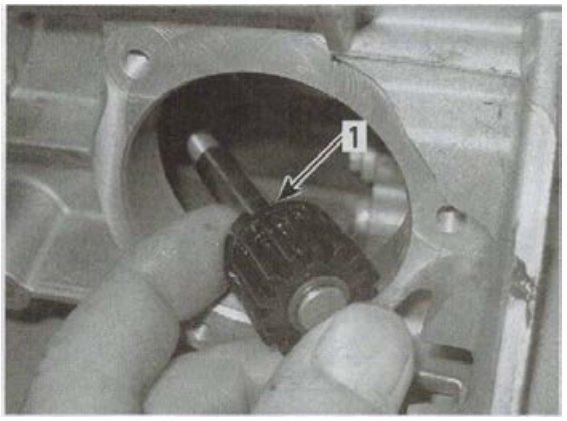
2.Inner drive gear

Sharply strike water pump shaft out with a plastic hammer.



Pull out water pump shaft through the engine drive shaft opening.

NOTE: Pay attention to hold thrust washer to prevent it from falling in crankcase.



1.Thrust water here

CAUTION: If thrust washer is not on water pump shaft, use a magnet to retrieve it inside crankcase.

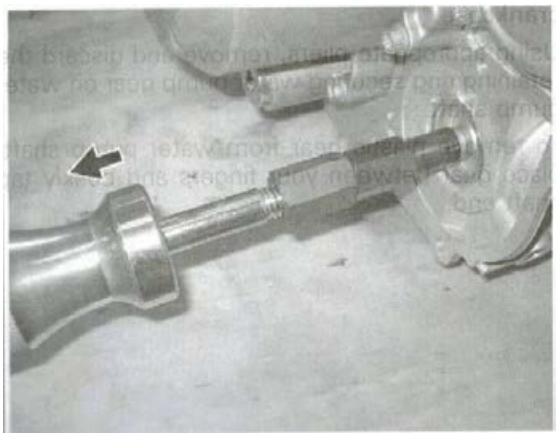
Using appropriate pliers remove and discard the retaining ring securing water pump gear on water pump shaft.

To remove plastic gear from water pump shaft place gear between your fingers and briskly tap shaft end.

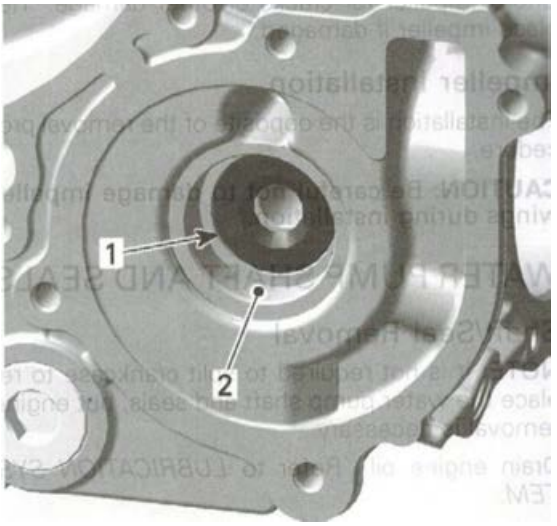
Using 2 screwdrivers, pry out inner part of the rotary seal.

To remove outer part of rotary seal, use an expander from puller kit.

Install expander snugly against outer part and pull rotary seal out.



Remove inner oil seal.



1.Inner seal

2.Rotary seal surface

CAUTION: Be careful not to damage the rotary seal surface in crankcase.

Part Inspection

Inspect water pump gear for wear and damage on the snap mechanism to the needle pin. Replace if damaged.

Shaft/Seal Installation

For installation, reverse the removal procedure.

However, pay attention to the following.

NOTE: For installation use the torque values.

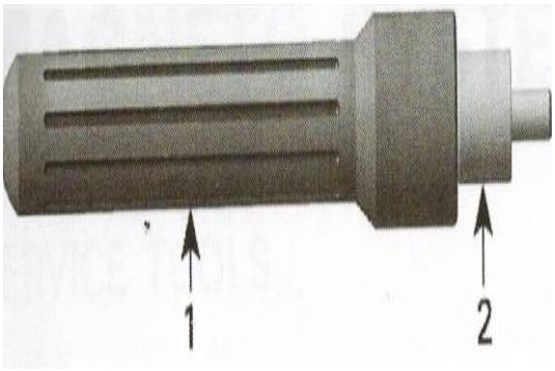
Ensure to use multipurpose grease oil seal.

CAUTION: Always replace rotary seal and water pump shaft together. Also, install a new inner oil seal (behind rotary seal) at the same time.

Apply engine oil on the water pump shaft and intermediate shaft.

NOTE: Never use oil in the press fit area of the oil seal and rotary seal.

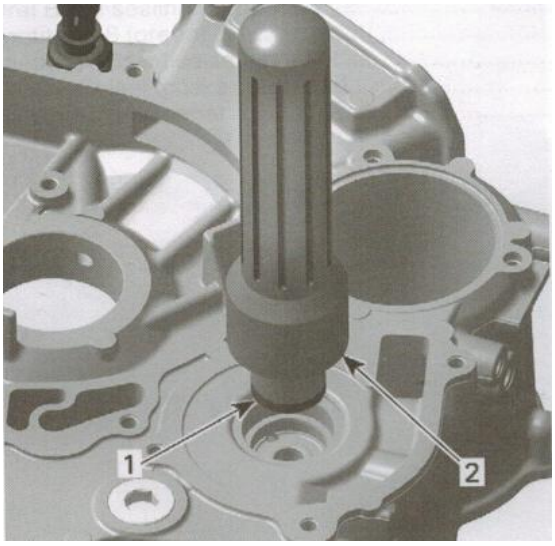
Use the oil seal pusher and the installer Handle to install inner oil seal.



1. Handle
2. Pusher

Apply MOLYKOTE inside lips oil seal when installing the oil seal on the pusher, make sure sealing lip points outside.

Push inner oil seal in place.



1.Inner oil seal
2.Installer handle with oil seal pusher

Slide water pump shaft with the new rotary seal into crankcase.

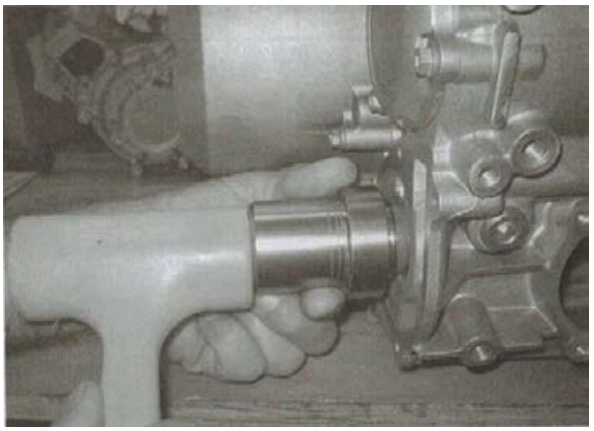
To properly install water pump shaft with rotary seal, use the rotary seal installer.

Use a plastic hammer and drive rotary seal into crankcase.

From engine drive shaft opening. Insert thrust washer pump shaft in crankcase.

Using a flashlight and a mirror, position the shaft hole so that pin can be installed.

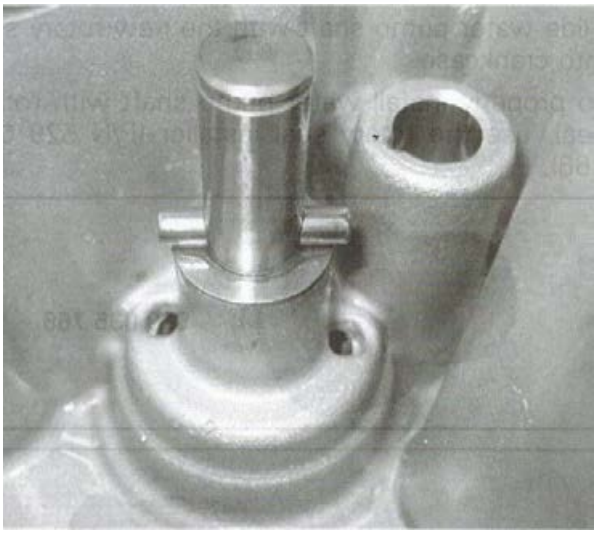
Position pin between your fingers, push in water pump.



shaft to fully expose hole then install pin.

Position pin equal distance out of shaft hole so gear can be installed.

Install water pump shaft gear.



NOTE: Ensure gear properly snaps on pin.

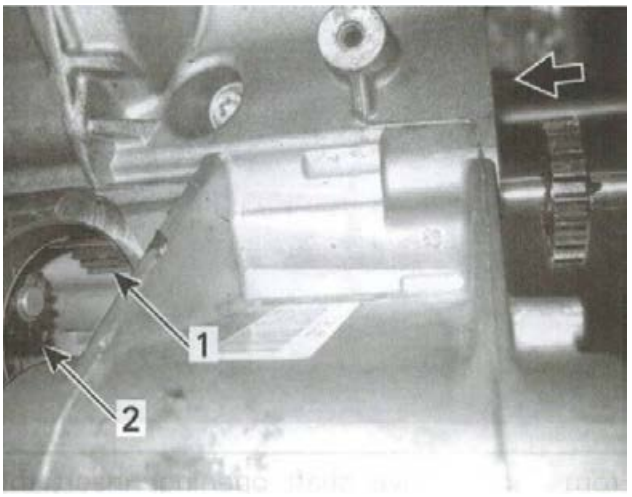
A screwdriver may have to be used to push gear in place.

Use a 45°snap-ring pliers and install a NEW retaining ring on pump shaft end.

CAUTION: Never use the retaining ring a second time. Always install a new one.

After installation, water pump shaft with rotary seal must rotate freely.

Carefully push in water pump gear while turning to mesh with the inner drive gear.



1.Water pump gear

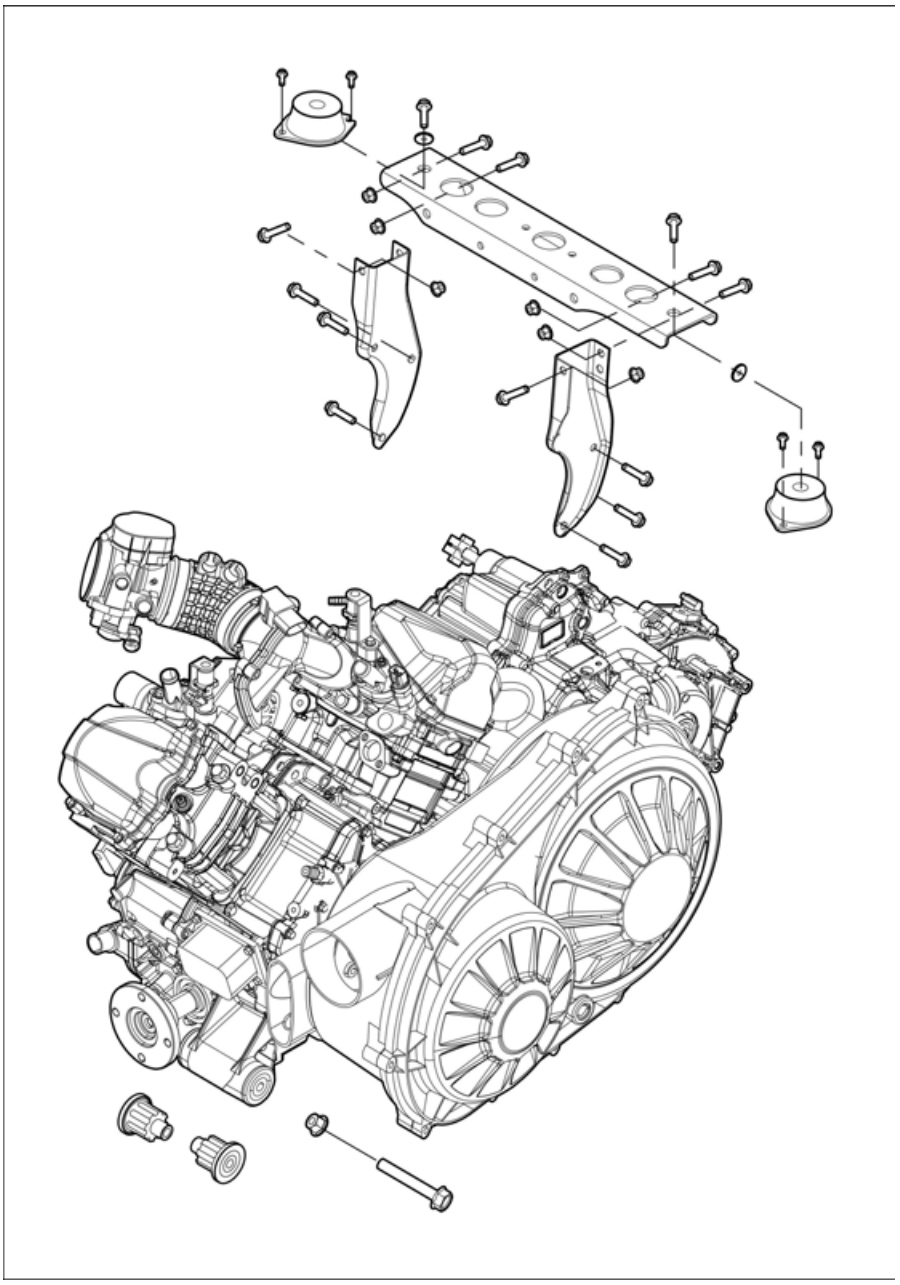
2.Inner drive gear

Tighten Screws of the water pump housing crosswise.

Refill all fluids.

4. Vehicle dismantling

NGINE REMOVAL AND INSTALLATION



ENGINE REMOVAL

Vehicle and Engine Preparation

1. Place vehicle on a workstation that will have access to an engine-lifting hoist.

2. Safely lift and support the vehicle. Refer to INTRODUCTION subsection.

3. Unplug the BLACK (-)

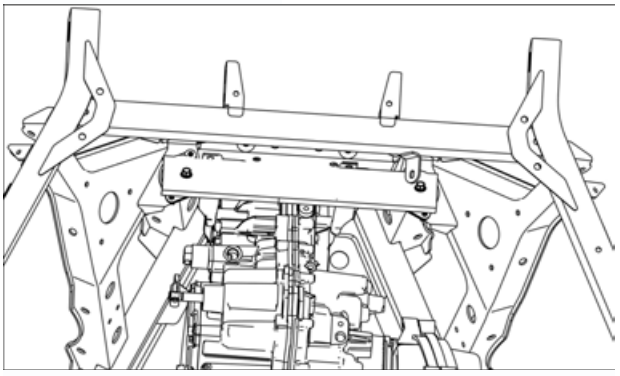
NOTICE: Always unplug battery cables exactly in the specified order, the BLACK (-) cable first.

4. Remove battery.

5. Remove rear drive shafts.

6. Remove cargo box cylinder.

7. Remove exhaust. Refer to EXHAUST SYSTEM subsection.



NOTE: Remove screws securing exhaust support bracket to frame. Leave muffler support bracket attached to rear engine support brackets.

8. Remove rear engine support bolts.

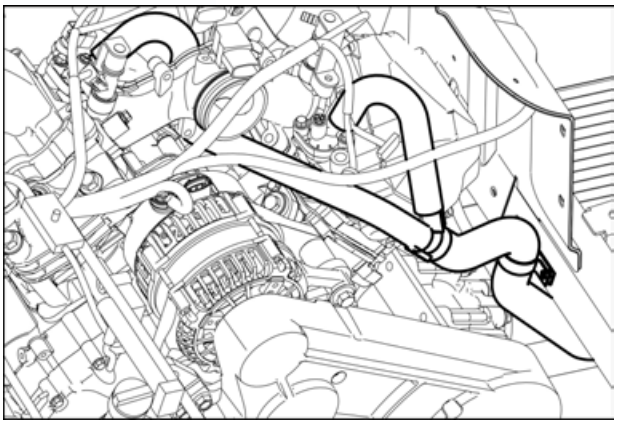
9. Drain engine oil. Refer to LUBRICATION SYSTEM subsection.

NOTE: Drain engine oil only if engine overhaul is necessary.

10. Drain the engine coolant.

10.1 Pinch coolant hose near water pump.

10.2 Pinch coolant hose near coolant bottle above Y fitting.



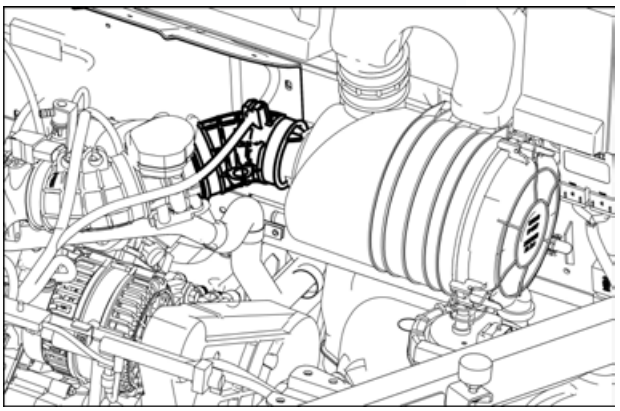
10.3 Open coolant drain plug.

NOTE: Completely drain engine coolant only if engine overhaul is necessary. Refer to COOLING SYSTEM subsection.

11. Remove fuel tank. Refer to FUEL TANK AND FUEL PUMP subsection.

12. Disconnect engine coolant hose above the Y fitting connecting to both cylinder heads.

13. Remove the air intake bellow.



NOTE: DO NOT Remove the front and rear head pipes from engine.

14. Disconnect the coolant hose at water pump.

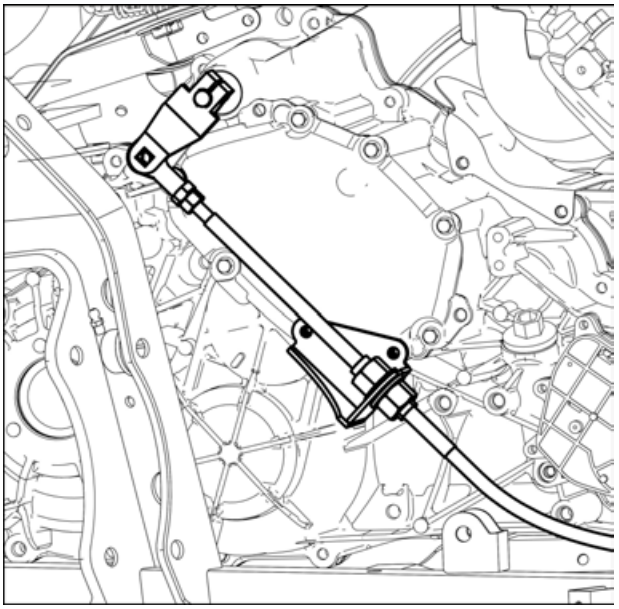
15. Disconnect the gearbox vent hose.

16. Remove the CVT outlet duct.

17. Remove the CVT inlet duct.

18. Unplug and remove the CTS (coolant temperature sensor).

19. Detach the shifter cable from its bracket and remove it.



20. Remove the front engine support nut.

21. Disconnect the crankcase vent hose.

22. Disconnect voltage regulator.

23. Unplug all remaining connectors and remove required cables from engine. Cut all necessary locking ties.

Lifting Engine

1. Install a hook and strap through the rear engine

lifting holes and route a second lifting strap under the front clynder.

2. Remove retaining screws on front and rear propeller shafts.

3. Slightly lift engine to ease removal of front engine support bolt.

4. Remove the front engine support bolt.

5. Raise the front of engine to separate front propeller shaft from engine.

6. Remove engine from vehicle.

ENGINE INSTALLATION

The installation is the reverse of the removal procedure. However, pay attention to the following. Prior to install engine, inspect condition of engine mounts.

Connect the front propeller shaft to engine output shaft while lowering engine.

Install rear and front engine mounting bolts then torque all mounting bolts.

Install air intake bellow. Ensure alignment marks are properly positioned and torque to specification.

Install exhaust. Refer to EXHAUST SYSTEM.

Final Assembly Procedure

1. Fill engine with the recommended oil and quantity. Refer to LUBRICATION SYSTEM subsection.

2. Fill and bleed cooling system. Refer to COOLING SYSTEM subsection.

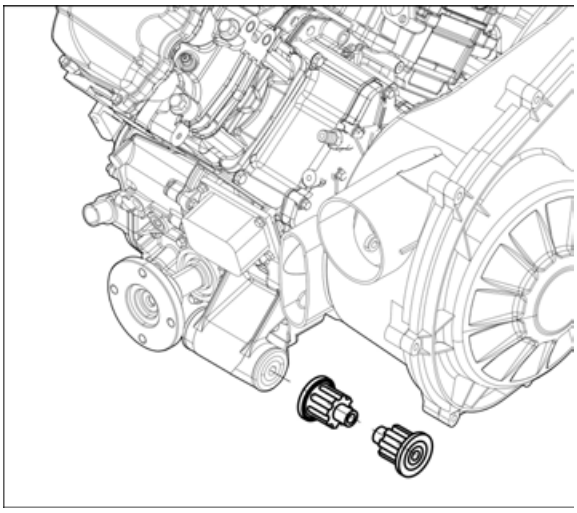
3. Check for any leaks.

4. Test drive vehicle to confirm proper operation.

ENGINE MOUNTS

Front Engine Mount Removal

Insert a punch into front engine mount bushing and push the opposite engine mount out.



Engine Mount Installation

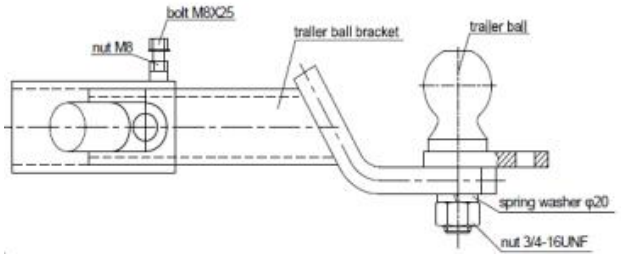
The installation is the reverse of the removal procedure.

TOW HITCH

Inspecting the Tow Hitch

Ensure tow hitch receptacle module is solidly mounted.

Inspect hitch for cracks and other damages. Repair or replace as necessary.



PASSENGER HANDHOLDS

Passenger Handhold Condition

Check if the passenger handholds are fixed firmly, not bent or otherwise damaged.

Replace if necessary.

STORAGE PROCEDURE

GENERAL

If the UTV is not used or is to be stored for an extended period of time, more than 4 months, be sure to perform the storage procedures described below.

Where applicable, refer to the appropriate subsections in this manual for the required tasks outlined in these procedures.

PROCEDURES

NOTE: To facilitate the inspection and ensure adequate lubrication of components, it is recommended to clean the entire vehicle. Refer to VEHICLE CLEANING in this subsection.

FUEL SYSTEM

Fuel System Protection

With the new fuel additives, it is critical to use the FUEL STABILIZER to prevent fuel deterioration and fuel system gumming. Follow the manufacturer's instructions for proper use.

NOTICE: Fuel stabilizer should be added prior to engine lubrication to ensure fuel system components protection against varnish deposits.

Pour fuel stabilizer in fuel tank. Fill up fuel tank.

ENGINE

Engine Internal Lubrication

Engine internal parts must be lubricated to protect them from rust formation during the storage period.

Proceed as follows:

1. Remove spark plugs.
2. Spray storage oil into each cylinder.

NOTE: Use the storage oil as per country availability.

3. Crank the engine over, 1 or 2 seconds maximum, to lubricate cylinders.
4. Reinstall the spark plugs.
NOTE: Do not run engine during storage period.
5. Block muffler outlet, engine air inlet and CVT outleth.
NOTICE: To avoid causing damage to vehicle, use memory aid to make sure rags are removed from their installed location.

CVT Protection

Remove drive belt. Refer to ENGINE, CVT AND GEARBOX.
Close CVT cover. Block CVT outlet with a rag.
NOTE: To reach the CVT outlet, detach it from exhaust heat shield.

ELECTRICAL SYSTEM

Battery Removal
Remove the battery.
Charge and store battery.

CHASSIS

Lubrication
Lubricate front and rear suspension and rear sway bar.
Tire Pressure
Inflate tires to the recommended pressure.
Vehicle Cleaning
Wash and dry the vehicle.
NOTICE: Never use a high pressure washer to clean the vehicle. USE LOW PRESSURE ONLY (like a garden hose). The high pressure can cause electrical or mechanical damages.
Remove any dirt or rust.
NOTICE: It is necessary to use flannel cloths on plastic parts to avoid damaging surfaces."Never clean plastic parts with strong detergent, degreasing agent, paint thinner, acetone, products containing chlorine, etc.

Vehicle Protection

Protect the vehicle with a cover to prevent dust accumulation during storage.
NOTICE: The vehicle has to be stored in a cool and dry place and covered with an opaque tarpaulin. This will prevent sun rays and grime from affecting plastic components and vehicle finish.

PRESEASON PREPARATION

Proper vehicle preparation is required after a storage period.
Any worn, broken or damaged parts found must be replaced.
Remove rags that were installed for storage: engine air inlet hose, CVT outlet hose and muffler. Clean drive and driven pulleys to remove storage protective lubricant, then reinstall drive belt. Refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT).
Remove parts required to allow inspection of entire engine air inlet system. Check for animal nests and other foreign material. Reinstall removed parts.
Drain fuel tank and fill with fresh fuel if a fuel stabilizer was not used for storage. Reinstall battery. Refer to CHARGING SYSTEM subsection.
Inflate tires to the recommended pressure.
NOTE: Perform any due maintenance items as per the MAINTENANCE SCHEDULE.
Test drive vehicle.

SPECIAL PROCEDURES

GENERAL

NOTE: Component failures resulting from these events are not warrantable.

Refer to the appropriate subsections in this manual for the required tasks outlined in these procedures.

ROLLED OVER VEHICLE

In the event the vehicle was rolled over, check the following.

Inspect suspension components and steering system components.

Inspect body and chassis for damage (welded joints, bent or cracked parts).

Pay particular attention to the cage, shoulder protector, seat belts and their mechanisms.

⚠ WARNING

Do not use vehicle if any of the safety devices are damaged or inoperative.

Check all fluids level before restarting engine.

NOTICE: Check for oil accumulation in the air intake system. Check air filter.

After restarting engine, check multi function gauge if any malfunction is detected.

Troubleshoot and repair as required before using vehicle.

SUBMERGED VEHICLE

In the event the vehicle was submerged, proceed with the following.

NOTICE: A submerged vehicle may cause several damages (short and long term) if not serviced adequately or soon enough. Do not crank or start engine.

Drain the entire air intake system. Inspect the throttle body. Remove parts as required.

Drain, inspect and clean the CVT.

Empty muffler (removal required).

Unplug ECM, multi function gauge and DPS connectors, and open fuse boxes. Check for presence of water. Dry as necessary.

Inspect all lights for water intrusion. Dry as required.

Replace the engine oil Without starting the engine.

Remove spark plugs. Crank engine in drowned mode to expel any water.

CAUTION: Keep away from spark plug holes to avoid to be splashed when cranking engine.

Add a small quantity of engine oil in cylinders (approximately 2 teaspoonfuls).

Install spark plugs (replace if required).

Look for water in fuel tank, in doubt, flush fuel tank and refill with new gas.

Look for water in brake system. Replace brake fluid as required.

Start the engine and allow it to run at idle speed until the engine reaches its operating temperature.

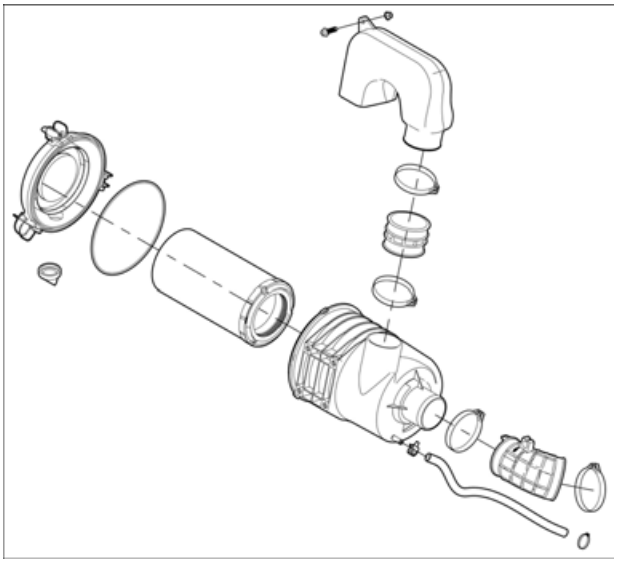
Stop the engine.

Change engine oil and filter.

NOTE: Change oil as many times as necessary. until there is no whitish appearance in engine oil. Check gearbox oil. Replace oil if contaminated with water.
Replace oil of front differential.

Check vent tubes. Clean if required.
Lubricate front and rear suspensions and propeller shaft joints. Refer to FRONT AND REAR SUSPENSIONS.
Test drive to confirm proper operation.

AIR INTAKE SYSTEM



GENERAL

NOTICE: Never modify the air intake system. Otherwise, engine performance degradation or damage can occur. The engine is calibrated to operate specifically with these components.

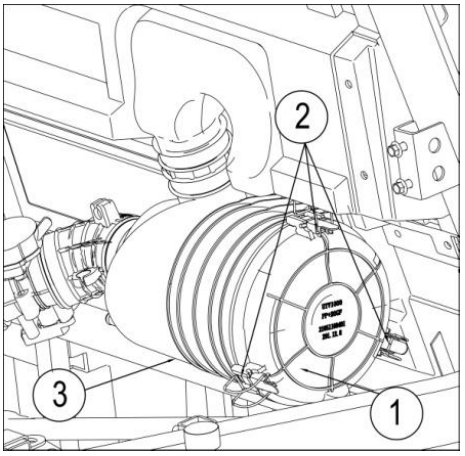
AIR FILTER

For air filter servicing, refer to PERIODIC MAINTENANCE PROCEDURES subsection.

AIR FILTER HOUSING

Removing Air Filter Housing

Release clamps and remove air filter cover and filter.



1. Air filter cover
2. Latches
3. Duck bill valve

The filter fits tightly over the outlet tube and there will be some initial resistance.

Gently move the end of the filter back and forth to break the seal, then rotate while pulling straight out.

Avoid knocking the filter against the housing.

Installing Air Filter Housing

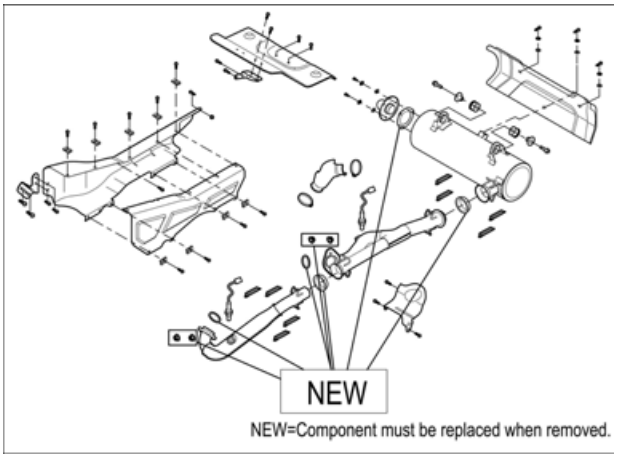
For installation, reverse the removal procedure but pay attention to the following.

Align installation marks on throttle body, air box and housing vent hose and make sure below is not crushed.

Do not over torque.

TIGHTENING TORQUE	
Air filter housing screws	10N.m±2N.m (89lbf.in±18lbf.in)

EXHAUST SYSTEM



⚠ WARNING

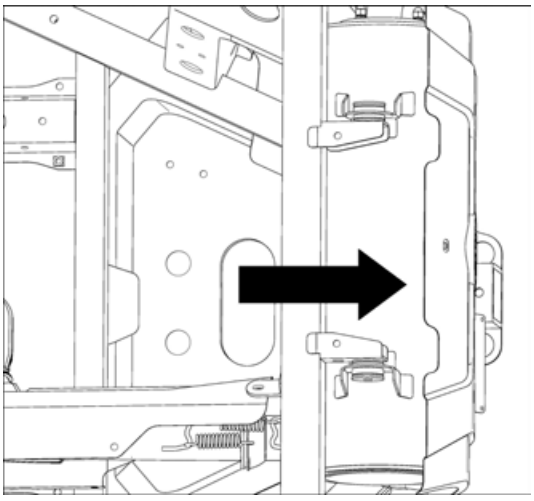
Never touch exhaust system components immediately after the engine has run.

PROCEDURES

For spark arrestor servicing, refer to PERIODIC MAINTENANCE PROCEDURES subsection.

Removing Muffler

First remove the tension spring on the hook (the four tension springs at the exhaust pipe of the second cylinder are removed at the same time), then remove the two bolts on the upper end of the muffler, and finally take off the muffler and graphite gasket in the direction of the arrow.

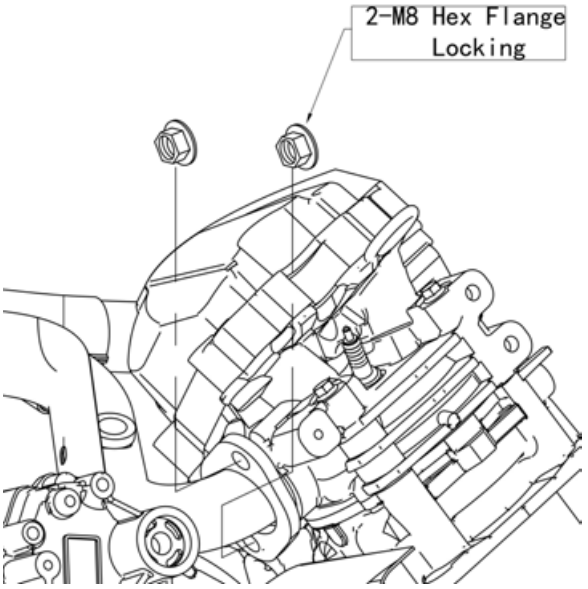


Inspecting Muffler

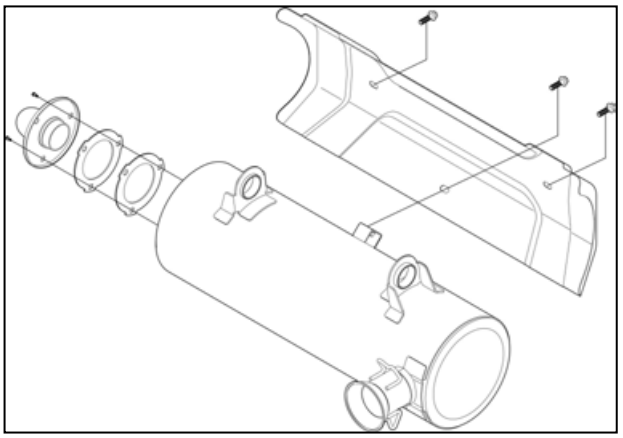
Check muffler for cracks or other damages. Replace if necessary.

Check heat shields for cracks or other damages. Replace if necessary.

Check if the rubber supports are brittle, hard or otherwise damaged. Replace if needed.



Remove the muffler trim cover, a total of 4 M6 hexagon flange bolts. Remove the 3 socket head cap bolts on the muffler end cap.



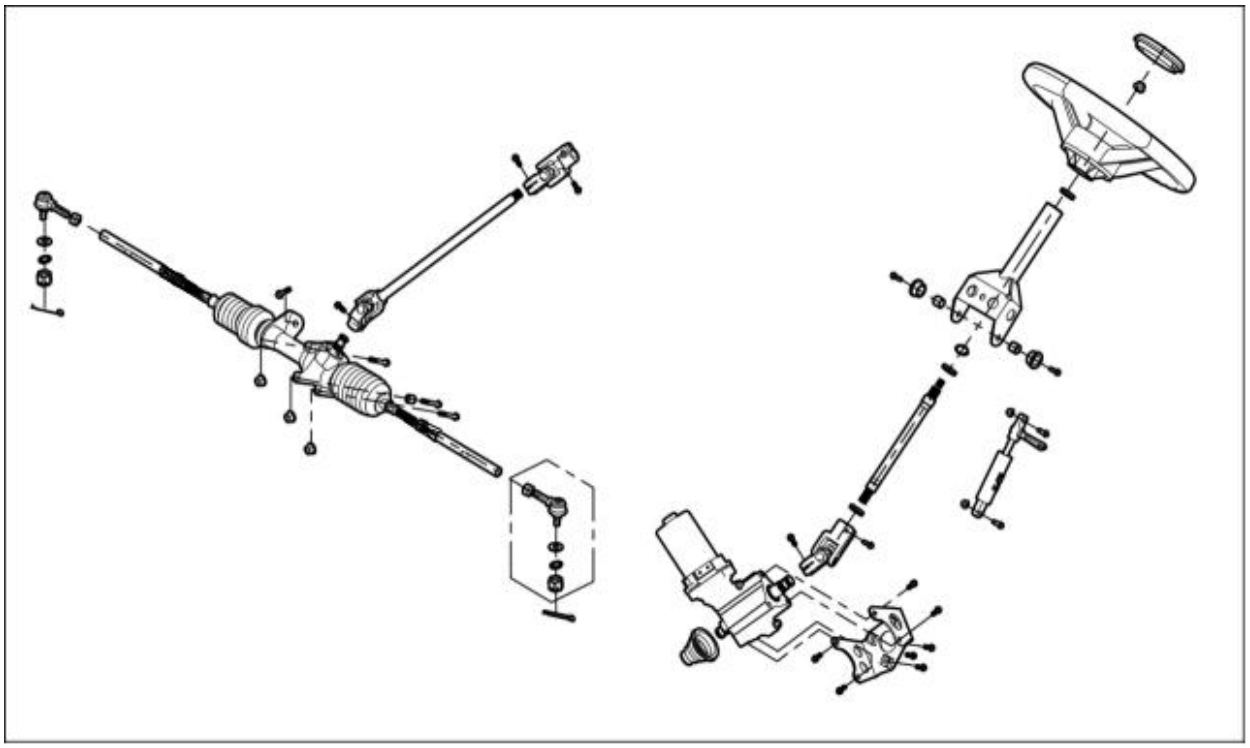
Installing Rear Head Pipe

The installation is the reverse of the removal procedure. However, pay attention to the following.

Do not torque yet. Strictly adhere to tightening sequence.

Install NEW exhaust gaskets.

STEERING SYSTEM



ALIGNING THE WHEELS

1. Place vehicle on a level surface.
2. Inflate tires to recommended pressure.
3. Find rack and pinion center to center as follows:

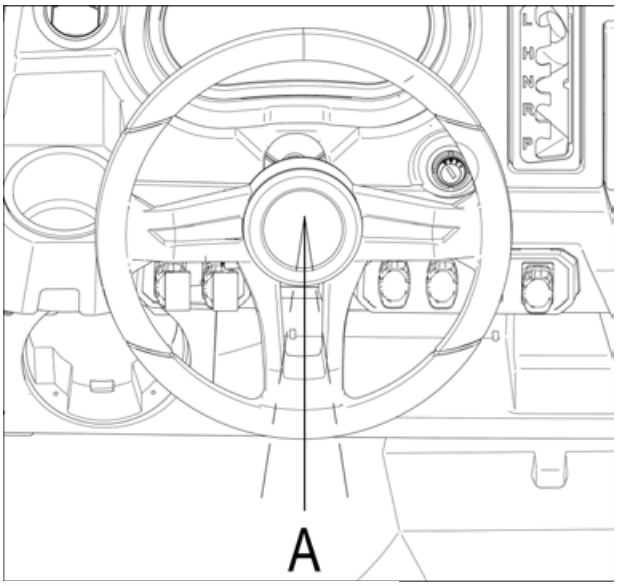
a. Calculate the total steering wheel otations from side to side.

b. Position the steering wheel at half the total rotations.

4. Check steering wheel position:

a. If stelering wheel is centered (within + 5°).go to step 6.

b. If steering wheel is offset more than 5°, go to step 5.



A. Steering wheel angle ±5°

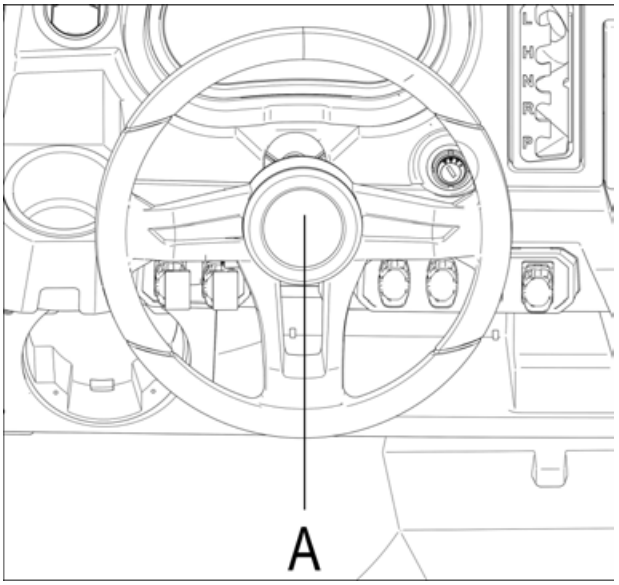
5. Reposition steering wheel on steering shaft as follows:

NOTICE: Make sure rack and pinion does not move during steering wheel repositioning.

a. Remove steering wheel. Refer to REMOVNG THE STEERING COLUMN.

b. Reinstall steering wheel to the closest centered position (nearest spline).

6. Center steering wheel.



A. Steering wheel centered

7. Place one mark on each front tire with a chalk at height of the center of the wheel. The mark must be under the frame, from a side point of view.

Inspecting the Wheel Bearing

1. Safely lift and support the front of vehicle. Refer to INTRODUCTION subsection.

2. Hold wheel by the top and the bottom and move it. Check for any play.

3. If there is any loose, replace wheel bearing, refer to STEERING SYSTEM subsection.

NOTE: To properly locate play during this inspection, be sure to check other components for wear or loose (ball joints, suspension pivots, etc). If necessary repair or replace all defective parts before checking the wheel bearing condition. Be careful not to misjudge loose in the ball joint and loose in the wheel bearing.

Inspect the tie rod for distortion or damage. If any damage are found, replace the tie rod with a new one.

Inspect the tie ends for smooth movement. If there are any abnormalities, replace the tie rod end with a new one.

Inspect the tie rod end boot for wear or damage.

If any damage are found, replace the tie rod end with a new one.

Inspecting the Steering System

Steering Column

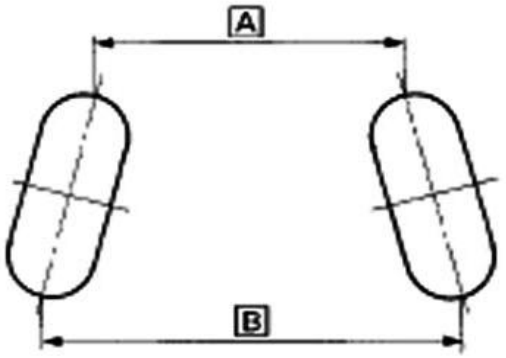
Turn and move steering column to detect any play.

Rack and Pinion

Check rack and pinion boots for:

- Damage
- Cracks
- Replace if necessary.

Park vehicle on flat ground, make sure the tire pressure for right and left tires is same and set to the proper specification, set the front wheels in the straight position, then place a load of 75kg on the seat.



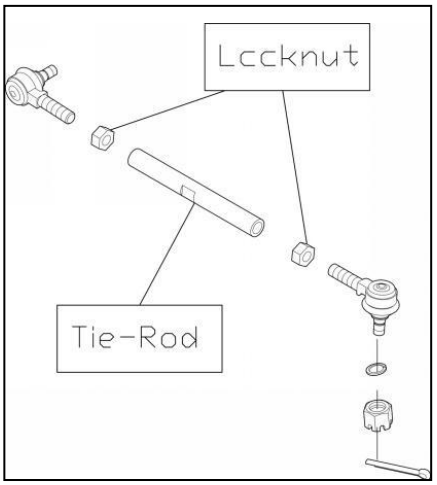
Measure The distance A and B of the front wheels and calculate the difference.

Toe-in.: B-A= 5 mm

A: front of front wheel

B: rear of front wheel

Out of range of toe-in: →Adjust nut of tie rod.



⚠ WARNING

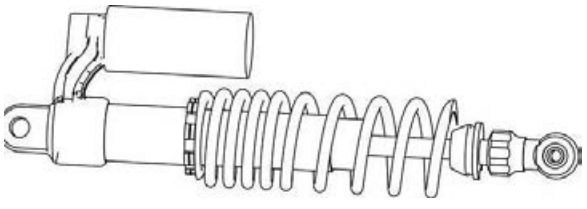
After adjusting toe-in, fist rotate steering wheel from center position to the left and right competely, to ensure that is the same corner, then slowly run vehicle to see whether its direction can be controlled.

SUSPENSION

The procedure explained below is the same for the RH and LH sides unless otherwise noted. During assembly or installation, use the torque values and service products as in the torque table.

In order to prevent collapse of vehicle, please do not dismantle left and right suspensions simultaneously.

Before overhauling front suspension system, please ensure stable support of vehicle



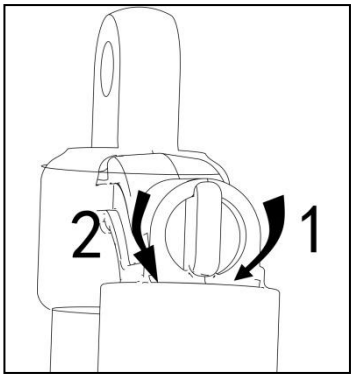
Inspecting the Shock Absorber

Your vehicle handling and comfort depend upon suspension adjustments.

Inspect the shock absorber for oil leakage or damage, inspect the bushing for wear or damage. If any damage are found, replace the front shock absorber with a new one.

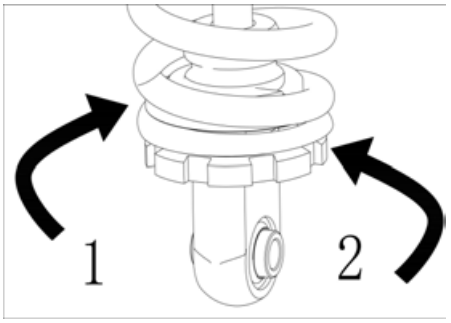
The compression damping clicker knob is located at the top of the shock reservoir.

Above the shock absorber



1. Turn the clicker clockwise to increase compression damping.
2. Turn the clicker counter-clockwise to decrease compression damping.

Below the shock absorber



1. Turn the clicker counter-clockwise to decrease compression damping.
2. Turn the clicker clockwise to increase compression damping.

⚠ WARNING

Suspension adjustment could affect vehicle handling. Always take time to familiarize yourself with the vehicle's behavior after any suspension adjustment has been made.

Choice of suspension adjustments vary with vehicle load, personal preference, driving speed and terrain condition.

The best way to set up the suspension, is to start from factory settings, then customize each adjustment one at a time.

Front and rear adjustments are interrelated. It may be necessary to readjust the rear shock absorbers after adjusting front shock absorbers for instance.

Test run the vehicle under the same conditions; trail, speed, load, etc.

Change one adjustment and retest.

Proceed methodically until you are satisfied.

Spring Preload Adjustment

⚠ WARNING

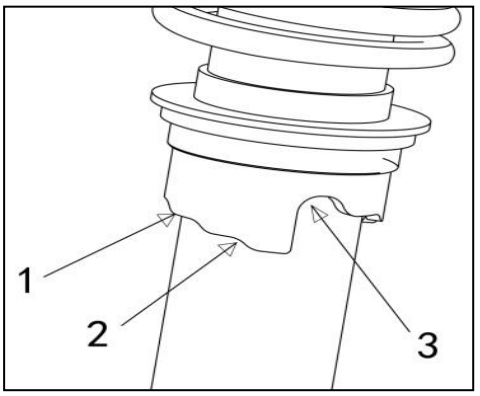
The left and right shock adjustment on front or rear suspension must always be set to the same position. Never adjust one only. never adjustment can cause poor handling and loss of stability which could lead to an accident

Shorten the springs for a firmer drive and rough conditions.

Lengthen the springs for a softer drive and smooth conditions.

Ordinary shock absorption

Adjust spring preload by turning adjustment cam.



TYPICAL

1.Adjustment cam

2.Firmer adjustment

3.Softer adjustment

Extend and compress the piston several times over its entire stroke. Check that it moves smoothly and with uniform resistance with rod up. Any of the following conditions will denote a defective shock:

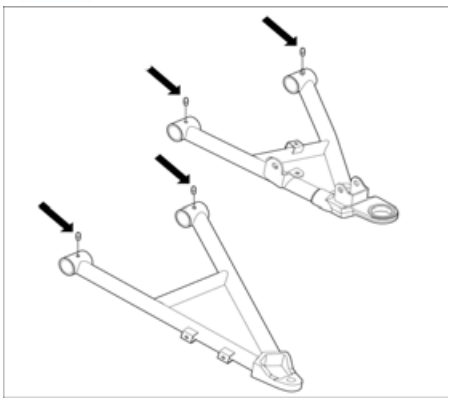
- A skip or hang up when reversing stroke at mid-travel.
- Seizing or binding conditions except at extreme end of either stroke.
- A gurgling noise after completing one full compression and extension stroke.

If you find any of these, replace the shock.

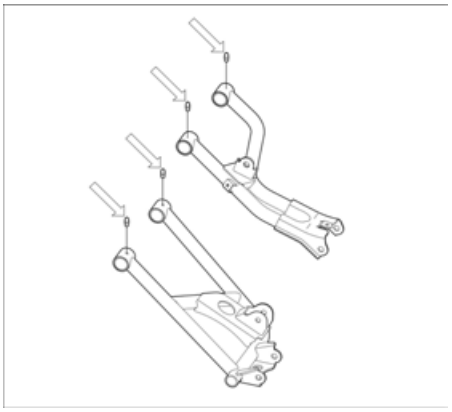
Suspension Arm

Lubricate suspension arm at grease fittings.

front



Rear



Inspect the suspension arm and for damage or distortion. If any damages or distortion are found, replace the suspension arm with a new one.

Move suspension arm from side to side. There should be no noticeable loose. Replace bushing if necessary.

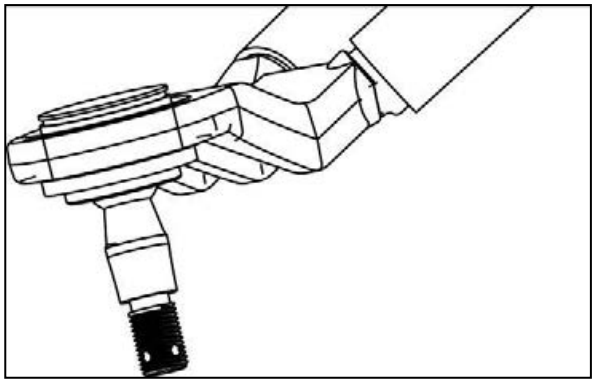
Move suspension arm up and down. There should be no noticeable loose. Replace bushing if necessary.

REASSEMBLY

Pay attention to the following points.

1.Install the washers and tighten the knuckle nuts to the specified torque.

2.Replace the removed cotter pins with new cotter pins.



Inspecting the Suspension Arm

Check suspension arm for:

-Cracks

-Pitting

-Bending

-Distortion

Check suspension arm for abnormal play:

- Side to side

-Up and down

If any play is detected, inspect:

- Bushings

- Cushions

-Wear plates

Check ball joint for:

-Damage

- Pitting

- Play

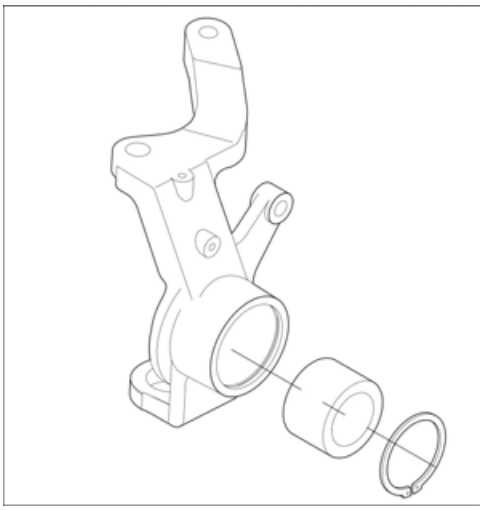
Check ball joint bellows for:

- Damage

-Cracks

Knuckle

Inspect the knuckle for damage. If any damages are found, replace the knuckle with a new one.



Check bearing and seal for damage or wear, If any damages or wear are found, replace a new one.

Rotate the inner race by hand to inspect for abnormal noise and smooth rotation.

BRAKES

Cleaning and Inspecting the Brake System

NOTICE: Do not clean brake components in petroleum based solvent. Use brake system cleaner only. Soiled brake pads must be replaced with new ones.

Brake Pads

1. Measure brake pad lining thickness.

NOTE: The brake pad grooves are wear indicators.

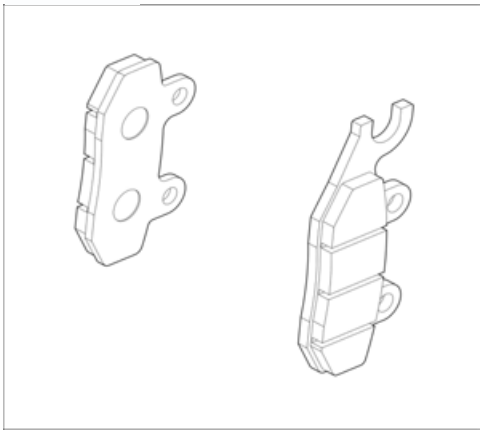
⚠ WARNING

Brake pads must always be replaced in pairs.

Brake Caliper

1. Remove calipers then check the following components:

- Check brake pad pins
- Check caliper boot for cracks
- Check caliper movement on its support
- Check pistons movement
- Check pistons for scratches, rust or other damages.



NOTE: Do not remove pistons from caliper for cleaning them.

2. Lubricate caliper sliders and pins using an appropriate brake caliper synthetic grease.

Brake Disc

1. Check brake disc as follows:

-Check disc thickness

-Check disc surfaces

-Check disc war page.

Brake Hoses

1. Check hoses for leaks, crushed, deformations, cracking or scrapes.

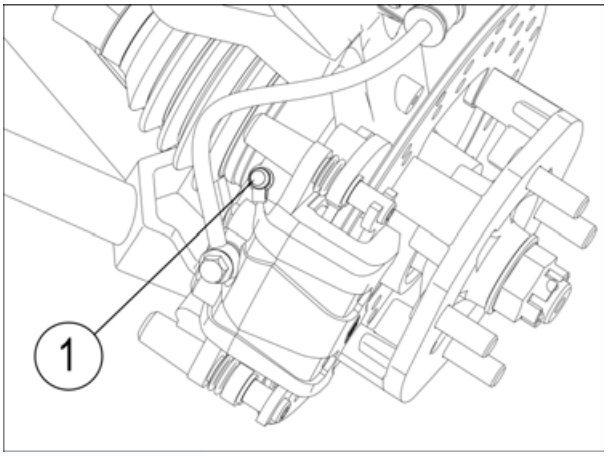
NOTE: Any deformation can restrict the proper flow of fluid and cause braking problems.

Replacing the Brake Fluid

Draining the Brake Fluid

1. Clean and remove reservoir cover with its diaphragm.

2. Connect a clear hose into caliper bleeder.



1. Caliper bleeder

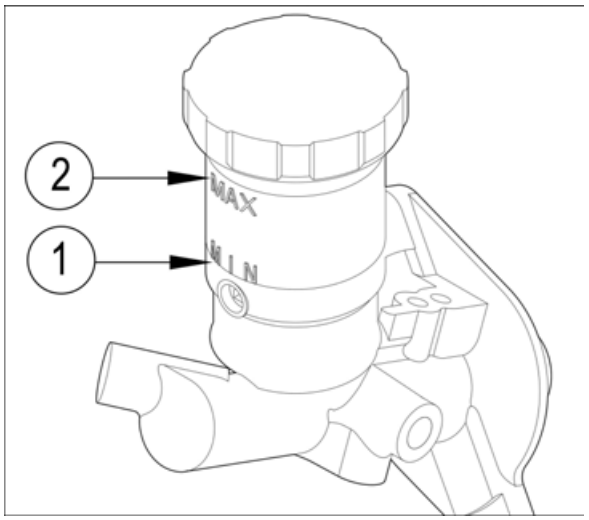
3. Loosen caliper bleeder.

4. Pump brake pedal until no more fluid flows out.

5. Repeat draining procedure for the other caliper bleeders.

Filling the Brake Fluid

1. Add recommended brake fluid to MAX. Do not overfill.



1. MAX
2. MIN

⚠ WARNING

- Use only DOT 4 brake fluid from a sealed container.
- Do not use brake fluid from an old or already opened container.

Bleeding the Brake System (Vacuum Pump)

NOTE: Brake fluid reservoir must be kept full to prevent air from being pumped into the system.

1. On each caliper, unscrew bleeder until brake fluid comes out then close it.
2. Install the vacuum pump onto caliper bleeder.
3. Place pump to vacuum position.
4. Pump vacuum pump a few times.
5. Loosen bleeder.
6. Continue to pump until no more air bubbles appear in clear hose.
7. Close then tighten bleeder.
8. Add recommended brake fluid to MAX. Do not overfill.
9. Perform bleeding procedure for the other caliper bleeders.
10. Check brake pedal operation:
    -If the brake pedal feels spongy, bleed the system again.

Bleeding the Brake System (Manual)

NOTE: Brake fluid reservoir must be kept full to prevent air from being pumped into the system.

1. Connect a clear hose onto caliper bleeder.
2. Pump up system pressure with brake pedal until pedal resistance is felt.
3. Depress and hold brake pedal.
4. Open bleeder and then close it.
5. Release brake pedal slowly.

NOTE: Do not release brake pedal until bleeder has been closed.

6. Repeat procedure until fluid flows out without any air bubbles.
7. Tighten bleeder.

TIGHTENING TORQUE	
Bleeder	5.5N.m±1.5N.m (49lbf.in±13lbf.in)

8. Perform bleeding procedure for the other caliper bleeders.
9. Check brake pedal operation:
   -If the brake pedal feels spongy, bleed the system again.

BRAKE LIGHT SWITCH

The brake light switch is located on the brake master cylinder. It cannot be adjusted.

Inspection

Fist ensure brake light is good. Check switch for dirt or corrosion. Make sure it is operating properly. Depress brake pedal

and check for brake light to turn on. Repeat with the brake pedal.

Test

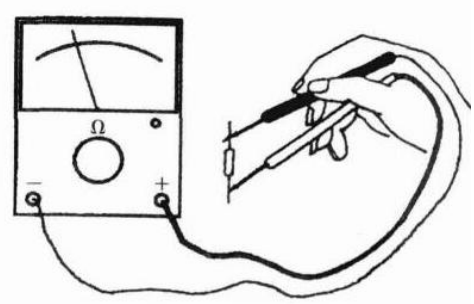
Disconnect switch connectors.

Check switch operation as follows.

SWITCH POSITION	PIN		RESISTANCE
Firmly pushed	1	2	0.2Ωmax
Released			Infinite

If switch is defective, replace with a new one.

If switch tests good, check wiring harness.



Remove

Disconnect switch connectors.

Drain brake system.

Unscrew brake light switch from master cylinder.

Catch spilled fluid with a rag.

Installation

For installation, reverse the removal procedure.

Bleed the brake system

Check for leaks and make sure the brakes operate normally before driving.

BRAKE HOSE

Inspection

Brake hose should be inspected frequently for leaks an damages.

Check if the hoses are crushed or damaged. Any deformation can restrict the proper flow of fluid and cause braking problems.

Check hoses for cracking scrapes. This damage can cause hose failure under pressure.

When hoses are removed or disconnected, cleanliness must be observed. Clean all joints and connections before disassembly. New hoses should be cleand with brake fluid before installation to remove any contamination.

Replace any defective parts.

Removal

Before removing any hoses, drain brake system.

Remove all necessary parts to reach the hoses.

Thoroughly clean the are around the joints that will be disconnected.

Place a pan under the joint that will be disconnected.

Disconnect any retaining clips or brackets holding the hose and remove the defective parts.

Installation

Install the new hose.

Make sure the piece will not rub against any other part.

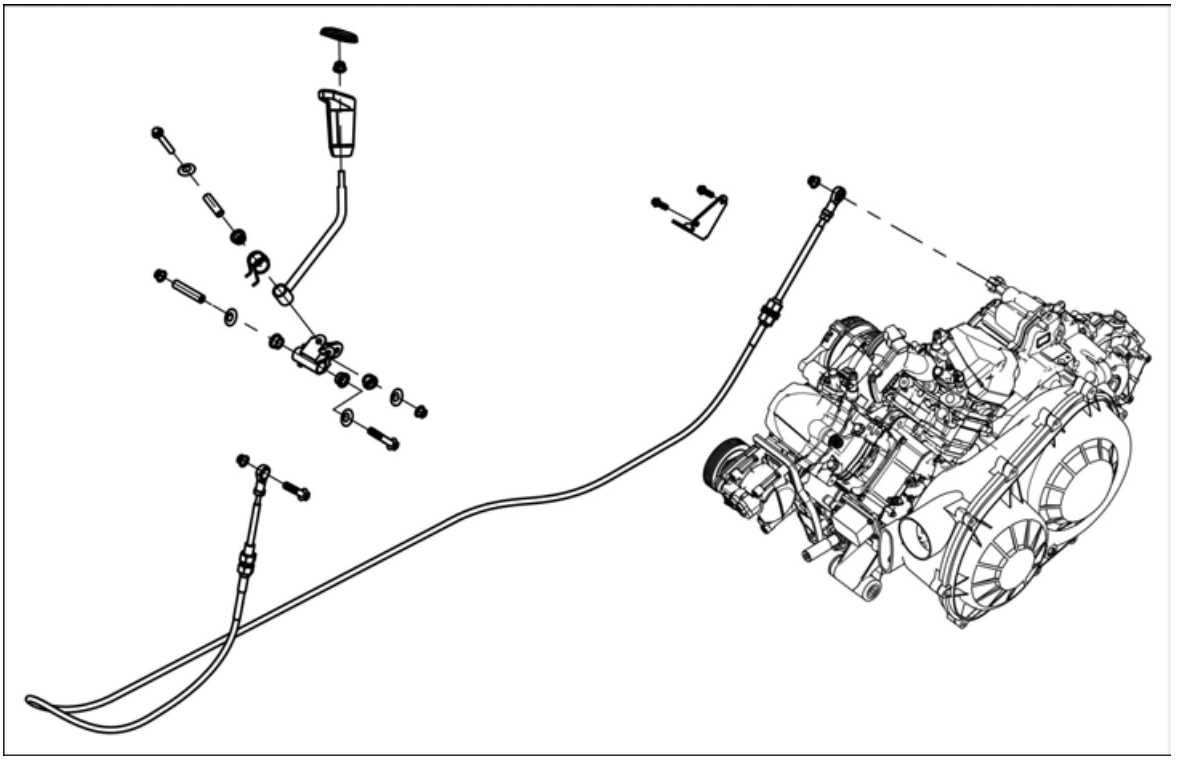
When there is a banjo fitting securing the hose to the caliper or to the master cylinder, always replace the sealing washers with new ones.

Install any retaining clips or brackets.

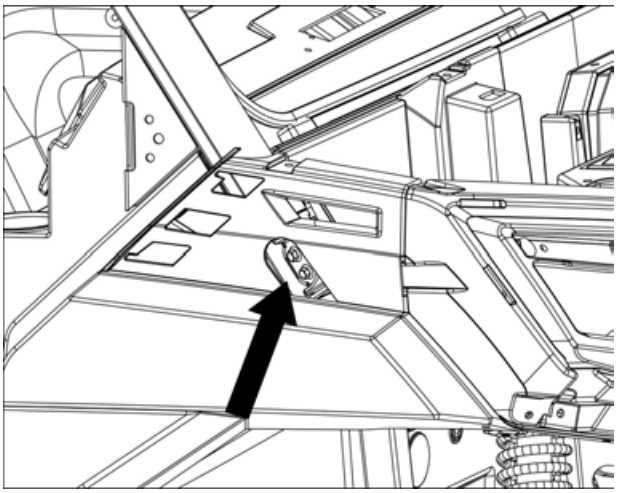
Refill and bleed the brake system.

Check for leaks and make sure the brakes operate normally before driving.

SHIFTER



NOTICE : If it is necessary to disassemble the dashboard to maintain gear shifting or other mechanisms, please remove the four bolts (including the left and right sides) indicated by the arrows at the front of the roof to remove the dashboard. (Other bolts on the ceiling do not need to be removed)



SHIFT LEVER

Shift Lever Access

1. remove the following components:

- Shifter indicator

Shift Lever Removal

1. Remove body parts as required. Refer to SHIFT LEVER ACCESS in this subsection.
2. Place shift lever in NEUTRAL position.
3. Secure vehicle using wheel blocks.
4. Unscrew shift lever handle.
5. Detach shifter cable from shift lever by removing nut and washer.

Shift Lever Inspection

Check shift lever for bending or cracks.

Check spring and bushing condition.

Replace all damaged parts.

Shift Lever Installation

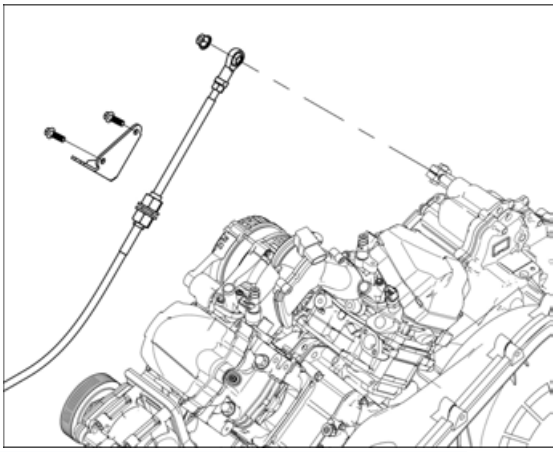
The installation is the reverse of the removal procedure. However, pay attention to the following. Ensure shift lever angle is within specifications.

SHIFT PLATE

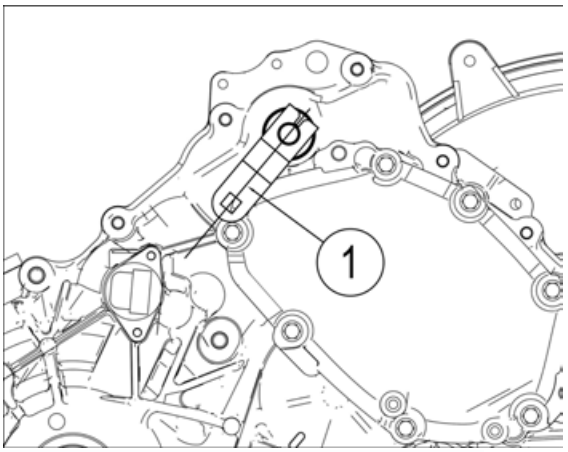
Shift Plate Removal

NOTE: Do not remove shift plate needlessly.

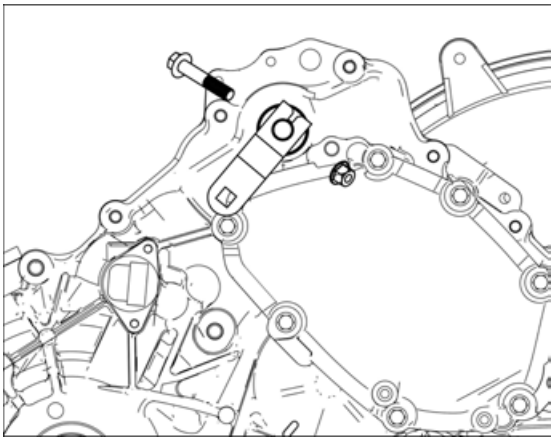
1. Remove shifter cable from shift plate.



2.Index shift plate and shift shaft.



3. Remove shift plate nut and bolt.



4. Remove shift plate.

Shift Plate Inspection

The installation is the reverse of the removal procedure. However, pay attention to the following. Place gearbox in NEUTRAL position before shift plate installation.

Install and align shift plate using marks previously tracked.

WINCH SAFETY

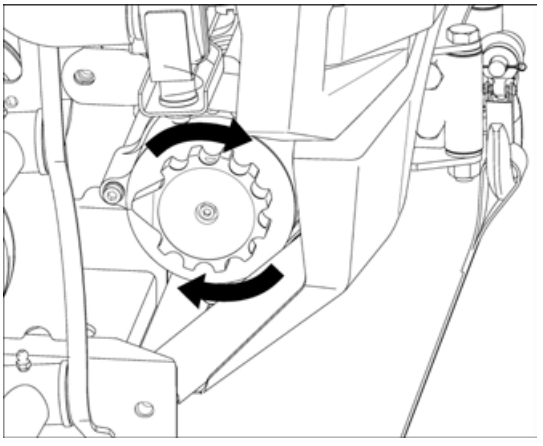
These safety warnings and instructions apply if your vehicle came equipped with a winch or if you choose to add an accessory winch to your vehicle.

⚠ WARNING

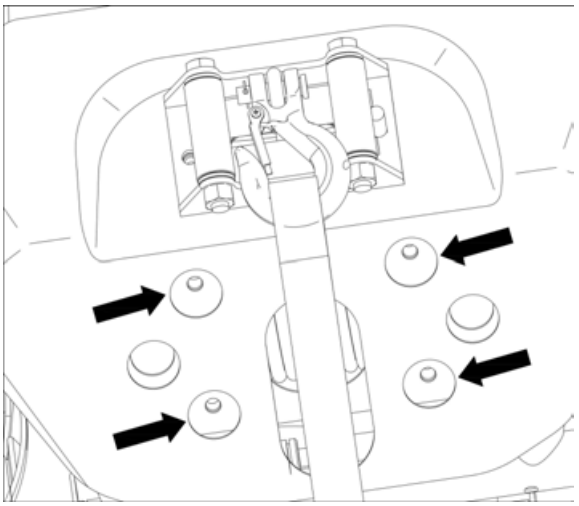
Improper winch use can result in SEVERE INJURY or DEATH. Always follow all winch instructions and warnings in this manual.

Your winch may have a cable made of either wire rope or specially designed synthetic rope. The term “winch cable” will be used for either unless noted otherwise.

Rotate control handle of traction engine clockwise , releasing lock-up status of cable. Pull out cable for about 30cm along .



Remove the four fixing bolts at the bottom, pull out the relevant connectors and cables, and finally remove the hoist for routine maintenance.



WINCH SAFETY PRECAUTIONS

1. Read all sections of this manual.
2. Never use alcohol or drugs before or while operating the winch.
3. Never allow children under 16 years of age to operate the winch.
4. Always wear eye protection and heavy gloves when operating the winch.
5. Always keep body, hair, clothing and jewelry clear of the winch cable, fair lead and hook when operating winch.
6. Never attempt to "jerk" a load attached to the winch with a moving vehicle.
7. Always keep the area around the vehicle, winch, winch cable, and load clear of people (especially children) and distractions while operating the winch.
8. Always turn the vehicle ignition power OFF when it and the winch are not being used.
9. Always be sure that at least five full turns of winch cable are wrapped around the winch drum at all times. The friction provided by this wrapped cable allows the drum to pull on the winch cable and move the load.
10. Always apply your vehicle' s park brake and/or park mechanism to hold the vehicle in place during winching. Use wheel chocks if needed.
11. Always align the vehicle and winch with the load directly in front of the vehicle as much as possible. Avoid winching with the winch cable at an angle to the winching vehicle' s centerline whenever possible.
12. If winching at an angle is unavoidable, follow these precautions:

a. Look at the winch drum occasionally. Never let the winch cable "stack" or accumulate at one end of the winch drum. Too much winch cable at one end of the winch drum can damage the winch and the winch cable.

b. If stacking occurs, stop winching. Follow step 15 of Winch Operation to feed and rewind the cable evenly before continuing the winch operation.

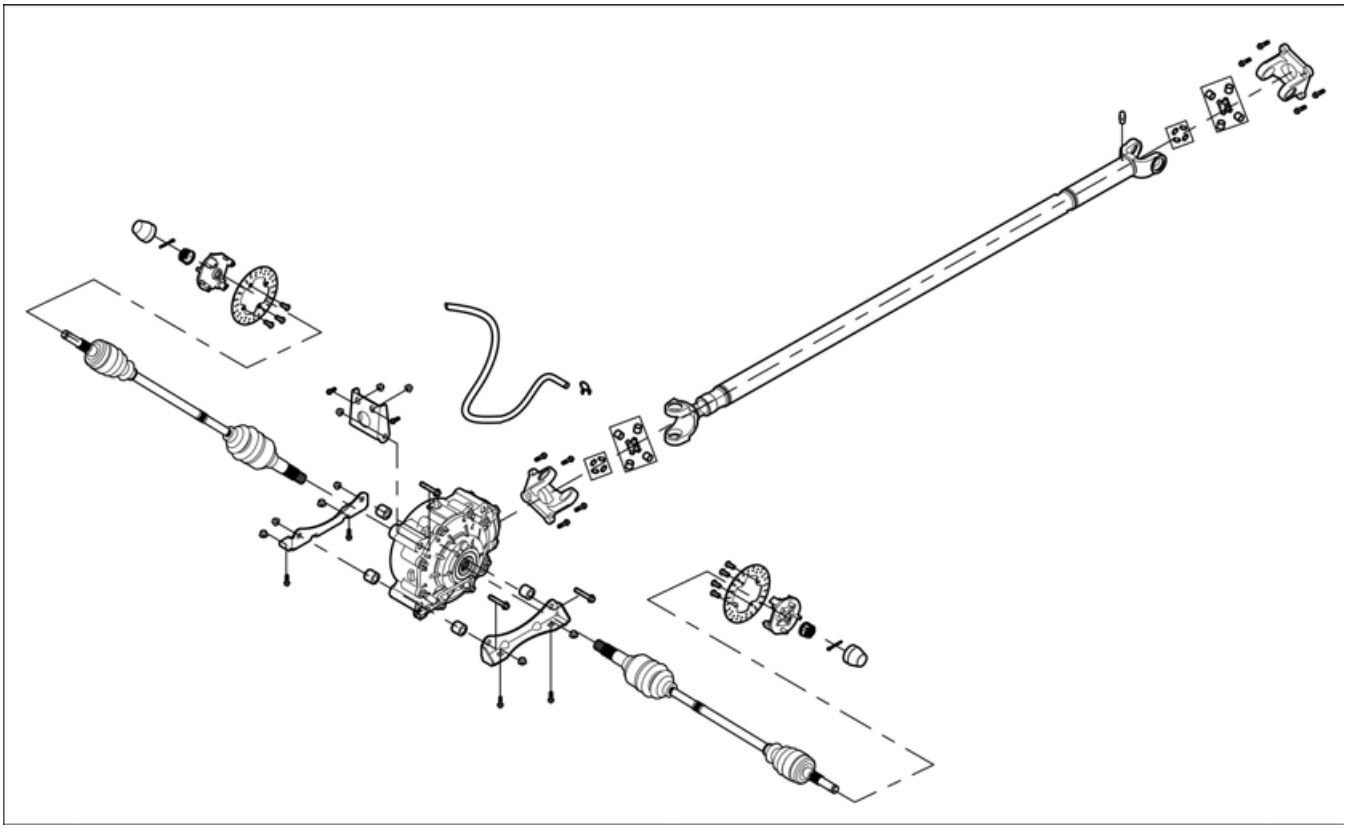
13. Never winch up or down at sharp angles. This can destabilize the winching vehicle and possibly cause it to move without warning.
14. Never attempt to winch loads that weigh more than the winch' s rated capacity.
15. The winch motor may become hot during winch use. If you winch for more than 45 seconds, or if the winch stalls during operation, stop winching and permit the winch to

cool down for 10 minutes before using it again.

16. Never touch, push, pull or straddle the winch cable while winching a load.
17. Never let the winch cable run through your hands, even if wearing heavy gloves.
18. Never release the clutch on the winch when the winch cable is under load.
19. Never use the winch for lifting or transporting people.
20. Never use the winch to hoist or suspend a vertical load.
21. Always inspect your winch and winch cable before each use.
22. Never winch the hook fully into the winch. This can cause damage to winch components.
23. Unplug the remote control from the vehicle when the winch is not in use to prevent inadvertent activation and use by unauthorized persons.
24. Never grease or oil the winch cable. This will cause the winch cable to collect debris that will shorten the life of the cable.

FRONT DRIVE

FRONT DRIVE SHAFTS AND FRONT PROPELLER SHAFT



GENERAL

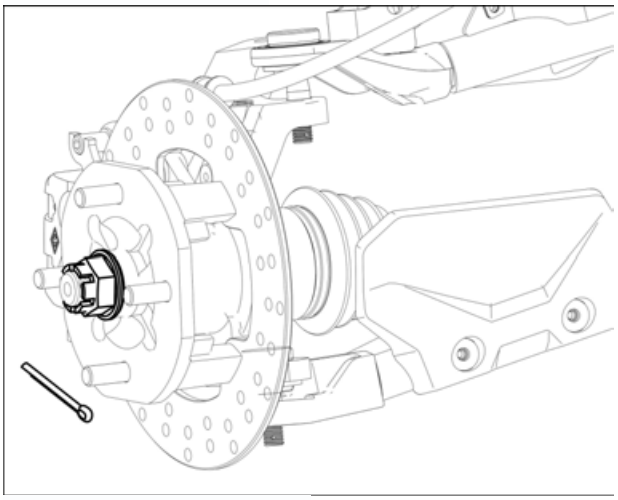
The procedure explained below is the same for the RH and LH sides unless otherwise specified.

PROCEDURES

WHEEL HUB

Removing the Wheel Hub

1. Lift and support vehicle. Refer to INTRODUCTION section for proper procedure.
2. Select the 4WD position and place the transmission lever on "P".
3. Remove caliper from knuckle. Refer to BRAKES subsection.
4. Remove the following parts:
   – Wheel
   – Cotter pin
   – Castellated nut
   – Belleville washer.



5. Remove wheel hub.

Inspecting the Wheel Hub

Check wheel studs for damaged threads and overall conditions

Check wheel hub for cracks or other damages.

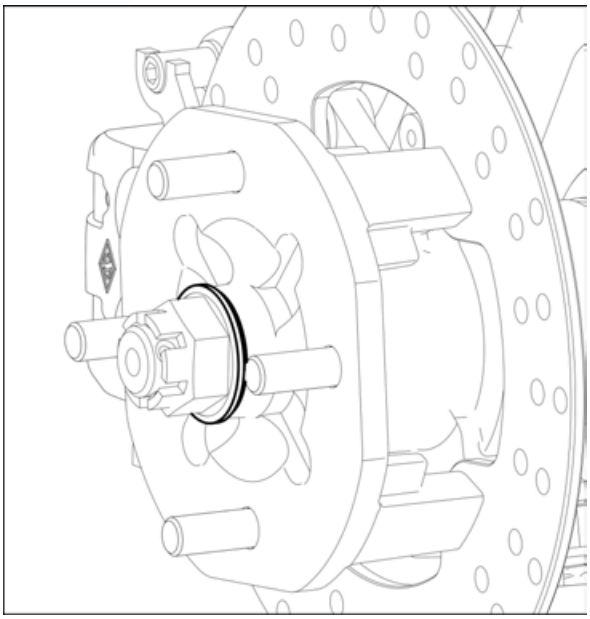
Check inner splines for wear or other damages.

Replace wheel hub and / or studs if any damage is detected.

Installing the Wheel Hub

The installation is the reverse of removal procedure. However, pay attention to the following.

Install Belleville washer with its domed side outwards.



TIGHTENING TORQUE	
Castellated nut	250 N•m ± 15 N•m (184 lbf•ft ± 11 lbf•ft)

NOTE: Tighten further castellated nut if required to align grooves with drive shaft hole.

Install a new cotter pin.

FRONT DRIVE SHAFT

Removing the Front Drive Shaft

1. Remove the wheel hub. Refer to procedure in this subsection.

2. Remove the knuckle. Refer to STEERING SYSTEM subsection.

3. Strongly pull drive shaft out of differential.

4. Discard the stop ring at the end of the shaft.

Inspecting the Front Drive Shaft

Inspect the condition of boots. If there is any damage or evidence of leaking lubricant, replace them.

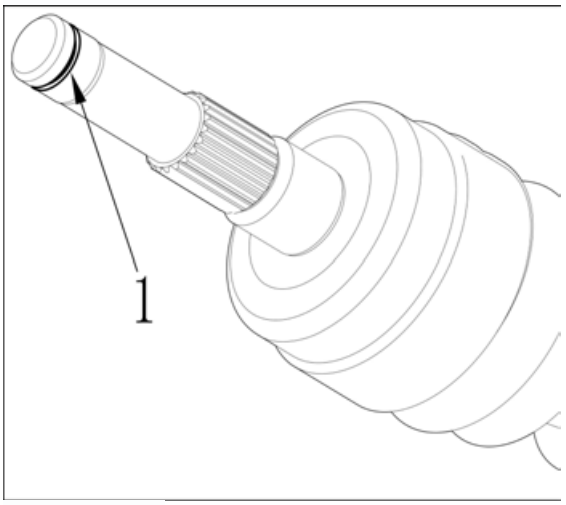
Check splines for excessive wear. Replace if necessary.

NOTE: If the splines on plunging joint are worn, a check of differential inner splines should be done.

Installing the Front Drive Shaft

The installation is the reverse of the removal procedure. However, pay attention to the following.

Install a new stop ring.



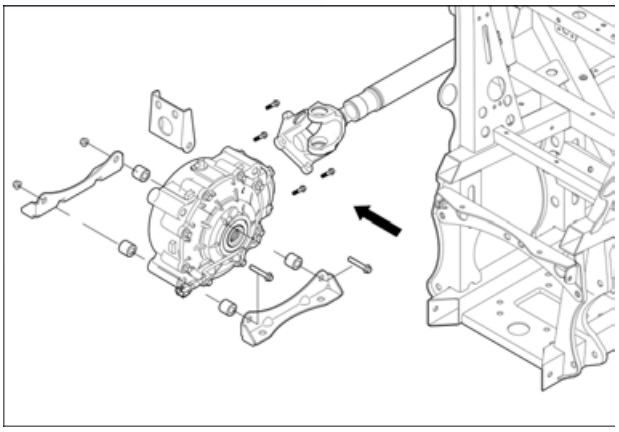
1. Stop ring

Apply XPS SYNTHETIC GREASE to the splines.

Remove the front drive

Remove the three installation brackets of the front drive and unload the four bolts of the front drive shaft after the plug, move a certain distance forward, withdraw the front drive shaft, take out the front reducer from the right side of the body for maintenance.

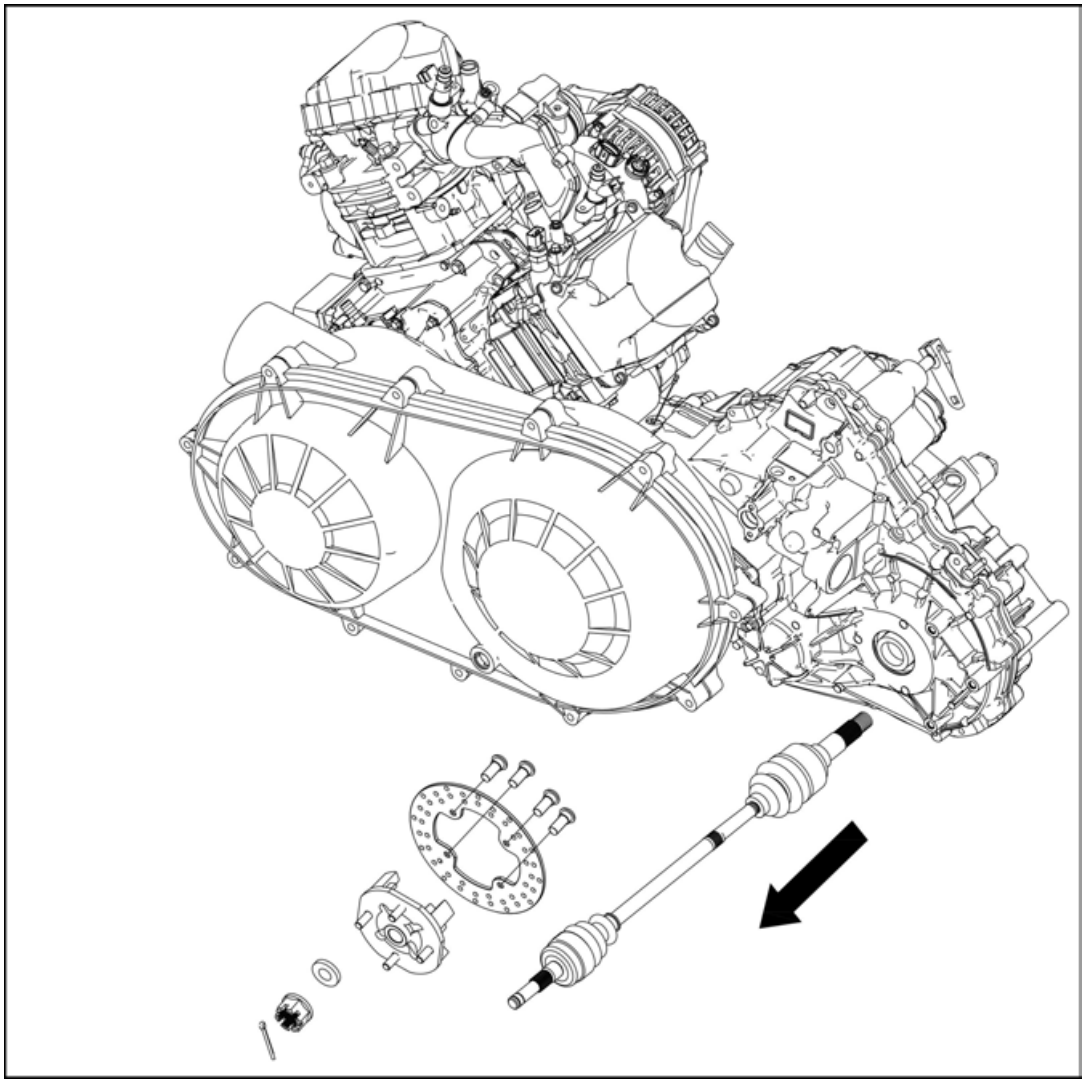
Note: Removal of the front drive does not require removal of any bolts of engine and front upper swing arm.



Re-installation

Conduct installation based on reversed sequence of dismantling.

REAR DRIVE



PROCEDURES

WHEEL HUB

Removing the Wheel Hub

1. Lift and support vehicle. Refer to INTRODUCTION section for proper procedure.

2. Select the 4WD position and place the transmission lever on "P".

3. Remove caliper from knuckle. Refer to BRAKES subsection.

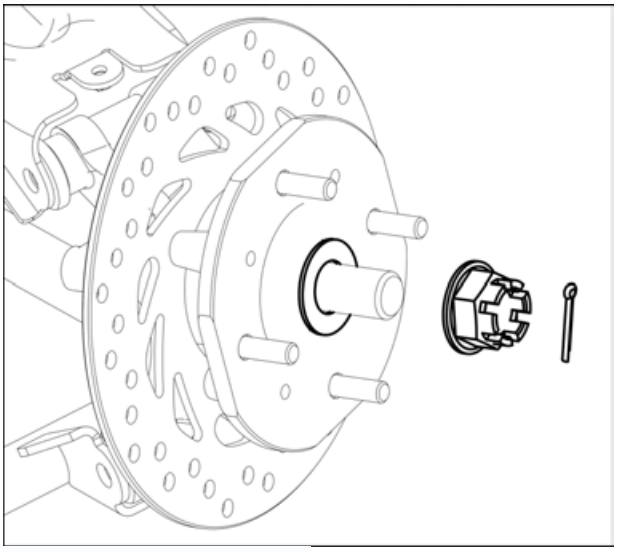
4. Remove the following parts:

– Wheel

– Cotter pin

– Castellated nut

– Belleville washer.



5. Remove wheel hub.

Inspecting the Wheel Hub

Check wheel studs for damaged threads and overall conditions

Check wheel hub for cracks or other damages.

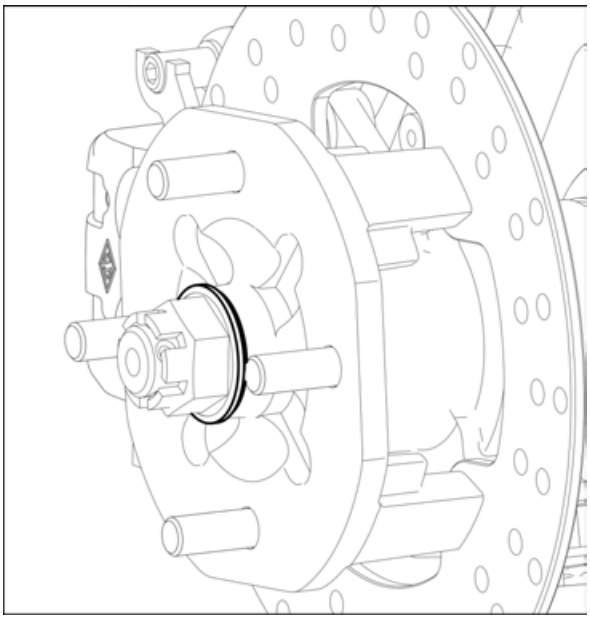
Check inner splines for wear or other damages.

Replace wheel hub and / or studs if any damage is detected.

Installing the Wheel Hub

The installation is the reverse of removal procedure. However, pay attention to the following.

Install Belleville washer with its domed side outwards.



TIGHTENING TORQUE	
Castellated nut	250 N•m ± 15 N•m (184 lbf•ft ± 11 lbf•ft)

NOTE: Tighten further castellated nut if required to align grooves with drive shaft hole.

Install a new cotter pin.

DRIVE SHAFT

Removing the Rear Drive Shaft

1. Remove the wheel hub. Refer to procedure in this subsection.

2. Remove the knuckle. Refer to STEERING SYSTEM subsection.

3. Strongly pull drive shaft out of gearbox.

NOTE: Keep track of the O-ring between the drive shaft and the gearbox.

4. Discard the stop ring at the end of the shaft.

Inspecting the Rear Drive Shaft

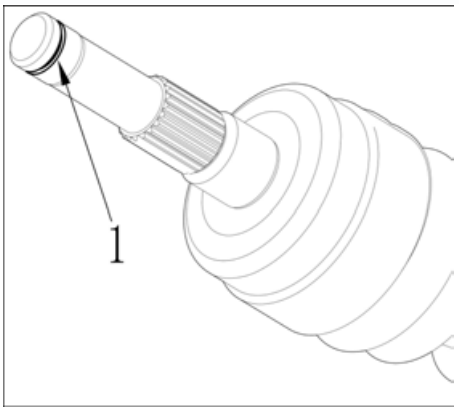
Inspect the condition of boots. If there is any damage or evidence of leaking lubricant, replace them.

Check splines for excessive wear. Replace if necessary.

NOTE: If the splines on plunging joint are worn, a check of differential inner splines should be done.

Installing the Rear Drive Shaft

The installation is the reverse of the removal procedure. However, pay attention to the following. Install a new stop ring.

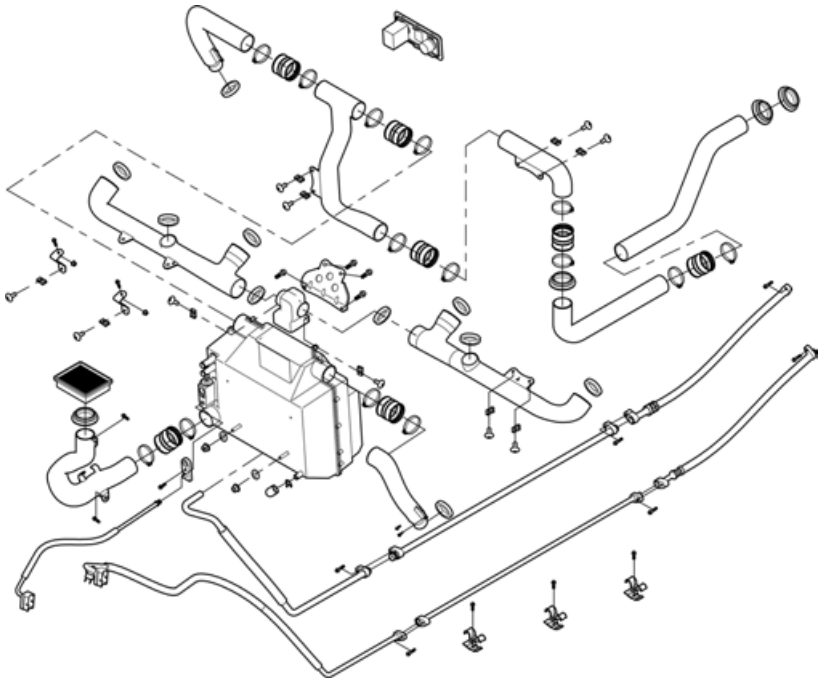


1. Stop ring

Apply XPS SYNTHETIC GREASE to the splines.

5.HVAC SYSTEM

GENERAL INFORMATION - HVAC



HVAC SYSTEM

OVERVIEW AIR CONDITIONING

DESCRIPTION

In an air conditioning system heat is removed from the cab by circulating R-134a refrigerant through a closed system containing five major components. At these five points in the system the refrigerant goes through pressure and temperature changes.

The compressor takes in heated, low pressure refrigerant gas through the suction valve (low pressure side) and pressurizes the heated refrigerant and forces it through the discharge valve (high pressure side) on the condenser. Should the pressure on the high pressure side become too high, the HPCO (High Pressure Cut-Out) switch will cycle the compressor clutch off.

Ambient air passing through the condenser removes the heat from refrigerant resulting in physical state change in the refrigerant from a gas to a liquid.

The liquid refrigerant moves on to the receiver / drier where impurities such as moisture and dirt are filtered out. The receiver / drier also serves as the storage tank for the liquid refrigerant. The liquid refrigerant (still under high pressure) flows to the expansion valve.

Since the refrigerant is colder than the air, it absorbs the heat from the air and produces cooled air, which is pushed into the cab by the blower. The moisture in the air condenses on the evaporator coil and drips into the drain pan, which directs the water out of the cab.

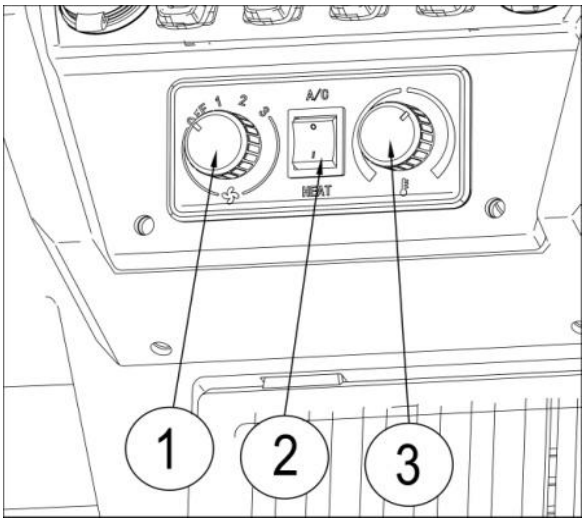
The refrigerant cycle is completed when the heated low pressure gas is again drawn into the compressor. The compressor cycles on and off to maintain the desired cab temperature. The Electronic De-icing Thermostat is a micro controller based module that measures evaporator coil temperature and cycles the compressor clutch to maintain a constant evaporator pressure.

SAFETY EQUIPMENT

In servicing A/C and heater systems you will be exposed to high pressures, temperatures and several chemical hazards. Moving belts and pulleys are normal shop hazards.

R-134a inside a canister or in an A/C system is a liquid under pressure. When it escapes or releases into the air, ITS TEMPERATURE DROPS TO -5.8° C (21.6° F) "INSTANTLY" . If it spills on your skin or in your eyes you should flood the area with cool water and SEEK MEDICAL ATTENTION FAST! It is a good idea to wear gloves to prevent frost bite if you should get refrigerant on your hands.

NOTE: HFC R-134a refrigerant can be dangerous if not properly handled. Liquid R-134a may cause blindness if it contacts the eyes and may cause serious frostbite if it contacts the skin. Gaseous R-134a becomes lethal (phosgene gas) when it contacts open flame or very hot substances. NEVER smoke when there is the possibility of even small amounts of R-134a in the air. Any servicing work that involves release or addition of R-134a to the system must be done by a competent refrigeration dealer who has the proper equipment, knowledge, and experience to service refrigeration equipment.



1.Rotate the fan control switch

2.A/C switch

3.Rotating the temperature control switch

Rotate the fan control

To operate the cab heater, rotate the fan control 1 to the desired fan speed setting. The far left setting turns the fan off.

Rotary temperature control

Adjust the temperature by rotating the temperature control 2 to the desired heat setting. Rotate the control clockwise to increase heat or counterclockwise to decrease heat.

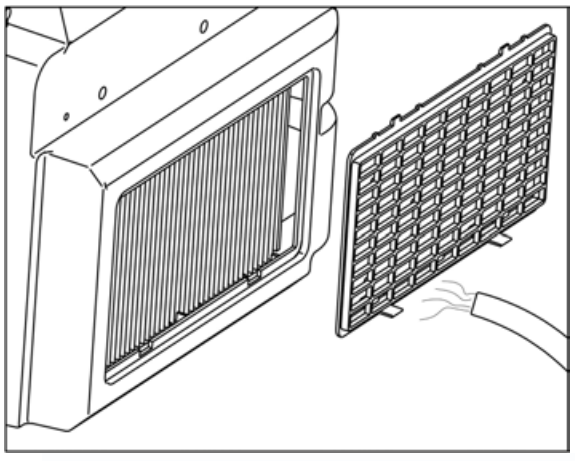
A/C switch

Press the top of the A/C switch 3 to enable the air conditioning system for cooling or defrost purposes.

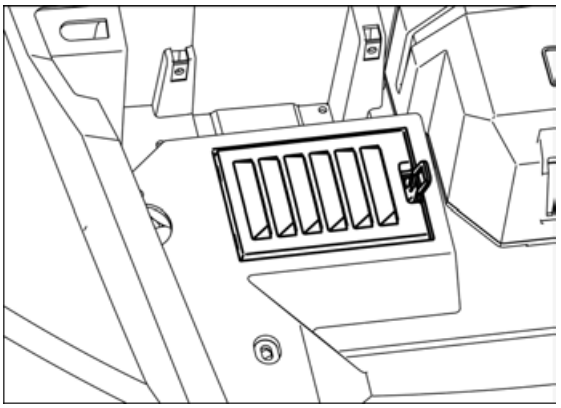
HVAC FILTER INSPECTION / REPLACEMENT

1.If you feel that the wind speed of the air conditioner has significantly decreased or the cooling effect has significantly decreased, please open the maintenance window of the air conditioning system in

the car and perform a deep cleaning of the cooler.



2. Remove the hood and the cabin air filter



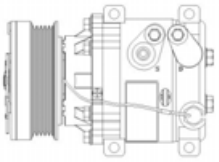
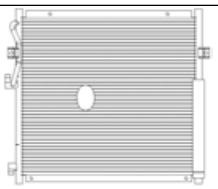
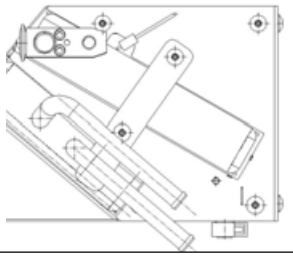
3. Clean the filter with low air pressure. Check for damage, replace if damaged.

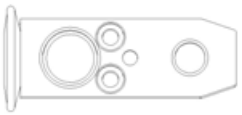
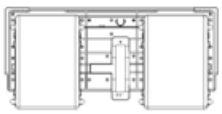
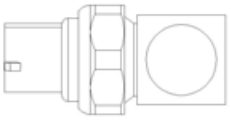
The basic components of HVAC system are:

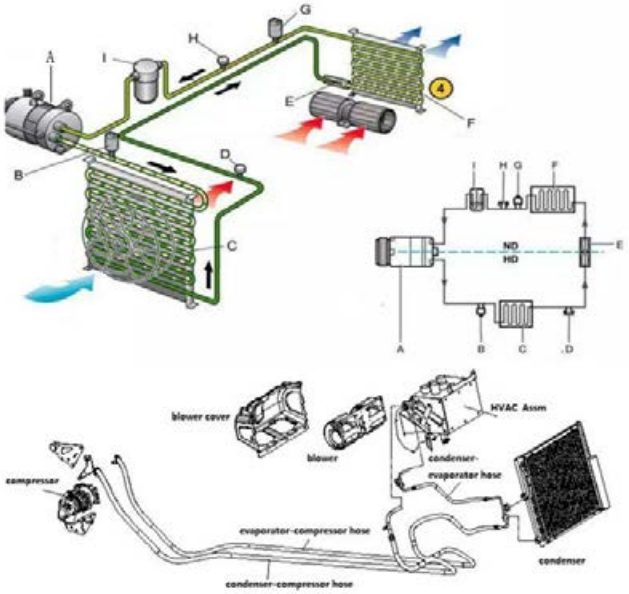
AC system, heating system, air supply system

AC SYSTEM

AC system consists of: **compressor, condenser, evaporator, TXV, blower, pipe, electrical components.**

PARTS	Sketch Map	Function
Compressor		Compress the refrigerant and circulate it in the system
Condenser		The gaseous refrigerant discharged from the compressor is cooled to make it into liquid refrigerant
Evaporator		The refrigerant expands and absorbs heat from the air

TXV		Throttling and depressurizatio n
Blower		Blow the hot air to the evaporator, and blow out the cool air from each air outlet
pressure switch		When the pressure of the AC system is too high or too low, the AC system will stop working, protect the pipe or stop the compressor
A/C Hos e		Refrigerant circulation pipe



The compressor is driven by the engine, and the refrigerant is sucked in from the evaporator and compressed to increase its pressure, and then sent to the condenser through the high-pressure hose.

The condenser is installed in front of the radiator. The refrigerant is cooled by the cooling fan of the engine and the ventilation of the car, and becomes liquid.

After the refrigerant gives off heat, it is filtered and drained by the drying filter.

The liquid refrigerant is pressed to the expansion valve under high pressure. Due to the limited flow function of the expansion valve, the refrigerant flow can be automatically adjusted according to the heat load in the vehicle compartment, so that the liquid refrigerant enters the evaporator after the limit.

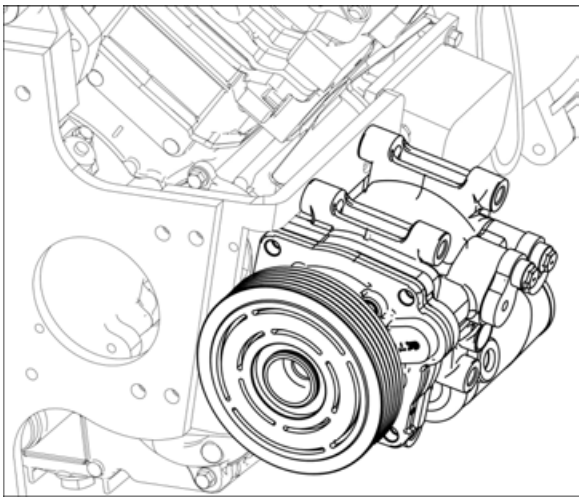
When the refrigerant suddenly enters the evaporator with large capacity, the pressure drops due to the volume increasing, and then changes from liquid state to gas state. At the same time, it absorbs a large amount of heat to cool the air flowing through the evaporator, and then the air is sent into the cabin by the blower to reduce the temperature in the cabin.

The gaseous refrigerant with heat is sucked into the compressor to start the next cycle.

COMPONENTS

Compressor: The compressor is the pump that circulates the refrigerant throughout the system. It raises the pressure of the refrigerant for heat transfer through the condenser and evaporator.

NOTE: when maintaining the compressor, please maintain the installation angle of the compressor and never invert the compressor. Because inversion may cause a large amount of refrigerant oil from the compressor to flow into the air conditioning pipeline, causing the air conditioning to lose its function.



Inspection and adjustment of belt

1. Remove the screw and remove the belt cover.

2. Use professional tooling Adjust the belt tightness.

3. If the belt tightness is not within the range, loosen 4 bolts first.

Then adjust the belt tightness or change the belt.

Belt tightness	TOOL
Belt deflection: 9-12mm(100N)	

4.Reassembly is the reverse of removal.

NOTE:

If the belt needs to be replaced, please follow the specified specifications and models.

Belt size	EL(mm)
5pk670（GATES）	670±5

⚠ WARNING

Turn off the ignition key and shift the gear to P. pay attention to the exhaust pipe to avoid scalding.

Compressor electromagnetic clutch

The function of the electromagnetic clutch is to transmit the power of the engine to the compressor through the pulley. When refrigeration, the electromagnetic clutch coil is electrified to generate magnetic force, and the clutch armature is closed to drive the compressor spindle to run. After cooling, cut off the coil power supply, the magnetic force disappears, the pulley rotates over the bearing, and the compressor stops running.

Parameters of electromagnetic clutch	
Rated voltage	DC12V
Minimum pull-in voltage	DC9V
Breakaway torque	≥23N.M
Rated power	48W（4A）
Maximum speed	10000rpm
Groove type	5PK

REQUIRED TOOL	
UNIT 115 MULTIMETER	

Unplug the connector of electromagnetic clutch and measure the resistance between terminal and ground.

Set the multimeter to 20Ω.

TEST probes	Resistance
Terminal and ground	3±0.5Ω

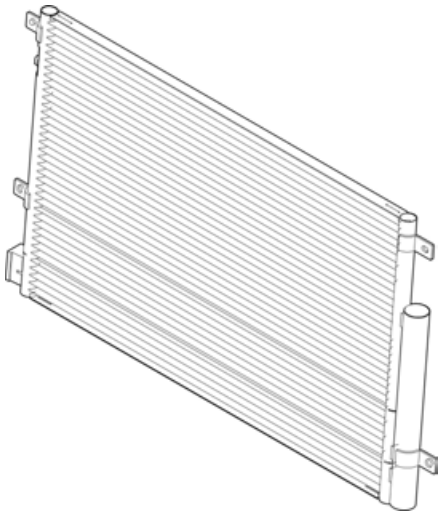
If the resistance is not within the range, the electromagnetic clutch needs to be repaired or replaced.

Condenser

The condenser w is the unit that receives the high pressure, high temperature refrigerant vapor from the compressor and condenses it into a high temperature liquid.

Condenser: The condenser is the unit that

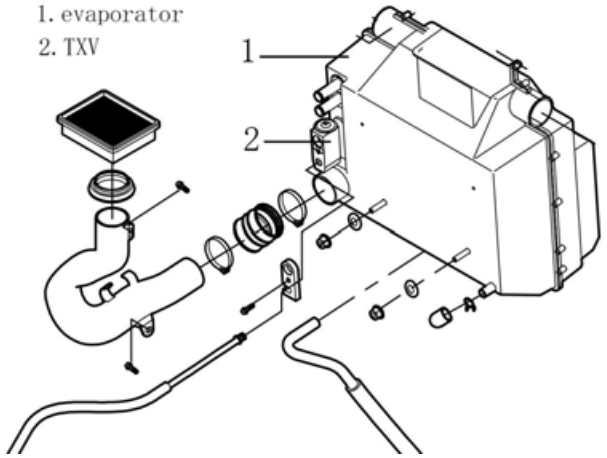
receives the high pressure, high temperature refrigerant vapor from the compressor and condenses it into a high temperature liquid.



NOTE
If you need to remove the pipe,
please refer to the ***refrigerant discharge and filling first.***

Evaporator

The evaporator is also a kind of heat exchanger, but opposite to the condenser, its function is to vaporize the low-temperature and low-pressure refrigerant liquid after throttling, absorb a lot of heat in the air in the car, so as to cool the air in the car.

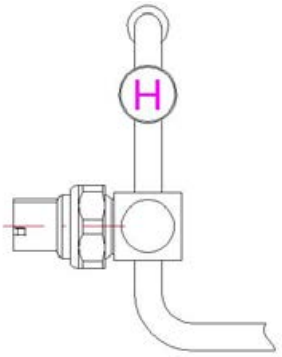


TXV

① The high temperature and high pressure refrigerant liquid is changed into low temperature and low pressure refrigerant liquid by throttling and depressurizing, and then sent to the evaporator for evaporation.
② Adjust the flow of refrigerant according to the change of refrigeration load, so as to keep the temperature in the car stable and the refrigerant working normally.
③ Control refrigerant flow to prevent liquid hammer and abnormal overheating.

NOTE: The TXV and evaporator are an assembly. If the TXV is broken, the whole assembly needs to be replaced.

Pressure switch



PARAMETER	
Refrigeration	HP 3.14MPa OFF
HFC-134a	LP 0.196MPa OFF

The pressure switch which protects the system in normal pressure. is installed on the condenser-evaporator hose.

REQUIRED TOOL	
UNIT 115 MULTIMETER	

Unplug the connector of pressure switch and measure the two terminals.
Set the multimeter to "DIODE"

Whether there is a beep when measuring within the normal pressure range.

A/C Hose

The hose needs to be replaced in case of leakage, wear and aging.

NOTE： replace the pressure switch, the refrigerant should be drained first, Refer to the refrigerant discharge and filling.

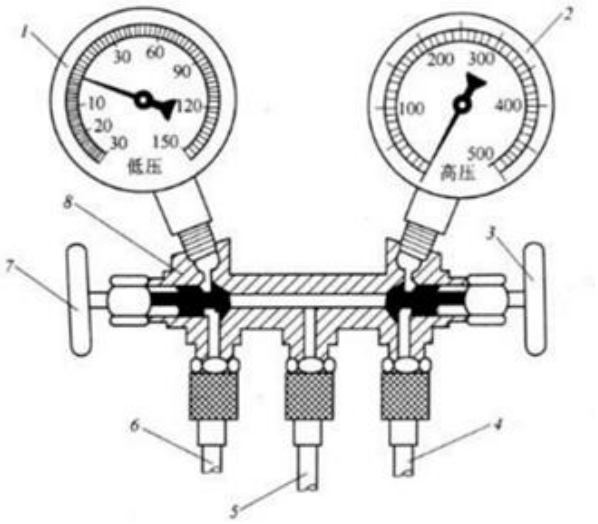
NOTE: When replacing a new hose, pay attention to the integrity of the O-ring and apply an appropriate amount of lubricating oil at the interface. The lubricating oil model is PAG56.

RECLAMATION AND CHARGING WITH RECOVERY / CHARGING UNIT

REQUIRED TOOLS	
Manifold Pressure Gage	AUTO refrigerant changer
	

Refrigerant discharge

When the refrigeration accessories need to be replaced, the refrigerant must be drained first. The following is operated by the manifold pressure gauge.

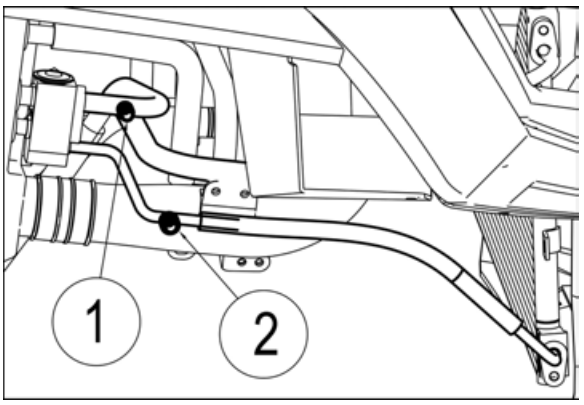


1. Low meter(blue)
2. High meter(red)
3. High pressure manual valve(red)
4. High pressure hose(red)
5. Service hose(yellow or green)
6. Low pressure hose(blue)
7. Low pressure manual valve(blue)

NOTE: Only A/C trained technicians should perform the reclaiming and recharging.

This test is run with the engine OFF, and the A/C switch in the OFF position.

1. Remove the caps on the high pressure port 2 and low pressure port 1.



1. Low port
2. High port

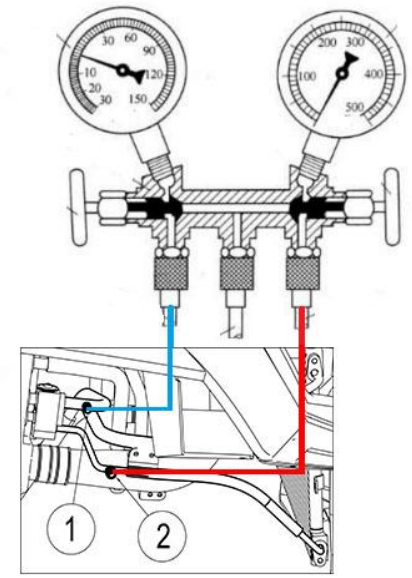
NOTE: Do not use the high pressure port for testing or charging.

⚠ WARNING

In the event of a leak, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes. In contact with a flame, R-134a refrigerant gives off a toxic gas.

2. Use an approved recovery / charging unit to evacuate the system.

3. Close the high and low manual valves of the meter valve first, connect the pipeline, and pay attention to the connection method of high pressure pipe and low pressure pipe.



4. Slowly open the low-pressure manual valve and slowly drain the refrigerant. A small amount of refrigerant flowing out of the refrigerant should be collected by an oil collector.

5. When the pressure of the low-pressure gauge drops to 345kpa, slowly open the high-pressure manual valve, and pay attention not to open too much. If there is more refrigerant oil flowing out at this time, it means that the discharge speed is too fast, and the high and low pressure manual valves should be adjusted down.

6. When the pressure gauge drops to 0, it means that the discharge is finished. At this time, the valve on the gauge valve should be closed.

7. Measure the collected frozen lubricating oil. If the oil quantity exceeds 15g, add the same amount of new frozen lubricating oil.

Note Do not mix different brands of oil.

NOTE: The reclaimer unit, has a complete step by step set of instructions to follow for reclimation and recharging of the A/C system. A trained technician should follow these instructions as they may very slightly depending on the model and brand of reclaimer used.

Leak detection of the system

Connect the hose to the high and low pressure interfaces correctly, connect the maintenance hose to the pressure equipment, open the high and low pressure valves, and fill the system with dry nitrogen (or dry compressed air) with the pressure of about 1.8MPa. Then stop inflation, close the high and low pressure valve valves, and coat the joints of the system with soap water for leakage detection. After holding for 20 minutes, the pressure did not change significantly.

Vacuum system

Connect the hose, connect the maintenance connector to the vacuum pump, open the high and low pressure valves, maintenance hose valve and start the vacuum pump. The vacuum time should not be less than 20 minutes. If the automatic filling machine is used, the vacuum degree should reach

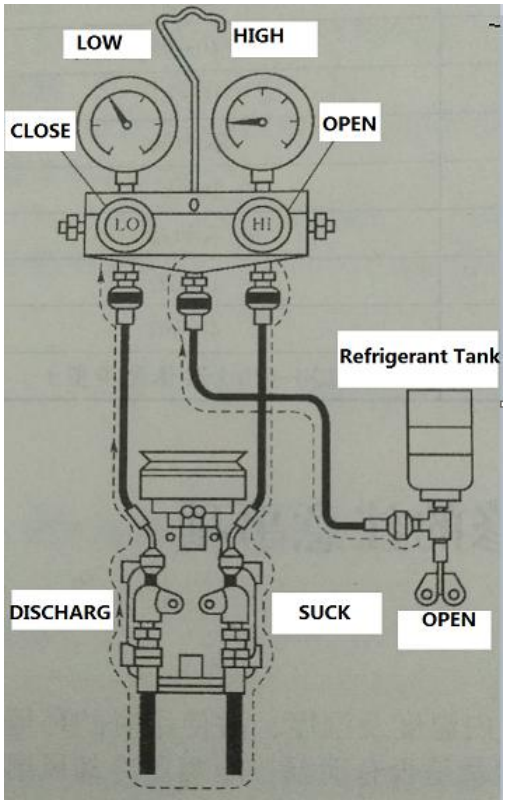
99.1kpa.

Refrigerant filling

After the vacuum is qualified, close the high and low pressure valves at the same time, connect the Yellow pipeline to the bottle opener, and then screw the bottle opener into refrigerant R134a, rotate the bottle opener to pierce the refrigerant bottle, and then rotate the bottle opener to release the refrigerant. (at this time, the red and blue switches of the high and low pressure meters are all closed), the air in the maintenance pipeline can be discharged, and the refrigerant can be seen to be ejected.

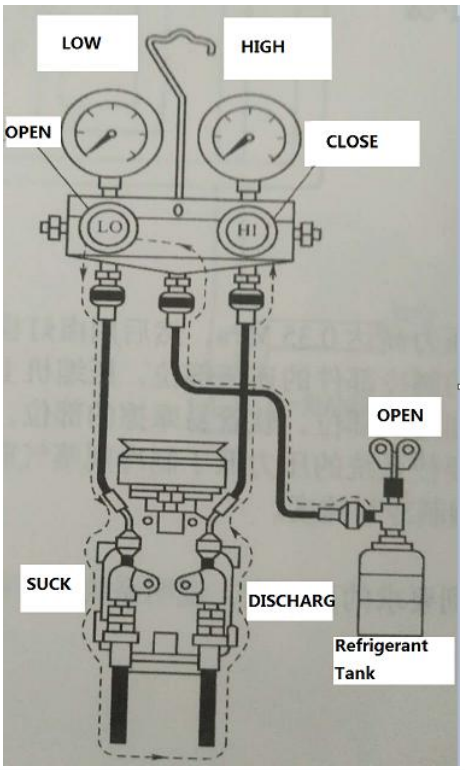
Note: The weight of the refrigerant of single row vehicles and double row vehicles is different. The single row plus is 400g, and the double row plus injection is 450g. Please find professionals for operation when you add a bet.

High port filling



Turn on the high-pressure filling knob (red), and fill with high-pressure. At this time, the refrigerant is added into the system as a liquid (refrigerant bottle is inverted), and a bottle (220g) is added. In this process, it is forbidden to start the air conditioning system. After filling, close the high-pressure filling knob.

Low port filling



Take off the bottle opener slowly to prevent frostbite caused by the rapid ejection of residual refrigerant. Replace the new refrigerant bottle, repeat the above refrigerant opening and exhaust process, turn on the low pressure filling knob (blue), and keep the high pressure (red) closed. At this time, the refrigerant is added into the system in gaseous state. Keep the refrigerant bottle upright, start the air conditioning system, and adjust the blower to the maximum, maintain the idle state.

During the low-pressure filling process, when replacing the refrigerant bottle, turn off the low-pressure knob (blue) first, and repeat the Yellow pipeline exhaust process. Continue filling according to the low-pressure filling method, observe the sight glass on the condenser-evaporator hose, and the filling is completed when there is no obvious bubble.

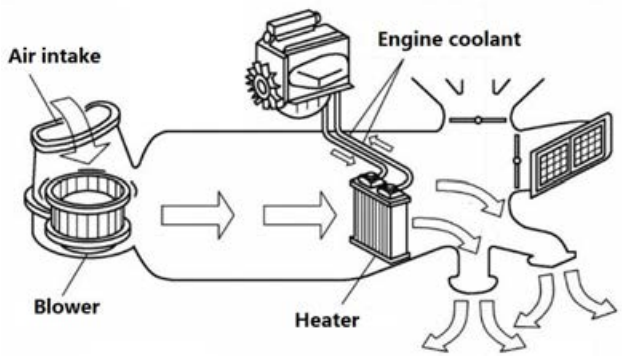
Turn off the engine, turn off the high and low pressure knobs.

Pressure range	
Low meter	High meter
0.15-0.2MPa	**1.45-1.5MPa**

Test conditions: The temperature of the evaporator suction inlet is 30-35 ℃, the engine speed is 2000rpm, the temperature switch is set to the maximum cooling gear, and the blower is at the max.

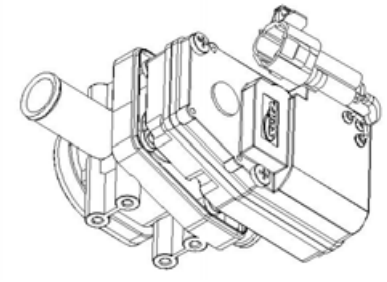
HEATING SYSTEM

PARTS	Function
Electric valve	The heater control valve opens to allow coolant to pass through. When the coolant circulates, it heats up the unit.
Heater core	The coolant flows through the heater core and the blower blows air through the heater core, which heats up the interior of the vehicle.

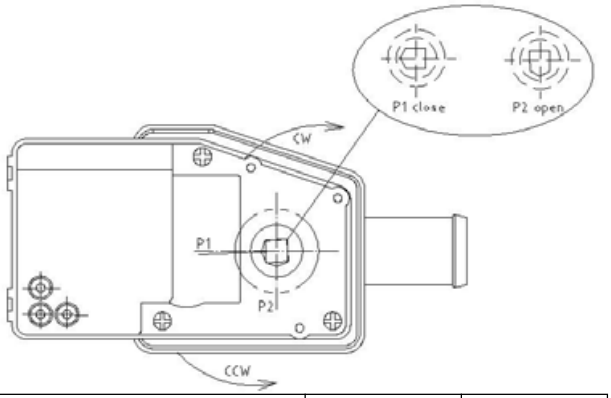


Electric valve

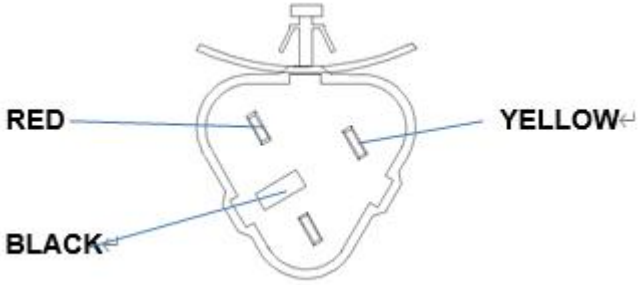
The valve is installed in the coolant passage of the engine to control whether the engine coolant enters the heater.



The electric valve is fixed on the water valve fixing plate with four self tapping screws.



Wire color			Direction	Position
red	black	yellow		
12V+	12V-	12V+	CCW	P2
12V+	12V-		CW	P1



Testing the Heater Control Valve

1. Remove the heater control valve actuator.

2. Follow the menu make heater control valve to full open and full closed positions.

If the heater control valve does not:

– Fully open;

– Fully close;

replace the heater control valve assembly.

Removing the Heater Valve Assembly

1. Disconnect valve connector.
2. Remove four self tapping screws.

3.Remove the hoses

4.Remove the heater valve.

Installing the Heater Control Valve Assembly

The installation is the reverse of the removal procedure.

NOTE Fill the cooling system with the recommended coolant. Check for coolant leaks from radiator and hoses.

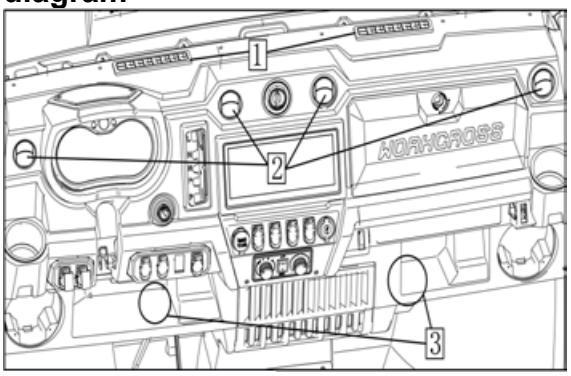
Heater core

The heater is a kind of heat exchanger. When the high-temperature coolant flows through the heater, it exchanges heat with the cold air in the car, never achieving the purpose of heating in the car and defrosting the windows.

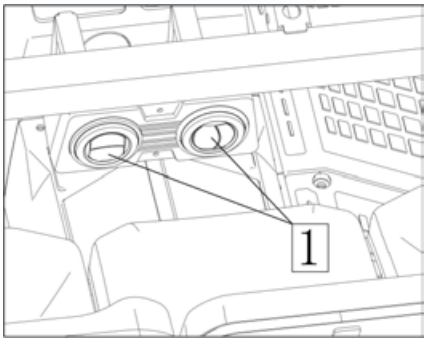
AIR SUPPLY SYSTEM

The air in the car is forced into the HVAC assembly by the blower, and then sent to the cabin after passing through the filter screen and ventilation pipe to realize the heating or cooling in the cabin.

Air outlet distribution diagram



1. Defrosting outlet
2. Blow the face outlet
3. Blow the foot outlet



1. Rear air outlet

NOTE If you need to turn on the warm air when you park for a long time and find that there is no hot air through the outlet, please increase the idle speed while ensuring the normal operation of the blower, there will be a steady stream of hot air for you.

Removing the Outlet Louver

The air outlet is inlaid on the air outlet elbow and can be removed by gently prying with a flat head screwdriver.

Testing the Blower Motor

Turn the vehicle key switch to ON. Turn the blower speed switch to low, medium1,medium2,then high.

BLOWER TROUBLESHOOTING CHART		
Is blower working?	YES →	Everything is OK
NO↓		
Check ACPOWER connector	NO →	Refer to wiring diagram
YES↓		
Check blower fuse (15A). Is fuse burnt?	YES →	Replace fuse Is blower working?
NO↓		
Bypass blower speed switch		
↓		
Blower turns?	YES →	Replace blower speed switch Is blower working?
	NO →	Replace blower and motor assembly Is blower working?
NO↓		
Check wiring harness, connectors, and ground		
↓		
Harness and connectors good?	NO →	Repair or replace defective part(s)

Blower Motor resistor

The blower motor resistor provides electrical resistance in series to the blower motor. The fan speed control switch sends current to one blower resistor pin based on selected fan speed.

Adding resistance to the circuit slows the blower motor. Removing resistance from the circuit speeds the blower motor.

Testing the Blower Motor Resistor

The blower motor resistor cannot be tested independently from the blower motor.

1.Turn the fan on to low, medium1, medium2,then high.

2.Read the voltage at the blower assembly connector for each speed.

If battery voltage is available at each pin of the blower assembly connector and the blower motor does not come on. Ensure there is a good ground. If all electrical tests are OK. Replace the blower assembly.

Blower speed switch

The blower speed switch sends current to one pin of the blower motor resistor depending on selected speed. The blower speed switch also supply power to AC switch, so AC switch can control AC system.

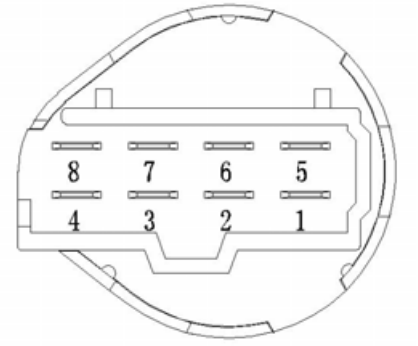
Testing the Blower Speed Switch

1. Disconnect blower speed switch.
2. Ensure battery voltage is available at pin 1 and 5 (switch side).
3. Disconnect blower speed switch.
4. Test resistance as per following table.

REQUIRED TOOL	
UNIT 115 MULTIMETER	

Set the multimeter to “200Ω”

SPEED	PINS	SPECIFICATION
Off	1 and 8	O.L
	5 and any pin	O.L
Any speed	1 and 8	0Ω
Low	5 and 3	0Ω
Medium1	5 and 6	0Ω
Medium2	5 and 2	0Ω
High	5 and 7	0Ω



Replace blower speed switch if test is not as per specifications.

6.ELECTRICAL SYSTEM

Overhauling information

Warning

‹ Bulb will be very hot after turning on headlamp. Please do not touch it immediately after its off. In operation, bulb needs to be cooled.

‹In warning inspection of water temperature, fire or high temperature liquid may be needed. Keep it far away from in flammables and do not to be burnt.

‹ The temperature will be very high in turning of headlamp. For replacement, grease dirt will be splashed to glass in case of operation with bare hands or wearing dirty gloves. As a result, hot spots and glass deformation may be caused with damage to bulb as well.

‹ Pay attention to the following in replacing bulb:

-- Do not replace bulb when it is on. Turn off ignition switch and replace it after cooling bulb.

-- In order to avoid splashing grease to glass, wear clean gloves in replacing bulb.

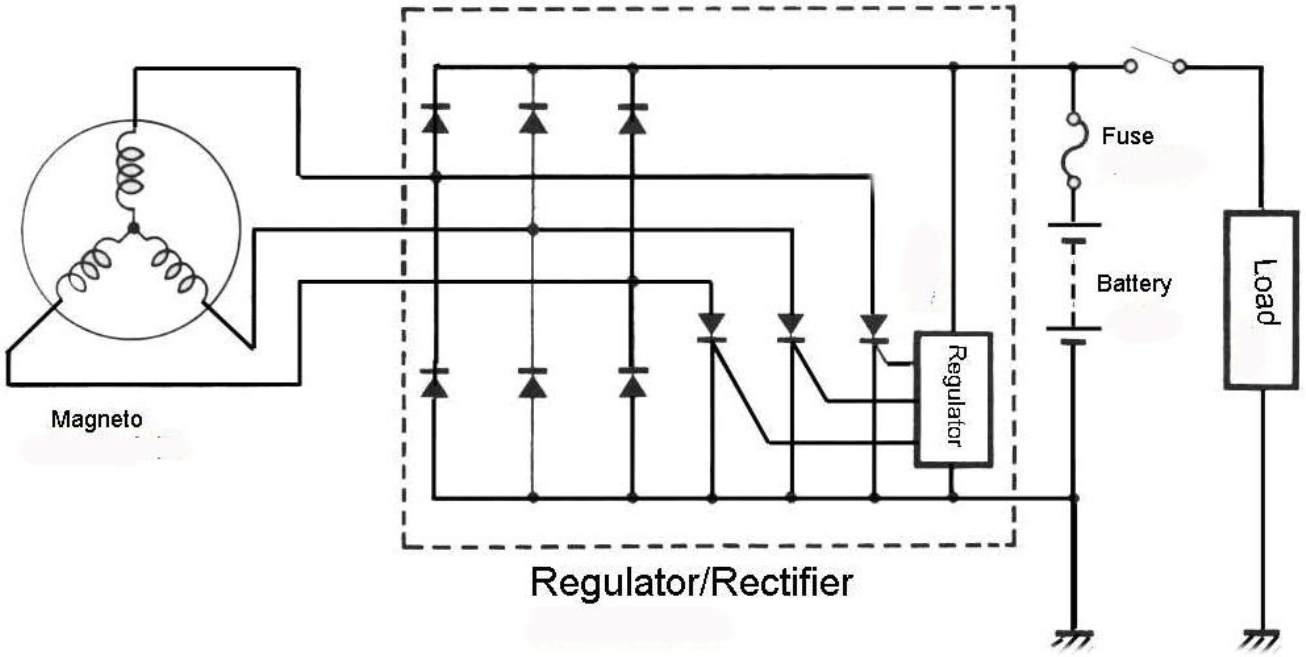
-- Use cloth with alcohol or banana water to clean glass to prevent any grease sticking to glass.

‹ Check battery to confirm whether it is normal.

‹ Regularly check switch and do not dismantle it from vehicle in inspection.

Electrical

Charging system



GENERAL

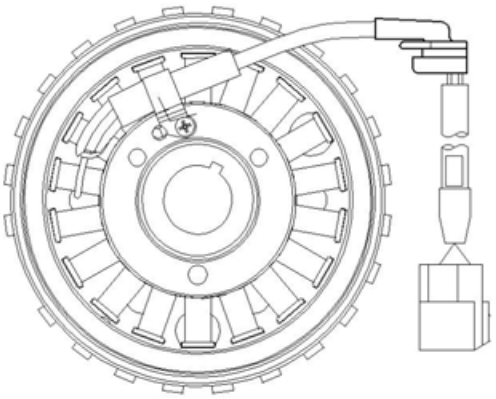
SYSTEM DESCRIPTION

The purpose of the charging system is to keep the battery at a full state of charge and to provide the electrical system with the required electrical power for normal vehicle operation.

Magneto

The magneto is the primary source of electrical energy. It transforms magnetic field into electric current (AC).

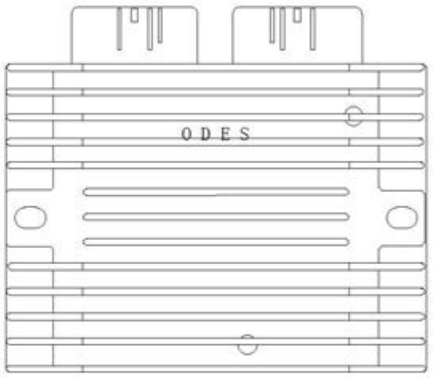
The magneto has a 3 phase series stator.



Voltage Regulator/Rectifier

The rectifier receives AC current from the magneto and transforms it into direct current (DC).

The voltage regulator, included in the same unit, limits voltage to prevent any damage to electrical components.



Battery

The battery supplies DC power to the electric starter for cranking the engine. During engine starting, it also supplies DC power to the entire electrical system.

At low engine RPM operation and high current load conditions, it supplements the magneto output and helps to maintain a steady system voltage.

INSPECTION

CHARGING SYSTEM OUTPUT

First ensure that battery is in good condition prior

to performing the following tests.

Testing the Output Voltage Using multimeter.

1. Start engine with the less consumption as possible (no lights, no accessories).

2. Increase engine RPM as specified in the following table and read voltage in the multimeter.

OUTPUT VOLTAGE TEST	
ENGINE SPEED	VOLTAGE (DC)
4000 RPM	14.5 ± 0.5V

If voltage is above specification, replace voltage regulator/rectifier.

If voltage is below specification, check stator output and wiring harness prior to concluding that voltage regulator/rectifier is defective.

Check stator

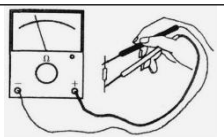
Stator Connector Access

The stator is directly connected to the voltage regulator/rectifier.

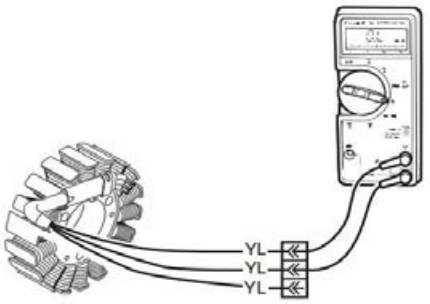
Testing the Stator Continuity

1. Disconnect the stator connector from the voltage regulator/rectifier.

2. Check resistance between YELLOW wires.

REQUIRED TOOL	
UNIT 115 MULTIMETER	

TERMINAL	RESISTANCE @ 20°C (68°F)
1 and 2	0.15 - 0.30 Ω
1 and 3	
2 and 3	



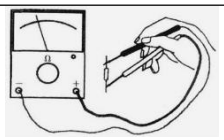
3. If any reading is out of specification, replace stator.

4. Re-plug connectors properly.

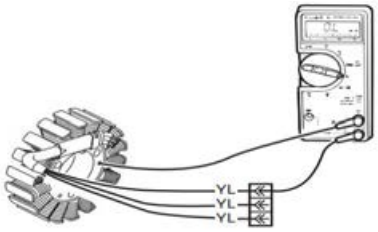
Testing the Stator Static Insulation

1. Disconnect the stator connector from the voltage regulator/rectifier.

2. Connect multimeter between any YELLOW wire (on stator connector) and engine ground.

REQUIRED TOOL	
UNIT 115 MULTIMETER	

TEST PROBES	RESISTANCE @ 20°C (68°F)
Any YELLOW wire and engine ground	Infinite (open circuit)



3. If there is a resistance or continuity, the stator coils and/or the wiring is shorted to ground and needs to be repaired or replaced.

4. Re-plug connectors properly.

Check battery

1. Connect a battery load tester.
2. Ensure proper test conditions.

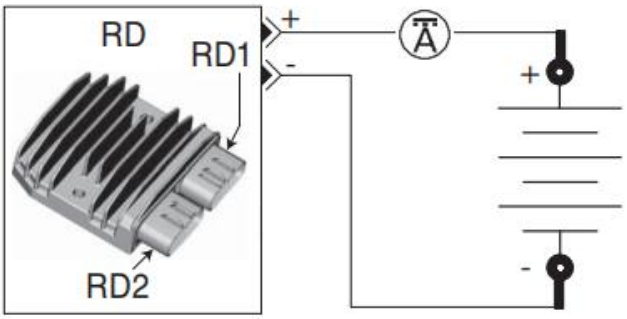
TEST CONDITIONS	
Initial battery voltage‡	Above 12.5 Vdc
Engine	OFF
Load	3 times the amp-hour (AH) rating
Time	15 seconds
‡ Required for accurate testing	

SPECIFICATION	
Battery	Above 9.6 Vdc

If battery voltage drops below specification during test, replace battery and perform a

CHARGING SYSTEM LOAD TEST

1. Connect a battery load tester.
2. Start vehicle and read voltage on tester.



SPECIFICATION	
Voltage	12.5 - 15 Vdc

If voltage is above specification, replace regulator and continue CHARGING SYSTEM LOAD TEST.

3. Connect an ammeter around RD1-1 wire.
4. Ensure proper test conditions.
5. Read amperage on ammeter.

45±5A mps

DC CURRENT TEST WITH INDUCTIVE AMMETER

a. Output connector of voltage regulator
b. Ammeter clamped over RED wire

TEST CONDITIONS	
Battery voltage at idle‡	Above 12.6 Vdc
Engine	Increase to 4000 RPM
Load	As required to decrease battery voltage to 12 Vdc
Time	15 seconds
‡ Required for accurate testing	

NOTE: With a fully charged battery and noelectrical loads, specification is less than 10A.

If amperage or voltage is not within specification, verify magneto and wires.

Replace:

– Voltage regulator if magneto test is within specifications.

– Magneto if magneto test is not within specifications.

VOLTAGE REGULATOR (RD)

Testing the Voltage Regulator Continuity

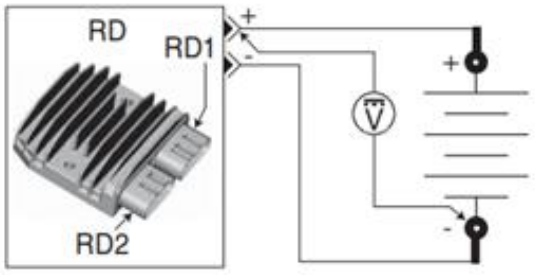
Due to internal circuitry, there is no static test available

Voltage Regulator Wire Identification

FUNCTION	PIN	COLOR
12Vdc output	RD1-1	RD
12Vdc ground	RD1-3	BK
12Vac input	RD2-1	BK
12Vac input	RD2-2	BK
12Vac input	RD2-3	BK

Testing the Voltage Regulator Power

1. Check voltage at RD1-1.



TEST CONDITIONS	
RD1-1	Hot at all times

BACKPROBE	PROBE	SPECIFICATION
RD1-1	BAT2 (-)	Battery voltage

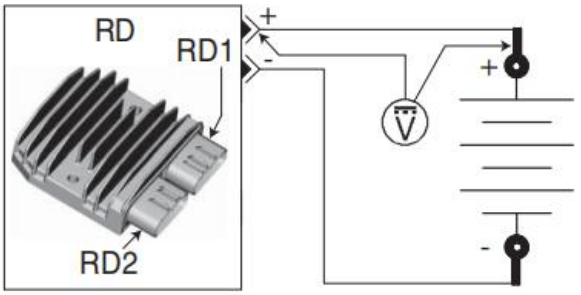
2. Connect a battery load tester.

3. Start vehicle.

4. Ensure proper test conditions

TEST CONDITIONS	
Battery voltage at idle‡	Above 12.6 Vdc
Engine	Increase to 4000 RPM
Load	As required to decrease battery voltage to 12 Vdc
Time	15 seconds
‡ Required for accurate testing	

5.Measure voltage drop.

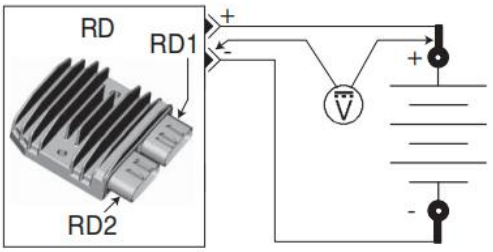


BACKPROBE	PROBE	SPECIFICATION
RD1-1	BAT1 (+)	Under 0.2 Vdc

If voltage drop is above specification, locate and repair damaged connector/wire.

Testing the Voltage Regulator Ground

1. Check ground at RD1-3.



TEST CONDITIONS	
RD1-3	Permanent ground

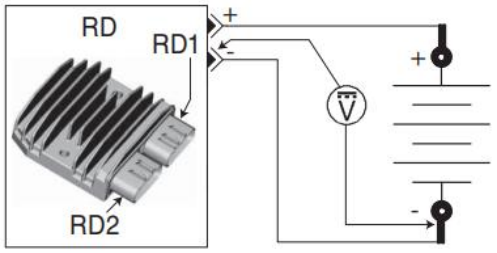
BACKPROBE	PROBE	SPECIFICATION
RD1-3	BAT1 (+)	Battery voltage

2. Start vehicle.

3. Ensure proper test conditions.

TEST CONDITIONS	
Battery voltage at idle‡	Above 12.6 Vdc
Engine	Increase to 4000 RPM
Load	As required to decrease battery voltage to 12 Vdc
Time	15 seconds
‡ Required for accurate testing	

4.Measure voltage drop.



BACKPROBE	PROBE	SPECIFICATION
RD1-3	BAT2 (-)	Under 0.4 Vdc

If voltage drop is above specification, locate and repair damaged connector/wire.

BATTERY

Refer to battery manufacturer's instructions for proper filling, activation and routine charging procedures.

Battery Access

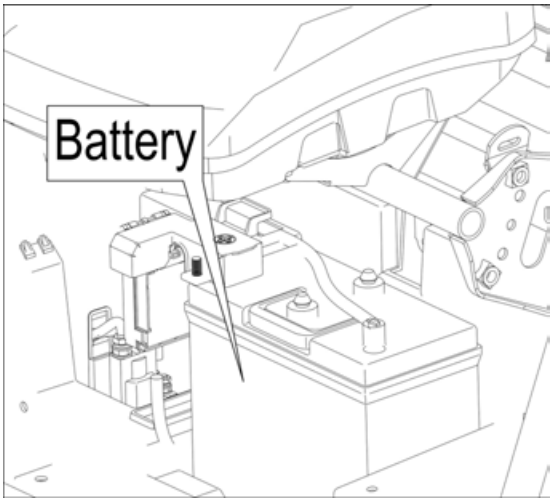
The battery is located underneath the driver's seat.

Removing the Battery

1. Remove under seat storage compartment if equipped.
2. Remove battery cover
3. Disconnect BLACK (-) cable first, then the RED (+) cable.

NOTICE: Always respect this order for removal; disconnect BLACK (-) cable first.

4.Remove battery.



Cleaning the Battery

Clean the battery rack, cables and battery posts using a solution of baking soda and water.

Remove corrosion (if so) from battery cable terminals and battery posts using a firm wire brush.

Rinse with clear water and dry well.

Inspecting the Battery

Visually inspect battery casing for cracks or any other damages. If casing is damaged, replace battery and thoroughly clean battery support with a water and baking soda solution.

Inspect condition of battery posts, battery support, holding strap and strap attachment points and wire terminal lugs.

Battery Storage

It is not necessary to remove the battery during vehicle storage but it is recommended for long term storage.

If the battery is left in the vehicle during storage or used infrequently, disconnect the BLACK (-) negative battery cable to eliminate battery current drain from the electrical equipment.

Recharge the battery once a month with an approved battery charger as per manufacturer's recommendations.

Clean battery, battery support and connections as required.

For other recommendations during storage, refer to battery manufacturers instructions.

⚠ WARNING

Ensure battery is stored in a safe place, out of reach for children.

Activating a New Battery

Refer to the instructions provided with the battery.

Charging a Battery

⚠ WARNING

Always wear safety glasses and charge in a well ventilated area. Never charge or boost a battery while it is installed on vehicle. Do not open the sealed cap during charging. Do not place battery near open flame.

NOTICE: If battery becomes hot, stop charging and allow it to cool before continuing.

NOTE: If battery pressure increases due to overcharging, the valve opens to release excess pressure, preventing battery damage.

An automatic charger is a fast and convenient way for error-proof charging.

Always follow the battery manufacturer's charging instructions.

When using a constant current charger, charge battery according to the chart below.

Battery Voltage Below 12.8 V and Above 11.5V

STANDARD CHARGING (RECOMMENDED)	
APPROXIMATE TIME	CHARGE
4 - 9 HOURS	2 A

QUICK CHARGING	
APPROXIMATE TIME	CHARGE
50 MINUTES	10 A

Installing the Battery

NOTICE: Always connect RED (+) cable first then BLACK (-) cable.

STARTING SYSTEM

GENERAL

SYSTEM DESCRIPTION

The starting system is composed of an electric starter supplied in current by the battery through a solenoid.

The starter solenoid receives a 12 volt input from the ignition switch and the ground signal is provided by the Gear controller.

– Transmission in Park or Neutral position and/or brake pedal held.

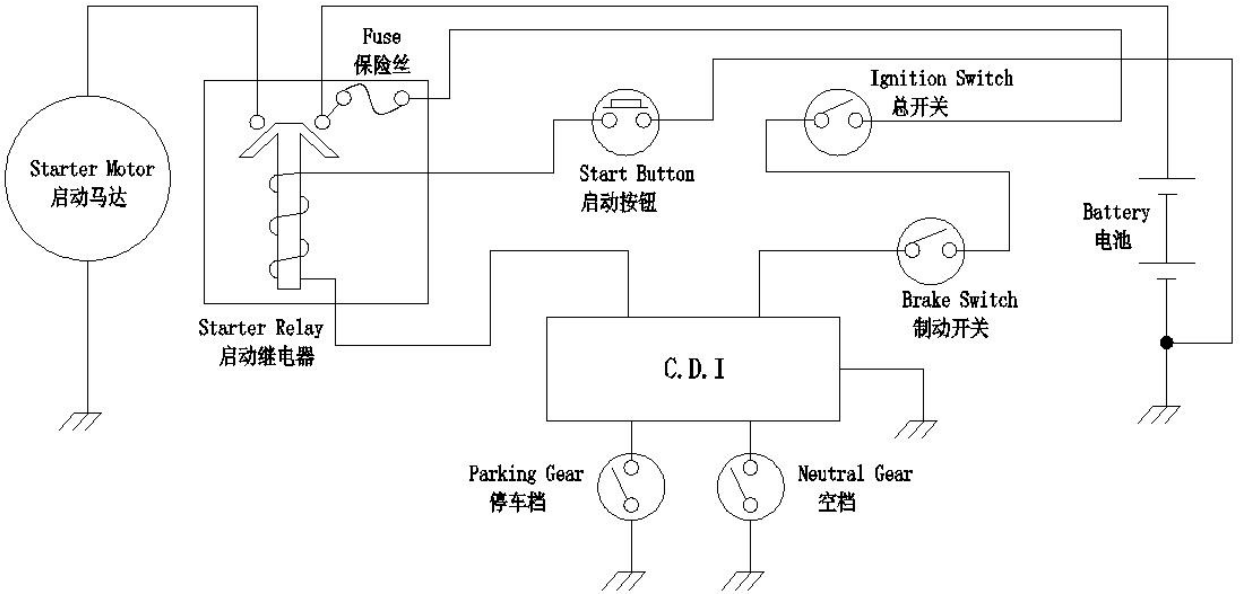
– Ignition switch turns to the start position and hold until the engine starts.

PROCEDURES

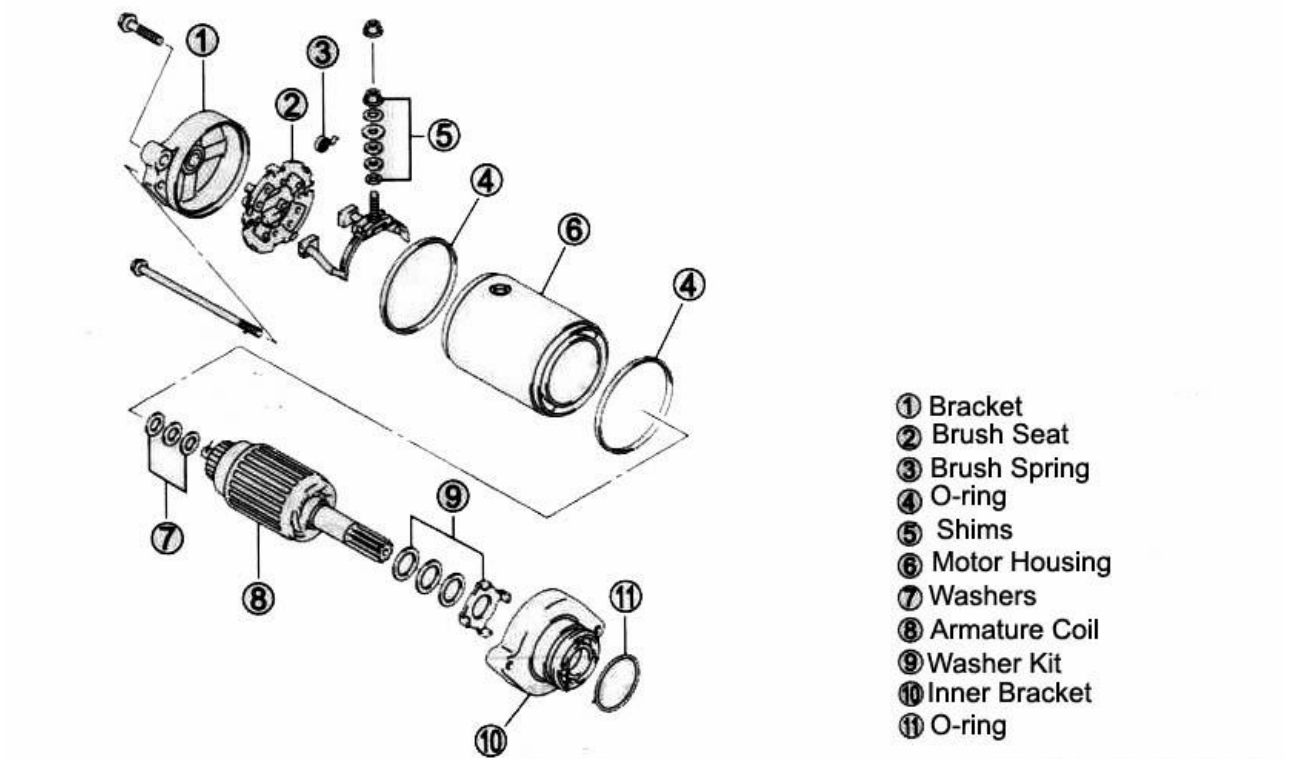
STARTER SOLENOID

Starter Solenoid Access

The starter solenoid is located beside the fuse box and the battery , underneath driver's seat.



Starter motor



Brush

Z Check the brush on the brush holder whether it is worn abnormal, cracked or not smooth. Worn, cracked, or not smooth: → Replace

Rectifier

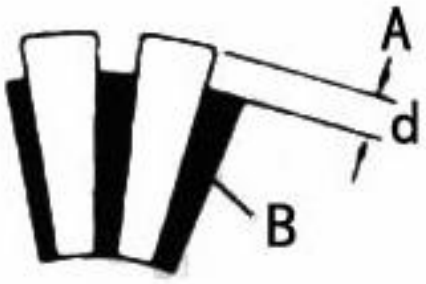
Z Check the rectifier whether it is discolored, abnormal wear or concave.

Abnormal wear or damage: → Replace

Z If the rectifier is discolored, grind it with sanding paper, then wipe it with a clean fabric.

Z If there is concave, scrape off insulator B, so that the distance with A is d.

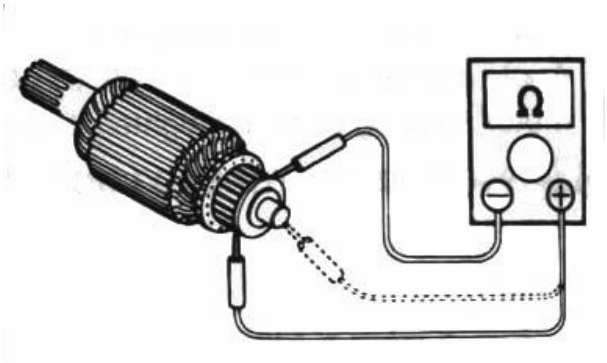
d≥1.5mm



Armature coil

Z Test the connection between each wire and the armature coil with the multimeter.

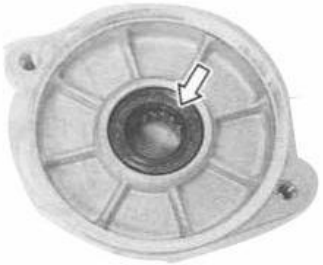
Z If they are not connected, replace the armature shaft.



Oil seal

Z Check the oil seal lip for damage or leak.

Damage or leakage: →Replace the starter motor.

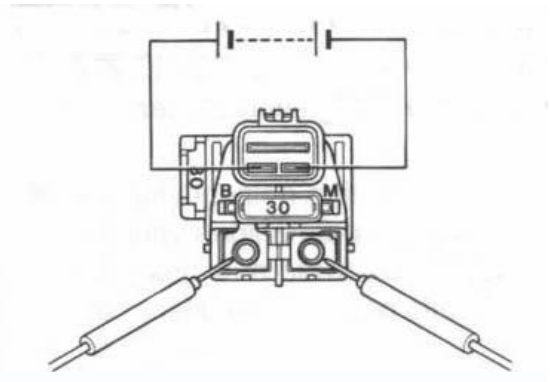


Starter relay

Z Inter-terminal voltage is 12V. Test the direct connection of positive and negative poles with the multimeter.

Z If the starter relay clicks and connected, the starter relay is OK.

Z When there is no voltage of 12V, they are not connected, the starter relay is OK.



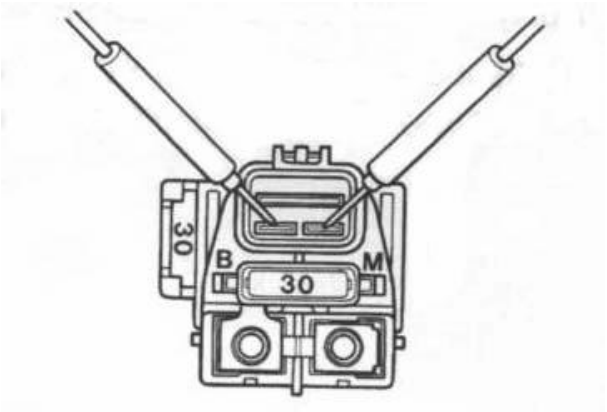
Note: Do not apply battery voltage on the starter relay for more than 2 seconds. This

will result in overheating or damaging the relay coil.

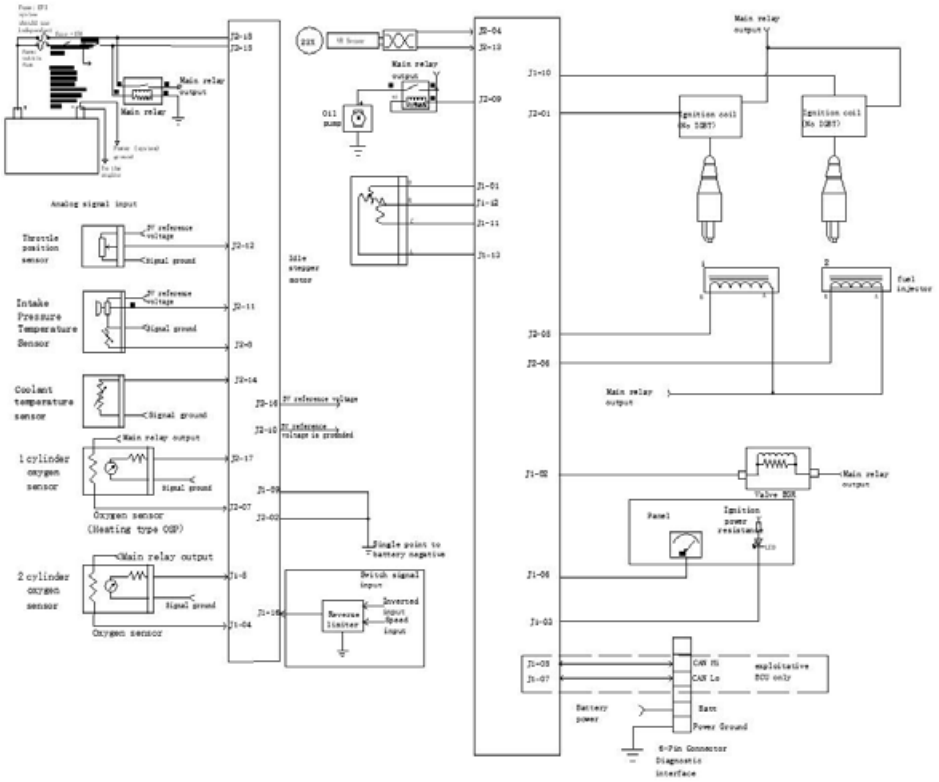
Z Measure the coil resistance with the multimeter. If the resistance exceeds the specified value, replace the starter relay.

The multimeter is set to 1x10Ω.

Starter relay coil resistance: 3-5Ω



EFI System



Function

Connector	description
J1-01	Idle stepper motor A high
J1-02	Valve BOX
J1-03	Fault light
J1-04	2 cylinder oxygen sensor heating
J1-05	2 cylinder oxygen sensor signal
J1-06	Tachometer
J1-07	CAN line signal low
J1-08	CAN line signal high
J1-09	Power (system) ground
J1-10	Ignition coil drive B (2 cylinder)
J1-11	Idle stepper motor A low
J1-12	Idle stepper motor B high
J1-13	Idle stepper motor B low
J1-14	Dumping sensor (low effective)
J1-15	2 VSS wheel speed signal
J1-16	Reverse speed limit
J1-17	
J1-18	Dumping sensor (low effective)
J2-01	Ignition coil drive A (1 cylinder)
J2-02	Power (system) ground
J2-03	
J2-04	23 tooth signal high
J2-05	Nozzle A
J2-06	Nozzle B
J2-07	1 cylinder oxygen sensor heating
J2-08	Inlet temperature signal
J2-09	Oil mass control signal
J2-10	5V reference voltage ground
J2-11	Inlet pressure signal
J2-12	Throttle position signal
J2-13	23 tooth signal low
J2-14	Coolant temperature signal
J2-15	Ignition power
J2-16	5V reference voltage
J2-17	1 cylinder oxygen sensor signal
J2-18	Battery power

Tyco	
J1 (Grey)	J2(Black)
1488533-6	1488533-5

schematic diagram of EFI system

The function of EFI system includes two parts: fuel injection management and ignition management, which are realized by the following institutions.

(1). ECU: it is responsible for the receiving of sensor signal, the formulation of control strategy, and the issue of control signal.

(2). Oil supply device: it is composed of oil pump, tubing and injector. The pump pressurizes the fuel to 250 KPA. The injector is installed on the engine inlet to control the injection timing and fuel injection amount.

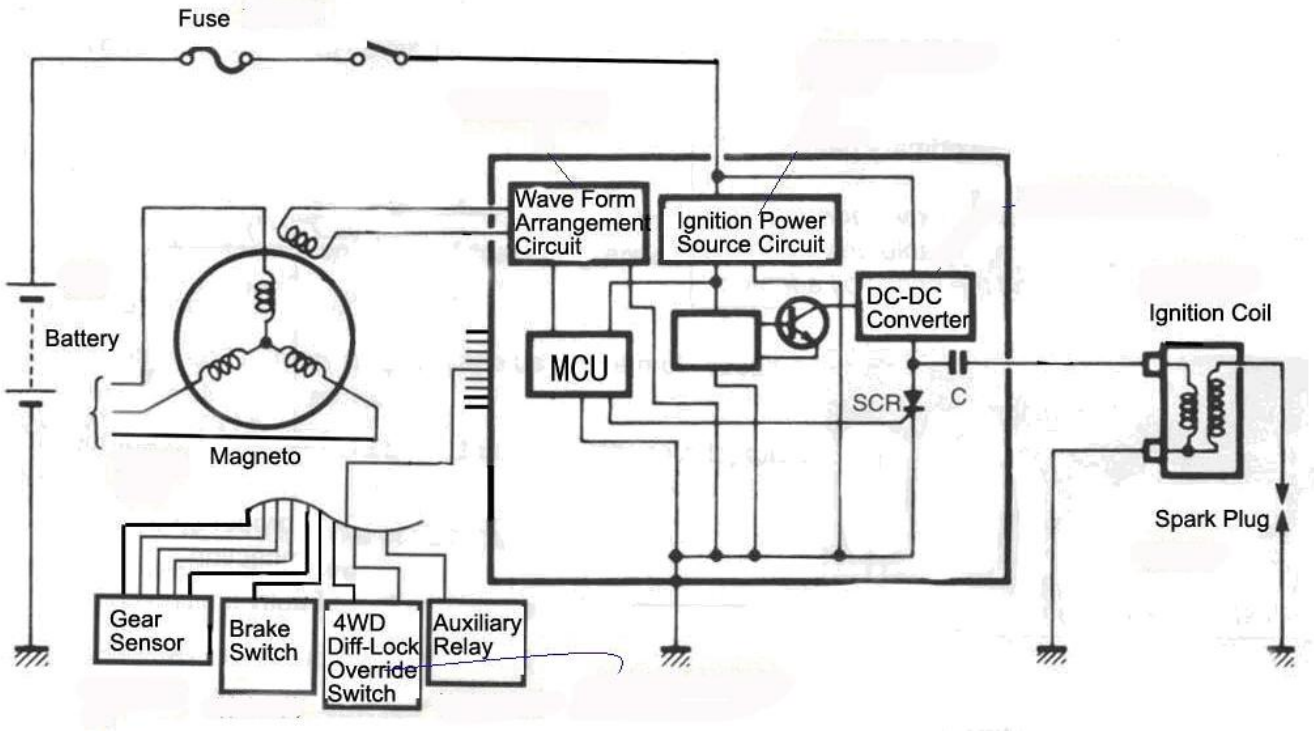
(3). Ignition device: it is composed of ignition module, high voltage wire and spark plug. The ignition module has a DC capacitor igniter and a high voltage ignition coil, which can raise the voltage of the battery from 12V to more than 15000V, which also can be transported to the spark plug by high-voltage wire to generate spark discharge.

(4). Sensors: including: a. The oxygen sensor, which mounted on an exhaust pipe to detect oxygen concentration in exhaust gases, can realize the closed-loop regulation of the mixture concentration, and when the closed-loop adjustment, the output of 0 ~ 0.9V alternating signal can be achieved; b. cylinder temperature sensor, which is installed on the engine cylinder head to detect the engine body temperature, will affect the starting thickening amount; c. Crankshaft position sensor, which is integrated on magneto to provide crankshaft angle signal, is the time reference for fuel injection and ignition control; d. The throttle position sensor is mounted on the throttle body to measure the rotation

angle of the throttle valve.

(5). Other: including： a. throttle body, which controls air intake through throttle pull wire; b. Fault alarm lamp, which is installed on the dashboard for fault alarm; c. Battery, door lock, fuse for power supply to EFI system.

Ignition system



Ignition coil

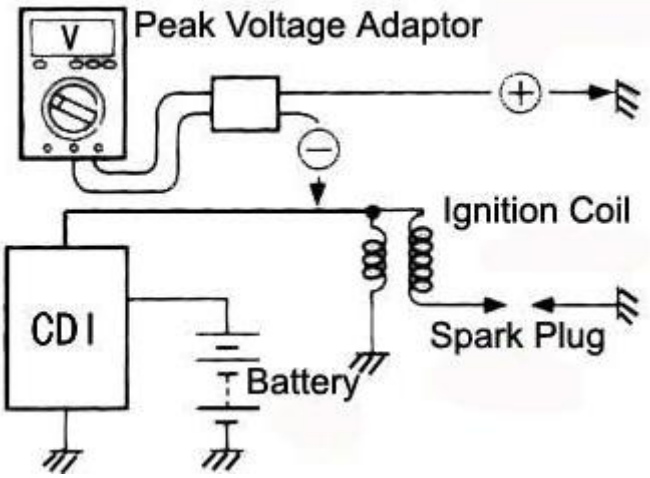
Primary peak voltage of ignition coil

Z Remove the spark plug cap as shown in the right figure. Install the new spark plug to the cap. The cylinder is connected to grounding.

Z Connect the multimeter and the peak voltage adapter as follows:

+Probe: BK wire or grounding wire

-Probe: Br / yellow wire



NOTE:

Z Make sure the battery voltage ≥ 12V. The ignition coil wires are connected.

Z When using multimeter and the peak voltage adapter, please refer to the user manual.

Z Move the gear to the neutral position, turn on the ignition device.

Z Press the start button and crank the engine for a few seconds. Then measure the primary peak voltage of the ignition coil;

Z Repeat the steps above for several times. Measure the maximal value of the primary peak voltage.

Set the multimeter at the AC voltage position.

Primary peak voltage of ignition coil: ≥150V

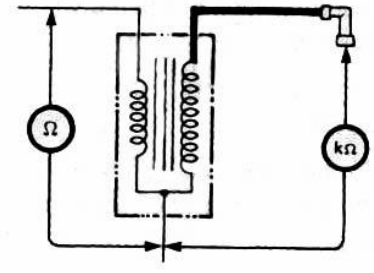
Note: Do not touch the test probes or spark plug, in case of electric shock.

Z If the voltage is lower than the standard value, check the ignition coil and coupling coil.

Resistance of ignition coil

Z Disconnect the ignition coil wires and spark plug cap. Remove the ignition coil;

Z Measure the resistance of the primary and secondary windings of the ignition coil with the multimeter. If the resistance of two coils is close to the specified value, the ignition coil is in good condition.



Resistance of ignition coil

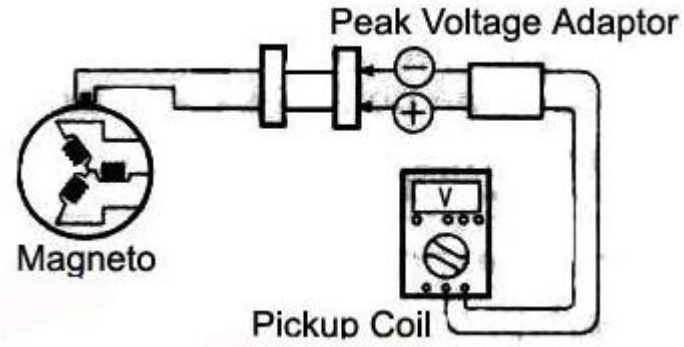
Primary winding: 0.58±0.058 Ω (terminal – ground)

Secondary coil: 7.1±0.71 (terminal - spark plug cap)

Peak voltage of coupling coil

Z Check the peak voltage of the coupling coil with following steps.

Z As shown in right figure, connect the multimeter with the peak voltage adapter.



+Probe: Green/white wire

-Probe: BL/Y wire

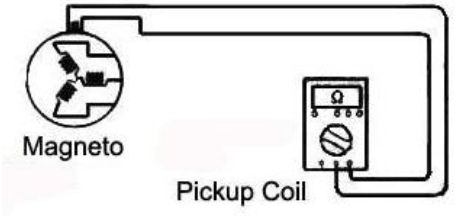
Z Move the gear to the neutral position, turn on the ignition device.

Z Press the start button and crank the engine for a few seconds, and then measure the primary peak voltage of the coupling coil;

Z Repeat the steps above for several times. Measure the maximal value of the primary peak voltage.

Put the multi meter at AC voltage step.

Peak voltage of coupling coil: ≥4V



Z If the voltage is lower than the standard value, replace coupling coil.

Resistance of coupling coil

The multi meter is put at 1x100Ω step.

Resistance of coupling coil: 135±5Ω

Z If the resistance is not within the specified value, replace the coupling coil.

Inspecting an Electrical Connection

When replacing an electric or electronic component, always check electrical connections.

Make sure they are tight, make good contact, and are corrosion-free.

Dirty, loose or corroded contacts are poor conductors and are often the source of a system or component malfunction.

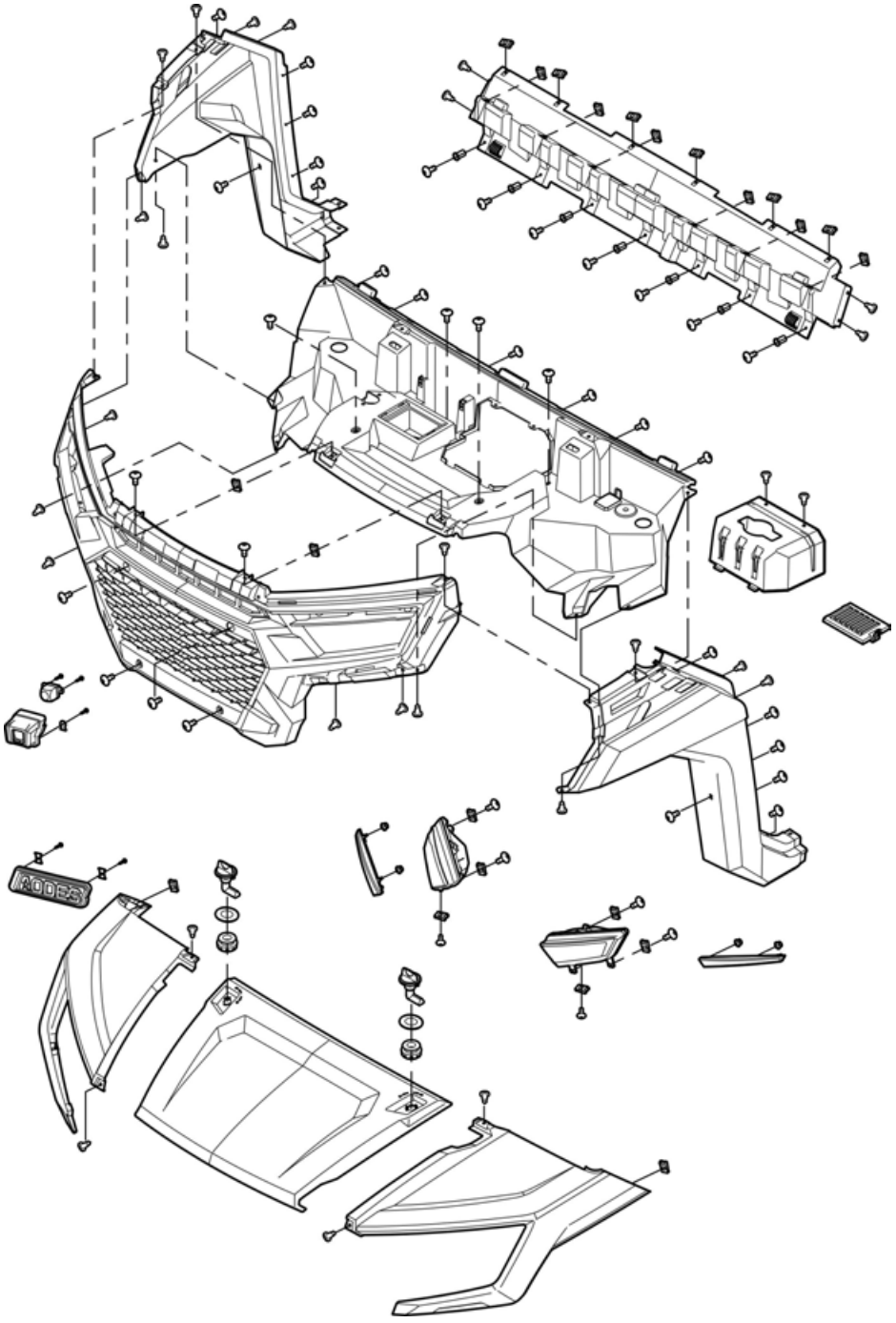
Pay particular attention to ensure that pins are not bent or pushed out of their connectors.

Ensure all wire terminals are properly crimped on wires, and connector housings are properly fastened.

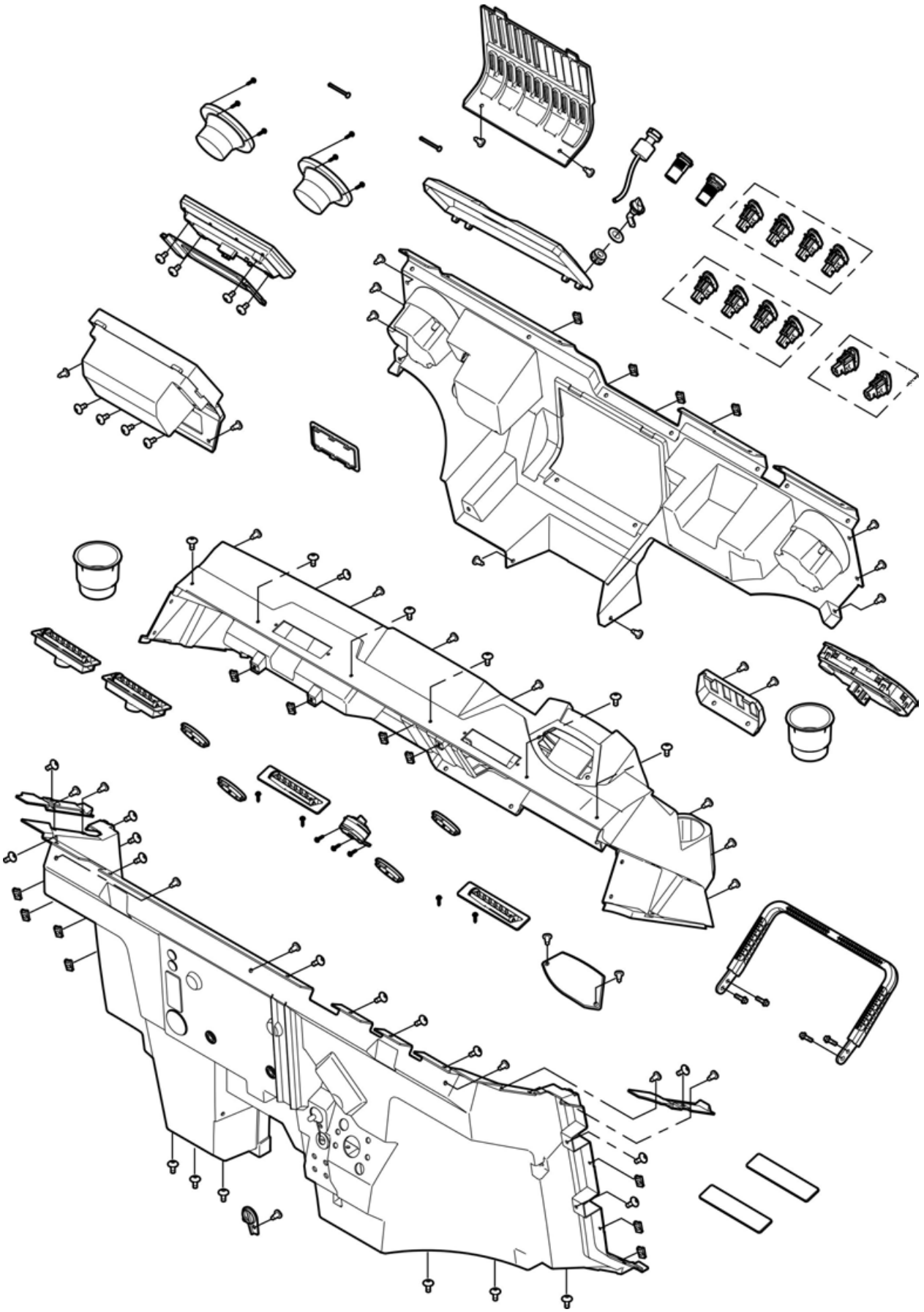
7.BODY

NOTICE: Since our products are air-conditioned and non-air-conditioned in addition to single-row and double-row, the following models may differ from the vehicle you own. Please compare it with your car according to the actual situation.

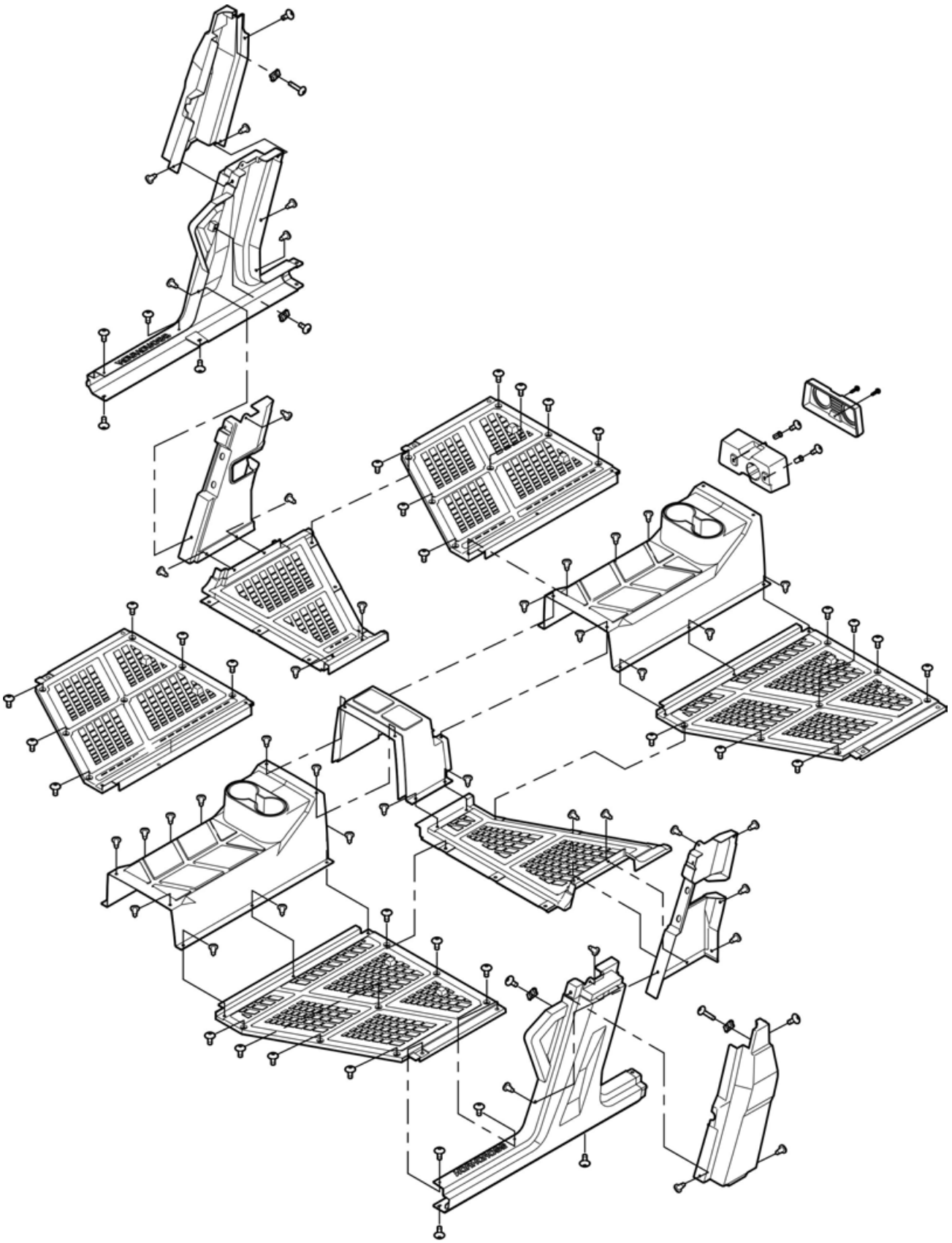
Front hood combination



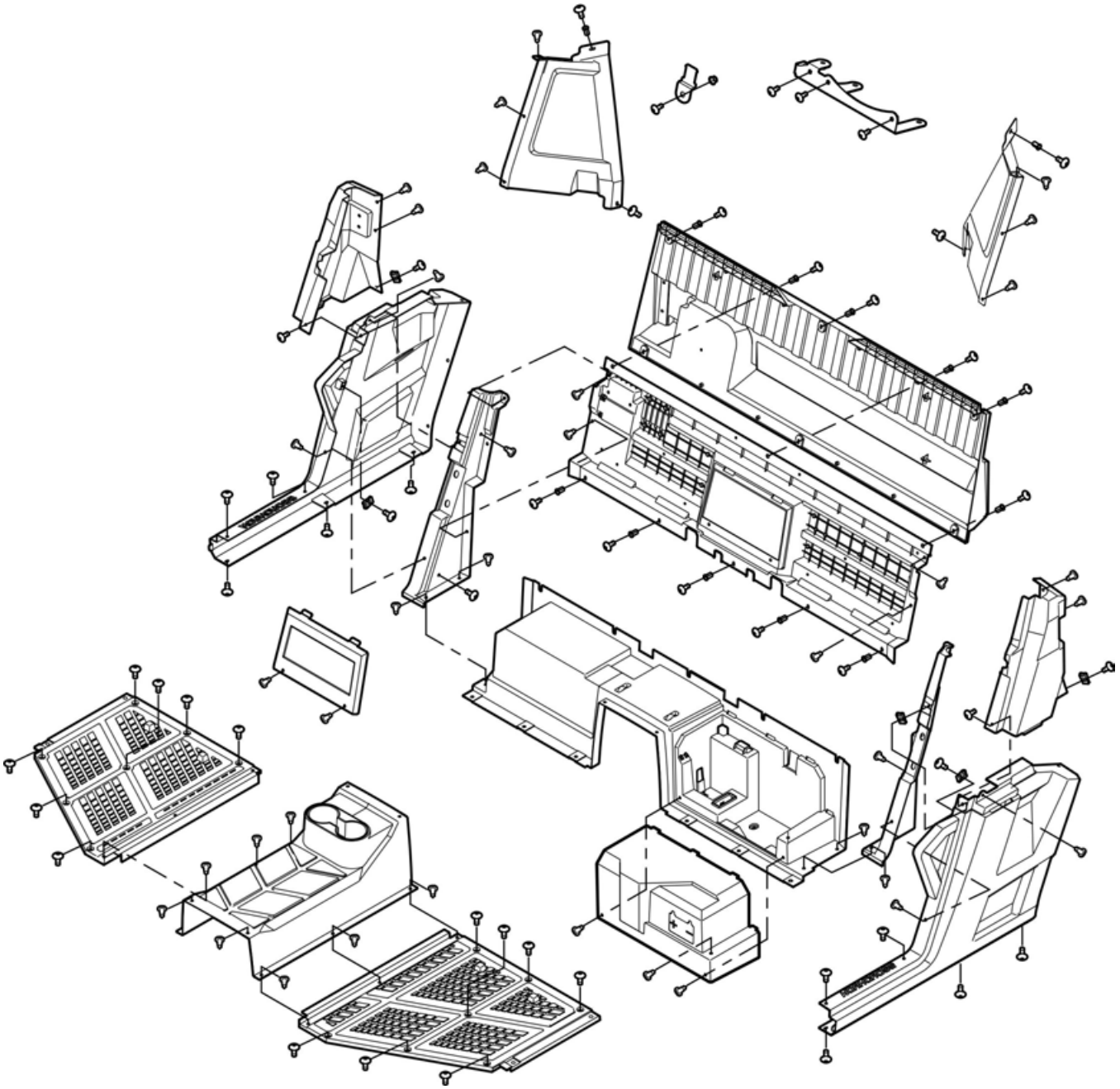
Dashboard combination



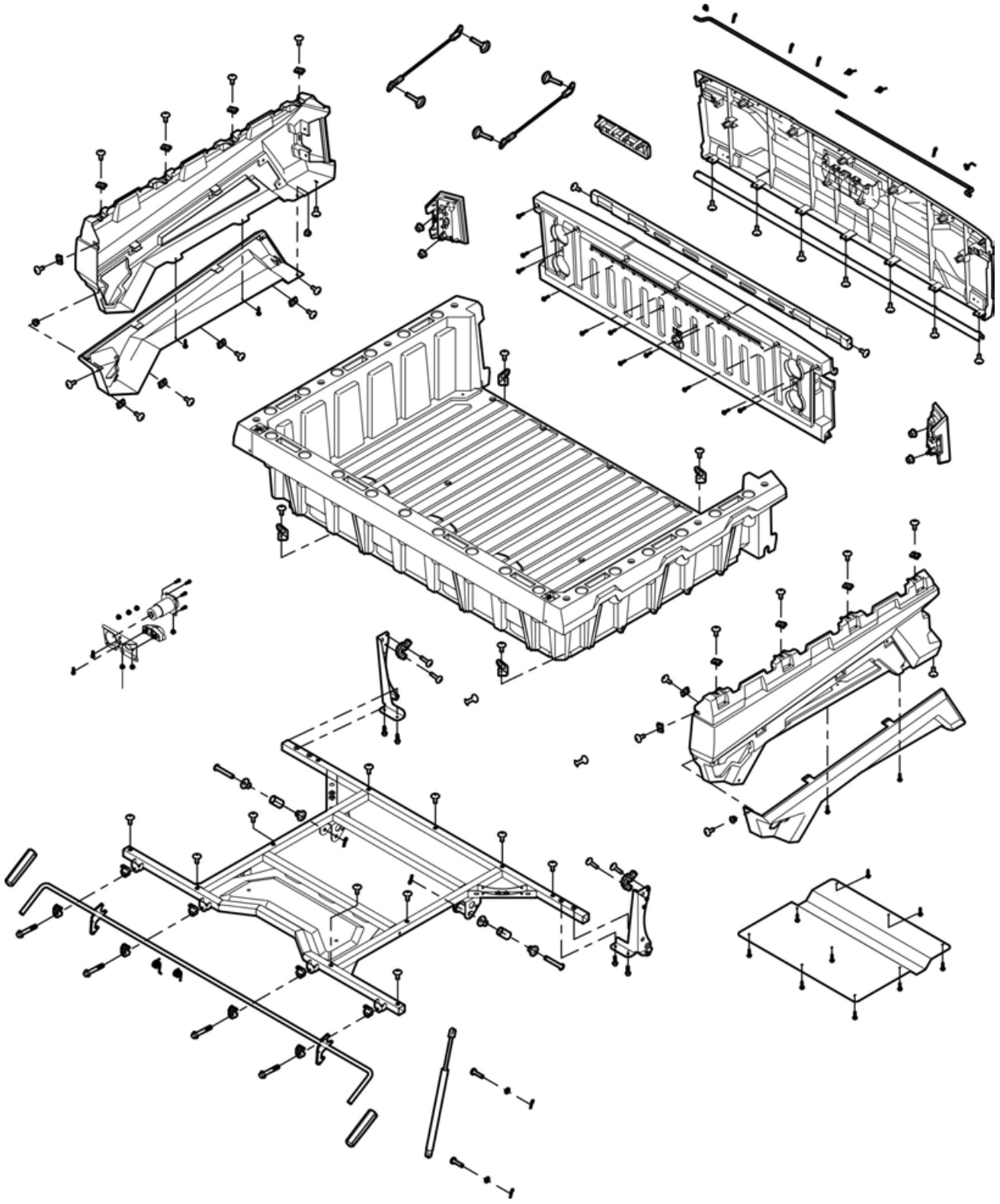
Front foot pedal combination



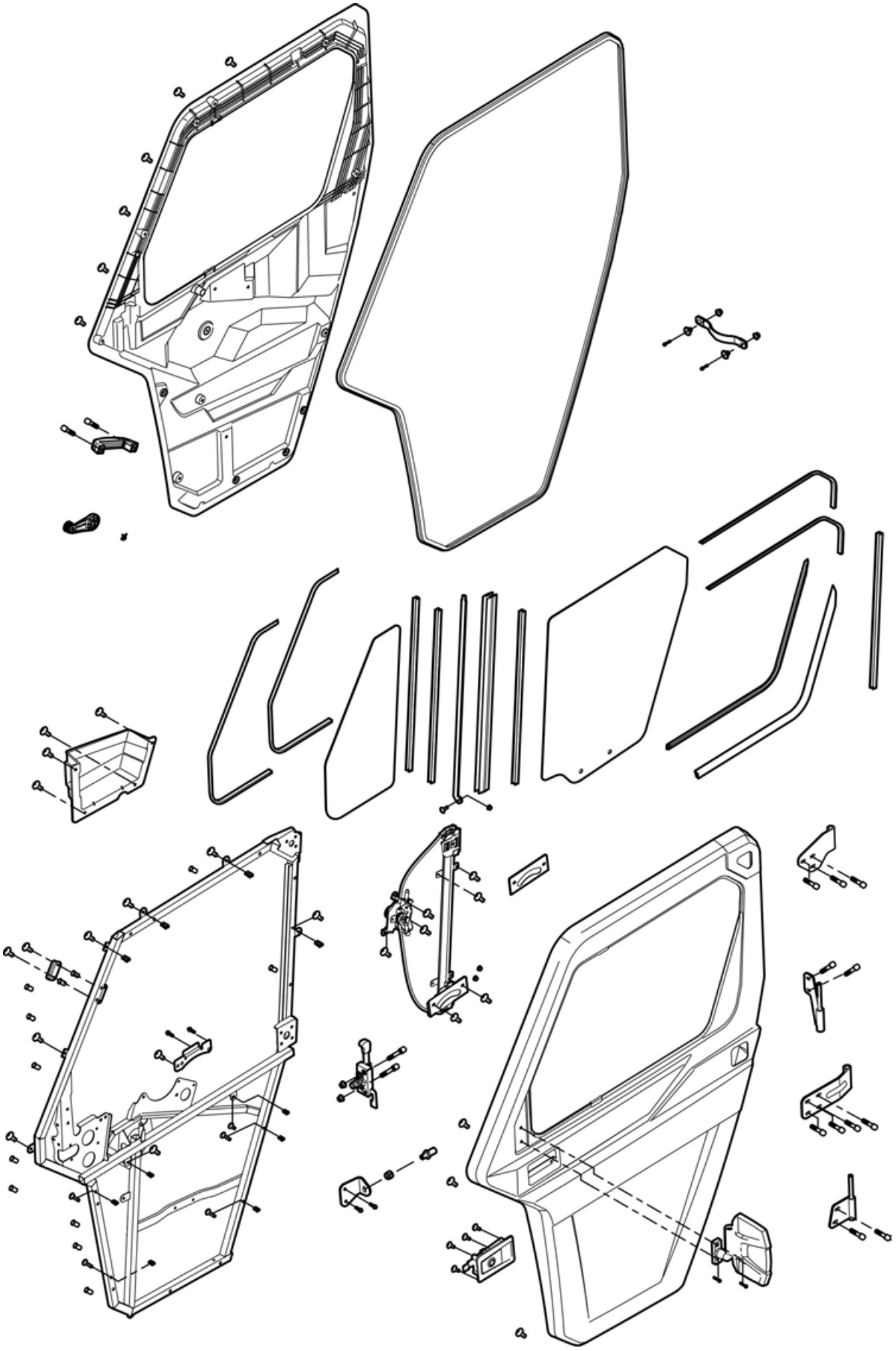
Rear pedal combination



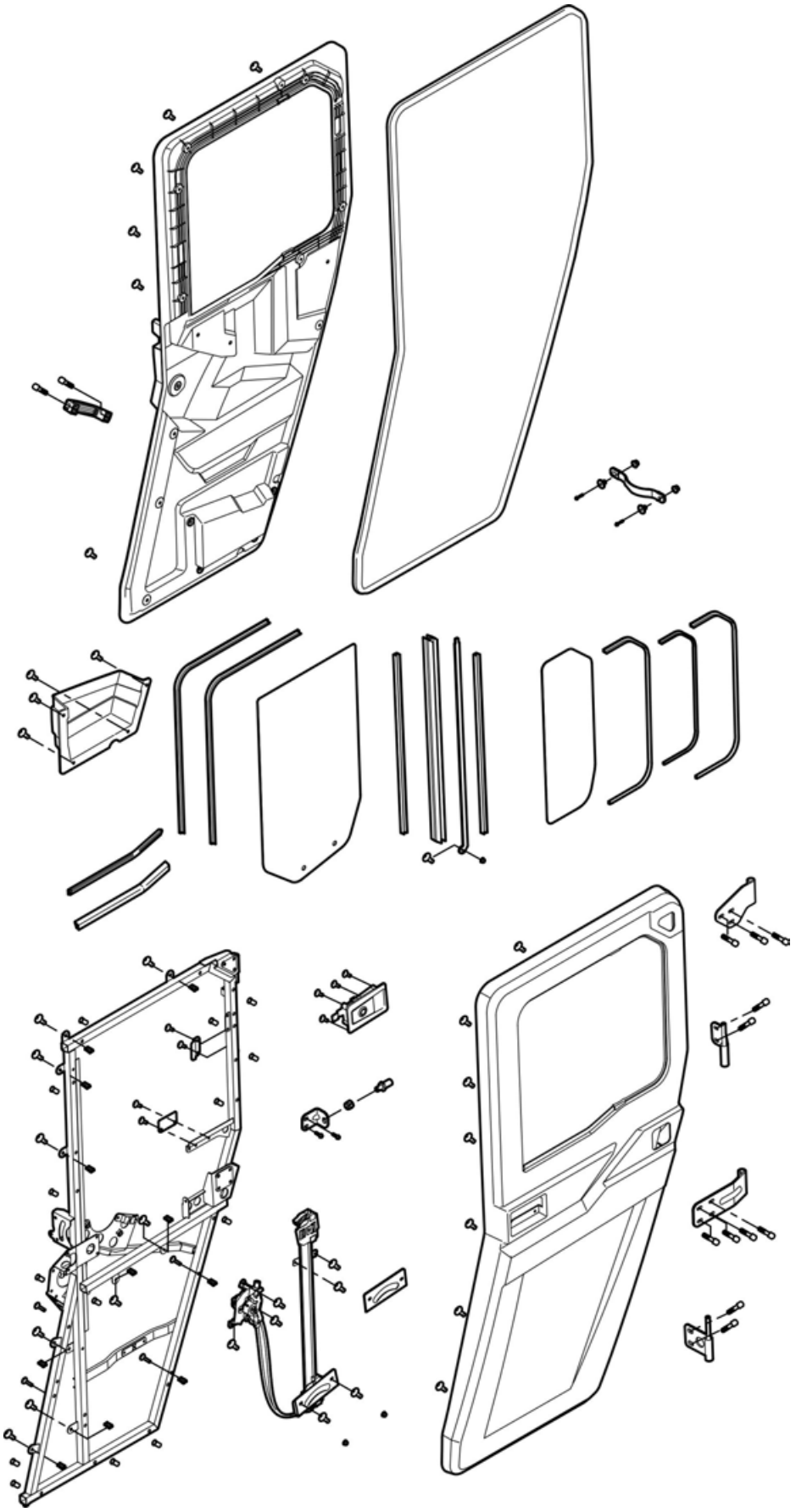
Cargo box combination



Front door combination

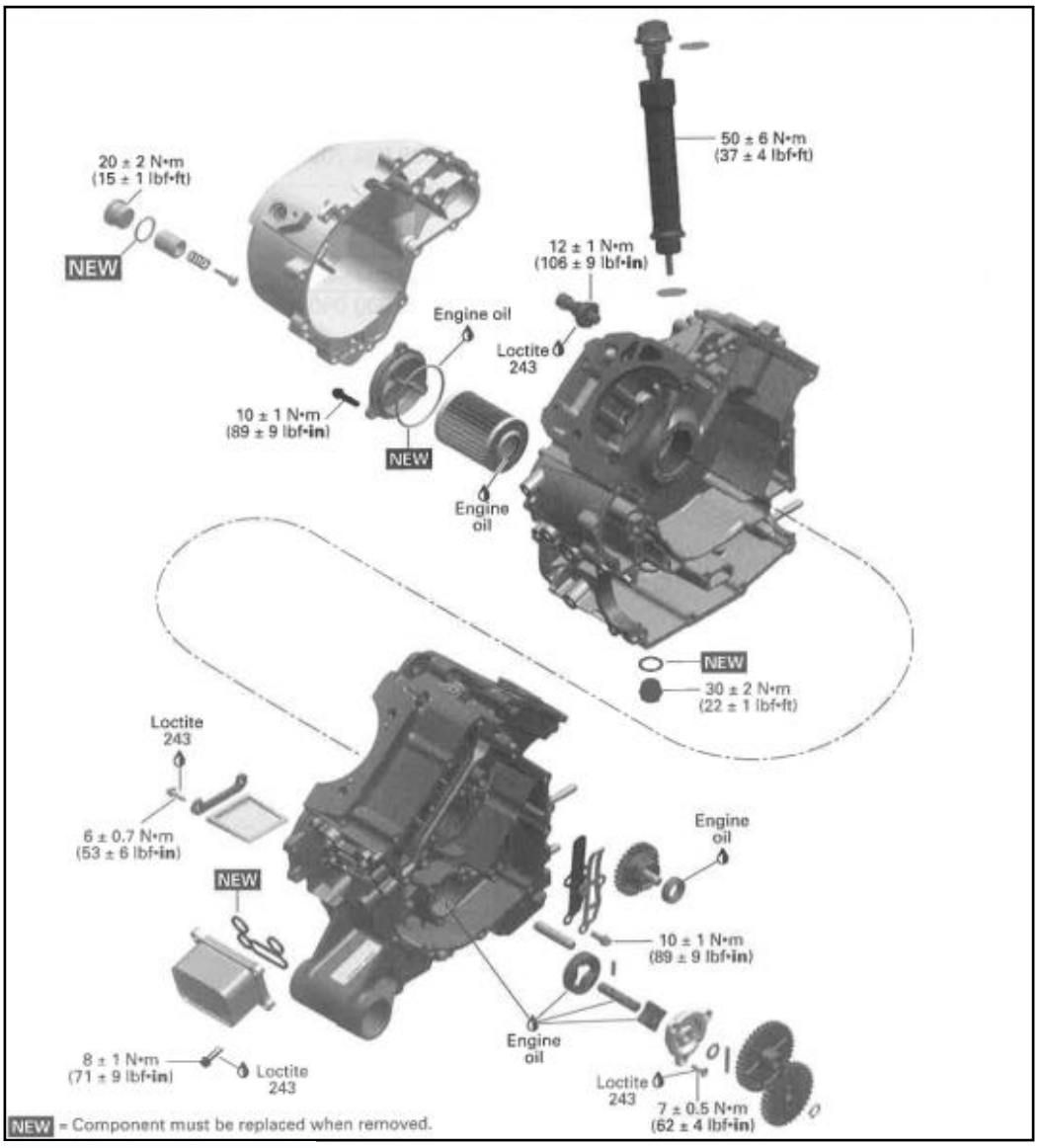


Rear door combination



8.ENGINE

ENGINE LUBRICATION CIRCUIT



1. Camshaft bearings
2. Oil pressure switch
3. Oil filter
4. Oil pressure regulator valve
5. Oil strainer
6. Oil pump
7. Crankshaft main bearings
8. Crankshaft support bearing
9. Connecting rod' bearings

INSPECTION

ENGINE OIL PRESSURE

NOTE : The engine oil pressure test should be

Done with a warm engine100°C(212°F) and the recommended oil.

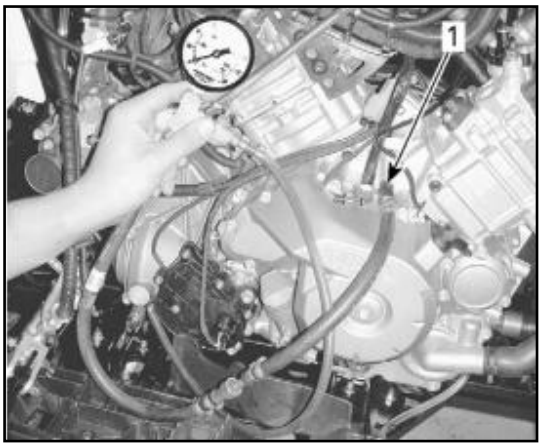
Remove the oil pressure switch. Refer to OIL PRESSURE SWICH in this subsection.

Use the pressure gauge with the proper adapter hose.

REQUIRED TOOL	
PRESSURE GAUGE	
ADAPTER HOSE	

The engine oil pressure should be within the fol- lowing values.

OIL PRESSURE	1250 RPM	6000 RPM
MINIMAL	70kPa(10PSI)	300kPa(44PSI)
NOMINAL	150kPa(22PSI)	350kPa(51PSI)
MAXIMA L	250kPa(36PSI)	450kPa(65PSI)



If the engine oil pressure is out of specifications,

check the points described in TROUBLESHOOT

INE in this subsection.

Remove oil pressure gauge and adapter hose.

Reinstall the oil pressure switch,

TROUBLESHOOTING

LOW OR NO OIL PRESSURE

1. Oil level is too low.

-Refill engine with recommended engine oil Refer to OIL LEVEL VERIFICATION in the PERIODIC MAINTENANCE PROCEDURES subsection.

-Check for high oil consumption ,refer to

HIGH OIL CONSUMPTION in the TROUBLESHOOT -ING subsection.

-Check for engine oil leaks. For leak indicator hole,refer to COOLING SYSYTEM INSPECTION in the PERIODIC MINTENANCE PROCEFURES subsection. Rapair if necessary.

2. Use of unsuitable engine oil type.

-Replace engine oil by the recommended engine oil.

3. Clogged oil filter.

-Replace oil and oil fi1ter at the same time.

4. Defective oil pressure switch.

-Test oil pressure switch, see procedure in this subsection.

5. Defective or worn oil pump.

-Check oil pump, see procedure in this subsection.

6. Defective engine oil pressure regulator.

Check engine oil pressure regulator ,see procedure in this subsection.

7. Worn plain bearings in crankcase.

-Check plain bearings clearance, refer to BOTTOM subsection.

8. Clogged engine oil strainer.

Check engine oil strainer, see procedure in this subsection.

OIL CONTAMINATION

1. Defective water pump seal ring or rotary seal.

- Check for oil or coolant leak from indicator hole near water pump, refer to COOLING SYSTEM INSPECTION in the PERIODIC MAINTENCE PROCEFURES subsection. Replace seal if necessary.

2. Cylinder head or cylinder base gasket leak

-Retighten cylinder head to specified torque, refer to TOP END subsection .replace gasket if tightening does not solve the problem.

3.Engine internal damage.

-Repair engine.

4.Oil cooler gasket leak.

-Replace oil cooler gasket and change engine oil.

HIGH OIL CONSUMPTION

1. Leaking breather oil seal.

-Check if the oil seal of the breather is brittle, hard or damaged. Refer to BOTTOM END subsection.

2. Valve stem seals worn or damaged.

-Replace valve stem seals.

3. Worn piston rings(blue exhaust smoke).

-Replace piston rings.

PROCEDURES

OIL COOLER (HD 10 ENGINE ONLY)

Oil Cooler Access

Remove the fuel tank to reash the oil cooler. Refer to FUEL TANK AND FUEL PUMP subsection.

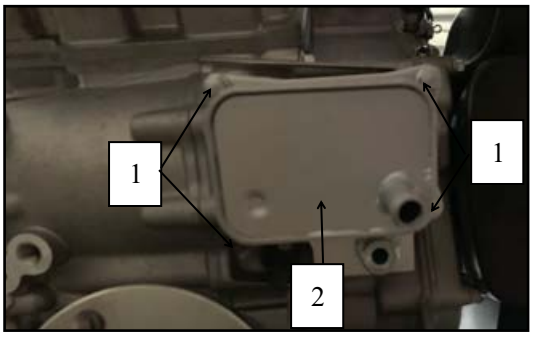
Oil Cooler Removal

Refer to the PERIODIC MAINTENCE PROCEDURES subsection to:

- Drain engine oil.

- Drain engine coolant.

Remove oil cooler retaining screws.

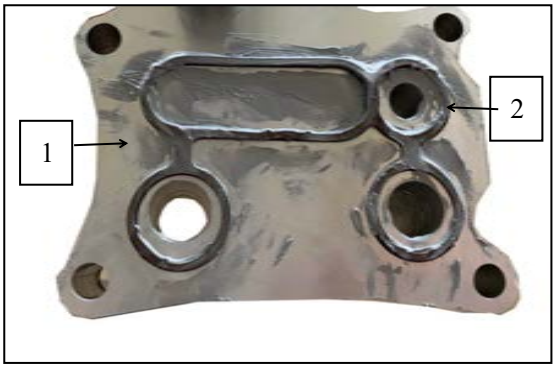


1 .Retaining screws

2. Oil cooler

Place rags or towels under oil cooler to catch remaining oil and coolant.

Remove oi1 cooler and discard gasket.



1. Oil cooler

2. Gasket

Inspecting Oil Cooler

Check oil cooler for cracks or other damage.

Replace if necessary.

Installating Oil Cooler

For installation, reverse the remova1 procedure. Pay attention to the following details.

Wipe off any oil and coolant spillage.

Install a NEW gasket.

Refer to PERIODIC MAINTENCE PROCEDURES subsection and carry out the following:

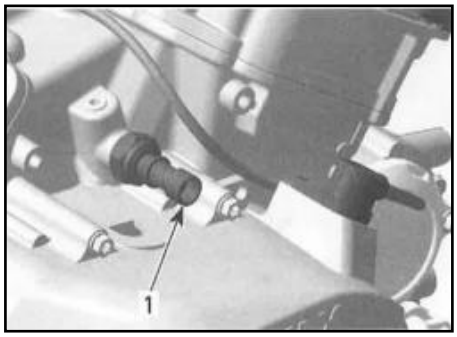
- Refill engine oil with recommended oil and at the proper oil lever.

- Refill and bleed cooling system.

OIL PRESSURE SWITCH (OPS)

Oil Pressure Switch Location

The oil pressure switch is located at engine MAG side above the magneto cover.



1. Oil pressure switch

Oil Pressure Switch Access

Open the cargo box to reach the engine

Oil Pressure Switch Activation

The oil pressure switch activates when the engine oil pressure is lower than the operating pressure range.

OIL PRESSURE SWITCH OPEATING PRESSURE
30kpa ±10kap (4.35PSI ±1.45 PSI)

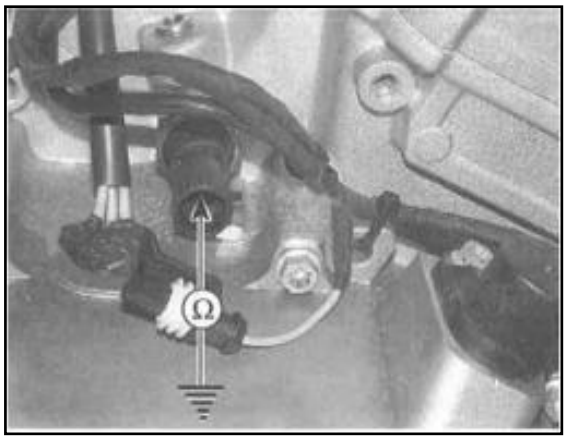
To check the function of the oil pressure switch, an oil pressure test has to be performed. Refer to ENGINE OIL PRESSURE in this subsection.

If the engine oil pressure is good perform the oil pressure switch resistance test.

Testing the Oil Pressure Switch Resistance Disconnect the connector from the oil pressure switch.

Use a multimeter to check the resistance between as shown.

OPS CONNECTOR		ENGINE NOT RUNNING	ENGINE RUNNING
PIN		RESISTANCE(Ω)	
4	Engine ground	Close to 0Ω (normally reaches	Infinite(open) when pressure 30kPa±10kPa



If resistance values are incorrect, replace the oil pressure switch.

If the values are correct, check wiring.

Removing the Oil Pressure Switch

Unplug the oil pressure switch connector.

Unscrew and remove oil pressure switch.

Installing the Oil Pressure Switch

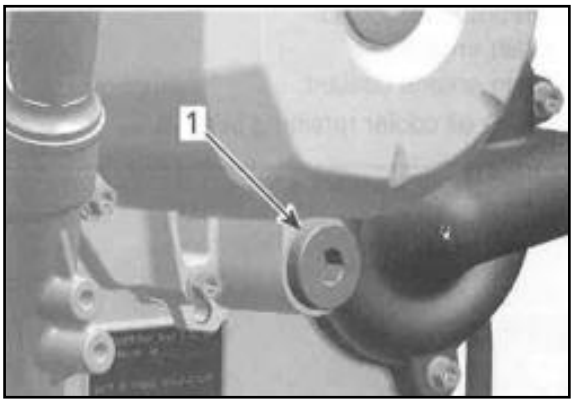
Tighten oil pressure switch to specified torque.

TIGHTENING TORQUE	
Oil pressure switch	12.5N·m±1 N·m

ENGINE OIL PRESSURE REGULATOR

Oil Pressure Regulator Location

The oil pressure regulator is located on the engine magneto side(inside magneto cover).



1. Engine oil ρressure regulator

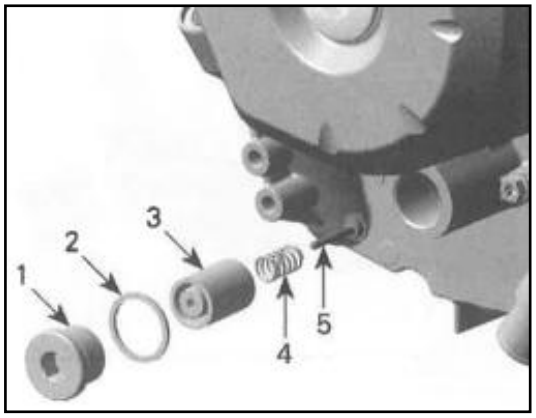
NOTE: The oil pressure regulator system works when the oil pressure exceeds 400kPa (58PSl).

Oil Pressure Regulator Access

Remove plug screw and pull oil perssure regulator out.

Oil Pressure Regulator Removal

Remove plug screw and pull oil pressure regulator out.



1. Plug screw

2. Gasket ring

3. Pressure regulator housing

4. Spring

5. Pressure regulator valve

Inspecting the Oil Pressure Regulator

Inspect pressure regulator housing and valve for scoring or other damages.

Check spring for free length.

SPRING FREE LENGTH	
NEW NOMINAL	39mm
SERVICE LIMIT	37 mm

NOTE: Replace worn or damaged components.

Clean bore and thread in the magneto housing from metal shavings and other contaminations. Installating Oil Pressure Regulator

For installation, reverse the removal procedure.

Pay attention to the following details.

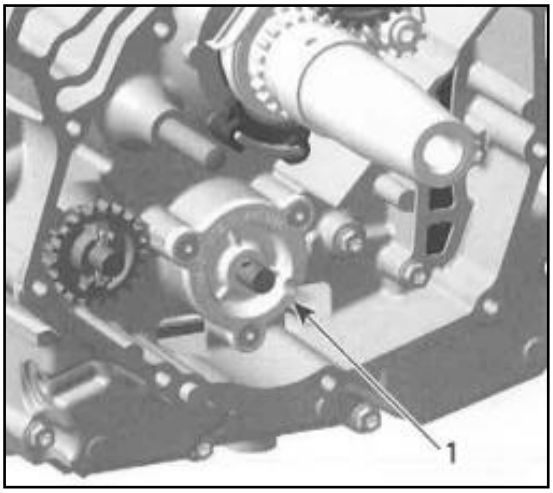
NOTE: At installation always replace the gasket ring of the plug screw by a new one.

OIL PUMP

Oil Pump Location

The oil pump is located on the engine PTO side

(behind PTO cover).



1. Oil pump

Oil Pump Removal

Remove the PTO cover. Refer to PTO COVER in the BOTTOM END subsection.

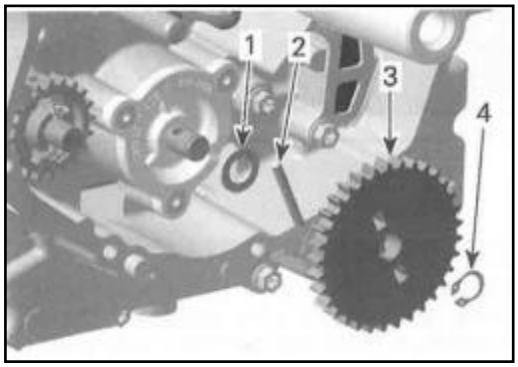
1. Remove:

- Retaining ring

- Oil pump gear

- Needle pin

- Thrust washer.



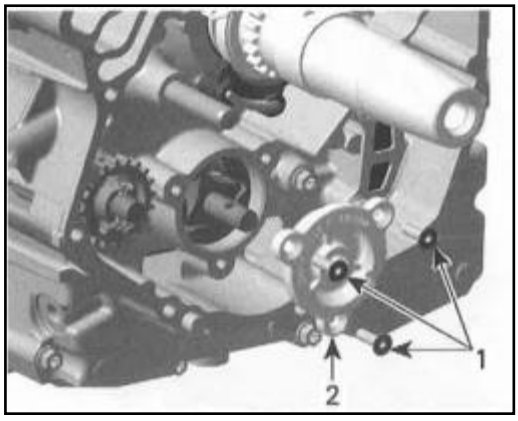
1.Thrust washer

2. Needle pin

3.Oil pump gear

4. Retaining ring

Remove oil pump cover screws and pull oil pump cover out..

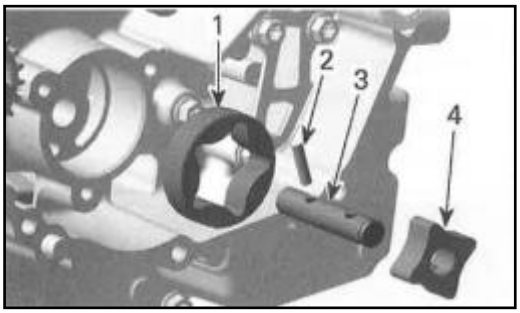


1. Retaining screws

2. Oil pump cover

3. Remove oil pump shaft with needle pin and inner rotor.

4. Remove outer rotor.



1. Outer rotor

2. Needle pin

3. Oil pump shaft

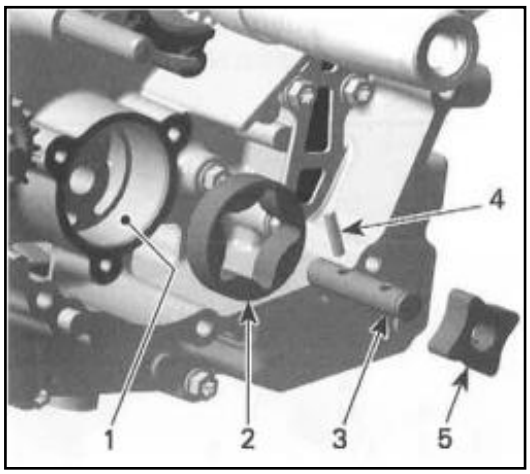
4. Inner rotor

Inspecting the Oil Pump

Inspect oil pump and oil pump cover bore for marks, scratches or other damages. Check for scratches in crankcase between outer rotor and

oil pump bore. If so, replace damaged parts.

Check oil pump cover for damages and for surface straightness with a straightedge.



1. Oil pump bore

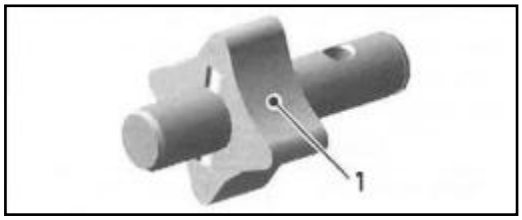
2. Outer rotor

3. Oil pump shaft

4. Needle pin

5. Inner rotor

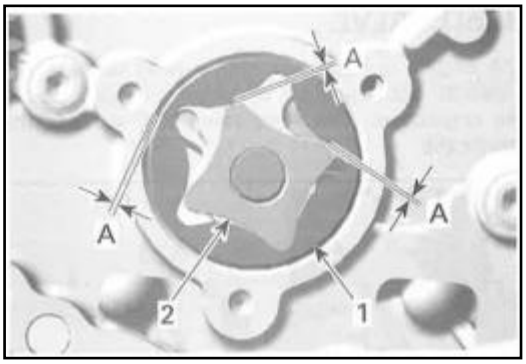
Check inner rotor for corrosion pin holes or other damages. If so, replace oil pump shaft assembly.



1. Pittings on the teeth

Using a feeler gauge, measure the clearance of inner and outer rotors as shown.

CLEARANCE OF INNER AND OUTER ROTOR	
SERNICE LIMIT	0.25mm



1. Outer rotor

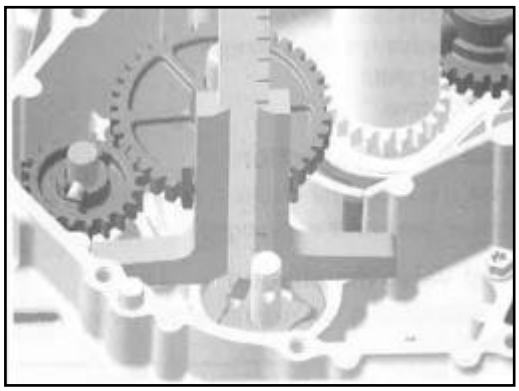
2. Inner rotor

A. 0.25mm (.0098in)

If clearance of inner and outer rotors exceeds the Tolerance, replace oil pump rotors. Ensure to also check oil pump cover. If damaged, replace the complete oil pump assembly.

If clearance between outer rotor and its bore in crankcase exceeds the tolerance, replace the complete oil pump rotors and/or the crankcase.

Using a depth gauge, measure the axial clearance of the oil pump as shown.



OIL PUMP- MEASUREMENT "A"

OIL PUMP COVER- MEASUREMENT "B"

Substract measurement ''B" from measurement "A" to obtain axial clearance.

OIL PUMP AXIAL CLEARANCE	
SERVICE LIMIT	0.2 mm

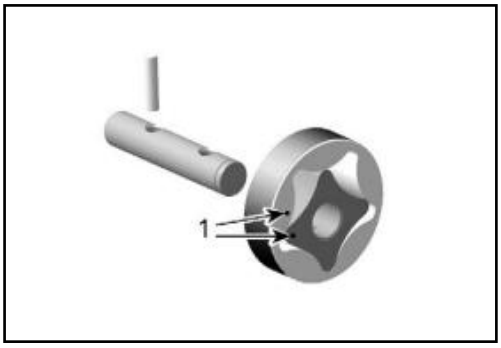
NOTE: When the axial clearance of the oil pump shaft assembly increases, the oil pressure decreases.

Installating the Oil Pump

For installation, reverse the removal procedure.

Pay attention to the following details.

NOTE: When installing the oil pump rotors, make sure both markings are on the outer side.



1. Markings

After reinstallation of the remaining parts, check for smooth operation of the oil pump assembly.

Testing the Oil Pump Function

After engine is completely reassembled, start engine and make sure oil pressure is within specifications (refer to ENGINE OIL PRESSIRE in this subsection).

ENGINE OIL STRAINER

Oil Strainer Location

The engine oil strainer is located between both crankcase halves.

Removing the Oil Strainer

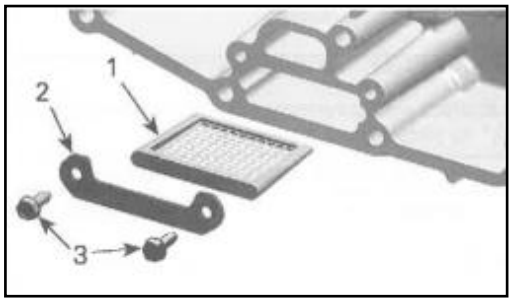
Separate crankcase halves .Refer to BOTTOM END subsection.

Remove:

-Screws

-Retaining plate

-Engine oil strainer



1. Engine oil strainer

2. Retaining plate

3. Screws

Cleaning and Inspecting Oil Strainer

Clean engine oil strainer with a part cleaner then use an air gun to dry it.

▲WARNING
Always wear eye protector. Chemicals can cause a rash break out and injure your eyes.

Check engine oil strainer for cracks or other damage. Replace if damaged.

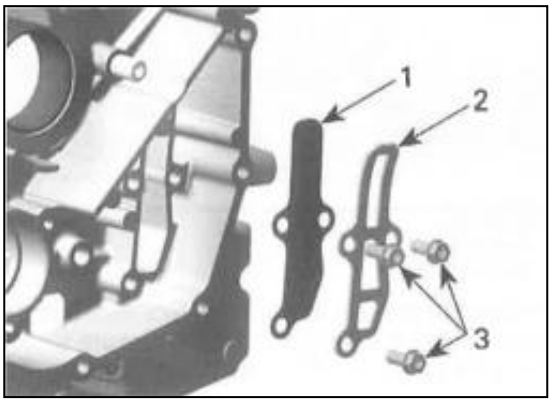
Installating the Oil Strainer

The installation is the reverse of the removal procedure.

OIL STRAINER RETAINING SCREWS	
Oil strainer reatining screws	6N·m± 0.7N·mm

REED VALVE

The engine is equipped with a reed valve which prevents accumulation of larger oil quantities in the crankcase. The reed valve is fitted into the crankcase.



1. Reed valve

2. Stopper

3. Screws

Reed Valve Removal

Remove:

-PTO cover (refer to PTO COVER in the BOTTOM END subsection)

- Reed valve retaining screws

- Stopper plate

- Reed valve.

Inspecting the Reed Valve

Check reed valve for cracks or other damage.

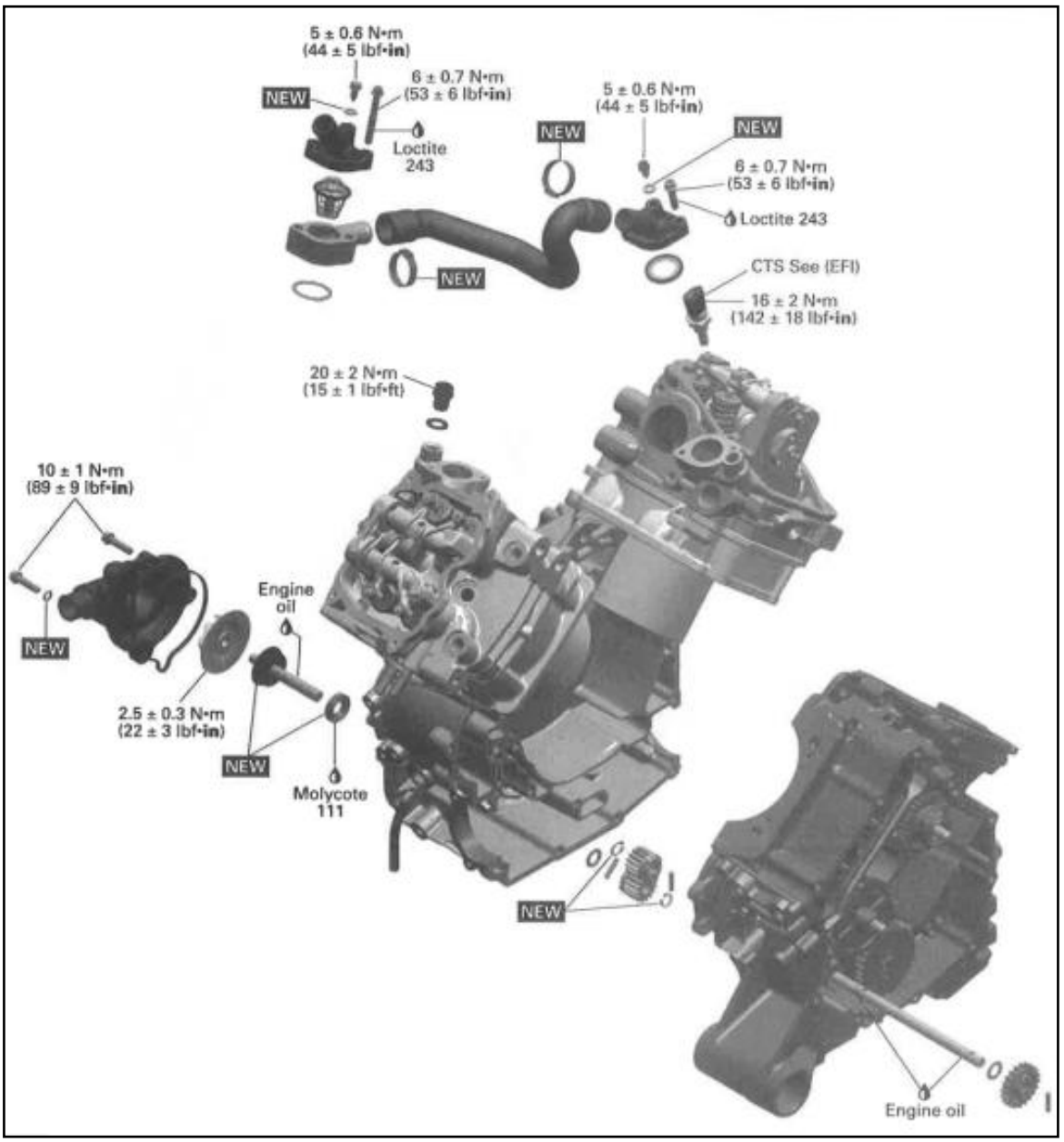
Replace reed valve if damaged.

Inspecting the Reed Valve

The installation is the reverse of the removal procedure.

TIGHRENING TORQUE	
Reed valve reating screws	10N·m±1N·m

COOLING SYSTEM
WATER PUMP



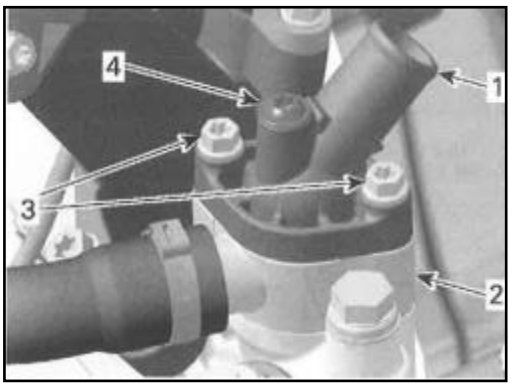
GENERAL

NOTICE Never start engine without coolant. Some engine parts such as the rotary seal on the water pump shaft can be damaged.

PROCEDURES

Thermostat Removal

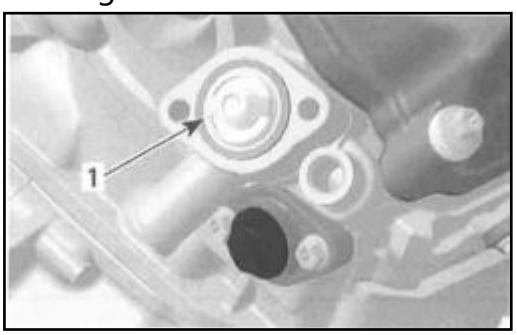
1. Install a hose pincher on both radiator hoses
2. Drain remainder of cooling system, refer to PERIODIC MAINTENANCE PROCEDURES subsection.
3. Remove thermostat housing screws and remove thermostat cover.



THERMOSTAT LOCATION FRONT CYLINDER HEAD

1. Thermostat cover
2. Thermostat housing
3. Cover screws
4. Bleed screw

Pull thermostat and gasket from thermostat housing.



1. Thermostat with gasket

WATER PUMP HOUSING

Water Pump Housing Location

1t is located on the engine MAG side (RH side of engine).

Water Pump Housing Access

Remove fuel tank. Refer to FUEL SYSTEM subsection.

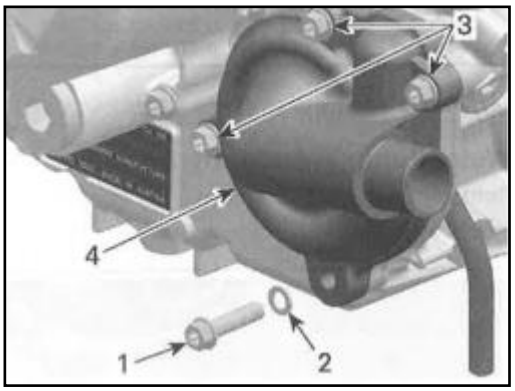
Water Pump Housing Removal

△WARNING
To avoid potential burns, do not remove the radiator cap or loosen the coolant drain plug if the engine is hot.

Drain cooling system. Refer to PERIDIC MAINTENANCE PROCEDURES subsection.

Remove radiator outlet hose from water pump housing.

Remove screws retaining water pump housing.

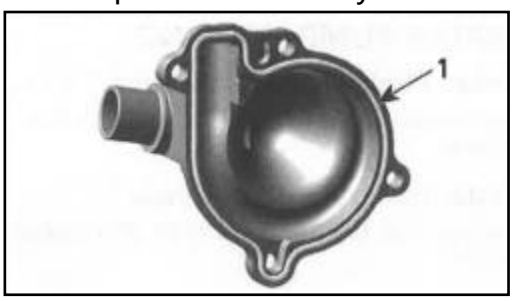


1. Coolant drain plug
2. Sealing ring,
3. Screws
4. Water pump housing

Pul1 water pump housing to remove it.

Inspecting the Water Pump Housing

Check if gasket is brittle, hard or damaged and re- place as necessary.



1. Gasket

Installating the Water Pump Housing

The installation is the opposite of the removal procedure.

NOTICE To prevent leaking ,take care that the gasket is exactly in groove when you reinstall the water pump housing.

Tighten screws of water pump housing in a criss cross sequence to specification.

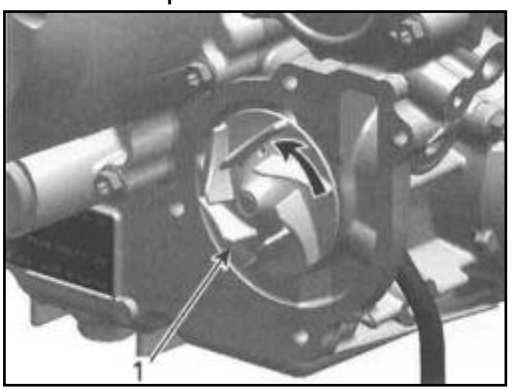
TIGHTENING TORQUE	
Water pump housing screws	10N·m±1 N.m

WATER PUMP IMPELLER

Removing theWater Pump Lmpeller

Remove water pump housing.

Unscrew impeller.



1. Turn counterclockwise unscrew

NOTICE Water pump shaft and impeller have right-hand threads. Remove by turning counterclockwise and install by turning clockwise.

Water Pump Impeller Inspection

Check impeller for cracks or other damage. Re- place impeller if damaged.

Water Pump Impeller Installation

The installation is the opposite of the removal procedure.

NOTICE Be careful not to damage impeller fins during installation.

WATER PUMP SHAFT AND SEALS

Use these guidelines to service these parts

DEFECTIVE RART	ACTION
Rotary seal	Replace: - Rotary seal - Oil seal (assembled engine)
Oil seal	Replace: -Rotary seal - Oil seal (assembled engine)
Water pump shaft	Replace: - Water pump shaft assembly (including rotary seal) - Oil seal (engine disassembled)

NOTICE Rotary seal must be replaced if water pump shaft is to be replaced.

Water Pump Seals Replacement

(Assembled Engine)

NOTE: Read and thoroughly understand the en- tire procedure before starting it.

Removing theSeals

Remove water pump housing, refer to WATER PUMP HOUSING in this subsection.

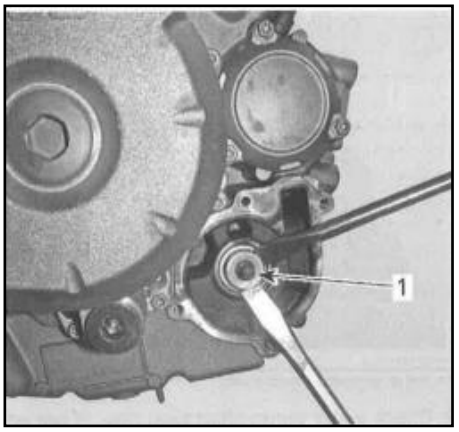
1. Remove the following parts, see procedure in

this subsection.

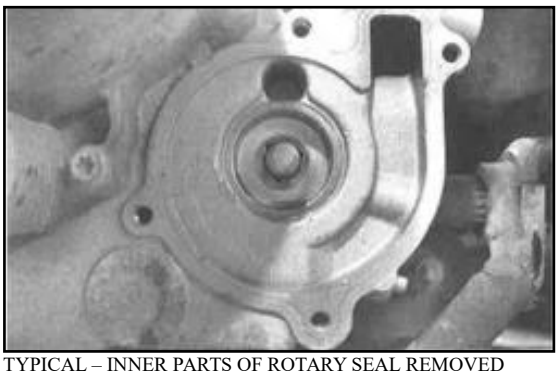
- WATER PUMP HOUSING
- WATER PUMP IMPELLER

Carefully pry out inner part of the rotary seal

using2screwdrivers.

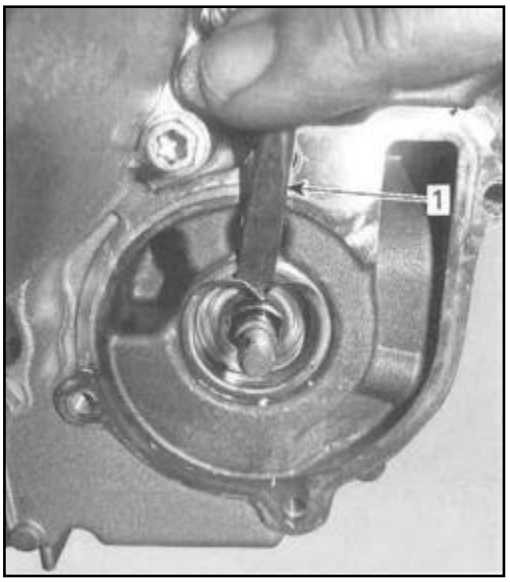


7. Inner part of rotary seal



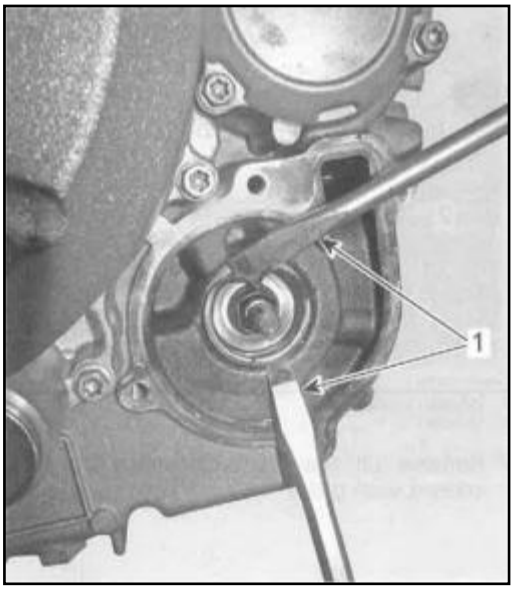
TYPICAL – INNER PARTS OF ROTARY SEAL REMOVED

3. Carefully bend down the outer part of rotary seal lip using a smal1 chisel.



1. Small chisel

4. Use 2 screwdrivers and carefully remove the outer part of the rotary seal.

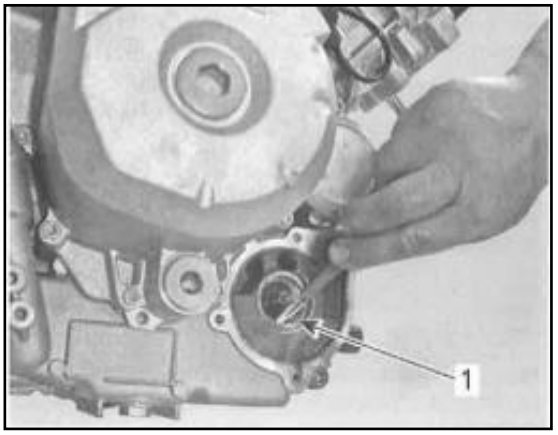


1. Screwdrivers

NOTICE Be careful not to damage the crankcase while removing outer part of the rotary seal.

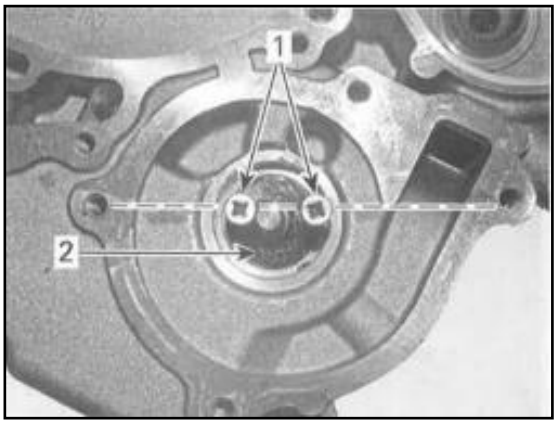
Thoroughly remove carefully sealing residue and burr of rotary seal using a scraper.

NOTICE Be careful not to damage water pump shaft.



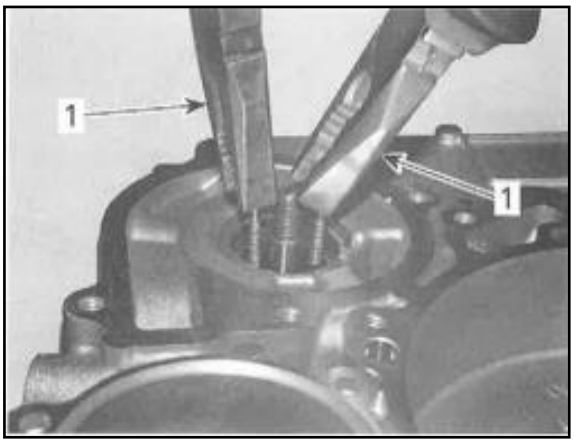
1. Scraper

Install 2 wooden screws in the seal



1. Wooden screws
2. Oil seal

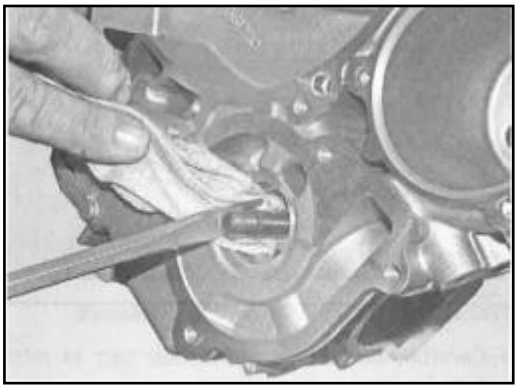
7. Remove oil seal from crankcase by pulling screws with pliers.



1. Pull on screws to remove seal

8. Check water pump shaft axial play. If not adequate, engine must be disassembled to replace the water pump shaft.

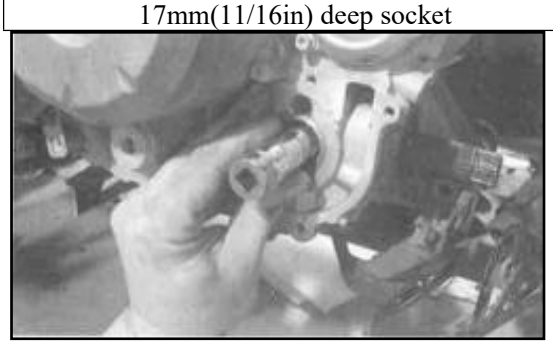
9. Clean oil seal seat.



Seals Installation

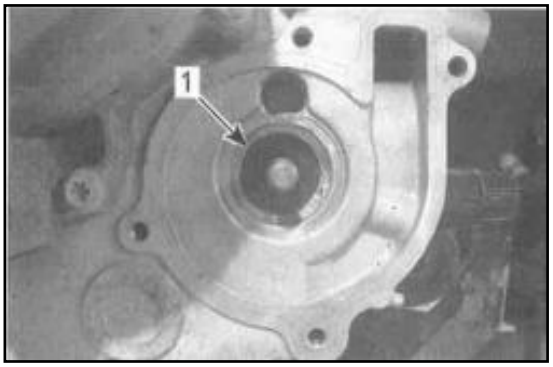
1. Apply engine oi1 on water pump shaft.
2. Apply grease to the lips of the oil seal.
3. Carefully install the oil seal over the water pump shaft.
4. Push the oil seal into the water pump cavity.

REOUIRED TOOL
17mm(11/16in) deep socket



OIL SEAL INSTALLATION

5. Ensure that the oi1 seal is properly seated in water pump cavity.

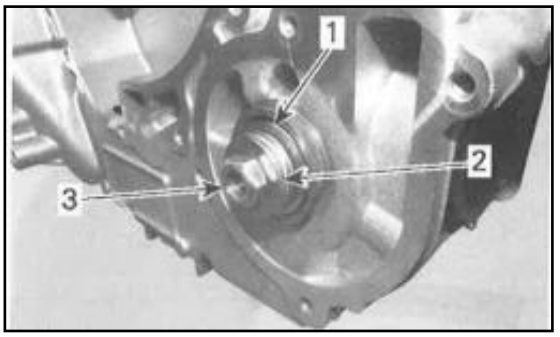


1. Oil seal proper/y seated

6. Apply engine oil on water pump shaft.
7. Place rotary seal onto water pump shaft and pull out water pump shaft by hand.

NOTICE Do not install the rotary seal completely into the crankcase to prevent the water pump shaft plastic gear from breaking. Push it partia1ly in then pull the shaft.

8. Place a robust M8 flat washer onto water pump shaft.
9. Install a M8×1.25 nut onto water pump shaft by hand.
10. Then thread nut1-1/2 turns to pull the shaft into rotary seal.



1. Rotary seal
2. M8 robust flat washer
3. M8×1.25 nut

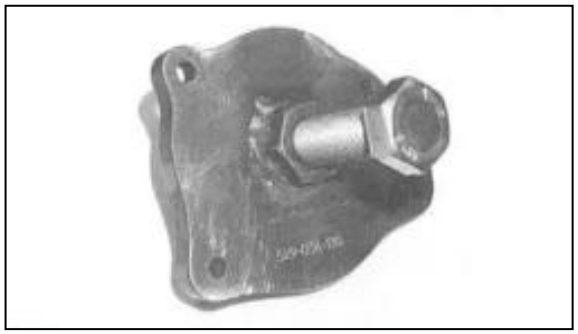
11. Remove M8 nut.

NOTE: The robust M8 flat washer remains

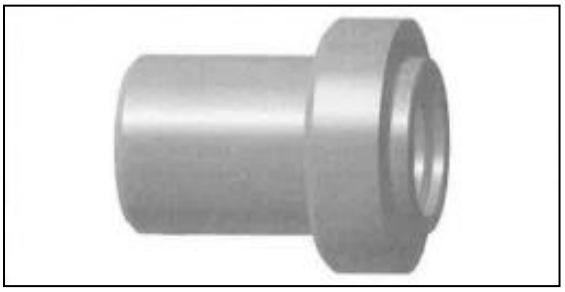
on water pump shaft.

12. Install rotary seal installation tools on crankcase as follows.

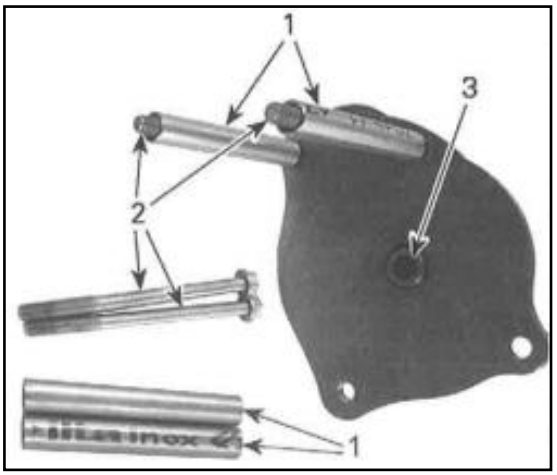
REQUIRED TOOLS
ROTARY SEAL PUSHER PLATE
4×M6×85 screws
4×tubes70mm(2.75in)
SEAL PUSHER



ROTARY SEAL PUSHER PLATE



SEAL PUSHER



ROTARY SEAL PUSHER PLATE ASSEMBLY

1. 4×tubes (70mm(2.75in) length)
2. 4×screws M6×85
3. Plane surface on pus1ler bolt

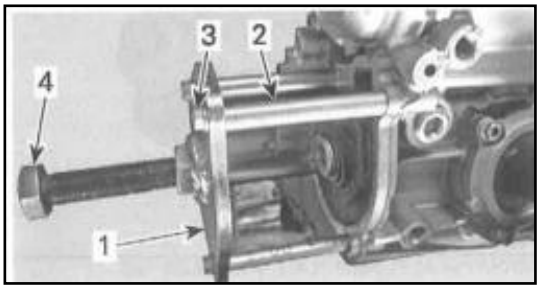
NOTE: Make sure pusher bolt has a plane surface.

12.1 Apply a little grease at the end of tool pusher bolt.

12.2 Ensure that pusher bolt is completely unscrewed.

12.3 Instal1 rotary seal pusher plate on crankcase by tightening M6 screws.

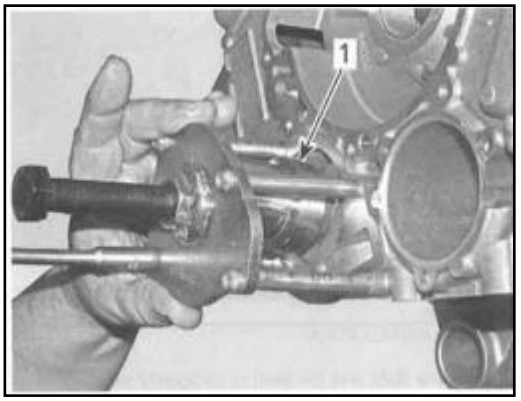
NOTICE Do not use pneumatic or electric tools for tightening screws.



ROTARY SEAL PUSHER PLATE INSTALLTION

1. Rotary seal pusher plate
2. Tube (70mm (2.75in)length)
3. M6×85 screw
4. Pusher bolt

12.4 Install seal pusher between rotary seal pusher plate and water pump shaft.



SEAL PUSHER INSTALLTION

1. Seal pus1lerai1gneol with pusher bolt

12.5 lighten the pusher bolt by hand until it stops against the sea1 pusher.

13. Carefully thread the pusher bolt1-1/2 turns.

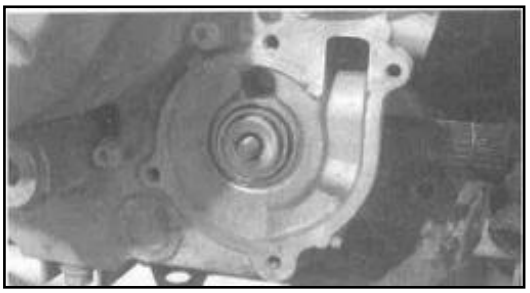
14. Ensure that the rotary seal is going straight into crankcase.

15. Remove rotary seal installation tools from crankcase.

Repeat the steps9to15 until rotary sea1 is

completely seated in the crankcase.

16. Remove tools from crankcase.

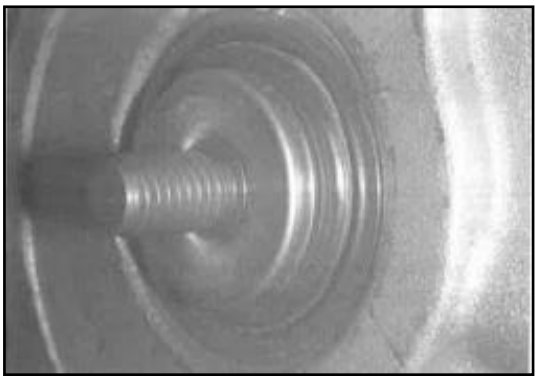


ROTARY SEAL PROPERLY SEATED ON CRANKCASE

17. Carry out the final adjustment of the water pump shaft as follows.

17.1 Instal1 M8×1.25 nut onto water pump shaft.

17.2 Carefully thread M8 nut until the rotary seal is flush with the end of water pump shaft threads.



WATER PUMP SHAFT PROPERYL ADJUSTED WISH ROTARY SEAL

NOTICE The water pump shaft must be properly adjusted with rotary seal.

The water pump shaft must move freely while pushing it toward the crankcase.

18. Install the following parts, see procedure in this subsection

- WATER PUMP IMPELLER
- WATER PUMP HOUSING

19. Refill and bleed cooling system. Refer to PERIODIC MAINTENANCE PRODUCEDURES subsection.

20. Check cooling system for leaks

Water Pump Shaft and Seals Replacement (Disassembled Engine)

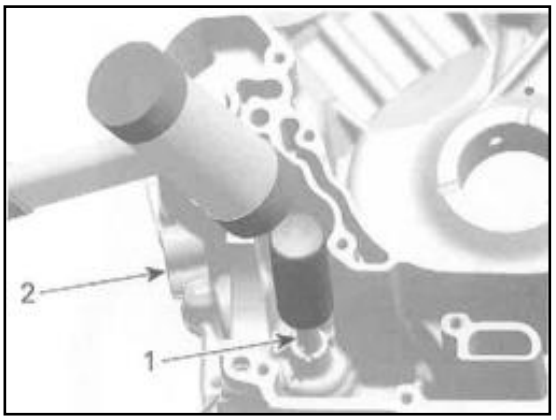
Water Pump Shaft and Seals Removal

1. Remove the following parts:

- WATER PUMP HOUSING
- WATER PUMP IMPELLER
- WATER PUMP GEARS

2. Push out water pump shaft with inner portion of rotary seal from inside of crankcase MAG side.

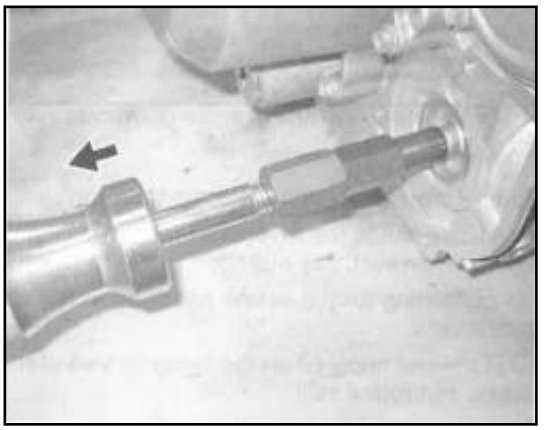
REQUIED TOOL
Soft hammer



1. Water pump shaft
2. Crankcase MAG side

3. Remove outer part of rotary seal.

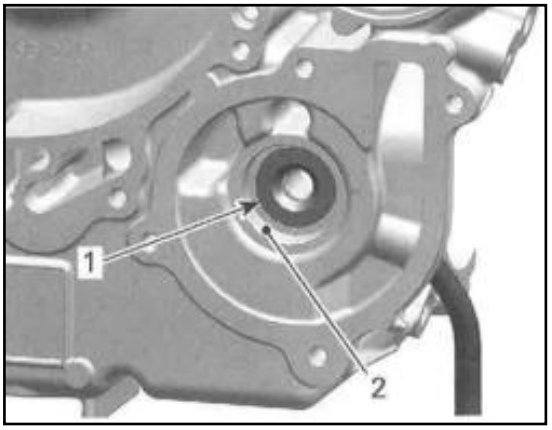
4. Install expander snugly against outer part of rotary seal and pull seal out.



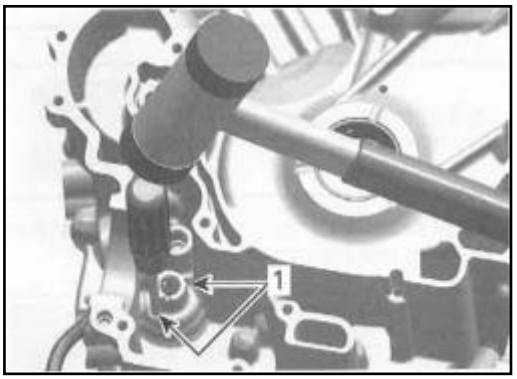
5.Remove oil seal from inside of crankcase MAG side using a pusher tool.

NOTICE Be careful not to damage the

rotary seal surface in crankcase.



1. Oil seal
2. Machined surface for rotary seal



OIL SEAL REMOVAL-FROM INSIDE CRANKCASE MAG SIDE

1. Orifices for oil seal removal

Water Pump Shaft and Seals Installation

The installation is there verse of the removal procedure. However, pay attention to the following.

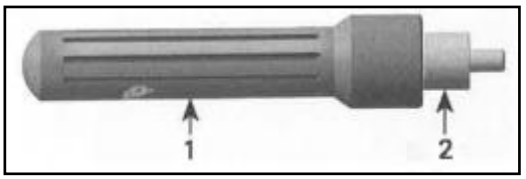
Use tightening torque values specified in the exploded view.

NOTE: Never apply oil on the press fit area of the oil seal and rotary seal.

Clean rotary seal surface of any old sealant.

Install oil seal.

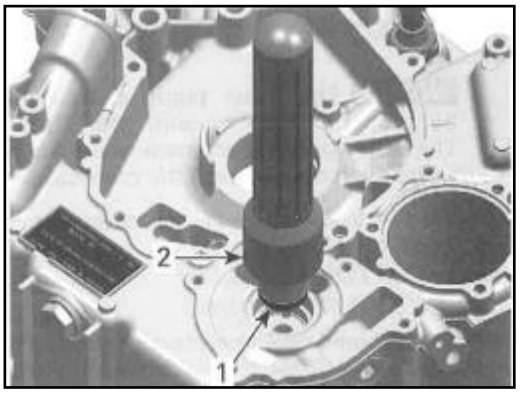
REQUIED TOOL
OIL SEAL PUSHER
HANDLE



1.Handle
2. Pusher

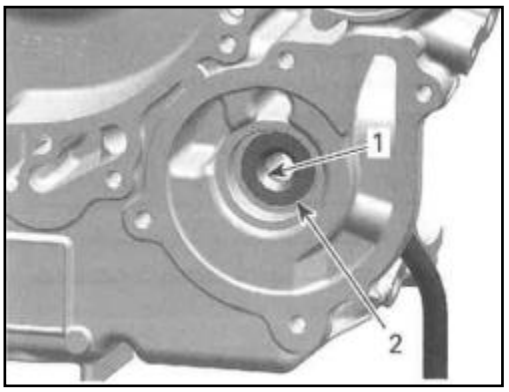
When installing the oil seal on the pusher, make sure the sealing lip points outwards.

Push NEW oil seal in place.



1. Oil seal
2. Installer handle with oil seal pusher

Lubricate sealing lip of the oil seal.

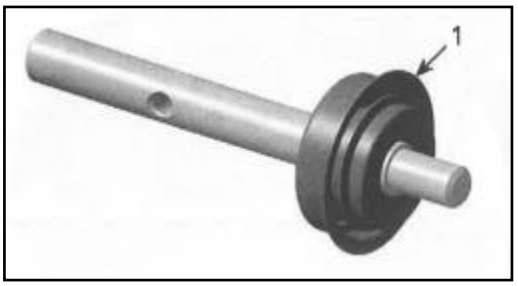


1. Sealing lip
2. Oil seal properly installed

Apply engine oil on the water pump shaft and intermediate shaft.

Slide NEW water pump shaft assembly into crankcase.

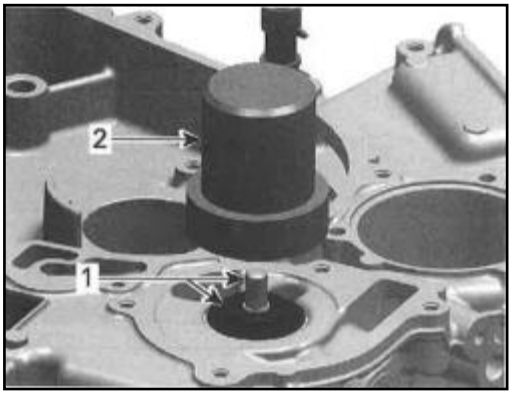
REQUIED TOOL	
SEAL PUSHER	



1. Surface where rotary seal is pushed by tool

Assembing the Water Pump Shaft

NOTICE Never use a hammer for rotary seal installation. Only use a press to avoid damaging the ceramic component.

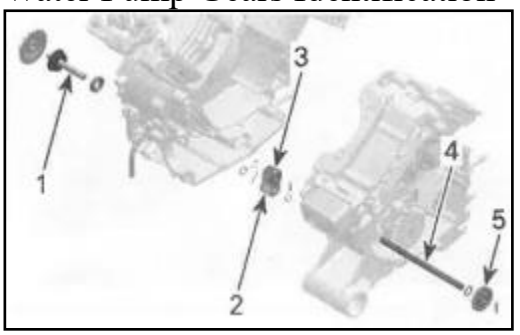


1. Water pump shaft with rotary seal
2. Water pump seal installer

NOTICE After installation, water pump shaft with rotary seal must rotate freely.

WATER PUMP GEARS

Water Pump Gears Identification

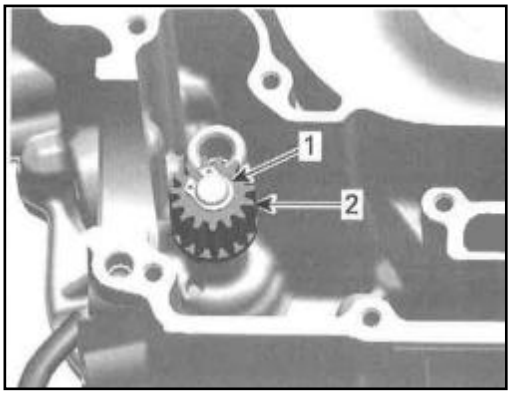


1. Water pump shaft
2. Water pump gear
3. Water pump intermediate drive gear
4. Water pump intermediate shaft
5. Water pump drive gear (see BOTTOM END subsection

Water Pump Gears Inspection

Water Pump Gear

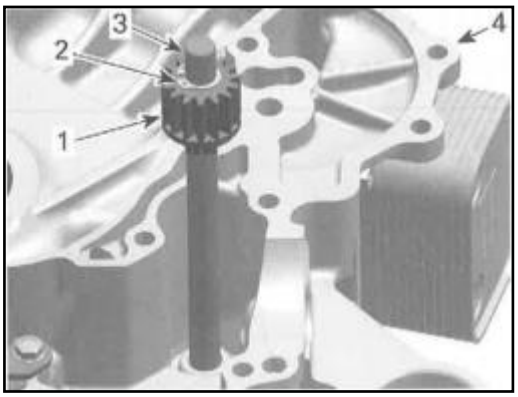
Inspect water pump gear for wear and damage on the snap mechanism to the needle pin. Replace if damaged.



CRANKCASE MAG SIDE
1. Circlip
2. Water pump gear

Water Pump Intermediate Drive Gear

Check water pump intermediate drive gear for wear or broken teeth. Replace if damaged.



CRANKCASE PTO SIDE
1. Water pump Intermediate drive gear
2. Circlip
3. Water pump intermediate shaft
4. Crankcase PTO side

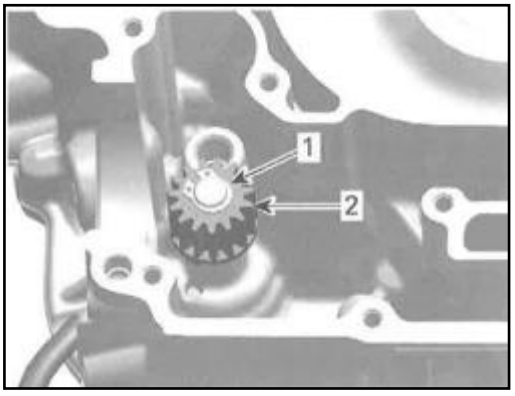
Water Pump Drive Gear

See BOTTOM subsection,

Water Pump Gears Removal

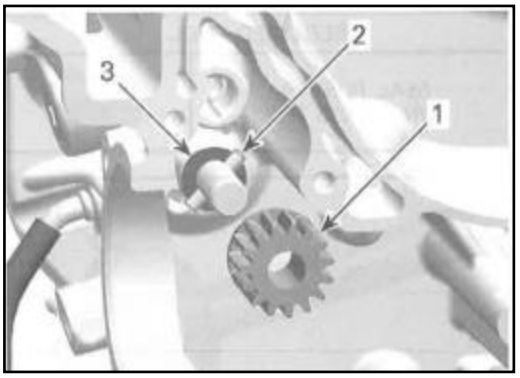
Water Pump Gear

1. Remove circlip retaining water pump gear and discard it.



CRANKCASE MAG SIDE
1. Circlip
2. Water pump gear

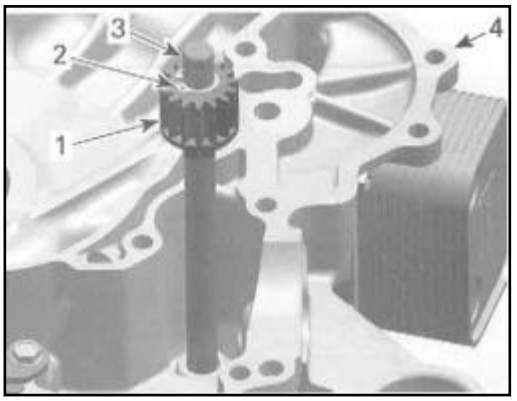
2. Remove the following parts
- Water pump gear
- Needle pin
- Thrust washer.



CRANKCASE MAG SIDE
1. Water pump gear
2. Needle pin
3. Thrust Washer

Water Pump Intermediate Drive Gear

1. Remove clrclip retaining water pump intermediate drive gear and discard it.



CRANKCASE PTO SIDE
1. Water pump intermediate drive gear
2. Circlip
3. Water pump intermediate shaft
4. Crankcase PTO side

2. Remove the following parts:
- Water pump intermediate drive gear
- Needle pin. .

Water Pump Drive Gear

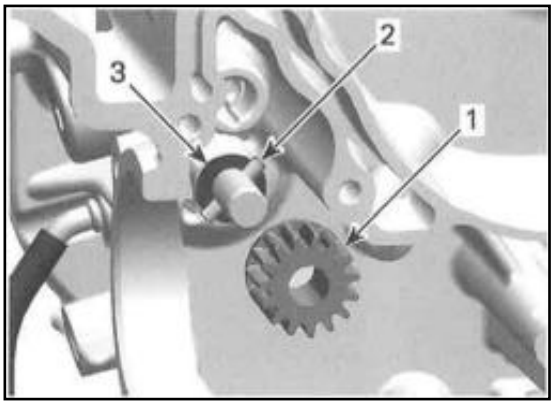
See BOTTOM END subsection.

Water Pump Gears Installation

Water Pump Gear

Install the following parts on water pump shaft.
- Thrust washer
- Needle pin
- Water pump gear.

NOTICE A missing thrust washer will cause a leaking rotary seal.



1. Water pump gear

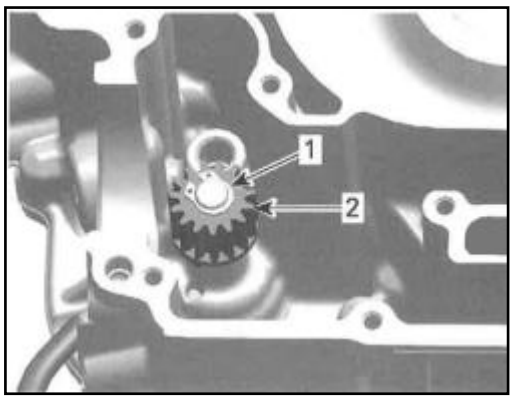
2. Needle pin
3. Thrust washer

NOTE: Ensure water pump gear snaps properly onto needle pin.

Install NEW circlip to retain water pump gear.

NOTICE Never use the circlip a second time.

Always install a NEW one.



1.Circlip
2. Water pump gear

Water Pump Intermediate Drive Gear

Install the following parts on water pump intermediate shaft.

- Needle pin

- Water pump intermediate drive gear.

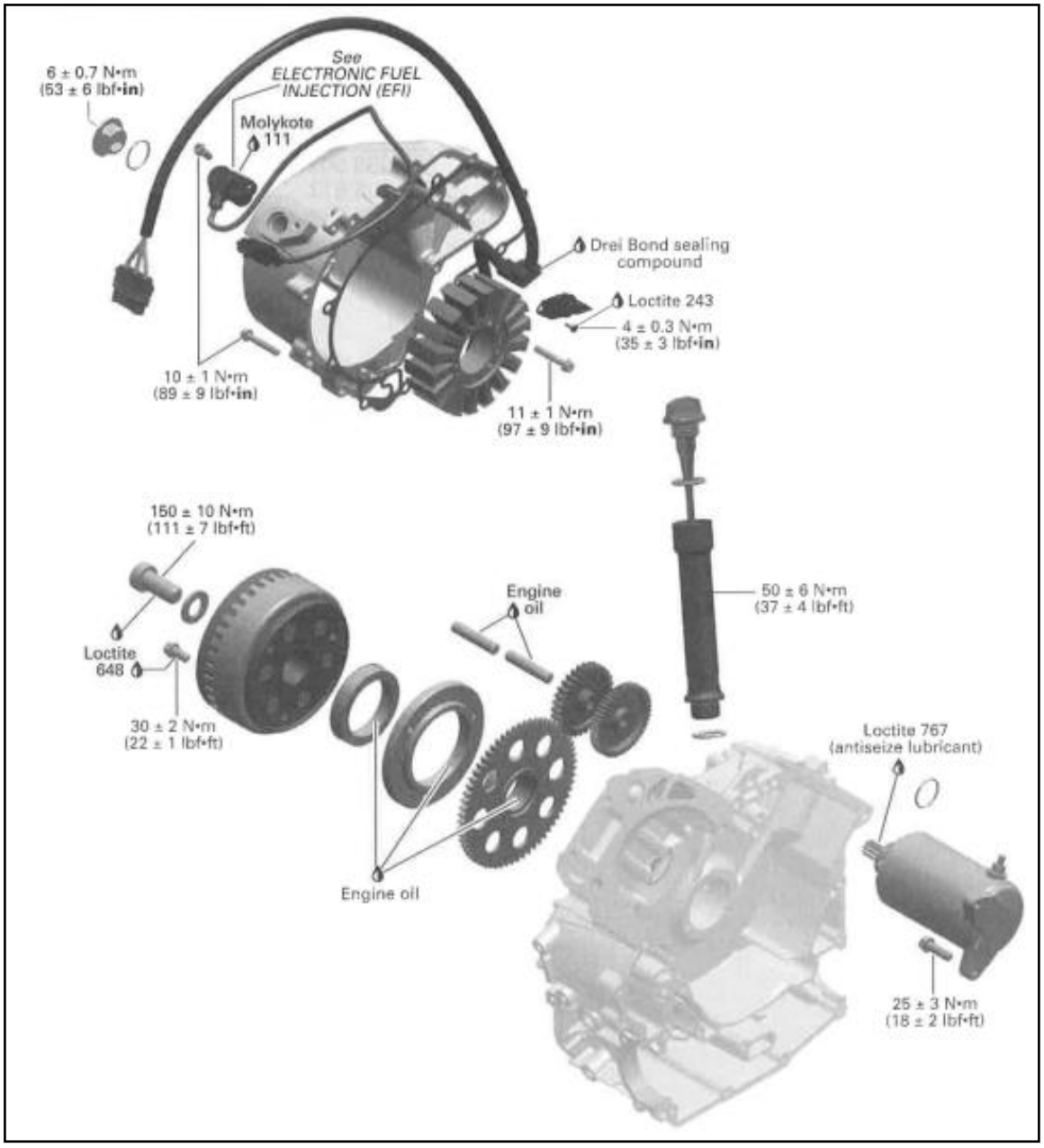
Install NEW circlip to retain water pump intermediate drive gear.

NOTICE Never use the circlip a second time. Always install a NEW one.

Water Pump Drive Gear

See BOTTOM END subsection.

MAGNETO AND STARTER



PROCEDURES

MAGNETO COVER

Magneto Cover Access

Remove fuel tank, refer to FUEL TANK AND FUEL PUMP

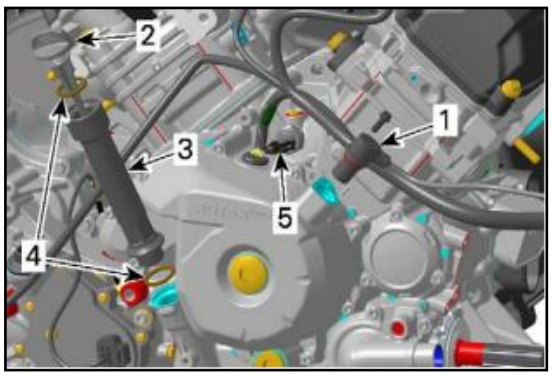
Removing the Magneto Cover

Drain engine oil (refer to PERIODIC MAINTENANCE PROCDURES subsection).

Remove crankshaft position sensor (CPS) and cut tie raps.

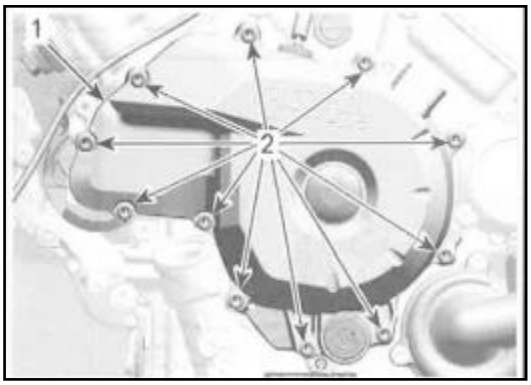
Remove dipstick and oi1 level tube with O-rings.

Disconnect oil pressure switch (OPS) connector.



1. Crank position sensor (CPS)
2. Dipstick
3. Oil level tube
4. O-rings
5.Oil pressure switch (OPS)connector.

Remove magneto cover retaining screws



1. Magneto cover
2. Retaining crews

Pull out magneto cover.

NOTE: If required, remove stator and harness from magneto cover.

Inspecting and Cleaning the Magneto Cover.

Check magneto cover for cracks or other damage. Replace if necessary.

NOTE: Clean all metal components in a nonferrous metal cleaner. Use LOCTITE CHISEL (GAS- KET REMOVER), or suitable equivalent.

▲WARNING
Wear safety glasses and work in a well ventilated area when working with strong chemical products. Also wear suitable nonabsorbent gloves to protect your hands.

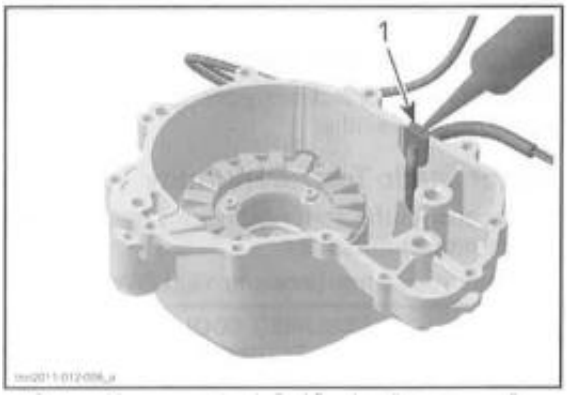
Installating the Magneto Cover

For installation, reverse the removal procedure. However, pay attention to the following.

NOTE: Install a NEW magneto cover gasket.

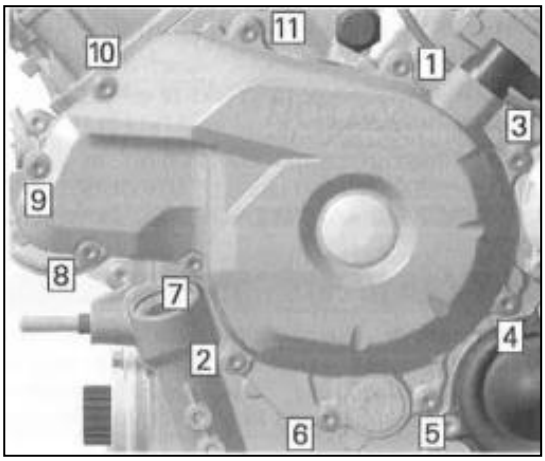
Apply sealant on stator cable grommet as shown in next illustration.

REQUIED TOOL	
Stator cable gromment	DREI BOND SEALING COMPOUND



1. Stator cable grommet (apply Drei Bond sealing compound

Tighten screws using the following sequence



TIGHTENING SEQUENCE

TIGHTENING TORQUE	
Mangneto cover screws	12.5N.m±1N.m

ROTOR

Removing the Rotor

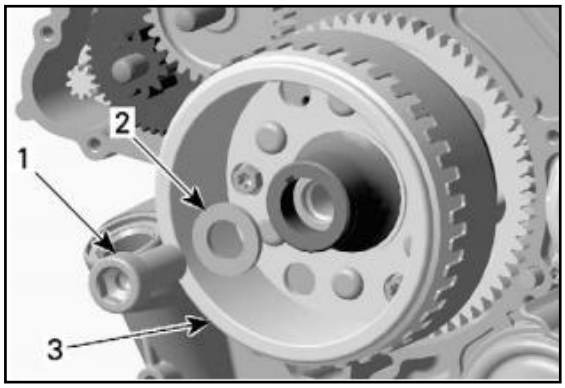
Remove MAGNETO COVER. See procedure in this subsection.

Lock crankshaft(refer to CRANKSHAFT LOCKING PROCEDURE in the BOTTOM END subsection).

REQUIRED TOOL	
CRANKSHAFT LOCKING BOLT	

Heat screw in order to break the Loctite.

Remove screw and washer securing rotor to crankshaft.

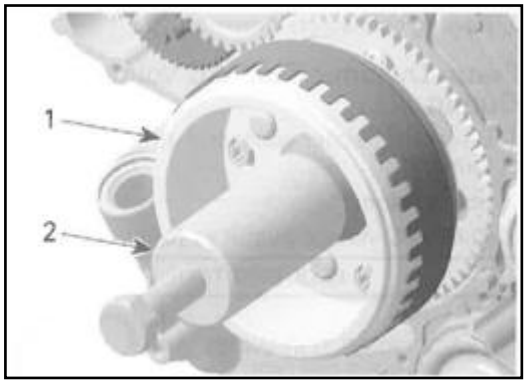


1. Screws M16
2. Washer
3. Rotor

Remove rotor.

REQUIRED TOOL	
MAGNET0 PULLER	
CRANKSHAFT PROTECTOR	

NOTE: Use grease to place protector on crank- shaft end prior to screw on the magneto puller.



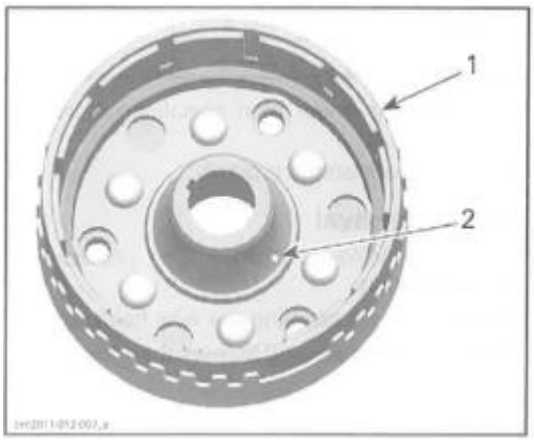
1. Rotor
2. Magneto puller

Screw magneto puller bolt to remove rotor.

Inspecting the Rotor

Check inner side of rotor for scratches or other damage.

Blow pressurized air in the rotor oil bore and make sure it is not clogged.



1. Rotor
2. Oil bore

Check keyway of the rotor for wear or damages. Check if trigger wheel teeth are bent or otherwise damaged.

Check woodruff key and keyway on the crank- shaft for wear or damages.

Replace parts as necessary.

Installating the Rotor

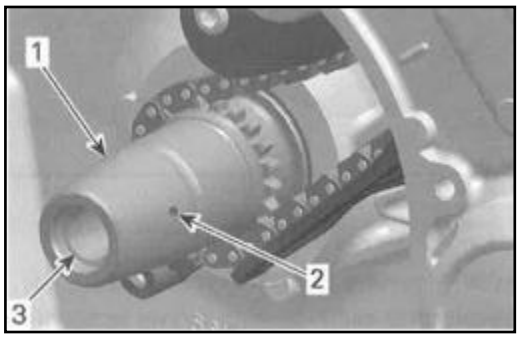
For installation, reverse the removal procedure.

However, pay attention to the following.

Use PULLEY FLANGE CLEANER to clean following:

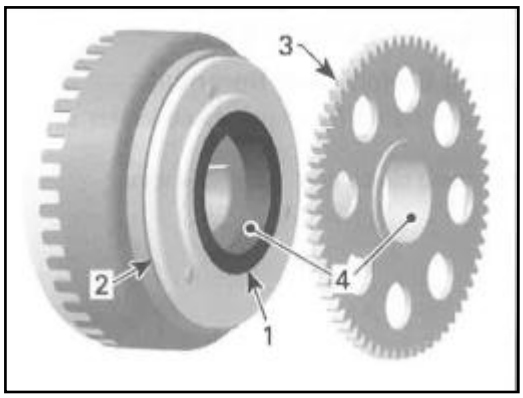
- Crank shaft taper
- Oil passage in crank shaft taper
- Thread in crankshaft
- Rotor taper
- Oil bore in rotor.

NOTICE Taper on crankshaft and rotor must be free of grease.



1. Crankshaft (MAG side)
2. Oil passage
3. Threads

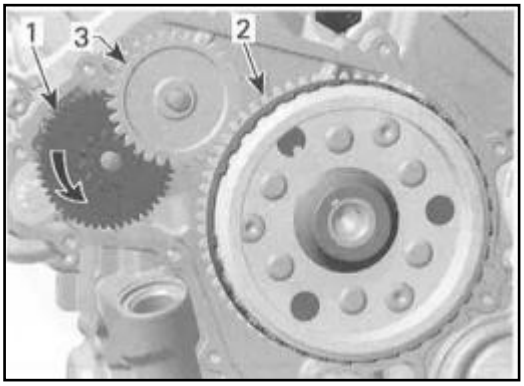
Oil sprag clutch and instal1 sprag clutch gear.



1. Sprag clutch
2. Sprag clutch housing
3. Sprag clutch gear
4. Apply engine oil here

Slide rotor onto crankshaft. The woodruff key and the keyway must be aligned.

Rotate starter double gear counterclockwise to align intermediate gear teeth with sprag clutch gear.



1. Starter double gear
2. Sprag clutch gear
3. Intermediate gear

ROTOR RETAINING SCREW	
Service product	德邦 2569
Tightening torque	150N·m±10N·m

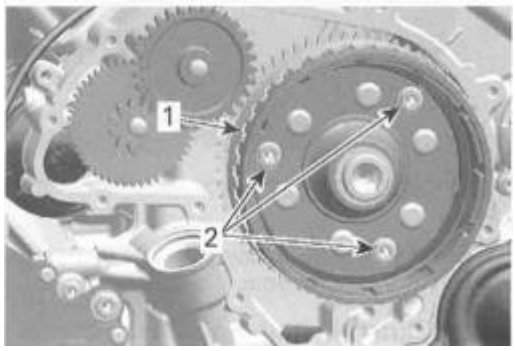
SPRAG CLUTCH

Sprag Clutch Removal

Remove MAGENTO CIVER. See procedure in this subsection.

Heat sprag clutch housing screws in order to break the Loctite.

Loosen screws.

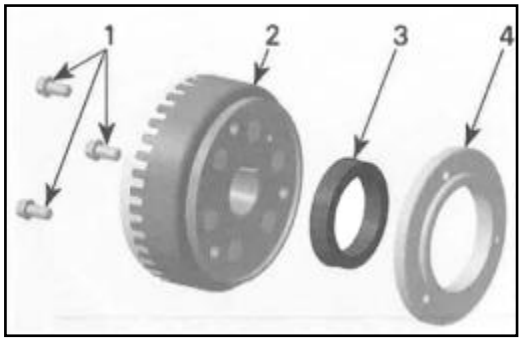


1. Rotor
2. Sprag clutch housing screws

Remove rotor,refer to ROTOR in this subsection.

Remove sprag clutch gear.

Remove sprag clutch housing screws and sprag clutch housing.



1. Sprag clutch housing screws
2. Rotor
3. Sprag cluth
4. Sprag clutch housing

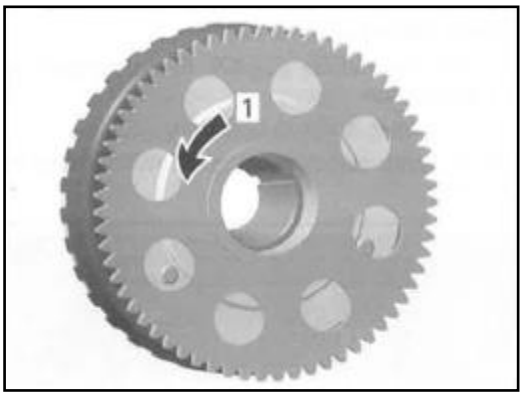
Inspecting the Sprag Clutch

Inspect sprag clutch and sprag clutch housing for wear and damage.

Also check the collar of the sprag clutch gear.

Rotate sprag clutch gear in sprag clutch.

NOTE: Sprag clutch must lock in counterclockwise direction.



SPRAG CLUTCH FUNCTION TEST
1. Lock

NOTE: Sprag clutch, housing and gear must be replaced at the same time, if damaged.

Installating the Sprag Clutch

For installation, reverse the removal procedure.

Pay attention to the following details.

Use PULLEY FLANGE CLEANER to clean following:

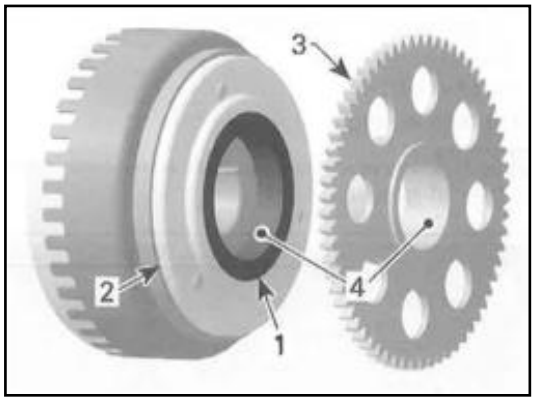
-Threads in sparg clutch housing

-Threads of sparg clutch housing screws.

Apply 2569 on threads of sprag clutch housing screws.

Install screws but do not torque yet.

Apply engine oil on sprag clutch and sprag clutch gear needle bearing.



1. Sprag clutch
2. Sprag clutch housing
3. Sprag clutch gear
4. Apply engine oil here

Insta11 rotor, refer to ROTOR in this subsection.

Tighten sprag clutch housing screws to specification.

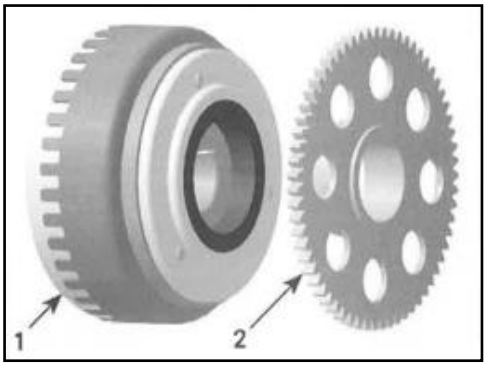
TIGHTENING TORQUE	
Sprag clutch housing screws	30N·m±2N·m

SPRAG CLUTCH GEAR

Sprag Clutch Gear Removal

Remove ROTOR. See procedure in this subsection.

Pul1 sprag clutch gear out of the rotor.

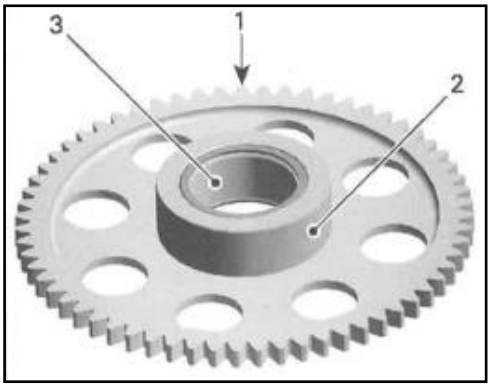


1. Rotor
2. Sprag clutch gear

Inspecting the Sprag Clutch Gear

Inspect gear, especially teeth and sprag clutch Collar, for wear and other damage.

Check needle bearing condition. Replace sprag clutch gear if necessary.



INSPECT
1. Teeth
2. Collar
3. Needle bearing

Installating the Sprag Clutch Gear

The installation is the reverse of the removal Procedure.

NOTE: Apply engine oil on needle

bearing and Collar of sprag clutch gear.

STARTER DRIVE GEARS

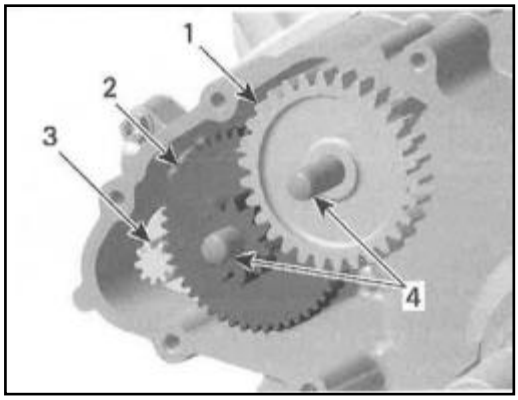
Starter Drive Gear Location

The starter drive gears are located on the engine MAG side behind the magneto cover.

Removing the Starter Drive Gear

Remove MAGENTO COVER. See procedure in this subsection.

Remove location pins, starter double gear and intermediate gear.



1. Intermediate gear
2. Starter double gear
3. Starter gear
4. Location pins

Inspecting the Starter Drive Gear

Inspect gears and location pins for wear and dam- age.

Replace parts as necessary.

Installating the Starter Drive Gear

The installation is the reverse of the removal Procedure. Pay attention to the following details.

Apply LOCTITE 767 (ANTISEIZE LUBRICANT) on starter gear before installing the starter double gear. Apply engine oil on location pins.

ELECTRIC STATER

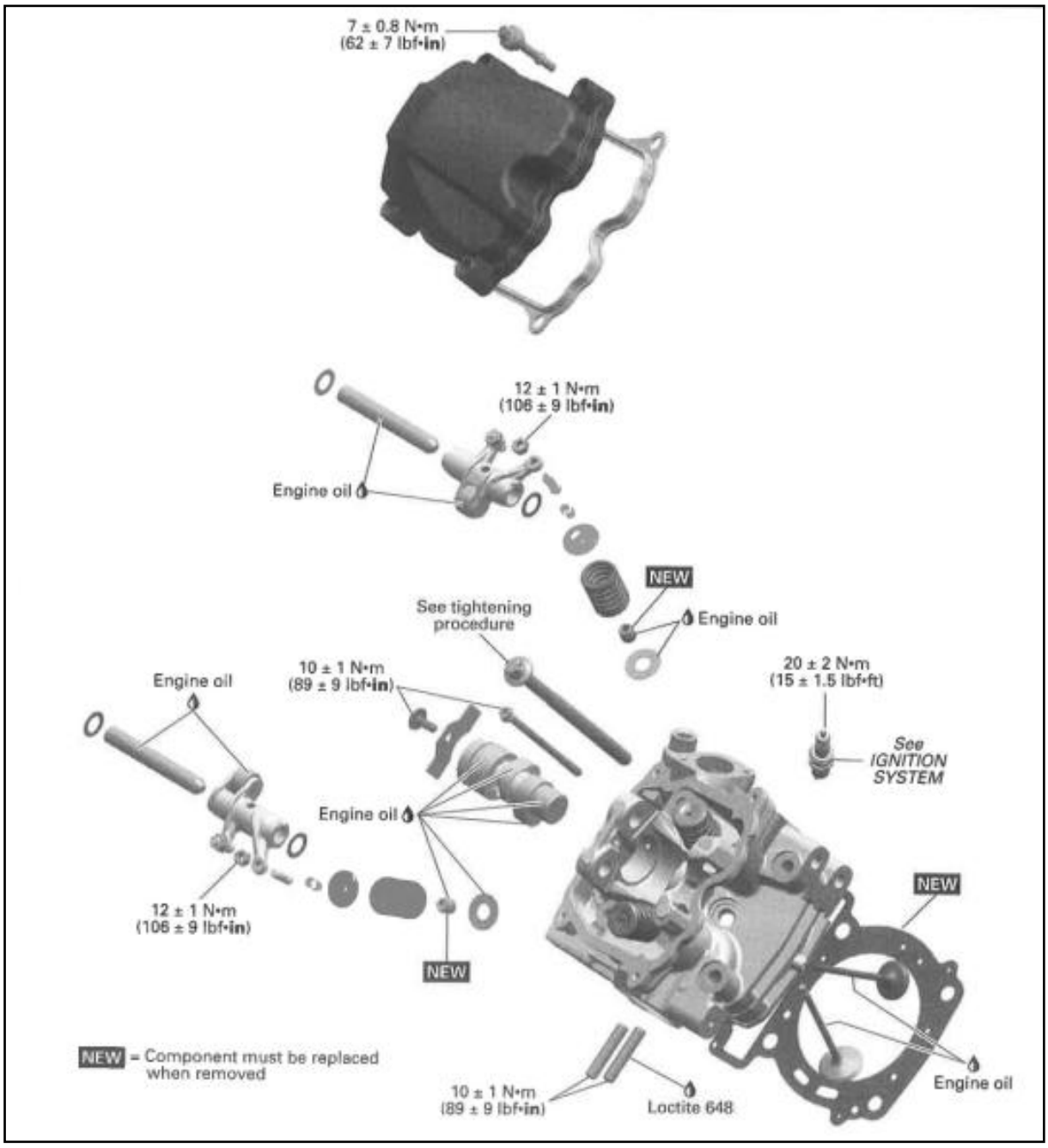
Staer Access

To reach the stater,open the cargo box .

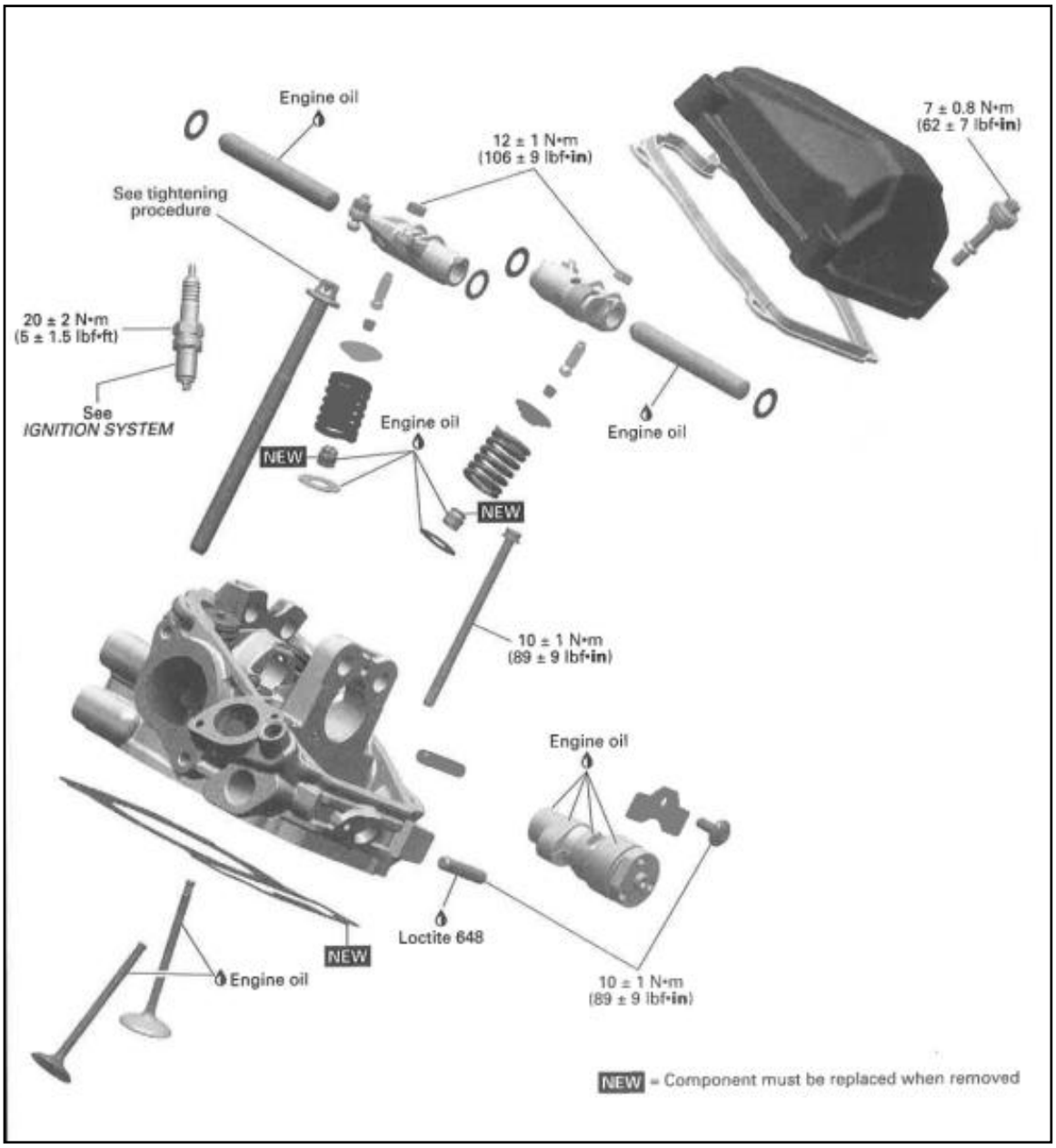
Stater is located under rear cylinder.

TOP END

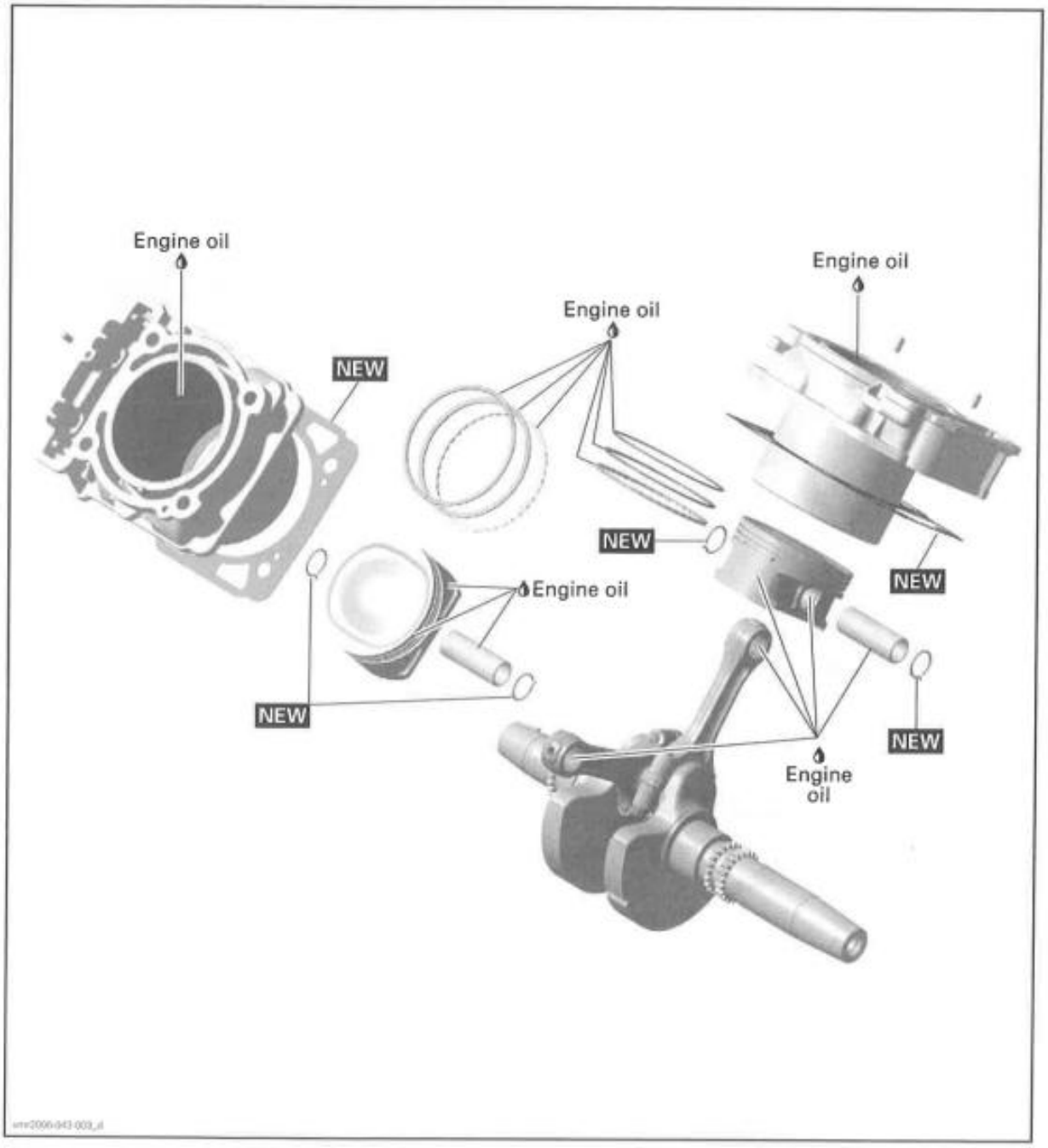
SERVICE TOOLS



CYLINDER HEAD NO.2



CYLINDER AND PISTONS



GENERAL

Special reference are made in the text for procedures which are different for cylinder no. 1 and cylinder no. 2.

1. Cylinder 1 (front)
2. Cylinder 2 (rear)

When diagnosing an engine problem, always perform a cylinder leak test.

NOTE: Even though the following procedures do not require the engine removal, many illustrations show the engine out of the vehicle for more clarity.

IMPORTANT: Note position of parts on disassembly. This may help to find the root cause of a problem. A component that is not replaced should be reinstalled in the same position as originally mounted.

INSPECTION

LEAK TEST

Before performing the cylinder leak test , verify the following:

- Clamp(s) tightness

- Radiator and hoses.

NOTE: For best accuracy, the leak test should be done with the engine at normal operating temperature.

△WARING
Prevent burning yourself on hot engine parts.

Preparation

Disconnect battery

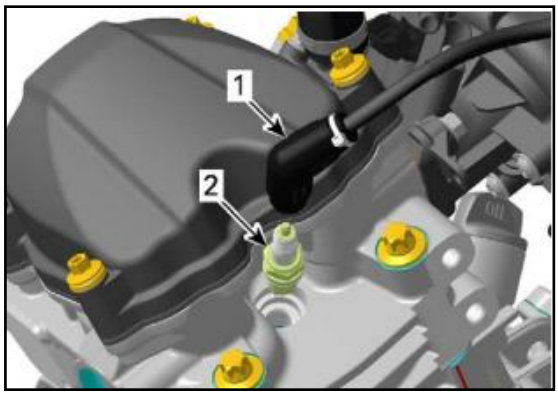
△WARING
Always respect this order for disassembly; disconnect BLACK (-) cable first.

Remove radiator cap.

△WARING
To prevent burning yourself only remove the radiator cap by wearing the appropriate safety equipment.

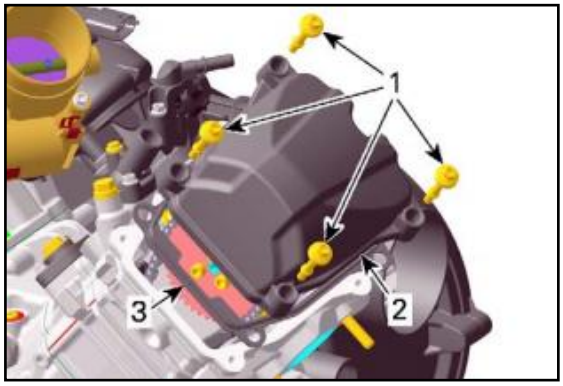
Unplug spark plug cable.

Clean spark plug area and remove spark plug from cylinder head.



1. Spark plug cable
2. Spark plug

Remove valve cover.



1. Valve cover screws
2. Valve cover
3.Gasket

Rotate crankshaft until piston is at ignition TDC.

To turn crankshaft, there are two possible procedures.

First Procedure

Turn the drive pulley.

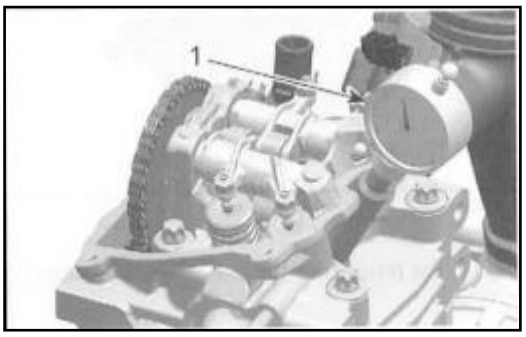
Second Procedure

1. Remove plug screw with O-ring from magneto cover.

2. Use a14 mm Allen key and turn crankshaft.

NOTICE Turn only clockwise to avoid loosening of magneto flywheel Allen screw. Set the piston to precisely ignition TDC.

REQIRED TOOL	
TDCDIAL INFICATOR	



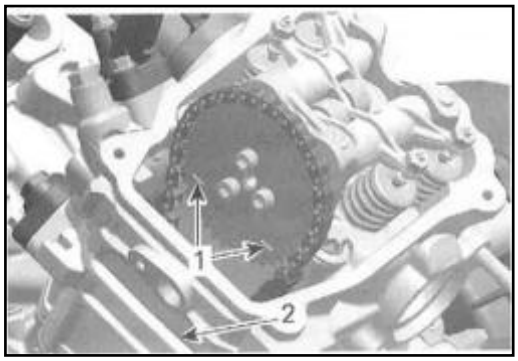
1. Dial gauge

NOTE: If a dial gauge is not available , use a screw driver or another similarly suitable tool.

NOTICE Do not scratch or damage piston/ cylinder surface.

NOTE: At ignition TDC the marks on the camshaft timing gear have to be parallel to cylinder head base as per following

illustration.



1. Marks on camshaft timing gear
2. Cylinder 1leaol base

Diagnosis

Listen for air leaks .

_ Air escaping in intake port/throttle body means leaking intake valve(s).

_ Air escaping in exhaust port means leaking exhaust valve(s).

_ Air bubbles in the coolant (radiator) means leaking cylinder head gasket.

_ Air/coolant escaping from cylinder/head means damaged gasket(s) and/or loosened screws.

_ Air escaping into crankcase area means excessively worn cylinder and/or broken piston rings.

_ Air/oil escaping from crankcase means damaged gasket and/or loosened screws(refer to BOTTOM END subsection).

NOTE: For all the checkpoints mentioned above, see the appropriate engine section to diagnose and repair the engine.

Reassembly

Reverse the preparation procedure. Ensure to respect torque values and use of appropriate Products / lubricants. Refer to exploded views in other subsections of this manual as required.

PROCEDURES

VALVE COVER

Valve Cover Access

Cylinder 1(front)

Remove the engine service cover located on the rear upper bulkhead.

Cylinder 2(rear)

Simply open the cargo box.

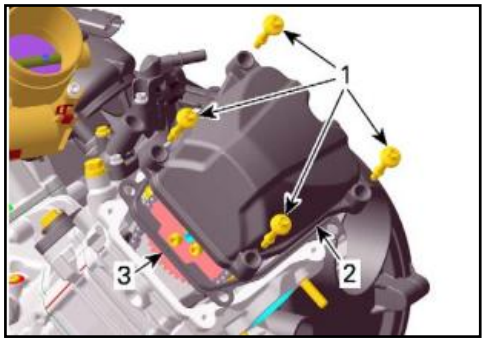
Removing the Valve Cover

Remove:

- valve cover screws

- valve cover.

- gasket



1. Valve cover screws
2. Valve cover
3. Gasket

Repeat the procedure for the other valve cover if required.

Inspecting the Valve Cover

Check the gasket on the valve cover if it is brittle, cracked or hard. If so, replace the gasket.

Installating the Valve Cover

For installation, reverse the removal procedure.

Tighten valve cover retaining screws to specified torque in a criss -cross sequence.

TIGHTENING TORQUE	
Valve cover screws	7N • m±0.8N • m

ROCKER ARM

Rocker Arm Removal

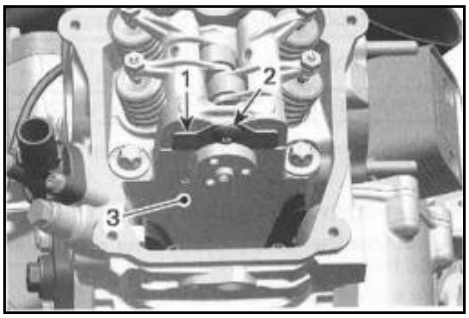
Remove valve cover.

Refer to TIMING CHAIN subsection and remove the following parts:

- Timing chain tensioner

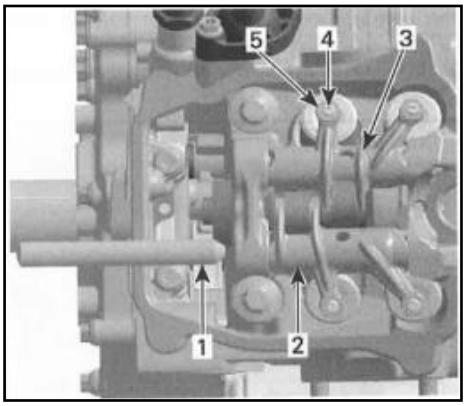
- Camshaft timing gear.

Remove pan head screw and camshaft retaining plate.



1. Camshaft retaining plate
2. Pan head screw
3. Cylinder head

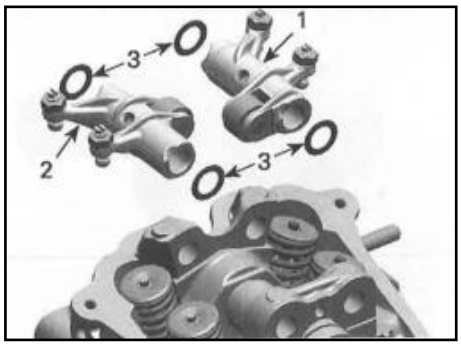
Remove rocker arm shafts



1. Rocker arm shaft
2. Rocker arm (exhaust side)
3. Rocker arm (intake side)
4. Adjustment screw
5. lock nut

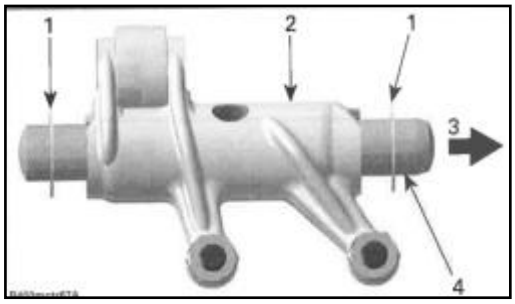
Remove rocker arm assembly(exhaust side and intake side) with adjustment screws and lock nut

Remove thrust washers.



1. Rocker arm (exhaust side)
2. Rocker arm (intake side)
3. Thrust washers

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

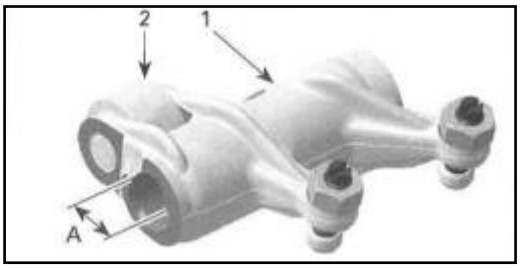


1. 2 thrust washers
2. Rocker arm (exhaust side)
3. Cylinder head (spark plug side)
4. Big taper to spark plug side

Inspecting the Rocker Arm

Inspect each rocker arm for cracks and scored friction surfaces. If so, replace rocker arm assembly.

Check the rocker arm rollers for free movement, wear and excessive radial play. Replace rocker arm assembly if necessary.

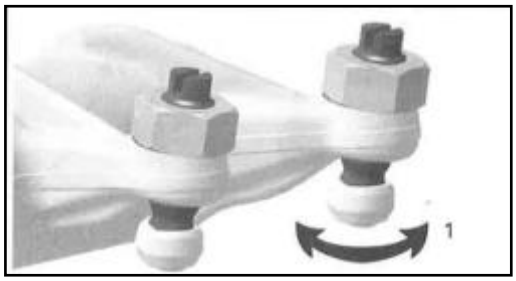


1. Rocker arm (exhaust side)
2. Roller
A. Bore for rocker arm shaft

Measure rocker arm bore diameter. If diameter is out of specification, change the rocker arm assembly.

ROCKER ARM BORE DIAMETER	
NEW	12.036mm to12.050mm
SERVICE LIMIT	12.060 mm

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

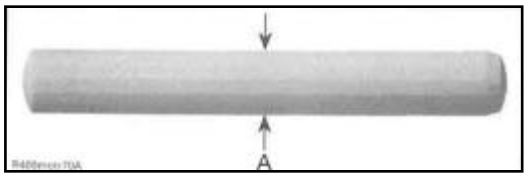


1. Free movement of adjustment screw top

Rocker Arm Shaft Inspection

Check for scored friction surfaces; if so, replace parts.

Measure rocker arm shaft diameter



A. Measure rocker arm shaft diameter here

ROCKER ARM SHAFT DIAMETER	
NEW	12.00mm to12.018mm
SERVICE LIMIT	11.990mm

Any area worn excessively will require parts replacement.

Installating the Rocker Arm

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

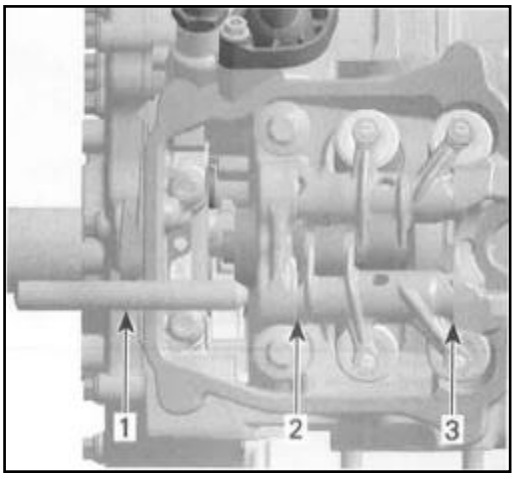
Apply engine oil on rocker arm shaft.

Install the rocker arm shafts with the chamfered edge first and use following procedure.

Insert a rocker arm pin through rocker arm pin bore.

Install a thrust washer at timing chain side, then the proper rocker arm(exhaust side or intake side).

Push in rocker arm shaft until its chamfer reaches the end of rocker arm bore.



1. Rocker arm shaft
2. Thrust washer (timing chain side)
3. Thrust washer (spark plug side)

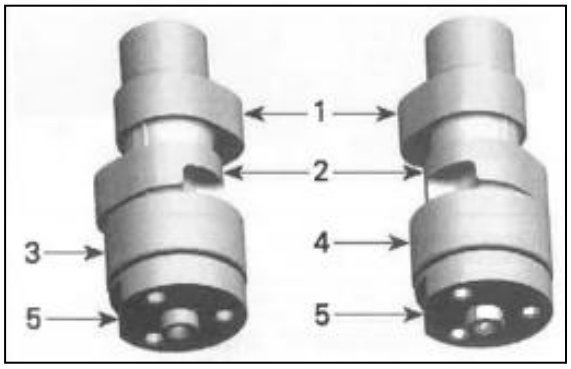
Place the other thrust washer and push rocker arm shaft to end position.

Install the camshaft retaining plate.

Adjust valve clearance, refer to PERODIC MAINTENANCE PROCEDURE

CAMSHAFT

NOTE: The engine is equipped with two different camshafts.



1. Intake cam
2. Exhaust cam
3. Camshaft of cylinder1
4. Camshaft of cylinder1
5. Flat spot

Removing the Camshaft

The removal procedure is the same for both camshafts.

NOTICE Each camshaft is different in design.

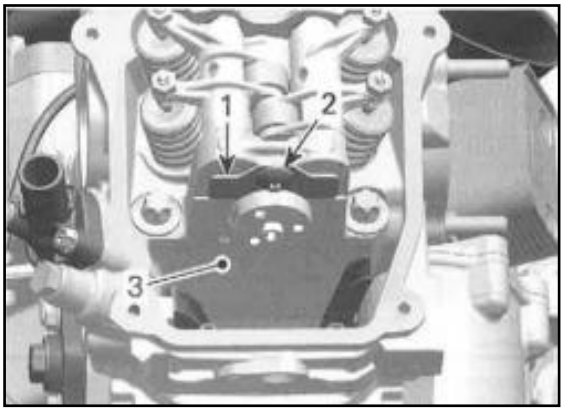
Thus, it is important not to mix up any parts of the camshaft assembly with that of the other cylinder. Keep parts as a group.

Remove valve cover(see VALVE COVER in this subsection).

Refer to TIMING CHAIN subsection and remove the following parts:

- Timing chain tensioner
- Camshaft timing gear.

Remove the camshaft retaining plate.

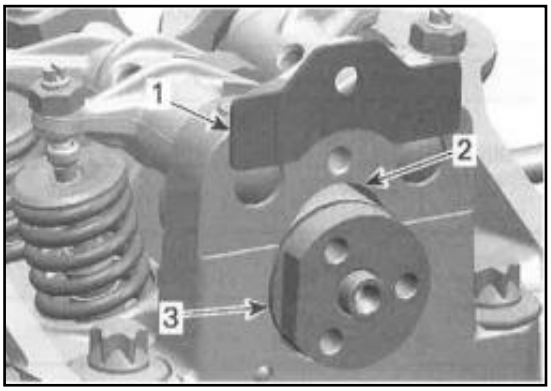


1. Camshaft retaining plate
2. Pan head screw
3. Cylinder head

Remove rocker arms (see ROCKER ARM in this subsection).

Remove the camshaft.

NOTE: For removal rotate camshaft so that intake/ exhaust lobe shows to upper side of cylinder head.



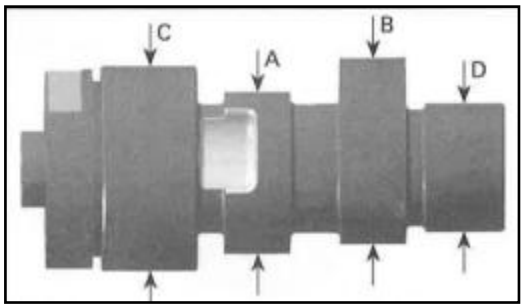
1. Camshaft retaining plate
2. Area for camshaft lobes
3. Camshaft

Inspecting the Camshaft

Inspecting the Camshaft Lobe

Check each lobe for scoring, scuffing, cracks or other signs of wear.

Measure camshaft lobe height using a micrometer



A. Camshaft lobe (exhaust valves)
B. Camshaft lobe (intake valves)
C. Camshaft journal (timing chain side)
D. Camshaft journal (spark plug side)

CAMSHAFT LOBE (EXHAUST)	
NEW	32.860 mm to33.060 mm
SERVICE LIMIT	32.840 mm

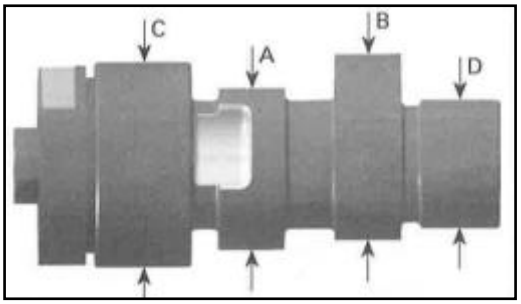
CAMSHAFT LOBE (INTAKE)	
NEW	32.960 mm to33.160 mm
SERVICE LIMIT	32.940 mm

Measure camshaft bearing in cylinder head . Refer to CYLINDER HEAD INSPECTION in this subsection.

Inspecting the Camshaft Journal

Check each journal for scoring, scuffing, cracks or other signs of wear.

Measure camshaft journal using a micrometer .



A. Camshaft lobe (exhaust valves)

B. Camshaft lobe (intake valves)

C. Camshaft journal (timing chain side)

D. Camshaft journal (spark plug side)

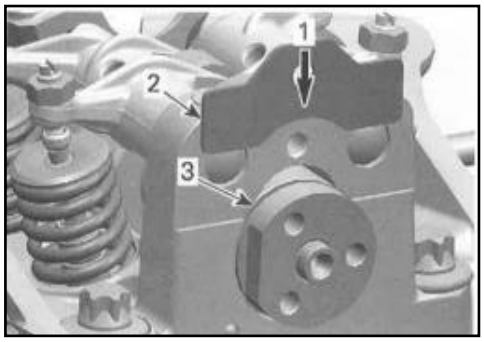
CAMSHAFT JOURNAL (TIMING CHAIN SIDE)	
NEW	34.959mm to34.975mm
SERVICE LIMIT	34.950 mm

CAMSHAFT JOURNAL (SPARK PLUG SIDE)	
NEW	21 959 mm to21 980 mm
SERVICE LIMIT	21 .950 mm

Installating the Camshaft

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

NOTICE The camshafts are not identical in design. Do not invert the camshafts during assembly. Any mix-up of the components will lead to engine damage. Place the camshaft retaining plate in the slot of the camshaft.



1. Direction of movement
2. Camshaft retaining plate
3. Slot retaining camshaft

For other parts, refer to proper installation procedure.

CYLINER HEAD

Cylinder Head Access

Cylinder 1(front)

The engine removal is required to work on cylinder 1.

Cylinder 2(rear)

Simply open the cargo box.

Removing the Cylinder Head

Drain coolant. Refer to ENGINE COOLANT REPLACEMENT in the PERIODIC MAINTENANCE PRODURES subsection.

NOTE: Before removing cylinder head, blow out remaining coolant by air pressure. During cylinder head removal, the remaining coolant in cylinder head could overflow into the engine and a little quantity of coolant could drop into the engine. In this case, the engine oil will be contaminated.

Disconnect spark plug wire.

Disconnect temperature sensor connector, located at rear cylinder head.

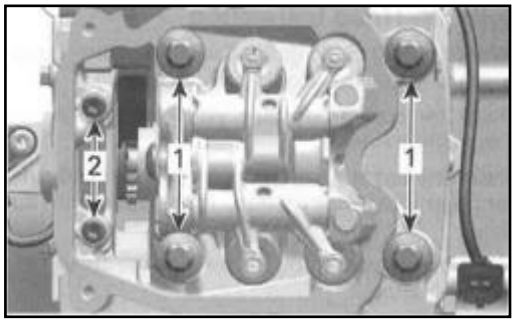
Remove the valve cover and its gasket (see VALVECOVER in this subsection).

Refer to TIMING CHAIN subsection and remove the following parts:

- Timing chain tensioner

- Camshaft timing gear.

First remove the M6 cylinder he1id screws, then the M10 cylinder head screws.

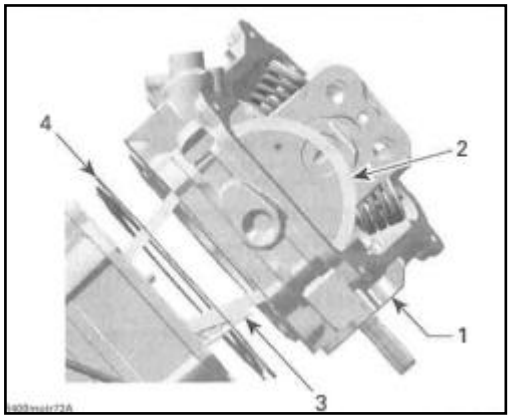


1. Cylinder head screws M 10
2. Cylinder head screws M 6

Pull up cylinder head.

Remove timing chain guide (fixed).

Remove and discard the cylinder head gasket,



1. Cylinder head
2. Timing chain
3. Chain guide (fixed)
4. Cylinder head l gasket

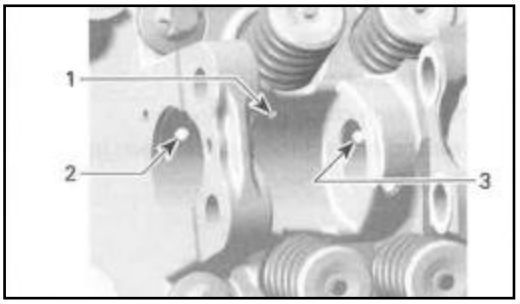
Inspecting the Cylinder Head

Inspect timing chain guide (fixed) for wear, cracks or other damages. Replace if necessary.

Check for cracks between valve seats, if so, replace cylinder head.

Check mating surface between cylinder and cylinder head for contamination. If so, clean both surfaces.

Clean oil support through the cylinder head from contamination.



1. Oil port to lubricate camshaft lobes intake /exhaust

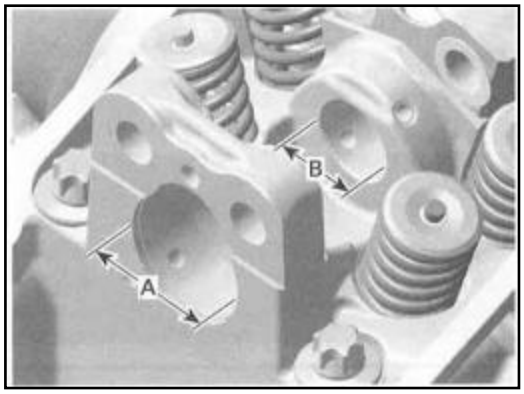
2. Oil supply to camshaft bearing journal (timing chain side)

3. Oil supply to camshaft bearing journal (spark plug side)

Inspecting theCylinder Head

Camshaft Bearing

Measure camshaft bearing in cylinder head.



A. Cam shaft bearing (timing chain side)
B. Cam shaft bearing (spark plug side)

CAMSHAFT BEARING (TIMING CHAIN SIDE)	
NEW	35.000 mm to35.025mm
SERVICE LIMIT	35.040 mm
CAMSHAFT BEARING (SPARK PLUG SIDE)	
NEW	22.000mm to22.021 mm
SERVICE LIMIT	22.040 mm

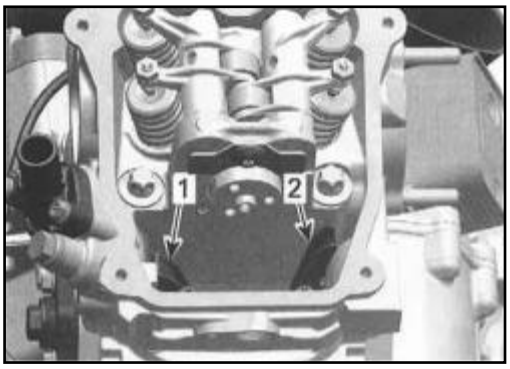
Cylinder Head Installation

NOTE: Never invert front and rear cylinder heads. 0n the800R, cylinder heads are not identica1.

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

Ensure dowel pins are in place.

NOTICE Timing chain guide (fixed) has to be fixed between cylinder and cylinder head.



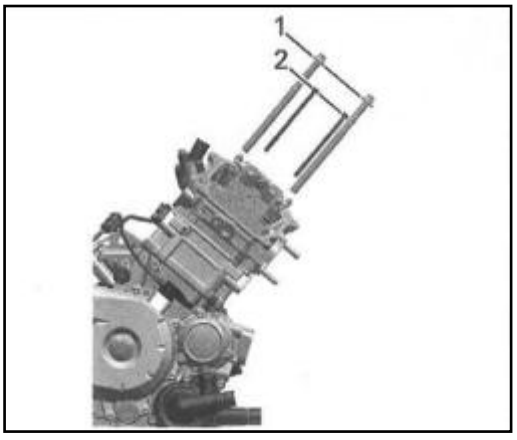
1. Timing chain guide (tensioner side) mounted in crankcase

2. Timing chain guide (fixed) between cylinder ,and cylinder head

Install a NEW cylinder head gasket.

Install cylinder head screws in correct position.

NOTICE Cylinder head screws have different sizes and lengths.

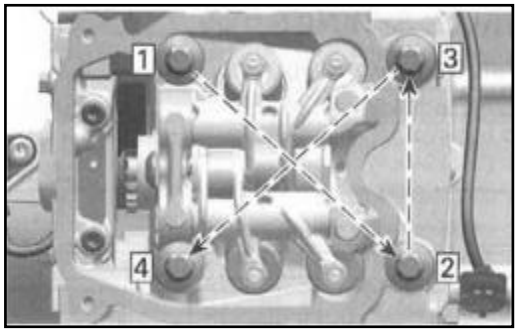


1. Location no. 1
2. Location no. 2

CYLINDER HEAD SCREW IDENTIFICATION	
Location no. 1	M10×159
Location no. 2	M6×105

Tighten M10 cylinder head screws FIRST as per following specifications.

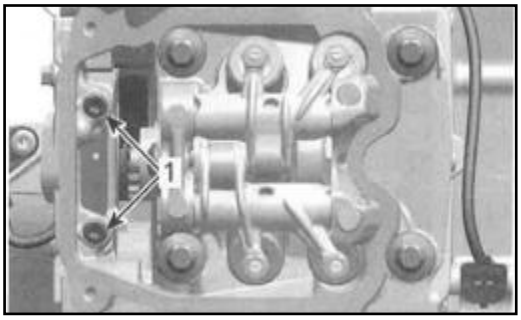
NOTE:Always perform one step on all M10 cylinder hend screws before going to the next step.



TIGHTENCE SEQUENCE-M10 CYLINDER HEAD SCREWS

TIGHTENING TORQUE		
M10 cylinder hend screws	Step A	20N·m±1N·m
	Step B	180° +/−5°

Tighten M6 cylinder head screws as per following specification.



1. M6 Screws

TIGHTENING TORQUE	
M6 cylinder head screws	10N·m±1N·m

Check timing chain guide (tensioner side) for movement.

On cylinder1, install the plenum bracket, refer to INTAKE MANIFOLD subsection.

VALVE SPRINGS

Valve Spring Removal

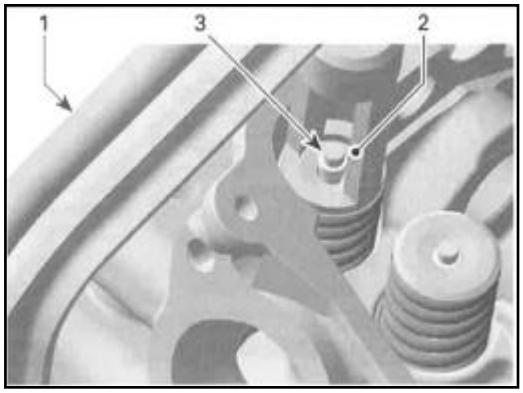
Refer to following procedures in this subsection to remove:

- CAMSHAFT
- CYLINDER

Compress valve spring.

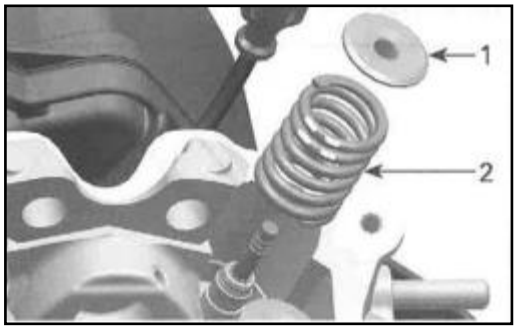
△WARNING
Always wear safety glasses when disassembling valve springs. Be careful when unlocking valves. Components could fly away because of the strong spring preload.

Remove valve cotters,



1. Valve spring compressor clamp
2. Valve spring compressor cup
3. Valve cotter

Remove tools and withdraw valve spring retainer and valve spring.



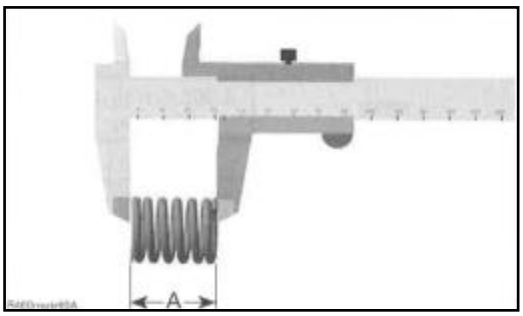
1. Valve spring retainer
2. Valve spring

Valve Spring Inspection

Check valve spring for visible damage.

lf so, re- place valve spring.

Check valve spring for free length and straightness.



A. Valve spring length

VALVE SPRING FREE LENGTH	
NEW	40.81 mm
SERVICE LIMIT	39.00 mm

Replace valve springs if not within specifications.

Installating the Valve Spring

For installation, reverse the removal procedure.

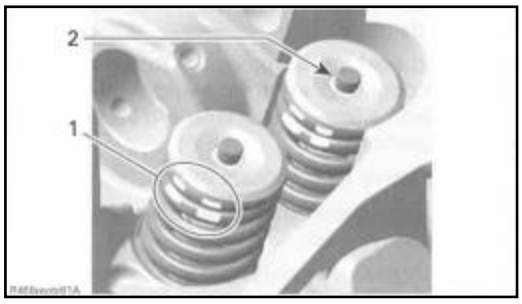
Pay attention to the following detai1s.

Colored area of the valve spring must be placed on top.

To ease installation of cotters, 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.



1. Position of the valve spring
2. Valve cotter

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.

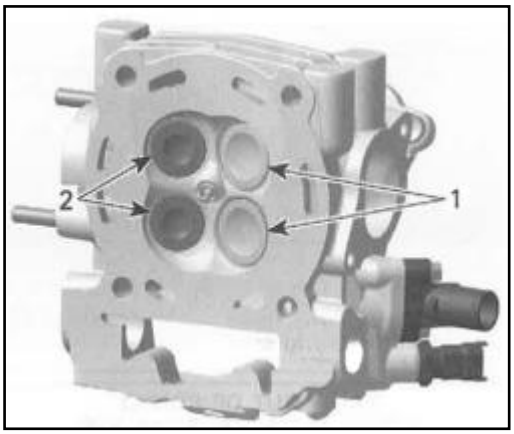
NOTICE An improperly 1ocked valve spring will cause engine damage.

VA LVES

Removing the Valve

Remove valve spring, see VALVE SPRING in this subsection.

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



1. Intake valve 31mm
2. Exhaust valve 27 mm

Remove valve stem seal and discard it

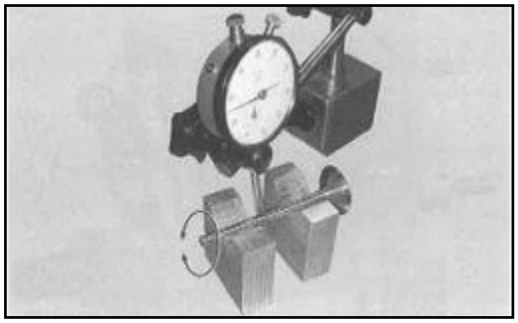
Valve Inspection

Whenever valves are removed always inspect valve guides. Refer to VALVE GUIEDS in this subsection.

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.

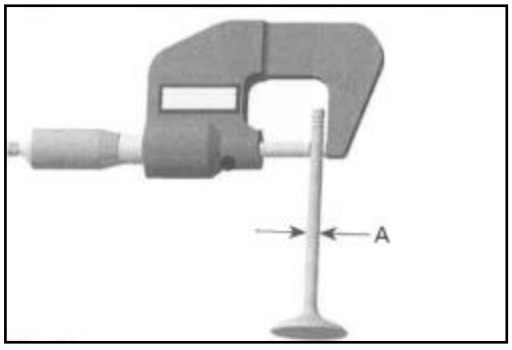


VALVE OUT OF ROUND (INTAKE AND EXHAUST VALVES)	
NEW	0.005mm
SERVICE LIMIT	0.06 mm

Valve Stem

Measure valve stem in three places using a micrometer .

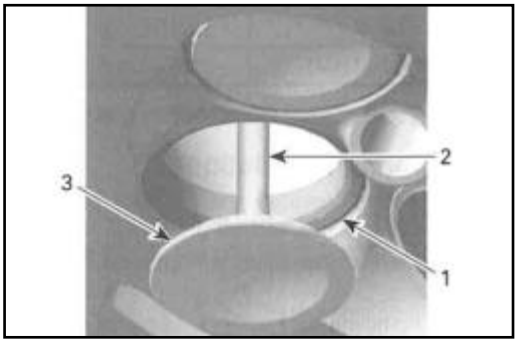
Replace valve if valve stem is out of specification or has other damages such as wear or friction surface.



A. Valve stem diameter

VALVE STEM DIAMETER	
EXHAUST VALVE	
NEW	4.956mm to4.970 mm
SERVICE LIMIT	4.930mm
INTAKE VALVE	
NEW	4.966mm to4.980 mm
SERVICE LIMIT	4.930mm

Valve Face and Seat



1. Valve seat
2. Exhaust valve contaminated area
3. Valve face (contact surface to valve seat)

Check valve face and seat for burning or pittings 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 1ts seat with a lapping tool (see VALVE GUIDEA in this subsection).

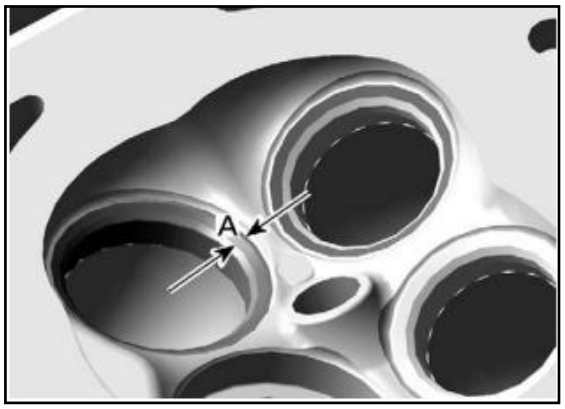
Measure valve face contact width.

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	1.25mm to1.55mm
SERVICE LIMIT	2.00 mm(.079 in)
INTAKE VALVE	
NEW	1.05mm to1.35mm
SERVICE LIMIT	1.80mm(.071 in)

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



A. Valve face contact width

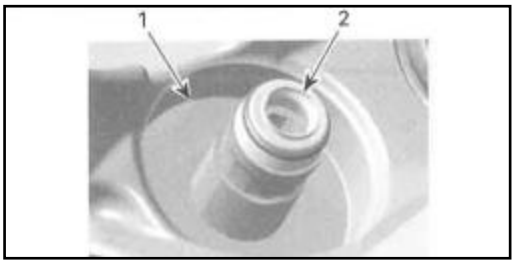
Installating the Valve

For installation, reverse the removal procedure. 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 insta1l it.

NOTICE Be careful when valve stem is passed through sealing lips of valve stem sea1.



1. Thrust washer
2. Sealing lips of valve stem seal

To ease installation of cotters, apply oil or grease on them so that they remain in place while releasing the spring.

After spring is installed, ensure it is properly locked by tapping on valve stem end with a soft hammer so that valve opens and c1oses a few times.

NOTICE An improperly locked valve spring wi11 cause engine damage.

VALVE GUIDES

Valve Guide Inspection

Always replace valve stem seals whenever valve guides are removed.

Measure valve guide in three places using a small bore gauge.

NOTE: Clean valve guide to remove carbon deposits before measuring.

Replace valve guide if it is out of specification or has other damages such as wear or friction surface.

VALVE GUIDE DIAMETER (INTAKE AND EXHAUST VALVES	
NEW	4.998mm to5.018mm
SERVICE LIMIT	5.050 mm

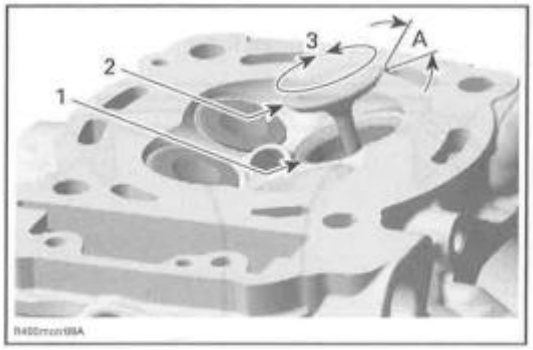
Removing the Valve Guide

Refer to following procedures in this subsection to remove:

- Cylinder head
- Valves.

Apply some lapping compound to valve face and

work valve on its seat with a lapping tool.



1. Valve seat
2. Valve face (contact surface to valve seat)
3. Turn valve while pushing against cylinder head

A. Valve seat angle 45°

NOTE: Ensure to seat valves properly.

Apply marking paste to ease checking contact pattern. Repeat procedure until valve seat/valve face fits together.

CYLINDER

Cylinder Removal

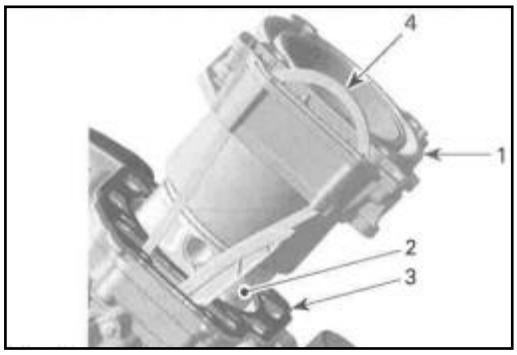
Refer to TUMING CHAIN subsection and remove the following parts:

- Timing chain tensioner
- Camshaft timing gear.

Remove the cylinder head (see CYLINDER HEAD in this subsection).

Pull cylinder.

Discard cylinder base gaskets.



1. Cylinder
2. Piston assembly
3. Cylinder base gasket
4. Camshaft timing chain

Inspecting the Cylinder

Check cylinder for cracks, scoring and wear ridges on the top and bottom of the cylinder. If so, replace cylinder.

Cylinder Taper

Measure cylinder bore at3 recommended positions.

A. First measurement (from cylinder bottom)
B. Second measurement
C. Third measurement

CYLINDER TAPER MEASUREMENTS	
MEASUREMENT	SPECIFICATION
A	5mm
B	58 mm
C	52 mm

CYLINDER TAPER SPECIFICATION	
NEW (MAXIMUM)	0.038mm
SERVICE LIMIT	0.090 mm

Distance between measurements should not exceed the service limit mentioned above. Otherwise, replace cylinder and piston rings.

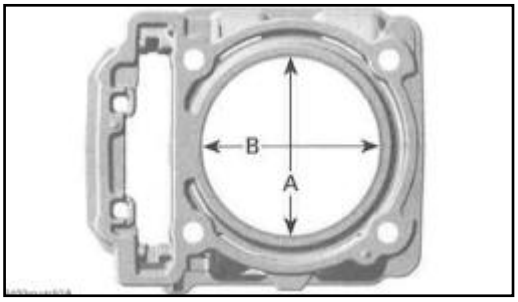
Cylinder Out of Round

Measure cylinder diameter:

-in piston axis

-perpendicular to piston axis.

NOTE: Use the same measuring points as described in CYLINDER TAPER.



A. Perpendicular to crankshaft axis
B. Parallel to crankshaft axis

CYLINDER OUT 0F ROUND	
NEW (MAXIMUM)	0.015mm
SERVICE LIMIT	0.020 mm

Installating the Cylinder

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

NOTICE Always replace cylinder base gasket before installing the cylinder.

NOTE: Make sure piston rings are properly spaced, refer to PISTION in this subsection.

Apply engine oil:

- In the bottom area of the cylinder bore

- On the piston rings

- On the compressor tool.

Compress piston rings.

First mount cylinder 2.

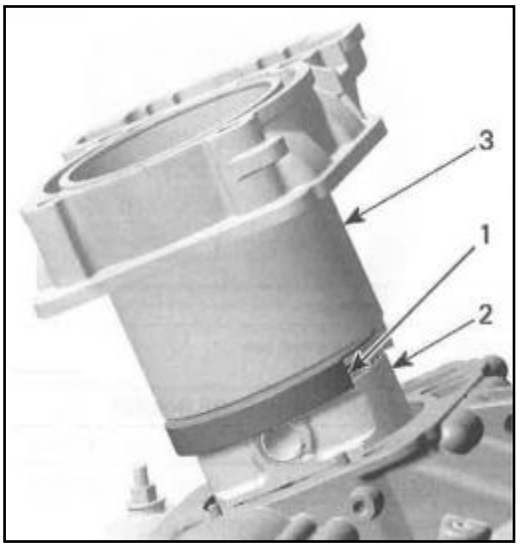
NOTE: The cylinder can not be pushed fully over the piston unless the piston is located at TDC.

Then remove the CRANKSHAFT **LOCKING BOLIT.**

Crank the engine further and position piston1 at TDC.

Mount cylinder 1.

Put timing chain through the chain pit then put the cylinder in place.



1. Piston ring compressor tool
2. Piston
3. Cylinder

NOTICE Chain guide has to be fixed between cylinder and cylinder head.

NOTE: After both cylinders are installed, turn crankshaft until piston of cylinder2 is at TDC and lock crankshaft. Refer to CRANKSHAFT

BOTTOM END subsection.

Install cylinder head and the other parts in accordance with the proper installation procedures.

PISTON

Removing the Piston

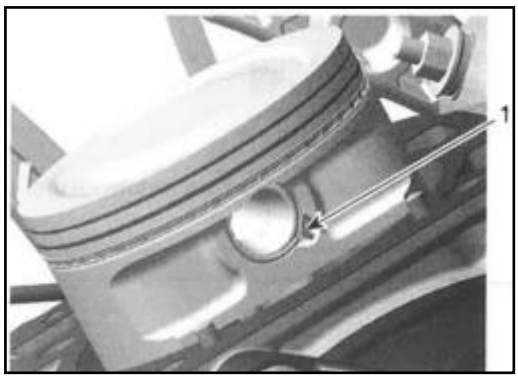
Refer to following procedures in this subsection to remove:

- Cylinder head
- Cylinder.

Place a rag under piston and in the area of timing chain compartment.

△WARNING
Piston circlips are spring loaded

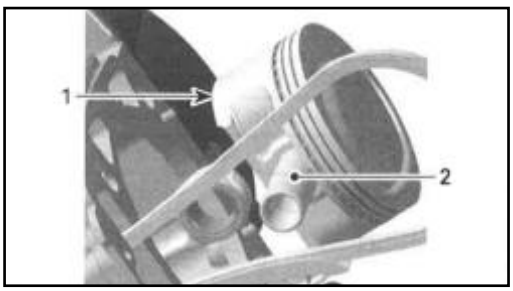
Remove one piston circlip and discard it.



1. Piston circlip

NOTE: The removal of both piston circlips is not necessary to remove piston pin.

Push piston pin out of piston.



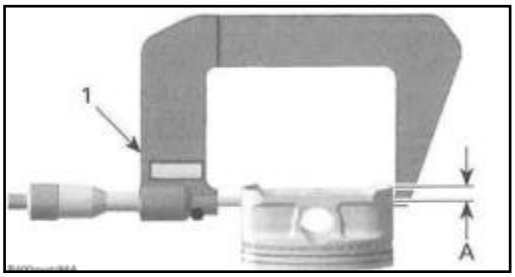
1. Piston
2. Piston pin

Detach piston from connecting rod.

Inspecting the Piston

Inspect piston for scoring, cracking or other damages. Replace piston and piston rings if necessary.

Using a micrometer, measure piston at 8mm perpendicularly (90°) to piston pin.



1. Measuring perpendicularly (90°) to piston pin

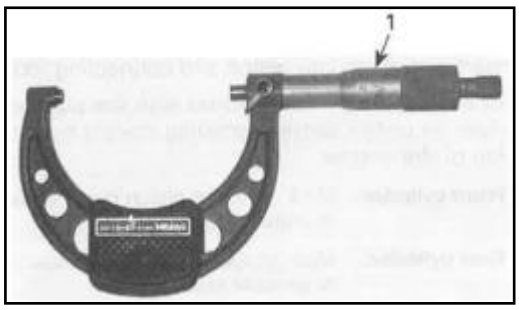
A. 8mrn

The measured dimension should be as described in the following tables. If not, replace piston.

PISTON MEASUREMENT	
NEW	90.950 mm to90.966mm
SERVICE LIMIT	90.850 mm

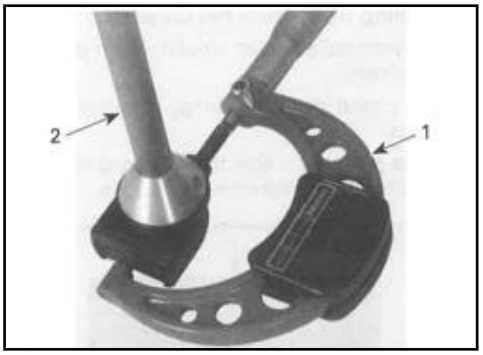
Piston/Cylinder Clearance

Adjust and lock a micrometer to the piston dimension.



1. Micrometer set to the piston dimension

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



1. Use the micrometer to set the cylinder bore gauge
2. Dial bore gauge

Position the dial bore gauge20 mm above cylinder base, measuring perpendicularly (90 °) to piston pin axis.

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

PISTON/CYLINDER CLEARANCE	
NEW	0.027mm to 0.057 mm
SERVICE LIMIT	0.100 mm

NOTE: Make sure used piston is not worn.

If clearance exceeds specified tolerance, replace piston by a new one and measure piston/cylinder clearance again.

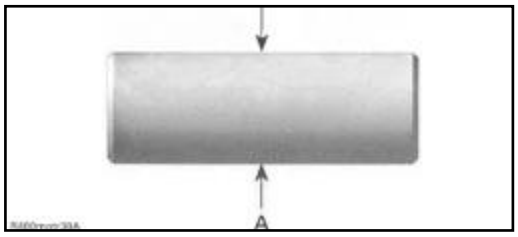
NOTE: Make sure the cylinder bore gauge indicator is set exactly at the same position as with the micrometer, otherwise the reading will be false.

Connecting Rod/Piston Pin Clearance

Using synthetic abrasive woven, clean piston pin from deposits .

Inspect piston pin for scoring, cracking or other damages.

Measure piston pin . See the following illustration for the proper measurement positions.

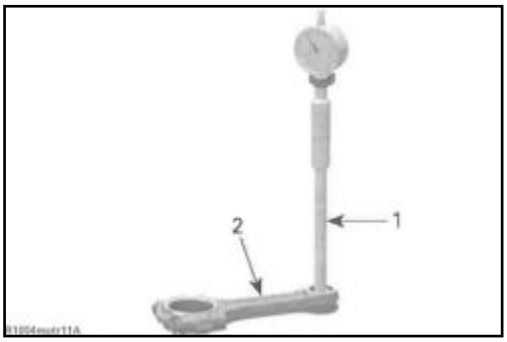


A. Piston pin diameter

PISTON PIN DIAMETER	
NEW	21.996mm to22.000 mm
SERVICE LIMIT	21 .980 mm

Replace piston pin if diameter is out of specifications.

Measure inside diameter of connecting rod small end bushing .



1. Bore gauge
2. Connecting rod

CONNECTING ROD SMALL END DIAMETER	
NEW	20.010 mm to20.020 mm
SERVICE LIMIT	20.050 mm

Replace connecting rod if diameter of connecting rod sma11 end is out of specifications. Refer to BOTTOM END subsection for removal procedure. Compare measurements to obtain the connecting rod/piston pin clearance.

CONNECTING ROD/ PISTON PIN CLEARANCE	
SERVICE LIMIT	0.080mm

Installating the Piston

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

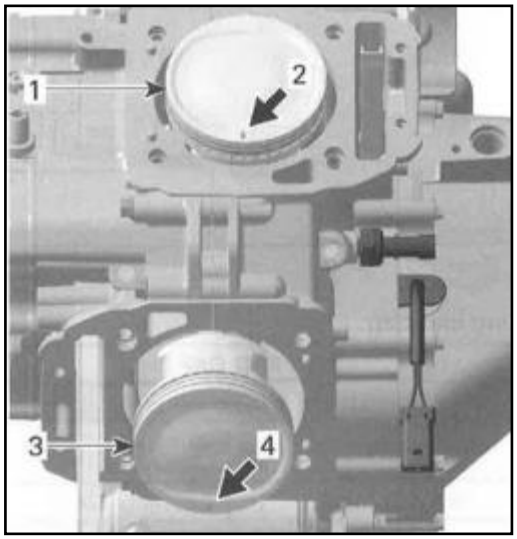
Apply engine oi1 on the piston pin.

1nsert piston pin into piston and connecting rod.

For each cylinder, Install piston with the punched arrow on piston dome is pointing toward the rear side of the engine.

Front cylinder: Mark on top of piston must show to intake side.

Rear cylinder: Mark on top of piston must show to exhaust side.



1. Piston of cylinder 1

2. Mark on piston must show to intake side of cylinder 1

3. Piston of cylinder 2

4. Mark on piston must show to exhaust side of cylinder 2

PISTON RINGS

Removing the Ring

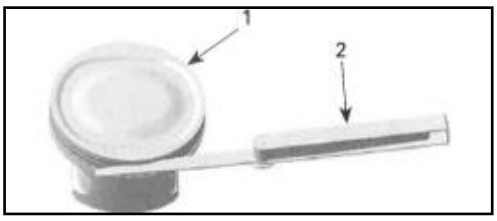
Remove the piston (see PISTON in this subsection).

Inspecting the Ring

Ring/Piston Groove Clearance

Using a feeler gauge measure each ring/piston groove clearance . If the clearance is too large, the piston and the piston rings should be replaced.

RING END GAP	
UPPER COMPRESSION RING	
NEW	0.03mm to 0.07mm
SERVICE LIMIT	0.150mm
LOWER COMPRESSION RING	
NEW	0.02 mm to 0.06mm
SERVICE LIMIT	0.150mm
OIL SCRAPER RING	
NEW	0.01 mm to 0.18mm
SERVICE LIMIT	0.250mm



1. Piston
2. Feeler gauge

Ring End Gap

RING/PISTON GR00VE CLEARANCE	
UPPER COMPRESSION RING	
NEW	0.20 mm to 0.40 mm
SERVICE LIMIT	0.60 mm
LOWER COMPRESSION RING	
NEW	0.20 mm to 0.40mm
SERVICE LIMIT	0.70 mm
OIL SCRAPER RING	
NEW	0.20 mm to 0.70mm
SERVICE LIMIT	1 .00 mm

To measure the ring end gap place the ring in the cylinder in the area of 8mmto16mm (5/16in to 5/8in) from top of cylinder.

NOTE: In order to correctly position the ring in the cylinder, use piston as a pusher.

Using a feeler gauge, check ring end gap. Replace ring if gap exceeds above described specified tolerance.

Installating the Ring

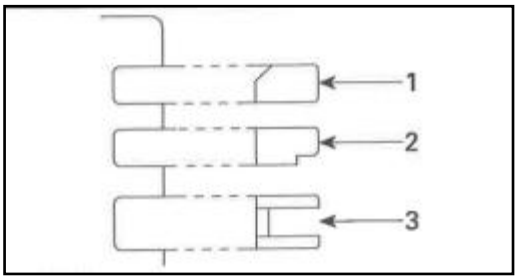
For installation, reverse the removal procedure. Pay attention to the following details.

NOTE: Use a ring expander to prevent breakage during installation.

The oil ring must be installed by hand.

NOTE: First install spring and then rings of oil scraper ring.

Install the oil scraper ring first, then the lower compression ring with the word “N” and “TOP” facing up, then the upper compression ring with the word “N” and “TOP” facing up.



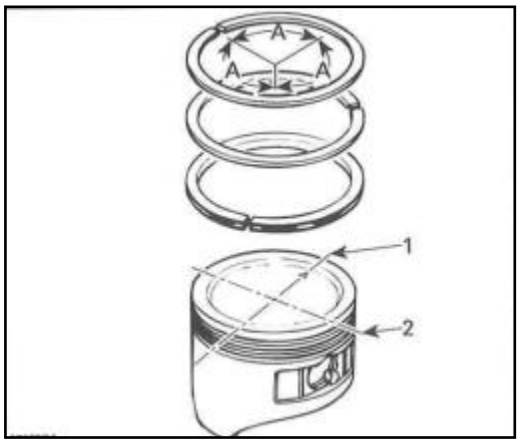
1. Upper compression ring
2. Lower compression ring
3.Oil scraper ring

NOTICE Ensure that top and second rings are not interchanged.

Check that rings rotate smoothly after installation.

Space the piston ring end gaps120° apart and do not align the gaps with

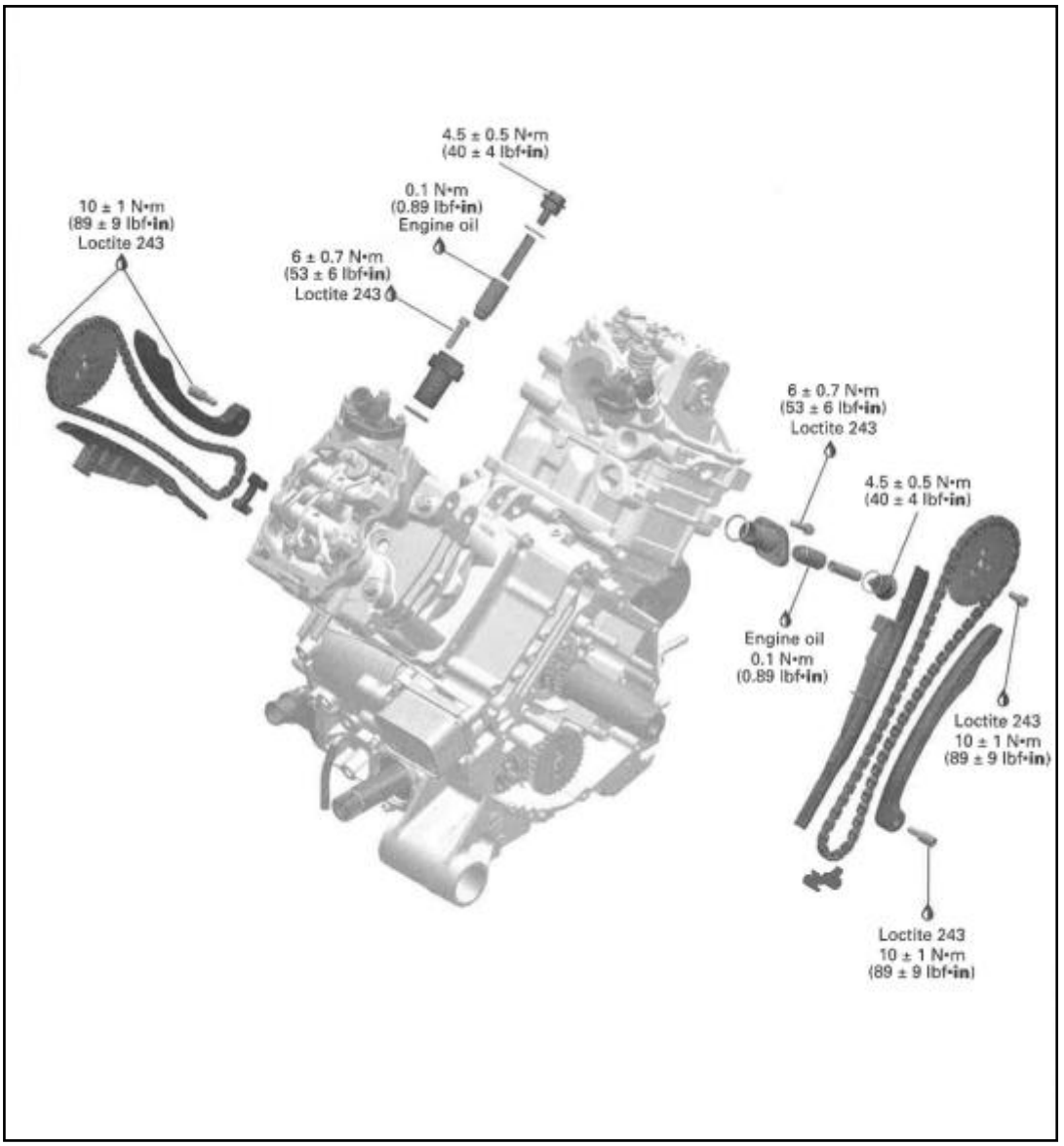
the piston pin bore or the thrust side axis.



1. DO NOT align ring gap with piston thrust side axis
2. DO NOT align ring gap with piston pin bore axis

A. 120°

TIMING CHAIN



GENERAL

IMPORTANT: Note position of parts on disassembly. This may help to find the root cause of a problem. A component that is not replaced should be reinstalled in the same position as originally mounted.

TROUBLESHAOOTONG

UNUSUAL ENGINE NOISE OR VIBRATION

1. IMPROPER VALVE CLEARANCE ADJUSTMENT AND/OR WORN OUT ROCKER ARM(S)

-Readjust valve clearance and/or replace defective part(s), refer to TOP END subsection.

2. DEFECTIVE CHAIN TENSIONER

-Replace chain tensioner

3. WORN OUTTIMING CHAIN GUIDE(S)

-Replace chain guide(s)

4. STRETCHED TIMING CHAIN OR WORN OUT TIMING GEARS

-Replace timing chain and timing gears.

5. LOOSE TIMING GEAR RETAINING SCREWS

-Retighten screws to recommender torque.

6. INCORRECT CAMSHAFT TIMING

-Replace damaged components and readjust camshaft timing.

ENGINE LACKS ACCELERATION OR POWER

1. INCORRECT CAMSHAFT TIMING

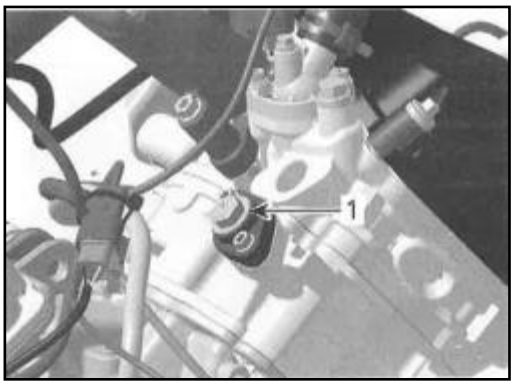
_Replace damaged components and readjust camshaft timing.

PROCEDURES

TIMING CHAIN TENSIONERS

Timing Chain Tensioner Location

The timing chain tensioner is located in the cylinder.



1. Timing chain tensioner

Removing the Timing Chain Tensioner

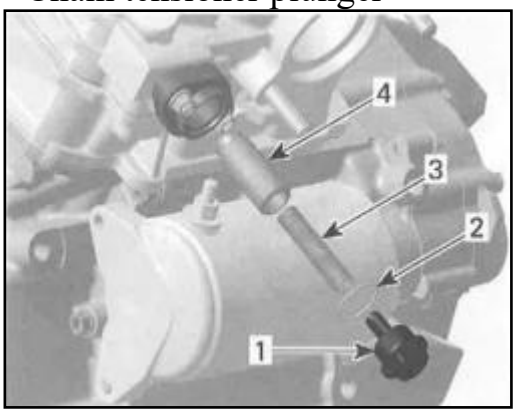
1. Make sure the respective cylinder is set to TDC ignition. Refer to CAMSHAFT TIMING GEARS in this subsection.

2. Carefully unscrew chain tensioner plug and release spring tension.

△ CAUTION Tensioner is spring loaded.

3. Remove:

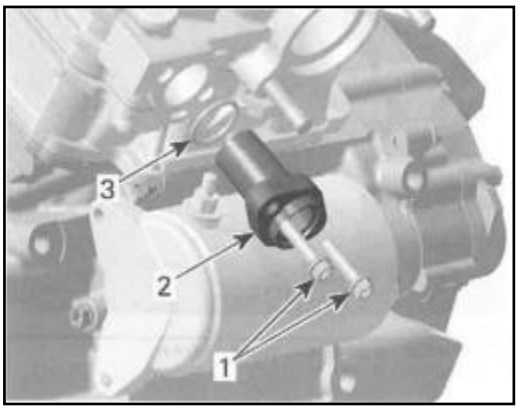
- O-ring
- Spring
- Chain tensioner plunger



1. Chain tensioner plug
2. O-ring
3. Spring
4. Chain tensioner plunger

4. Remove:

- Chain tensioner housing retaining screws
- Chain tensioner housing
- O-ring.



1. Screws
2. Chain tensioner housing
3. O-ring,

Inspecting theTiming Chain Tensioner

Check the chain tensioner housing and plug for cracks or other damages. Replace if necessary.

Check chain tensioner plunger for free movement and/or scoring.

Check if 0-rings are brittle, cracked or hard. Replace if necessary.

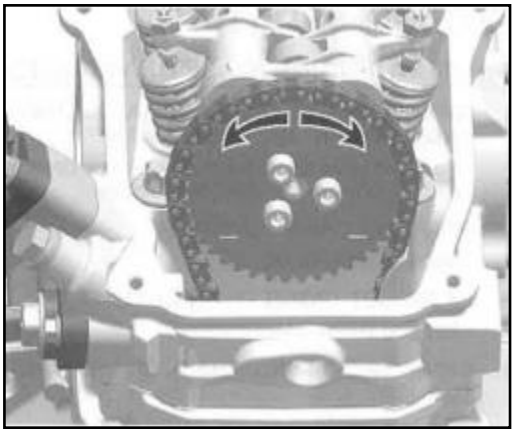
Check spring condition. Replace if bent, broken or worn.

Timing Chain Tensioner Installation

1. For installation, reverse the removal procedure.

However, pay attention to the following.

NOTE: Before installing the chain tensioner make sure, that the camshaft timing gear can be moved back and forth.



MOVE GEAR BACK AND FORTH

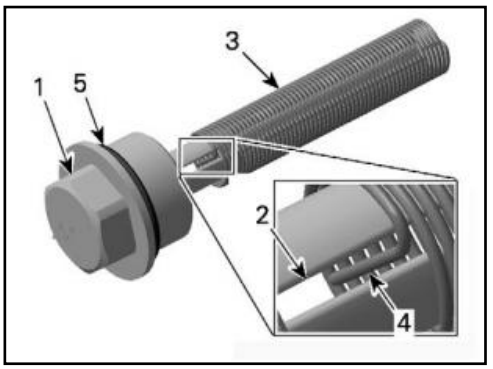
2. Apply engine oil on the plunger before insta1lation.
3. Slightly turn the camshaft timing gear in order to get the timing chain play on the tensioner side.
4. Slightly screw the plunger in until the timing chain allows no more back and forth movement of the camshaft timing gear.
5. Screw the plunger in an additional 1/8 turn to reach the required specified torque.

TIMING CHAIN TENSIONER ADJUSTMENT (TORQUE)
0.1 N·m

NOTICE: Improper adjustment of the timing chain will lead to severe engine damage.

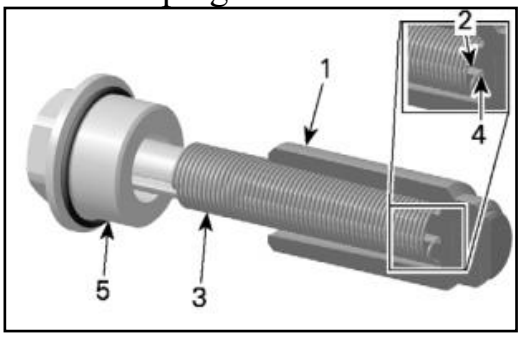
6.Pace the O-ring on chain tensioner screw plug.

7.Fit the spring on one side into the slot of the plug.



1. Plug
2. Slot
3. Spring
4. Spring end
5. O-ring

8.Fit the spring on other side into the slot of the plug.



FOR CLARITY PARTS ARE REMOVED FROM CYLINDER

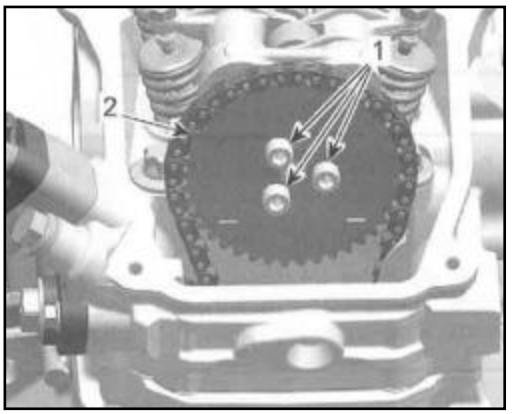
1. Plug
2. Notch
3. Spring
4. Spring end
5. Plug with O-ring

NOTE: Turn spring only clockwise in order to fit the spring end into the notch of the plunger to avoid loosening the plunger during spring installation. Do not pre1oad the spring.

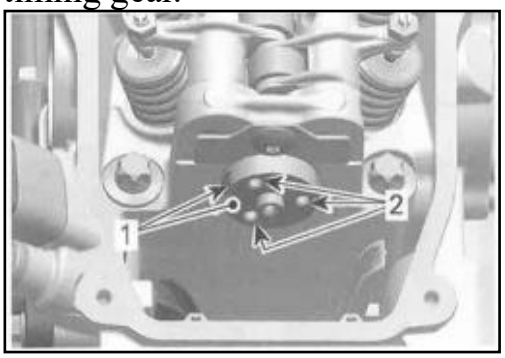
9. Then compress the spring and screw the plug in.
NOTE: To avoid overstressed timing chain, the plug must engage into threads within the first full turn.
10. Remove locking tool and install all other removed parts.
11. Finally, tighten the plug.

TIGHTENING TORQUE	
Chain tensioner plug	4.5 N·m±0.5N·m

CAMSHAFT TIMING GEARS
Camshaft Timing Gear Removal
Remove the valve cover , refer to TOP END sub section.
Turn crankshaft to TDC ignition of the respective cylinder and lock magneto flywheel, see CAMSHAFT TIMING in this subsection.
Unscrew timing chain tensioner. Refer to TIMING CHAIN TENSIONERS in this subsection.
Remove camshaft timing gear retaining screws.



1. Camshaft timing gear retaining screws
2. Camshaft timing gear
NOTE: Secure timing chain with a piece of wire.
Inspecting the Camshaft Timing Gear
Check camshaft timing gear for wear or deterioration.
If gear is worn or damaged, replace it as a set with
the timing chain.
For crankshaft gear, refer to BOTTOM END subsection, see CRANKSHAFT.
Camshaft Timing Gear Installation
For installation, reverse the removal procedure. Pay attention to the following details.
1. Clean mating surface and threads of camshaft prior installing camshaft timing gear.



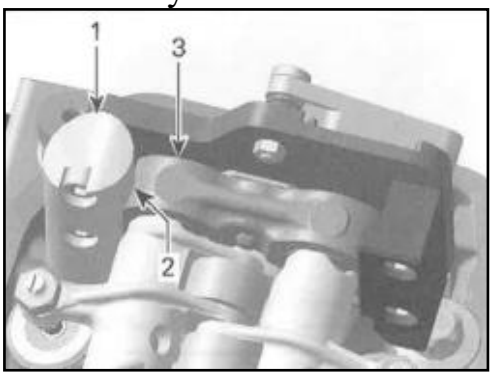
1. Mating surface on camshaft
2. Threads for camshaft screws

2. Crankshaft must be set to TDC ignition position before installing the timing chain, refer to CAMSHAFT TIMING in this subsection.
3. Insta11 the camshaft timing tool on

the cylinder head.

REQUIED TOOL	
CAMSHAFT TIMING TOOL	

NOTE: Align tube of camshaft adjustment tool properly with machined radius on cylinder head.

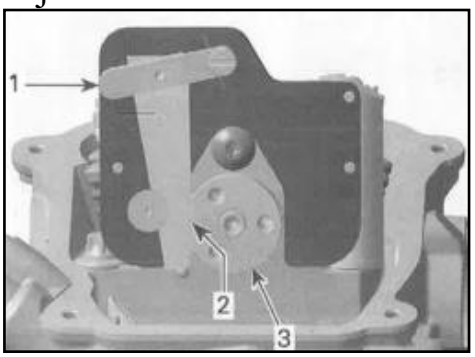


CAMSHAFT TIMING TOOL INSTALLED

1. Tube (camshaft adjustment tool)
2. Machined radius (camshaft adjustment tool)
3. Cylinder head

4. Set camshaft to TDC ignition position by aligning the camshaft flange flat spot with the tool lever.

NOTE: In addition, to ensure proper camshaft timing, press camshaft adjustment tool lever downwards.



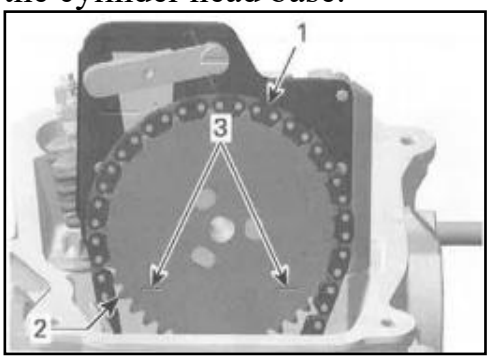
PRESS TOOL LEVER DOWN

1. Lever
2. Flat spot
3. Camshaft

NOTICE Crankshaft and camshaft must be locked at TDC ignition position to place camshaft timing gear and timing chain in the proper position.

5. Place camshaft timing gear along with the timing chain on the camshaft.

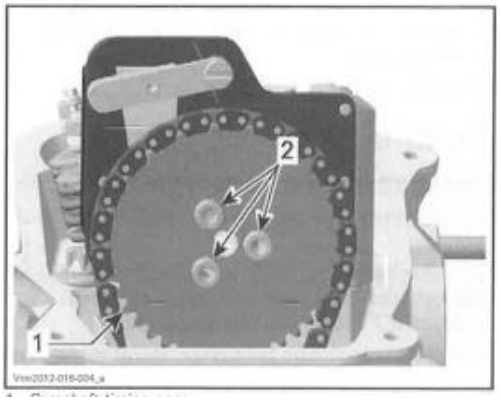
NOTE: The printed marks on the camshaft timing gear must be parallel to the cylinder head base.



1. Timing chain
2. Camshaft timing gear
3. Printed marks on camshaft timing gear

6. Install and adjust timing chain tensioner , refer to TIMING CHAIN TENSIONERS in this subsection.

7. Install and tighten camshaft timing gear retaining screws to specified torque.



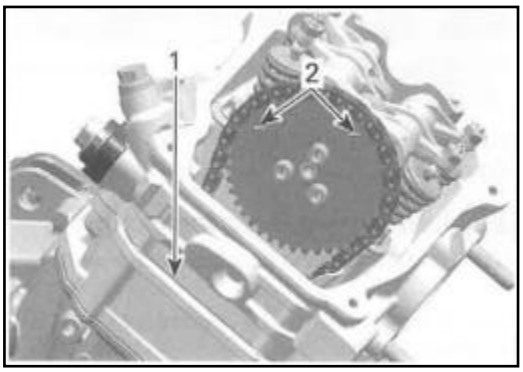
1. Camshaft timing gear
2. Timing gear retaining screws

CAMSHAFTTIMING GEAR RETAINING SCREWS	
Tightening torque	10N·m±1N·m

8. Remove the CAMSHAFTTIMING TOOL

Camshaft Timing

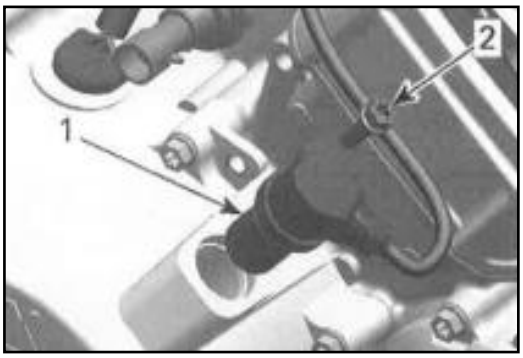
NOTE: If a piston (of cylinder1 or2) is set to TDC ignition, the camshaft timing gear of the opposite cylinder must be in the following position.



1. Cylinder head base
2. Marks on timing gear of the opposite cylinder

Camshaft Timing Piston No. 2 (rear)

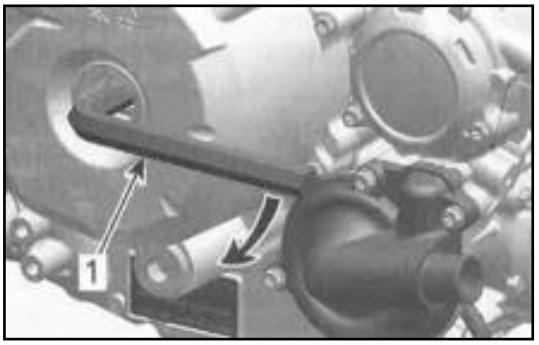
1. Remove spark plugs of both cylinders
2. Remove valve covers of both cylinders.
3. Remove the crankshaft position sensor (CPS),



1. CPS
2. Screw

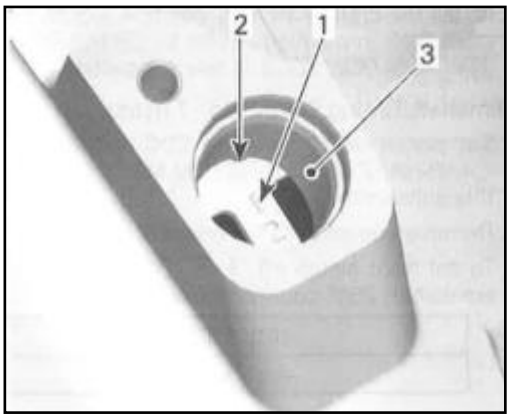
4. Set piston no. 2to TDC ignition by turning the crankshaft.

REQUIED TOOL
Allen key 14mm



1. Allen key14mm

4.1 The rear piston is at TDC when it's index mark on the magneto flywheel is aligned with notch in the magneto cover.

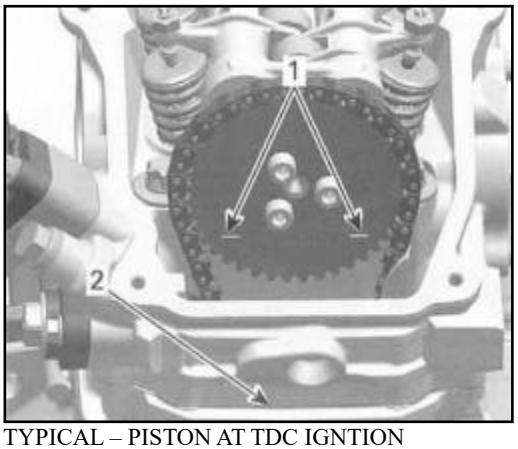


PISTON N0. 2 AT TDC
1. Mark “2” on magneto flywheel
2. Notch on magneto cover
3. Crankshaft position sensor location

4.2 Confirm printed marks on the camshaft timing gear are parallel to cylinder head base, in the lower position.

NOTE: If printed marks on camshaft timing gear are not as specified, turn crankshaft 360° .

NOTE: In this position the piston is set to TDC ignition.



TYPICAL – PISTON AT TDC IGNTION
1. Printed marks on camshaft timing gear
2. Cylinder head base

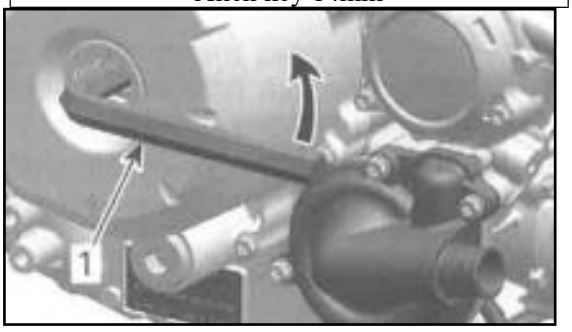
5. Install the crankshaft TDC position tool to lock crankshaft in position. Refer to CRANKSHAFT TDC POSITION TOOL in this subsection.

Camshaft Timing Piston No. 1 (front)

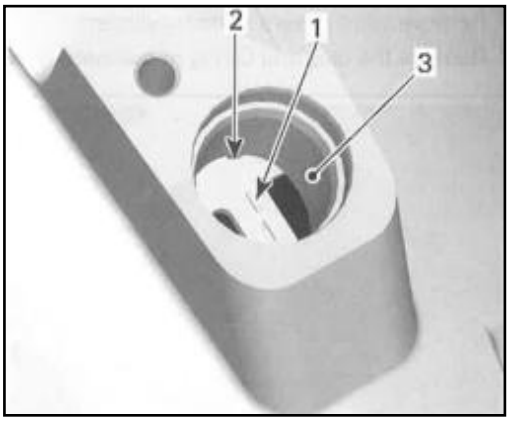
1. Set piston no. 2 (rear) to TDC ignition,

see CRANKSHAFT TIMING PISTON NO. 2(READ) in this subsection.
2. Remove crankshaft TDC position tool.
3. To set front piston no. 1 to TDC ignition turn crankshaft 280 ° counterclockwise.

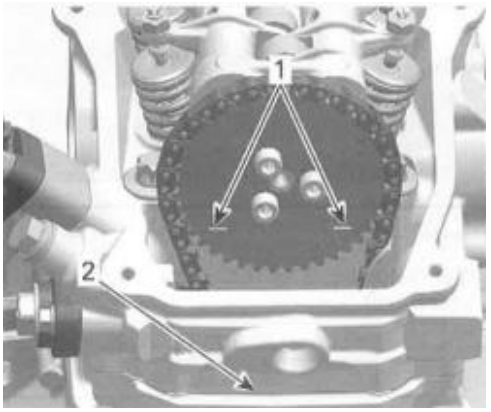
REQUIED TOOL
Allen key 14mm



TURN CRANKSHAFT 280° COIUNTERCLOCKWISE
1. Allen key14 mm
3.1 The front piston is at TDC when it's index mark on the magneto flywheel is aligned with the notch in the magneto cover.

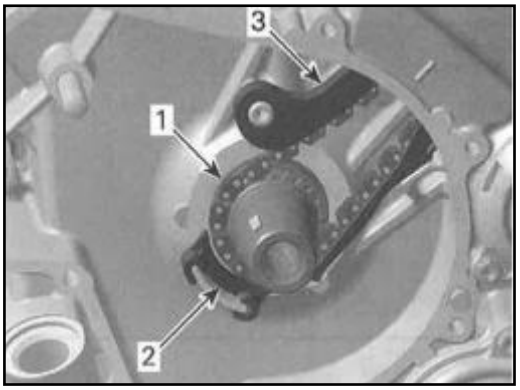


CYLINDER 1 AT TDC IGNTION
1. Mark “1” on magneto flywheel
2. Notch on magneto cover
3. Location of crankshaft position sensor
3.2 Confirm printed marks on the camshaft timing gear are parallel with cylinder head base, in the lowest position.
NOTE: In this position the piston is set to TDC ignition.



TYPICAL – PISTON AT TDC IGNTION
1. Printed marks on camshaft timing gear
2. Cylinder head base
Crankshaft TDC Position Tool Installation
NOTICE Never use crankshaft TDC posotion tool to remove or tighten drive CVT screw or rotor retaining screw. Damage to the teeth of the trigger whell on the rotor will occur.
Install tool in magneto cover CPS bore.
NOTE: Make sure to match the teeth on the crankshaft TDC position tool with the magneto rotor.
TIMING CHAIN
The engine is equipped with two timing chains.
- MAG side timing chain is located behind the magneto cover.
- PTO side timing chain is located behind the PT0 cover.
Removing the Timing Chain (MAG Side)
Refer to MAGENTO SYSTEM subsection and remove following parts:
- Magneto cover
- Rotor
- Sprag clutch gear.
Refer to TOP END subsection and remove following parts:
- Valve cover.
Refer to following procedures in this subsection and remove following parts:
- Chain tensioner
- Camshaft timing gear.

Remove timing chain guide (tensioner side) and lower timing chain guide.



1. Timing chain
2. Lower timing chain guide
3. Timing chain guide (tensioner side)

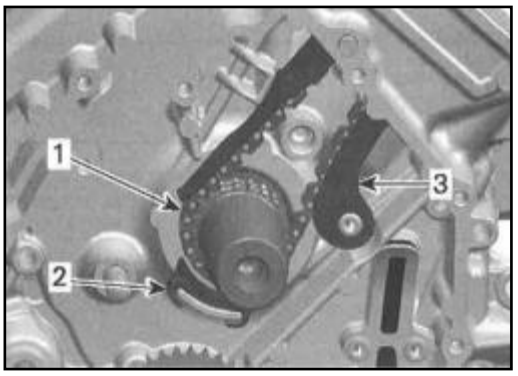
Carefully pull the timing chain downwards and sideways, then out of the crankcase.

Removing theTiming Chain (PTO Side)
NOTE: Mark the operating direction of the timing chain and check for excessive radial play before removal. Refer to INSPECTING THETIMING CHAIN.
Refer to BOTTOM END subsection and remove following parts:
- PTO cover
- Breather gear
- Intermediate gear.

Refer to PTO END subsection and remove following parts:
- Valve cover.

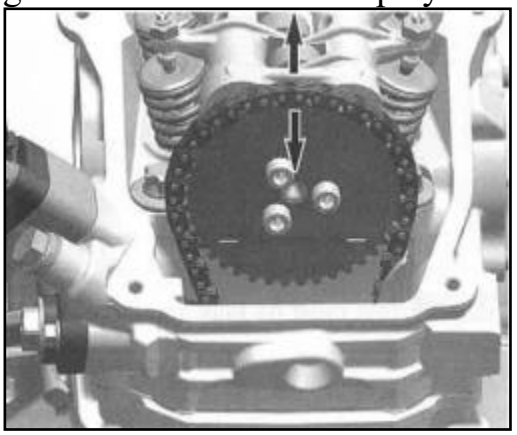
Refer to following procedures in this subsection and remove following parts:
- Chain tensioner
- Camshaft timing gear.

Remove timing chain guide (tensioner side) and lower timing chain guide.



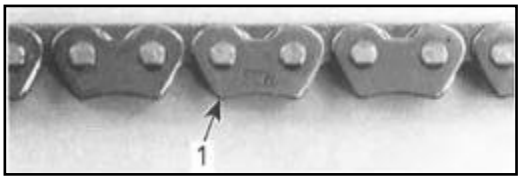
1. Timing chain
2. Lower timing chain guide
3. Timing chain guide (tensioner side)

Carefully pull the timing chain sideward and down from the crankcase.
Inspecting the Timing Chain
Inspection is the same for both timing chains.
Check timing chain on camshaft timing gear for excessive radial play.



CHECK TIMING CHAIN RADIAL PLAY

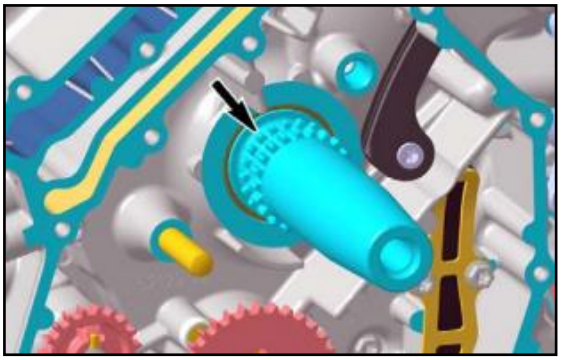
Check chain condition for wear and teeth condition.



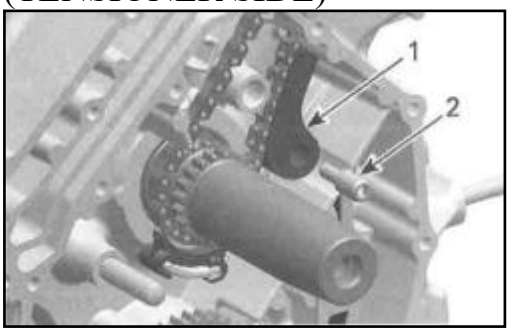
1. Timing chain

If chain is excessively worn or damaged, replace it as a set (camshaft timing gear and timing chain).
Check timing chain guides for wear, cracks or deforming. Replace as required.
NOTE: Check also the timing chain guide (tensioner side).

Check if crankshaft timing gears are excessively worn or damaged.
Replace if necessary. Refer to CRANKSHAFT in the BOTTOM END subsection.



Installating theTiming Chain
The installation is essentially the reverse of the removal procedure, but pay attention to the following details.
NOTE: Installation is the same for both timing chains.
Install timing chain with camshaft timing gear.
NOTE: Ensure to carry out proper valve timing, refer to CAMSHAFT TIMING GEARS in this subsection.
NOTICE Improper valve timing will damage engine components.
TIMING CHAIN GUIDE (TENSIONER SIDE)

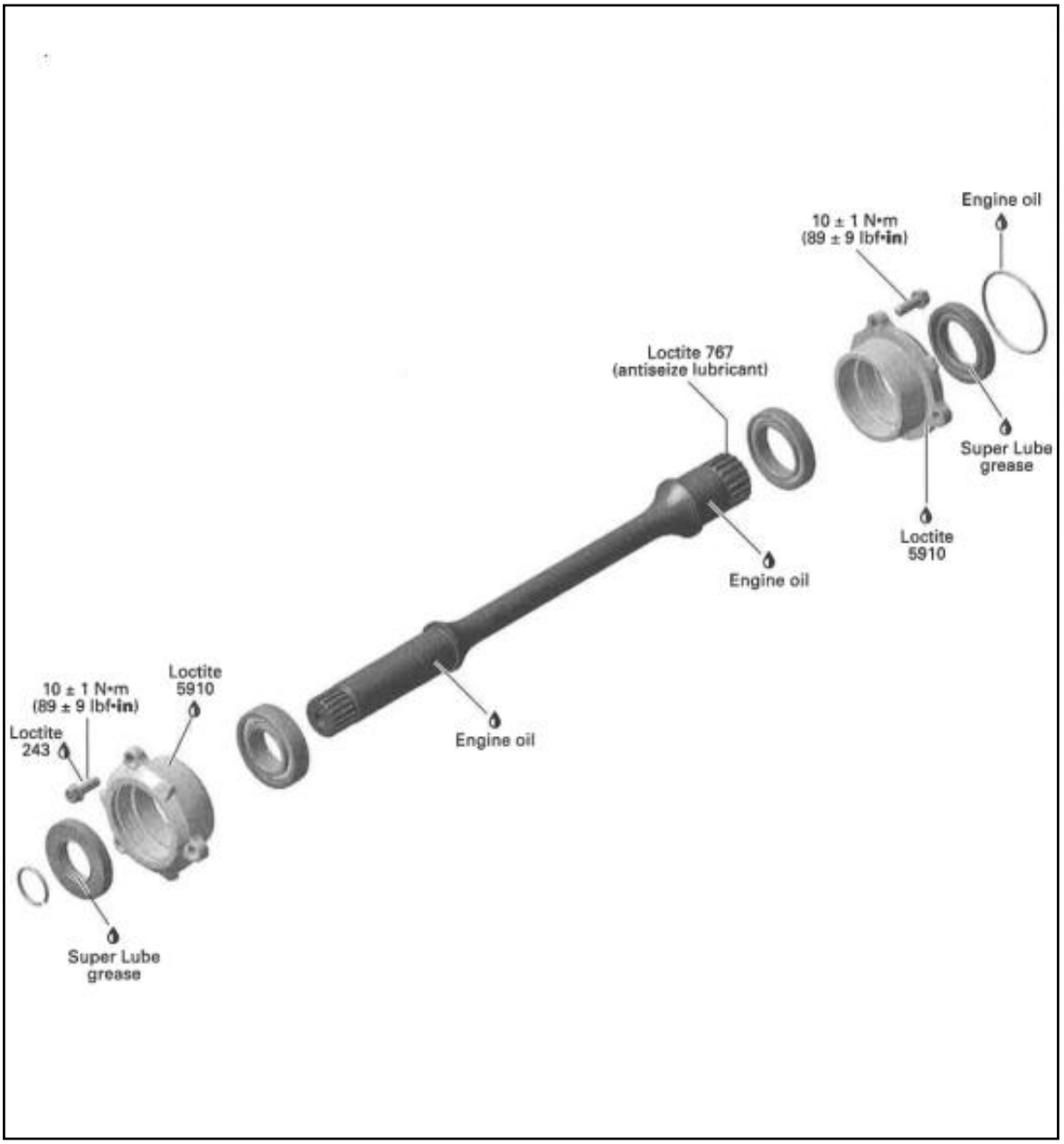


1. Timing chain guide (tensioner side)
2. Bearing screw

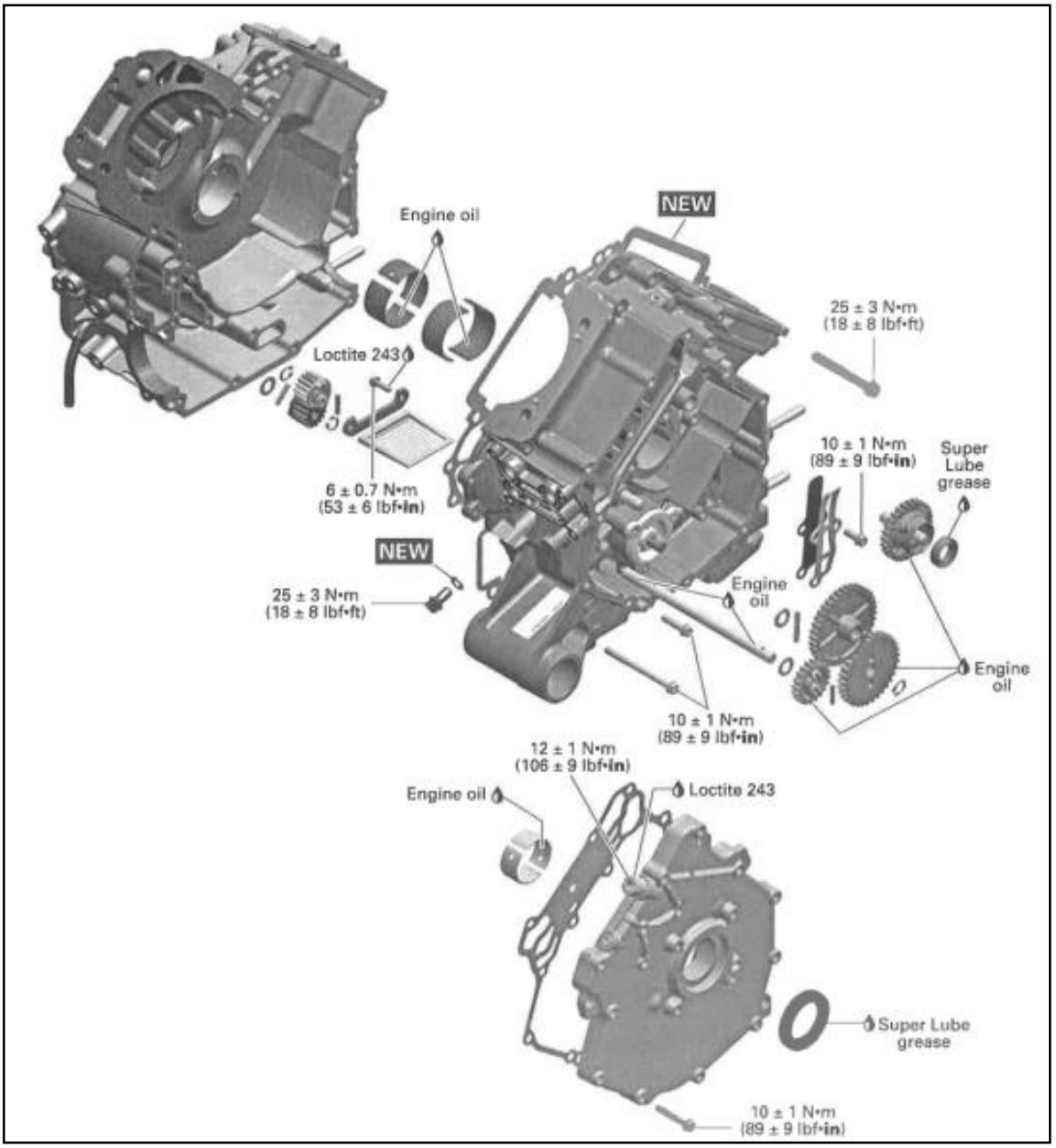
Removing the Timing Chain Guide (Tensioner Side)
Refer to TIMING CHAIN in this subsection
Inspecting the Timing Chain Guide (Tensioner Side)
Check timing chain guide for wear, cracks or de- forming. Replace if necessary.
Insalling the Timing Chain Guide (Tensioner Side)
The installation is the reverse of the removal procedure.

TIGHTENING TORQUE	
Timing chain guide bearing screw	10N • m ± 1 N • m

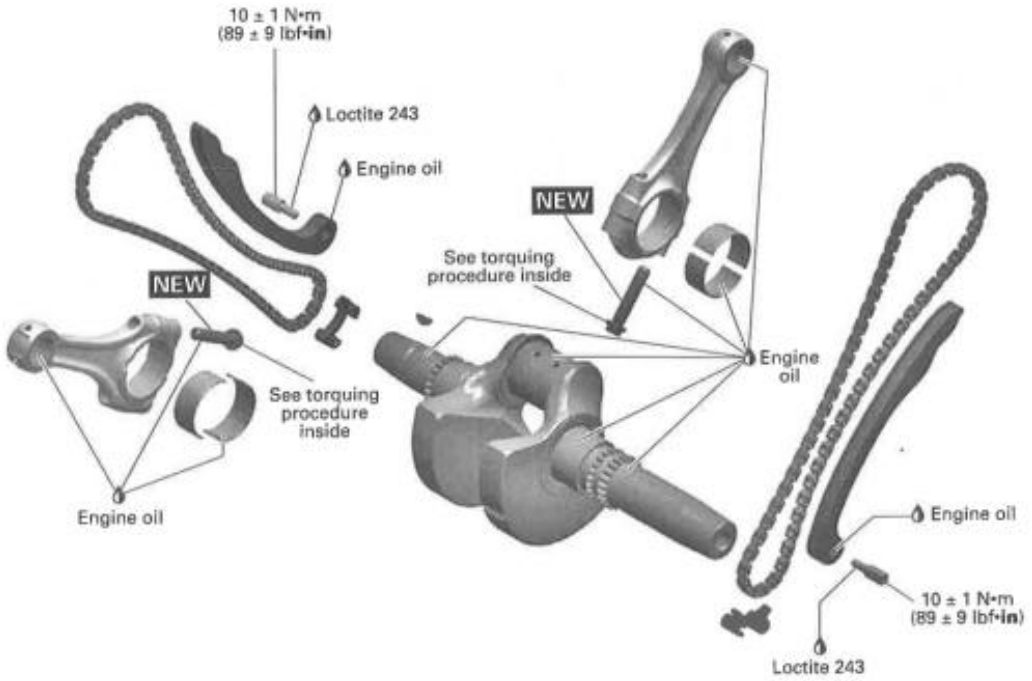
BOTTOM END
ENGINE DRIVE SHAFT



CRANKCASE AND PTO COVER



CRANKSHAFT


10 ± 1 N•m
(89 ± 9 lbf•in)
Loctite 243
Engine oil
NEW
See torquing
procedure inside
NEW
See torquing
procedure
inside
Engine oil
Engine
oil
Engine oil
10 ± 1 N•m
(89 ± 9 lbf•in)
Loctite 243

GENERAL

IMPORTANT: Note position of parts on disassembly. This may help to find the root cause of a problem. A component that is not replaced should be reinsta1led in the same position as originally mounted.

PROCEDURES

ENGINE DRIVE SHAFT

NOTE: The engine drive shaft transmits the power from the gearbox to the front differentia1 and is located inside the crankcase.

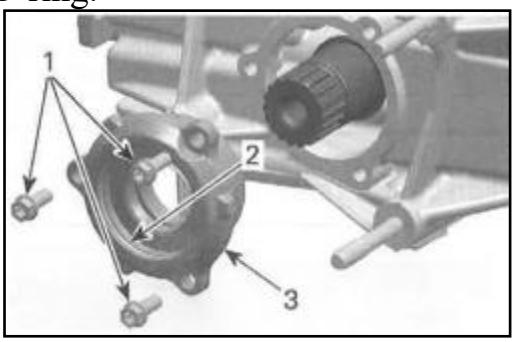
Removing the Engine Drive Shaft

Remove the engine. Refer to ENGINE REMOVAL AND INSTALLATION subsection.

Removing the Rear Bearing Cover

Detach gearbox from engine, refer to GEARBOX UNIT subsection.

Removing the bearing cover and its O-ring.



1. Bearing cover screws
2. O-ring
3. Bearing cover gearbox

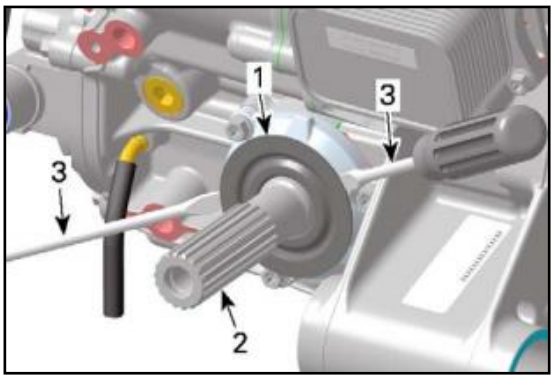
Removing the Front Bearing Cover

NOTE:The front bearing cover can be repalaced with the engine installed.

Life and support vehicle.

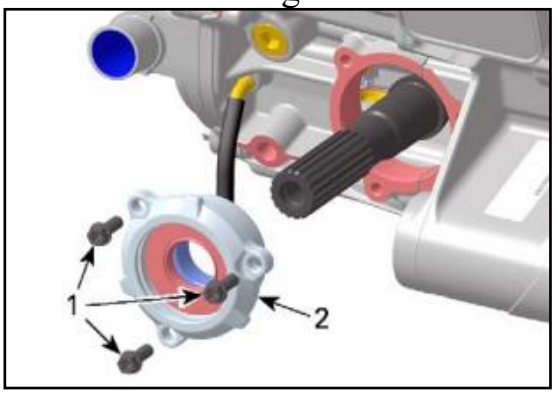
Remove the front drive shaft. Refer to FRONT DRIVE subsection.

Remove cover washer from drive shaft using 2 screw drives.



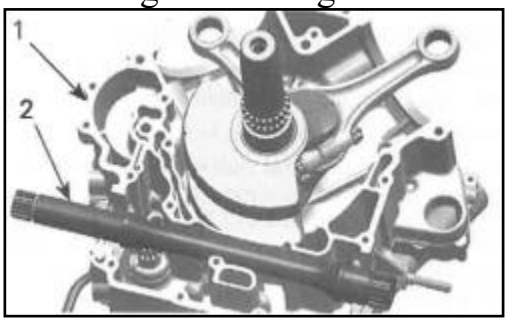
1. Cover washer
2. Drive shaft
3. Screwdrivers

Rrmove the bearing cover



1. Bearing cover screws
2. Bearing cover

Removing the Engine Drive Shaft



Split crankcase , refer to CRANKCASE in this subsection.

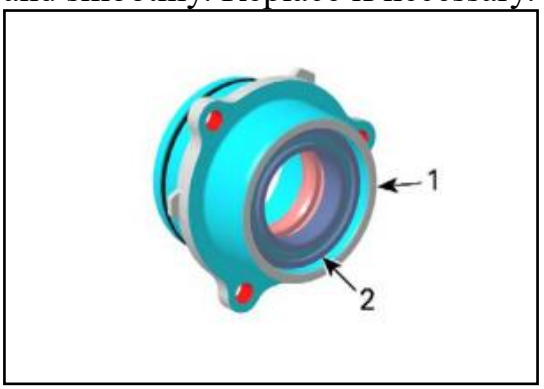
Remove engine drive shaft from the crankcase.

1. Crankcase MAG side
2. Engine drive shaft

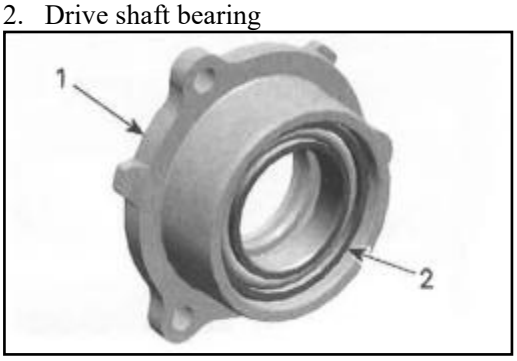
Inspecting the Engine Drive Shaft

Replace oil seals and/or O-ring (bearing cover gearbox side) if they are brittle , hard or damaged. Check drive shaft bearings for contamination and/or metal shavings. Check if bearings turn freely

and smoothly. Replace if necessary.



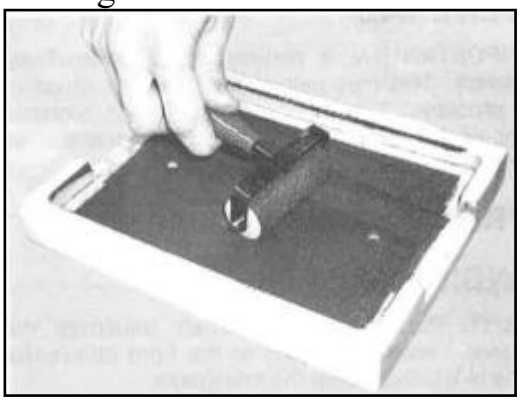
1. Rear bearing cover
2. Drive shaft bearing



1.Front bearing cover
2. Drive shaft bearing

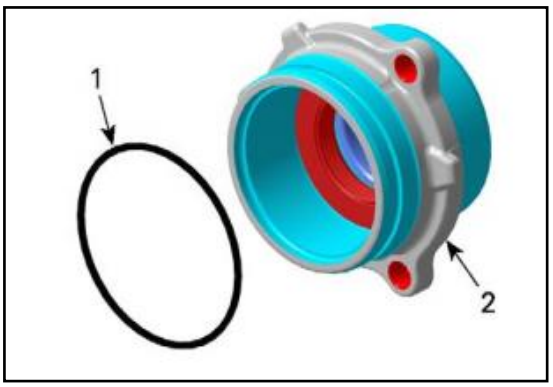
Check drive shaft for cracks, bend, pitting or other visible damages.
Check drive shaft splines for wear or damages.
Check oil seal running surface of the drive shaft for scratches. Replace if necessary.
Installating the Engine Drive Shaft
The installation is the reverse of removal procedure. Pay attention to the following details.
Clean all metal components in solvent.
Crankcase surfaces and bearing covers are best cleaned using a combination of LOCTITE CHISEL (GASKET REMOVER) and a brass brush. Brush a first pass in one direction then make the final brushing perpendicularly (90°) to the first pass.
NOTICE Do not wipe with rags. Use a new clean hand towel only.
Use a suitable installer for installing bearings.
Use LOCTITE5910 on mating Su faces.

IMPORTANT: When beginning the application of the bearing cover sealant, the assembly and the first torquing should be done within10 minutes.
it is suggested to have all you need on hand to save time.
Use a plexiglass plate and apply some sealant on it. Use a soft rubber roller50mm-75mm (2in_3in), available in arts products suppliers for printing, and roll the sealant to get a thin uniform coat on the plate (spread as necessary). When ready, apply the sealant on bearing cover surfaces.



Do not apply in excess as it will spread out inside crankcase.
NOTE: It is recommended to apply this specific sealant as described here to get a uniform application without lumps. If you do not use the roller method, you may use your finger to uniformly distribute the sealant (using a finger w1ll not affect the adhesion).
Installating the Rear Bearing Cover
Check O-ring on bearing cover if brittle,hand or damaged Replace if necessary.
Luvricate O-ring.

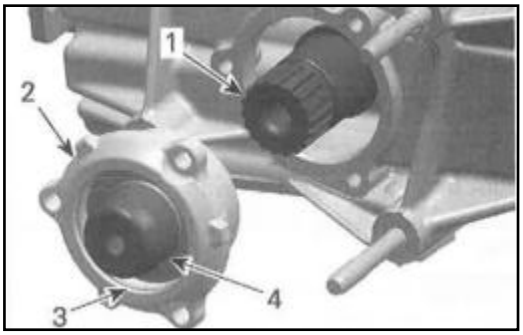
O-RING LUBRICATION	
Service product	Engine oil



1. O-ring
2. Bearing cover

For bearing cover installation on gearbox side, protect the oil seal to avoid damaging the sealing lip.

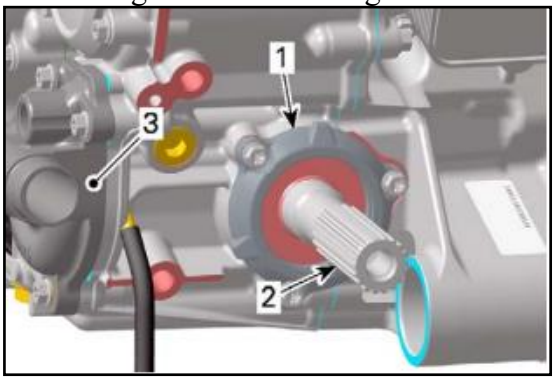
REQUIED	
ERIVE SHAFT OIL SEAL	



1. Drive shaft
2. Bearing cover gearbox side
3. O-ing
4. Protection sleeve

TIGHTENING TORQUE	
Rear bearing cover screws	10N·m ± 1 N • m

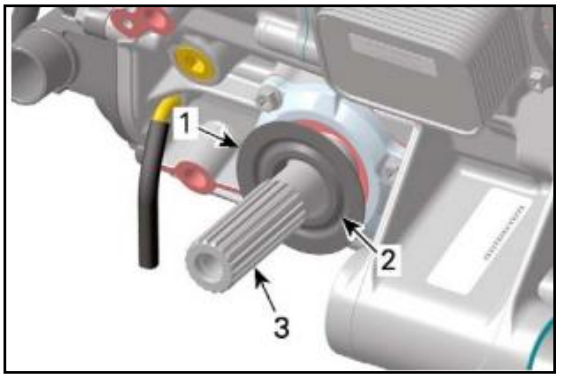
Installating the Front Bearing Cover



1. Bearing cover
2. Drive shaft
3. Water pump cover

TIGHTENING TORQUE	
Front bearing cover screws	10N·m ± 1 N • m

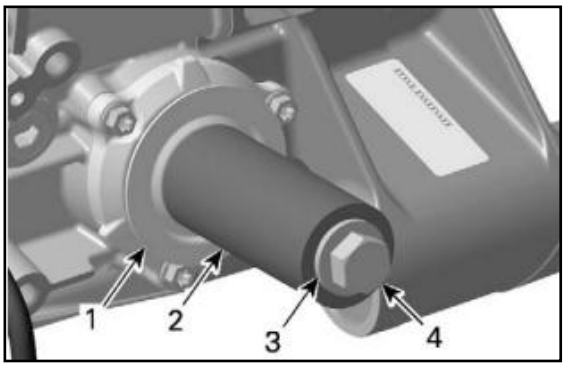
Place NEW cover washer on drive shaft.
NOTE:Groove must face outwards the engine



1. Cover washer
2. Groove
3. Drive shaft

Press cover washer on drive shaft

REQUIED YOOL	
COVER WASHER INSTALLER	
Flat washer	
M12×1.25×25hexagonal screw	



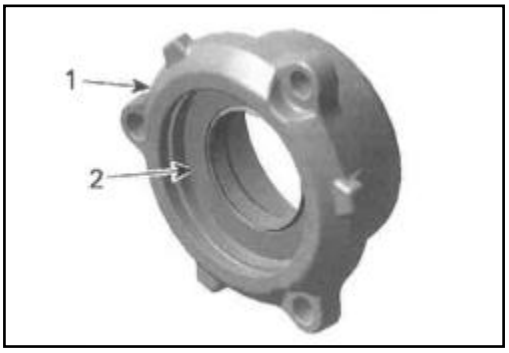
1. Cover washer
2. Cover washer installer
3. Flat washer
4. M12×1.25×25 hexagonal screw

Installating the Engine Drive Shaft
Finally check for axial play of the drive shaft
Front Oil Seal Replacement
(Engine Drive Shaft)
Remove front propeller shaft.Refer to FRONT DRIVE subsection

2. Remove the front bearing cover, refer to ENGINE DRIVE SHAFT

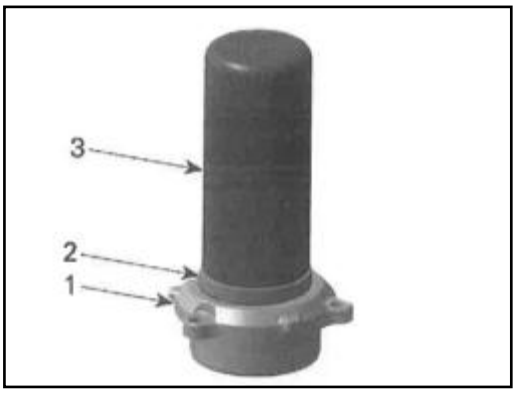
REMOVAL / INSTALLATION in this subsection.

3. Remove drive shaft seal from bearing cover.



1. Bearing cover
2. Oil seal

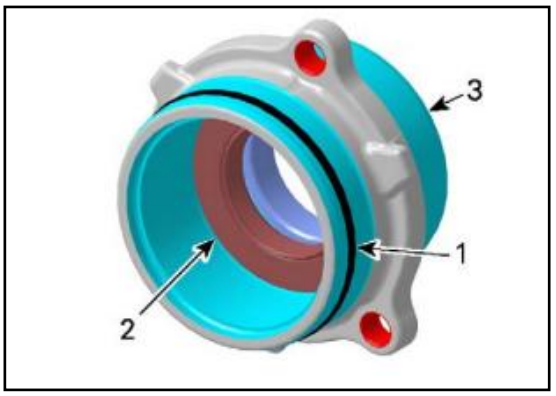
4. Install drive shaft oil seal.



1. Bearing cover
2. Oil seal
3. Oil seal installer

REQUIED TOOL	
ERIVE SHAFT OIL SEAL INSTALLER	

5. Reinstall remaining parts in the reverse order of removal.



1. Bearing cover
2. O-ring
3. Bearing cover

REAR OIL SEAL

(ENGINE DRIVE SHAFT)

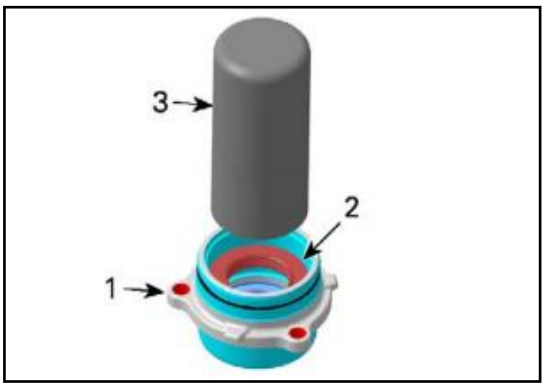
Rear Oil Seal Replacement

(Engine Drive Shaft)

1. Remove rear bearing cover , refer to ENGINE DRIVE SHAFT REMOVAL / INSTALLATION in this subsection.

2. Remove drive shaft seal from bearing cover.

3.Install drive shaft oil seal.



1. Bearing cover
2. Oil seal
3. Oil seal installer

REQUIED	
ERIVE SHAFT OIL SEAL	

4. Reinstall remaining parts in the reverse order of removal.

PTO COVER OIL SEAL

To replace oil seal it is not necessary to remove engine from vehicle.

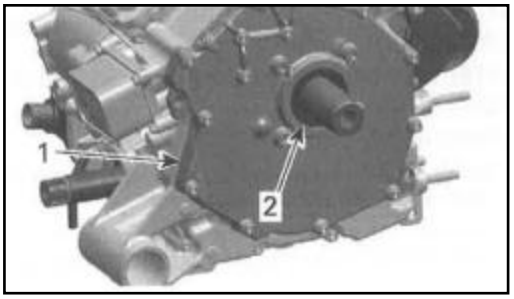
Removing the PTO Oil Seal

Refer to CONTINUOUSLY VARLABLE TRAINSMISSION (CVT) subsection to remove the following parts:

- CVT cover
- Drive pulley
- Driven pulley
- CVT air guide.

Remove oil seal with a small flat screwdriver.

NOTICE Avoid scoring surfaces with tool.



1. PTO cover
2. Oil seal

Inspecting the PTO Oil Seal

Check oil seal running surface of crankshaft PTO side for grooves. Replace if necessary.

Installating the PTO Oil Seal

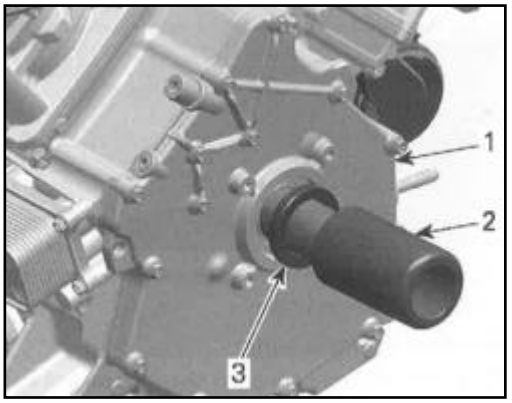
The installation is the reverse of the removal procedure.

Pay attention to the following details.

NOTICE Oil seal must be installed with sealing lip toward the engine.

Push oil seal in place.

REQUIED TOOL	
PTO COVER OIL SEALINTALLER	



1. PTO cover
2. Oil seal installer
3. Oil seal

PTO COVER

Removing the PTO Cover

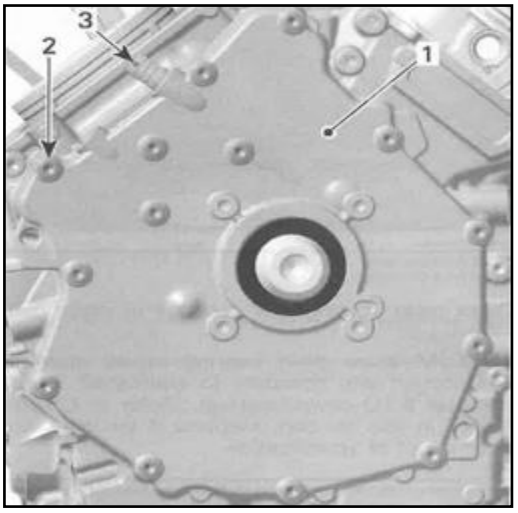
Refer to CONTINUOUSLY VARLABLE TRAINSMISSION (CVT) subsection to remove the following parts:

- CVT cover
- Drive pulley
- Driven pulley
- CVT air guide.

Disconnect vent hose.

Remove PTO cover screws and pul1 PTO cover.

▲WARNING
Always wear skin and eye protection. Chemicals can cause skin rash, skin burns and severe eye injury.



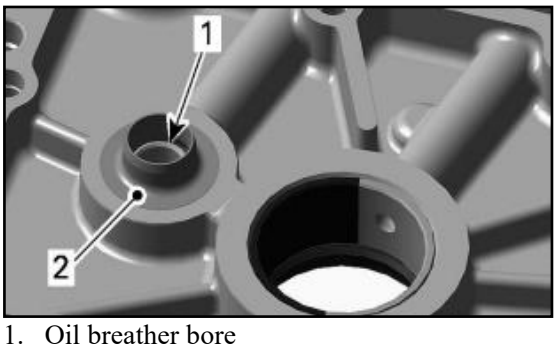
1. PTO cover
2. PTO cover screws
3. Vent hose nipple

Inspecting the PTO Cover

Check the PTO cover for cracks or other damage. Replace PTO cover if damaged.

Clean oil breather bore in PTO cover from contaminations with part cleaner then use pressurized air to dry it.

Check surface of sealing sleeve for wear or other damages. Replace PTO cover if damaged.

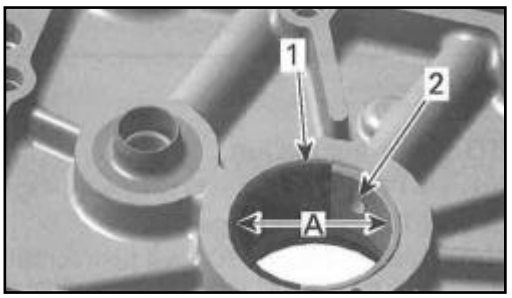


1. Oil breather bore
2. Surface of sealing sleeve

Check plain bearings for scorings or other damages.

NOTE: Measure plain bearing inside diameter (PTO cover) and compare to crankshaft journal

Diameter (PTO cover bearing). Refer to CRANK SHAFT in this section. Replace if the measurement is out of specification.



1. Plain bearing
2. Oil bore
A. Measure plain bearing inside diameter

PLAIN BEARING INSIDE DIAMETER (PTO COVER)	
SERVICE LIMIT	34.120 mm

Plain Bearing Replacement (PTO Cover)

Removing the Plain Bearing

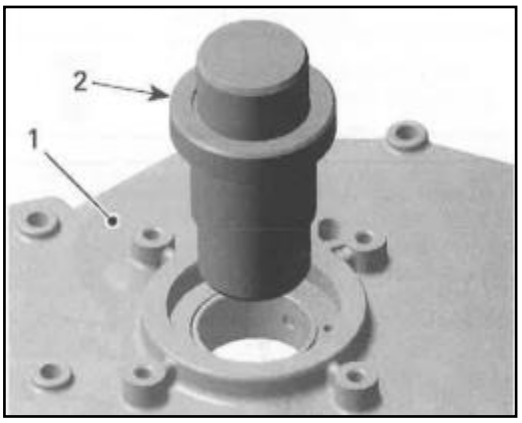
NOTICE Unless otherwise instructed, never use a hammer to install plain bearings. Use a press only.

Carefu1ly remove the PT0 oil seal with a screwdriver, without damaging the PT0 cover.

Press out the plain bearings from the outside towards the inside.

REQUIED TOOL	
PLAIN BEARING REMOVER / UNSTALLER	

The PTO cover has to be supported from below with suitable support with straight surface, in order to prevent damage of the sealing surface.



1. PTO cover
2. Plain bearing remover /installer

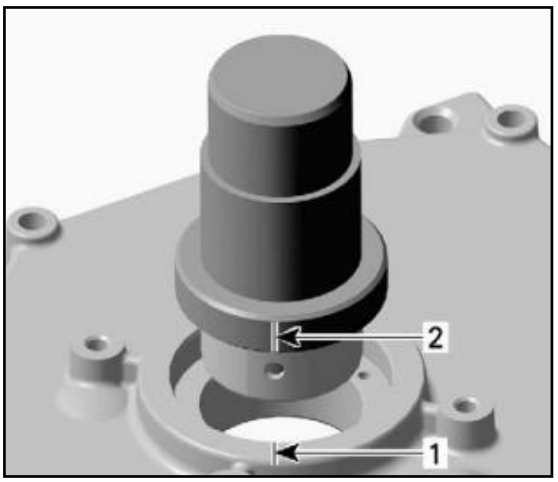
Installating the Plain Bearing

NOTE: Do not lubricate plain bearings and/or PT0 cover for installation.

Install plain bearings in a cool PTO cover.

REQUIED TOOL	
PLAIN BEARING REMOVER / UNSTALLER	

NOTICE Mark position of oil bore on PTO cover and on plain bearing remover/installer. Align mark on plain bearing remover/installer with mark on PTO cover.

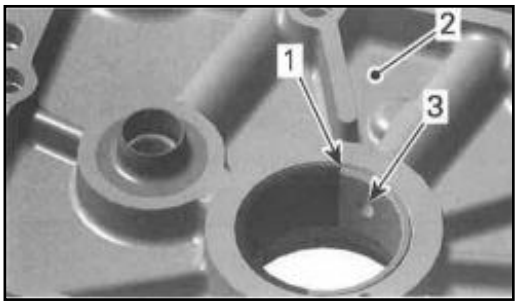


1. Mark position of oil bore on PTO cover
2. Mark position of oil bore on plain bearing remove/installer

Carefully press-in the plain bearings in the same direction as during disassembly, from the outside towards the inside. Support PT0 cover with suitable support with straight surface, in order to prevent damage of the sealing surface.

NOTE: Wrong oil bore position will stop oil supply to plain bearings and wil1 damage the engine.

NOTICE The partition of the plain bearings must be positioned near to oil bore in counterclockwise direction.



1. Partition
2. PTO cover (inside)
3. Oil bore

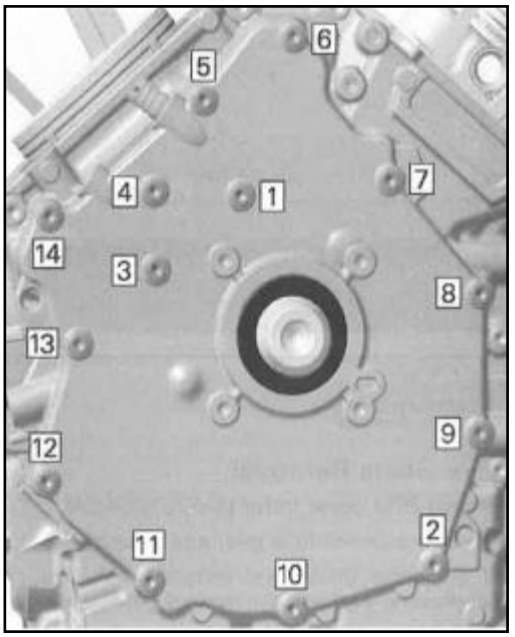
Installating the PTO Cover

For installation, reverse the removal procedure.

Pay attention to the following details.

NOTE: At installation, replace PTO cover gasket and oil seal.

Tighten PTO cover screws following the illustrated sequence.



TIGHTENING SEQUENCE

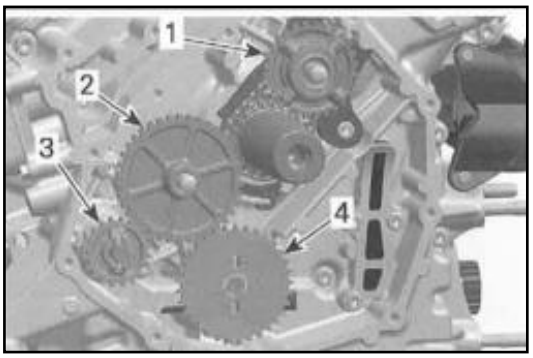
TIGHTENING TORQUE	
PTO cover screws	12.5N • m ± 1 N • m

DRIVE GEARS

Drive Gears Location

The engine is equipped with a breather gear which prevents engine oil coming out through the breathing system into the air intake system.

The drive gears are located on the engine PTO side behind the PTO cover.



1. Breather gear
2. Intermediate gear
3. Water pump drive gear
4. Oil pump drive gear

Removing theDrive Gears

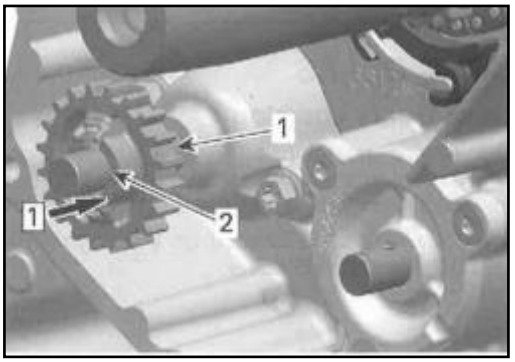
Remove PTOcover (refer to PTO COVER).

Withdraw intermediate gear and breather gear.

For oil pump drive gear removal, refer to OIL PUMP in the LUERICATION subsection.

To remove water pump drive gear, pull the shaft assembly a bit out and turn it about one teeth until it stays out.

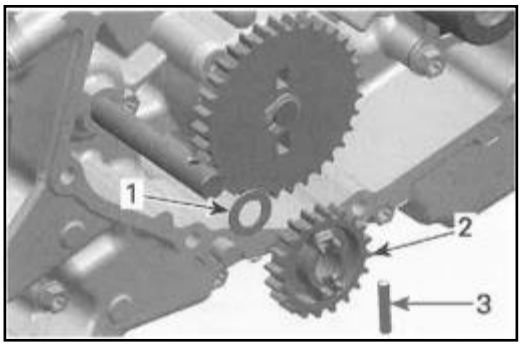
Then push water pump drive gear in.



Step: Push gear in
1. Water pump drive gear
2. Intermediate shaft

Remove needle pin and pull water pump drive gear out.

Remove thrust washer from intermediate shaft.



1. Thrust washer
2. Water pump drive gear
3. Needle pin

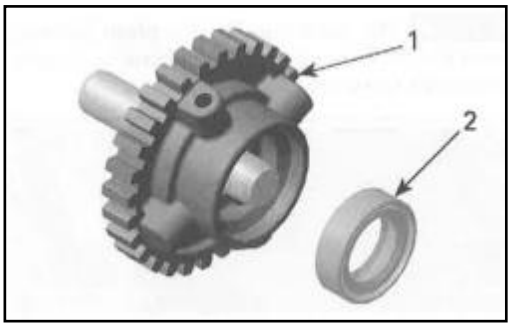
Inspecting the Drive Gears

Intermediate Gear/Oil Pump Drive Gear/Water Pump Drive Gear

Inspect gears for wear or other damage. Replace if damaged.

Breather Gear

Check if oil seal is brittle, hard or damaged. Replace if necessary.



1. Breather gear
2. Oil seal

Inspect gear for wear or other damage.

Check ball bearing for excessive play and smooth operation. Replace breather gear assembly if necessary.

Installating the Drive Gears

The installation is essentially the reverse of the removal procedure.

Adequately oil the ball bearing of the breather gear.

CRAN KCASE

Disassembing the Crankcase

1. Refer to PEROIDIC MAINTENANCE PROCEDURES subsection and:

1.1 Drain cooling system.

1.2 Drain engine oil.

1.3 Drain gearbox oil.

2. Lock crankshaft. Refer to CRANKSHAFT LICKING PROCEDURES in the this subsection.

3. Refer to COUNTINUOUSLY VARIABLE TRAINSMISSION (CVT) subsection to remove following parts:

- CVT cover
- Drive pulley
- Driven pulley
- CVT air guide.

4. Remove engine from vehicle. Refer to ENGINE REMOVAL AND INSTALLATION subsection.

5. Detach gearbox from engine. Refer to GEARBOX AND 4×4 COUPLING UNIT .

6. Refer to MAGENTO SYSTEM subsection to remove the following parts:

- Magneto cover
- Rotor with sprag clutch gear
- Starter drive gears.

7. Refer to following procedures in this subsection to remove the following parts:

- PTO cover
- Drive gears
- Bearing covers of engine drive shaft.

8. Refer tonM/~0 al-1l,4//Vsubsection to remove following parts:

- Chain tensioners
- Camshaft timing gears
- Timing chains
- Timing chain guides.

9. Refer to TIMING CHAIN subsection to remove following parts:

- Front cylinder head
- Rear cylinder head
- Cylinders.

10. Refer to COOLING SYSTEM subsection to remove following parts:

- Water pump housing.

11. Refer to LUBRICATION SYSTEM subsection to remove following parts:

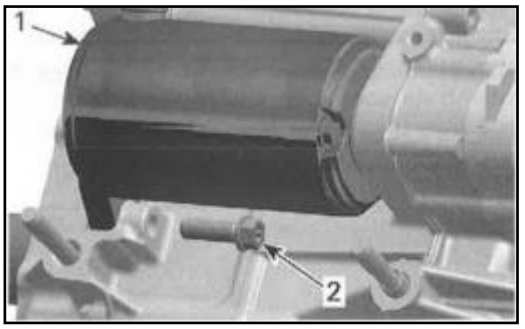
-Oil filter

-Oil cooler

-Oil pump drive gear.

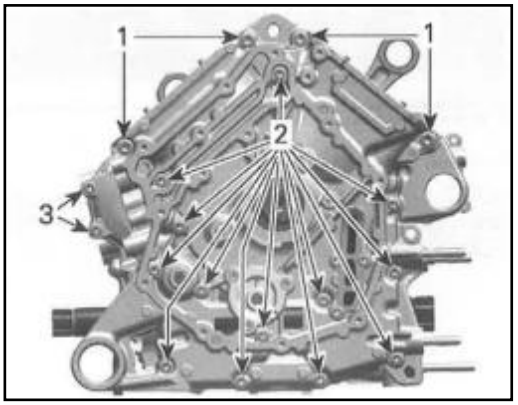
NOTE: Oil pump removal from crankcase is not necessary, but recommended to see condition of oil pump (refer to LUBRICATION SYSTEM subsection).

12. Remove electric starter.



1. Electric starter
2. Screw

NOTE: Before splitting the crankcase, measure crankshaft axial play. Refer to CRANKSHAFT. Remove retaining screws of crankcase.



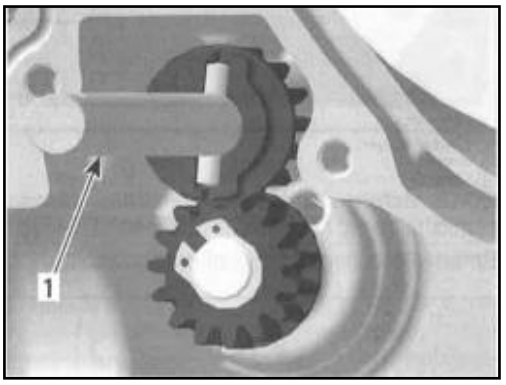
1. 4 screws M8x65
2. 13 screws M16x75
3. 2 screws M6x25

Carefully split crankcase halves.

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

Pull crankshaft out of crankcase.

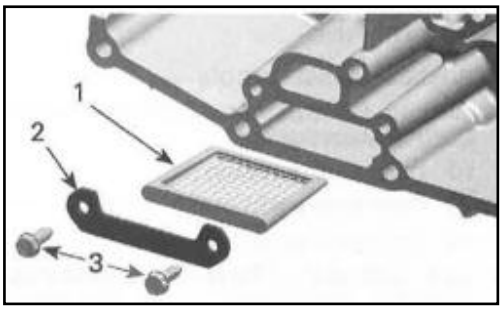
Remove the water pump intermediate shaft.



1. Water pump intermediate shaft

Remove engine oil strainer.

NOTE: Oil strainer removal for inspection and cleaning is recommended. Refer to LUBRICATION SYSTEM subsection.



1. Engine oil strainer
2. Retaining plate
3. Screws

Cleaning the Crankcase

Clean crankcase using a part cleaner.

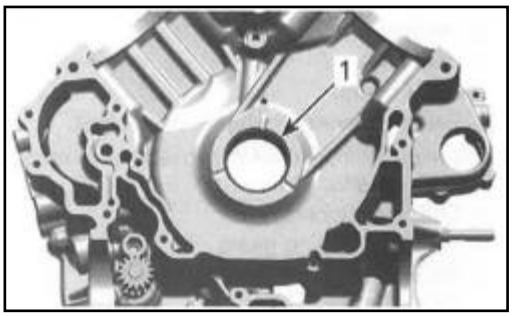
Dry crankcase using compressed air .

Blow the oil supply lines.

Inspecting the Crankcase

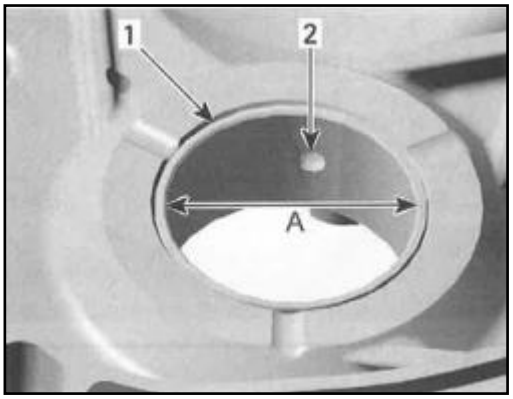
Check crankcase halves for cracks or other dam- age. Replace if damaged.

Check MAG and PTO plain bearings in for scoring or other damages.



1. Plain bearing

NOTE: Measure plain bearing inside diameter and compare to PT0/MAG main journa1 diameters of crankshaft (refer to CRANKSHAFT). Replace if the measurements are out of specification.



1. Plain Bearing
2. Oil bore
A. Measure plain bearing inside diameter

MAIN BEARING INSIDE DIAMETER(PTO/MAG)	
SERVICE LIMIT	42.100 mm

Plain Bearing Replacement (Main)

Removing the Plain Bearing

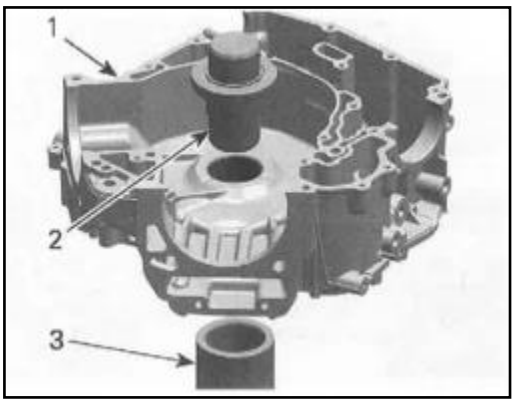
NOTICE Always support crankcase halves properly when plain bearings are removed. Damages to crankcase halves may occur if this procedure is not performed correctly.

NOTE: Always use a press for removal of plain bearings.

Carefully press the plain bearings out, from the crankcase half inside towards the outside.

REQUIED TOOLS	
CRANKCASE SUPPORT MAG/PTO	
PLAIN BEARING REMOVER/INSTALLER	

NOTE: During disassembly, make sure not to damage the sealing surfaces of the crankcase halves.



PUSH PLAIN BEARING OUTSIDE
1. Crankcase half
2. plain bearing remover/installer
3. Crankcase support sleeve

Installating the Plain Bearing (Main)

NOTICE Unless otherwise instructed, never use hammer to install plain bearings. Use press only.

NOTE: Place the proper crankcase support sleeve under crankcase halves before installing the plain bearings (refer to BEARING REMOVAL PROCEDURE)

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

During reassembly, make sure not to damage the sealing surfaces of the crankcase halves.

Install plain bearings in a cold crankcase.

NOTE: Do not lubricate plain bearings and/or crankcase for installation.

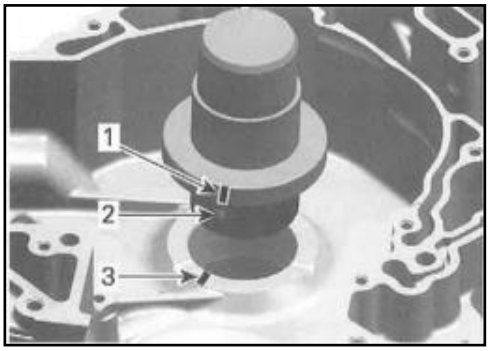
REQUIED TOOLS	
PLAIN BEARING REMOVER/INSTALLER	

Use an O-ring (φ42×1mmto1.5mm thickness) to hold plain bearings in place during installation .The O-ring will disappear in the groove of the plain bearing remover/installer.

Mark position of plain bearing oil bore on plain bearing remover/installer.

Mark position of oil bore on crankcase half.

Align mark on plain bearing remover/installer with mark on crankcase half.

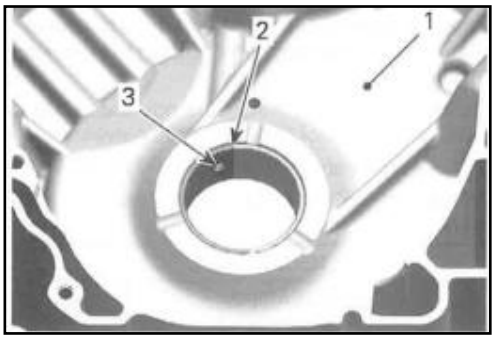


1. Oil bore position marked on plain bearing remover/installer
2. Plain bearing oil bore
3. Oil bore position marked on crankcase

NOTICE Misalignment of the plain bearing and crankcase oil bores will prevent proper oil supply to plain bearings.

Carefully press in the plain bearings from inside the crankcase towards the outside.

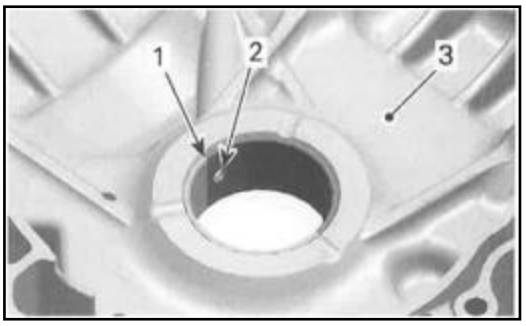
NOTICE The partition of the plain bearings in crankcase half MAG side must be positioned near to oil bore in clockwise direction.



1. Crankcase half MAG (inside surface)
2. Partition
3. Oil bore

NOTICE The partition of the plain bearings

in crankcase half PT0 side must be positioned near to oil bore in counterclockwise direction.



1. Partition
2. Oil bore
3. Crankcase half PTO (inside)

Assembing the Crankcase

The assembly of crankcase is essentially the re- verse of removal procedure. However, pay attention to the following details.

Install a NEW crankcase gasket.

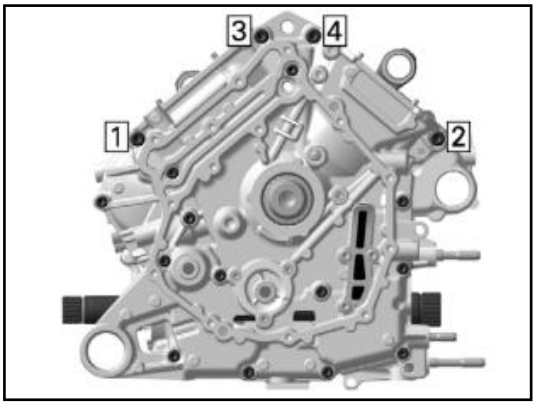
Oil the plain bearings before mounting the crank- shaft.

NOTICE Correctly reinstall crankshaft (refer to CRANKSHAFT)

Properly reinstall engine oil strainer and screws. Refer to LIBRICATION SYSTEM subsection.

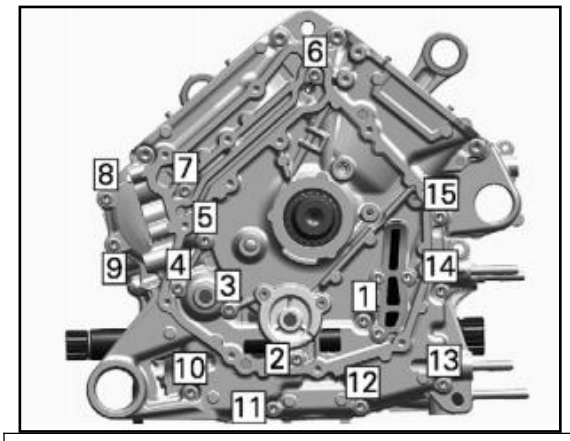
Reinstall water pump intermediate shaft and gears. Refer to WATER PUMP GEARS in the COOLING SYSTEM subsection.

Tightening sequence for screws on crankcase is as per following illustration.



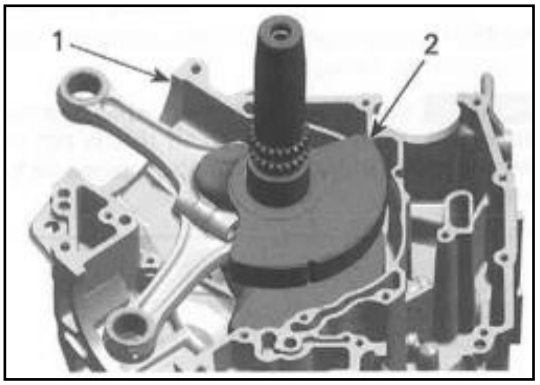
M8 SCREWS TIGHTENCE SEQUENCE

TIGHTENING TORQUE	
M8 crankcase screws	25N·m±3N·m



TIGHTENING TORQUE	
M6 crankcase screws	12.5N·m±1N·m

CRANK SHAFT



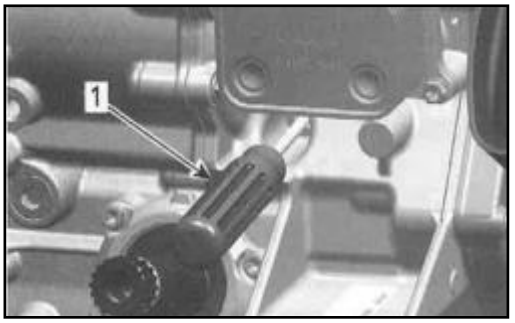
1. Crankcase MAG
2. Crankshaft

Crankshaft Locking Procedure

NOTE: When crankshaft is locked, the rear piston no. 2 is at TDC. Crankshaft can not be locked at piston no.1 TDC.

NOTICE To see if the rear piston no. 2 is at TDC ignition refer to CRANKSHAFT TIMING GEAR in the TIMING CHAIN subsection.

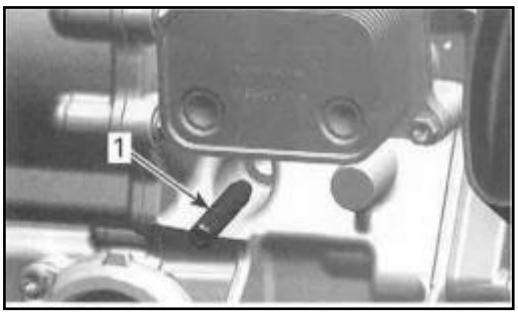
Use a screwdriver to check if the groove in the crankshaft is aligned with the hole.



1. Screw driver

Lock crankshaft

REQUIED TOOL	
CRANKSHAFT LOCKING	



1. Crankshaft locking bolt

Gradually insert the tool in the crankshaft groove. Make sure that the tool tip enters the groove and does not jam on the crankshaft balancer surface.

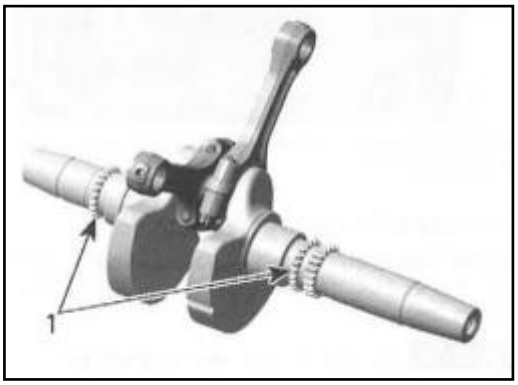
Removing the Crankshaft

Refer to CRANKCASE

Inspecting the Crankshaft

NOTE: Check each bearing journal of crankshaft for scoring, scuffing, cracks or other signs of wear. NOTE: Replace crankshaft if the gears are worn or otherwise damaged.

NOTICE Components out of specifications always have to be replaced .If this is not observed, severe damage may be caused to the engine.



1. Crankshaft timing gears

Crankshaft Axial Play

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

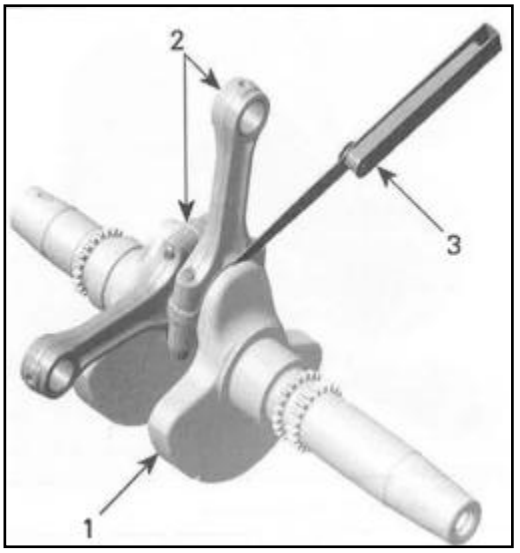
Measure play on PT0 end, using a dial indicator.

CRANKSJAFT AXIAL PLAY	
NEW	0.200 mm to 0.500 mm
SERVICE LIMIT	0.600 mm

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

Connecting Rod Big End Axial Play

Using a feeler gauge, measure distance between butting face of connecting rods and crankshaft counterweight . If the distance exceeds specified tolerance, replace the crankshaft.



1. Crank shaft
2. Connecting rods
3. Feeler gauge

CONNECTING ROD BIG END AXIAL PLAV	
NEW	0.250 mm to 0.550 mm
SERVICE LIMIT	0.600 mm

Connecting Rod/Piston Pin Clearance

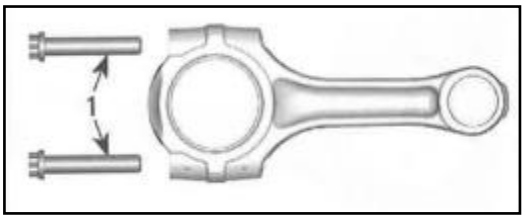
Refer to TOP END section.

Connecting Rod Big End Radial Play

NOTE: prior to remove connecting rod from the crankshaft, mark big end halves together to ensure a correct reinstallation (cracked surface fits in only one position).

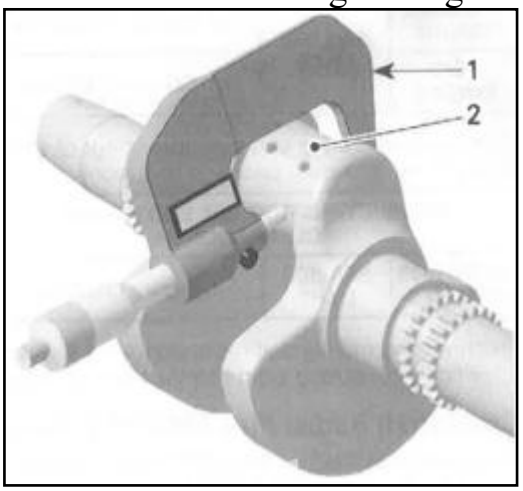
Remove connecting rods from crankshaft.

NOTICE Connecting rod screws are not reusable. Always discard screws and replace by NEW ones. It is recommended to install new plain bearings when reinstalling connecting rods.



1. Connecting rod screws

Measure crankpin . Compare to inside diameter of connecting rod big end.



1. Micrometer
2. Crankpin area for plain bearing

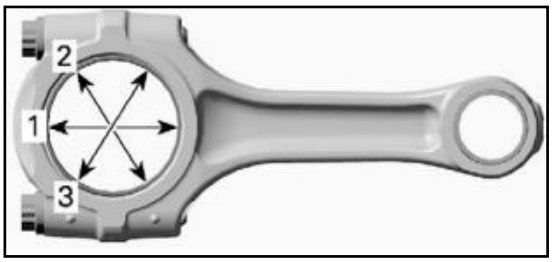
CRANK PIN DIAMETER	
NEW	41 .986 mm to42.010 mm
SERVICE LIMIT	41 967mm

If the crank pin diameter is out of specification, replace crankshaft.

To measure the connecting rod big end diameter, use the OLD connecting rod screws.

Install the OLD plain bearings as they were mounted initia11y.

Carry out the tightening procedure described in CRANKSHAFT ASSEMBLY in this subsection.



MEASURE AT 3 DIFFERENT POSITIONS

CONNECTING ROD BIG END RADIAL	
SERVICE LIMIT	40.100mm(1.5787in)
	42.100mm(1.6575in)

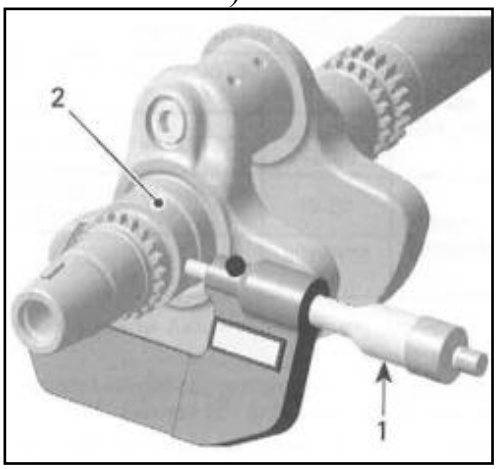
If connecting rod big end diameter is out of specification, replace plain bearings and recheck.

CONNECTING ROD BIG END RADIAL CLEARANCE	
SERVICE LIMIT	0.09mm(.0035in)

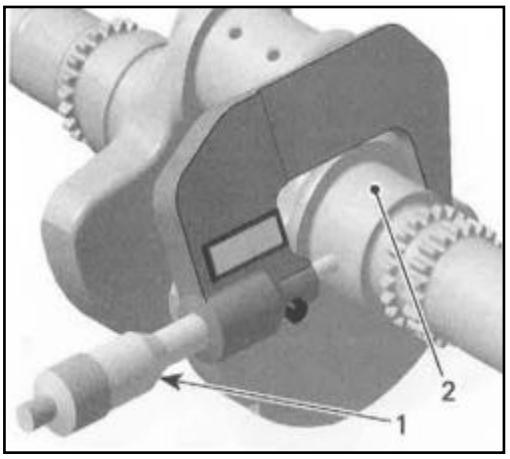
If connecting rod big end radial clearance is out of specification, replace plain bearings and recheck.

Crankshaft Radial Play MAG/PTO Side

Measure crankshaft on MAG/PTO side . Compare to inside diameter of MAG/PT0 plain bearing (refer to CRANKCASE).



1. Micrometer
2. Crankshaft area for MAG plain bearing

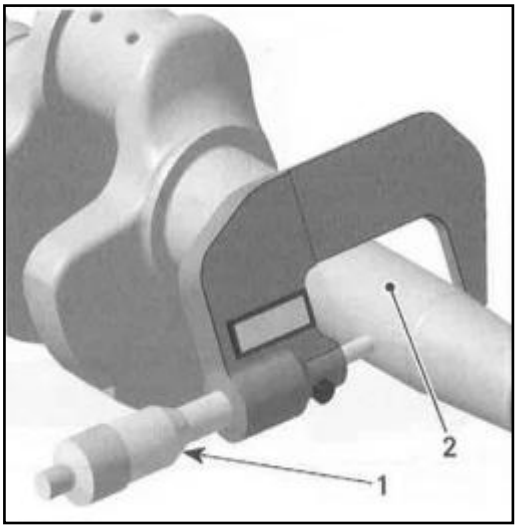


1. Micrometer
2. Crankshaft area for PTO plain bearing

CRANKSHAFT MAIN BEARING JOURNAL DIAMETER (MAG/PTO SIDE)	
NEW	42.016mm to42.040mm
SERVICE LIMIT	42.000mm

CRANKSHAFT RADIAL PLAY (MAG/PTO SIDE)	
SERVICE LIMIT	0.07 mm(.0028in)

Crankshaft Radial Play
(PTO Cover Bearing)
Measure crankshaft journal diameter (PTO cover bearing) . Compare to plain bearing inside diameter (PTO cover). Refer to PTO COVER in this subsection.



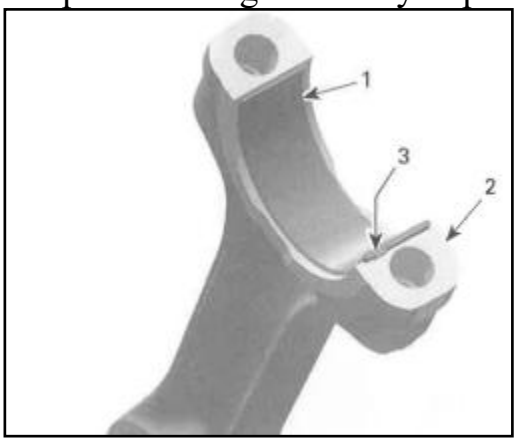
1. Micrometer
2. Crankshaft journal (PTO support bearing)

CRANKSHAFT JOURNAL DIAMETER (PTO COVER BEARING)	
NEW	34.004mm to34.020 mm
SERVICE LIMIT	33.998 mm

CRANKSHAFT RADIAL PLAY (PTO COVER BEARING)	
SERVICE LIMIT	0.10 mm

If crankshaft journal diameter is out of specification, replace crankshaft.
If crankshaft radial play (PTO cover bearing) out of specification, replace plain bearings and recheck.

Assembling the Crankshaft Assembly
For assembly, reverse the disassembly procedure. Pay attention to following details.
Clean the split surface on both sides (cracked area) carefully with compressed air.
Put plain bearings correctly in place.

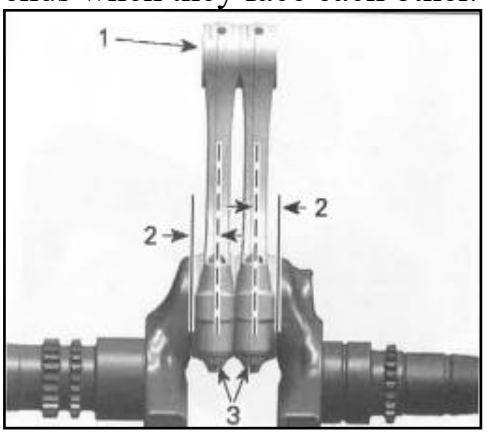


1. Half plain bearing of connecting rod big end
2. Split surface of the connecting rod
3. Nose of plain bearing in line with connecting rod groove

Oil the plain bearing surface of the connecting rod and crank pin before installation.
NOTICE Lower cap and rod must match together since there is a cracked surface.
Oil NEW connecting rod screws
NOTICE Always use NEW connecting rod screws at final assembly. They are not reusable.
Thread screws in the connecting rods, then tighten as per fo11owing procedure.
NOTICE Strictly adhere following instructions:

- Do not apply any thread locker.
- The running direction of the big end bearings and of the piston pins must not chan9e.
- Always perform each step on both connecting rod -Failure to strictly follow procedure may cause connecting rod screws to loosen and lead to Severe engine damage.

NOTICE Connecting rods are asymmetric. There must be no gap between the small ends when they face each other.



1. Connecting rod small ends
2. Connecting rod offset
3. Connecting rod screws

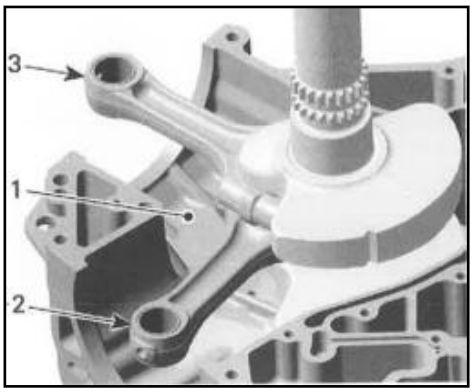
CONNECTING RODS SCREWS TIGHTENING SEQUENCE	
1	Tighten to1/2 of specified torque
2	Tighten to30N·m±2N·m
3	Torque by an additional 90±5° turn using an angle torque wrench

Crankshaft Installating

For installation of crankshaft in crankcase reverse the removal procedure. Pay attention to the fol_ lowing details.

Do not mix up the connecting rods of cylinders1 and2 during installation.

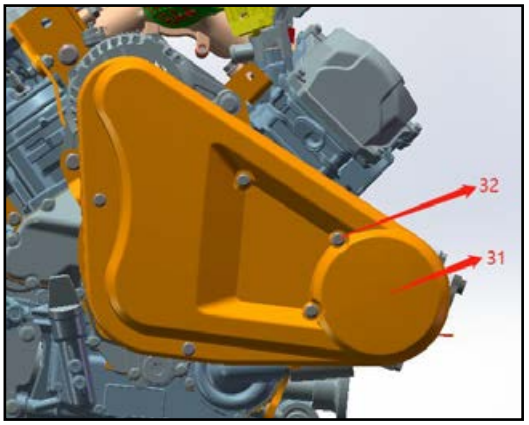
NOTICE Observe the correct installation position when fitting the crankshaft with the connecting rods. The connecting rod MAG side has to face cylinder no. 1.



1. Crankcase half MAG side
2. Connecting rod cylinder 1
3. Connecting rod cylinder 2

Air conditioning accessory maintenance

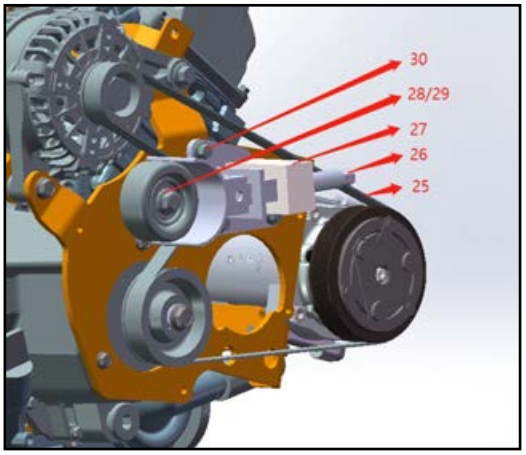
1.Remove the belt cover



31-belt cover
32-M6 bolt×5

2.Remove the idler gear

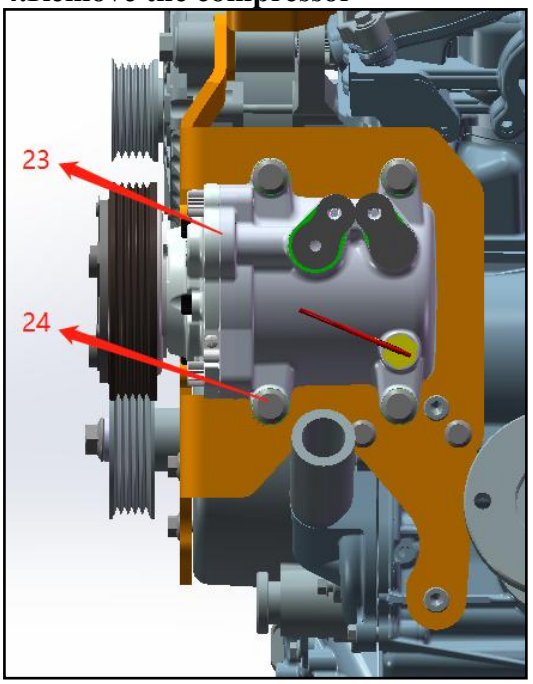
3.Remove the elastic belt



25.Elastic belt
26-27.Elastic belt disassembly and assembly tooling
28.Idler
29.M10 nut
30.M8 bolt×3

Elastic belt disassembly and assembly tooling

4.Remove the compressor

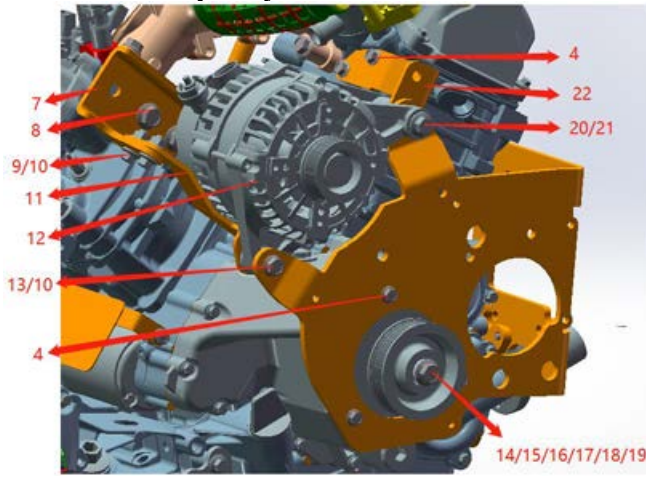


23. Compressor
24. M8 bolt×4

5.Remove the generator and generator bracket

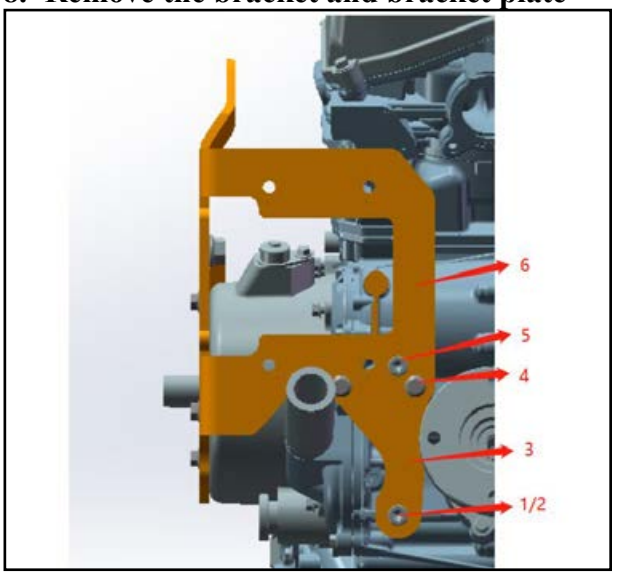
6.Remove the bracket fixing plate

7.Remove the pulley



7. Bracket fixing plate
8. bolt M10×2
9. bolt M8×2
10. nut M8×3
11. Generator rear bracket
12. Generator
13. bolt M8
14. Plug M10
15. Oil seal
16. Ordinary round head flat key
17. Belt pulley
18. Butterfly gasket
19. bolt M10
20. bolt M10
21. Generator clamping sleeve
22. Generator front bracket

8. Remove the bracket and bracket plate



1.bolt M10
2. Spacer
3. Support plate
4. bolt M8×7
5. bolt M10
6. Bracket

9.For installation, reverse the removal proce dure.

CONTINUOUSLY VARIABLE TRANSMISSION (CVT)

GENERAL

NOTE:For a better understanding,the following illustration are taken with engine out of vehicle.

To perform the following instruction,it is not necessary to remove engine.

This CVT is lubrication free. Never lubricate any components except drive pulley hub.

△WARING
Never touch CVT while engine is running. Never drive vehicle when CVT cover is re-moved.

△WARING
Any drive pulley repairs must be performed by an authorized Can-Am dealer. Subcompo-nent installation and assembly tolerances re-quire strict adherence to procedures detailed.

△WARING
The clutch assembly is a precisely balanced unit. Never replace parts with used parts from another clutch assembly.

PROCEDURES

CVT COVER

CVT Cover Access

Tilt the cargo box.

Remove the rear deflector on the driver side.

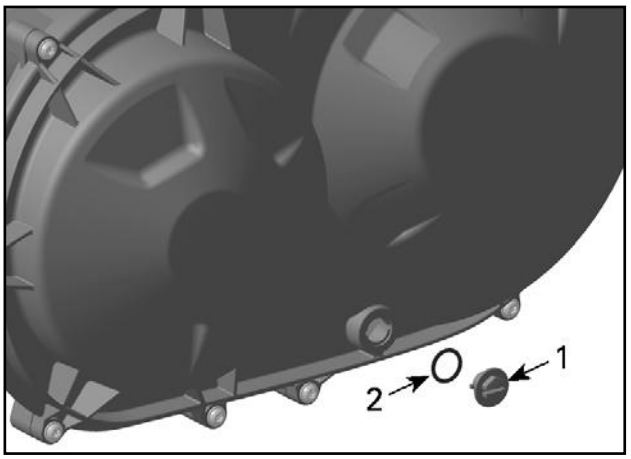
The wheel can also be removed to make more room.

Draining the CVT Cover

If water is present in CVT cover, it can be drained as follows:

Turn bayonet cap 90 ° counterclockwise to open it.

Remove bayonet cap and O-ring.



1. Bayonet cap
2. O-ring

3. Let water drain from CVT cover.
4. Reinstall bayonet cap and O-ring.

TIGHTENING TORQUE	
Bayonet cap	2N.m±0.2N.m

NOTICE If any debris entered the CVT cover, CVT must be cleaned and inspected.

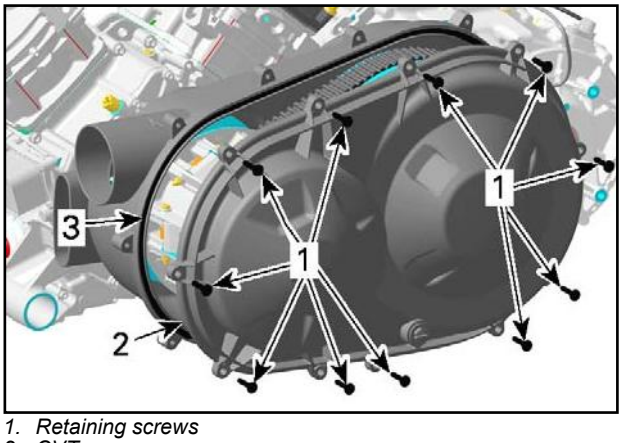
Removing the CVT Cover

Remove:

- Retaining screws
- CVT cover
- Gasket.

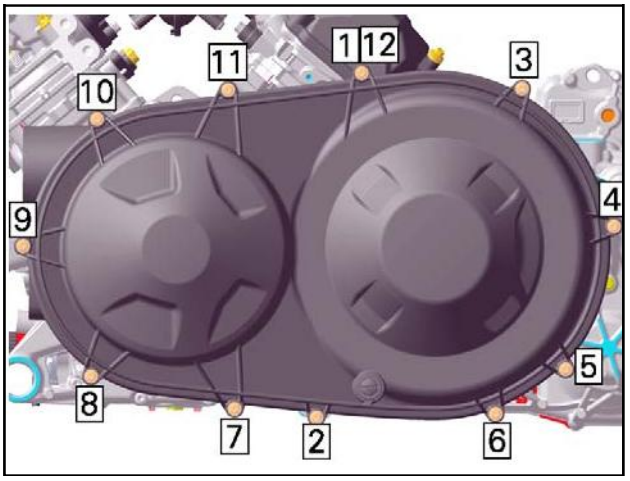
NOTE: Remove the center top screw last to sup-port the cover during removal.

NOTICE Do not use and impact tool to re-move CVT cover screws



1. Retaining screws
2. CVT cover
3. Gasket

Installing the CVTCover
Install the center top screw of first.
Tighten the CVT cover retaining screws as per fol-lowing sequence.



TIGHTENING TORQUE	
CVT cover retainingscrews	6N.m±0.7N.m

DRIVE BELT

Removing the Drive Belt

NOTICE In case of a drive belt failure, the CVT, cover and air outlet must be cleaned.

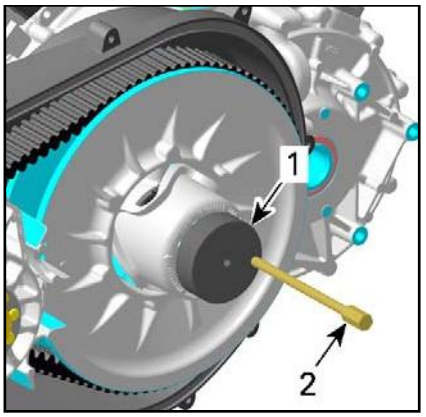
Remove *CVT COVER*.

REQUIED TOOL	
DRIVEN PULLEY EXTRACTOR	

Screw in the driven pulley adapter into the driven pulley shaft.

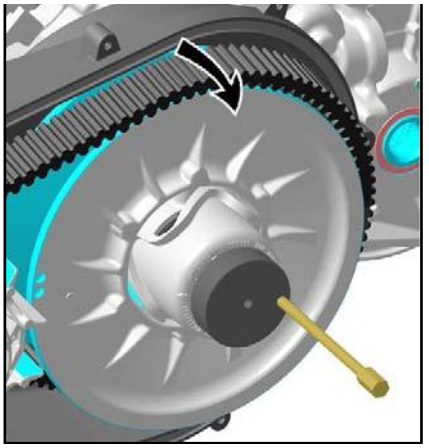
Screw in the driven pulley extractor into the threaded offset hole of the adapter.

Tighten the extractor to open the pulley.



1.Driven pulley adapter
2.Driven pulley extractor

To remove belt, slip the belt over the top edge of fixed sheave, as shown.



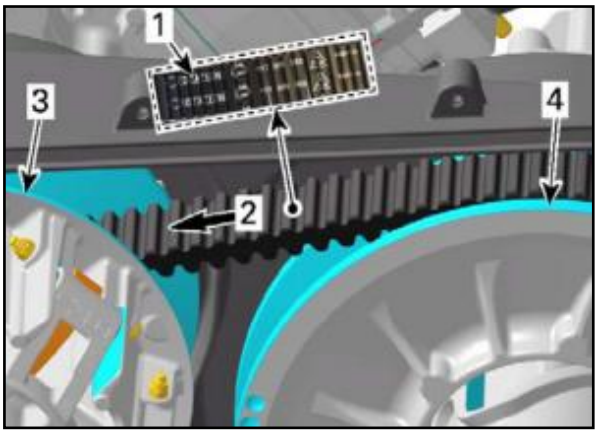
Inspecting the Drive Belt

For drive belt inspection refer to DRIVE BELT INSPECTION in the PERIODIC MAINTENANCE PROCEDURES subsection.

Installing the Drive Belt

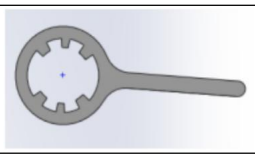
For installation, reverse the removal procedure. Pay attention to following details.

The maximum drive belt life span is obtained when the drive belt has the proper rotation direction. Install it so that the arrow printed on belt is pointing towards front of the vehicle, viewed from top.



1.Arrow printed on belt
2.Rotation direction
3.Drive pulley (front)
4.Driven pulley (rear)

DRIVE PULLEY

REQUIED TOOL	
Retaining tool	

Removing the Drive Pulley

REQUIRED TOOLS	
CLUTCH HOLDER	

1.Remove DRIVE BELT, see procedure in this subsection.
2.Lock the drive pulley.
3.Loosen the drive pulley screw.
NOTICE Never use any type of impact wrench for drive pulley removal.

NOTE: Do not unscrew the drive pulley screw completely.

Remove service tool.

Apply axial pressure with your hand on the gov-ernor cup until clutch puller for removal is
in-stalled.

REQUIED TOOL	
CLUTCH HOLDER	

Remove drive pulley screw and spring washer.
⚠ **CAUTION** Sliding sheave of drive pulley is spring loaded.
Screw clutch puller in fixed sheave to remove drive pulley.
NOTICE Use only recommended tool.
Disassembling the Drive Pulley

Drive Pulley

Screw clutch puller into fixed sheave shaft about 63 mm (2-1/2 in).

Raise drive pulley by the sliding sheave while knocking on the puller head to disengage fixed sheave.
NOTICE Never tap on governor cup.

TIGHTENING TORQUE	
Drive pulley screw	120N.m± 8 N•m

Lock the drive pulley as per removal procedure.
Tighten drive pulley screw to specified torque.

NOTICE Never use any type of impact wrench for drive pulley installation.

DRIVEN PULLEY

Removing the Driven Pulley
1.Remove:
- CVT cover
- Drive belt.

2.Install the clutch holder.
Remove:
- Driven pulley screw (discard it)
- Collar washer.

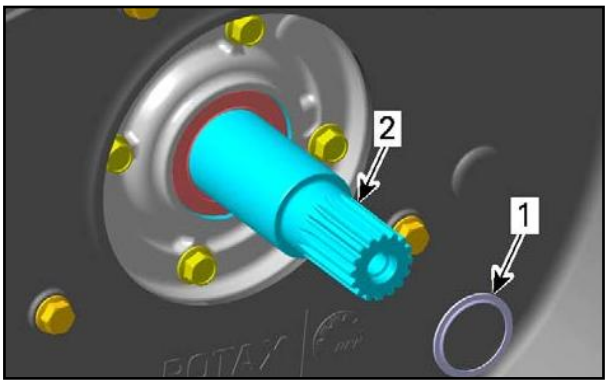
4.Remove the clutch holder.
Pull the driven pulley out of the vehicle.

5.1If removed, reinstall the DRIVEN PULLEY ADAPTER.

5.2Screw in the DRIVEN PULLEY EXTRACTOR
in the center hole of the driven pulley adapter.

5.3Tighten the extractor until driven pulley is free.

5.4Remove tools from the driven pulley.
Remove thrust washer from countershaft.



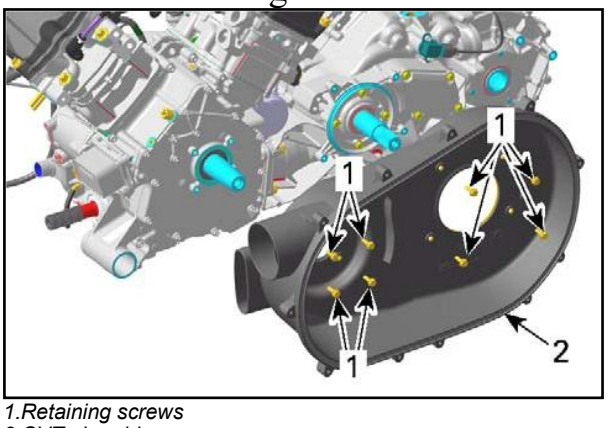
1.Thrust washer
2.Countershaft

CVT AIR GUIDE

Removing the CVT Air Guide

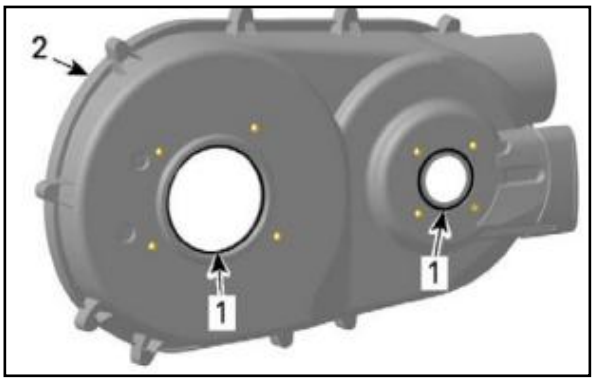
Remove:
– DRIVE PULLEY
– DRIVEN PULLEY

Unscrew the clamps retaining the CVT air hoses.
Remove CVT air guide.



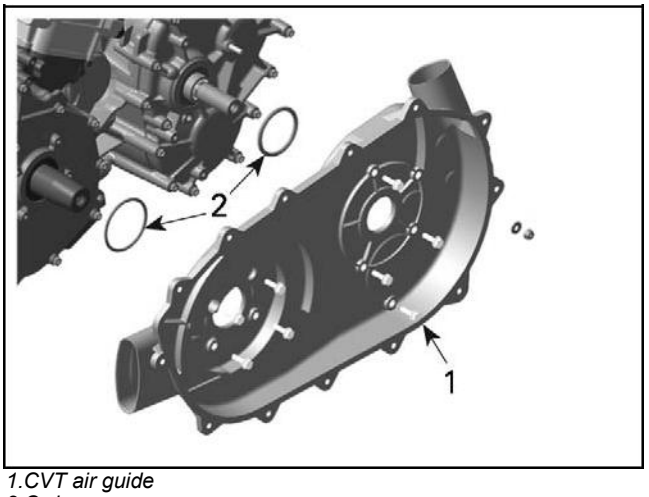
1.Retaining screws
2.CVT air guide

Remove and discard O-rings



1.CVT air guide
2.O-rings

Inspecting the CVT Air Guide
Clean CVT air guide from contamination



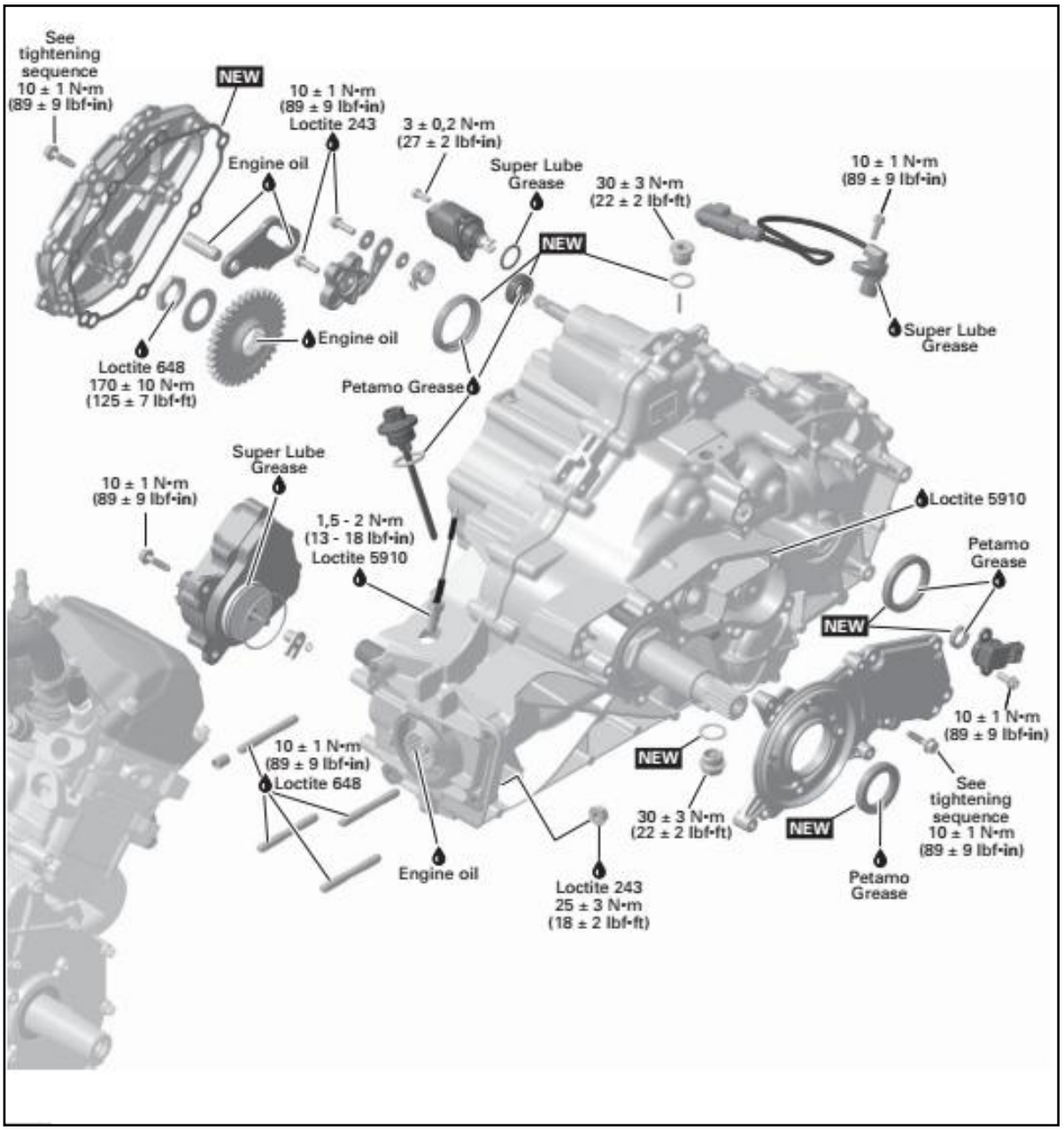
1.CVT air guide
2.O-rings

Installing the CVT Air Guide

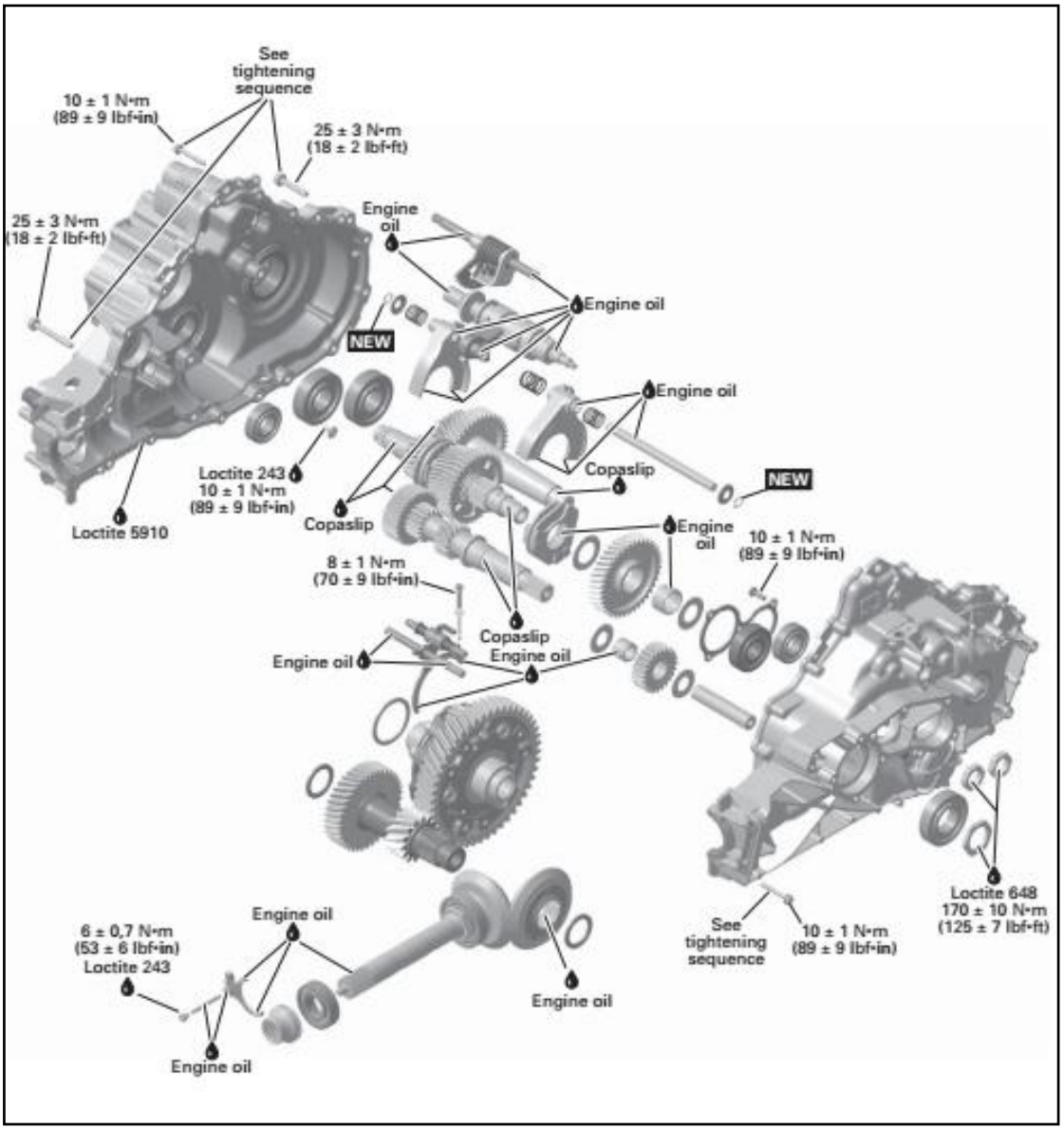
For installation reverse the removal procedure

TIGHTENING TORQUE	
CVT air guide retaining	10 N•m ± 1 N•m

GEARBOX COUPLING UNIT
GEARBOX

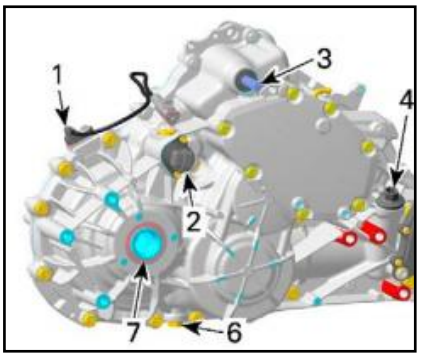


GEARBOX COMPONENTS MECHANISISM

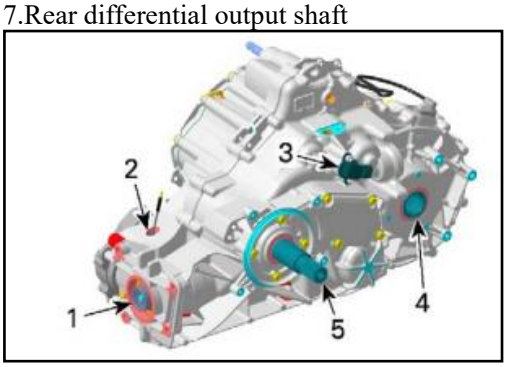


GENEAL

GEARBOX OVERVIEW



1. Vehicle speed sensor (VSS)
2. Differerntial locking actuator
3. Shift shaft
4. Gearbox oil
6.Magnetic drain plug
7.Rear differential output shaft



1. 4WD couping sleeve
2. 4WD indicator switch
3. Gearbox position sensor(GBPS)
4. Rear differential output shaft
5. Shift shaft

TROUBLESHOOTING

UNUSUAL GEARBOX NOISE AND/OR VIBRATIONS

1. Low oil level in gearbox.
-Oil leakage from gearbox .Replace damaged(s) and/or oil seal（s）
2. Defective bearings.
-Bearing(s) do(es) not turn smoothly. Replace bearing(s).
3. Damaged or worn gears.
-Inspect gears for damages or missing teeth. Replace respective gears.

GEARINDICATION FAILS

1. Defective gearbox position sensor (GBPS)
-Perform a gearbox position sensor test.
-Damaged wires .Repair as required.

GEAR(S) IS (ARE) HARD TO SHIFT

1. Incorrect shifter cable adjustment.
-Adjust shifter cable (refer to SHIFTER CABLE in SHIFTER subsection.

4 WHEEL DRIVEINDICATION FAILS

1. 4WD indicator switch failure .
-Test 4WD indicator switch. Replace as required
-Bad contact. Check for corrosion or loose co11nector.
-Damaged wires. Repair as required

4 WHEEL DRIVE DOES NOT ENGAGE OR DISENGAGE

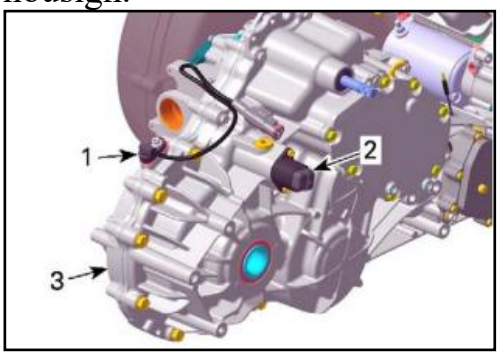
1. Defective 4WD switch.
-Check 4WD switch operation.
2. Defective actuator.
-Test actuatol1.
3. Damaged or worn shifting fork or sleeve.
Remove actuator and inspect shifting fork and sleeve.

PROCEDURES

VSS (VEHICLE SPEED SENSOR)

VSS Location

The vehicle speed sensor is located on the rear top side of the left gearbox housign.



1. VSS (Vehicle Speed Sensor)
2. Differerntial locking actuator
3. Left housing of gearbox

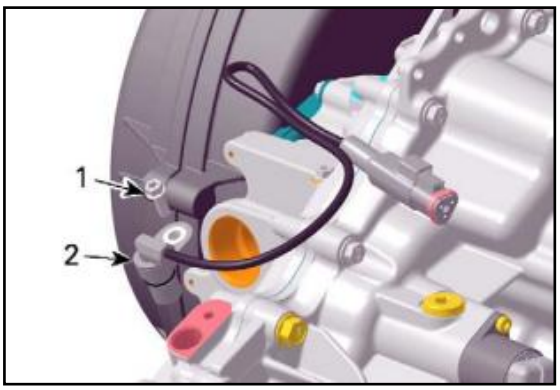
VSS Access

The VSS is accessible by the rear of the vehicle.

Removing theVSS

Disconnect VSS connector.

Remove screw retaining the VSS.
Using a long screwdrive,pull out the VSS.



SEVEAL PARTS REMOVED FOR CLARITY
1. Screw
2. VSS

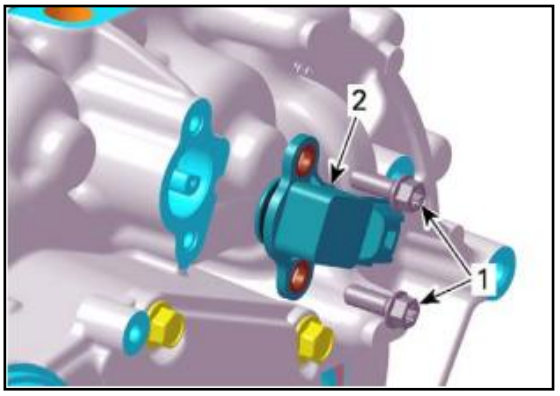
VSS Installation
For installation, reverse the removal procedure.
Pay attention to the following.
Lubricate VSS O-ring.

VSS O-RING	
TEST PROBES	SUPER LUBE GREASE

TIGHTENING TORQUE	
VSS retaining screw	10N.m±1N.m

GEARBOX POSITION SENSOR （GBPS）
GBPS Reset
When replacing the gearbox position sensor
(GBPS), it is required to reset (re-zero) its values for proper operation.
A reset must be carried out each time any of the following parts has been replaced:
- Gearbox assembly
- Shift drum
- GBPS
- ECM.

A message will be displayed if the operation is successful.
If an error occurred or the GBPS is not within the allowed range while resetting, the ECM will generate a fault code and will not accept the setting.
5. If a fault message is displayed, follow the instructions in the message(s).
6. Check for fault codes.
If a fault code is generated:
- Carry out the service action.
- Reset the fault code.
- Repeat the reset procedure.
7. Close and disconnect B.U.D.S.
NOTE: Do not turn ignition key OFF.
8. Verify gears engagement.
8.1 With the vehicle on ground and in NEUTRAL position, start engine.
8.2 During4-5 seconds, rev engine to2500±200 RPM.
8.3 Let engine returns to idle.
8.4 Select an other position(P，R，H or L). Repeat substeps8.2 and8.3 until all position are verified.
NOTE: The vehicle must be in movement to complete the procedure on R, H and L position.
GBPS Access
Tilt the cargo box
Testing the BGPS input Voltage
NOTE: Prior to conduct testing, check fault codes in B.U.D.S.
Set shift lever in NEUTRAL position.
Back-probe the GBPS connector .
Removing theGBPS
Set shift lever in NEUTRAL position.
Unplug GBPS connector.
Remove screws and withdraw GBPS.

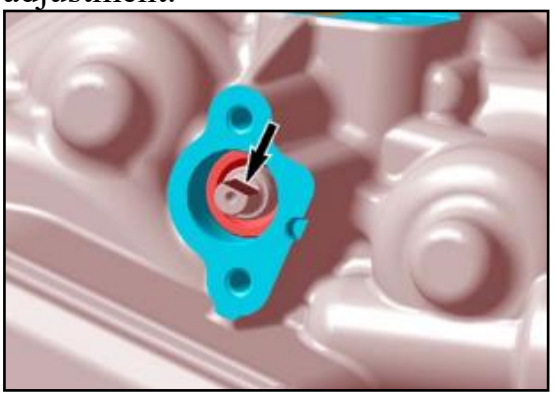


1. Screws
2. Gearbox Position Sensor (GBPS)

Installating the GBPS

For installation, reverse the removal procedure.
Pay attention to the following details.
Shift lever must be in the NEUTRAL position.
Align GBPS with the flat on the shift drum shaft.

NOTE:Do not force to install GBPS if shaft flat is not properly aligned. If alignment is incorrect,check shift rod adjustment.



Reset the GBPS. Refer to GBPS RESET in this subsection.

DIFFERENTIAL LOCKING ACTUATOR

Differential Locking Actuator Access
Tilt the cargo box,
1.Set shaift lever on NEUTRAL
2.Turn ignition switch to ON. Do not shart the engine.
3.Place the rear differential switch in LOCK position.

NOTE: The rear differential is locked when the switch is pushed upwareds.
4.Lift the rear of the vehicle until rear wheels are off the groud ,
5.Turn a rear wheel.
-If both wheels turn,the actuator is in LOCK position. Continue with step 6.
-If only one wheel turns, check the switch position and turn the wheel again.if the resule is the same,carry out

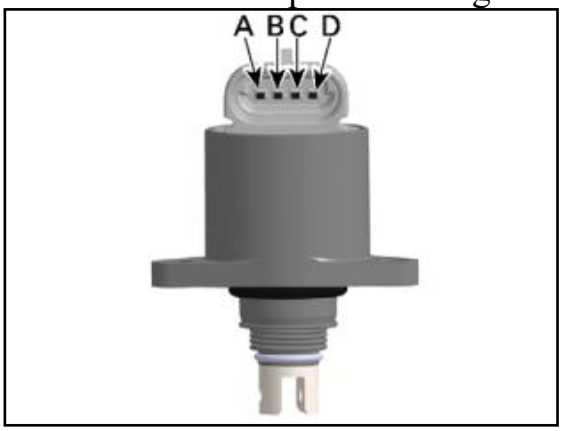
TESTING THE DIFFERENTIAL LOCKING ACTUATOR RESISTANCE.

6.Move the rear differential switch UNLOCK position.
NOTE:The rear diffferential is unlock when the switch is pushed downwards.
7.Turn a rear wheel.
-If only one wheel turns the actuator and its electrical system work properly .
-If both wheels turn, check the switch position and turn the wheel again

Tisting the Differerntial Locking Actuator Resistance
Disconnevt differential locking actuator connector .
Set muliimeter to Ω

REQUIRED TOOLS	
FLUKE 115 MULTIMETER	

Probe terminals as per following table



If resistance is mot within specifications,replace the actuator.
If resistance tests good,reconnect the actuator connector.
Install ECM-A connector on ECM adapter.

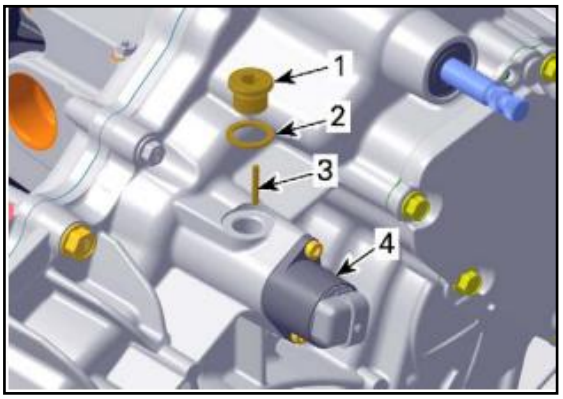
REQUIRED TOOLS	
ECM ADAPTER TOOL	

Using a multmeter,recheck resistance as per table.

ECM CONNECTOR		MEASUREMENT
PIN		RESSTANCE Ω @20℃（68° F）
A-C2	A-C1	28-34 Ω
A-B2	A-A4	

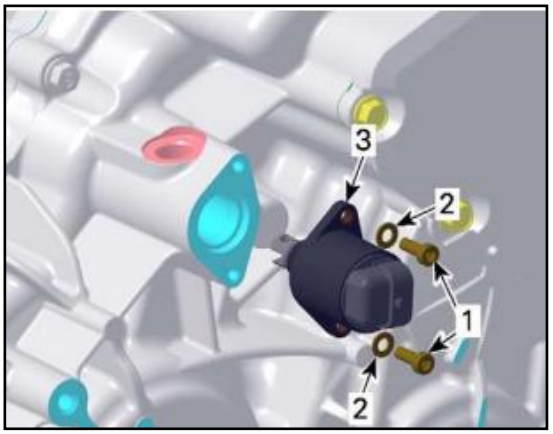
ACTUATOR CONNECTOR		MEASUREMENT
PIN		RESSTANCE Ω @20℃（68° F）
A	C	28-34 Ω
B	D	

If resistance value is connect replace ECM,refer to ECM REPLACEMENT in the ELECTRONIC FUEL INJECTION(EFI)subsection.
If resistance value is connect,repair the conntctor or replace the wiring harness between ECM connector and actuator.
Removing the Differntial Locking Acyuator
Remove:
-Plug screw
-Sealing ring (discard it)
-Pin



1. Plug screw
2. Seaing ring
3. Pin
4. Differential locking actuator

Remove:
-Retaining screws
-Washers
-Differential locking actuator.



1. Retaining screws
2. Washers
3. Dfferential locking actuator

Installing the Differential Locking Actuator
Lubricate actuator O-ring

DIFFERENTIAL LOCKING ACYUATOR O-RING	
Service product	SUPER LUBE GREASE

Tighten retaining screws to specification

TIGHTENING TORQUE	
Differential locking actuator retaining screws	3N.m±0.2N.m

Install a NEW sealing ring and tighten plug screw to specification.

TIGHTENING TORQUE	
Plug screws	30N.m±3N.m

GEARBOX OIL SEALS

Replacing the Gearbox Oil Seal

Replace oil seals if they are brittle, hard or dam- aged.

A small flat screwdriver can be used to remove most of these oil seals.

NOTICE Avoid scoring parts during oil seal removal.

When replacing an oil seal, take this opportunity to inspect the following:

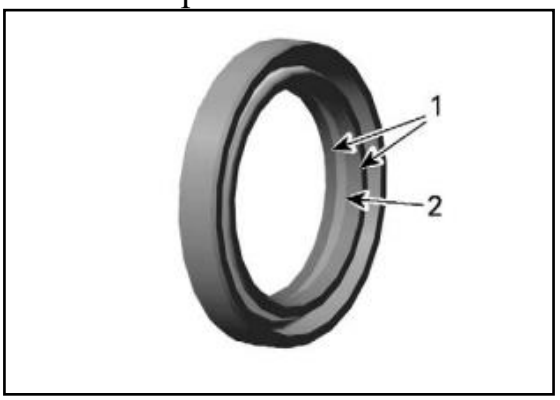
-Check bearings behind each oil seal for contamination and/or metal shavings.

-Check oil seal running surfaces for scratches. Lubricating the Oil Seal

When installing or reinstalling oil seals,use PETAMO GREASE GHY 133N to :

-Lubricate sealing lips aii around.

-Fill up the between sealing lips halfway aroiund the permetre.



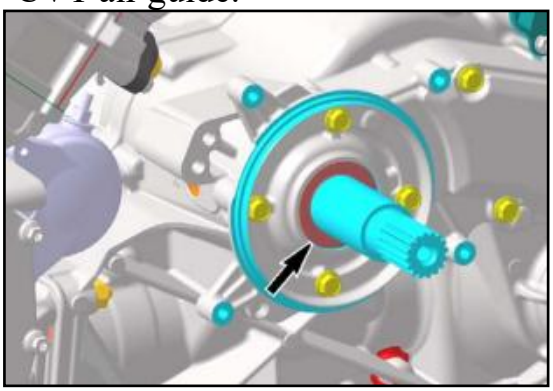
1. Sealing lips
2. Room between sealing lips

Countershaft Oil Seal

To replace the countershaft oil seal, remove:

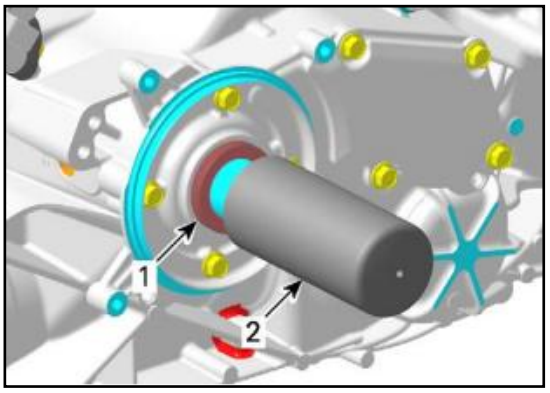
-Drive and driven pulleys

-CVT air guide.



Install countershaft oil seal.

REQUIRED TOOL	
OIL SEAL INSTALLER (COUNTERSHAFT)	

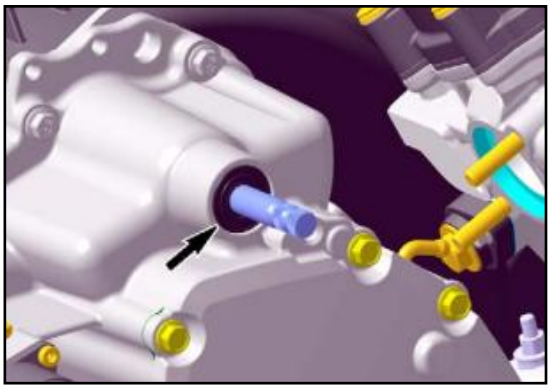


1. Countershaft oil seal
2. Oil seal installer

Shift Shaft Oil Seal

Remove the shaft plate. Refer to SHIFTER subsection.

The shift shaft oil seal can be removed without removing the gearbox from the vehicle.



Use a suitable tube with the proper diameter to install the oil seal.

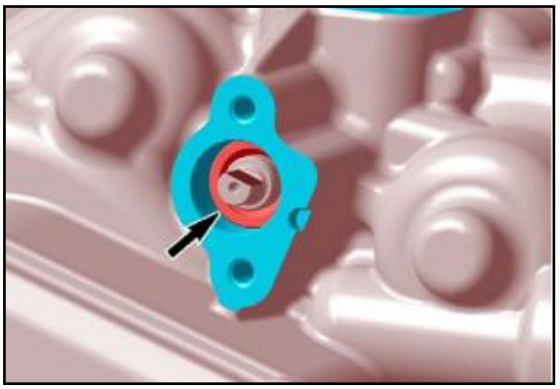
If gearbox housing is apart, use following tools for shift shaft oil seal installation.

REQUIRED TOOL	
OIL SEAL INSTALLER (GEARBOX)	
HANDLE	

NOTICE Oil seal must be installed with sealing lip toward gearbox.

Shift Drum Shaft Oil Seal

To replace the shift drum shaft oil seal, remove the GBPS (GEARBOX POSITION SENSIR). See procedure in this subsection.

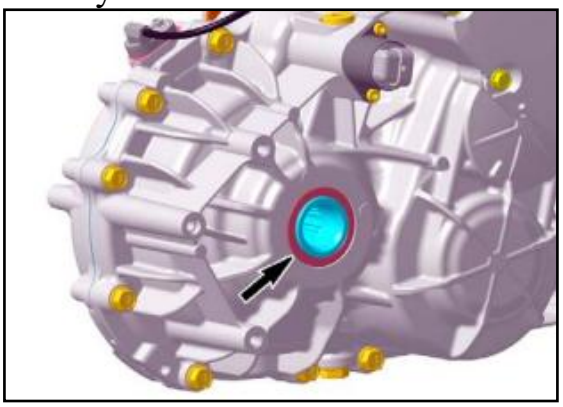


Use a suitable tube with the proper diameter to install the oil seal.

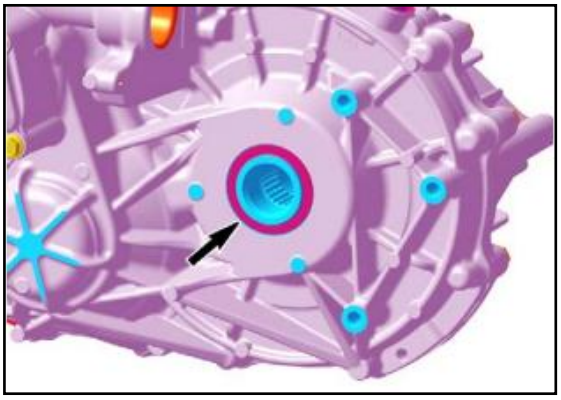
NOTICE Oil seal must be installed with sealing lip toward gearbox.

Output Shaft Oil Seal

Remove the aooropriate drive shaft. Refer yo REAR DRIVE subsection.



RIGHT SIDE

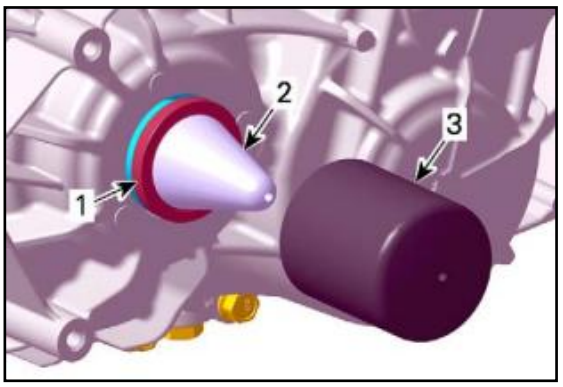


LEFT SIDE

Punch a sharp screwdrive thought oil seal for removal.

Place oil seal on output shaft and install it using the following tools.

REQUIRED TOOL	
OIL SEAL INSTALLER (DIFFERENTIAL OUT PUT)	



1. Output shaft oil seal
2. Eeve installer
3. Oil seal installer

GEARBOX ASSEMBLY

Removing the Gearbox Assembly

Remove engine from vehicle. Refer to ENGINE REMOVAL AND INSTALLATUON for the procedure.

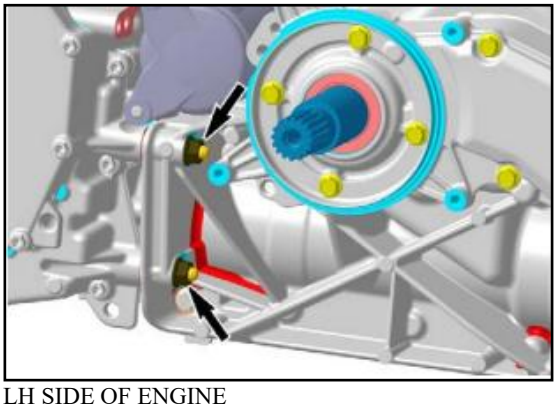
Refer to COUNTINOUSLY VARIABLE TRANSMISSION (CVT) subsection to remove following parts:

- CVT cover
- Drive and driven pulleys
- CVT air guide.

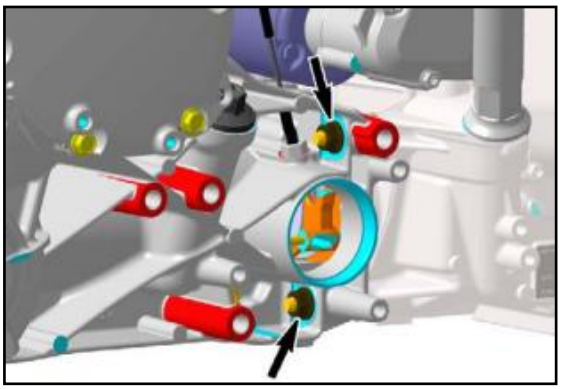
Drain gearbox. Refer to GEARBOX OIL REPLACEMENT in PERIODIC MAINTEANCE PROCDURES subsection.

Remove 4WD ACTUATOR see procedure in this subsection.

Unscrew the four (4) gearbox retaining nuts.



LH SIDE OF ENGINE



RH SIDE OF ENGINE

Pull gearbox to separate it from engine.

Installing the Gear box

For installation reverse the removal procedure.

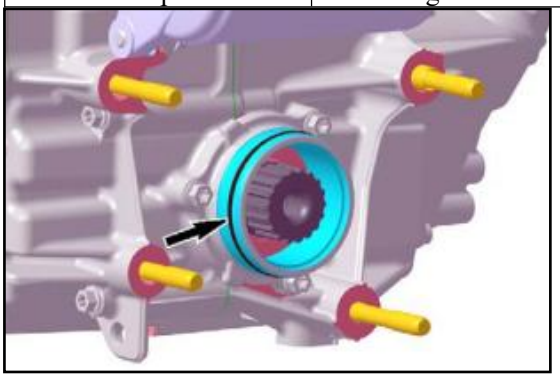
Pay attention to following.

Before gearbox installation check

O-ring on bearing cover if brittle,hard or damaged.Replace if necessary.

Lubricate O-ring on rear bearing cover.

O-RING LUBRICATION	
Service product	Engine oil



Tighen gearbox retaining nuts to specification

TIGHTENING TORQUE	
Gearbox retaining nuts	25N.m±3N.m

After installation refill gearbox oil,refer **to PERIODIC MAINTENANCE PRODURES subsection.**

GRARBOX HOUSING

Disassembing the Gearbox Housing

See prucedures in this subsection to remove:

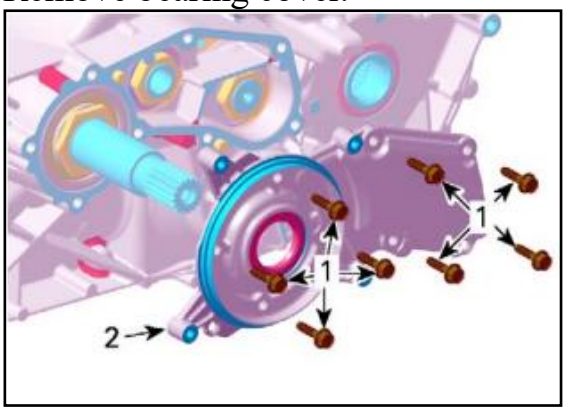
-4WD ACTUATOR

-GBPS (GEARBOX POSITION SENSOR)

-DIFFERENTIAL LOCKING ACTUATOR

Set gearbox to PARK position.

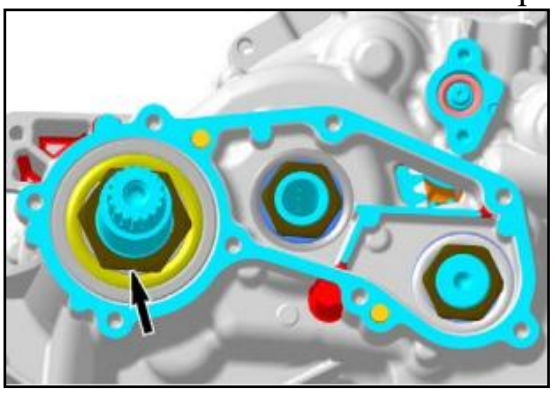
Remove bearing cover.



1. Retaining screws
2. Bearing cover

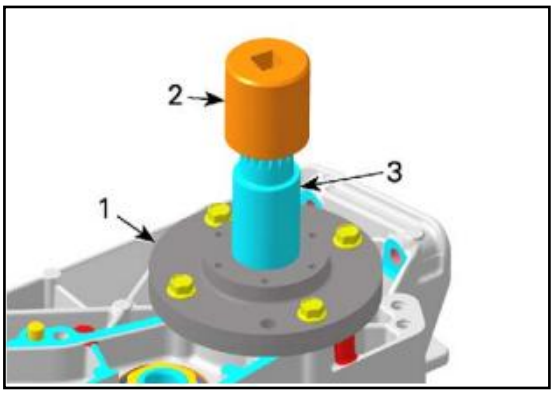
Remove countershaft nut.

△CAUTION Nut can loosen abruptly.



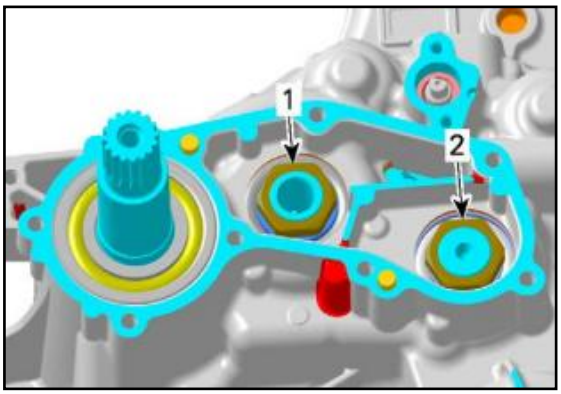
REQUIRED TOOL	
M34 SOCKET	
SPLINES SOCKET1/2	

NOTICE Turn spline socket clockwise to loosen the nut.



1. M34 socket
2. Spline socket
3. Countershaft

Remove nuts of main shaft and instermediate shaft.

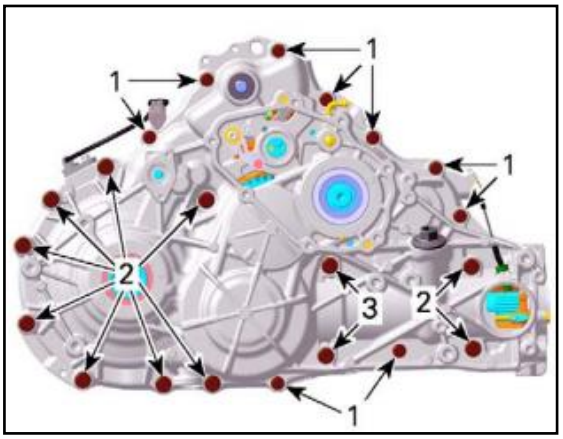


1. Main shaft nut
2. Intermediate shaft nut

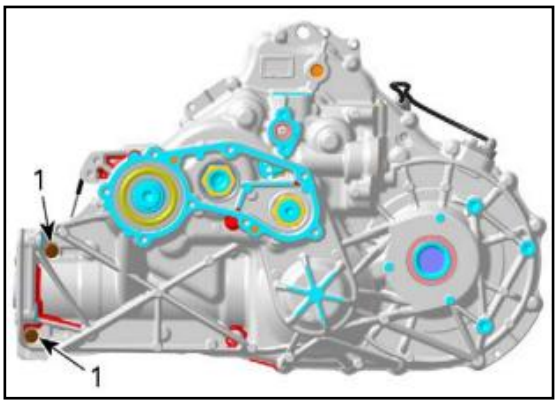
Refer to GEARBOX AND SHAFTING MECHANISM in this subsection and remove:

Parking lock gear
-Index washer.
Remove all gearbox housing screws:

1. Start removing the M6 screws.
2. Then remove the M8 screws.

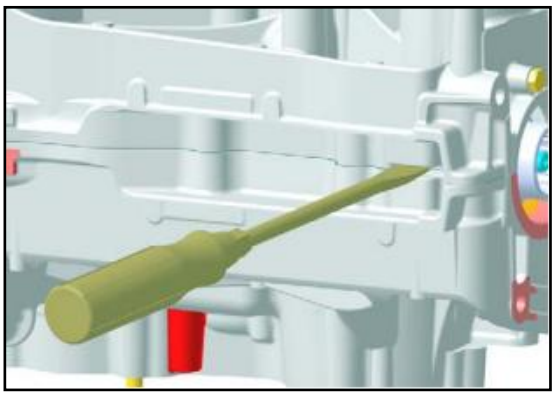


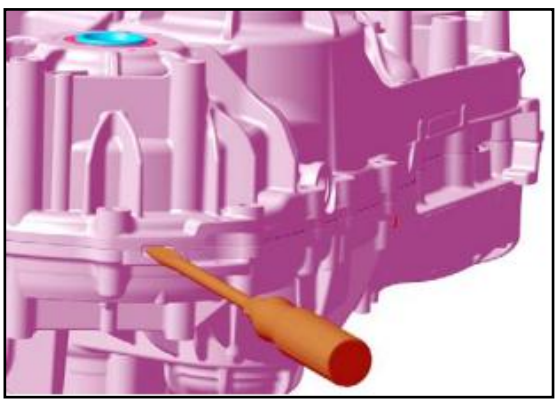
1.11 screws M6×45
2.10 screws M8×45
3.2 screws M8×65



1.2 screws M6×45

Separte gearbox housing,use 2 big screwdrivers.





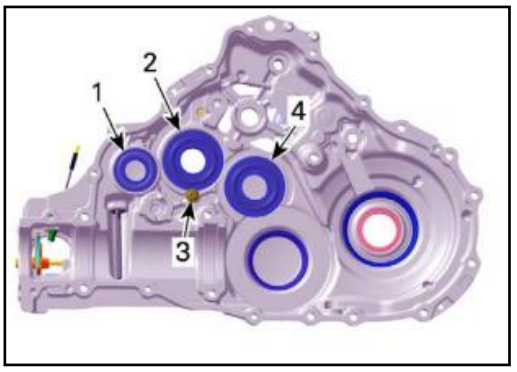
If necessary, refer to proce dures in this subsection and remove:

-GEARBOX AND SHAIFTING MECHANISM
-PUTPUT SHAFT AND COUPLING MECHANISM
-REAR DIFFERENTIAL AND LOCKING MECHANISM.

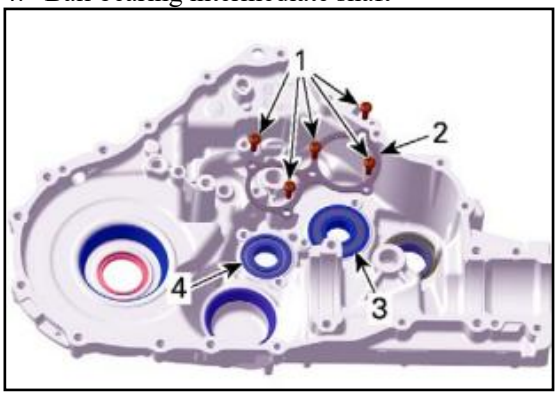
Inspecting the Gearbox Housing
Check gearbox ball bearings for: contamination and/or metal shavings.
Check if ball bearings turn freely and smoothly.
Replace if necessary.
Bearing Replacement
If necessary heat housing up to 100℃（212° F）before removing ball bearings.

△WARNING
Clean oil, outside and inside, from housing before heating.

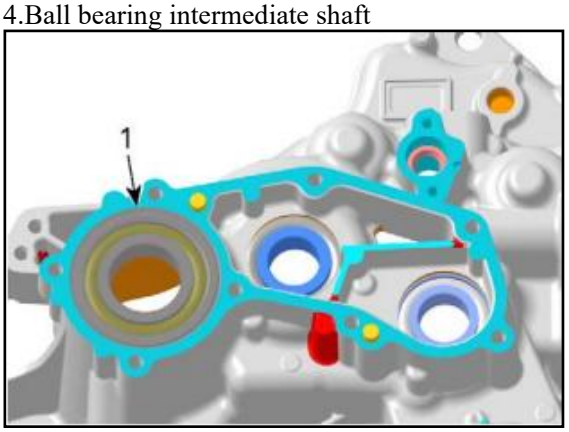
NOTICE Always support gearbox housings properly when ball bearings are removed.
Housing damages may occur if this procedure is not performed correctiy.
Use a blind hole bearing puller ball bearings of :
-Countershaft(right cover)
-Inrermediate shaft(right cover)
Remove retaining plate securing the main shaft and internediate shaft bearings in the left housing.
Remove screw securing the main shaft bearing in the right cover.
Use a suitable puller to remove ball bearings of:
-Main shaft(right and left cover)
-Countershaft (left cover)
-Intermediate shaft (left cover)



RIGHT GEARBOX HOUSING
1. Ball bearing countershaft
2. Ball bearing main shaft
3. Screw
4. Ball bearing intermediate shaft



LEFT GEARBOX HOUSING
1.Screw
2.Retaining plate
3.Ball bearing main shaft
4.Ball bearing intermediate shaft



LEFT GEARBOX HOUSING
1. Ball bearing countershaft

Unless otherwise instructed,never use hammer to install ball bearings.Use press machine oniy.
If necessary heat housing up to100° C(212° F) before removing ball bearings.

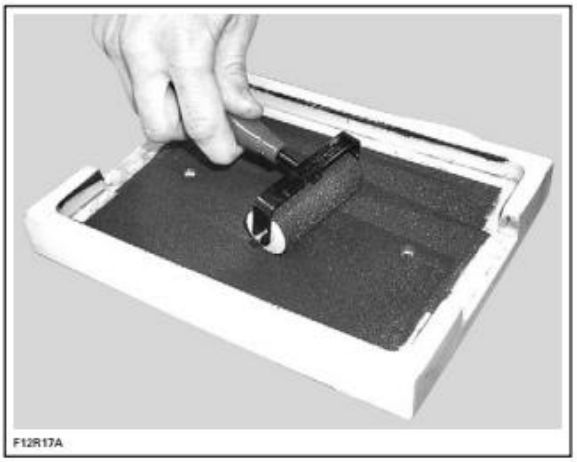
△WARNING
Clean oil, outside and inside, from housing before heating.

Place new bearing in freezer for 10 minutes before installation.
Use a suitable installer for installing ball bearings of counter shaft,main shaft and intermediate shaft.
NOTE:Place gearbox housings on a wood stand before installing ball bearings.

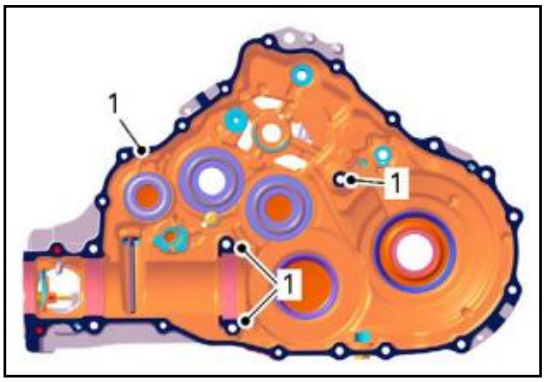
TIGHTENING TORQUE	
Retaining plate screws	10N.m±1N.m

TIGHTENING TORQUE	
Retaining screws main shaft bearing (right cover)	10N.m±1N.m

Install new oil seals with the proper installer(refer to GEARBOX OIL SEALS in this subsection)
Assembing the Gearbox Housing
Clean aii metal components in a solvent.
Gearbox housing mating surface are best cleaned using a combination of LOCTITE CHISEL(GASKET REMOVER)and a brass bursh.Bursh a first pass in one direction then make the final burshing perpendiculary (90°)to the first pass cross (hatch).
NOTICE Do not wipe with rages,use a new clean hand towel only.
IMPORTANT:When beginning the application of the gear housing sealant,the assembly and the first torquing should be done within 10 minutes.
It is suggested to have aii you need on hand to save time.
Use a plexiglall plate and apply some sealant on it .Use a soft rubber roller (50mm-75mm),available in arts products suppliers for printing,and roll the sealant to get a thin uniform coat on the plate (spread as necessary).When ready,apply the sealant on gearbox housing mating surfaces,

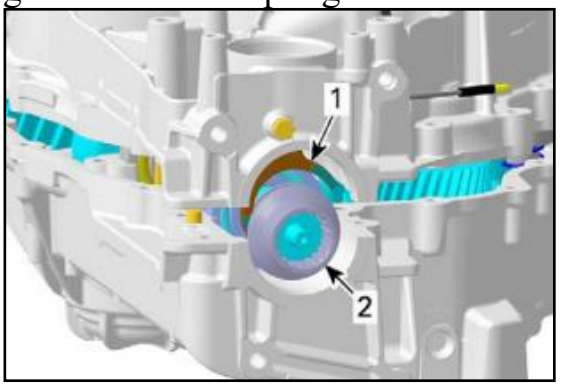


Do not aopply in excess as it will spread out inside gearbox housing.
NOTE: It is recommended to apply this specification without lumps. If you do not use the roller method,you may use your finger to uniformly distribute then sealant(using a finger not affect the adhesion).



1. Apply sealant here

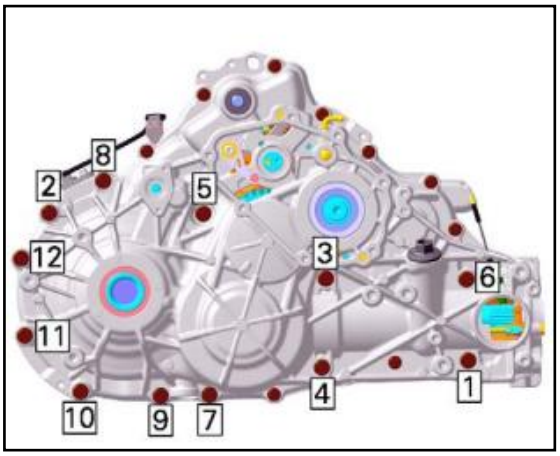
Durning installation of the rght hear box housing align the coupling fork with the groove in the coupling sleeve.



1. Coupling fork
2. Coupling sleeve

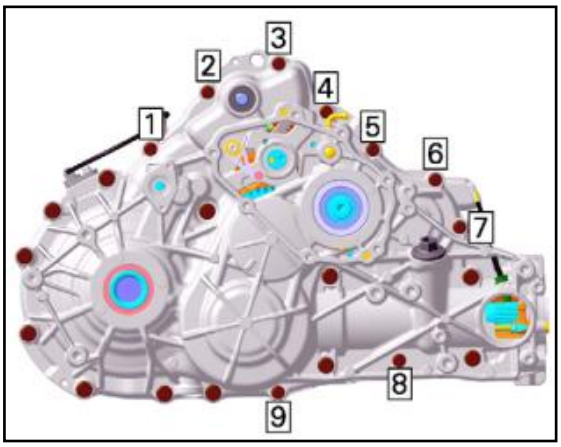
Install all gearbox housing screws.
Tighten M8 gearbox housing screws as per fllowing sequence.

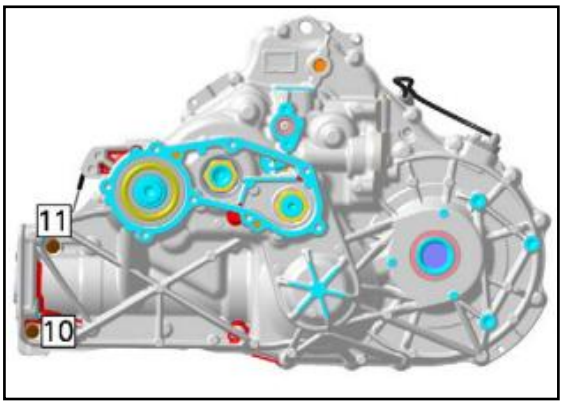
TIGHTENING TORQUE	
M8 gearbox housing screws	25N.m±3N.m



Tighten M6 gearbox housing screws as per fllowing sequence.

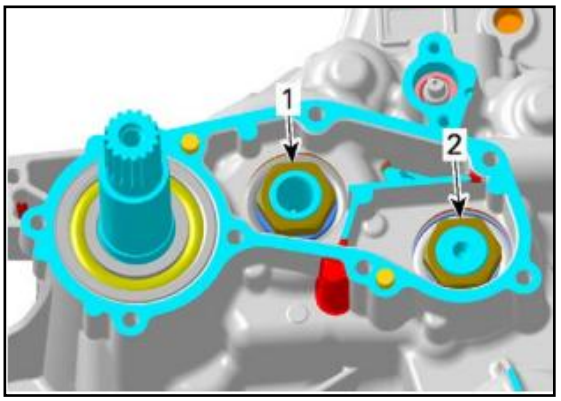
TIGHTENING TORQUE	
M6 gearbox housing screws	10N.m±1N.m





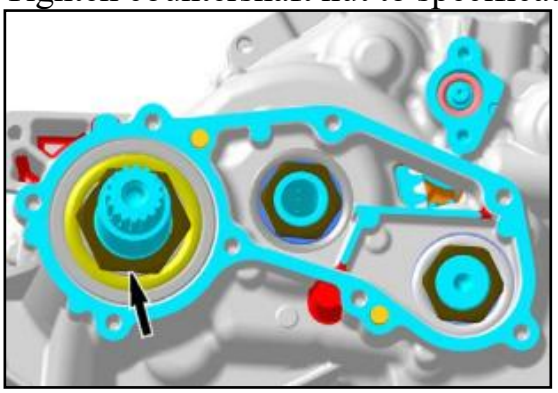
Refer to GEARBOX AND SHAIFT MECHANISM in this subsection to install:
-Index lever
-Index washer
-Parking lock gear
Set gearbox to PARK position.
Tighten main shaft and intermediate shaft nuts to specification.

TIGHTENING TORQUE	
main shaft and intermediate shaft nuts	10N.m±1N.m



1. Main shaft nut
2. Intermediate shaft nut

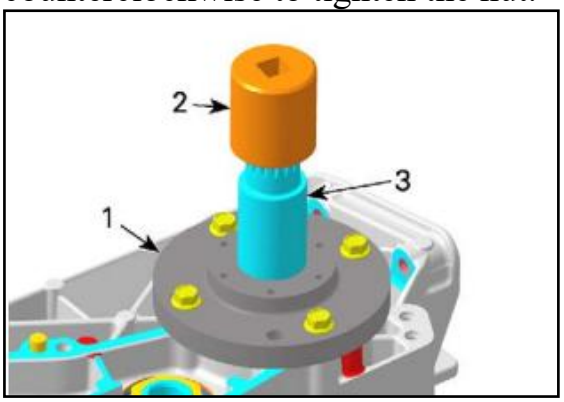
Tighten countershaft nut to specification



TIGHTENING TORQUE	
Service product	
Countershaft nut	170N.m±10N.m

REQUIRE TOOL	
M34 SOCKET	
SPLINE SOCKET 1/2”	

NOTICE Turn spline socket counterclockwise to tighten the nut.



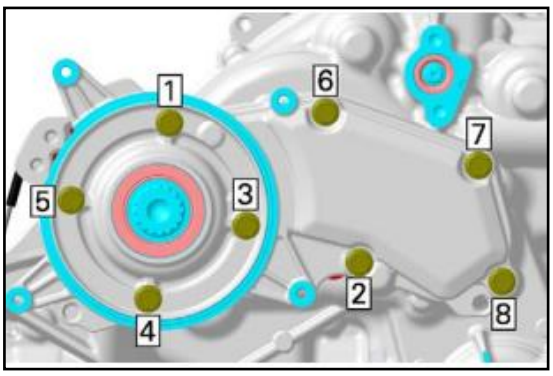
1. M34 socket
2. Spline socket
3. Countershaft

Apply sealant on mating surface of bearing housing.

BEARING HOUSING MATING SURFACE SEALANT	
Service product	

Install bearing housing screws and tighten them as per following sequence.

TIGHTENING TORQUE	
Bearing housing screws	10N.m±1N.m



1. GEARBOX AND SHIFTING MECHANISM

Disassenbling the Gearbox and Shifting Mechanism

NOTE:Durning gearbox and shafting mechanism disassembly,inspect the condition of each part closely.

Index Lever,Index Washaer and Parking Locking Lever

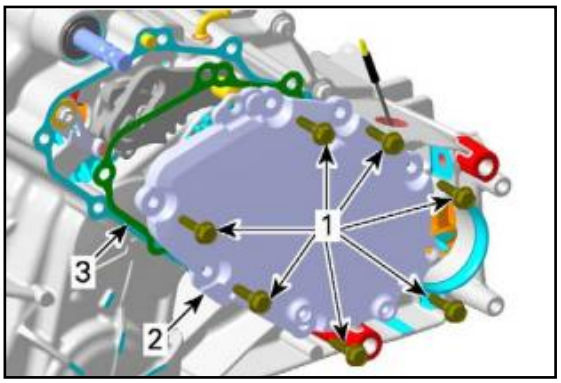
Set gearbox to PARK position.

Remove:

-Reating screws

-Gearbox cover

-Gasket(discare it)



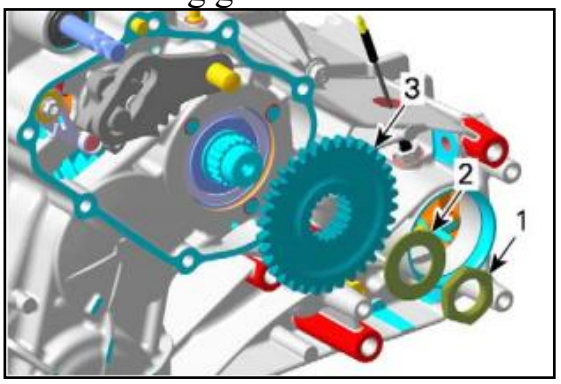
1. Retaining screws
2. Gearbox cover
3. Gasket

Remove:

-Nut

-Spring washer

-Park locking gear

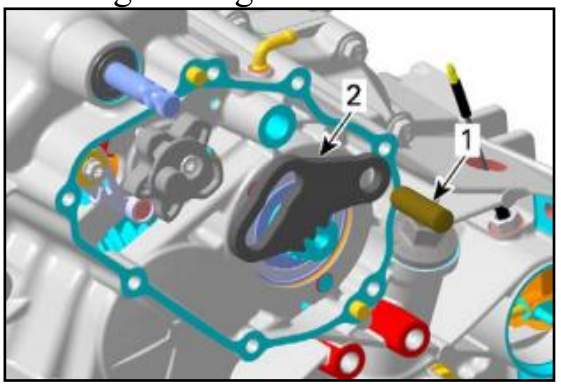


1. Nut
2. Spring washer
3. Praking locking gear

Remove:

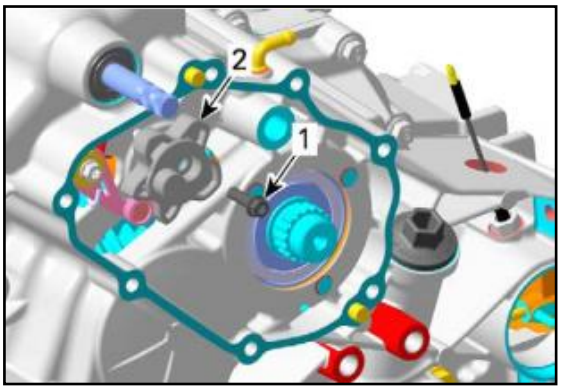
-Pin

-Parking locking lever.



2. Pin
3. Parking locking lever

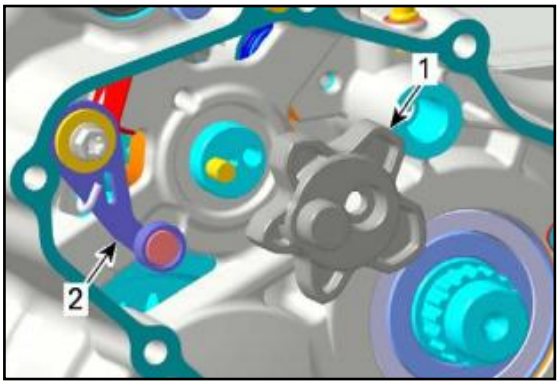
Remove screw retaining the index washer to the shaft drum,



1. Screw
2. Index washer

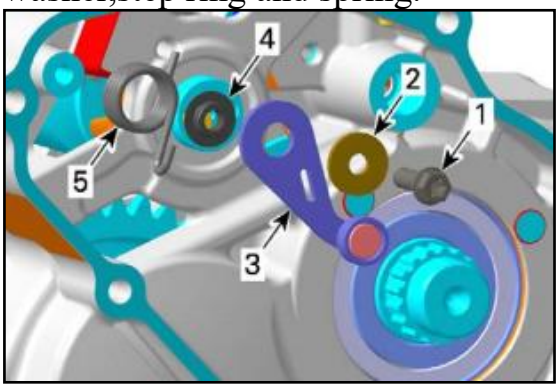
Insert a flat screwdriver in the slot of index lever.

Turn screwdriver clockwise and remove index washer.



1. Index washer
2. Index lever

Remove the index lever with washer,step ring and spring.

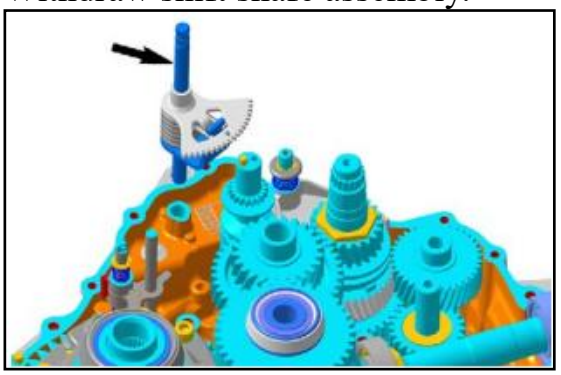


1. Screw
2. Washer
3. Index lever
4. Step ring
5. Index spring

Shift shaft Assembly

Separaate gearbox housing,refer to GRARBOX HOUSING in this subsection.

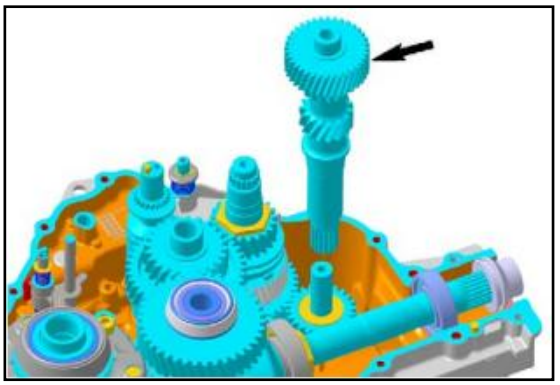
Withdraw shift shafe assembly.



Countershaft and Reverse Intermediate Gear

Separate gearbox housing,refer to GEARBOX HOUSING inthis sunscetion.

Use a soft hammer to push out countershaft from gearbox housing CVT side.



Remove:

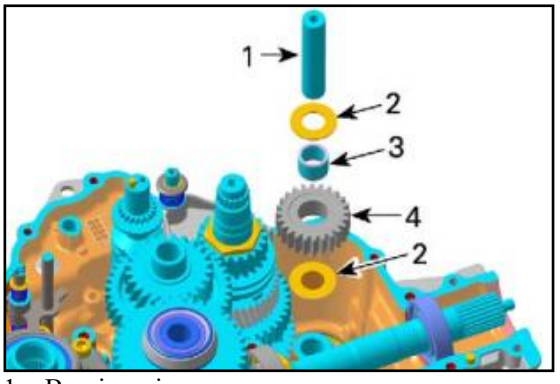
-Bearing pin

-Reverse intermediaye gear

-Needle bearing

-Thrust washer

NOTE:Take care not to lose lower thrust washer durning remova.



1. Bearing pin

2. Thrust washer
3. Needle bearing
4. Reverse intermediate gear

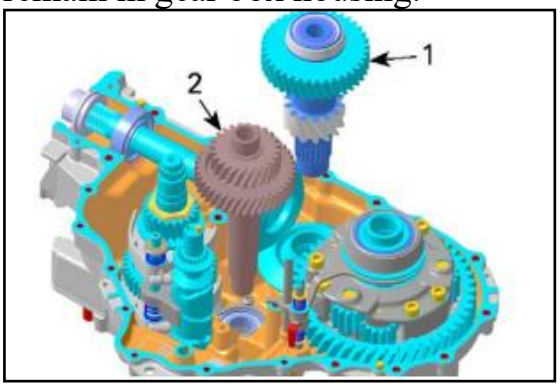
Pinion Drive Shaft and Intermediate Shaft

Separate gearbox housing,refer to GEARBOX HOUSING in this subsection.

Remove:

1. Pinion drive shaft
2. Intermediate shaft

NOTE: Bevel gear and distance shim remain in gear box housing.



1. Pinion drive shaft
2. Intermedication shaft

Main Shaft,Shift Fork Shaft Assembly and Shift Durm.

Separate gearbox housing,refer to GEARBOX HOUSING in this subsection.

See produres in this subsection to remove:

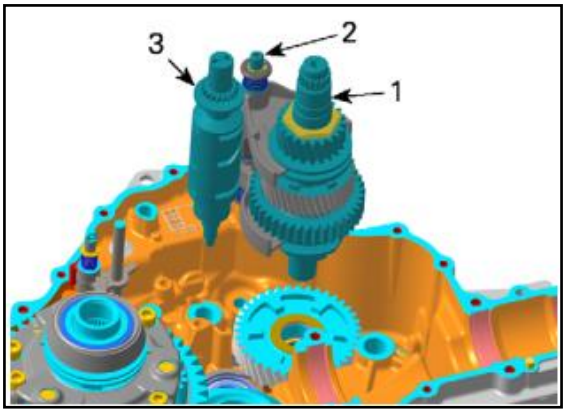
-Pinion drive shaft

-Intermedication shaft.

-Countershaft

-Reverse intermedication gear.

Remove main shaft assembly together with shift fork shaft assembly and shaift durm.



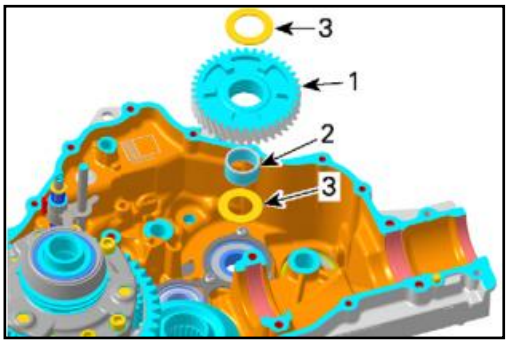
1. Main shaft assembly
2. Shift fork shaft assembly
3. Shift durm

Remove:

-LOW range gear

-Needle bearing

-Thtust washer



1. Free pinion LOW range rear
2. Neddle bearing
3. Thrust washer

Disassembly the Shift Fork Shaft Assembly

NOTICE Springs are not identical.Mark them to reinstall them in thier orangial position.

Remove :

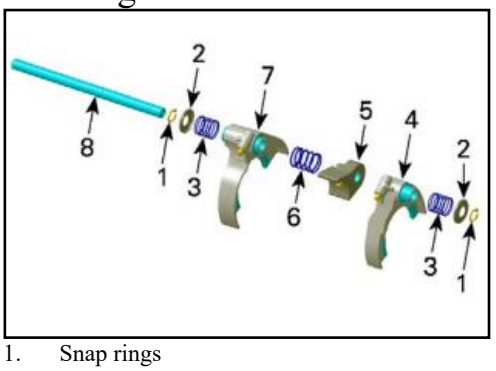
-Snap rings(discard them)

-Spring seats

-Springs

-Shift forks

-Shifting block.



1. Snap rings
2. Spring seat
3. Outer spings
4. Shift fork HIGH
5. Shifting block
6. Center spring
7. Shift fork LOW/REVERSE
8. Shift fork shaft

Inspeting the Gearbox and Shifting Mechanism

Always verify for the following when inspecting gearbox components:

-Gear teeth damage

-Worn or scoured bearing surfaces
-Rounded engagement dogs and slots
-Worn shaift fork
-Worn splines on shafts and shaifting sleeves.

Bearings

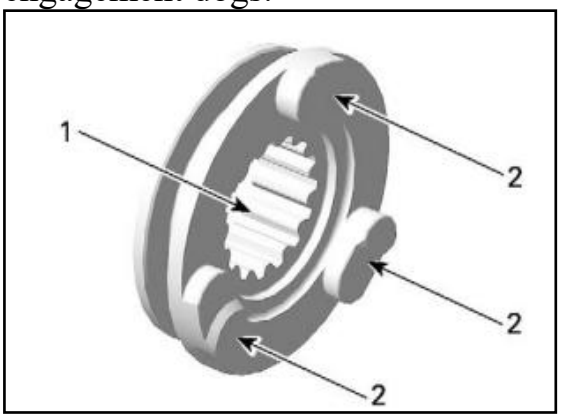
When gearbox is removed check gearbox ball bearings for contamination and/or metal shavings.

Check if ball bearing turn freely and smoothly.

Replace if necessary,refer to GEARBOX HOUSING in this subsection.

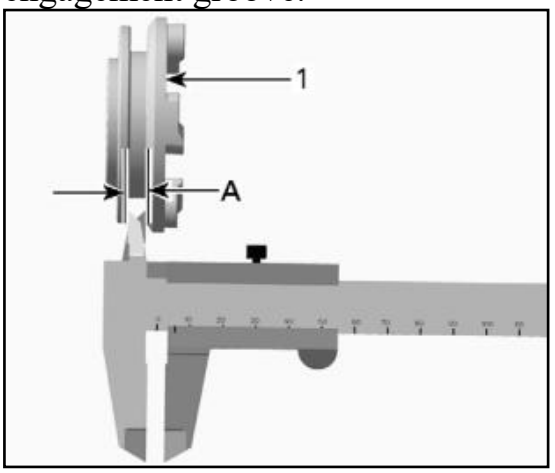
Shifting Sleeves

Check shaifting sleeves for worn inner splines and roundde or damaged engagement dogs.



TYPICAL
1. Inner splines
2. Enagement dogs

Measure the width of shift fork engagement groove.

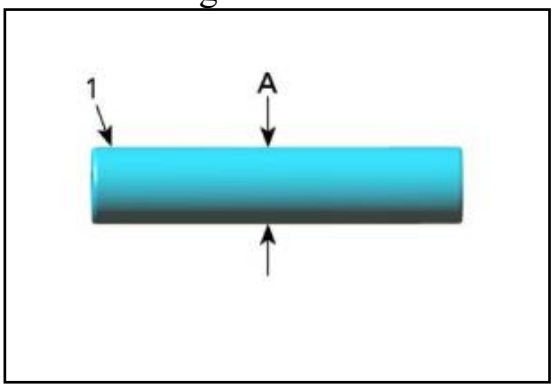


TYPICAL
1.Shifting sleeve
A.Width of shaift fork engagement groove.

WIDTH OF SHIFT FORK ENGAGEMENT GROOVE	
NEW	5.30mm to 5.40mm
SERVICE LIMT	5.50mm

Shafts

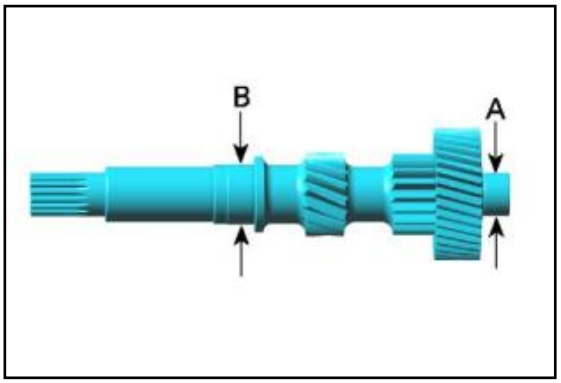
Check bearing pin of reverse intermediate gear for wear.



1.Bearing pin
A.Outre diameter

BEARING PIN OUTER DIAMETER	
NEW	24.987mm to 25.000mm
SERVICE LIMT	24.977mm

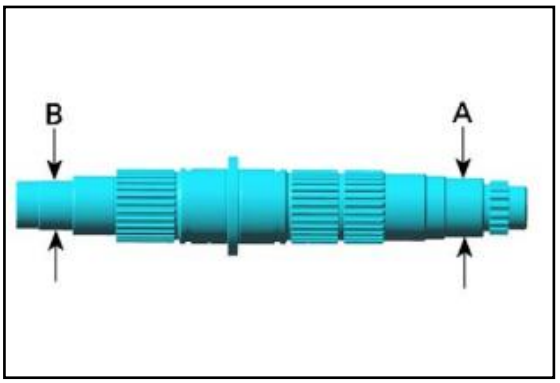
Check countershaft bearing journals for wear.



A.MAG side
B.Bearing journal CVTside

COUNTERSHAFT BEARING JOURNALS	
MAG SIDE	
NEW	19.977mm to 19.990mm
SERVICE LIMT	19.973mm
CVT SIDE	
NEW	24.977mm to24.990mm
SERVICE LIMT	24.970mm

Check main shaft for wear.



A.Bearing journal MAG side
B.Bearing journal CVTside

MAIN SHAFT BEARING JOURNAL CVT/MAG SIDE	
NEW	16.980mm to 16.991mm
SERVICE LIMT	16.976mm

Shift Shaft

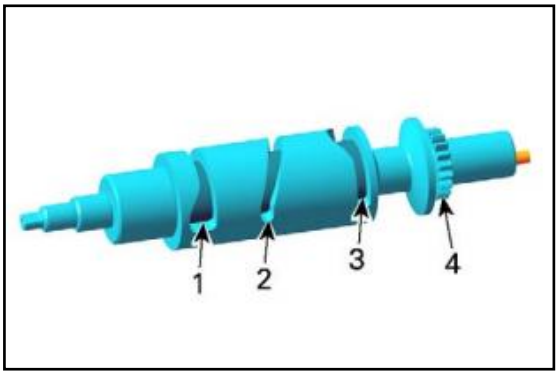
Check shaift shaft for worn splines and gears

Check shaift shaft spring fir damages.

Shift Durm

NOTICE Do not dissassemble shaft durm.

Check shaift durm tracks for scouring or heavy wear.like rounded engagement slots.



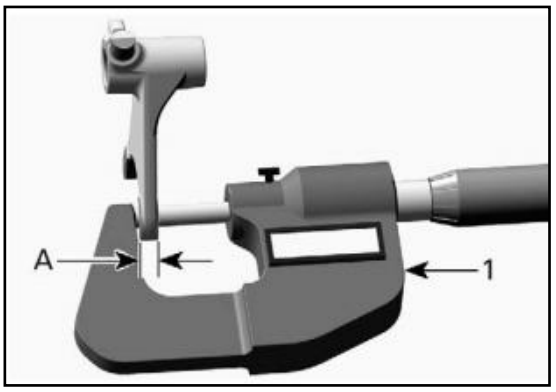
1.Track for the low/reverse range gear shaift fork
2.Track for the shifting block
3.Track for the high range gear shift fork
4.Shift durm gear

Shift Forks

Check both shaift forks for visible damage,wear or bent shaft fork claws.

Check engagement rollers for wear and smooth movement.

Measure the shift fork claw thickness.



TYPICAL
1.Micromerer
A.Shift fork claw thickness

MAIN SHAFT BEARING JOURNAL CVT/MAG SIDE	
NEW	16.980mm to 16.991mm
SERVICE LIMT	16.976mm

Shift Fork Shaft

Check shaift fork shaft for visible damage or wear.

Check if shaft fork shaft is straight.

Index Lever and Parking lever

Index lever with toller must move freely.

Check parking lever for cracks or other damages.

Assembling the Fearbox and Shifting Mechanism

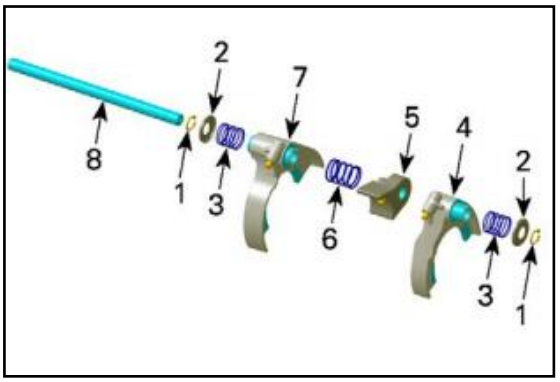
The assembly of gearbox is essentially the reverse of disassembly procedure. However,pay attention to the following details.

BALL BEARING SEATS LUBRICATION	
Service product	COPASLIP

Assembling the Shift Fork Shaft Assembly

NOTICE Spring are not identical.

Install:
-NEW snap rings.
-Spring seats.
-Springs
-Shift forks
-Shifting block.

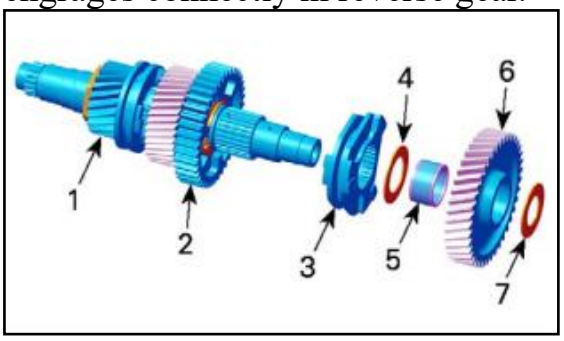


1.Snap rings
2.Spring seat
3.Outer springs
4.Shift fork HIGH
5.Shifting block
6.Center spring
7.Shift fork LOW/REVERSE
8.Shift fork shaft

Main Shaft,Shift Fork SHAFT Assembly and Shift Durm

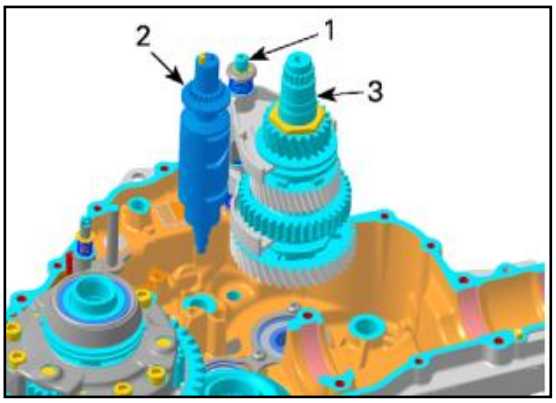
Install shaifting sleeve,thrust washer and LOW gear pinion on main shaft assembly.

NOTE:Check if shaifting sleeve engrages connectly in reverse gear.



1.Main shaft assembly
2.Reverse gear
3.Shifting sleeve
4.Thrust washer
5.Needle bearing
6.LOW gear pinion
7.Thrust washer

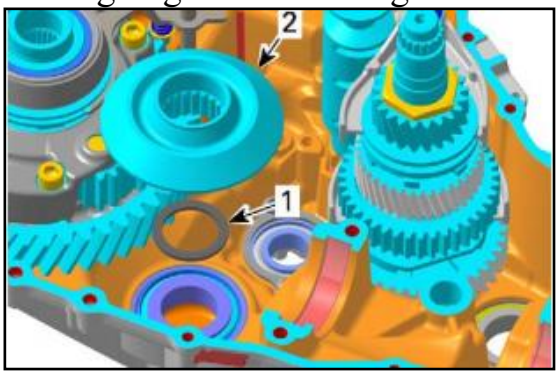
Install shaift fork shaft assembly,shift durm and main shaft assembly together into gearbox housing.



1.Shift fork shaft assembly
2.Shift durm
3.Main shaft assembly

Pinion Drive Shaft and Intermediate Shaft

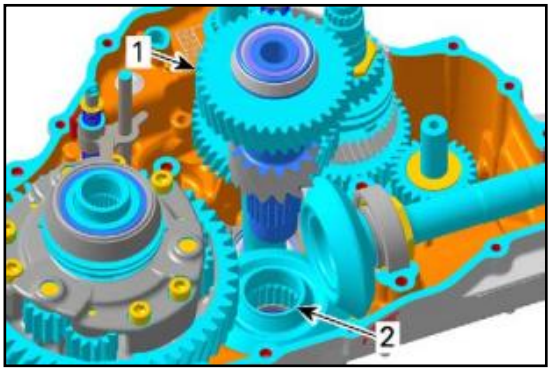
Ensure distance shaim and bevel gear are placed on the pinion drive shaft bearing in geaibox housing.



1.Distance shim
2.Bevel gear

Install:
1.Intermediate shaft
2.Pinion drive shaft

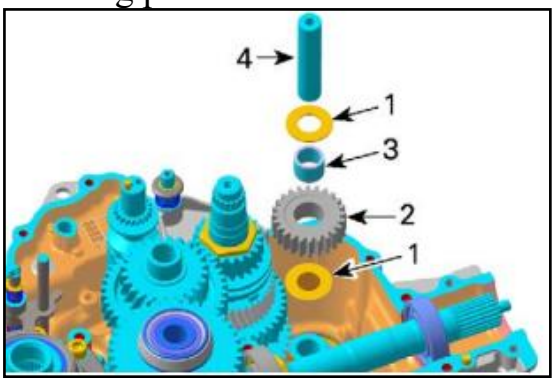
Carefully fit pinion drive shaft into inner solines of bevel gear.



1.Pinion drive shaft
2.Bevel gear solines

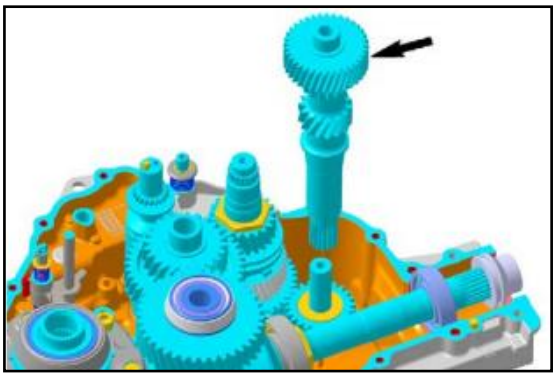
Countershaft and Revise Intermediate Gear

Intall:
-Reverse intermediate gear
-Needle nearing
-Thrust washer
-Bearing pin.



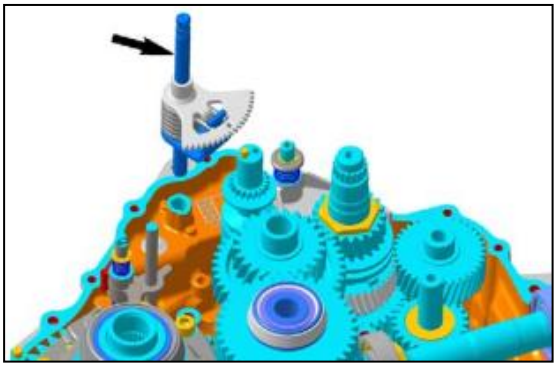
1.Thrust washers
2.Reverse intermediate gear
3.Needle bearing
4.Bearing pin]

Install countershaft from.

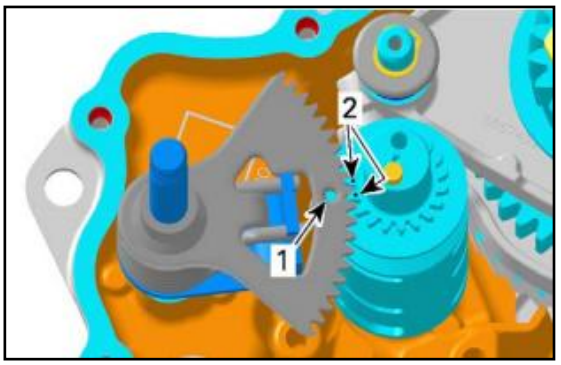


Shift Shaft Assembly

Install shaft shaft assembly.



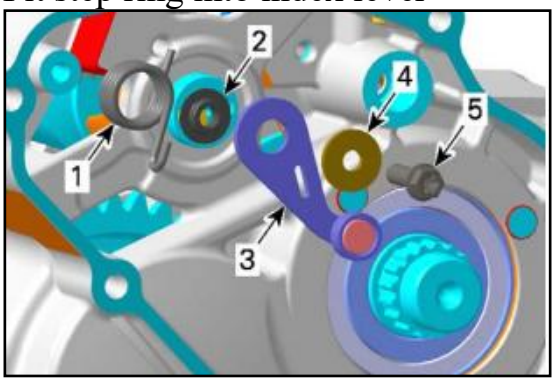
Align mark on shift shaft with marks on shift durm gear.



1.Mark on shift shaft
2.Marks on shift durm gear

Index Lever, Index Washer and Parking lock Lever

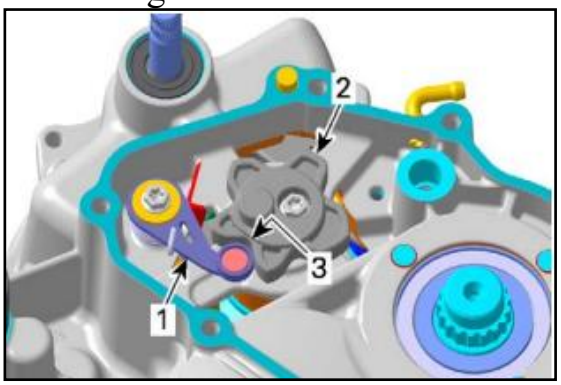
Fit step ring into index lever



1.Index spring
2.Step ring
3.Index lever
4.Washer
5.Screw

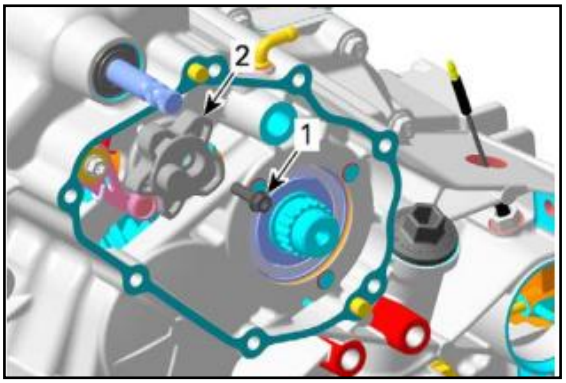
TIGHTENING TORQUE	
Index lever retaining screw	10N.m±1N.m

Install index washer on shift durm.
Insert a flat scerwdrive in the slot of the index lever.turn scerwdrive clockwise and engage lever in index washer in NEUTRAL position as per following illustrating.



1.Index lever
2.Index washer
3.NEutral position

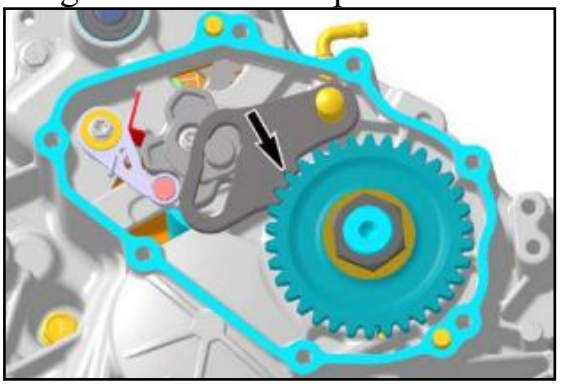
Install screw retaining the index washer to the shift drum.



1.Screw
2.Index washer

TIGHTENING TORQUE	
Index washer retaining screw	10N.m±1N.m

Install:
-Parking locking gear
-Spring washer
-Nut
-Pin
-Park locking lever
Set gearbox to PARK position.



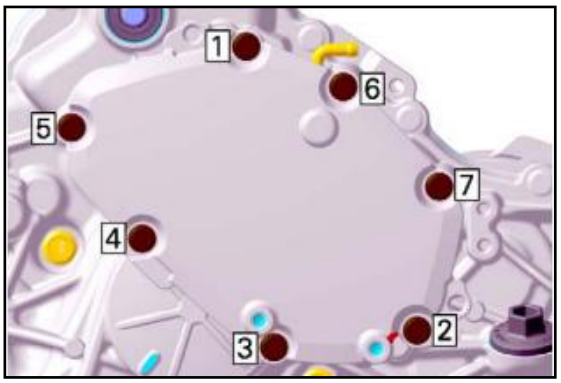
PARK LOCKING LEVER ENGAGED

Tighten nut to specification.

TIGHTENING TORQUE	
Park locking gear nut	170N.m±10N.m

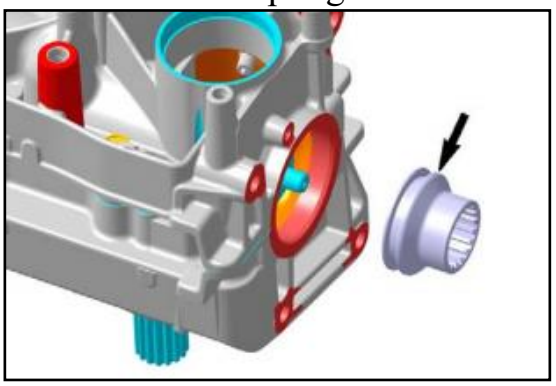
Install gearbox cover with New gastet.
Tighten gearbox cover screws as per following sequence.

TIGHTENING TORQUE	
Gearbox cover screws	10N.m±1N.m

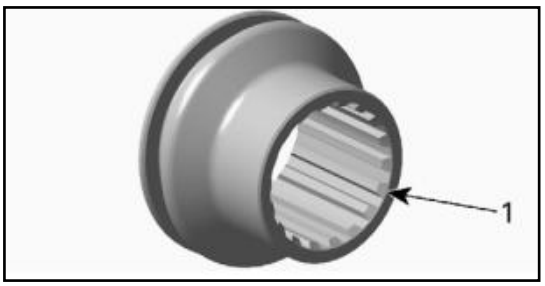


OUTPUT SHAFT MECHANISM

Removing the Out put Shaft Mechanism
Drain gearbox oil.Refer to GEARBOX OIL REPLACEMENT in PERIODIC MAINTENANCE PROCEDURES subcestion.
Remove:
Pull out 4×4 coupling sleeve.



Inspecting the Output Shaft and 4 × 4 Coupling Mechanism
Output Shaft
Check output shaft and its gear for cracks,bend,pitting or other visible damages.
Check output shaft splines for wear or other damades.
Check if output shaft bearing turn freely and smoothly.
Replace oil seal if brttle,hand or damaged.
4×4 Coupling Sleeve
Check splines of coupling sleeve for wear or other damages.



1. Inspect splines

Measure the coupling sleeeve groove width.

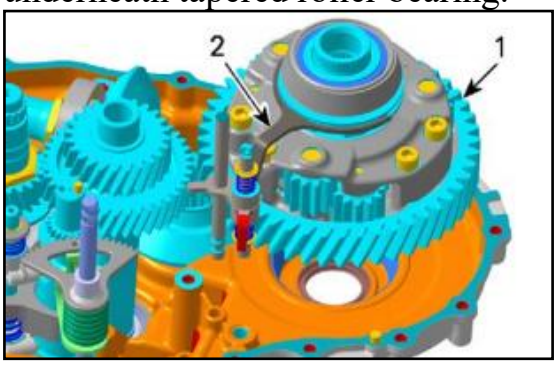
REAR DIFFERENTIAL AND LOCKING MECHANISM

Removing the Rear Different and Locking Mechanism

Separte gearbox housing,refer to GRARBOX HOUSING in this subsection.

Remove rear differential together with locking mechanism.

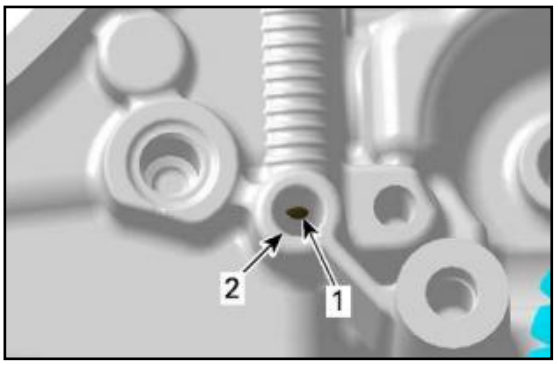
Take care not losing the distance shin underneath tapered roller bearing.



1.Rear differential
2.Locking mechanism

Inspecting the Rear Differential and Locking Mechanism

Check for ball of locking mechanism setting in gearbox housing.



1.Ball
2.Bore of lockiong mechanism in gearbox housing

Installing the Rear Differential and Locking Mechanism

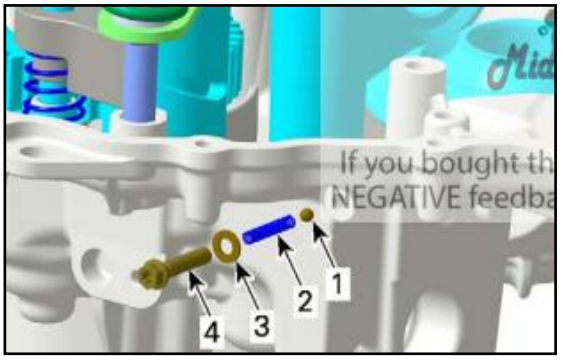
Install:

-Ball

-Spring

-Sealing ring

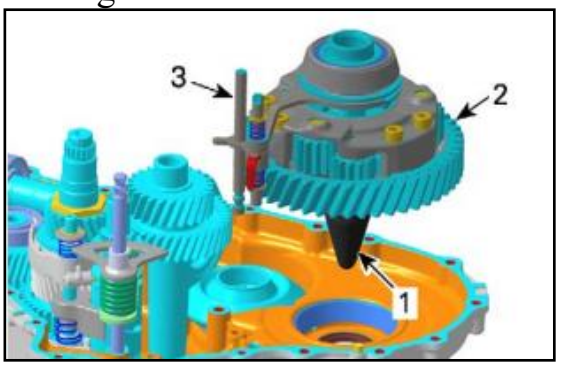
-Screw.



1.Ball
2.Spring
3.Sealing ring
4.screw

TIGHTENING TORQUE	
Screw	8N.m±1N.m

Install rear differential togetuer with locking mechanism.



1.Sleeve installer
2.Rear differential
3.Locking mechani

9. TROUBLESHOOTING

ELECTRICAL SYSTEM

Symptom: NO SPARK OR POOR SPARK

1. Refer to ignition system.

Symptom: STARTER DOES NOT TURN

1. Refer to starting system.

Symptom: STARTER TURNS BUT DOES NOT CRANK THE ENGINE

1. Refer to starting system.
2. Check gear condition on electric starter.

   Worn and/or damaged starter gear. Replace electric starter and/or starter drive.
3. Check condition of starter pinion gear.

   Worn and/or damaged starter pinion and/or ring gear. Replace starter drive and/or drive pulley fixed sheave.
4. Check splines on starter drive.

   Poor movement of pinion gear on splines. Clean and/or replace starter drive.

Symptom: STARTER TURNS BUT STARTER DRIVE DOES NOT MESH WITH RING GEAR

1. Refer to starting system.

Symptom: STARTER KEEPS RUNNING

1. Refer to starting system.

COOLING SYSTEM

Symptom: HIGH ENGINE OPERATING TEMPERATURE

1. Check coolant level.

   Coolant level lower than recommended. Refill(refer to cooling system).
2. Check for air bubbles in cooling system.

   Air in cooling system. Refill and bleed cooling system (refer to cooling system).
3. Check temperature sensor for electrical/mechanical failure.

   Temperature sensor defective. Replace.
4. Check thermostat.

   Thermostat defective (does not open when engine gets hot). Replace (refer to cooling system).

5. Check leak indicator hole (in crankcase MAG side-water pump housing area) if coolant leaks.

   Coolant leaking from indicator hole means a damaged water pump rotary seal. Replace rotary seal (refer to cooling system)..

6. Check condition of hoses and hose clamps fixation.

   Hoses are brittle and/or hard. Replace.

   Hose clamps are loose. Retighten clamps.

7. Check condition of impeller located on the water pump shaft.

   Impeller wirings broken and/or impeller threads are damaged. Replace (refer to cooling system).

8. Check gasket on water pump housing.

   Gasket on water pump housing leaks. Retighten screws and/or replace gasket.

9. Check cylinder head and/or cylinder base gasket.

   Worn out gasket(s) is (are) causing coolant leakage. Replace.

10. Check coolant drain screw on water pump housing MAG side.

    Copper ring on drain screw leaks. Retighten screw and/or replace copper ring.

11. Check intermediate gear(s) behind of PTO cover.

    Worn out and/or broken gear(s) is/are causing less coolant supply. Replace worn out and/or broken gear(s) (refer to bottom end).

12. Check if water pump shaft is seized.

    Water pump shaft does not turn. Replace defective part(s).

13. Check cooling fan and connection.

    Fan motor faulty. Replace.

    Wire harness is brittle or hard (no connection). Replace.

14. Check radiator fan switch and fuse.

    Faulty fan switch and/or faulty fuse. Replace defective part(s).

15. Check radiator condition for leakage.

    Radiator cracked or deformed. Replace radiator.

16. Check mud/dust in radiator fins.

    Radiator fin obstructed, hard air cooling. Clean radiator fins.

MAGNETO SYSTEM

Symptom: BATTERY NOT CHARGING OR CHARGING VOLTAGE INADQUATE

1. Check battery

   Battery shows less power. Reload battery.

2. Check magneto for damage and/or electrical failure.

Radial position of rotor wrong due to broken woodruff key. Replace woodruff key.

Coating on stator winding is damaged. Replace stator.

Resistance value is out of specification (refer to technical specifications). Replace magneto.

Connector on magneto is damaged and/or has electrical failure. Repair and clean contacts of connector.

3. Check voltage regulator/rectifier.

   Refer to charging system.

4. Check wiring harness for cracks or other damages.

   harness shows electrical failure and/or other damages. Replace/repair wiring harness.

LUBRICATION

Symptom: LOW OR NO OIL PRESSURE/HIGH OIL CONSUMPTION

1. Check oil level and search for leakage on crankcase and/or sealing parts.

   Crankcase is leaking due to damage. Rebuild engine with new crankcase and gasket parts. Use recommended oil (refer to technical specifications).

   Crankcase is leaking due to loose screws. Retighten screws with recommended torque

   Sealing rings, O-rings and/or gaskets are brittle, hard or damaged. Replace damaged parts.

   Poston rings worn out (blue colored engine exhaust emission). Replace piston rings (refer to cylinder and head).

   Piston rings are broken (low compression). Replace piston rings (refer to cylinder and head).

   Valve stem seal damaged and/or sealing lip is hard and/or brittle. Replace all valve stem seals.

2. Check oil filter for contamination.

   Oil filter clogged. Replace oil and oil filter at the same time. Use recommended oil (refer to technical specifications).

3. Check oil drain plug on engine bottom.

   Plug is loose and/or gasket ring is missing. Retighten the plug and/or place gasket ring.

4. Check leak indicator hole if oil leaks (in crankcase MAG side-water pump housing area).

   Oil leaking from leak indicator hole means a damaged oil seal on water pump shaft. Replace oil seal (refer to cooling system).

5. Check oil pressure switch function.

   Oil pressure switch damaged. Replace oil pressure switch.

6. Check oil orifice(s) on the oil pump suction side.

   Oil orifice(s) is (are) clogged. Clean from contamination. Replace oil and oil filter if necessary (refer to maintenance or lubrication system).

7. Check oil pump function.

   Oil pump rotor is out of wear limit. Replace oil pump (refer to lubrication system).

   Oil pump seized due to oil leakage and/or air inclusion. Replace oil pump (refer to lubrication system).

   Gears driving oil pump are broken or otherwise damaged. Replace gears.

   Incorrect oil being used. Use recommended oil (refer to technical specifications).

8. Check oil pressure regulator valve (spring) function.

   Valve spring damaged (valve always open). Replace spring.

   Valve piston is worn or broken. Replace valve piston (refer to lubrication system).

   Valve piston stays open due to contamination. Clean or repair valve piston.

9. Check plain bearings in crankcase for heavy wear.

   plain bearings out of specification (increased clearance). Replace plain bearings (refer to bottom end).

10. Check engine oil strainer in crankcase.

    Oil strainer is clogged due to contamination. Clean or replace strainer and diagnose causes. Replace possible damaged parts (refer to bottom end).

Symptom: OIL CONTAMINATION (white appearance)

1. Check leak indicator hole (in crankcase MAG side-water pump housing area) if water and oil leaks.

   Leakage of oil/water mixture from indicator bore means damaged water pump seal ring and rotary seal. Replace sealing ring, rotary seal and change oil, oil filter and/or coolant (refer to lubrication system, cooling system and bottom end).

2. Check cylinder head and/or cylinder base gasket..

   Gasket damaged or leaking. Retighten cylinder head with recommended torque and/or replace gasket.

3. Check tightening torque of cylinder head screws.

   Screws not properly tightened. Retighten screws to recommended torque and replace oil.

4. Check oil for particles (may indicate possible engine internal damages).

   Oil contamination due to metal or plastic particles. Replace possibly damaged part(s) including oil and oil filter. Use recommended oil (refer to technical specifications).

CYLINDER AND HEAD

Symptom: UNUSUAL ENGINE NOISE AND/OR VIBRATION

1. Check noise coming from cylinder head area.

   Improper valve clearance adjustment. Readjust valve clearance and/or replace defective part(s).

   Faulty chain tensioner. Replace spring and/or mechanism.

   Chain guide worn out. Replace chain guide.

   Stretched chain and/or worn out sprockets. Replace chain and sprockets.

   Sprocket screws got loose. Retighten screws with recommended torque.

   Rocker arm(s) is (are) worn out (valve adjustment). Readjust valve clearance and/or replace rocker arm(s).

   Incorrect camshaft timing adjustment. Replace damaged components and readjust camshaft timing (refer to cylinder and head).

Symptom: OIL CONTANMINATION ON CYLINDER AND/OR HEAD

1. Check screws for torque.

   Loose screws. Retighten screws with recommended torque.

   Gaskets are brittle, hard, worn out or otherwise damaged. Replace damaged gaskets, O-rings or the V-ring on breather.

CRANKSHAFT

Symptom: UNUSUAL ENGINE NOISE AND/OR VIBRATION

1. Check noise coming from crankshaft area..

   Crankshaft plain bearings are damaged,. Replace crankshaft plain bearings.

   Connecting rod plain bearings are damaged. Replace connecting rod plain bearings.

   Magneto rotor got loose. Replace damaged components and retighten rotor retaining screw with recommended torque (refer to MAGNETO SYSTEM).

GEARBOX

Symptom: UNUSUAL GEARBOX NOISE AND/OR VIBRATION

1. Check oil level in gearbox.

   Oil leakage from gearbox. Replace damaged gasket(s) and/or oil seal(s), torque screws and refill with oil up to specified level (refer to TECHNICAL SPECIFICATIONS and GEARBOX)

2. Check bearings in the gearbox for free movement.

   Bearing(s) do(es) not move freely. Replace bearing(s)

3. Check for knocking noise.

   Tooth of gears are damaged and/or worn. Replace respective gears.

Symptom: GEAR INDICATION FAILS.

1. Check contact screws on gear housing center.

   Check contact screw outside for contamination and wetness. Clean contact screw and screw for wiring harness.

   Contact(s) is (are) corroded and/or contact screw for wiring harness got loose. Clean contact surface and retighten contact screw(s) with recommended torque.

   Wiring harness has broken cables. Replace wiring harness.

   Shifting indicator switch(es) pin(s) is (are) worn and/or damaged. Replace shifting indicator switch(es).

Symptom: GEAR(S) IS (ARE) HARD TO SHIFT

1. Check shift shaft splines and/or shift forks for wear and/or damages.

   Shift shaft is worn out and/or shows damaged splines. Replace shift shaft.

   Shift drum track(s) and/or splines is (are) worn out or damaged. Replace shift drum and damaged part(s).

   Shift fork(s) is (are) worn out and/or engagement pins are damaged. Replace shift fork(s).

   Shift fork(s) is (are) worn out and/or fork(s) is (are) damaged. Replace shift fork(s).

   Shift gear(s) is (are) worn out. Replace shift gear(s).

   Shifting indicator switch(es) pin(s) is (are) worn out (no rounding on top of pin). Replace shifting indicator switch(es).

2. Check engine idle speed.

   Check throttle cable and throttle adjustment.

   Check bypass idle valve and connectors.

3. Check CVT one way clutch on drive pulley.

   CVT one way clutch was not lubricated correctly. Lubricate CVT one way

clutch (refer to CONTINUOUSLY VARBRIABLE TRANSMISSION (CVT)).

CVT one way clutch is worn out or damaged. Replace defective part(s) (refer to CONTINUOUSLY VARBRIABLE TRANSMISSION (CVT)).

Check if friction washer at one way clutch is worn. Replace friction washer (refer to CONTINUOUSLY VARBRIABLE TRANSMISSION (CVT)).

4. Check transmission lever and connecting rod.

   Ball joint and/or ball joint nut is (are) loose. Retighten or replace the ball joint.

5. Check spring on shift shaft in gearbox.

   Broken spring. Replace the spring (refer to GEARBOX).

6. Check for any mud intrusions.

   CVT parts dirty. Clean all CVT parts.

COUPLING UNIT

Symptom: 4 WHEEL DRIVE INDICATION FAILS

1. Check contact screw on gear housing right side for damage and/or wear.

   Shifting indicator switch pin is worn and/or damaged. Replace shifting indicator switch.

   Contact is corroded and/or contact screw for wiring harness got loose. Clean contact surface and retighten contact screw with recommended torque.

   Wiring harness has broken cable. Replace wiring harness.

Symptom: 4 WHEEL DRIVE DOES NOT ENGAGE OR DISENGAGE

1. Check actuator and/or actuator shifting fork for wear and/or damages.

   Check if selector works properly. If so, check actuator.

   If selector is out of specifications, check wires, connectors and/or replace selector.

   Actuator shifting fork is worn out and/or damaged. Replace shifting fork of actuator.

   Check function of actuator. Replace if actuator is not turning, refer to GEARBOX.

2. Check shifting sleeve splines and/or shifting fork for wear and/or damages.

   Check sleeve shows damaged splines. Replace shifting sleeve (refer to GEARBOX).

   Shifting fork is worn out and/or engagement pin is damaged. Replace shifting fork.

CVT

Symptom: UNUSUAL ACCELERATION BEHAVIOR

1. Check drive belt condition.

   Belt is too narrow (drive belt engagement is higher in drive pulley).replace belt if width is less than specified.
2. Check lever condition on drive pulley sliding sheave and/or roller(s) on governor cup.

   Lever(s) on drive pulley sliding sheave is (are) worn and/or damaged. Replace all levers at the same time (lever kit).

   Roller(s) is (are) worn and/or damaged. Replace governor cup assembly.
3. Check drive/driven pulley sliding sheave for free axial movement.

   Sliding sheave is stuck. Replace damaged part(s).
4. Check condition of drive/driven pulley spring.

   Drive pulley spring tension is too smooth and/or damaged. replace spring.

   Driven pulley spring tension is too stiff. Replace spring.
5. Check if cam of driven pulley is worn.

   -- Replace if out of specifications.
6. Check condition of fixed and sliding sheaves (drive and driven pulley).

   Check surface of fixed and sliding sheaves (drive and driven pulley) for grooves or other damages.
7. Check valve adjustment.

   Intake and/or exhaust valves are not adjusted correctly. Adjust valves.
8. Check engine condition.

   Low engine compression.
9. Check ignition condition.

   Faulty spark plug. Install new spark plug(s).
10. Check differentials operation.

    Vehicle on Neutral is hard to move. Repair or replace defective part(s).

Symptom: ENGINE MAXIMUM RPM IS TOO HIGH AND VEHICLE TOP SPEED IS NOT REACHED.

1. Check drive/driven pulley area for contamination and/or water intrusion.

   CVT area is contaminated with water, dirt or oil. Clean CVT system and replace damaged part(s).
2. Check drive/driven pulley spring tension.

   Drive pulley spring tension is too stiff. Replace spring.

   Driven pulley spring tension is too smooth and/or damaged. Replace spring.

Symptom: DRIVE PULLEY NOISE IN IDLE SPEED

1. Check slider shoes (drive pulley).
   Worn slider shoes (increased clearance between governor cup and drive pulley sliding sheave). Replace all slider shoes at the same time (slider shoes kit).
2. Check driven pulley sliding mechanism (between driven pulley outer and inner sheave).
   Mechanism is stuck and/or damaged. Replace driven pulley assembly.
3. Check roller(s) and/or levers for wear (located on sliding sheave of drive pulley).
   Roller(s) on governor cup is (are) worn out and/or damaged. Replace governor cup assembly.
   Lever(s) on drive pulley sliding sheave is (are) worn out and/or damaged. Replace all levers at the same time (lever kit).
4. Check drive pulley screw for torque.
   Loose screw. Retighten screw with recommended torque.
5. Check one-way clutch condition on drive pulley sliding sheave.
   Bearing(s) do(es) not move freely. Replace damaged part(s) and lubricate inside of one-way clutch.
   Spring sleeve(s) inside one-way clutch is (are) worn out. Replace both sleeves and springs and lubricate inside of one-way clutch.
   Spring(s) inside one-way clutch is (are) worn out. Replace both pins and springs and lubricate inside of one-way clutch.

Symptom: DRIVE PULLEY NOISE WHEN ACCELERATING/DECELERATING

1. Check if belt runs in dry condition.
   Drive pulley area is wet/contaminated due to water/dirt intrusion. Clean driven pulley area and/or drain water out of CVT cover.
2. Check drive/driven pulley screw for torque.
   Loose screw on drive pulley. Retighten screw with recommended torque.
3. Check cam and driven pulley fixed sheave for wear.
   Cam and/or drive pulley fixed sheave out of wear limit and/or damaged. Replace damaged part(s).
4. Check torque gear fixed in driven pulley sliding sheave for wear.
   Torque gear out of wear limit and/or damaged. Replace torque gear).
5. Check for foreign particles in CVT area (stones, dirt, etc.).
   Small particles damaged belt and/or pulley surface(s). clean system and replace damaged parts.

Symptom: VIBRATIONS ORIGINATING FROM DRIVE PULLEY

1. Check tightening torque of drive pulley screw.
   Moving sliding sheave. Retighten screw.
2. Check fixed sheave bushings.
   Excessive gap between bushings and fixed sheave shaft, thus restraining sliding sheave movements. Replace fixed sheave assembly.
3. Check if slider shoes are present and/or placed in correct position.
   Slider shoe(s) is (are) missing and/or damaged. Replace all slider shoes at the same time (slider shoes kit).

Symptom: VIBRATIONS ORIGINATING FROM DRIVEN PULLEY

1. Check fixed and sliding sheave bushings on driven pulley.
   Excessive gap between bushings and CVT shaft, thus restraining sliding sheave movements. Replace fixed and/or sliding sheave of driven pulley, polish CVT shaft area with fine emery cloth and wipe clean with a cloth.

Symptom: PULLEYS DO NOT DOWN/UP SHIFT PROPERLY.

1. Check drive pulley bushings (cleanliness, wear, etc.)
   Check items 1 and 2 of UNUSUAL ACCELERATION BEHAVIOR.
   Bushings stick to fixed sheave pulley shaft. Clean or replace.
   Spring seat sticks to sliding sheave pulley bushing. Clean system and/or replace sliding sheave pulley.
   One-way clutch does not operate properly. Clean system and/or replace damaged part(s).
2. Check driven pulley spring tension.
   Driven pulley spring tension is too weak or broken. Replace.
   Driven pulley cam is worn or damaged. Replace.

Symptom: BELT GLAZED EXCESSIVELY OR HAVING BAKED APPEARANCE

1. Check if CVT air intake and/or outlet is clogged.
   CVT area heats up due to contamination. Clean air intake and/or outlet from contamination.
   Fans located on drive pulley is worn or damaged. Replace.
2. Check if pulley sheaves are clean.
   Oil on pulley surfaces. Clean pulley sheaves and replace belt.
   Water intrusion in CVT area. Find root cause and repair. Drain water and replace belt.

Symptom: BELT WORN EXCESSIVELY IN TOP WIDTH.

1. Check drive belt width.
   Considerable wear. Replace belt if narrower than specified (refer to CONTINUOUSLY VARIABLE TRANSMISSION (CVT) OR TECHNICAL SPECIFICATIONS)。

2. Check driver belt identification number.
   Wrong type of belt. Replace belt with an appropriate drive belt.
3. Check for localized belt wear caused by belt slippage.
   Localized wear. Replace belt.

Symptom: BELT DISINTEGRATION.

1. Check drive belt lifetime is exceeded..
   Clean CVT system and rebuild with a new drive belt.
2. Check drive belt identification number.
   Excessive belt speed. Using unspecified type of belt. Replace belt with proper type of belt.
3. Check if pulley sheaves are clean.
   Oil on pulley surfaces. Clean pulley surfaces with fine emery cloth and wipe clean using pulley flange cleaner and a cloth.
   Drive/driven pulley sheaves are damaged through stones inside CVT area. Clean pulley surfaces with fine emery cloth, wipe clean with a cloth or replace drive/driven pulley sheaves and belt.

Symptom: BACK BETWEEN COGS

1. Check drive belt condition.
   Considerable use, belt wearing out. Replace.
   Brittle belt condition through aging. Replace belt.

ENGINE GENERAL

Symptom: ENGINE CRANKS BUT FAIL TO START

1. Check if spark plug connectors fit on spark plugs (refer to IGNITION SYSTEM).
2. Check spark plugs.
   Define spark plugs (no spark) or wrong spark plug gap. Readjust gap and clean spark plugs or replace.
3. Check for fuel on spark plugs.
   Flooded engine (spark plugs wet when removed). Activate engine drowned mode and crank engine with rags over the spark plug holes.
4. Check battery voltage.
   Battery is discharged and starter works not properly. Charge battery.
5. Check fuel level in fuel tank and fuel pressure. Ensure fuel pump was not disabled.
   -- Low or no fuel pressure. Replace defective part(s).
6. Check fuel injectors.
   Plugged or faulty injector(s).Replace defective part(s).
7. Check idle bypass valve.
   Stuck or defective..

8. Check encoder wheel.
   Bent tooth. Refer to MAGNETO SYSTEM.
9. Check engine compression.
   Insufficient engine compression. Replace defective part(s).
10. Check fault codes in B.U.D.S. system.
    Check if electrical actuator(s) is/are defective. Replace defective part(s) (refer to COMPONENT INSPECTION AND ADJUSTMENT).

Symptom: ENGINE DOES NOT START

1. Electrical problem.
   Determine if the electrical system works correctly (fuse(s), battery, wiring harness, etc.). refer to IGNITION SYSTEM.
2. Problem with fuel system (carburetor, fuel pump, hoses, etc.).
   Clean, inspect, repair or replace defective parts. Replace defective part(s).
3. Check engine compression.
   Insufficient engine compression. Replace defective parts.
   Valve seat worn and/or damaged. Repair by performing valve guide procedure (refer to CYLINDER AND HEAD). Readjust valve clearance.
4. Internal engine problem.
   Overhaul engine to find defective parts. Refer to the appropriate section in ENGINE.

Symptom: ENGINE HARD TO START

1. Check idle bypass valve.
   Stuck or defective. Refer to ENGINE MANAGEMENT.
2. Check closed throttle and idle actuator with B.U.D.S.
   Wrong TPS zero setting/idle bypass valve reset. Refer to ENGINE MANAGEMENT.
3. Check engine compression.
   Wrong adjustment (likely too tight). Refer to ENGINE MANAGEMENT.
4. Check engine compression.
   Insufficient engine compression. Replace defective part(s) refer to LEAK TEST.
5. Verify spark plug condition.
   Defective, improperly set, worn out, fouled. Identify source of problem and correct. Replace.
6. Check fuel level in fuel tank and fuel pressure.
   Low or no fuel pressure. Replace defective part(s) refer to FUEL TANK AND FUEL PUMP.
7. Check CAPS (camshaft position sensor).

Defective sensor/wiring. Refer to ENGINE MANAGEMENT.

Symptom: ENGINE SUDDENLY TURNS OFF

1. Perform engine leak test.

   Damaged head gasket and/or seal and/or leaking inlet/exhaust valve(s). replace and/or repair defective parts.

2. Check spark plugs condition and/or gap.

   Fouled spark plugs or wrong spark plug gap. Readjust gap and clean spark plugs or replace..

3. Piston seizure.

   Spark plugs heat range is too hot. Install spark plugs with appropriate heat range (refer to TECHNICAL SPECIFICATIONS).

   Compression ratio is too high. Install genuine parts.

   Poor oil quality. Use recommended oil.

   Leaks at air intake manifold (engine gets too lean). Retighten screws or replace air intake manifold gasket.

   Snow/water intrusion through intake system into combustion chamber. Clean intake system and replace defective part(s).

4. Melted and/or perforated piston dome; melted section at ring end gap.

   Spark plugs heat range is too hot. Install recommended spark plugs (refer to TECHNICAL SPECIFICATIONS).

   Coolant less than recommended level (engine gets too hot). Repair cooling circuit and/or refill with recommended liquid.

   Poor quality and/or wrong fuel. Clean from contamination and use appropriate fuel (refer to TECHNICAL SPECIFICATIONS).

5. Piston color is dark due to seizure on intake and exhaust side.

   Cooling system leaks and lowers coolant level. Tighten clamps or replace defective parts. Add antifreeze in cooling system until appropriate level s reached. Replace damaged parts.

6. Cracked or broken piston.

   Cracked or broken piston due to excessive piston/cylinder clearance or engine overheating. Replace piston. Check piston/cylinder clearance (refer to CYLINDER AND HEAD).

7. Check piston rings and cylinder surface for grooves.

   Poor oil quality. Use recommended oil.

   Contamination through engine intake. Replace defective part(s) and use new air filter.

8. Check crankshaft, rocker arms movement.

   Oil pump failure due to lack of oil. Repair and replace defective parts and

use new recommended oil.

Oil contamination due to clogged oil filter/oil strainer. Replace oil and oil filter at the same time, replace defective part(s).

9. Check valve springs exhaust/intake.

   Broken valve spring damages the cylinder head, valve(s), rocker arm(s), piston, piston rings and connecting rod. Replace defective part(s).

10. Check if fuel supply is sufficient.

    Low fuel level.

    Clogged fuel filter or fuel injector filter.

    Fuel line is contaminated and/or bent. Clean and/or replace defective part(s).

Symptom: ENGINE BACKFIRES

1. Check spark plugs.

   Carbon accumulation caused by defective spark plugs. Replace spark plugs.

2. Check leakage on intake manifold.

   Air leak on intake system. Retighten screws and/or replace intake manifold gasket.

3. Check exhaust air leaking.

   Exhaust gasket is leaking. Retighten screws and/or replace exhaust gasket.

4. Check intake valve(s) for leaking.

   Intake valve(s) is (are) leaking. Repair or replace valve(s).

5. Check if fuel supply is sufficient.

   Fuel line is contaminated and/or bent (engine gets lean). Clean and/or replace defective part(s).

6. Check engine ground.

   Poor engine ground. Clean.

Symptom: ENGINE DOES NOT OFFER MAXIMUM POWER AND/OR DOES NOT REACH MAXIMUM OPERATING RPM

1. Check spark plugs condition and/or gap.

   Fouled spark plugs or wrong spark plug gap. Readjust gap and clean spark plugs or replace.

2. Check spark plugs type.

   Improper spark plugs heat range. Install recommended spark plugs (refer to TECHNICAL SPECIFICATIONS).

3. Perform engine leak test.

   Damaged head gasket and/or seal and/or leaking intake/exhaust valve(s).

replace and/or repair defective parts.

4. Check for water in fuel (wrong fuel).

   There is water in fuel or wrong fuel. Drain fuel system, search for leakage and refill it with appropriate fuel.

5. Check engine compression.

   Worn piston(s) and/or piston ring(s). Replace defective part(s).

6. Check fuel pressure.

   Low fuel pressure. Perform fuel pressure test (refer to FUEL SYSTEM).

7. Check air intake system.

   Air filter is clogged due to contamination. Replace air filter.

8. Check if EMS (engine management system) is in limp home mode. Check fault codes in B.U.D.S. system.

   Check if electrical actuator(s) is/are defective. Replace defective part(s).

9. Check drive belt.

   Worn. Replace belt if its width is less than specified.

Symptom: HIGH ENGINE OPERATING TEMPERATURE

1. Check if cooling system shows any failure (see COOLING SYSTEM).

   System is leaking. Repair and/or replace damaged part(s).

2. Check function of lubrication system (see LUBRICATION SYSTEM).

   Lubrication is not working properly. Repair and/or replace damaged part(s).

3. Check condition and heat range of spark plugs.

   Melted spark plug tip or inadequate heat range. Replace.

4. Check air leakage on engine intake.

   Leakage causes overheating. Replace/repair damaged part(s).

5. Check air inlet and outlet of the CVT cover.

   Air circulation is clogged (overheating). Clean air circulation from contamination.

   Drive belt worn and/or damaged. Replace belt with an appropriate drive belt (refer to TECHNICAL SPECIFICATIONS).