

## Foreword

This manual is designed primarily for use by the ATV factory certified service technicians in a properly equipped shop. Persons using this manual should have a sound knowledge of mechanical theory, tool use, and shop procedures in order to perform the work safely and correctly. The technician should read the text and be familiar with service procedures before starting the work. Certain procedures require the use of special tools. Use only the proper tools, as specified. Cleanliness of parts and tools as well as the work area is of primary importance.

This manual is divided into sections. Each section covers a specific ATV component or system and, in addition to the standard service procedures. Keep this manual available for reference in the shop area. When using this manual as a guide, the technician should use discretion as to how much disassembly is needed to correct any given condition.

All references to left and right side of the vehicle are from the operator's perspective when seated in a normal riding position.

At the time of publication all information contained in this manual was technically correct. Some photographs used in this manual are used for clarity purposes only and are not designed to depict actual conditions. We constantly refine and improve its products, all materials and specifications are subject to change without notice.

This ATV's publications and decals display the words **Warning, Caution, Note**, and At This Point to emphasize important information:

### **WARNING**

Indicates a potential hazard which will result in severe injury or death to the operator, bystander or person inspecting or servicing the ATV..

### **CAUTION**

Indicates a potential hazard which may result in personal injury or death or damage to the machine.

### **NOTE**

The word "**NOTE**" in this manual will alert you to key information or instructions.

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**WARNING**

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

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

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

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

# CHAPTER 1 GENERAL INFORMATION

**WARNING**

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

## 1.1 IMPORTANT INFORMATION

## 1.2 V.I.N AND ENGINE SERIAL NUMBER

## 1.3 VEHICLE DIMENSIONS

**1.1 IMPORTANT INFORMATION**

**PREPARATION FOR REMOVAL PROCEDURES**

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

**REPLACEMENT PARTS**

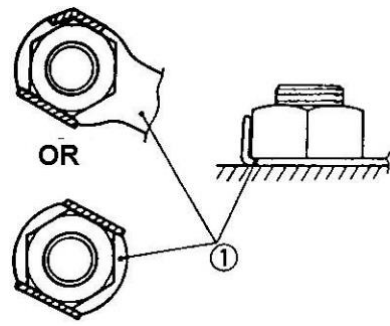
Use only genuine parts for all replacements. Use recommended oil and grease for all lubrication jobs. Other brands may be similar in function and appearance, but inferior in quality.

**GASKETS, OIL SEALS AND O-RINGS**

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

**LOCK WASHERS/PLATES AND COTTER PINS**

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



**BEARINGS AND OIL SEALS**

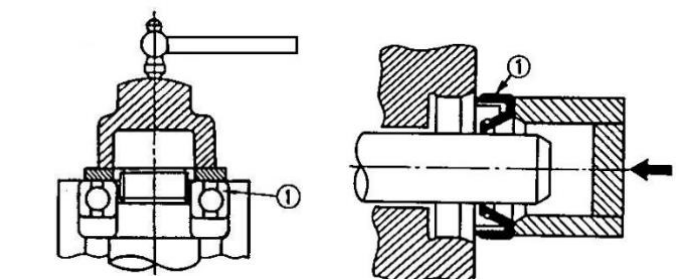
Install bearings and oil seals so that the manufacturer's marks or numbers are visible. When installing oil seals, apply a light coating of lightweight lithium base grease to the seal lips. Oil bearings liberally when installing, if appropriate.

① oil seal

**CAUTION:**

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

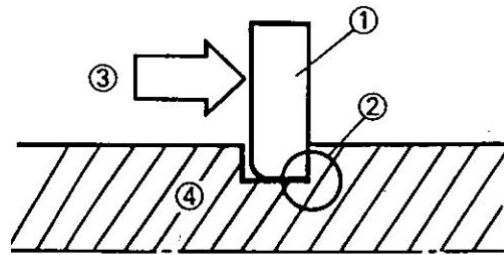
① Bearing



**CIRCLIPS**

1. Check all circlips carefully before reassembly.

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



④ Shaft

**CHECKING OF CONNECTIONS**

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

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



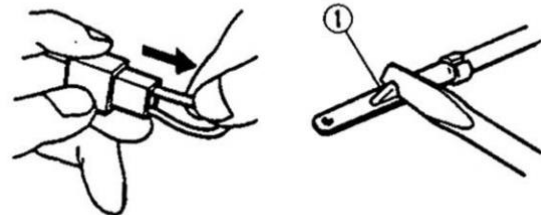
**NOTE:**

The two connectors "click" together.

7. Check for continuity with a tester.

**NOTE:**

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



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**CONVERSION TABLE**

**How to use the CONVERSION TABLE**

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

Ex.

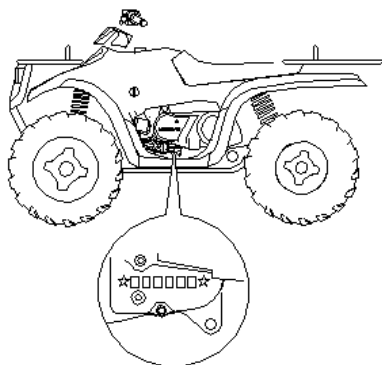
METRIC		MULIPLIER		IMP
**mm	x	0.3937	=	**in
**cm	x	0.03937	=	**in

**CONVERSION TABLE**

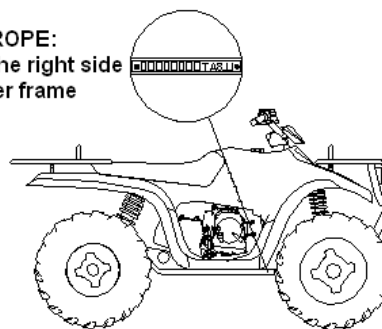
METRIC TO IMP			
	Known	Multiplier	Result
Torque	m • kg	7.233	ft • lb
	m • kg	86.794	ln • lb
	cm • kg	0.0723	ft • lb
	cm • kg	0.8679	ln • lb
Weight	kg	2.205	lb
	g	0.03527	oz
Distance	km/h	0.6214	mph
	km	0.6214	mi
	m	3.281	ft
	m	1.094	yd
	cm	0.3927	in
	mm	0.03927	in
Volume/ Capacity	cc(cm <sup>3</sup>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

**1.2 V.I.N AND ENGINE SERIAL NUMBER**

ENGINE SERIAL NUMBER



EUROPE:  
on the right side  
lower frame



1.3 VEHICLE DIMENSIONS



NOTES





# **CHAPTER 2 MAINTENANCE**

## **WARNING**

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

### **2.1 PERIODIC MAINTENANCE**

### **2.2 FUEL SYSTEM**

### **2.3 TOE ALIGNMENT**

### **2.4 BRAKING SYSTEM INSPECTION**

### **2.5 SUSPENSION SPRING RPELOAD ADJUSTMENT**

### **2.6 WHEELS**

### **2.7 TIRE PRESSURE**

### **2.8 FRAME, NUTS, BOLTS, FASTENERS**

**2.1 PERIODIC MAINTENANCE**

**GENERAL CAUTION**

**Mark on the following chart**

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

**▲** : Service/Inspect more frequently when operating in adverse conditions.

**PERIODIC MAINTENANCE SCHEDULE**

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

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

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

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

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

- A = Adjust      I = Inspect
- C = Clean      L = Lubricate
- D = Drain      R = Replace
- T =Tighten to Correct Torque

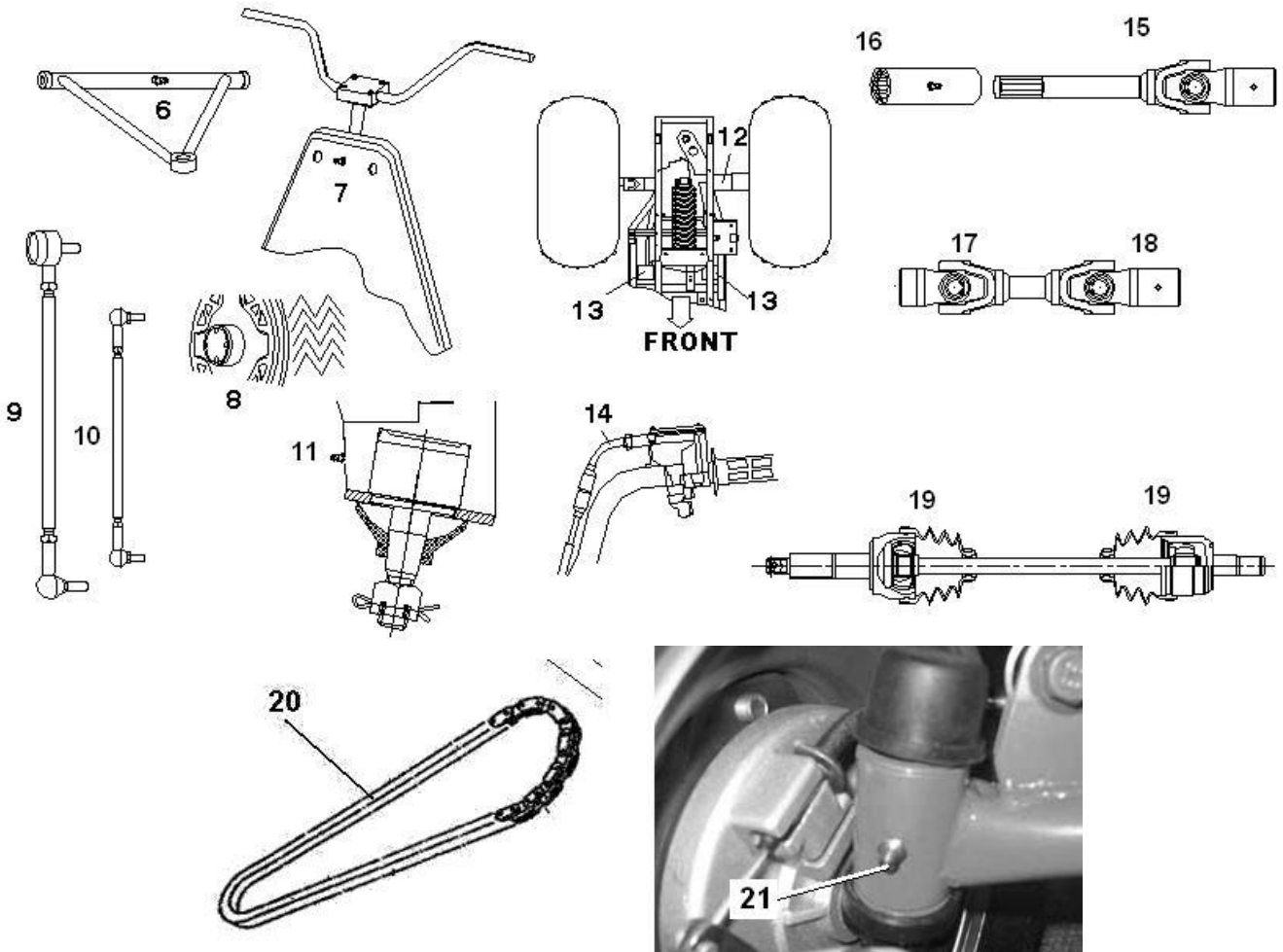
	<b>Item</b>	<b>Hours</b>	<b>When</b>	<b>Remarks</b>
	Service (Main) Brake System	/	Pre-ride	I
	Auxiliary (Secondary) Brake	/	Pre-ride	I
	Parking Brake	/	Pre-ride	I
	Tires	/	Pre-ride	I
	Wheels	/	Pre-ride	I
	Frame nuts, bolts fasteners	/	Pre-ride	I
<b>▲</b>	Air Filter-Pre-Cleaner	/	Daily	I C
	Coolant/Level	/	Daily	I
	Coolant	150	Annually	R
	Coolant strength	25 hrs	3 months	I Inspect strength seasonally
<b>▲</b>	Air Box Sediment Tube	/	Daily	D
	Headlamp Inspection	/	Daily	C apply dielectric grease to connector when

				replaced
	Tail lamp inspection	/	Daily	C apply dielectric grease to socket when replaced
▲	Air Filter-Main Element	2	Weekly	I C Replace if necessary
▲	Transmission Oil Level	10	Monthly	I change annually
	Battery Terminals	10	Monthly	I C
	Battery fluid level	10	Monthly	I
DL	Brake pad wear	2	Weekly	I
▲	Gear case Oil	10	Monthly	C
		150	annually	R
	Engine Cylinder Head and Cylinder Base Fasteners	25	3 months	I (re-torque required at first service only)
▲	General Lubrication all fittings, pivots, cables, etc.	25	3 months	L
	Engine Oil-Level	/	Daily	I
	Engine Oil Change	30 hrs	3 months	R Break-in Service at 1 month. Change oil more often in cold weather use.
▲	Oil Filter	50 hrs	6 months	I C
▲	Engine breather hose	100 hrs	6 months	I
	Throttle Cable	/	Pre-ride	I
DL	Throttle Cable	50 hrs	6 months	A L (Grease M) R if necessary
	Shift linkage	50 hrs	6 months	I A R if necessary
DL	Transmission belt	50 hrs	6 months	I R if necessary
▲	Steering	50 hrs	6 months	I L T if necessary
▲	Rear Axle ( and Bearings)	50 hrs	6 months	I L
▲	Front Suspension	50 hrs	6 months	I L T if necessary
▲	Rear Suspension	50 hrs	6 months	I T if necessary
	Spark Plug	100 hrs	12 months	I

				R if necessary
<b>DL</b>	Ignition Timing	100 hrs	12 months	I Adjust as needed
<b>DL</b>	Fuel System	100 hrs	12 months	Check for leaks at tank, cap, lines, filter. Replace lines every 2 years.
<b>DL</b>	Fuel Filter	100 hrs	12 months	R
	Radiator	100 hrs	12 months	I R
	Cooling System hoses	50 hrs	6 months	I R if necessary
	Spark arrestor	10 hrs	monthly	C R if necessary
<b>DL</b>	Clutches (drive and Driven)	25 hrs	3 months	I R R if necessary
	Engine mounts	25 hrs	3 months	I T
<b>DL</b>	Valve clearance	100 hrs	12 months	I A
<b>DL</b>	Shift selector box (H/L/R/N)	200 hrs	24 months	Change grease every two years
<b>DL</b>	Brake fluid Level	/	Pre-ride	I
	Brake fluid	200 hrs	24 months	Change every two years
	Idle Speed	/	As Required	A
<b>DL</b>	Toe adjustment	/	As Required	Periodic inspection, adjust when parts are replaced
	Headlight Aim	/	As Required	Adjust if necessary
<b>▲</b> <b>DL</b>	Front drive chain (and sprockets) in transmission (only SDX300 );	300 hrs (full time in 4X4), or 1000 hrs ( in 2X4 alternate 4X4 )		I, Replace if necessary
<b>▲</b> <b>DL</b>	Ball joint (A arm- strut)	10 hrs	monthly	I, (for damage, wear, and play) R. Replace if necessary






**LUBRICANT AND FLUID**

	Item	Lube Rec	Method	Frequency
	1. Engine Oil	SAE 15W/40 SE	Add to proper level on dipstick (new engine 1400ml)	Check level daily
	2. Brake Fluid	DOT 3 Only	Maintain level Between fill lines. See "7.CONTROL"	As require; change every two years or 200 hours
	3. Transmission Oil	SEA 80W/90GL5	Add to proper level on dipstick (new transmission 900ml)	Change annually or at 100 hours
	4.Rear Gear case oil	SEA 80W/90GL5	Add to proper Level (new rear gear case 300ml)	Change annually or at 100 hours
	5. Front Gear case oil ( SDX30-0 )	SEA 80W/90GL5	Add to proper level (new front gear case 290ml)	Change annually or at 100 hours
▲	6. Front A-arm pivot Shaft	Grease	Locate fitting on pivot shaft and grease with grease gun	Every 3 months or 50 hours ( Except Maintenance-Free A-arm pivot )
▲	7.Steering Post Bushings	Grease	Locate fitting on pivot shaft and grease with grease gun	Every 3 months or 50 hours
▲	8.Front Wheel bearings	Grease (high temperature resist)	Inspect and replace bearings if necessary	Semi-annually
	9.Tie rods	Grease	Locate fittings and grease	Semi-annually
	10.Shift Linkages	Grease	Locate fittings and grease	Semi-annually
▲	11.Ball joints	Inspect	Inspect and replace it if necessary	Semi-annually
▲	12.Rear Axle Bearing	Grease	Locate fittings and grease	Every 3 months or 50 hours
▲	13.Swing Arm Bearing	Grease	Locate fittings and grease	Monthly or 20 hours
▲	14.Throttle Cable	Grease M	Grease, inspect and replace it if necessary	Monthly or 20 hours
	15. Rear prop shaft U-joint	Grease	Locate fittings and grease	Every 3 months or 50 hours
	16. Rear prop shaft yoke	Grease	Locate fittings and grease	Every 3 months or 50 hours
	17. Front prop shaft U-joint ( SDX300)	Grease	Locate fittings and grease	Every 3 months or 50 hours
	18. Front prop shaft yoke ( SDX300)	Grease	Locate fittings and grease	Every 3 months or 50 hours
	19. Inner and outer CV-Joints (SDX300)	Grease M	Grease, inspect and replace it if necessary	Every 3 months or 50 hours
	21. A-arm pivot shaft	Grease	Locate fittings and grease	Every 3 months or 50 hours



**LUBRICATION RECOMMENDATIONS**

**NOTE:**

1.  More often under severe use, such as wet or dusty conditions.
2.  Grease: Light weight lithium-soap grease.
3.  Grease M: Molybdenum disulfide (MoS<sub>2</sub>) grease (water resistant).
4.  When suspension action becomes stiff or after washing.
5.  Hours are based on 10 mph(16Km/h) average.

## 2.2 FUEL SYSTEM

### WARNING

Gasoline is extremely flammable and explosive under certain conditions.

Always stop the engine and refuel outdoors or in a well ventilated area.

⚠ Do not smoke or allow open flames or sparks in or near the area where refueling is performed or where gasoline is stored.

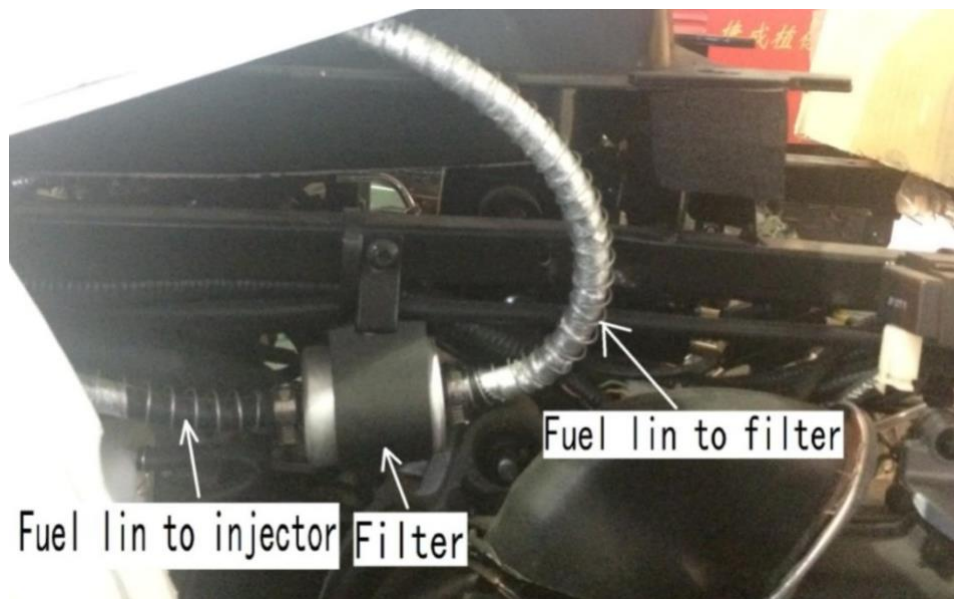
⚠ Do not overfill the tank. Do not fill the tank neck.

If you get gasoline in your eyes or if you swallow gasoline, see your doctor immediately.

If you spill gasoline on your skin or clothing, immediately wash it off with soap and water and change clothing.

Never start the engine or let it run in an enclosed area. Gasoline powered engine exhaust fumes are poisonous and can cause loss of consciousness and death in a short time.

⚠ Do not drain the float bowl when the engine is hot. Severe burns may result.



### FUEL LINES

Check fuel lines for signs of wear, deterioration, damage or leakage. Replace if necessary.

Be sure fuel lines are routed properly and secured with cable ties.

**CAUTION:** Make sure lines are not kinked or pinched.

Replace all fuel lines every two years.

### FUEL FILTER

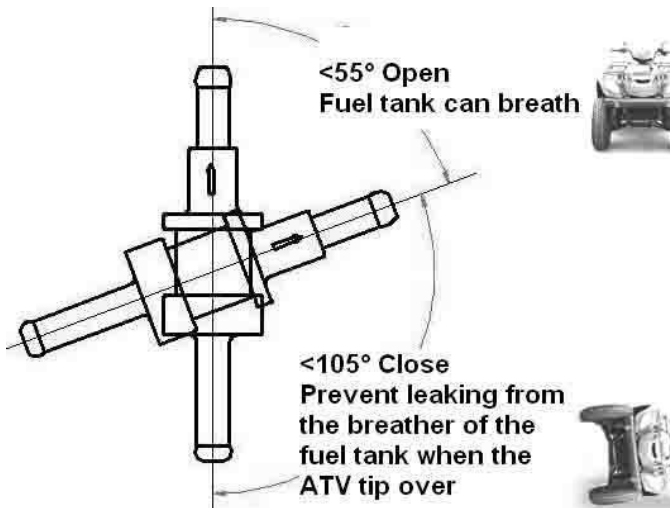
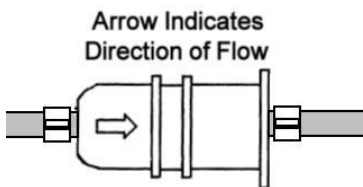
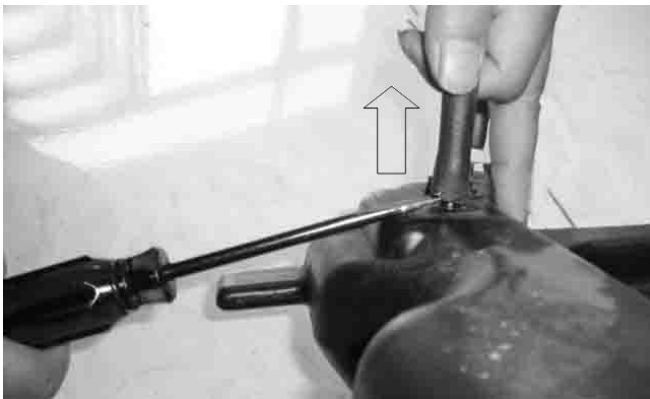
The fuel filter should be replaced in accordance with the Periodic Maintenance Chart or whenever sediment is visible in the filter.



**VENT LINES AND ROLL OVER VALVE\***

1. Check fuel tank, oil tank, battery, and transmission vent lines for signs of wear, deterioration, damage or leakage. Replace every two years.
2. Be sure vent lines and drain lines are routed properly toward the ground and secured with cable ties. **CAUTION:** Make sure lines are not kinked or pinched

**\*NOTE. On some models, there is a Roll-Over Valve on the end of the gas tank vent line. Make sure the ↑ mark on the R-O Valve is upwards.**



**Fuel Pump Module**

**Description and Working Principle**

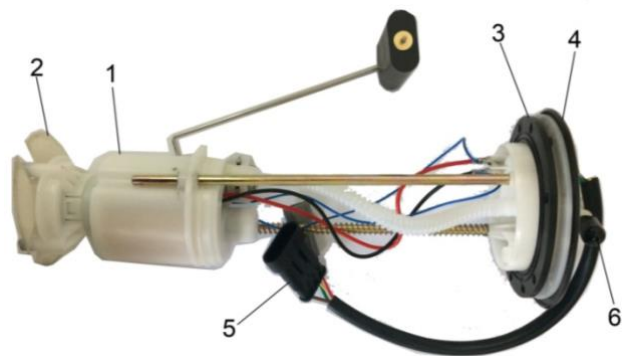
Fuel Pump Module supplies fuel to engine at system pressure. Fuel Pump Module is mounted to fuel tank at bottom and supplies fuel to engine through hoses.

Fuel Pump module consists of Fuel Pump to generate the fuel flow and pressure regulator to regulate the fuel pressure.

**Fuel Pump**

When power is supplied to fuel pump, motor in pump assembly rotates the impeller. Impeller in turn draws the fuel from strainer and pumps the flow to generate the system pressure.

**Appearance & Components of Fuel Module**



1. Fuel Pump
2. Strainer
3. Gasket, Fuel Module
4. Module Bracket
5. Module Harness
6. Fuel Tube (out pump)

**Dimensions**

Fuel Module Cover in elliptical shape with outer edge dimensions as 115mm x 65mm.

**Identification and Markings**

Fuel Module, Fuel Pump and Regulator are marked with batch code in Julian Date Code. On Fuel Module, batch code in mentioned on

the label available on fuel module cover. On Fuel Pump Batch code is engraved on pump body (shell).

On Fuel Pressure Regulator, batch code is engraved on regulator dome area.

**Operating Conditions**

□□Fuel Pump Module needs to be mounted on Fuel Tank Bottom according to the installation instructions.

□□Fuel Pump Module is intended to use with gasoline. However if the fuel contains ethanol, please contact vehicle manufacture to check whether the fuel pump module itself can survive or not.

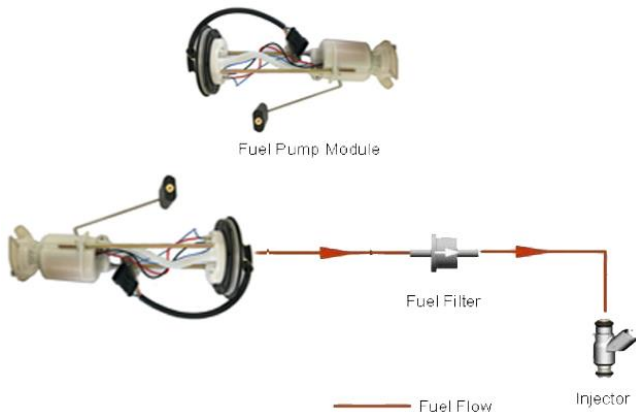
□□Make sure there is at least 3 liters of gasoline in the fuel tank before priming for first time (do not run the pump dry)

□□Fuel Hose connections needs to be installed according to the fuel flow diagram shown Fuel Flow Description in vehicle fuel system

**Service Procedure**

**Precautions:**

Before attempting any service on fuel system, following cautions should be always



followed for personal safety and to avoid system damages.

- Disconnect negative cable at battery.
- DO NOT smoke, and place ‘No SMOKING’ sign near work area
- Make sure to have fire extinguisher handy.
- Make sure to perform work in well ventilated area and away from any open fire/flames.
- Wear Safety glasses
- To relieve fuel vapor pressure in fuel tank, remove fuel filler cap fuel filler neck and then reinstall it.
- As fuel lines are at high pressures when the engine is stopped, loosening or disconnecting fuel line will cause dangerous spout of fuel. Before loosening/

disconnecting fuel lines, please follow the “Fuel Pressure Relief Procedure” described in this section.

□□Small amount of fuel may drip after the fuel lines are disconnected. In order to reduce the risk of personal injury, cover the pipe/ hose ends with suitable blind with no rust or contamination.

□□After servicing, make sure that the fuel hoses and clamps are connected according to the hose fitment instructions given in vehicle instruction manual.

□□After servicing, please follow the ‘Fuel Leakage Check Procedure’ described in this section.

□□After servicing make sure to fill at least 3 liters gasoline before pump is primed (ignition key should be turned on only after ensuring there is minimum 3 liters of fuel in the fuel tank)

**Fuel Module Removal:**

□□Relieve fuel pressure in fuel lines referring to the ‘Fuel Pressure Relief Procedure’ provided in this section.

□□Disconnect negative cable at battery.

□□Disconnect fuel module wire coupler.

□□Drain the fuel in fuel tank thru fuel filler with help of hand pump (siphon). Collect the fuel in approved container for contamination and safety.

□□Disconnect the fuel hoses from fuel module by using standard tools

□□Remove the fuel tank from vehicle.

□□Place the fuel tank with bottom up condition. Care to be taken not to cause any scratches/ damages on fuel tank.

□□Open the fuel module mounting bolts.

□□Take out fuel module assembly from fuel tank with care

□□Care to be taken not to damage the strainer while removing fuel module from tank.

**Fuel Module Installation:**

□□Replace the fuel module gasket in fuel module assembly with a new one. Old/ used gaskets can cause leakages.

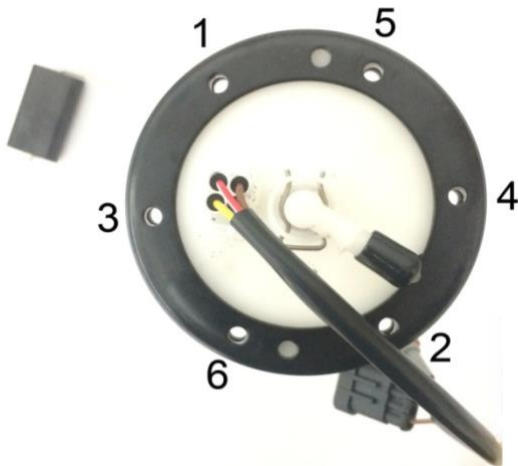
□□Fold strainer towards fuel pump and insert fuel module in tank opening with care. Care should be taken not to cause any damages on strainer.

Fuel Module Orientation: Fuel module bolts not symmetrical and can be mounted

only in the intended direction. Regulator side should be facing the Fuel Tank rear side.

Make sure that the fuel tank surface at module mounting area is clean and free of surface defects.

□□Place the bolts on module cover and tighten the bolts gradually in star pattern sequence to apply equal compression on gasket. It is shown as below.



Bolt Tightening Torque: 4.4 Nm.

Fuel module is installed with special bolts (step bolts). Use designated bolts only.

Follow the tightening torque and tightening sequence instruction. Over torque and miss-sequence can cause unequal compression of gasket and leakage.

- Install the fuel tank to vehicle.
- Connect for fuel hoses with suitable hose clamps.
- Connect fuel module coupler
- Follow “Fuel Leakage Check Procedure’ to check any leakage before the engine is started.

**Fuel Pressure Relief Procedure:**

Caution: This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst (if equipped)  
After making sure that engine is cold, relieve fuel pressure as follows.

- Place vehicle gear in ‘Neutral’.
- Disconnect fuel module electrical coupler from vehicle harness.
- Start engine and run till it stops due to lack of fuel. Repeat ignition key ON and OFF for 2 ~ 3 times of about 3 seconds each time to relieve fuel pressure in lines. Fuel Connections are now safe for servicing.
- Upon the completion of servicing, Connect

**Fuel Module Connector to Vehicle Harness**

**2.3 TOE ALIGNMENT**

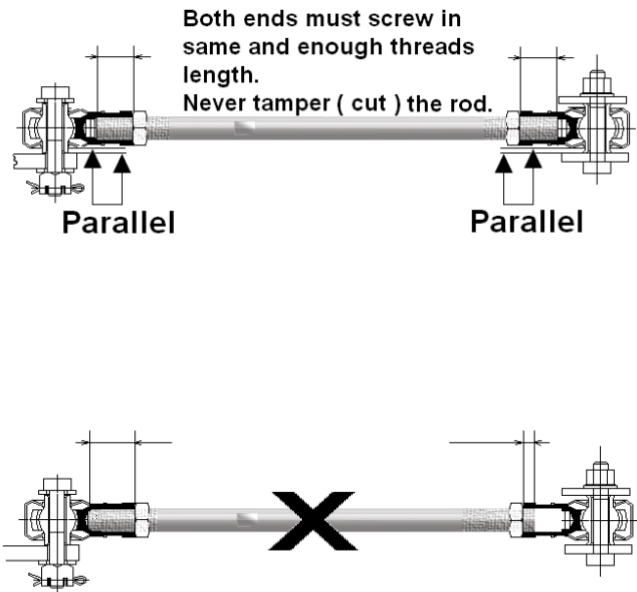
**METHOD: STRAIGHTEDGE OR STRING**

Be sure to keep handlebars centered

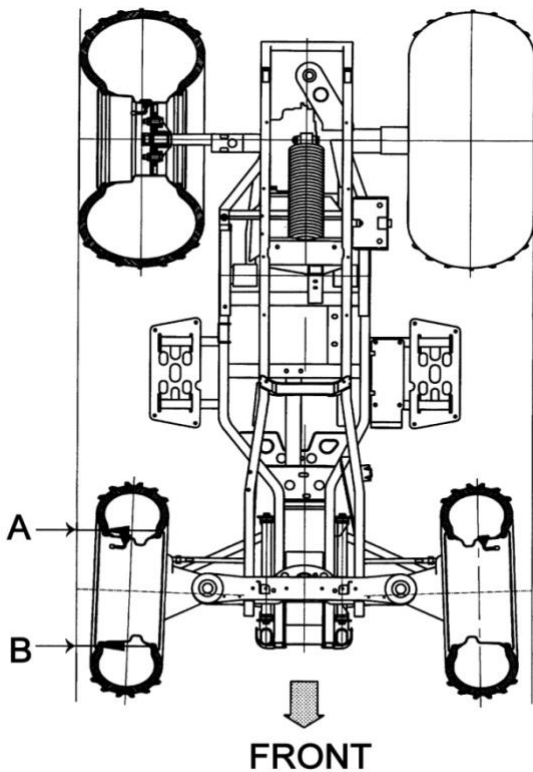
**NOTE:** String should just touch side surface of rear tire on each side of the ATV. Measure from string to rim at front and rear of rim.

Rear rim measurement (A) should be 1/16" to 1/8" (1.5 to 3 mm) more than front rim measurement (B).

**NOTE:** The steering post arm (frog) can be used as an indicator of whether the handlebars are straight. The frog should always point straight back from the steering post when handlebars are straight.



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



**2.4 BRAKING SYSTEM**

**INSPECTION**

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

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

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

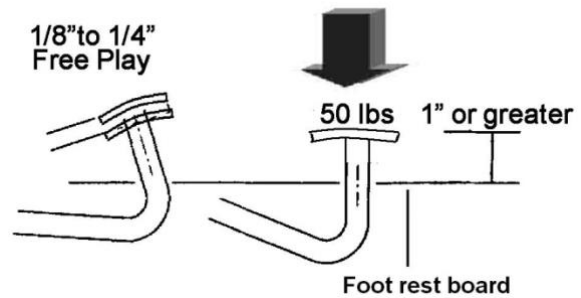
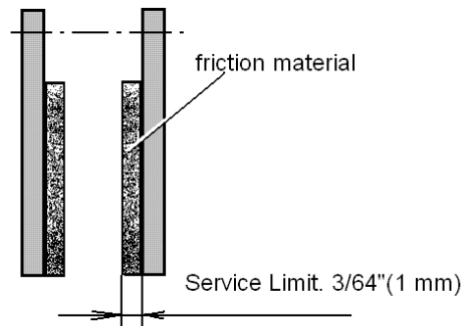
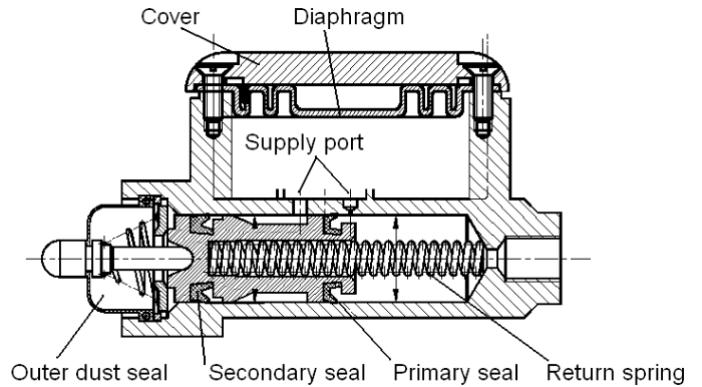
- Check brake system for fluid leaks.
- Check brake for excessive travel or spongy feel.
- Check friction pads for wear, damage and looseness.
- Check surface condition of the disc.

**BRAKE PAD INSPECTION**

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

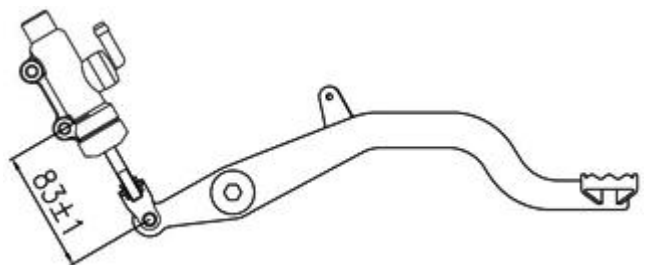
**HOSE/FITTING INSPECTION**

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



**Adjusting brake pedal for B-Type**

If the push rod joint is reinstalled, adjust the push rod length so that the distance between the centers of the master cylinder lower mounting bolt hole and joint pin hole is 83±1mm. After adjustment, tighten the joint nut.



1. First check foot brake effectiveness by applying a 25 kg (50 lb). (Approx) downward force on the pedal.

The top of the pedal should be at least 1 inch, (25 .4m m) above the surface of the footrest.

**If less than one inch, two things must be examined:**

**Free Play:**

**Free play of the brake pedal should be 1/8-1/4 inch (3-6mm).**

If free play is excessive, inspect pedal, linkage, and master cylinder for wear or damage and replace any worn parts.

**Bleeding:**

If free play is correct and brake pedal travel is still excessive, air may be trapped some where in the system. Bleed the hydraulic brake system in a conventional manner, following the procedure outlined in the Brake chapter.

## **2.5 SUSPENSION SPRING RPELOAD ADJUSTMENT**

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

### **FRONT SUSPENSION**

Compress and release front suspension. Damping should be smooth throughout the range of travel.

Check all front suspension components for wear or damage.

Inspect from strut cartridges for leakage. Shock spring preload can not be adjusted, replace if necessary.

### **REAR SUSPENSION**

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

Inspect shock for leakage.

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

### **FOOT BRAKE TESTING**

The foot brake should be checked for proper adjustment.

Support the rear wheels off the ground. While turning the rear wheels by hand, apply the auxiliary footbrake. This brake should not stop the wheels from turning until the lever is half way between its rest position and bottoming on the footrest.

**2.6 WHEELS**

Inspect all wheels for run out of damage.  
 Check wheel nuts and ensure they are tight.  
 Do not over tighten the wheel nuts.

**WHEEL, HUB TORQUE TABLE**

Item	LH400ATV-F	
Front Wheel Nuts	69 Ft.Lbs	96 N.m
Rear Wheel Nuts	69 Ft.Lbs	96 N.m
Front Spindle Nut	Refer to FRONT HUB INSTALLATION	
Rear Hub Retaining Nut	80 Ft.Lbs	110.6 N.m

**WHEEL REMOVAL**

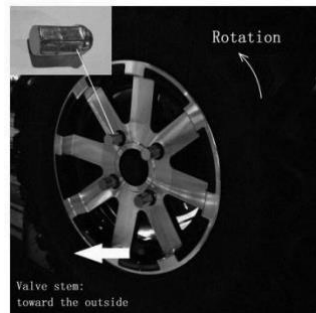
1. Stop the engine, place the transmission in gear  
 And lock the parking brake.
2. Loosen the wheel nuts slightly.
3. Elevate the side of the vehicle by placing a suitable stand under the footrest frame.
4. Remove the wheel nuts and remove the wheel.

**CAUTION:**

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

**WHEEL INSTALLATION**

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



**Front**  
 Flange nuts:install with tapered side against wheel



**Rear**  
 Flange nuts:install with tapered side against wheel

**2.7 TIRE PRESSURE****TIRE INSPECTION****CAUTION :**

- Maintain proper tire pressure. Refer to the warning tire pressure decal applied to the vehicle.
- Improper tire inflation may affect ATV maneuverability.
- When replacing a tire always use original equipment size and type and replace in pairs, especially in SDX300 model.
- The use of non- standard size or type tires may affect ATV handling and cause machine damage, especially in SDX300 model.

**TIRE TREAD DEPTH**

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

**Tire Pressure Inspection**

	Front	Rear
LH400ATV-F (recommend)	7PSI (48±0.5KPa)	7PSI (48±0.5KPa)

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

Worn tires can cause an accident.  
Always replace tires when the tread depth measures 1/8" (3mm ) or less.



**2.8 FRAME , NUTS, BOLTS, FASTENERS**

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

<b>LH400 ATV-F</b>			
Item	Torque (Ft-Lb)	Torque (Nm)	Remarks
Handlebar Clamp Nut M6	12	16	
Handlebar Clamp Nut M8	18	25	
Nut M10X1.25 Attaching Tie Rod to Steering column	26-30	35-41	
Nut M10X1.25 Attaching Tie Rod to Front Absorber Strut body	26-30	35-41	
Tie Rod Jam Nut M12	13	17	
Bolt M10 Attaching A-Arm and Frame	30	41	
MANTENANCE-FREE PIVOT DESIGN Bolt M12 Attaching A-Arm and Frame	37-44	50-60	LT*
Nut M10X1.25 Attaching A-Arm to Ball Joint Stud	22-25	30-35	
Screw M6 Attaching Ball Joint Mounting Bracket to Front Absorber Strut body (MacPherson)	8	11	LT*
Swing Arm Pivot Left	14	19	Refer to SWING ARM ASSEMBLY INSTALLATION , 4.2 SWING ARM, CHAPTER 4A CHASSIS
Swing Arm Pivot Right	120	165	
Threaded Pivot Nut (for swing arm)	120	165	
Nut M14X1.5 Attaching Front Absorber to Frame (MacPherson)	15-18	21-25	LT*
Nut M8 Binding Front Absorber and Front Absorber Strut body (MacPherson)	15	21	LT*
Bolt M8 Attaching Front Caliper to Front Absorber Strut body	18	25	LT*
Bolt M8 Attaching Upper Steering Clamp to Frame	12	16	
Nut M8 Attaching Lower Steering Bearing Retainer to Frame	12	16	
Nut M10X1.25 Attaching Front Wheel to Front Wheel Hub	20	27	
Front (Drive) Axle Nut	Refer to FRONT HUB INSTALLATION		
Screw M8 Attaching Front Brake Disc to Front Wheel Hub	18	25	LT*
Nut M10X1.25 Attaching Rear Brake Disc to Rear Brake	22-25	30-35	LT*
Rear Axle Nut M20X2 (for swing arm)	80	110.6	
Rear Hub Retaining Nut M20X1 (for IRS)	101	137	
Nut M10X1.25 Attaching Rear Caliper to Axle Tube	18	25	LT*
Bolt M12x30 Attaching Axle Tube and Swing arm to Rear Gear-box	60	80	
Bolt M12x35 Attaching Axle Tube to Swing arm	60-66	80-90	

LT\*—Apply Loctite™ 242



# **CHAPTER 3 ENGINE**

**400 cc**

## **3.1 MAINTENANCE SPECIFICATIONS**

### **3.1.1 SPECIFICATIONS**

### **3.1.2 TIGHTENING TORQUES**

## **3.2 PARTS INSPECTION AND SERVICE**

### **3.2.1 VALVE CLEARANCE ADJUSTMENT**

### **3.2.2 SPARK PLUG INSPECTION**

### **3.2.3 COMPRESSION PRESSURE**

### **3.2.4 ENGINE OIL LEVEL INSPECTION**

### **3.2.5 COOLANT LEVEL INSPECTION**

## **3.3 CYLINDER HEAD**

## **3.4 CAMSHAFT AND ROCKER ARMS**

## **3.5 VALVES AND VALVE SPRINGS**

## **3.6 CYLINDER AND PISTON**

## **3.7 V-BELT, CLUTCH AND SECONDARY/PRIMARY SHEAVE**

## **3.8 A.C. MAGNETO AND STARTER CLUTCH**

## **3.9 OIL PUMP**

## **3.10 CRANKCASE AND CRANKSHAFT**

## **3.11 COOLING SYSTEM**

### **3.11.1 RADIATOR**

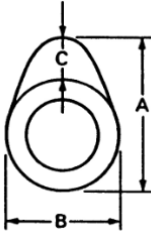
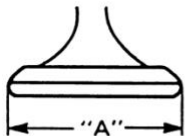
### **3.11.2 WATER PUMP**

### **3.11.3 THERMOSTAT**

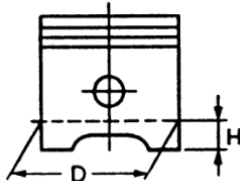
## **3.12 ECU**

**3.1 MAINTENANCE SPECIFICATIONS**

**3.1.1 SPECIFICATIONS**

Item	Standard	Limit
Cylinder head : Warp limit:		0.03 mm
Cylinder: Bore size	80.000- 80.014 mm	80.025 mm
Out of round limit		0.03 mm
Camshaft: Cam dimensions Intake "A" "B" "C" Exhaust "A" "B" "C" Camshaft runout limit	 36 .545- 36 .645 mm 30.021-30.121 mm 6.524 mm 36 .547- 36 .647 mm 30 .067- 30.167 mm 6.48 mm .....	 36 .45 mm 29.92 mm ... 36 .45 mm 29 .97 mm ... 0.03m m
Cam chain: Cam chain type/No. of links	DID SC.A-0404A SDH/108	...
Rocker arm /rocker armshaft: Rocker arm inside diameter Rocker shaft outside diameter Rocker arm - to- rocker arm shaft clearance	 12 .000- 12 .018 mm 11.981- 11.991 mm 0.009- 0.012 mm	 12 .03 mm 11.95 mm ...
Valve, Valve seat, Valve guide: Valve clearance (cold)	 IN 0.08-0.12 mm EX 0.16-0.20 mm	 ... ...
Valve dimensions Valve dimensions	 Face Width Seat Width Margin Thickness	

"A" head diameter	IN	33.9-34.1mm	...
	EX	28.4-28.6mm	...
"B" face width	IN	3.394-3.960mm	...
	EX	3.394-3.960 mm	...
"C " seat width	IN	0.9-1.1mm	...
	EX	0.9-1.1 mm	...
"D" margin thickness	IN	0.8-1.2 mm	...
	EX	0.8-1.2 mm	...
Stem outside diameter	IN	5.975- 5.990 mm	5.94 mm
	EX	5.960-5.975 mm	5.92 mm
Guide inside diameter	IN	6.000- 6.012 mm	6.05 mm
	EX	6.000- 6.012 mm	6.05 mm

Item		Standard	Limit
Stem-to-guide clearance	IN	0.010- 0.037 mm	0.08 mm
	EX	0.025-0.052 mm	0.1 mm
Stem runout limit	IN	...	0.01 mm
	EX	0.9-1.1 mm	1.6 mm
Valve seat width	IN	0.9-1.1 mm	1.6 mm
	EX	0.9-1.1 mm	1.6 mm
Valve spring :			
Free length (Inner)	IN/EX	38.1 mm	361 mm
	(Outer) IN/EX	36.93 mm	35.0 mm
Set length (valve closed)	(Inner) IN/EX	30.1 mm	...
	(Outer) IN/EX	31.6 mm	...
Com pressed pressure	(Inner) IN/EX	7.8- 9.0 kg	...
	(Outer) IN/EX	37.22-42.83 kg	...
Tilt limit	(Inner) IN/EX	...	2.5° /1.7mm
	(Outer) IN/EX	...	2.5° /1.7mm
Piston:			
Piston to cylinder clearance		0.02 - 0.049mm	0.15m m
Piston size "D"		79.965-79.980 mm	...
Measuring point "H"		5mm	...
Piston pin bore inside diameter		18.004-18.015 mm	18.045 mm
Piston pin outside diameter		17.991-18.000 mm	17.975 mm
Piston rings :			
Top ring :			
Type		Barrel	...
End gap (installed)		0.2-0.35 mm	0.5 mm
Side clearance (installed )		0.03-0.065 mm	0.1 mm
2nd ring :			
Type		Taper	...
End gap (installed)		0.28-0.48 mm	0.73 mm
Side clearance		0.02-0.052 mm	0.1 mm

<p>Oil ring : End gap (installed)</p>	<p>0.15-0.4 mm 0.2- 0.7 mm</p>	<p>...</p>
<p>Crankshaft:</p> <div data-bbox="507 607 699 846" data-label="Diagram"> </div> <p>Crank width "A" Runout limit "C " Big end side clearance "D"</p>	<p>59.95-60.00 mm 0.03 mm 0.35- 0.85 mm</p>	<p>... ... ...</p>

<b>Item</b>	<b>Standard</b>	<b>Limit</b>
Automatic centrifugal clutch: Clutch shoe thickness Clutch hosing inside diameter Clutch shoe spring free length W eight outside diameter Clutch- in revolution	3.0 mm 135 mm 2 8.1 mm 20 mm 2 ,100- 2,700 r/m in	2.0 mm 135 .5 mm ... 19 .5 mm ...
V-belt: V-belt width	22.6 mm	21.0 mm
Oil pump: Type Tip clearance Side clearance Housing and rotor clearance	Trochoid type 0.1- 0 .34 mm 0.013- 0.03 6 mm 0 .04- 0.09 mm	0 .4 mm 0 .15 mm 0 .15 mm

<b>Item</b>	<b>Standard</b>	<b>Limit</b>
Radiator: Type Width/height/thickness	Cooling fin with electric fan 360/246/68 mm	... ... ...
Radiator cap opening pressure	110-140kPa (1.1-1.4kg/cm <sup>2</sup> , 1.1-1.4bar)	...
Radiator capacity	2 L	...
Reservoir tank capacity	0 .35 L	
Thermostatic valve: Valve opening temperature Valve full open temperature Valve full open lift	70- 74 °C 83 °C 4 mm	

3.1.2 TIGHTENING TORQUES

Part to be tightened	Part name	Thread size	Q'ty	Tightening Torque		Remarks
				N.m	m.kg	
Oil check bolt	—	M 6	1	10	1.0	
Exhaust pipe stud bolt	—	M 8	2	13	1.3	
Spark plug	—	M12	1	18	1.8	
Cam sprocket cover	Bolt	M 6	2	10	1.0	
Cylinder head and cylinder	Nut	M 8	4	22	2.2	
Cylinder head and cylinder (Cam chain side)	Bolt	M 6	2	10	1.0	
Valve cover	Bolt	M 6	5	10	1.0	
Rotor	Nut	M16	1	80	8.0	
Valve adjuster locknut	Nut	M 6	2	14	1.4	
Cam shaft bearing stopper	Bolt	M 6	2	8	0.8	
Cam sprocket	Bolt	M10	1	60	6.0	
Cam chain tensioner (Body)	Bolt	M 6	2	10	1.0	
(Plug)	Bolt	M8	1	8	0.8	
Guide stopper 2	Bolt	M 6	1	10	1.0	
Water pump housing cover	Bolt	M 6	3	10	1.0	
Hose joint	—	M 6	2	7	0.7	
Thermostatic valve cover	Bolt	M 6	2	10	1.0	
Filer neck supporting	Bolt	M 5	1	5	0.5	
Oil pump	Screw	M 6	2	7	0.7	
Oil pump cover	Bolt	M 3	1	1	0.1	
Drain plug	Bolt	M 35	1	32	3.2	
Throttle body joint	Bolt	M 6	2	10	1.0	
Throttle body joint and Throttle body	Bolt	M 6	2	10	1.0	
Fuel pump	—	M6	2	10	1.0	
Exhaust pipe assembly	Nut	M8	2	20	2.0	
Crankcase (left and right)	Bolt	M 6	9	10	1.0	
Drain bolt	Bolt	M 8	1	22	2.2	
Oil filer	Bolt	M 14	1	3	0.3	
Crankcase cover (left)	Bolt	M 6	10	10	1.0	
Magnet cover	—	M 6	10	10	1.0	



Part to be tightened	Part name	Thread size	Q'ty	Tightening torque		Remarks
				Nm	m.kg	
Cover (oil pump)	Bolt	M 6	2	12	1.2	
Timing check plug	P lug	M 16	1	8	0.8	
One way clutch	—	M 8	3	30	3.0	
Clutch housing	Bolt	M 14	1	60	6.0	
Grease stopper (Primary sheave)	—	M 4	4	3	0.3	
Primary fixed sheave	—	M 14	1	60	6.0	
Clutch carrier assembly	—	M 36	1	90	9.0	
Stator	—	M 5	3	7	0.7	
Pick up coil	—	M 5	2	7	0.7	
Starter motor	Bolt	M 6	2	10	1.0	
Thermo switch	—	M 16	1	23	2.3	
Thermo unit	—	P t1/8	1	8	0.8	

## 3.2 PARTS INSPECTION AND SERVICE

### 3.2.1 VALVE CLEARANCE ADJUSTMENT

#### NOTE:

Valve clearance adjustment should be made with the engine cool, at room temperature.

When the valve clearance is to be measured or adjusted, the piston must be at Top Dead Center (T.D.C.) on the compression.

1. Remove :

●Crankcase cover

2. Remove :

●Spark plug

● Valve cover (intake side)

●Valve cover (exhaust side)

3. Remove:

●Timing check plug

4.Measure:

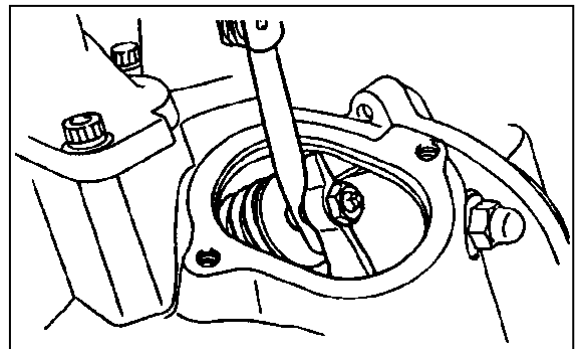
●Valve clearance

Out of specification → Adjust.

**Valve clearance (cold):**

**300: Intake valve 0.08- 0.12m m**

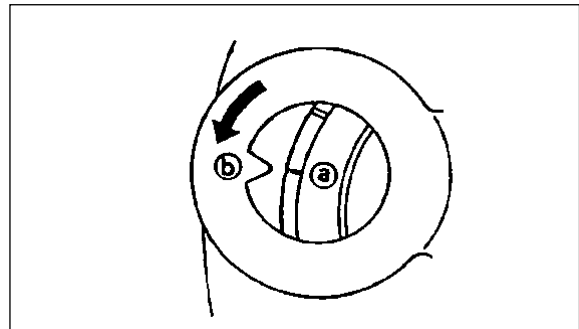
**Exhaust valve 0.16- 0 .20mm**



#### Measurement steps:

●Rotate the primary fixed sheave counterclockwise to align the slit "a" on the rotor with the stationary pointer "b" on the crankcover 1 when the piston is Top Dead Center (TDC).

●Measure the valve clearance by using a feeler gauge.



6. Adjust

●Valve clearance


#### Adjustment steps:

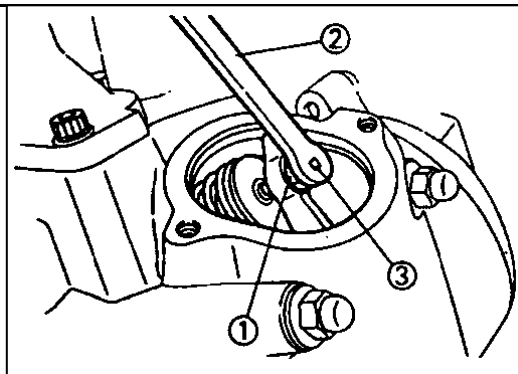
●Loosen the locknut ①

●Turn the adjuster ③ in or out with the valve adjusting tool ② until specified clearance is obtained .

Turning in → Valve clearance is decreased  
 Turning out → Valve clearance is increased


- Hold the adjuster to prevent it from moving and tighten the locknut.

 14Nm(1.4m·kg)



- Measure the valve clearance.
- If the clearance is incorrect, repeat above steps until specified clearance is obtained.

7. Install:

- Valve cover (intake side)  10Nm(10m·kg)

- O-ring 

8. Install:

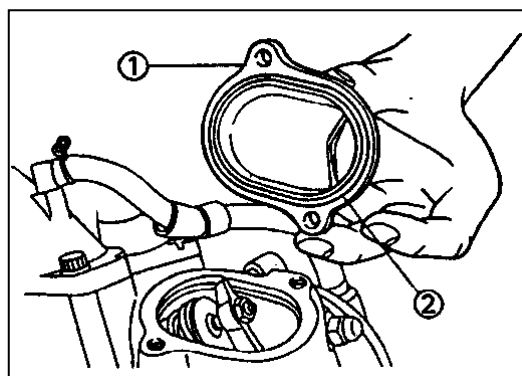
- Valve cover(exhaust side)  10Nm(1.0m·kg)

- O-ring

- Spark plug  18Nm(1.8m·kg)

- Timing check window screw

- Crankcase cover 8N.m( 0.8m.kg)



## 3.2.2 SPARK PLUG INSPECTION

1. Remove :

- Spark plug cap
- Spark plug

### CAUTION:

Before removing the spark plug, use compressed air to blow away any dirt accumulated in the spark plug wells to prevent it from falling into the cylinder.

1. Check:

- Spark plug type

Incorrect →Replace.

	<b>Standard spark plug: DR8EA (NGK)</b>
---	---

2. Inspect:

- Electrode ①

Wear/ damage →Replace.

- Insulator ②

Abnormal color →Replace.

Normal color is a medium - to- light tan color.

3. Clean:

- Spark plug

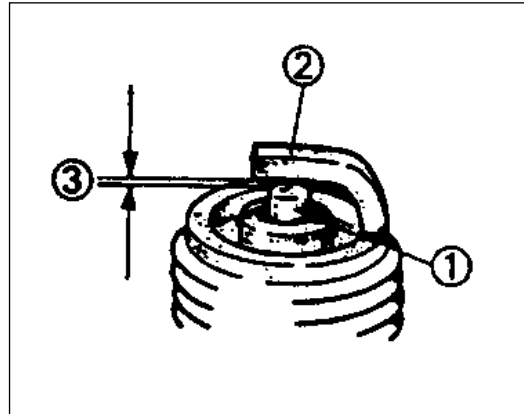
(with spark plug cleaner or wire brush)


4. Measure:

- Spark plug gap ③


(with a wire gauge)

Out of specification →Adjust gap.



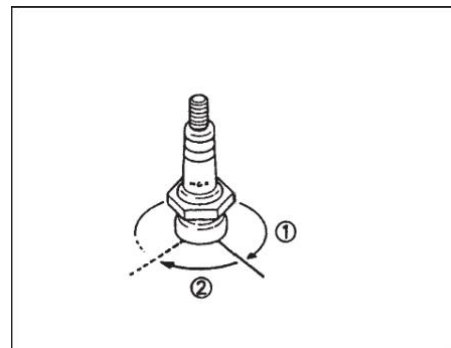
	<b>Spark plug gap :</b> 0.6-0.7 mm
--	---------------------------------------

6. Install:

- Spark plug  18Nm(1.8m·kg)

**NOTE:**

**Before installing a spark plug, clean the Gasket surface and plug surface.**



**3.2.3 COMPRESSION PRESSURE MEASUREMENT**

**NOTE :**

Insufficient compression pressure will result in performance loss.

1. Check:

- Valve clearance

Out of specification →Adjust.

Refer to “CALCE CLEARANCE ADJUSTMENT” section.

2. Start the engine and let it warm up for several minutes.

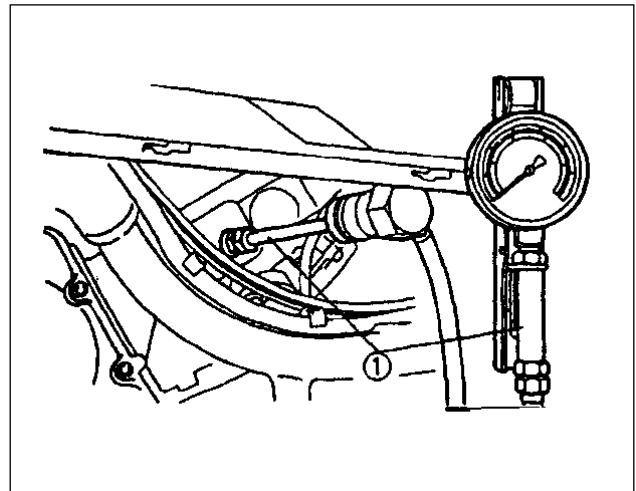
3. Turn off the engine.
4. Remove:
  - Spark plug

Before removing the spark plug, use compressed air to blow away any dirt accumulated in the spark plug well to prevent it from falling into the cylinder.

5. Attach:
  - Compression gauge①


6. Measure:
  - Compression pressure

If it exceeds the maximum pressure allowed → Inspect the cylinder head, valve surfaces and piston crown for carbon deposits.



If it is below the minimum pressure → Squirt a few drops of oil into the affected cylinder and measure again. Follow the table below.


Compression pressure (With oil applied into cylinder)	
Reading	Diagnosis
Higher than without oil	Worn or damaged pistons
Same as without oil	Possible defective ring (s), valves, cylinder head gasket or Piston →Repair.

	Compression pressure(at sea level): Standard: 1,400 kPa (14Kg/cm <sup>2</sup> , 14 bar) Minimum : 1,120 kPa (11.2 kg /cm <sup>2</sup> , 11.2 bar)
---	---

- Measurement steps :
- Crank the engine with the throttle wide open until reading on the compression gauge stabilizes.

**WARNING :**  
 Before cranking the engine, ground all spark plug leads to prevent sparking.

8. Install:

- Spark plug  18Nm(1.8m·kg)

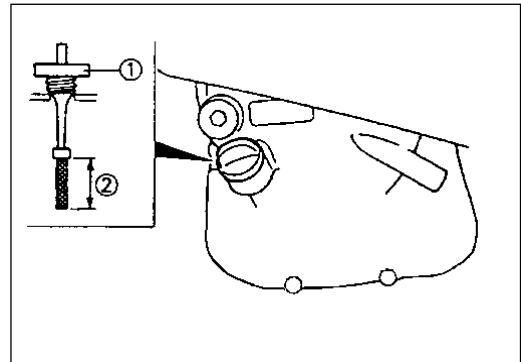
**3.2.4ENGINE OIL LEVEL INSPECTION**

1. Start the engine and let it warm up for a few minutes .
2. Turn off the engine.
3. Inspect: (Do not thread dipstick in)

●Engine oil level

Oil level should be between maximum and minimum marks “2” .

Oil level is below the minimum mark      Add oil up to the proper lever.



**RECOMMENDED ENGINE OIL**

Refer to the chart for selection of the oils suited to the atmospheric temperature.

	<b>API STANDARD: API SG or higher grade</b>
---	---

**CAUTION:**

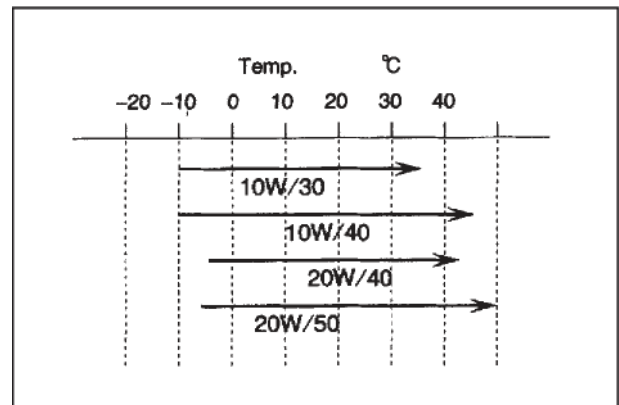
- Do not put in any chemical additives, use oils with a grade of SG or higher.
- Be sure not to use oils labeled "ENERGY CONSERVING I" or higher. Engine oil also lubricates the clutch and additives could cause clutch slippage.
- Be sure no foreign material enters the crankcase.

4. Start the engine and let it warm up for a few minutes.
5. Turn off the engine.

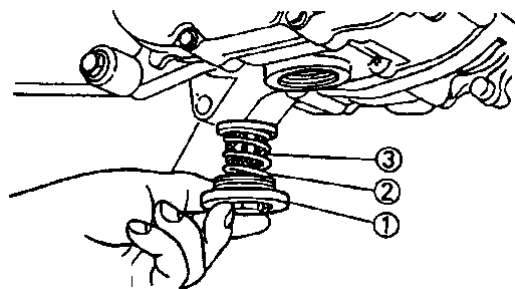
**NOTE:**

Wait a few minutes until the oil settles before inspecting the oil level.

**ENGINE OIL REPLACEMENT**




1. Start the engine and let it warm up for several minutes .



2. Turn off the engine and place an oil pan under the engine.

3. Remove :

- Oil filler plug

 32Nm(3.2m·kg)

- Drain plug ①

- Compression spring ②

- Oil strainer ③

- O-ring

- Drain the crankcase of its oil.

4. Install:

- O-ring ① **NEW**

- Compression spring ②

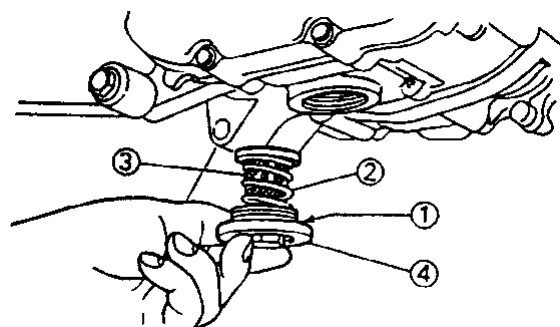
- Oil strainer ③

- Drain plug ④

- Oil filler plug


**NOTE :**

Check the drain plug O-ring. If damaged, replace it with a new one.



5. Fill:

- Crankcase

	Oil quantity: 1.4L
--	-----------------------

6. Check:


- Engine oil level

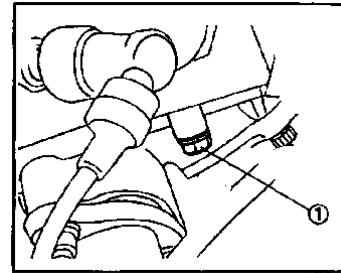
Refer to "ENGINE OIL LEVEL INSPECTION" section

**ENGINE OIL PRESSURE INSPECTION**

Inspection steps:

- Slightly loosen the oil check bolt ①
- Start the engine and keep it idling until the oil begins to seep from the oil check bolt. If no oil comes out after one minute, turn the engine off so it will not seize.
- Check oil passages and oil pump for damage or leakage.
- Start the engine after solving the problem (s), and recheck the oil pressure.
- Tighten the oil check bolt to specification.

 10Nm(1.0m·kg)



**CAUTION:**

- Start the engine and check the oil pressure with the oil check bolt loosened.
- Do not apply at high speeds more than specified when checking the pressure.

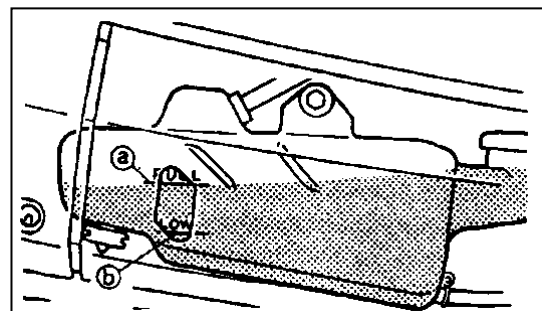
**NOTE:**

Wipe any spilled oil off the engine.

**3.2.5 COOLANT LEVEL INSPECTION**

Inspect:

- Coolant level
- Coolant level should be between the maximum<sup>Ⓐ</sup> and minimum<sup>Ⓑ</sup> marks.
- Coolant level is below the "LOWER " level line  
Add soft water (tap water) up to the proper level.



**CAUTION:**

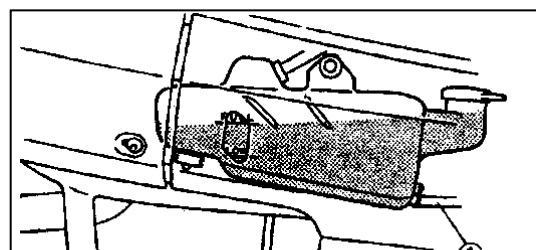
Hard water or salt water is harmful to engine parts. Use only distilled water if soft water is not available. If you use tap water, make sure it is soft water.

1. Start the engine and let it warm up for several minutes.
2. Turn off the engine and inspect the coolant level again.

**NOTE:**

Wait a few minutes until the coolant settles before inspecting the coolant level.

**COOLANTRE PLACE MENT**





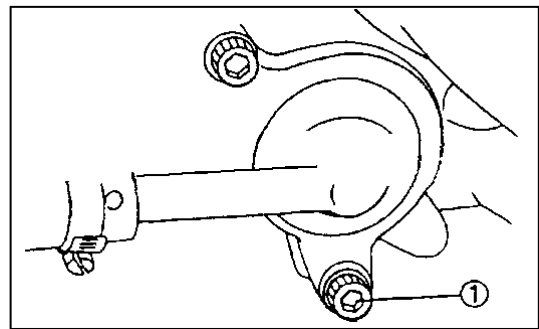
1. Remove:
  - Front cover of ATV plastic body work.
  - Seat.
2. Remove:
  - Hose ① (reservoir tank)

Drain the reservoir tank of its coolant.
3. Remove:
  - Drain bolt ①
  - Radiator cap

**WARNING:**

Do not remove the radiator cap when the engine and radiator are hot. Scalding hot fluid and steam may be blown out under pressure, which could cause serious injury. When the engine has cooled, open the radiator cap as follows:

Place a thick rag or a towel over the radiator cap. Slowly rotate the cap counterclockwise toward the detent. This allows any residual pressure to escape. When the hissing sound has stopped, press down on the cap while turning counterclockwise and remove it.



**NOTE:**

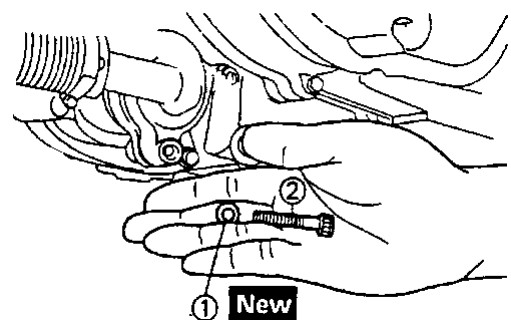
- Remove the radiator cap after removing the drain bolt.

4. Clean:
  - Radiator

Fill soft water into the filler neck support ① (reservoir tank).

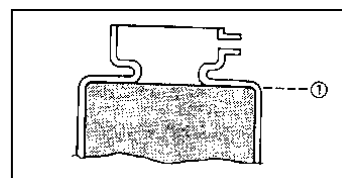
5. Install:

- Gasket ① **NEW**
- Drain bolt ② 10Nm(1.0m·kg)



6. Loosen:

- Hose ①



7. Connect:

- Hose (reservoir tank)

8. Fill:

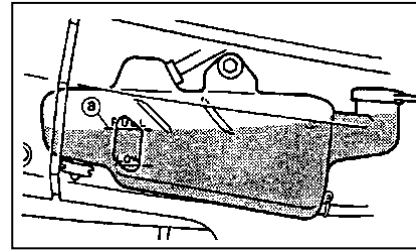
- Radiator


( to specified level ① )


Fill the coolant slowly, until the coolant comes out from the head hose.

- Reservoir tank

( to maximum level ② )



	Recommended coolant: High quality ethylene glycol anti-freeze containing corrosion inhibitors for aluminum engine.
---	---

	Coolant ② and water ③ (soft water) : Mixed ratio: min50% /max50% follow the instruction of the coolant Total amount: 2 L Reservoir tank capacity: 0.35L
---	---

Handling notes for coolant:

Coolant is potentially harmful and should be handled with special care.

**WARNING:**

splashes in your eyes:

Thoroughly wash your eyes with water and consult a doctor.

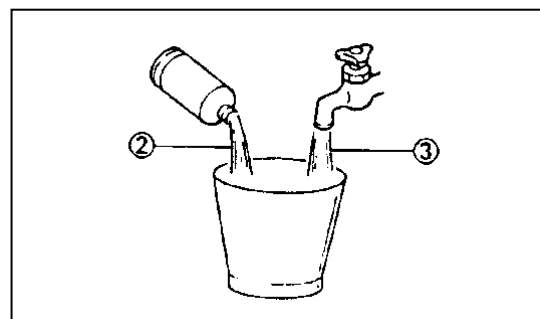
If coolant splashes on your clothes:

- Quickly wash it away with water and then with soap and water.

If coolant is swallowed:

Vomit immediately and see a physician.

CAUTION:



- Hard water or salt water is harmful to engine parts. Use only distilled water if soft water is not available.

- If you use tap water, make sure it is soft water.

- Do not use water containing impurities or oil.

- Take care that no coolant splashes onto painted surfaces. If it does, wash them immediately with water.

- Do not mix different types of ethylene glycol antifreeze containing corrosion inhibitors for aluminum engines.

9. Tighten:

- Hose

Fill the coolant slowly to the specified level.

10. Install:

- Radiator cap

11. Start the engine and let it warm up for several minutes.

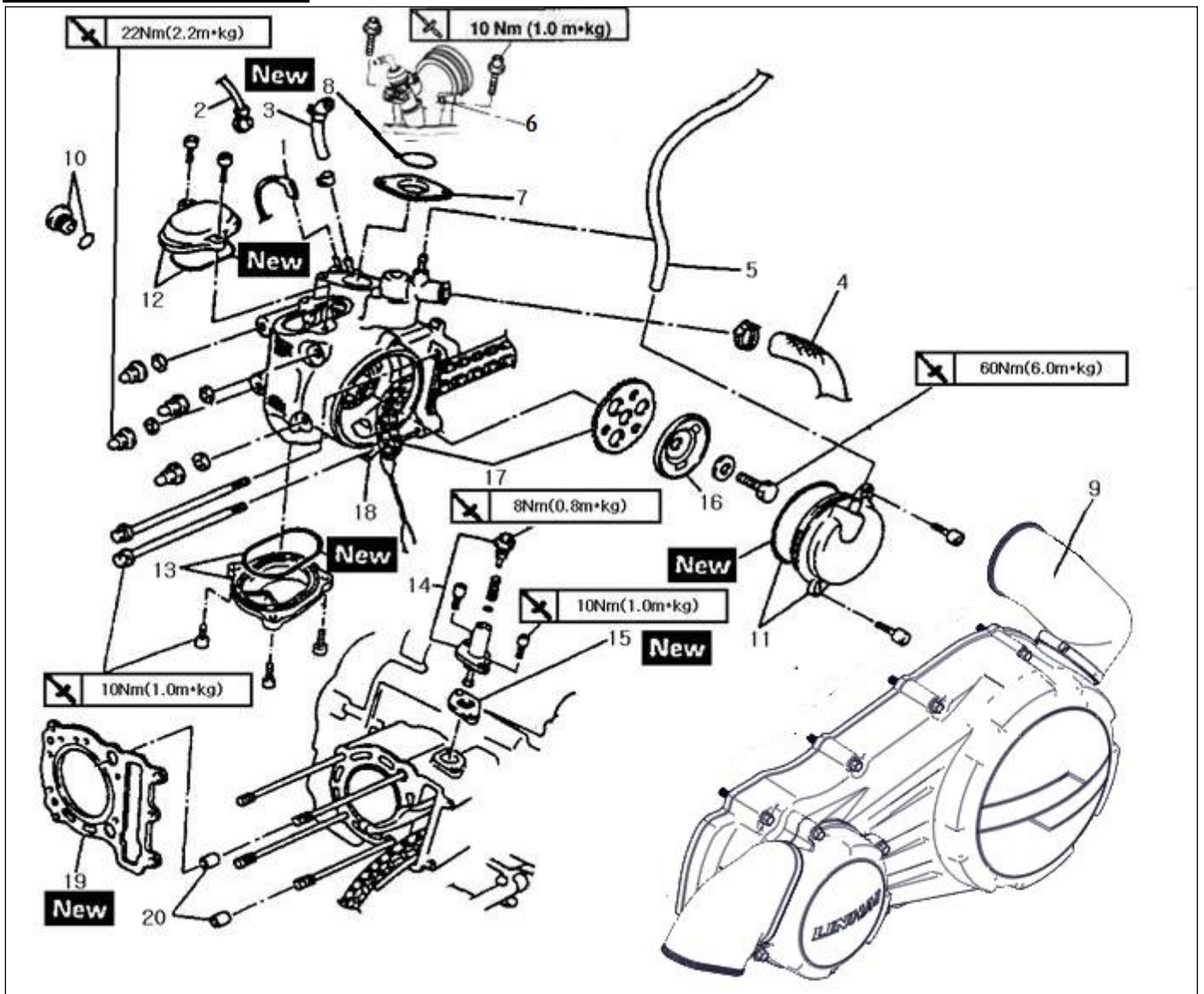
12. Stop the engine and inspect the level.

**NOTE:**

Wait a few minutes until the coolant settles before inspecting the coolant level.

13. Install: Remain parts.

**3.3 CYLINDER HEAD**



Order	Job name / Part name	Q 'ty	Remarks
	Cylinder head removal Drain the coolant. Side panel Footrest board		Remove the parts in order.
1	Thermo unit lead	1	
2	Plug cap	1	
3	Crankcase breather hose	2	
4	Outlet hose (cylinder head)	1	
5	Breather hose (crankcase)	1	
6	Throttle body joint	1	
7	Joint	1	
8	O-ring	2	

9	Crankcase cover	1	Refer to "CYLINDER HEAD REMOVAL AND INSTALLATION" section.  Reverse the removal procedure for installation.
10	Plug/O-ring	1/1	
11	Cam sprocket cover/O-ring	1/1	
12	Valve cover (intake side)/O-ring	1/1	
13	Valve cover (exhaust side)/O-ring	1/1	
14	Timing chain tensioner assembly	1	
15	Timing chain tensioner gasket	1	
16	Breather plate	1	
17	Cam sprocket/Timing chain	1/1	
18	Cylinder head	1	
19	Cylinder head gasket	1	
20	Dowel pin	2	

**CYLINDER HEAD REMOVAL**

1. Align:

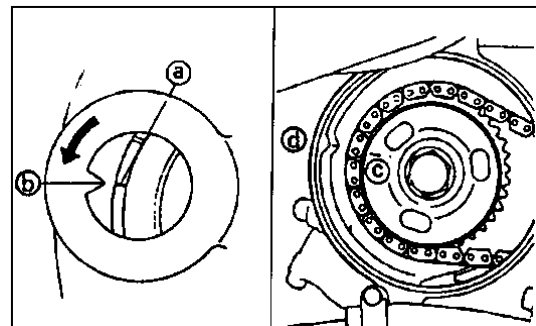
"I" mark ㉑ on the rotor

(with stationary pointer ㉒ on the crankcase cover )

**NOTE:** If any special mark found, contact the ATV manufacture via the agent for the parts and special instruction.

**NOTE:**

Turn the primary sheave counterclockwise with a wrench and align the "I" mark ㉓ with the cylinder head match mark ㉔ when the piston is at TDC on the compression



2. Loosen:

● Bolt ①

3. Remove:

● Timing chain tensioner assembly

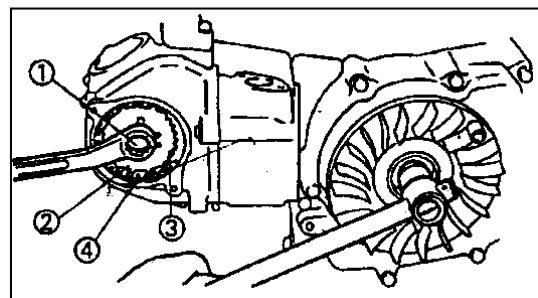
● Timing chain tensioner gasket

4. Remove:

● Breather plate ②

● Cam sprocket ③

● Timing chain ④



**NOTE:**

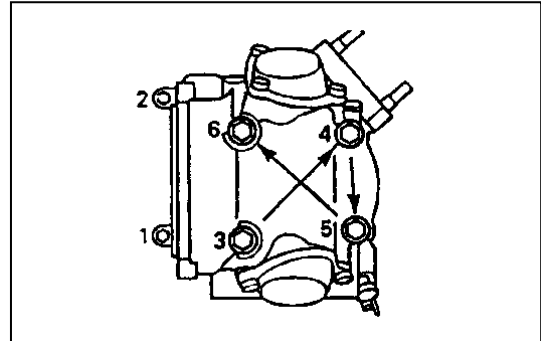
- Fasten a safety wire to the timing chain to prevent it from falling into the crankcase.
- Remove the bolt ① while holding the rotor mounting bolt with a wrench.

5. Remove:

- Cylinder head

**NOTE:**

- Loosen the nuts in their proper loosening sequence.
- Start by loosening each nut 1/2 turn until all are loose.



**CYLINDER HEAD INSPECTION:**

1. Eliminate:

- Carbon deposits (from combustion chambers)  
Use a rounded scraper.

**NOTE:**

Do not use a sharp instrument to avoid damaging or scratching:

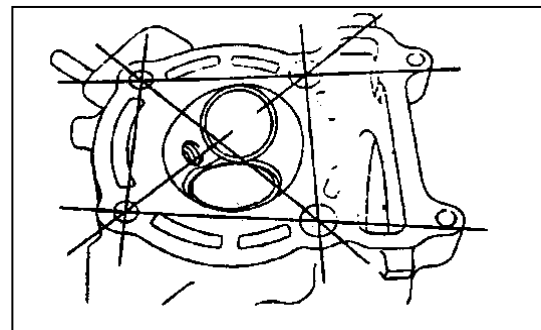
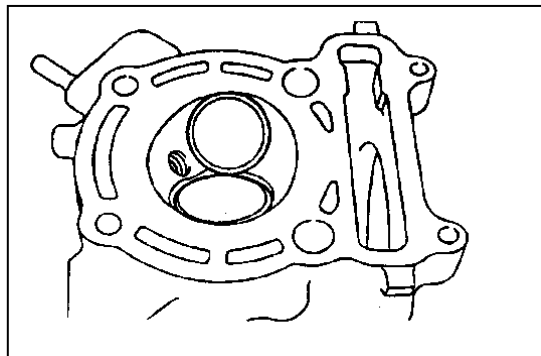
- Spark plug threads
- Valve seats


2. Inspect:

- Cylinder head  
Scratches/damage → Replace.

3. Measure:

- Cylinder head warpage  
Out of specification → Resurface .



	<p><b>Cylinder head warpage :</b> <b>Less than 0.03 mm</b></p>
---	--

**Warpage measurement and resurfacement steps:**

- Place a straight edge and a feeler gauge across the cylinder head.
- Measure the warpage.

If the warpage is out of specification, resurface the cylinder head.

- Place a 400 ~ 600 grit wet abrasive pape on the surface plate, and resurface the head using a figure eight sanding patten.

**NOTE:**

Rotate the cylinder head several times for an even resurfacement.

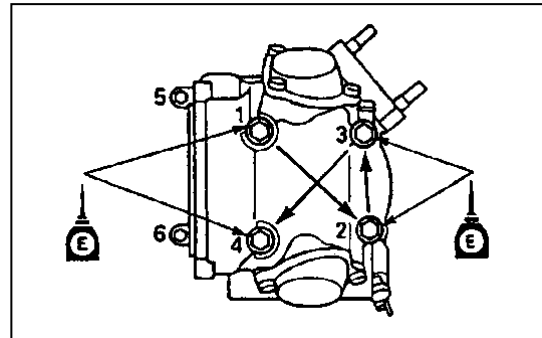
**CYINDER HEAD INSTALLATION**

1. Install:

- Gasket (cylinder head) **NEW**
- Dowel pins
- Cylinder head

**NOTE:**

- Apply engine oil onto the nut threads.
- Tighten the nuts in a crisscross pattern.

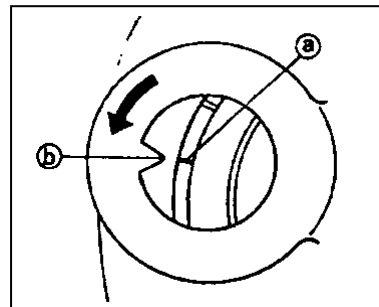


2. Tighten:

- Nuts (cylinder head) 22Nm(2.2m·kg)
- Bolts (cylinder) 10Nm(1.0m·kg)

3. Install:

- Cam sprocket ①
- Timing chain ②

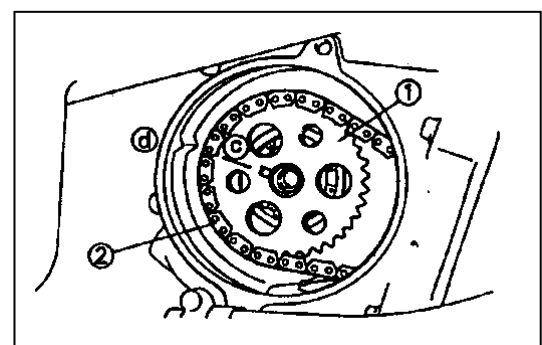


Installing steps :

- Turn the primary sheave counterclockwise until the TDC mark ① matches the stationary pointer ②.

- Align the "I" mark ③ on the cam sprocket with the stationary pointer ④ on the cylinder head.

**NOTE:** If any special mark found, contact the ATV manufacture via the agent for the parts and special instruction.



- Fit the timing chain onto the cam sprocket and install the cam sprocket on the camshaft.

**NOTE:**

- When installing the cam sprocket, keep the timing chain as tense as possible on the exhaust side.
- Align the match mark ③ on the cam sprocket with the stationary pointer ④ on the



cylinder head.

- Align the pin on the cam shaft with the slot in the cam sprocket.

**CAUTION:**

Do not turn the crankshaft during installation of the cam shaft. Dam age or improper valve timing will result.

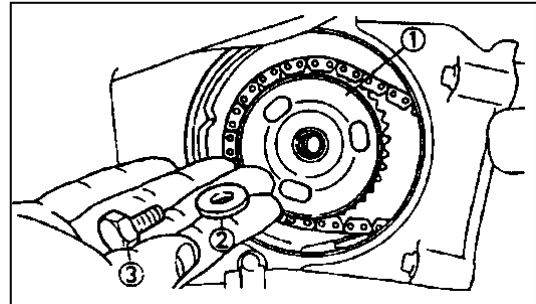
- While holding the camshaft, temporarily tighten the bolts .
- Remove the safety wire from the timing chain.

4. Install:

- Breather plate ①
- Plane washer ②

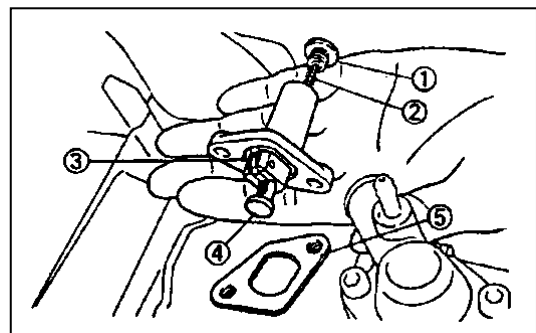
5. Install:


- Timing chain tensioner




**Installing steps:**

- Remove the tensioner cap bolt ① and springs ②.
- Release the timing chain tensioner one-w ay cam ③ and push the tensioner rod ④ all the way in.
- Install the tensioner with a new gasket ⑤ onto the cylinder.
- Install the springs ② and cap bolt ①.
- Tighten the bolt (with gasket) to the specified torque .



Bolt (chain tensioner)  10Nm(1.0m·kg)

Cap bolt (timing chain tensioner)  8Nm(0.8m·kg)

6. Tighten:

- Bolt (cam sprocket)

7. Check:

- Valve timing

Out of alignment → Adjust.

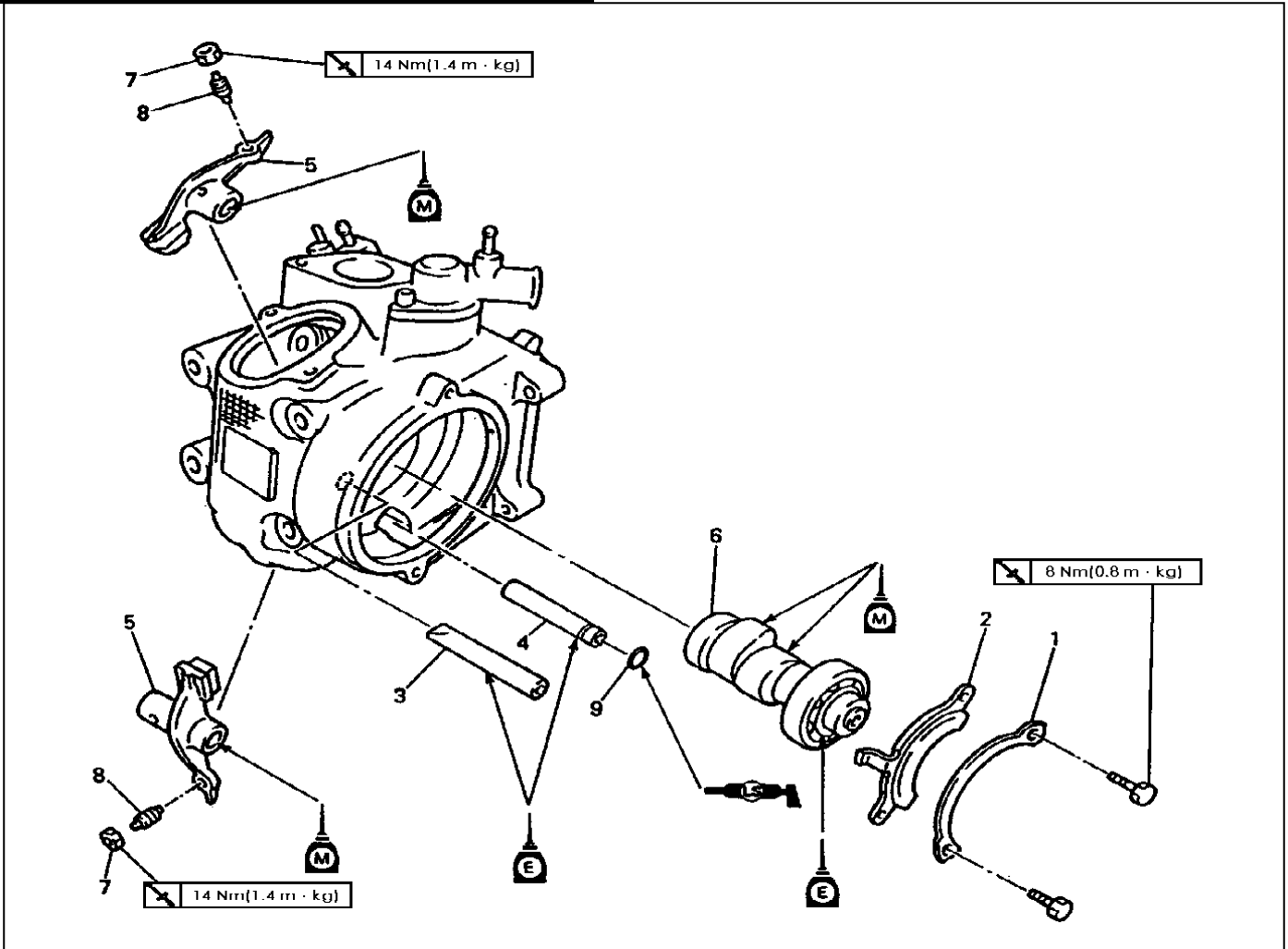
8. Check:

- Valve clearance

Out of specification → Adjust.

Refer to the "VALVE CLEARANCE ADJUSTMENT" section.

**3.4 CAMSHAFT AND ROCKER ARMS**



Order	Job name / Part name	Q 'ty	Remarks
	<b>Cam shaft and rocker arms removal</b>		Remove the parts in order. Refer to "CYLINDER HEAD" section.
1	Cylinder head		
1	Lock washer	1	
2	Plate	1	Refer to "ROCKER ARM AND ROCKER SHAFT REMOVAL AND INSTALLATION" section..
3	Rocker arm shaft (intake)	1	
4	Rocker arm shaft (exhaust)	1	
5	Rocker arm	2	
6	Camshaft	1	Refer to "CAMSHAFT INSTALLATION" section .
7	Locknut	2	
8	Adjuster	2	
9	O-ring	1	
			Reverse the removal procedure for installation

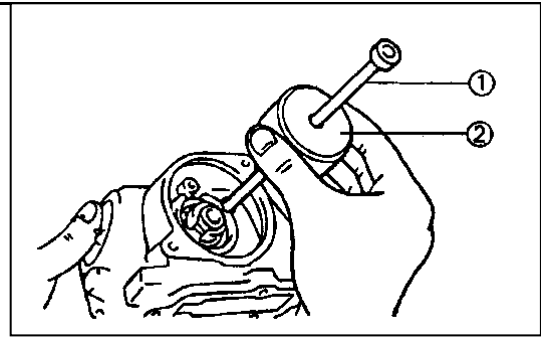
**ROCKER ARM AND ROCKER ARM SHAFTRE MOVAL**

1. Remove:

- Rocker arm shaft (intake)
- Rocker arm shaft (exhaust)

**NOTE:**

Attach a rocker arm shaft puller bolt ① and weight ② to the rocker arm shaft and slide out the shaft.

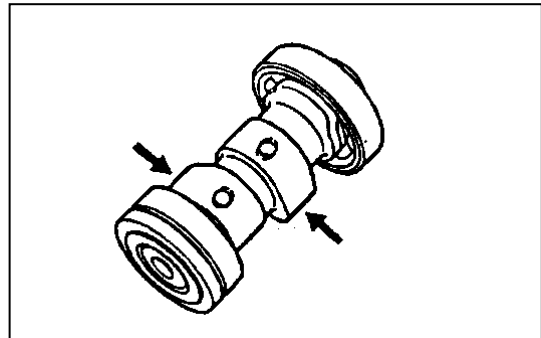


**CAM SHAFT INSPECTION**

1. Inspect:

- Cam lobes

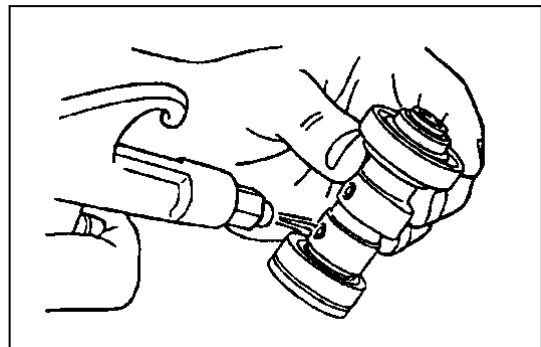
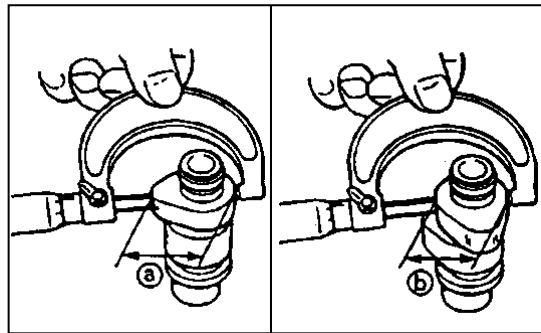
Pitting/Scratches/Blue discoloration → Replace .



2. Measure:

- Cam lobes length ① and ②

Out of specification → Replace.



	<p><b>Cam lobes length:</b></p> <p><b>Intake:</b></p> <p>① 36 .545- 36 .645 mm &lt;Lim it: 36.45 mm&gt;</p> <p>② 30.021-30.121 mm &lt;Lim it: 29.92 mm&gt;</p> <p><b>Exhaust:</b></p> <p>① 36 .547- 36 .647 mm &lt;Lim it: 36.45 mm&gt;</p> <p>② 30.067- 30.167 mm &lt;Lim it: 29.97 mm&gt;</p>
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3. Inspect:

- Cam shaft oil passage

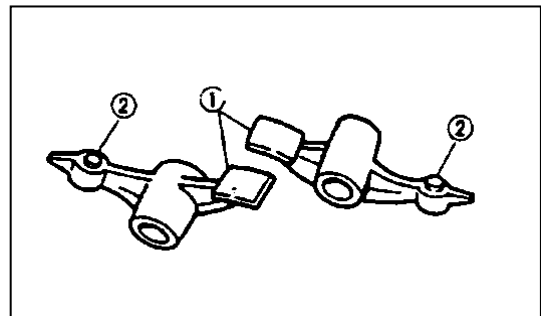
Stuffed → Blow out oil passage with compressed air.

**ROCKER ARMS AND ROCKER ARM SHAFTS INSPECTION**

1. Inspect:

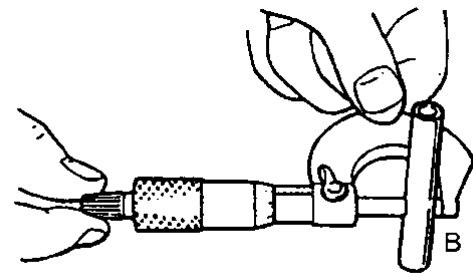
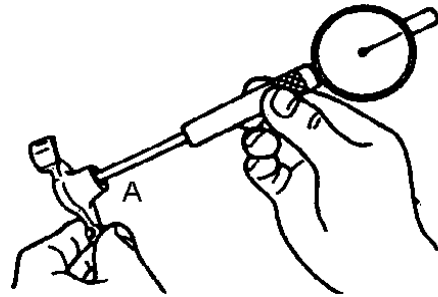
- Cam lobe contact surface ①
- Adjuster surface ②

Wear/Pitting/Scratches/Blue discoloration → Replace.



**Inspection steps:**

- Inspect the two contact areas on the rocker arms for signs of unusual wear.
- Rocker arm shaft hole.
- Cam-lobe contact surface.  
Excessive wear → Replace.
- Inspect the surface condition of the rocker arm shafts.  
Pitting/scratches/blue discoloration → Replace or check lubrication.
- Measure the inside diameter A of the rocker arm holes.  
Out of specification → Replace.



	<b>Inside diameter (rocker arm ):</b> <b>12.000- 12.018mm</b> <b>&lt; Lim it: 12.030 mm &gt;</b>
--	--

- Measure the outside diameter B of the rocker arm shafts.  
Out of specification → Replace.

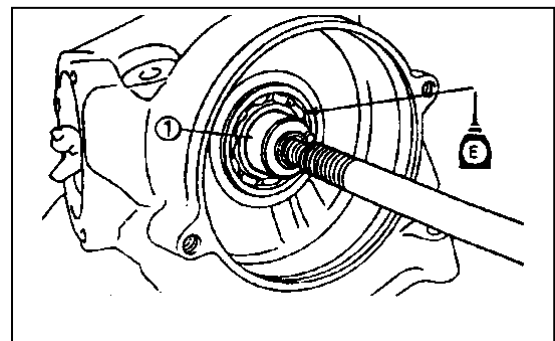
	<b>Outside diameter(rocker arm shaft):</b> <b>11.981-11.991 mm</b> <b>&lt;Limit: 11.95 mm&gt;</b>
--	---

**CAMSHAFT AND ROCKER ARM INSTALLATION**

1. Lubricate:

- Cam shaft ①

	<b>Camshaft:</b> <b>Molybdenum disulfide oil</b> <b>Camshaft bearing:</b> <b>Engine oil</b>
--	--

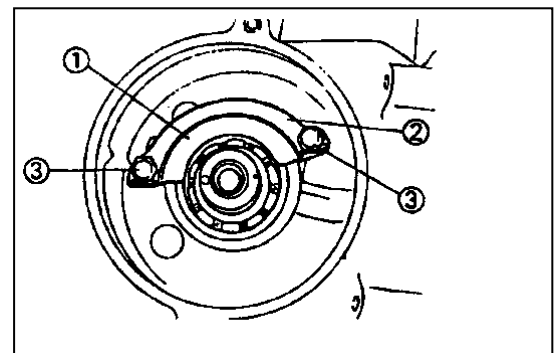


2. Install:

- Plate ①
- Lockwasher ② **NEW**
- Bolt ③ 8Nm(0.8m·kg)

**NOTE:**

Bend the lockwasher tabs along the bolt ③ falts.



3. Apply:

- Molybdenum disulfide oil onto the rocker arm and rocker arm shaft.

	<b>Molybdenum disulfide oil</b>
--	---------------------------------

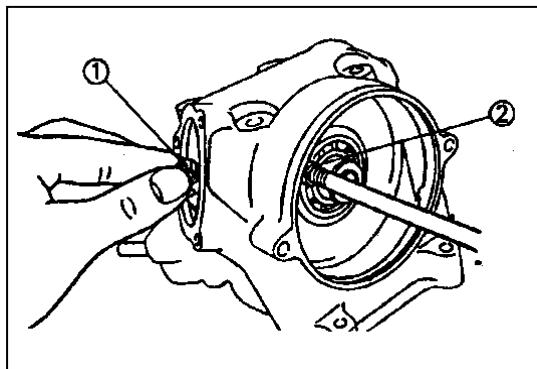
4. Install:

- Rocker arm ①
- Rocker arm shaft ② (exhaust)

**NOTE:**

Exhaust:

Install the rocker arm shaft (exhaust) completely pushed in.



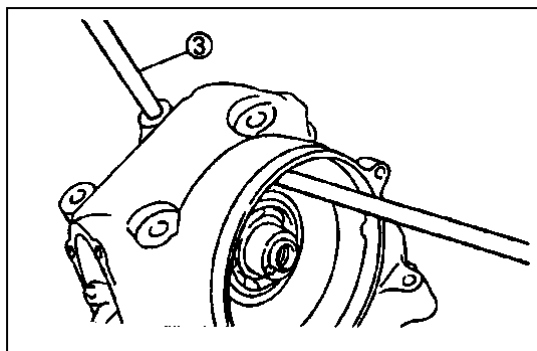
5. Install:

- Rocker arm ①
- Rocker arm shaft ② (intake)

**NOTE:**

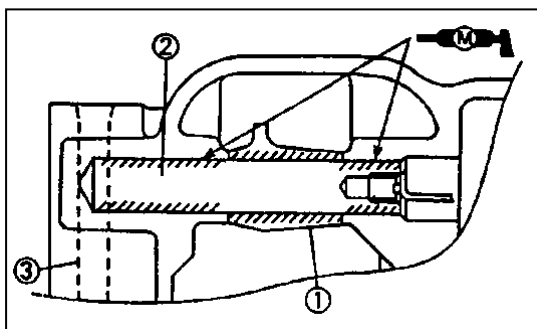
Intake:

Insert the guide shaft (8 mm) ③ into the stud bolt hole in the cylinder head to the rocker arm shaft (intake).

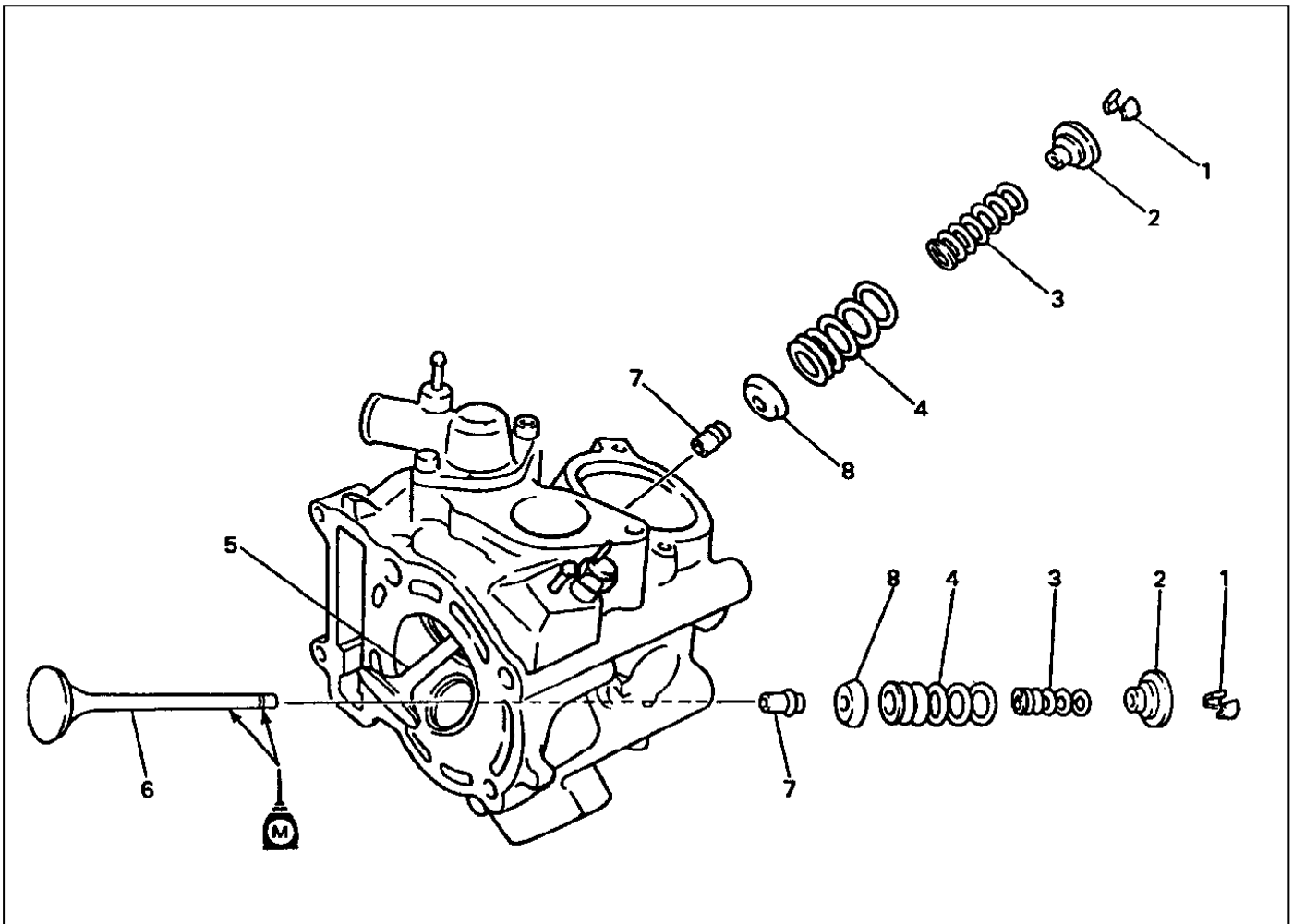


**CAUTION:**

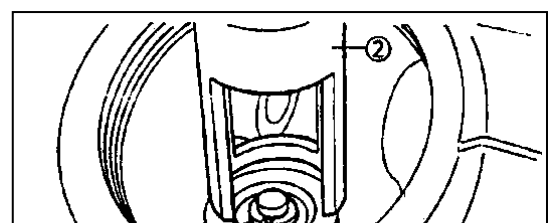
Do not confuse the installation direction of rocker arm shaft. Be sure to install the threaded part facing outward.



## 3.5 VALVES AND VALVE SPRINGS



Order	Job name / Part name	Q 'ty	Remarks
	Valves and valve springs removal Cylinder head Rocker arm , rocker arm shaft		Remove the parts in order. Refer to "CYLINDER HEAD " section . Refer to "ROCKER ARM SHAFT AND ROCKER ARMS" section.
1	Valve cotts	4	Refer to "VALVES AND VALVE SPRINGS REMOVAL/INSTALLATION" section.
2	Spring retainer	2	Refer to "VALVES AND VALVE SPRINGS INSTALLATION" section
3	Valve spring (inner)	2	
4	Valve spring (Outer)	2	
5	Valve (intake)	1	
6	Valve (exhaust)	1	
7	Valve guide	2	
8	Spring seat	2	



**VALVES AND VALVE SPRINGS REMOVAL**

1. Remove:

- Valve cotters ①

**NOTE:**

Attach a valve spring compressor and attachment ② between the valve spring retainer and cylinder head to remove the valve cotters.

**CAUTION:**

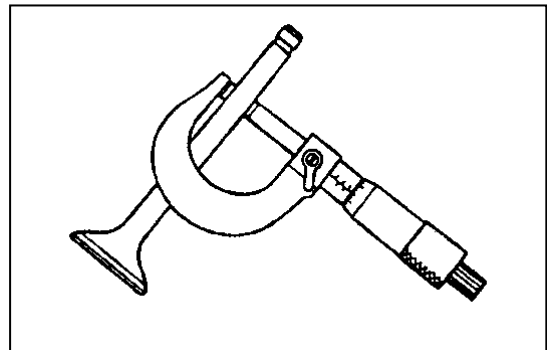
Do not compress so much as to avoid damage to the valve spring.


**VALVE AND VALVE SPRINGS INSPECTION**

1. Measure:

- Valve stem diameter

Out of specification → Replace.

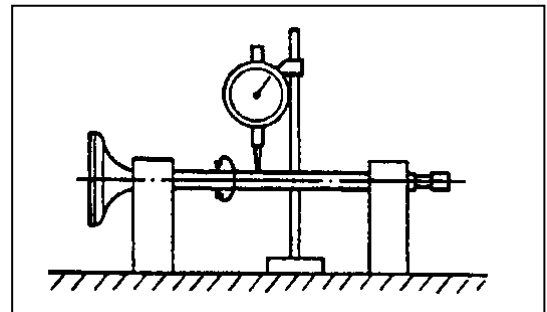



	<p><b>Valve stem diameter:</b>  <b>Intake:</b>                  5.975-5.990mm                  &lt;Limit: 5.94mm&gt;  <b>Exhaust:</b>                  5.960-5.975mm                  &lt;Limit: 5.92mm&gt;</p>
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2. Measure:

- Runout (valve stem )

Out of specification → Replace.

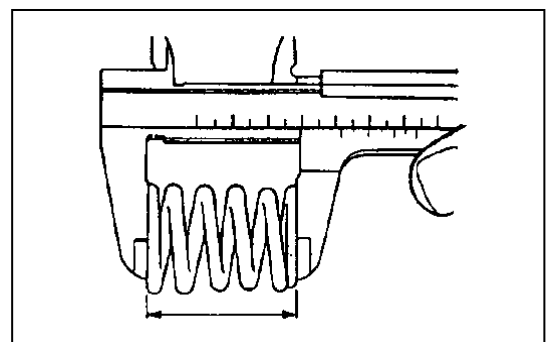



	<p>● <b>Runout limit:</b>                  0.01 mm</p>
---	--

3. Measure:

- Free length (valve spring)

Out of specification → Replace.

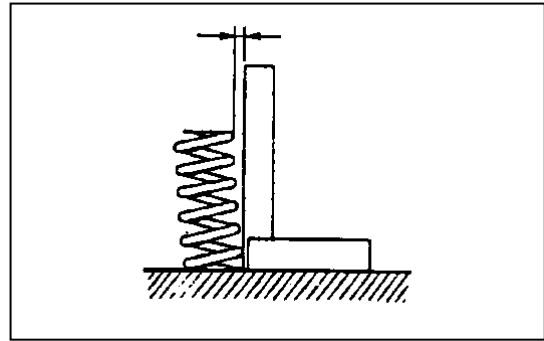



	<p><b>Valve spring free length:</b>  <b>Inner spring:</b>                  38.1 mm                  &lt;Limit: 36.1mm&gt;  <b>Outer spring:</b>                  36.93 mm                  &lt;Limit: 35.0mm&gt;</p>
---	--

4. Measure:

- Spring tilt

Out of specification → Replace.

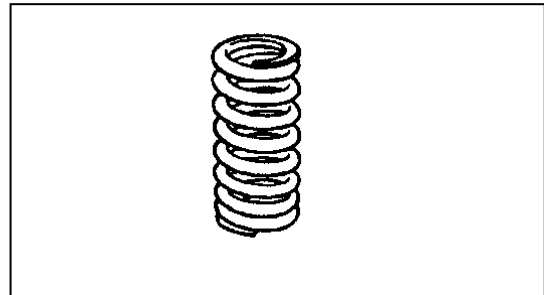


	<p>Spring tilt limit: 1.7mm (2.5°)</p>
---	--

5. Inspect:

- Spring contact face


Wear/Pitting/Scratches → Replace.

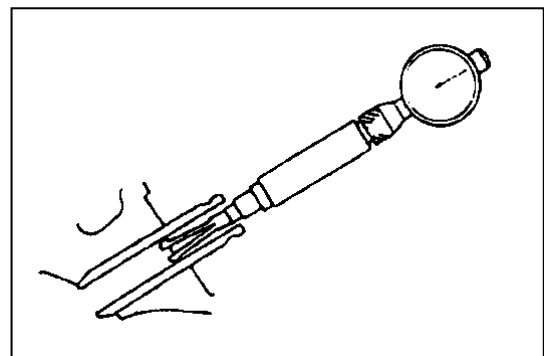


6. Measure:

- Valve guide inside diameter

Out of specification → Replace.


	<p><b>Valve guide inside diameter:</b>  <b>Intake:</b>                  6.000-6.012 mm                  &lt;Limit: 6.05mm&gt;  <b>Exhaust:</b>                  6.000-6.012 mm                  &lt;Limit: 6.05 mm&gt;</p>
---	--



7. Measure:

**Stem-to guide clearance=**  
**Valve guide inside diameter-**  
**Valve stem diameter**

Out of specification → Replace the valve guide.

	<p><b>Stem-to-guide clearance limit:</b>  <b>Intake:</b>                  0.08 mm  <b>Exhaust:</b>                  0.10 mm</p>
---	---

**VALVE SEATS INSPECTION**

1. Eliminate:

- Carbon deposits

(from the valve face and valve seat)

2. Inspect:

- Valve seats

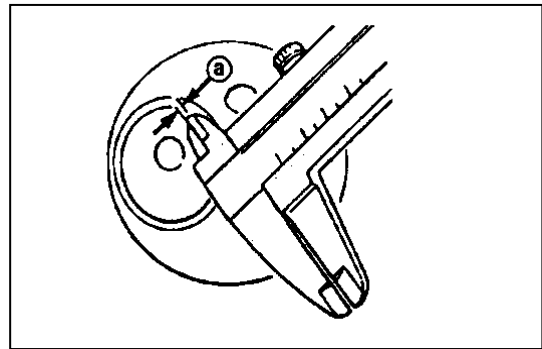
Pitting/wear → Reface the valve seat.




3. Measure:

- Valve seat width ②

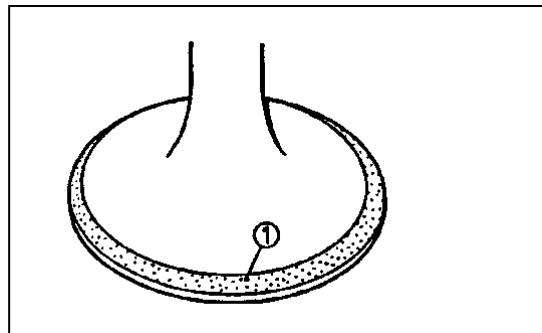
Out of specification → Reface the valve seat.



	<p><b>Valve seat width:</b></p> <p><b>Intake:</b></p> <p>0.9-1.1mm</p> <p>&lt;Limit:1.6mm&gt;</p> <p><b>Exhaust:</b></p> <p>0.9-1.1mm</p> <p>&lt;Limit:1.6mm&gt;</p>
---	--

**Measurement step:**

- Apply Mechanic's blueing dye (Dykem)① to the valve face.
- Install the valve into the cylinder head. Press the valve through the valve guide and onto the valve seat to make a clear pattern.
- Measure the valve seat width. Where the valve seat and valve face made contact, blueing will have been removed.
- If the valve seat is too wide, too narrow, or the seat is not centered, the valve seat must be replaced.

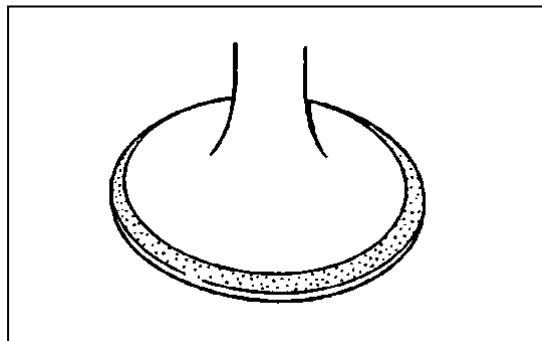


4. Lap:

- Valve face
- Valve seat

**NOTE:**

After replacing the valve seat, valve and valve guide, the valve seat and valve face should be lapped.

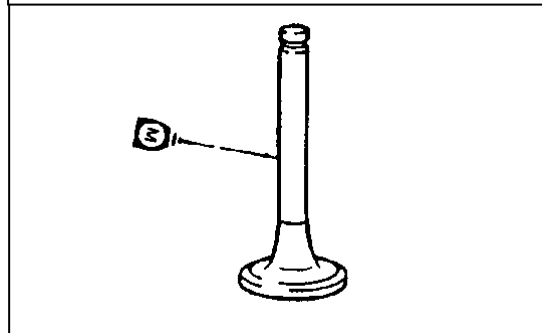


**Lapping steps:**

- Apply a coarse lapping compound ③ to the valve face.

**CAUTION:**

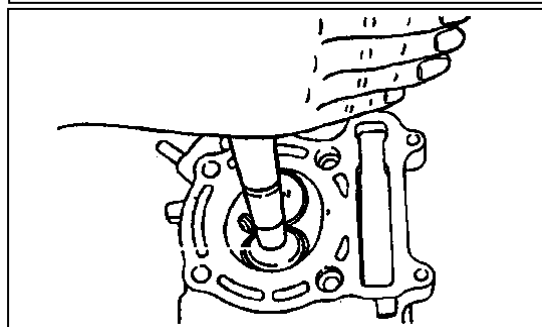
Do not let compound enter the gap between the valve stem and the guide.



- Apply molybdenum disulfide oil to the valve stem.
- Install the valve into the cylinder head.
- Turn the valve until the valve face and valve seat are evenly polished, then clean off all compound.

**NOTE:**

For best lapping results, lightly tap the valve seat while rotating the valve back and forth between your hand.

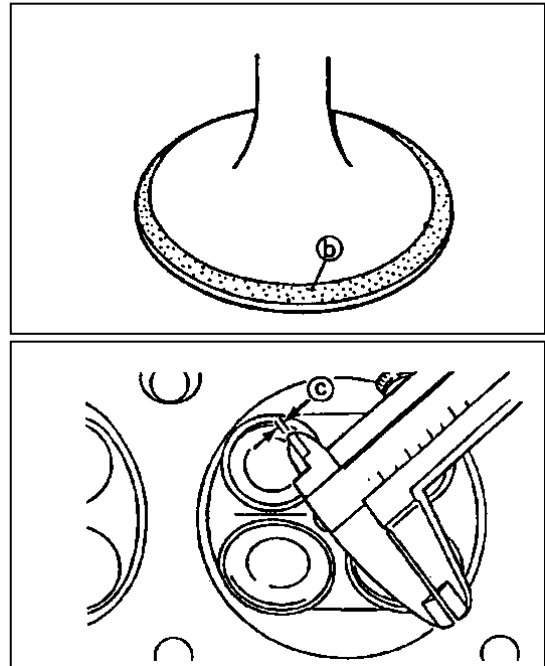


- Apply a fine lapping compound to the valve face and repeat the above steps.

**NOTE:**

Make sure to clean off all compound from the valve face and valve seat after every lapping operation.

- Apply Mechanic’s blueing dye (Dykem) ⑥ to the valve face.
- Install the valve into the cylinder head.
- Press the valve through the valve guide and onto the valve seat to make a clear pattern.
- Measure the valve seat with ③ again.



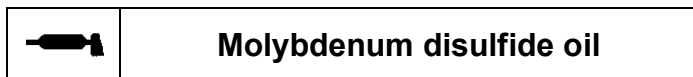
**VALVES AND VALVE SPRINGS INSTALLATION**

1. Deburr:

- Valve stem end
- Use an oilstone to smooth the stem end.

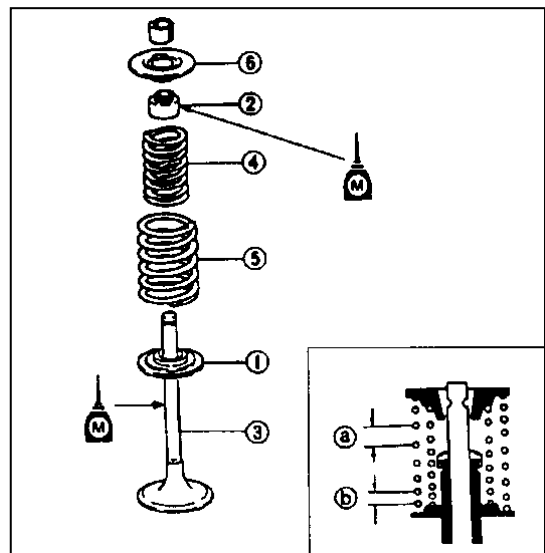
2. Apply:

- Molybdenum disulfide oil (onto the valve stem ③ and oil seal ② )



3. Install:

- Valve spring seat ①
- Valve stem seal ② **NEW**
- Valve ③ (into the cylinder head)
- Valve spring (under) ④
- Valve spring (outer) ⑤
- Spring retainer ⑥



**NOTE:**

Install the valve spring with the larger pitch ① facing upwards.

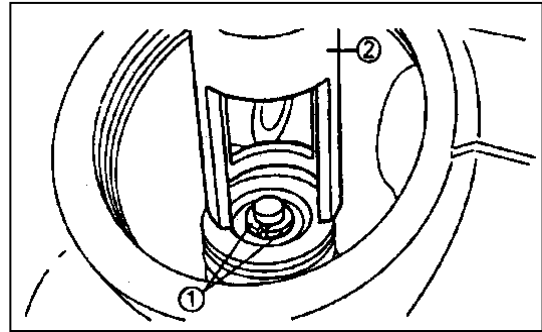
- ① Smaller pitch

4. Instal:

●Valve cotters ①

**NOTE:**

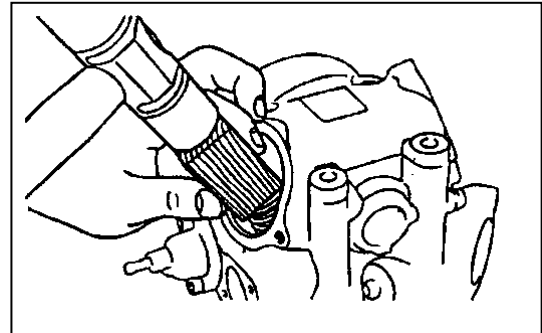
Install the valve cotters while com pressing the valve spring with a valve spring compressor and attachment ②.



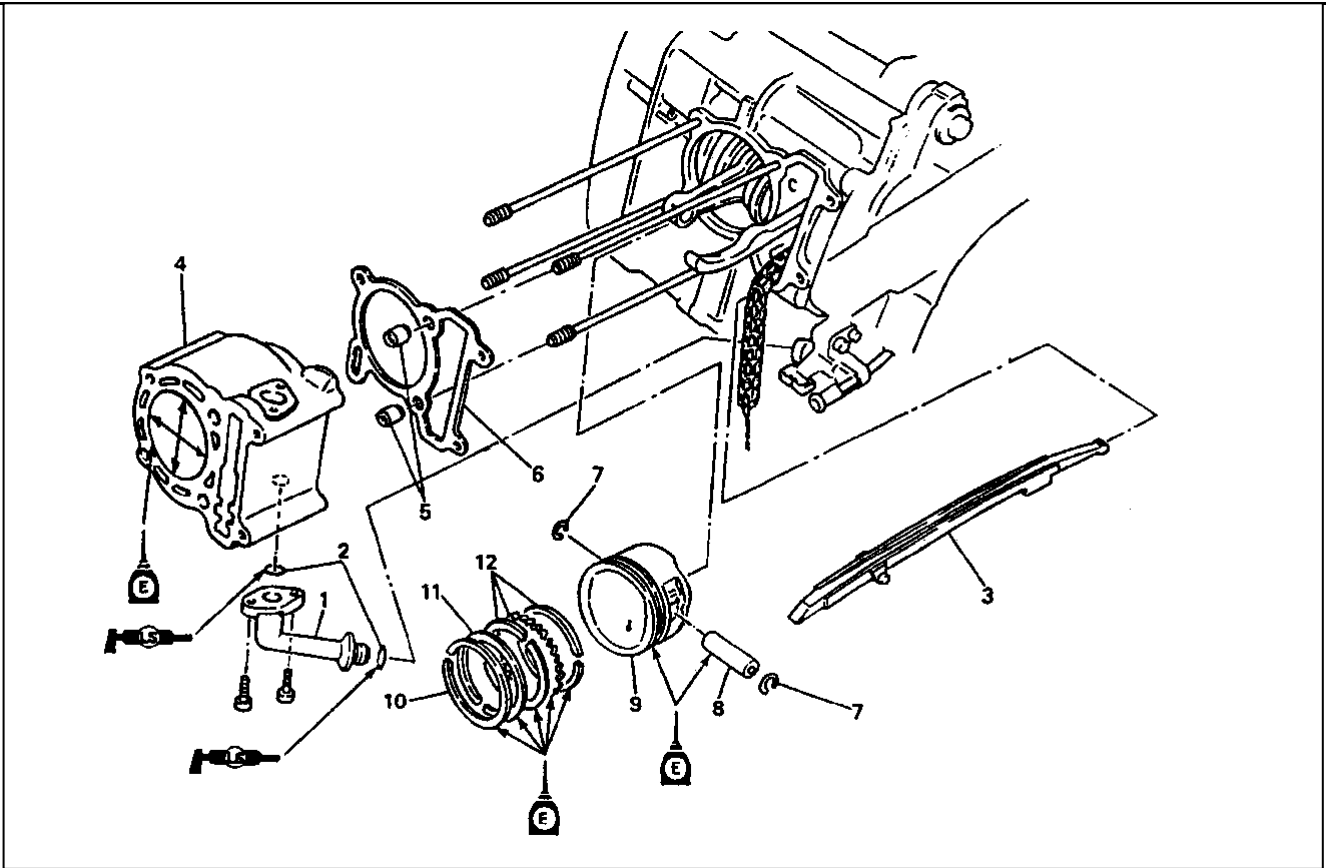
5. Secure the valve cotters onto the valve stem by tapping lightly with a piece of wood.

**CAUTION:**

Do not hit so much as to damage the valve.



**3.6CYLINDER AND PISTON**



Order	Job name / Part name	Q 'ty	Remarks
	Cylinder and piston removal		Remove the parts in order.
1	Cylinder head	1	Refer to " CYLINDER HEAD " section .
2	Joint	2	
3	O-ring	1	Refer to " PISTON RINGS, PISTON AND CYLINDER INSTALLATION" section.
4	Timing chain guide (exhaust side)	1	
5	Cylinder	1	
6	Dowel pin	2	
7	Cylinder gasket	1	
8	Piston pin circlip	2	Refer to "PISTON AND PISTON RINGS REMOVAL" section .
9	Piston pin	1	
10	Piston	1	Refer to "PISTON RINGS, PISTON AND CYLINDER INSTALLATION " section .
11	Piston ring (top)	1	
12	Piston ring (2nd)	1	
	Side rail/Spacer	2/1	Reverse the removal procedure for installation .

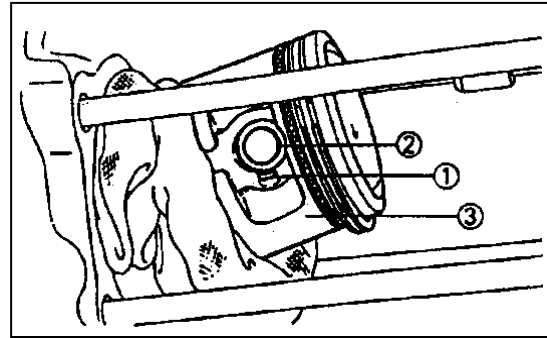
**PISTON AND PISTON RINGS REMOVAL**

1. Remove:

- Piston pin circlip ①
- Piston pin ②
- Piston ③

**NOTE:**

Before removing the piston pin circlip, cover the crankcase opening with a clean tow el or rag to prevent the circlip from falling into the crankcase cavity.

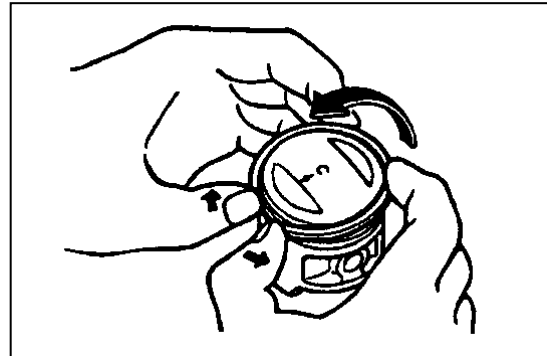


2. Remove:

- Top ring
- 2nd ring
- Oil ring

**NOTE:**

When removing the piston ring, open the end gap of the ring by fingers, and push up the other side of the ring.



**CYLINDER INSPECTION**

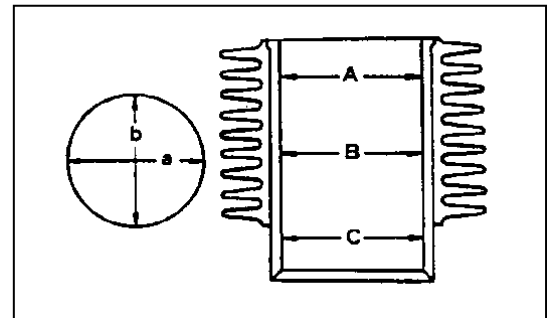
1. Measure:


- Cylinder bore

Out of specification → Rebore or replace.

**NOTE:**

- Measure the cylinder bore with a cylinder bore gauge.
- Measure the cylinder bore in parallel to and a right angle to the crankshaft. Then, find the average of the measurements.

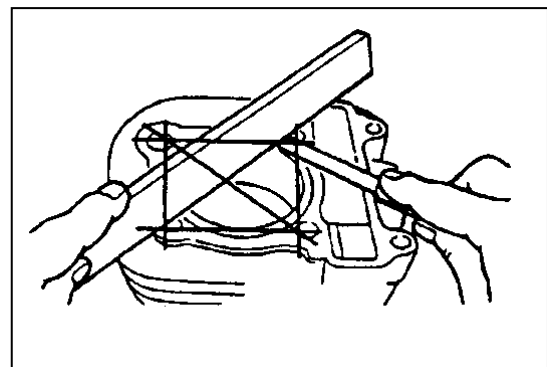



	<p><b>Cylinder bore:</b>  <b>300;72.500- 72.514mm</b>                  &lt; Limit: 300;72.525mm                  &lt; Difference limit between A,B and C :0.03m m &gt;</p>
---	--

2. Measure:

- Warpage

Out of specification → Replace.

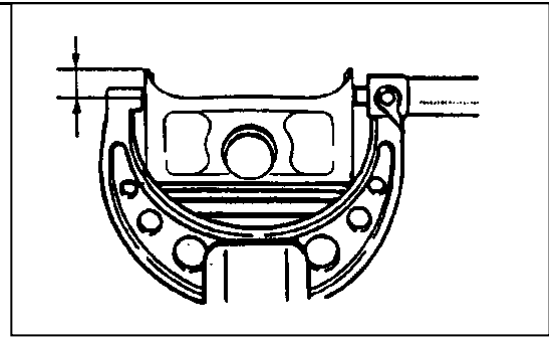


	<p>Cylinder warpage limit:                  0.03mm</p>
---	--

**PISTON AND PISTON PIN INSPECTION**

1. Measure:

- Piston skirt diameter  
Out of specification → Replace .
- ⓐ 5.0mm from the piston bottom edge.



	<b>Valve skirt diameter:</b>
	<b>300; 72.465-72.480 mm</b>
	<b>Oversize (2)</b>
	<b>300; 72.0 mm</b>
	<b>Oversize (4)</b>
	<b>300;72.5 mm</b>

2. Calculate:

- Piston-to-cylinder clearance

<b>Piston-to-cylinder clearance=</b> <b>Cylinder bore-Piston skirt diameter</b>
--

Refer to "CYLINDER" section for cylinder bore measurement.

Out of specification → Replace the piston and piston rings as a set.

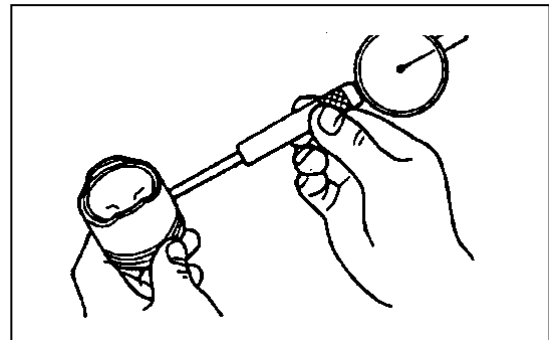
	<b>Piston-to-cylinder clearance:</b>
	<b>0.02-0.04mm</b>

3. Measure:

- Piston pin bore diameter

Out of specification → Replace.

	<b>Piston pin bore diameter:</b>
	<b>17.004-17.015mm</b>
	<b>&lt;Limit:17.045mm&gt;</b>

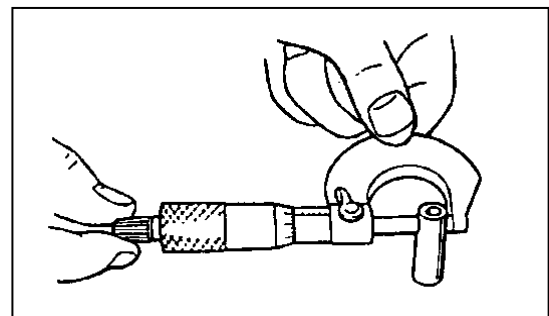


4. Measure:

- Piston pin outside diameter

Out of specification → Replace.

	<b>Piston pin bore diameter:</b>
	<b>16.991-17.000mm</b>
	<b>&lt;Limit:16.975mm&gt;</b>



5. Inspect:

- Piston pin

Blue discoloration/groove → Clean or replace.

**PISTON RINGS INSPECTION**

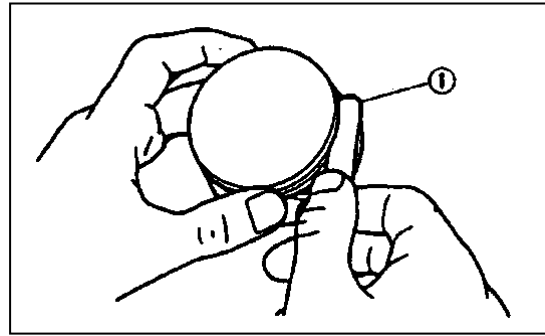
1. Measure:


- Side clearance ①

Out of specification → Replace the piston and the piston rings as a set.

**NOTE:**

Eliminate the carbon deposits from the piston ring grooves and rings before measuring the side clearance.



	<p><b>Side clearance (piston ring):</b></p> <p><b>Top ring:</b>  <b>0.04- 0.08m m</b>  <b>&lt;Limit: 0.12mm&gt;</b></p> <p><b>2nd ring:</b>  <b>0.03 - 0.07mm</b>  <b>&lt;Limit: 0.12mm&gt;</b></p>
---	---

2.Position:

- Piston ring into the cylinder

**NOTE :**

Push the ring with the piston crown so that the ring will be at a right angle to the cylinder bore.

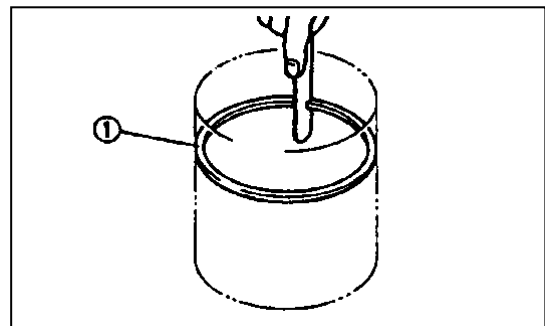
① 5.0mm


3. Measure:

- End gap
- Out of specification → Replace.

**NOTE:**

You cannot measure the end gap on the expander spacer of the oil ring. If the oil ring rails show excessive gap, replace all three rings.



	<p><b>End gap:</b></p> <p><b>Top ring:</b>  <b>0.15-0.30mm</b>  <b>&lt;Limit:0.45mm&gt;</b></p> <p><b>2nd ring:</b>  <b>0.30-0.45mm</b>  <b>&lt;Limit:0.70m m&gt;</b></p> <p><b>Oil ring:</b>  <b>0.20-0.70mm</b></p>
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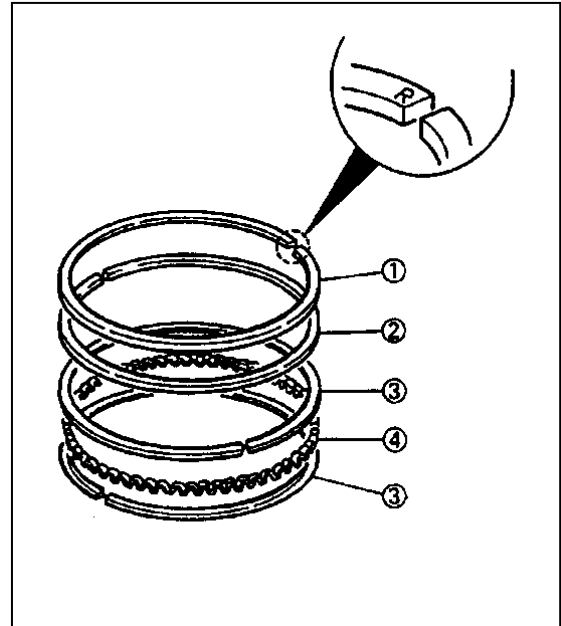
**PISTON RINGS, PISTON AND CYLINDER INSTALLATION**

1. Install:

- Top ring ①
- 2nd ring ②
- Side rails (oil ring) ③
- Expander spacer (oil ring) ④

**NOTE:**

- Make sure to install the piston rings so that the manufacturer's marks or numbers are located on the upper side of the rings.
- Lubricate the pistons and piston rings liberally with engine oil.

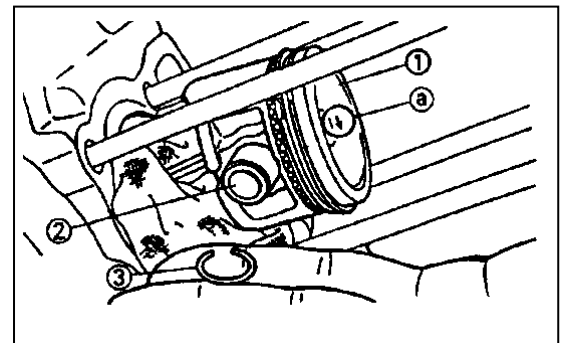


2. Install:

- Piston ①
- Piston pin ②
- Piston pin clip ③ **NEW**

**NOTE:**

- Apply engine oil to the piston pins.
- The " → " mark ④ on the piston must face the exhaust side of the cylinder.
- Before installing the piston pin clip, cover the crankcase opening with a clean rag to prevent the piston pin clip from falling into the crankcase.
- Make sure to install each piston in its respective cylinder.



3. Install:

- Gasket (cylinder) **NEW**
- Dowel pins

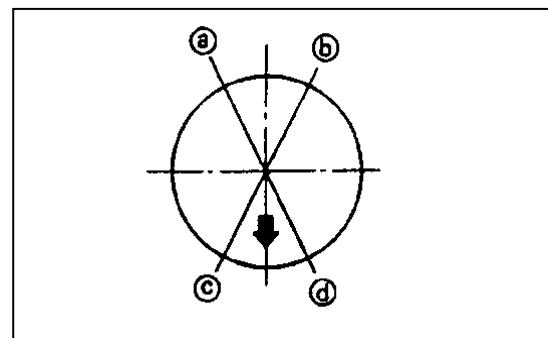
4. Position:

- Piston rings

**NOTE:**

Offset the piston ring end gaps as shown.

- ① Top ring end
- ② Oil ring end (lower)
- ③ Oil ring end (upper)
- ④ 2nd ring end





5. Lubricate:

- Piston outer surface
- Piston ring
- Cylinder inner surface

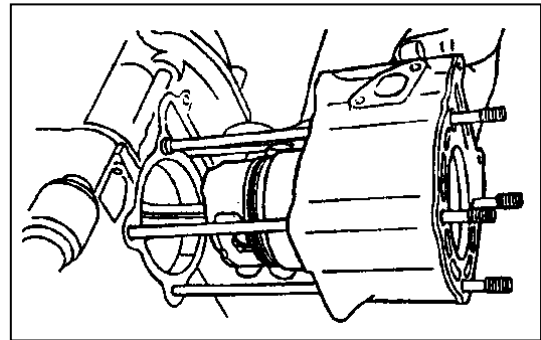
	<b>Engine oil</b>
---	-------------------

6. Install:

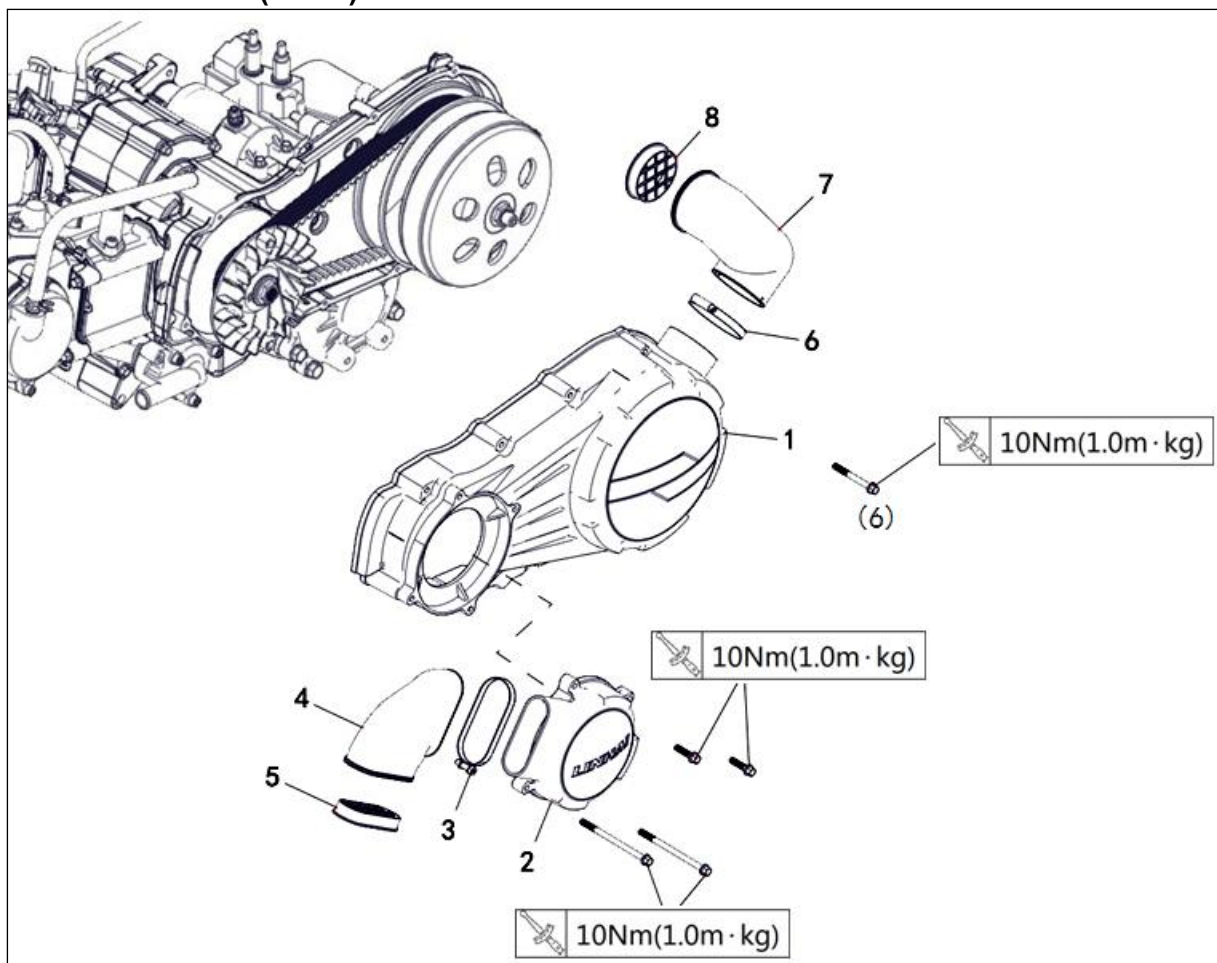
- Cylinder

**NOTE:**

- Install the cylinder with one hand while com pressing the piston rings with the other hand.
- Pass the timing chain and timing chain guide (exhaust side) through the timing chain cavity.



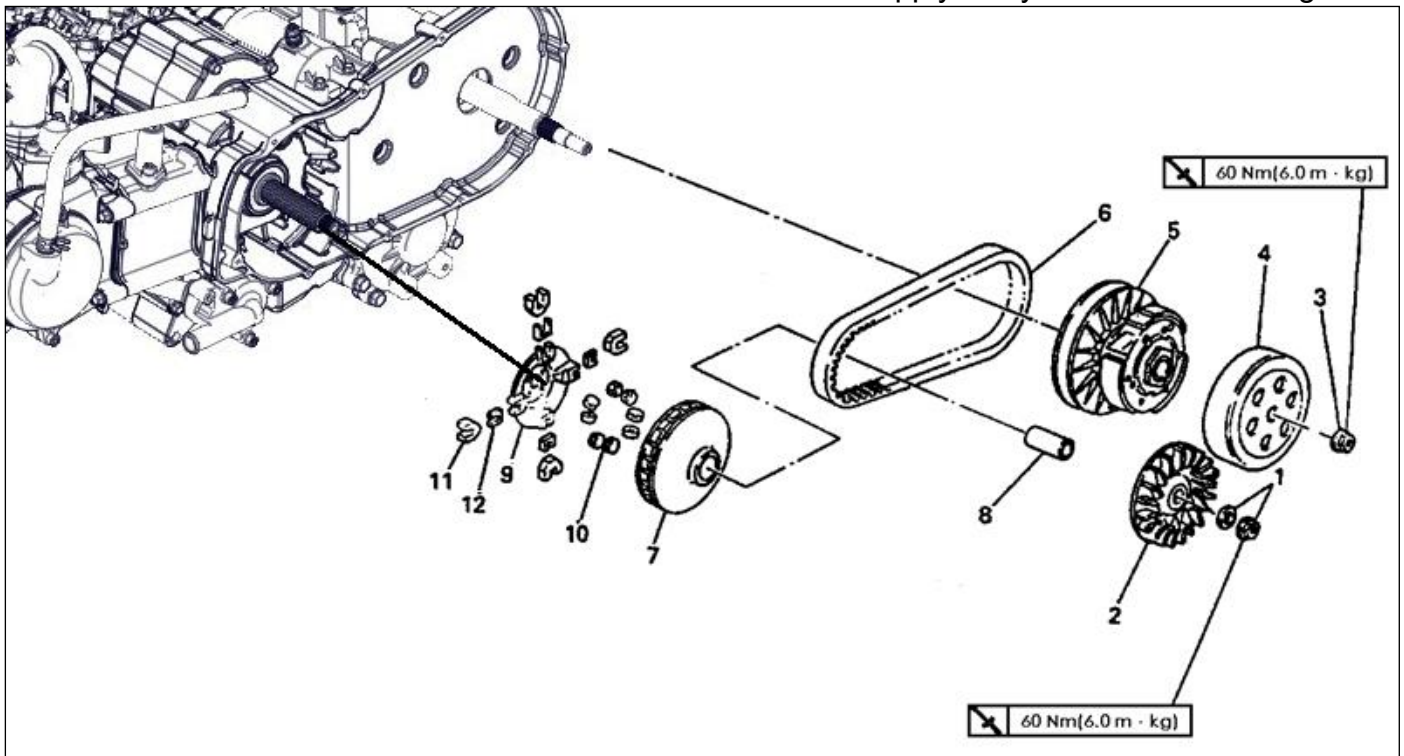
**3.7V-BELT,CLUTCH AND SECONDARY/PRIMARY SHEAVE**  
**CRANKCASE COVER (LEFT)**



Order	Job name / Part name	Q 'ty	Remarks
	Crankcase cover (left) removal		<b>Remove the parts in order.</b>
1	Crankcase cover (left)	1	
2		1	
3	Hose clamp B	1	
4	Joint B	1	
5	Air strainer B	1	
6	Hose clamp A	1	
7	Joint A	1	
8	Air strainer A	1	Reverse the removal procedure for installation .

**PRIMARY SHEAVE**

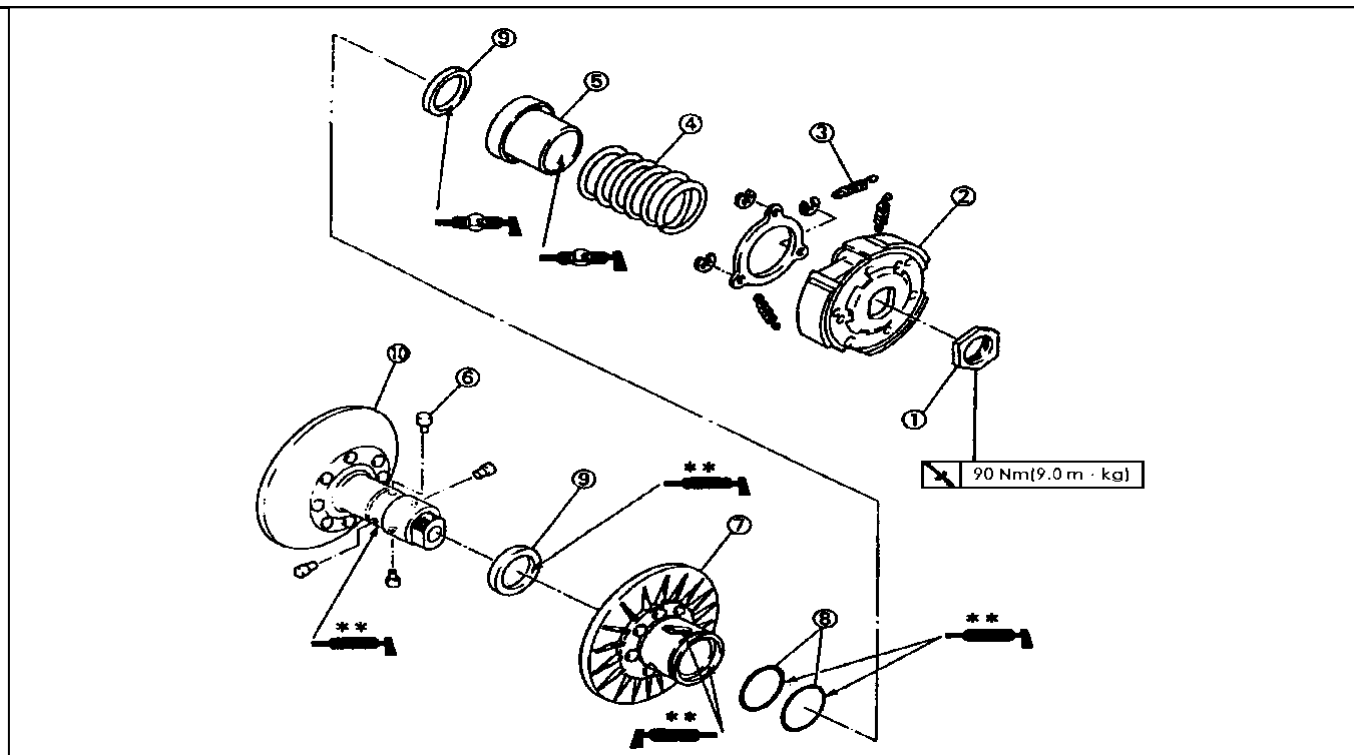
\*Apply molybdenum disulfide grease



Order	Job name / Part name	Q 'ty	Remarks
	V-belt, clutch and secondary/primary sheave removal		Remove the parts in order
1	Nut/Plain washer	1/1	Refer to "PRIMARY SHEAVE REMOVAL" section.
2	Primary fixed sheave	1	
3	Nut	1	Refer to "SECONDARY SHEAVE AND V-BELT REMOVAL" section.
4	Clutch housing	1	
5	Clutch assembly	1	Refer to "SECONDARY SHEAVE INSTALLATION" section.
6	V-belt	1	
7	Primary sliding sheave	1	Refer to "PRIMARY SHEAVE ASSEMBLY" section.
8	Collar	1	
9	Cam	1	Refer to "PRIMARY SHEAVE ASSEMBLY" section.
10	Weight	8	
11	Slider	4	Refer to "PRIMARY SHEAVE ASSEMBLY" section. Reverse the removal Procedure for installation.
12	Spacer	4	

**SECONDARY SHEAVE**

\*\*Apply lightweight lithium-soap base grease



Order	Job name / Part name	Q 'ty	Remarks
	Secondary sheave disassembly		Disassemble the parts in order.
1	Nut	1	
2	Clutch carrier	1	Refer to "SECONDARY SHEAVE DISASSEMBLY" section.
3	Clutch shoe spring	3	
4	Compression spring	1	
5	Spring seat	1	Refer to "SECONDARY SHEAVE INSTALLATION " section .
6	Guide pin	4	
7	Secondary sliding sheave	1	
8	O-ring	2	Refer to "SECONDARY SHEAVE INSTALLATION" section.
9	Oil seal	2	
10	Secondary fixed sheave	1	
			Reverse the disassembly procedure for assembly.

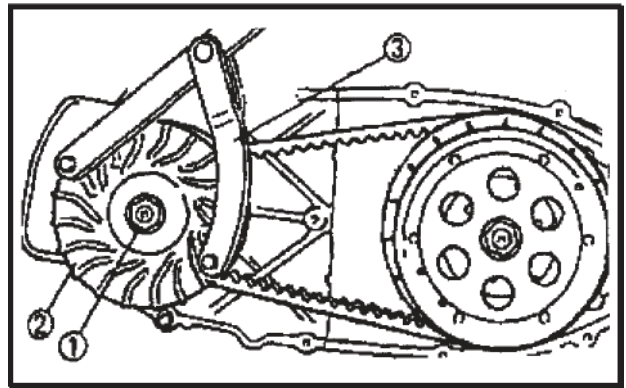
**PRIMARY SHEAVE REMOVAL**

1. Remove:

- Nut ①(primary sheave)
- Plate washer
- Primary fixed sheave②

**NOTE:**

Loosen the nut (primary fixed sheave) while holding the primary fixed sheave with the rotor holder③.



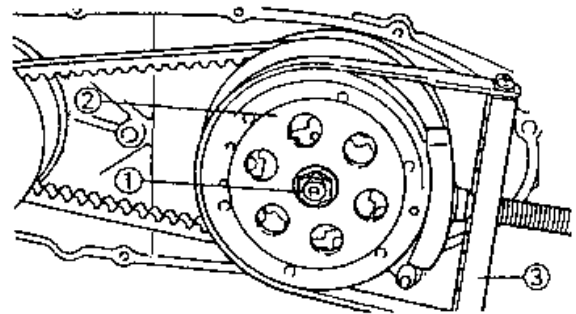
**SECONDARY SHEAVE AND V-BELT REMOVAL**

1. Remove:

- Nut ① (secondary sheave)
- Clutch housing ②

**NOTE:**

Loosen the nut (secondary sheave) while holding the clutch housing with the sheave holder③.



2. Remove:

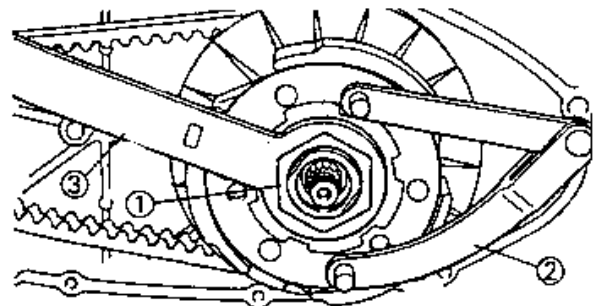
- Nut ① (clutch carrier)

**CAUTION:**

Do not remove the nut (clutch carrier) yet.

**NOTE:**

Loosen the nut (clutch carrier) one turn using the locknut wrench ③ while holding the clutch carrier with the rotor holder②.

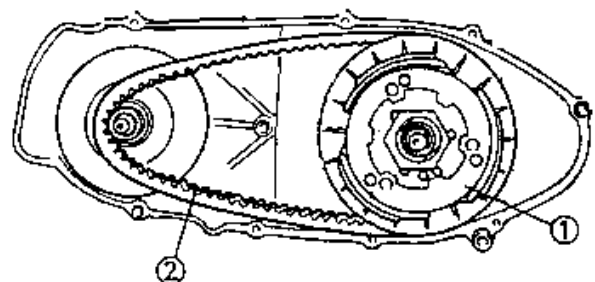


3. Remove:

- Clutch assembly ①
- V-belt ②

**NOTE:**

Remove the V-belt from the primary sheave side with clutch assembly.



**SECONDARY SHEAVE DISASSEMBLY**

1. Remove:

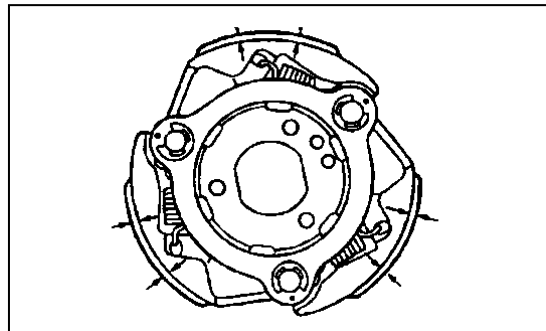
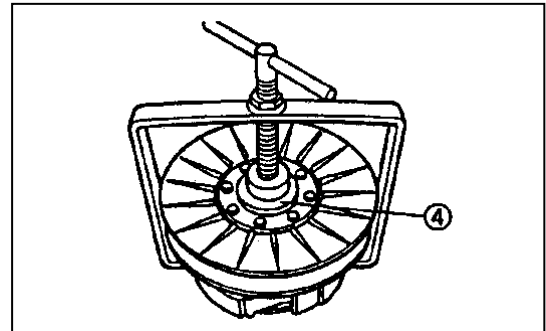
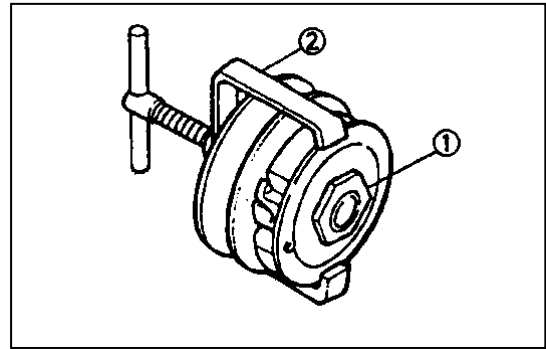
- Nut ① (secondary sheave)

**NOTE:**

Loosen the nut ① while attaching the clutch spring compressor ② and clutch spring holder arm ③ and release the compressed spring after removing the nut.

**CAUTION:**

Use the spacer ④ (diameter:  $\varnothing$  30mm thickness: 2-3mm).



**CLUTCH INSPECTION**

1. Measure:

- Clutch shoe thickness

Scratches → Glaze using coarse sandpaper.

Wear /Damage → Replace

	<p><b>Clutch shoe thickness:</b>  <b>3.0mm</b>                  &lt;Limit:2.0mm&gt;</p>
--	---

**NOTE:**

- After using the sandpaper, clean off the polished particles.
- Inspect the other clutch shoes.
- Replace all three as a set.

**V-BELT INSPECTION**

1. Inspect:

- V-belt ①

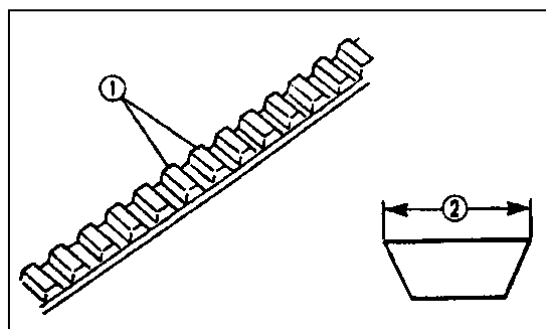
Cracks/Wear /Scaling /Chipping → Replace.

Oil/Grease → Check primary sheave and secondary sheave.

2. Measure:

- V-belt width ②

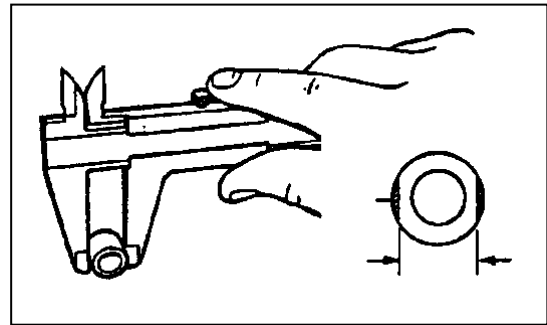
Out of specification → Replace




	<p><b>V-belt width:</b>  <b>22.6mm</b>                  (Limit:21.0mm)</p>
--	--

**WEIGHT INSPECTION**

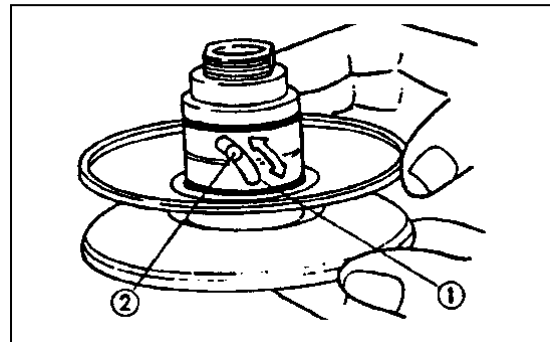
1. Inspect:
  - Weight minimum outside diameter
  - Cracks/Wear /Scaling /Chipping → Replace.
  - Out of specification → Replace



	<p><b>Weight out side diameter:</b>  <b>20.0 mm</b>  <b>&lt;Limit: 19.5mm&gt;</b></p>
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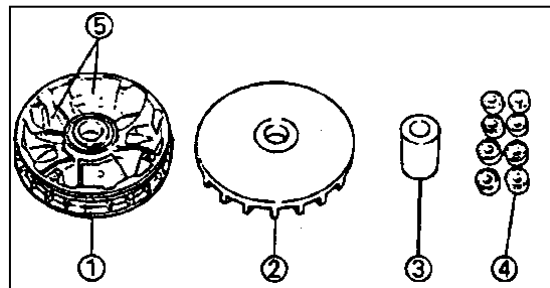
**SECONDARY SHEAVE INSPECTION**

1. Inspect:
  - Secondary fixed sheave smooth operation
  - Secondary sliding sheave smooth operation
2. Inspect:
  - Torque cam groove ①
  - Wear /Damage → Replace.
3. Inspect:
  - Guide pin ②
  - Wear /Damage → Replace.



**PRIMARY SHEAVE ASSEMBLY**

1. Clean:
  - Primary sliding sheave face ①
  - Primary fixed sheave face ②
  - Collar ③
  - Weight ④
  - Primary sliding sheave cam face



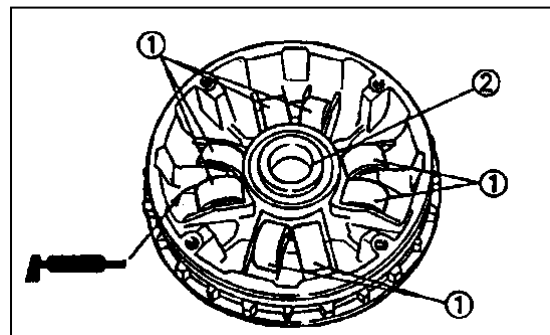
**NOTE:**

Remove any excess grease.

2. Install:
  - Weight ①
  - Collar ②


**NOTE:**

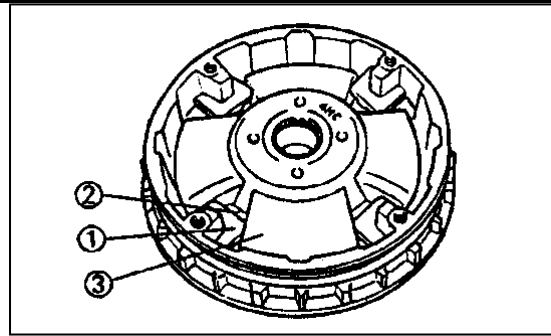
- Apply molybdenum disulfide grease to all of the outside of the weight and install.
- Apply lightweight lithium-soap base grease to the inside of the collar.



3. Install:

- Spacer ①
- Slider ②
- Cam ③
- Primary sliding sheave cap.

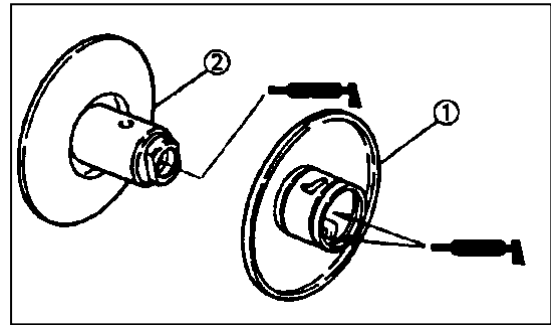
 3Nm(0.3m·kg)



**SECOMDARY SHEAVE INSTALLATION**

1. Apply:

- Lightweight lithium-soap base grease (to the secondary sliding sheave ① inner surface, grease nipple groove, and oil seals)
- Lightweight lithium-soap base grease (to the bearings, oil seals and inner surface of the secondary fixed sheave ② )

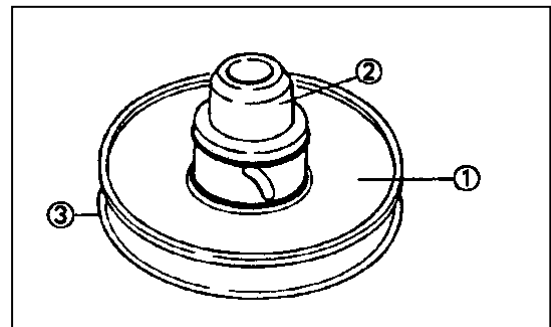


2. Install:

- Secondary sliding sheave ①

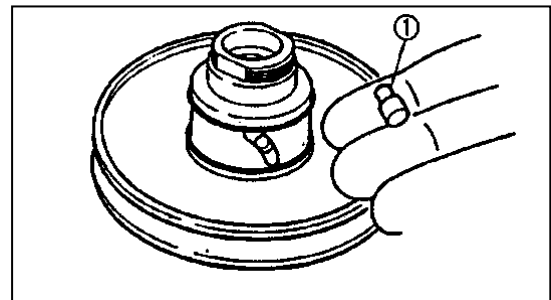
**NOTE:**

Install the secondary sliding sheave ① using the oil seal guide ② to the secondary fixed sheave ③.



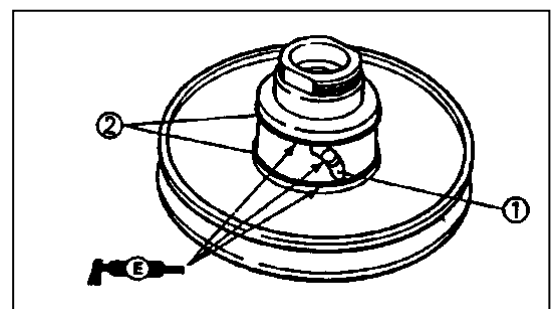
3. Install:

- Guide pin ①



4. Apply:

- Lightweight lithium-soap base grease (to the guide pin sliding groove ①, and oil seal ② **NEW**)



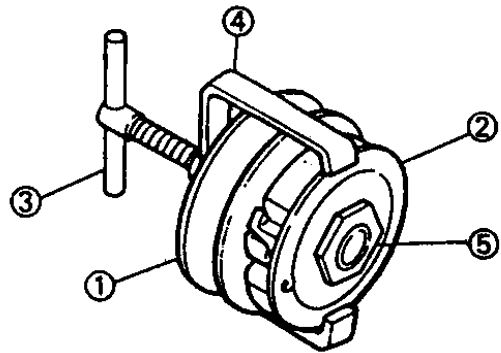


5. Install:

- Secondary sheave complete ①
- Compression spring
- Clutch carrier ②

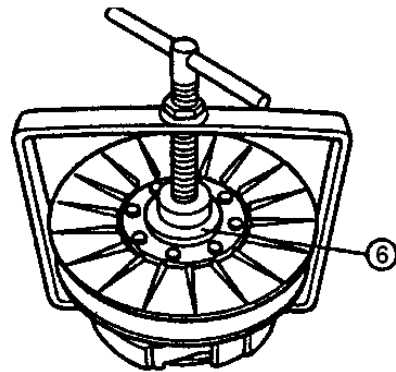
**NOTE:**

Temporarily tighten the nut ⑤ while attaching the clutch spring holder ③ and clutch spring holder arm ④ and compress the spring.



**CAUTION:**

Use the spacer ⑥ (30mm, thickness: 2-3mm).



6. Install:

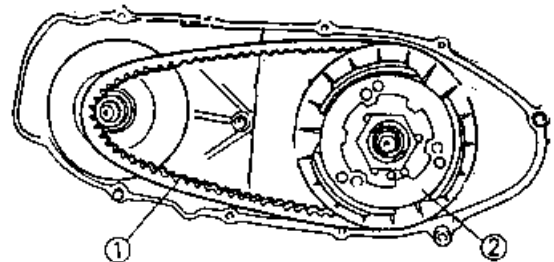
- V-belt ①
- Clutch assembly ②

**NOTE:**

Install the V-bet with clutch assembly to the primary sheave side.

**CAUTION:**

Never smear grease to the V-belt, secondary sheave and clutch.

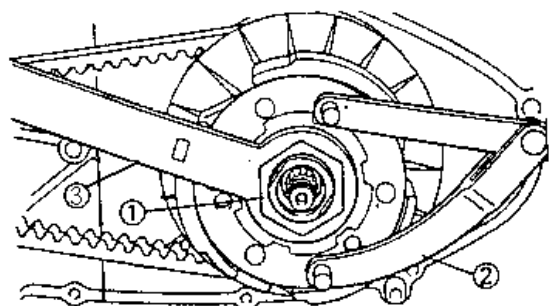


7. Install:

- Nut ① (clutch carrier)

**NOTE:**

Tighten the nut (clutch carrier), using the locknut wrench ③ while holding the clutch carrier with the rotor holder ②

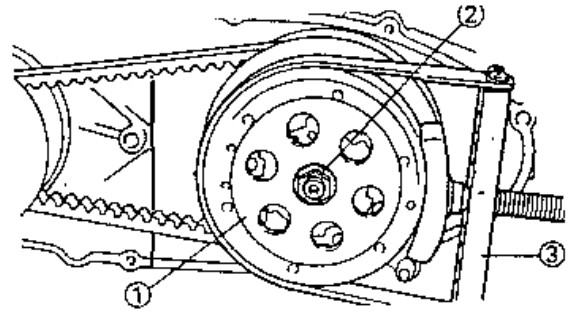


8. Install:

- Clutch housing ①
- Nut (clutch housing) ②

**NOTE:**

Tighten the nut (clutch housing),using the sheave holder ③).

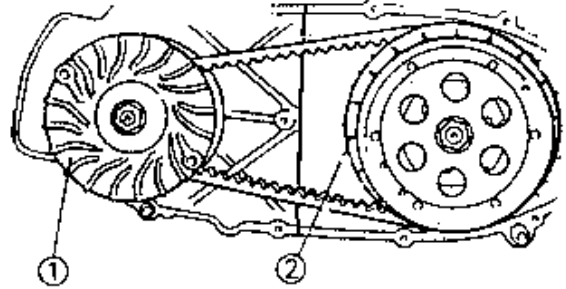


9. Set:

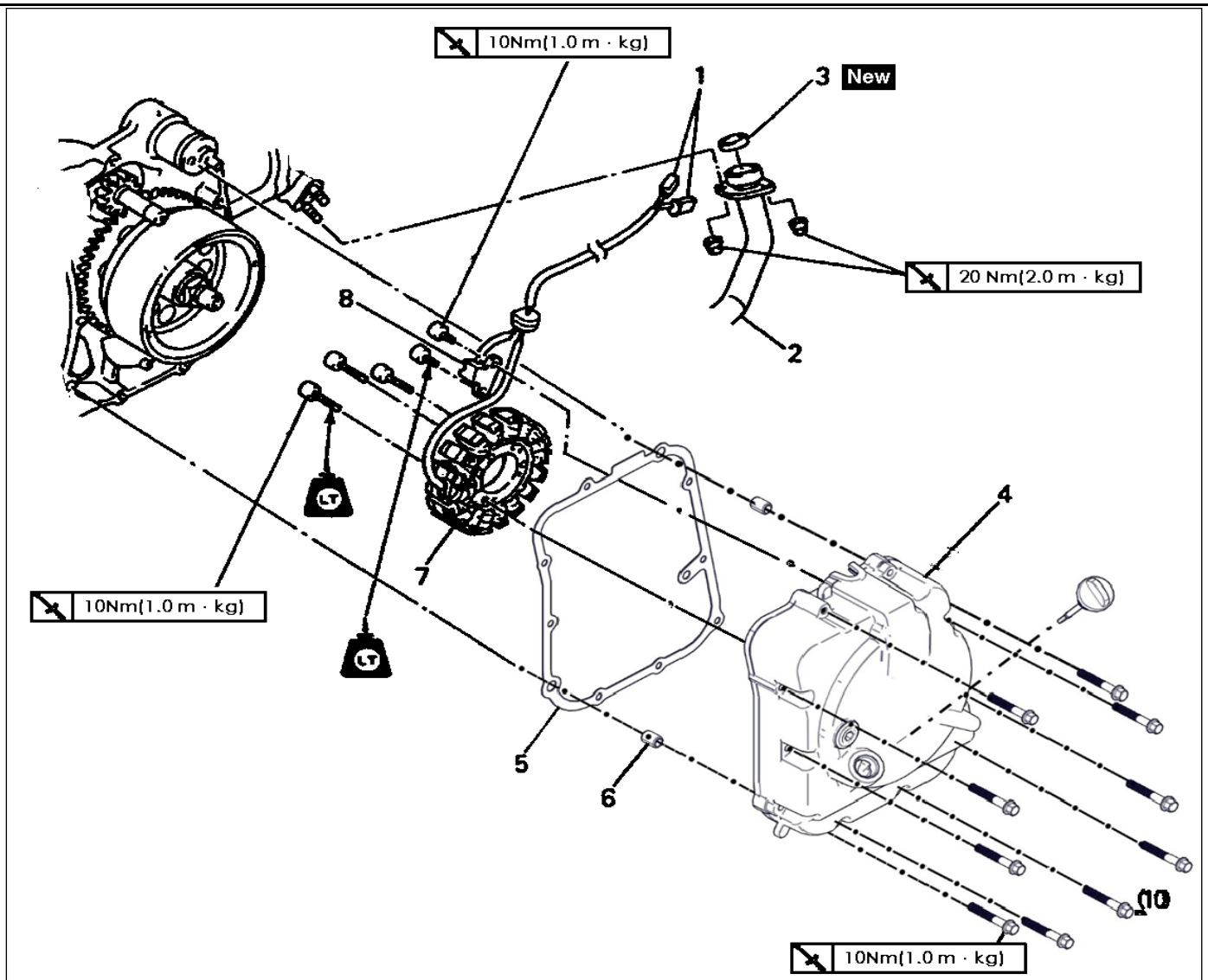
- V- belt ①

**NOTE:**

Move the V-belt to minimum diameter of the primary sheave ①, maximum diameter of the secondary sheave ② and make the V-belt tense.

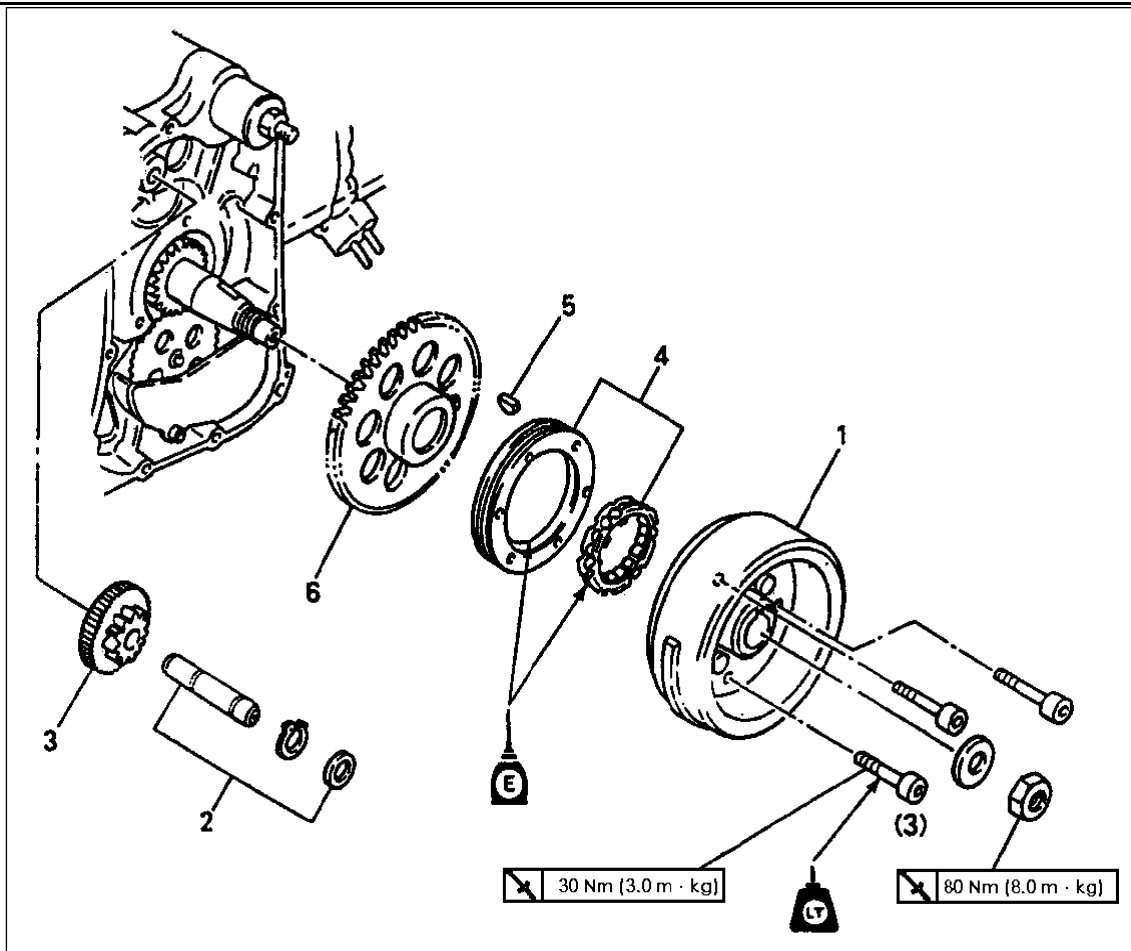


**3.8A.C. MAGNETO AND STARTER CLUTCH**  
**MAGNETO COVER AND STATOR COIL**



Order	Job name/ Part name	Q'ty	Remarks
	<b>Magneto cover and stator coil removal</b>		Remove the parts in order. Refer to "ENGINE OIL REPLACEMENT" section.
	Drain the engine oil.		
1	Couplers (A.C. magneto lead)	2	<b>NOTE:</b> Disconnect the couplers.  Reverse the removal procedure for installation.
2	Exhaust pipe	1	
3	Exhaust pipe gasket	1	
4	Magneto cover	1	
5	Gasket (magneto cover)	1	
6	Dowel pins	2	
7	Stator coil	1	
8	Pick up coil	1	

**A. C. MAGNETO AND STARTER CLUTCH**



Order	Job name/ Part name	Q'ty	Remarks
	<b>A.C. magneto and starter clutch removal</b>		Remove the parts in order.
1	Rotor	1	Refer to "A.C. MAGNETO ROTOR REMOVAL /INSTALLATION" section.
2	Shaft (idle gear)	1	
3	Idler gear	1	
4	Starter one way clutch assembly	1	
5	Woodruff key	1	
6	Starter wheel gear	1	
			Reverse the removal procedure for installation.

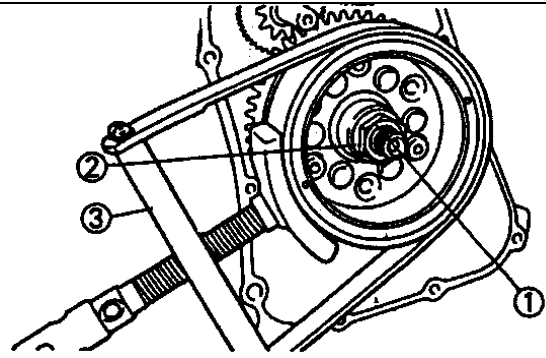
**A.C. MAGNETO ROTOR REMOVAL**

1. Remove:

- Nut ① (rotor)
- Plain washer②

**NOTE:**

- Loosen the nut (rotor) ①while holding the rotor with a sheave holder③ .
- Do not allow sheave the holder touch to the projection on the rotor.

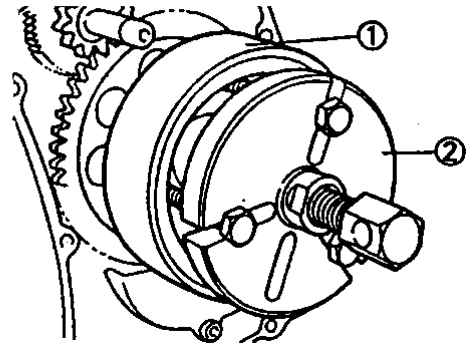


2. Remove:

- Rotor ①
- Woodruff key

**NOTE:**

- Remove the rotor ②using the flywheel puller.
  - Center the flywheel puller over the rotor.
- Make sure after installing the holding bolts that the clearance between the flywheel puller and the rotor is the same everywhere. If necessary, one holding bolt may be turned out slightly to adjust the flywheel puller's position.



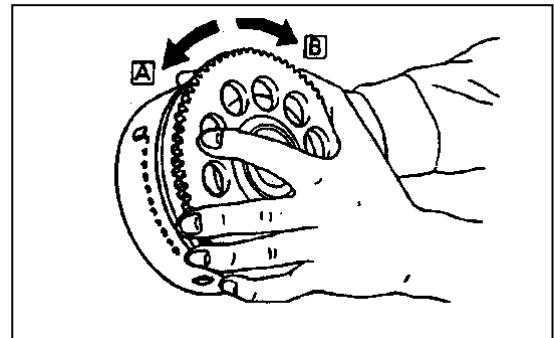
**CAUTION:**

Cover the crankshaft end with the box wrench for protection.

**STARTER DRIVE GEAR INSPECTION**

1. Inspect:

- Starter idle gear teeth
  - Starter drive gear teeth
  - Starter wheel gear teeth
- Burrs /chips /roughness /wear → Replace.

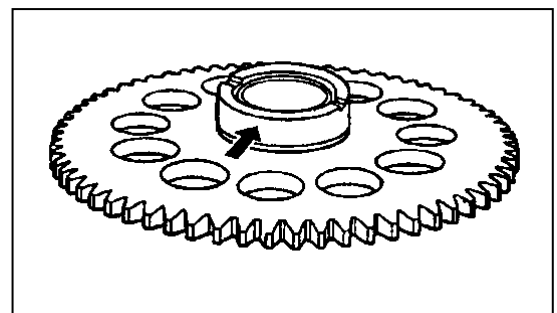


2. Check:

- Starter clutch operation
- Push the dowel pins to the arrow direction.  
Unsmooth operation → Replace.

**Checking steps:**

- Hold the starter clutch.
- When turning the starter wheel gear clockwise, the starter clutch and the starter wheel gear should be engaged.
- If not, the starter clutch is faulty. Replace it.
- When turning the starter wheel gear counter clockwise, it should turn freely.
- If not, the starter clutch is faulty. Replace it.



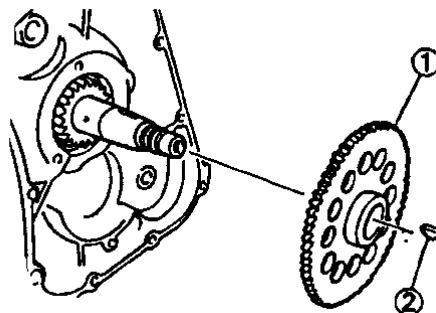
**A.C. MAGNETO ROTOR INSTALLATION**

1. Install:

- Starter wheel gear ①.
- Woodruff key ②.

**NOTE:**

Install the starter wheel gear①, then install the woodruff key②.

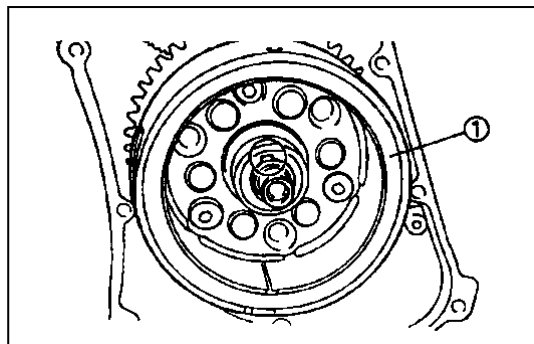


2. Install:


- Rotor ①
- Plain washer

**NOTE:**

- Clean the tapered portion of the crankshaft and the rotor hub.
- When installing the magneto rotor, make sure the woodruff key is properly seated in the key way of the crankshaft.

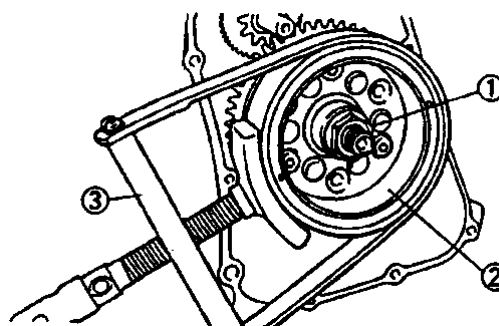


3. Tighten:

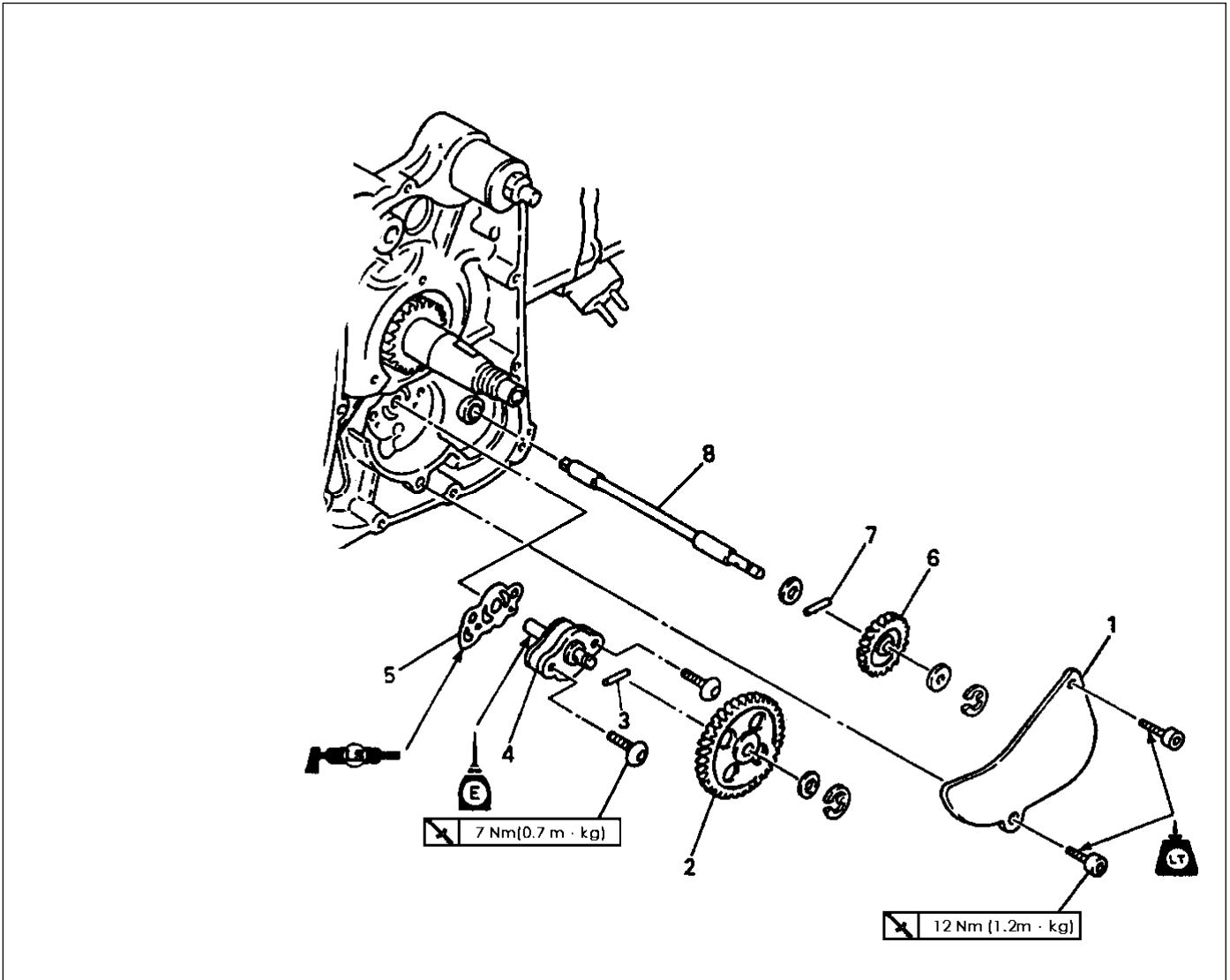
- Nut(rotor)①  80Nm(8.0m·kg)

**NOTE:**

Tighten the nut (rotor)① while holding the magneto rotor② with a sheave holder③.



**3.9 OIL PUMP**



Order	Job name/ Part name	Q'ty	Remarks
	<b>Oil pump removal</b>		Remove the parts in order. Refer to "A.C. MAGNETO AND STARTER CLUTCH" section.  Reverse the removal procedure for installation.
	<b>A.C. magneto</b>		
1	Cover	1	
2	Pump driven gear	1	
3	Dowel pin	1	
4	Oil pump assembly	1	
5	Gasket	1	
6	Impeller shaft gear	1	
7	Dowel Pin	1	
8	Shaft	1	

**OIL PUMP INSPECTION**

1. Inspect:

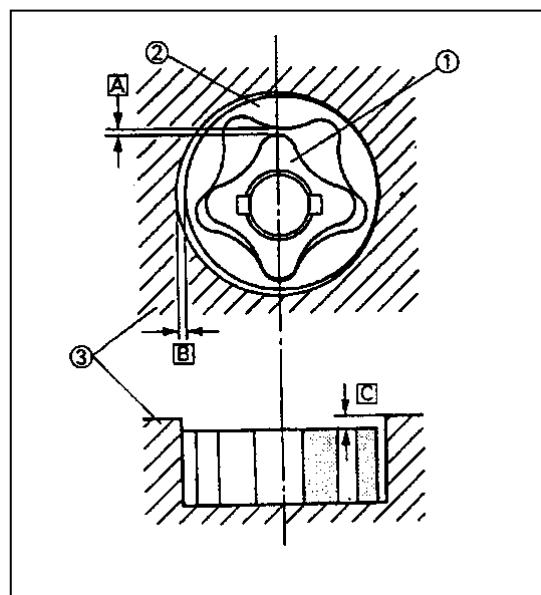
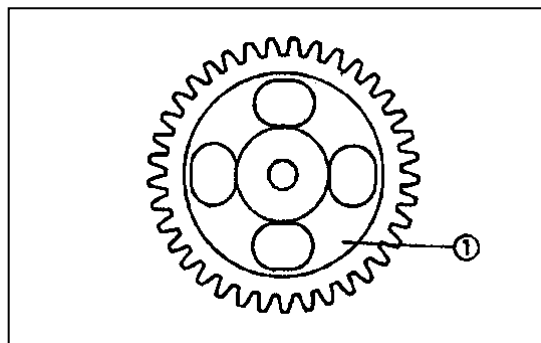
- Drive gear (oil pump) ①
- Pump housing
- Pump housing cover

Wear /cracks/ damage → Replace.

2. Measure:

- Tip clearance  
(between the inner rotor ① and the outer rotor ②)
- Side clearance  
(between the outer rotor ② and the pump housing ③ )
- Housing and rotor clearance  
(between the pump housing ③ and the rotors ① ②)

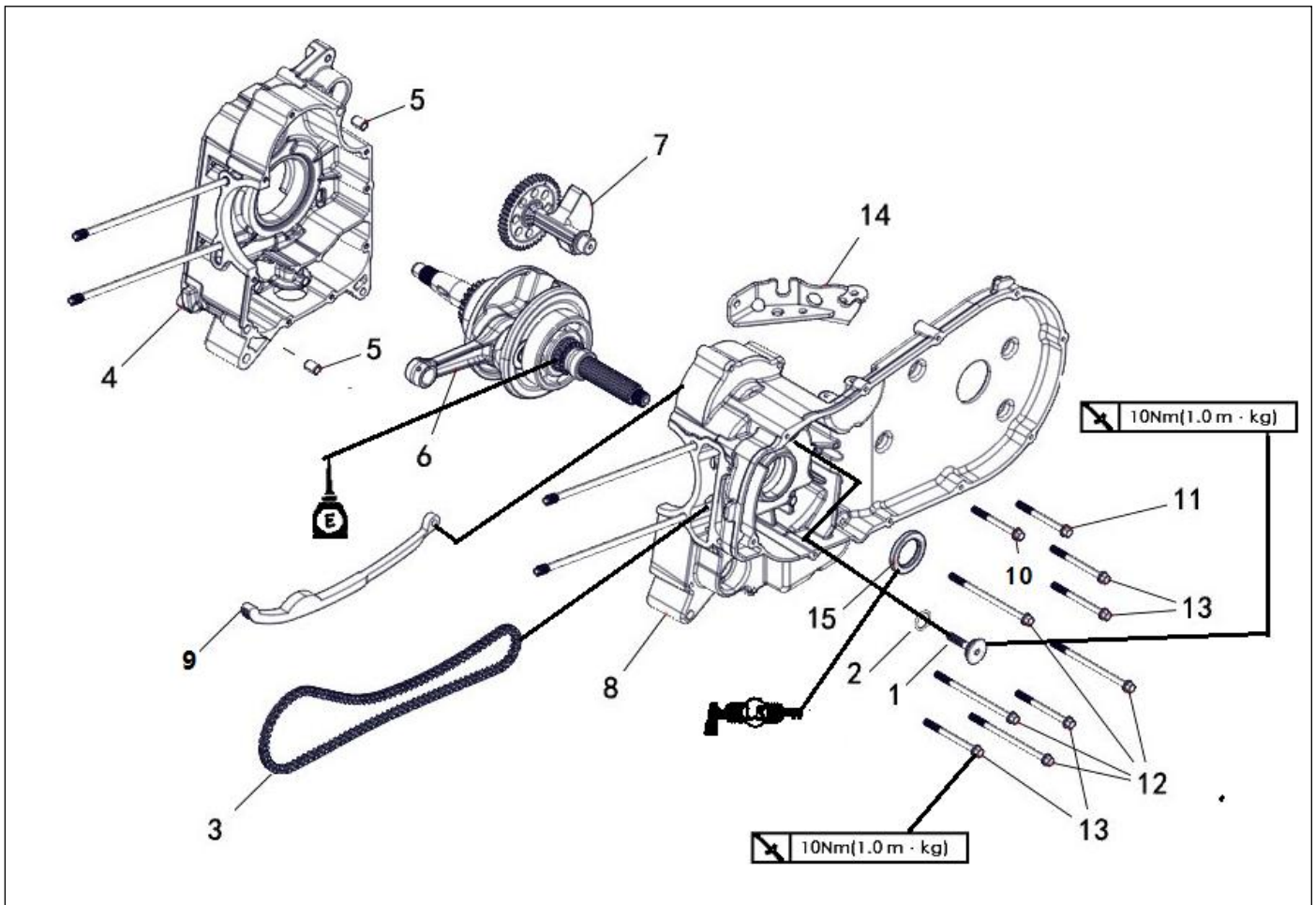
Out of specification → Replace the oil pump assembly.



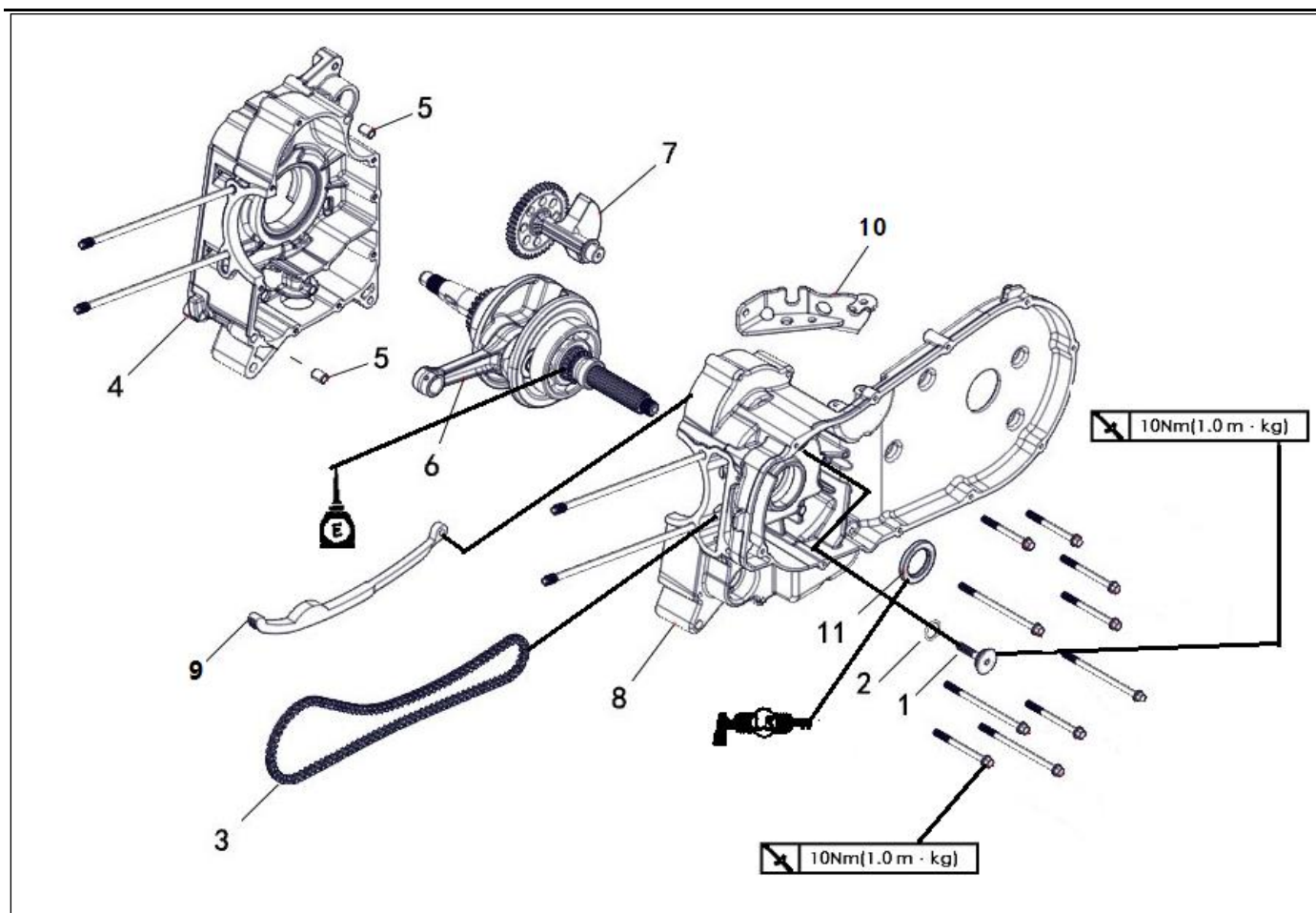
	<b>Tip clearance [A]:</b> <b>0.10-0.34 mm &lt;Limit: 0.40mm&gt;</b>
	<b>Side clearance [B]:</b> <b>0.013-0.036mm &lt;Limit:0.15mm&gt;</b>
	<b>Housing and rotor clearance [C]:</b> <b>0.04-0.09 mm &lt;Limit: 0.15mm&gt;</b>



**3.10CRANKCASE AND CRANKSHAFT**



Order	Job name/ Part name	Q'ty	Remarks
	<b>Crankcase and crankshaft removal</b>		Remove the parts in the order.
	Engine removal		Refer to "ENGINE REMOVAL" section.
	Cylinder head		Refer to "CYLINDER HEAD" section.
	Cylinder, and piston		Refer to "CYLINDER AND PISTION" section.
	V-belt, clutch, secondary/ primary sheave		Refer to "V BELT, CLUTCH AND SECONDARY/ PRIMARY SHEAVE" section.
	A.C. magneto and starter clutch		Refer to "A.C. MAGNETO AND STARTER CLUTCH" section.
	Oil pump		Refer to "OIL PUMP" section.
	Water pump		Refer to "WATER PUMP" section.
	Rear wheel		Refer to "REAR WHEEL AND REAR BRAKE" section.
1	Bolt	1	
2	O- ring	1	



Order	Job name/ Part name	Q'ty	Remarks
3	Timing chain	1	
4	Crankcase (right)	1	Refer to "CRANKSHAFT INSTALLATION" section.
5	Dowel pin	2	
6	Crankshaft assembly	1	Refer to "CRANKSHAFT REMOVAL/ INSTALLATION" section.
7	Balancer assembly	1	
8	Crankcase (left)	1	
9	Timing chain guide (intake)	1	
10	Bracket shift	1	
11	Oil seal	1	Reverse the removal procedure for installation.

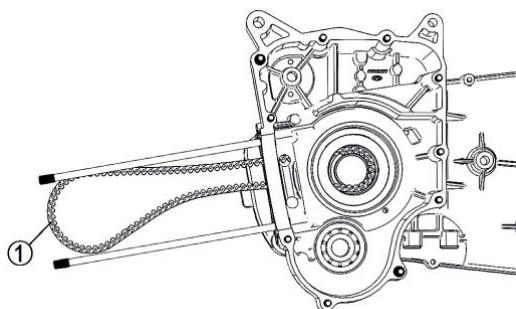
**CRANKSHAFT REMOVAL**

1. Remove:

- Crankshaft assembly
- Balancer assembly
- Timing chain

**NOTE:**

- Before removing the crankshaft assembly, remove the timing chain from the crankshaft sprocket.
- If the timing chain hooks to the crankshaft sprocket, the crankshaft cannot be removed.



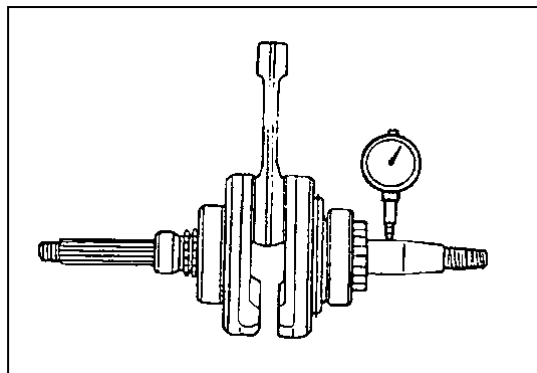
**CRANKSHAFT INSPECTION**


1. Measure:

- Crankshaft runout
- Out of specification → Replace crankshaft and/or bearing.

**NOTE:**

Measure the crankshaft runout with the crankshaft assembly running slowly.



	<b>Runout limit: 0.03 mm</b>
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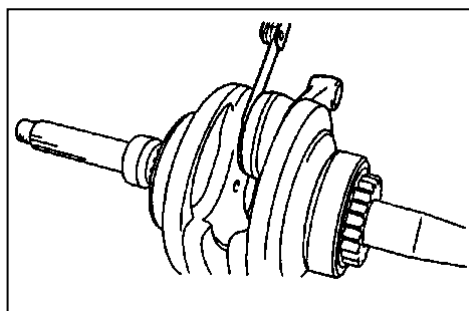


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2. Measure:


- Big end side clearance
- Out of specification → Replace big end bearing, crank pin and/or connecting rod.

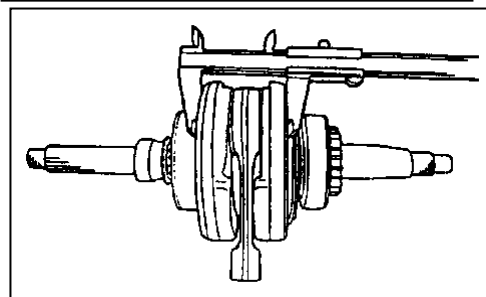
	<b>Big end side clearance: 0.35-0.85 mm</b>
---	---



3. Measure:

- Crank width
- Out of specification → Replace crankshaft.

	<b>Crank width: 59.95-60.00 mm</b>
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4. Inspect:

- Crankshaft sprocket ①

Wear/ Damage → Replace crankshaft.

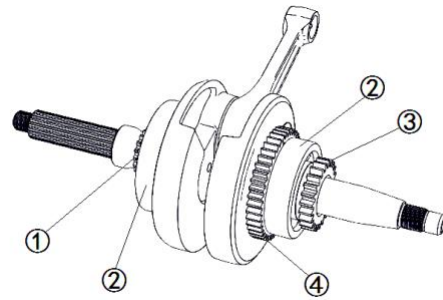
- Bearing ②

Wear/ Crack /Damage → Replace crankshaft.

- Pump drive gear ③

- Balancer drive gear ④

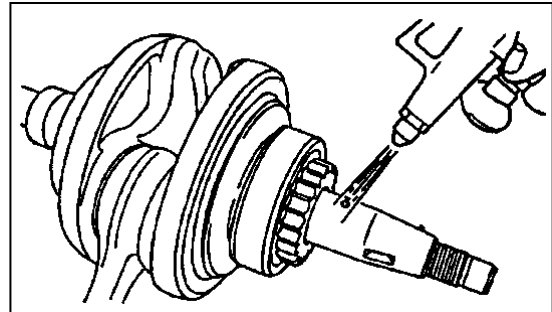
Wear/ Damage → Replace crankshaft.



5. Inspect:

- Crankshaft journal

Clogged → Blow out the journal with compressed air.

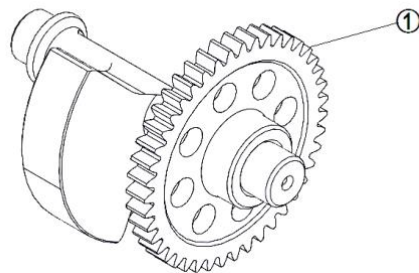


**BALANCER INSPECTION**

Inspect:

- Balancer driven gear ①

Wear/ Damage → Replace balancer.



**CRANKCASE INSTALLATION**

1. Clean all the gasket mating surface and crankcase mating surface thoroughly.

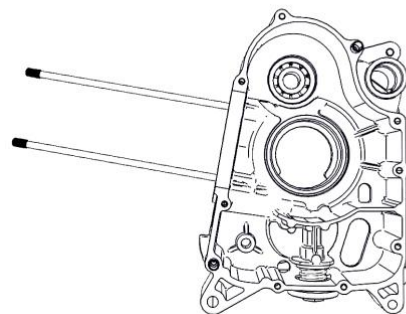
2. Apply:

- Sealant

(onto the crankcase mating surfaces)

**NOTE:**

DO NOT ALLOW any sealant to come into contact with the oil gallery.



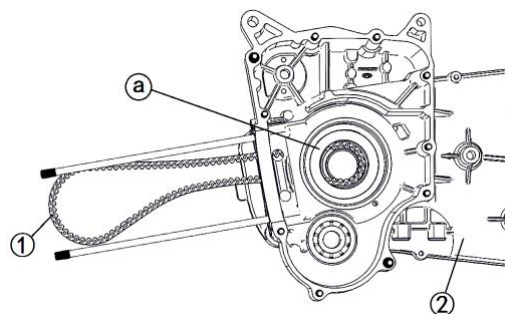
3. Install:

- Dowel pins

- Timing chain ①

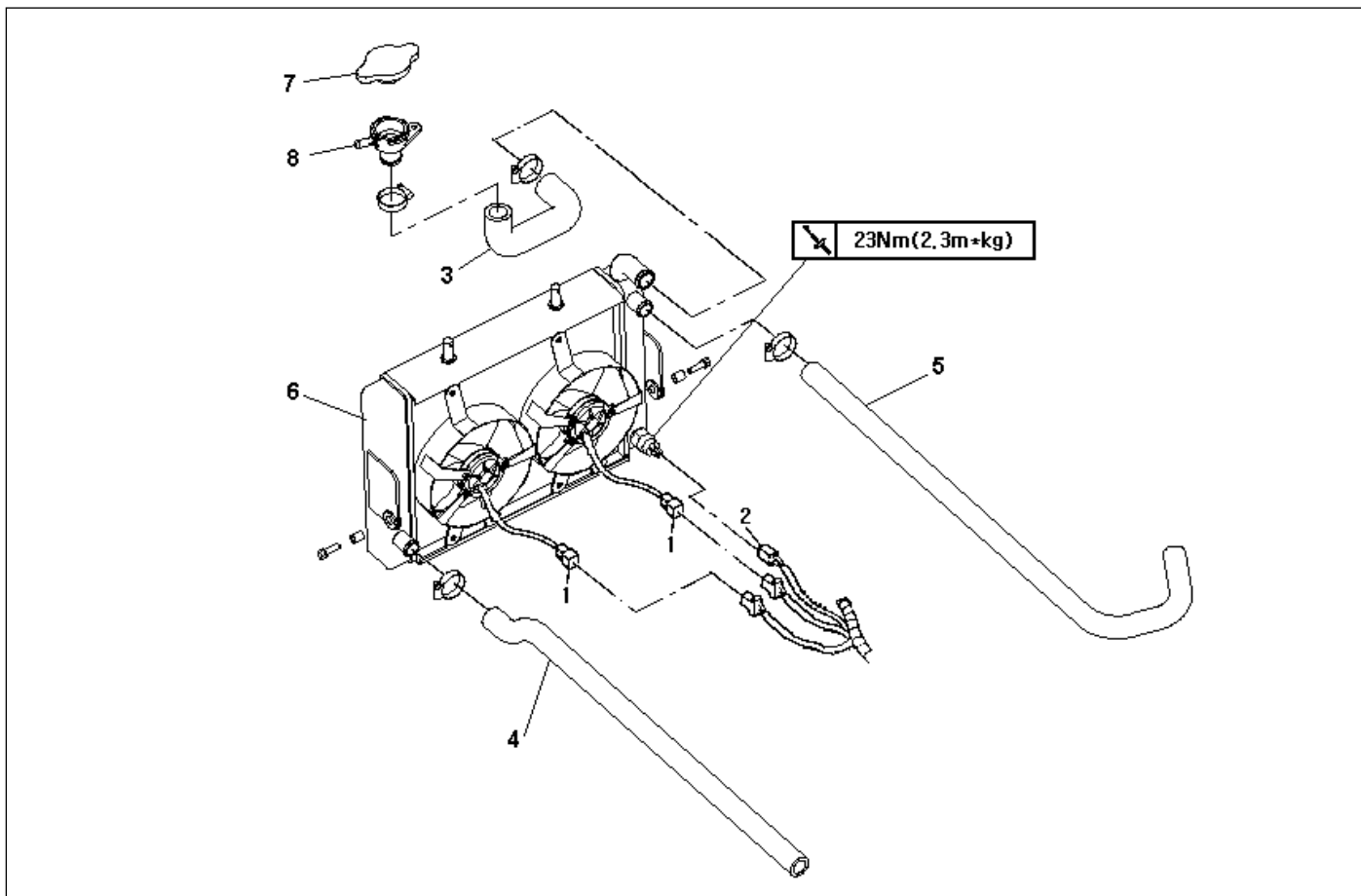
**NOTE:**

Install the timing chain not to be seen through the crankshaft hole<sup>a</sup> on the crankcase (left)<sup>②</sup>.



**3.11 COOLING SYSTEM**

**3.11.1 RADIATOR**



Order	Job name/ Part name	Q'ty	Remarks
	<b>Radiator removal</b> Drain the coolant.		Remove the parts in order. Refer to "COOLANT REPLACEMENT" section.
1	Fan motor leads	2	
2	Thermo switch leads	2	
3	hose (radiator)	1	
4	Outlet hose (radiator)	1	
5	Inlet hose (radiator)	1	
6	Radiator	1	
7	Radiator cap	1	
8	Radiator filler neck	1	
			Reverse the removal procedure for installation.

**INSPECTION**

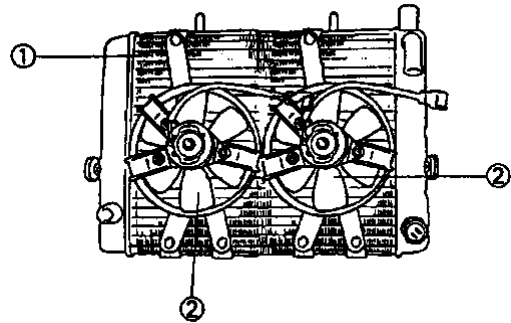
1. Inspect:

- Radiator ①

Obstruction → Blow out with compressed air through the rear of the radiator.

Flattened fins → Repair or replace.

If flattened over the 20% of radiator fin, repair or replace the radiator.



**CAUTION:**

Use only specified adhesive to repair the radiator.

2. Inspect:

- Radiator hoses


- Radiator pipes

Cracks/damage → Replace.

3. Measure:

- Radiator cap opening pressure

●Radiator cap opens at a pressure below the specified pressure → Replace.

	<p><b>Radiator cap opening pressure:</b>  <b>110-140kPa</b>  <b>(1.1-1.4kg/cm<sup>2</sup>, 1.1-1.4 bar)</b></p>
---	---

Measurement steps:

- Attach the radiator cap tester ① and adapter ② to the radiator cap ③.

●Apply the specified pressure for 10 seconds, and make sure there is no pressure drop.

4. Inspect:

- Fan motor assembly

Damage → Replace.

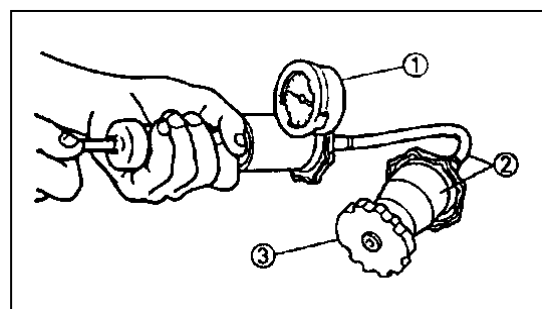
Malfunction → Check and repair.

Refer to "COOLING SYSTEM".

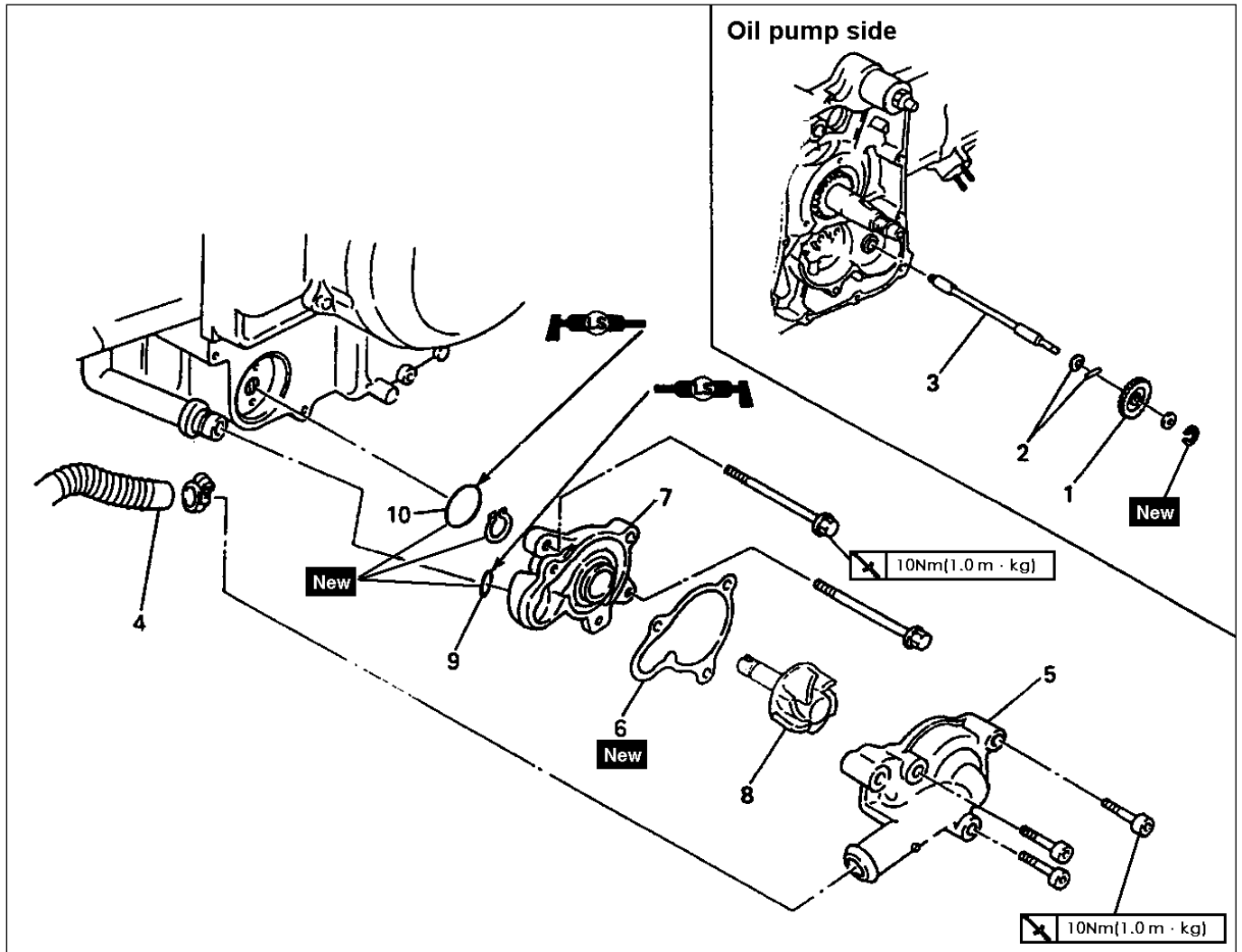
5. Inspect:

- Pipes

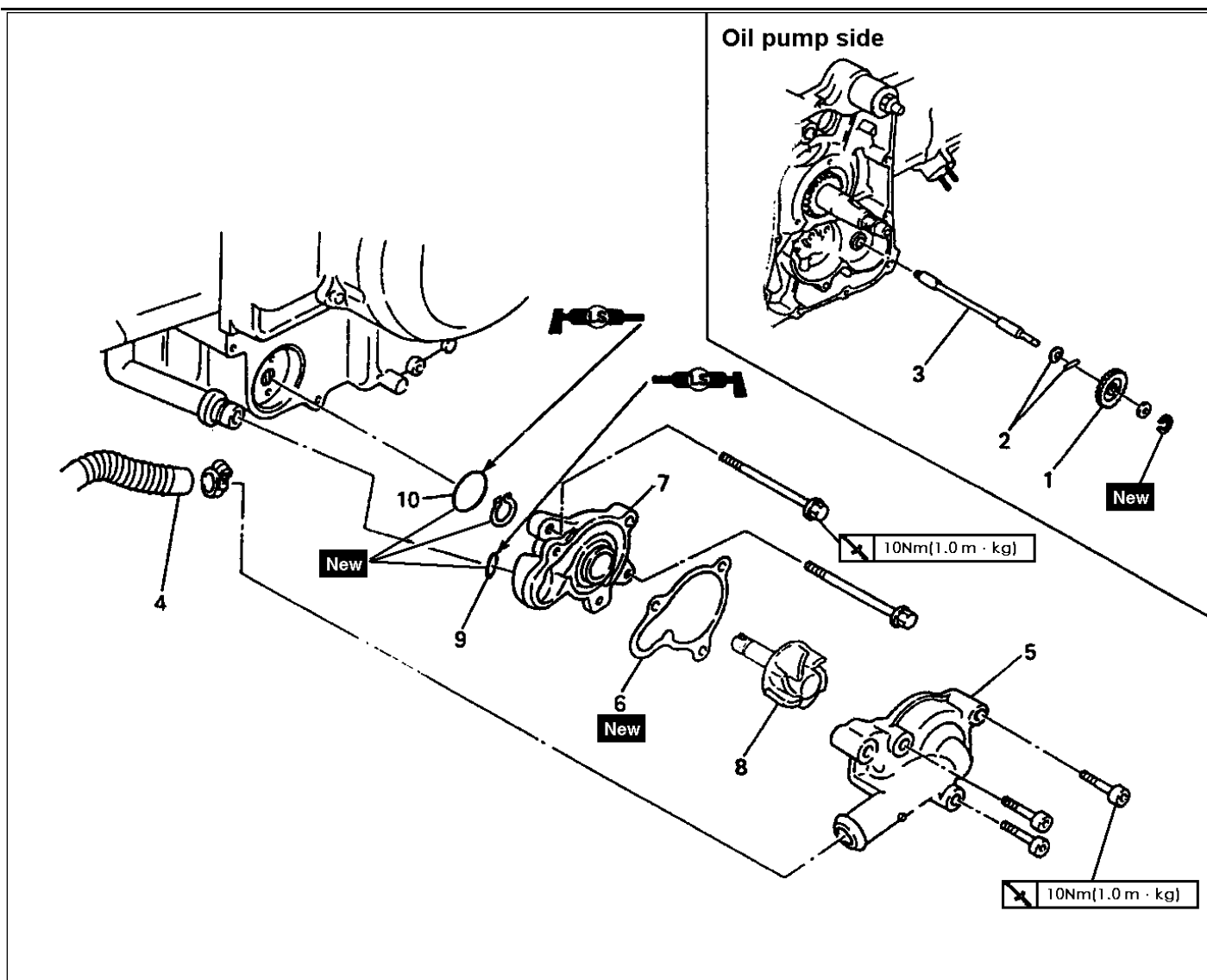
Cracks/damage → Replace.



3.11.2 WATER PUMP



Order	Job name/ Part name	Q'ty	Remarks
	Water pump removal Drain the coolant.		Remove the parts in order. Refer to "COOLANT REPLACEMENT" section.
	A.C. magneto		Refer to "A.C. MAGNETO AND STARTER CLUTCH" section.
1	Impeller shaft gear	1	
2	Dowel pin/plain washer	1/1	
3	Shaft	1	Refer to "WATER PUMP INSTALLATION" section.
4	Outlet hose (radiator)	1	
5	Housing cover	1	
6	Housing cover gasket	1	
7	Water pump housing	1	



Order	Job name/Part name	Q'ty	Remarks
8	Impeller shaft	1	Refer to "WATER PUMP INSTALLATION" section.
9	O-ring	1	
10	O-ring	1	



**NOTE:**

●It is not necessary to disassemble the water pump, unless there is an abnormality such as excessive change in coolant temperature and/or level, discoloration of coolant, or milky transmission oil.

●If necessary, replace water pump as an assembly.

**INSPECTION**

1. Inspect:

●Impeller shaft

Wear/damage → Replace.

Fur deposits → Clean.

2. Inspect:

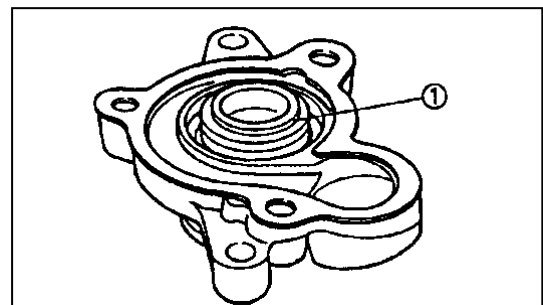
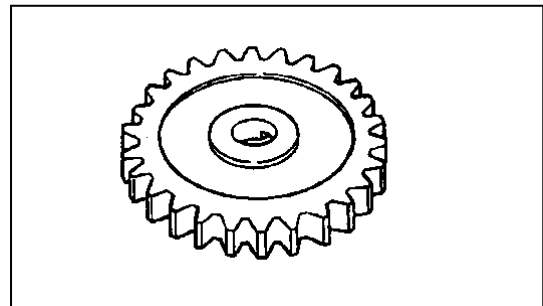
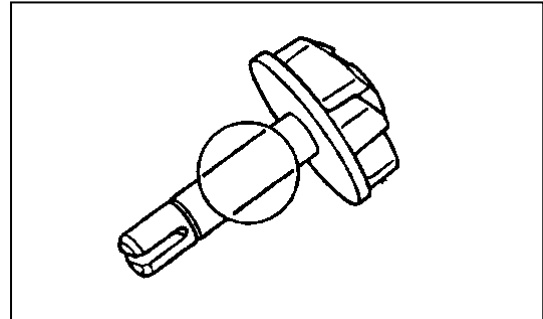
●Impeller shaft gear

Wear/damage → Replace.

3. Inspect:

●Mechanical seal ①

Damage/worn/wear → Replace.



**WATER PUMP INSTALLATION**

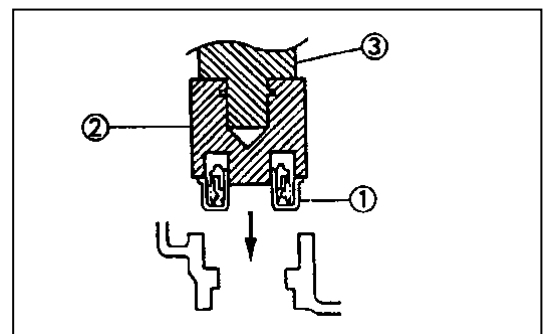
1. Install:

●Mechanical seal ① **NEW**

**Installation steps:**

●Apply the bond to the outside of the mechanical seal.

●Install the mechanical seal by using the mechanical seal installer ② and middle shaft bearing driver ③



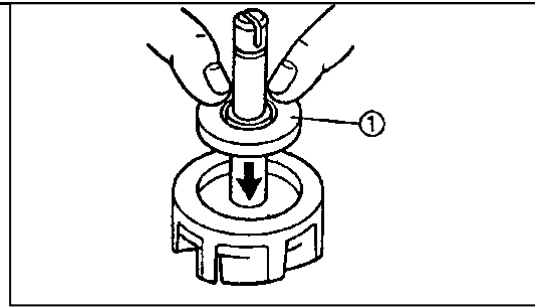
2. Install:

●Mechanical seal ① **NEW**

Apply coolant to the outside of the mechanical seal before installing.

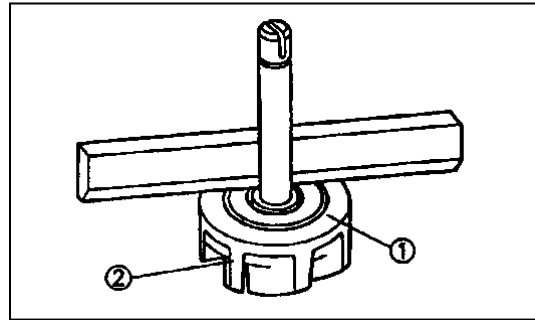
**NOTE:**

Do not smear any oils or grease on the ring side of the mechanical seal.



3. Inspect:

- Mechanical sea , slip ring side ①
- Inspect the slip ring side of the mechanical seal and the impeller ② for level installation.  
Incorrect level → Reinstall.



4. Install:

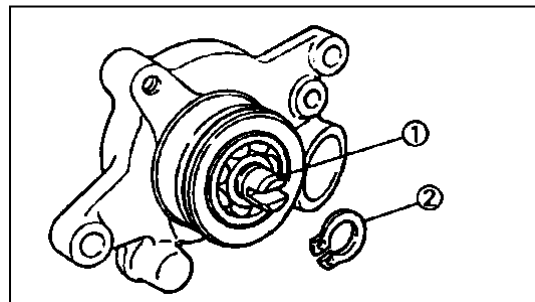
- Impeller shaft①
- Circ lip ② **NEW**

**Installation steps:**

- Apply a small amount of grease to the impeller shaft tip.
- Install the impeller shaft while turning it. Use care so that the oil seal is not damaged or the spring does not slip off its position.

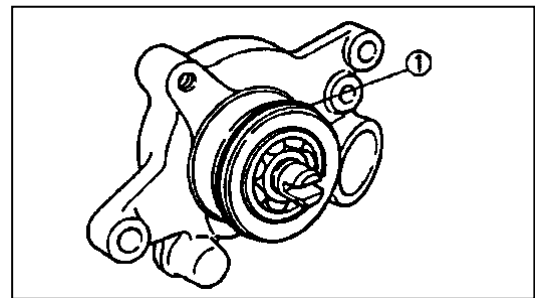
**NOTE:**

After installing the impeller shaft, check it for smooth rotation.



5.Install:

- O-ring①**NEW**

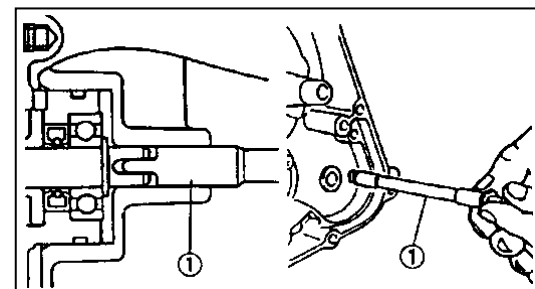


6. Install:

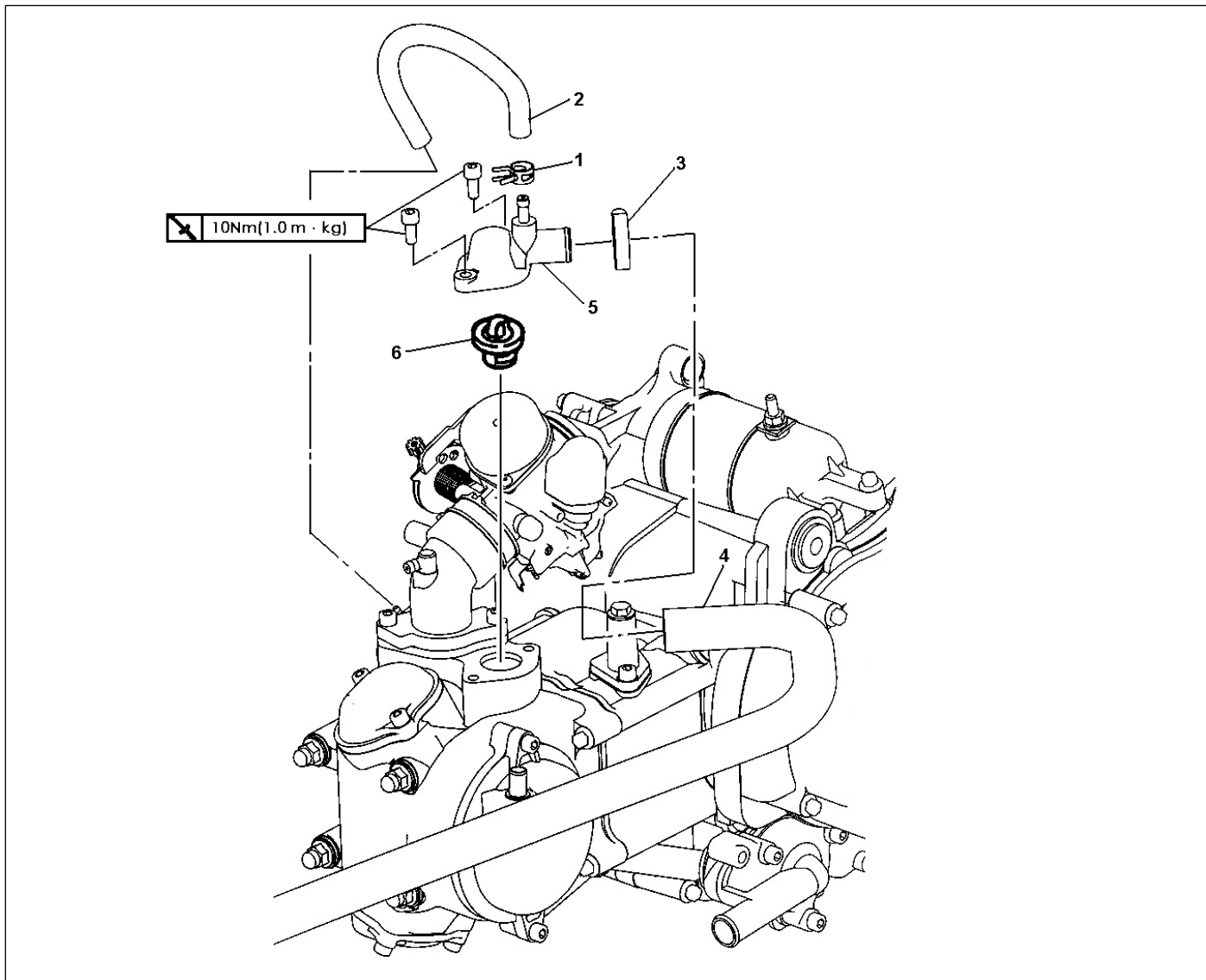
- Water pump housing
- Housing cover 10Nm(1.0m·kg)

7. Install:

- Shaft①
- Align the slot on the impeller shaft with the projection on the shaft when installing.



3.11.3 THERMOSTAT



Order	Job name/ Part name	Q'ty	Remarks
	<b>Thermostat removal</b> Drain the coolant		Remove the parts in order. Refer to "COOLANT REPLACEMENT" section.
1	Clip	1	
2	Hose	1	
3	Hose clamp	1	
4	Inlet hose (radiator)	1	
5	Thermostatic cover	1	Refer to "THERMOSTAT INSTALLATION" section.
6	Thermostatic valve	1	Reverse the removal procedure for installation.

**INSTALLATION**

1. Inspect:

- Thermostatic valve

Valve does not open at 70.5-73.5°C → Replace.

**Inspection steps:**

- Suspend the thermostatic valve in a vessel.
- Place a reliable thermometer in water.
- Observe the thermometer, while continually stirring the water.

① Thermostatic valve

② Vessel

③ Thermometer

④ Water

**A** CLOSE

**B** OPEN

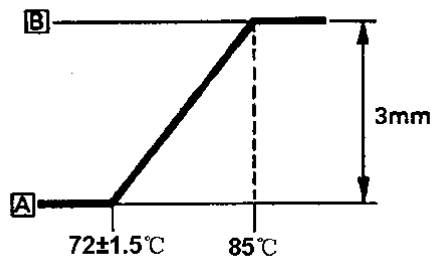
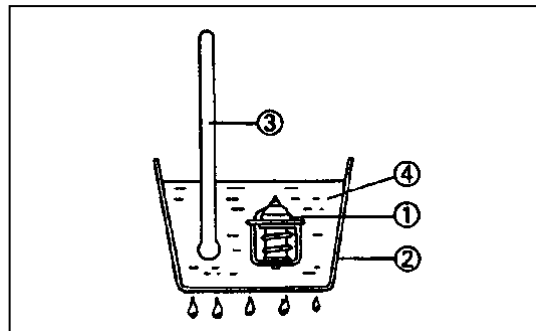
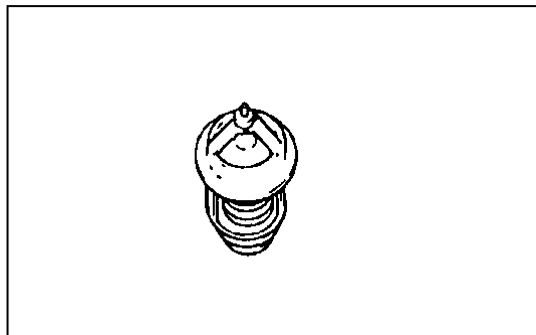
**NOTE:**

The thermostatic valve is sealed and its setting requires specialized work. If its accuracy is in doubt, replace. A faulty unit could cause serious over-heating or over cooling.

2. Inspect:

- Thermostatic cover

Cracks /damage → Replace.



**INSTALLATION**

1. Install:

- Thermostatic valve
- Thermostatic cover

3.12.1 ECU

3.12.1 .1 Description & Working Principle

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

3.12.1 .2 Appearance

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



3.12.1 .3 Handling – DOs & DONTs

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

3.12.1 .4 Installation requirements

The ECU shall be mounted using M5 machined screws with a torque of 3.9Nm ±10%. The

mounting surface should also be flat to avoid subjecting the base plate to unnecessary force and warping the PCB.

### 3.12.1 .5 Power Requirements

- Power Supply: The controller's power supply module will power up the microprocessor if the battery voltage is greater than 6.3 Volts. The power on is controlled by the controller hardware only.
- Operating Range: All planned functions are executed in this range. Battery and/or Ignition voltage: 9.0 to 16V DC
- Power Off: The controller will turn its power off when the ignition voltage: < 6.2 V DC. The controller prepares for entry into Power Down mode. The preparation involves storing important information into EEPROM.
- Reset: During reset, all outputs shall be set to a predefined state. The controller shall monitor itself for proper operation and enter reset should any internal errors be detected. The controller shall then restart normal operations after the computer has properly reset
- Over Voltage: the controller will survive no permanent damage if the ignition voltage do not exceed 26V for more than 1 minute
- Reverse Voltage: The controller will survive with no permanent damage: Battery and/or Ignition voltage < -13V DC for 1 minute

### 3.12.1 .6 Temperature Requirements

- Storage: The controller shall suffer no damage as a result of being stored at temperatures of -40 °C or +105 °C continuously for 168 hours. If the storage temperature is not as extremely high as +105 °C or as extremely low as -40 °C, the ECU could be stored for longer time without damage.
- Operating: The controller shall operate in the ambient temperature from -20 °C to +85 °C.

### 3.12.1 .7 Maintenance service and Repair

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

## 3.12.2 INJECTOR

### 3.12.2.1 Appearance

The figure below shows the standard Multec 3 Fuel Injector appearance



### 3.12.2.2 Sealrings

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

#### Injector to fuel rail seal ring

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

#### Injector to manifold

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

### 3.12.2.3 Sealrings replacement

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

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

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

### 3.12.2.4 Lubricant Recommendation

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

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

**3.12.2.5 Over -Voltage**

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

**3.12.2.6 Temperature Requirements :**

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

- Normal Operating Temperature Range: - 30 to 125°C
- Extreme Operating Temperature Range (some performance degradation): - 40 to 150°C
- Storage Temperature Range: -60 to 60°C

**3.12.2.7 Fuel Contamination**

The injector fuel inlet filter protects the fuel injector from initial build fuel contamination as well as from fuel system assembly contamination. Filtration is extremely important because particle contaminants can cause an injector to stick open, flow shift or tip leak.

The injector inlet filter is not a serviceable component and is designed only to trap potential built-in contamination between the chassis fuel filter and injector.

**3.12.2.8 Wire Routing**

- Electrical wiring to the injector should be routed so that conductors are protected from excessive heat, damage, and wear.
- Avoid unnecessary handling (disconnecting and connecting) of the electrical



connector.

3.12.2.9 Handling - DOs & DONTs

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

reseat injector valves.	false leakage.
<b>DO:</b> Avoid any liquid contamination in the injector area.	Coil could short circuit.
<b>DO:</b> Use care during connection of harness to injector.	Avoid terminal damage.
<b>DO:</b> Use recommended terminal lubricant on mating connector.	Minimize potential for terminal fretting corrosion.
<b>DO:</b> Return any dropped, damaged, or suspect material with a tag that describes the problem.	Ensure fast and correct diagnosis of root cause.

**3.12.2.10 Installation guide lines**

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

- Lubrication: Apply a light coating of lubricant to the lower injector seal ring. ISO 10 light mineral oil or equivalent is recommended.
- The preferred technique is to apply the lubricant to the sockets the injectors are being installed into, rather than directly to the seal ring itself. This will help minimize the possibility of injector contamination.
- Avoid applying lubricant over the director plate holes – this may restrict injector flow. Do not dip the injector tip in lubricant.
- All Multec 3 and Multec 3.5 injectors come from the factory with the seal rings attached. The re-use of seal rings is not preferred when replacing an injector. If an injector is to be re-used, and no new seal rings are available, take care to inspect each seal ring for signs of damage. Even minor defects in the seal ring can lead to leakage. Take extra care in installing seal ring over flange of injector inlet.
- Carefully installing the harness connector will prevent terminal damage. Listen for a positive audible click from the connector retention device — this ensures that it is fully engaged.
- Avoid unnecessarily disconnecting/reconnecting the harness connector.
- Wires routed in a manner that can allow them to become pinched between components can result in a short circuit and a stuck open injector.
- For injectors that require orientation for spray pattern, do not rotate the injector in the fuel rail assembly to install the injector electrical connector. This may dislodge the retaining clip, and result in improper spray orientation

**3.12.2.11 Replacement Techniques**

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

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

- Shut off ignition.
- Disconnect negative battery cable to avoid possible fuel discharge if an accidental attempt is made to start the engine.
- Disconnect the electrical connector from the injector wiring harness.
- Relieve fuel pressure
- Remove the retaining clip from the fuel injector.
- Remove the fuel line connection from the injector
- Carefully clean debris from the interface surfaces. Do not damage seal mating

surfaces.

- Remove the injector from the manifold
- Apply a light coating of a lubricant to both the upper and lower injector seal ring of the replacement injector.
- Install the new injector into the manifold. Check that the injector is installed in the original orientation to maintain proper spray targeting, and that the retaining clip is properly seated on the injector and the fuel line
- Install the retaining clip after connecting the fuel line
- Tighten the injector mounting to the desired torque as mentioned in the manufacturer manual
- Tighten the fuel line
- Re-install the injector electrical connector
- Check for fuel leaks with the key "on" and the engine "off"
- Start engine and verify proper operation

#### 3.12.2.12 Interchange ability

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

#### 3.12.2.13 Plugging

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

- Plugging can cause flow restrictions, frictional changes and the collection of other particles attracted by the tacky surface. The flow restrictions can degrade emissions and drivability.
- Other fuel and environmental conditions may cause crystal or corrosion growth in the injector and cause a flow shift.
- Oxidation stability of the gasoline affects the potential for deposit formation and must be controlled by the fuel supplier.
- Increased levels of detergent additives reduce the rate of injector plugging.
- In case of plugging of injector follow the injector cleaning procedure mentioned in the section below

#### 3.12.2.14 Cleaning Procedure

- Electrically disable the fuel pump by removing the fuel pump connection.
- Relieve the fuel pressure in the system and disconnect the fuel connection at the injector. Plug the fuel feed line.
- Injector cleaner with the specific ratio of the cleaner and gasoline to be mixed in the Injector cleaning tank.
- Connect the injector-cleaning tank to injector in the vehicle.
- Pressurize the injector-cleaning tank to system pressure.
- Start and idle the engine for 15- 20 minutes.
- Disconnect the injector-cleaning tank from the system and install the fuel pump connections. Connect the fuel feed line to injector.
- Start and idle the vehicle for an additional 2 minutes to ensure the residual

injector cleaner is flushed from system.

### 3.12.3 Throttle Body Assembly (with stepper motor )

#### 3.12.3.1 Description and Working Principle

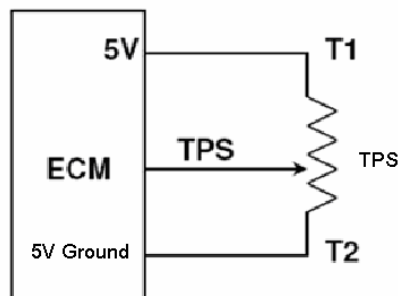
The Throttle Body Assembly is an interactive system comprised of the following subsystems: the main casting body, bearing system, shaft and valve system, return spring system, cable interface system, throttle position sensing system, and the bypass air control system. The subsystems interact and support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

- Control intake air flow
- Control idle air flow
- Sense throttle position - Provide position feedback to Engine Controller
- Provide reactionary force to the throttle

#### 3.12.3.2 Technical Parameters

Throttle Position Sensor:

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



Idle Air Control Valve:

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

#### 3.12.3.3 Operating Conditions

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

#### 3.12.3.4 Throttle Body Removal

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

#### 3.12.3.5 Cleaning Procedure

Once the throttle body cover is removed, spray the throttle-body cleaner inside the shipping air passage, and use the brushes to gently dislodge the dirt, gum and varnish that are present. Do not let the by pass

holes be blocked by dirt or foreign particles.

**3.12.3.6 Throttle Body Installation**

Reverse the procedure for installation noting the following:

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

**3.12.3.7 Precautions**

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

**3.12.3.8 Handling - DOs & DONTs**

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

dirt or foreign particles.	
<b>DO NOT:</b> Rake, stage, or handle parts in a manner that allows contact between parts.	Damage will occur.

### 3.12.4 Engine Coolant Temperature Sensor

#### 3.12.4.1 Description and Working Principle

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

#### 3.12.4.2 Appearance



#### 3.12.4.3 Installation Requirements

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

□□Minimum: 20 N·m

□□Maximum: 25 N·m

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

#### 3.12.4.4 Operating Environment

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

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

□□Relative Humidity: 0 to 100% RH.

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

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

#### 3.12.4.5 Storage Environment

- Storage temperature: -40°C to 120°C for an indefinite duration
- Transport at altitudes to: 13,700 m for an indefinite duration

#### Electrical Environment

- Typical Voltage: The sensor circuit operates with a DC voltage reference of  $5 \pm 0.1$  VDC.
- Maximum Excitation Current: The sensor calibration shall not be affected by a current source of less than 1 mA at all temperatures.

#### 3.12.4.6 Sample Cleaning

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

### 3.12.5 Intake Air Pressure and Temperature Sensor(MAP&MAT)

#### 3.12.5.1 Description and Working Principle

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

#### 3.12.5.2 Appearance



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

#### 3.12.5.3 Operating Environment

- This device is intended for use in inlet manifold for sensing air temperature and pressure which shall withstand such an under hood environment.
- Pressure Range: 20~102kPa
- Temperature Range: -40~105°C
- Relative Humidity: 0 to 100% RH.
- Extreme Operating Environment: Maximum temperature excursion to 125°C for 2 hours.

#### 3.12.5.4 Storage Environment

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

### 3.12.5.5 Electrical Environment

- Typical Voltage: The sensor circuit operates with a DC voltage reference of  $5 \pm 0.1$  VDC.

### 3.12.5.6 Sample Cleaning

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

## 3.12.6 Oxygen Sensor

### 3.12.6.1 Description and Working Principle

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

### 3.12.6.2 Appearance

The appearance of the Engine Oxygen Sensor is shown as below



### 3.12.6.3 Technical Parameters

- A/F ratio rich threshold:  $>750$  mVDC
- A/F ratio lean threshold:  $<120$  mVDC
- Heater power: 7.0W

(These parameters as above are measured basing on 450°C (engine dyno), typically on 70% duty at 10Hz and under 13.5V)

- Heater part resistance:  $9.6 \pm 1.5 \Omega$
- (This parameter is measured basing on 21°C)
- Operating temperature range: 260-850 °C

### 3.12.6.4 Fuel Quality Requirements

- Pb  $\leq 0.005$ g/L
- P  $\leq 0.0002$ g/L
- S  $\leq 0.04\%$  (weight proportion)x
- MMT  $\leq 0.0085$ g/L



□□Si≤4ppm

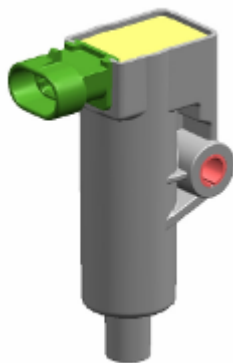
### 3.12.7 Ignition Coil

#### 3.12.7.1 Description and Working Principle

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

#### 3.12.7.2 Appearance

The appearance of the Ignition coil is shown as below.



#### 3.12.7.3 Technical Parameters

- Input voltage: 9~14VDC
- Output voltage: ~25~30KV
- Operating temperature: -30 ~110 °C
- Storage temperature: -40~155°C
- Mounting Torque: 8.8~11.8Nm

#### 3.12.7.4 Installation requirements

- The vehicle frame provides the mounting surface and mounting holes.
- Mount coil close to the spark plug and keep the plug wire length very short (less than 6 “).
- Mount coil away from any pick coil device. Especially, a VR type Crank / Cam sensor. Keep a Min distance of 150 mm (around 6”) between coil and any VR sensor device.
- Never route the coil C- wire with the same bundle as the Crank sensor wires. There is around 200 V peak potential between C- wire and engine ground. This voltage potential could cause a noise on sensor cables.

#### 3.12.7.5 DOs and DONTs

ACTION	REASON
<b>DO NOT:</b> Install the low voltage connectors with the power applied	This might cause an unwanted secondary firing, possibly leading to personal injury
<b>DO NOT:</b> Use a screw driver to asset in removing secondary boots from the secondary tower. Use	It is possible to damage a secondary lead in such a manner that creates an electrical path to outside the

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

	damage the ignition component, and test equipment
<b>DO:</b> Take care when working around the ignition system.	The high voltage produced by the coil secondary circuit can cause personal injury and/or damage test equipment
<b>DO:</b> Proper handling and shipping methods need to be in place to reduce the risk of damage due to impact, moisture, or contamination	Damaged components can lead to premature failure.
<b>DO:</b> Avoid unnecessary disconnecting and connecting of the electrical components.	The electrical connections are not designed for repeated connection and disconnection.
<b>DO:</b> Insure the low voltage connectors are entirely seated and the locking mechanism is engaged.	This prevents intermittent electrical connections leading to an improper ignition system operation.
<b>DO:</b> Use approved connector breakouts when testing the ignition system.	Connector and/or component damage may occur.
<b>DO:</b> Insure the appropriate seals are included in the connector system.	Liquid intrusion into the terminal connection area might occur causing an electrical intermittent or short condition. In the event of severe terminal corrosion, an open condition might occur.
<b>DO:</b> Operate with gasoline based internal combustion engines.	Other fuels or combustion designs may require additional design considerations
<b>DO:</b> The power feed line should be fused.	This could protect the system in the event of an electrical short
<b>DO:</b> The module heat sink and back plate must not be used as a connection point when jump starting the engine	The high level of voltage and current which the module could be subjected to, could cause module performance degradation or failure.
<b>DO:</b> Connection of the module back plate to vehicle ground is desirable whenever possible	This greatly reduce potential ground loops and acts as a heat transfer source from the module.
<b>DO:</b> The ignition system ground wire should be kept as short as possible. And, when permissible, should be grounded at the same engine block position as the engine controller	This would greatly reduce the possible of unwanted electrical ground loops.
<b>DO:</b> The electrical wiring to the ignition system should be routed so that the conductors are protected from excessive heat, damage, and wear.	Helps prevent electrical intermittent, open or shorted operating conditions.
<b>DO:</b> Ignition secondary leads should not be routed with the ignition primary harness or any other electrical harness.	Voltage spikes can be transmitted from the secondary cables into other leads which are in close. This could create a component performance degradation or failure condition
<b>DO:</b> Spark plug wires(secondary leads) & primary wiring: - must not contact sharp surface - must not be under tension between fixed points - must be clear of moving parts (belts, fan, etc...)	- Spark plug wires carry very high voltage (30,000 volt). If the secondary lead loses its dielectric characteristics thru being nicked, cut , chaffed, then an arc thru to a near by ground could take place. This

<ul style="list-style-type: none"> <li>- must be protected from or kept at least 125 mm away from radiant heat source exceeding 400 F.</li> <li>- must be protected from environmental damage (dirt, splash, oils, fluids, etc....)</li> <li>- must be retained, secured or insulated to prevent pinching, mis-routing, rattles, and squeaks</li> </ul>	<p>kind of condition could lead to misfire, no start, or premature failure of ignition system.</p>
<p><b>DO:</b> Not all fasteners are designed for repeat use. Beware of fastener specifications. All harnesses should be supported within 6" of a mating connection.</p>	<p>Adequate retention force might not be achieved if the fastener is not designed to be reused. Mating connections are not designed to support the weight of the harness assembly</p>
<p><b>DO:</b> For removing spark plugs follow the following steps:</p> <ol style="list-style-type: none"> <li>1- Grasp the spark plug boot and gently rotate 90°; and then pull the spark plug boot and cable away from the spark plug</li> <li>2- Before removing spark plug, brush or air blast dirt away from the well areas</li> <li>3- Use correct size deep socket wrench to loosen each spark plug one or two turns</li> </ol>	<p>To remove spark plugs from Aluminum heads, allow the engine to cool. The heat of the engine, in combination with a spark plug that is still hot, may cause the spark plug threads to strip the cylinder head upon removal</p> <p>Use goggles to protect eyes from dirt when applying compressed air to spark plug wells</p>
<p><b>DO:</b> Cleaning a spark plug could be done as follow:</p> <ol style="list-style-type: none"> <li>1- wipe all spark plug surfaces clean....remove oil, water, dirt and moist residues.</li> <li>2- If the firing end of spark plug has oily or wet deposit, brush the spark plug in an approved, non-flammable and non-toxic solvent. Then dry the spark plug thoroughly with compressed air</li> <li>3- Use a propane torch to dry wet-fuel fouled plugs. Allow the torch flame to enter up the center electrode insulator. Allow plug to cool down</li> <li>4- If the spark plug threads have carbon &amp; scale deposits, clean with wire brush, taking care not to injure the electrode or the insulator tip</li> </ol>	<ul style="list-style-type: none"> <li>- Cleaning a spark plug will reduce the voltage required for an electrical arc(spark) across the electrodes</li> <li>- Cleaning &amp; re-gapping will not restore a used spark plug to a new condition. It may be more economical and efficient to replace used spark plugs with new plugs instead of cleaning.</li> <li>- Sooted plugs should be replaced</li> <li>- Do not cool by using water or any liquid</li> <li>- Clean threads permit easier installation and proper seating which will maximize transfer heat away from the plug</li> </ul>
<p><b>DO:</b> Regap spark plugs to the exact measurement specified by the engine manufacturer to keep the best fuel economy and proper engine performance</p> <ul style="list-style-type: none"> <li>- Use round wire-type gauge for an accurate measure of gap on all used spark plugs</li> <li>- when gapping a spark plug only the side electrode is moved. The center electrode must not be moved</li> </ul>	<ul style="list-style-type: none"> <li>- Too wide a gap could cause the plug to misfire(higher required ignition voltage).</li> <li>- Too narrow of a gap could affect idle stability</li> <li>- A flat gauge can't accurately measure the spark plug on used plugs</li> </ul>
<p><b>DO:</b> When replacing spark plugs with new ones, always use equivalent plugs with same heat range, thread, size, etc....</p>	<ul style="list-style-type: none"> <li>- Higher heat range plug(hotter plug) could lead to pre-ignition &amp; possible piston damage</li> <li>- Lower heat range (colder plug) could lead to cold fouling &amp; emission problem</li> </ul>

<p><b>DO:</b> For installing spark plugs follow the following steps:</p> <p>1- make sure the cylinder head threads and spark plug threads are clean. Make sure the spark plug thread is free of dings and burrs. If necessary, use a thread chaser and seat cleaning tool.</p> <p>2- Make sure the spark plug gasket seat is clean, then thread the gasket to fit flush against the gasket seat. Tapered seat plugs do not require gaskets</p> <p>3- Screw the spark plugs finger-tight into the cylinder head. Then, use a torque wrench to tighten spark plugs following manufacturer's recommendation).</p> <p>Torque is different for various plug type &amp; cylinder head material</p>	<ul style="list-style-type: none"> <li>- If the thread is damage, it prevents a good heat transform from the shell to the cylinder head</li> <li>- Do not use any type of anti-seize compound on spark plug threads. Doing this will decrease the amount of friction between the threads. The result of the lowered friction is that when the spark plug is torqued to the proper specification, the spark plug is turned too far into the cylinder head. This increases the likelihood of pulling or stripping the threads in the cylinder head</li> <li>- Over-tightening of a spark plug can cause stretching of the spark plug shell and could allow blowby to pass thru the gasket seal between the shell and insulator. Over-tightening also results in extremely difficult removal</li> </ul>
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### 3.12.8 Fuel Pump Module

#### 3.12.8.1 Description and Working Principle

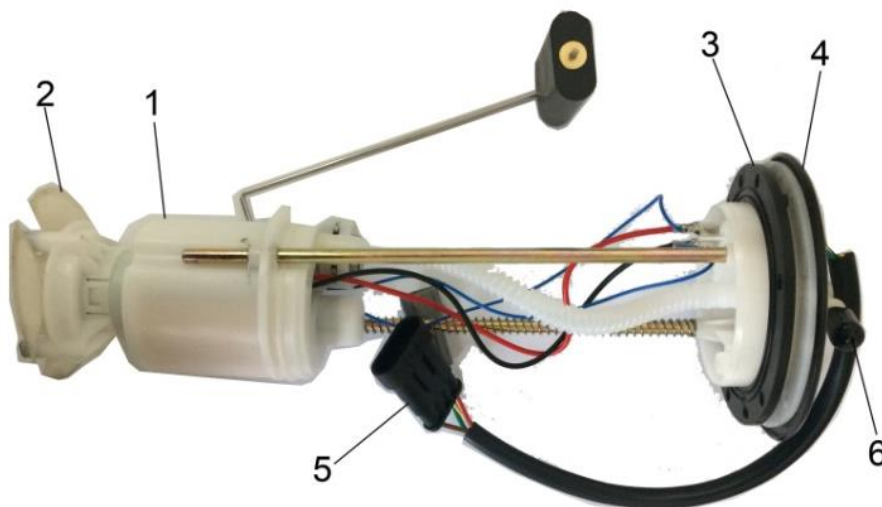
Fuel Pump Module supplies fuel to engine at system pressure. Fuel Pump Module is mounted to fuel tank at bottom and supplies fuel to engine through hoses.

Fuel Pump module consists of Fuel Pump to generate the fuel flow and pressure regulator to regulate the fuel pressure.

#### Fuel Pump

When power is supplied to fuel pump, motor in pump assembly rotates the impeller. Impeller in turn draws the fuel from strainer and pumps the flow to generate the system pressure.

#### 3.12.8.2 Appearance & Components of Fuel Module



1. Fuel Pump      2. Strainer      3. Gasket, Fuel Module

4. Module Bracket      5. Module Harness      6. Fuel Tube (out pump)

**3.12.8.3 Dimensions**

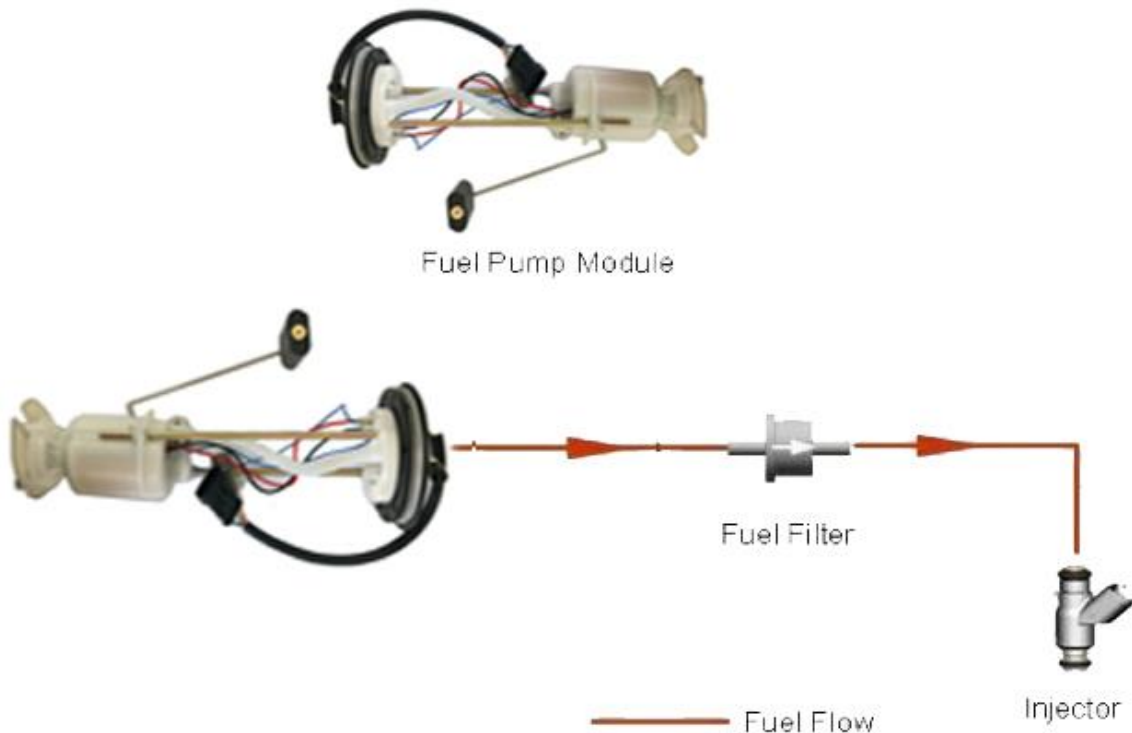
Fuel Module Cover in elliptical shape with outer edge dimensions as 115mm x 65mm.

**3.12.8.4 Identification and Markings**

Fuel Module, Fuel Pump and Regulator are marked with batch code in Julian Date Code.  
 On Fuel Module, batch code in mentioned on the label available on fuel module cover.  
 On Fuel Pump Batch code is engraved on pump body (shell).  
 On Fuel Pressure Regulator, batch code is engraved on regulator dome area.

**3.12.8.5 Operating Conditions**

- ☐☐ Fuel Pump Module needs to be mounted on Fuel Tank Bottom according to the installation instructions.
- ☐☐ Fuel Pump Module is intended to use with gasoline. However if the fuel contains ethanol, please contact vehicle manufacture to check whether the fuel pump module itself can survive or not.
- ☐☐ Make sure there is at least 3 liters of gasoline in the fuel tank before priming for first time (do not run the pump dry).
- ☐☐ Fuel Hose connections needs to be installed according to the fuel flow diagram shown.  
 Fuel Flow Description in vehicle fuel system.



**3.12.8.6 Service Procedure**

Precautions:

Before attempting any service on fuel system, following cautions should be always followed for personal safety and to avoid system damages.

- ☐☐ Disconnect negative cable at battery.
- ☐☐ DO NOT smoke, and place 'No SMOKING" sign near work area.
- ☐☐ Make sure to have fire extinguisher handy.
- ☐☐ Make sure to perform work in well ventilated area and away from any open fire/flames.
- ☐☐ Wear Safety glasses.

- To relieve fuel vapor pressure in fuel tank, remove fuel filler cap fuel filler neck and then reinstall it.
- As fuel lines are at high pressures when the engine is stopped, loosening or disconnecting fuel line will cause dangerous spout of fuel. Before loosening/disconnecting fuel lines, please follow the “Fuel Pressure Relief Procedure” described in this section.
- Small amount of fuel may drip after the fuel lines are disconnected. In order to reduce the risk of personal injury, cover the pipe/ hose ends with suitable blind with no rust or contamination.
- After servicing, make sure that the fuel hoses and clamps are connected according to the hose fitment instructions given in vehicle instruction manual.
- After servicing, please follow the ‘Fuel Leakage Check Procedure’ described in this section.
- After servicing make sure to fill at least 3 liters gasoline before pump is primed (ignition key should be turned on only after ensuring there is minimum 3 liters of fuel in the fuel tank).

**3.12.8.7 Fuel Module Diagnosis:**

Step	Action	Yes	No
1	Switch on Ignition key. Fuel Pump primes for 3 seconds when the ignition key is ON. Check for fuel pump running noise for 3 seconds after ignition key is ON.	If fuel pump running noise can be heard, go to step 4.	If fuel pump running noise can not be heard, go to step 2.
2	Disconnect fuel module coupler. Check voltage at harness coupler. Is the voltage within 10-14V?	Go to step 3	Check the electrical circuit from Ignition to fuel module.
3	Connect 12V DC power supply (battery) to fuel module. Make sure that enough fuel available in fuel tank to avoid fuel pump running dry. Is the fuel pump running?	1. Check electrical circuit from fuel module to ECU 2. Check ECU	1. Check Fuel Pump Harness integrity 2. Check Fuel Pump
4	Check fuel system pressure at Injector inlet (with a T-joint) while engine is running in idle condition. Is the pressure between 220 ~ 270kPa?	Fuel Module Operation Normal	Go to Step 5
5	Is the Pressure below 220kPa?	1. Check for leakages from hoses, hose joints 2. Check Fuel Pump 3. Check Pressure Regulator	1. Clogged Filter 2. Kink/ Blockage in Fuel Hoses 3. Check Re

**3.12.8.8 Fuel Module Removal:**

- Relieve fuel pressure in fuel lines referring to the ‘Fuel Pressure Relief Procedure’ provided in this section.
- Disconnect negative cable at battery.

- Disconnect fuel module wire coupler.
- Drain the fuel in fuel tank thru fuel filler with help of hand pump (siphon). Collect the fuel in approved container for contamination and safety.
- Disconnect the fuel hoses from fuel module by using standard tools
- Remove the fuel tank from vehicle.
- Place the fuel tank with bottom up condition. Care to be taken not to cause any scratches/ damages on fuel tank.
- Open the fuel module mounting bolts.
- Take out fuel module assembly from fuel tank with care
- Care to be taken not to damage the strainer while removing fuel module from tank.

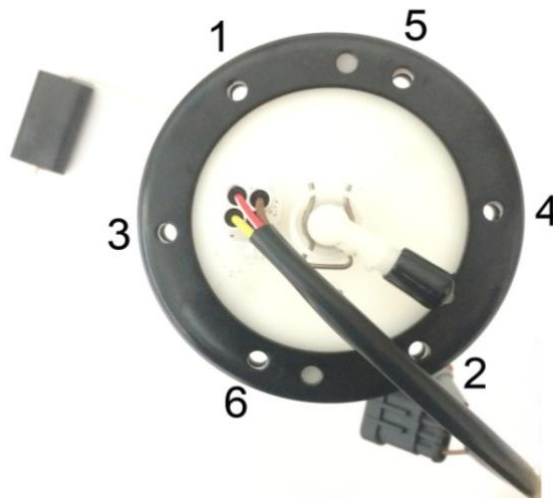
#### 3.12.8.9 Fuel Module Installation:

- Replace the fuel module gasket in fuel module assembly with a new one. Old/ used gaskets can cause leakages.
- Fold strainer towards fuel pump and insert fuel module in tank opening with care. Care should be taken not to cause any damages on strainer.

Fuel Module Orientation: Fuel module bolts not symmetrical and can be mounted only in the intended direction. Regulator side should be facing the Fuel Tank rear side.

Make sure that the fuel tank surface at module mounting area is clean and free of surface defects.

- Place the bolts on module cover and tighten the bolts gradually in star pattern sequence to apply equal compression on gasket. It is shown as below.



Bolt Tightening Torque: 4.4 Nm.

Fuel module is installed with special bolts (step bolts). Use designated bolts only.

Follow the tightening torque and tightening sequence instruction. Over torque and miss-sequence can cause unequal compression of gasket and leakage.

- Install the fuel tank to vehicle.
- Connect for fuel hoses with suitable hose clamps.
- Connect fuel module coupler
- Follow "Fuel Leakage Check Procedure" to check any leakage before the engine is started.

#### 3.12.8.10 Pressure Regulator Assembly Replacement:

- Remove the regulator retainer from module.
- Apply gradual pull force on retainer to avoid any personal injury due to spring action of



retainer.

- Take out the pressure regulator assembly from module.
- Do not hit/ damage on the regulator dome and crimping portion.
- Lubricate the O-rings in new pressure regulator assembly with recommended lubrication oils as mentioned in Table no: 3. Lubrication oil is applied only for ease of regulator assembly.
- Make sure that 2 O-rings (one is bigger diameter the other is smaller diameter) are assembled in pressure regulator.
- Place the pressure regulator on module at regulator pod. Push the regulator gently in the pod.
- Do not hit/ damage on the regulator dome and crimping portion. This will disturb the pressure setting.
- Assemble the retainer on the regulator pod
- Replace the gasket, module with new gasket provided in the kit.

**3.12.8.11 Fuel Pressure Relief Procedure:**

Caution: This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst (if equipped)

After making sure that engine is cold, relieve fuel pressure as follows.

- Place vehicle gear in 'Neutral'.
- Disconnect fuel module electrical coupler from vehicle harness.
- Start engine and run till it stops due to lack of fuel. Repeat ignition key ON and OFF for 2 ~ 3 times of about 3 seconds each time to relieve fuel pressure in lines. Fuel Connections are now safe for servicing.
- Upon the completion of servicing, Connect Fuel Module Connector to Vehicle Harness

**3.12.8.12 Fuel Leakage Check Procedure:**

After performing any service on fuel system, check to make sure that there are no fuel leakages as below.

- Fill about 3 ~ 5 liters of fuel in tank.
- Turn Ignition key to ON position for 3 seconds (to operate fuel pump) and then turn to OFF position. Repeat this for 3 ~ 4 times to apply fuel pressure in fuel lines.
- In this state, check to see that there are no fuel leakage from any part of fuel system (Fuel Tank, Hoses, Hose Joints, etc)

Handling – DOs and DONTs :

<b>ACTION</b>	<b>REASON</b>
<b>DO NOT:</b> Drop Fuel Module on Floor	Could cause internal damage to Fuel Pump.
<b>DO NOT:</b> Run Fuel Pump Dry (without fuel at pump inlet/ strainer) ensure atleast 3 litres of gasoline is present in the fuel tank	Caused internal damage to Fuel Pump
<b>DO NOT:</b> Damage the strainer during servicing, insertion of fuel module in fuel tank	Contamination enters fuel pump thru damaged strainer damages the Fuel Pump
<b>DO NOT:</b> Disassemble Fuel Pump and regulator internal parts out side Delphi premises.	Warranty void.

<b>DO NOT:</b> Do any adjustments on pressure regulator and pump except for replacement.	
<b>DO NOT:</b> Use module harness for hold/ carry fuel module. <b>DO NOT:</b> Pull Wiring Harness in vertical direction to module cover	Wiring Harness Breakage/ Fuel Pump Power disconnection
<b>DO NOT:</b> Use damaged/ distorted hose clamps	Can cause fuel seepage/ leakage.
<b>DO NOT:</b> Use Fuel Module if the strainer with excessive damage/ cut.	Contamination enters fuel pump thru damaged strainer damages the Fuel Pump
<b>DO NOT:</b> Use Fuel Pump for draining fuel in fuel tank.	Not intended function of fuel module
<b>DO NOT:</b> Use module mounting bolts for mounting other components.	Affects fuel module sealing.
<b>DO NOT:</b> Damage fuel pump harness while servicing fuel module.	Damaged terminals will cause intermittent/ No contact for power supply.
<b>DO NOT:</b> Force hand pump towards fuel module while draining fuel from tank.	To avoid any damages on fuel module
<b>DO :</b> Ensure that there are no damages to fuel pipes while servicing fuel module	Can cause fuel seepage/ leakage.
<b>DO:</b> Use genuine module gasket only.	Spurious gaskets can cause leakages
<b>DO:</b> Use designated hose clamps.	To ensure no leakages/ seepages thru hose joint.
<b>DO:</b> Clamp fuel module harness to vehicle chassis	Clamp provides mechanical support for wiring harness in vibrations.
<b>DO:</b> Use only standard gasoline for operating vehicle/ module	Fuel Module is intended to run in standard gasoline. Adulterated fuel can cause fuel module premature failures which are not covered under warranty.
<b>DO:</b> Change the fuel filter at recommended intervals.	Clogged fuel filter will cause restriction in fuel flow and can cause flow reduction.
<b>DO:</b> Use fuel filters supplied/ recommended fuel filters only.	Spurious fuel filters causes damages to injector, regulator and fuel pump performance.
<b>DO:</b> Ensure that the hoses are routed properly and there are no kinks / rubbing with other components.	Improper routing, kinks and fouling of hoses with other components causes hose damage
<b>DO :</b> Ensure that always sufficient fuel till the strainer height	Avoids Pump running in dry
<b>DO:</b> Replace two O-rings along with replacement/ re-installation of pressure regulator.	For proper functioning of regulator
<b>DO:</b> Use care during connection of harness to module coupler.	Avoid terminal damage.
<b>DO:</b> Return any dropped, damaged, or suspect material with a tag that describes the problem.	Ensure fast and correct diagnosis of root cause.

### 3.12.9 Diagnostic Tools

#### 3.12.9.1 Mot or Scanner ( for MT05 EMS)

##### 3.12.9.1.1 P r e c a u t i o n s

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

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

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

□□Never test electrical signals that exceed the limit of specifications.

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

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

Ambient temperature: 0~50°C

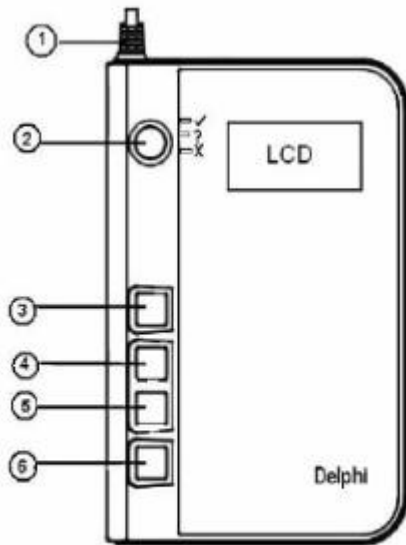
Relative humidity: <90%

##### 3.12.9.1.2 .C o n f i g u r a t i o n s

Delphi Motor scanner consists of 2 main part: the main units (with diagnostic main cable) and diagnostic connector link (one end is 6PIN connector; the other is the interface for connecting diagnostic main cable). They are shown in figure 34 as below.



#### Outline of Main Unit



Main Unit

The 6 PIN diagnostic connector link cable and USB type main unit's software update cable are in the delivered package.

1	Diagnostic Cable	To connect the unit and vehicle socket for diagnosis
2	reserved Key	The Key is reserved for future
3	[←] Key	To return to the previous interface.
4	[↑] Key	To move the cursor to upper item in the menu
5	[↓] Key	To move the cursor to down item in the menu
6	[↵] Key	To confirm and execute this operation.

Screen:

128×64 array high definition screen with back light for displaying all the information during testing.

Keyboard:

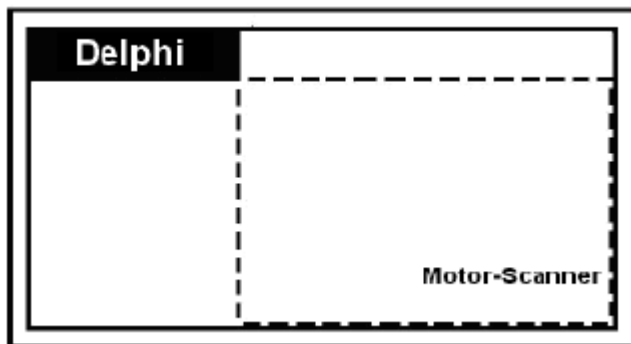
There are 5 keys (one is reserved) on the main unit for selecting and controlling test steps.

### 3.12.9.1.3 . Preparations Connection

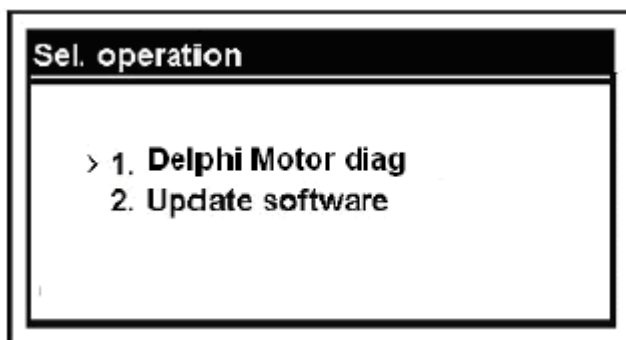
- Find the 6PIN diagnostic socket on the motor.
- Connect one end of the diagnostic main cable to the main unit, and the other end to diagnostic socket on the motor, tighten the screws.

Normal Powe r – on Display

When power is on normally, the unit will display:



Seconds later, the unit will display:



#### 3.12.9.1.4 . F u n c t i o n s


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

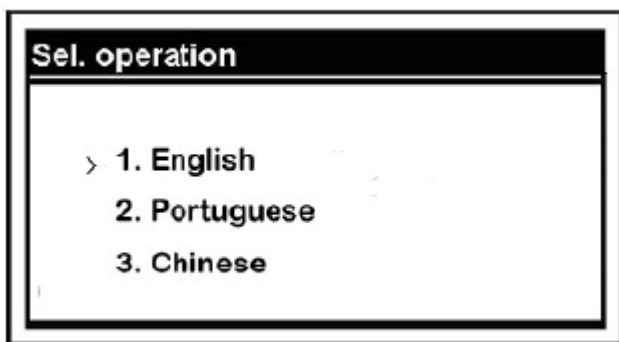
Op e r a t i o n s

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

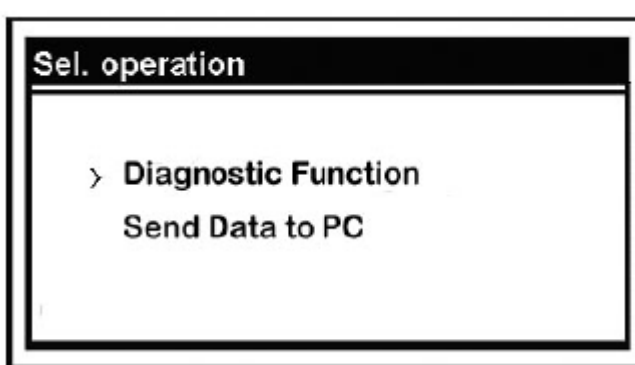


Here, we take diagnostic function for demonstration.

Select 1 and press  key, it will display an interface for language selection, as shown below:



Select 'English' and press [↵] key, it will display information about the diagnostic software version, press [↵] to continue, the interface will display as below:

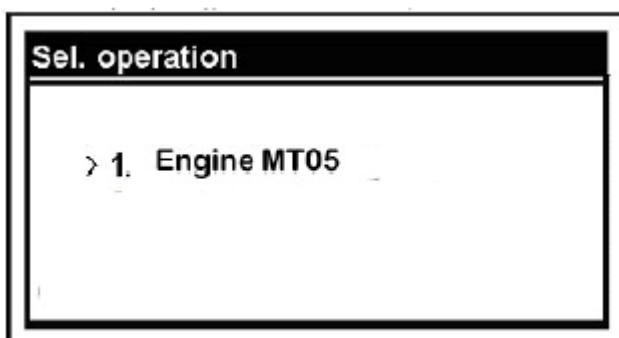


### Diagnostic Function

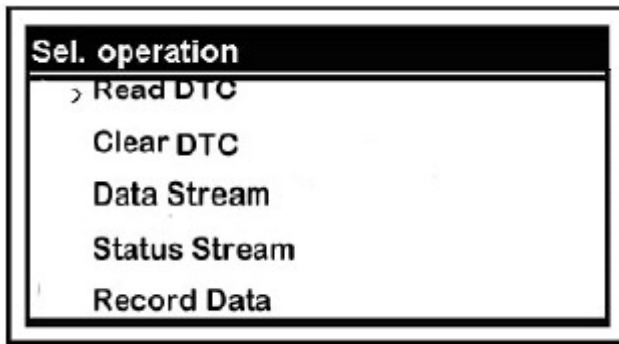
Here, we take 'diagnostic function' for demonstration.

Select 'diagnostic function' and press [↵], the screen will display an interface to indicate 'Delphi-3' diagnostic connector should be used.

Press [↵], the screen will display engine information as below:



Press [↵], with 'accessing system' fleeting on the screen, then, it will display as below:



Available functions are as follows:

- Read DTC
- Clear DTC
- Data Stream
- Status Stream
- Record Data

Press [↑] or [↓] key to select function you needed.

1. Read DTC

Select 'Read DTC', and press [↵], it will display fault code as below:

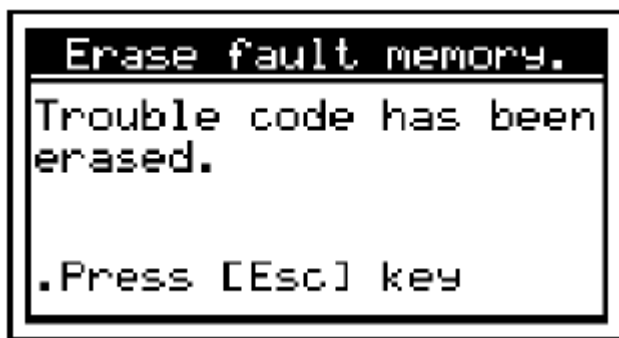
Power Train System		
● P0118	P0113	P0122
P0201	P0650	P0135
P0351		

Press [←] or [→] key to move '.' icon, and select fault code, take 'P0118' for example, it's selected when there is '.' in front of it, press [↵], the screen will display detailed information of the code, as below:

Temperature of engine
oil sensor short V
/ Open
Code: P0118
01 01

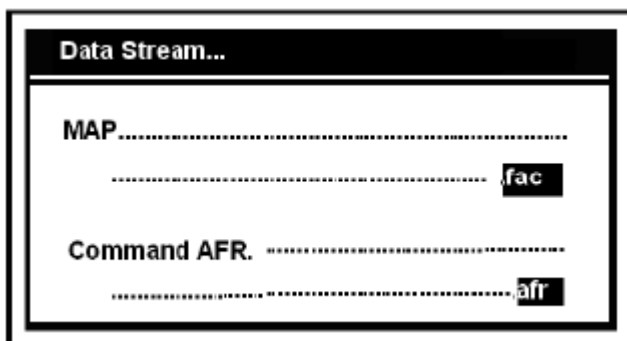
2. Clear DTC

Select 'Clear DTC' and press [↵], it will display as below:



3. Data Stream

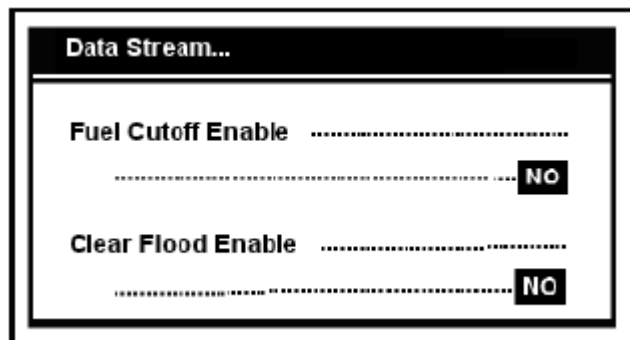
Select 'Data Stream' and press [↵], it will display as below:



Press [↑] or [↓] key for page up/down to view more. Press [⏪] key to exit.

4. Status Stream

Select 'Status Stream' and press [↵], the interface will display as below:



Press [↑] or [↓] key for page up/down to view more. Press [⏪] key to exit.

5. Record Data

Select 'Record Data' and press [↵], it will display:



Press [↑] or [↓] key to enter code, when the first number of the code was set, press [↵] to confirm and continue to input the sequent numbers, till all the 7 numbers were input.

When all the 7 numbers were set, press [↵], the screen will display a message for confirmation of the Plate Number input. Press [⏪] to return to the previous interface to input the code again or press [↵] to confirm the code.

Press [↵], another interface will be displayed for you to input date, as below:

It's the same way to enter month as vehicle code input.

Month was input, then enter date, as below:

Then, 'Enter Year' continues, as below:

**Date Input...**

**Enter Year:**  
[00-99]

00

After that, 'Enter Week' follows, as below:

**Date Input...**

**Enter Week:**  
[0-6]

0

Till now, the 'date input' was completed, and it starts to record data, press [⏪] to stop recording.

☐☐ Check malf code meaning by reading the below table.

Malf code in MT05	Description
<b>P0107</b>	MAP Circuit Low Voltage or Open
<b>P0108</b>	MAP Circuit High Voltage
<b>P0112</b>	IAT Circuit Low Voltage
<b>P0113</b>	IAT Circuit High Voltage or Open
<b>P0117</b>	Coolant/Oil Temperature Sensor Circuit Low Voltage

<b>P0118</b>	Coolant/Oil Temperature Sensor Circuit High Voltage or Open
<b>P0122</b>	TPS Circuit Low Voltage or Open
<b>P0123</b>	TPS Circuit High Voltage
<b>P0131</b>	O2A Circuit Low Voltage
<b>P0132</b>	O2A Circuit High Voltage
<b>P0031</b>	O2A Heater Circuit High Voltage
<b>P0032</b>	O2A Heater Circuit Low Voltage
<b>P0201</b>	Injector 1 Circuit Malfunction
<b>P0202</b>	Injector 2 Circuit Malfunction
<b>P0230</b>	FPR Coil Circuit Low Voltage or Open
<b>P0232</b>	FPR Coil Circuit High Voltage
<b>P0336</b>	CKP Sensor Noisy Signal
<b>P0337</b>	CKP Sensor No Signal
<b>P0351</b>	Cylinder 1 Ignition Coil Malfunction
<b>P0352</b>	Cylinder 2 Ignition Coil Malfunction
<b>P0505</b>	Idle Speed Control Error
<b>P0562</b>	System Voltage Low
<b>P0563</b>	System Voltage High
<b>P0650</b>	MIL Circuit Malfunction
<b>P1693</b>	Tachometer Circuit Low Voltage
<b>P1694</b>	Tachometer Circuit High Voltage

**NOTES**

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# CHAPTER 4 CHASSIS

**WARNING**

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

## 4.1 A-RM REPLACEMENT

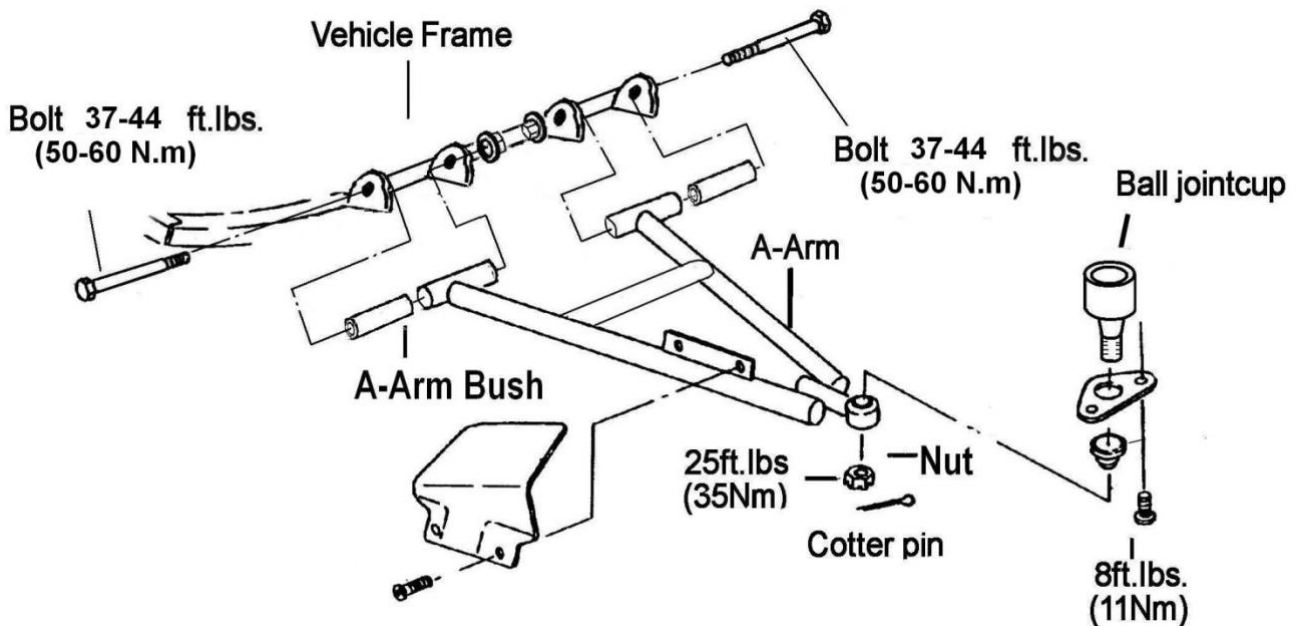
## 4.2 FRONT STRUT REPLACEMENT

## 4.3 FRONT STRUT BALL JOINT REPLACEMENT

## 4.4 STEERING POST ASSEMBLY

## 4.1 A-RM REPLACEMENT (MacPherson)

### MANTENANCE-FREE PIVOT DESIGN



1. Elevate and safely support vehicle
2. Remove cotter pin from ball joint cup at wheel end of A- arm and loosen nut until it is flush with end of cup.
3. Using a soft face hammer, tap nut to loosen A- arm from bolt. Remove nut and A-arm from hub strut assembly.
4. Loosen and remove two bolts on A-arm, and remove A-arm.
5. Examine bushing. Replace if worn or tore. Discard hardware.
6. Install new A-arm assembly onto vehicle frame. Install new bolts and new nuts.  
**NOTE.** Tighten the nuts only finger-tighten at this time. They will be tightened to the final torque after the front wheels are installed and the vehicle is on the ground.

#### WARNING

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

7. Attach A-arm to strut assembly. Tighten ball joint nut to 25 ft. lbs. (35 Nm). If cotter pin holes are not aligned, tighten nut slightly to align. Install a new cotter pin with open ends toward rear of machine. Bend both ends in opposite directions around nut.
8. Install hubs, calipers and wheels, lower the vehicle to the ground. Apply Loctite™ 242 to screw threads of the A arm bolts and torque bolts to 37-44 ft. lbs. (50-60 Nm ).

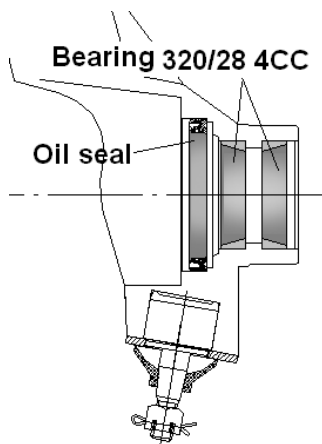
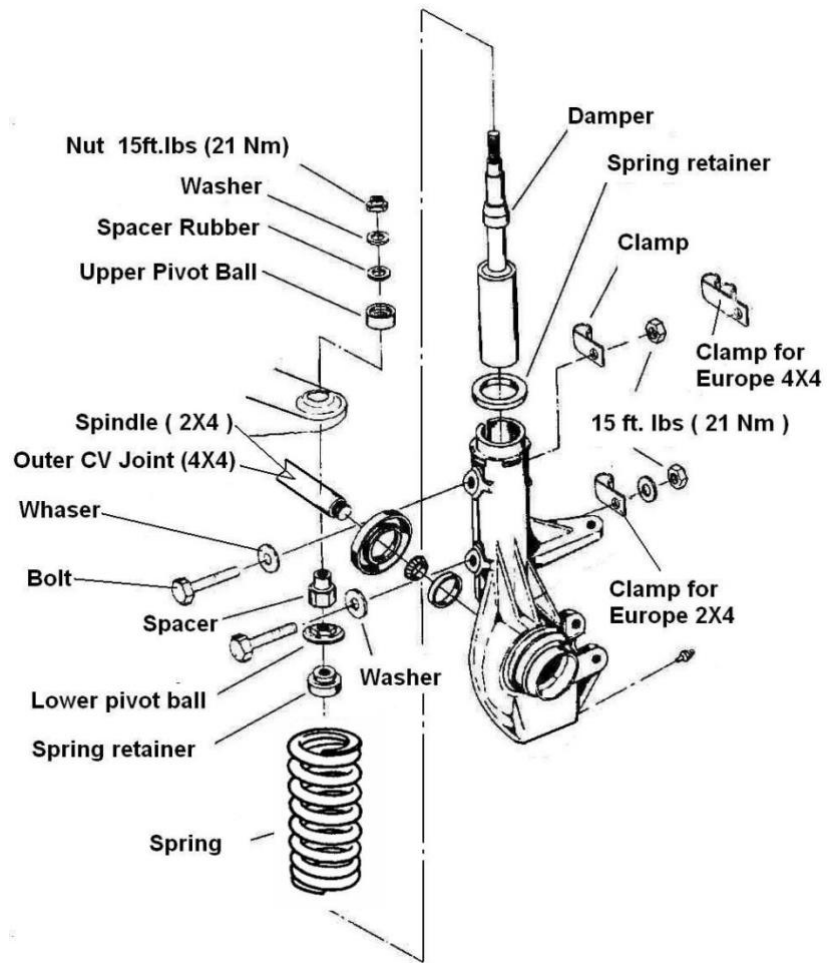
#### WARNING

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

**4.2 FRONT STRUT REPLACEMENT**

1. Hold strut rod with wrench and remove top nut
2. Compress spring.
3. Remove upper strut pivot assembly.
4. Remove coil spring and collapse strut body.
5. Remove two pinch bolts from strut body.
6. Remove strut body.
7. Install front shock cartridge until bottomed in strut casting.
8. Install pinch bolts with clamp(s).  
Torque pinch bolts to 15ft.lbs.(21Nm).
9. Reassemble spring and top pivot assembly. Be sure all parts are installed properly and seated fully.
10. Torque strut rod nut to specification. Do not over torque nut.

**Strut Rod Nut Torque  
15 ft. lbs. (21 Nm)**

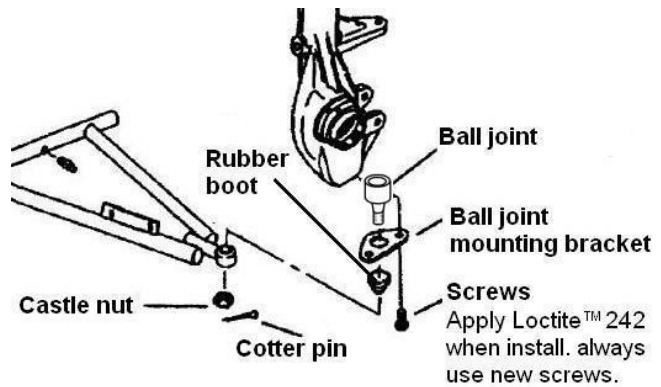


**4.3FRONT STRUT BALL JOINT REPLACEMENT**

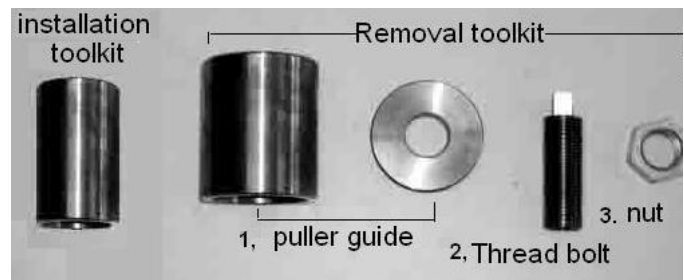
1. Loosen front wheel nuts.
2. Elevate and safely support ATV under footrest/frame area . .

**CAUTION:** Serious injury may result if ATV tips or falls. Be sure ATV is secure before beginning this service procedure.

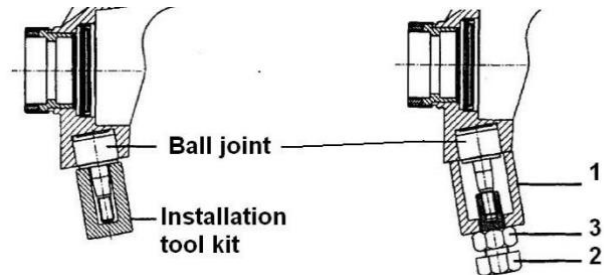
3. Remove wheel nuts and wheels.
4. Remove cotter pin from ball joint
5. Remove castle nut and separate A-arm from ball joint stud.
6. Remove screws and ball joint mounting bracket.



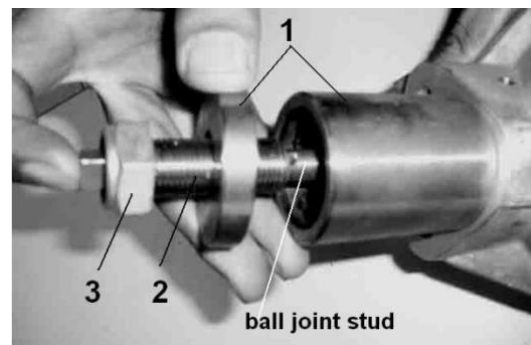
7. Using ball joint cup removal/installation toolkit, remove ball joint cup from strut housing. Refer to photos at right.
  - Install puller guide (1) .
  - Thread bolt (2) with nut (3) onto ball joint stud as shown .
  - Hold bolt (2) and turn nut (3) clockwise until ball joint is removed from strut housing.



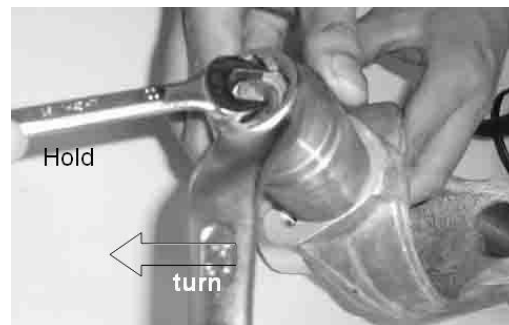
8. To install new ball joint cup.
  - Insert new ball joint into driver (installation toolkit).
  - Drive new ball joint cup into strut housing until fully seated.



9. Apply Loctite 242 (blue) to threads of mounting bracket new screws. Torque screw s to 8 ft.lbs. (11 Nm).

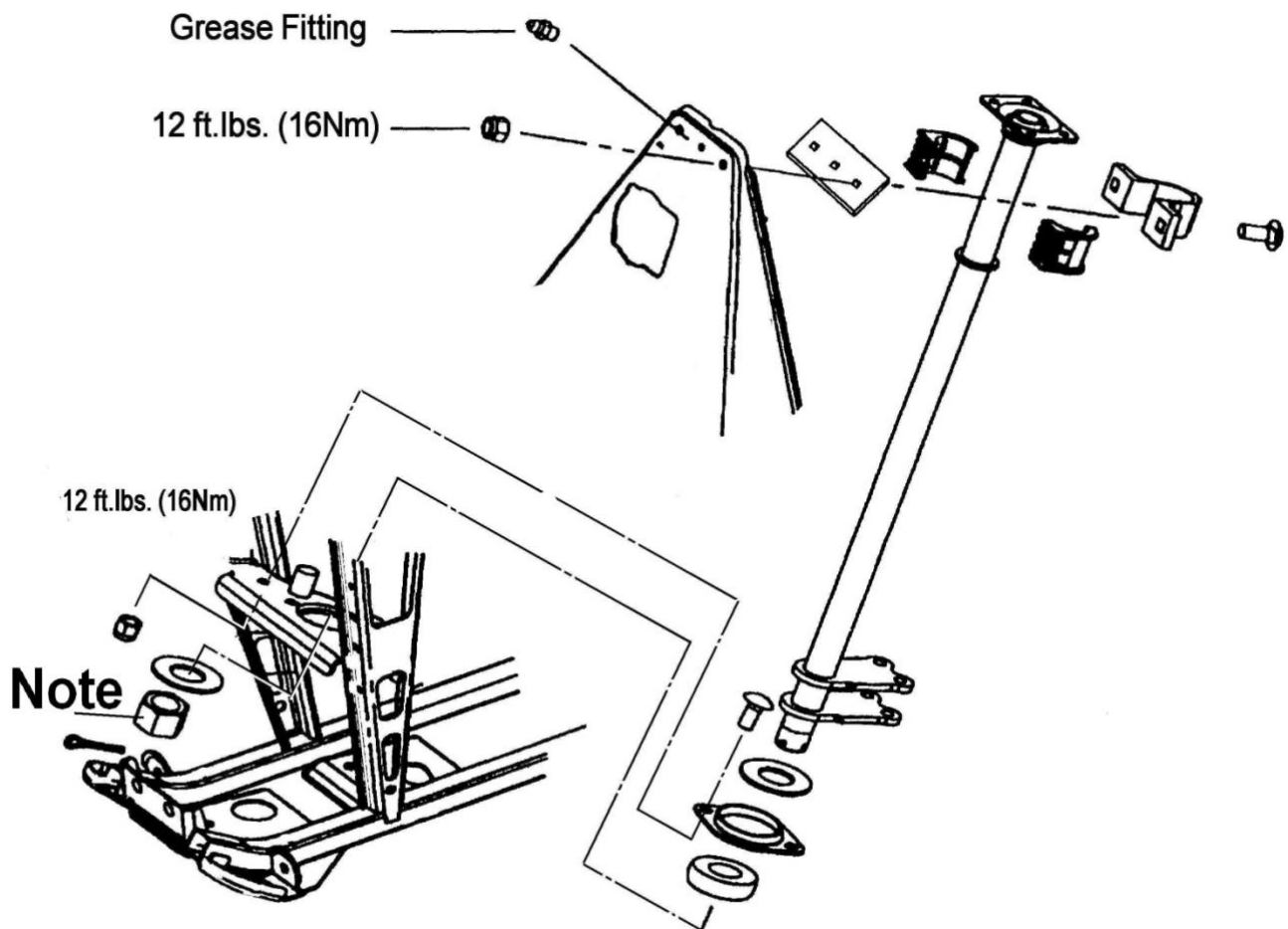


10. Install A- arm on ball joint cup and torque castle nut to 25 ft. lbs. (35 Nm ).
11. Reinstall cotter pin with open ends toward rear of machine.





#### 4.4 STEERING POST ASSEMBLY

**Note:**

- 1, Hand tighten the crown nut of the steering post.
- 2, Align cotter pin hole.
- 3, Install cotter pin. Bend both ends of cotter pin around nut in opposite directions.
- 4, Check steering, must move freely and easily from full left to full right without binding.



# CHAPTER 5 FINAL DRIVE

## WARNING

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

- 5.1 WHEEL, HUB, AND SPINDLE TORQUE TABLE
- 5.2 FRONT HUB DISASSEMBLY/INSPECTION
- 5.3 FRONT HUB ASSEMBLY
- 5.4 FRONT HUB INSTALLATION (4WD)
- 5.5 FRONT DRIVE AXLE (INNER AND OUTER CV JOINT) REMOVAL/INSPECTION (4X4)
- 5.6 FRONT DRIVE AXLE INSTALLATION (4X4)
- 5.7 FRONT DRIVE AXLE DISASSEMBLY/ INSPECTION (4X4)
- 5.8 FRONT DRIVE AXLE ASSEMBLY (4X4)
- 5.9 REAR HUB INSPECTION
- 5.10 REAR GEARCASE DISASSEMBLY
- 5.11 REAR GEARCASE ASSEMBLY
- 5.12 FRONT GEARCASE SLIP LIMIT TORQUE TEST (4X4)
- 5.13 FRONT GEARCASE DISASSEMBLY/ INSPECTION (4X4)
- 5.14 FRONT GEARCASE ASSEMBLY (4X4)
- 5.15 FRONT DIFFERENTIAL DISASSEMBLY/ INSPECTION (4X4)
- 5.16 FRONT DIFFERENTIAL ASSEMBLY (4X4)
- 5.17 REAR, FRONT PROP SHAFT REMOVAL

**NOTE.** *ELECTRIC 4WD SHIFT---See CHAPTER 7 ELECTRICAL*

**5.1 WHEEL, HUB, AND SPINDLE TORQUE TABLE**

Item	Specification
Front Wheel Nuts	69 Ft.Lbs 96 N.m
Rear Wheel Nuts	69 Ft.Lbs 96 N.m
Front Hub Nut on Spindle/ outer CV joint	Refer to FRONT HUB INSTALLATION
Rear Hub Retaining Nut	ATV400: 101Ft.Lbs 137N.m

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

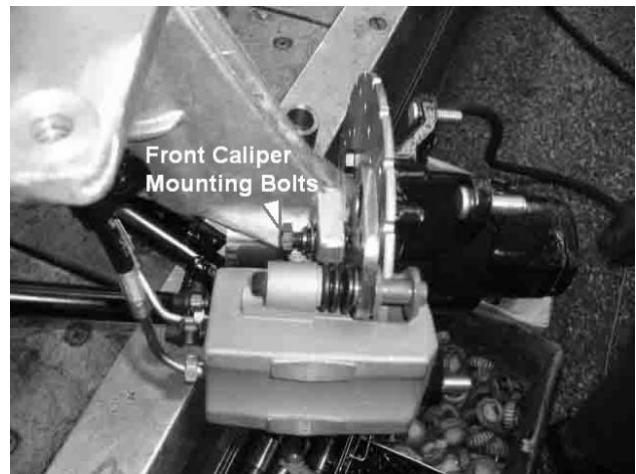
**5.2 FRONT HUB DISASSEMBLY/INSPECTION**

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

**CAUTION**

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

2. Check bearings for side play by grasping tire/wheel firmly and checking for movement. It should rotate smoothly without binding or rough spots.
3. Remove wheel nuts and wheel.
4. Remove brake caliper
5. Remove hub cap, cotter pin, front spindle nut, and washer.
6. Rotate each bearing by hand and check for smooth rotation. Visually inspect bearing for moisture, dirt, or corrosion. Replace bearing if moisture, dirt, corrosion, or roughness is evident.
7. Place a shop towel on hub to protect surface. Carefully pry seal out of hub. Do



not damage the surface of the seal. Clean the hub.

8. Drive bearing out through opposite side of hub and discard.
9. Drive other bearing out and discard.
10. Clean hub and spacer thoroughly.



## **5.2 FRONT HUB REMOVAL/INSPECTION 4x4**

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

### **CAUTION:**

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

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

### **CAUTION:**

Do not hang the caliper by the brake Line. Use wire to hang the caliper to prevent. Possible damage to the brake line.

5. Remove hub cap, cotter pin, front spindle nut, and Washer.
6. Rotate each bearing by hand and check for smooth rotation. Visually inspect

bearing for moisture, dirt, or corrosion, or roughness is evident.

### **5.3 FRONT HUB INSTALLATION 4X4**

1. Inspect the hub strut bearing surface for wear or damage.
2. Apply grease to drive axle spindle.
3. Install spindle through the backside of the hub strut. Install the hub onto the spindle.
4. Install spindle nut and tighten to specification.
5. Install a new cotter pin. Tighten nut slightly if necessary to align cotter pin holes.
6. Rotate wheel and check for smooth operation. Bend both ends of cotter pin around end of Spindle in different directions.
7. Install hub cap.
8. Rotate hub. It should rotate smoothly without binding or rough spots or side play.
9. Install brake caliper using new bolts. Tighten bolts to specified torque.

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

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

torque.

## **5.4 FRONT HUB BEARING REPLACEMENT 4X4**

1. Remove outer snap ring.
2. From the back side, tap on the outer bearing race with a drift punch in the relief as shown.
3. Drive bearing out evenly by tapping on outer race only. Once bearing is at bottom of casting, support casting on outer edges so bearing can be removed.
4. Inspect bearing.

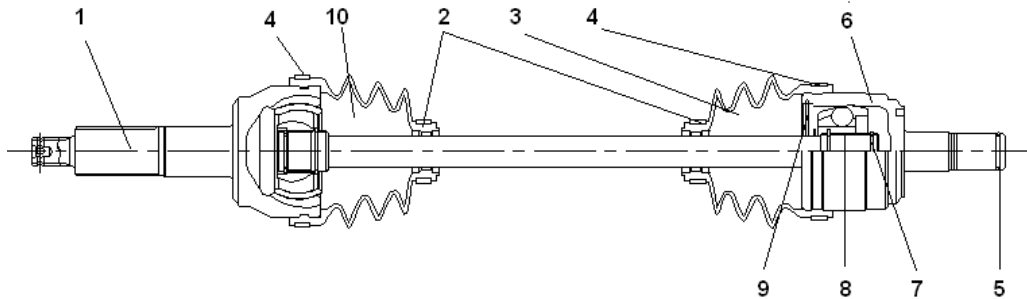
**NOTE:** Due to extremely close tolerances and minimal wear, the bearings must be inspected visually, and by feel. inspect for rough spots, discoloration, The bearings should turn smoothly and quietly, no detectable up and down movement and minimal movement sideways between inner and outer race.

5. Inspect bearing housing for scratches, wear or damage. Replace housing if damaged.

**5.5 FRONT DRIVE AXLE (INNER AND OUTER CV JOINT) REMOVAL/**

**INSPECTION (4X4)**

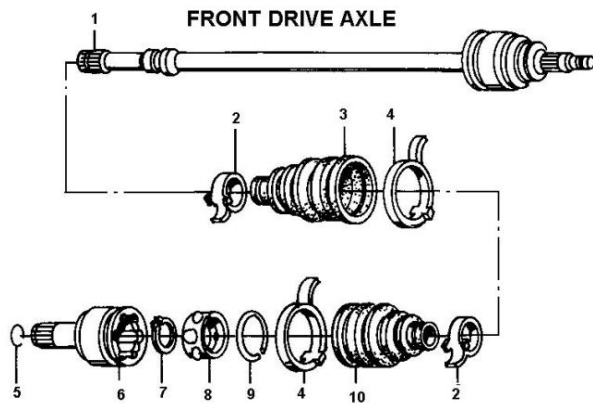
**FRONT DRIVE AXLE**



**NOTE**

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

1. Drive axle/ outer CV joint assembly.
2. Boot band "A".
3. Outer board boot.
4. Boot band "B".
5. Stopper ring
6. Outer CV joint \*
7. Circlip
8. Bearing \*
9. stopper ring
10. Inboard boot.



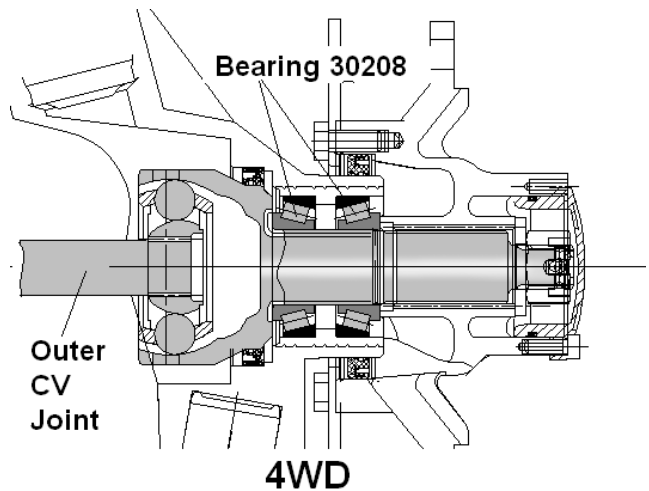
**NOTE:** Always order and replace 6 and 8 together.

**REMOVAL**

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

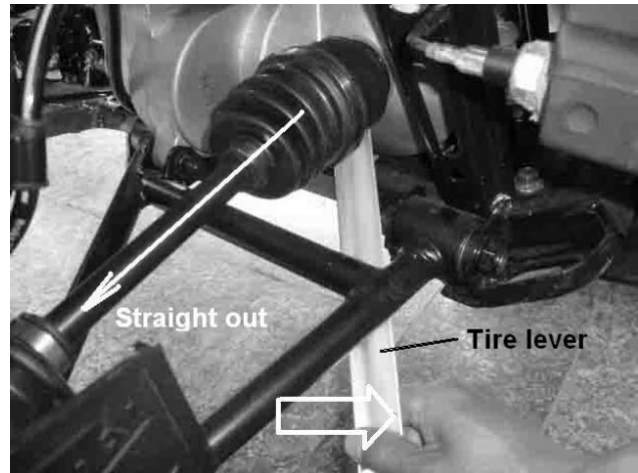
**CAUTION**

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





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



**INSPECTION**

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

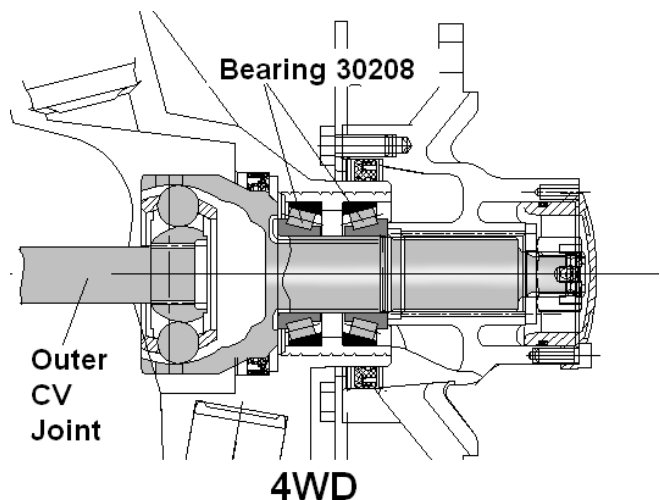
1. Check the rubber boots for wear, cuts or damage and replace if necessary as described under the Disassembly / Assembly procedure in this chapter.
2. Move each end of the drive shaft in a circular motion (and also a reciprocate for inner one) and check the drive shaft joints for excessive wear or play.
3. This inner CV joint (inboard pivot joint) can be serviced if there is wear or play. The outer CV joint (outboard pivot joint) cannot be serviced if worn or damage and if necessary, the drive shaft assembly must be replaced.

**5.6 FRONT DRIVE AXLE INSTALLATION (4X4)**

**CAUTION**

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

1. Hold the drive shaft straight in from the front differential.
2. Push the drive shaft straight into the front differential and push it in all the way until it bottoms out. If necessary, carefully tap on the outer end of the drive shaft with a rubber mallet or soft-faced mallet.



3. After the drive shaft is installed, pull the inner CV joint a little to make sure the drive shaft stopper ring has locked into the front differential side gear groove.
4. Carefully install the outer CV joint (spindle) into the strut, install the front hub and wheel.
5. Install the ball joint on the A arm, the steering tie rods, the hubs and the wheels as described in this Chapter and Chapter 4.



**5.7 FRONT DRIVE AXLE DISASSEMBLY/ INSPECTION (4X4)**

**INNER CV JOINT DISASSEMBLY**

**NOTE**

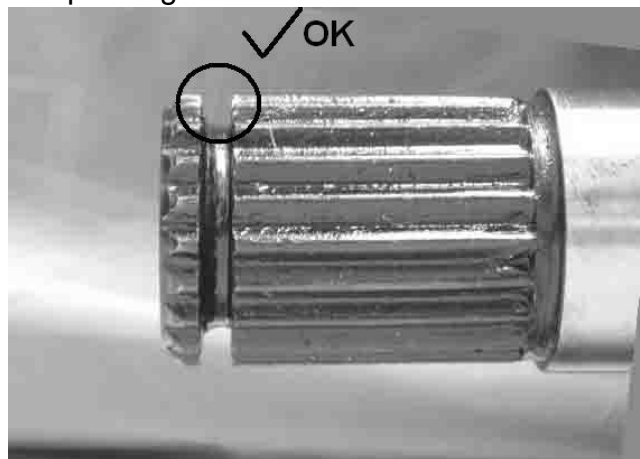
The outer CV joint cannot be disassembled or repaired, if damage or faulty the drive axle assembly must be replace.

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



Remove the stopper ring

Inspect groove

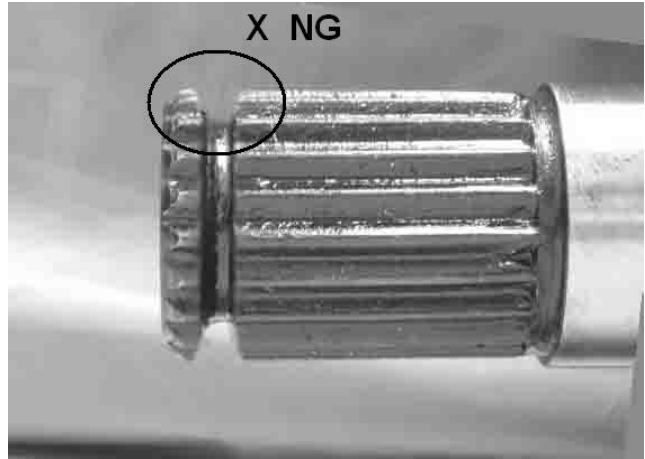


axle and discard the boot band “A” , it cannot be reused.

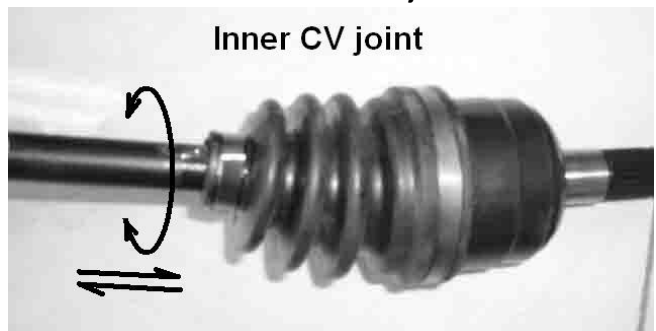
9. Inspect the drive axle as described in this chapter.

**INNER CV JOINT INSPECTION**

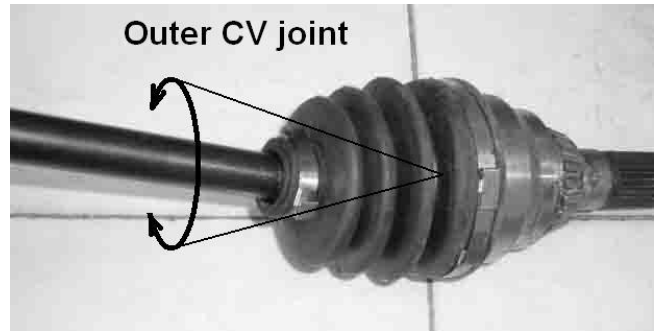
1. Clean the bearing assembly in solvent and thoroughly dry.
2. Inspect the steel balls, bearing case and the bearing race for wear or damage.
3. Check for wear or damage to the inner splines of the bearing race.
4. If necessary, disassembly the bearing assembly for further inspection. Carefully remove the steel balls from the bearing cage then remove the bearing race from the bearing cage.
5. If any of the components of the bearing assembly are damaged, replace the entire assembly as no replacement parts are available.
6. Clean the inner CV joint in solvent and thoroughly dry.
7. Inspect the interior of the inboard joint where the steel balls ride. Check for wear or damage and replace the joint if necessary.
8. Inspect the snap ring groove on the inboard joint for wear or damage.
9. Inspect the splines on the inner CV joint for wear or damage.
10. Check the stopper ring in the end of the inboard joint. Make sure it seats in the groove correctly, if damage the ring must be replaced.
11. Inspect the exterior of the inner CV joint for cracks or damage, replace if necessary. Check the movement of the joint for excessive play or noise by moving the drive axle in a circular and reciprocate direction.
12. Inspect the drive axle for bending, wear or damage.
13. Inspect the inner end splines, the outer end splines and the front hub cotter pin



Check the movement of the joint



hole for wear or damage. If any of these areas are worn or damaged, replace the drive axle.



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

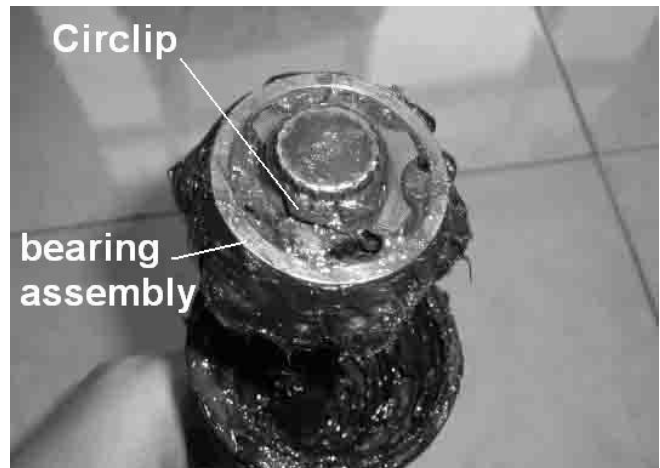
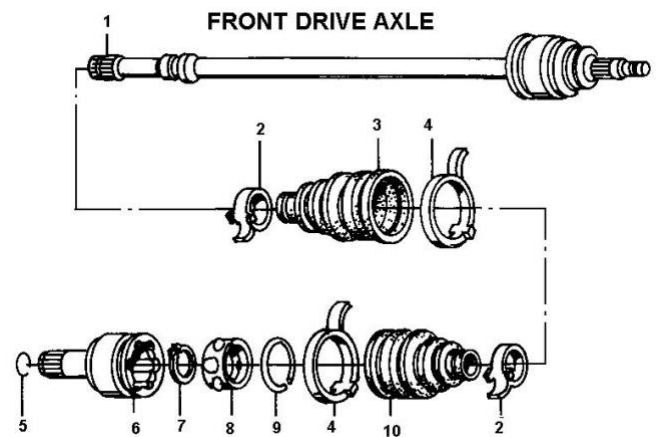
**5.8 FRONT DRIVE AXLE ASSEMBLY (4X4)**

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

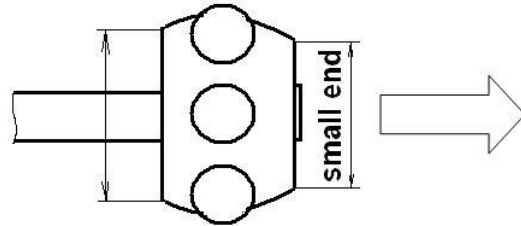
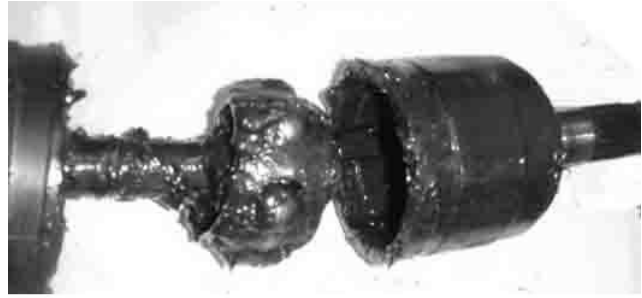
**NOTE**

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

3. Install 2 new small boot bands onto the drive axle.
4. Install the inboard boot and move the small boot band onto the boot. Bend down the tab on the boot band and secure the tab with the locking clips and tap them with a plastic hammer. Make sure they are locked in place.
5. If the bearing assembly was disassembled, assemble the bearing as follows:
  - a. Position the bearing race and install the race into the bearing case. Align the steel ball receptacles in both parts.
  - b. Install the steel balls into their receptacles in the bearing case.
  - c. Pack the bearing assembly with molybdenum disulfide grease. This will help hold the steel balls in place.



6. Position the bearing assembly with the small end of the bearing going on first and install the bearing onto the drive axle.
7. Push the bearing assembly on until it stops, then install the circlip, Make sure the circlip seats correctly in the drive axle groove.
8. Apply a liberal amount of molybdenum disulfide grease to the bearing assembly. Work the grease in between the balls, the race and the case. Make sure all voids are filled with grease.
9. Apply a liberal amount of molybdenum disulfide grease to the inner surfaces of the inboard joint.
10. Install the inboard joint over the bearing assembly and install the stopper ring. Make sure it is seated correctly in the inboard joint groove.
11. After the stopper ring is in place, fill the inboard joint cavity behind the bearing assembly with additional molybdenum disulfide grease.
12. Pack each boot with the following amounts of molybdenum disulfide grease:
  - a. Inboard boot:35-55grams(1.2-1.9oz.).
  - b. Outboard boot:30-50grams(1.1-1.8oz.).
13. Move the inboard boot onto the inner CV joint.
14. Move the inboard joint on the drive axle.



**NOTE**

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

15. Move the small boot band onto the boot. Bend down the tab on the boot band and secure the tab with the locking clips and tap them with a plastic hammer. Make sure they are locked in place.
16. Install the large boot bands onto each boot.

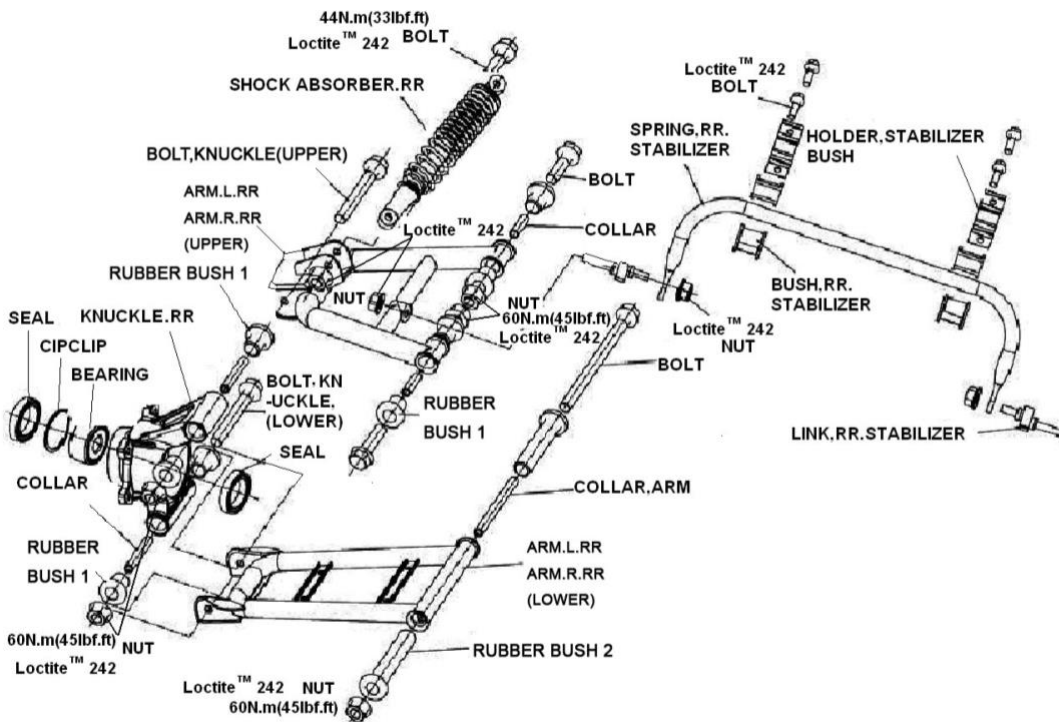
**CAUTION**

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



17. Secure all large boot bands. Bend down the tab on the boot band and secure the tab with the locking clip and tap them with a plastic hammer. Make sure they are locked in place.
18. If removed, install the stopper ring and make sure it is seated correctly in the drive axle groove.
19. Apply molybdenum disulfide grease to the end splines.

**5.9 REAR HUB INSPECTION**



1. Remove rear wheel.
2. Remove the cotter pin on the rear wheel driving shaft nut, than remove the nut.
3. Remove the rear disc brake caliper.
4. Remove the link, RR. Stabilizer.
5. Remove the mounting bolt of rear shock absorber and upper and lower A-arm. Takedown the

A-arm components.

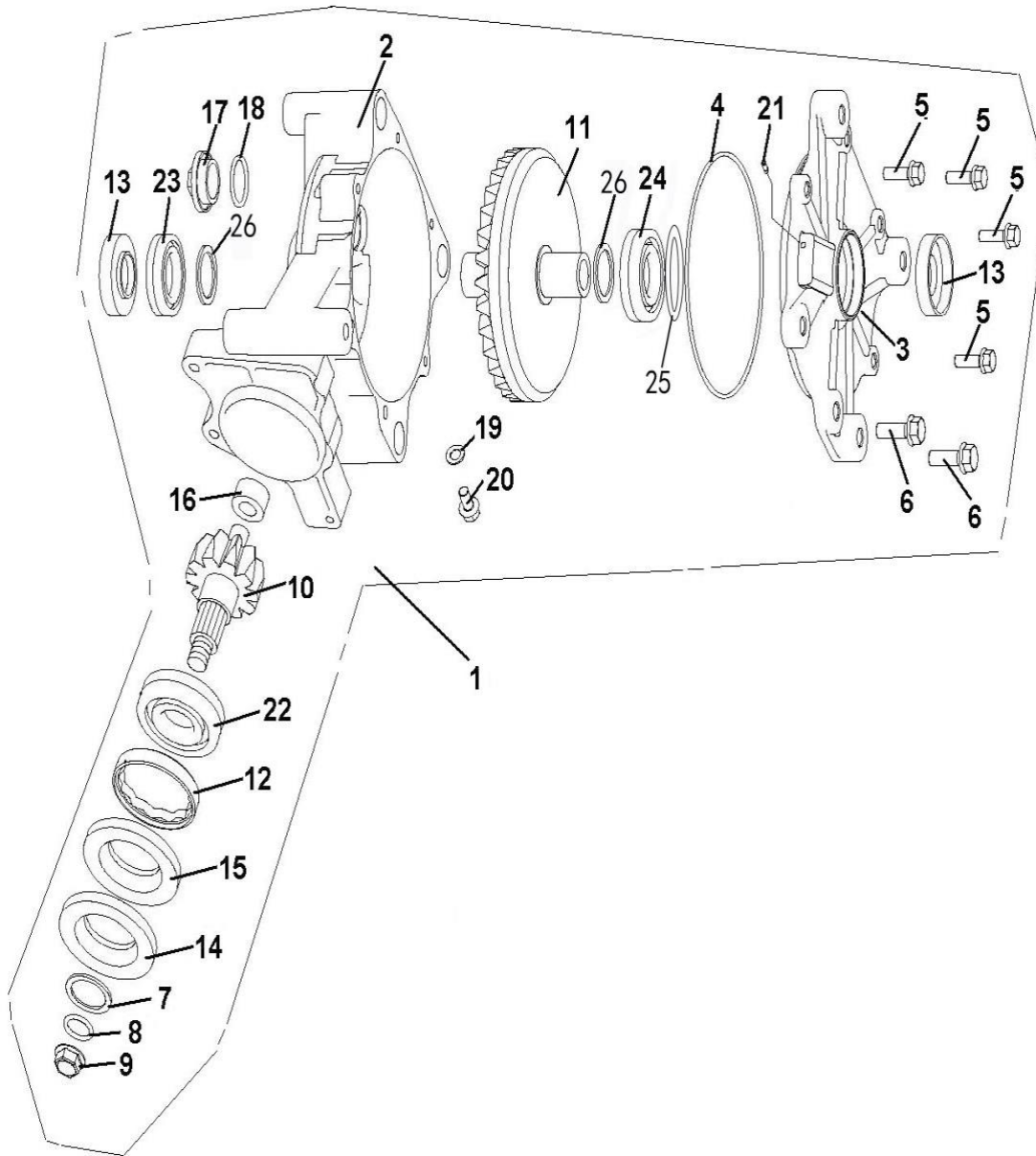
6. Remove the mounting bolt of the rear hub, after that inspect bushes, A-arms and collar. Replace if worn. Discard hardware.



7. Using hub extractor to take down the rear hub.
8. Remove oil seal.
9. Remove the snap spring of the rear hub.
10. Using bearing extractor to take down the hub bearing.

Notice: when reassembling hub bearing that were removed and rear hub, which are need replaced. (The method is in accordance with removing steering knuckle.)

**5.10 REAR GEARCASE DISASSEMBLY**



- |                                     |                                    |                                  |
|-------------------------------------|------------------------------------|----------------------------------|
| 1. REAR GEAR-BOX ASSY               | 2. DRIVE HOUSING                   | 3. OUTPUT COVER                  |
| 4. O-RING 160X2.65                  | 5. BOLT M8X28                      | 6. BOLT M10X1.25X28              |
| 7. WASHER 31                        | 8. O-RING 20X3                     | 9. NUT M16X1.5                   |
| 10. OUTPUT AXLE, RING REAR GEAR-BOX | 11. INPUT AXLE, RING REAR GEAR-BOX | 12. LOCK NUT                     |
| 13. SEAL 30X55X11                   | 14. SEAL 38X85X8                   | 15. SEAL 38X80X8                 |
| 16. BEARING 15NQ2815                | 17. OIL SCREEN CAP                 | 18. O-RING                       |
| 19. WASHER                          | 20. OIL PLUG                       | 21. TUBE, REAR GEAR-BOX BREATHER |
| 22. BEARING 6306                    | 23. BEARING 6006                   | 24. BEARING                      |
| 25. WASHER 53                       | 26. WASHER 31(B)                   |                                  |



1. Drain and properly dispose of used oil.
2. Loosen the cover bolts in a crisscross pattern in several steps and remove them.
3. Pry the cover at the prying points using a screw-driver and remove the output cover. Remove the o-ring.
4. Remove the ring gear and bearing assembly.
5. Remove the oil seals and o-ring.
6. Unstuck the pinion bearing lock nut with a drill or grinder. Remove the lock nut using the special tool.
7. Remove the pinion bearing assembly.



### **5.11.1 REAR GEARCASE ASSEMBLY**

1. Drive the pinion gear assembly into the drive housing.
2. Install a new lock nut and tighten it using the special tool.
3. Stake the lock into the case groove.
4. Coat a new O-ring with grease and install it onto the pinion gear shaft.
5. Apply grease to the lips of new oil seals. Install the inner oil seal into the drive housing until it is flush with the stepped edge.
6. Install the outer oil seal into the drive housing until with the drive housing outer surface.
7. Coat a new O-ring with grease and install it into the cover groove.
8. Install the outer cover onto the drive housing.
9. Install the cover bolts and tighten them in several steps until the cover evenly touches the drive housing. Then while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.  
TORQUE:  
10mm bolt: 45Nm  
8mm bolt: 20Nm
10. Check that the gear assembly turns smoothly without binding.



### 5.11.2 BACKLASH INSPECTION

1. Remove the oil filler cap.
2. Install the special tool into the pinion joint, and set the final drive assembly and tool in a vise.
3. Install the drive shaft into the final drive assembly and hold it.
4. Set a horizontal type dial indicator on the ring gear through the filler hole.
5. Turn the ring gear back and forth with the drive shaft to read backlash.

**STANDARD:0.05-0.25mm**

**SERVICE LIMIT:0.4mm**

6. Remove the dial indicator. Turn the ring gear 120° and measure backlash.
7. Repeat this procedure once more.
8. Compare the difference of the three measurements.

**SERVICE LIMIT:0.2mm**

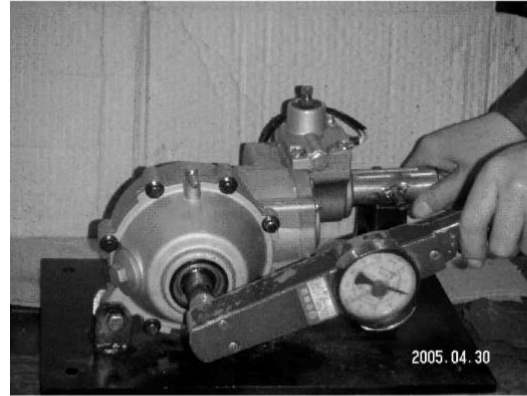
9. If the difference in measurements exceeds the service limit, it indicates that the bearing is not installed squarely, or the case is deformed.
10. Inspect the bearings and case.
11. If the backlash is excessive, replace the ring gear right shim with a thinner one.
12. If the backlash is small, replace the ring gear right shim with a thicker one.
13. Backlash is changed by about 0.06mm when thickness of the spacer is changed by 0.12mm.



**5.12 FRONT GEARCASE SLIP LIMIT TORQUE TEST**

**CAUTION:** Slip limit torque relate to the preload on the differential (see 5.19 FRONT DIFFERENTIAL ASSEMBLY), and affect the Steering Effort (heavy steering). Always field test the ATV carefully and thoroughly after front gearcase and differential service for vehicle maneuvers and operation.

Mount the front gear case assembly to Torque Test Jig. The input shaft must be firmly held by the jig, and measure one side output shaft by turning with a torque gauge until another side start to spin counter wise.



**Slip torque: 35---45N.m for Europe  
45---55N.m for USA**

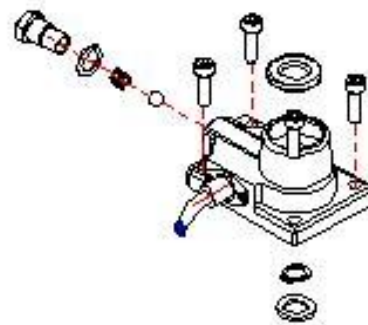
**Note:** It is recommended to replace the FRONT DIFFERENTIAL as an assembly when out of specification.

**5.13 FRONT GEARCASE DISASSEMBLY/ INSPECTION**

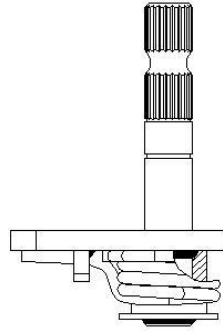
1. Drain and properly dispose of used oil.
2. Remove bolts and selector cover..



3. Remove screws and selector switch from the selector cover.
4. Remove bolt, washer, spring and detent ball from the selector cover.



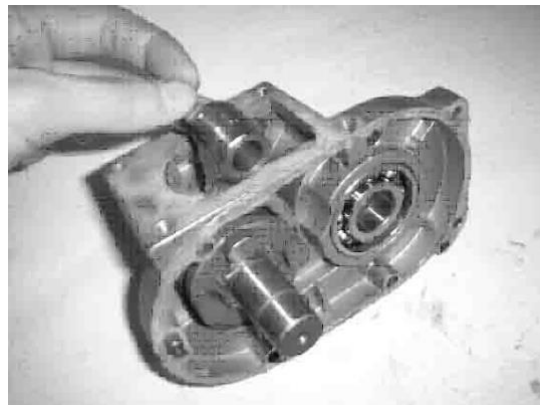
5. Remove seal, washers, circlip and selector shaft assembly from the selector cover.



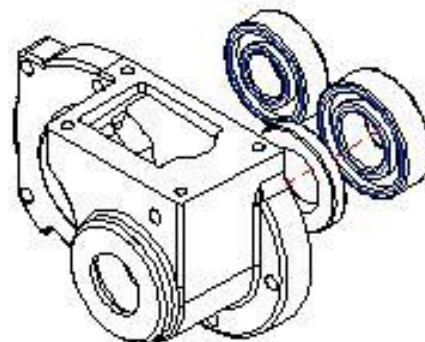
6. Remove bolts and diff case cover.  
7. Remove pins, gear and selector rail.



8. Remove selector fork, splined dog and input shaft.



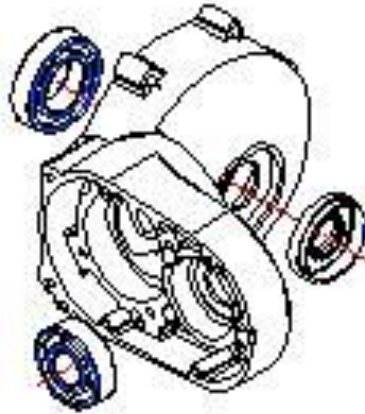
9. Remove bearing and seal.



10. Remove gear, screws, pinion shaft retainer plate and pinion shaft.



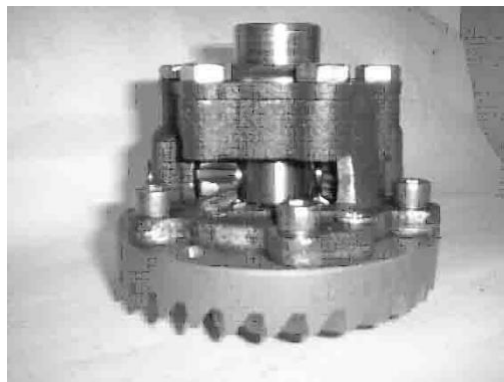
11. Remove seal from the case.



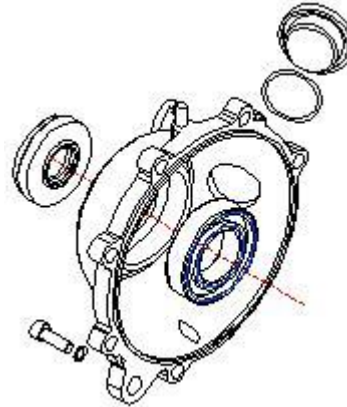
12. Remove bolts, left cover and differential.



Differential →



13. Remove seal from left cover.

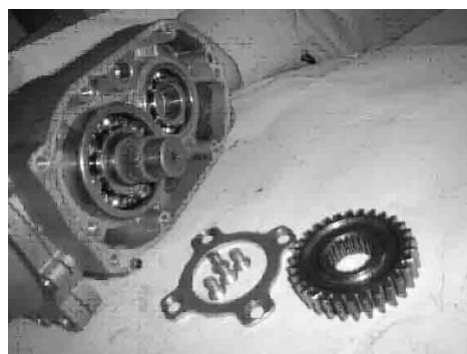


14. Clean all components and inspect for wear. Inspect gears for wear, cracks, chips or broken teeth. Inspect engagement dogs and detent ball housing, replace if edges are rounded. Inspect casting for crack. Inspect bearings for smooth operation. Check for excessive play between inner and outer race. Inspect detent spring and finger spring for wear, cracks, relaxation. Replace part with any defects.

**IMPORTANT:** New seals should be installed after the transmission is completely assembled.

**5.14 FRONT GEARCASE ASSEMBLY**

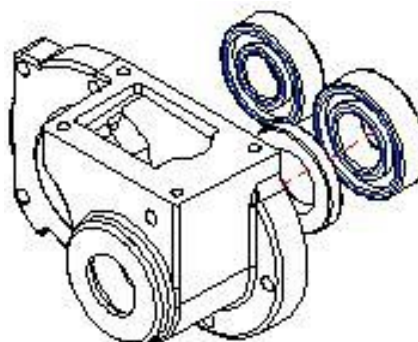
- 1. Install pinion shaft with bearing.
- 2. Install retainer plate with flat side toward bearing and torque screws.  
Apply Loctite™ 243(Blue) to screw threads and torque screws to 8ft.lbs. (12Nm)



3. Install gear.

4. Install oil seal.

**IMPORTANT:** New seals should be installed after the transmission is completely assembled.



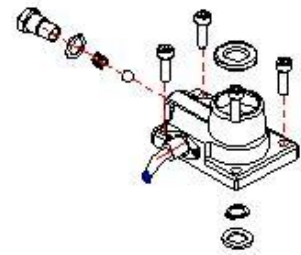
- 5. Install input shaft, splined dog, selector fork.
- 6. Install selector rail, gear and pins.



- 7. Apply LocTite™ 518 to mating surfaces, reinstall cover and torque bolts.  
8ft.lbs. (12Nm)



- 8. Install selector shaft assembly, washers, circlip, and new seal into the selector cover.
- 9. Install detent ball, spring, washer and bolt.
- 10. Install selector switch with new O-ring and screws.



- 11. Apply LocTite™ 518 to mating surfaces, reinstall selector cover and torque bolts.  
8ft.lbs. (12Nm)

- 12. Install differential into case.,  
Apply LocTite™ 518 to mating surfaces, reinstall left cover and torque bolts.  
14ft.lbs. (20Nm)
- 13. Install new seals.

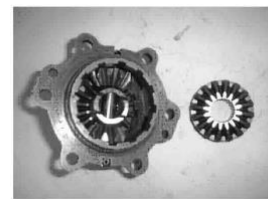


**5.15 FRONT DIFFERENTIAL DISASSEMBLY/ INSPECTION**

1. Remove bolts and bevel crownwheel.



- 2. Remove bolts and differential cap A.
- 3. Remove spring seat, springs, outer single clutch plate, differential plat, outer double clutch plate, bevel gear and gear axle washer.



4. Remove bolts and differential cap B.





5. Remove spring seat, springs, outer single clutch plate, differential plat, outer double clutch plate, bevel gear and gear axle washer.



6. Remove roll pin from center pin.  
 7. Remove center pin, bevel pinion washers, bevel pinions and center spacer from differential housing.



8 Clean all components and inspect for wear. Inspect gears for wear, cracks, chips or broken teeth. Inspect inner and outer splines on the spider gears and friction plates, replace if edges are rounded. Inspect casting for crack. Inspect axletree for smooth operation, check for excessive play between inner and outer race. Inspect dish spring for wear, cracks, relaxation. Replace part with any defects.

## **5.16 FRONT DIFFERENTIAL ASSEMBLY**

1. Install center pin, bevel pinion washers, bevel pinions and center spacer into differential housing.



2. Install bevel gear, gear axle washer, outer double clutch plate, differential plate, outer single clutch plate, springs, spring seat.



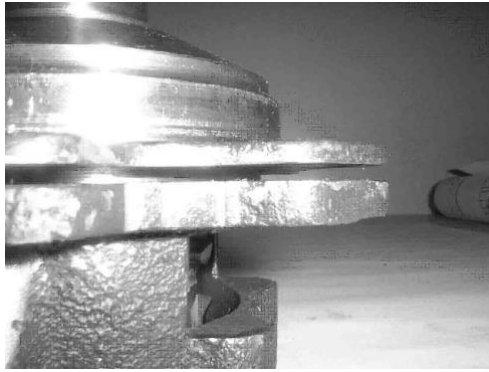
3. Install differential cap A.



4. Check the preload clearance.

**Clearance: 1.2—1.5mm**

Out of specification→ change spring seat, spring, .replace clutch plate as necessary,



5. Install bevel crownwheel, Apply Loctite™ 271 (red) to screw threads and torque bolts to 24ft.lbs. (32Nm)



6. Install bevel gear, gear axle washer, outer double clutch plate, differential plate, outer single clutch plate, springs, spring seat.



7. Install differential cap B.



8. Check the preload clearance.

**Clearance: 1.2—1.5mm**

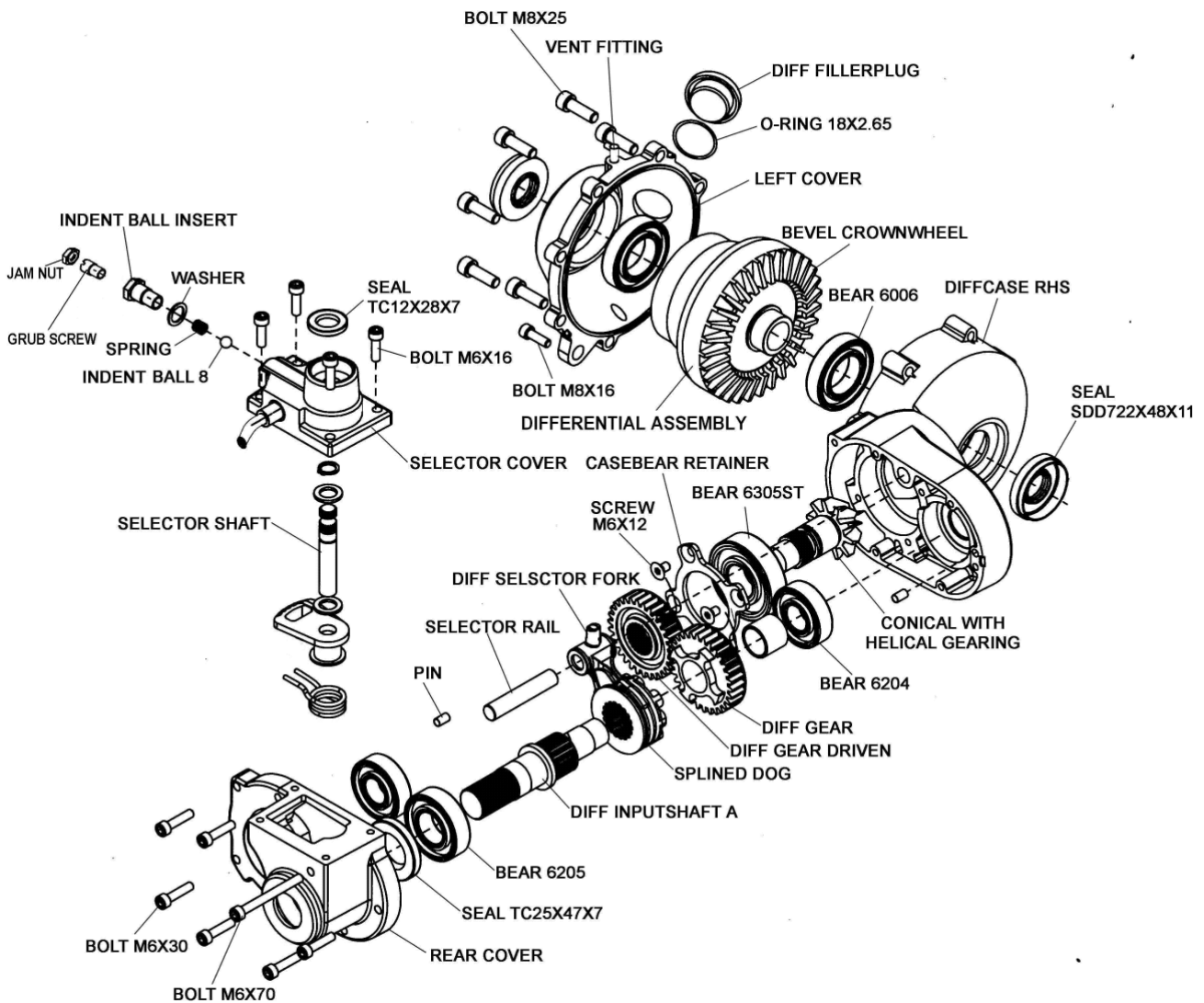
Out of specification → change spring seat, spring, .replace clutch plate as necessary,

9. Apply Loctite™ 271(red) to screw threads and torque bolts to 16ft.lbs. (22Nm)

**CAUTION:** Slip limit torque relate to the preload clearance on the differential, and affect the Steering Effort (heavy steering). Always field test the ATV carefully and thoroughly after front gearcase and differential service for vehicle maneuvers and operation.



**FRONT GEARCASE EXPLODED VIEW**



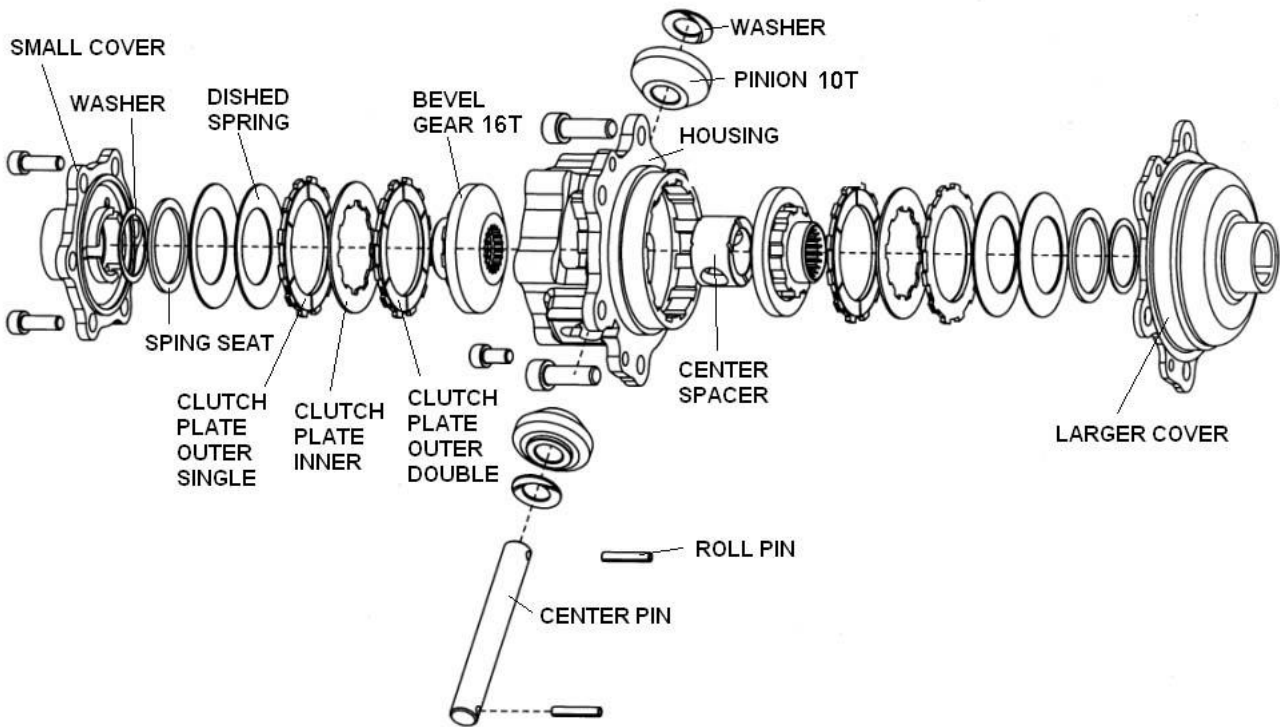
**TROUBLE SHOOTING**

Symptom: Gears won't stay in position when shift 2WD/ 4WD.

Solution: Increase the preload to indent ball by turning the grub screw or change a new spring.

**Note:** Make sure not to over press the spring by shifting 2WD/ 4WD. Remember to tighten the jam nut on the grub screw.

DIFFERENTIAL CENTRE EXPLODED VIEW

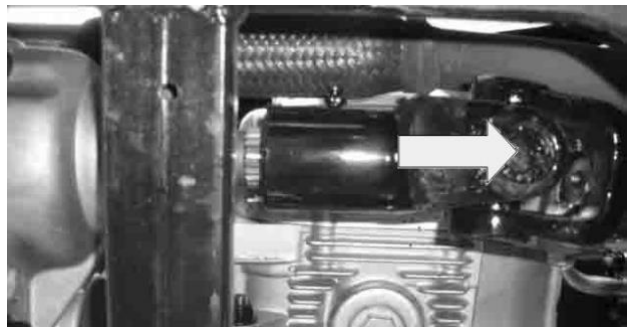


**5.17 REAR, FRONT PROP SHAFT REMOVAL**

Using roll pin remover, remove the roll pin from prop shaft



Slide the prop shaft back and away from the gear case. (The swing arm must be disassembly from the frame before the rear prop shaft removal).





# CHAPTER 6 TRANSMISSION

## **WARNING**

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

6.1 SHIFTER REMOVAL

6.2 SHIFTER INSTALL ATION

6.3 SHIFT LINKAGE ADJUSTMENT

6.4 ENGINE ANDTRANSMISSION REMOVAL

6.5 ENGINE AND TRANSMSSION INSTALL ATION

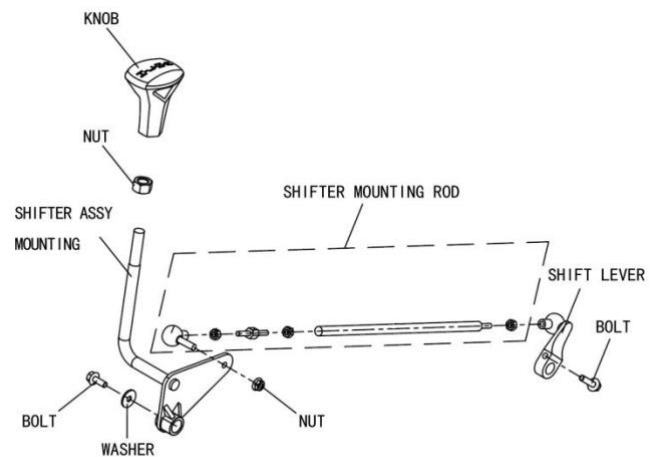
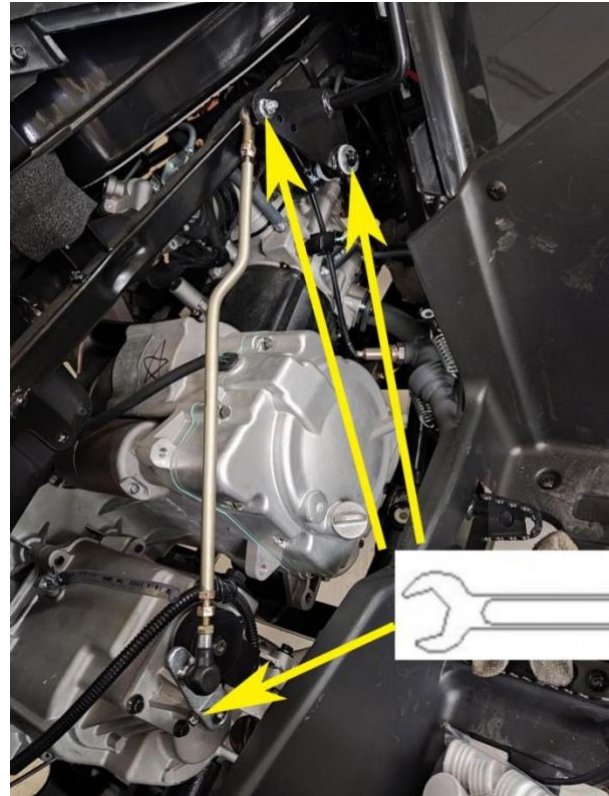
6.6 TRANSMISSION DISASSEMBLY

6.7 TRANSMISSION ASSEMBLY

6.8 TROUBLE SHOOTING CHECKLIST

**6.1 SHIFTER REMOVAL**

1. Remove parts that interfere with access to shift selector (seat, right side panel etc.).
2. Disconnect the two linkage rods from gear shift selector slides.
3. Remove five bolts attaching gear shift selector to the mounting bracket.
4. Lift gear selector out of mounting bracket and away from frame.



**6.2 SHIFTER INSTALLATION**

1. Place shift rod back into the mounting bracket and replace five bolts.
2. Reconnect linkage rods to shift rod slides. Adjust as required. See linkage adjustment procedures.
3. Replace remaining parts.



### **6.3 SHIFT LINKAGE ADJUSTMENT**

Linkage rod adjustment is necessary when symptoms include:

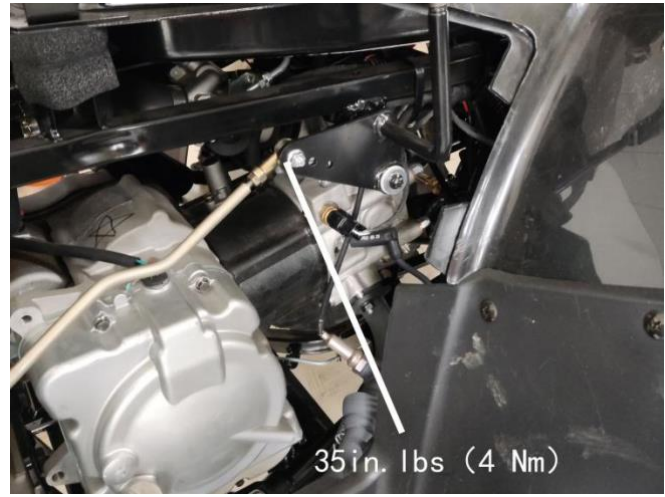
- Noise on deceleration
- Inability to engage a gear
- Excessive gear clash(noise)
- Shift selectors moving out of desired range

**NOTE:** When adjusting linkage, always adjust both linkage rods. The adjustment of one rod can prevent proper adjustment of the other rod. Remove necessary components to gain access to shift linkage rod ends.

1. Inspect shift linkage tie rod ends, and pivot bushings and replace if worn or damaged. Lubricate the tie rod ends with a light aerosol lubricant or grease.
2. Loosen all rod end adjuster jam nuts.
3. Note orientation of tie rod end studs with stud up or down. Remove both rod end studs from transmission bell cranks.
4. Be sure idle speed is adjusted properly.

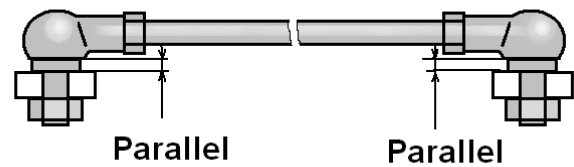
**NOTE:** It is important to disconnect both rod ends from the transmission bell cranks. If one linkage rod is incorrectly adjusted, it can affect the adjustment of the other rod.

5. Place gear selector in neutral. Make sure the transmission bell cranks are engaged in the neutral position detents.
6. Be sure the shift linkage rod ends are firmly attached to the gear selector slides. Adjust the low range (inside) rod so the rod end is centered on the transmission bell crank. Install the lock nut to the rod end and torque to 35 in.lbs ( 4 Nm).
7. Rotate the linkage rod clockwise until resistance is felt. Mark the rod so revolutions can be easily counter.
8. Rotate the linkage rod counterclockwise until the same resistance is felt, counting the revolutions as the rod is turned.



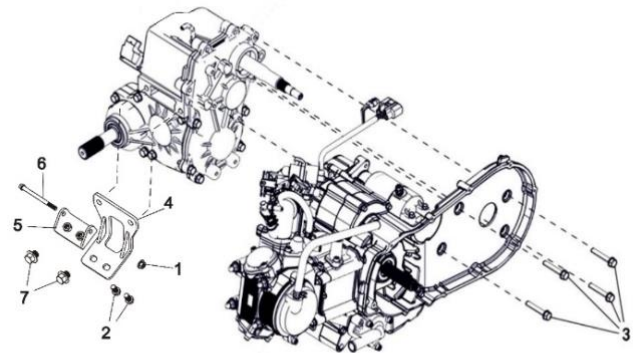
**Mark for counter**

9. Turn the rod clockwise again one half of the revolutions counted in Step 8.
10. Tighten the rod end jam nuts securely while holding the rod end. The jam nuts must be tightened with both front and rear rod ends parallel to each other. If jam nuts are properly tightened, the rod should rotate freely 1/4 turn without binding.
11. Repeat steps 7-10 for the High/Reverse rod.



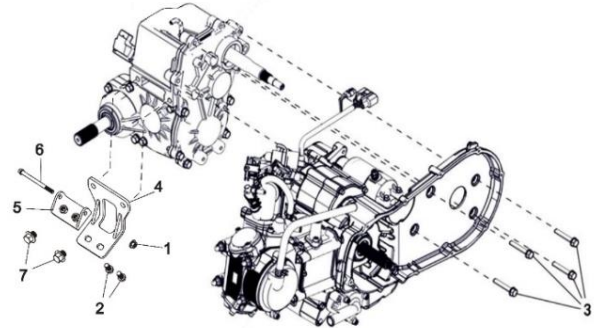
## **6.4 ENGINE AND TRANSMISSION DISASSEMBLY**

1. Remove the bolts(6) and the nut(1);
2. Remove four bolts from the engine;
3. Remove the transmission;
4. Loosen two bolts(7), Remove the engine connecting plate1(4).



**6.5 ENGINE AND TRANSMSSION ASSEMBLY**

1. Install the engine connecting plate1(4) to the transmission, tighten two bolts(7) with Loctite™ 243(Blue), the torque is 80-85N.m
2. Connectl the engine connecting plate1(4) to the engine connecting plate2(5), tighten two bolts(2) Loctite™ 243(Blue), the torque is 50-55N.m
3. Install the transmission to the engine, tighten four bolts ( 3 ) with Loctite™ 243(Blue), the torque is 28-32N.m
4. Install the bolts(6), tighten the nut(1), the torque is 28-32N.m

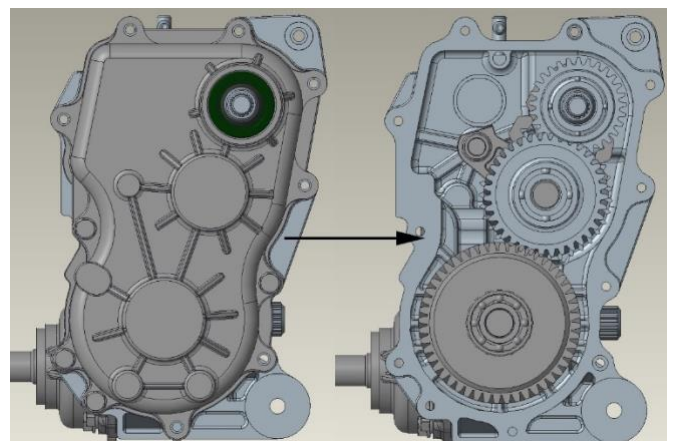
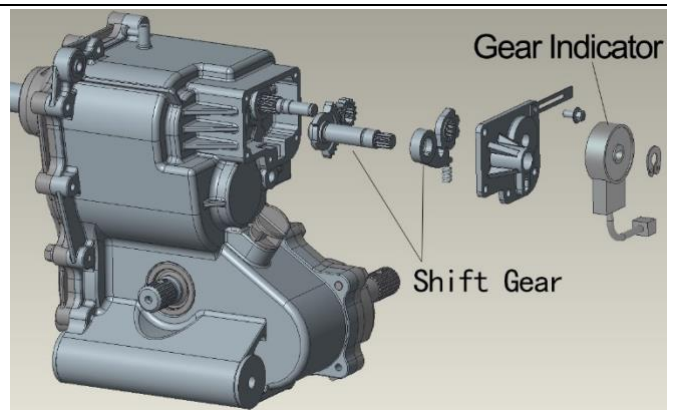


**6.6 TRANSMISSION DISASSEMBLY**

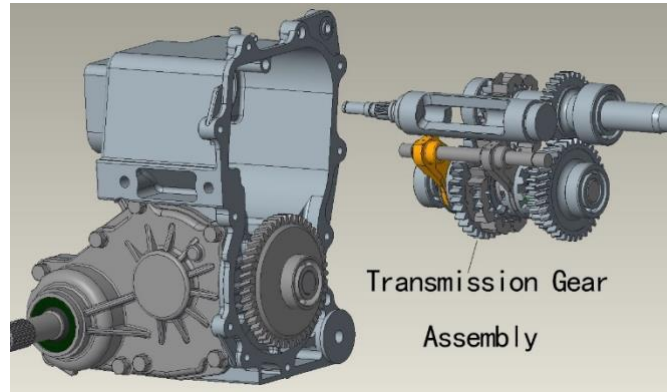
**IMPORTANT:** The gear position indicator

must be removed prior to disassembly.

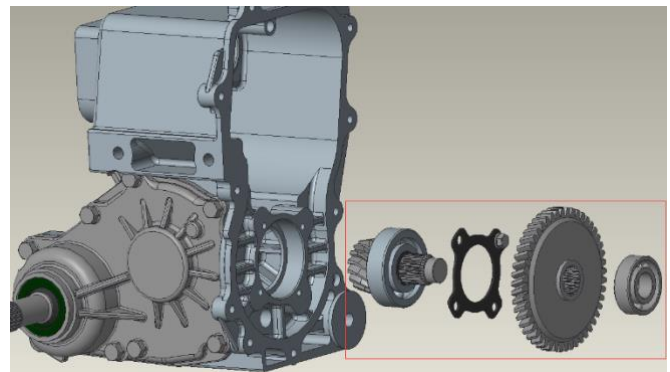
2. Place gears in neutral.
3. Remove gear position indicator, shift cover and shift gears.
4. Remove the transmission cover bolts.
5. Carefully remove the cover with a soft face hammer tap on the cover bosses.



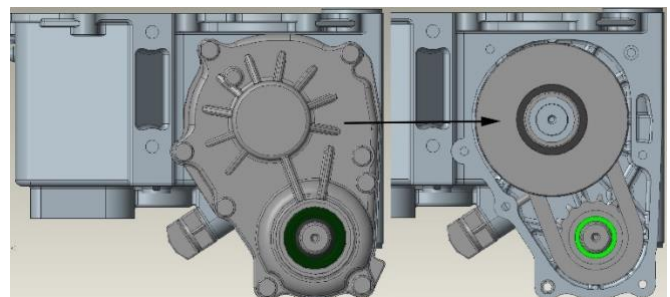
6. Remove transmission gear assembly.



7. Remove bearing, helical gear, pinion shaft retainer plate and pinion shaft.



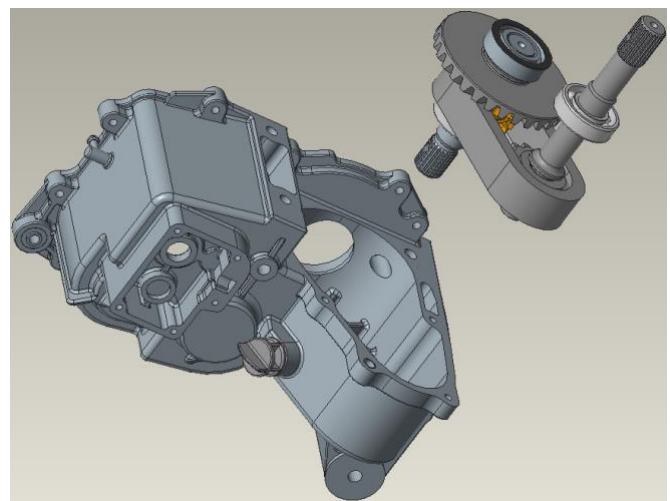
8. Remove front drive output housing cover screws. Carefully remove the cover with a soft face hammer tap on the cover bosses.



- 9. Remove shafts as an assembly.
- 10. Clean all components and inspect for wear.
- 11. Inspect engagement dogs of gears and replace if edges are rounded.
- 12. Inspect gear teeth for wear, cracks, chips or broken teeth.
- 13. Remove seals from transmission case.

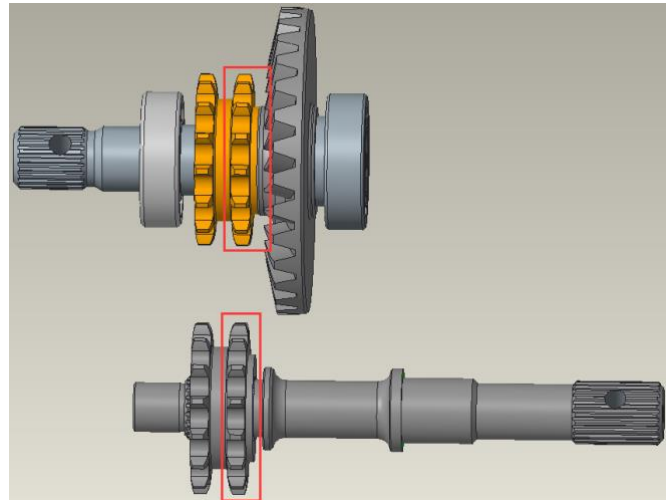
**IMPORTANT:** New seals should be installed after the transmission is completely assembled.

14. Inspect bearings for smooth operation. Check for excessive play between inner and outer race.

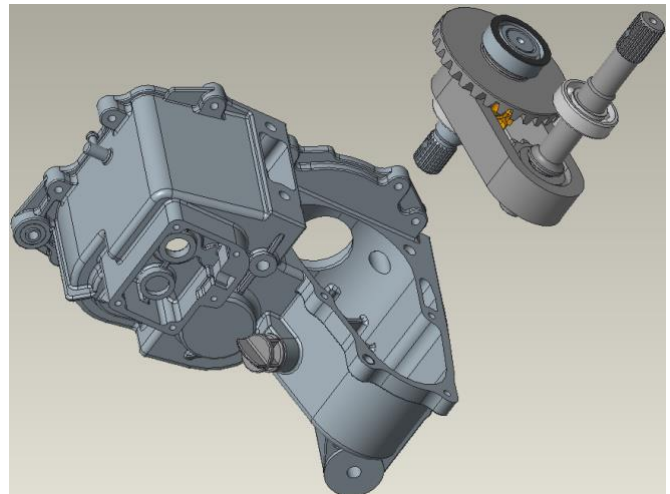


## 6.7 TRANSMISSION ASSEMBLY

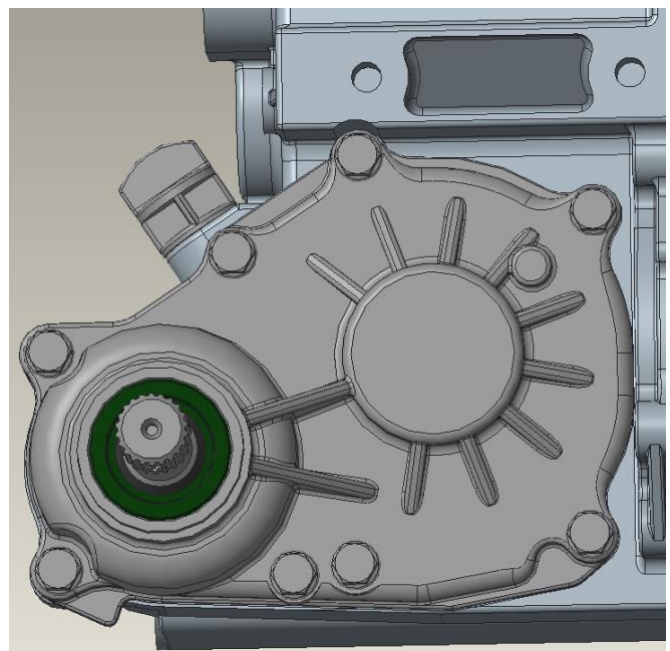
1. Install sprocket on front output shaft and rear output shafts, sprocket step facing right as shown.



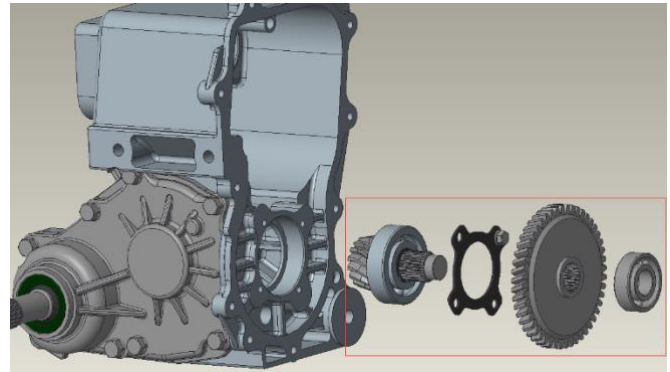
2. Install front and rear output shafts with chain as an assembly.
3. Before installing the cover make sure the sealing surfaces are clean and dry, and shafts are fully seated in the transmission case. Apply silicon glue to mating surfaces.



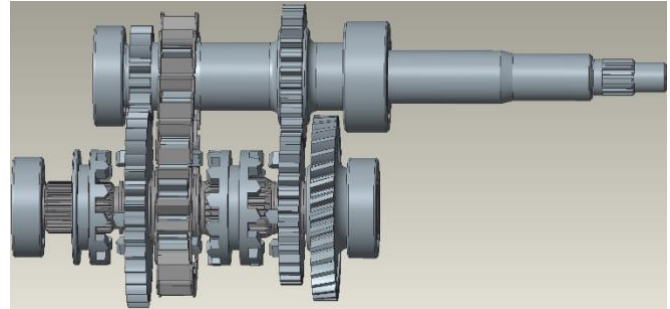
4. Reinstall cover and torque bolts in a criss-cross pattern in 3 steps to 14 ft. lbs. (20 Nm).
5. Install new front and rear output shaft seals.



6. Install pinion shaft, bearing, snap ring.
7. Install retainer plate with flat side toward bearing, apply Loctite™ 242(Blue) to screw threads and torque screws to 8 ft-lb (12Nm).
8. Install helical gear and bearing.

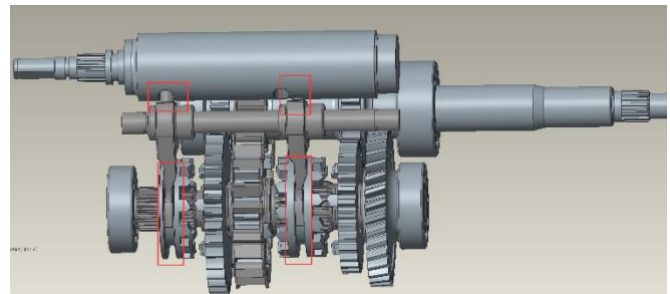


9. Assemble shafts with chain.

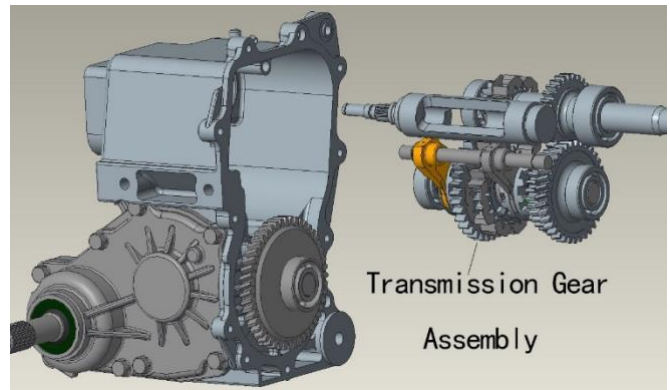


10. Install shift drum, shift fork and guide shaft.

**NOTE:** Make sure shift forks are properly positioned in the slot on switching plate and shift drum.



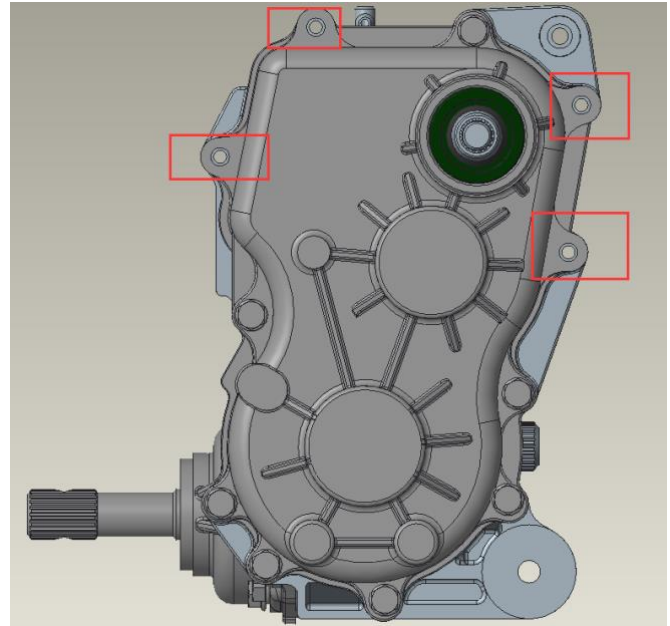
11. Carefully install transmission gear assembly. Tap with a soft face hammer to seat shaft assemblies.



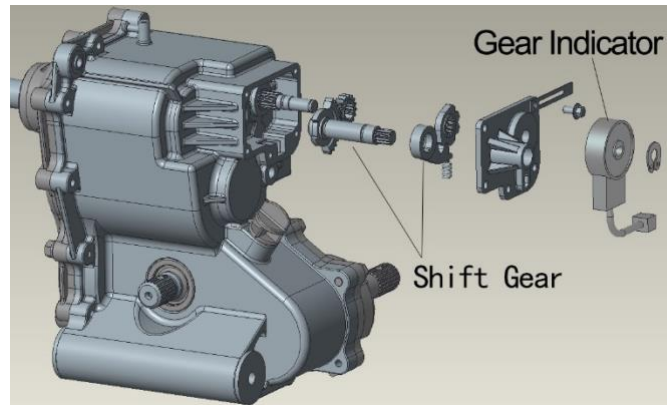
- 12. Prior to reinstalling the cover make sure the mating cover surfaces are clean and dry, and shafts are fully seated in transmission case. Apply silicon to mating surfaces.
- 13. Reinstall main cover and torque bolts in a cross pattern in 3 steps to 14 ft-lb (20Nm).

**NOTE:** The positions in the boxes shown in the figure are not fitted with bolts.

- 14. Install new input shaft seal.

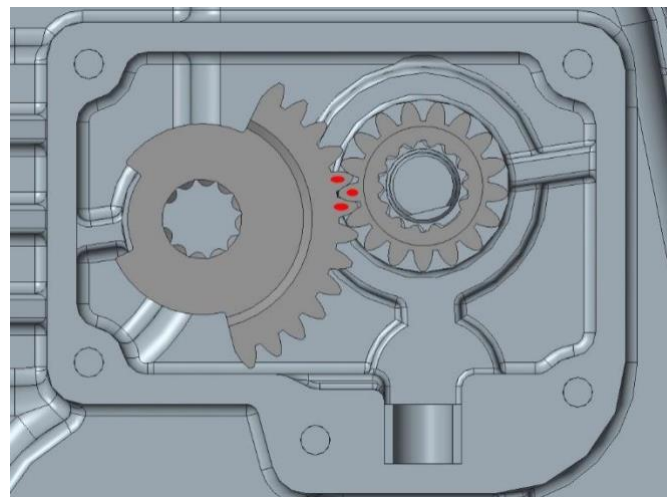


- 15. Install shift gears, shift cover and gear position indicato.



**NOTE:** When installing the shift gear, the symbols on top should correspond, as shown in the figure.

- 16. Install drain plug with a new sealing washer. Torque drain plug to 14 ft-lb.(19Nm).
- 17. Install transmission and add 80W/90 oil in the recommended amount. Refer to Maintenance Chapter.



## **6.8 TROUBLE SHOOTING CHECKLIST**

Check the following items when shifting difficulty is encountered

- Idle speed adjustment
- Transmission oil type/quality
- Driven clutch (CVT) deflection
- Loose fasteners on rod ends
- Loose fasteners on gear shift box
- Worn rod ends, clevis pins, or pivot arm bushings
- Linkage rod adjustment and rod end positioning
- Shift selector rail travel
- \*Worn, broken or damaged internal transmission components

Check the following items when transmission locked

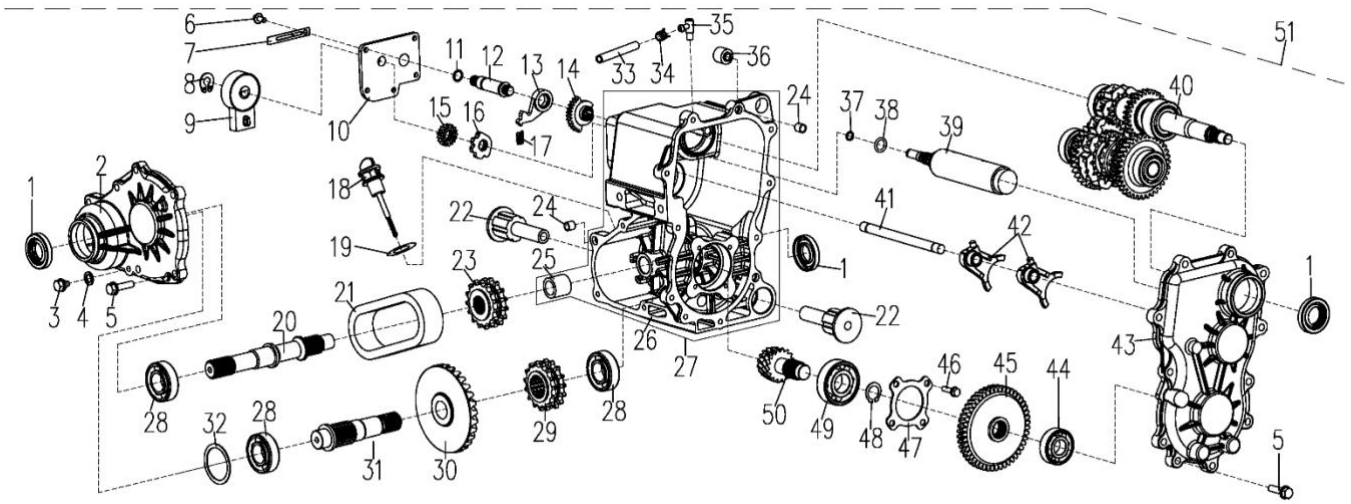
- Gear shifter malfunction (Selector lever end come out from slides notches), engage the Hi and Lo Gear at the same time.

**\*NOTE** : To determine if shifting difficulty or problem is caused by an internal transmission problem , isolate the transmission by disconnecting linkage rods from transmission bell cranks . Manually select each gear range at the transmission bell crank, and test ride vehicle. If it functions properly, the problem is outside the transmission.

If transmission problem remains, disassemble transmission and inspect all gear dogs for wear (rounding), damage. Inspect all bearings, circlips, thrust washers and shafts for wear.

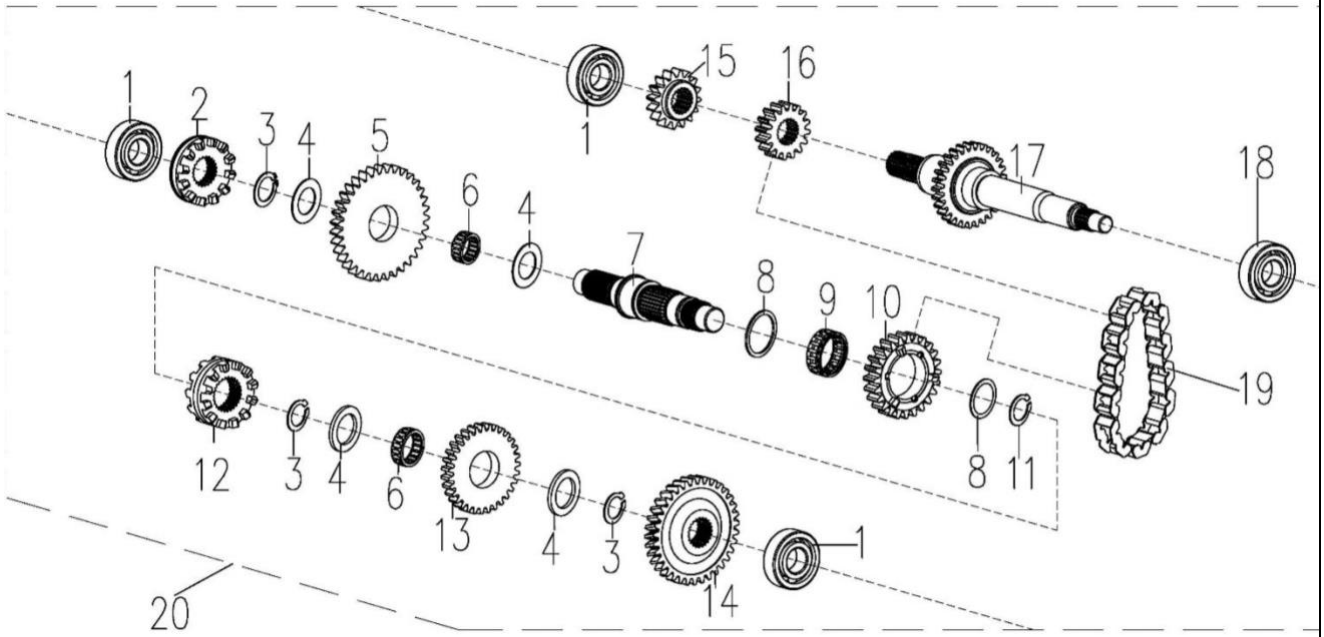


TRANSMISSION EXPLODED VIEW



REF. No.	DESCRIPTION	Q'TY	REF. No.	DESCRIPTION	Q'TY
1	SEAL 25X47X8	3	27	Gear Case assembly	1
2	Front Cover	1	28	BEARING 6205C3	3
3	DRAIN SCREW	1	29	Drive Sporcket	1
4	WASHER	1	30	REAR DRIVE GEAR	1
5	BOLT M8X28	14	31	REAR OUTPUT SHAFT	1
6	BOLT M6×16	5	32	SHIM 1	1
7	CABLE CLAMP	1	33	VENT	1
8	Circlip 11	1	34	CLAMP	1
9	Gear Shift Component	1	35	BEARING	1
10	Shift Cover	1	36	Rear Flex Sleeve	1
11	O-Ring 13.2X1.8	1	37	O-Ring 9.5X1.8	1
12	Shaft, Gear Shift	1	38	O-Ring 14.5X3	1
13	Stop Swing Lever, Gear Shift	1	39	Drum, Fork Shift	1
14	Drive Gear, Gear Shift	1	40	Main transmission assembly	1
15	Driven Gear, Gear Shift	1	41	Guide Shaft, Shift Fork	1
16	Camshaft, Gear Shift	1	42	Shift Fork	2
17	Spring	1	43	Left Cover	1
18	DIPSTICK	1	44	BEARING 6204	1
19	O RING 18X2.65	1	45	GEAR HELICAL 46T	1
20	SHAFT FRONT OUTPUT	1	46	SCREW M6X10	4
21	CHAIN	1	47	BEARING RETAINER PLATE	1
22	ENGINE MOUNT BUSHING	2	48	SNAP RING	1
23	Driven Sporcket	1	49	BEARING 6305	1
24	DOWEL PIN	4	50	PINION SHAFT 10T	1

25*	BUSHING	1	51	TRANSMISSION(4WD)	1
26*	GEAR CASE	1			



REF. No.	DESCRIPTION	Q'TY	REF. No.	DESCRIPTION	Q'TY
1	BEARING 6204	3	11	SNAP RING	1
2	ENGAGEMENT	1	12	DOG GEAR	1
3	SNAP RING	3	13	GEAR 31T	1
4	THRUST WASHER 1	4	14	GEAR, HELICAL 35T	1
5	GEAR 35T	1	15	GEAR 16T	1
6	NEEDLE BEARING 25	2	16	SPROCKET	1
7	SHAFT	1	17	INPUT SHAFT	1
8	THRUST WASHER 2	2	18	BEARING 5205 C3	1
9	NEEDLE BEARING 25	1	19	CHAIN	1
10	SPROCKET 24T	1	20	Main transmission assembly	1



# CHAPTER 7 BRAKES

## WARNING

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

## NOTE

Also See Chapter 2 for Maintenance Information.

See Chapter 4B for Assembling information about Drum Brake of Youth/ Mini.ATV.

### 7.1 SPECIFICATIONS

### 7.2 TORQUE

### 7.3 BRAKE SYSTEM SERVICE NOTES

### 7.4 BURNISHING PROCEDURE

### 7.5 FLUID REPLACEMENT/BLEEDING PROCEDURE

### 7.6 HAND BRAKE MASTER CYLINDER REMOVAL/ INSPECTION /INSTALLATION

### 7.7 FRONT PAD REMOVAL / INSPECTION / INSTALLATION

### 7.8 FRONT DISC INSPECTION / REMOVAL / REPLACEMENT

### 7.9 FRONT CALIPER REMOVAL/ INSPECTION / INSTALLATION

### 7.10 REAR BRAKE PAD REMOVAL/ INSPECTION / INSTALLATION

### 7.11 REAR CALIPER REMOVAL/ INSPECTION/ INSTALLATION

### 7.12 REAR BRAKE DISC INSPECTION / REMOVAL / REPLACEMENT

**7.1 SPECIFICATIONS**

<b>Front Brake Caliper</b>		
<b>Item</b>	<b>Standard</b>	<b>Service Limit</b>
Brake Pad Friction material Thickness	0.157"/ 4mm	0.04"/ 1mm
Brake Disc Thickness	0.150- 0.164"/3.810- 4.166mm	0.140"/3 .556mm
Brake Disc Thickness Variance Between Measurements	-	0.002 "/ .051mm
Brake Disc Runout	-	0.005 "/ .127mm
<b>Rear Brake Caliper</b>		
<b>Item</b>	<b>Standard</b>	<b>Service Limit</b>
Brake Pad Friction material Thickness	hydraulic	0.04"/ 1mm
	Hydraulic with mechanics park	
	mechanics park	
Brake Disc Thickness	0.177-0.187"/4.496-4.750mm	0.167"/4.242mm
Brake Disc Thickness Variance Between Measurements	-	0.002 "/ 0.051mm
Brake Disc Run out	-	0.005 "/ 0.127mm

**7.2 TORQUE**

<b>Item</b>	<b>Torque (ft. lbs. except where noted*)</b>	<b>Torque (Nm )</b>
Front Caliper Mounting Bolts	18.0	25
Rear Caliper Mounting Bolts	18 .0	25
Master Cylinder Mounting Bolts	*55 in. lbs	6.0
Master Cylinder Reservoir Cover Bolts	*5 in. lbs	.6
Hand Brake Hose Banjo Bolt	15 .0	21
Front Brake Disc	18 .0	25
Front Wheel Mounting Nuts	20 .0	27

**7.3 BRAKE SYSTEM SERVICE NOTES**

●It is strongly recommended always change the caliper and (or) the master cylinder as an assembly. The parts inside maybe not interchangeable due to different brake manufactures and (or) different brake type.

- Do not over – fill the master cylinder fluid reservoir.
- Make sure the brake lever and pedal returns freely and completely.

- Check and adjust master cylinder reservoir fluid level after pad service.
- Make sure atmospheric vent on reservoir is unobstructed.
- Adjust foot brake after pad service.
- Test for brake drag after any brake system service and investigate cause if brake drag is evident.
- Make sure caliper moves freely on guide pins (where applicable) .
- Inspect caliper piston seals for foreign material that could prevent caliper pistons from returning freely.
- Perform a brake burnishing procedure after install new pads to maximize service life.

**7.4 BURNISHING PROCEDURE**

Brake pads (both hydraulic and mechanical) must be burnished to achieve full braking effectiveness. Braking distance will be extended until brake pads are properly burnished. To properly burnish the brake pads, use the following procedure.

1. Choose an area large enough to safely accelerate the ATV to 50 km/h (30 mph ) and to brake to a stop.
2. Using hi gear, accelerate to 50 km/h (30 mph); then compress brake lever (pedal) to decelerate to 0-8km/h (5 mph).
3. Repeat procedure on each brake system 20 times until brake pads are burnished.
- (4. Adjust the mechanical parking brake (if necessary).)
5. Verify that the brake light illuminates when the hand lever is compressed or the brake pedal is depressed.

**WARNING**

Failure to properly burnish the brake pads could lead to premature brake pad wear or brake loss. Brake loss can result in severe injury.

**7.5 FLUID REPLACEMENT/BLEEDING PROCEDURE**

**NOTE :** When bleeding the brakes or replacing the fluid always start with the caliper farthest from the master cylinder.

**CAUTION**

Always wear safety glasses.

**CAUTION**

Brake fluid is highly corrosive. Do not spill brake fluid on any surface of the ATV.



**BRAKE BLEEDING-FLUID CHANGE**

This procedure should be used to change fluid or bleed brakes during regular maintenance.

1. Clean reservoir cover thoroughly.
2. Remove screws, cover and diaphragm from reservoir.
3. Inspect vent slots in cover and remove any debris or blockage.
4. If changing fluid, remove old fluid from reservoir with a brake fluid pump or similar tool.

**NOTE:** Do not remove brake lever when reservoir fluid level is low.

5. Add brake fluid up to the indicated MAX level on the reservoir.
6. Begin bleeding procedure with the caliper that is farthest from the master cylinder. Install a box end wrench on the caliper bleeder screw. Attach a clean, clear hose to the fitting and place the other end in a clean container. Be sure the hose fits tightly on the fitting.

**NOTE:** Fluid may be forced from supply port when brake lever is pumped. Place diaphragm in reservoir to prevent spills. Do not install cover.

**DOT 3 Brake Fluid**

Reservoir Cover Torque  
5 in. lbs. (.6 Nm)

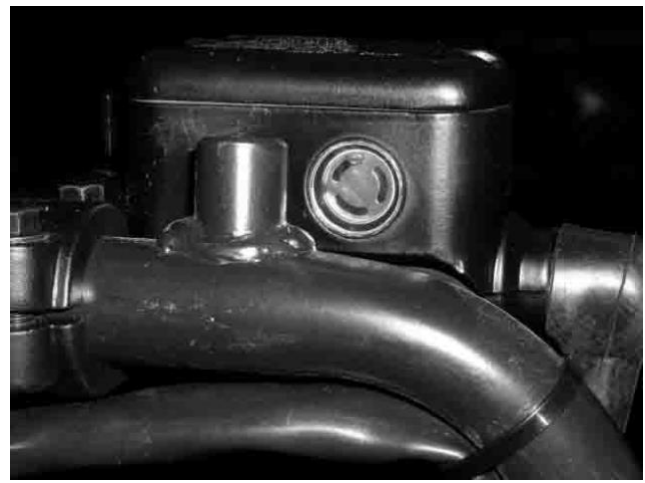
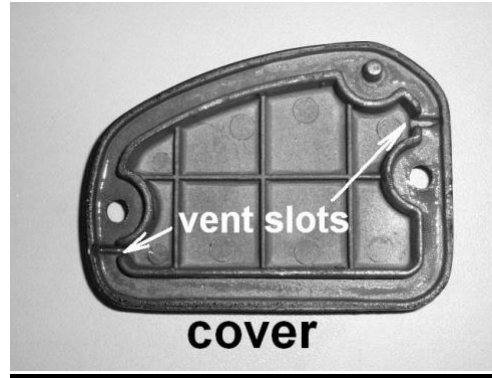
7. Slowly pump brake lever (D) until pressure builds and holds.
8. While maintaining lever pressure, open bleeder screw. Close bleeder screw and release brake lever.

**NOTE:** Do not release lever before bleeder screw is tight or air may be drawn into caliper.

**NOTE:** In some versions of brake, there are 2 hydraulic circuits in one caliper for foot brake and hand brake. Make sure you bleed the right circuit.

9. Repeat procedure until clean fluid appears in bleeder hose and all air has been purged. Add fluid as necessary to maintain level in reservoir.

**CAUTION:**



Maintain at least 1/2 " (13mm) of brake fluid in the reservoir to prevent air from entering the master cylinder.

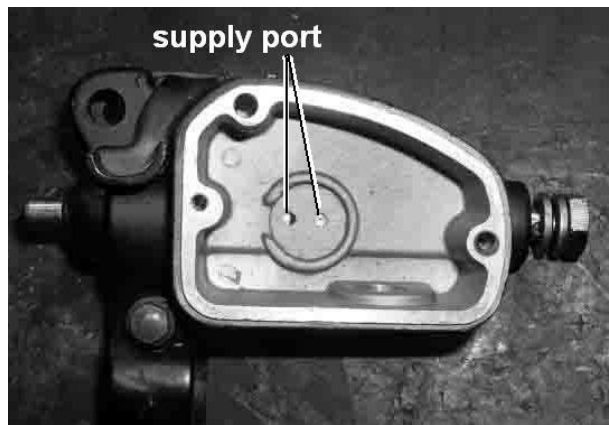
10. Tighten bleeder screw securely and remove bleeder hose.
11. Repeat procedure steps 5- 9 for the remaining caliper (s).
12. Add brake fluid to MAX level on reservoir.

#### Master Cylinder Fluid Level:

#### MAX level or

**Sight glass must look dark, if sight glass is clear, fluid level is too low.**

13. Install diaphragm, cover and screws. Tighten screws to specification.
14. Field test machine at low speed before putting into service. Check for proper braking action and lever reserve. With lever firmly applied, lever reserve should be no less than 1/2 " (13mm ) from handlebar.
15. Check brake system for fluid leaks and inspect all hoses and lines for wear or abrasion. Replace hose if wear or abrasion is found.



## 7.6 HAND BRAKE MASTER CYLINDER REMOVAL/ INSPECTION

### /INSTALLATION

**CAUTION:** The master cylinder is a non-serviceable Component; it must be replaced as an assembly.



**NOTE:** If any special service needed, contact the ATV manufacture via the agent for the parts and special instruction.

**REMOVAL**

1. Clean master cylinder and reservoir assembly. Make sure you have a clean work area to disassemble brake components.
2. Place a shop towel under brake hose connection at m aster cylinder. Loosen bolt, remove bolt and sealing washers.



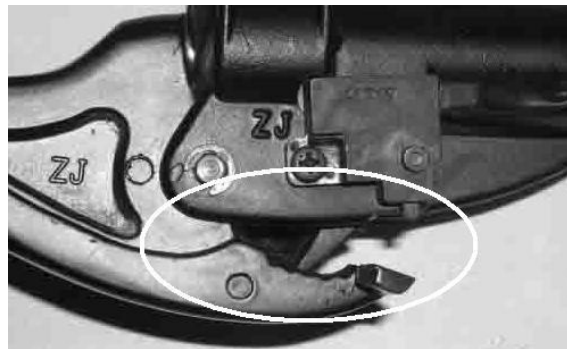
**CAUTION**

Brake fluid will damage finished surfaces. Do not allow brake fluid to come in contact with finished surfaces.

3. Remove master cylinder from handlebars.

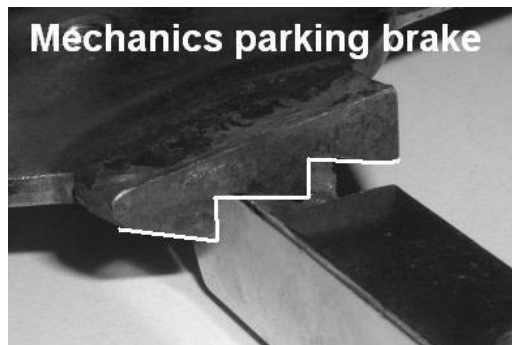
**INSPECTION**

Inspect parking brake for wear. If teeth or locking cam are worn, replace lever and test the parking performance, if any locking problem exists, Replace the master cylinder as an assembly. **NOTE:** Mechanics parking brake is equipped for new Europe model.



**INSTALLATION**

1. Install master cylinder on handlebars. Torque mounting bolts to 55 in. lbs. (6 N m). **NOTE:** To speed up the brake bleeding procedure the m aster cylinder can be purged of air before brake hose is attached. Fill with DOT3 brake fluid and pump lever slowly two to three times with finger over the outlet end to purge master cylinder of air.
2. Place new sealing washers on each side of hand brake hose and torque bolt to specification.

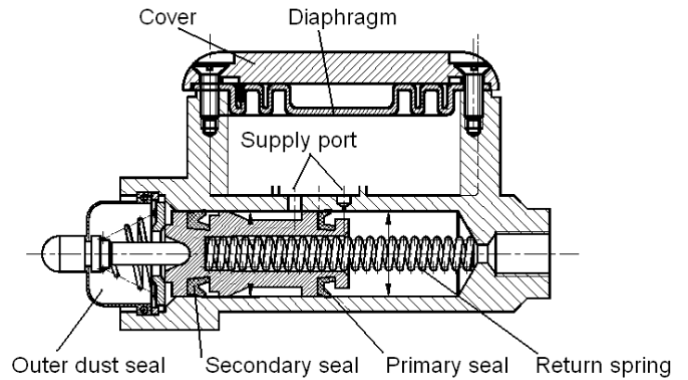


**Master Cylinder Mounting Bolt Torque 55 in. lbs . (6 N m)**

**Brake Line Banjo Bolt Torque 15 ft. lbs. (21 Nm )**

3. Fill reservoir with **DOT 3** fluid.
4. Follow bleeding procedure, Check all connections for leaks and repair if

necessary.



**7.7 FRONT PAD REMOVAL / INSPECTION / INSTALLATION**

**NOTE:** The brake pads should be replaced as a set.

**REMOVAL**

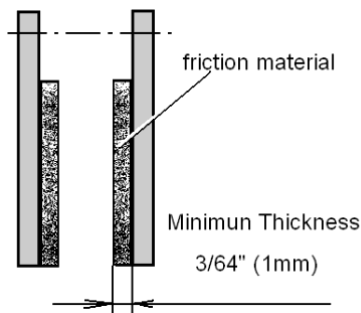
1. Elevate and support front of ATV safely.

**CAUTION:** Use care when supporting vehicle so that it does not tip or fall. Severe injury may occur if machine tips or falls.

2. Remove the front wheel.
3. Remove caliper from mounting bracket.
4. Push caliper piston into caliper bore slowly using a C-clamp or locking pliers with pads installed.

**NOTE:** Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.

5. Push mounting bracket inward and slip outer brake pad past edge. Remove inner pad.
6. Measure the thickness of the pad material. Replace pads if worn beyond the service limit.



**INSPECTION**

Measure the thickness of the pad friction material. Replace pads if worn beyond the service limit.

Service Limit 0.3/64"(1 mm)

**INSTALLATION**

1. Lubricate mounting bracket pins with a light film of All Season Grease, and install rubber

dust boots.

2. Compress mounting bracket and make sure dust boots are fully seated. Install pads with friction material facing each other. Be sure pads and disc are free of dirt or grease.

Front Caliper Mounting Bolts Torque 18 ft. lbs. (25 Nm )

3. Install caliper on hub strut, and torque mounting bolts.

4. Slowly pump the brake lever until pressure has been built up. Maintain at least 1/2 ". (13 mm) of brake fluid in the reservoir to prevent air from entering the brake system.

5. Install the adjuster screw and turn clockwise until stationary pad contacts disc, then back off 1/2 turn (counter clockwise).

6. Install reservoir cap.

**Hand and (or) Foot Brake Master Cylinder(s) Fluid Level:**

**Between MIN and MAX lines**

7. Install wheels and torque wheel nuts, test and burnish.

See **BURNISHING PROCEDURE**

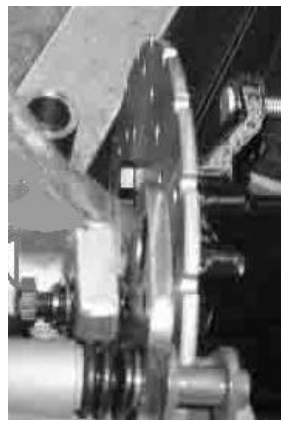


**7.8 FRONT DISC INSPECTION / REMOVAL / REPLACEMENT**

**INSPECTION**

1. Visually inspect the brake disc for nicks, scratches, or damage.

2. Measure the disc thickness at 8 different points around the pad contact surface using a 0-1" micrometer and a dial indicator. Replace disc if worn beyond service limit.



**Brake Disc Thickness**

New 0.150-0.164" (3.810-4.166mm)

Service Limit 0.140" / 3.556 mm

**Brake Disc Thickness Variance**

Service Limit 0.002 " (0.051mm)

difference between measurements

**Brake Disc Runout**

Service Limit 0.005" (0.127 mm)

**REMOVAL/ REPLACEMENT**

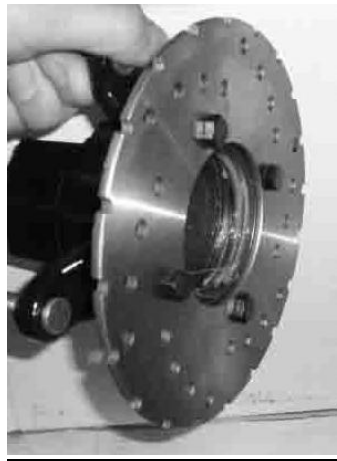
1. Removal caliper and hub. Apply heat to the

hub in the area of the brake disc mounting bolts to soften the bolt locking agent.

2. Remove bolts and disc.
3. Clean mating surface of disc and hub.
4. Install new disc on hub.
5. and tighten to specified.

**CAUTION:** Always use new brake disc mounting bolts.

Front Brake Disc Mounting Bolt Torque :  
18 ft. lbs. (25 Nm )



## 7.9 FRONT CALIPER REMOVAL/ INSPECTION / INSTALLATION

**CAUTION:** The caliper is a non-serviceable Component; it must be replaced as an assembly.

**NOTE:** If any special service needed, contact the ATV manufacture via the agent for the parts and special instruction.

### REMOVAL

1. Remove wheel, remove caliper from the strut.
2. Loosen and remove brake hose(s) to caliper. Place a container under caliper to catch fluid draining.

### INSPECTION

Inspect caliper body for nicks, scratches or worn. Replace caliper as an assembly if any problem exists.

### INSTALLATION

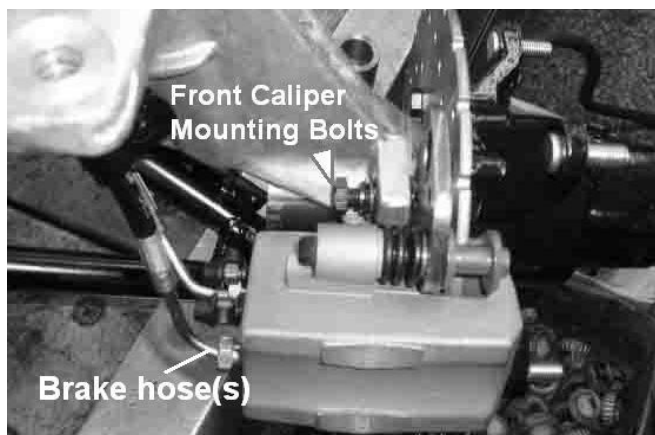
1. Install caliper on hub strut, Apply Loctite™ 242 to screw threads and Install new bolts.

Front Caliper Mounting Bolt Torque  
18 ft. lbs. (25 Nm )

2. Install brake hose and tighten securely.

**NOTE:** In some versions of brake, there are 2 hydraulic circulates (for foot brake and hand brake) in one caliper. Make sure you install the right hose.

3. Bleeding and Install wheels, If new brake pads are installed, burnishing procedure should be performed. See **BURNISHING PROCEDURE**, And field test unit for proper



braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when lever is released. If the brake drags, recheck assembly and installation.

**7.10 REAR BRAKE PAD REMOVAL/ INSPECTION / INSTALLATION**

**NOTE:** The brake pads should be replaced as a set.

**REMOVAL and INSPECTION**

1. Remove caliper mounting bolts and lift caliper off of disc.

**NOTE.** When removing caliper, be careful not to damage brake hose . Support caliper so as not to kink or bend brake hose.

2. Push caliper pistons into caliper bore slowly with pads installed.

**NOTE:** Brake fluid will be forced through compensating port into master cylinder fluid reservoir when piston is pushed back into caliper. Remove excess fluid from reservoir as required.

3. Remove brake pad retaining pin, and pad spacer.

**NOTE:** Do not over spread this spring pin a part farther than necessary to remove it.

4. Clean.

5. Measure the thickness of the pad friction material. Replace pads if worn beyond the service limit.

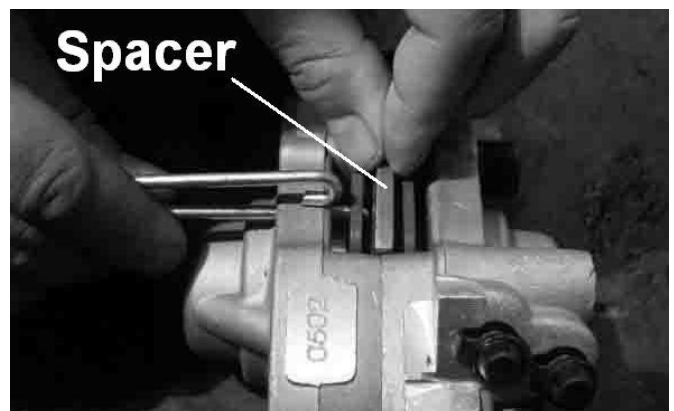
Rear Brake Pad Service Limit 0.3/64"(1 mm)

**INSTALLATION**

1. Install new pads in caliper body. Be sure to put spacer between pads.

2. Install caliper and torque mounting bolts.

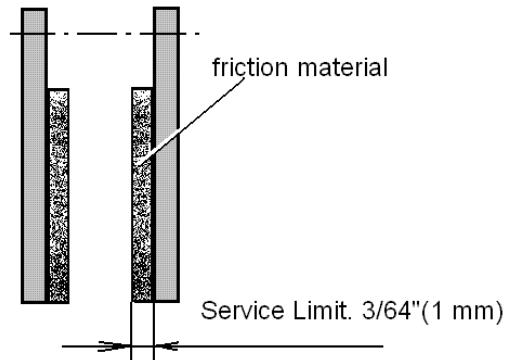
Brake Caliper Torque: 18 ft. lbs. (25 Nm )



3. Slowly pump the brake lever until pressure has been built up. Maintain at least 1/2 " (13 mm) of brake fluid in the reservoir to prevent air from entering the master cylinder.

**Hand and (or) Foot Brake Master Cylinder(s) Fluid Level:  
Between MIN and MAX lines**

4. Install wheels, burnishing procedure should be performed. See **BURNISHING PROCEDURE**, And field test unit for proper braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when lever is released. If the brake drags, recheck assembly and installation.



**7.11 REAR CALIPER REMOVAL/ INSPECTION/ INSTALLATION**

**CAUTION:** The caliper is a non-serviceable Component; it must be replaced as an assembly.

**NOTE:** If any special service needed, contact the ATV manufacture via the agent for the parts and special instruction.

1. Clean caliper area.
2. Using a flare nut wrench, remove hose(s). Place a container to catch brake fluid draining from brake hose.
3. Remove caliper.
4. Remove brake pad as described above.
5. Inspect surface of caliper for nicks, scratches or damage and replace if necessary.
6. Install brake pads in caliper body with friction material facing each other, with the spacer between the pads. Install retaining pin through outer pad, pad spacer and inner pad.
7. Install caliper and torque mounting bolts.

**Caliper Mounting Bolt/ Caliper body Bolt  
Torque:**

**18 ft. lbs. (25 Nm)**

8. Install brake hose and tighten to specified torque.

**Banjo Bolt Torque: 15 ft. lbs. (21 Nm)**

**NOTE:** In some versions of brake, there are 2 hydraulic circulates (for foot brake and hand



brake) in one caliper. Make sure you install the right hose.

9. Bleed.

10. Field test unit for proper braking action before putting into service. Inspect for fluid leaks and firm brakes. Make sure the brake is not dragging when lever is released. If the brake drags, recheck assembly and installation.

## **7.12 REAR BRAKE DISC INSPECTION / REMOVAL / REPLACEMENT**

### **INSPECTION**

1. Visually inspect the brake disc for nicks, scratches, or damage.
2. Measure the disc thickness at 8 different points around the pad contact surface using a 0-1" micrometer and a dial indicator. Replace disc if worn beyond service limit.

Brake Disc Thickness

New 0.177-0.187" (4.496-4.750mm)

Service Limit 0.167" (4.242 mm)

Brake Disc Thickness Variance

Service Limit 0.002 " (0.051mm)

difference between measurements

Brake Disc Runout

Service Limit 0.005" (0.127 mm)

### **REMOVAL/ REPLACEMENT**

1. Removal wheel/ hub and caliper.
2. Remove bolts and disc from the flange.
3. Clean mating surface of disc and hub.
4. Install new disc on flange.
5. Tighten to specified.

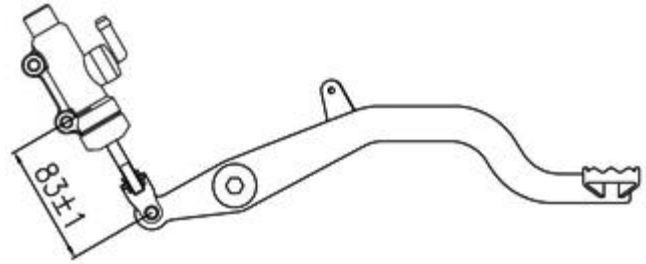
**CAUTION:** Always use new brake disc mounting bolts.

Rear Brake Disc Mounting Bolt Torque :  
18 ft. lbs. (25 Nm )

**7.13 FOOT BRAKE PEDAL FOR B-TYPE**

**ADJUSTING**

If the push rod joint is reinstalled, adjust the push rod length so that the distance between the centers of the master cylinder lower mounting bolt hole and joint pin hole is 83±1mm. After adjustment, tighten the joint nut.



**NOTES**

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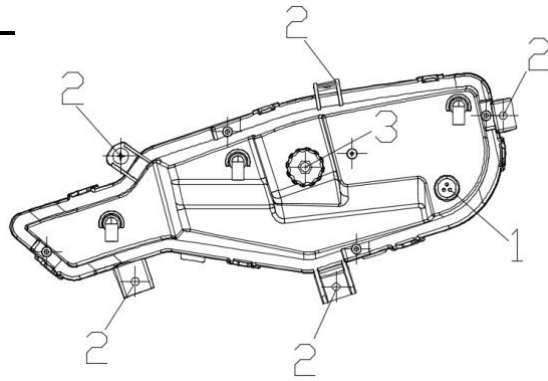
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# **CHAPTER 8 ELECTRICAL**

- 8.1 PARTS INSPECTION AND SERVICE
- 8.2 BATTERY
- 8.3 IGNITION SYSTEM
- 8.4 CHARGING SYSTEM
- 8.5 ELECTRICS STARTING SYSTEM
- 8.6 COOLING SYSTEM
- 8.7 LIGHTING SYSTEM
- 8.8 REVERSE LIMIT SYSTEM
- 8.9 GEAR POSITION INDICATOR SWITCH TEST
- 8.10 SPEEDOMETER SYSTEM
- 8.11 MAIN SWITCH AND HANDLE SWITCH
- 8.12 FUEL GAUGE/ FUEL LEVEL SENSOR
- 8.13 THE OPERATION PRINCIPLE OF THE ELECTRIC 4WD SHIFT
- 8.14 WIRING DIAGRAM

**8.1 PARTS INSPECTION AND SERVICE****HEADLIGHT LAMP REPLACEMENT  
ATV300-T3**

1. Use LED light sources. High beam: 12V 7.8w; Low beam: 12V 7.2w; Side Light: 12V 2.4w.
2. Unplug the lamp (1) from the harness.
3. Loosen the five fastening screws (2), remove the lamp and replace it with a new headlamp assembly.

**HEADLIGHT ADJUSTMENT**

1. The headlight beam can be adjusted vertically. High beam and low beam can only be adjusted simultaneously.
2. Place the vehicle on a level surface with the headlight approximately 25' (7.6m) from a wall.
3. Measure the distance from the floor to the center of the headlight and make a mark on the wall at the same height.
4. Start the engine and turn the headlight switch to high beam.
5. Observe headlight aim. The most intense part of the headlight beam should be aimed 2' (51mm) below the mark placed on the wall in step 2. NOTE : Riding weight must be included on the seat.
6. Loosen (3) but not remove pivot bolt/ screw and adjust beam to desired position. The upper and lower adjustment range is  $\pm 3^\circ$
7. Tighten nut and bolt / screw.

**8.2 BATTERY**

Battery electrolyte is poisonous. It contains sulfuric acid. Serious burns can result from contact with skin, eyes or clothing Antidote:

**External:** Flush with water.

**Internal:** Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately.

**Eyes:** Flush with water for 15 minutes and get prompt medical attention.

Batteries produce explosive gases. Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in an enclosed space. Always shield eyes when working near batteries.

**KEEP OUT OF REACH OF CHILDREN**

**WARNING:** The gases given off by a battery are explosive. Any spark or open flame near a battery can cause an explosion which will spray battery acid on anyone close to it. If battery acid gets on anyone, wash the affected area with large quantities of cool water and seek immediate medical attention.

To ensure maximum service life and performance from a new battery, perform the following steps.  
**NOTE:** Do not service the battery unless it will be put into regular service within 30 days. After initial service, add only distilled water to the battery. Never add electrolyte after a battery has been in service.

**NOTE:** New Battery must be fully charged before use.

1. Remove vent plug from vent fitting.
2. Fill battery with electrolyte to upper level marks on case.
3. Set battery aside and allow it to cool and stabilize for 30 minutes.
4. Add electrolyte to bring level back to upper level mark on case.

**NOTE:** This is the last time that electrolyte should be added. If the level becomes low after this point, add only distilled water.

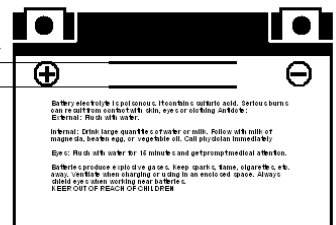
5. Charge battery at 1 /10 of its amp /hour rating. Examples: 1 /10 of 14 amp battery = 1.4 amp; 1/10 of 7 amp battery = 0.7 amp (recommended charging rates).
6. Check specific gravity of each cell with a hydrometer to assure each has a reading of 1.270 or higher.

**BATTERY INSPECTION / REMOVAL**

The battery is located under the left rear fender. Inspect the battery fluid level. When the battery fluid nears the lower level, the battery should be removed and distilled water should be added to the upper level line. To remove the battery:

1. Disconnect holder strap and remove cover.
2. Disconnect battery negative (-) (black) cable first, followed by the positive (+) (red) cable.

Maintain between upper  
and lower level marks

**CAUTION**

Whenever removing or reinstalling the battery, disconnect the negative (black) cable first and reinstall the negative cable last!

3. Disconnect the vent hose.
4. Remove the battery.
5. Remove the filler caps and add *distilled water only* as needed to bring each cell to the proper

level.

Do not overfill the battery.

To refill use only distilled water. Tap water contains minerals which are harmful to a battery.

Do not allow cleaning solution or tap water to enter the battery. It will shorten the life of the battery.

5. Reinstall the battery caps.

### BATTERY INSTALLATION

1. Clean battery cables and terminals with a stiff wire brush. Corrosion can be removed using a solution of one cup water and one tablespoon baking soda. Rinse with clean water and dry thoroughly.

2. Reinstall battery, attaching positive (+) (red) cable first and then the negative (-) (black) cable.

3. Install clear battery vent tube from vehicle to battery vent.

**WARNING:** Vent tube must be free from obstructions and kinks and securely installed. If not, battery gases could accumulate and cause an explosion. Vent should be routed away from frame and body to prevent contact with electrolyte. Avoid frame, corrosion will occur.

4. Route cables so they are tucked away in front and behind battery.

5. Reinstall battery cover and holder strap.

Do not start the engine with the battery disconnected. Vehicle lamps will burn out if battery is disconnected during vehicle operation. Also, the reverse speed limiter can be damaged.

### BATTERY TESTING

Whenever a service complaint is related to either the starting or charging systems, the battery should be checked first.

Following are three tests which can easily be made on a battery to determine its condition: OCV Test, Specific Gravity Test and Load Test.

**MF (Maintenance Free) battery does not require the Specific Gravity Test and Refill**

#### Open Circuit Voltage Test

Battery voltage should be checked with a digital multimeter. Readings of 12.6 or less require further battery testing and charging.

**NOTE:** Lead acid batteries should be kept at or near a full charge as possible.

#### Load test

**CAUTION:** Remove spark plug high tension leads and connect securely to engine ground before proceeding.

**NOTE:** This test can only be performed on machines with electric starters. This test cannot be performed with an engine or starting system that is not working properly.

A battery may indicate a full charge condition in the OCV test and the specific gravity test, but still may not have the storage capacity necessary to properly function in the electrical system. For this reason, a battery capacity or load test should be conducted whenever poor battery performance is encountered. To perform this test, hook a multimeter to the battery in the same manner as was done in the OCV test. The reading should be 12.6 volts or greater. Engage the electric starter and view the registered battery voltage while cranking the engine. Continue the test for 15 seconds. During this cranking period, the observed voltage should not drop below 9.5 volts. If the beginning voltage is 12.6 or higher and the cranking voltage drops below 9.5 volts during the test, replace the battery.

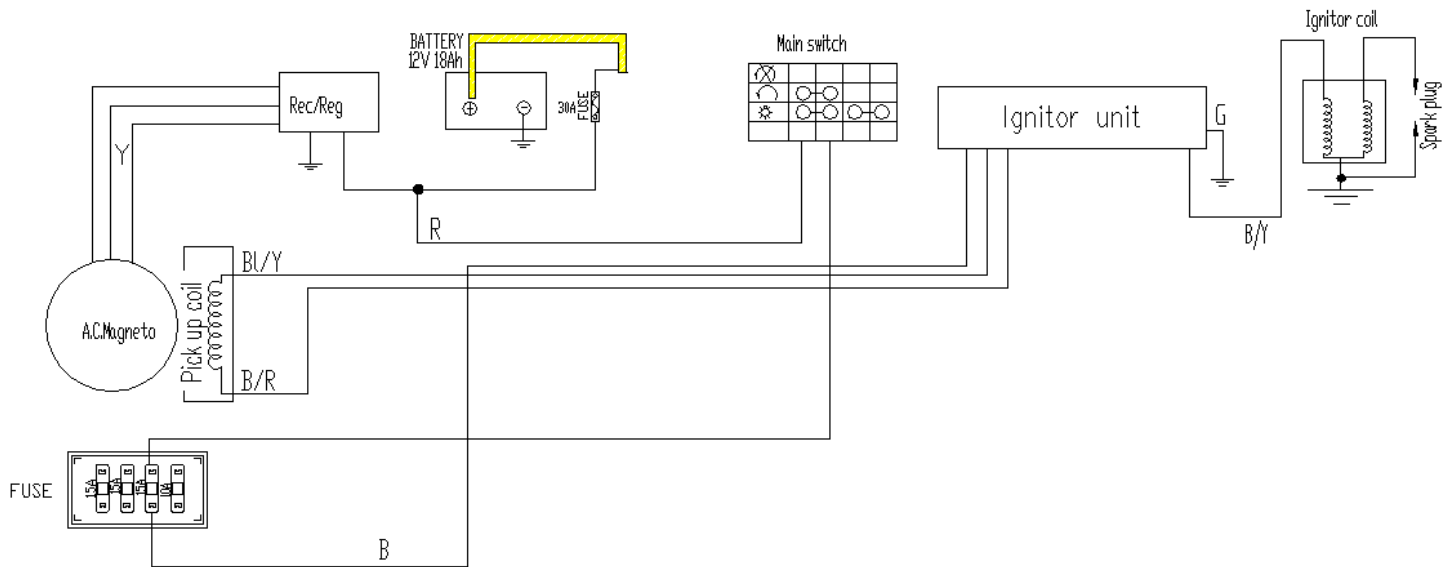
**8.3 IGNITION SYSTEM**

**IGNITION SYSTEM TROUBLESHOOTING**

**No Spark, Weak or Intermittent Spark**

- Spark plug gap incorrect
- Fouled spark plug
- Faulty spark plug cap or poor connection to high tension lead
- Related wiring loose, disconnected, shorted, or corroded
- Ignition switch faulty
- Terminal board or connections wet, corroded
- Poor ignition coil ground (e.g. coil mount loose or corroded)
- Faulty stator (measure resistance of all ignition related windings)
- Incorrect wiring (inspect color coding in connectors etc. )
- Faulty ignition coil winding (measure resistance of primary and secondary)
- Worn magneto (RH) end crankshaft bearings
- Sheared flywheel key
- Flywheel loose or damaged
- Trigger coil air gap too wide (where applicable) should be 0.030-0 .050" (0. 75-1.25 mm)
- Excessive crankshaft run out on magneto (RH) end should not exceed 0.005" (0.13mm)
- Faulty ECU model

**CIRCUIT DIAGRAM**

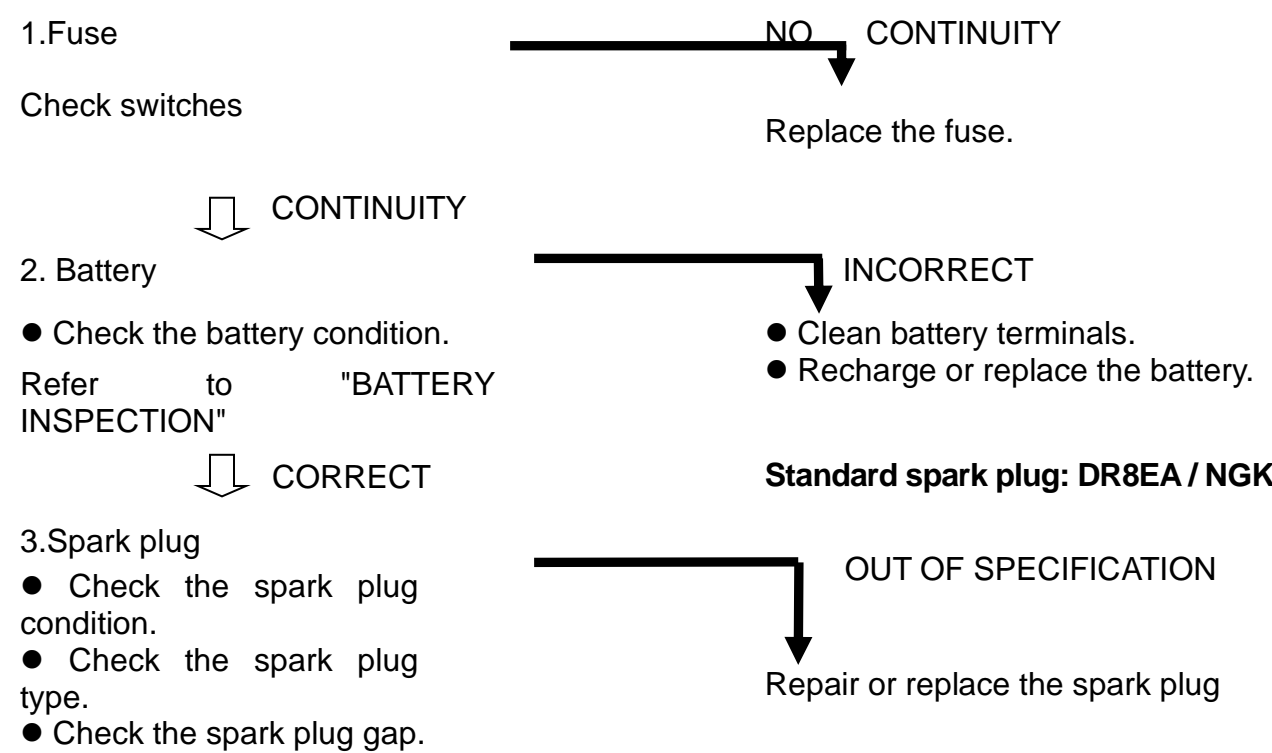



**IF THE IGNITION SYSTEM FAILS TO OPERATE**

**Procedure**

Check:

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Fuse (Main)</li> <li>2. Battery</li> <li>3. Spark plug</li> <li>4. Ignition spark gap</li> <li>5. Spark plug cap resistance</li> <li>6. Ignition coil</li> </ol> | <ol style="list-style-type: none"> <li>7. Pickup coil resistance</li> <li>8. Main switch</li> <li>9. Wiring connection (entire ignition system)</li> </ol> |
|--|--|



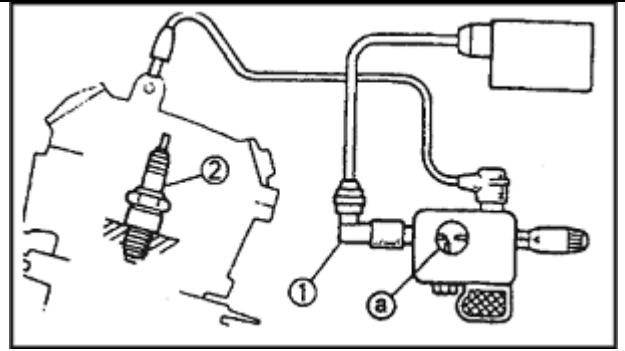
 Spark plug gap: 0.6 ~ 0.7mm  
↓  
\*

\*



4. Ignition spark gap

- Disconnect the spark plug cap from the spark plug
- Connect the ignition tester 1 as shown.
- 2 Spark plug
- Turn the main switch to "ON".
- Check the ignition spark gap .
- Check the spark by pushing the starter switch, and increase the spark gap until a misfire occurs.

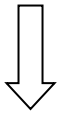


MEETS SPECIFICATION

The ignition system is not faulty.



**Minimum spark gap:  
6mm (0.24 in)**

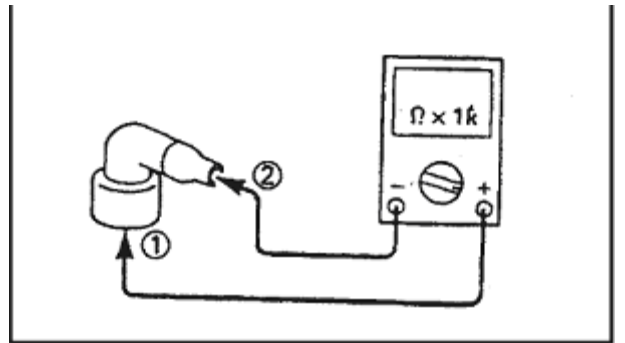


OUT OF SPECIFICATION  
OR  
NO SPARK

5. Spark plug cap resistance

- Remove the spark plug cap.
  - Connect the pocket tester ( $\Omega \times 1k$ ) to the spark plug cap.
- NOTE:
- When removing the spark plug cap, do not pull the spark plug cap from high tension cord.
  - Remove → Turning counterclockwise
  - Connect → Turning clockwise.
  - Check the high tension cord when connecting the spark plug cap.
  - When connecting the spark plug cap, cut the high tension cord about 5mm.

Tester (+) lead →  
Spark plug side ①  
Tester (-) lead →  
High tension cord side ②



OUT OF SPECIFICATION

Replace the spark plug wire



**Spark plug wire  
resistance:  
5K $\Omega$ (20 °C)**



CORRECT

\*



\*

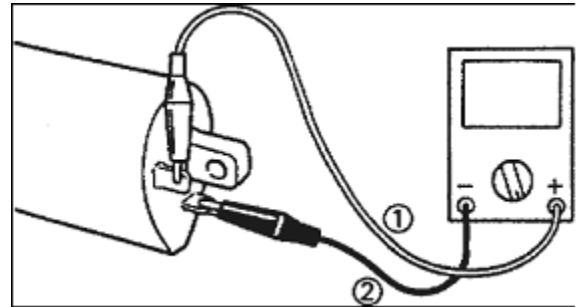


6. Ignition coil resistance

Disconnect the ignition coil connector from the wire harness.

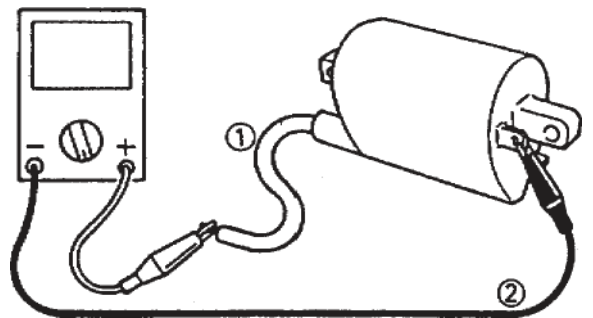
- Connect the pocket tester (1) to the ignition coil.
- Check if the primary coil has the specified resistance.

Tester (+) lead  
Pink Terminal  
Tester (-) lead B/Y Terminal



**Primary coil resistance:**  
3.6-4.8Ω(20 °C)

Tester (+) lead  
Spark plug lead  
Tester (-) lead  
Pink Terminal



- Connect the pocket tester (Ω×1k ) to the ignition coil.
- Check the secondary has the specified resistance



**Secondary coil resistance:**  
10.7-14.5 KΩ (20°C)



BOTH MEET SPECIFICATION

OUT OF SPECIFICATION



Replace the ignition coil.

\*

\*

7. Pickup coil ↓istance

- Disconnect the pickup coil coupler from the wire harness.
- Connect the pocket tester ( $\Omega$  100) to the pickup coil coupler.

Tester (+) lead →

BI/Y Terminal ①

Tester (-) lead →

B/R Terminal ②

- Check the pickup coil has the specified resistance.



Primary coil resistance:  
168 -252 $\Omega$  (20°C)

MEETS  
SPECIFICATION

8. Main switch

CHECK SWITCHES

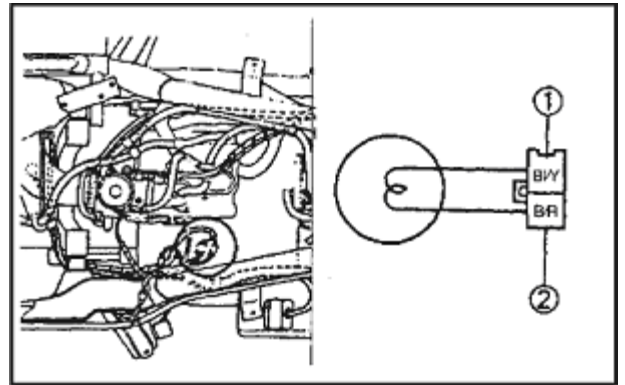
CONTINIUTY

9. Wiring connection

- Check the connection of the entire ignition system  
Refer to "CIRCUIT DIAGRAM".

CORRECT

↓  
Replace the igniter unit.



OUT OF SPECIFICATION

Replace the pickup coil.

NO CONTINUITY

Replace the main switch

NO CONTINUITY

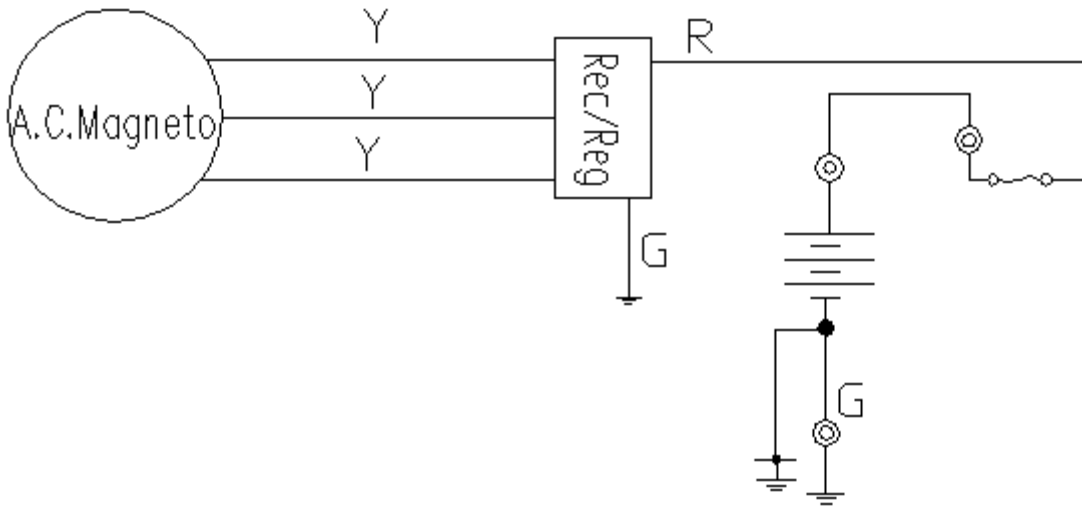
POOR CONNECTIONS

Correct



**8.4 CHARGING SYSTEM**

**CHARGING SYSTEM CIRCUIT DIAGRAM**



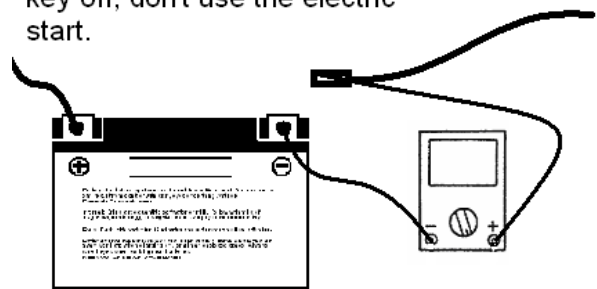
**CURRENT DRAW - KEY OFF**

**CAUTION:** Do not connect or disconnect the battery cable or ammeter with the engine running. Damage will occur to light bulbs and speed limiter.

Connect an ammeter in series with the negative battery cable. Check for current draw with the key off, if the draw is excessive, loads should be disconnected from the system one by one until the draw is eliminated. Check component wiring as well as the component for partial shorts to ground to eliminate the draw.

<b>Current draw key off:</b>
<b>Maximum of 0.01DCA(10mA)</b>

key off, don't use the electric start.



**CHARGING SYSTEM**

**Procedure**

Check:

- 1. Fuse (Main)
- 2. Battery
- 3. Charging voltage
- 4. Stator coil resistance
- 5. Wiring system (entire charging system)

1. fuse

2. Battery

Check the battery condition.  
Refer to "BATTERY INSPECTION"

3. Charging voltage

Connect the engine tachometer to the spark plug lead.

● Connect the pocket tester (DC20V) to the battery

**Test (+) lead**→

**Battery (+) terminal ①**

**Tester (-) lead**→

**Battery (-) terminal ②**

Measure the battery terminal voltage.

start the engine and accelerate to about 5,000rpm

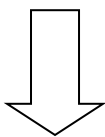
● check the terminal voltage

**Measured voltage-terminal**

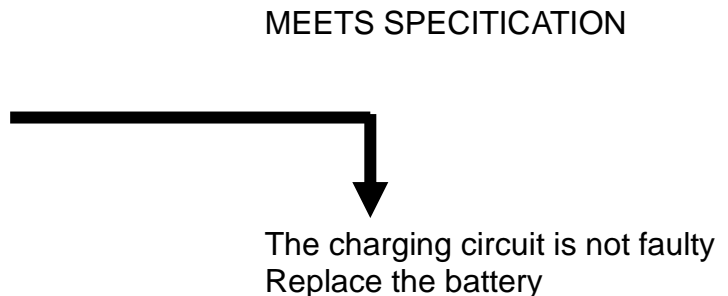
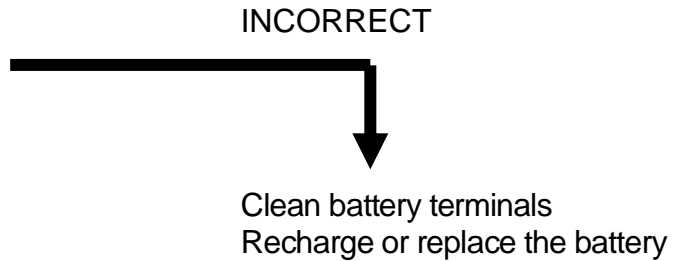
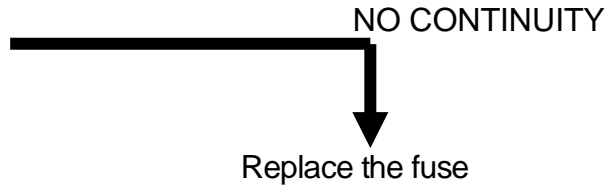
**Voltage:**

**0.2-2.5V up**

**NOTE:** Use a fully charged battery.



OUT OF SPECIFICATION



4. Starter coil resistance

Remove the A.C. magneto coupler from wire harness

Connect the pocket tester ( $\Omega \times 1$ ) to the stator coil

Tester (+) lead –yellow terminal

Tester (-) lead –yellow terminal

Measure the stator coil resistance

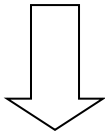
Stator coil resistance  $0.5-0.8\Omega$  (20°C)

OUT OF SPECIFICATION



Replace the stator coil

MEETS SPECIFICATION



5. Wiring connection

check the entire charging system for connections

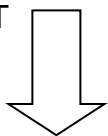
Refer to "CIRCUIT DIAGRAM"

POOR CONNECTION



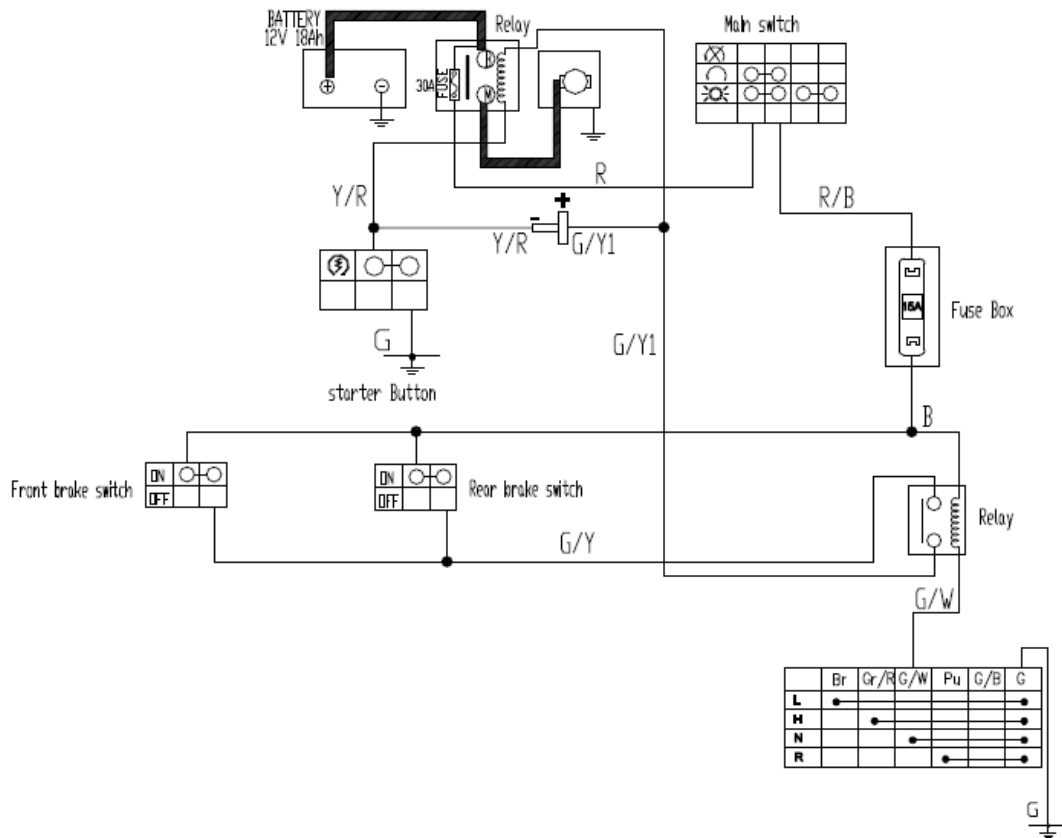
correct

CORRECT



Replace the rectifier/regulator

**8.5 ELECTRICS STARTING SYSTEM  
DIAGRAM**



**TROUBLESHOOTING**

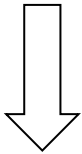
**IF THE STARTER MOTOR FAILS TO OPERATE**

**Procedure**

Check:

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. Fuse (Main)</li> <li>2. Battery</li> <li>3. starter motor</li> <li>4. starter relay</li> <li>5. starting circuit cut-off relay</li> <li>6. main switch</li> </ol> | <ol style="list-style-type: none"> <li>7. front/rear brake switch</li> <li>8. starter switch</li> <li>9. wiring connection (entire starting system)</li> </ol> |
|---|--|

1. fuse  
refer to "CHECKING SWITCHES" section

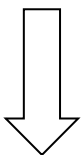


NO CONTINUITY



Replace the fuse

2. Battery  
Check the battery condition.  
Refer to "BATTERY INSPECTION" section in CHAPTER 3

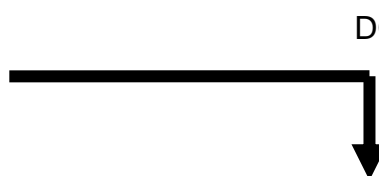


INCORRECT



Clean battery terminals  
Recharge or replace the battery

3. Starter motor  
Connect the battery positive terminal and starter motor cable using a jumper lead.  
Check the starter motor operation



DOES NOT MOVE

Repair or replace the starter motor

4. Starter relay

● Disconnect the relay unit coupler from the wire harness.

● Connect the pocket tester ( $\Omega \times 1$ ) and battery (12V) to the relay unit coupler terminals.

- Battery (+) lead → Green/Yellow terminal ①
- Battery (-) lead → Yellow/Red terminal ②

● Check the starter relay for continuity.

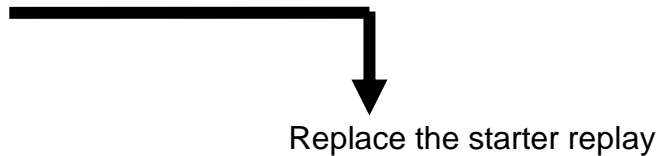
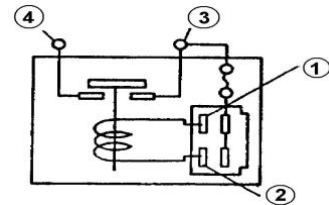
- Test (+) lead → ③ terminal
- Test (-) lead → ④ terminal



**WARNING**

A wire used as a jumper lead must have the equivalent capacity as that of the battery lead or more, otherwise it may burn.

This check is likely to produce sparks, so be sure that no flammable gas or fluid is in the vicinity



5. Starting circuit cut-off relay

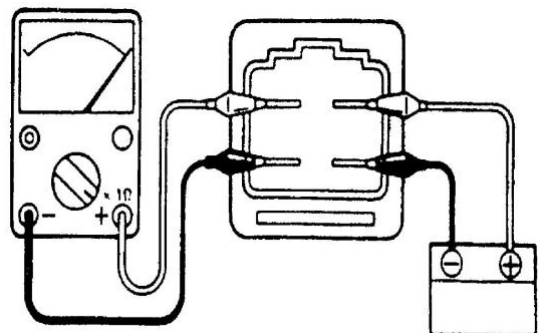
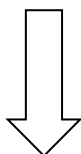
● Disconnect the starting circuit cut-off relay coupler from the wire harness.

● Connect the pocket tester ( $\Omega \times 1$ ) and battery (12V) to the starting circuit cut-off relay coupler terminals.

- Battery (+) lead → terminal ②
- Battery (-) lead → terminal ④

● Check the starting circuit cut-off relay for continuity.

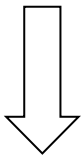
- Test (+) lead → ① terminal
- Test (-) lead → ③ terminal





Replace the starting circuit cut-off relay

6. Main switch  
CHECK SWITCHES



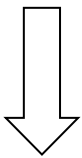
NO CONTINUITY



Replace the main switch

7. Front /rear brake switch

CHECKING SWITCHES



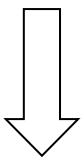
NO CONTINUITY



Replace the brake switch

8. Starter switch

CHECKING SWITCHES



NO CONTINUITY



Replace the handlebar switch

9. Wiring connection

Check the connections of the entire starting system.

Refer to "CIRCUIT DIAGRAM

POOR CONNECTION



Correct

**8.6 COOLING SYSTEM****IF THE FAN MOTOR FAILS TO TURN**

---

Procedure

Check:

1. Fuse (Main, Fan)

2. Battery

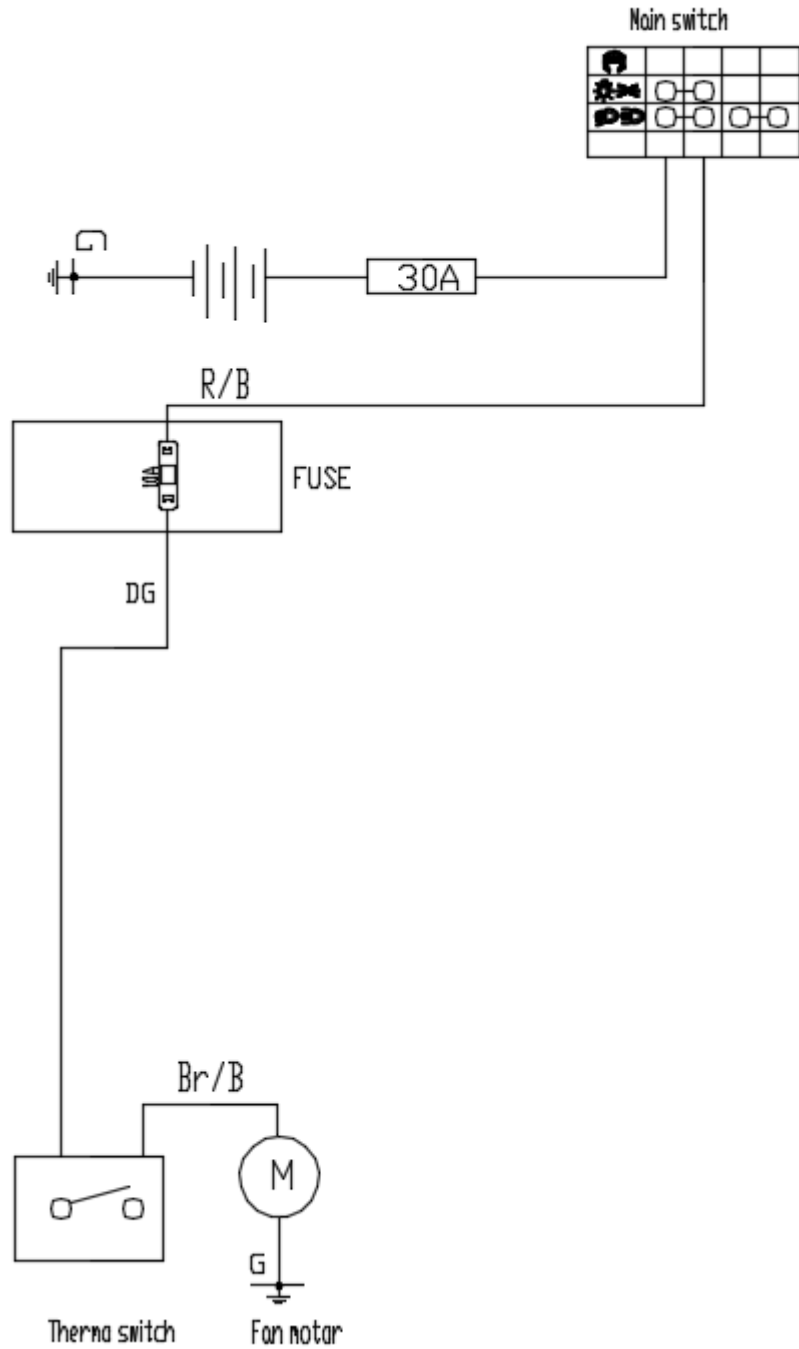
3. Main switch

4. Fan motor (inspection)

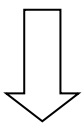
5. Thermo switch

6. Wiring connection (entire cooling

system)



1. fuse  
CHECK SWITCHES



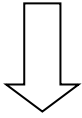
NO CONTINUITY



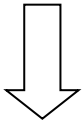
Replace the fuse

2. Battery

Check the battery condition.  
Refer to "BATTERY INSPECTION" section

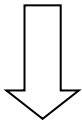


3 Main switch  
CHECK SWITCHES



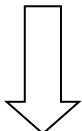
4. Fan motor(inspection 1)

Connect the battery to the fan motor.  
**Battery (+) lead**→**Green/Blue terminal**  
①  
**Battery (-) lead**→**Green ground** ②  
Check the fan motor operation



5. Fan motor (inspection 2)

Turn the main switch to off.  
●Remove the thermo switch lead from thermo switch.  
●Connect jumper lead to thermo switch leads.  
●Turn the main switch to on



INCORRECT

Clean battery terminals  
Recharge or replace the battery

NO CONTINUITY

Replace the main switch

DOES NOT MOVE

Replace fan motor

DOES NOT MOVE

The wiring circuit from battery to fan motor is faulty. Repair

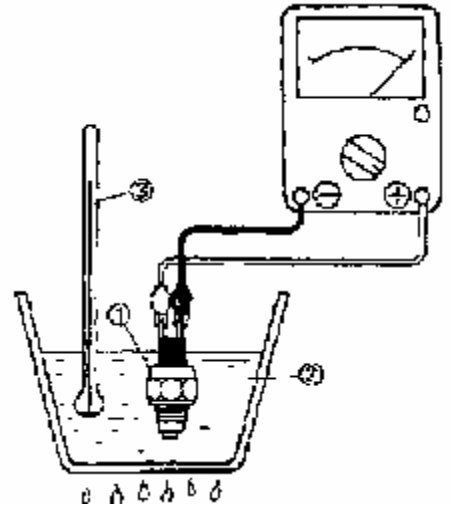
6. Thermo switch

Remove the thermo switch from the radiator.

- Connect the pocket tester ( $\Omega X1$ ) to the thermo switch ①.
- Immerse the thermo switch in the water ②
- Check the thermo switch for continuity.

**NOTE:**

Measure temperatures while heating the coolant with the temperature gauge



**WARNING**

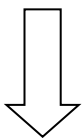
- Handle the thermo switch with special care. Never subject it to strong shocks or allow it to be dropped. Should it be dropped, it must be replaced.
- Do not touch the thermo switch to the bottom of the heated vessel.

88±3°C Thermo switch "ON"  
80 °C Thermo switch "OFF"

OUT OF SPECIFICATION



Replace the thermo switch



Wring connection

- Check the connection of the entire cooling system. Refer to "CIRCUIT DIAGRAM"

UPPER CONNECTION



Correct

**IF THE HEAT ALARM UNIT WORKING**

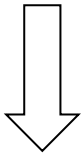
When the main switch is turned on, the temperature of the engine begins to go up. As it comes to 88±3°C the thermostat is connected and the fan starts to work, cooling the coolant, if the thermostat or the fan, fails to work; the coolant temperature will keep rising. The heat alarm unit operates the moment the temperature reaches 115±5°C with the buzzer sounding and the signal flashing. Stop the engine now to have the circuit fixed.

Procedure

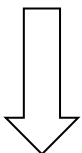
Check:

- 1. Fuse(Main, Fan)
- 2. Battery
- 3. Main switch
- 4. Thermo unit
- 5. Voltage
- 6. Wiring connection (entire cooling system)

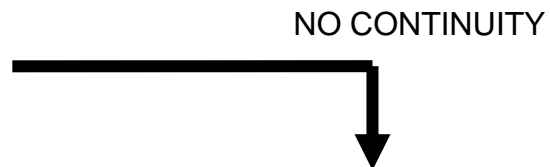
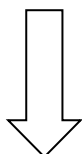
1. fuse  
CHECKING SWITCHES



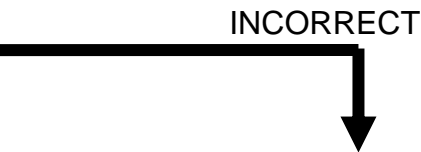
2. Battery  
Check the battery condition.  
Refer to "BATTERY INSPECTION"



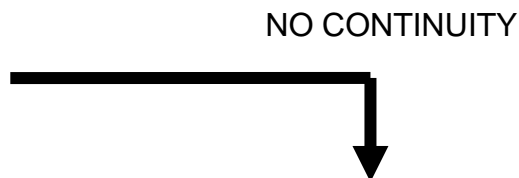
3. Main switch  
CHECKING SWITCHES



Replace the fuse



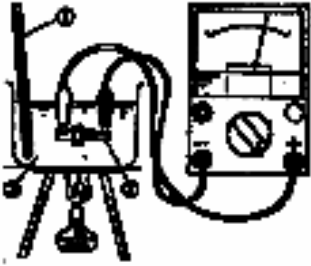
Clean battery terminals  
Recharge or replace the battery



Replace the main switch

4. Thermo unit

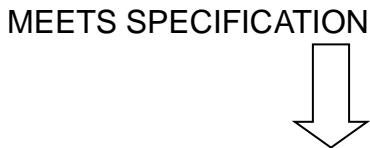
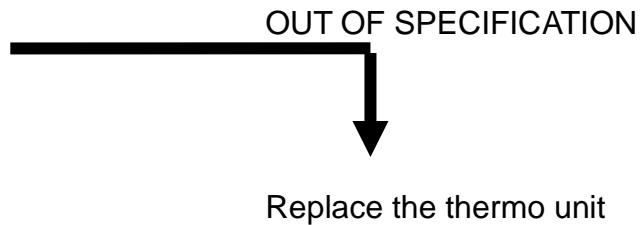
- Drain the coolant and remove the thermo unit from the cylinder head.
- Immerse the thermo unit ② in the coolant ③ .
- ① Thermometer.



Coolant temperature

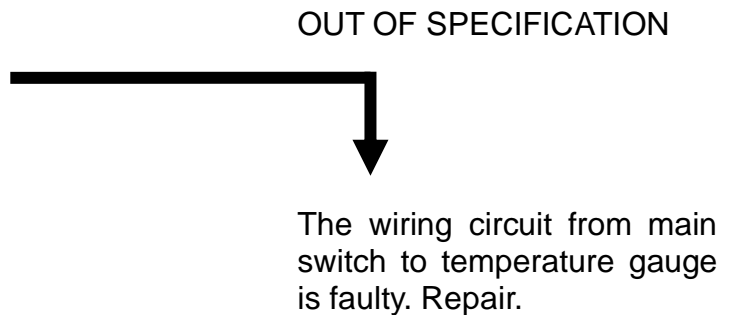
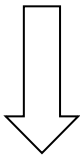
Resistance

Handle the thermo unit with special care. Never subject it to strong shocks or allow it to be dropped. Should it be dropped, it must be replaced. Do not touch the thermo unit to the bottom of the heated vessel.



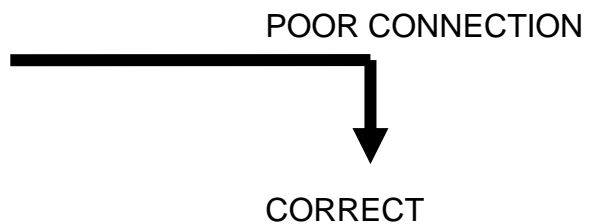
**8.** Voltage

- Connect the pocket tester (DC20V) to the Temperature gauge couple.
- Tester (+) lead → Green/Blue terminal**
- Tester (-) lead → Green ground**
- Turn the main switch to on.
- Check for voltage (12V) on the temperature gauge lead.



- 8.** Wiring connection check the connections of the entire cooling system.

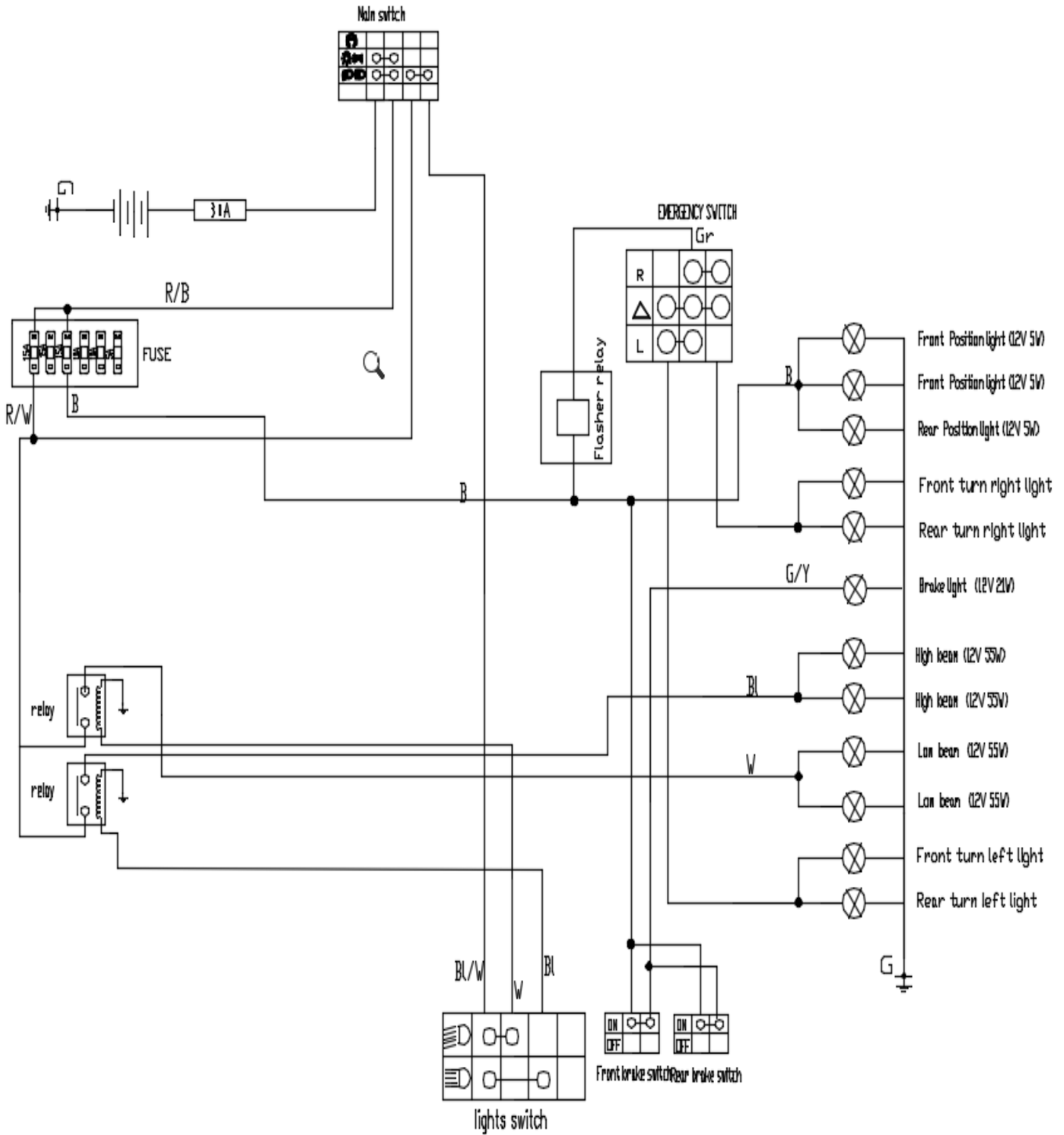
Refer to "CIRCUIT DIAGRAM"



Replace the temperature gauge

**8.7 LIGHTING SYSTEM**

FOR EUROPE MODEL





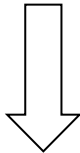
**TROUBLESHOOTING**

**Procedure**

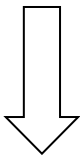
Check:

- 1. Fuse (Main)
- 2. Battery
- 3. Main switch
- 4. Lights switch
- 5. Dimmer switch
- 6. Wiring connection (entire lighting system)

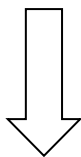
1. fuse refer to "CHECKING SWITCHES" section



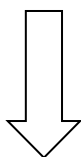
2. Battery Check the battery condition. Refer to "BATTERY INSPECTION" section in CHAPTER 3



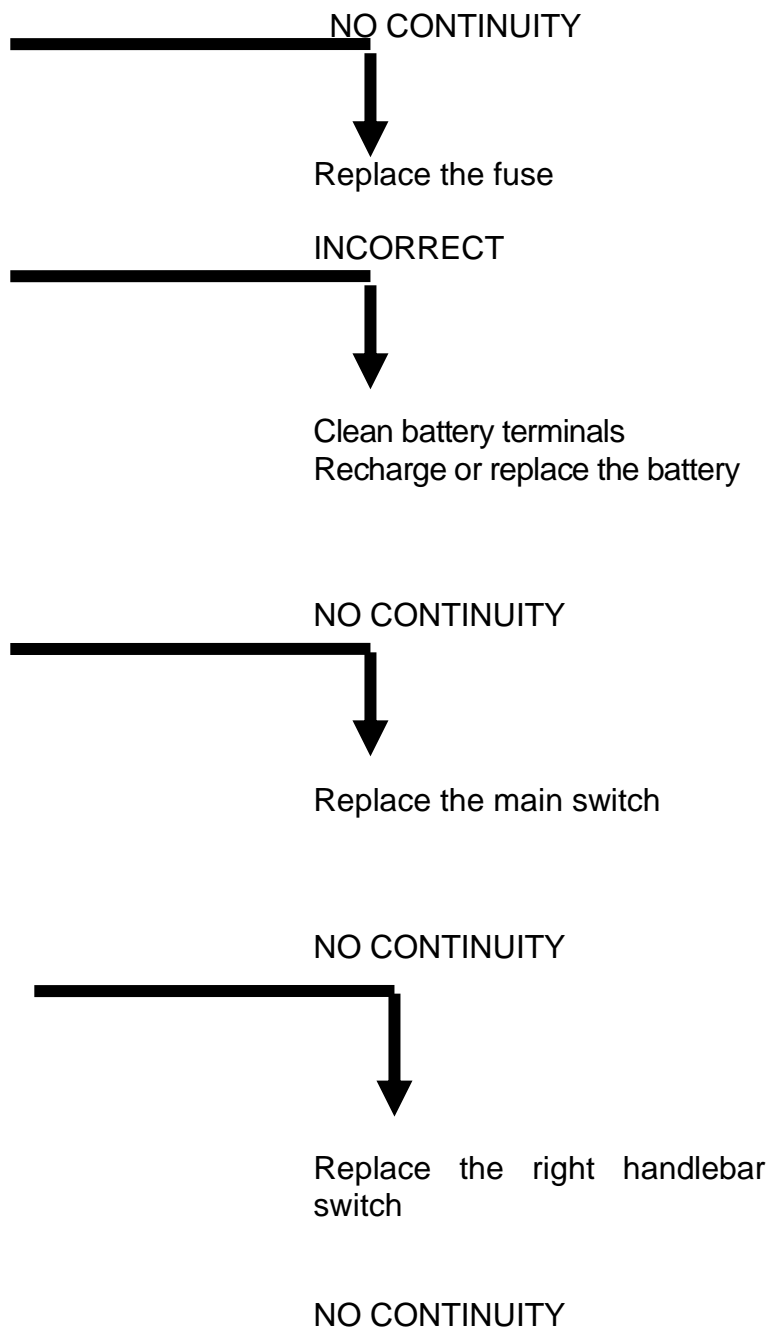
3. Main switch  
CHECK SWITCHES



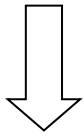
4. Light switch  
CHECK SWITCHES



5. Dimmer sw

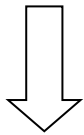


CHECK SWITCHES



6. Wiring connection

Check the connection of the entire lighting system



7. check the condition of each of the lighting system's circuits

Refer to "LIGHTING SYSTEM CHECK"

LIGHT SYSTEM CHECK

1. If the headlight and the high beam indicator light fail to come on

1. Bulb and bulb socket

CHECK SWITCHES



2. Voltage

Connect the pocket tester (DC20V) to the headlight and high beam indicator light couplers.

**A** When the dimmer switch is on low beam.

**B** When dimmer switch is on high beam

Headlight::

Tester (+) lead → White ① or Blue ② lead

Tester negative (-) lead → Green ③ lead

Turn the main switch to on.

Turn the light switch to on position.

Turn the dimmer switch to low beam or high beam.



Replace the left handlebar switch

POOR CONNECTIONS



correct

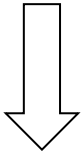
NO CONTINUITY



Replace the bulb and/ or bulb socket



Check for voltage (12V) on the lead at bulb socket connectors



This circuit is not faulty

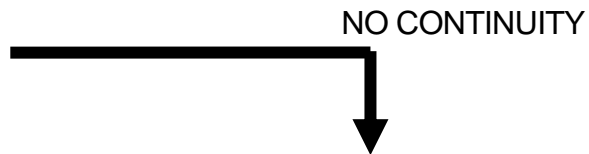
OUT OF SPECIFICATION

The wiring circuit from the main switch to bulb socket connector is faulty. Repair

2. the taillight fails to come on

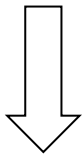
1. Bulb and bulb socket

CHECK SWITCHES



Replace the bulb and /or bulb socket

CONTINUITY



2. Voltage

Connect the pocket tester (DC20V) to the bulb socket connector.

Tester (+) lead →

Black terminal ①

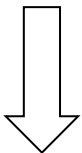
Tester (-) lead →

Green terminal ②

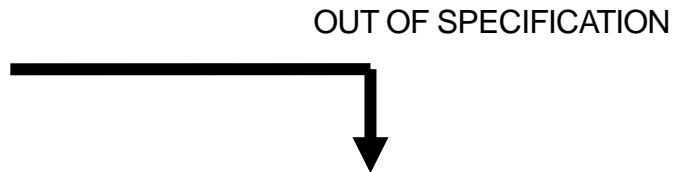
Turn the main switch to on.

Turn the lights switch to on pilot position.

Check the voltage (12V) on the bulb socket connector



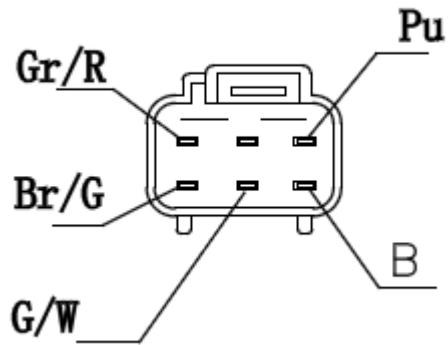
This circuit is not faulty



OUT OF SPECIFICATION  
The wiring circuit from main switch to bulb connector of faulty. Repair

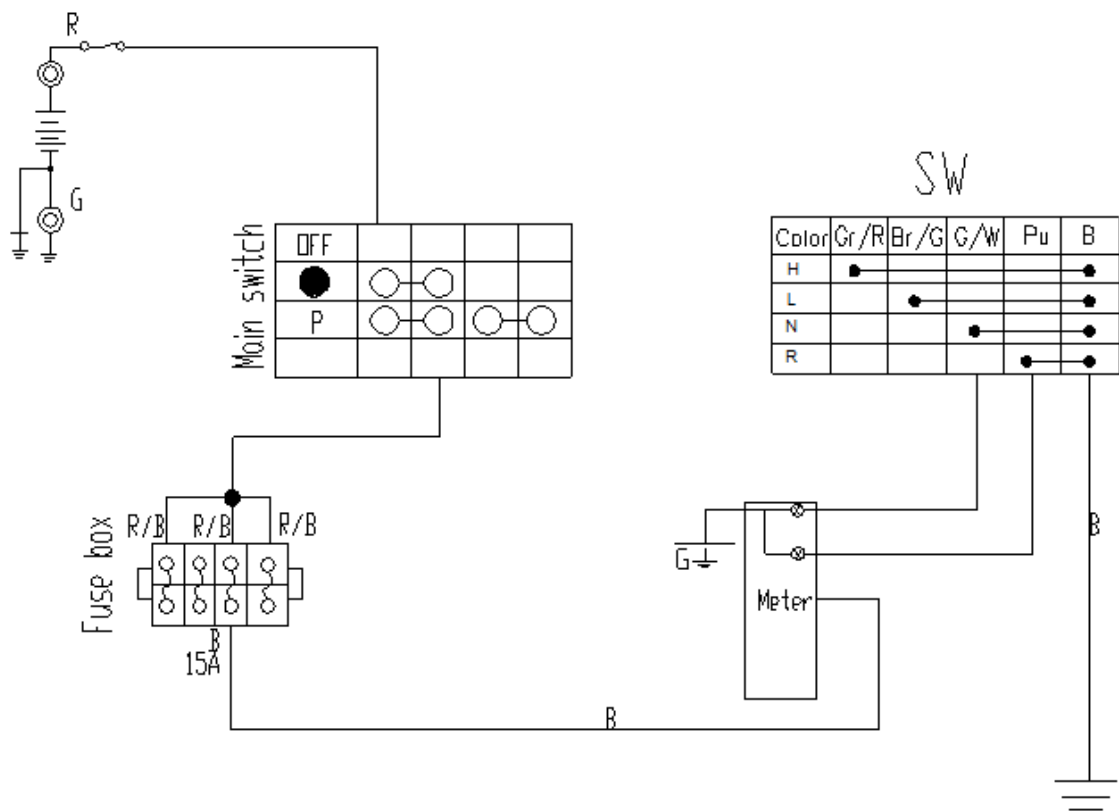
**8.9 GEAR POSITION INDICATOR SWITCH TEST**

Switch table



Color	Gr/R	Br/G	G/W	Pu	B
H	●				●
L		●			●
N			●		●
R				●	●

Switch schematic



**8.10 SPEEDMETER SYSTEM**

**OPERATION OF SPEED SENSOR**

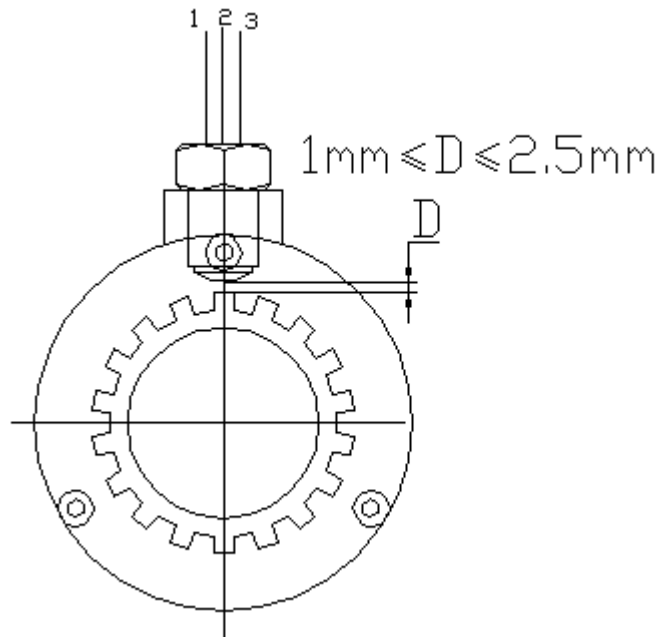
**Speed Sensor is on the rear axle**

Operation Instructions of Electric Dial Meter and Speed Sensor/ Operation Instructions of LCD Meter and Speed Sensor

- A. Hall Sensor is a new type sensor used to measure speed, angle, revolution and length, etc by means of voltage pulse signals converted from sensing gear ratio of black metal gear or gear rack.
- B. Main Technical Parameter for sensor:

Item	Code	Vol value	Unit
Operating voltage	Vcc	5-20	V
Operating current	Icc	≤15	mA
Low voltage output	Vol	≤ 0.4	V
High voltage output	Voh	≥ (Vcc-1)	V
Operating distance	D	1mm ≤ D ≤ 2.5mm	mm

- C. The following is the graphic illustration for sensor installation, Wire 1 (red) is positive and wire 2 (black) negative, Wire 3 (yellow) works as the one to output signals.



**Note:** Always screw in the sensor by hand when installation or adjustment.

1. Align one tooth of the splines to the centre of the hole of the sensor by turning the rear axle.
2. Screw the sensor in (CW) by hand slightly until resistance is felt.
3. Turn the sensor CCW by 1 to 2 turn(s).
4. Tighten the jam nut.

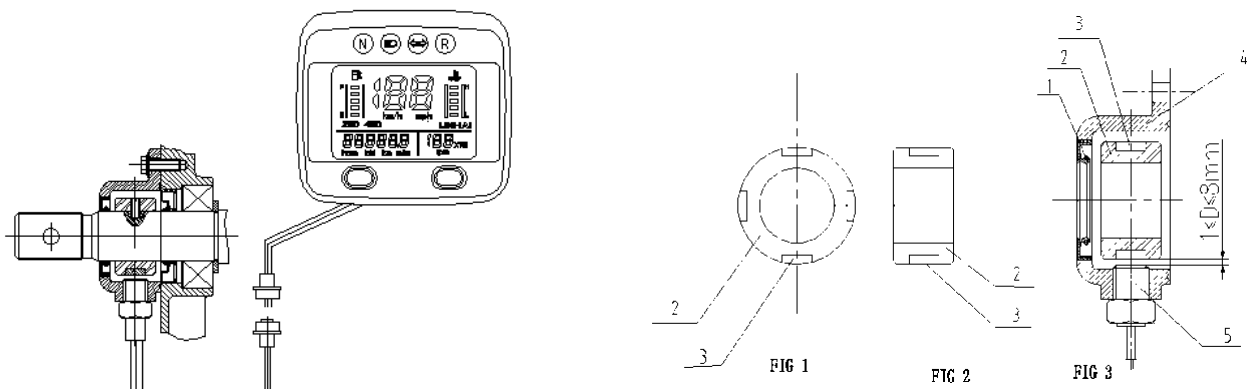
**Speed Sensor on the Transmission Out Put Shaft.**

Operation Instructions of LCD Meter and Speed Sensor

Main Technical Parameter:

Item	Code	Vol value	Unit
Operating voltage	Vcc	5-20	V
Operating current	Icc	≤15	mA
Operating distance	D	1mm ≤ D ≤ 8mm	mm

The following is the graphic illustration for sensor installation.



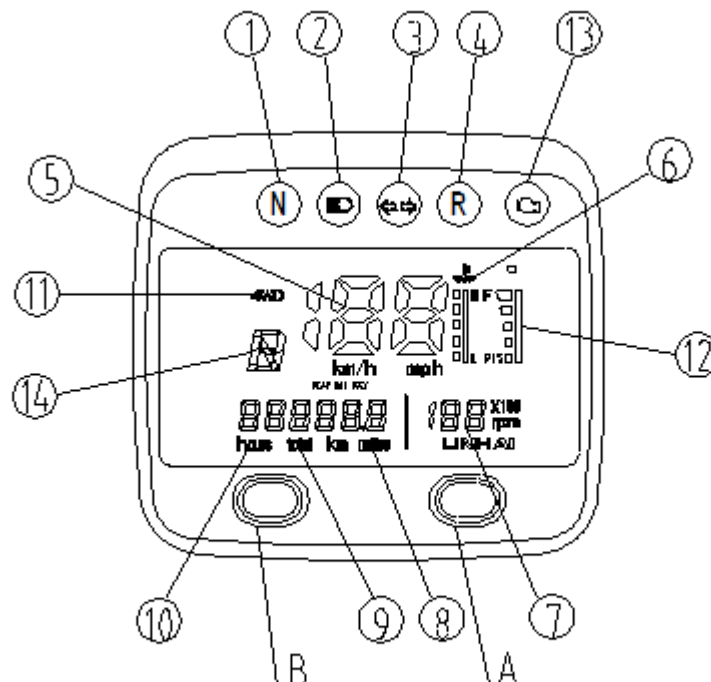
1. OIL SEAL	4. THE COVER
2. DOWEL PIN	5. THE HALL SENSOR
3. MAGNET	

METER

Dial Meter

Item	Vol value	Unit
Operating voltage	10V~18V	V
Operating current	≤ 500mA	A
Operating Environmental temperature	-10°C~65°C	°C
Battery warning voltage	≤11.5V	V

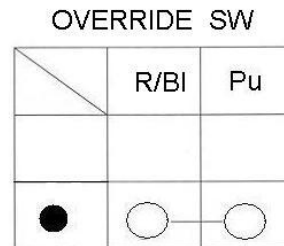
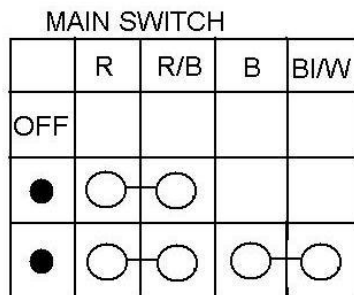
LCD  
Meter





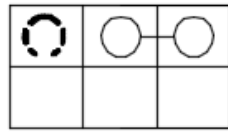
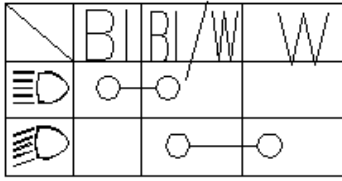
- |                              |                                 |
|------------------------------|---------------------------------|
| 1. Neutral indicator light   | 10. Engine working hour counter |
| 2. High beam indicator light | 11. 2WD/4WD indicator           |
| 3. Turn indicator light      | A: km/ mile selector            |
| 4. Reverse indicator light   | B: hour / distance selector     |
| 5. Speedometer               | 12. Fuel gauge Indicator        |
| 6. Coolant temperature meter | 13. EFI                         |
| 7. Engine rpm meter          | 14. Gear position               |
| 8、 9. The odometer           |                                 |

**8.11 MAIN SWITCH AND HANDLE SWITCH**



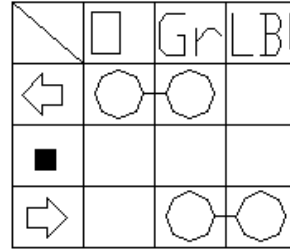
**400ATV-F T3 HANDLE SWITCH SCHEMATIC FOR EUROPE MODEL**

HIGH/LOW BEAM SWITCH

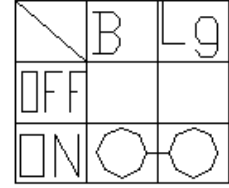


starter Button

TURN INDICATORS SWITCH



HORN SWITCH



**8.12 FUEL GAUGE/ FUEL LEVEL SENSOR**

**Removal**

Turn the ignition switch to “OFF” .  
 Remove the fuel tank cover.  
 Remove the three bolts, retaining plate and fuel level sensor from the fuel tank.

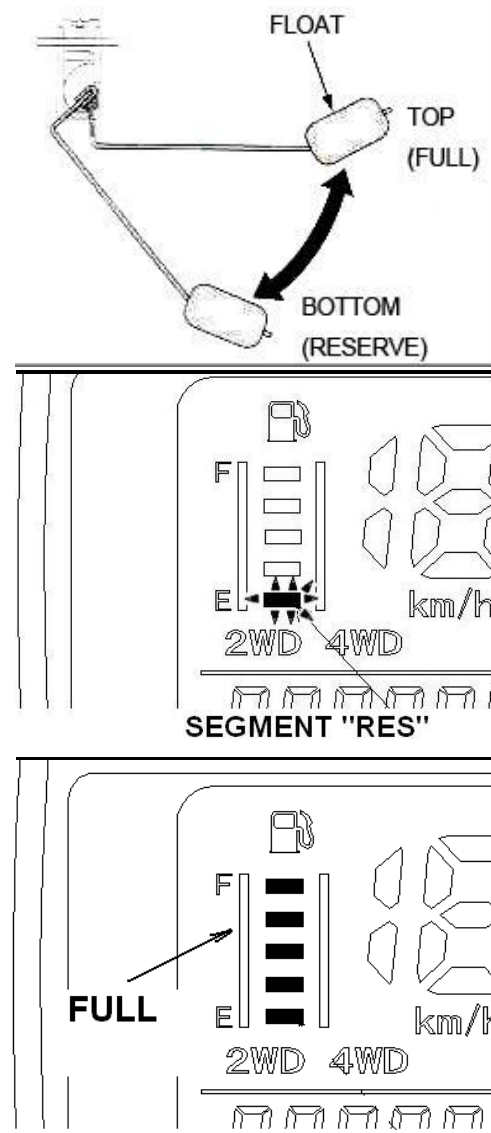
**Installation**

Install a new seal rubber onto the fuel level sensor.  
 Install the retainer plate onto the sensor by aligning the tab with the groove.

Install the sensor into the fuel tank while aligning the groove in the plate with the boss on the fuel tank.  
 Install and tighten the bolts securely.  
 Install the removed parts in the reverse order of removal.

**Fuel Gauge / Fuel level Sensor Inspection**

Move the float to the bottom (RESERVE) position, turn the ignition switch to “ON” and check the fuel gauge.



Segment “RES” should blink.

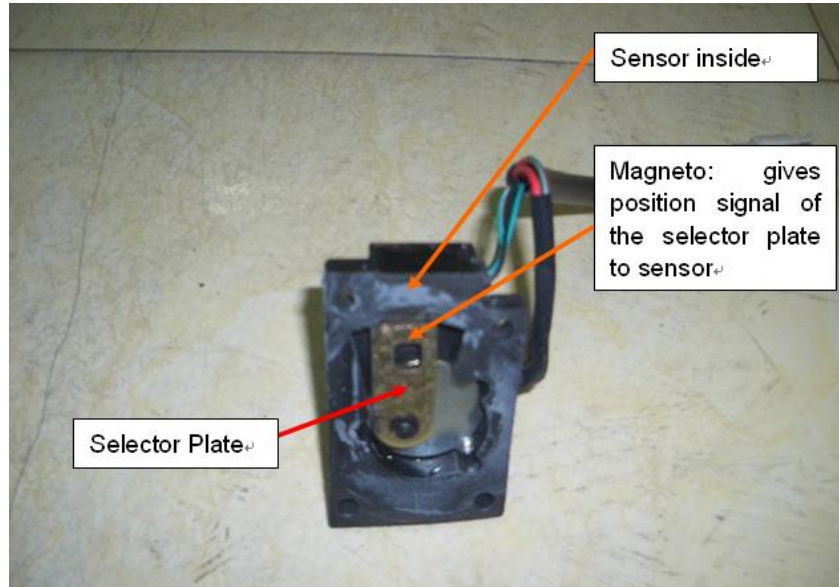
FLOAT POSITION	RESISTANCE(20°C/ 68° )
TOP(FULL)	4-10 Ω
BOTTOM(RESERVE)	100-110 Ω

With the fuel level sensor float at the top (FULL) position, turn the ignition switch to “ ON ” and check the fuel gauge. All segments up to segment “ F ” should come on.

If the fuel gauge does not function properly, check the fuel level sensor  
 If the fuel level sensor is OK, replace the LCD Meter.

**Fuel level Sensor Inspection**

Disconnect the fuel level sensor 2p Green connector and connect the ohmmeter to the sensor side connector terminals.  
 Measure the fuel level sensor resistance with the float at the top (FULL)  
 And bottom (RESERVE) positions.

**8.13 THE OPERATION PRINCIPLE OF THE ELECTRIC 4WD SHIFT**

SHIFT MOTOR ASSY.

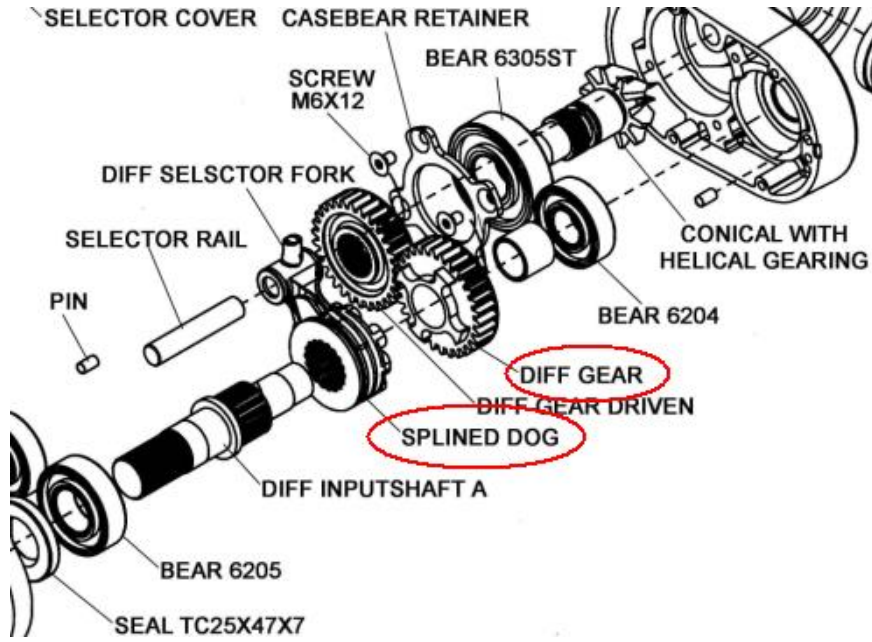
(Fig 1)

- 1, The rider shifts 2WD to 4WD by the Switch on handlebar.
2. The Switch gives signal to Controller.
- 3, The controller gives power to the Shift Motor.
- 4, If the Splined Dog (Fig 2) is in right position, 4WD will engage immediately. This information will be given to the Sensor by the Magneto on the Selector Plate, and then to the Controller. Controller lights the 4WD indicator.
5. If the Splined Dog is not in right position, 4WD won't engage, this information will be given to the Sensor by the Magneto on the Selector Plate, and then to the Controller. The controller will try to drive the Shift Motor several times in 1 min.

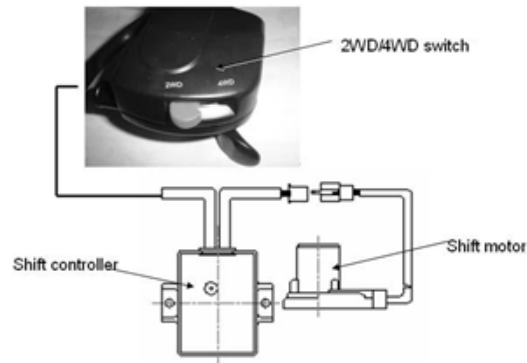
During this time, the 4WD indicator is not on, this requires the rider to back or move (ride) the ATV a little to allow the Dog change position for engagement. ( See owner's manual or decal).

If the rider doesn't do as the owner's manual, after 1 min, the buzzer comes on and 4WD indicator blinks, remind the rider to re-shift.

Shift from 4WD to 2WD is same as above.



(Fig 2)



**CAUTION:**

Always shift as the vehicle stop.

**NOTE:**

When shift 2WD/ 4WD, the mechanics in the front gear box maybe still engaged/ disengaged, the mechanics would finally disengaged/ engaged when rides on a hard surface or rides in reverse.

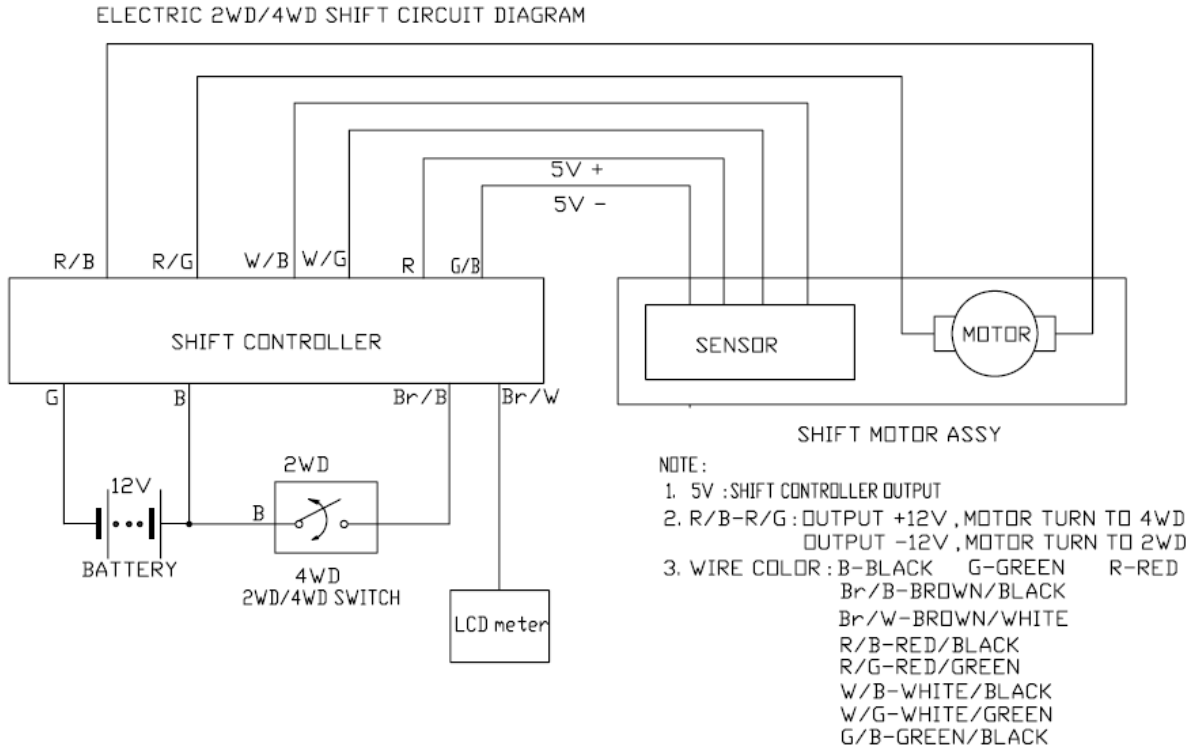
The buzzer will beep if the procedure which list above is not done in 1 minute.

Re-shift to stop the buzzer.

**CAUTION**

Do not switch on 4WD if the rear wheels are spinning. This may cause severe machine damage. When switch on 4WD, the button will stay in 4WD position but 4WD mechanics maybe still disengaged. Always apply throttle gently and let the wheels move slightly to allow the 4WD mechanics finally engage. The 4WD indicator on the speedometer will come on when 4WD engaged.

( Fig 3 ) Page from owner’s manual



(Fig 4)



**8.14 WIRING DIAGRAM**







# SERVICE MANUAL 23.0

## LH400ATV-F EFI

### WARNING

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

- ※ *General Information*
- ※ *Maintenance*
  - ※ *Engine*
  - ※ *Chassis*
  - ※ *Final Drive*
- ※ *Transmission*
  - ※ *Brakes*
  - ※ *Electrical*



## **LH400ATV-F EFI SERVICE MANUAL 23.0**

LH400ATV-F EFI 维修手册欧标英文 版本 23.0