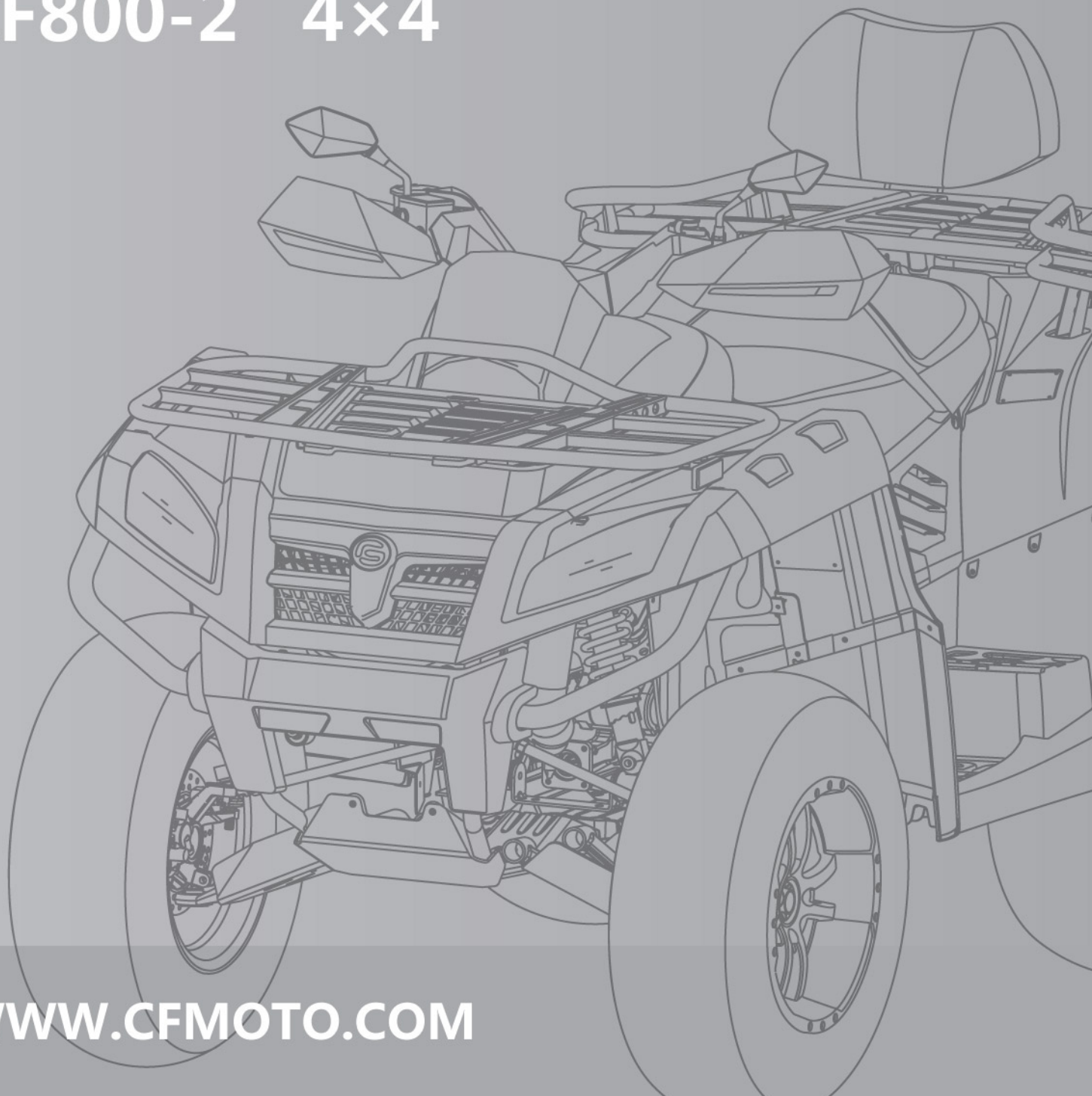
CFMOTO

# SERVICE MANUAL

## TERRALANDER 800

## CF800-2 4×4



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## FOREWORD

This manual introduces CF800-2 maintenance information, removal&installation procedure, check & adjustment methods, troubleshooting and technical specifications in detail. There are illustrations to guide your operations.

Chapter 1 mainly introduces general operation information, service tools, vehicle structure and basic specifications.

Chapter 2 mainly introduces check & adjustment methods and how to do vehicle maintenance.

Chapter 3 and further chapters mainly introduce removal, installation, adjustment, maintenance and troubleshooting information.

**CFMOTO reserves right to make improvements and modifications to the products without prior notice. Overhaul and maintenance should be done according to actual condition of vehicle.**


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## INDEX

## Unit Conversion Table

| Item | Example | Conversion |
|---|---|---|
| Pressure | 200kPa(2.00kgf/cm²)33kPa(250mmHg) | 1 kgf/cm$^2$=98.0665kPa 1kPa=1000Pa<br>1mmHg=133.322Pa=0.133322kPs |
| Torque | 18N・m(1.8kgf・m) | 1 kgf・m=9.80665N・m |
| Volume | 419ml(419cm$^3$,419cc) 419ml(0.419l) | 1 ml=1 cm$^3$=1 cc 1l=1000 cm$^3$ |
| Force | 12N(1.2kgf) | 1 kgf=9.80665N |

## MAINTENANCE INFORMATION

### Operation cautions

1. Engine exhaust fumes are poisonous and can result in loss of consciousness or death. Do not run the engine in an enclosed or poorly ventilated area.
2. Do not touch the engine or muffler with bare hands after the engine has been just stopped to avoid burns. Wear long-sleeve work clothes and gloves for operation.
3. Battery electrolyte (dilute sulfuric acid) is highly caustic and can result in burns from contact with skin and eyes. If you spill electrolyte on skin,flush with water and seek for medical attention immediately. If you spill electrolyte on clothes,flush with water if to avoid burns. Keep battery and electrolyte out of reach of children.
4. Coolant is poisonous. Do not drink or spill it on skin, eyes or clothes. If you spill coolant on skin,immediately wash with soap and water. If you spill coolant on eyes, flush with water and seek prompt mediacal attention. If you swallow coolant, induce vomit and see the doctor. Keep coolant out of reach of children.
5. Wear proper work clothes, cap and boots. If necessary, were dust-glass, gloves and mask.
6. Gasoline is highly flammable. No smoking or fire. Also keep gasoline away from sparks. Vaporized gasoline is also explosive. Operate in a well-ventilated area.
7. When the battery is being charged, it produces explosive gases. Charge the battery in a well-ventilated area.
8. Be careful not to get pinched by the turning parts like wheels and clutch.
9. When more than two people are operating, keep reminding each other for safety purpose.

### Cautions for removal and installation

1. Use genuine CFMOTO parts, lubricants and service products.
3. Clean mud, dust before servicing.
2. Store the removed components separately in order for correct installation.
4. Replace the removed washers, o-rings, piston pin retainers, cotter pins with new ones.
5. Elastic retainers might get distorted after disassembled. Do not use the loosened retainers.
6. Clean and blow off the detergent after removal. Apply lubricants on the surface of moving parts. Measure the data during removal for correct installation.
7. If you do not know the length of screws, install the screws one by one and make sure they are screwed in with the same depth.
8. Check if the removed rubber parts are aged and replace if necessary. Keep the rubber parts away from grease.
9. Pre-tighten the bolts, nuts and screws, then torque to specification.The basic sequence is from big to small, from inner side to outer side and criss-cross.
10. Replace aged rubber parts when assembling. Do not splash gasoline,grease onto the surface,as this could cause damage.

11. Apply or inject recommended lubricant to the specified lubrication points.
12. Use special tools when necessary.
13. When ball bearing is removed by pressing steel balls, it can not be reused.
14. Finger turn the inner and outer rings of ball bearing to make sure the bearing will turn smoothly.
- Replace if the axial or radial play is too big.
- If the surface is uneven, clean with oil and replace if the cleaning does not work.
- When pressing the bearing into the machine or onto the shaft,if the bearing can not be securely seated, replace it.

15. Install the one-side dust-proof bearing in the right direction. When assembling the open type or double-side dust-proof bearing, install with manufacturer's mark outward.
16. Keep the bearing block still when blowing dry the bearing after washing clean. Apply oil or lubricant before installation.
17. Install the elastic circlip properly. Turn the circlip after assembling to make sure is has been installed into the slot.
18. After assembling, check if all the tightened parts are properly tightened and can move smoothly.
19. Brake fluid and coolant may damage painting, plastic and rubber parts. Flush with water if splashed on thses parts.
20. Install oil seal with the side of manufacturer's mark outward.
- Do not fold or scratch the oil seal lip.
- Apply grease to the oil seal lip before assembling

21. When installing pipes, insert the pipe till the end of joint. Fit the pipe clip, if any, into the groove. Replace the pipes or hoses that cannot be tightened.
22. Do not mix mud or dust into engine and/or the hydraulic brake system.
23. Clean the gaskets and washers of the engine casing before assembling. Remove the scratches on the joint faces by polishing evenly with an oilstone.
24. Do not twist or bend the cables too much. Distorted or damaged cables may cause poor
25. When assembling the parts of protection caps, insert the caps to the grooves, if any.

## ENGINE BREAK-IN

There are many movable components inside the engine, such as piston, piston ring, cylinder, crankshaft, gears and so on.During initial use period, proper run-in for every critical component is necessary.Break-in can help engine components match each other better and adjust working condition.Careful treatment of a new engine will result in more efficient performance and a longer service life.

Recommended break-in period: First 20 hours

Operation guide:

**0~10 Hours**

Do not operate continously at more than 50% throttle position.

Cool down the engine for every 5~10 minutes after every 1 hour operation.

Avoid sudden acceleration.Vary the throttle position slowly and smoothly.Do not vary the throttle position rapidly.

**10~20 Hours**

Avoid long-time run at more than 75% throttle position. Do not open throttle completely during the period.

**ATTENTION:**

**1.Maintain and repair as regular procedures during break-in period.**

**2.After break-in, do not forget to check and maintain the engine before normal use.**

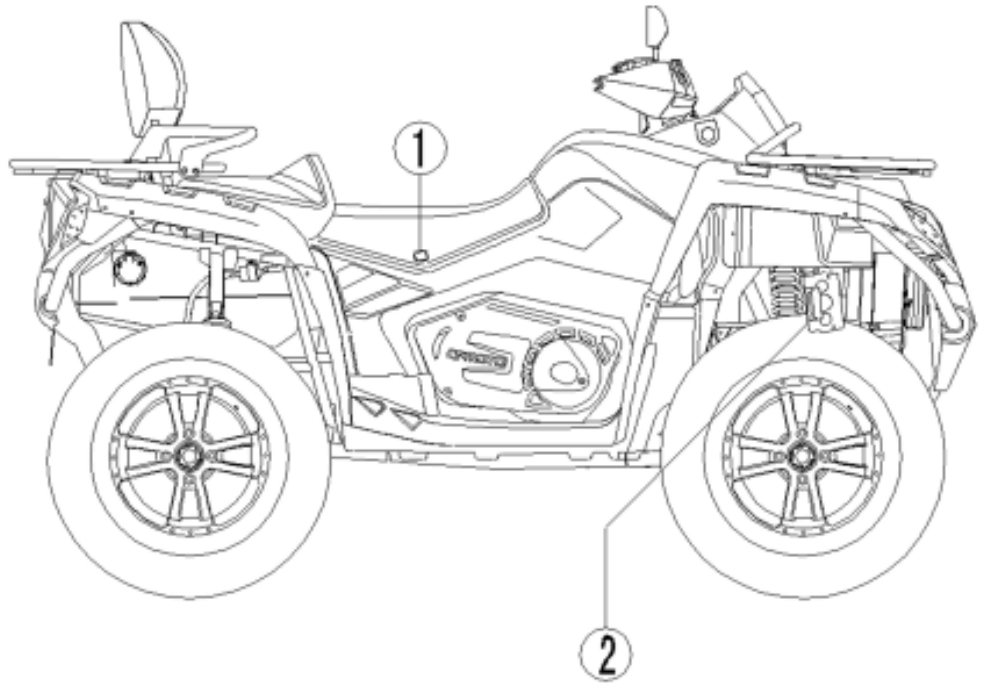
## LOCATION OF VIN/EIN

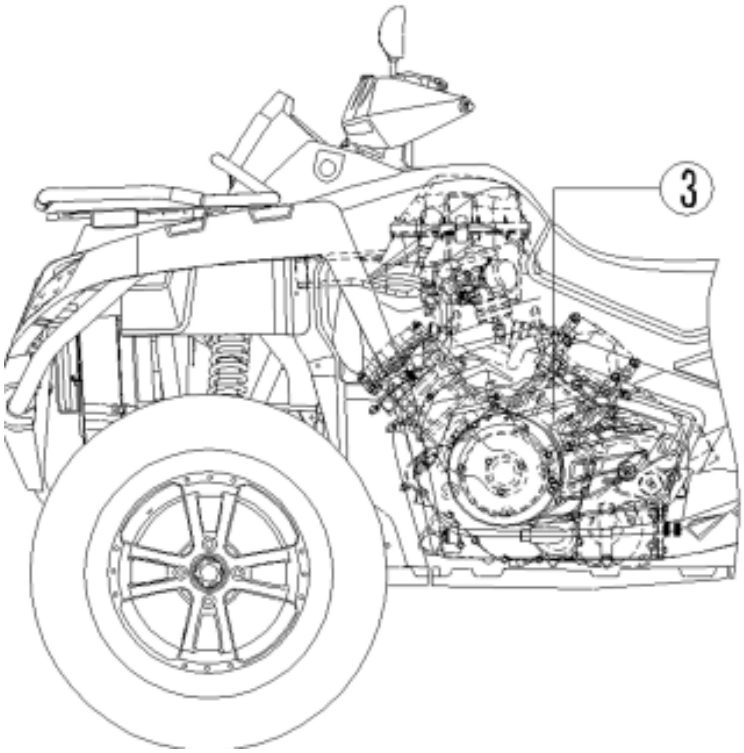
**Model Number：CF800-2**

**1. Vehicle identification number(VIN): LCELVYZ3~**

**2. Name plate (Vehicle identification number label)**

**3. Engine identification number(EIN): 2V91W~**



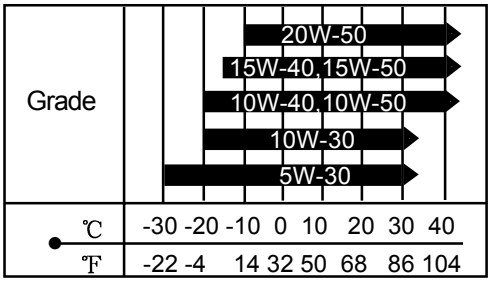



| Item | | | Specifications |
|---|---|---|---|
| Model type | | | CF800-2 |
| Overall length | | | 2310mm |
| Overall width | | | 1180mm |
| Overall height | | | 1340mm |
| Wheelbase | | | 1480mm |
| Engine type | | | 2V91W |
| Displacement | | | 800ml |
| Fuel type and Octane No. | | | RQ-93 or higher unleaded gasoline |
| Dry weight | | | 400 kg |
| Passengers | | | 2 persons (including driver) |
| Total vehicle load allowed | | | 2persons +105 kg =255 kg |
| Tire | | Front | AT26×9—12 49J |
| | | | AT26×9—14 48J |
| | | Rear | AT26×11—12 55J |
| | | | AT26×11—14 54J |
| Min. ground clearance | | | 270mm |
| Min. turning radius | | | 8000mm |
| Engine | Starting | | Electric start |
| | Type | | V-twin cylinder,4-stroke,liquid-cooled,8 valves,SOHC |
| | Valves | | SOHC /Timing chain drive |
| | Bore×Stroke | | 91mm×61. 5mm |
| | Compression ratio | | 10.3:1 |
| | Lubrication | | Wet sump, replaceable oil filter |
| | Oil pump | | Rotor drive |
| | Oil filter | | Paper type, replaceable |
| | Engine oil type | | SAE15W-40/SG or higher |
| | Cooling system | | Liquid-cooled/close-loop cooling |
| | Coolant type | | -30℃anti-corrosion and anti-freezing |

| Item | | | | | | Specifications |
|---|---|---|---|---|---|---|
| Air intake devices | Air filter type | | | | | Paper filter element |
| | Throttle body | | Type | | | 0800-173000 |
| | | | Diameter of throttle body | | | 48mm |
| Fuel tank capacity | | | 23 L | | | |
| Drive train | Clutch type | | Wet shoes and auto centrifugal | | | |
| | Transmission type | | CVT+ Gearshift | | | |
| | Gearshift | | High, Low and Reverse | | | |
| | Gearshift methods/orders | | Manual operation/L-H-N-R-P | | | |
| | CVT ratio range | | 2.88~0.70 | | | |
| | Gearshift ratio | | | “H” gear | “L” gear | “R” gear |
| | | Final ratio | | 1.333 | | |
| | | Secondary ratio | | 1.952 | | |
| | | Single gear ratio | | 1.143 | 2.529 | 2.231 |
| | | Total ratio | | 2.975 | 6.585 | 5.807 |
| | Ratio of drive gear | | Front | 33 / 9 = 3.667 | | |
| | | | Rear | 33 / 9 = 3.667 | | |
| | Output type | | | Front/Rear shaft drive | | |
| | Rotation of engine output | | | When forward, clockwise (rear view) | | |
| Steering | Turn angle | | Left | 31º | | |
| | | | Right | 31º | | |
| Brakes | | | Front | Hydraulic Disc | | |
| | | | Rear | Hydraulic Disc | | |
| Suspension | | | Double A-arm and independent | | | |
| Frame type | | | Steel tube and plate | | | |

## MAINTENANCE SPECIFICATIONS

### Lubrication System

| Item | | Standards | Service Limit |
|---|---|---|---|
| Engine OiL Capacity | Oil Change | 3400ml(without oil filter replacement) | - |
| | Oil Change | 3500ml(with oil filter replacement) | |
| | Oil Capacity | 3600ml | - |
| | Oil Inside the Oil Radiator and Hoses | 600ml(Note:fill after first start) | |
|  | | • Recommended engine oil:SAE 15w40 API SG.If it's not available,select alternative according to the following specifications.<br>• API classifications: SG or higher<br>• Viscosity rating: according to the left chart | |
| Oil Pump Rotor | Clearance Between Inner and Outer Rotor | 0.06-0.14mm | 0.25mm |
| | Clearance Between Outer Rotor and Bore | 0.09-0.15mm | 0.25mm |
| | Rotor End Clearance | 0.023-0.109mm | 0.20mm |
| | Oil Pressure | 1500rpm:70-300kPa(90 ),Typical:180kPa<br>6000rpm:350-550kPa(90),Typical:420kPa | |

### Air Intake System

| Item | | Standards and Specifications |
|---|---|---|
| Fuel Tank | Total Capacity | 23L |
| Throttle Body Part NO. | | 0800-173000 |
| T-MAP Sensor Part No. | | 0800-175000 |
| Fuel Injector Part No. | | 0800-171000 |
| Idle Speed | | 1300±100rpm |

| Item | | Standards | | Service limit |
|---|---|---|---|---|
| Coolant capacity | Full capacity | 3000ml | | |
| | Capacity of reservoir tank | 380～600ml | | |
| | Standard density | 50% | | |
| Opening pressure | | 108kpa(1.1kgf/cm$^2$) | | |
| Thermostat | Opening temperature | 65±2℃ | | |
| | Fully opening | 85℃ | | |
| | Travel when fully opening | When 85℃，＞5mm | | |
| Relati onsbetween water temp.and resistan t of water temp. sensor | Water temperature（℃） | Resistant of B terminal（Ω） | Resistant of A,C terminal（kΩ） | |
| | -20 | ---- | 28.582±0.004 | |
| | 25 | ----- | 2.795±0.0025 | |
| | 50 | 216.0-216.4 | 0.98±0.00227 | |
| | 80 | 74.6-90.6 | 0.334±0.00204 | |
| | 110 | 32-36 | 0.133±0.00252 | |
| Working temp. of thermoswitch | OFF-ON | Around 88℃ | Around 88℃ | |
| | ON-OFF | Around 82℃ | Around 82℃ | |
| Coolant type | -30℃ anti-freezing, anti-corrosive and high boiling point | | | |

| Item | | | Standard value | Service limit |
|---|---|---|---|---|
| Front wheel | Rim jump | Longitude | 1.0mm | 2.0mm |
| | | Transverse | 1.0mm | 2.0mm |
| | Front tire | Remaining groove | | 3.0mm |
| | | Pressure | 45kPa（0.45kgf / $cm^2$） | |

| Item | | | Standard value | Service limit |
|---|---|---|---|---|
| Rear wheel | Rim jump | Longitude | 1.0mm | 2.0mm |
| | | Transverse | 1.0mm | 2.0mm |
| | Rear tire | Remaining groove | | 3.0mm |
| | | Pressure | 45kPa（0.45kgf / $cm^2$） | |

| Item | | Standard value | Service limit |
|---|---|---|---|
| Front brake | Free play of brake lever | 0mm | |
| | Thickness of brake disc | 3.5mm | 2.5mm |
| Rear brake | Free play of brake lever | 10-20 mm | |
| | Free play of brake pedal | 0mm | |
| | Thickness of brake disc | 7.5mm | 6.5mm |

| Item | | | Standards |
|---|---|---|---|
| AC Flywheel | Type | | Magneto 3-phase AC generator |
| | Output | | 3-phase AC output |
| | Resistance of coil（20℃） | | 0.2Ω-0.3Ω |
| | Resistance of pick-up coil | | 250Ω-300Ω |
| | Voltage without load(cold engine) | | ＞100V（AC），5000r/min |
| | Max. output power | | 350W，5000r/min |
| | Stable voltage | | 13.5V-15.0V, 5000r/min |
| | Peak voltage of pick-up | | ≥1.5V，200 r/min |
| Regulator type | | | 3-phase supply power of thyristor trigger circuit |
| Battery | Capacity | | 12V 30Ah |
| | Voltage between terminals | Fully recharged | 14.4V |
| | | Not-fully recharged | ≤11.8V |
| | Recharging current/time | Standard | 1A／5～10H |
| | | Quick | 5A／1H |

| Item | | Standards |
|---|---|---|
| Ignition type | | ECU |
| Spark plug | Type | Resistant-type |
| | Standard | DCPR8E (NGK) |
| | Gap of spark plug | 0.8-0.9mm |
| | Characteristic | ＞8mm，under 1Kpa |
| Ignition time | BTDC10º 1500r/min | |
| Resistance of ignition coil | Primary | 0.70Ω-0.75Ω |
| | Secondly | 6.0kΩ-7.0 kΩ |
| Peak voltage | Primary | ＞150V |
| | Pulse voltage | 2V |
| Resistance of starter relay coil | | 3Ω-5Ω |
| Resistance of auxiliary relay coil | | 90Ω-100Ω |

| Item | | Standards |
|---|---|---|
| Fuse | Main | 30A |
| | Auxiliary | 10A×1 15A×5 |
| Light & Bulb | Headlight（Hi／Lo） | 12V—35W/35W×2 |
| | Front position light | 12V—5W×2 |
| | Brake light/Tail light | 12V—21W/5W×2 |
| | Turn signal light | 12V—10W×4 |
| | Dashboard indicator light | LED |
| | Water temperature, fuel level,2x4 drive indicator light | LCD |
| | MIL | LED |

**Valves & Cylinder Head**

| Item | Standard value | | Service limit | Remarks |
|---|---|---|---|---|
| Dia. Of valve neck | Intake valve | φ33 | —— | |
| | Exhaust valve | φ29 | —— | |
| Thickness of valve neck | Intake/Exhaust | 1 | 0.5 | |
| Valve clearance(cold engine) | Intake | 0.06-0.14 | —— | |
| | Exhaust | 0.11-0.19 | —— | |
| Inner dia. Of valve guide | Intake/Exhaust | 5.000-5.012 | 5.045 | |
| Gap between valve guide and stem | Intake | 0.020-0.047 | | |
| | Exhaust | 0.030-0.057 | | |
| Valve length | Intake | 90.1 | | |
| | Exhaust | 88.7 | | |
| Width of valve seat seal | Intake valve | 1.2±0.1 | 1.7 | |
| | Exhaust valve | 1.3±0.1 | 1.8 | |
| Valve spring free length | Intake/Exhaust | 40 | 38.2 | |
| Elasticity of valve spring | Intake/Exhaust | 33: 200-235N<br>23: 530-587N | | |
| Axial clearance of camshaft | 0.12-0.28 | | | |
| Camshaft run-out | | | 0.10 | |
| Bore diameter of rocker arm | Intake/Exhaust | 12.000-12.018 | 12.03 | |
| Flatness of cylinder head bottom surface | 0.03 | | 0.05 | |

**Cylinder, Piston, Piston Ring & Crankshaft**

| Item | Standards | | Service limit | Remarks |
|---|---|---|---|---|
| Cylinder compression | 1000kPa | | | |
| Piston/Cylinder clearance | 0.03-0.05 | | 0.10 | |
| Flatness of cylinder top and bottom surface | 0.03 | | 0.05 | |
| Gap of piston ring | 1st ring | 0.25-0.40 | 1.5 | |
| | 2nd ring | 0.35-0.45 | 1.5 | |
| | Oil ring | 0.2-0.7 | 1.5 | |
| Height of piston ring | 1st ring | 1.17-1.19 | | |
| | 2nd ring | 1.47-1.49 | | |
| | Oil ring | 2.37-2.47 | | |
| Height of piston groove | 1st ring | 1.21-1.23 | | |
| | 2nd ring | 1.51-1.53 | | |
| | Oil ring | 2.50-2.52 | | |
| Ring/Piston groove clearance | 1st ring | 0.02-0.06 | 0.15 | |
| | 2nd ring | 0.02-0.06 | 0.15 | |
| | Oil ring | 0.03-0.15 | 0.25 | |
| Piston bore | 22.004-22.010 | | | |
| Inner diameter of small end of connecting rod | 22.01-22.02 | | 22.06 | |
| Diameter of piston pin | 21.995-22.000 | | 21.980 | |
| Gap of piston/piston pin | 0.004-0.015 | | 0.08 | |
| Gap of piston pin/small end hole of connecting rod | 0.010-0.025 | | 0.08 | |
| Side gap of big end of connecting rod | 0.3-0.56 | | 0.8 | |
| Gap of connecting rod bearing | 0.022-0.049 | | 0.09 | |
| Gap of main bearing | 0.02-0.05 | | 0.09 | |
| Gap of crankshaft axial direction | 0.05-0.35 | | 0.6 | |

**Clutch + CVT + Gearbox**

| Item | Standard value | Service limit | Remarks |
|---|---|---|---|
| Inner dia. of clutch friction disc | 140.00-140.15 | 140.5 | |
| Clutch engagement RPM | 1800-2400r/min | | |
| Clutch locking RPM | 3300-3900r/min | | |
| Belt width | 34.5（Cord layer） | 33.5 | |
| Free length of driven pulley spring | 238.5 | | |
| Hole dia. of driven pulley collar | 38.10-38.14 | 38.30 | |
| Groove width of gearshift | 6.10-6.20 | 6.30 | |
| Output gear width of driven shaft | 6.10-6.20 | 6.30 | |
| Thickness of left and right gearshift fork | 5.80-5.90 | 5.70 | |
| Clearance between gearshift fork and engagement groove | 0.20-0.40 | 0.50 | |
| Groove width of gearshift drum | 8.05-8.10 | | |
| Dia. of gearshift pawl pin | 7.90-7.95 | 7.83 | |

**Tightening Torque**

| Items | TorqueN·m(kgf·m) | Items | TorqueN·m(kgf·m) |
|---|---|---|---|
| 5mm Bolt,Nut | 5(0.5) | 5mm Screw | 4(0.4) |
| 6mm Bolt,Nut | 10(1.0) | 6mm Screw | 9(0.9) |
| 8mm Bolt,Nut | 20(2.0) | 6mmSH Flanged bolt | 10(1.0) |
| 10mm Bolt,Nut | 34(3.5) | 6mm Flanged bolt, nut | 12(1.2) |
| 12mm Bolt,Nut | 54(5.5) | 8mm Flanged bolt, nut | 20(2.0) |
| | | 10mm Flanged bolt, nut | 39(4.0) |

Fasteners not included in below table should also be torqued to specification. Note: Threads and contact area should be applied by engine oil.

| Ref. No. | Items | Part number | Qty | Torque（N·m） |
|---|---|---|---|---|
| 1 | Mount bolt, upper part of engine | GB5789 M8×35 | 2 | 35～45 |
| 2 | Bolt, upper bracket of engine | GB5789 M10×1.5×20 | 2 | 40～50 |
| 3 | Mount bolt, front and left side of engine | GB5789 M10×1.25×125 | 1 | 40～50 |
| 4 | Mount bolt, front and right side of engine | GB5789 M10×1.25×100 | 1 | 40～50 |
| 5 | Mount bolt, front bracket of engine | GB5789 M8×20 | 6 | 35～45 |
| 6 | Mount bolt, rear part of engine | GB5789 M10×1.25×170 | 1 | 40～50 |
| 7 | Bolt, rear bracket of engine | GB5789 M8×20 | 6 | 35～45 |
| 8 | Bolt, rocker arm | GB5789 M10×1.25×70 | 16 | 40～50 |
| 9 | Bolt, front shock absorber | GB5789 M10×1.25×50<br>GB5789 M10×1.25×70 | 2<br>2 | 40～50 |
| 10 | Bolt, rear shock absorber | GB5789 M10×1.25×50<br>GB5789 M10×1.25×70 | 2<br>2 | 40～50 |
| 11 | Bolt, bracket of rear wheel axle | GB5789 M10×1.25×140 | 4 | 40～50 |
| 12 | Mount nut, rim | 901B-070002 | 16 | 70～80 |
| 13 | Nut, rim shaft | 901-07.00.03 | 4 | 110～130 |
| 14 | Bolt, rear brake caliper | GB70 M10×1.25×20 | 2 | 30～40 |
| 15 | Bolt, front brake disc | 901-08.00.03 | 8 | 25～30 |
| 16 | Bolt, front brake caliper | GB5789 M8×16 | 4 | 15～25 |
| 17 | Bolt, cover of handlebar | GB5789 M8×55 | 4 | 15～25 |
| 18 | Mount bolt, muffler | GB5789 M10×1.25×70 | 1 | 40～50 |
| 29 | Lower bolt, muffler body | GB5789 M8×68 | 1 | 15～25 |
| 20 | Bolt, muffler clamp | GB5789 M8×35 | 1 | 15～25 |
| 21 | Bolt, rear axle | GB5787 M10×1.25×110 | 2 | 40～50 |
| 22 | Bolt, front axle | GB5787 M10×1.25×90 | 1 | 40～50 |
| 23 | Bolt, front axle | GB5787 M10×1.25×25 | 2 | 40～50 |
| 24 | Bolt, bracket of front axle | GB5789 M8×14 | 2 | 15～25 |
| 25 | Bolt, rear end of rear drive shaft | 9010-300001 | 6 | 40～50 |
| 26 | Bolt, front end of rear drive shaft | 9010-290001 | 4 | 30～40 |
| 27 | Bolt, front drive shaft | 9010-290001 | 8 | 30～40 |

| Item | Qty | Dia. Of thread(mm) | Torque (N.m) | Remarks |
|---|---|---|---|---|
| Bolt M14X1.5 | 2 | M14×1.5 | 25 | |
| Plug screw, oil passage of left crankcase | 1 | ZM14 | 20 | Apply glues |
| Oil drain boltM12×1.5 | 1 | M12×1.5 | 20 | |
| Flange bolt M8×12.5 (left crankcase) | 1 | M8×12.5 | 20 | |
| Screw $R_2$1/8 (oil passage) | 2 | $R_2$1/8 | 20 | Apply glues |
| Nut M6(right crankcase) | 4 | M6 | 10 | |
| Stud AM6×35-8.8 (right crankcase) | 4 | AM6×35 | 10 | Threadlocker |
| Screw M6×12（CVT cover） | 1 | M6×12 | 8 | |
| Bolt of wiring clamper(left crankcase cover) | 2 | M5×10 | 6 | Threadlocker |
| Screw of oil seal plate(left crankcase cover) | 3 | M6×8 | 8 | |
| Bolt M12×1.25(Magneto rotor) | 1 | M12×1.25 | 105 | Threadlocker |
| Adjust nut, valve clearance | 8 | M6 | 12 | |
| Bolt, timing sprocket | 2 | M8 | 30 | Threadlocker |
| Plunger, tensioner | 2 | M16×1.5 | 0.1 | |
| Plug screw, tensioner | 2 | M18×1 | 4.5 | |
| Bolt, cylinder | 8 | M10 | 20,60 | |
| Thrust nut M8（exhaust pipe） | 4 | M8 | 13 | |
| Spark plug | 2 | M12×1.25 | 20 | |
| Stud M8x42（exhaust pipe） | 4 | M8×42 | 10 | Threadlocker |
| Plug screw M12×1.5（head of cylinder 1） | 1 | M12×1.5 | 20 | |
| Tapping screw ST5.5×13(thermostat cap) | 1 | ST5.5×13 | 5 | |
| Screw, tensioner plate | 2 | M6×15.5 | 10 | Threadlocker |
| Bolt M8, intake manifold | 4 | M8 | 20 | |
| Bolt, connecting rod | 4 | M9×1 | 10,20,50 | |
| Nut M18x1.5(left)（right crankcase） | 1 | M18×1.5 | 70 | Left thread |

To be continued

| Item | Qty | Thread Dia. (mm) | Torque (N.m) | Remarks |
|---|---|---|---|---|
| Nut, drive shaft（CVT drive pulley） | 1 | M20×1.5 | 115 | Threadlocker |
| Nut,main shaft（CVT driven pulley） | 1 | M20×1.5 | 115 | Threadlocker |
| Lock nut, bevel gear | 1 | M22×1 | 145 | |
| Bolt M8x28(bearing seat, drive bevel gear) | 4 | M8×28 | 32 | |
| Screw M8x5（bearing holder, drive bevel gear） | 4 | M8×5 | 15 | |
| Stopper nut,M65X1.5(driven bevel gear) | 1 | M65×1.5 | 110 | Threadlocker |
| Nut M8X28(bearing housing, driven bevel gear) | 4 | M8×28 | 25 | |
| Screw T25(shift fork drum) | 1 | M5×8 | 6 | |
| Spring seat, Limit | 1 | M12×1 | 20 | |
| Screw M5×16（oil pump） | 3 | M5×16 | 7 | Threadlocker |
| Screw M8X20（overriding clutch） | 6 | M8×20 | 30 | Threadlocker |
| Bolt M6×30（Magneto stator） | 3 | M6×30 | 10 | Threadlocker |
| Bolt, valve cap | 8 | M6 | 7 | |
| Bolt M6×45(thermostat cap, cylinder 1) | 2 | M6×45 | 6 | |
| Bolt M6×25 (Tensioner, thermostat cap of cylinder 2） | 6 | M6×25 | 6 | |
| Water temperature sensor | 1 | M12×1.5 | 16 | |
| Switch of oil pressure | 1 | M10×1 | 12 | Threadlocker |
| Retainer, bearing (left) | 1 | M55×1.5 | 80 | Threadlocker,left thread |
| Other bolts | | M5 | 4.5-5.5 | |
| | | M6 | 8-12 | |
| | | M8 | 25 | |

**Engine Service Tools**

| Item | Tool name | Specifications | Purposes |
|---|---|---|---|
| 1 | Vernier caliper | 0-150mm | Measure length and thickness |
| 2 | Micrometer | 0-25mm | Measure outer diameter of rocker arm shaft, valve stem, camshaft |
| 3 | Dial gauge | 25-50mm | Measure Max. travel of camshaft |
| 4 | Dial gauge | 75-100mm | Measure size of piston skirt |
| 5 | Inner dia. of cylinder meter | | Measure cylinder size & pressure |
| 6 | Inside caliper micrometer | 10-34mm | Measure inner diameter of rocker and piston pin hole, connecting rod hole |
| 7 | Dial indicator | 1/100 | Measure jump |
| 8 | Knife straight edge | | Measure flatness |
| 9 | Feeler gauge | | Measure flatness and adjust valve clearance |
| 10 | Oil guage | | Measure fuel level of carburetor |
| 11 | Plastigauge | | Measure fit clearance |
| 12 | Spring balance | | Measure elasticity of spring |
| 13 | RPM meter | | Measure RPM |
| 14 | Compression tester and adapter | | Measure cylinder compression |
| 15 | Oil pressure meter | | Measure oil pressure |
| 16 | Air pressure meter | | Measure opening pressure of radiator cover |
| 17 | Ohmmeter | | Measure resistance and voltage |
| 18 | Amperometer | | Measure current of switch |
| 19 | Thermometer | | Measure coolant temp. |
| 20 | Timing light | | Measure ignition timing |
| 21 | Torque wrench | One set | Measure tightening torque |
| 22 | Alcohol light | | Warm up or increase temp. |
| 23 | Magnetic meter seat | | Mounting dial indicator |
| 24 | Plate | | Auxiliary measurement |
| 25 | V-shaped bluff | | Auxiliary measurement for jump |
| 26 | Nipper | | Mounting valve lock-clip |
| 27 | Double clip reed | | Disassembly and assembly of double clip |
| 28 | Pinching tools | | Disassembly and assembly of retainer |
| 29 | Impact driver | | Disassembly of crosshead bolt |
| 30 | Screw driver | | |
| 31 | Plus driver | | |

## Service Tools

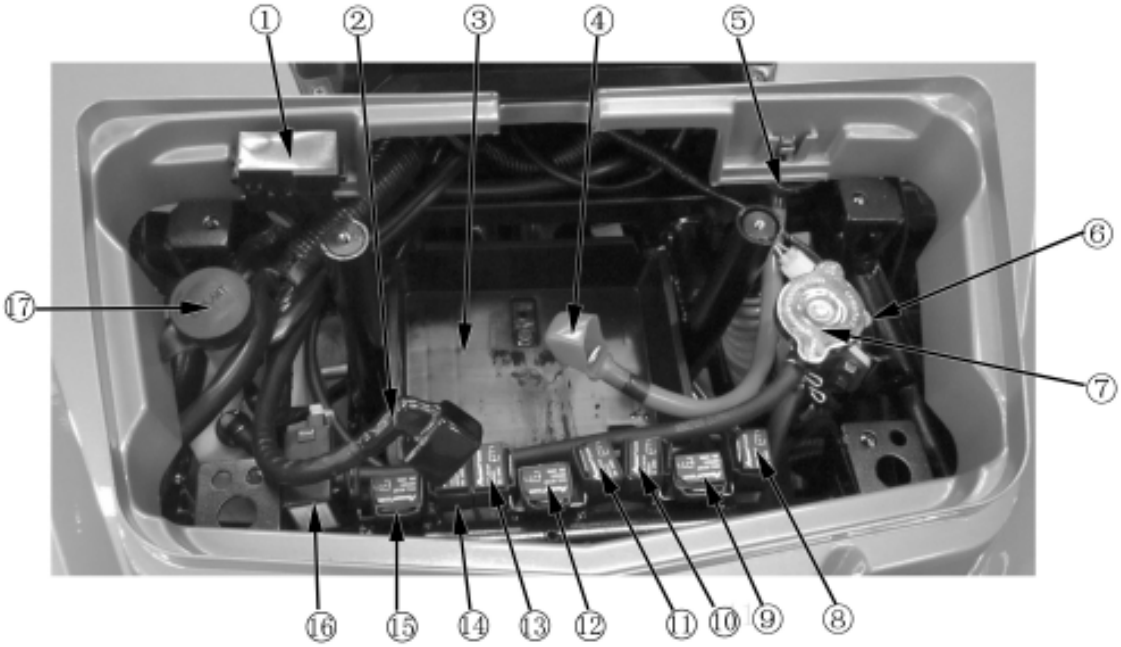
| Part number | Tool name | Purposes |
|---|---|---|
| 0800-000000-871-001 | Joint, oil hose | Measure oil pressure |
| 0800-014001-922-003 | Remover, bearing 60/28 of left crankcase | Remove bearing 60/28 |
| 0800-014001-921-002 | Press tool, bearing of left crankcase | Press bearing |
| 0800-041000-922-001 | Screw, locking crankshaft | Lock crankshaft |
| 0800-031000-922-001 | Remover, magneto rotor | Remove magneto rotor |
| 0800-013201-922-001 | Remover, bearing 6003 of CVT case | Remove bearing 6003 |
| 0800-013201-921-001 | Damper, CVT case cover | Support CVT case cover when pressing bearing |
| 0800-052000-922-003 | Split tool, drive & driven pulley | Split driven fixing and moving sheave to install belt |
| 0800-051204-923-001 | Installation tool, drive pulley oil seal | Install drive pulley oil seal 35×42×4 |
| 0800-052000-922-002 | Remover, driven pulley | |
| 0800-052000-922-001 | Wrench, CVT driven pulley | Fix nut of driven pulley when installation |
| 0800-013101-922-001 | Remover, bearing 6208 of CVT case | Remove bearing |
| 0800-013101-921-001 | Damper, CVT case | Support CVT case when pressing bearing |
| 0800-013104-923-001 | Installation tool, clutch housing oil seal | Install oil seal of CVT clutch housing34×55×9 |
| 9010-180100-922-001 | Radiator test cap | Measure cooling system pressure |
| 0800-014001-922-002 | Puller, oil seal | Remove oil seal |
| 0800-014001-922-001 | Puller, bearing | Remove bearing |
| 0800-014001-921-003 | Press tool, bearing | Press bearing |
| 0800-022800-922-001 | Sleeve, spark plug | Disassemble/install spark plug |
| 0800-024001-922-001 | Locking tool, camshaft | Lock up and fix camshaft |
| 0800-000000-871-002 | Joint, cylinder pressure meter | Measure cylinder pressure |
| 0800-022102-922-001 | Remover, valve guide | Remove valve guide |
| 0800-022102-922-002 | Installer, valve guide | Install valve guide |
| 0800-040003-922-001 | Compressor, piston ring | Compress piston ring when installation |
| 0800-040005-922-001 | Installer, circlip | Install circlip of piston pin |
| 0800-011201-923-001 | Oil seal installer, breather | Install oil seal of breather |
| 0800-011201-921-003 | Installation jig, breather gear shaft | Support breather gear shaft |
| 0800-011201-921-001 | Press tool, breather gear shaft | Press breather gear shaft |
| 0800-011101-922-001 | Support tool, left crankcase plain bearing removing | Support left crankcase when removing plain bearing |
| 0800-012101-922-001 | Support tool, right crankcase plain bearing removing | Support right crankcase when removing plain bearing |
| 0800-011102-922-001 | Remove/install tool, roller bearing | Remove/install bearing |
| 0800-060000-923-001 | Press tool, front output shaft oil seal | Install oil seal35×61×9 of front output shaft |

| | | |
|---|---|---|
| 0800-062301-923-001 | Installer, front output shaft | Install front output shaft |
| 0800-062206-922-001 | Nut sleeve, driven bevel gear bearing | Install/remove nut of driven bevel gear |
| 0800-062204-923-001 | Press tool, oil seal of driven bevel gear | Install oil seal of driven bevel gear 34×50×7 |
| 0800-062000-922-001 | Backlash measurement tool | Measure backlash between drive bevel gear and driven bevel gear |
| 0800-060002-922-001 | Remover, shaft of reverse immediate gear | Remove shaft of reverse immediate gear |
| 0800-011000-922-001 | Remover, left crankcase bearing | Remove bearing of left crankcase |
| 0800-012000-922-001 | Remover, right crankcase bearing 5206 | Remove bearing 5206 |
| 0800-012101-921-001 | Damper, right crankcase | Support right crankcase |
| 0800-011101-921-001 | Damper, left crankcase | Support left crankcase |
| 0800-060000-922-001 | Press tool, reverse immediate gear shaft | Press reverse immediate gear shaft |
| 0180-014001-921-001 | Press tool, left crankcase cover bearing 60/28 | Press bearing 60/28 |
| 0180-013201-921-001 | Press tool, CVT case cover bearing 6003 | Press bearing 6003 |
| 0180-013207-923-001 | Press tool, oil seal of CVT case cover | Press oil seal |
| 0180-051000-922-001 | Holding Wrench, CVT drive pulley | Stop rotation of drive pulley |
| 0180-013101-921-002 | Press tool, CVT case bearing 6207 | Press bearing |
| 0180-053100-921-002 | Press tool, clutch housing | Press clutch housing |
| 0180-053100-921-001 | Damper, clutch housing | Support clutch housing when pressing clutch |
| 0180-054000-922-001 | Holding wrench, clutch | Stop clutch rotation |
| 0110-080005-923-001 | Press tool, oil seal of water pump | Install oil seal 10×20×5 of water pump |
| 0010-081004-921-001 | Press tool, water seal | Press water seal |
| 0180-022006-922-001 | Valve spring compressor clamp | Compress, remove valve spring |
| 0180-060008-922-001 | Wrench, circlip of front output shaft bearing | Install/Remove front output shaft bearing circlip |
| 0180-062201-921-003 | Press tool, driven bevel gear shaft bearing（6207C3） | Press bearing |
| 0180-062103-921-002 | Press tool, drive bevel gear shaft bearing（6305） | Press bearing |
| 0010-060002-921-002 | Installer, bearing 6203 | Press bearing |
| 0180-012100-921-004 | Installer, bearing 3206A | Press bearing |
| 0180-011100-921-004 | Press tool, gearshift shaft bearing 6303 | Press bearing |
| 0040-012001-921-002 | Press tool, bearing 6203 | Press bearing |

## Lubricants and Service Products

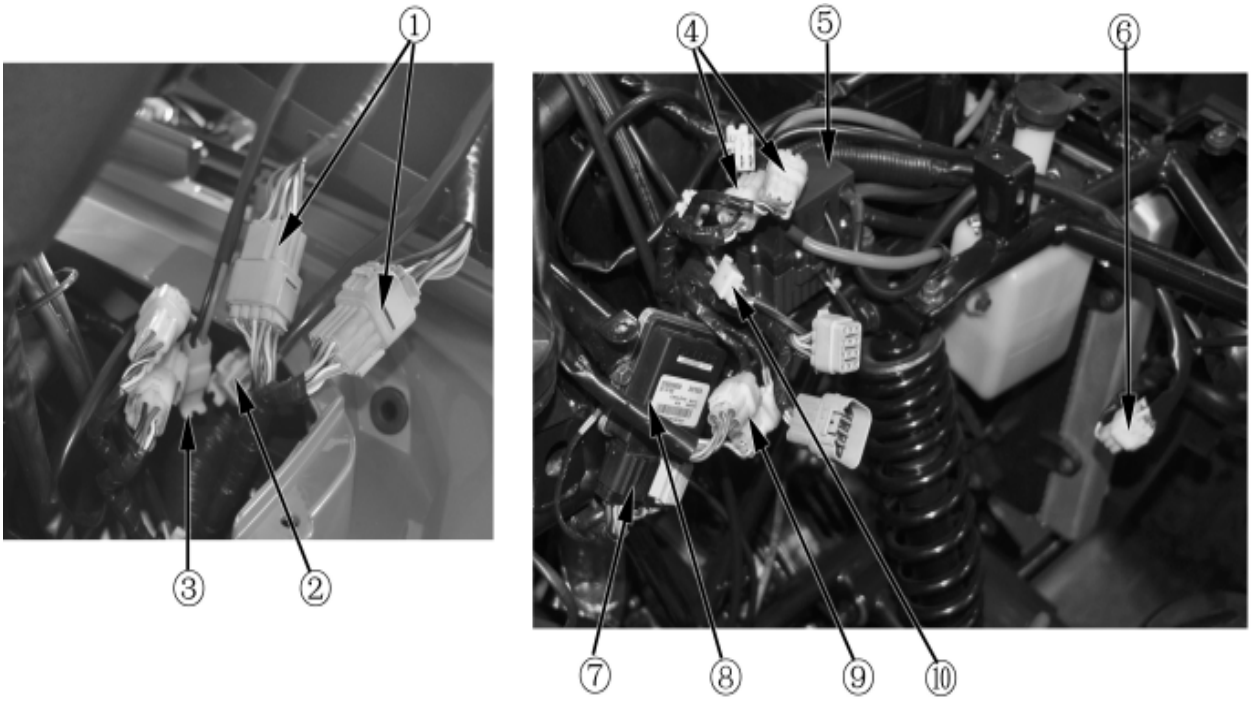
| Item | Type | Lubrication points | Remarks |
|---|---|---|---|
| Engine oil | SAE15W-40<br>API : SG or higher<br>(Alternative please see page 1-6) | Cylinder,Crankcase,Cylinder head,see page（10-3） | |
| Molybdenum disulfide grease | | Piston pin, valve stem, valve oil seal, camshaft | |
| Grease | No. 3 $MoS_2$ grease | Oil seal, O-ring and other rubber seals. Sealed bearing, CVT bearing and bushing | |
| Coolant | -30℃Anti-freezing, anti-corrosive, high-boiling coolant | Engine cooling system | Coolant capacity depends on radiator pipes |
| Silicone sealant | Loctite5699 | Crankcase splitting surfaces,contact surface between crankcase and cylinder,contact surface between cylinder head and valve cover | |
| Threadlocker | KB243 | Some threads | |
| Retaining compound | KB648 | Oil seal | |

## WIRING,PIPES& CABLES LOCATION




1.Fuse box 2.Negative cable, battery 3.Battery case 4.Positive cable,battery 5.Starter relay 6.PDA connector 7.Radiator cap 8.Relay of headlight 9.Fan relay 10. 2x4 drive relay 11. 4x4 drive lock relay 12. Relay of brake light 13. Relay of fuel pump 14. Starter auxiliary relay (1) 15. Starter auxiliary relay(2) 16. Flasher relay 17. Cap,reservoir tank

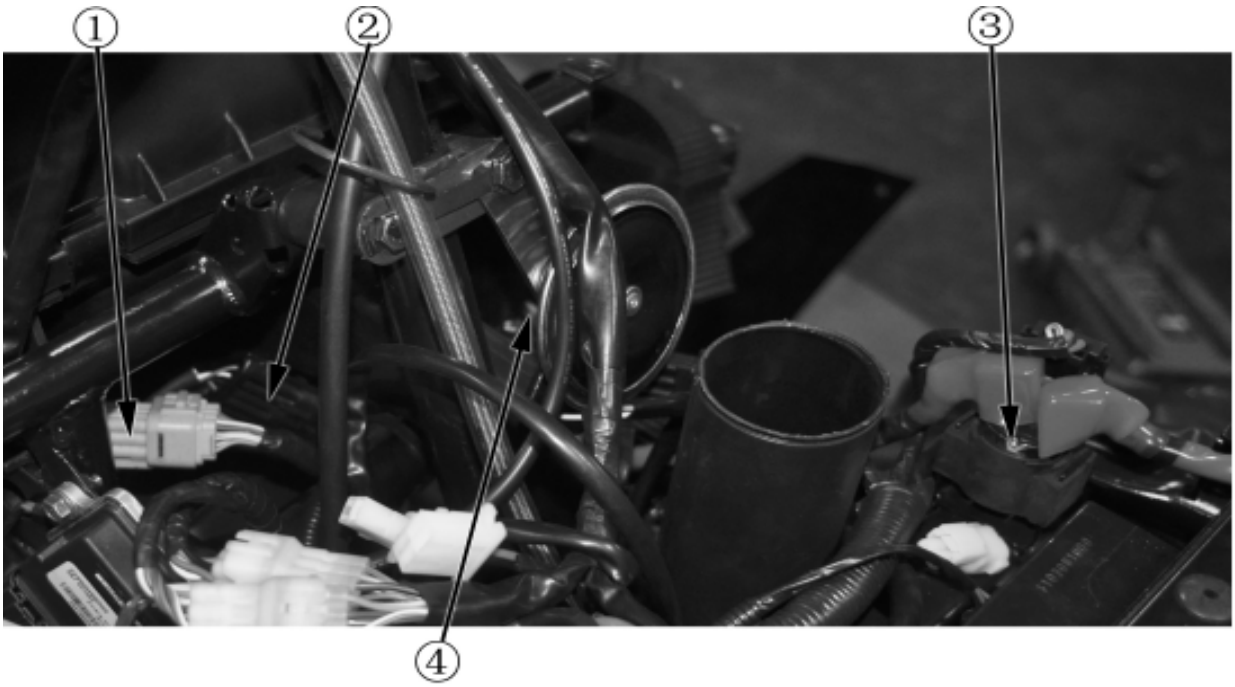
**NOTE:***Before check or repair above items, front top cover shoud be removed, but when check starter relay, it can be operated from upper part of front left wheel.*



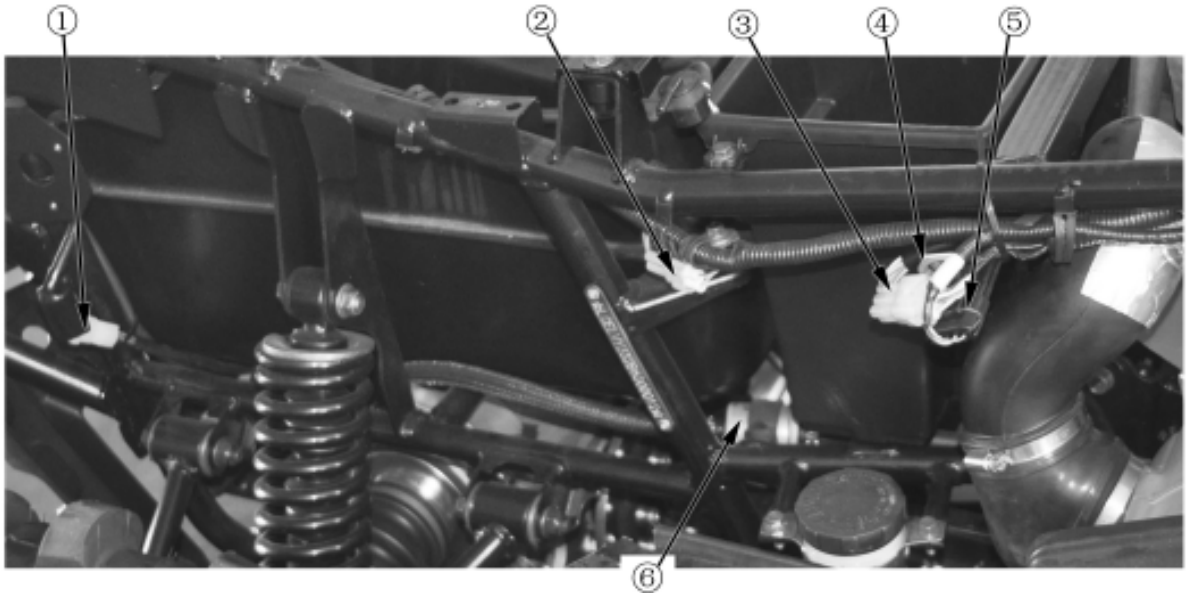

1.Dashboard connector 2.Connector of ignition switch 3.Connector,cigeratte lighter 4.Connector,left handle-bar switch

5.Winch control unit 6.Connector,right headlight 7.ECU connector 8.ECU 9.Connector, right handlebar switch 10.Connector, winch motor switch

Before checking above items, seat, front rack, left and right side panel, cover of air filter and front fender should be removed.

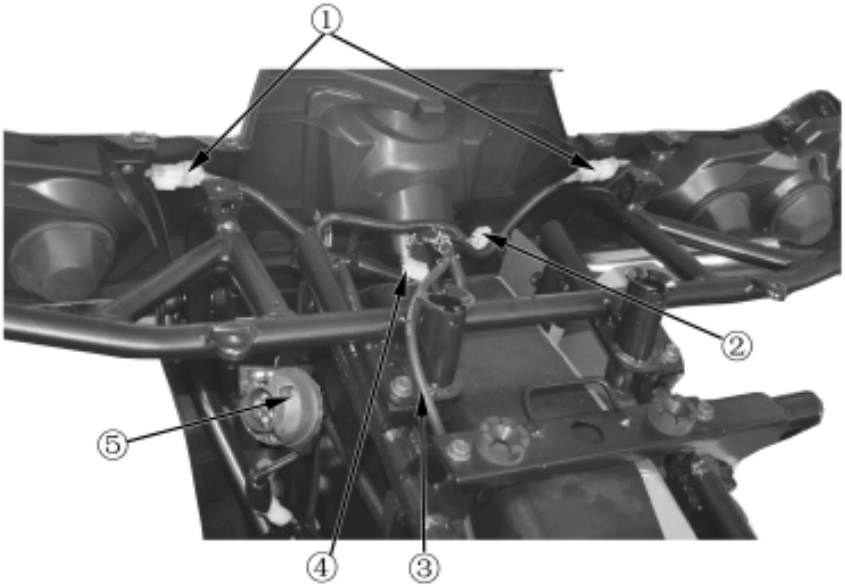



1.Connector, auxiliary cable 2.Connector1, oxygen sensor 3. Starter relay 4.Connector, horn




1.Connector, fuel pump 2.Connector, fuel sensor 3.Connector, gear sensor 4.Connector, rear brake switch 5. Connector 2, oxygen sensor 6. Fuel filter

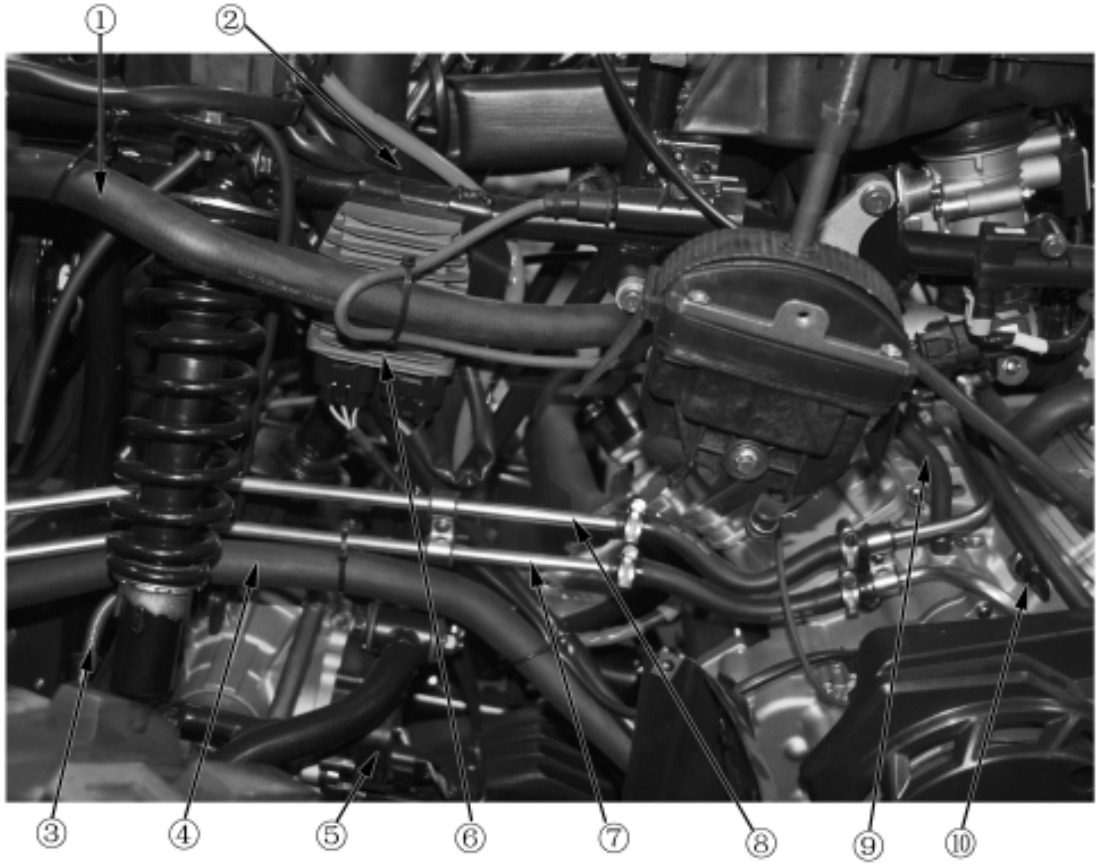
Before checking and repair above items, left and right side panel, seat should be removed.



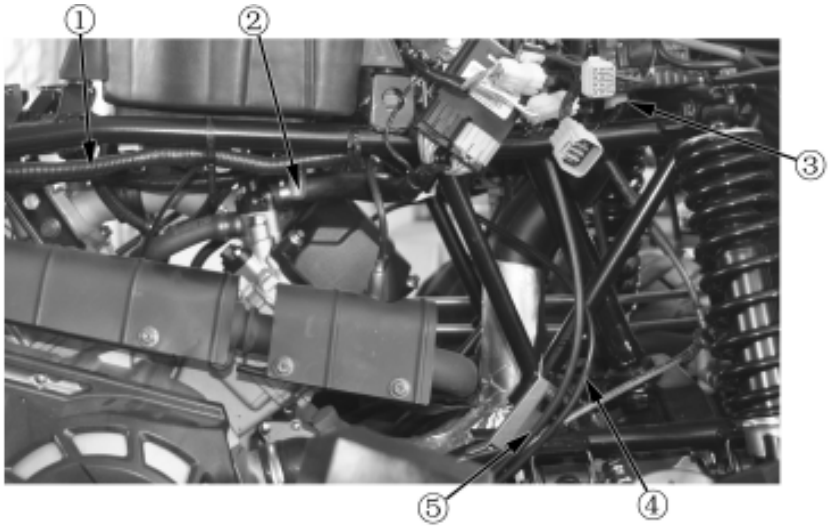

1.Connector,tail light/brake light/rear turn light 2.Connector, rear licence light 3.Breather hose, fuel evaporated system(Note:For Euro standard, ATV is without fuel evaporated system, so the breather hose is only for balancing pressure of fuel tank. It's important to avoid hose blocked, otherwise fuel pump will be damaged. At the same time, avoid to overfill fuel.  4.Connector, trailer power socket 5.Trailer power socket

Attention: Voltage of trailer power socket (DC12V) Max. current is less than 10A. The socket is only used for power supply for rear turn light of trailer, tail light and rear licence light.


1.Throttle cable 2.Connector, pick-up coil 3.Throttle body 4. TPS 5. Air by-pass valve6. Injector 7. Water temp. sensor 8. Water pipe 9. Air intake temp. sensor 10. Ignition coil




1.Water outlet pipe 2. Connector, differential gear motor 3. Brake hose 4. Water inlet pipe 5. Differential gear motor 6. Regulator 7. Oil inlet pipe 8. Oil outlet pipe 9.Exhaust gas pipe between crankcase and air filter 10. Oil pressure switch




1. Main cable 2.Waste fuel collection hose 3. Connector, cooling fan 4.Limit cable, gearshift 5.Rear brake cable

## MIL

MIL is located at ①position.

When the light flashes, it will indicate there's something wrong in vehicle.The flash code consists of 4 digits.

Example：0650

"0" means flash 10 times;

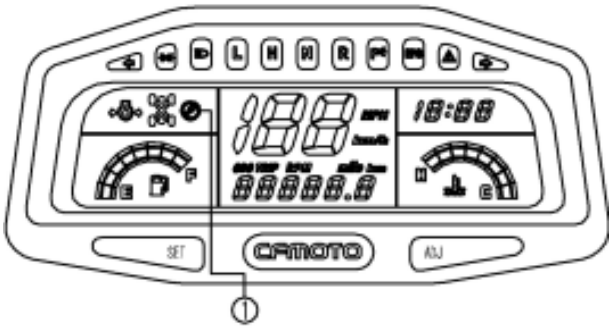
"6" means flash 6 times;

"5" means flash 5 times;

"0" means flash 10 times.

Detailes please refer to page (15-27).

Also PDA can be used for diagnosis. please see page (1-19) and (15-26) to know "How to use PDA".

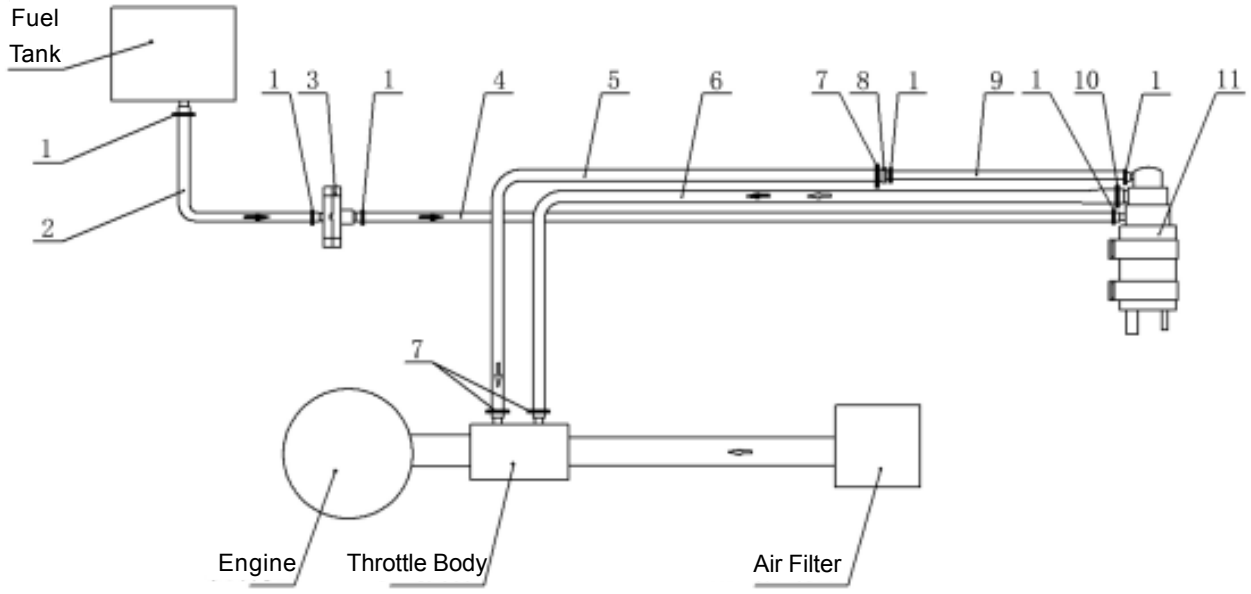



## EVAP(Evaporative Emission Control System)

The system is only assembled for specified regions (such as USA california state). For European countries and other regions, it's not available.

If there is something wrong for EVAP, please contact local dealer for service. Do not modify the system without approval, otherwise it will not in accordance with related laws and regulations. After disassembling the system, check if fuel hoses are good, if any air or fuel leakage, if any blocked, if any damaged.Evaporative fuel goes into canister through disorption hose. When engine stops, carbon inside canister can adsorp evaporative fuel. When engine starts, fuel inside canister will go to combustion chamber through disorption hose to avoid going out to pollute air. Meanwhile adsorption hose can balance air pressure inside fuel tank to protect fuel tank and fuel pump.

**Working Flow Layout**:




1. Clamp 2.Vacuum pipe of canister 3. Two way valve 4. Vaccum pipe (2) 5.Evaporative fuel pipe(2) 6.Evaporative fuel pipe(1) 7.Clamp 8.Water pipe joint 9.Evaporative fuel pipe (3) 10.Clamp 11.Canister

## MAINTENANCE INFORMATION

### Operation Cautions

**WARNING:**

Gasoline is highly flammable, therefore smoke and fire are strictly forbidden in the work place. Special attention should also be paid to sparks. Gasoline may also be explosive when it is vaporized, so operation should be done in a well-ventilated place.
Remove and Install muffler after it is fully cold.

- This chapter is on the disassembly and installation of rack, visible parts, exhaust pipe, muffler and fuel tank.
- Hoses, cables and wires should be routed properly.
- Replace the gasket with a new one after muffler is removed.
- After muffler is installed, check if there is any exhaust leakage.

### Tightening Torque

Muffler Rear Fixing Bolt: 35-45**N • m**
Muffler Exhaust Pipe Bolt: 35-45**N • m**
Muffler Body Fixing Bolt: 35-45**N • m**

### Troubleshooting

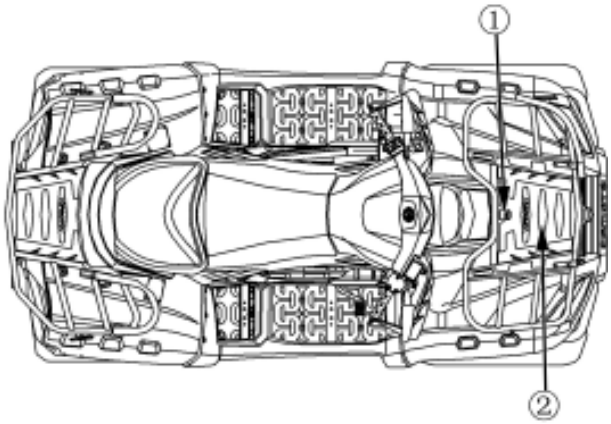
Loud exhaust noise
- Broken muffler
- Exhaust leakage

Insufficient power
- Deformed muffler
- Exhaust leakage
- Muffler clogged

## BATTERY COVER

### Removal

Pull strap no.1 toward dashboard cover to disengage the latch to remove battery cover no.2.




## FRONT RACK

### Removal

Remove battery cover;

Remove the 4 bolts no.4;


Remove front rack no.5.

### Installation

Reverse the removal procedure for installation.

### Tightening Torque:

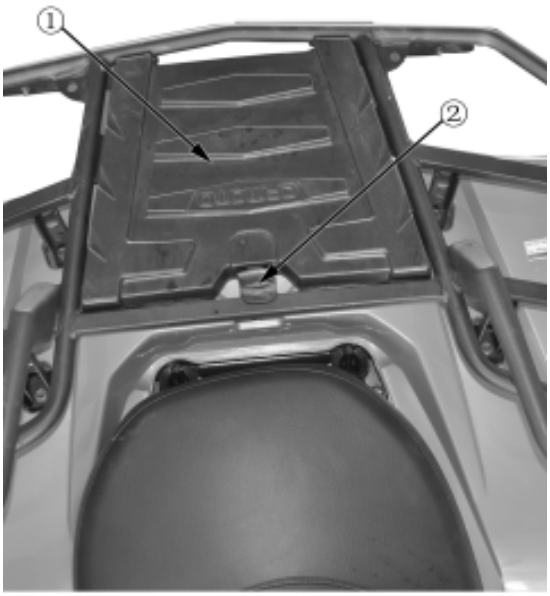
Front rack mounting bolt no.4:

35**N • m**-45**N • m**

## TOOL BOX COVER

### Removal

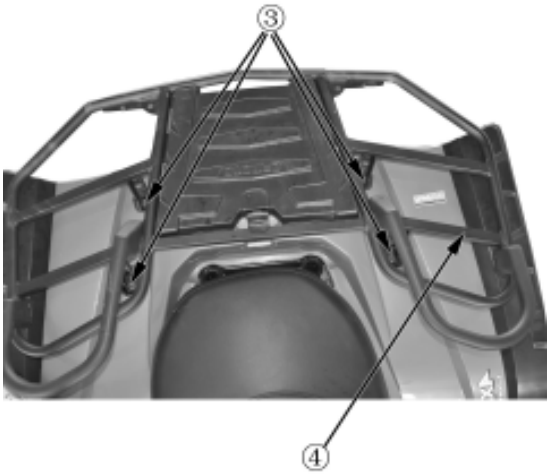
Pull strap no.2 toward passenger seat to disengage the latch to remove tool box cover no.1.




## REAR RACK

### Removal

Remove the 4 bolts no.3;
Remove rear rack no.4.




### Installation

Reverse the removal procedure for installation.

### Tightening Torque:

Rear rack mounting bolt no.3:
35N • m-45N • m

## PASSENGER SEAT

### Removal

Pull upward strap no.2 and lift passenger seat back to remove passenger seat no.1.

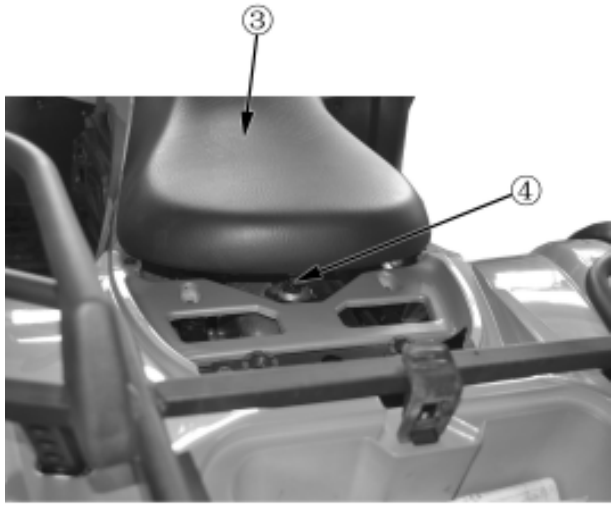

### Installation

Reverse the removal procedure for installation.

## DRIVER SEAT

### Removal

Remove passenger seat;
Disengage driver seat latch no.4;
Remove driver seat no.3.




### Installation

Reverse the removal procedure for installation.
Check if the driver seat is secured and in place after installation.

## AIR FILTER COVER

### Removal

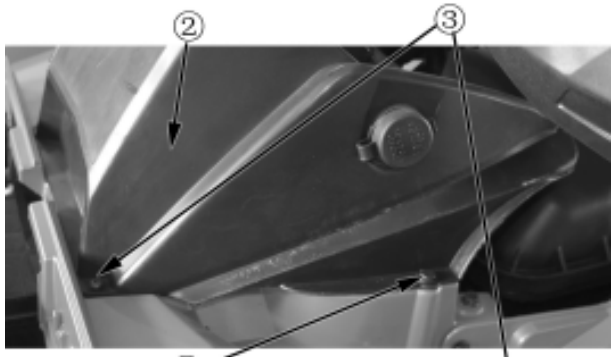
Remove passenger seat(→2-4);
Remove driver seat(→2-4);
Lift the rear of air filter cover no.1 to disengage plastic latches then pull the air filter cover backward to remove it.

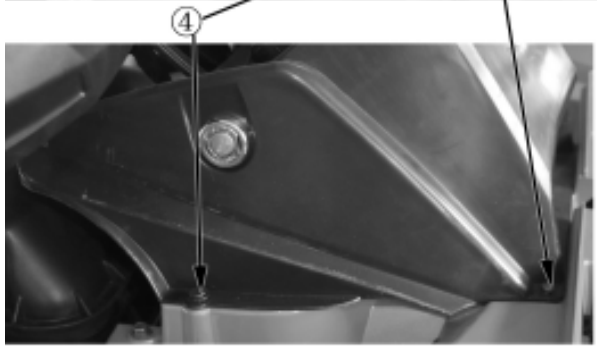

### Installation

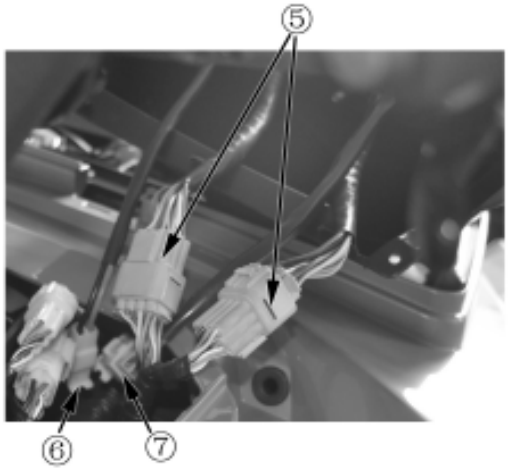
Reverse the removal procedure for installation.

## DASHBOARD COVER

Remove passenger seat set(→2-4);
Remove driver seat(→2-4);
Remove air filter cover(→2-5);
Remove push rivets no.4;
Remove tapping screws no.3;
Remove dashboard cover no.2;
Unplug dashboard connectors no.5;
Unplug cigarette lighter connector no.6;
Unplug ignition switch connector no.7.




### Installation

Reverse the removal procedure and direction for installation.

## GEARSHIFT LEVER KNOB

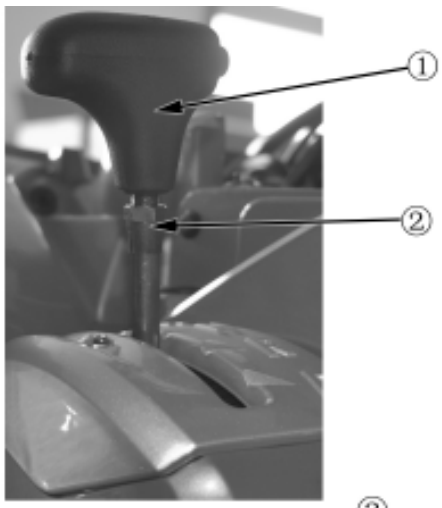
### Removal

Loosen locking nut no.2;

Remove gearshift lever knob by turning it counterclockwise.

### Installation

Reverse the removal procedure and direction for installation.




## GEARSHIFT LEVER INDICATOR

### Removal

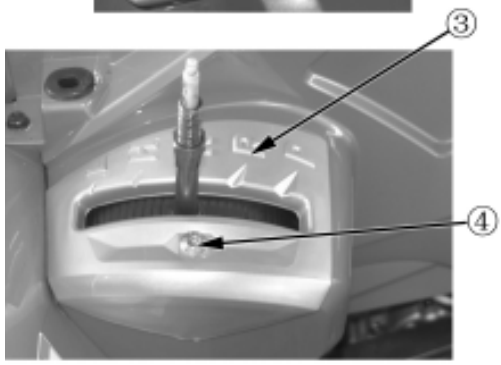
Remove gearshift lever knob;

Remove screw no.4;

Remove lever indicator no.3.

### Installation

Reverse the removal procedure and direction for installation.




## LH SIDE PANEL

### Removal

Remove passenger seat set(→2-4);

Remove driver seat(→2-4);

Remove air filter cover(→2-5) ;

Remove gearshift lever knob ;

Remove lever indicator;

Remove push rivets no.5;

Remove bolts no.6;

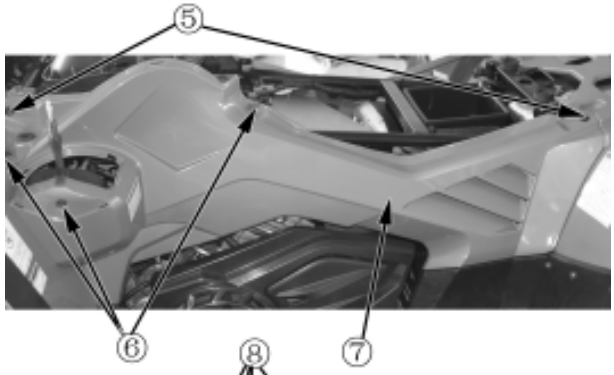
Remove tapping screws no.8 retaining front and rear fender;

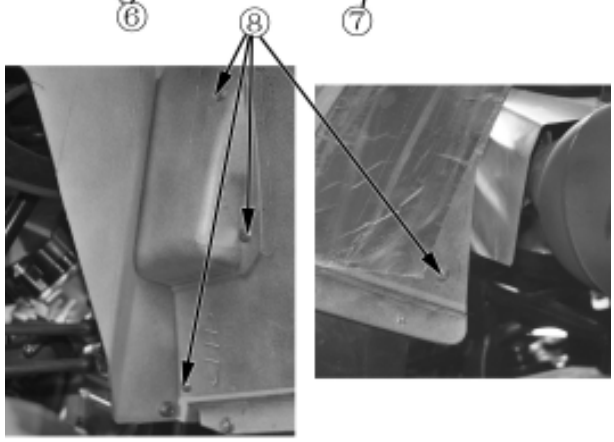
Remove latch no.9;

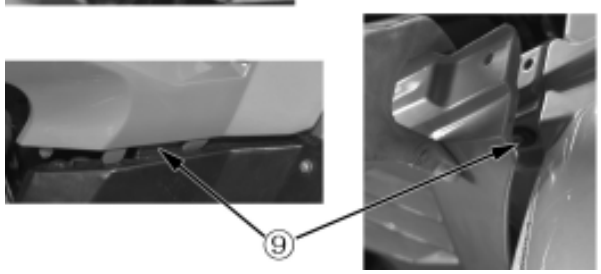
Remove side panel.

### Installation

Reverse the removal procedure and direction for installation.



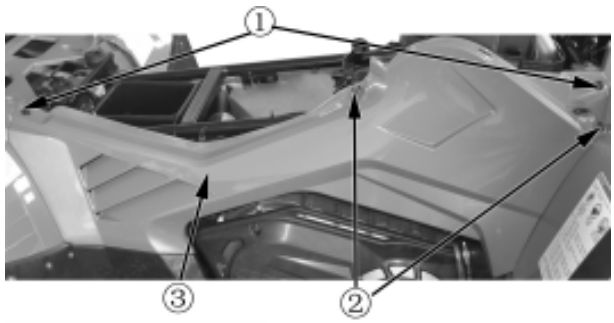
## RH SIDE PANEL

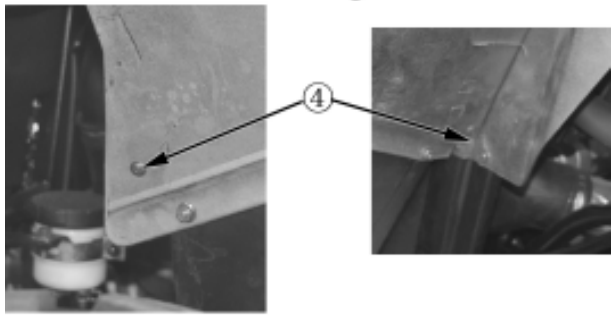
### Removal

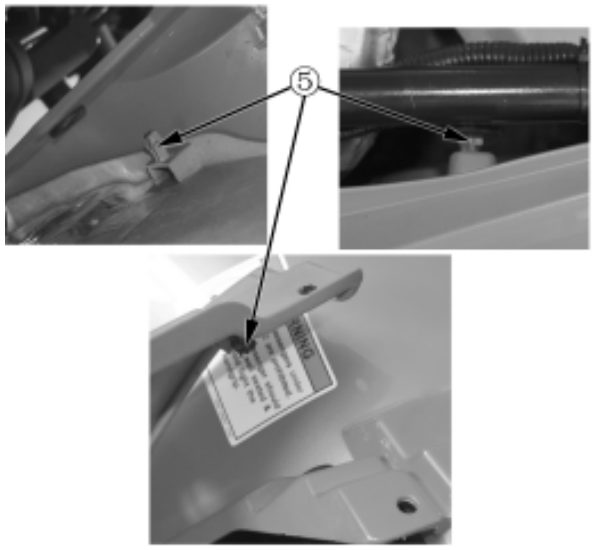
Remove passenger seat(→2-4);
Remove driver seat(→2-4);
Remove air filter cover(→2-5);
Remove push rivets no.1;
Remove bolts no.2;
Remove tapping screws no.4;
Remove push rivets no.5;
Remove RH side panel.

### Installation

Reverse the removal procedure and direction for installation.



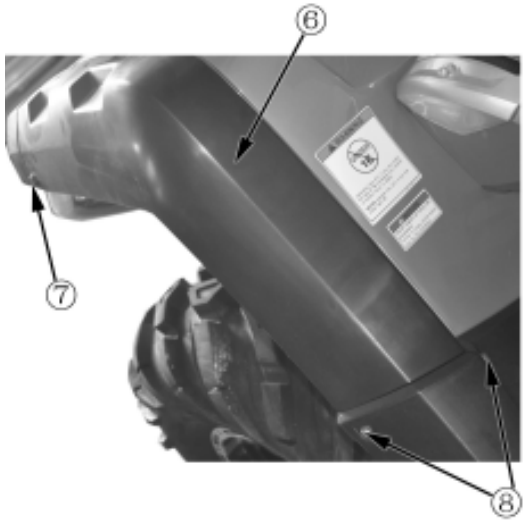

## FRONT FENDER EXTENSION,LH

### Removal

Remove bolts&nuts no.8;
Remove push rivet no.7;
Disengage plastic latches;
Remove front LH fender extension no.6.

### Installation

Reverse the removal procedure and direction for installation.



## FRONT FENDER EXTENSION,RH

### Removal

Remove bolts&nuts no.3;
Remove push rivet no.2;
Disengage plastic latches;
Remove front RH fender extension no.1.

### Installation

Reverse the removal procedure and direction for installation.

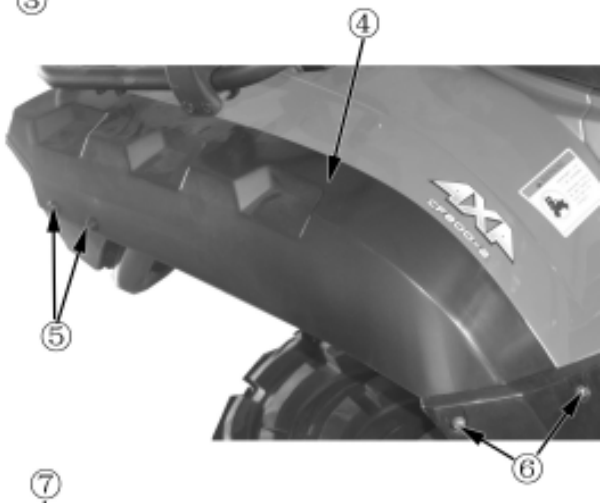

## REAR FENDER EXTENSION,LH

### Removal

Remove push rivets no.5;
Remove bolts&nuts no.6;
Remove tapping screw no.7;
Disengage plastic latches;
Remove rear fender extension,LH no.4.

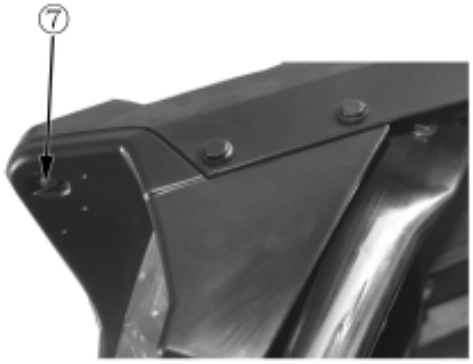
### Installation

Reverse the removal procedure and direction for installation.




## REAR FENDER EXTENSION,RH

Refer to rear ***LH Fender Extension Removal&Installation.***



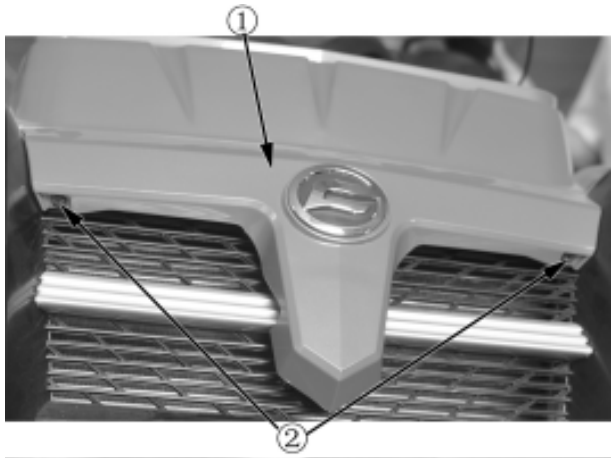
## CENTER FRONT FASCIA

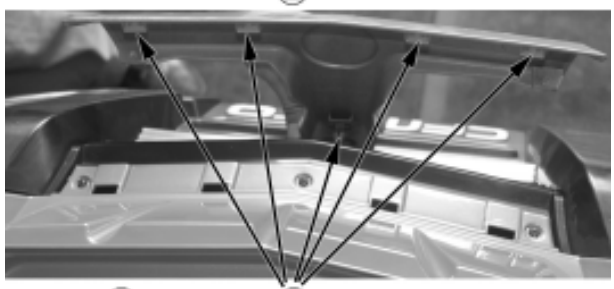
### Removal

Remove the 2 tapping screws no.2;
Remove push rivets no 3;
Remove center front fascia.

### Installation

Reverse the removal procedure for installation.



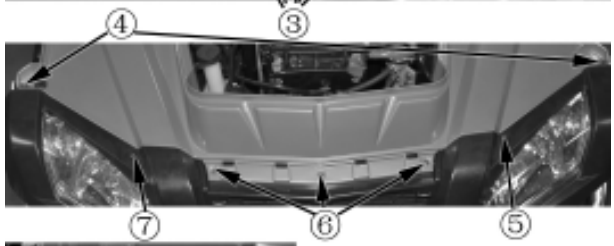

## FRONT FENDER

### Removal

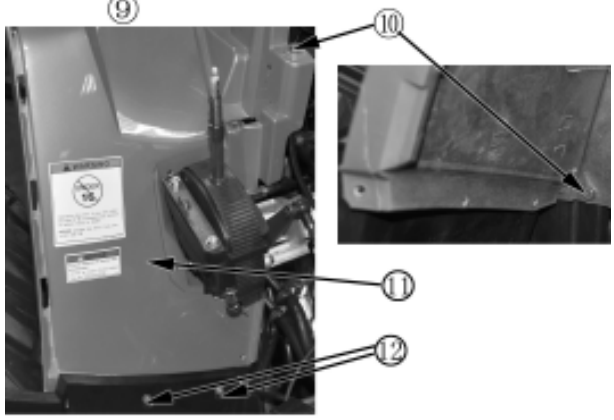
Remove front rack(→2-2);
Remove passenger seat(→2-4);
Remove operator seat(→2-4);
Remove air filter cover(→2-5);
Remove dashboard front cover(→2-5);
Remove gearshift lever knob(→2-6);
Remove lever indicator(→2-6);
Remove front LH&RH fender extension(→2-7);
Remove L&R side panel(→2-7);
Remove front center fascia;
Remove push rivets no.5&7;
Remove bolts no.4;
Remove tapping screws no.6;
Remove bolts no.8;
Remove bolts no.9;
Remove bolts no.10;
Remove bolts no.12;
Remove fuse box;
Remove front fender no.11.

### Installation

Reverse the removal procedure for installation.



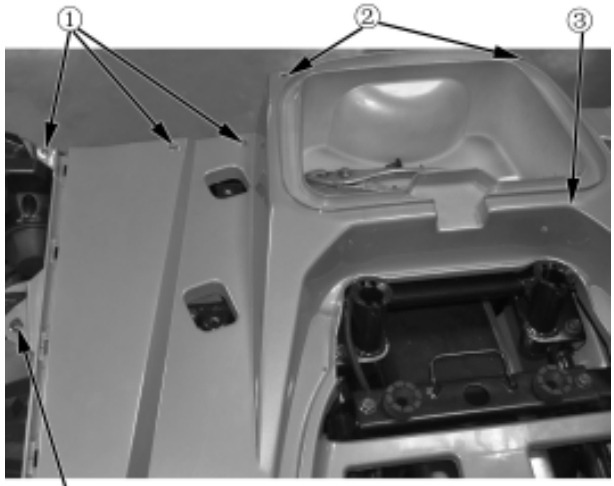


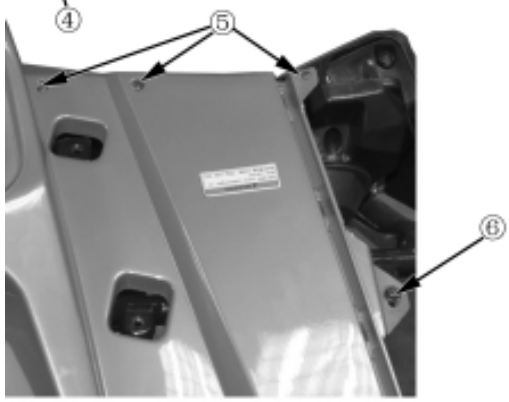


## Rear Fender

### Removal

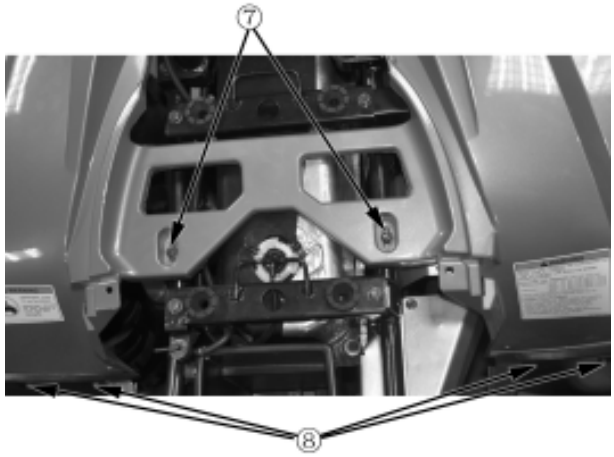
Remove rear rack(→2-3);
Remove passenger seat(→2-4);
Remove driver seat(→2-4);
Remove air filter cover(→2-5）;
Remove rear LH&RH side panel(→2-8);
Remove LH&RH side panel(→2-6);
Remove tapping screws no.1;
Remove push rivets no.2;
Remove bolt no.4;
Remove tapping screws no.5;
Remove bolt no.6;
Remove bolt no.7;
Remove bolts no.8;
Remove rear fender no.3.




### Installation

Reverse the removal procedure for installation.



## LH FOOTBOARD

### Removal

Remove passenger seat(→2-4);

Remove driver seat(→2-4);

Remove air filter cover(→2-5);

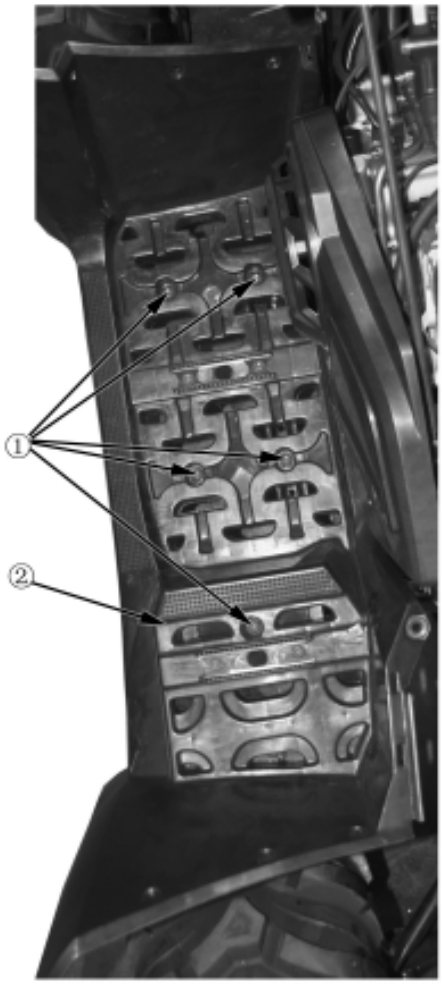
Remove side panel(→2-6);

Remove the bolts,nuts retaining front and rear mudguard;

Remove bolts no.1;

Remove screws no.1;

Remove LH footboard no.2.




### Installation

Reverse the removal procedure for installation.

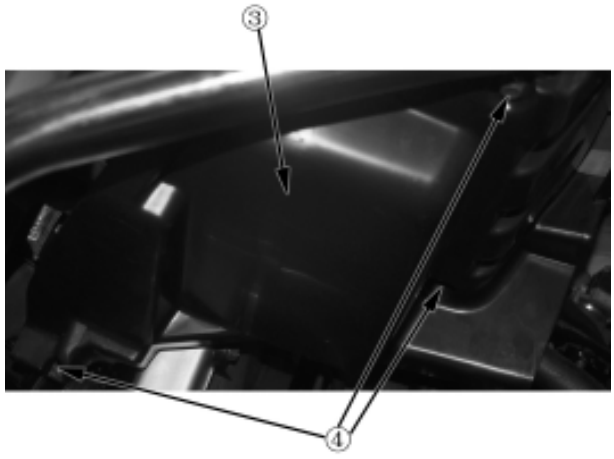
## RH FOOTBOARD

### Removal

Remove gearshift lever knob(→2-6);

Remove lever indicator(→2-6);

Refer to ***LH Footboard Removal&Installation.***




## HEADLIGHT PROTECTOR,LH

### Removal

Remove bolts no.4;

Remove headlight protector,LH.

### Installation

Reverse the removal procedure for installation.

## HEADLIGHT PROTECTOR,RH

### Removal&Installation

Refer to ***LH Headlight Protector Removal&Installation.***

## REAR BUMPER GUARD,LH

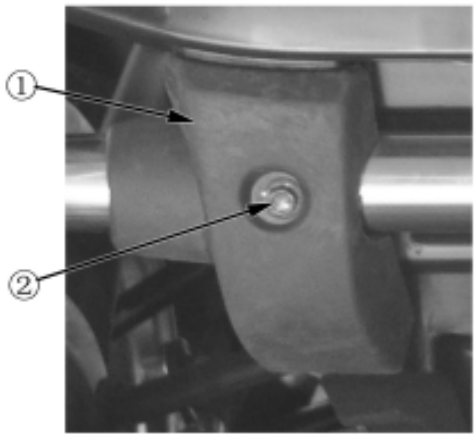
### Removal

Remove bolt no.2;

Removal rear LH bumper guard no.2.

### Installation

Reverse the removal procedure for installation.




## REAR BUMPER GUARD,RH

### Removal&Installation

Refer to ***Rear LH Bumper Guard Removal&Installation.***

## REAR BUMPER

### Removal

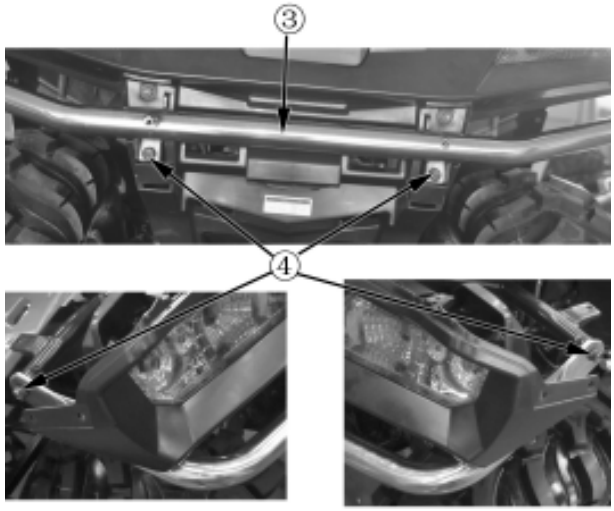
Remove rear LH&RH bumper guard.

Remove bolt no.4;

Remove rear bumper no.3.

### Installation

Reverse the removal procedure for installation.




## FRONT BUMPER PROTECTOR

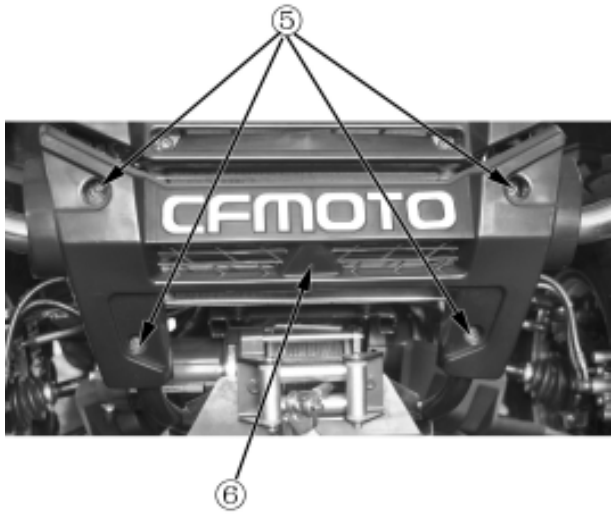
### Removal

Remove bolt no.5;

Remove front bumper protector no.6.

### Installation

Reverse the removal procedure for installation.



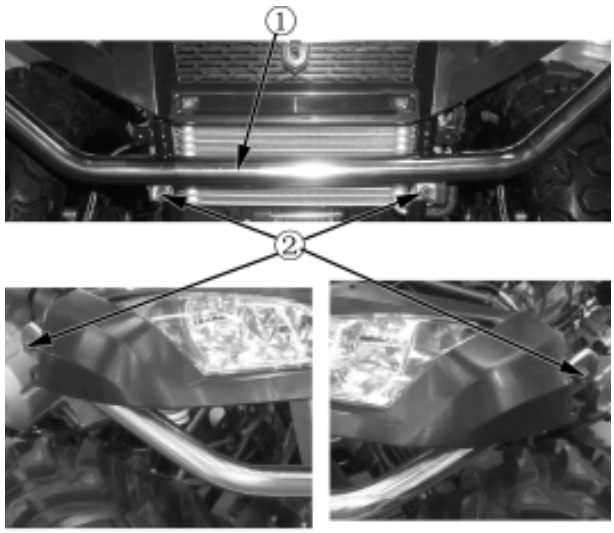
## FRONT BUMPER

### Removal

Remove front bumper protector(→2-12);
Remove bolt no.2;
Remove front bumper no.1.1

### Installation

Reverse the removal procedure for installation.




## HEADLIGHT TRIM

### Removal

Remove front rack(→2-2);
Remove passenger seat(→2-4);
Remove driver seat(→2-4);
Remove air filter cover(→2-5);
Remove dashboard cover(→2-5);
Remove font LH&RH fender extension(→2-7);
Remove LH&RH side panel(→2-6);
Remove center front fascia(→2-9);
Remove front fender(→2-9);
Remove bolts no.4;
Remove bolts no.5;
Disconnect headlight connectors;
Remove headlight trim no.3.

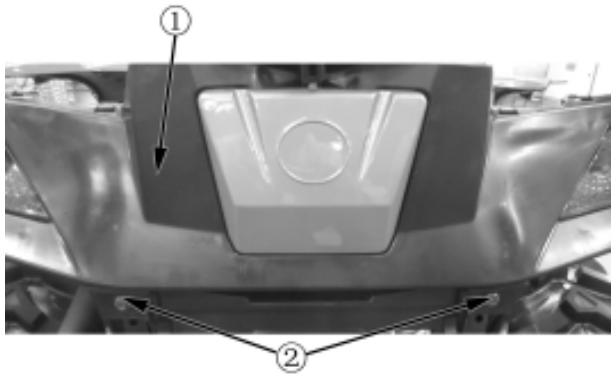
### Installation

Reverse the removal procedure for installation.

## TAILLIGHT TRIM

### Removal

Remove rear rack(→2-3);
Remove passenger seat(→2-4);
Remove operator seat(→2-4);
Remove air filter cover(→2-5);
Remove rear LH&RH fender extension(→2-8);
Remove LH&RH side panel(→2-6);
Remove rear mudguard(→2-10);
Remove rear LH&RH bumper guard(→2-12);
Remove rear bumper(→2-12);
Remove bolts no.2;
Disconnect tail light,license plate light,rear turn lights connectors;
Remove taillight trim no.1.



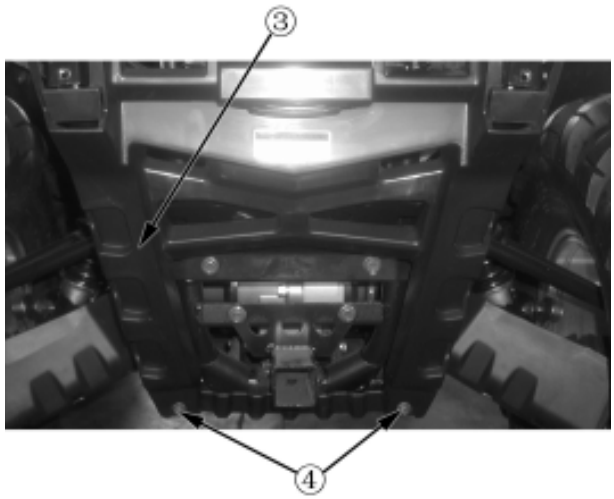

### Installation

Reverse the removal procedure for installation.

## REAR FASCIA

### Removal

Remove rear LH&RH bumper guard(→2-12);
Remove rear bumper(→2-12);
Remove bolts of taillight trim;
Remove bolts no.4;
Remove rear fascia no.3.




### Installation

Reverse the removal procedure for installation.

## LH PROTECTOR,FRONT SUSPENSION

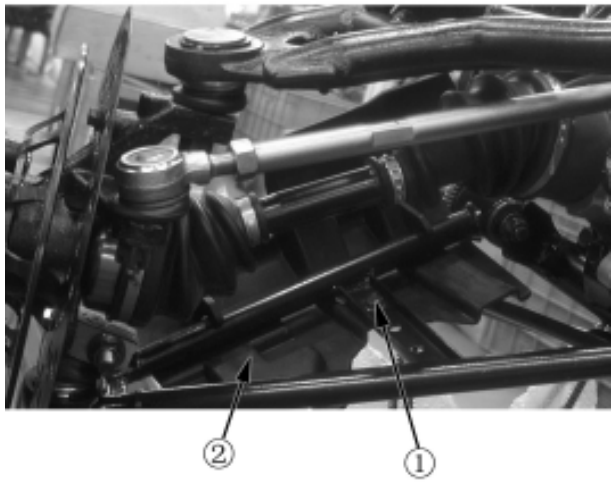
### Removal

Remove bolt no.1;

Remove LH protector no.2.

### Installation

Reverse the removal procedure for installation.




## RH PROTECTOR,FRONT SUSPENSION

Refer to ***LH Protector,Front Suspension Removal&Installation.***

## RH PROTECTOR,REAR SUSPENSION

### Removal

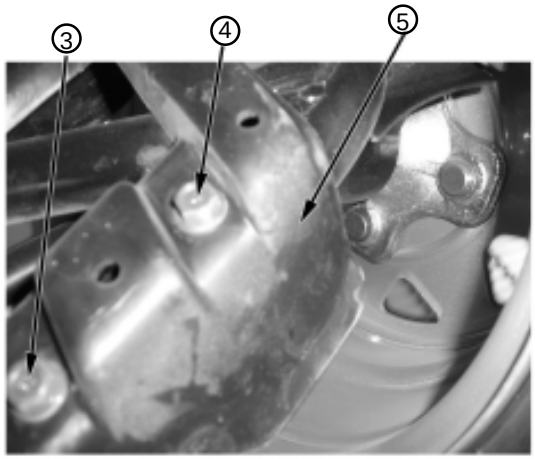
Remove bolt no.3;

Remove bolt no.4;

Remove LH protector no.5.

### Installation

Reverse the removal procedure for installation.




## LH PROTECTOR,FRONT SUSPENSION

Refer to ***RH Protector,Rear Suspension Removal&Installation***.

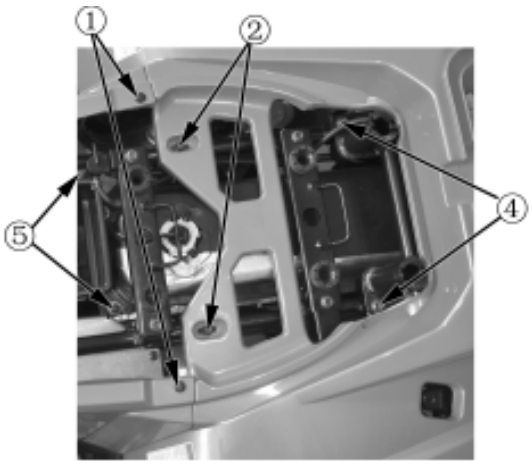
## FUEL TANK

### Removal

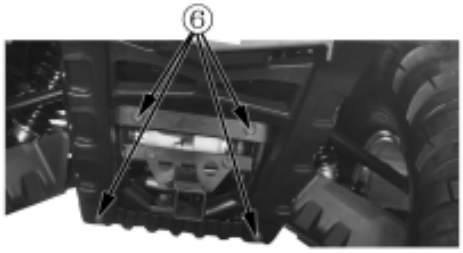
**WARNING:**

Gasoline is highly flammable, therefore smoke and fire are strictly forbidden in the work place.

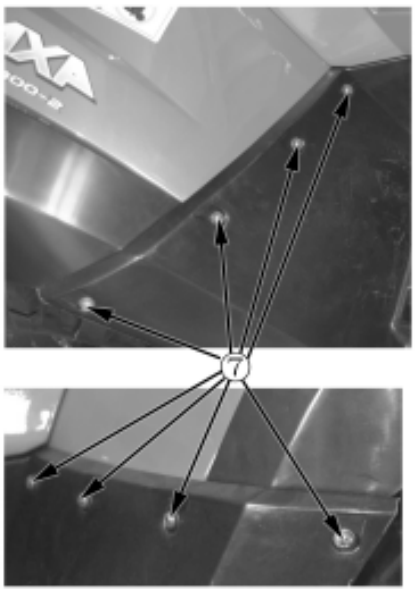
Special attention should also be paid to sparks. Gasoline may also be explosive when it is vaporized, so operation should be done in a well-ventilated place.

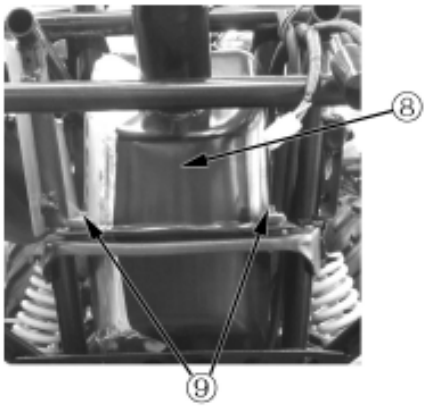



Remove passenger seat set(→2-4);
Remove driver seat(→2-4);
Remove bolts no.4;
Remove push rivets no.1;
Remove bolts no.2;
Remove bolts no.6;
Remove bolts no.7;




Remove rear plastic parts;
Disconnect fuel pump connector;
Unplug high pressure fuel line connector;
Remove fuel tank breather hose and hoses of fuel evaporation control system;
Disconnect fuel pump connector;
Remove bolts no.5;
Remove bolts no.9;
Remove fuel tank no.8.



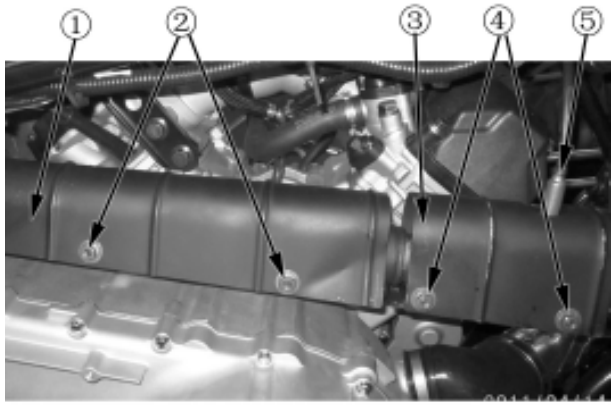
## MUFFLER

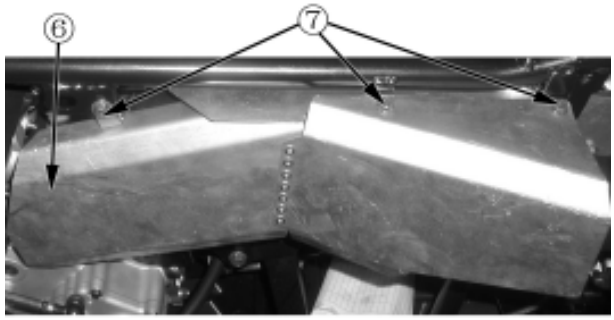
**WARNING:**

Remove and Install muffler after it is fully cold.

### Removal

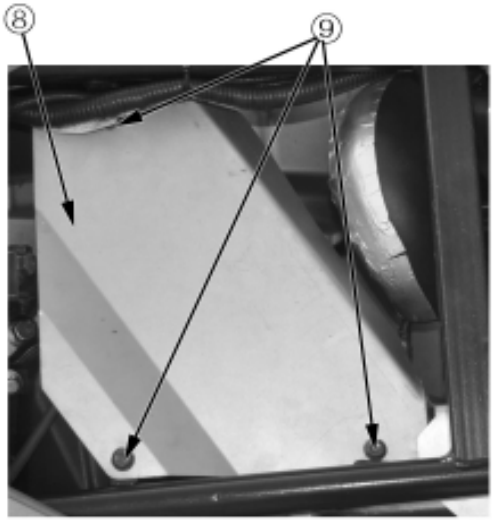
Remove passenger seat set(→2-4);
Remove operator seat(→2-4);
Remove air filter cover(→2-5);
Remove RH side panel(→2-7);
Remove LH side panel(→2-6);
Remove bolts&nuts no.2;
Remove heat shield no.1;
Remove bolts&nuts no.4;
Remove heat shield no.3;
Remove bolts no.7;
Remove heat shield no.6.




Remove bolts no.9;

Remove heat shield no.8;




Remove bolt no.10 and the clamp;


### Installation

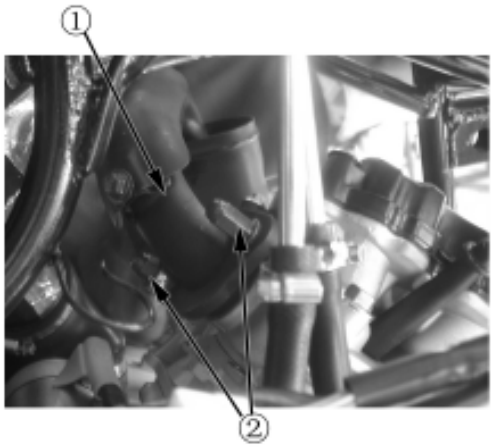
Reverse the removal procedure for installation.

**NOTE:**

*Replace the gasket on the exhaust port when installing.*

Remove exhaust pipe bolts no.2;

Remove the exhaust pipe comp.no.1 of the front cylinder;



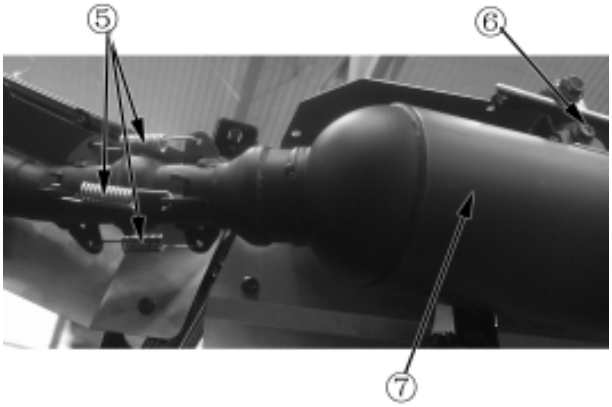

Remove exhaust pipe bolts no.3;

Remove “Y” exhaust pipe comp. no.4;


Remove spring no.5;

Remove bolt no.6;

Remove muffler no.7.



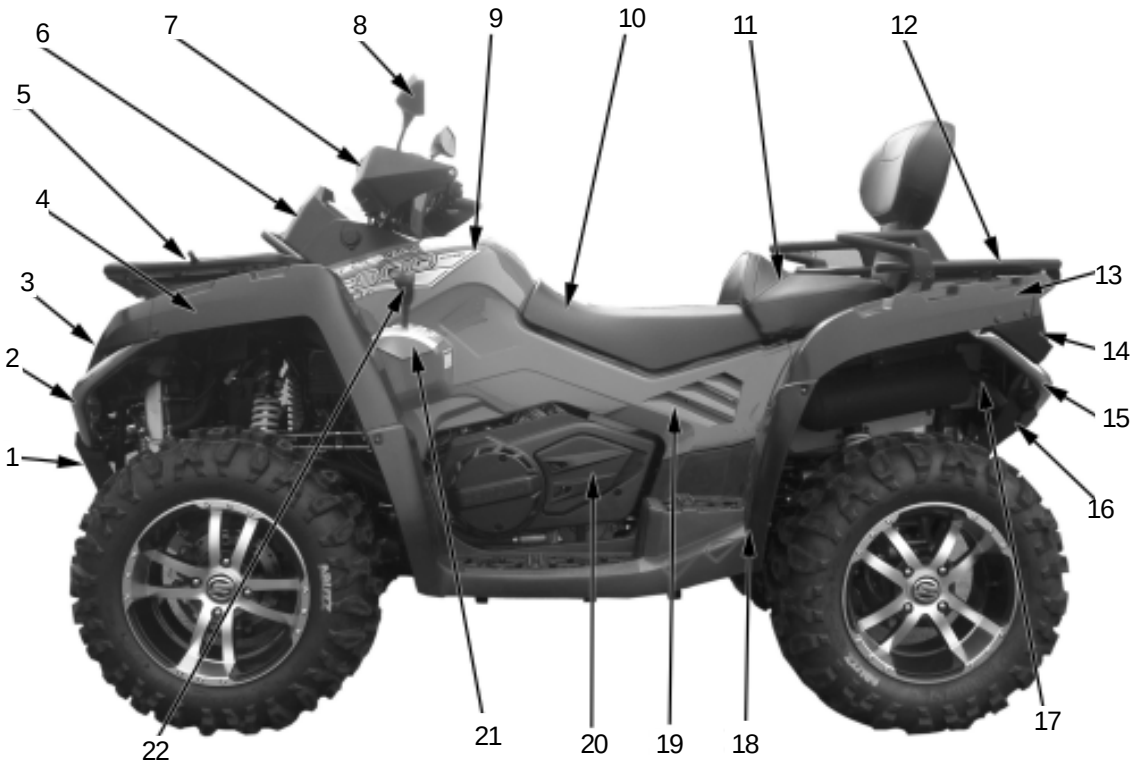

## Installation

Reverse the removal procedure for installation.

**NOTE:**

*When installing,replace the gasket on exhaust port and graphite collar in front exhaust pipe comp..*

## BODY AND ACCESSORIES




| | | | |
|---|---|---|---|
| 1.Protector,Front Bumper | 2.Front Bumper | 3.Headlight Trim | 4.Front Fender Extension,LH |
| 5.Front Rack | 6.Dashboard Cover | 7.LH Handguard | 8.LH Mirror |
| 9.Air Filter Cover | 10.Driver Seat | 11.Passenger Seat | 12.Rear Rack |
| 13.Rear Fender Extension,LH | 14.Taillight Trim | 15.Rear Bumper | 16.Rear Fascia |
| 17.Spark Arrester | 18.LH Footboard | 19.LH Side Panel | 20.Oil Check Access Cover |
| 21.Gearshift Lever Indicator | 22.Gearshift Lever Knob | | |

## MAINTENANCE INFORMATION

### Operation Cautions

**WARNING:**

- Engine exhaust contains poisonous carbon monoxide and can cause loss of consciousness resulting in severe injury or death.Never run an engine in an enclosed area.
- Don't perform the maintenance immediately after the engine stops,as the exhaust system and engine become very hot.Serious burns could result from the contact with the exhaust system or engine.Wear long-sleeved uniform and gloves to operate when necessary.
- Gasoline is highly flammable, therefore smoke and fire are strictly forbidden in the work place. Special attention should also be paid to sparks.Gasoline may also be explosive when it is vaporized, so operation should be done in a well-ventilated place.
- Don't get pinched by the drive system and other rotational parts.

**ATTENTION:**

**Always position the vehicle on level ground.**

### Maintenance Intervals

Careful periodic maintenance will assure your vehicle good performance, reliability, economy and durability. Inspection, adjustment, lubrication and other details are explained in below periodic maintenance chart.

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

| A：Adjust<br>C：Clean<br>I： Inspect<br>L：Lubricate<br>R：Replace | 10 hours or 300km | Every 25 hours or 750km | Every 50 hours or 1500km | Every 100 hours or 3000km or 1year | Every 200 hours or 6000km or 2 years | Remark |
|---|---|---|---|---|---|---|
| Engine | | | | | | |
| Engine Oil and Filter | R | | | R | | |
| Valve Clearance | I，A | | | I，A | | |
| Condition of Engine Seals | I | | | I | | |
| Engine Mounting Fasteners | I | | | I | | |
| Air Filter | | C | R | | | |
| Coolant | I | | I | I | R | |
| Radiator Cap, Cooling System Pressure Test | I | | | | I | |
| Spark Plug | | | | I | R | |
| Fuel System | | | | | | |
| Throttle Body | I | | | I，L | | |
| CVT | | | | | | |
| CVT Belt | | | I | R | | |
| Primary Pulley, Driven pulley | | | | I，C | | |
| Clutch | | | | I | | |

**O**：Maintenance Interval

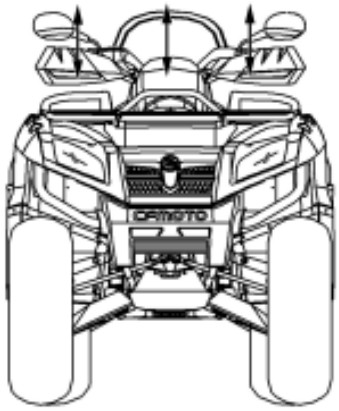
| Task | Inspection Item | Maintenance Interval | | | Criteria |
|---|---|---|---|---|---|
| | | Daily | Every 6 Months | Yearly | |
| Handlebar | Agility | **O** | | | |
| Steering System | Damage | **O** | | | |
| | Installing condition | **O** | | | |
| | Free play of ball joint pin | **O** | | | |
| Brake Lever | Free play | **O** | **O** | | Front brake lever:0mm<br>Main brake(FR&RR) lever: 0mm |
| | Braking performance | **O** | **O** | | |
| Brake lines&fittings | Looseness&damage | **O** | | **O** | |
| Brake System | FR&RR brake fluid level | **O** | **O** | | Brake fluid should be between “LOWER” and “UPPER” |
| | Brakedisc&pads wear&damage. | **O** | **O** | | If front brake disc thickness is less than 2.5mm or rear brake disc thickness is less than 6.5mm,replace the disc. |
| Wheel | Tire pressure | **O** | **O** | | Front tire:45kP（0.450kgf/cm$^2$）<br>Rear tire:45kPa（0.45kgf/cm$^2$） |
| | Crack&damage | **O** | | **O** | |
| | Tread depth&abnormal wear | **O** | | **O** | Tread depth should be more than 3.0mm. |
| | Looseness of wheel nuts&axle | **O** | **O** | | |
| | FR wheel bearing free play | **O** | | **O** | |
| | RR wheel bearing free play | **O** | | **O** | |
| A-arm | Free play&damage | **O** | | **O** | |
| Shock | Leaks or damages | **O** | | **O** | |
| FR Diff | Leaks&lubrication | **O** | | **O** | |
| RR Gearcase | Leaks&lubrication | **O** | | **O** | |
| Gearcase/Diff | Leaks&oil level | **O** | | **O** | Keep the oil level even with the bottom threads of fill plug hole. |

| Maintenance Item | | Maintenance Interval | | | Criteria |
|---|---|---|---|---|---|
| Task | Inspection Item | Daily | Every 6 Months | Yearly | |
| Propshaft | Looseness of connection | **O** | **O** | | |
| | Free play of splines | | | **O** | |
| Ignition | Spark plug condition | | **O** | | Spark plug clearance：0.8－0.9mm |
| | Timing | | **O** | | |
| Battery | Connections of terminals | | | **O** | |
| Electric Routing | Looseness&damages of connections | | | **O** | |
| Fuel System | Fuel leakage | | **O** | | |
| | Throttle condition | | | **O** | Throttle lever free play: 3－5mm |
| Cooling | Coolant level | **O** | **O** | | |
| | Leaks | | | **O** | |

| Maintenance Item | | Maintenance Interval | | | Criteria |
|---|---|---|---|---|---|
| Task | Inspection Item | Daily | Every 6 Months | Yearly | |
| Lights&Turn Signal Indicators | Function | **O** | **O** | | |
| Alarming&locking Components | Function | | | **O** | |
| Meters | Function | | | **O** | |
| Exhaust Pipe&Muffler | Looseness&damages | | | **O** | |
| | Muffler function | | | **O** | |
| Frame | Looseness&damages | | | **O** | |
| | Lubrication | | | **O** | |
| Others | Abnormal conditions | **O** | | | |

## STEERING COLUMN

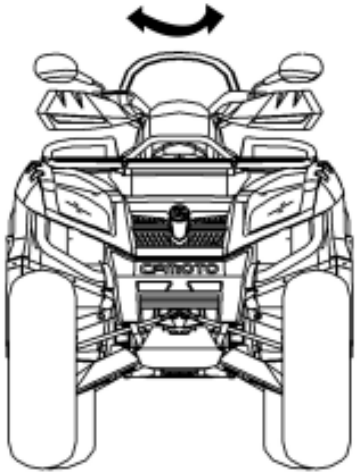
Position the vehicle on level ground.Put your hands on the grips and shake the handlebar in the direction illustrated in the right figure to check for free play.



If there is a free play,determine the source of it.

If the free play comes from steering column,tighten the steering column locking nut or remove steering column for further inspection and repair.

Position the vehicle on level ground.Turn the handlebars slowly to left or right to check for agility.
If the handlebars feel rough when turning somewhere, inspect the wiring,cables or tie-rod ends for interference.If no interference,check the steering bearing for damages.

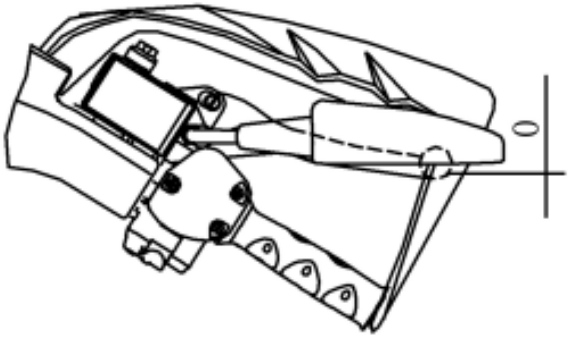


**WARNING:**
**Inspect the agility of handlebars before every ride.Steering failure may result in severe injury or death.**

## BRAKE SYSTEM

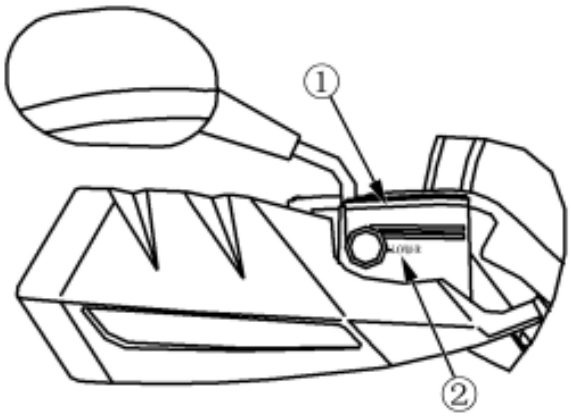
### Front Brake Lever Free Play

Check the free play of front brake lever and the performance of front brake.



Free play of front brake lever:0mm

## MASTER CYLINDER,FRONT BRAKE



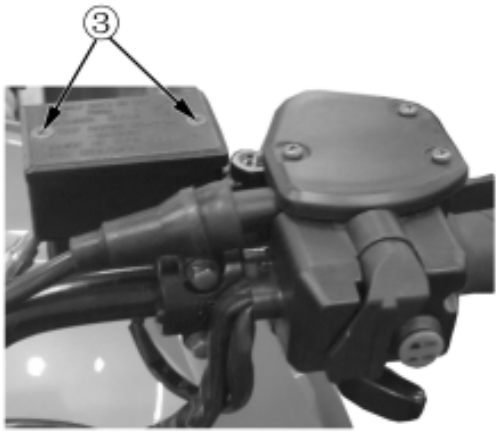

### <Brake Fluid Level>

Check brake fluid level.

If the brake fluid level is below the mark"Lower",check master cylinder,brake lines and connections for leaks.

Remove the 2 retaining screws no.3 to open the reservoir cap.

Add DOT 3 or DOT 4 brake fluid only.Never exceed the mark no.1.




- When adding brake fluid,always avoid dirt or water.
- Always use specified brake fluid.
- Don't spill brake fluid on plastic or rubber parts,as it would damage them.
- Turn handlebar to left or right to keep the master cylinder level before the reservoir cap removal.

## FRONT BRAKE DISC&BRAKE PADS

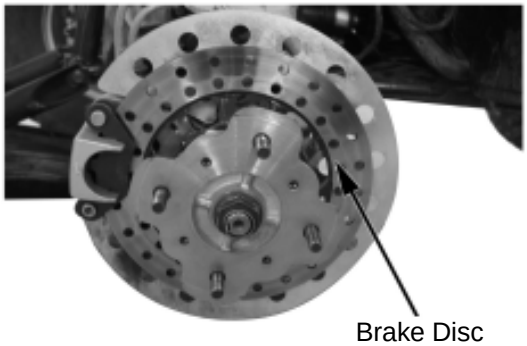
### <Brake Pad Wear>

Inspect brake pads from the marked place.

Replace brake pads if they are worn to service limit groove.

**CAUTION:**

**Pads should be replaced as an assembly.**




### Brake Disc Inspection&Replacement

Inspect brake disc for excessive wear or damage.Replace brake disc when its thickness is less than 2.5mm.

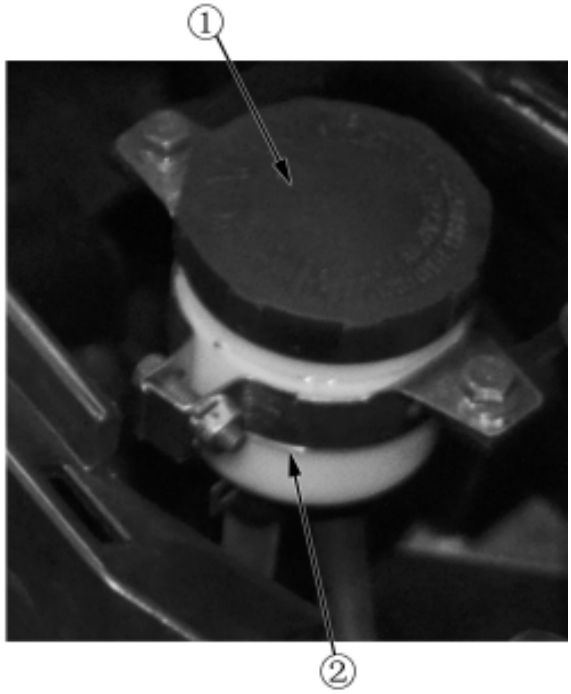
Front brake disc service limit thickness:2.5mm

## Brake Fluid Replacement

### <Brake Fluid Replacement>

Replace brake fluid every year.

## MASTER CYLINDER ASEEMBLY,4-WHEEL BRAKE




**<Brake Fluid Level>**

Check brake fluid level.

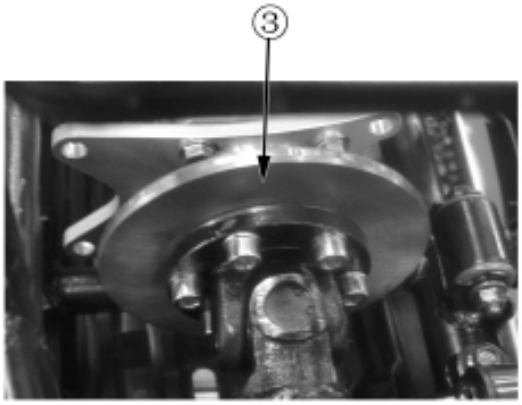
If brake fluid level is below the mark no.2,inspect master cylinder,brake lines and connections for leaks.

Unscrew reservoir cap no.1 to remove it.

Add DOT 3 or DOT 4 brake fluid only.Never exceed the mark “UPPER”.

- When adding brake fluid,always avoid dirt or water.
- Always use specified brake fluid.
- Don’t spill brake fluid on plastic or rubber parts,as it would damage them.
- Turn handlebar to left or right to keep the master cylinder level before the reservoir cap removal.

## REAR BRAKE DISC& REAR BRAKE PADS




**<Brake Pad Wear>**

Inspect rear brake pads from the marked place.

Replace rear brake pads if they are worn to service limit groove.

**CAUTION:**

**Pads should be replaced as an assembly.**

Brake Disc Inspection&Replacement

Inspect brake disc for excessive wear or damage.Replace brake disc when its thickness is less than 2.5mm.

Front brake disc service limit thickness:2.5mm

**Brake Fluid Replacement**

**<Brake Fluid Replacement>**

Replace brake fluid every year.

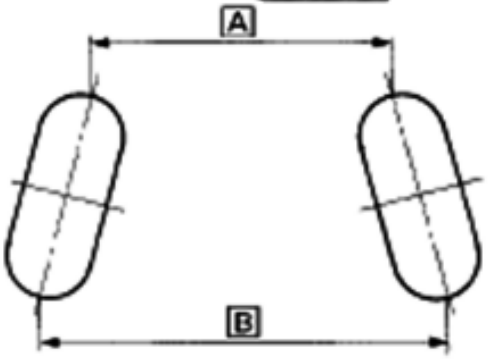
## WHEEL

Position the vehicle on level ground.Elevate the appropriate side of the vehicle by plaing a suitable stand or other tool under the footrest frame.Shake the wheel to check for free play or looseness.If any free play or looseness is found,inspect A-arms,axle,rim bolts and nuts and tighten them if necessary.
If free play or looseness still remains,inspect bearing, A-arm bushings and ball joint pin and replace if needed.

## FRONT Wheel TOE-IN

Position the vehicle on level ground to measure the front wheel toe-in.

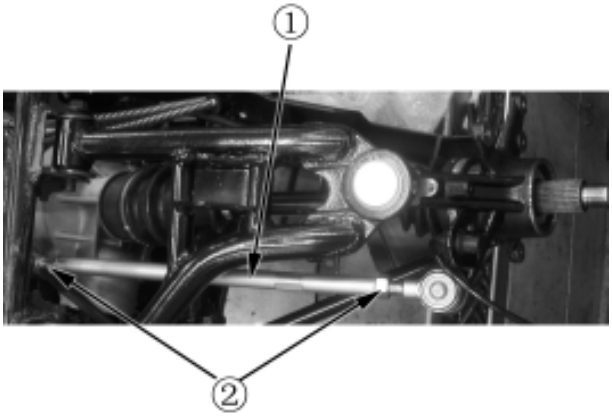
Toe-in:B-A=0-10mm




If the measurement is out of specification,adjust the tie rod(no.1) locking nuts no.2.

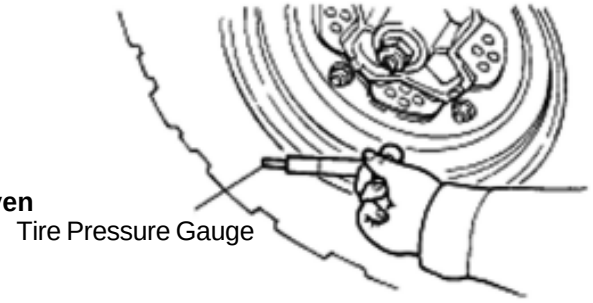
**CAUTION:**

**Drive the vehicle slowly after the adjustment is completed.Ensure that handlebar works properly.**



## TIRE PRESSURE

Use tire pressure gauge to measure tire pressure.




**CAUTION:**

T**est tire pressure when the tire is cold.**
**Maintain proper tire pressure.Improper inflation may affect ATV maneuverability,comfort,or uneven wear to different tires.**

Specified Tire Pressure/Tire

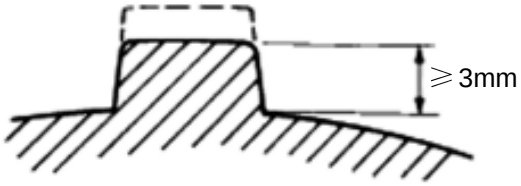
| | Front | Rear |
|---|---|---|
| Pressure | 45kPa(0.45kgf/cm$^2$) | 45kPa(0.45kgf/cm$^2$) |
| Size | See chapter 1 | See chapter 1 |

## TIRE TREAD DEPTH

Replace tires when tire depth is worn to 1/8”(3mm) or less.

**CAUTION:**

**When tire depth is worn to 3mm or less,replace tires immediately.**



## AXLE NUTS AND AXLE

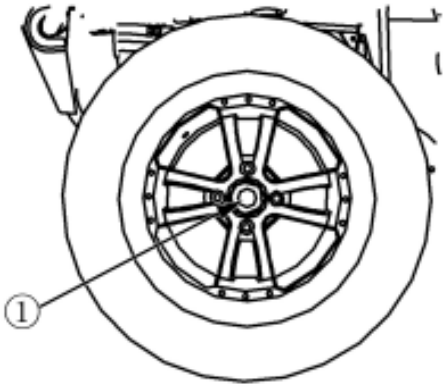
Check front&rear axle nuts for looseness.

If axle nuts are loose,torque them to specified values.

**Torque Specification:**

**Front:110-130N • m(11.2kgf • m-13.3kgf • m)**

**Rear:110-130N • m(11.2kgf • m-13.3kgf • m)**



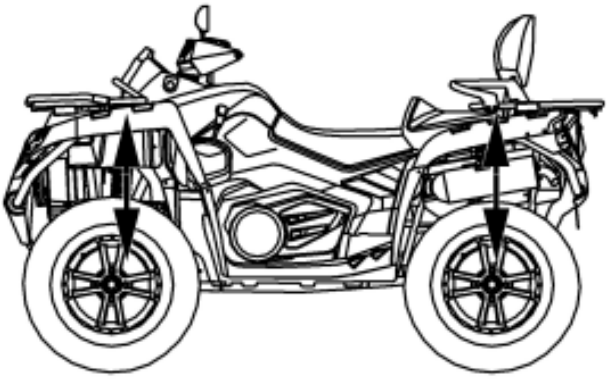

## Wheel Bearing Free Play

Elevate the appropriate side of vehicle by placing a suitable stand under the footrest frame.Shake the wheel to check for free play.

If there is a free play,inspect the wheel bearing.

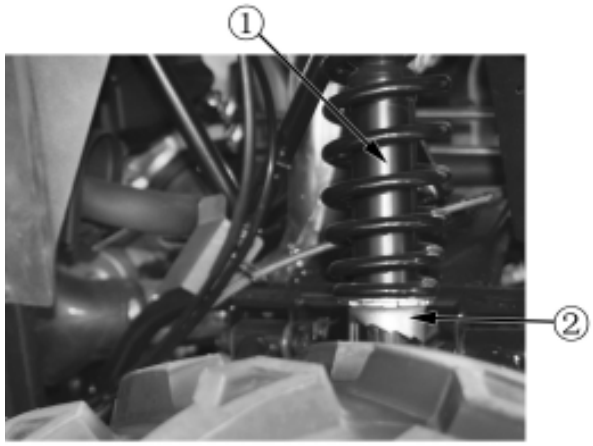
## SUSPENSION

Position the vehicle on level ground,push and release the vehicle as illustrated.If the vehicle found unstable or abnormal sound,check shocks for leaks,damages or looseness to fasteners.



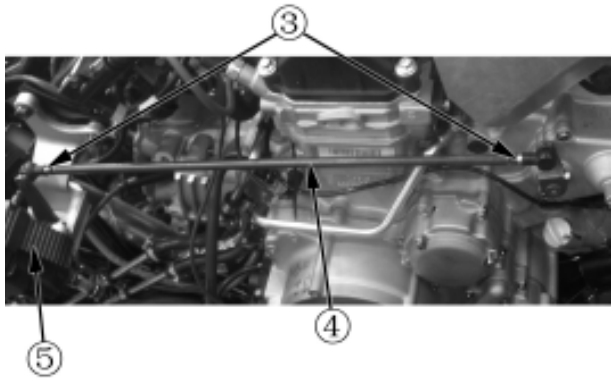
## Shock Absorber Adjustment

The front and rear shock springs are adjustable.Rotate the adjuster cam no.2 clockwise to decrease the spring tension or counter-clockwise to increase the spring tension.Always adjust two sides equally.




## GEARSHIFT LINKAGE

Shift to check gearshift for smoothness.If not,attempt to adjust the length of gearshift rod by turning the locking nuts no.3.




## FUEL SYSTEM

Fuel System Condition

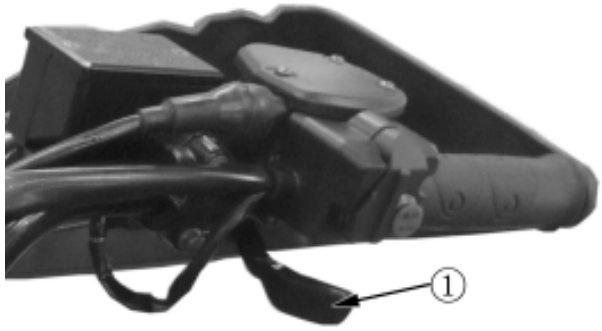
Remove seat(→2-3);

Check fuel lines for aging,damage;

Replace fuel line if aging,damage found.

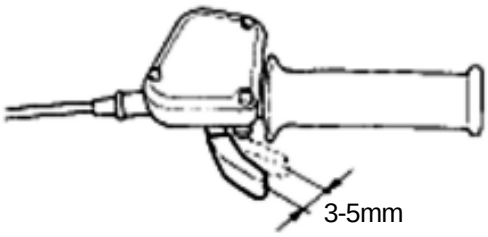
Inspect fuel tank breather hose and the hose of fuel evaporation control system(if appliable) for damages, bending.Replace the hoses if any damage found.

**Throttle Lever no.1 Inspection**




Inspect throttle lever no.1 for free play.

**Free Play:3 — 5mm**

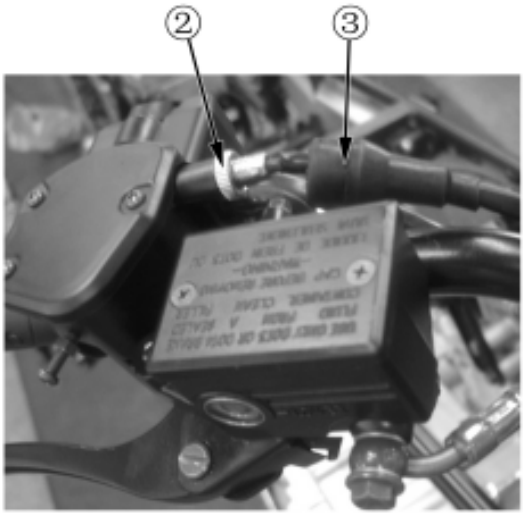



Adjust throttle lever if free play is out of specification,

Slide sleeve no.3 out of place.loosen throttle cable locking nut no.2.Turn adjuster to change the throttle lever free play.

Reinstall locking nut no.2 and throttle cable sleeve no.3.

If adjuster fails to change throttle lever free play to specified value,replace throttle cable.




## Speed Limiter

Speed limiter is designed to adjust throttle lever travel, so as to limit the max speed.

Inspect the max length of limiter screw threads

Max limiter screw threads:a=12mm

Adjustment

Loose the locking nut.

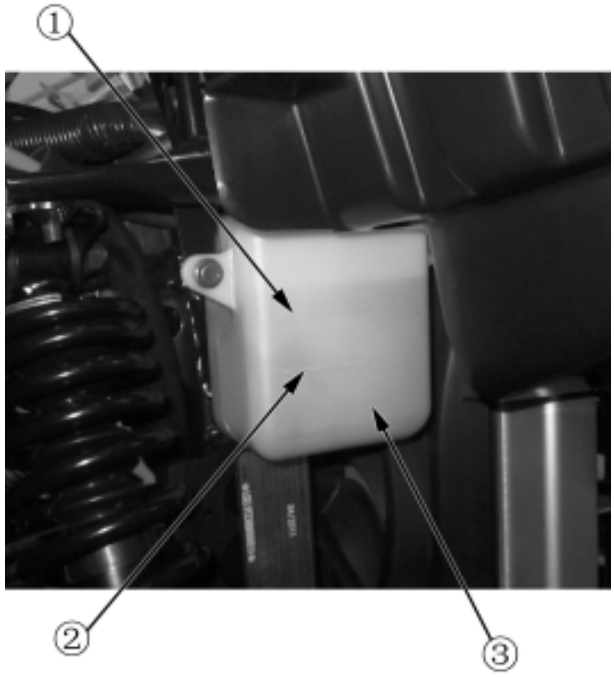
Use a cross screw driver to turn the limiter screw clockwise or counter-clockwise to adjust throttle lever travel.

**CAUTION:For beginners,keep the adjuster screw clockwise turned to the max. For experienced riders,turn the adjuster screw counter-clockwise to change the throttle lever travel according to speed requirements.**

## COOLING SYSTEM

### CAUTION:

- ●For safety,check the coolant level in the reservoir tank,not radiator.Never open the pressure cap when the engine is hot(more than 100℃), Escaping steam can cause severe burns.The engine must be cool before removing pressure cap.
- ●Coolant is toxic.Don't drink nor spill on skin,eyes, clothing.
  - — If you spill coolant on your skin or clothing, immediately wash it off with soap.
  - — If you get coolant in your eyes,immediately wash it off before medical attention.
  - —If you swallow coolant,immediately spit it out and gargle before medical attention.
- ●Coolant must be kept out of reach of children.




### Coolant Level

Coolant would decrease due to evaporation,etc.Inspect coolant level periodically.

### CAUTION:

- ●Coolant is anti-rust and anti-freezing.Using tap water will rust the engine,and may crack the engine when it's freezing. Always use specified coolant.
- ●Position the vehicle on level ground before cooling system inspection.
- ●Start the engine and warm it up before inspecting the cooling system.

Start the engine and warm it up.
Shut off the engine.

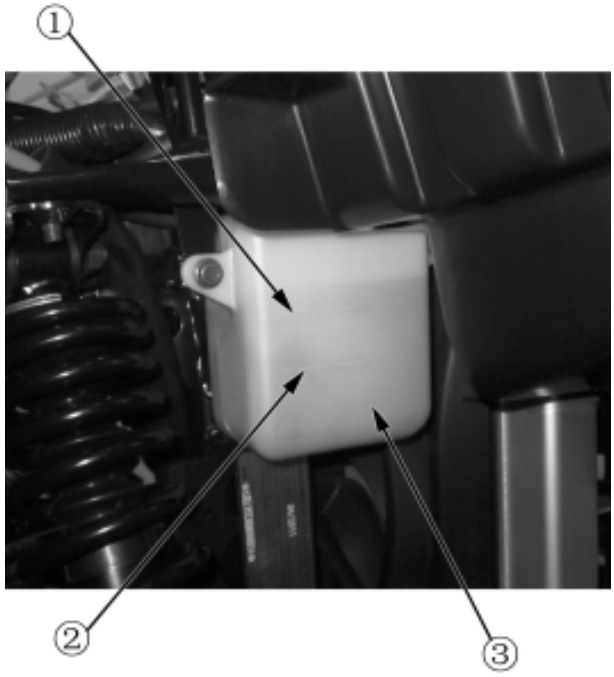
Inspect the coolant level,ensure that the level is between "LOWER" and "UPPER".

When the coolant level is below the mark no.1-"LOWER",remove the reservoir tank cap and add coolant to the mark no.2-"UPPER".

**Recommended Coolant:CFMOTO coolant.**

**Standard Mixture Ratio:50%(The freezing temperature varies according to the mixture ratio. Adjust the mixture ratio according to freeze protection required in your area.)**

When coolant is reduced significantly,inspect the cooling system for leaks.If no coolant remains in the reservoir tank no.3,there may be air in the cooling system.Purge the cooling system of air.



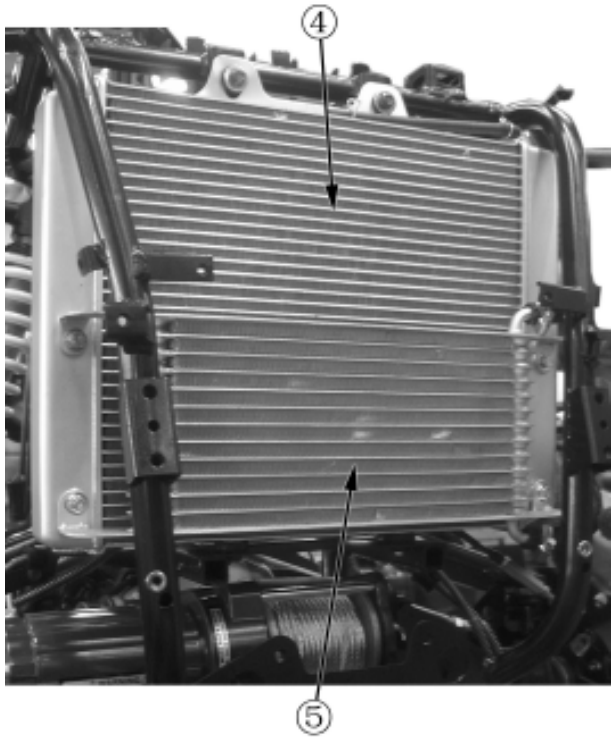

## Coolant Leakage

Inspect radiator hoses,water pump,and connections for leaks.

If any leaks found,repair the cooling system.**(→ Chapter 4)**

Inspect radiator hoses for aging,damages and cracks. Hoses ages over time due to special working conditions and may crack.Bend a hose to inspect for cracks. If any damages or cracks found,replace it with a new hose.

Inspect coolant hose clamps and tighten the loose ones.




Inspect radiator fins for damages or mud.

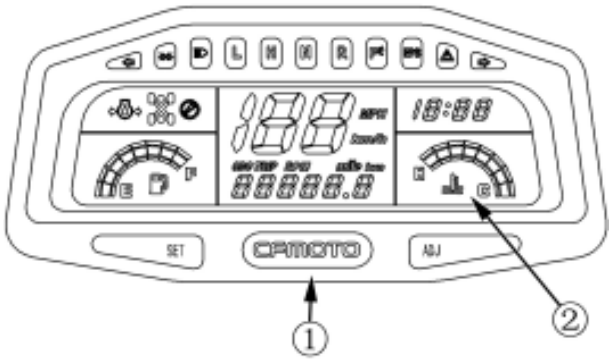
Correct the fin bending.Use tap water or compressed air to clean off the mud.

The radiator should be replaced when 20% fins are damaged.

4.Coolant Radiator 5.Oil Radiator

### Coolant Gauge Inspection

The indicator should point at 0 when the engine is not working.Start the engine to check coolant gauge for response.If the indicator doesn't move,determine the cause and take a repair.

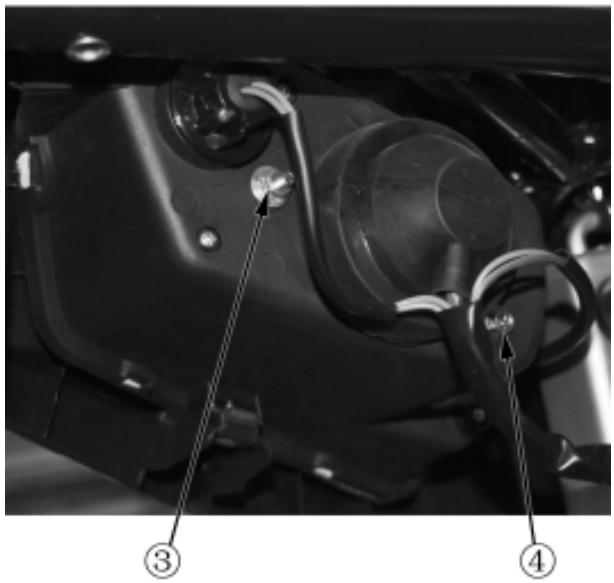



## LIGHTING

### Headlight Beam Adjustment

Remove headlight protector(→2-11)

In order to adjust headlight beam,adjust bolt no.4 with a cross screw driver or adjust nut no.3. with a wrench.



# COOLING SYSTEM

## SERVICE TOOLS

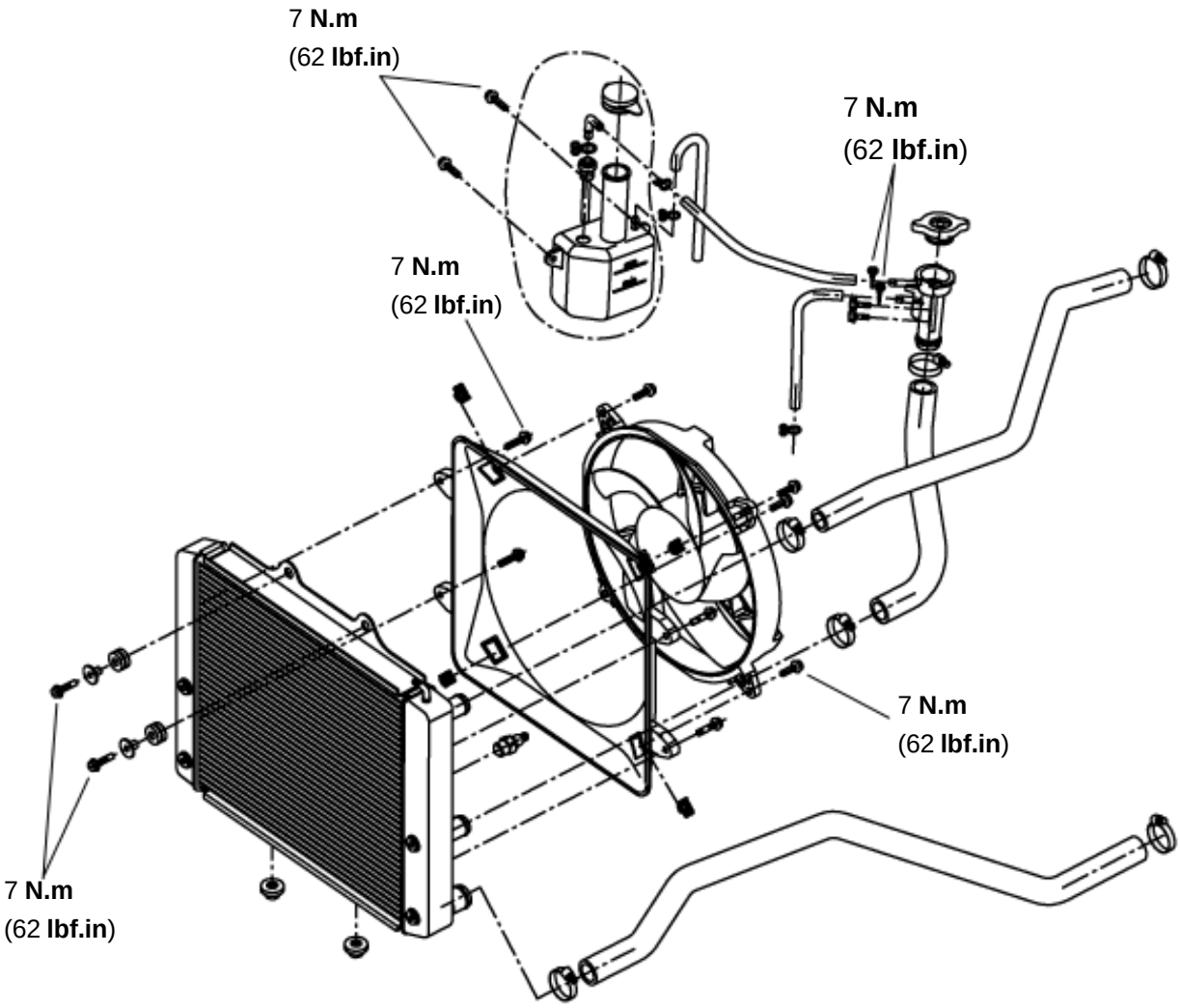


| Description | P/N | Page |
|---|---|---|
| Test Cap | 9010-180100-922-001 | 04 |
| Special Puller | 0800-014001-922-002 | 15 |
| Bearing Puller | 0800-014001-922-001 | 15 |
| Press Tool,Oil seal | 0110-080005-923-001 | 16 |
| Press Tool,Bearing | 0800-014001-921-003 | 17 |

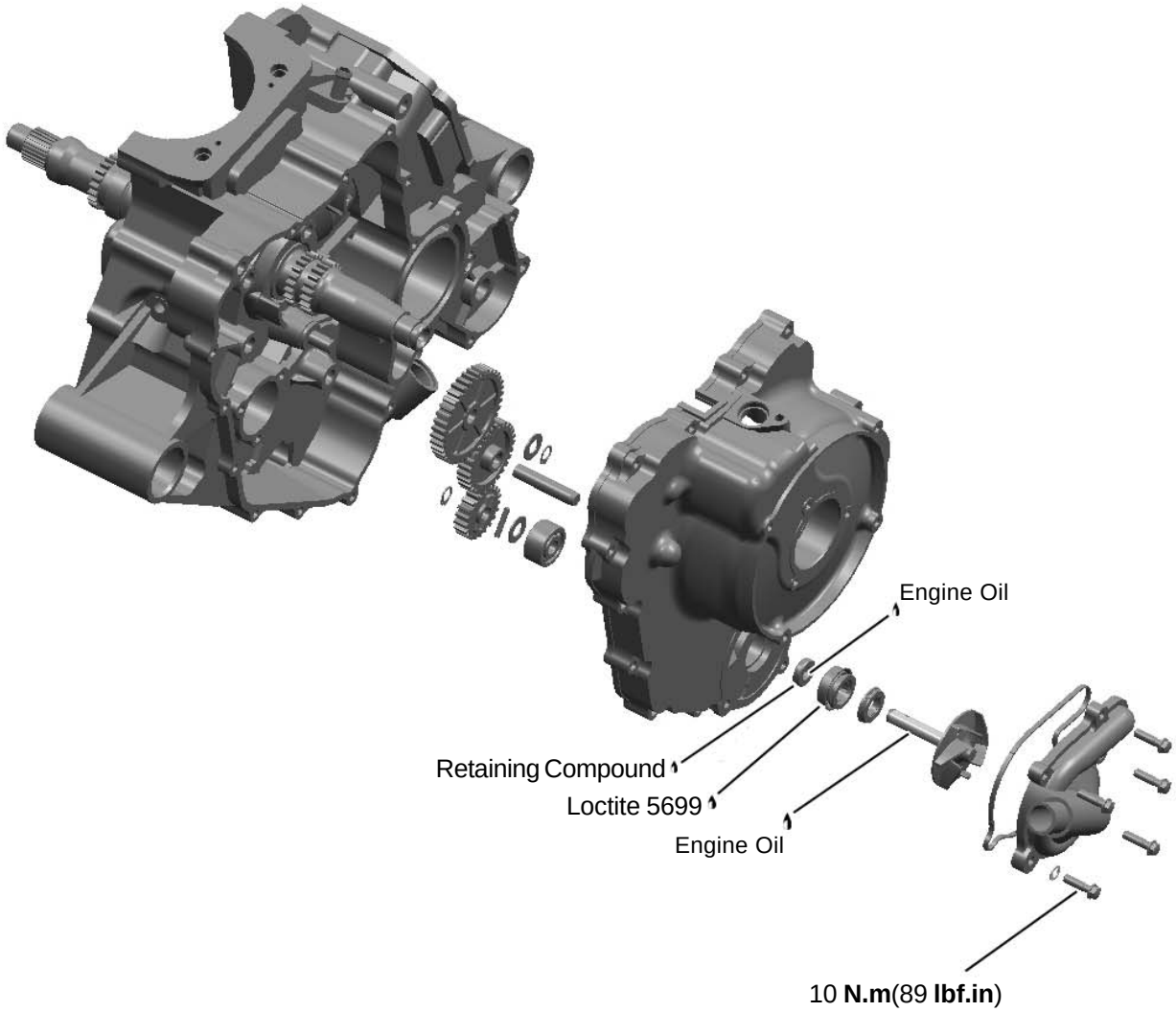
## SERVICE PRODUCTS

| Description | P/N | Page |
|---|---|---|
| Retaining Compound | | 03 |
| Coolant | | 05 |
| Engine Oil | | 16 |
| Loctite 5699 | | 17 |

## RADIATOR


7 **N.m**
(62 **lbf.in**)
7 **N.m**
(62 **lbf.in**)
7 **N.m**
(62 **lbf.in**)
7 **N.m**
(62 **lbf.in**)
7 **N.m**
(62 **lbf.in**)

## WATER PUMP


Engine Oil
Retaining Compound
Loctite 5699
Engine Oil
10 **N.m**(89 **lbf.in**)

## GENERAL

**WARNING**

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

During installation,use the torque values and service products as in the exploded views.
Clean threads before applying a threadlocker.Refer to ***LUBRICANTS AND SERVICE PRODUCTS*** at the beginning of this manual for complete procedure.

**WARNING**

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

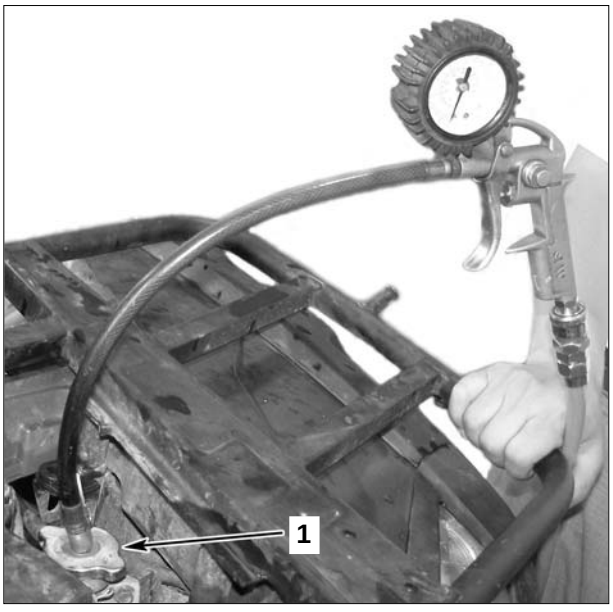
## INSPECTION

## COOLING SYSTEM LEAK TEST

**WARNING**

**To avoid potential burns,don't remove the radiator cap or loosen the cooling drain plug if the engine is hot**.

Remove battery cover to access and remove radiator cap.
Install the test cap(P/N 901-18.01.00-922-001 ) on the filler neck.
Use a pressure/vaccum pump to pressurize system to 103kpa(15PSI).
Check all hoses,radiator and cylinder(s)/base for coolant leaks or air bubbles.




*1.Special Radiator Cap.*

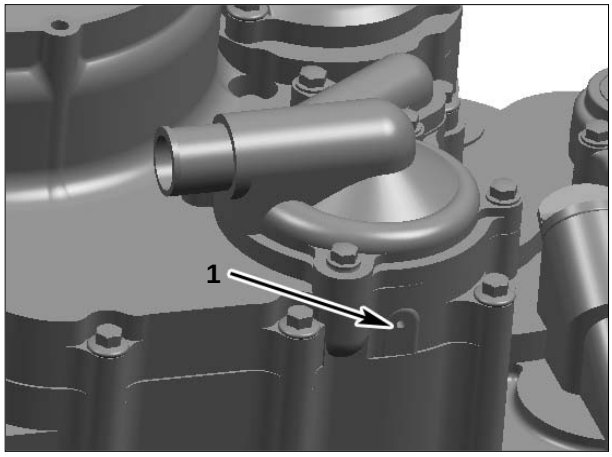
### Inspection

Check general condition of hoses and clamps tighteness.

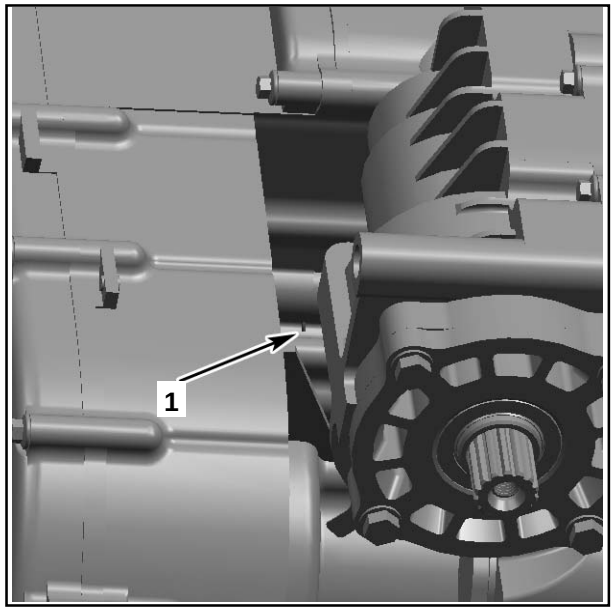
Check the leak indicator hole if there is oil or coolant.

**NOTE:***Leaking coolant indicates a defective rotary seal.Leaking oil indicates a defective inner oil seal.If either seal is leaking,both seals must be replaced at the same time.Refer to* ***WATER PUMP SHAFT AND SEALS*** *in this section.*

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




*1.leak Indicator Hole*




*1.leak Indicator Hole*

## MAINTENANCE

## COOLANT REPLACEMENT

**WARNING**

**To avoid potential burns,don't remove the radiator cap or loosen the cooling drain plug if the engine is hot**.

Use CFMOTO premixed coolant or a blend of 50% antifreeze with 50% water.

To avoid antifreeze deterioration,always use the same brand.Never mix different brands unless cooling system is completely flushed and refilled.

**CAUTION:To prevent rust formation or freezing condition,always fill the system with the CFMOTO premixed coolant or with 50% antifreeze and 50% water.Don't use tap water , straight antifreeze or straight water in the system.Tap water contains minerals and impurities which build up in the system.During cold weather,straight water causes the system to freeze while straight antifreeze thickens and does not have the same efficiency.Always use ethylene glycol antifreeze containing crrosion inhibitors specifically recommended for aluminum engines.**

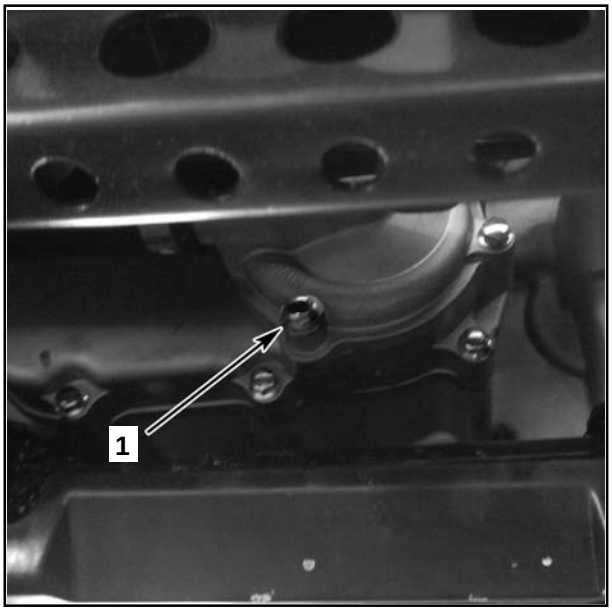
### Draining the System

**WARNING**

**Never drain or refill cooling system when engine is hot.**

Remove the radiator cap.

Partially unscrew cooling drain plug located below water pump housing.
When cooling system is drained completely,remove cooling drain plug completely and install a new washer. Screw the cooling drain plug and torque it to 10**N.m** (89l**bf.in**)



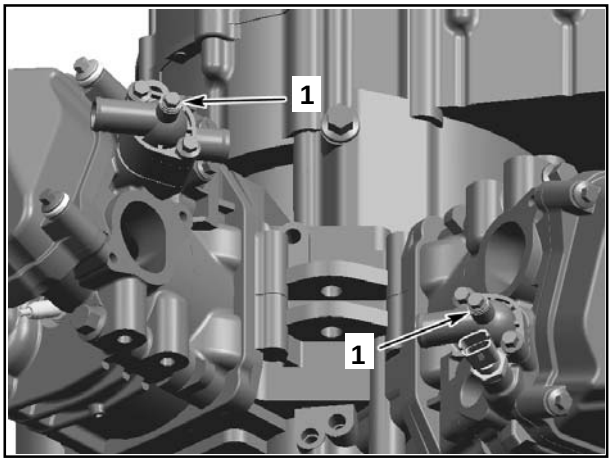

*Under LH Footrest*
*1.Cooling Drain Plug*

## Refilling the System

Remove related parts.

Unscrew bleeding screws on top of thermostat housing.

**NOTE:***Both two cylinders must be bled.*




*1.Bleeding Screws*

With vehicle on a flat surface,engine cold,refill radiator. When the coolant comes out by the thermostat housing hole,install the bleeding screw with its washer and torque to 5 **N.m**(44 **lbf.in**).

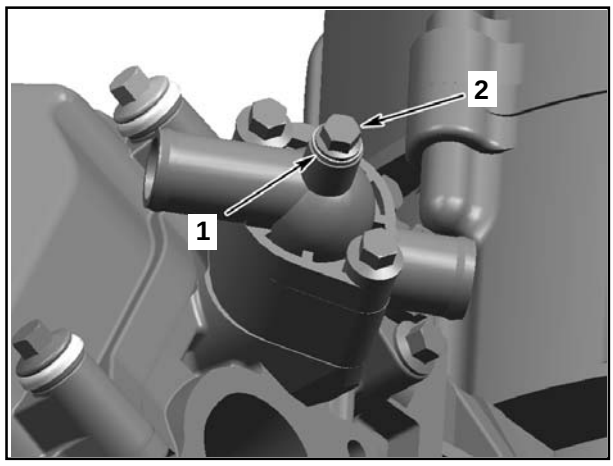
Fill up the radiator and intall radiator cap.

Fill the reservoir tank and keep the coolant level even at "LOWER" mark,then install reservoir tank cap.

Run the engine until thermostat opens,then shut off the engine.

Recheck the coolant level in reservoir tank after the egine is completely cooled down.Refill coolant if necessary. Maintain coolant level between "LOWER" and "UPPER".

**NOTE:***Each year or every 100 hours or when vehicle reaches 3000km(1865mi),check coolant concentration (freezing point) with proper tester.*




*1.Washer*
*2.Bleed ing Screw*

## PROCEDURES

### THERMOSTAT

The thermostat is a single action type.

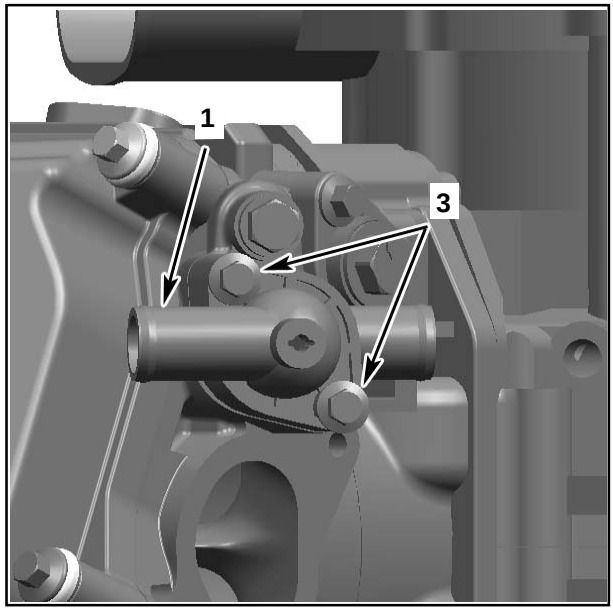
#### Thermostat Removal

**NOTE:***Thermostat is located on the top of cylinder head,on intake side(front cylinder).*

Install a hoe pincher on both radiator hoses.

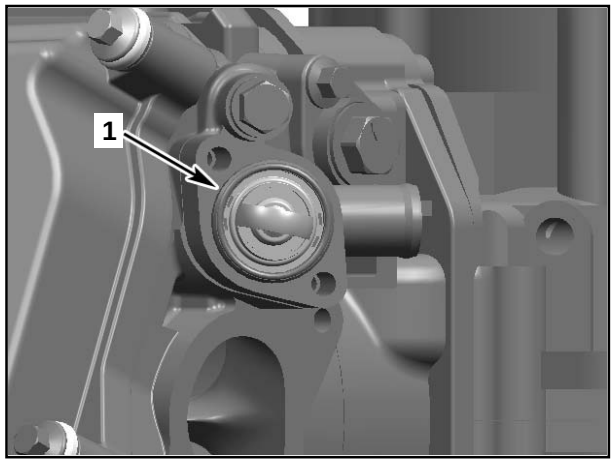
**Remove:**

——thermostat housing screws and pull thermostat cover.




*1.Thermostat Cover*
*2.Screws*

——thermostat with seal ring out of the hole.




*1.Thermostat with Seal Ring*

### Thermostat Test

To check thermostat,put it in water and heat water.
Thermostat should open when water temperature reaches 65℃(149℉).
Check if the seal ring is brittle,hard or damaged.If so, replace the seal ring.

### Thermostat Installation

For installation,reverse the removal procedure,pay attention to the following details.
Install the thermostat cover then torque screws to 6**N.m** (53**lbf.in**).
Check coolant level in radiator and reservoir tank and top up if necessary.

**CAUTION:**

**Don't forget to bleed the cooling system**.Refer to ***COOLANT REPLACEMENT***.

### RADIATOR CAP

Using a pressure cap tester,check the efficiency of radiator cap.If the efficiency is feeble,install a new 110kPa(16PSI) cap(don't exceed this pressure).

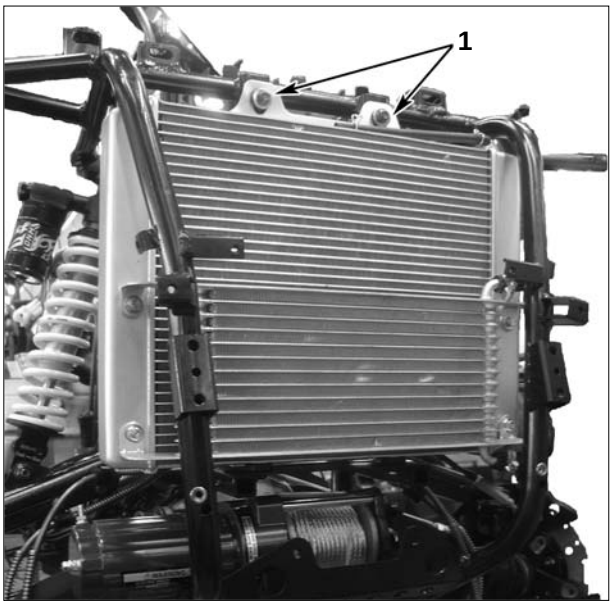
## RADIATOR

### Radiator Inspection

Check radiator fins for clogging or damage.Remove insects,mud or other obstructions with compressed air or low pressure water.

### Radiator Removal

Drain cooling system
Remove front facia and radiator shroud,refer to ***VEHICLE BODY AND MUFFLER***.
Remove:
—RH inner fender
––radiator mounting bolts
—overflow hose
––support and reservoir tank
Unplug radiator fan.
Remove radiator.



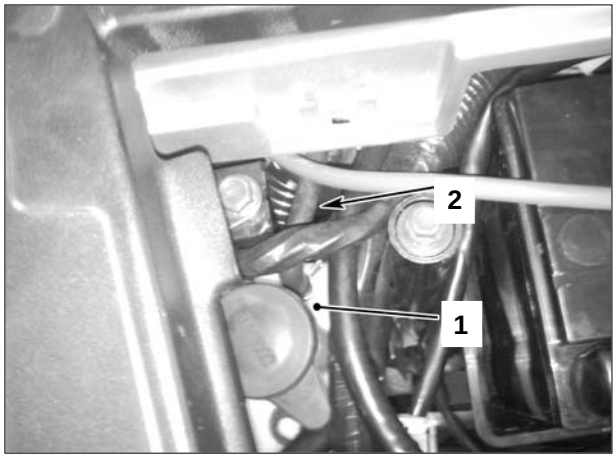

*1.Radiator Mounting Bolts*

### Radiator Installation

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

## RESERVOIR TANK

The coolant expands as the temperature (up to 100 to 110℃(212 to 230℉)) and pressure rise in the system. If the limiting system working pressure cap is reached 110kPa(16PSI),the pressure relief valve in the temperature cap is lifted from its seat and allows coolant to flow through the overflow hose into the reservoir tank. Ensure ventilation holes are not obstructed.




*1.*Reservoir Tank
*2.Overflow Hose*

### Removal

**Remove:**

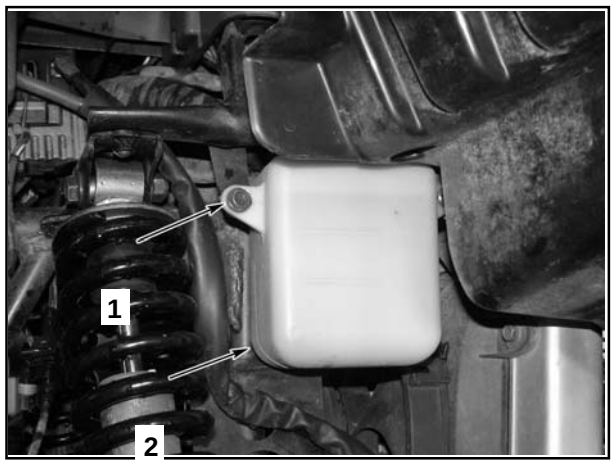
——RH inner fender(refer to ***VEHICLE BODY AND MUFFLER***).

——coolant support bolt

——overflow hose

——support and reservoir tank

Empty coolant tank.




*1.Bolt*
*2.Reservoir Tank*

### Installation

Reverse the removal procedure for installation.

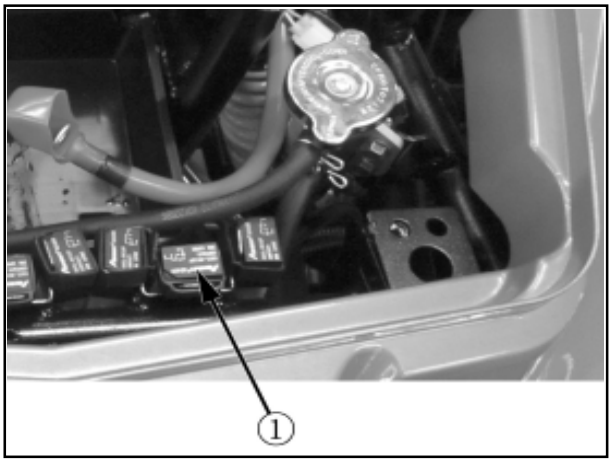
## COOLANT TEMPERATURE SENSOR (CTS)

Refer to ***ELECTRICAL SYSTEM*** for inspection and renewal process of CTS.

## RADIATOR FAN RELAY

### Installation

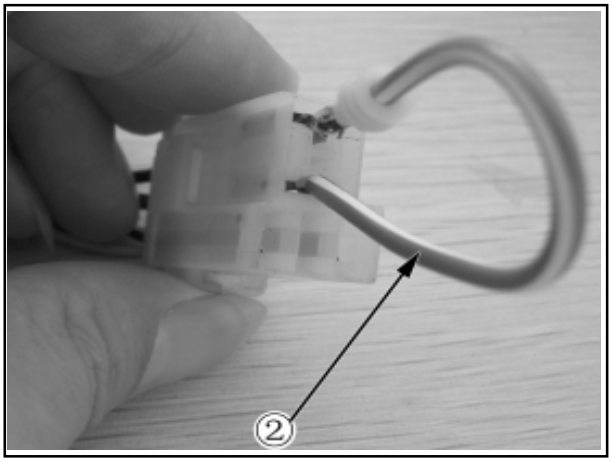
**NOTE:***Relay may be inverted by 180° at installation and it will work correctly.Ensure to align tabs of relay with terminals of fuse holder at installation.*




*1.Radiator Fan Relay*

### Relay Operation Test

The easiest way to check the relay is to remove it and bypass it with a jumper.If the radiator fan is activated, replace the relay.See illustration to find where to by-pass the relay.




*2. Bypass the Relay*

### Relay Continuity Test

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

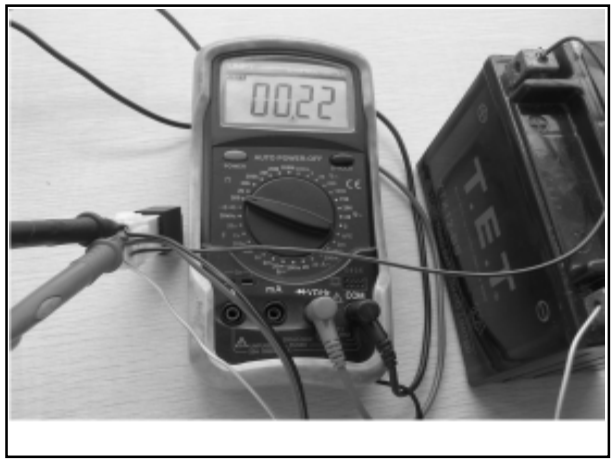
| Terminals | | Resistance |
|---|---|---|
| 30 | 87 | Open circuit (0L) |

*3.Probe Relay*

Connect battery as follows.

| Terminals | | Resistance |
|---|---|---|
| 30 | 87 | 0.5 Ω max. (continuous) |

If relay fails any test,replace it.



*4.Connect Battery*

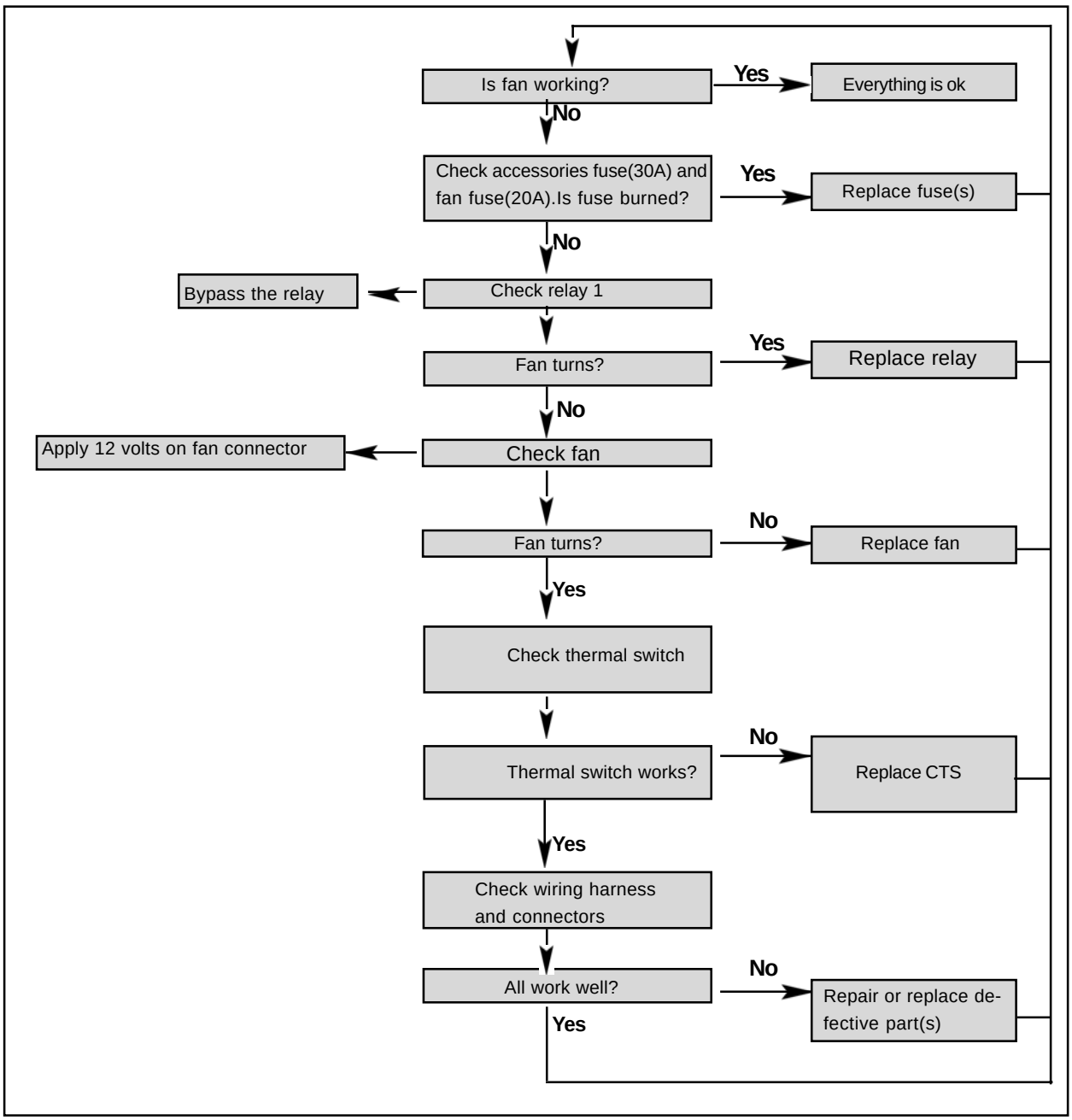
## RADIATOR FAN

### Operation

The thermal switch controls the radiator operation. Radiator fan should turn on when coolant temperature reaches 88℃(190.4℉) and should turn off when the coolant cools down at 84℃(183.2℉).

### Radiator Fan Test

If radiator fan doesn't turn on when the coolant temperature exceeds 88℃(190.4℉),use the following troubleshooting chart to resolve the problem.




### Removal

Remove radiator shroud.
Remove the bolts.
Remove the radiator fan.

### Installation

Reverse the removal procedure for installation.

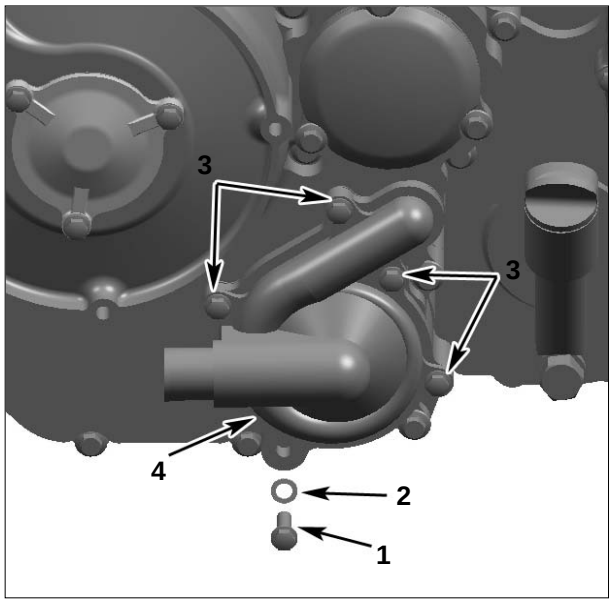
## WATER PUMP HOUSING

It's located on the engine MAG side.

### Removal

**WARNING**
**To avoid potential burns,don't remove the radiator cap or loosen the cooling drain plug if the engine is hot.**

Drain the cooling system.
Remove outlet hose from water pump housing.
Remove screws retaining water pump housing.
Pull water pump to remove it.




*1.Cooling Drain Plug*
*2.Sealing ring*
*3.Screws*
*4.Water Pump Housing*

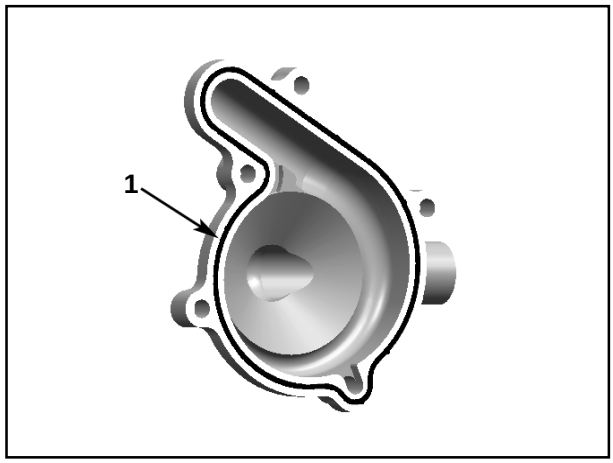
### Inspection

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

### Installation

Reverse the removal procedure for installation.

**CAUTION:To prevent leaking,take care that the gasket is exactly in groove when you reinstall the water pump housing.**
**Tighten screws of water pump housing in a criss cross sequence.**

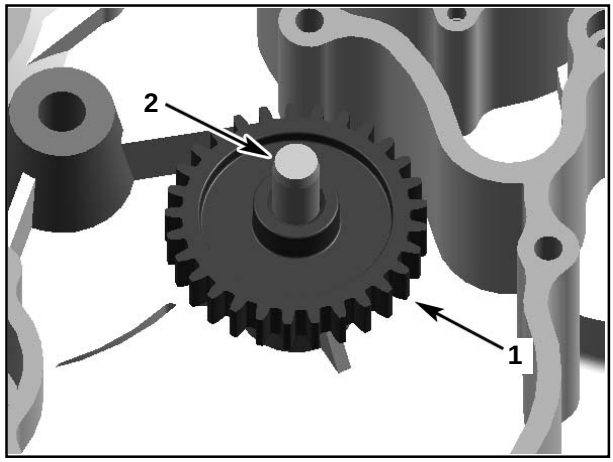



*1.Gasket*

## WATER PUMP IMPELLER,GEARS, SEALS,SHAFT

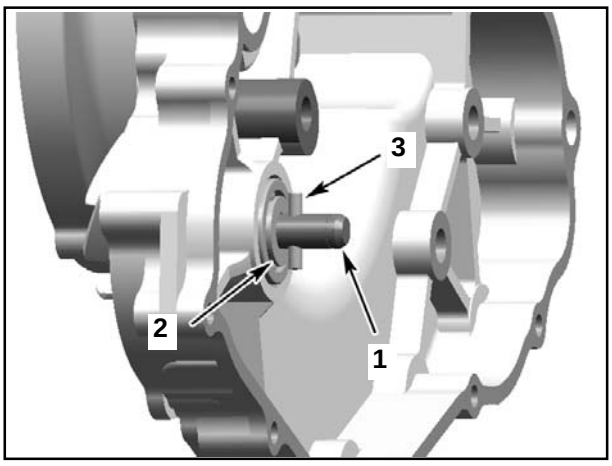
### Removal

Drain cooling system.Refer to this chapter.
Empty engine oil.Refer to ***LUBRICATION SYSTEM***.
Remove water pump housing.Refer to this chapter.
Remove the crankcase cover,MAG side.Refer to crankcase.
Remove the water pump intermediate gear and breather shaft.




*1.Intermediate Gear,Water Pump*
*2.Breather Shaft*

Using appropriate pliers,remove and discard the retaining ring securing water pump gear on water pump shaft.
Remove water pump gear.
Remove needle pin and gasket of water pump shaft.

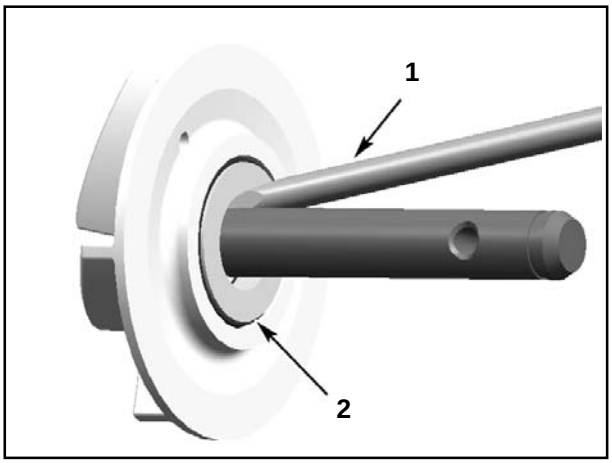



*1.Water Pump Impeller Assembly*
*2.Gasket*
*3.Needle Pin*

To remove water pump impeller assembly from left crankcase cover, briskly tap the water pump shaft end.

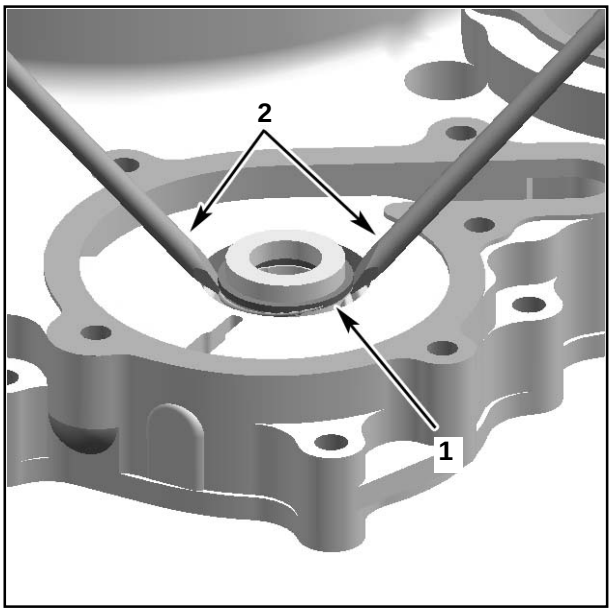
**CAUTION:Take care not to damage impeller wings during installation.**

Using an appropriate slotted screwdriver,pry out the rotary seal.



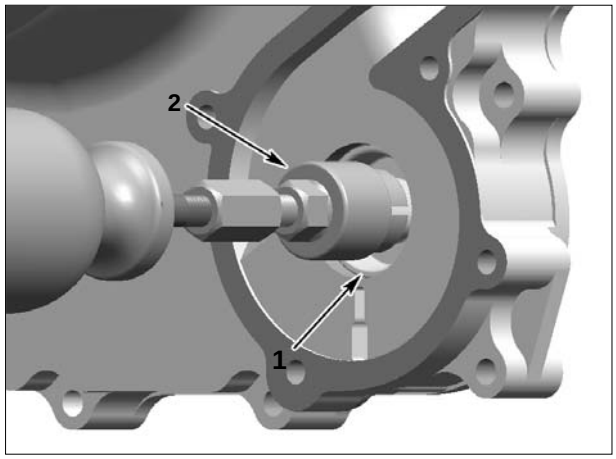

*1.Slotted Screwdriver*
*2.Rotary Seal*

Using 2 slotted screwdrivers ,remove outer part of water pump stationary seal.



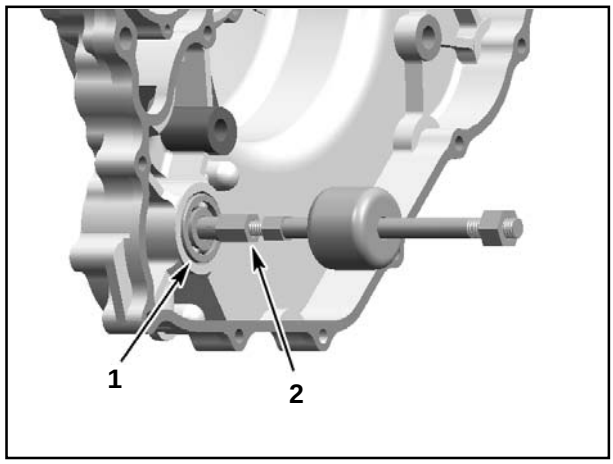

*1.Stationary Seal,Water Pump*
*2.Slotted Screwdrivers*

Using an puller,remove outer part of rotary seal. Install puller snugly against outer part and pull rotary seal out.



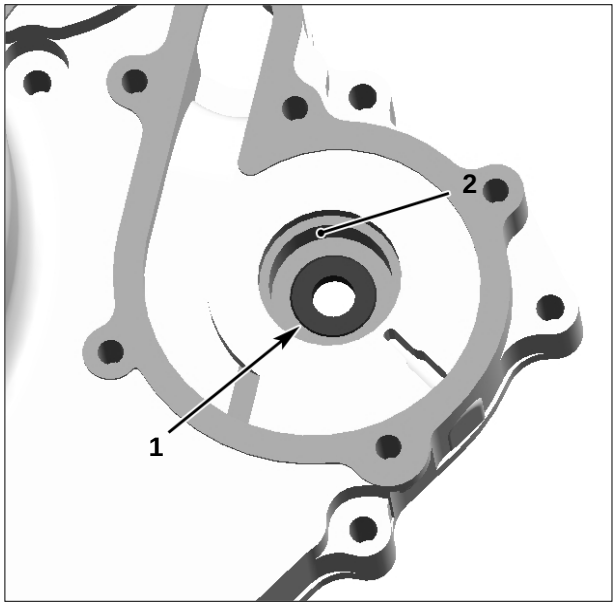

*1.Inner Part,Stationary Seal*
*2.Seal Puller*

Using a bearing puller(P/N:0800-014001-922-001 ),remove water pump bearing(If it's necessary to replace the water pump bearing).




*1.Bearing*
*2.Bearing Puller*

Remove oil seal.




*1.Oil seal*
*2.Stationary Seal Surface*

**CAUTION:**

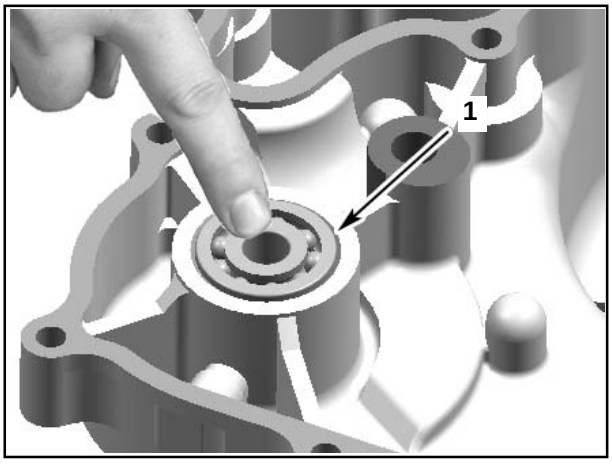
**Be careful not to damage the rotary seal surface.**

## Inspection

Check impeller for cracks or other damages.Replace impeller if damaged.

Inspect water pump intermediate gear and water pump gear for cracks,wear and other damages(especially on the snap mechanism to the needle pin).Replace if necessary.

Turn the bearing inner ring by hand. The bearing should run smoothly,peacefully.If it's stuck or has noise or other defects,replace it.



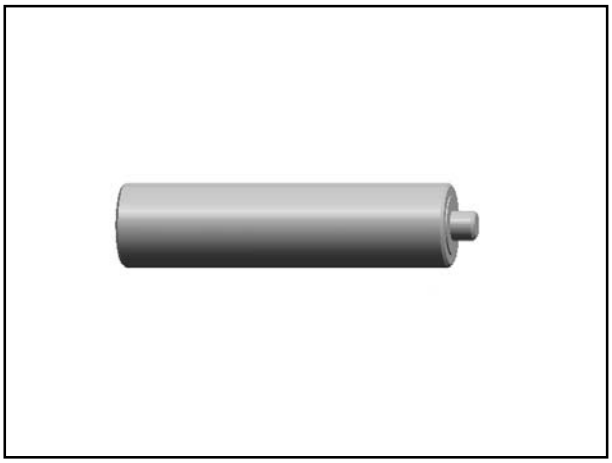

*1.Bearing*

## Installation

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

**NOTE:***For installation,use the torque values in the exploded view.Ensure to apply engine oil on intermeadiate shaft,water pump shaft and oil seal inner surface.Don't use oil in the press fit area of the oil seal abd rotary seal.*

**CAUTION:Always replace rotary seal and stationary seal at the same time.Meanwhile, install a new oil seal(behind the rotary seal).**



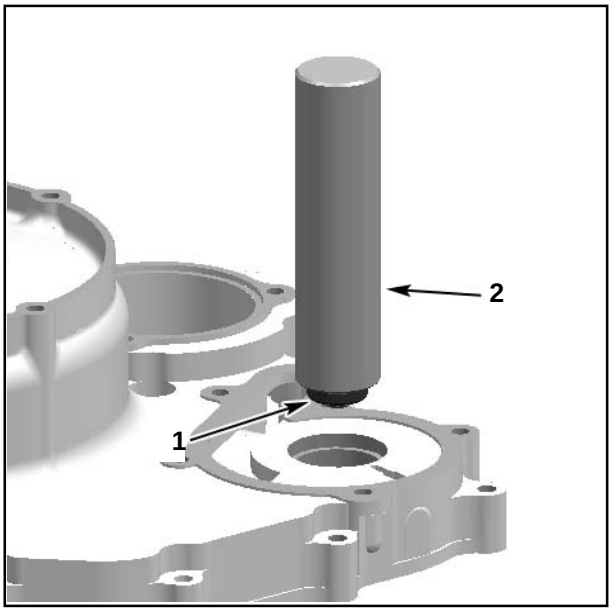
*Seal Pusher*

Use the oil seal pusher(P/N 0110-080005-923-001) to install oil seal.

Apply oil on oil seal lip.

When installing the oil seal on the pusher,make sure sealing lip poits outside.

Using oil seal pusher,install the oil seal in place.

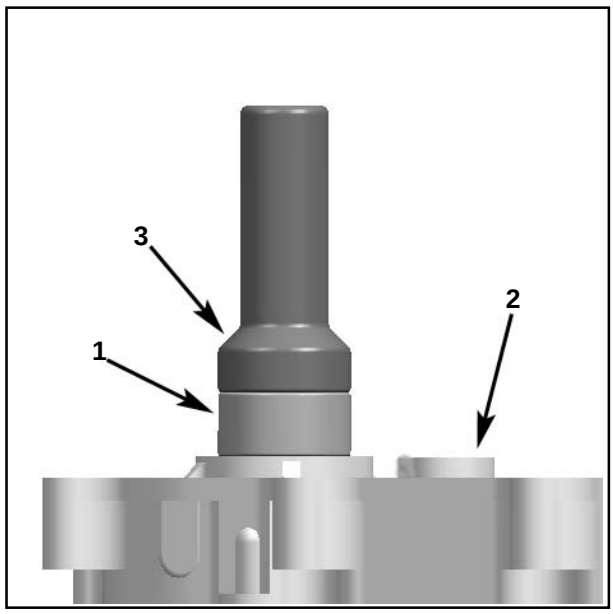



*1.Oil seal*

*2.Seal Pusher*

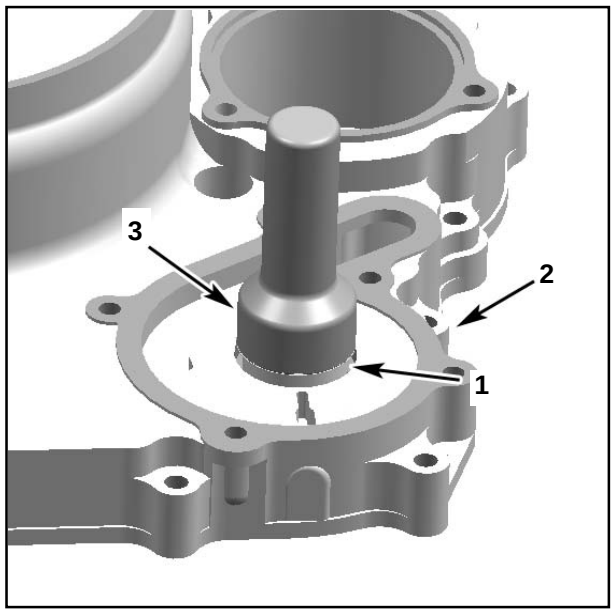
Place appropriate cushion blocks under the crankcase cover to keep it level.
Using bearing pusher to push the bearing into left crankcase press fit area.

**NOTE:** *The left crankcase cover may be damaged if no appropriate cushion bolks placed under it.*




*1.Bearing*
*2.Crankcase Cover,MAG Side*
*3.Bearing Pusher*

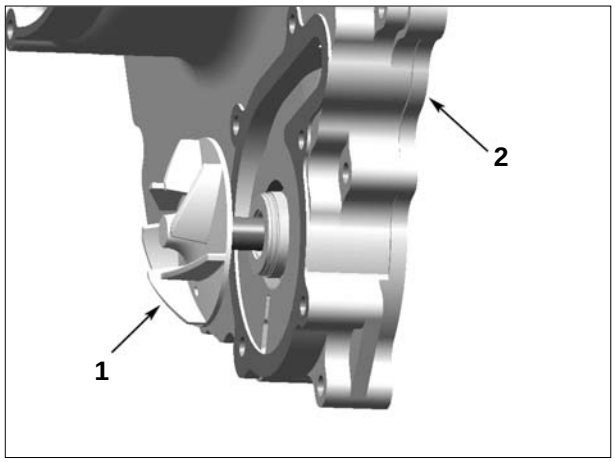
Apply loctite(silicone sealant) on stationary seal surface.
Gently tap the seal pusher to install stationary seal in place.




*1.Stationary Seal,Water Pump*
*2.Crankcase Cover,MAG Side*
*3.Seal Pusher*

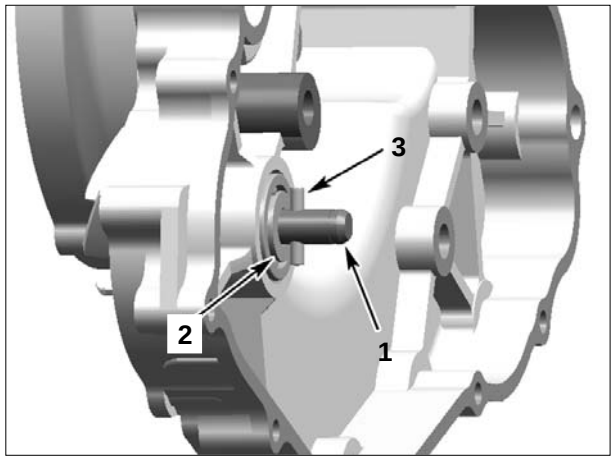
Install the water pump impeller assembly with rotary seal into left crankcase cover.

**NOTE:***Before water pump impeller installation, clean the rotary seal and stationary seal surface,or water may enter the crankcase.*



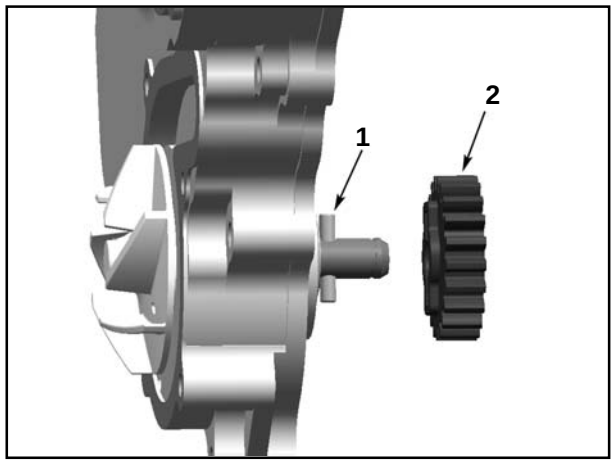

*1.Water pump Impeller Assembly*
*2.Left(MAG Side) Crankcase Cover*

Install thrust washer on water pump shaft.
Push impeller by hand to fully expose shaft hole that needle pin can be installed.
Install pin and position it at equal distance out of shaft hole so water pump gear can be installed.



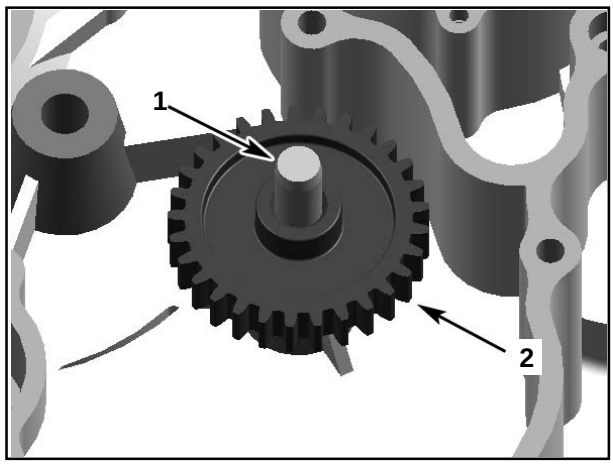

*1.Water Pump Impeller Assembly*
*2.Gasket*
*3.Needle Pin*

Align the water pump gear groove with needle pin,then install water pump gear on the shaft.
Make sure gear properly snaps on pin.
Install a new retaining ring on pump shaft end.




*1.Needle Pin*
*2.Water Pump Gear*

Install water pump intermediate shaft and ensure its end with chamfer points outside.
Install water pump intermediate gear on shaft.
For remaining parts installation,reverse their removal procedure.
Assemble the other parts base on reverse sequence of removal.
Refill all fluids,including coolant and engine oil.




*1.Breather Shaft*
*2.Intermediate Gear,Water Pump*

## MAINTENANCE INFORMATION

### Operation Cautions:

●When performing engine removal and installation,use jack or other appropriate tools to securely support the vehicle.Take care not to damage the engine,bolts and cables.

●Wrap the frame in appropriate areas where might be scratched to avoid damage during removal and installation.

●It's not necessary to remove the engine when servicing the following parts:

-oil pump.
-throttle body,air filter.
-valve cover,cylinder head ,cylinder,camshaft.
-CVT system,CVT cover.
-magneto cover,AC magneto,water pump
-piston,piston ring ,piston pin
-front differential,rear gearcase

●It's necessary to remove engine when servicing the following parts:

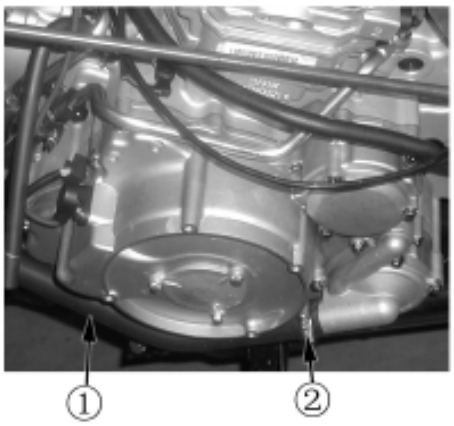
-crankshaft
-transmission.

### Tightening Torque:

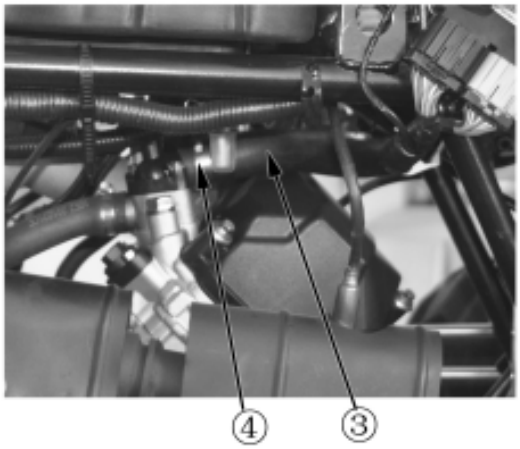
| | | |
|---|---|---|
| Engine mounting bolts (upper) | GB5789 M8X35 | (35-45)**N•m** |
| Engine mounting bracket bolts (upper) | GB5789 M10X1.5X20 | (40-50)**N•m** |
| Engine mounting bolts (front left) | GB5789 M10X1.25X125 | (40-50)**N•m** |
| Engine mounting bolts (front right) | GB5789 M10X1.25X100 | (40-50)**N•m** |
| Engine mounting bracket bolts (rear) | GB5789 M8X20 | (35-45)**N•m** |
| Engine mounting bolts (rear) | GB5789 M10X1.25X170 | (40-50)**N•m** |
| Engine mounting bracket bolts (rear) | GB5789 M8X20 | (35-45)**N•m** |

## ENGINE REMOVAL

Remove plastics (→ ***VEHICLE BODY AND MUFFLER***,Chapter 2);
Remove air filter (→***AIR INTAKE*** system);
Remove throttle body(→***ELECTRICAL SYSTEM***);
Drain coolant;
Drain engine oil;
Remove hose clamp no.2;
Remove coolant inlet hose no.1;




Remove hose clamp no. 4;
Remove coolant outlet hose no.3;

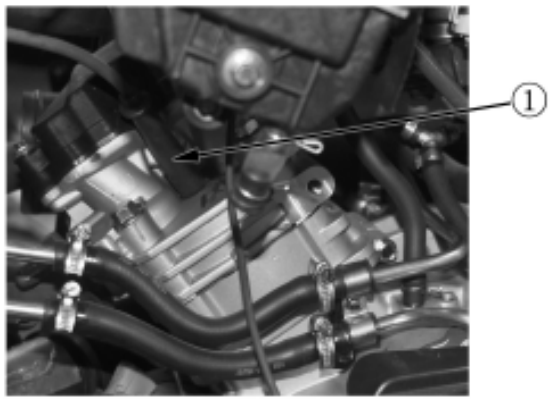



Remove hose clamp no.5;
Remove engine external oil pipe no.6;

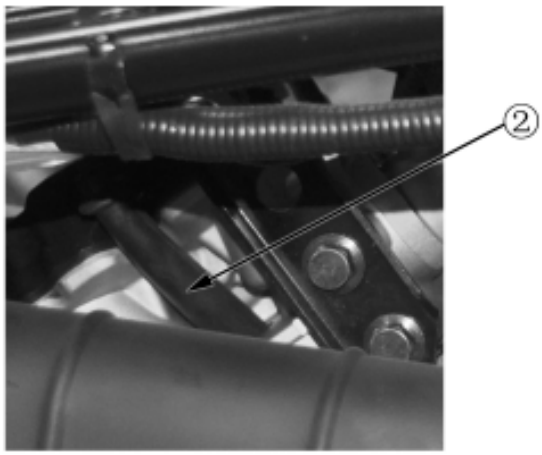

Disconnect magneto connector,CPS connector,coolant temperature sensor connector,gear position sensor connector,TPS connector,idle air control valve connector,high pressure fuel line and throttle cable, etc;

Remove muffler(→ ***VEHICLE BODY AND MUFFLER***,Chapter 2);

Remove spark plug cap no.1 from cylinder 1(front);

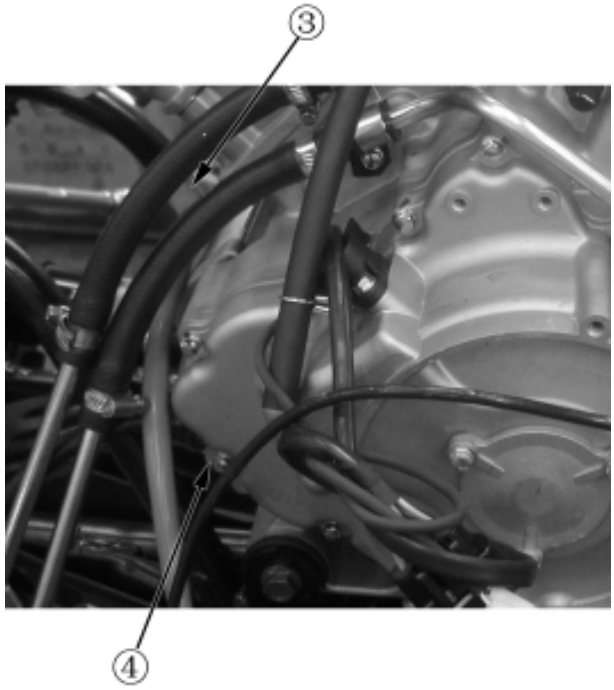



Remove spark plug cap no.2 from cylinder 2(rear);



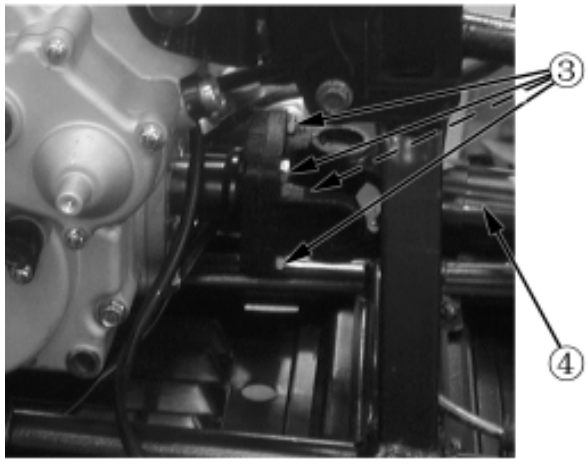

Take starter motor positive terminal sleeve off.Remove the nut and starter motor positive cable no.3;

Remove the bolt and negative cable no.4 of starter motor;

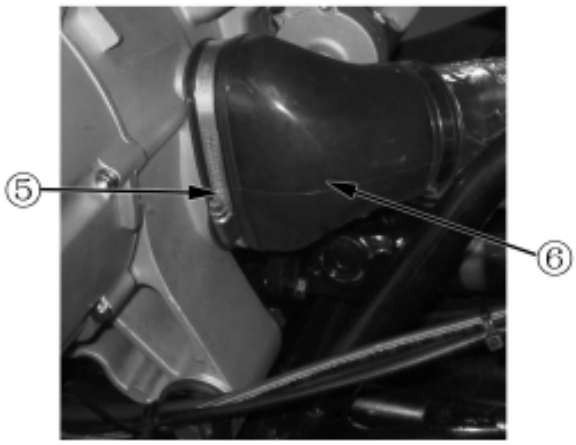


Remove the 4 bolts no.1 to disconnect front propshaft from engine;

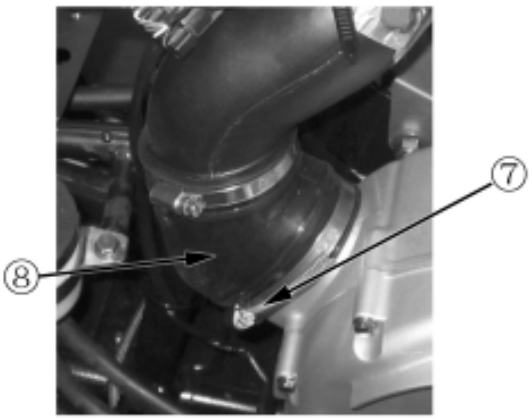

Remove the 4 bolts no.3 to disconnect rear propshaft from engine;



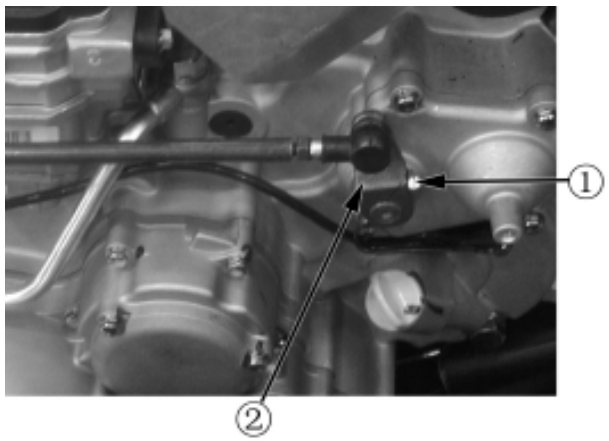

Remove CVT inlet hose clamp no.5;
Remove CVT inlet hose no.6;



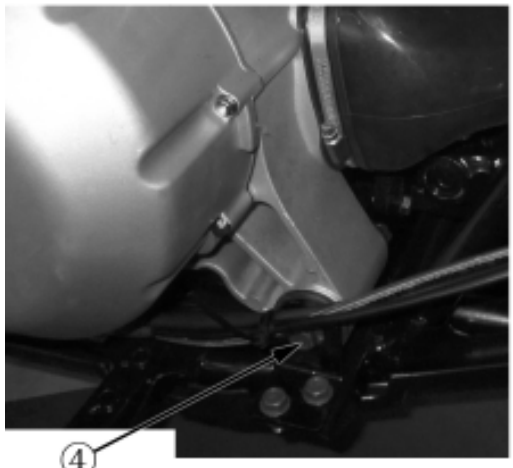

Remove CVT outlet hose clamp no.7;
Remove CVT outlet hose no.8;



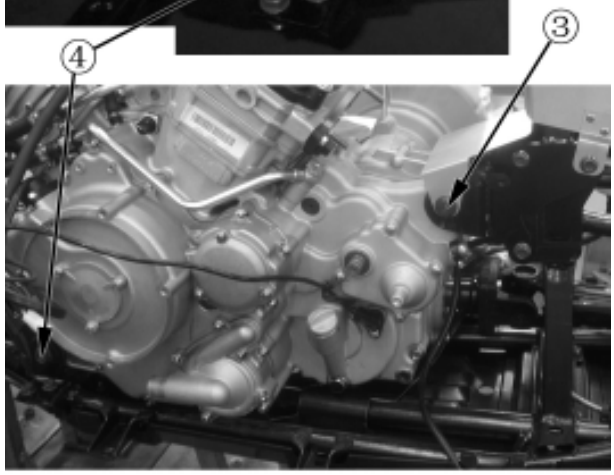
Remove bolt no.1 to disconnect shifting plate no.2 from engine;



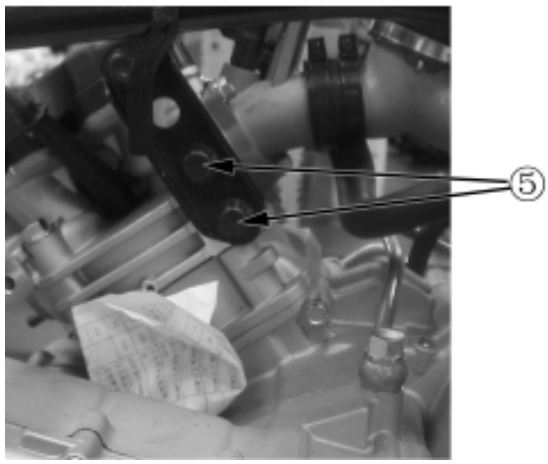

Remove engine mounting bolts (front left)&(front right) no.4;




Remove engine mounting bolts(rear) no.3;




Remove engine mounting bolts(upper) no.5;



## ENGINE INSTALLATION

After placing engine on the vehicle,install engine mounting bolts and nuts (front left) first,then (front right) and (rear).

Install engine inlet/outlet coolant hoses/oil pipes by clamps onto the engine.Connect starter motor positive/negative cables.

Connect all connectors.Install CVT breather duct,spark plus cap.Install shifting plate,air filter,throttle body and other removed parts.

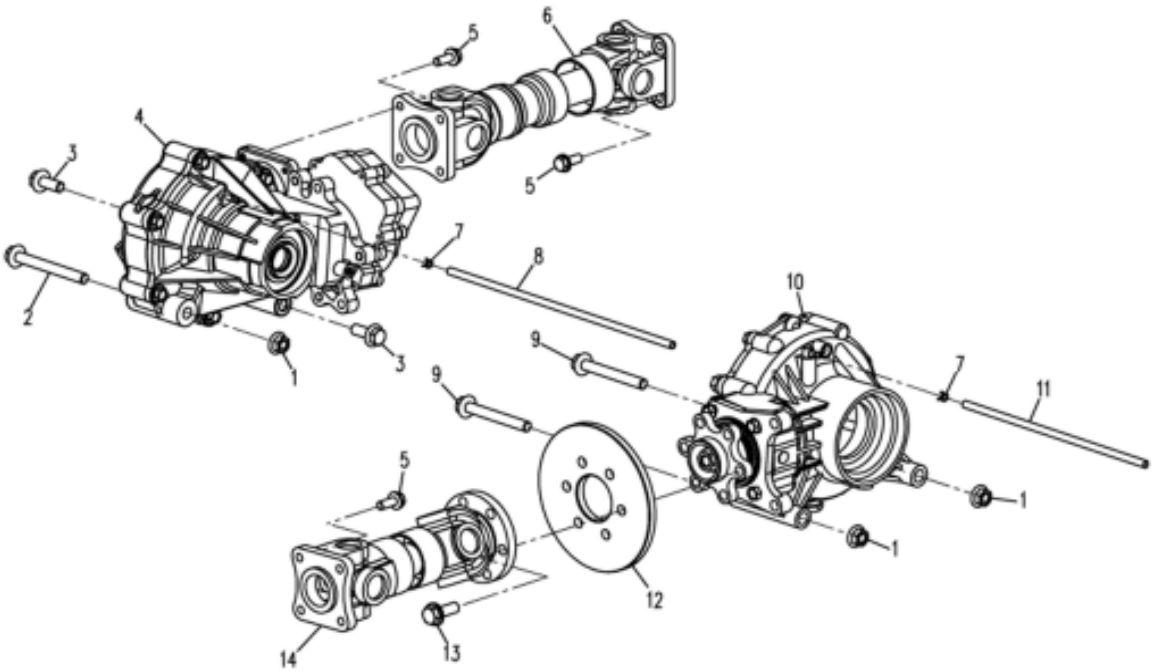
## FRONT/REAR GEARCASE REMOVAL AND INSTALLATION

### Removal

Raise the vehicle off ground with jack.Ensure the vehicle would not tip or fall.

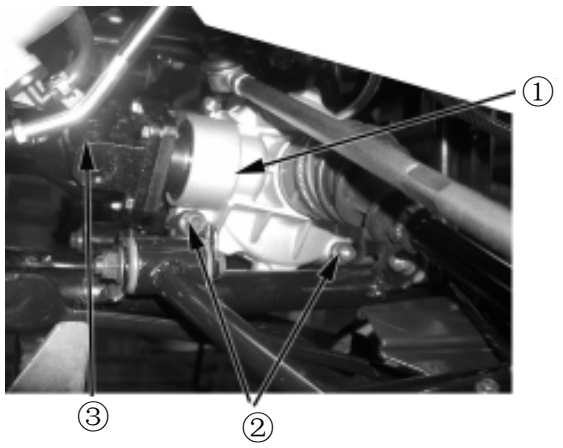
Remove plastics (→ ***VEHICLE BODY AND MUFFLER***,Chapter 2);

Remove front/rear wheels and A-arms.

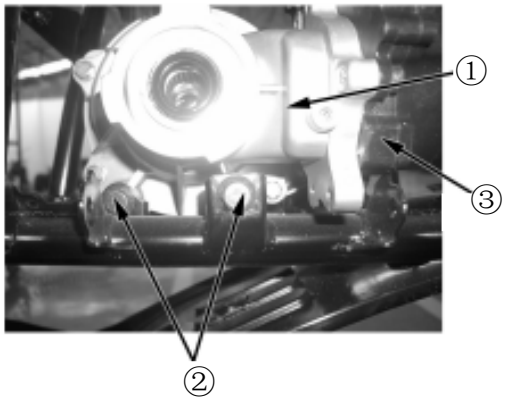



1.Nut 2.Bolt#1 3.Blt#2 4.Front Differential 5.Bolt#3 6.Front Propshaft 7.Clamp
8 . Front Differential Breather Hose 9.Bolt#4 10.Rear Gearcase 11.Rear Gearcase Breather Hose
12.Rear Brake Disc 13.Bolt#5 14.Rear Propshaft

Remove front differential mounting bolts & nuts;

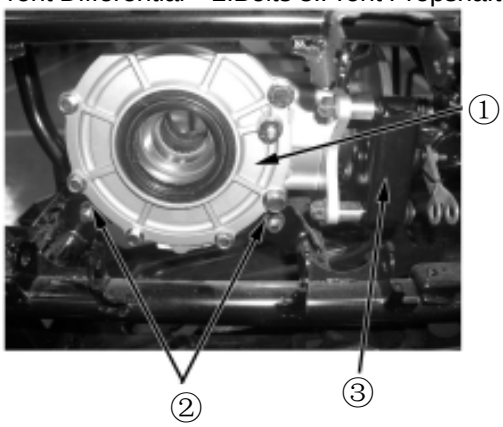



1.Front Differential 2.Bolts 3.Front Propshaft

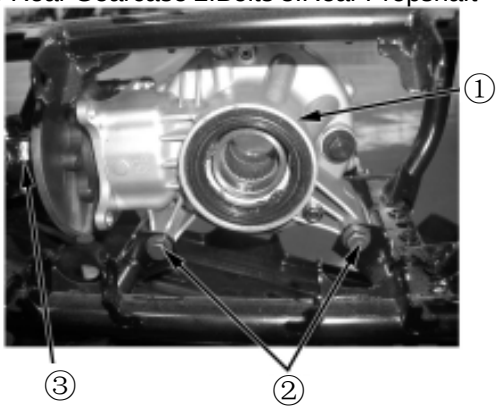



1.Front Differential 2.Bolts 3.Front Propshaft

Remove rear gearcase mounting bolts & nuts ;




1. Rear Gearcase 2.Bolts 3.Rear Propshaft



Remove the 18 bolts which connect propshafts and gearcases(see 5,bolt 3);
Remove propshafts,gearcases,and brake discs.

### Installation

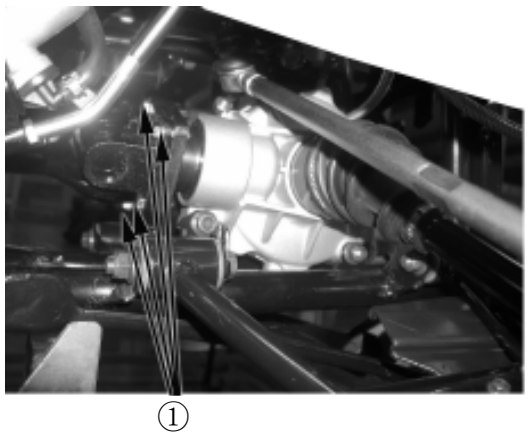
Reverse the removal procedure for installation.

### Tightening Torque:

Front differential mounting bolt :40-50**N•m**

Rear gearcase mounting bolt :40-50**N•m**

Front and rear propshaft bolt :40-50**N•m**

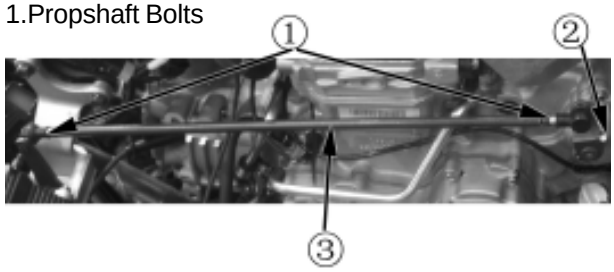



1.Propshaft Bolts

## GEARSHIFT LINKAGE

### Removal

Remove passenger seat(→2-4);
Remove driver seat(→2-4);
Remove air filter cover(→2-5);
Remove left side panel (→2-6);
Remove gearshift lever knob(→2-6);
Remove gearshift lever indicator(→2-6);
Remove bolt no.2 and shifting plate;
Loosen gearshift rod adjustment nuts no.1,remove gearshift rod;





Remove gearshift locking cable no.5;

Remove the 3 bolts of gearshift bracket and then remove the linkage.

### Installation

Reverse the removal procedure for installation.

After installation,check gearshift linkage for smoothness and agility.If gearshifting sticks,adjust nuts no.1 to change the length of gearshift rod.

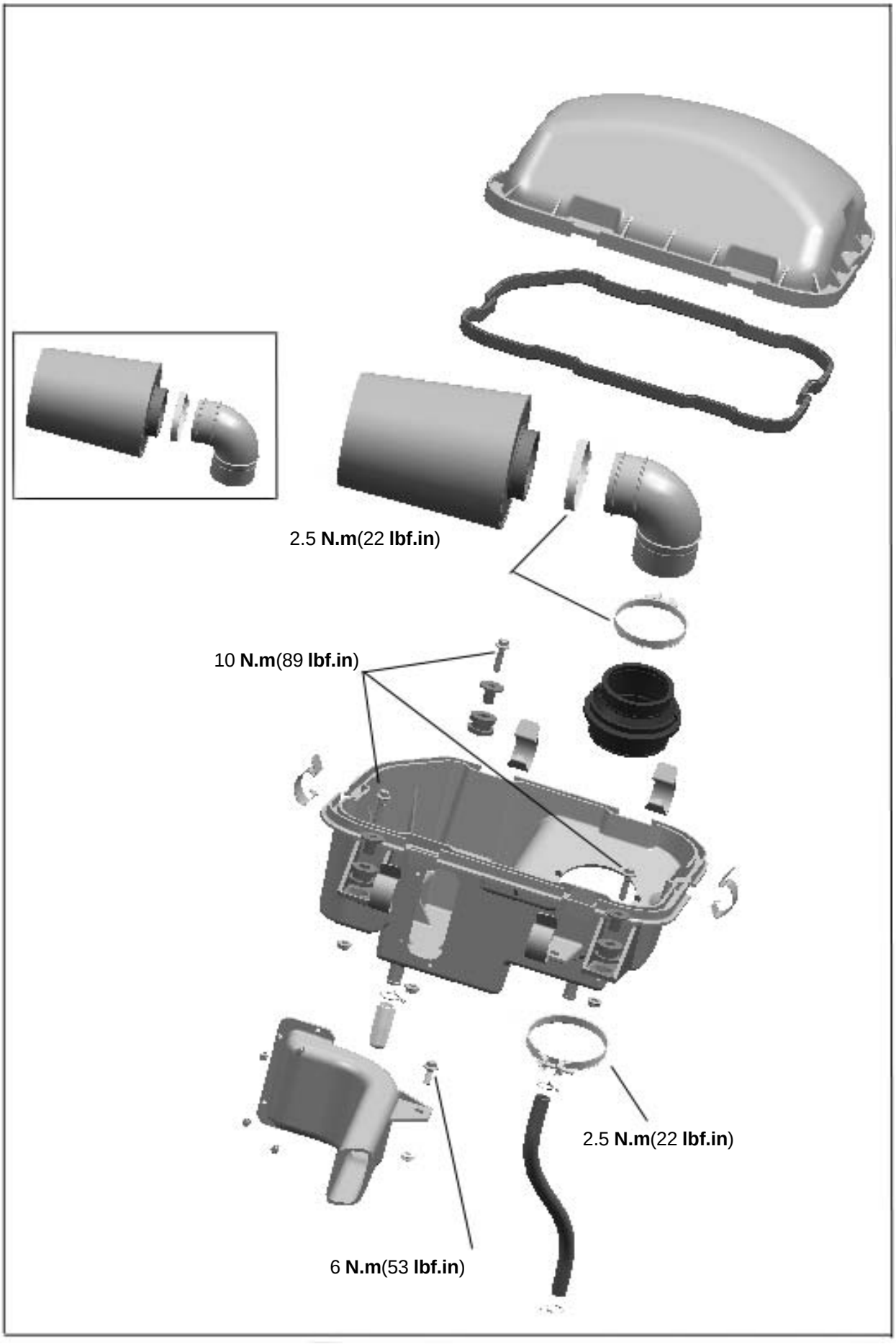
# AIR INTAKE SYSTEM

## SERVICE PRODUCTS



| Description | Part Number | Page |
|---|---|---|
| Air Filter Cleaning Solution | | 03 |

## AIR FILTER HOUSING



## GENERAL

During assembly/installation, use the torque values and service products as in the exploded views.Clean threads before applying a threadlocker.Refer to ***LUBRICANTS AND SERVICE PRODUCTS*** at the beginning of this manual for complete procedure.

**WARNING**

**Torque wrench must be used when tightening. Locking devices(e.g.:locking tabs,elastic stop nuts, cotter pin,etc.) must be replaced with new ones.**

## PROCEDURES

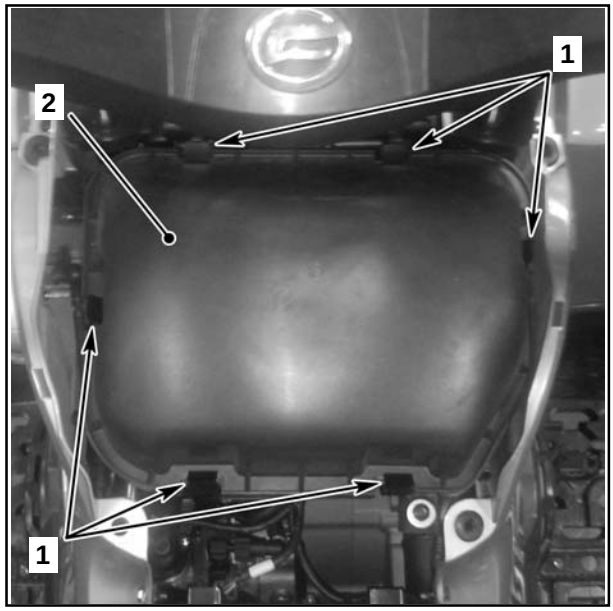
## AIR FILTER

### Air Filter Removal

**CAUTION:** Never remove or modify any component in the air filter housing. The engine management system is calibrated to operate specifically with these components. Otherwise, engine performance degradation or damage can occur.

Remove passenger seat,driver seat. Refer to ***VEHICLE BODY AND MUFFLER***.

Release clamps and remove air filter cover.




*1.Clamps*
*2.Air Filter Housing*

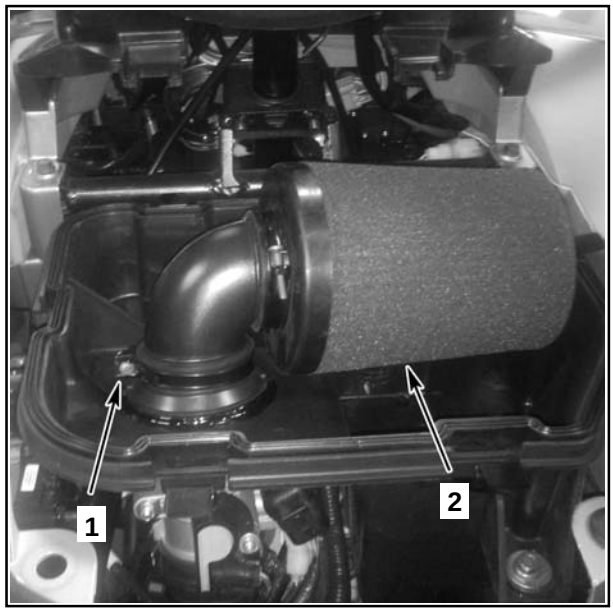
Loosen clamps and remove air filter housing(upper).

**NOTE:** *If vehicle is used in dusty area,inspect more frequently than specified in MAINTENANCE CHART. If lilquid/deposits are found, squeeze and dry the foam filter. Replace filter element if damaged.*

**CAUTION: Do not start engine if liquid or deposit are found. If there is oil in the air filter housing, check engine oil level. Oil level may be too high.**

Pour air filter cleaning solution or an equivalent into a bucket. Put the foam filter in to soak. Do not wash filter element.

While filter soaks, clean inside of air filter housing.




*1.Clamp*
*2.Air Filter*

Rinse foam filter with warm water and let it dry completely.
Blow low pressure compressed air on filter element to clean it.

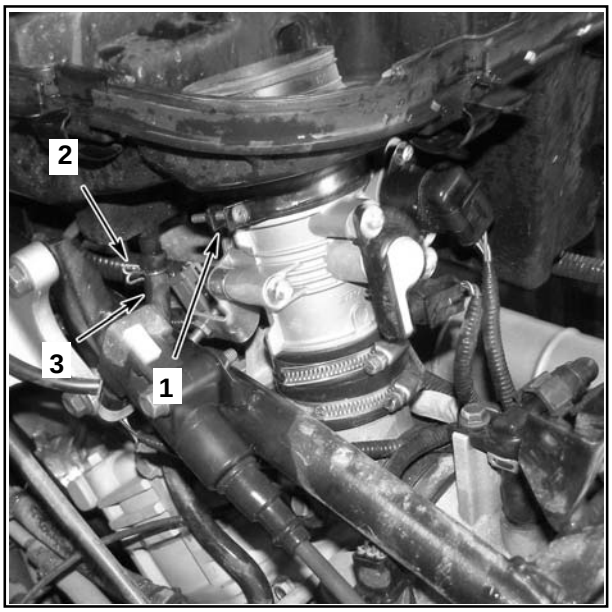
## Air Filter Installation

Properly reinstall removed parts in the reverse order of their removal.

## AIR FILTER HOUSING

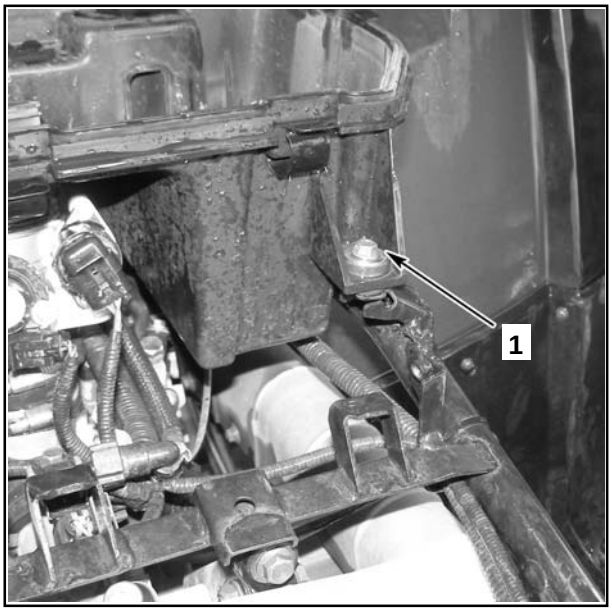
### Air Filter Housing Removal

Remove seat, side panels;
Refer to ***VEHICLE BODY AND MUFFLER***;
Loosen clamp and hose tie;
Disconnect breather hose;




*1.Clamp*
*2.Hose Tie*
*3.Breather Hose*

Remove air filter housing mounting bolts;




*1.Bolt*

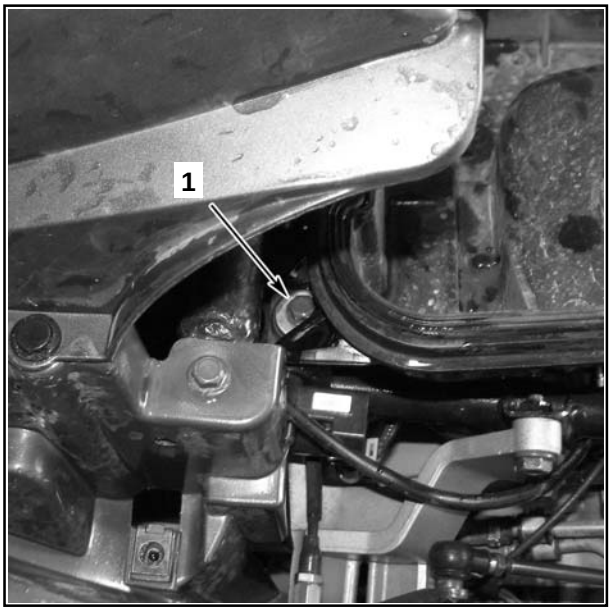
Pull air filter housing out.

## Air Filter Housing Installation

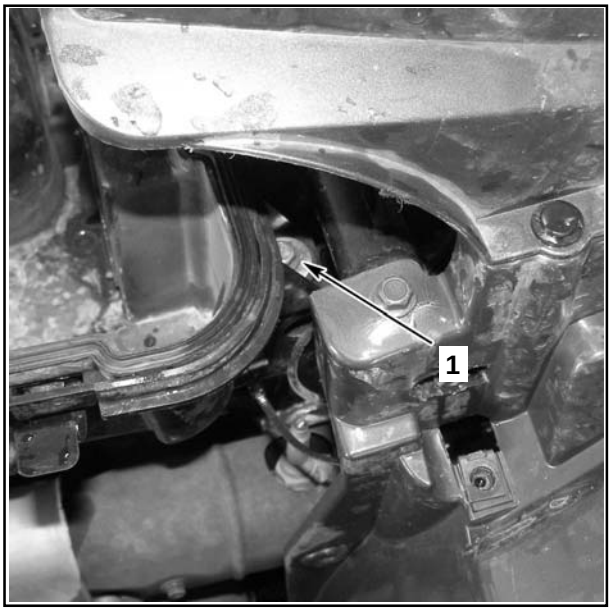
Reverse the removal procedure for installation.

**WARNING**

**Depress throttle lever several times to ensure it properly returns.**




*1.Bolt*




*1.Bolt*

# INTAKE MANIFOLD,CYLINDER HEAD AND CYLINDER



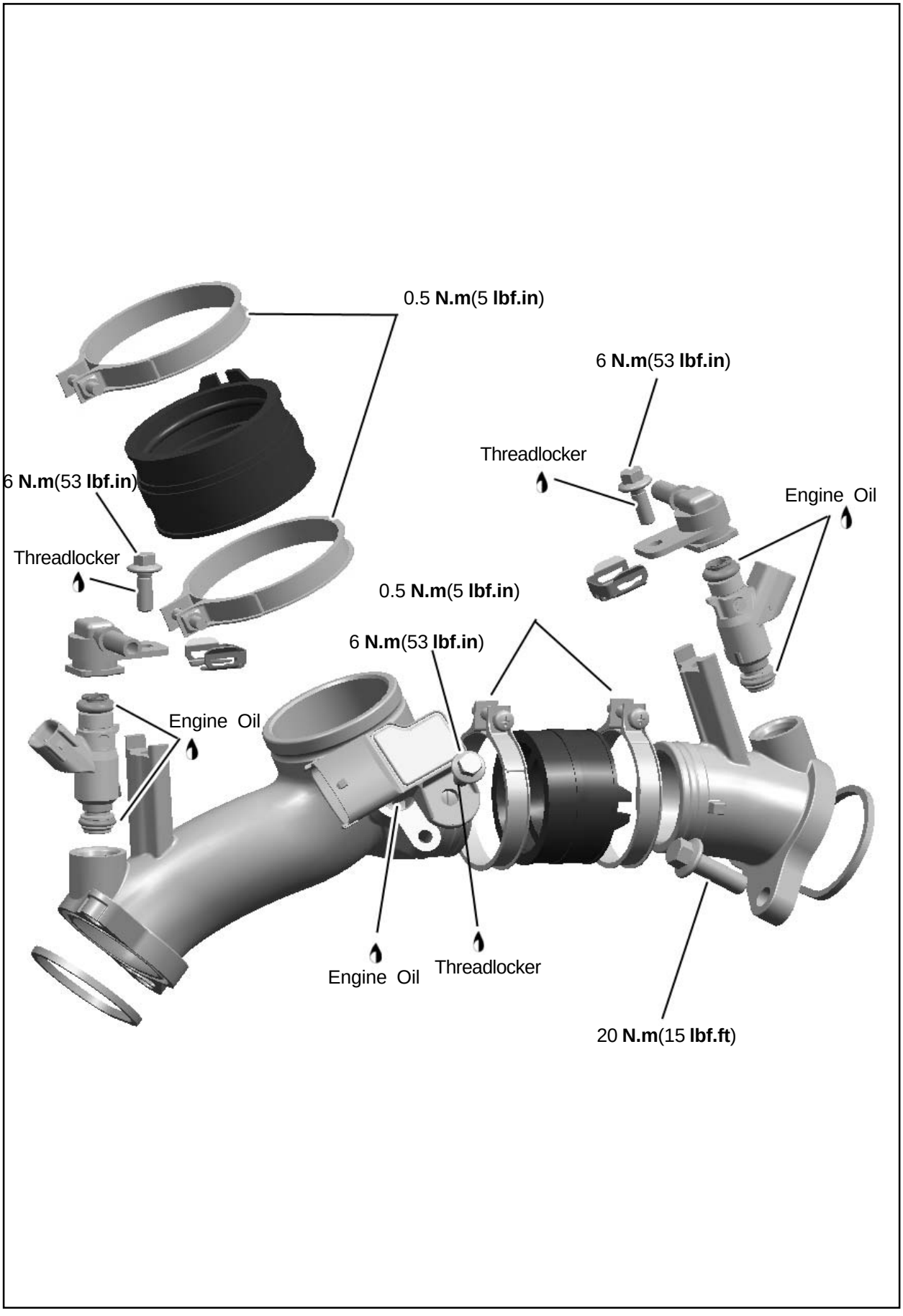
## SERVICE TOOLS

| Description | P/N | Page |
|---|---|---|
| Spark plug spacer | 0800-022800-922-001 | 07 |
| Camshaft locking tool | 0800-024001-922-001 | 09 |
| Crankshaft locking bolt | 0800-041000-922-001 | 27 |
| Valve spring compressor clamp | 0180-022006-922-001 | 32 |
| Valve guide remover | 0800-022102-922-001 | 37 |
| Valve guide installer | 0800-022102-922-002 | 38 |
| Piston ring compressor | 0800-040003-922-001 | 41 |
| Piston pin circlip installer | 0800-040005-922-001 | 45 |

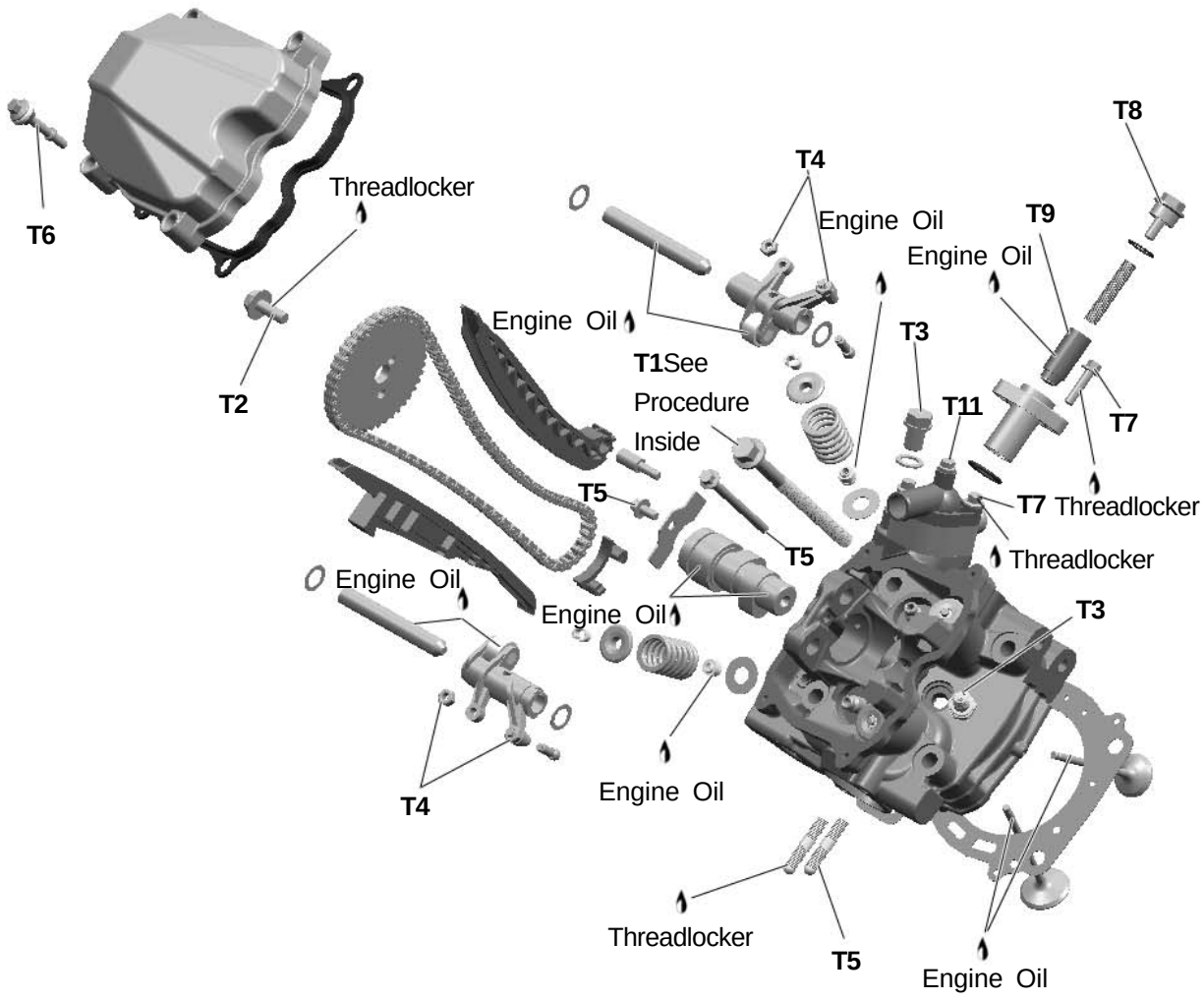
## SERVICE PRODUCTS

| Description | P/N | Page |
|---|---|---|
| Coolant | | |
| Engine oil | | |
| Loctite | | 38 |

## INTAKE MANIFOLD



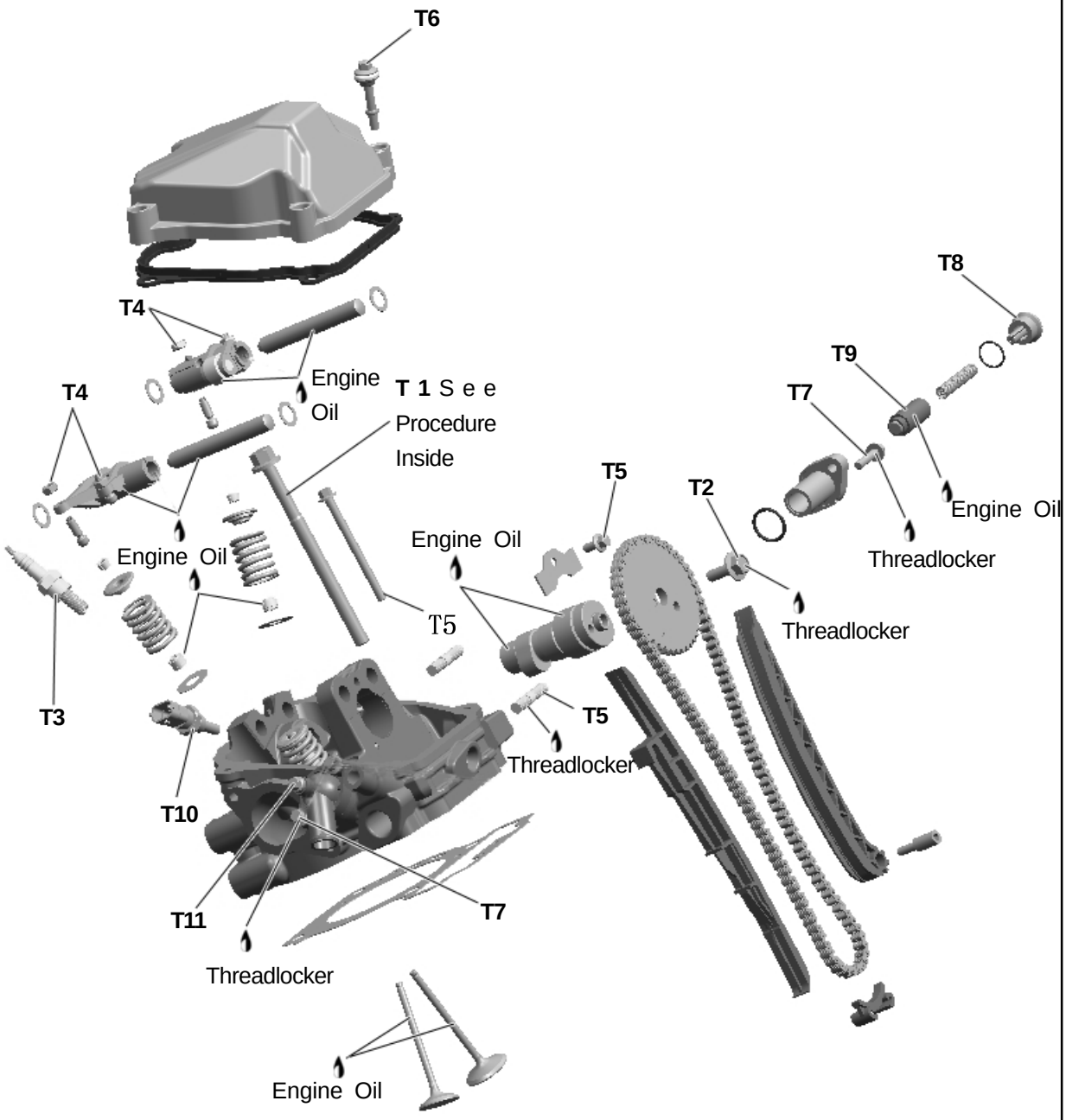
## CYLINDER HEAD I




| | |
|---|---|
| **T1** | 60**N.m** (44 **lbf.ft**) |
| **T2** | 30**N.m** (22 **lbf.ft**) |
| **T3** | 20**N.m** (15 **lbf.ft**) |
| **T4** | 12**N.m** (106 **lbf.in**) |
| **T5** | 10**N.m** (89 **lbf.in**) |
| **T6** | 7**N.m** (62 **lbf.in**) |

| | |
|---|---|
| **T7** | 6**N.m** (53 **lbf.in**) |
| **T8** | 4.5**N.m** (40 **lbf.in**) |
| **T9** | 0.1**N.m** (0.89 **lbf.in**) |
| **T10** | 16**N.m** (141 **lbf.in**) |
| **T11** | 5**N.m** (44 **lbf.in**) |

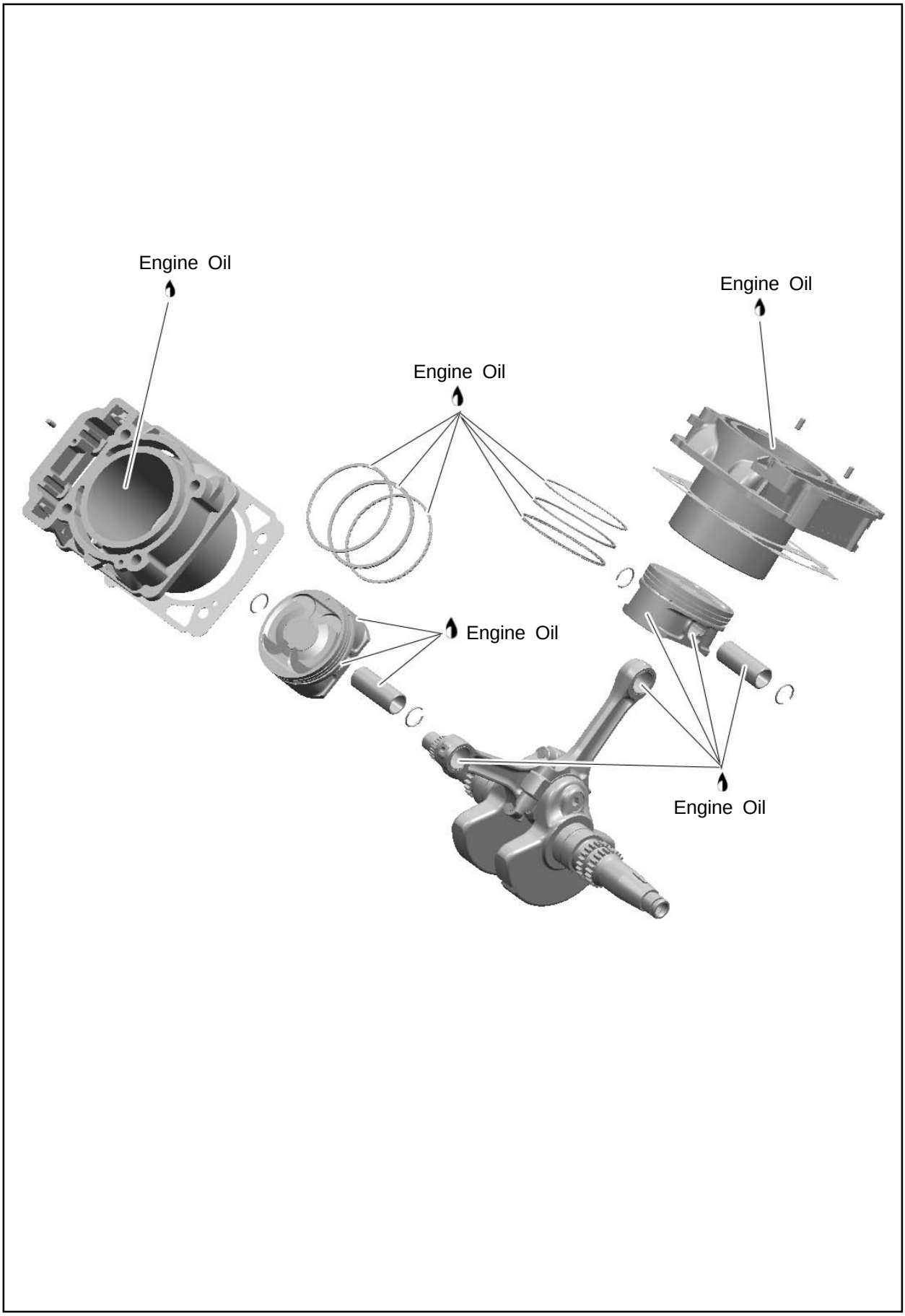
## CYLINDER HEAD II




| | |
|---|---|
| **T1** | 60**N.m** (44 **lbf.ft**) |
| **T2** | 30**N.m** (22 **lbf.ft**) |
| **T3** | 20**N.m** (15 **lbf.ft**) |
| **T4** | 12**N.m** (106 **lbf.in**) |
| **T5** | 10**N.m** (89 **lbf.in**) |
| **T6** | 7**N.m** (62 **lbf.in**) |

| | |
|---|---|
| **T7** | 6**N.m** (53 **lbf.in**) |
| **T8** | 4.5**N.m** (40 **lbf.in**) |
| **T9** | 0.1**N.m** (0.89 **lbf.in**) |
| **T10** | 16**N.m** (141 **lbf.in**) |
| **T11** | 5**N.m** (44 **lbf.in**) |

## CYLINDERS AND PISTONS



## GENERAL

Components which are identical for both cylinders/ cylinder heads are identified in the two exploded views by the same number. Components which are different or which are, for instance, present of one of the cylinders/cylinder heads but not on the other, have different numbers. The information given below always relates as a genaral rule.

Special reference is made in the text to work instructions which are not the same for cylinder no. 1 and cylinder no.2.

When diagnosing an engine problem, always diagnose cylinder 1 and 2 respectively.

Always place the vehicle on a level surface.

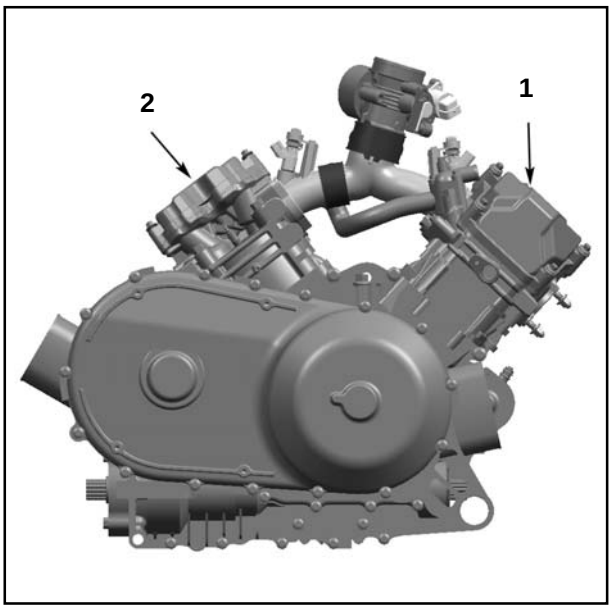
**NOTE:** *For a better understanding, the many illustrations are taken with engine out of vehicle. To perform the following instructions if it is not necessary to remove engine from vehicle.*

Always disconnect BLACK(-) cable from the battery, then RED(+) cable before working on the engine.

Even if the removal of many parts is not necessary to reach another part, it is recommended to remove these parts in order to check them.

During assembly/installation, use the torque values and service products as in exploded views.

Clean threads before applying a threadlocker.Refer to ***LUBRICANTS AND SERVICE PRODUCTS*** at the beginning of this manual for complete procedure.




*1.Cylinder 1 (Front)*
*2.Cylinder 2 (Rear)*

**WARNING**

**Torque wrench must be used when tightening. Locking devices(e.g.: locking tabs, elastic stop nuts,cotter pin,etc.)must be replaced with new ones.**

When disassembling parts that are duplicated in the engine,(e.g.: values), it is strongly recommended to note their position(PTO/MAG side, front/rear cylinder) and to keep them as a “group”. If you find a defective component, it would be much easier to find the cause of the failure among its group of parts(e.g.: you found a worn valve guide. A bent spring could be the cause and it will be easy to know which one among the springs is the cause to replace it if you grouped them at disassembly). Also, since used parts have matched together during the engine operation, they will keep their matched fit when you reassemble them together within their “group”.

## MAINTENANCE

## VALVE ADJUSTMENT

**NOTE:** *Check and adjust valve clearance only when engine is cold.*

Remove valve cover.

Before checking or adjusting the valve clearance, turn crankshaft to TDC ignition of the respective cylinder, see ***CAMSHAFT***.

Use feeler gauge to check the valve clearance.

| Valve Clearance | |
|---|---|
| Exhaust | 0.11-0.19mm(0.0043-0.0075in) |
| Intake | 0.06-0.14mm(0.0024-0.0055in) |

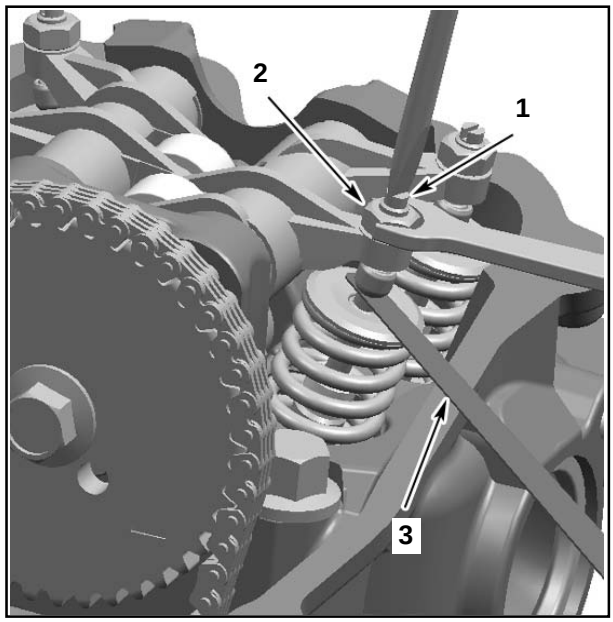
If the valve clearance is out of specification, adjust valves as folows.

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

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

Repeat the procedure for each valve.

Before installing valve cover, recheck valve clearance.




*1.Adjustment Screw*

*2.Locking Nut*

*3.Feeler Gauge*

## INSPECTION

### LEAK TEST

Before performing the cylinder leak test, verify the following:

-clamp(s) tightness

-radiator and hoses

**NOTE:** *For best accuracy, the leak test should be done with the engine at normal operating temperature.*

**WARNING**

**Prevent burning yourself on hot engine parts.**

### Preparation

Disconnect battery

**WARNING**

**Always respect this order for disassembly; disconnect BLACK(-)cable first.**

Remove radiactor cap.

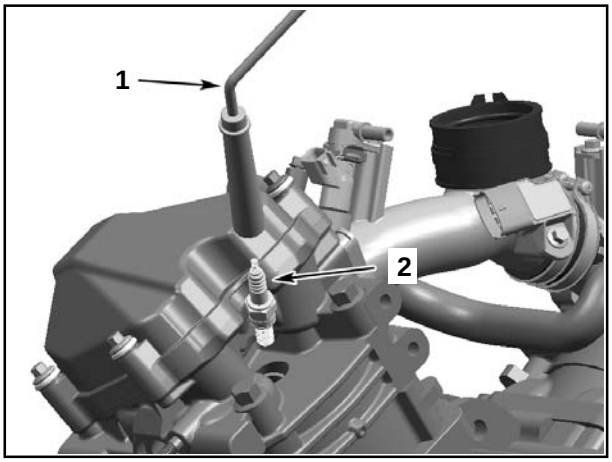
**WARNING**

**To prevent burning yourself only remove the radicator cap by wearing the appropriate safety equipment.**

Remove any parts to have access to engine cylinder heads.

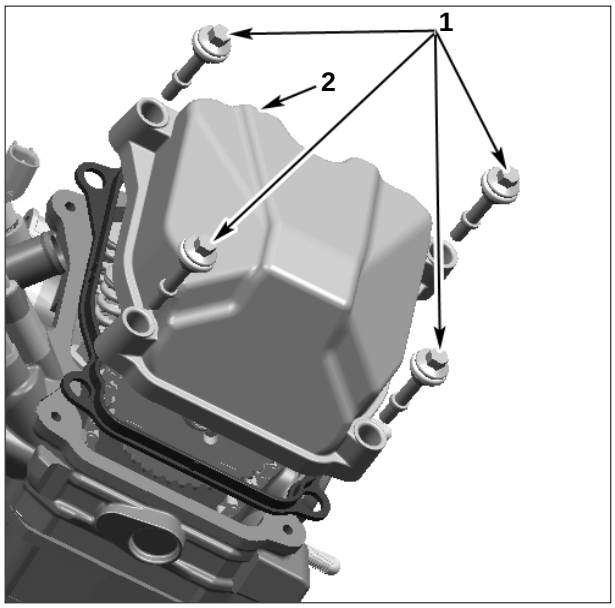
Unplug spark plug cable.

Clean spark plug area and remove spark plug from cylinder head.




*1.Spark Plug Cable*
*2.Spark Plug*

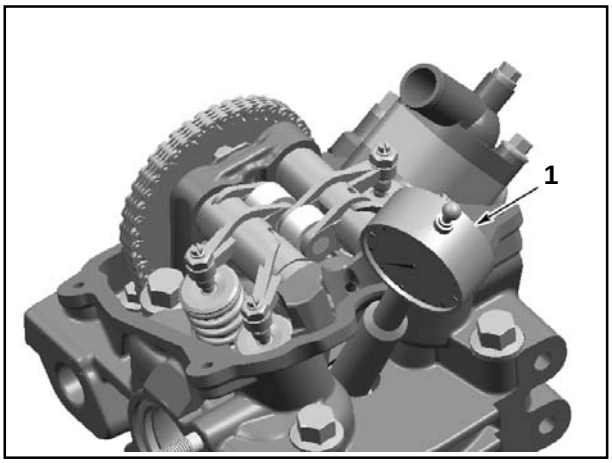
Remove valve cover.




*1.Valve Cover Screws*
*2.Valve Cover*

Rotate crankshaft until piston is at ignition TDC(Refer to ***CAMSHAFT TIMING*** in this chapter).

Using the dial gauge, turn the crankshaft and set the piston to precisely ignition TDC.

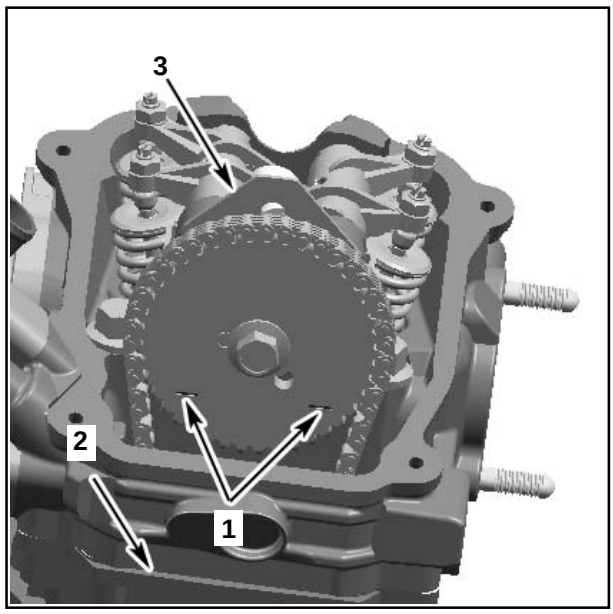



*1.Dial Gauge*

**NOTE:** *If a dial gauge is not available, use a screw-driver or another similar suitable tool.*

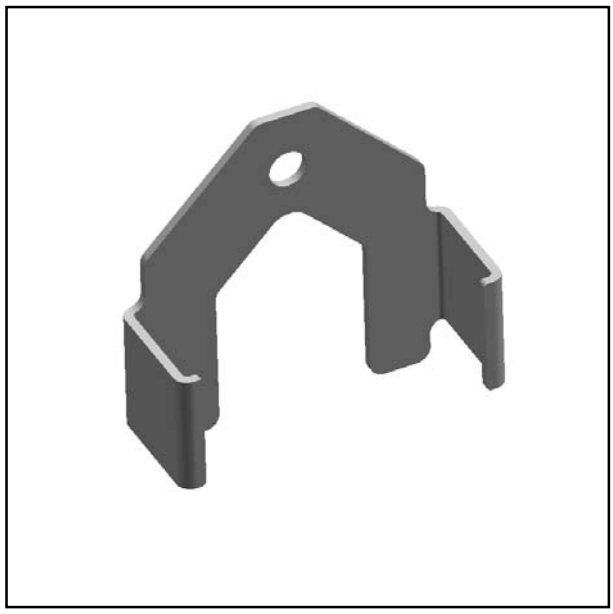
**CAUTION: Do not scratch or damage piston/ cylinder surface.**

**NOTE:** *At ignition TDC the marks on the camshaft timing gear have to be parallel to cylinder head base as per following illustration.*




*1.Marks on Camshaft Timing Gear*
*2.Cylinder Head Base*
*3.Camshaft Locking Tool*

Lock camshaft at TDC by using camshaft locking tool (0800-024001-922-001).



*Camshaft Locking Tool*

## LEAK TEST

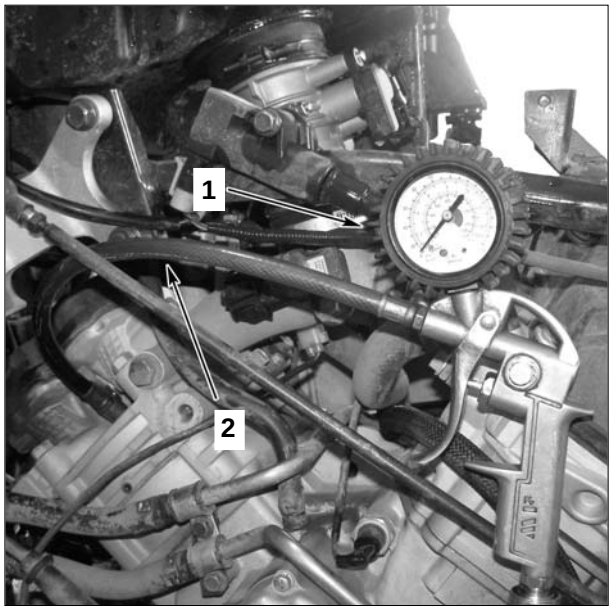
Connect to adequate air supply.
Set needle of measuring gauge to zero.

**NOTE:** *All testers have specific instructions on gauge operation and required pressure.*

Install gauge adapter into previously cleaned spark plug hole.
Supply combustion chamber with air pressure.

Note the amount or percentage of leakage(depending on tester).

| Leakage Percentage | Engine Condition |
|---|---|
| 0%-15% | Excellent condition |
| 16%-25% | Good condition |
| 26%-40% | Fair Condition |
| ⩾41% | Poor condition, diagnose and repair engine |




*1.Leak Tester*
*2.Air Supply Hose*

## Diagnosis

Listen for air leaks:
-air escaping on intake port/throttle body means leaking intake valve(s)
- air escaping on exhaust port means leaking exhaust valve(s)
-air bubbles out of radiator means leaking cylinder head gascket
-air/oil escaping from crankcase means damaged gascket and/or loosened screws.
-air/coolant escaping from cylinder/head means damaged gascket(s) and/or loosened screws(refer to ***INTAKE MANIFOLD,CYLINDER HEAD AND CYLINDER***)
-air escaping into crankcase area means excessively worn cylinder and/or broken piston rings(refer to ***INTAKE MINIFOLD, CYLINDER HEAD AND CYLINDER***).

**NOTE:** *For all the checkpoints mentioned above, see the appropriate engine section to diagnose and repair the engine.*

## Reassembly

Reverse the preparation procedure. Ensure to respect torque values and use of appropriate products/ lubricants. Refer to exploded views in other sections of this manual as required.

## PROCEDURES

## INTAKE MANIFOLD

### Intake Manifold Removal

Disconnect fuel pump control plug.

Release fuel pressure by running engine until it runs out of gas.

Remove seat, both side panels and fender. Refer to ***VEHICLE BODY AND MUFFLER***.

**WARNING**

**The fuel hose may be under pressure. Cover the fuel line connection with an absorbent rag. Slowly disconnect the fuel hose to release the pressure. Wipe off any fuel spillage.**

Remove the cover of air filter housing.

Remove air filter.

Unscrew bolts securing the air filter housing to frame.

Unscrew the lower clamp retaining the manifold adapter between throttle body and intake manifold.

Remove teh manifold adapter.

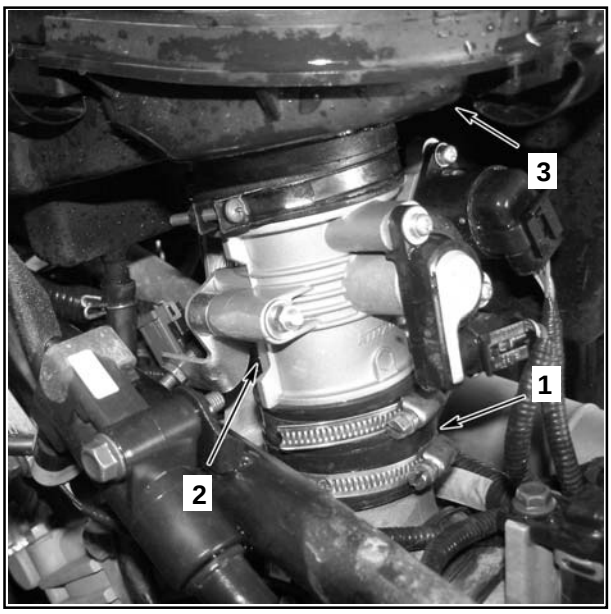
Unplug fuel lines from injectors.

Disconnect both injectors.

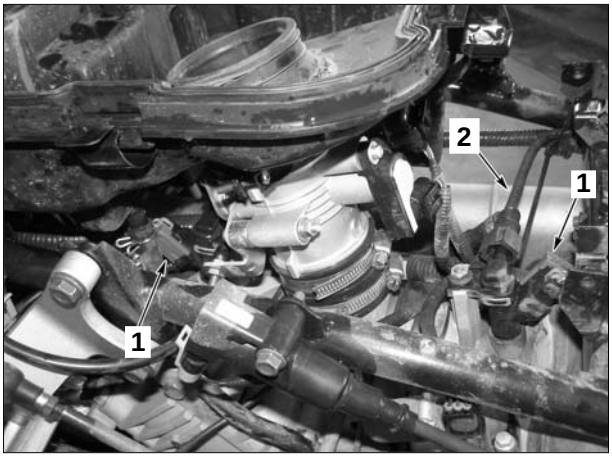
Disconnect the manifold air pressure temperature sensor(**T-MAP Sensor**).

Unscrew intake manifold from cylinders.

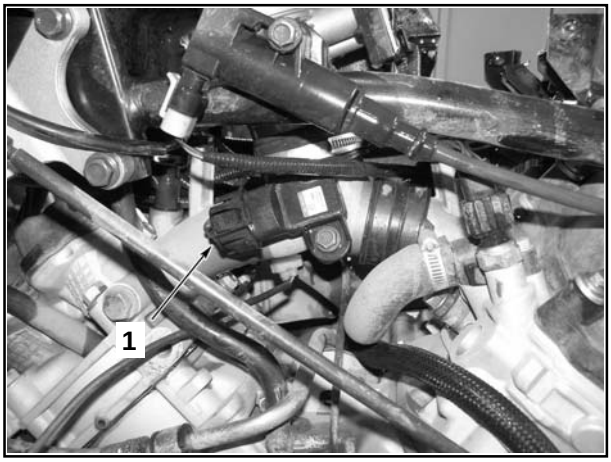
Remove intake manifold from vehicle.




*1.Manifold Adapter*
*2.Throttle Body*
*3.Air Filter Housing*




*1.Injector Connector*
*2.Fuel Line*




*1.T-MAP Sensor*

### Intake Manifold Inspection

Check intake manifold for cracks, warping at flanges or any other damage. Replace if necessary.

### Intake Manifold Installation

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

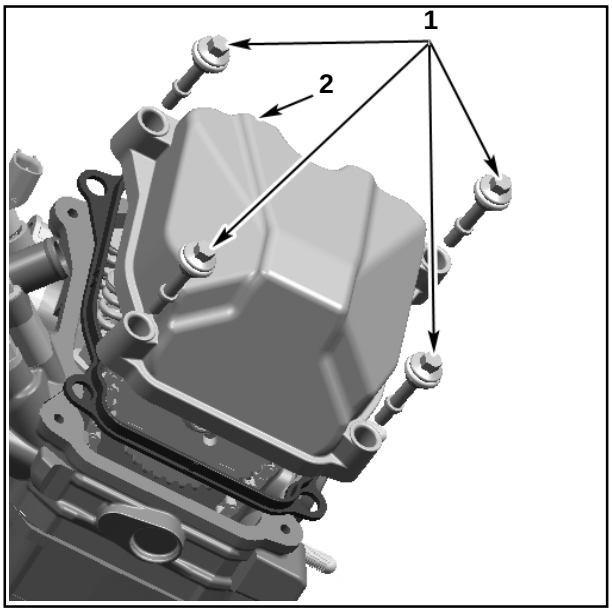
Torque manifold screws to 20**N.m**(15 **lbf.ft**)one cylinder at a time.

Re-enable fuel pump control plug.

## VALVE COVER

### Cover Removal

Remove distance screws of valve cover.



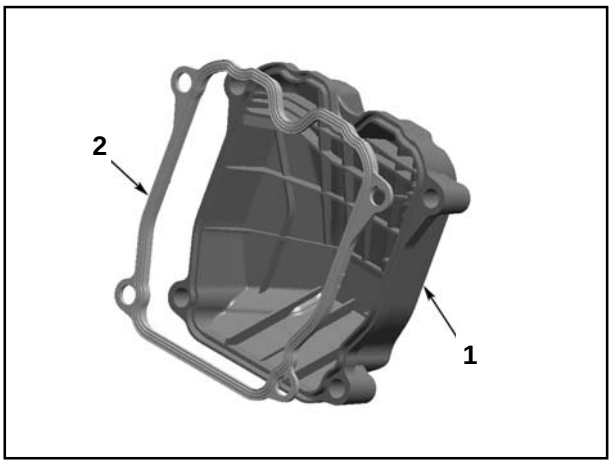

*1.Distance Screws*
*2.Valve Cover*

Remove valve cover and gasket.

Repeat the procedure for the other valve cover if required.

### Cover Inspection

Check the gasket on the valve cover if it is brittle, cracked or hard. If so, replace the gasket.




*1.Valve Cover*
*2.Gasket*

### Cover Installation

For installation, reverse the removal procedure. Torque the cylinder screws in a crisscross sequence.

## TIMING CHAIN TENSIONER

**NOTE:** *Before removal and installation, make sure that the respective cylinder is set to TDC ignition. Refer to* ***CAMSHAFT****.*

### Tensioner Removal

**WARNING**

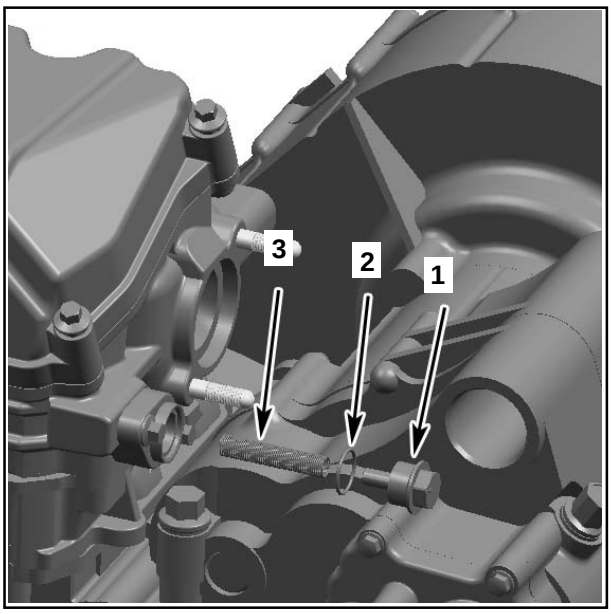
**Timing chain tensioner is spring loaded. Never perform this operation immediately after the engine has been run because the exhaust system can be very hot. Wait until exhaust system is warm or cold.**

Remove chain tensioner plug.
Unscrew chain tensioner plug.
Remove O-ring and spring.

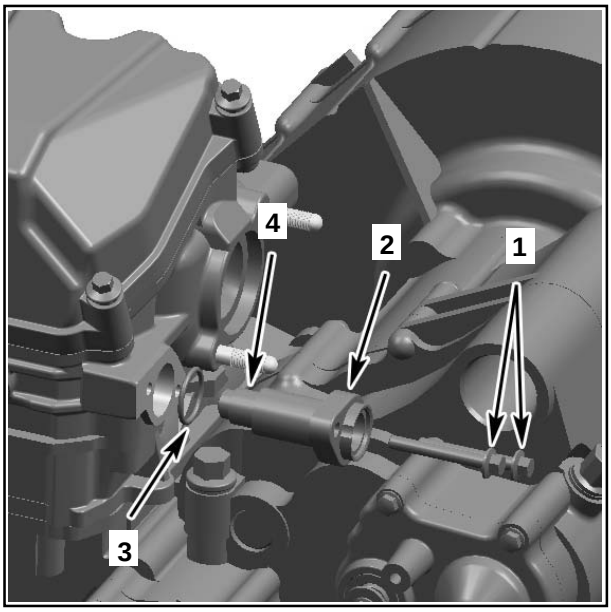
Unscrew screws retaining chain tensioner housing.
Remove chain tensioner housing with O-ring.
Screw tensioner plunger into housing several turns.

### Tensioner Inspection

Check the housing for cracks or other damages. Replace if any.
Check chain tencioner plunger for free movement and/or scoring.
Check if O-ring are brittle, cracked or hard. Replace if any.
Check spring condition. Replace if broken or worn.




*1.Chain Tensioner Screw*
*2.O-ring*
*3.Spring*




*1.Chain Tnesioner Screws*
*2.Chain Tnesioner Housing*
*3.O-ring*
*4.Chain Tnesioner Plunger*

## Tensioner Installation

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

**NOTE:** *Before installing the chain tensioner, make sure that the camshaft timing gear can be moved back and forth.*

Apply engine oil on the plunger before installing.

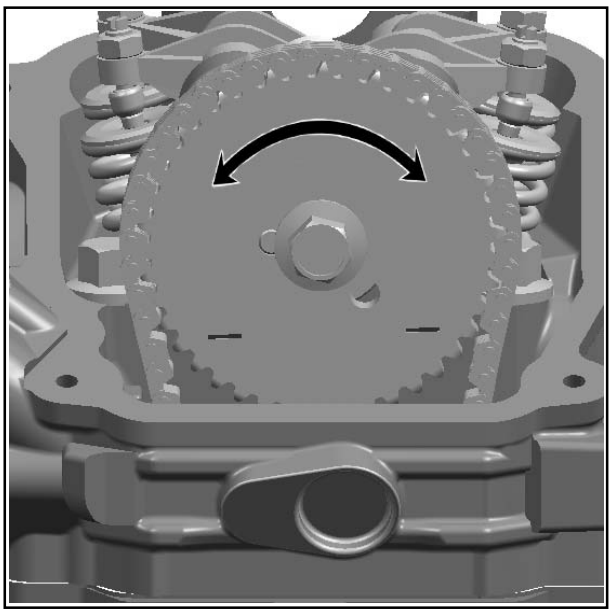
**NOTE:** Slightly screw in the plunger until the timing chain allows no more back and forth movement of the camshaft timing gear. then screw in the plunger an additional 1/8 turn to reach the required torque of 0. 1**N.m**(0.9 **lbf.in**).

**CAUTION:Improper adjustment of the timing chain will lead to severe engine damage.**

Fit spring on one side into the slot of the plug screw and on the other side into the plunger. Turn spring only clockwise in order to fit the spring end into the notch of the plunger and to avoid loosening the plunger during spring installation. Do not preload the spring.

**NOTE:** *Do not forget to place the O-ring on chain tensioner plug.*

Then compress the spring and screw in the plug screw. Finally, tighten the plug screw to 4.5**N.m**(40 **lbf.in**).



*Move Gear Back and Forth*

## CAMSHAFT TIMING GEAR

### Gear Removal

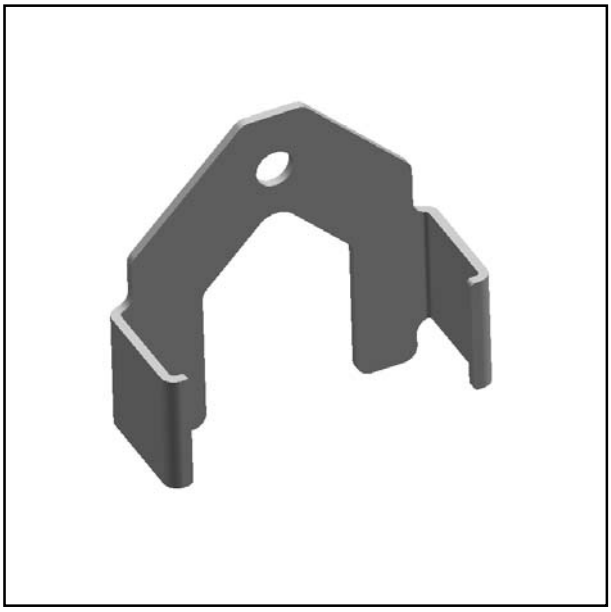
Remove valve cover.

Turn crankshaft to TDC ignition of the respective cylinder, see ***CAMSHAFT***.

Unscrew timing chain tensioner.

Remove camshaft timing gear screw.

To prevent timing chain stretching during removal of camshaft timing gear screw, use the camshaft locking tool(0800-024001-922-001).



*Camshaft Locking Tool*

Remove camshaft timing gear.

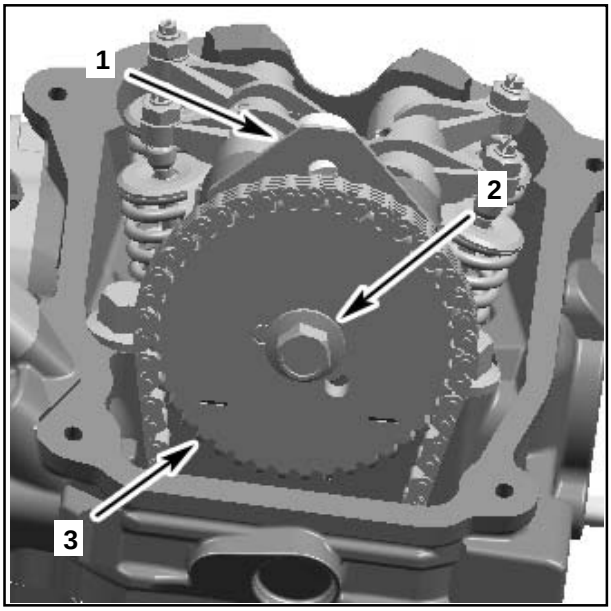
**NOTE:** *Secure timing chain with a retaining wire.*

### Gear Inspection

Check camshft timing gear for wear or deterioration.

If gear is worn or damaged, replace it as a set(camshaft timing gear and timing chain).

For crankshaft gear, refer to Chapter 8, see ***CRANKSHAFT***.




*1.Camshaft Locking Tool*

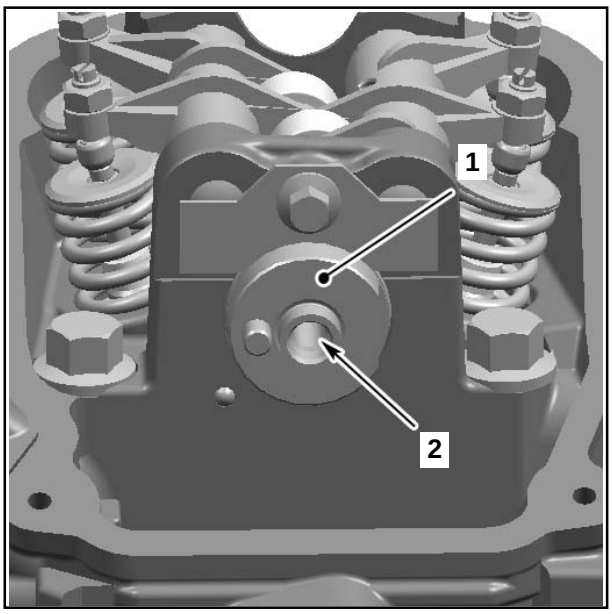
*2.Camshaft Timing Gear Screw*

*3.Camshaft Timing Gear*

### Gear Installation

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

Clean mating surface and threads of camshaft prior to assembling camshaft timing gear.

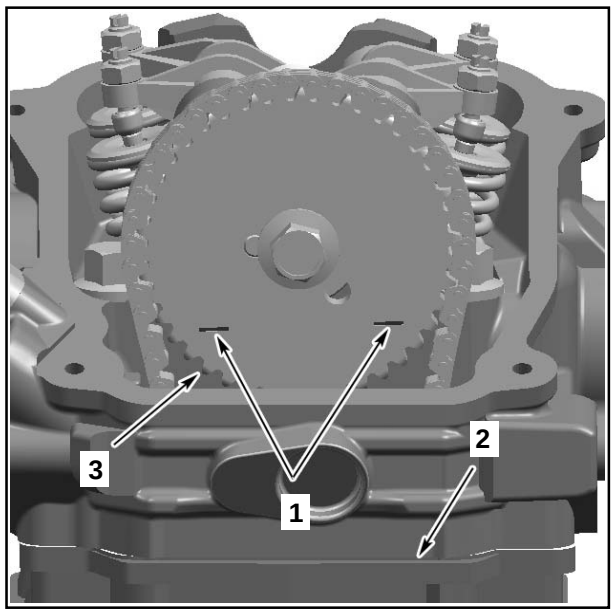



*1.Mating Surface on Camshaft*
*2.Threads for Camshaft Screw*

Camshaft timing gear and crankshaft must be at TDC ignition before installing the timing chain.

**CAUTION: Crankshaft and camshaft must be locked on TDC ignition position to place camshaft timing gear and timing chain in the proper position.**

The printed marks on the camshaft timing gear must be parallel to the cylinder head base. See the following illustration for a proper positioning.

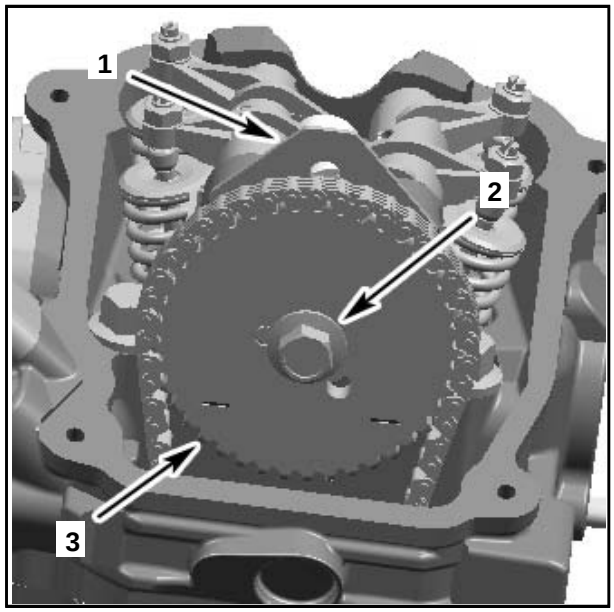



*1.Marks on Camshaft Timing Gear*
*2.Cylinder Head Base*
*3.Camshaft Timing Gear*

When the camshaft timing gear and the timing chain are installed, remove the crankshaft locking bolt as well as the camshaft locking tool.

**NOTE:** *Before installing the camshaft screw adjust the chain tensioner(see **CHAIN TENSIONER** below) and check again if marks on the timing gear are parallel to cylinder head base.*

Reinstall all other removed parts.




*1.Camshaft Locking Tool*
*2.Camshaft Screw*
*3.Camshaft Timing Gear*

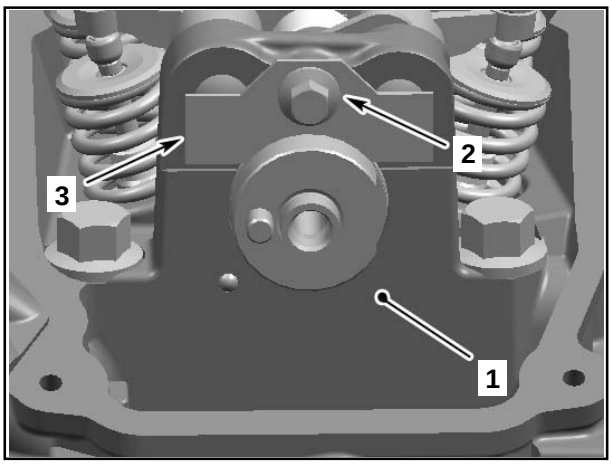
## ROCKER ARM

### Rocker Arm Removal

Remove valve cover.

Remove chain tensioner and camshaft timing gear.

Remove screw and camshaft retaining plate.



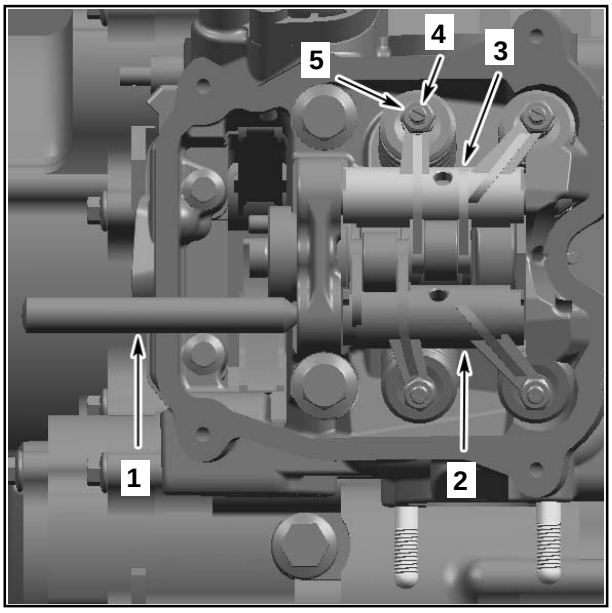

*1.Cylinder Head*

*2.Screw*

*3.Camshaft Retaining Plate*

Remove rocker arm shafts.

Remove rocker arm assembly(exhaust side and intake side) with adjustment screws and nuts.




*1.Rocker Arm Shaft*

*2.Rocker Arm,Exhaust*

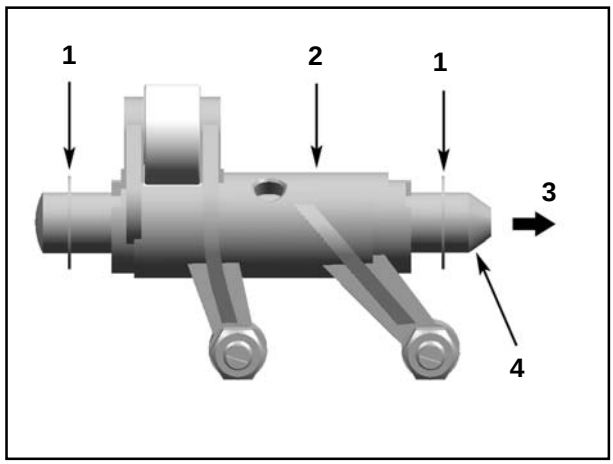
*3.Rocker Arm,Intake*

*4.Adjustment Screw*

*5.Locking Nut*

Remove thrust washers.

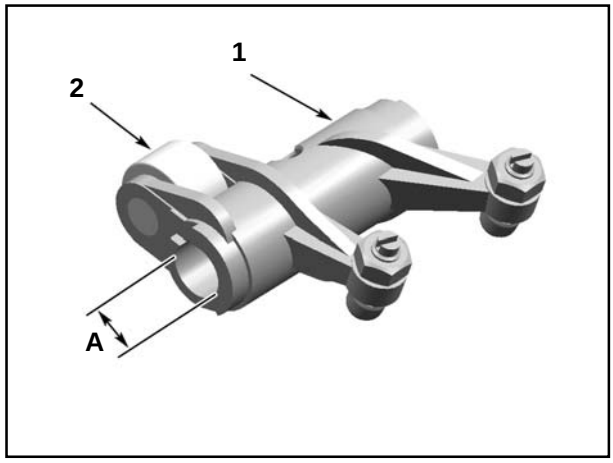
**CAUTION: Pay attention not to lose thrust washers or drop them into the timing chain compartment.**




*1.2 Thrust Washers*
*2.Rocker Arm,Exhaust*
*3.Cylinder Head—Spark Plug Side*
*4.Big Taper to Spark Plug Side*

## Rocker Arm Inspection

Inspect each rocker arm for cracks and scored friction surfaces. If any, replace rocker arm assembly. Check the rocker arm rollers for freee movement, wear and excessive radial play. Replace rocker arm assembly if necessary.

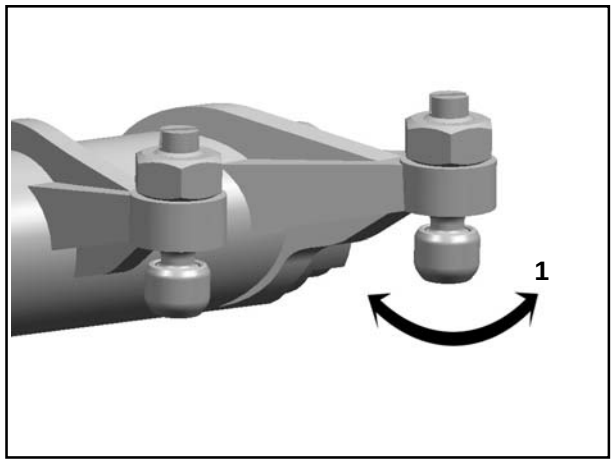



*1.Rocker Arm,Exhaust*
*2.Roller*
*A.Bore for Rocker Arm Shaft*

Check rocker arm bore diameter. If diameter is out of specification, change rocker arm assembly.

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

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



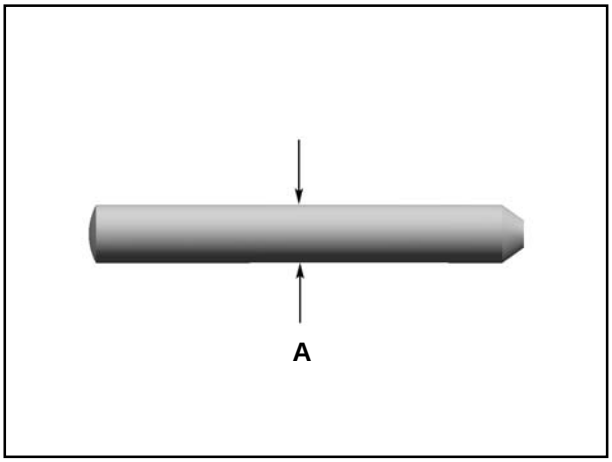

*1.Free Movement of Adjustment Screw Top*

### Rocker Arm Shaft

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

| Rocker Arm Shaft Diameter | |
|---|---|
| New | 11.973-11.984mm (0.4714-0.4718in) |
| Service Limit | 11.960mm(0.4709in) |

Any area worn excessively will require parts replacement.

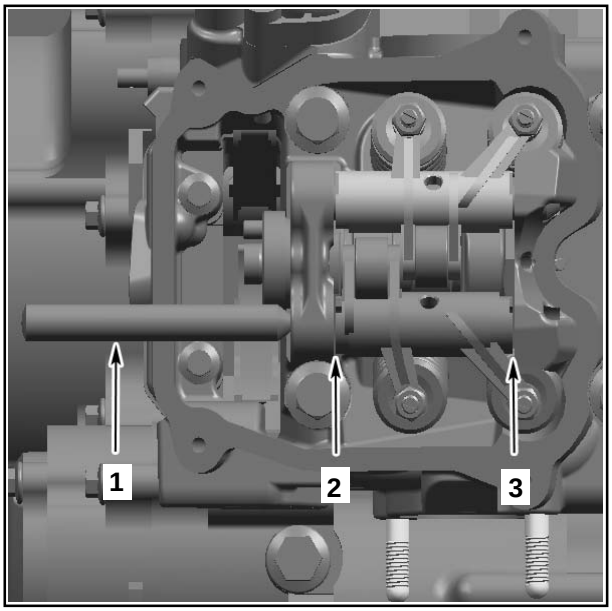



*A.Measure rocker arm shaft diameter here*

### Rocker Arm Installation

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

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




*1.Rocker Arm*
*2.Thrust Washer(Timing Chain Side)*
*3.Thrust Washer(Spark Plug Side)*

Place the other thrust washer and push rocker arm shaft to end position.

### TIMING CHAIN

Refer to Chapter 8, see ***TIMING CHAIN***.

## CYLINDER HEAD

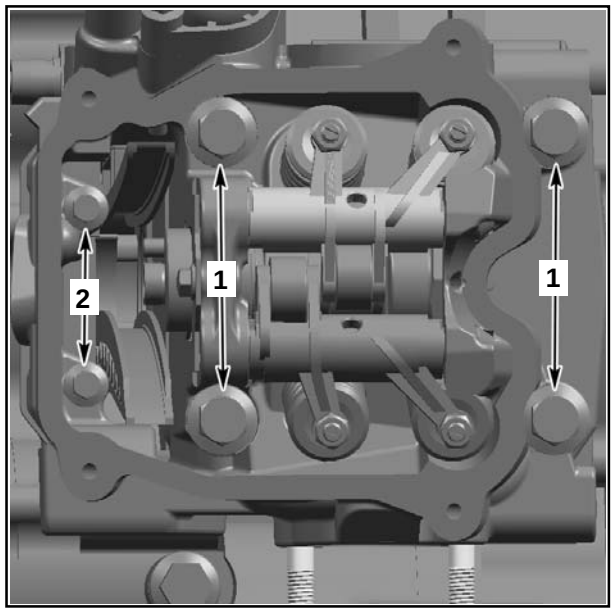
### Cylinder Head Removal

The removal procedure is the same for both cylinder heads.
Drain coolant(refer to ***COOLING SYSTEM***).

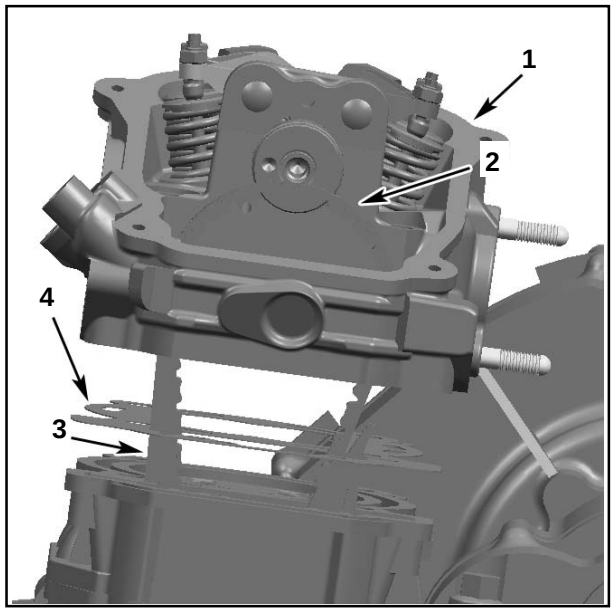
**NOTE:** *Before removing cylinder head, blow out remaining coolant by air pressure.During cylinder head removal, the remianing coolant in cylinder head could overflow into the engine and a little quantity of coolant could drop into engine. In this case, the engine oil will be contaminated.*

Disconnect spark plug wire.
Disconnect temperature sensor connector, located at rear cylinder head.
Remove both side panels and both inner fenders(refer to ***VEHICLE BODY AND MUFFLER***).
Remove exhaust pipe springs or exhaust pipe clamp.
Unscrew exhaust pipe nuts
Unplug radiator inlet hose.
Remove air filter.
Remove throttle body.
Remove the intake manifold(see ***INTAKE MANIFOLD*** above).
Remove the chain tensioner(see ***CHAIN TENSIONER*** above).
Remove the valve cover and its gasket(see ***VALVE COVER*** above).
Remove thecamshaft timing gear.
Unscrew cylinder head screws M6 and M10 retaining cylinder head and cylinder to cylinder base.

Pull up cylinder head.
Remove chain guide.
Remove the cylinder head gasket and scrap it.



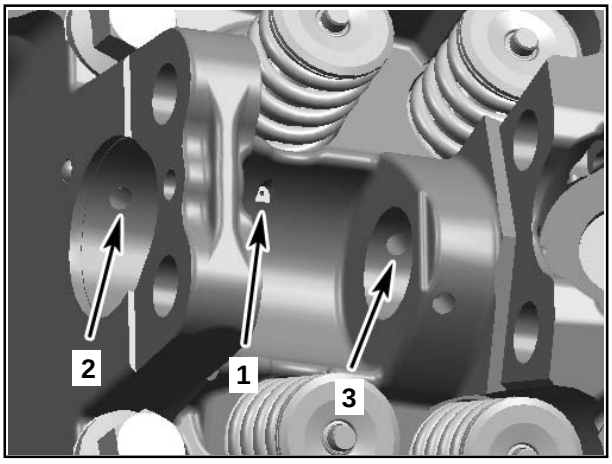

*1.Cylinder Head Screws M10*
*2.Cylinder Head Screws M6*




*1.Cylinder Head*
*2.Timing Chain*
*3.Chain Guide*
*4.Cylinder Head Gasket*

### Cylinder Head Inspection

Inspect timing chain guide for wear, cracks or other damages, Replace if any.
Check for cracks between valve seats, if any, replace cylinder head.
Check mating surface between cylinder and cylinder head for contamination, if any, clean both surfaces.
Clean oil support through the cylinder head from contamination.

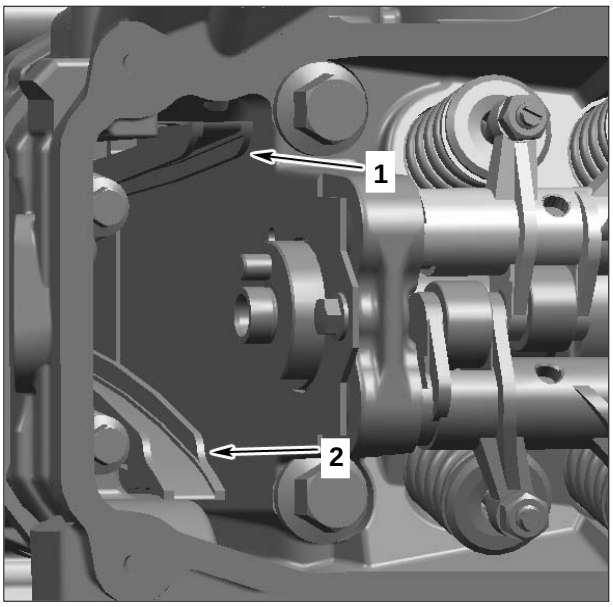



*1.Oil Port to lubricate Camshaft Lobes Intake/Exhaust*
*2.Oil Supply to Camshaft Bearing Journal Timing Chain Side*
*3.Oil Supply to Camshaft Journal Spark Plug Side*

### Cylinder Head Installation

**NOTE:** *The cylinder heads are not identical in design. Do not invert the cylinder heads at assembly.*

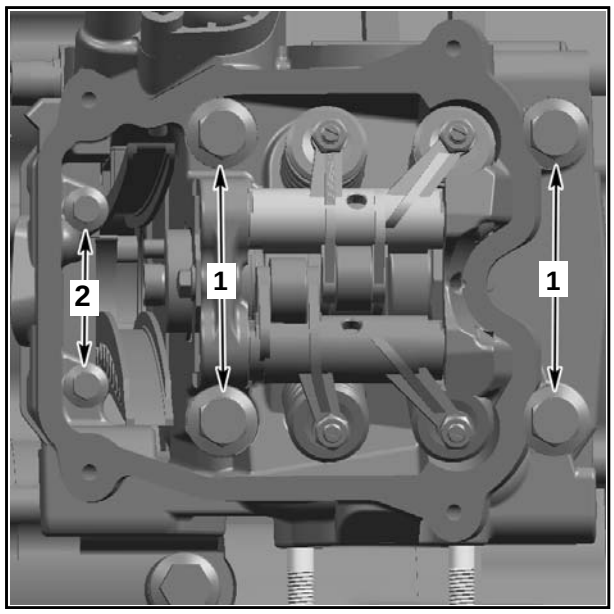
For installation, reverse the removal procedure. Pay attention to the following details.
Ensure dowel pin are in place.
**CAUTION: Chain guide has to be fixed between cylinder and cylinder head.**




*1.Chain Guide(fiexed between cylinder and cylinder head)*
*2.Chain Tensioner Guide(mounted in Crankcase)*

Install a **NEW** cylinder head gasket.
First, torque cylinder head screws M10 in crisscross sequence to 20N.m(15 lbf.ft), then finish by tightening to 60**N.m**(44 **lbf.ft**).
Install cylinder head screws M6.

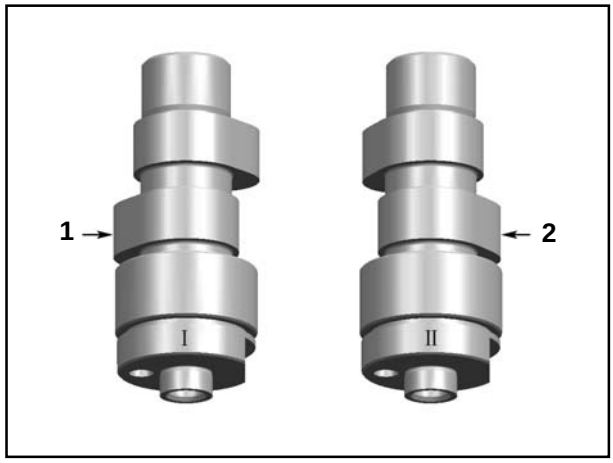
Check chain guide for movement.




*1.Cylinder Head Screws M10*
*2.Cylinder Head Screws M6*

## CAMSHAFT

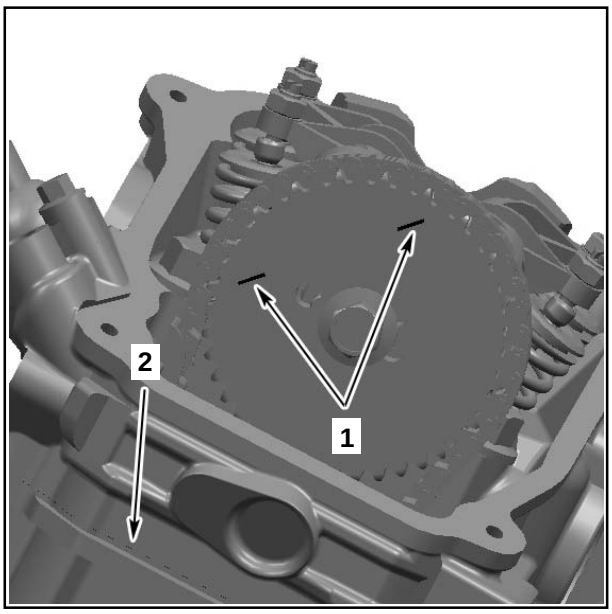
**NOTE:** *The engine is equipped with two different camshafts.*




*1.Camshaft of Cylinder 1*
*2.Camshaft of Cylinder 2*

## Camshaft Timing

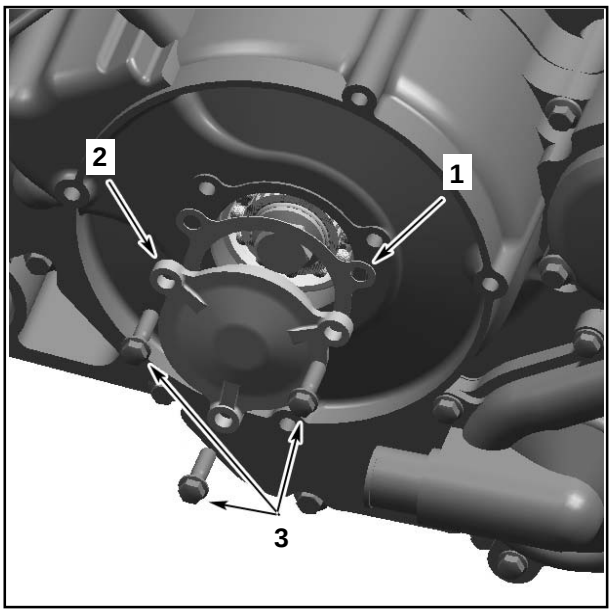
**NOTE:** *If a piston(of cylinder 1 or 2) is set to TDCignition, the camshaft timing gear of the opposite cylinder must be in the following position.*




*1.Marks on Timing Gear of Opposite Cylinder*
*2.Cylinder Head Base*

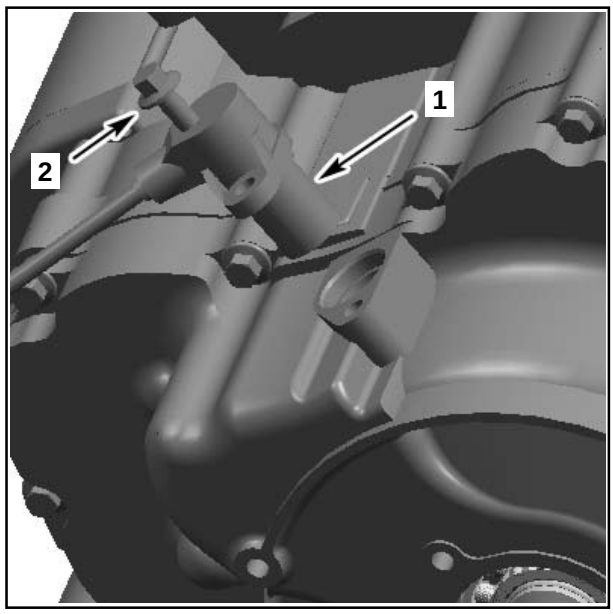
## Camshaft Timing Cylinder 2

Turn crankshaft until piston is at TDC ignition as follows
Remove spark plug of both cylinders.
Remove valve cover of both cylinders.
Remove plug screw cover.



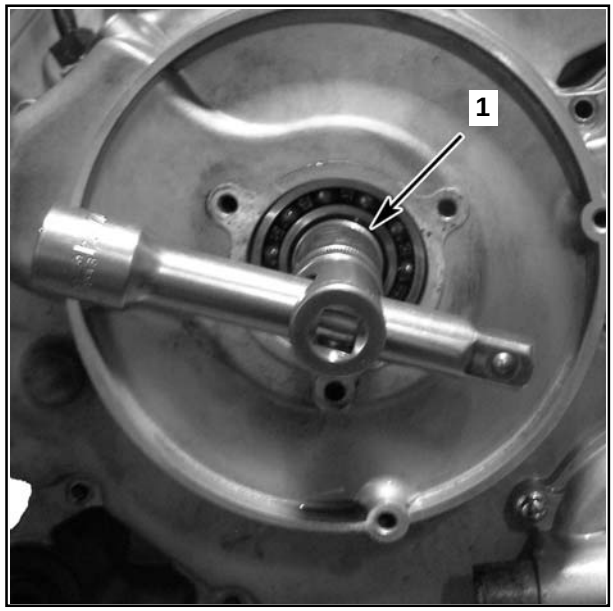

*1.Gasket*
*2.Cover*
*3.Screws*

Remove the crankshaft position sensor (CPS).



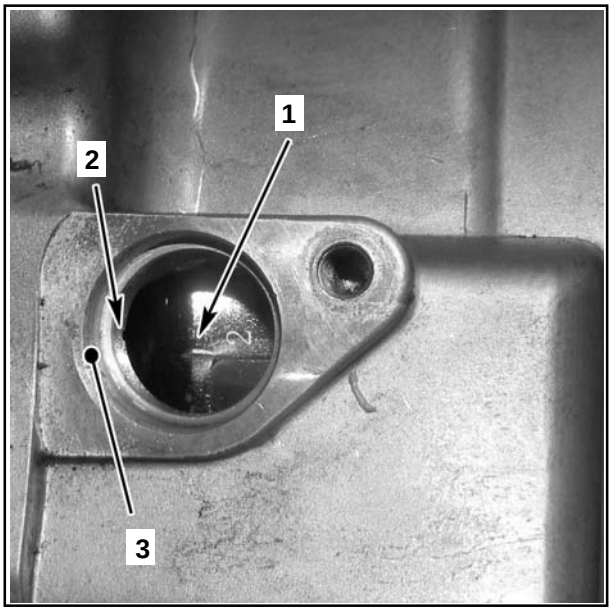

*1.Crankshaft Position Sensor(CPS)*
*2.Screw*

Use a 18mm socket to turn crankshaft until pistion 2 (rear) is at TDC ignition.



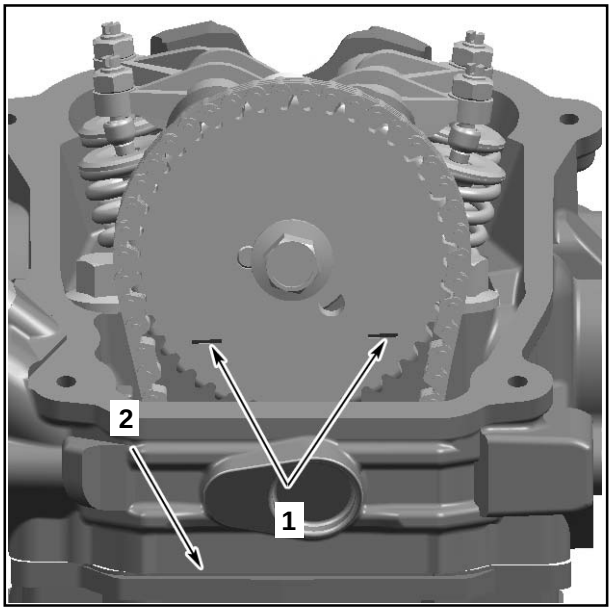

*1.18mm Socket*

When rear piston is at TDC ignition, marks on magneto flywheel" 2 "and on the left crankcase cover(centre of bore) are aligned.



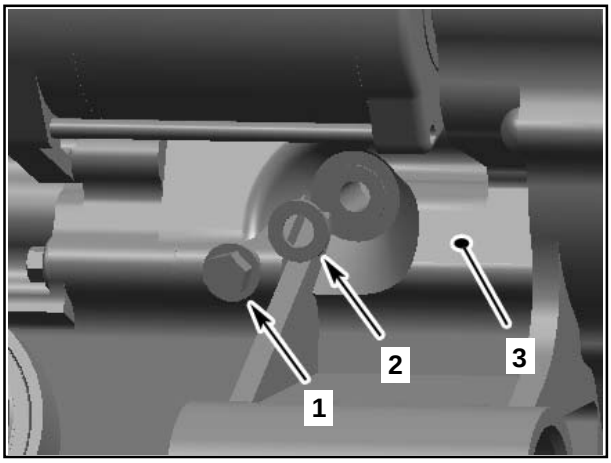

*1.Mark "2" on MAG Flywheel*
*2.Notch on MAG Cover*
*3.CPS Location*

At TDC ignition, the printed marks on the camshaft timing gear have to be parallel to cylinder head base.




*1.Marks on Camshaft Timing Gear*
*2.Cylinder Head Base*

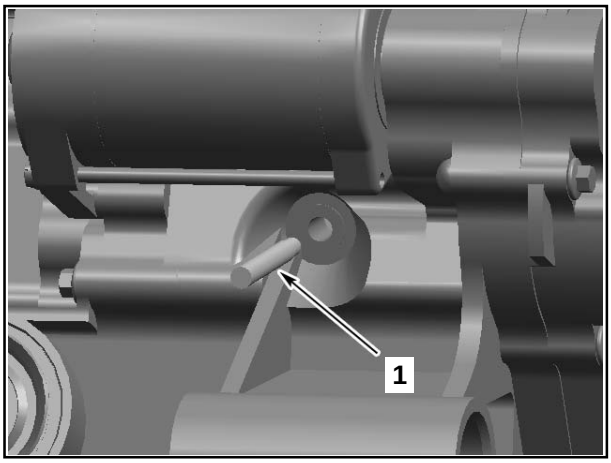
To lock crankshaft at TDC ignition, proceed as follows.
Remove from crankcase plug screw with sealing ring.




*1.Plug Screw*
*2.Sealing Ring*
*3.Crankcase PTO Side,Front Side*

Lock crankshaft with the crankshaft locking bolt ( 0800-041000-922-001).

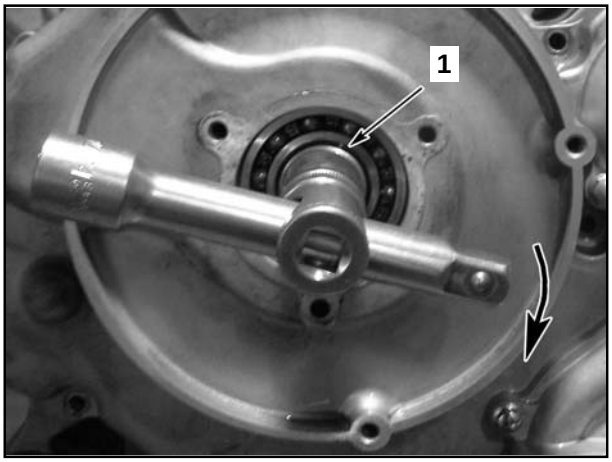
**NOTE: Make sure the locking bolt engages in the groove of the crankshaft.**




*1.Crankshaft Locking Bolt*

### Camshaft Timing Cylinder 1

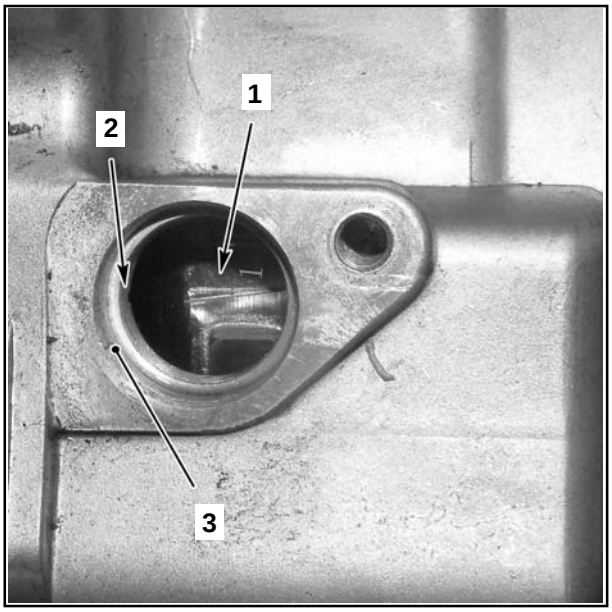
Turn cylinder 2 to TDC ignition, see *Camshaft Timing, Cylinder 2*.




*1.18mm Socket*
*2.Turn Crankshaft 280° Counterclockwise*

**NOTE:** *Do not lock crankshaft.*

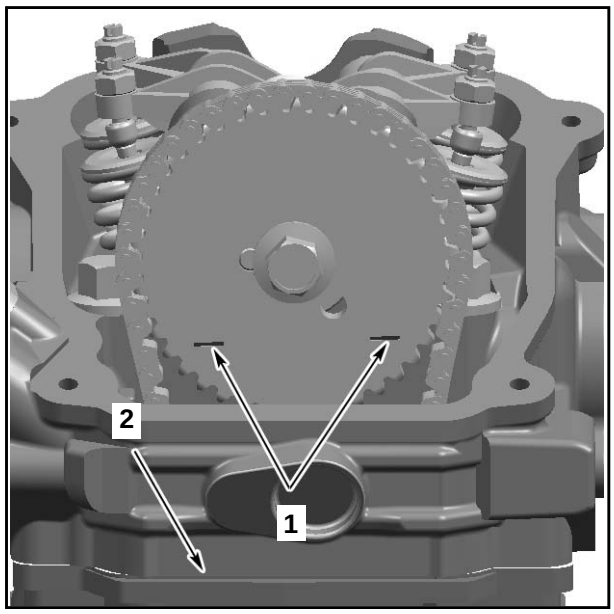
Use a 18mm socket, turn crankshaft 280° counterclockwise, until marks on magneto flywheel and left crankcase cover are aligned.




*1.Mark "1" on MAG Flywheel*
*2.Notch on MAG Cover*
*3.CPS Location*

**NOTE:** *At TDC ignition, the printed marks on the camshaft timing gear have to be parallel to cylinder head base as per following illustration.*

**CAUTION: Crankshaft can not be locked at cylinder 1 TDC ignition.**




*1.Marks on Camshaft Timing Gear*
*2.Cylinder Head Base*

### Camshaft Removal

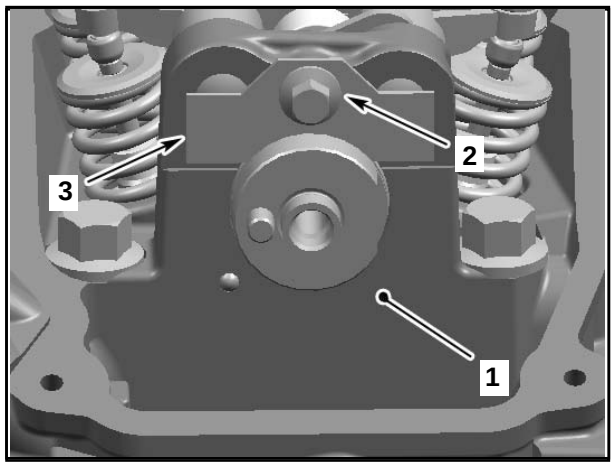
The removal procedure is the same for both camshafts. Each camshaft is different in design. Thus, it is important not to mix up any parts of the camshaft assembly with that of ths other cylinder. Keep parts as a group.

Remove valve cover(see ***VALVE COVER*** above).

Remove chain tensioner(see ***CHAIN TENSIONER*** above).

Remove camshaft timing gear(see ***CAMSHAFT TIMING GEAR*** above).

Remove camshaft retaining plate.

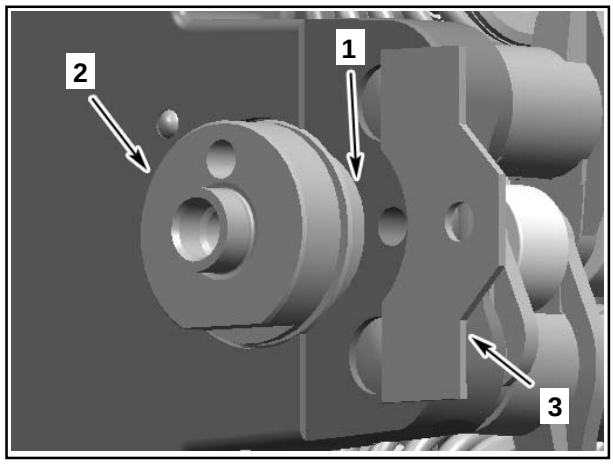



*1.Cylinder Head*
*2.Screw*
*3.Camshaft Retaining Plate*

Remove rocker arms(see ***ROCKER ARM*** above).

Remove camshaft.

**NOTE:** *For removal, rotate camshaft so that intake/exhaust lobe shows to upper side of cylinder head.*




*1.Area for Cranshaft Lobes*
*2.Camshaft*
*3.Camshaft Retaining Plate*

### Camshaft Inspection

Check each lobe and bearing journal of camshaft for scoring, scuffing,cracks or other signs of wear.
Measure camshaft journal diameter and lobee height using a micrometer.

| Camshaft Cylinder1 | |
|---|---|
| **Camshaft Lobe(exhaust)** | |
| New | 31.98-32.1mm (1.2591-1.2638in) |
| Service Limit | 31.88mm(1.2551in) |
| **Camshaft Lobe(Intake)** | |
| New | 32.129-32.249mm (1.2649-1.2696in) |
| Service Limit | 32.03mm(1.2610in) |

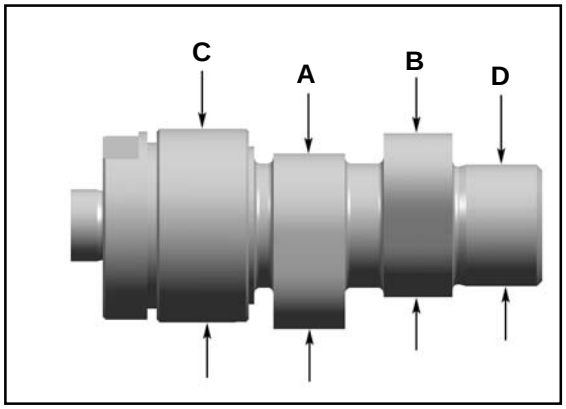
| Camshaft Cylinder2 | |
|---|---|
| **Camshaft Lobe(exhaust)** | |
| New | 31.966-32.086mm (1.2585-1.2632in) |
| Service Limit | 31.87mm(1.2547in) |
| **Camshaft Lobe(Intake)** | |
| New | 32.163-32.283mm (1.2663-1.2710in) |
| Service Limit | 32.06mm(1.2622in) |

| Camshaft Journal(Timing Chain Side) | |
|---|---|
| New | 34.959-34.975mm (1.3763-1.3770in) |
| Service Limit | 34.950mm(1.3760in) |
| **Camshaft Journal(Spark Plug Side)** | |
| New | 21.959-21.980mm (0.8645-0.9654in) |
| Service Limit | 21.950mm(0.8642in) |

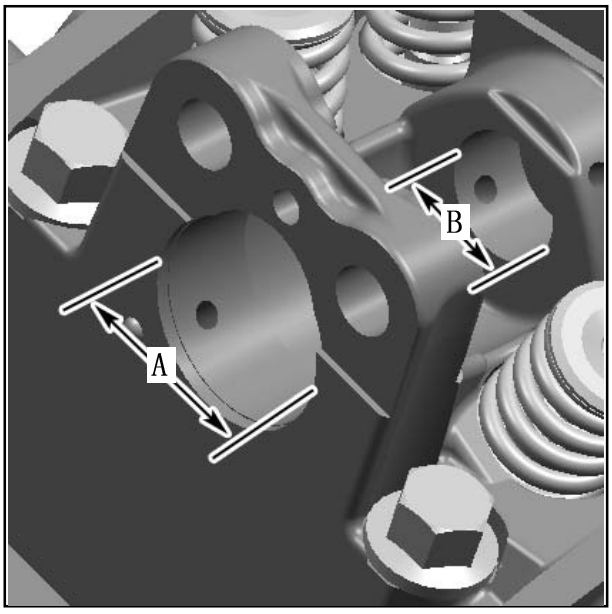
Measure matching clearance between two ends of camshaft and cylinder head.

| Camshaft Bearing(Timing Chain Side) | |
|---|---|
| New | 35.007-35.025mm (1.3782-1.3789in) |
| Service Limit | 35.040mm(1.3795in) |
| **Camshaft Bearing(Spark Plug Side)** | |
| New | 22.012-22.025mm (0.8666-0.8671in) |
| Service Limit | 22.040mm(0.8677in) |

Replace parts that are not within specifications.




*A.Camshaft Lobe(Exhaust Valves)*
*B.Camshaft Lobe(Intake Valves)*
*C.Camshaft Journal(Timing Chain Side)*
*D.Camshaft Journal(Spark Plug Side)*




*A.Camshaft Bearing(Timing Chain Side)*
*B.Camshaft Bearing(Spark Plug Side)*

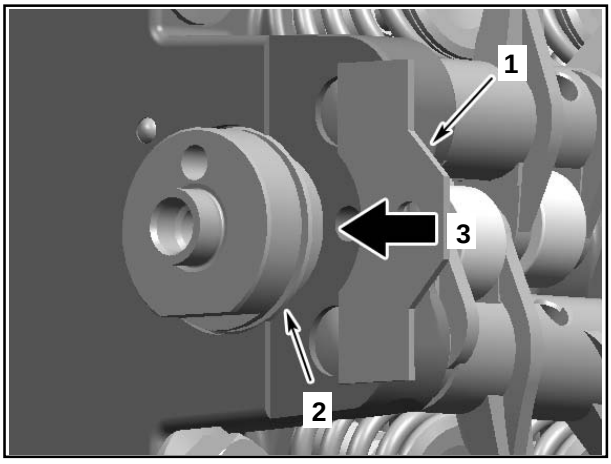
## CAMSHAFT INSTALLATION

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

**CAUTION: The camshafts are not identical in design. Do not invert the camshafts during assembly. Any mis-up of the components will lead to engine damage.**

Place the camshaft retaining plate in the slot of the camshaft.

For other parts, refer to proper installation procedure.




*1.Camshaft Retaining Plate Position*
*2.Slot Retaining Shaft*
*3.Direction of Movement*

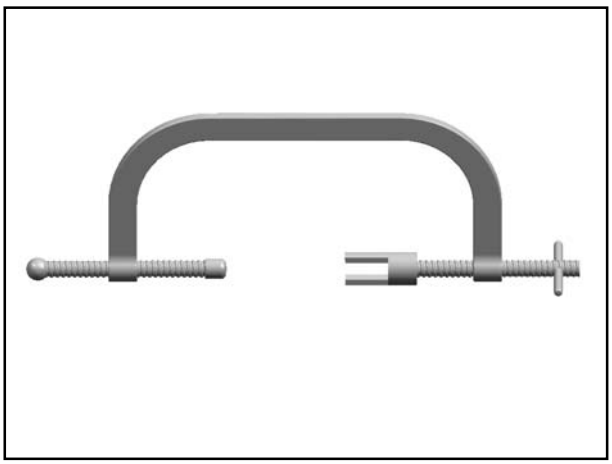
## VALVE SPRING

### Valve Spring Removal

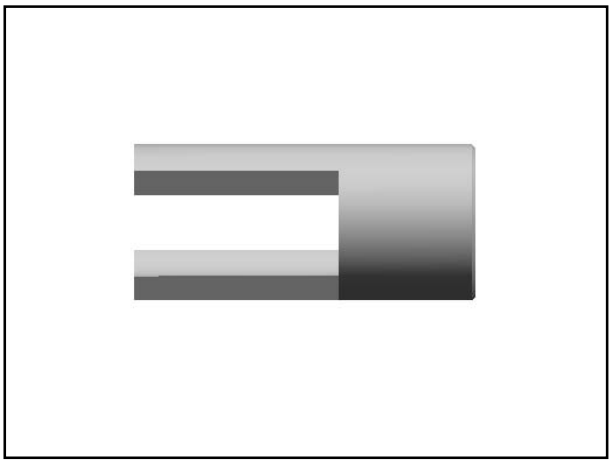
Remove rocker arm(see ***ROCKER ARM*** above).Remove cylinder head(see ***CYLINDER HEAD*** above). Use valve spring compressor clamp(0180-022 006-922-001)to compress valve spring.

**WARNING**

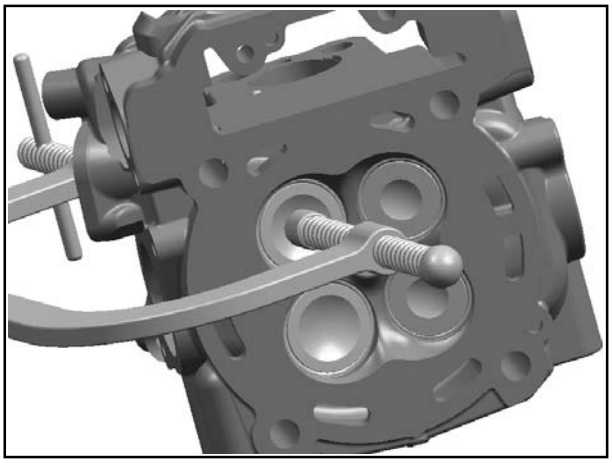
**Always wear safety glasses when disassembling valve springs. Be careful when unlocking valves. Components could fly away because of the strong spring preload.**



*Valve Spring Compressor Clamp*



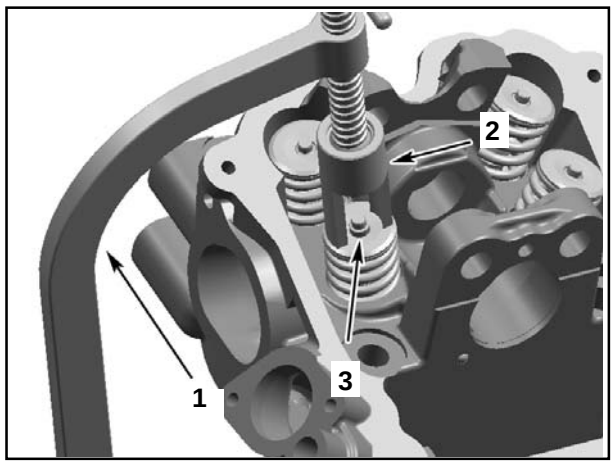
*Valve Spring Compressor Cup*



*Align valve spring compressor clamp with the center of Valve*

Remove valve cotters.

Withdraw valve spring compressor, valve spring retainer and valve spring.

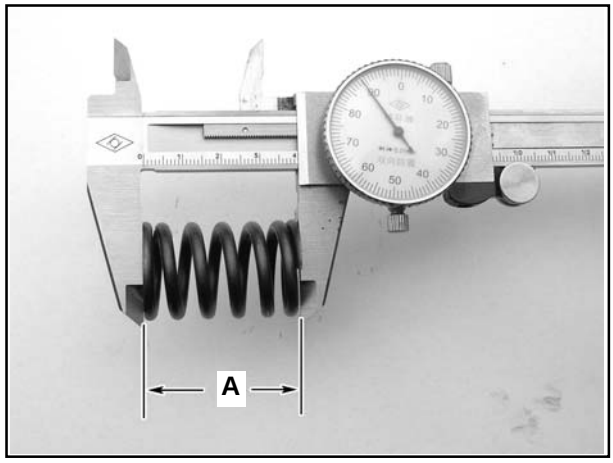



*1.Valve Spring Compressor Clamp*
*2.Valve Spring Compressor Cup*
*3.Valve Cotter*

### Valve Spring Inspection

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

| Valve Spring Free Length | |
|---|---|
| Normal New | 40mm(1.575in) |
| Service Limit | 38.2mm(1.504in) |




*A.Valve Spring Length*

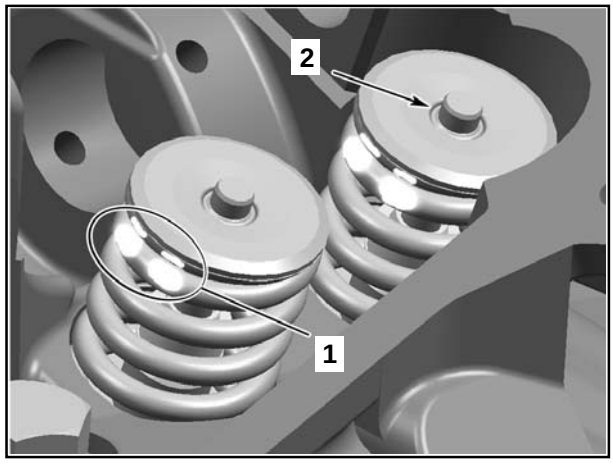
Replace valves springs if not within specifications.

### Valve Spring Installation

For installation, reverse the removal procedure. Pay attention to the following details.
Colored area of the valve spring must be placed on top.
To ease installation of cotters, apply oil or grease on them so that they remain in place while releasing the spring.

**NOTE:** *Valve cotter must be properly engaged in valve stem grooves.*
After spring is installed, ensure it is properly locked by tapping on valve stem end with a soft hammer so that valve opens and closes a few times.

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

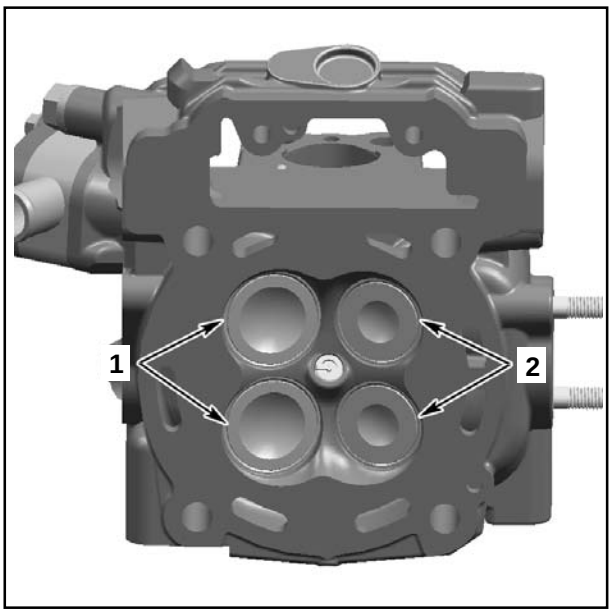



*1.Position of the Valve Spring*
*2.Valve Cotter*

## VALVE

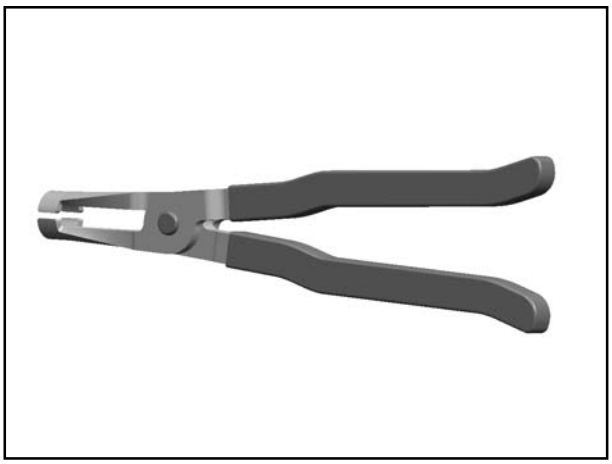
### Valve Removal

Remove valve spring, see ***VALVE SPRING*** above.
Push valve stem, then pull valves(intake and exhaust) out of valve guide.

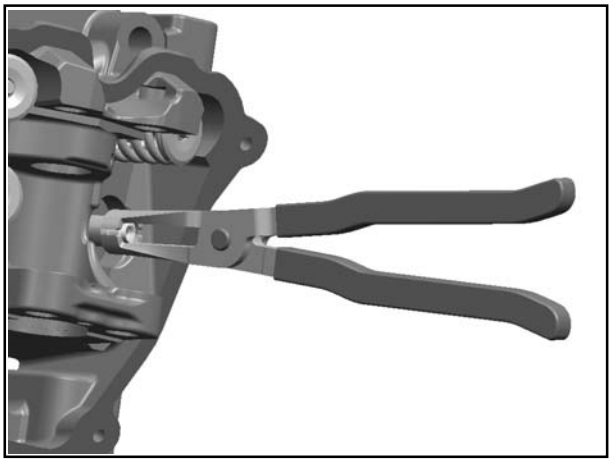



*1.Intake Valve 33mm*
*2.Exhaust Valve 29mm*

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



*Plier*



*1.Plier*
*2.Valve Stem Seal*

## Valve Inspection

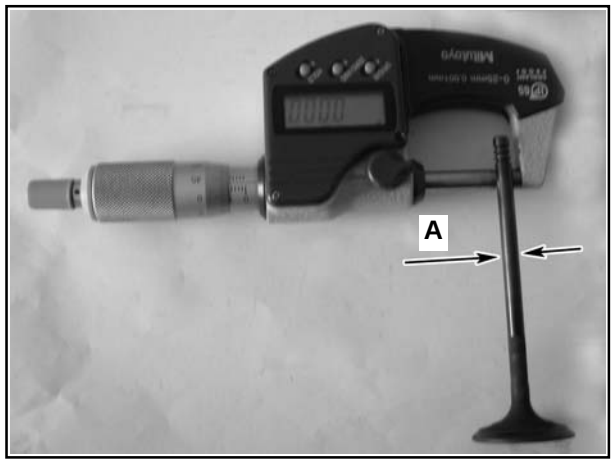
### Valve Stem Seal

Always install new seals whenever valves are removed.

### Valve

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

| Valve Out of Round (Intake and Exhaust Valves) | |
|---|---|
| New | 0.005mm(0.0002in) |
| Service Limit | 0.06mm(0.0024in) |




*A.Valve Stem Diameter*

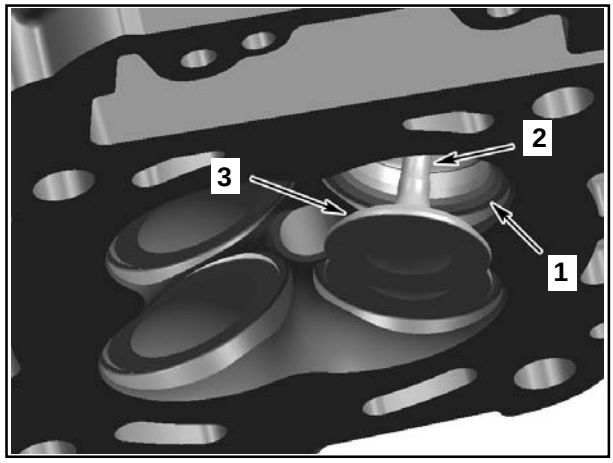
### Valve Stem and Valve Guide Clearance

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

**NOTE:** *Clean valve guide to remove carbon deposit before measuring.*

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

| Valve Stem Diameter | |
|---|---|
| **Exhaust Valve** | |
| New | 4.955-4.970mm (0.1951-0.1957in) |
| Service Limit | 4.930mm(0.1941in) |
| **Intake Valve** | |
| New | 4.965-4.980mm (0.1955-0.1960) |
| Service Limit | 4.930mm(0.1941in) |




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

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

| Valve Guide Diameter (Intake and Exhaust Valves) | |
|---|---|
| New | 5.000-5.012mm (0.1969-0.1973in) |
| Service Limit | 5.045mm(0.1986in) |

### Valve Face and Seat

Check valve face and seat for burning or pittings and replace valve or cylinder head if there are signs of damage.

Ensure to seat valves properly. Apply some lapping compound to valve face and work valve on its seat with a lapping tool(see ***Valve Guide Procedure*** below).

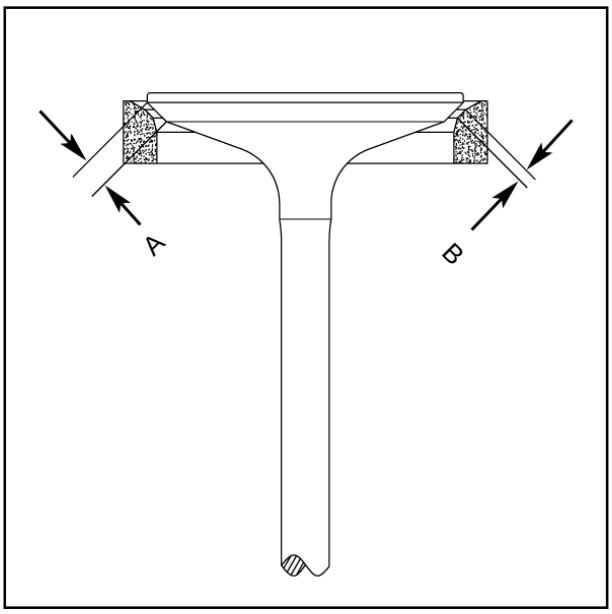
Measure valve face contact width.

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

Measure valve seat width using a caliper.

| Valve Seat Contact Width | |
|---|---|
| **Exhaust Valve** | |
| New | 1.20-1.40mm (0.047-0.055in) |
| Service Limit | 1.80mm(0.071in) |
| **Intake Valve** | |
| New | 1.10-1.30mm (0.043-0.051) |
| Service Limit | 1.70mm(0.067in) |

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




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

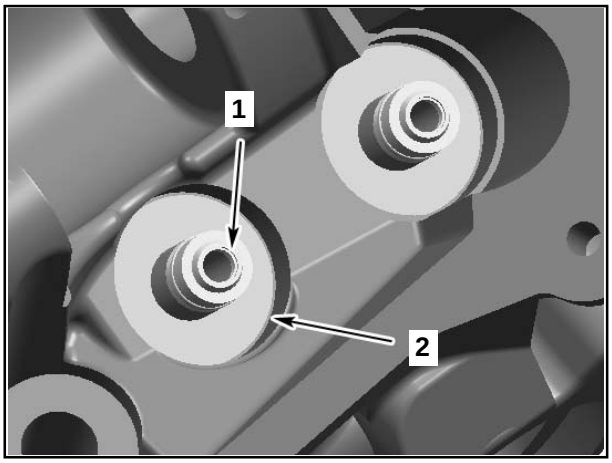
### Valve Installation

For installation, reverse the removal procedure. Pay attention to the following details.
Install a **NEW** valve stem seal. Make sure thrust washer is installed before installing seal.
Apply engine oil on valve stem and install it.

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

To ease installation of cotters, apply oil or grease on them so that they remain in place while releasing the spring.
After spring is installed, ensure it is properly locked by tapping on valve stem end with a soft hammer so that valve opens and closes a few times.

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




*1.Valve Spring Lower Seat*
*2.Sealing Lips of Valve Stem Seal*

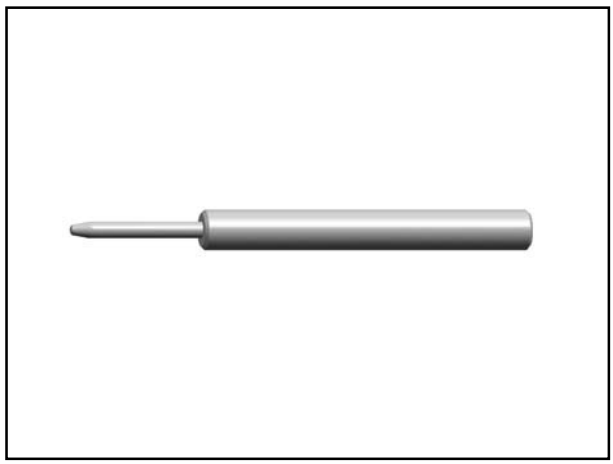
## VALVE GUIDE

### Valve Guide Removal

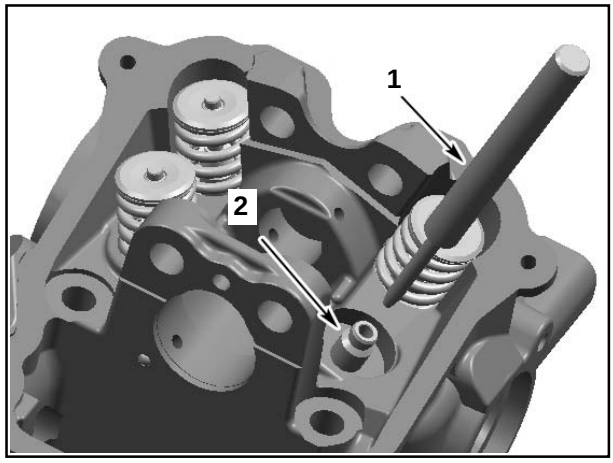
Remove cylinder head(see ***CYLINDER HEAD*** above).
Remove valves(see ***VALVE*** above)

**NOTE: Clean valve guide area from contamination before removal.**

Use valve guide remover(0800-022102-922-001)and a hammer, drive the valve guide out of cylinder head.



*Valve Guide Remover*




*1.Valve Guide Remover*
*2.Valve Guide*

### Valve Guide Inspection

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

### Valve Guide Inspection

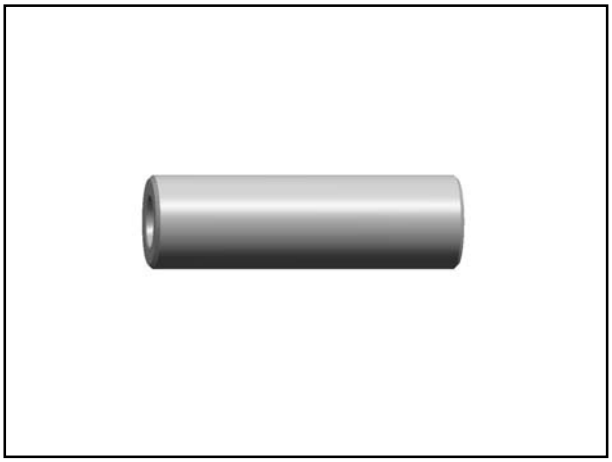
Reverse the removal procedure for installation.Pay attention to the following details.

Use valve guide installer(0800-022102-922-002)to install valve guide.

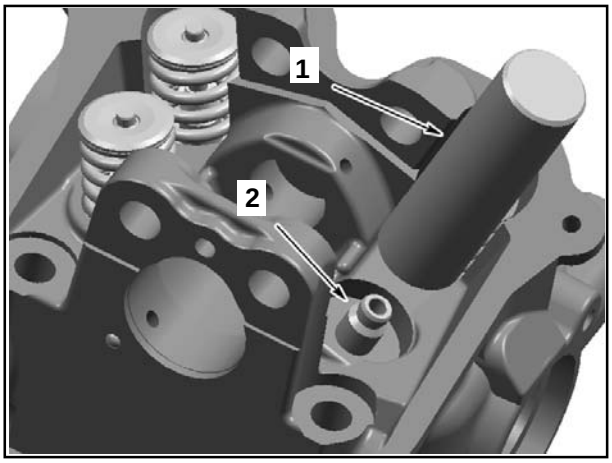
**NOTE:** *Apply loctite(antiseize lubricant) on valve guide prior to install it into the cylinder head.*

**CAUTION: Push valve guide in the cold cylinder head as per following illustration.**

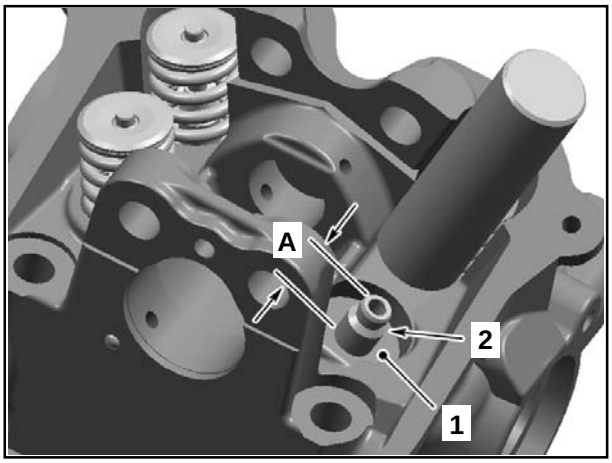
| Valve Guide (Measurement "A") | |
|---|---|
| New | 14.70-15.30mm(0.5787-0.6024) |



*Valve Guide Installer*




*1.Valve Guide Installer*
*2.Valve Guide*

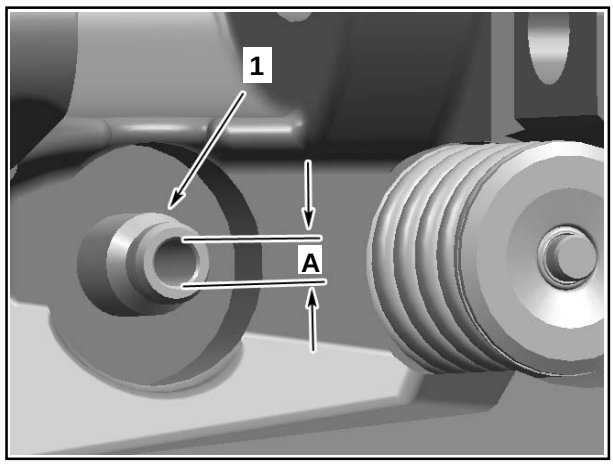



*1.Thrust Surface of Cylinder Head*
*2.Valve Guide*
*A.Measurement from Thrust Surface to Valve Guide Top*

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

| Valve Guide Diameter (Intake and Exhaust Valves) | |
|---|---|
| New | 5.000-5.012mm(0.1969-0.1973in) |

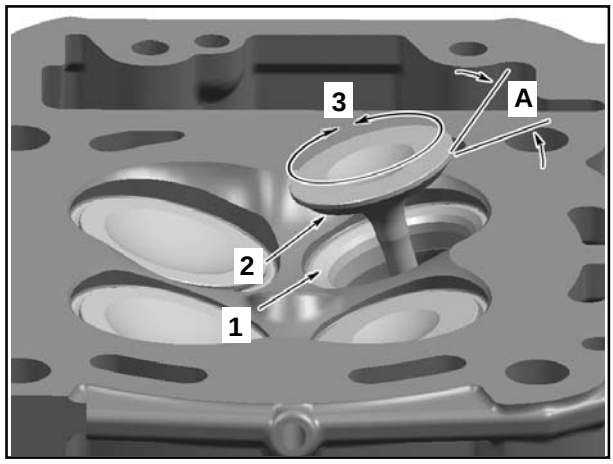
**NOTE:** *Ensure to turn reamer in the right direction. Use cutting oil and make brakes to clean reamer/ valve guide from metal shavings.*




*1.Valve Guide*
*A.Valve Guide Diameter*

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

**NOTE:** Ensure to seat valves properly. Apply marking paste to ease checking contact pattern.
Repeat procedure until valve seat/valve face fits together.

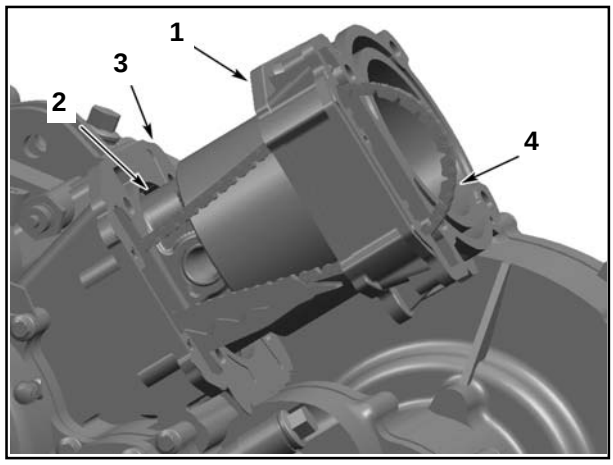



*1.Valve Seat*
*2.Valve Face(contact surface to valve seat)*
*3.Turn valve while pushing against cylinder head*
*A.Valve Seat Angle 45°*

## CYLINDER

### Cylinder Removal

Remvoe chain tensioner(see ***CHAIN TENSIONER***).
Remove the camshaft timing gear(see ***CAMSHAFT TIMING GEAR***).
Remove cylinder head(see ***CYLINDER HEAD***).
Pull cylinder.
Discard cylinder base gasckets.




*1.Cylinder*
*2.Piston Assembly*
*3.Cylinder Base Gasket*
*4.Camshaft Timing Chain*

### Cylinder Inspection

Check cylinder for cracks, scoring and wear ridges on the top and bottom of the cylinder.If so, replace cylinder.

### Cylinder Taper

Measure cylinder bore and if it is out of specifications, replace cylinder and piston rings.

Measure cylinder bore at 3 recommended positions. See the following illustration.

| Cylinder Taper IN Diameter (Intake and Exhaust Valves) | |
|---|---|
| New（maximum） | 0.038mm(0.0015in) |
| Service Limit | 0.090mm(0.0035in) |

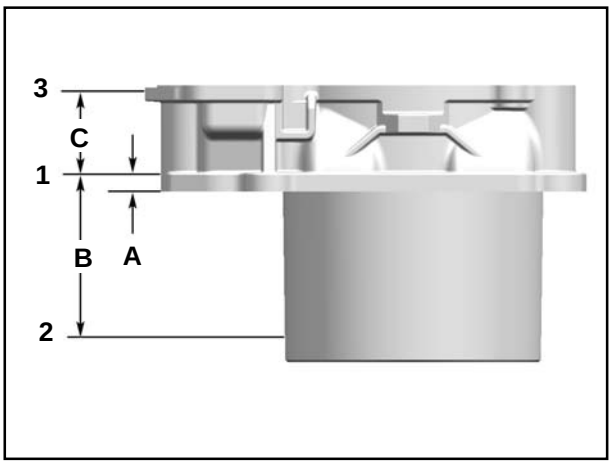
Distance between measurements should not exceed the service limit mentioned above.

### Cylinder Out of Round

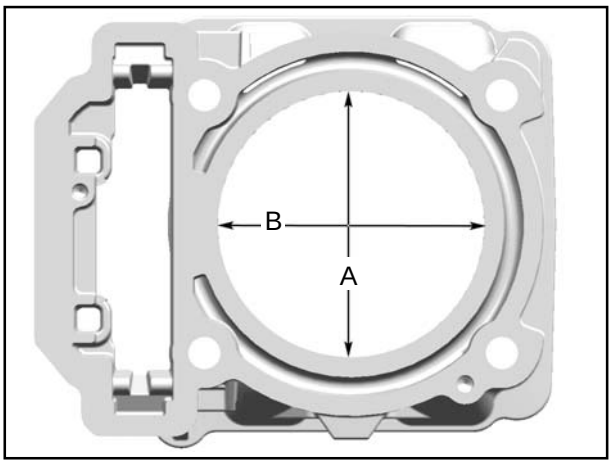
Measure cylinder diameter in piston axis direction from top of cylinder. Take another measurement 90° from first one and compare.

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

| Cylinder Out Of Round (Intake and Exhaust Valves) | |
|---|---|
| New（maximum） | 0.015mm(0.0006in) |
| Service Limit | 0.020mm(0.0008in) |




*1.First Measuring of Diameter*
*2.Second Measuring of Diameter*
*3.Third Measuring of Diameter*
*A.7mm(0.276 in)from Cylinder Bottom*
*B.68mm(2.68 in)*
*C.32mm(1.260 in)*




*A.Perpendicular to Crankshaft Axis*
*B.Parallel to Crankshaft Axis*

### Cylinder Installation

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

**CAUTION:** *Always replace cylinder base gasket before installing cylinder.*

First mount cylinder 2.Then remove crankshaft locking bolt(P/N 529 035 617). Turn engine to piston 1 at TDC, mount cylinder 1.Cylinder can not be pushed fully over the piston unless the piston is located at TDC.

Apply engine oil in the bottom area of the cylinder bore and also on the brand of the piston ring compressor tool(0800-040003-922-001).

**NOTE:** *Put timing chain through the chain pit then put the cylinder in place.*

**CAUTION:** *Chain guide has to be fixed between cylinder and cylinder head.*

**NOTE:** *After both cylinders are installed, turn crankshaft until piston of cylinder 2 is at TDC ignition and lock crankshaft. Refer to* ***CAMSHAFT****.*

**Install cylinder head and the other parts in accordance with the proper installation procedures.**

### PISTON

### Piston Removal

Remove cylinder head(see ***CYLINDER HEAD*** above)

Remove cylinder(see ***CYLINDER*** above).

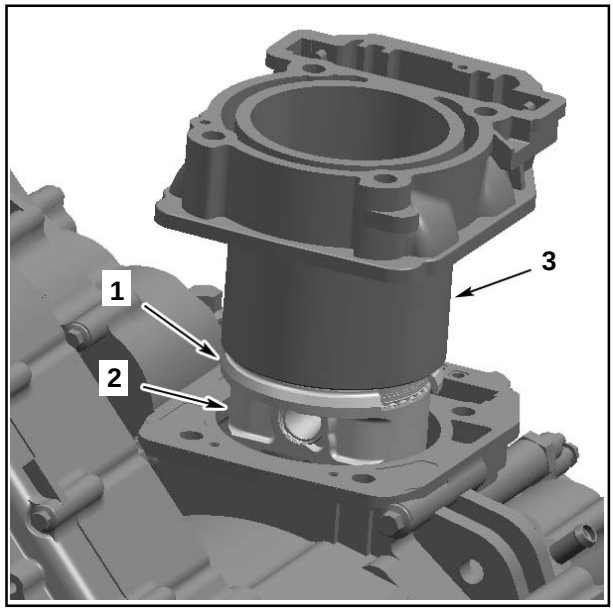
Place a rag under piston and in the area of timing chain compartment.

| WARNING |
| --- |
| **Piston circlips are spring loaded.** |

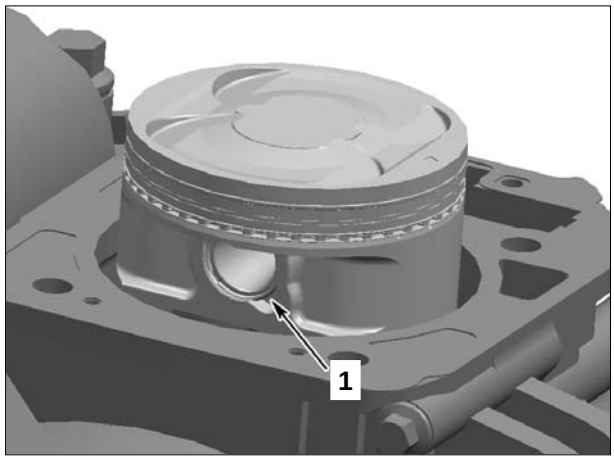
Remove one piston circlip and discard it.

**NOTE:** *Removal of both piston circlips is not necessary to remove piston pin.*

*Piston Ring Compressor Tool*



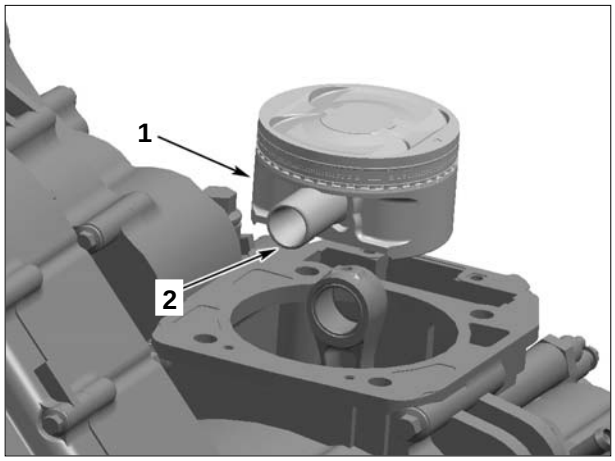

*1.Piston Ring Compressor Tool*
*2.Piston*
*3.Cylinder*




*1.Piston Circlip*

Push piston pin out of piston.

Detach piston from connecting rod.

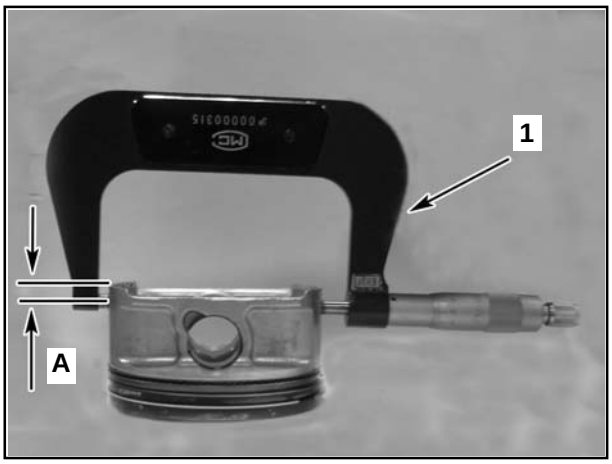



*1.Piston*
*2.Piston Pin*

## Piston Inspection

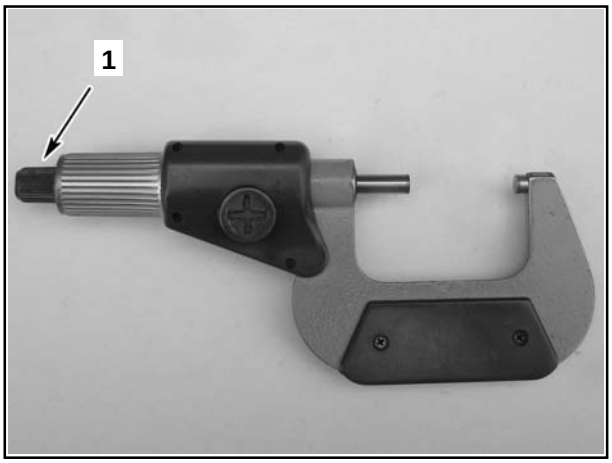
Inspect piston for scoring, cracking or other damages. Replace piston and piston rings if necessary.
Using a micrometer, measure piston at 8mm(0.315 in)perpendicularly(90° )to piston pin.

The measuring dimension should be as described in the following tables. If not, replace piston.




*1.Measuring perpendicularly (90¡ã) to pston pin*
*A.8 mm(0.315 in)*

| Piston Measurement | |
|---|---|
| New | 90.950-90.970mm (3.5807-3.5815in) |
| Service Limit | 90.85mm(3.577in) |




*1.Micrometer set to the piston dimension*

### Piston/Cylinder Clearance

Adjust and lock micrometer to the piston dimension.

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

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

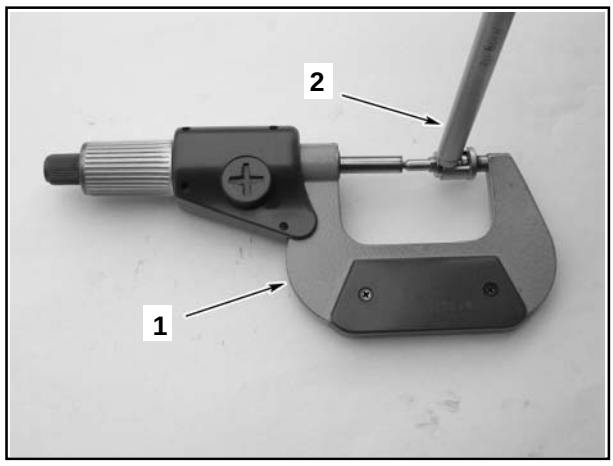
Read the measurement on the cylinder bore gauge. The result is the exact piston/cylinder wall clearance.

| Piston/Cylinder Clearance | |
|---|---|
| New | 0.030-0.050mm (0.0012-0.0020in) |
| Service Limit | 0.100mm(0.0040in) |

**NOTE:** *Make sure used piston is not worn.*

if clearance exceeds specified tolerance, replace piston by a new one and measure piston/cylinder clearance again.

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




*1.Use the micrometer to set the cylinder bore gauge*
*2.Dial Bore Gauge*

*1.Indiacator set to 0(zero)*

## Connecting Rod/Piston Clearance

Using synthetic abrasive woven, clean piston pin from deposits.

Inspect piston pin for scoring, cracking or other damages.

Measuring piston pin. See the following illustration for the proper measurement positions.

| Piston Pin Diameter | |
|---|---|
| New | 21.995-22.000mm (0.8659-0.8661in) |
| Service Limit | 21.980mm(0.7866in) |

Replace piston pin if diameter is out of specifications.

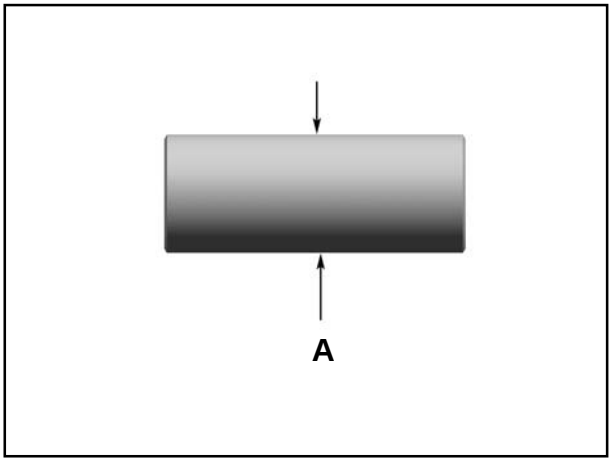
Measure inside diameter of connecting rod small end bushing.

| Connecting Rod Small End Diameter | |
|---|---|
| New | 22.010-22.020mm (0.8665-0.8669in) |
| Service Limit | 22.060mm(0.8685in) |

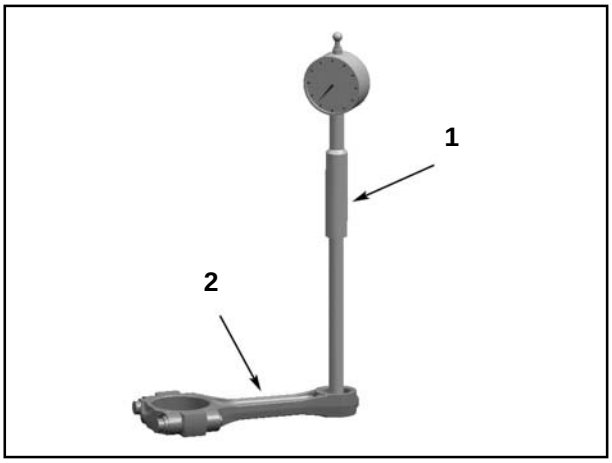
Replace connecting rod if diameter of connecting rod small end is out of specifications. Refer to *BOTTOM END* for removal procedure.

Compare measurement to obtain teh connecting rodpiston clearance.

| Connecting Rod/Piston Pin Clearance | |
|---|---|
| Service Limit | 0.080mm(0.0035in) |




*A.Piston Pin Diameter*




*1.Bore Gauge*
*2.Connecting Rod*

## Piston Installation

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

Apply engine oil on the piston pin.

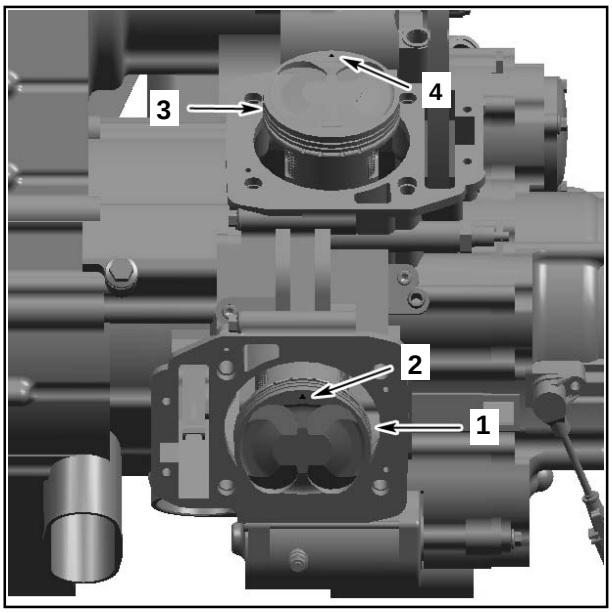
Insert piston pin into piston and connecting rod.

**CAUTION: Make sure the mounting direction of the piston is correct.**

For each cylinder, install piston with the punched arrow on piston dome pointing toward the rear side of the engine.

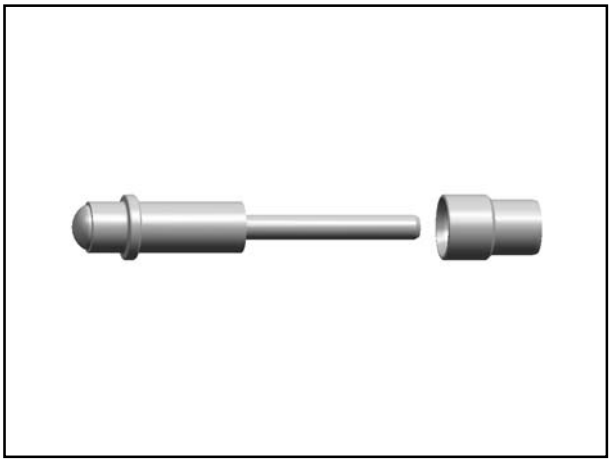
**Front Cylinder:** Mark on top of piston must show to intake side.

**Rear cylinder:** Mark on top of piston must show to exhaust side.




*1.Piston of Cylinder 1*
*2.Mark on piston must show to exhaust side of cylinder 1*
*3.Piston of Cylinder 2*
*4.Mark on piston must show to exhaust side of cylinder 2*

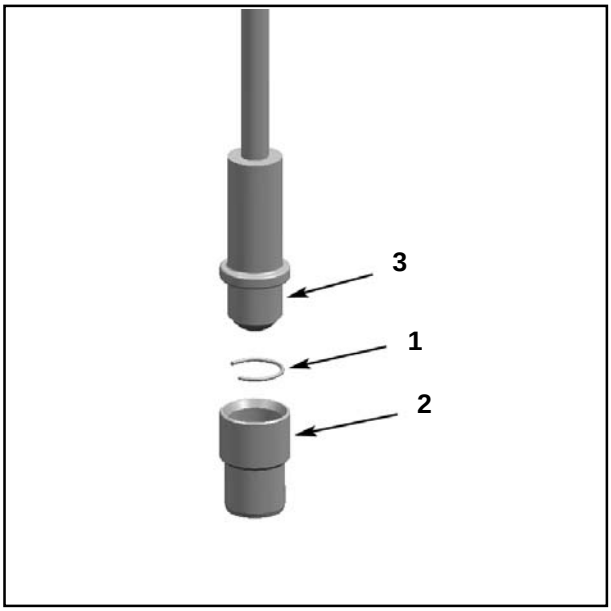
Use the piston appropriate circlip installer (0800-040005-922-001)to assemble the **NEW** piston circlip as per following procedure:



*Circlip Installer*

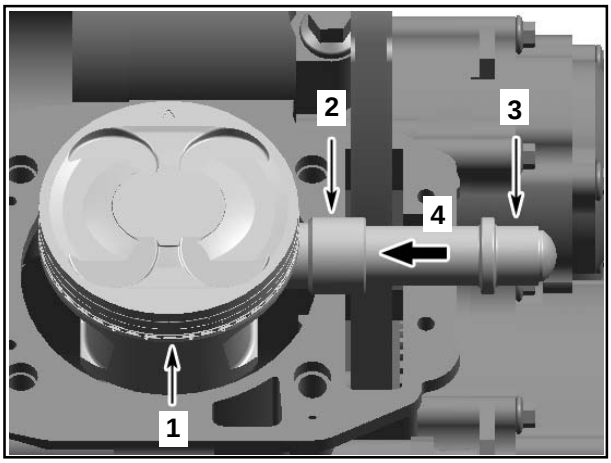
**CAUTION: Always replace disassembled piston circlip(s) by new ones. Place a rag on cylinder base to avoid dropping the circlip inside the engine.**

Place circlip in sleeve as per following illustration.




*1.Piston Pin Circlip*
*2.Sleeve*
*3.Assembly Jig from Piston Clip Installer*

Push taper side of assembly jig until circlip reaches middle of sleeve.
Align sleeve with piston pin axis and push push assembly jig until engages in piston.




*1.Hold piston while pushing circlip in place*
*2.Sleeve*
*3.Assembly Jig*
*4.Direction to push circlip*

**NOTE:** *Take care that the hook of the piston circlip is positioned properly.*

## PISTON RINGS

### Ring Removal

Remove the piston(see ***PISTON*** above).

### Ring Inspection

### Ring/Piston Groove Clearance

Using a feeler gauge measure each ring/piston groove clearance. If the clearance is too large, the piston and piston rings should be replaced.

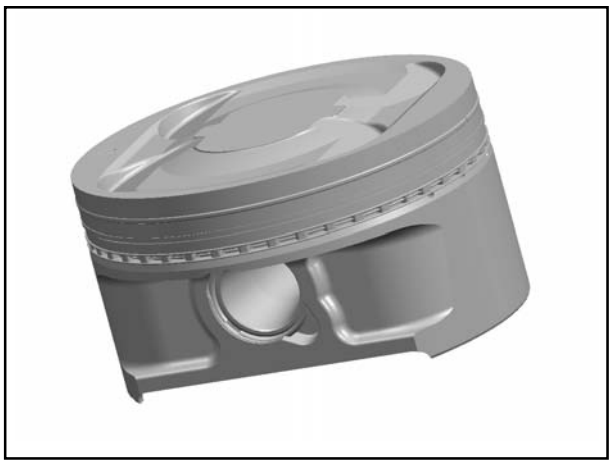
| Ring/Piston Groove Clearance | |
|---|---|
| **Piston Ring(1)** | |
| New | 0.020-0.060mm (0.0008-0.0024in) |
| Service Limit | 0.150mm(0.0059in) |
| **Piston Ring(2)** | |
| New | 0.020-0.060mm (0.0008-0.0024in) |
| Service Limit | 0.150mm(0.0059in) |
| **Oil Scraper Ring** | |
| New | 0.030-0.150mm (0.0012-0.0059in) |
| Service Limit | 0.250mm(0.0098in) |

| Ring End Cap | |
|---|---|
| **Piston Ring(1)** | |
| New | 0.25-0.40mm (0.010-0.016in) |
| Service Limit | 1. 50mm(0.059in) |
| **Piston Ring(2)** | |
| New | 0.30-0.45mm (0.012-0.018in) |
| Service Limit | 1.50mm(0.059in) |
| **Oil Scraper Ring** | |
| New | 0.20-0.70mm (0.008-0.028in) |
| Service Limit | 1.50mm(0.059in) |

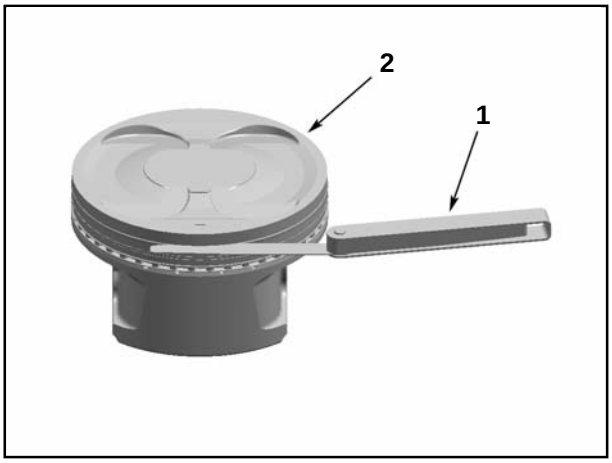
To measure the ring end gap, place the ring in the cylinder in the area of 8–16mm(5/16–5/8in) from top of cylinder.

**NOTE:** *In order to correctly position the ring in the cylinder, use piston as a pusher.*

Using a feeler gauge, check ring end gap.Replace ring if gap exceeds above described specified tolerance.



***CORRECT POSITION OF THE PISTON CIRCLIP***




*1.Feeler Gauge*
*2.Piston*

### Ring Installation

Reverse the removal procedure for installation.

**NOTE:** *First install spring and then rings of oil scraper ring.*

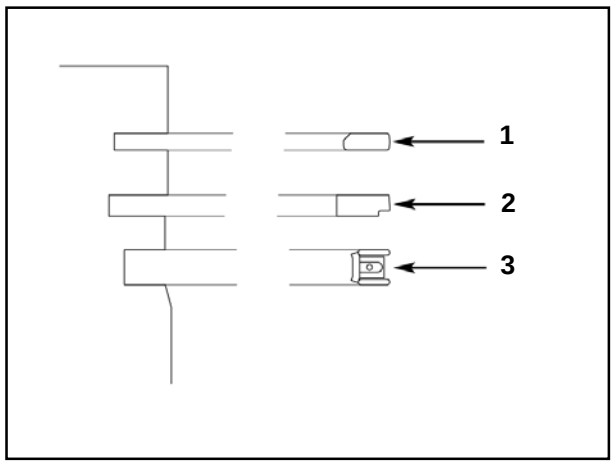
Install oil scraper ring first, then piston ring(2) with the word “N and TOP” facing up, then piston ring(1) with the word “N and TOP” facing up.

**CAUTION: Ensure that top and second rings are not interchanged.**

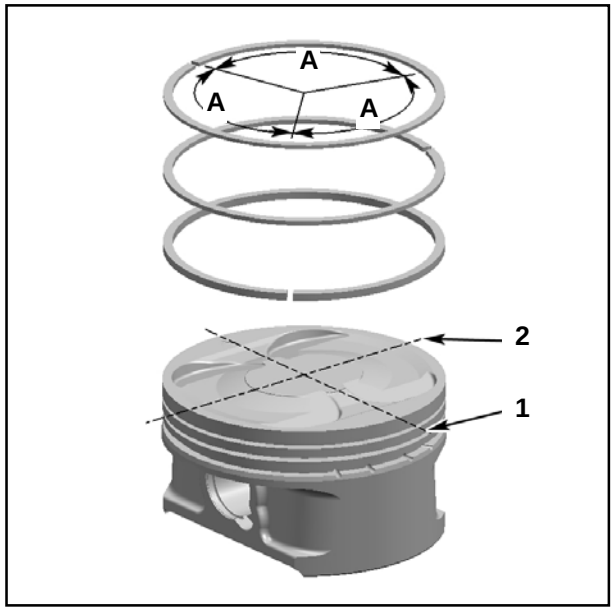
**NOTE:** *Use a ring expander to prevent breakage during installation.The oil ring must be installed by hand.*

Check that rings rotate smoothly after installation.

Space the piston ring end gaps $120^\circ$ apart and do not align the gaps with the piston pin bore or the thrust side exis.




*1.Upper Compression Ring*
*2.Lower Compression Ring*
*3.Oil Scraper Ring*




*1.Don’t align ring gap with piston thrust side axis*
*2.Don’t align ring gap with piston pin bore axis*
*A.120 °*

## CRANKCASE,CRANKSHAFT,TRANSMISSION



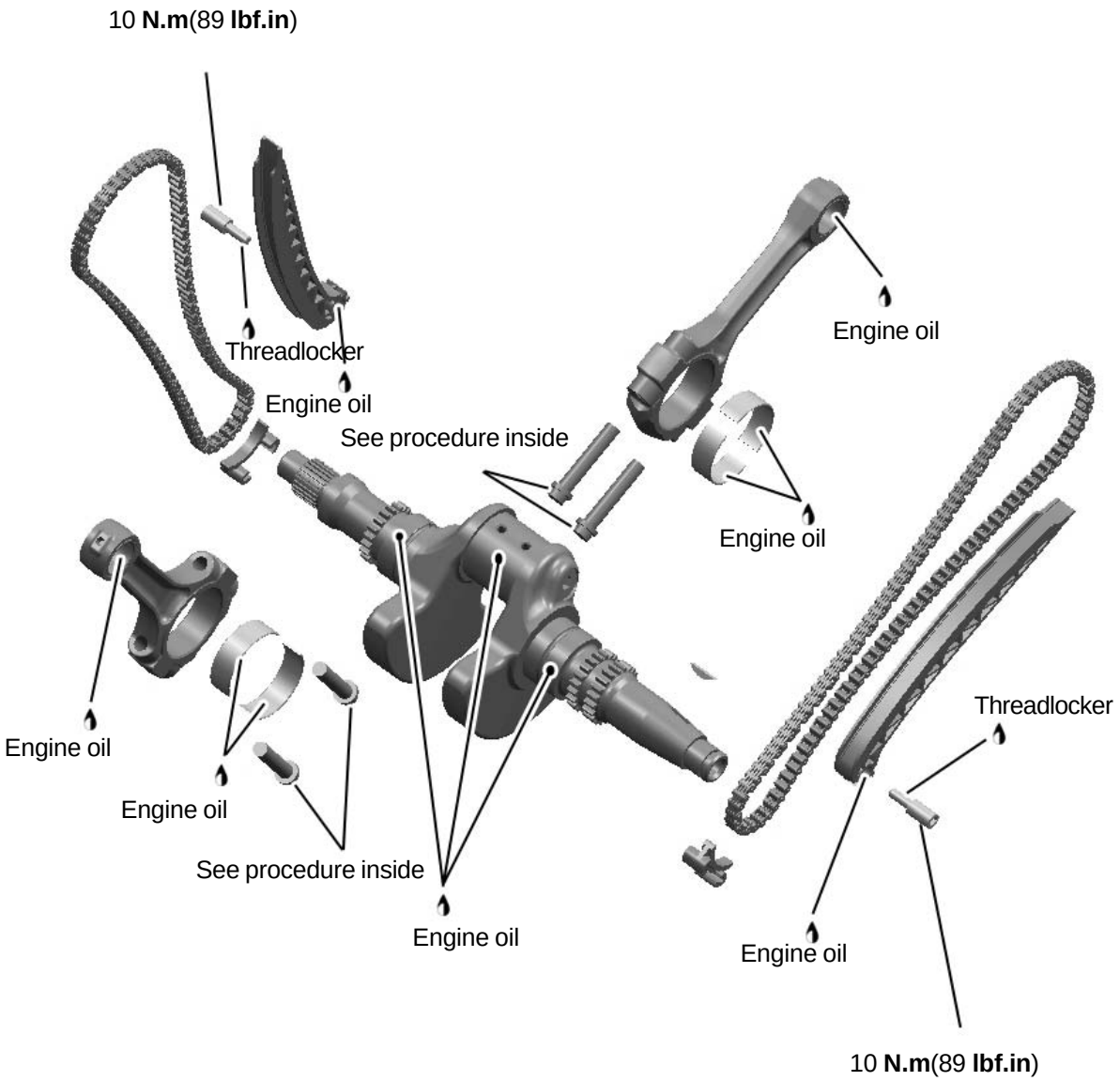
### SERVICE TOOLS

| Description | P/N | Page |
|---|---|---|
| Breather Oil Seal Installer | 0800-011201-923-001 | 06 |
| Installation Jig,Breather Gear Shaft | 0800-011201-921-003 | 06 |
| Press Tool,Breather Gear Shaft | 0800-011201-921-001 | 06 |
| Left Crankcse Support Sleeve | 0800-011101-922-001 | 09 |
| Right Crankcse Support Sleeve | 0800-012101-922-001 | 09 |
| Plain Bearing Remover/Installer | 0800-011102-922-001 | 09 |
| Crankshaft Locking Bolt | 0800-041000-922-001 | 14 |
| Wrench,Front Output Shaft Circlip | 0180-060008-922-001 | 18 |
| Press Tool,Front Output Shaft Oil Seal | 0800-060000-923-001 | 18 |
| Installer,Front Output Shaft | 0800-062301-923-001 | 18 |
| Install Handle | 0800-062206-922-001 | 20 |
| Drive Pinion Gear Oil Seal Installer | 0800-062204-923-001 | 20 |
| Ring Gear Needle Bearing Installer | 0180-062201-921-003 | 20 |
| Drive Pinion Gear Needle Bearing Installer | 0180-062103-921-002 | 20/21 |
| Backlash Measurement Tool | 0800-062000-922-001 | 21 |
| Remover,Reverse Intermediate Gear Shaft | 0800-060002-922-001 | 25 |
| Remover,Left Crankcase Bearing | 0800-011000-922-001 | 26 |
| Remover,Right Crankcase Bearing 5206 | 0800-012000-922-001 | 26 |
| Damper,Right Crankcase | 0800-012101-921-001 | 32 |
| Installer,Bearing 6203 | 0010-060002-921-002 | 32 |
| Installer,Bearing 3206A | 0180-012100-921-004 | 32 |
| Damper,Left Crankcase | 0800-011101-921-001 | 32 |
| Press Tool,Reverse Intermediate Gear Shaft | 0800-060000-922-001 | 32 |
| Press Tool,Gearshift Shaft Bearing 6303 | 0180-011100-921-004 | 32 |
| Press Tool,Bearing 6203 | 0040-012001-921-002 | 32 |

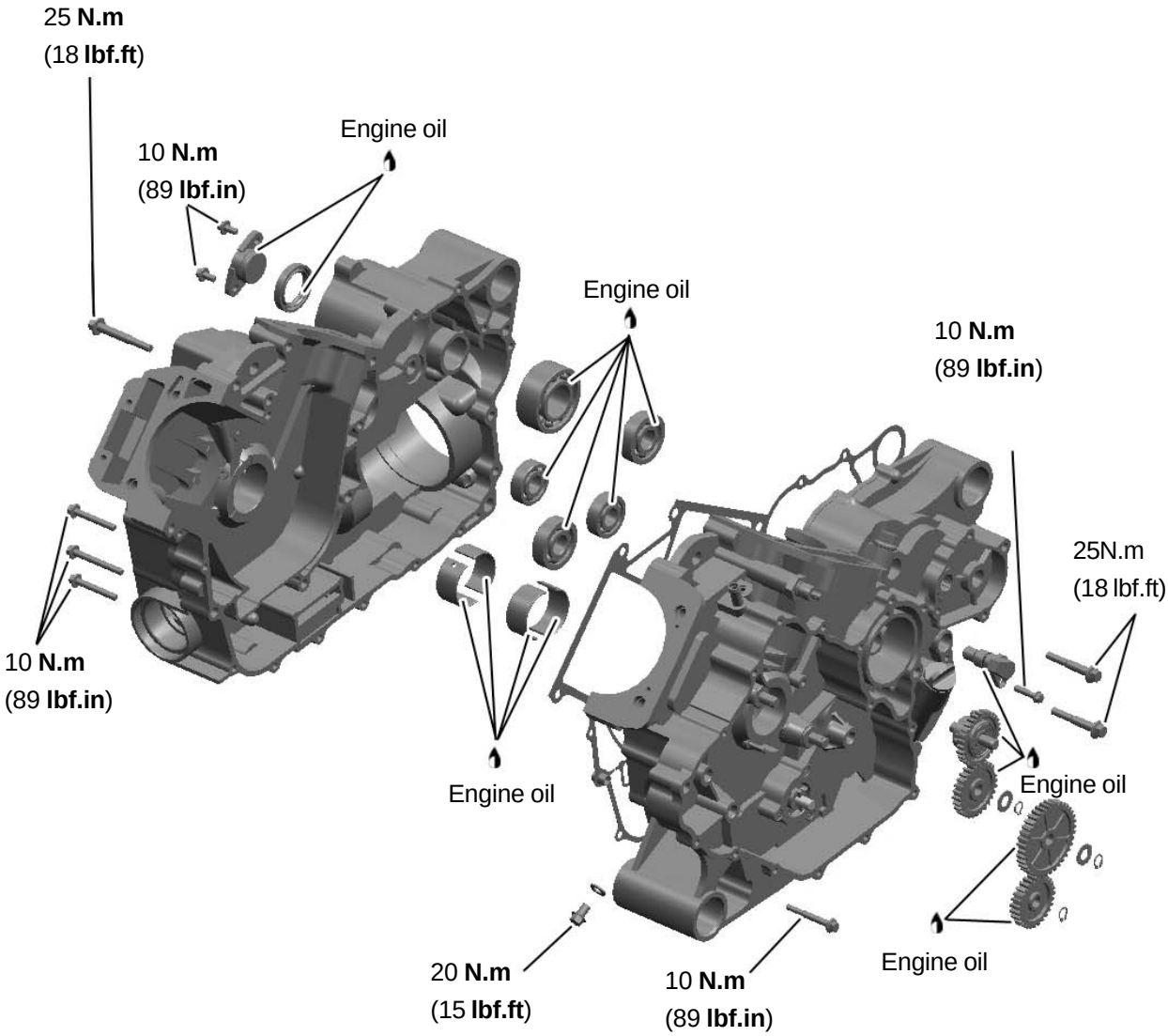
### SERVICE PRODUCTS

| Description | P/N | Page |
|---|---|---|
| Threadlocker | | 18 |
| Engine coolant | | 35 |
| Enigne oil | | |

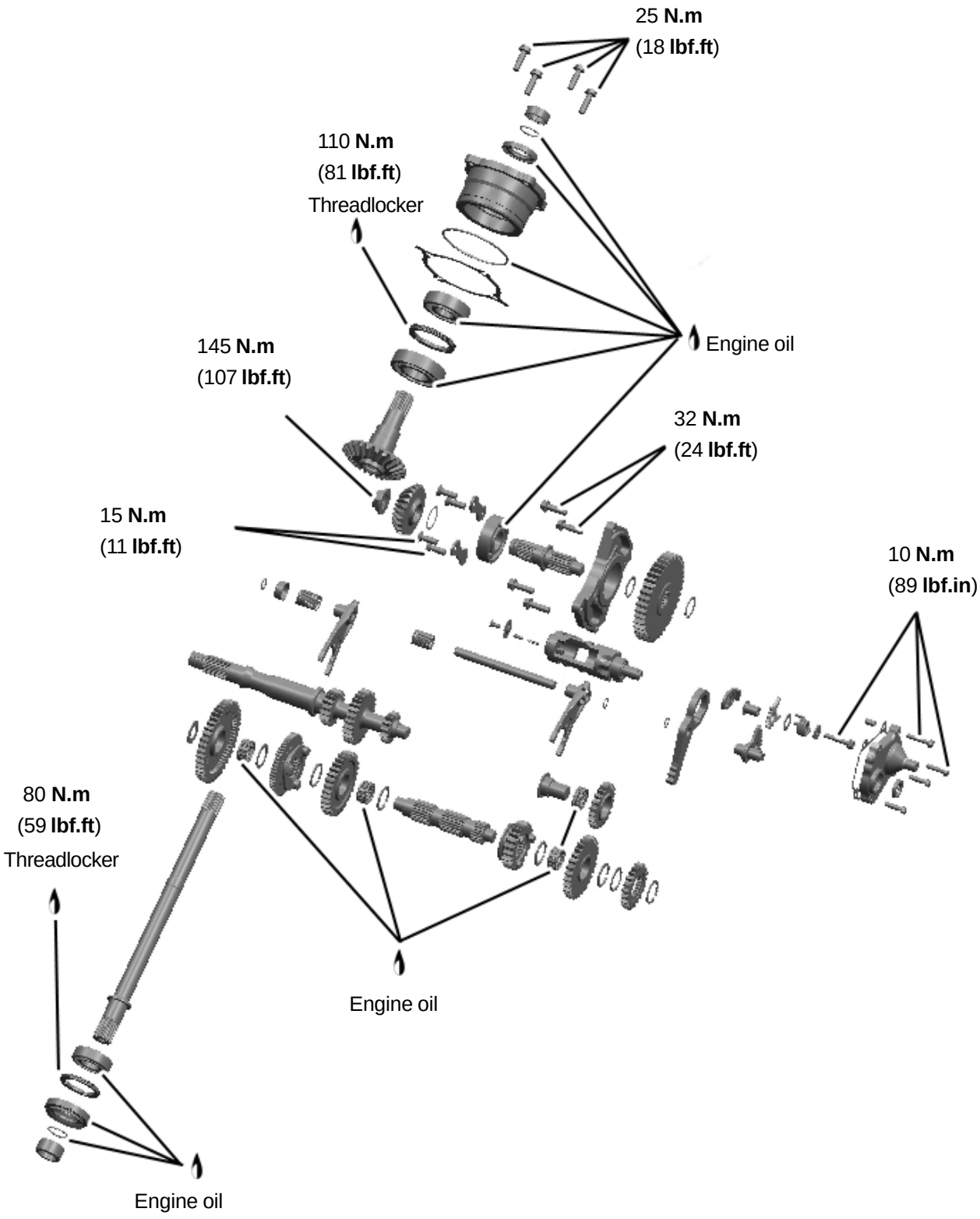
## CRANKSHAFT


10 **N.m**(89 **lbf.in**)
Threadlocker
Engine oil
See procedure inside
Engine oil
Engine oil
Engine oil
Engine oil
See procedure inside
Engine oil
Threadlocker
Engine oil
10 **N.m**(89 **lbf.in**)

## CRANKCASE


25 N.m
(18 lbf.ft)
10 N.m
(89 lbf.in)
Engine oil
Engine oil
10 N.m
(89 lbf.in)
10 N.m
(89 lbf.in)
25N.m
(18 lbf.ft)
Engine oil
Engine oil
20 N.m
(15 lbf.ft)
10 N.m
(89 lbf.in)
Engine oil

## GEARBOX


25 N.m
(18 lbf.ft)
110 N.m
(81 lbf.ft)
Threadlocker
Engine oil
145 N.m
(107 lbf.ft)
32 N.m
(24 lbf.ft)
15 N.m
(11 lbf.ft)
10 N.m
(89 lbf.in)
80 N.m
(59 lbf.ft)
Threadlocker
Engine oil
Engine oil

## GENERAL

During assembly/installation,use the torque value and serivce products as shown in the exploded view(s).

**WARNING**

**Torque Wrench Tightening specifications must strictly be adhered to .Locking devices (e.g.:lock ing tabs ,elastic stop nuts ,self-locking fasteners, cotter pin,etc.)must be replaced with new ones where specified .**

**NOTE:***Before disassembly ,drain engin oil and engine coolant.*

### DRIVE GEARS

The drive gears are located on the MAG side behind the magneto cover.

### Removal

Remove :

-Magneto cover(refer to ***Magneto Cover Removal***, Chapter 11 )

-Retainer ring no.10

-Magneto,driven gear

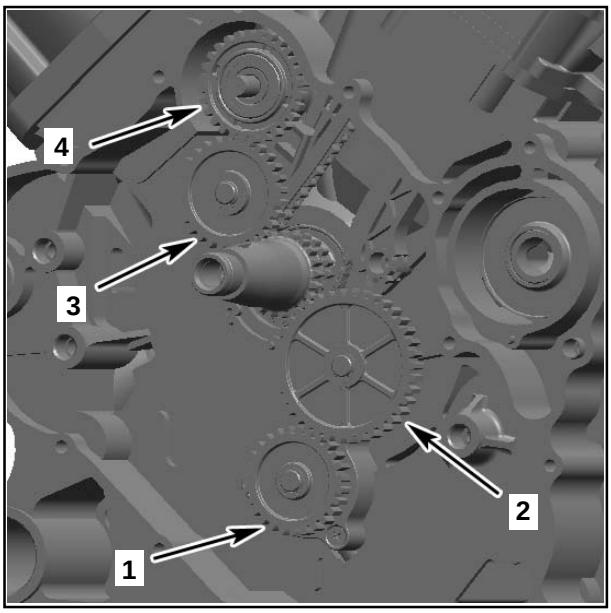
-Oil pump intermediate gear

-Breather intermediate gear

-Oil pump gear (refer to ***LUBRICATION SYSTEM***)

-water pump gear

-Breather gear




*1.Oil Pump Gear*
*2.Oil Pump Intermediate Gear*
*3.Breather Intermediate Gear*
*4.Breather Gear*

### Inspection

**Oil Pump Intermediate Gear/Breather Intermediate Gear/Oil Pump Gear**

Inspect gears for wear or damage,replace if damaged.

**Breather Gear**

The engine is equipped with a breather gear which prevents engine oil coming out though the breathing system into the air box.

Inspect gear for wear or damage .

Check ball bearing for excessive play and smooth operation .Replace breather gear assembly if necessay

### Installation

The installation essentially the reverse of the removal procedure ,but pay attention to the follow details:

1.Replace the oil seal of the breather gear.
2.Adequately oil the ball bearing of the breather gear.
3.All drive gears on the same plane.
4.Replace the retainer ring no.10.

### Service Tools:

Breather Oil Seal Installer
0800-011201-923-001
Installation Jig,Breather Gear Shaft
0800-011201-921-003
Press Tool,Breather Gear Shaft
0800-011201-921-001

## TIMING CHAIN

The engine is equipped with two chains .one is located on the magneto side .the second is loacted on the CVT side.

**Removal(MAG side)**

Remove:
-valve cover chain tensioner,camshaft timing gear(refer to ***INTAKE MANIFOLD,CYLINDER HEAD AND CYLINDER***)
-Magneto,driven gear,oil pump intermediate gear, breather intermediate gear.
-Timing chain guide and lower timing chain guide.
Carefully pull the timing chain sideward and down from the crankcase.

**NOTE:***Mark the operation direction of the timing chain before removal.*

**Removal(CVT side)**

Remove:
-valve cover chain tensioner and camshaft timing gear (refer to ***INTAKE MANIFOLD,CYLINDER HEAD AND CYLINDER***)
-CVT cover CVT drive gear CVT driven gear£¬Belt
Note Mark operation direction of the belt .
-CVT case Clutch

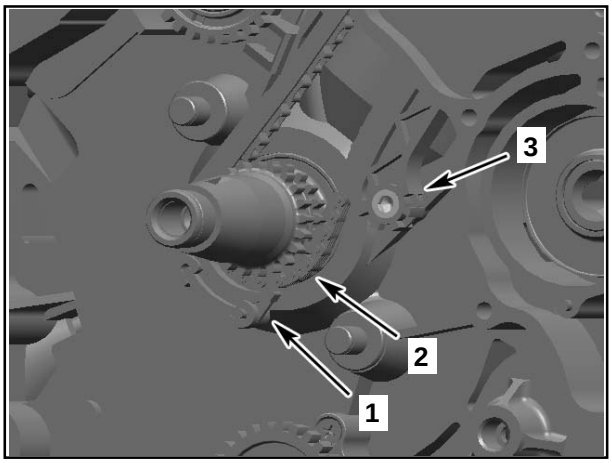
-Timing chain guide and lower timing chain guide.
Carefully pull the timing chain sideward and down from the crankcase.
Note:Mark the operation direction of the timing chain before removal.

### Inspection

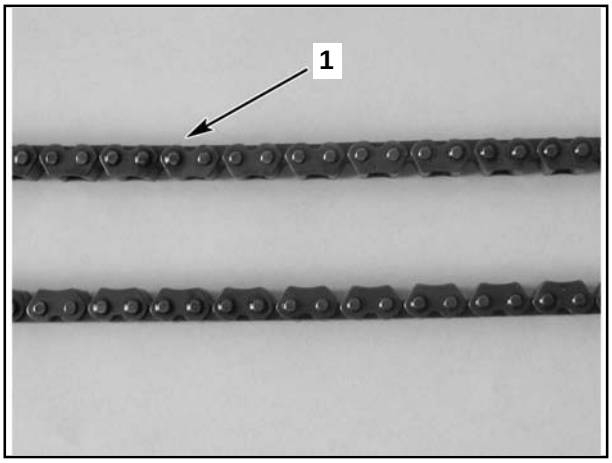
Inspection is the same for both timing chains.
Check timing chain on camshaft timing gear for excessive radial play.
Check chain condition for wear and teeth condition.
If chain is excessively worn or damaged,replace it as a set(camshaft timing gear and timing chain)

### Installation

Installation is the same for both timing chains.




*1.Timing Chain Guide*
*2.Timing Chain*
*3.Chain Tensioner*




*1.Timing Chain*

The installation essentially the reverse of the remove procedure ,but pay attention to the follow details:
Note:Ensure to perform proper valve timing .lock crankshaft (see crankshaft )and camshaft at TDC ignition (refer to intake manifold ,cylinder head and cylinder section).Install timing chain with camshaft timing gear then ,adjust chain tension (refer to intake manifold , cylinder head and cylinder section).Loosen crankshaft ,turn 440 degree on clockwise direction (from CVT side) and camshaft at TDC ignition,Install timing chain with camshaft timing gear then ,adjust chain tension,to perform proper valve timingrefer to intake manifold , cylinder head and cylinder section).

**CAUTION:Improper valve timing will damage engine components.**

## TIMING CHAIN TENSIONER

### Removal

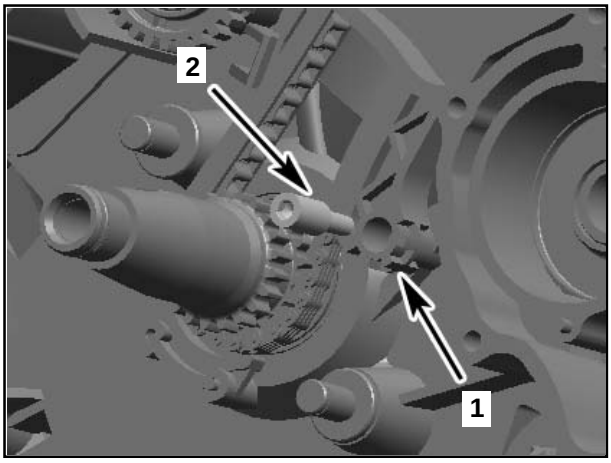
Refer to ***TIMING CHAIN*** above.

### Inspection

Check timing chain tensioner for wear ,cracks or other damage ,replace if necessary.

### Installation

The installaiton is the reverse of the removal procedure .




*1.Chain Tensioner*
*2.Screw*

## CRANKCASE

**NOTE:***Before disassembly ,drain engin oil and engine coolant.*

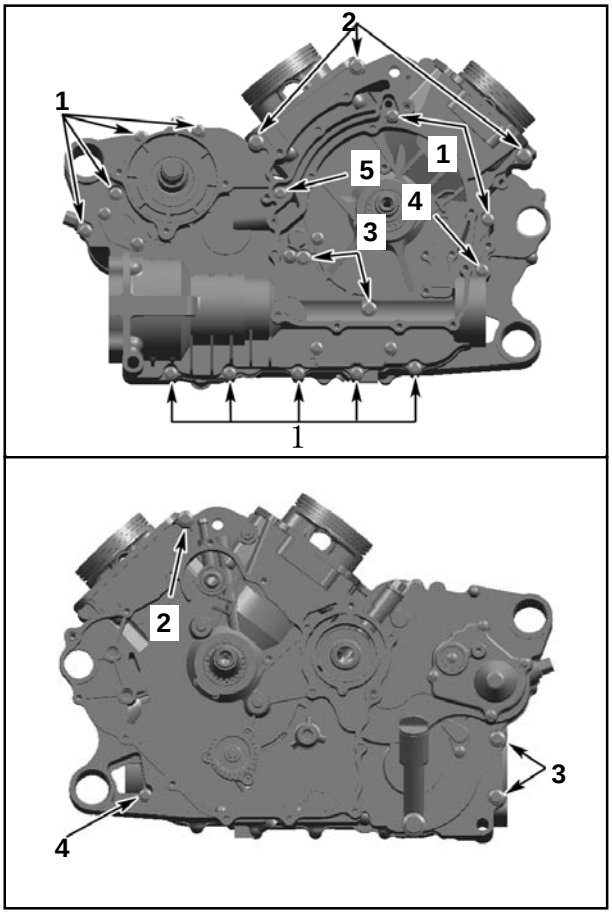
### Crankcase Disassembly

**NOTE:***Before splitting the crankcase,measure crankshaft axial play (refer to* ***CRANKSHAFT****).*

Remove:
-Front drive shaft,ring gear
-CVT cover,CVT,belt,CVT air guide and clutch(refer to ***CVT AND CLUTCH***)
-Drive gears(refer to ***DRIVE GEARS***)

**NOTE:***Oil pump removal from crankcase is not necessary ,but recommended to see condition of oil pump*.
-Left crankcase cover and electric starter(refer to ***MAGNETO SYSTEM*** )
-electric starter drive gear(refer to ***STARTING SYSTEM***)
-oil filter(refer to ***LUBRICATION SYSTEM***)

-Cylinder head and cylingder( refer to ***INTAKE MANIFOLD,CYLINDER HEAD AND CYLINDER***)
-Timing chain,tensioner and guide.(refer to ***TIMING CHAIN,TENSIONER AND GUIDE***).
Remove all bolts of crankcase.




*1.11 bolt M6X45*
*2.4 bolt M8X60*
*3.4 bolt M8X50*
*4.2 bolt M6X50*
*5.1 bolt M6X80*

Carefully split crankcase halves by using a soft hammer .

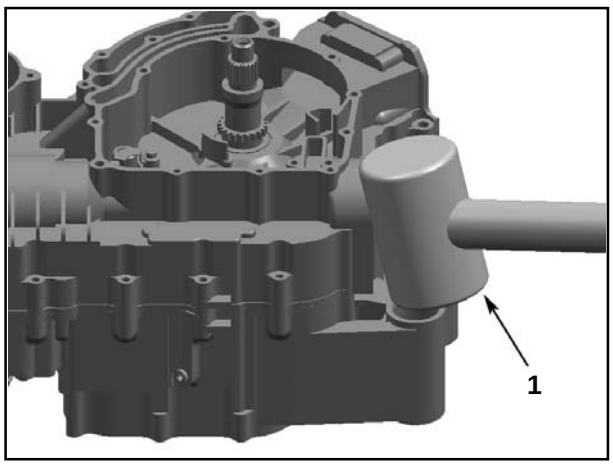
**NOTE:***During disassembly ,do not damage the sealing surface of the crankcase halves.*

Pull crankshaft out of crankcase.

**Crankcase Cleaning**

| **WARNING** |
| --- |
| **Use safety goggles to avoid eye injuries.** |

Clean crankcase using a part cleaner;
Dry crankcase using compressed air;
Clean oil passage.




*1.Soft Hammer*

**Crankcase inspection**

Check crankcase halves for cracks or other damage. replace if necessary.

Check plain bearing for scoring or other damages.

**NOTE:***Measure plain bearing inside diameter and compare to magneto and CVT side journal diameter of crankshaft(refer to* ***CRANKSHAFT****).*Replace if the measurements are out of specification.

plain bearing inside diameter(CVT/MAG)

**service Limit:** 42.100mm(1.6575in)

**Plain Bearing Replacement**

**plain bearing removal**

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

**NOTE:***Always use a press for removal of plain bearing.*

Remove plain bearing with the proper plain bearing remove/installer.

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

**NOTE:***Place the proper crankcase support sleeve under crankcase halves before removing plain bearings .*

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

**Service Tools:**

Left crankcse support sleeve

0800-011101-922-001

Right crankcse support sleeve

0800-012101-922-001

Plain bearing remover/installer

0800-011102-922-001

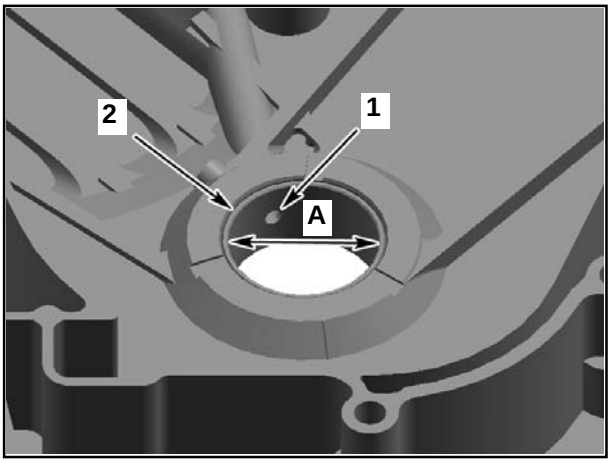
## Plain Bearing Installation

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

| Crankcase | Plain Bearing |
|---|---|
| Red (A) | Red |
| Blue(B) | Blue |

**CAUTION:Unless otherwise instructed,never use hammer to install ball bearings or plain bearings, use press only.**

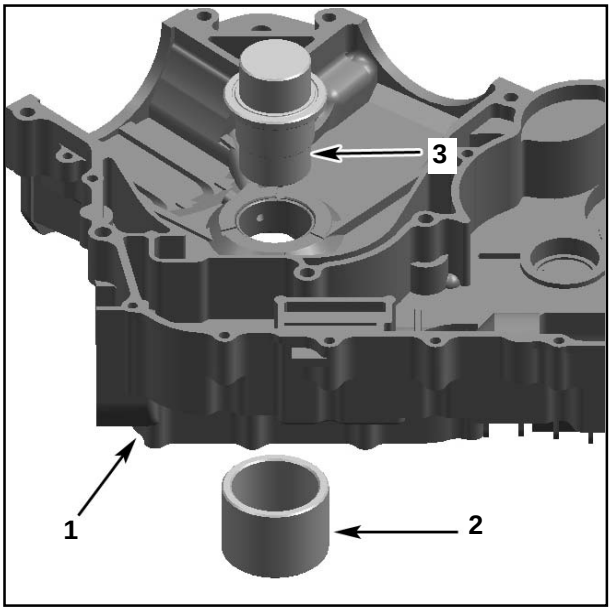
Install plain bearings with the proper plain bearing remover/installer in a cool crankcase.Do not lubricate plain bearing and /or crankcase for installation.




*1.Oil bore*

*2.Plain bearing*

*3.Measure plain bearing inside diameter*




*1.Crankcase half*

*2.Crankcase support sleeve*

*3.Plain bearing remover/installer*

**NOTE:***Place proper crankcase support sleeve under the crankcase halves before installing the plain bearings(refer to bearing removal procedure).*

Carefully press-in the plain bearings in the same direction as during disassembly,from then crankcase inside towards the outside.
During disassembly ,make sure not to damage the sealing surface of the crankcase halves.

**CAUTION:Mark position of oil bore on crankcase half and on plain bearing remover/installer .Align mark on plain bearing remover/installer with mark on crackcase half.**

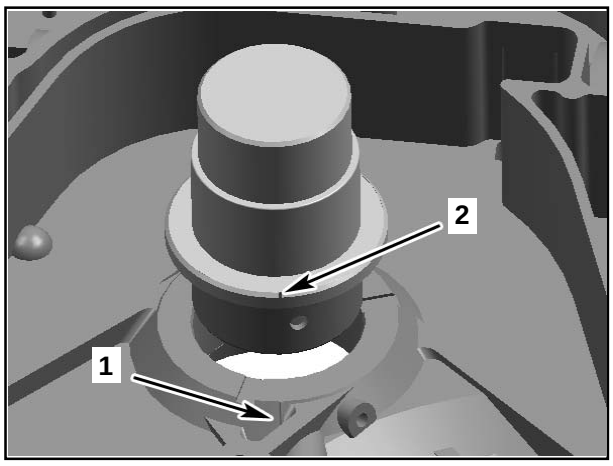
**NOTE:***Wrong oil bore will stop supply to plain bearing and will cause engine damaged.*

**CAUTION:The partition of the palin bearing in left crankcase must be positoned near to oil bore in clockwise direction.(refer to No.2 in next installation)**

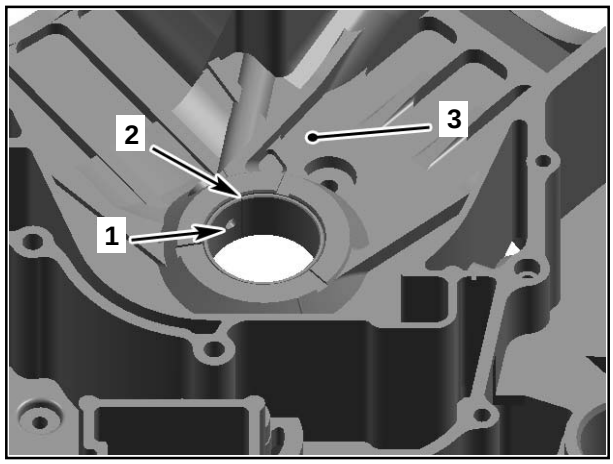
**CAUTION:The partition of the palin bearing in right crankcase must be positoned near to oil bore in clockwise direction.(refer to No.2 in next installation)**

**NOTE:**Use an o-ring ( $\phi$ 42x1-1.5mm (0.04-0.05in)) to hold plain bearing in place during installation,the o-ring will disappear in the groove of the palin bearing remover/installer.

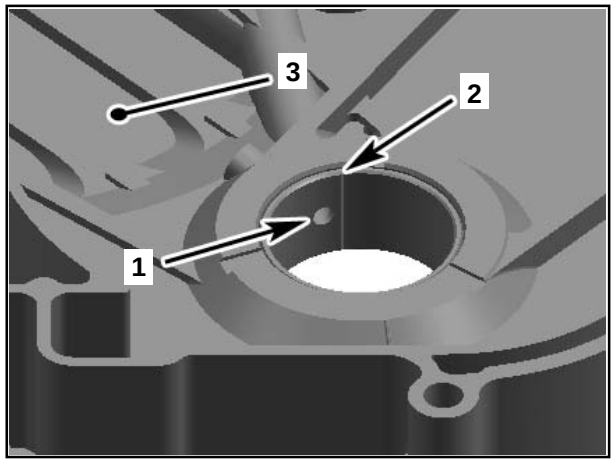
**Service Tools:**
Left crankcse support sleeve
0800-011101-922-001
Right crankcse support sleeve
0800-012101-922-001
Plain bearing remover/installer
0800-011102-922-001




*1.Oil positon marked on crankcase*
*2.Plain bearing remover/installer*




*1.Oil bore*
*2.The partition of the plain bearing*
*3.Left crankcase*

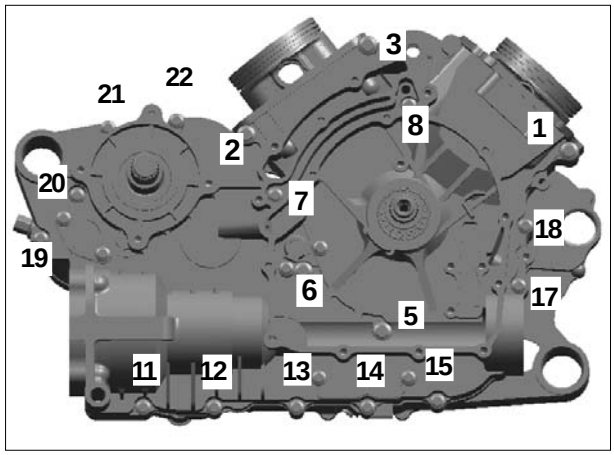



*1.Oil bore*
*2.The partition of the plain bearing*
*3.Right crankcase*

### Crankcase Assembly

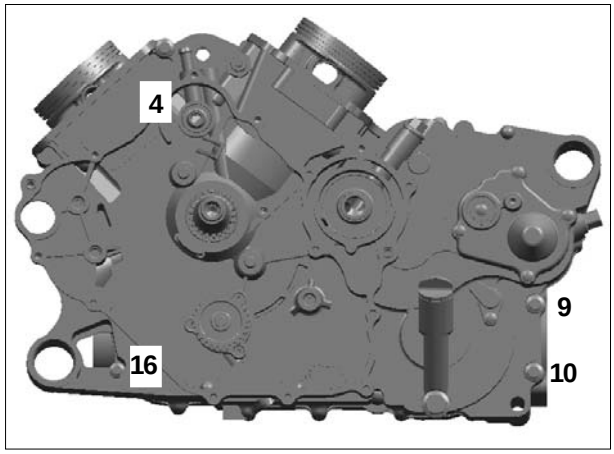
The assembly procedure of crankcase is the reverse of disassembly procedure.However,pay attention to the following details.

1. Clean oil passages and make sure they are not clogged.
2. Clean all metal components.
3. Carefully clean contact surface between left and right crankcase.
4. Install a new crankcase gasket.
5. Apply engine oil when install crankshaft bearing.

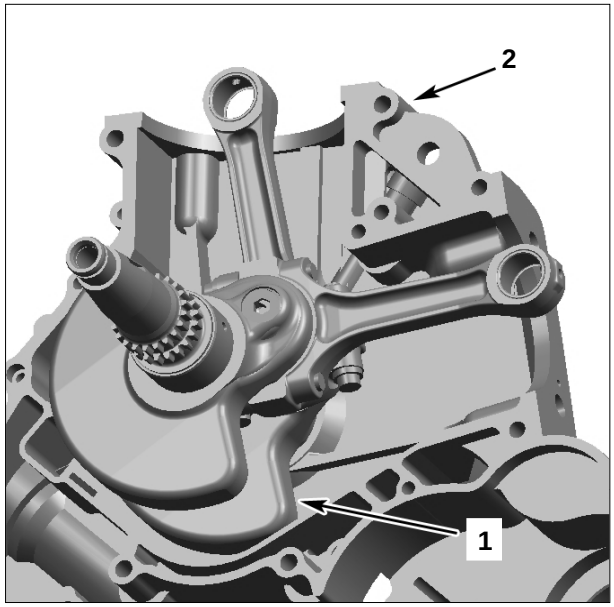



**ATTENTION:Correctly reinstall crankshaft (refer to CRANKSHAFT ).**

Tighten screws on crankcase in sequence as shown in right picture.




## CRANKSHAFT




*1.Crankshaft*
*2.Right Crankcase*

## Crankshaft Locking Procedure

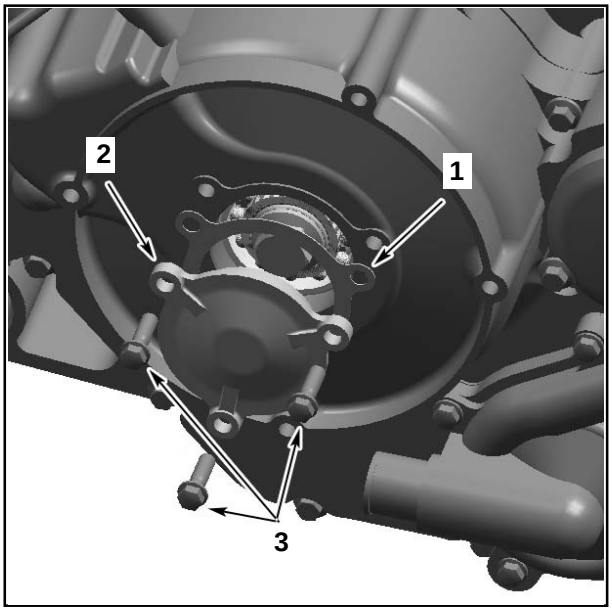
**NOTE:***When crankshaft is locked, rear cylinder (cylinder No.2 ) is at TDC ignition, crankshaft cannot locked at TDC of front cylinder (Cylinder No.1)*

Remove:

-Spark plug cable and spark plugs of both cylinders

-Valve covers of both cylinders

-Plug cover and gasket of plug cover

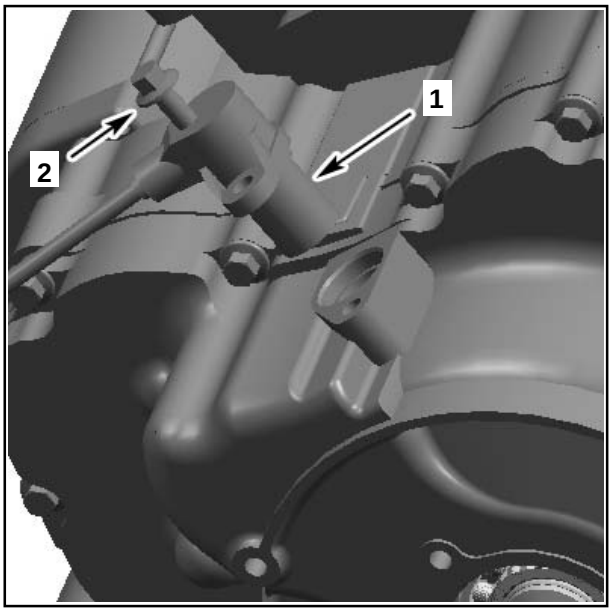



*1.Gasket*

*2.Plug Cover*

*3.Screws*

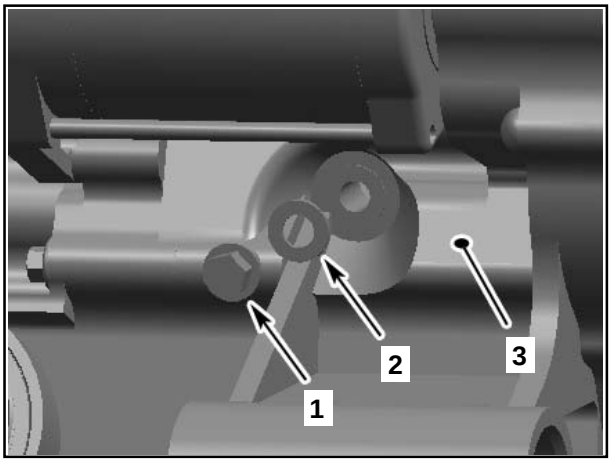
-Crankshaft position sensor(CPS)




*1.Crankshaft position sensor*

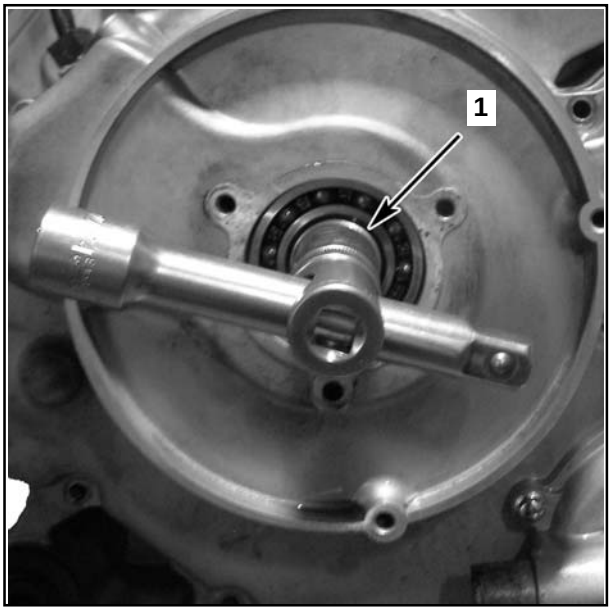
*2.Screw*

-Screw and gasket washer



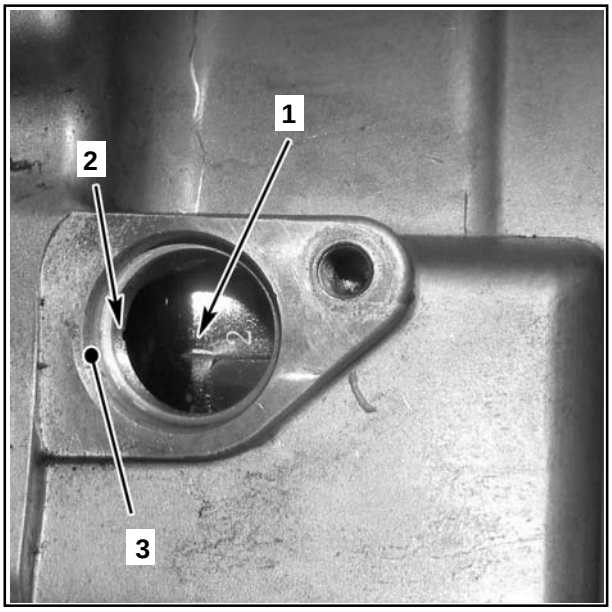

*1.Screw*
*2.Washer*
*3.Left crankcase*

Use 18mm socket to rotate crankshaft until piston of cylinder No.2 is at TDC ignition.



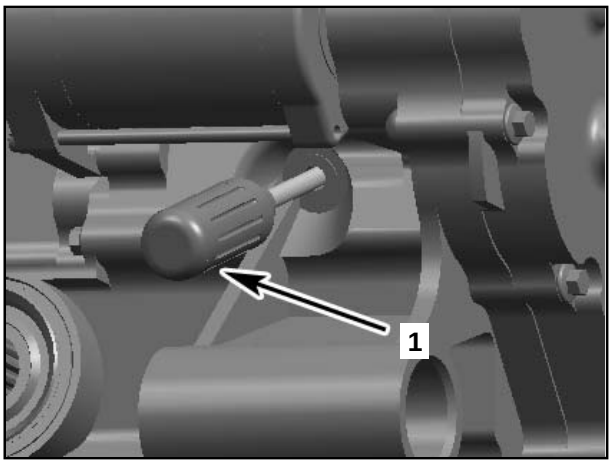

*1.18mm Socket*

When piston of rear cylinder is at TDC, Marks on magneto flywheel and magneto cover are aligned.



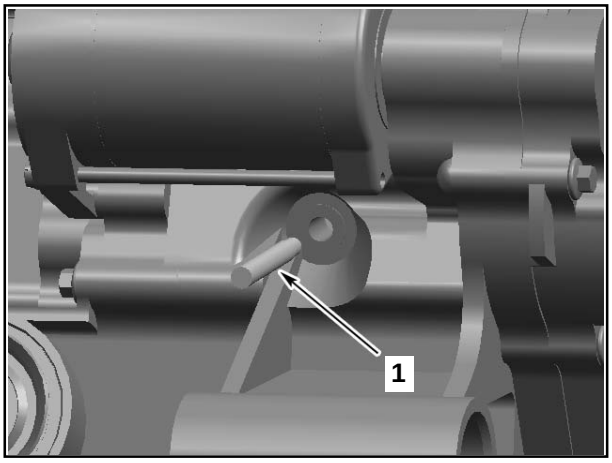

*1. Mark “2” on magneto flywheel*
*2.Notch on magneto cover*
*3.CPS Location*

Use screwdriver to check if V-type groove of crankshaft balancer is aligned with the hole.




*1.Screwdriver*

Lock crankshaft with crankshaft locking bolt (P/N:0800-041000-922-001).




*1.Crankshaft locking screw*

### Crankshaft Removal

Refer to ***CRANKCASE***.

### Crankshaft Inspection

**NOTE:***Check each bearing journal of crankshaft for scoring,scuffing,cracks and other signs of wear.*

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

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

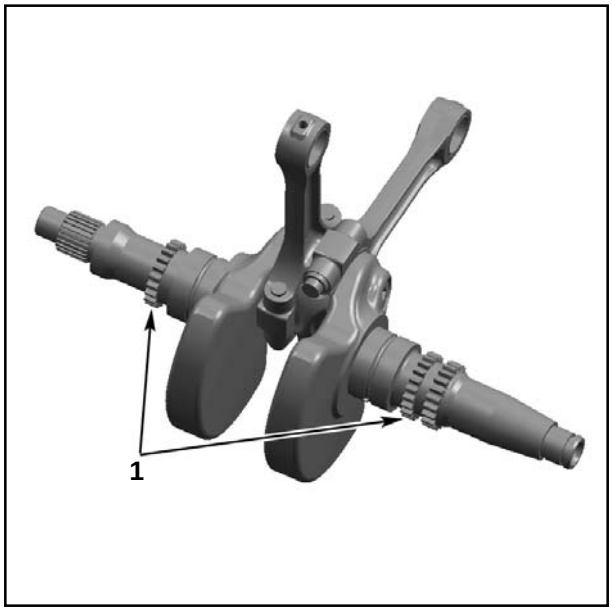
### Crankshaft Axial Play

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

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

| Crankshaft Axial Play | |
|---|---|
| New | 0.050-0.350 (0.002-0.014in) |
| Service Limit | 0.6mm(0.024in) |

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

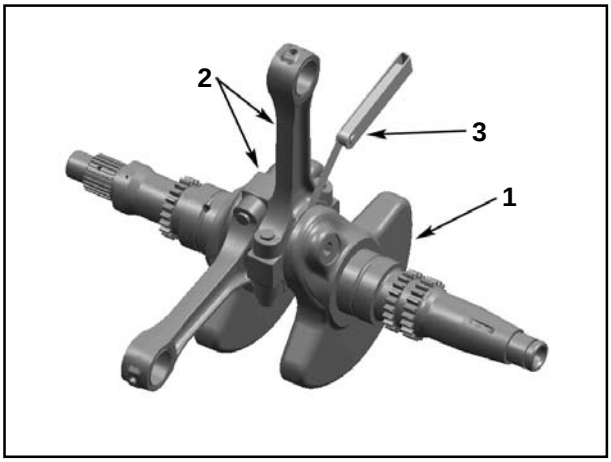



*1.Timing sprokcet (gear) of crankshaft*

## Connecting Rod Big End Axial Play

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

| Connecting Rod Big End Axial Play | |
|---|---|
| New | 0.300-0.560 (0.012-0.022in) |
| Service Limit | 0.8mm(0.031in) |




*1.Crankshaft*
*2.Connecting Rod*
*3.Gauge*

## Connecting Rod/Piston Pin Clearance

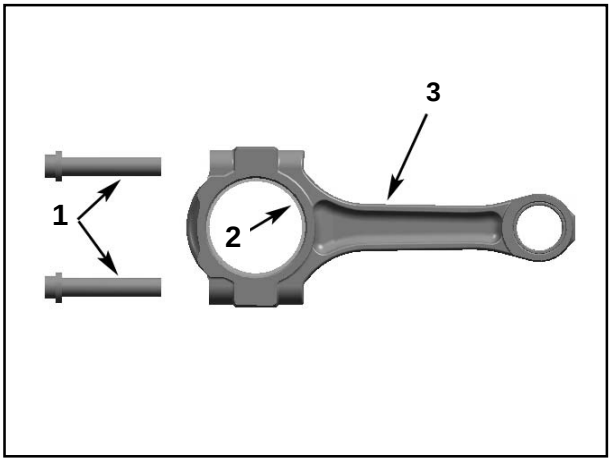
Refer to ***INTAKE MANIFOLD,CYLINDER HEAD AND CYLINDER***.

### Connecting Rod Big End Radial Play

Remove connecting rod from crankshaft.

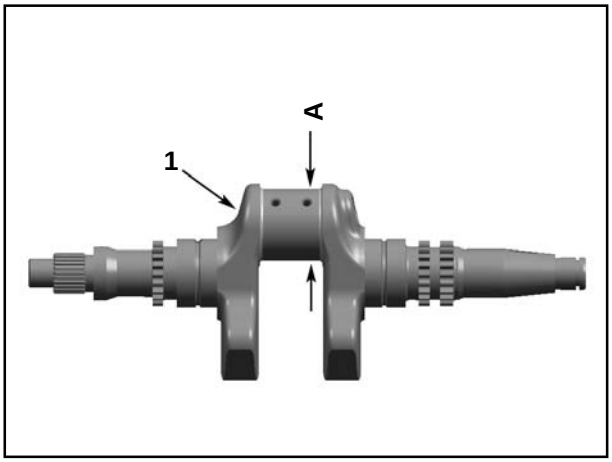
**NOTE:** *Make sure the same marking of connecting rod to assemble together, do not mix it and exchange between cylinder 1 and cylinder 2.*

**CAUTION:Always replace connecting rod screws no.1 if removing connecting rod.**




*1.Connecting Rod Screws*
*2.Plain Bearing*
*3.Connecting Rod*

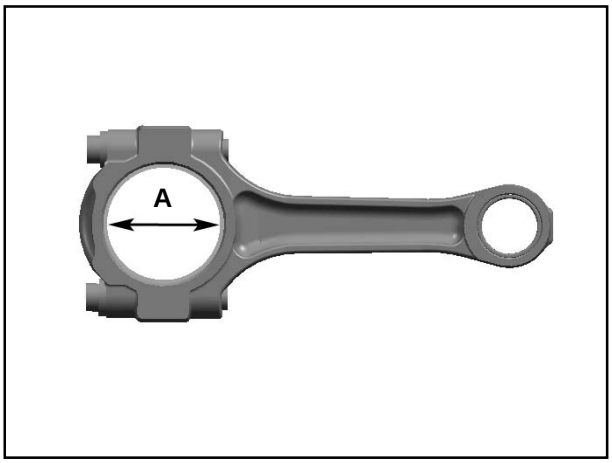
Measure the diameter of crankpin and compare to inside diameter of connecting rod big end.




*1.Crankshaft*
*A.Diameter of Crankpin*

Install screws of connecting rod and measure inside diameter of connecting rod big end.

Install bearing of connecting rod as original condition. Use below-mentioned methods and torque to tighten.

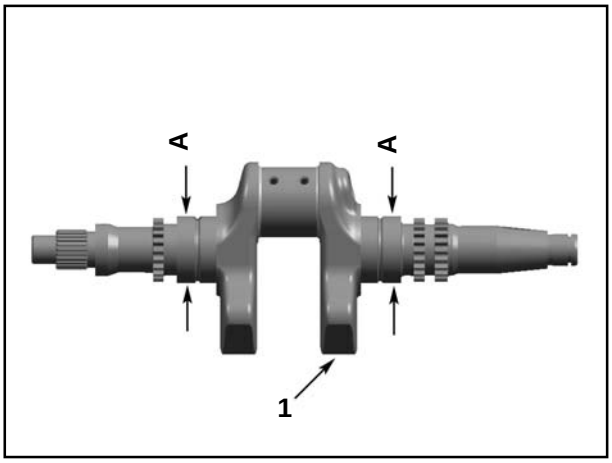



*1.Inside Diameter of Connecting Rod Bid End*

| **Crankpin** | |
|---|---|
| Standard | 43.946-43.960mm (1.7302-1.7307 in) |
| Service Limit | 43.93mm(1.7295 in) |
| **Inside Diameter of Connecting Rod Big End** | |
| Service Limit | 44.03mm(1.7335 in) |
| **Clearance between Connecting Rod Big End and Crankpin** | |
| Service Limit | 0.09mm(0.0035 in) |

## Crankshaft Radial Play,MAG/PTO Side

Measure crankshaft on MAG/PTO side and compare to inside diameter of MAG/PTO plain bearing(see ***CRANKCASE***).




*1.Crankshaft*
*A.Diameter of PTO Side Crankshaft*
*B.Diameter of MAG Side Crankshaft*

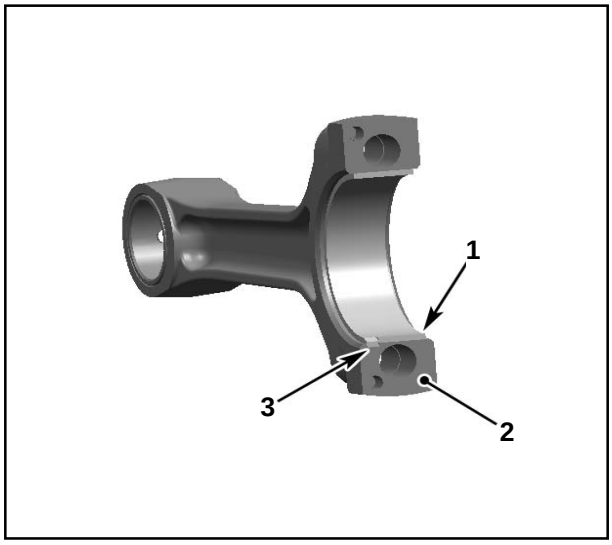
| **Diameter of Crankshaft MAG/PTO Side** | |
|---|---|
| Standard | 41.960-41.970mm (1.652-1.6524 in) |
| Service Limit | 41.935mm(1.651 in) |

| **Clearance between Crankshaft and Crankcase Hole** | |
|---|---|
| Service Limit | 0.09mm(0.0035 in) |

## Crankshaft Assembly

**NOTE:** *Follow the table below to assemble crankshaft,connecting rod and connecting rod plain bearing.*

| Inside Diameter of Connecting Rod Big End | Crankpin | Bearing of Connecting Rod |
|---|---|---|
| I | A | Black |
| II | | Blue |
| I | B | Red |
| II | | Black |




*1.Half Plain Bearing of Connecting Rod Big End*
*2.Split Surface of the Connecting Rod*
*3.Nose of Plain Bearing in Line with Connecting Rod Groove*

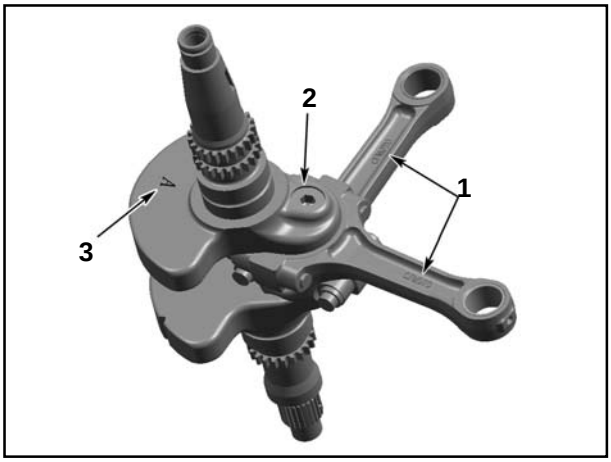
Cranksahft assembly procedure is the reverse of disassembly procedure.However,the following details should be noted.

1.When inside diameter of connecting rod big end is less than service limit, replace and use new connecting rod bearing.

2.After installing bearing into big end of connecting rod,use compressed air to clean connecting rod split surface.

**NOTE:** *Oil inner surface of connecting rod plain bearing and crankshaft pin surface before installation.*

There is an oil passage plug at CFMOTO logo side of cylinder 1 and cylinder 2 connecting rod.




*1.CFMOTO Logo*
*2.Plug of Oil Passage*
*3.Mark A or B on connecting shaft*

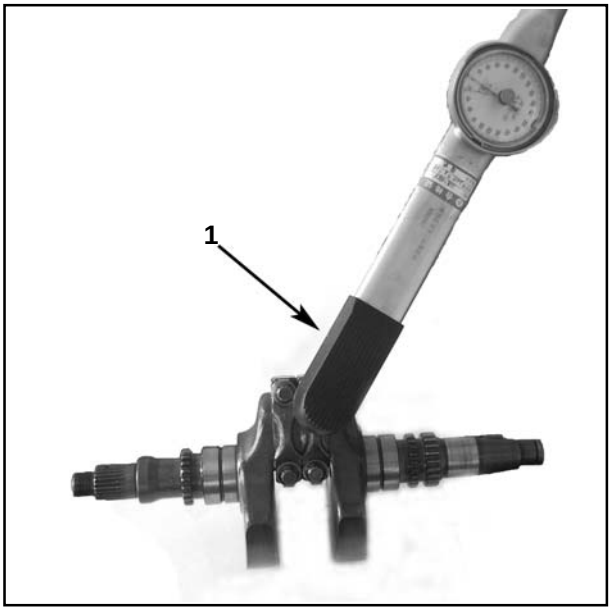
Screw of connecting rod should be tightened by following methods.

-Firstly torque to 10**N•m**(7.5**lbf•ft**).

**DO NOT** apply threadlocker.

-Then, torque to 20**N•m**(15 **lbf•ft**).

-Finally torque to 50**N•m**(35.25 **lbf•ft**).




*1.Torque Wrench*

**CAUTION: Improper installation will cause screw looseness and engine damage.**

**ATTENTION:** Bearing of connecting rod big end and piston pin rotation cannot be changed.

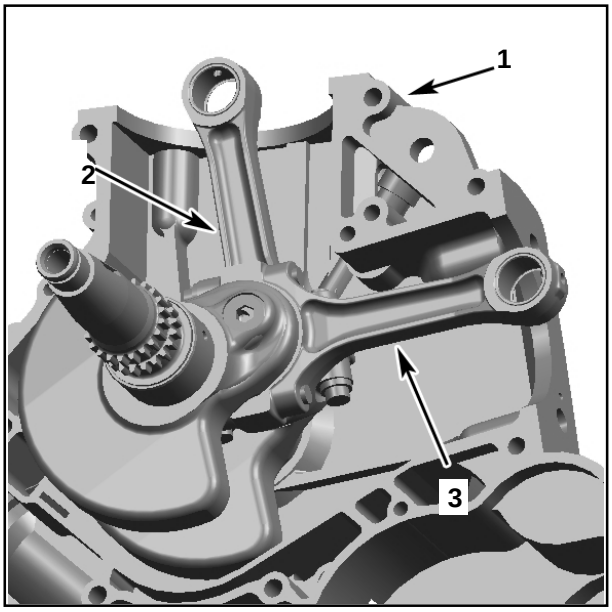
## Crankshaft Installation

The procedure of crankshaft installation is the reverse of removal, but following detailes should be cared.

Do not mix connecting rod of cylinder No. 1 and No.2

**ATTENTION:Do not damage plain bearing of crankcase when installing crankshaft (together with connecting rod).**

**ATTENTION:Before installation of camshaft and valve rocker arm, do not forget to install locking bolt to make sure crankshaft on top dead position.**




*1.Crankcase*
*2.Connecting rod of cylinder No.1*
*3.Connecting rod of cylinder No.2*

## Engine Front Output Shaft Removal

Remove shaft collar, O-ring, oil seal and bearing retainer.

Remove front output shaft.

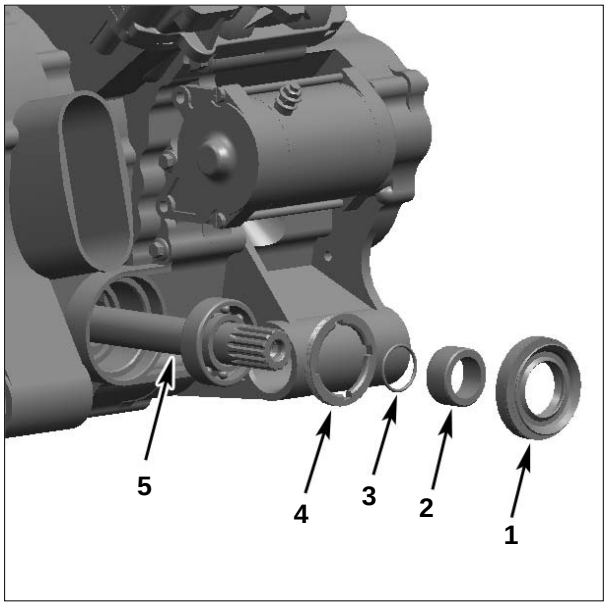
## Inspection

Inspect if bearing turns freely and smoothly,or has abnormal wear.Replace if necessary.

## Installation

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

Before installation, Oil bearing. Meanwhile,use a new oil seal and grease should be applied on lip of oil seal.




*1.Oil Seal*
*2.Shaft Collar*
*3.O-ring*
*4.Bearing Retainer*
*5.Front Output Shaft*

Use service tool to tighten bearing retainer (left thread) by applying threadlocker.

Tightening Torque: 80**N•m**

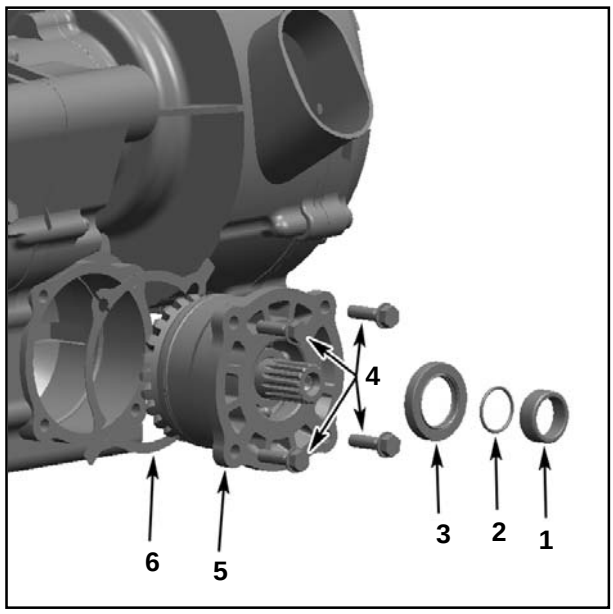
**Service Tool:**

Bearing retainer socket: 0180-060008-922-001
Oil seal installer: 0800-060000-923-001
Installer,front output shaft: 0800-062301-923-001

### Ring Gear Removal

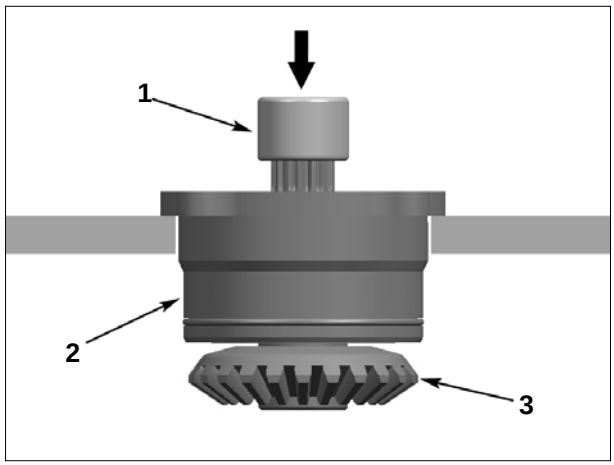
Remove ring gear bearing carrier screws;

Remove ring gear and adjustment shimshaft; Remove output shaft collar, O-ring, and oil seal;




*1.Shaft Collar*
*2.O-ring*
*3.Oil seal*
*4.Screws*
*5.Ring Gear Comp.*
*6.Adjustment Shim*

Use protector to avoid ring gear damage, fasten bearing carrier and press ring gear out;




*1.Ring Gear Protector*
*2.Bearing Carrier*
*3.Ring Gear*

Use bench vice to fix bearing carrier, then remove bearing and use special wrench (0800-062206-922-001)to remove thrust nut, finally remove bearing.

### Ring Gear Inspection

Inspect gear for any surface damage,wear. Replcae if necessary.

Inspect bearing for operation condition.

### Ring Gear Installation

Installation procedure is the reverse of removal procedure.Pay attention to the details.

Use oil seal installer (0800-062204-923-001) to install **NEW** oil seal and O-ring.

When replacement of right crankcase,ring gear or bearing seat, adjustment shim should be chekced and adjusted.

**Service Tool:**

Drive pinion gear bearing(6305) installer:

0180-062103-921-002

Ring gear bearing(6207C3) installer:

0180-062201-921-003

When installation, apply oil on bearing, oil seal, o-ring; apply threadlocker on bearing thrust nut and tighten to below torque.

Tightening Torque:**110N•m**

### Drive Pinion Gear Removal

Separate left and right crankcase(see ***CRANKCASE***);

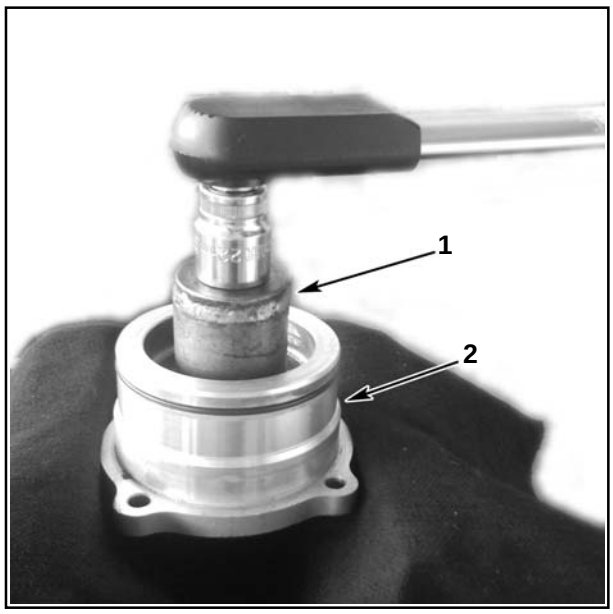
Remove drive pinion gear bearing carrier screws;

Remove drive pinion gear;

Remove circlip of drive pinion gear and output driven gear;

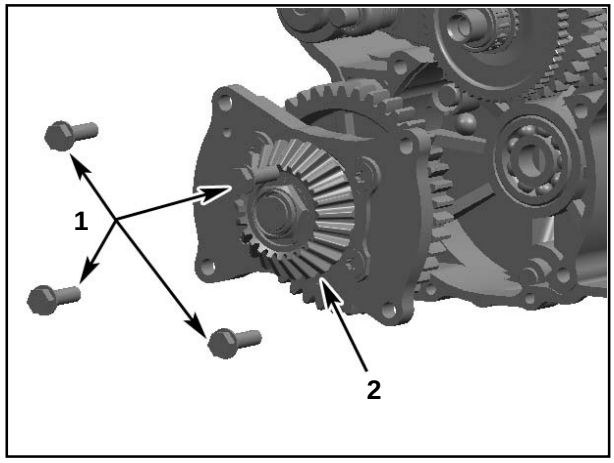
Use a clean rag to protect drive pinion gear shaft and fix it on bench vice;

Loosen drive pinion gear nut and remove drive pinion gear and adjustment shim;



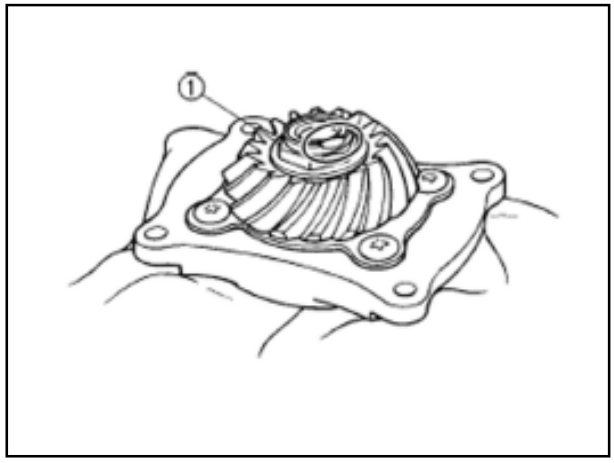

*1.Special Tool*

*2.Bearing Carrier of Ring Gear*




*1. Screws*

*2.Drive Pinion Gear*




*1.Nut*

## Drive Pinion Gear Inspection

Inspect drive pinion gear and output driven gear teeth for rusting,scratches,wear.Replace if necessary.

Inspect if bearing turns freely and smoothly.Replace if necessary.

When replacing any of crankcase,drive pinion gear, and drive pinion gear carrier,the adjustment shim should be readjusted.Refer to the content further.

## Drive Pinion Gear Installation

Reverse the removal procedure for installation.Oil bearing and tighten nut to sepecified torque.

Tightening Torque:145**N • m**.

## Shim Adjustment Procedure

When crankcase and/or drive pinion gear and/or ring gear and/or bearing carrier are replaced,the shim must be adjusted.

**WARNING**

**Both gear backlash and tooth contact should be in specification.**

## Gear Backlash

Install drive pinion gear and ring gear then install crankcase gasket;

Close crankcase and install some screws;

To lock drive pinion gear,using a clean screwdriver, reach the hole of drive pinion gear seat through speed sensor hole,then pry output driven gear out of place in its axial direction;

Install gear backlash measurement tools and dial gauge;

Rotate ring gear shaft from engagement to engagement to measure gear backlash.

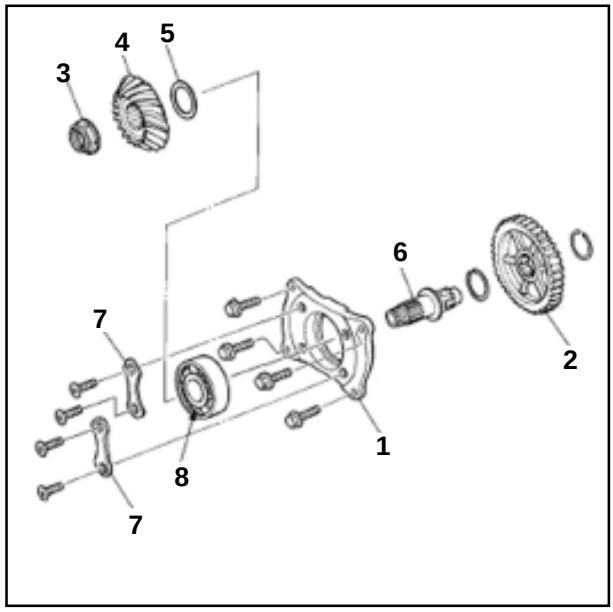
**NOTE**:*Measure the gear backlash at 4 positions. Rotate the shaft 90° each time.*

If gear backlash is out of specification,make the adjustment by adjusting the thickness of ring shim.

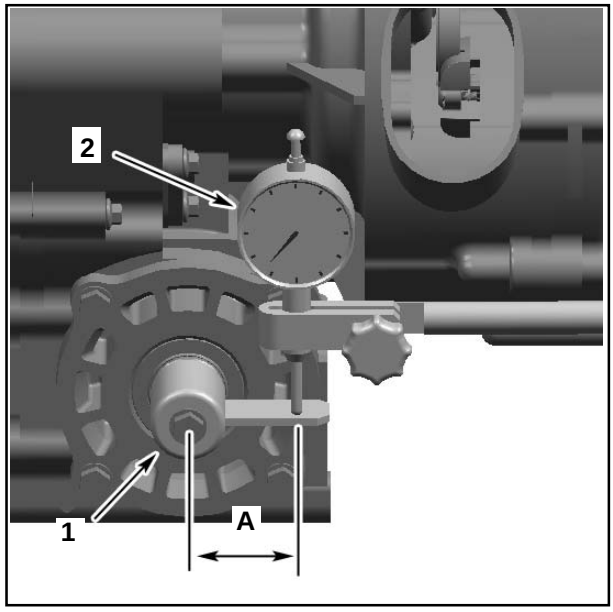
Gear Backlash:0.1-0.2mm(0.004-0.008in)

**Adjustment Steps**

| Gear Backlash | Shim Adjustment |
|---|---|
| < 0.1mm | Increase shim thickness |
| 0.1-0.2mm | Correct |
| > 0.2mm | Reduce shim thickness |




*1.Drive Pinion Gear Carrier 5.Adjustment Shim*
*2.Output Driven Gear 6.Drive Pinion Gear Shaft*
*3.Drive Pinion Gear Nut 7.Bearing Retaining Plate*
*4.Drive Pinion Gear 8.Ball Bearing*




*1.Backlash Measurement Tool*
*2.Dial Gauge*
*A.46mm(1.81 in)*

**Tooth Contact**

After backlash adjustment is carried out,the tooth contact must be checked.Pay attention to the following procedures:

Remove ring gear from crankcase;

Clean and degrease drive pinion gear and ring gear teeth;

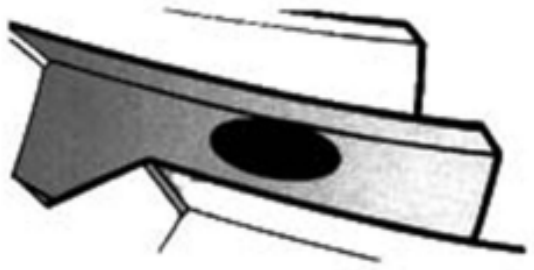
Apply a coating of machinist's layout dye or paste to several teeth of the driven gear;

Install ring gear;

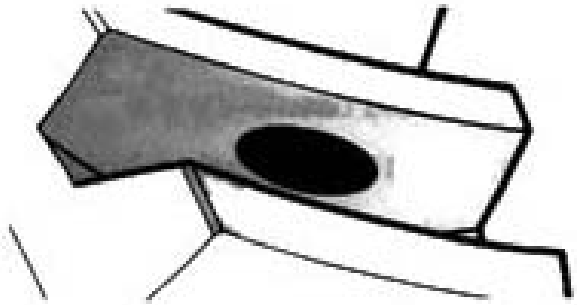
Rotate the ring gear several turns in both directions;

Remove drive pinion gear and ring gear,then inspect the the coated teeth of the drive pinion gear.The tooth contact pattern should be as shown below;

1



2



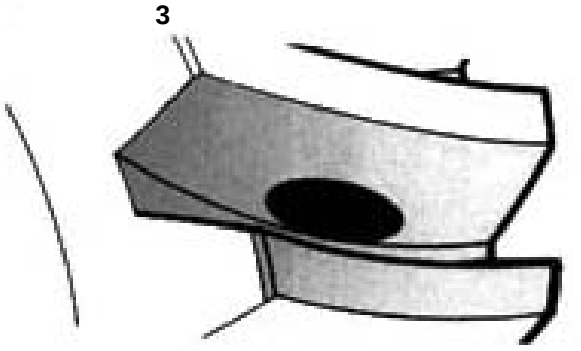
| | | |
|---|---|---|
| Pattern 1 | Contact at tooth top | Incorrect |
| Pattern 2 | Contact at tooth middle | Correct |
| Pattern 3 | Contact at tooth root | Incorrect |

If gear tooth contact is found to be correct(pattern 2), continue the next step.

If gear tooth contact is found to be incorrect(pattern 1 and pattern 3),the shim thickness between the drive pinion gear and ring gear must be changed and the tooth contact re-checked until correct.

**NOTE:***Clean the dye coated on the gear teeth after the tooth contact adjustment is finished.*

3



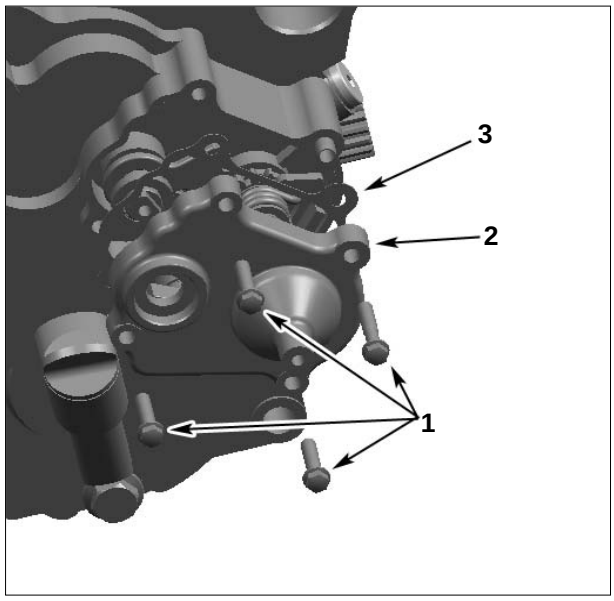
**Adjustment Steps**

| Tooth Contact | Shim Adjustment |
|---|---|
| Pattern 1 | Reduce shim thickness |
| Pattern 3 | Increase shim thickness |

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

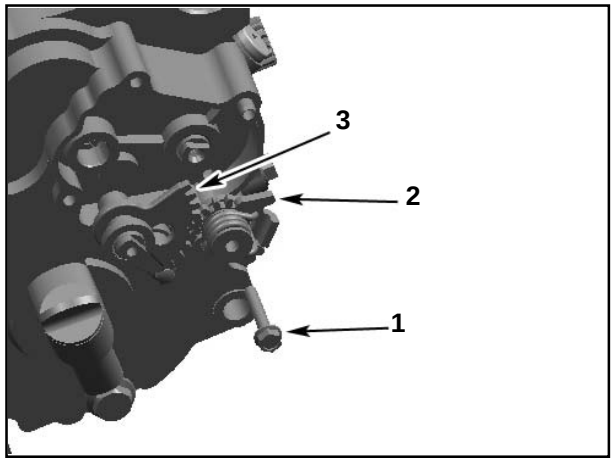
### Shift Lever Assembly Removal

Remove shift lever cover screws;
Remove shift lever cover and gasket;




*1.Screws*
*2.Shift Lever Cover*
*3.Shift Lever Gasket*

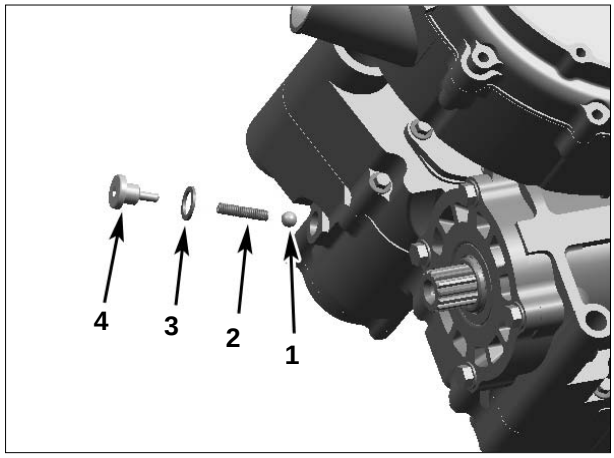
Remove driven shift lever assembly;
Remove drive shift lever assembly.




*1.Screw*
*2.Driven Shift Lever Assembly*
*3.Drive Shift Lever Assembly*

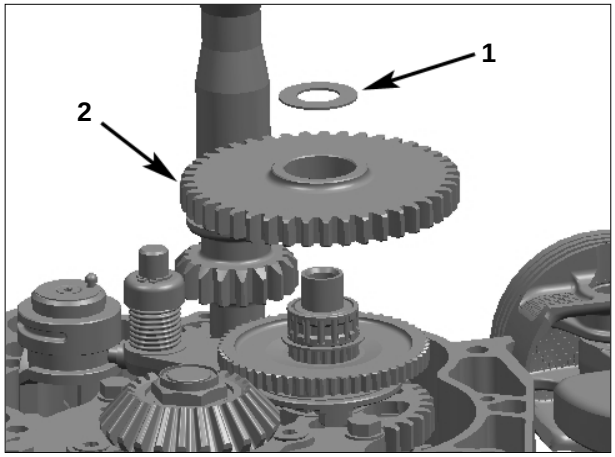
### Main Shaft,Driven Shaft Assembly,Shift Drum,Shift Fork/Shaft Removal

Remove gearshift limit spring seat;
Remove limit spring and steel ball;



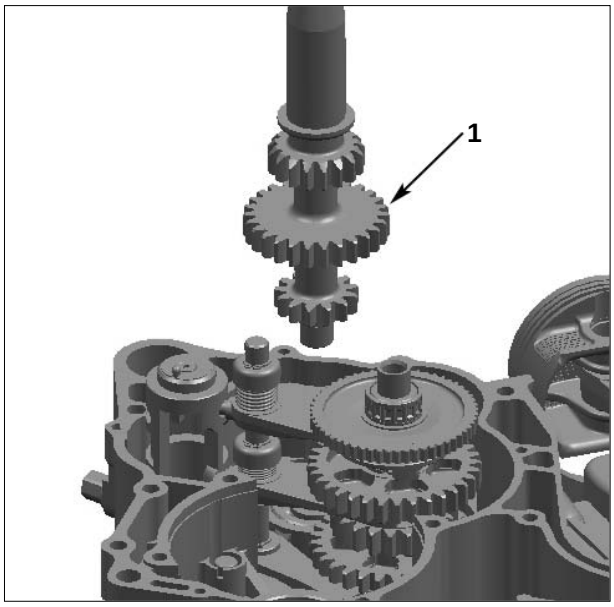

*1.Steel Ball*
*2.Spring*
*3.Washer*
*4.Spring Seat*

Split crankcase(see ***CRANKCASE***);
Remove gearshift driven shaft washer,driven lo range gear;



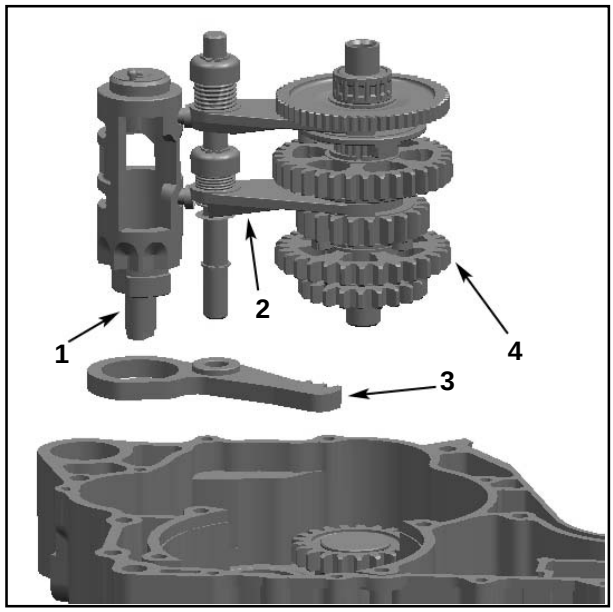

*1.Washer*
*2.Driven Lo Range Gear*

Remove drive pinion gear assy;
Remove gearshift main shaft by shifting to lo gear range;




*1.Main Shaft*

Remove gearshift driven shaft assy,shift drum,shift forks,parking lock lever;

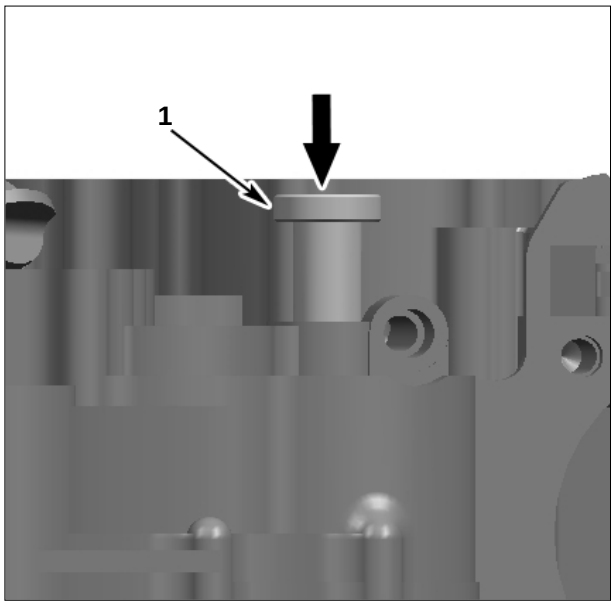



*1.Shift Drum*
*2.Shift Fork*
*3.Parking Lock Lever*
*4.Driven Shaft Assy*

### Reverse Intermediate Gear Removal

**NOTE**：*If reverse intermediate gear and needle bearing turn freely and smoothly,and clearance of them is normal,no need to remove them.*

To remove reverse intermediate gear and needle bearing,a proper service tool is required to press it out of left crankcase.(Use care to protect reverse intermediate gear and needle bearing from damage.)




*1.Service Tool*

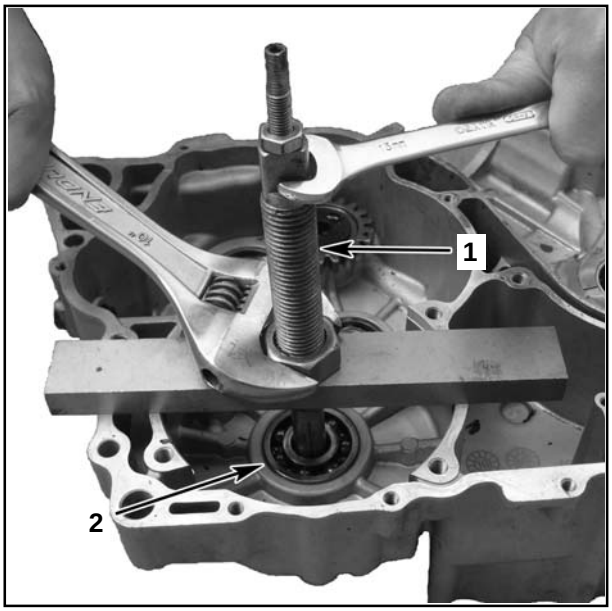
### Bearing Removal in Crankcase

If necessary,heat crankcase up to 100℃(212℉) before bearing removal.

**WARNING**
**Clean oil,outside and inside,from crankcase before heating.**

**CAUTION:Always support crankcase properly when bearing is removed.Crankcase damages may occur if this procedure is not performed correctly.**

To remove ball bearing in crankcase,use a blind hole bearing puller.




*1.Bearing Puller*
*2.Ball Bearing*

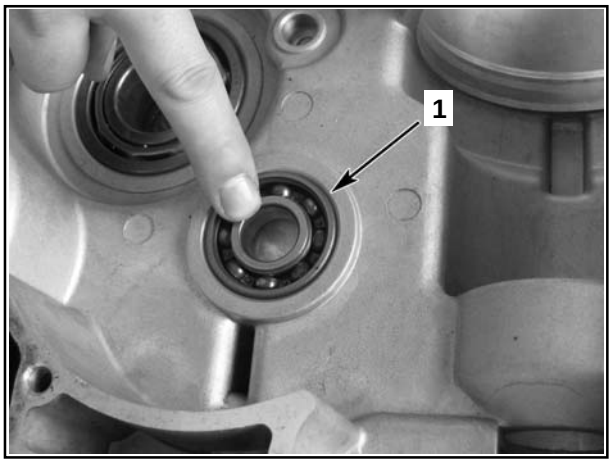
### Inspection

Always verify for the following when inspecting components in crankcase:

- gear teeth damage
- worn or scoured bearing surface
- excessively worn ,scoured,or bent shift fork
- excessively worn ,scoured,or bent shift fork shaft
- rounded engagament dogs and slots
- excessively worn ,scoured parking lock lever
- worn shift fork engagement pins
- worn shift track on shift drum
- worn or scoured shift fork claw
- worn splines on shafts and gears
- excessively worn and scoured parking cam

### Bearing

Check if bearing turns freely and smoothly.If any binding or abnormal noise has been found,replace it with a new one.



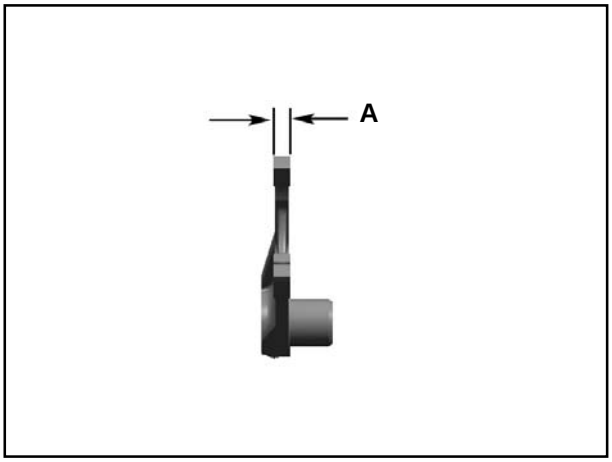

*1.Bearing*

### Shift Fork/Shaft

Check both shift forks for excessice wear.Check shift fork claw for bending.

Measure shift fork claw thickness.

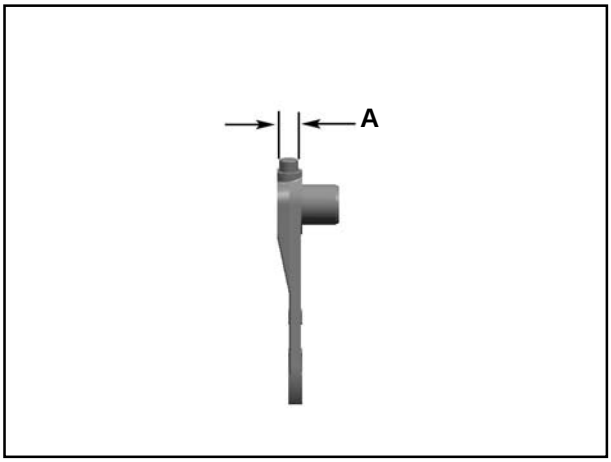
| Shift Fork Claw Thickness(both forks) | |
|---|---|
| New | 5.8-5.9mm(0.228-0.232in) |
| Service Limit | 5.7mm(0.224in) |




*A.Shift Fork Claw*

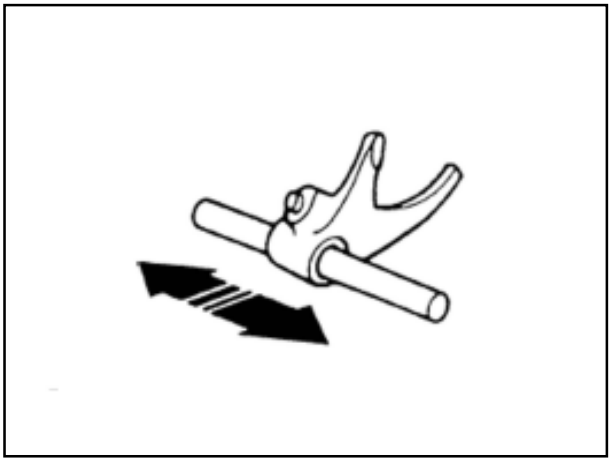
Measure shift fork pins.

| Shift Fork Pin Diameter(both) | |
|---|---|
| New | 7.9-7.95mm(0.311-0.313 in) |
| Service Limit | 7.83mm(0.318 in) |



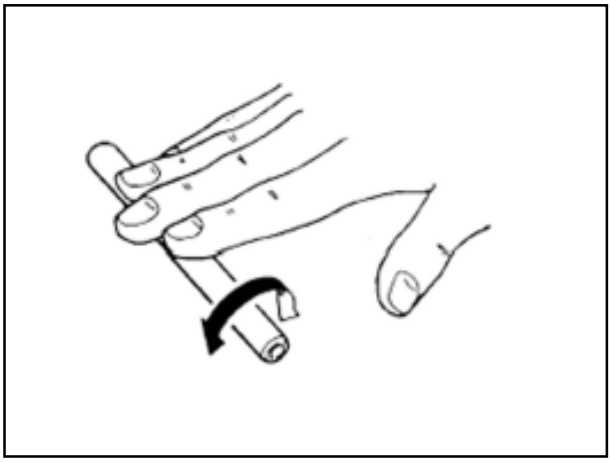

*A.Diameter of Shift Fork Pin*

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

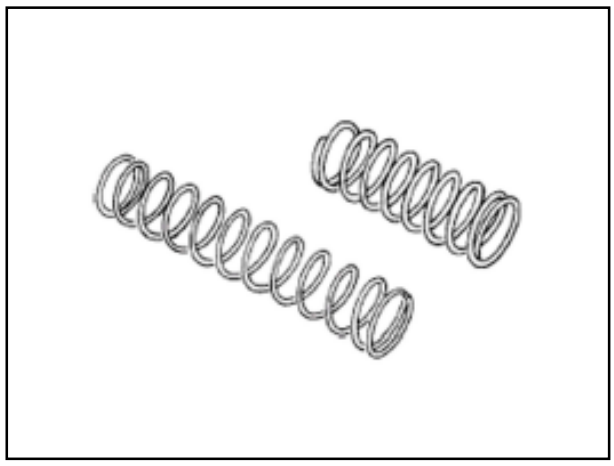


Place shift fork shaft on a level surface and roll it.If any bending has been found,replace it with a new one.

**CAUTION: Do not try to correct the bend shift fork pin.**

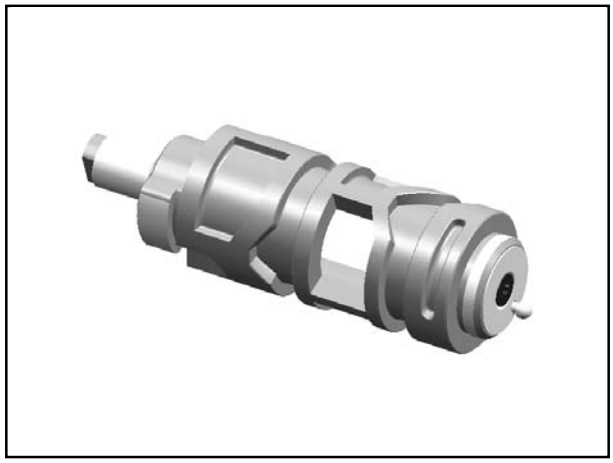


Inspect shift fork springs for damages.Replace if necessary.



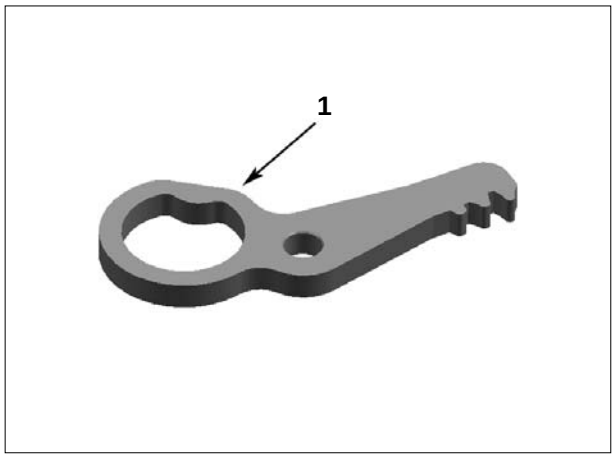
**Shift Drum**

Inspect shift drum tracks for excessive wear and other damages.
Inspect parking lock cam on shift drumfor excessive wear and other damages.Replace if necessary.
Inspect limit washer for damages.
Replace if necessary.



**Parking Lock Lever**

Check parking lock lever for cracks or other damages.

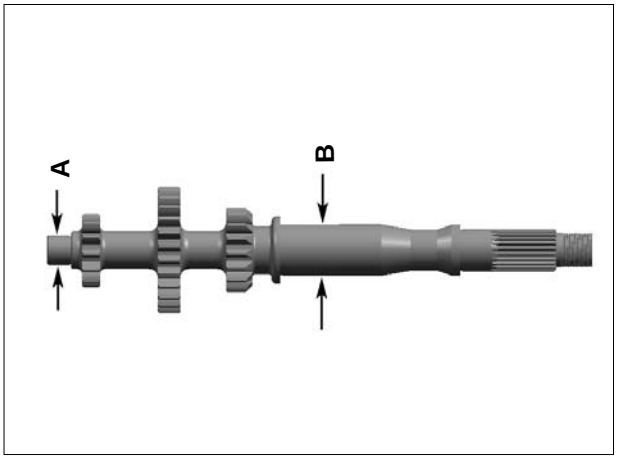



*1.Parking Lock Lever*

### Gearshift Main Shaft

Check gearshift main shaft for damages.
Check gear teeth of gearshift main shaft for pittings, scuffing and excessive wear.Replace if necessary.
Measure main shaft neck diameter of two ends as shown.If the meassurements are less than the service limit,replace.

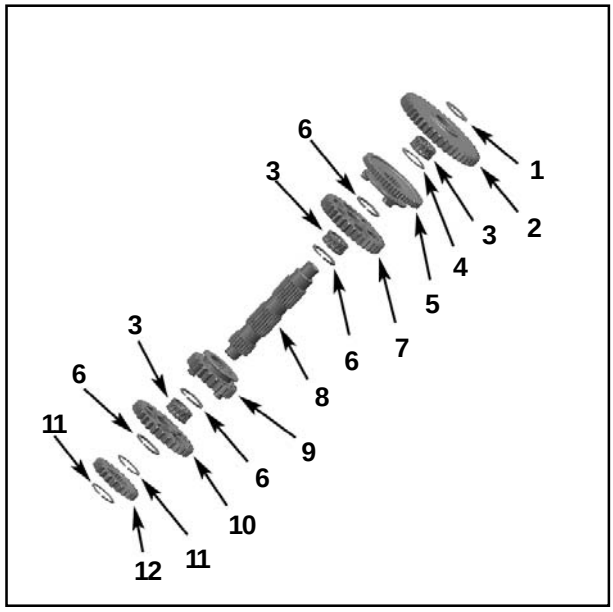
| Gearshift Main Shaft Neck Diameter | |
|---|---|
| Service Limit | |
| MAG Side | 16.97mm(0.666 in) |
| CVT Side | 29.97mm(1.178 in) |




*A.MAG Side*
*B.CVT Side*

### Gearshift Driven Shaft Assy

Disassemble gearshift driven shaft assy as shown.
Check teeth of each gear for fittings,scuffing and excessive wear.Check needle bearing and circlip for wear and damages.Replace if necessary.




*1.Washer 17.5x32x1*
*2.Driven Lo Range Gear*
*3.Needle Bearing*
*4.Washer 24.5x33.5x1*
*5.Gearshift Sliding Bushing*
*6.Circlip 29*
*7.Driven Hi Range Gear*
*8.Driven Shaft*
*9.Driven Output Gear*
*10.Reverse Driven Gear*
*11.Circlip 29*
*12.Parking Lock Gear*

## Gears

**NOTE:***Gears must be replaced in a pair.Always replace circlip after removal.*

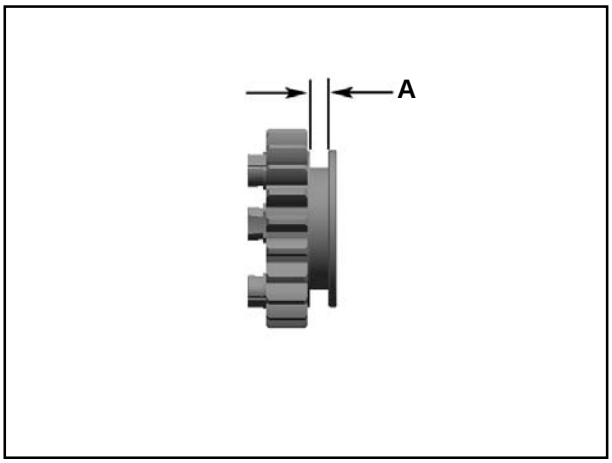
–driven shaft output gear for reverse gear shifting

–gearshift sliding sleeve for high and low gear shifting

Measure the width for engegement of shift fork.If the width is out of specification,replace the gear.

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

| Width for Engagement of Shift Fork | |
|---|---|
| New | 6.1-6.2mm(0.240-0.244 in) |
| Service Limit | 6.3mm(0.248 in) |

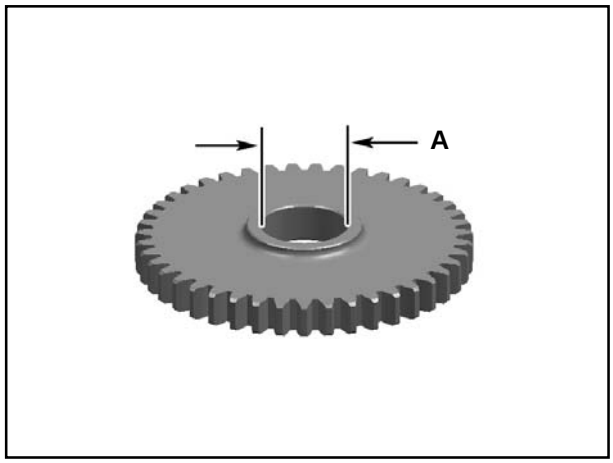



*A.Groove Width*

Inspect reverse driven gear,high range gear,low range gear for damages.Measure the gear inner diameter,if it's out of specification,replace the gear.

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

| Inner Diameter | |
|---|---|
| New | 29-29.021mm(1.1417-1.1425 in) |
| Service Limit | 29.025mm(1.1427 in) |




*A.Inner Diameter*

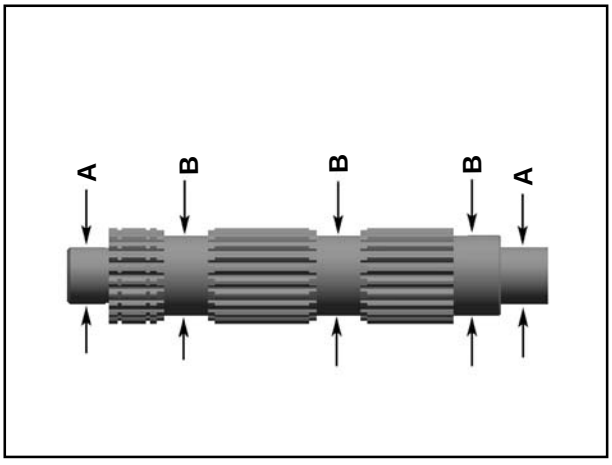
## Driven Shaft

Check driven shaft for damages.

Check driven shaft for pittings,scouring and excessive wear.Replace if necessary.

Measure driven shaft neck diameter,f it's out of specification,replace it.

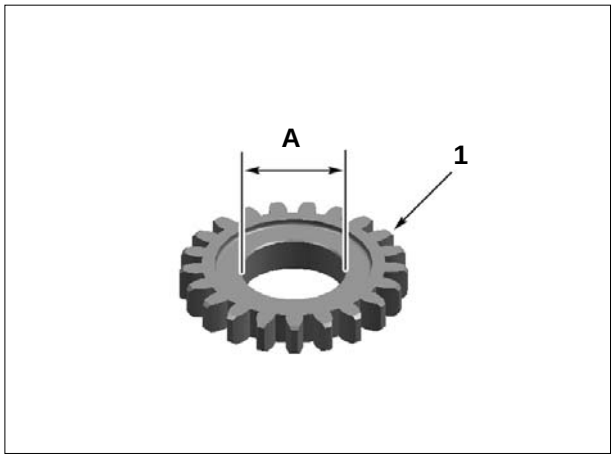
| Driven Shaft | |
|---|---|
| Service Limit | |
| A | 16.978(0.6684 in) |
| B | 23.970(0.9437 in) |



### Reverse Intermediate Gear

Check reverse intermediate gear for damages.Measure the inner diameter.If it's out of specifiacation,replace it.

| Reverse Intermediate Gear Inner Diameter | |
|---|---|
| New | 29.007-29.028 mm(1.1420-1.1428 in) |
| Service Limit | 29.032 mm(1.1430 in) |

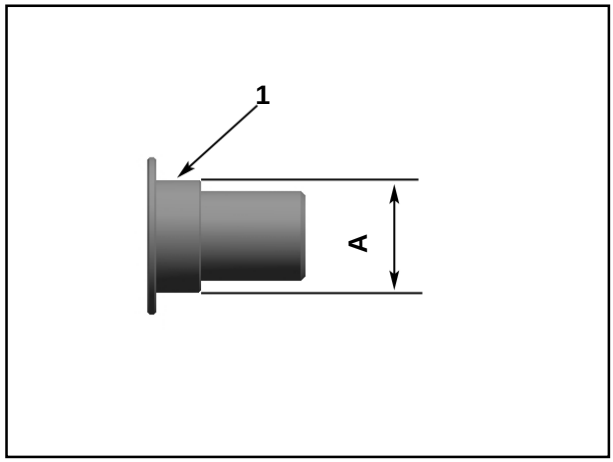



*1.Reverse Intermediate Gear*
*A.Inner Diameter*

### Reverse Intermediate Gear Shaft

Check reverse intermediate gear for damages.Measure reverse intermediate gear shaft neck diameter. If it's out of specification,replace it.

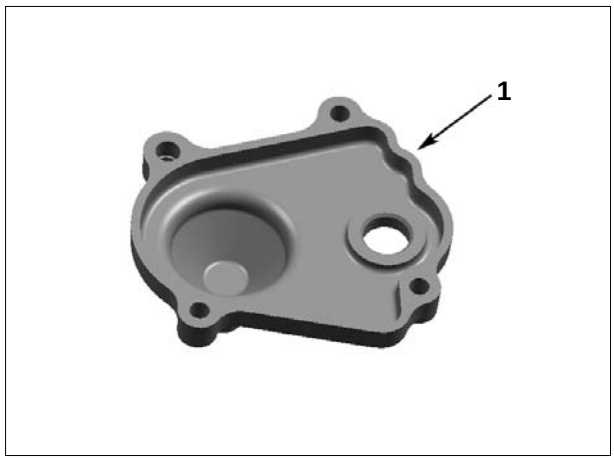
| Reverse Intermediate Gear Neck Diameter | |
|---|---|
| New | 24.980-24.993 mm(0.9834-0.984 in) |
| Service Limit | 24.974 mm(0.9832) |




*1.Reverse Intermediate Gear Shaft*
*A.Reverse Intermediate Gear Shaft Neck Diameter*

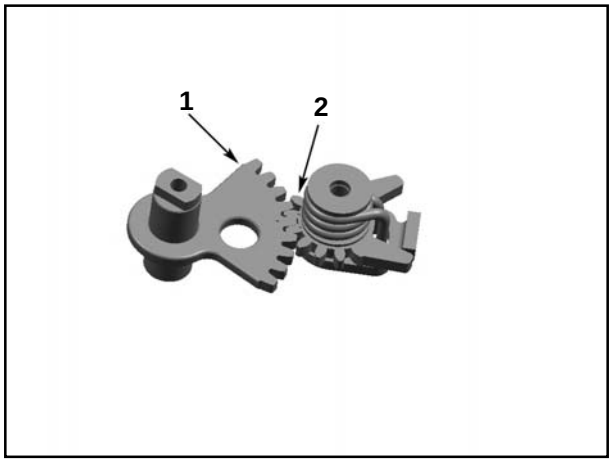
### Shift Lever Assembly

Check shift lever cover for cracks,deformation and other damages.Replace if necessary.




*1.Shift Lever Cover*

Check drive shift lever and driven shift lever for cracks, deformation,wear and other damages.Replace if necessary.

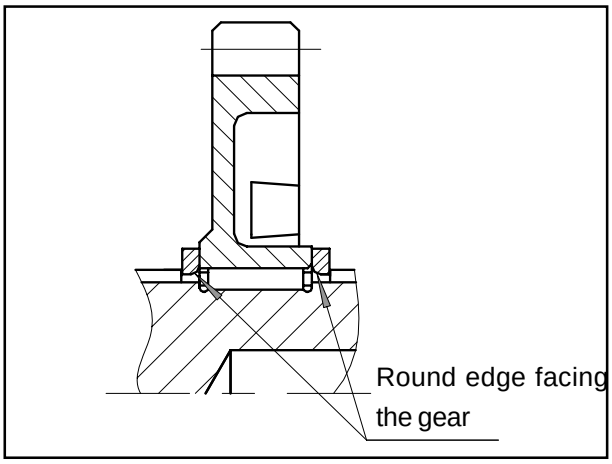



*1.Drive Shift Lever*
*2.Driven Shift Lever*

**Assembly**

Assembly procedure is the reverse of disassembly procedure.Pay attention to the following details:

Always use a new circlip.Pay attention to the direction when installing a new circlip.Perform the installation as illustrated.



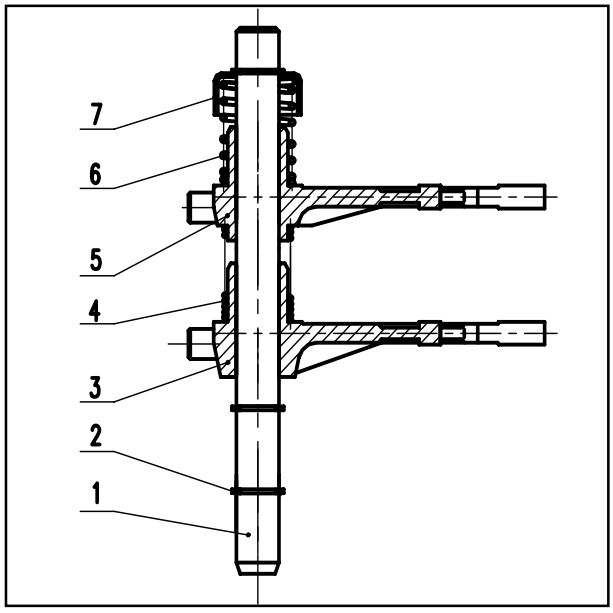

Lightly oil gears and shafts before assembly.

**CAUTION:**

**Once circlip is removed,it has been damaged. Therefore,never use it for a second time.When installing a new circlip,do not open the circlip too much.**

After circlip installation is finished,make sure the circlip is in place.

When installing shift fork shaft,ensure shift forks and shift fork springs are in correct locations as illustrated.




*1.Shift Fork Shaft 2.Circlip 12;*
*3.Left Shift Fork 4 Shift Fork Spring(thin)*
*5.Right Shift Fork 6.Shift Fork Spring(thick)*
*7 .Spring Seat*

### Installation

Crankcase installation procedure is the reverse to removal installation procedure.However,pay attention to the following details:

Do not use a hammer to install ball bearing unless its structure is special.Only use a press tool to install a bearing.

If necessary,heat crankcase up to 100℃(212℉) before removing ball bearing.

**WARNING**

**Clean oil,inside and outside,from crankcase before heating.**

Put a new ball bearing in an icebox or equivalent facility to chill for 10 minutes before installation.

Using sevice tool,install the ball bearings in left crankcase and right crankcase.

**CAUTION:Always support crankcase properly when installing ball bearings.**

**Perform the correct procedure when installing a new oil seal**(Refer to ***Oil Seal Installation*** above)**.**

### Other Parts in Crankcase

Fit needle bearing onto reverse intermediate gear shaft, then install them together with reverse intermediate gear.

**NOTE:** *Reverse intermediate gear collar faces reverse intermediate gear shaft small end.*

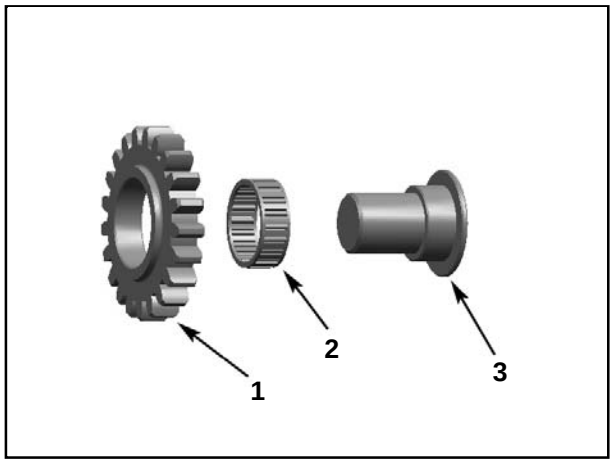
**NOTE:***Press bearing no.3 before installing reverse intermediate gear.*

Using press machine,press reverse intermediate gear in the left crankcase.

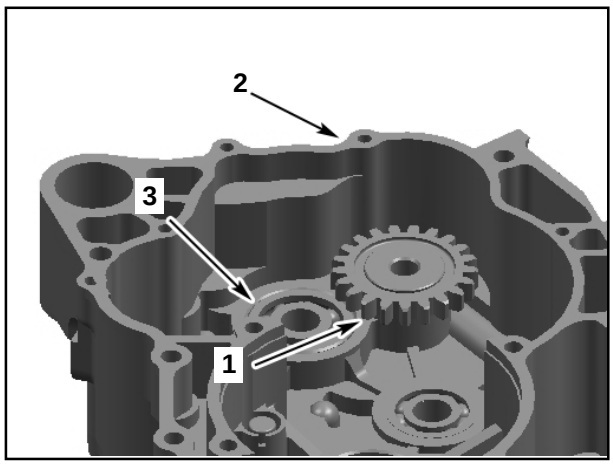
Place parking lock lever in place in crankcase.

Engage shift fork assy with gearshift driven shaft assy, then fit them in place in left crankcase.

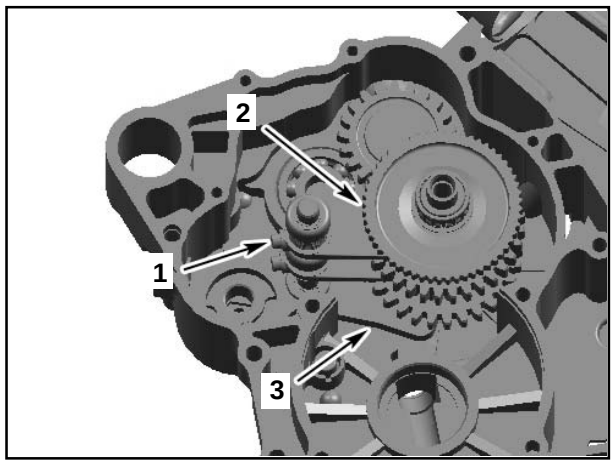
**NOTE:***Do not install washer 17X32X1and reverse range gear into gearshift driven shaft assy.*




*1.Reverse Intermediate Gear*
*2.Needle Bearing*
*3.everse Intermediate Gear Shaft*

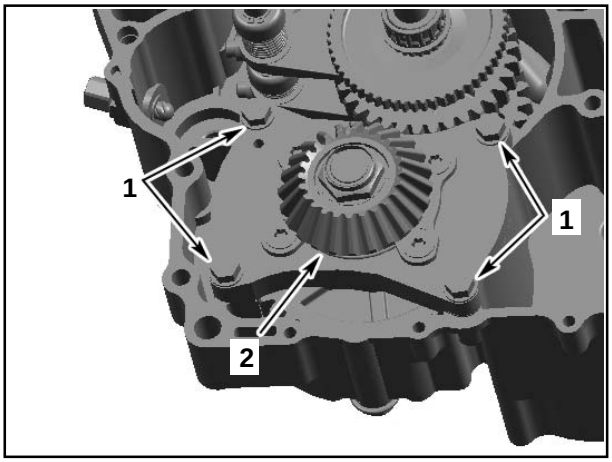



*1.Reverse Intermediate Gear*
*2.Left Crankcase*
*3.Bearing*



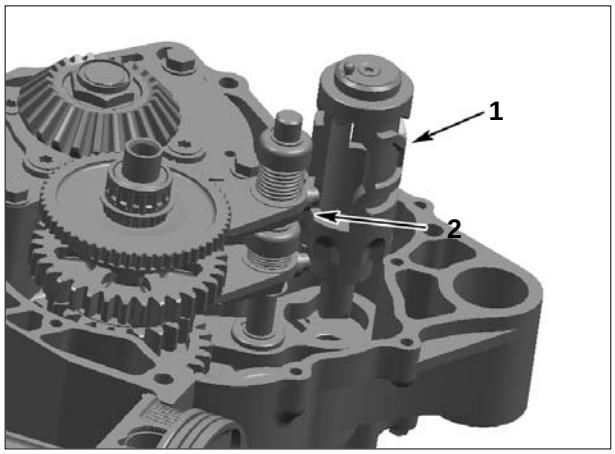

*1.Shift Fork Assy*
*2.Driven Shaft Assy*
*3.Parking Lock Lever*

Install drive pinion gear assy then tighten the 4 retaining screws.




*1.Screws*
*2.Drive Pinion Gear*

Place parking lock lever in parking position,then align shift drum tracks with shift forks and fit it in left crankcase.Shift parking lock lever to parking position, then align shift drum axial track with shift fork pin and fit it in the left crankcase.

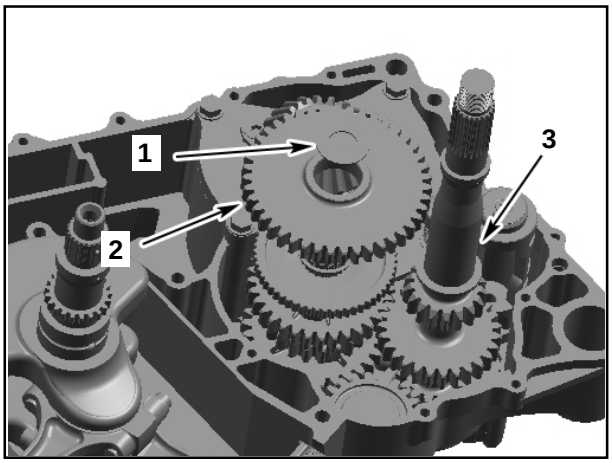



*1.Shift Drum*
*2.Axial Track*

Using an appropriate tool,shift to low range,then install gearshift main shaft.
Install washer and low range gear.
Using an appropriate tool,shift to neutral range.
Turn main shaft,check if gears rotate freely and smoothly.

Rotate the main shaft,check if the corresponding meshing gears turn freely and smoothly.

**NOTE:***When installing rotational parts,equally oil shaft necks.*




*1.Washer*
*2.Lo Range Gear*
*3.Main Shaft*

Install a new crankcase gasket**.**

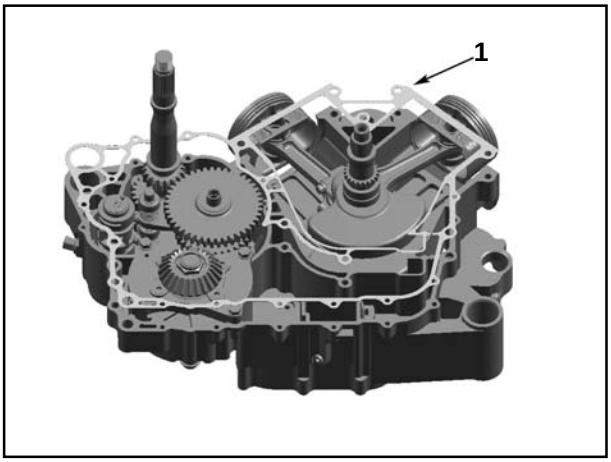
**NOTE:***Always use a new crankcase after splitting crankcase.*

Place the right crankcase on the left crankcase.Install screws and torque to specifications.

**WARNING**

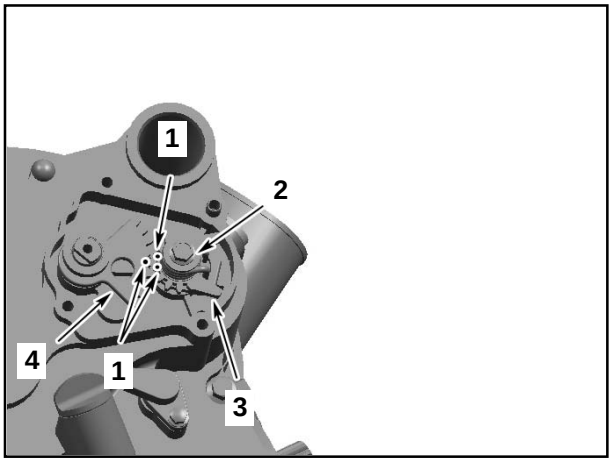
**Do not turn shift drum before shift lever installa tion is completed.**

Install driven shift lever assy and drive shift lever assy.; Torque driven shift lever screw to specified value;



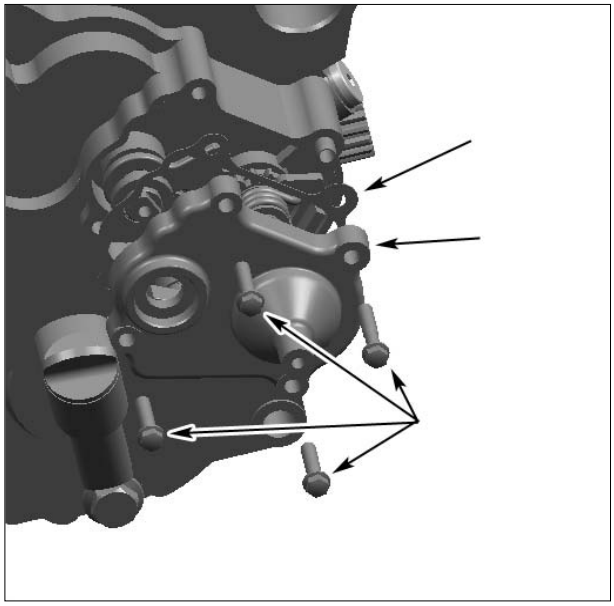

*1.Crankcase Gasket*

**NOTE:***When installing driven shift lever assy and drive shift lever assy,the marks on their teeth should be aligned***.**




*1.Marks*
*2.Screw*
*3.Driven Shift Lever Assy*
*4.Drive Shift Lever Assy*

Install shift lever cover gasket and cover;
Install shift lever cover screws and torque to specified value;



*1.Screws*
*2.Shift Lever Cover*
*3.Shift Lever Cover Gasket*

Install other removed parts.

# CVT AND CLUTCH

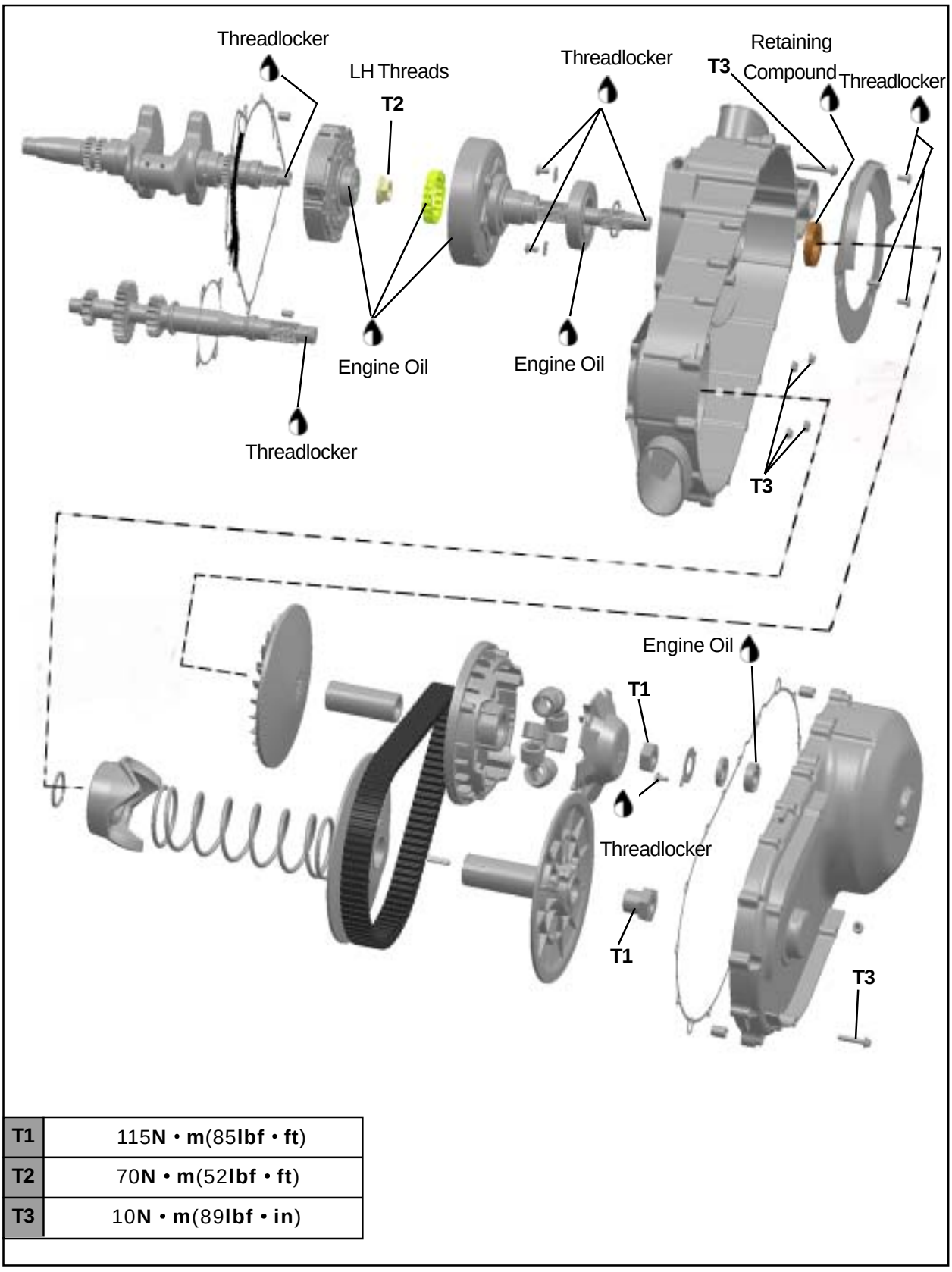


## SERVICE TOOLS

| Decription | P/N | Page |
|---|---|---|
| Split tool,drive&driven pulley | 0800-052000-922-003 | 6 |
| Drive pulley oil seal installer | 0800-051204-923-001 | 8 |
| Drive pulley holder | 0180-051000-922-001 | 10 |
| Driven pulley remover | 0800-052000-922-002 | 11 |
| Driven pulley holding wrench | 0800-052000-922-001 | 14 |
| Installer,clutch housing oil seal | 0800-013104-923-001 | 16 |
| Clutch housing damper | 0180-053100-921-001 | 16 |
| Clutch holding wrench | 0180-054000-922-001 | 18 |

## SERVICE PRODUCTS

| Decription | P/N | Page |
|---|---|---|
| Engine oil | | |
| Threadlocker | | |
| Retaining Compound | | |




| | |
|---|---|
| **T1** | 115**N • m**(85**lbf • ft**) |
| **T2** | 70**N • m**(52**lbf • ft**) |
| **T3** | 10**N • m**(89**lbf • in**) |

## GENERAL

**NOTE:** *For a better understanding, the following illustrations are taken with engine out of vehicle.To perform the following instructions,it is not necessary to remove engine.*

During assembly/installation,use the torque values and service products as in the exploded views.

Clean threads before applying a threadlocker.Refer to ***LUBRICANTS AND SERVICE PRODUCTS*** at the beginning of this manual for complete procedure.

**WARNING**

**Torque wrench tightening specifications must strictly be adhered to.Locking devices(e.g.: locking tabs, elastic stop nuts,cotter pin,etc.)must be replaced with new ones.**

**WARNING**

**Never touch CVT while engine is running.**
**Never drive vehicle when CVT cover is removed.**

**WARNING**

**Any drive pulley repairs must be performed by an authorized CFMOTO dealer.Subcomponent installation and assembly tolerances require strict adherence to procedures detailed.**

**CAUTION: Never use any type of impact wrench at drive pulley removal and installation.**

**WARNING**

**The clutch assembly is a precisely balanced unit.Never replace parts with used parts from another clutch assembly.**

**CAUTION: These pulleys have metric threads. Do not use SAE threads puller.Always tighten ouller by hand to ensure that the drive pulley has the same type of threads(metric vs SAE) prior to fully tightening.**

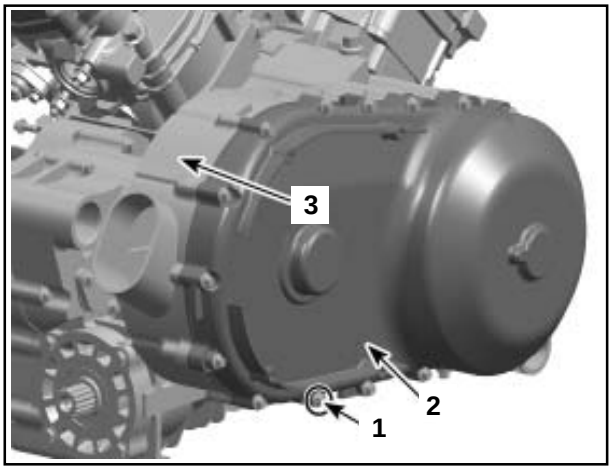
## CVT COVER

### CVT Cover Removal

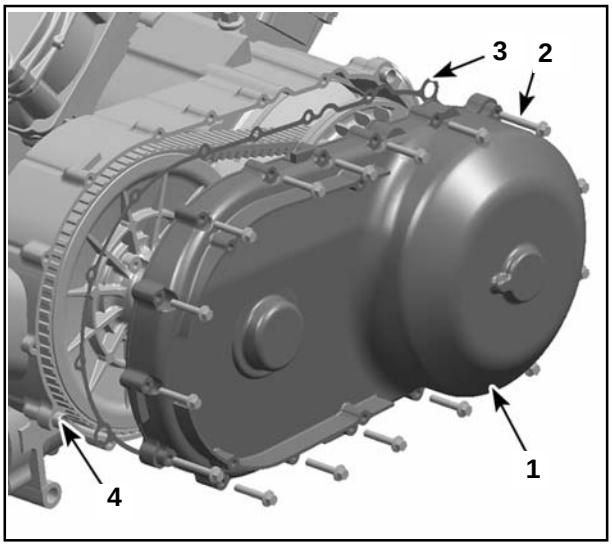
Remove CVT cover screws;

Remove CVT cover comp.;

Remove gasket.




*1.Screw*
*2.CVT Cover*
*3.CVT Case*




*1.CVT Cover 2.Screw*
*3.Gasket 4.Dowel Pin*

### CVT Cover Inspection

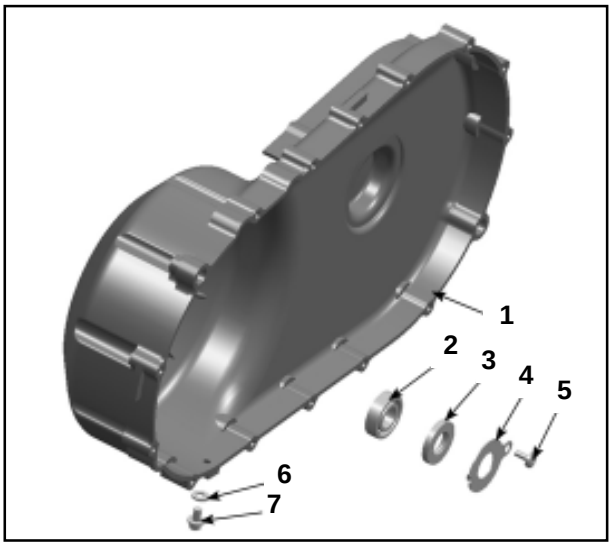
Remove the bolts and retaining plate, the remove oil seal;

Inspect bearing rotating condition.If any damage has been found,replace the bearing;

Apply lubricant oil on bearing outer ring.Use special tool to instrall the bearing and check it for smoothness;

Apply grease inside bearing;

Use a new seal and apply grease on seal lips.




*1.CVT Cover 2.Bearing*
*3.Oil Seal 4.Retaining Plate*
*5.Screw 6.Washer*
*7.Screw*

### CVT Cover Installation

Reverse the removal procedure for CVT Cover installation.

**NOTE:**

*Tighten bolts in criss-cross sequence;*
*Replace new seal;*
*After Installing oil seal retaining plate, apply threadlocker on screw threads.*

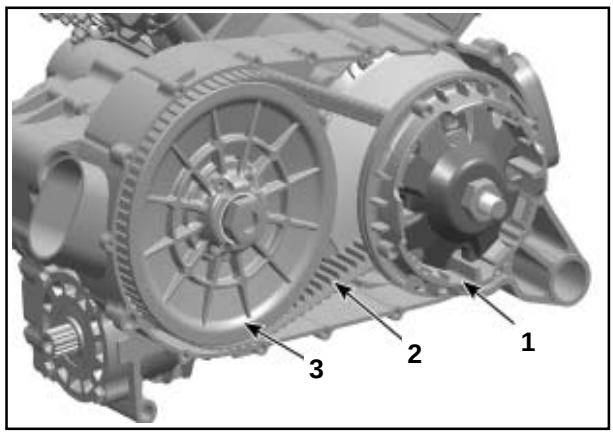
## DRIVE BELT

### Drive Belt Removal

Remove CVT cover and gasket(Refer to *CVT Cover*);

Remove drive pulley (refer to *Drive Pulley*);

Remove driven pulley (refer to Driven Pulley);




*1.Drive Pulley*
*2.Drive Belt*
*3.Driven Pulley*

**NOTE:**

*If no printed arrow mark has been left on drive belt, remark the belt during removal to avoid incorrect installation.*

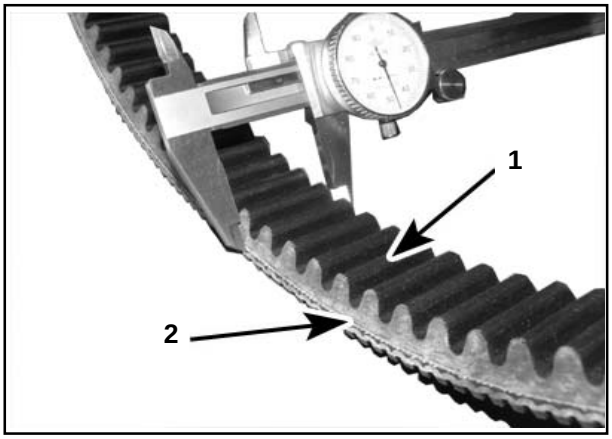
### Drive Belt Inspection

Check belt for cracks,fraying or abnormal wear.
Replace if necessary.
Check drive belt width at cord level.
Replace if it is out of specification.

**Belt Width Service Limit:**33.0mm(1.181 in)

**Tool:**Vernire caliper

**CAUTION: If belt surface is contaminated with grease or oil, degrease the belt thoroughly.**




*1.Drive Belt*
*2.Cord in Drive Belt*

### Drive Belt Installation

Reverse the removal procedure for belt installation.

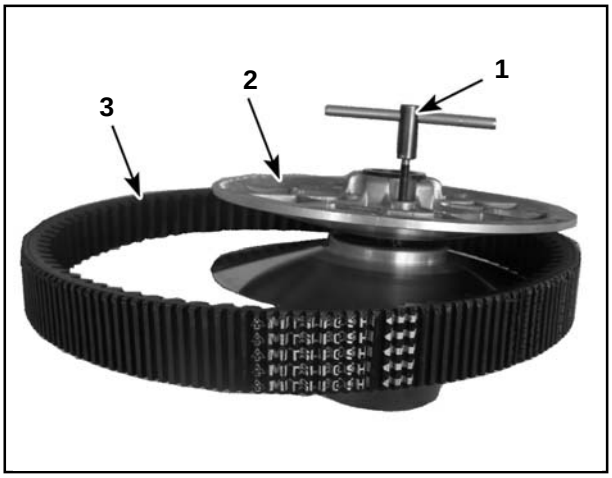
**NOTE:**

*1.Using special tool,insert the threaded hole of driven pulley and tighten to open the pulley.*

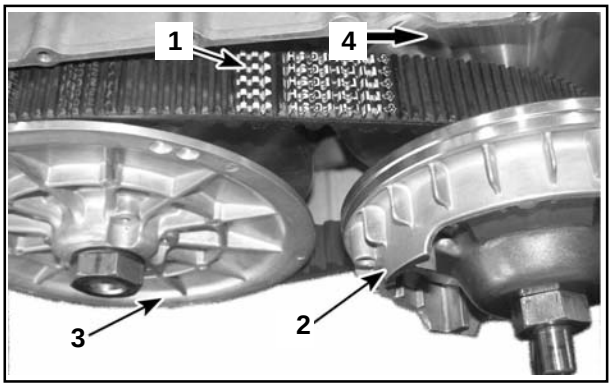
*2.No grease on belt and drive pulley*

*3.Arrow printed on belt should point towards the front of vehicle,viewed on top.*
*If no arrow on belt, install follow removal directly remark.*

*4.Primary sheave should install corectly to avoid belt against other parts and not well installed.*




*1.Special Tool*
*2.Driven Pulley*
*3.Drive Belt*

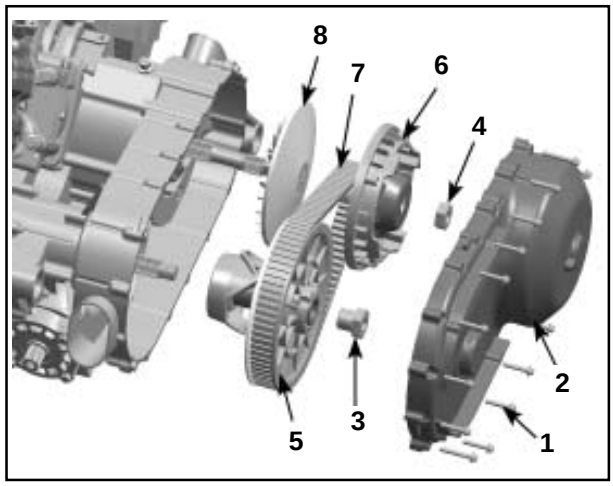



*1.Printed Mark on Drive Belt*
*2.Drive Pulley(Front)*
*3.Driven Pulley(Rear)*
*4.Rotation Direction*

## DRIVE PULLEY

### Drive Pulley Removal

Remove CVT Cover no.2 (refer to ***CVT Cover***);
Remove drive pulley nut no.4 and drive pulley sliding sheave no.6;
Remove driven pulley nut no.3 and driven pulley no.5;
Remove drive belt(refer to ***Drive Belt***);
Remove drive pulley fixed sheave;

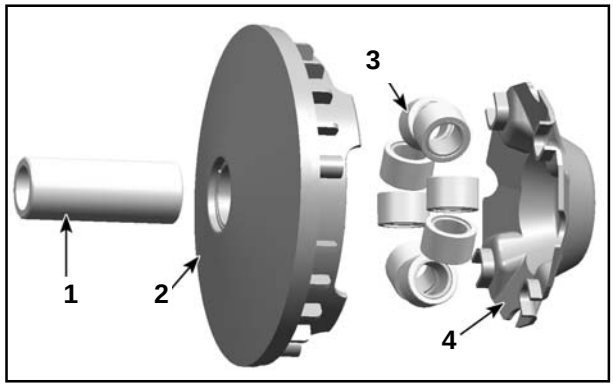



*1.CVT Cover Screw 2.CVT Cover*
*3.Driven Pulley Nut 4.Drive Pulley Nut*
*5.Driven Pulley 6.Drive Pulley Sliding Sheave*
*7.Drive Belt 8.Drive Pulley Fixed Sheave*

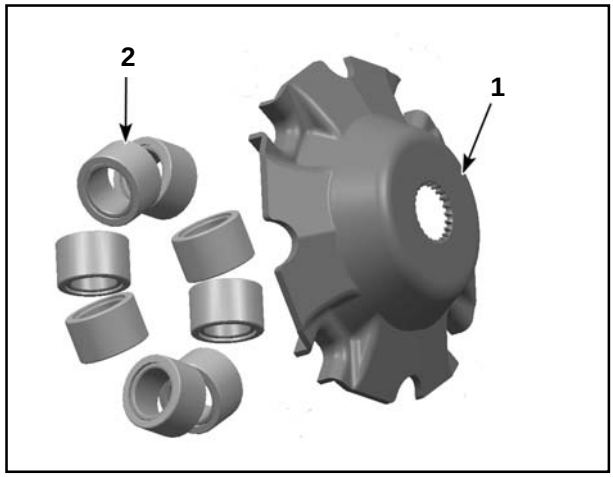
### Drive Pulley Disassembly

Remove drive pulley shaft sleeve;

Remove cam and rollers;



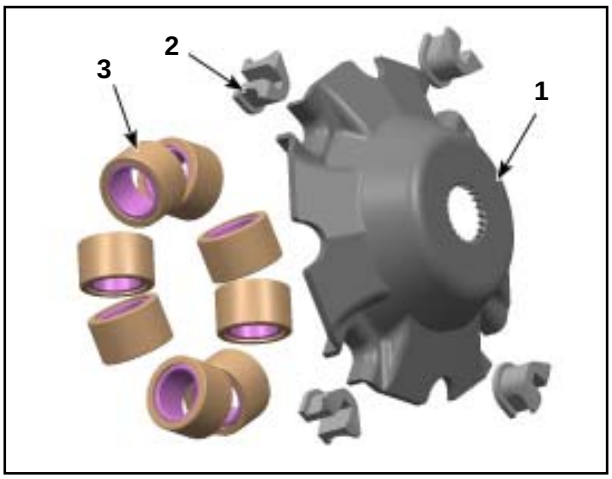

*1.Sleeve 2.Drive Pulley Sliding Sheave*
*3.Roller 4.Cam*




*1.Cam*
*2.Roller*

### Cam, Sliders and Rollers Inspection

Check Cam for wear and other damages. Replace if necessary.
Check slider wear and other damages. Replace if necesary.
Check each roller and sliding surface for wear and other damages, if any damage has been found,replace all rollers.



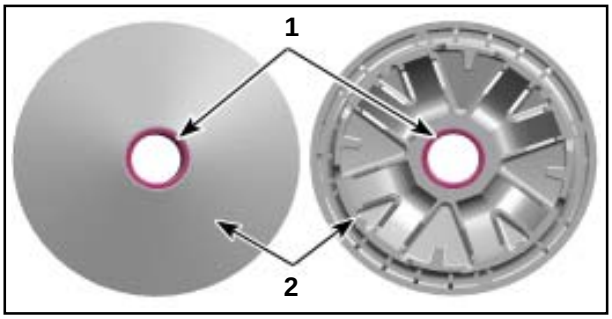

*1.Cam*
*2.Slider*
*3.Roller*

**NOTE**: *Whenever replacing rollers and sliders,always replace all rollers and sliders at the same time,or unbalanced drive pulley will occur because of rollers or sliders difference.*

### Oil Seal Inspection

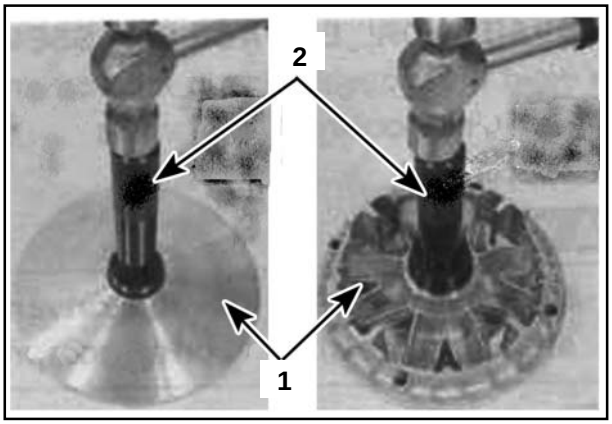
**NOTE:***If no oil seal inside, It's not necessary to perform this procedure.*

Check oil seal lip for wear and other damages.Replace if necessary.




*1.Oil Seal*
*2.Drive Pulley Sliding Sheave*

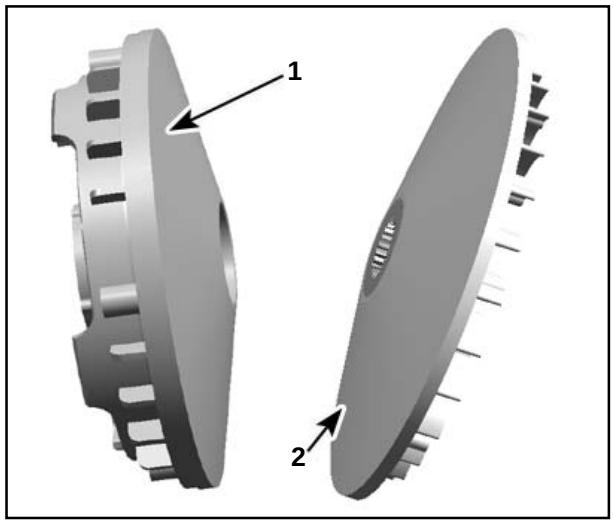
Special tool is required to install the oil seal.




*1.Drive Pulley Sliding Sheave*
*2.Special Tool*

### Primary sliding sheave and fixed sheave Inspection

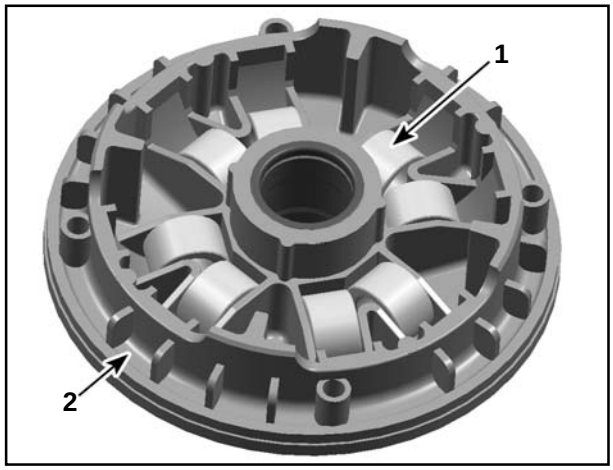
Check drive pulley faces for abnormal conditions.If any wear and damage has been found,replace it.




*1.Drive Pulley Sliding Sheave*
*2.Drive Pulley Fixed Sheave*

### Drive Pulley Sliding Sheave Installation

Install 8 rollers into sliding sheave;

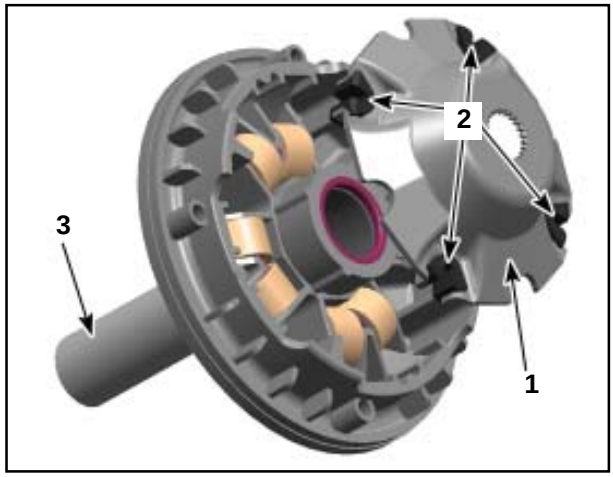



*1.Roller*
*2.Drive Pulley Sliding Sheave*

Install 4 sliders on cam;

Install cam on sliding sheave;

Install shaft sleeve into sliding sheave.




*1.Cam*
*2.Slider*
*3.Drive Pulley Shaft Sleeve*

**NOTE:** *When installing shaft sleeve, hold the cam to avoid rollers coming out of place.*

### Drive Pulley Installation

Reverse the removal procedure for installation

**NOTE:**

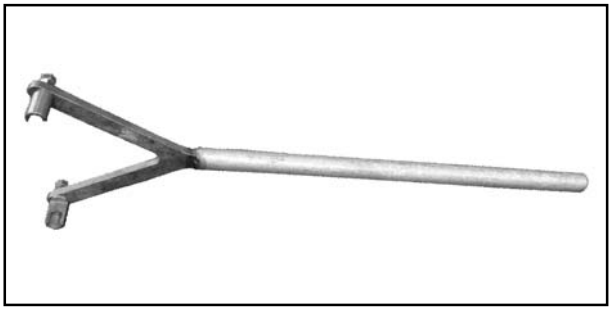
*1.If oil seal is inside the hole, apply grease inside the hole and oil seal lip*

*2.If belt surface is stained with grease or oil, degrease the belt thoroughly.*

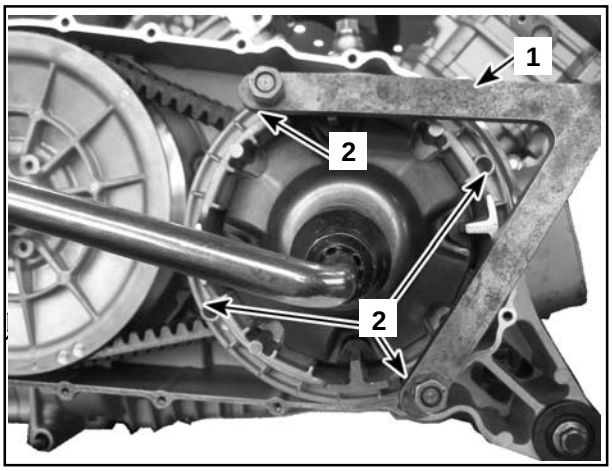
*3.Using sepecial tool,tighten the drive pulley nut to specified torque:*

*Drive Pulley Nut Tightening Torque:115**N.m***

**Special tool:**Drive Pulley Holder



*CVT Drive Pulley Holder*




*1.Drive Pulley Holder*

*2.Locations to Place Drive Pulley Holder*

## DRIVEN PULLEY

### Removal

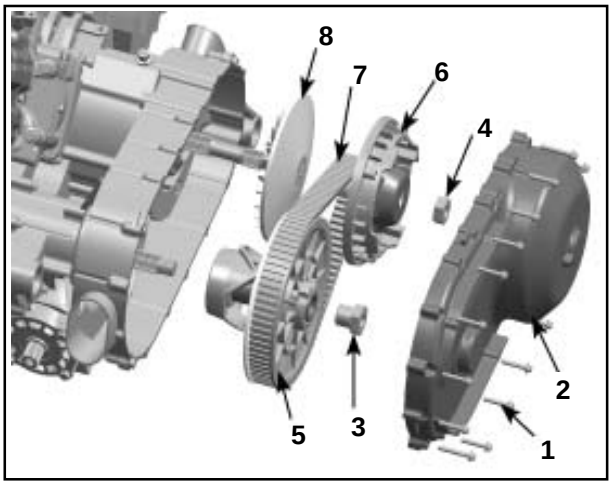
Remove CVT case(refer to ***CVT COVER***);

Remove drive pulley nut(refer to ***DRIVE PULLEY***);

Remove driven pulley nut and driven pulley;

Remove drive belt(refer to ***DRIVE BELT***);

Remove driven pulley;




*1.CVT Cover Bolt 2.CVT Cover*

*3.Driven Pulley Nut 4.Driven Pulley Nut*

*5.Driven Pulley 6.Drive Pulley*

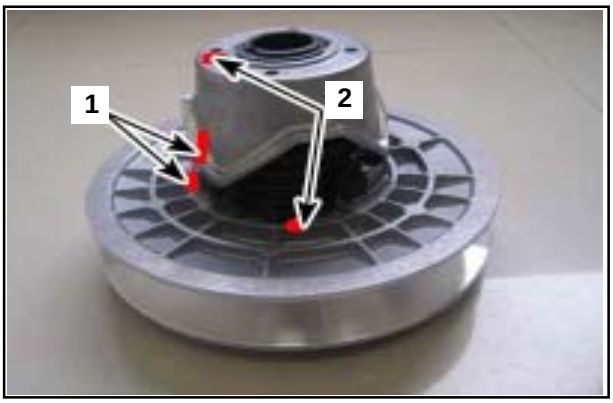
*7.Drive Belt 8.Drive pulley Fixed Sheave*

## DRIVEN PULLEY

### Disassembly

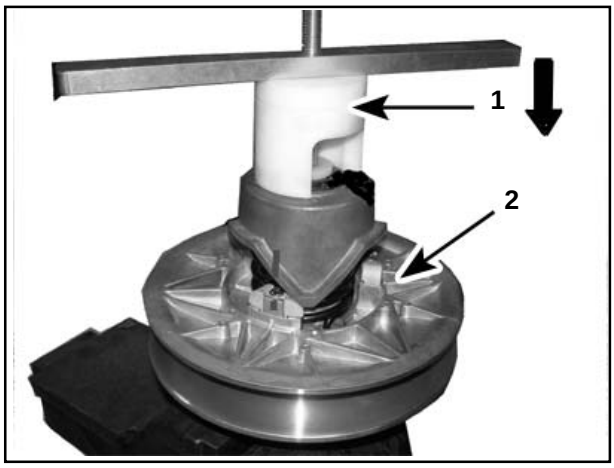
**NOTE:**

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



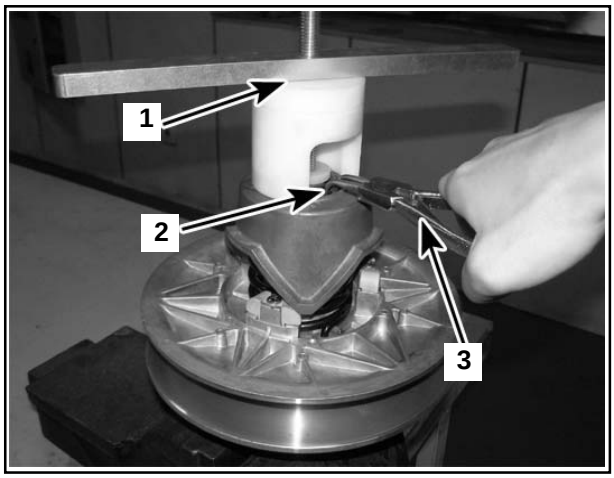

*1.Cam and slider marks*
*2.Spring Installation Holes Marks*

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



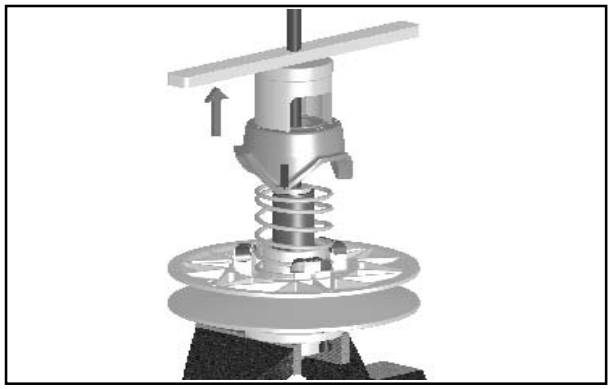

*1.Driven Pulley Remover*
*2.Driven Pulley*

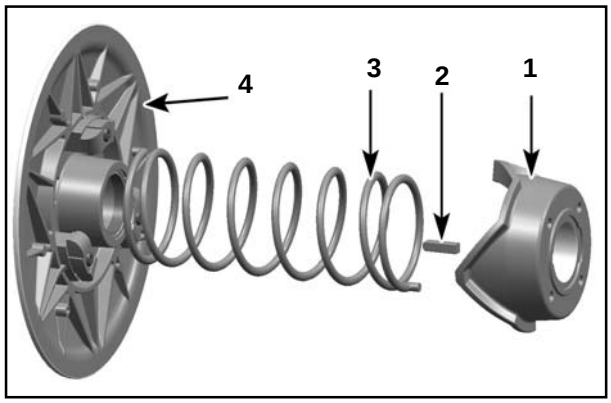
Turn special tool handle to compress the cam and spring.Using a circlip remover(a plier),remove circlip.




*1.Driven Pulley Remover*
*2.Circlip*
*3.Circlip Remover*

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





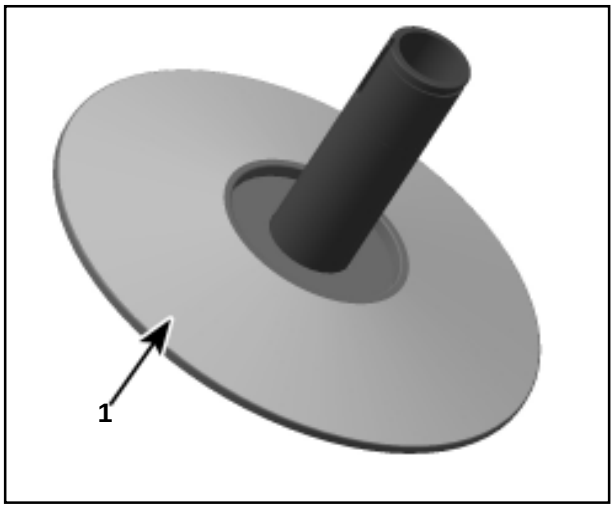

*1.Cam*
*2.Guide Pin*
*3.Spring*
*4.Sliding Sheave of Driven Pulley*

**Driven Pulley Inspection**

**Driven Pulley Fixed Sheave Inspection**

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

**NOTE:***Clean fixed sheave of driven pulley before inspection.*

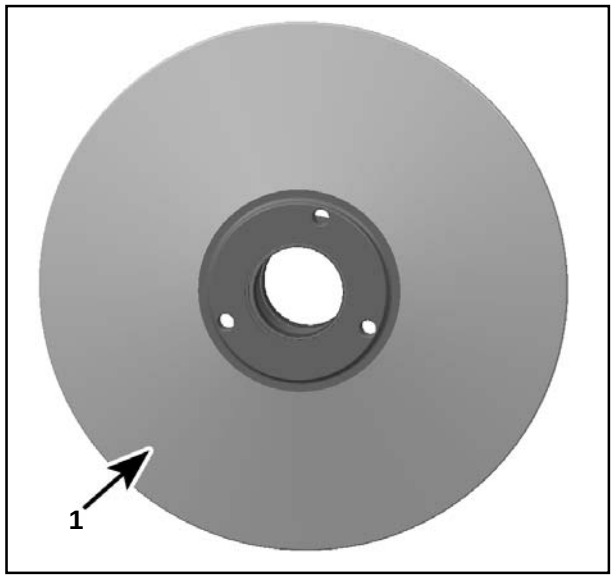



*1.Drive Face of Fixed Sheave*

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

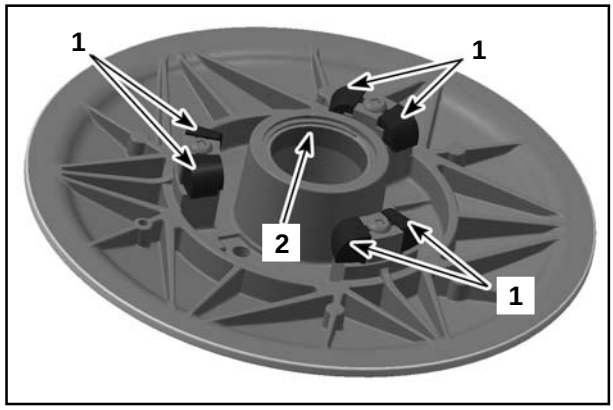
### Driven Pulley Sliding Sheave Inspection

Inspect the drive face of sliding sheave for heavy wear and damage.Replace if necesary.




*1.Drive Face of Sliding Sheave*

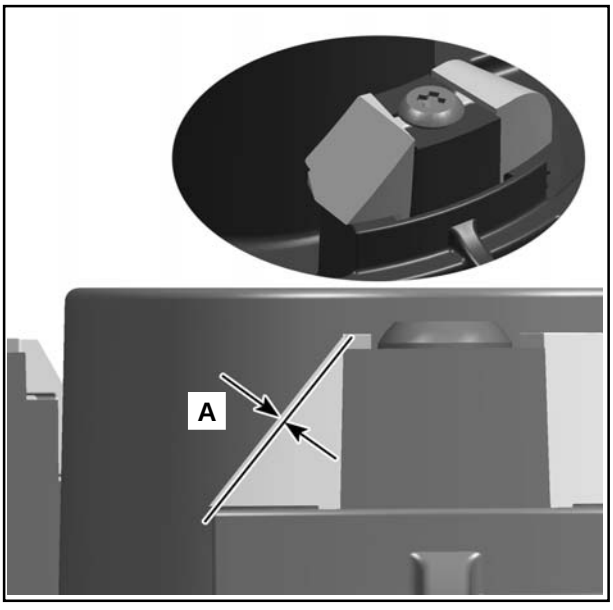
Inspect the 4 sliders on driven pulleyfor wear and other damages.If the worn thickness is over the measurement illustrated in the following figure, replace all 4 sliders at the same time.




*1.Slider*
*2.Sliding Sleeve*

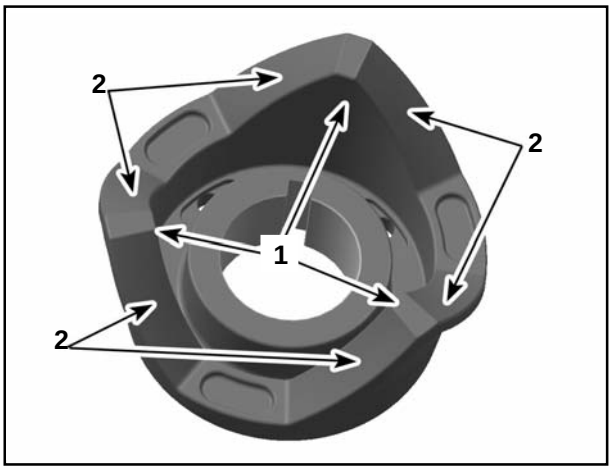
**NOTE**:*Clean the sliding sheave before inspection.*

A ⩾ 1.5mm



### Cam Inspection

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

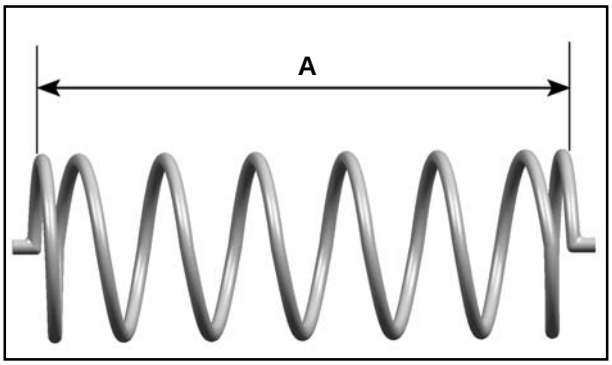



*1.Cam*
*2.Sliding Face*

### Driven Pulley Spring Inspection

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

Spring free limit length A:214.0mm.




*1.Spring*

### Driven Pulley Assembly

Reverse the disassembly procedure for driven pulley assembly.

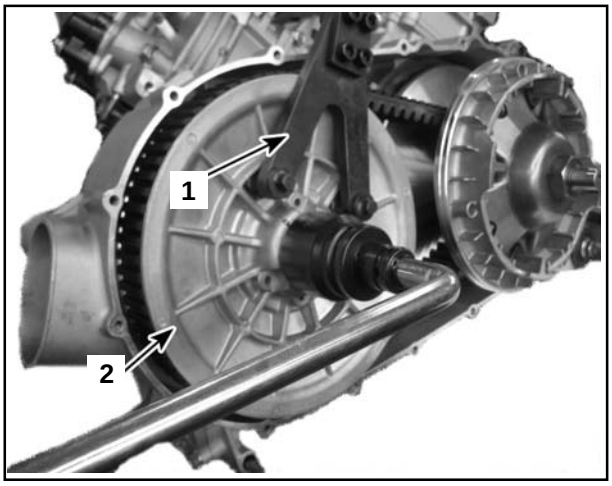
**NOTE:***Special tool is also required in driven pulley assembly.*

### Driven Pulley Installation

Reverse the removal procedure for driven pulley installtion.

**NOTE:**

*Torque driven pulley nut to specified value.*
*Driven Pulley Nut Tightening Torque:115**N.m**.*




*1.CVT Driven Pulley Holder*

## CVT AIR GUIDE

### CVT Air Guide Removal

Remove CVT cover(refer to ***CVT COVER***);

Remove drive pulley(refer to ***DRIVE PULLEY***)

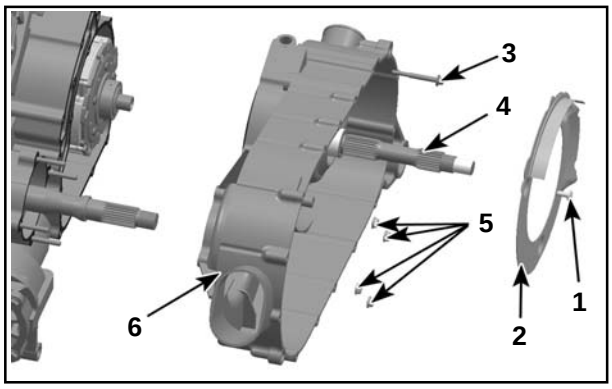
Remove driven pulley(refer to ***DRIVEN PULLEY***);

Remove drive belt(refer to ***DRIVE BELT***);

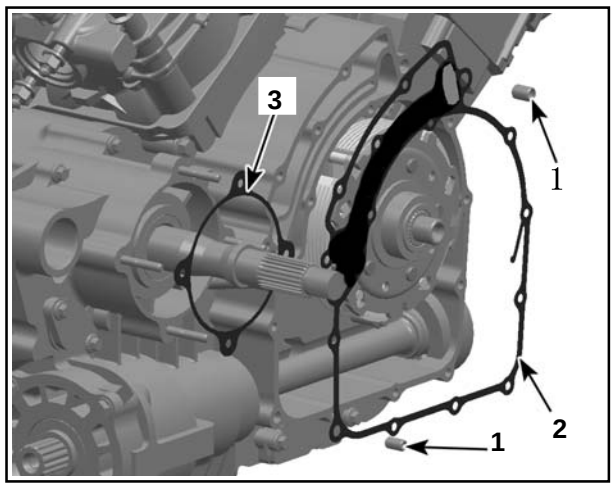
Remove air guide plate;
Remove CVT case screws and nuts;
Remove clutch housing and CVT Case;

Remove dowel pin(or not) and gaskets;

Remove one-way clutch.




*1.Screws 2.Air Guide Plate*
*3.Screw 4.Clutch Housing*
*5.Nut 6.Air Guide*




*1.Dowel Pin*
*2.Gasket(front)*
*3.Gasket(rear)*

### Clutch Housing Disassembly

Remove oil seal;

Remove retaining ring;

Use press machine to press clutch housing out of CVT air guide.

**NOTE:** *If bearing or oil seal is not suspected to be damaged, it's not necessary to perform the disassembly procedure.*

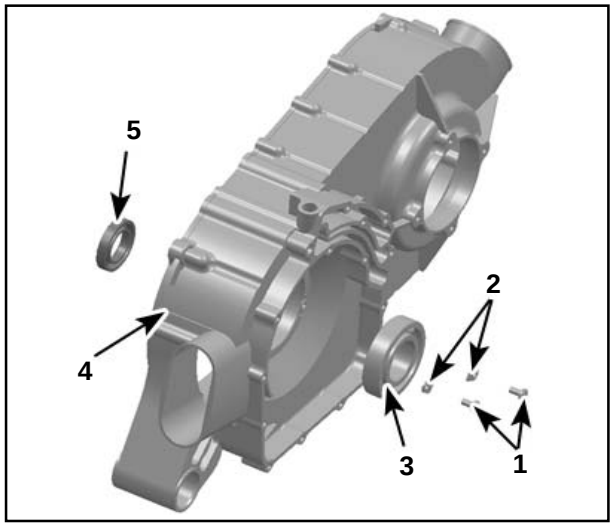
### CVT Air Guide and Clutch Inspection

Check bearing for rotation condition,if any abnormal condition has been found, remove bolt and bearing plate to replace the bearing.

Check oil sea,if any damage has been found, replace it;

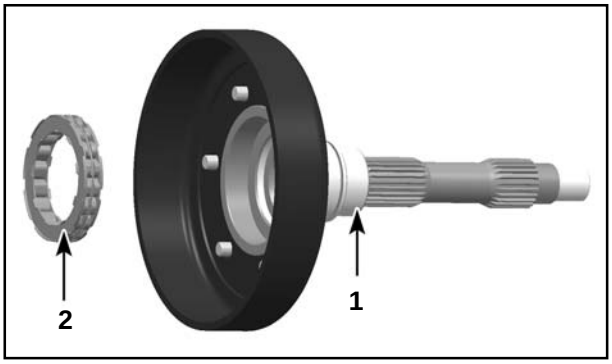
Check one-way clutch for wear and damage.Replace if necessary;

Check clutch housing innner side if color changes into blue and for scratches, cracks or uneven wear, if serious damage has been found, replace it.




*1.Screws 2.Bearing Plate*
*3.Bearing 4.CVT Air Guide*
*5.Oil Seal*

**NOTE:***If bearing is checked to be ok,it's not necessary to replace it.However,whenever disassembling clutch housing,oil seal must be replaced.*




*1.One-way Clutch*
*2.Clutch Housing*

### CVT Air Guide and Clutch Housing Assembly

Apply grease on bearing and install it in place by special tool.Check the rotation condition;

Install CVT bearing plate and screws;

Using hydraulic press machine and special press tool, install the clutch housing into CVT air guide.

**NOTE:** *When pressing clutch housing, it's required to put a special holding tool on clutch shaft end to support bearing inner ring.*

Apply grease on oil seal lip and install it with a special tool;

Install one-way clutch into clutch housing;

**NOTE:***The marked side of one-way clutch should point outside.*

### CVT Air Guide and Clutch Housing Installation

Reverse the removal procedure for CVT air guide and clutch housing installation.

**NOTE:**

1.Use new front and rear gasket.Keep them even on bases .

2.Fasten screws/nuts in criss-cross sequence.

## CLUTCH

### Removal

Remove CVT cover (refer to ***CVT COVER***);

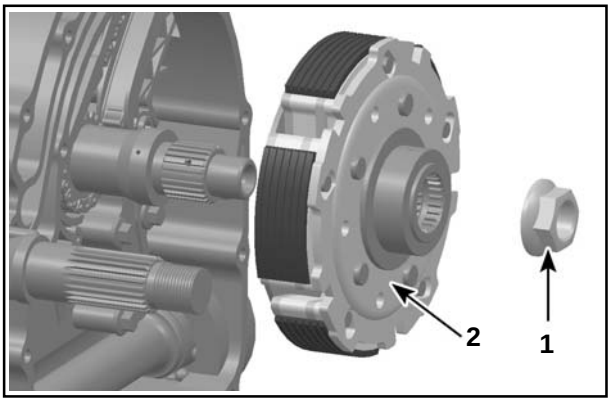
Remove drive pulley(refer to ***DRIVE PULLEY***);

Remove driven pulley(refer to ***DRIVEN PULLEY***);

Remove drive belt(refer to ***DRIVE BELT***);

Remove CVT air guide and clutch housing (refer to ***CVT AIR GUIDE*** **and** ***CLUTCH HOUSING***);

Use special tool to remove clutch nut and remove clutch.




*1.Clutch Nut*

*2.Clutch*

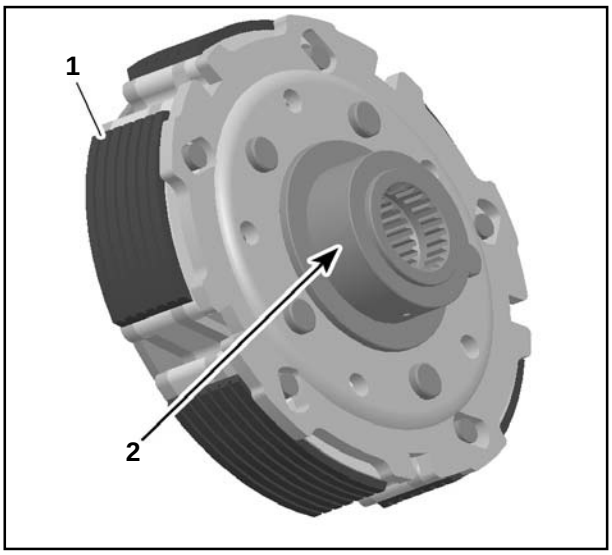
**NOTE:** *Clutch nut threads is left hand oriented.*

### Clutch Inspection

Check clutch for debris,scratches, uneven wear and discolouration.Meanwhile,check clutch shoe depth, if no groove remains on any brake shoe, replace the clutch.

Check one-way clutch for wear, if any damage has been found,replace it.

**NOTE:***Clutch must be replaced as an assembly.*



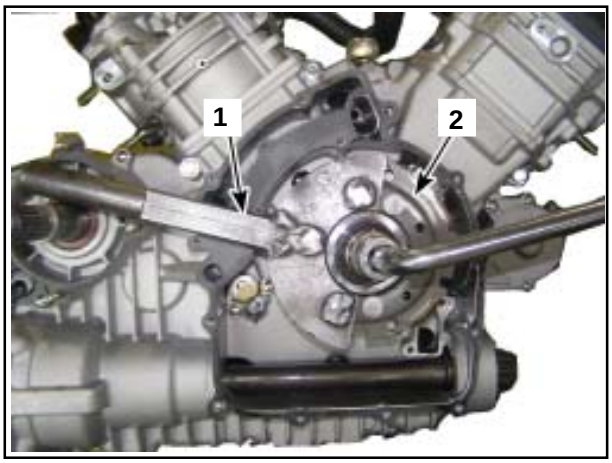

*1.Clutch Shoe*
*2.Clutch Collar*

### Clutch Installation

Reverse the removal procedure for clutch installation.

Use special tool to hold clutch and then tighten nut.

**NOTE:** *Apply threadlocker on nut threads.Torque it to specified torque value.The threads are left hand oriented.*




*1.Clutch Holding Tool*
*2.Clutch*

Nut tightenning Torque Value:105**N • m**.

# ENGINE LUBRICATION SYSTEM



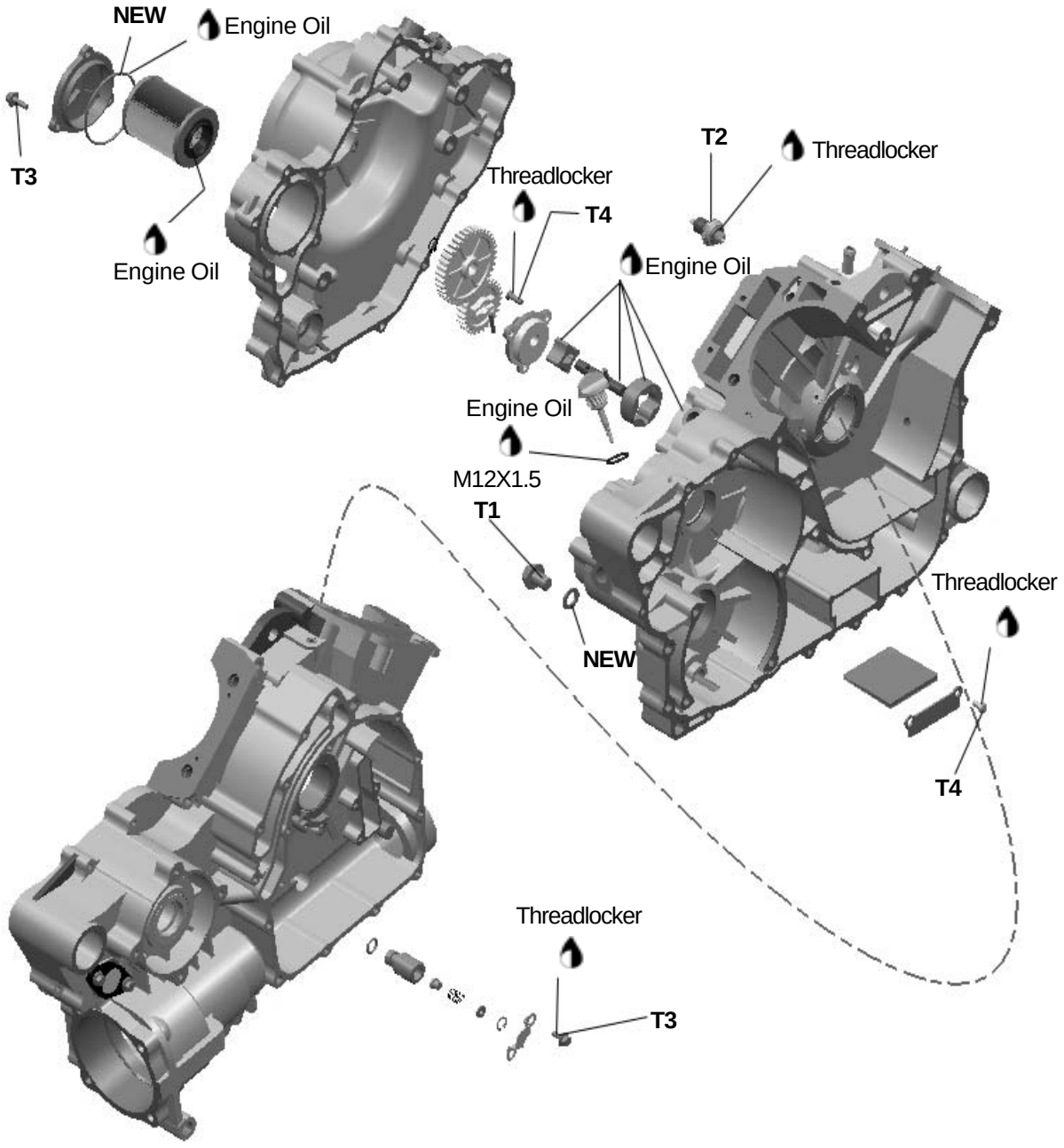
## SERVICE TOOLS

| Description | P/N | Page |
|---|---|---|
| Oil Pressure Gauge | | 6 |
| Adapter Hose | | 6 |

## SERVICE PRODUCTS

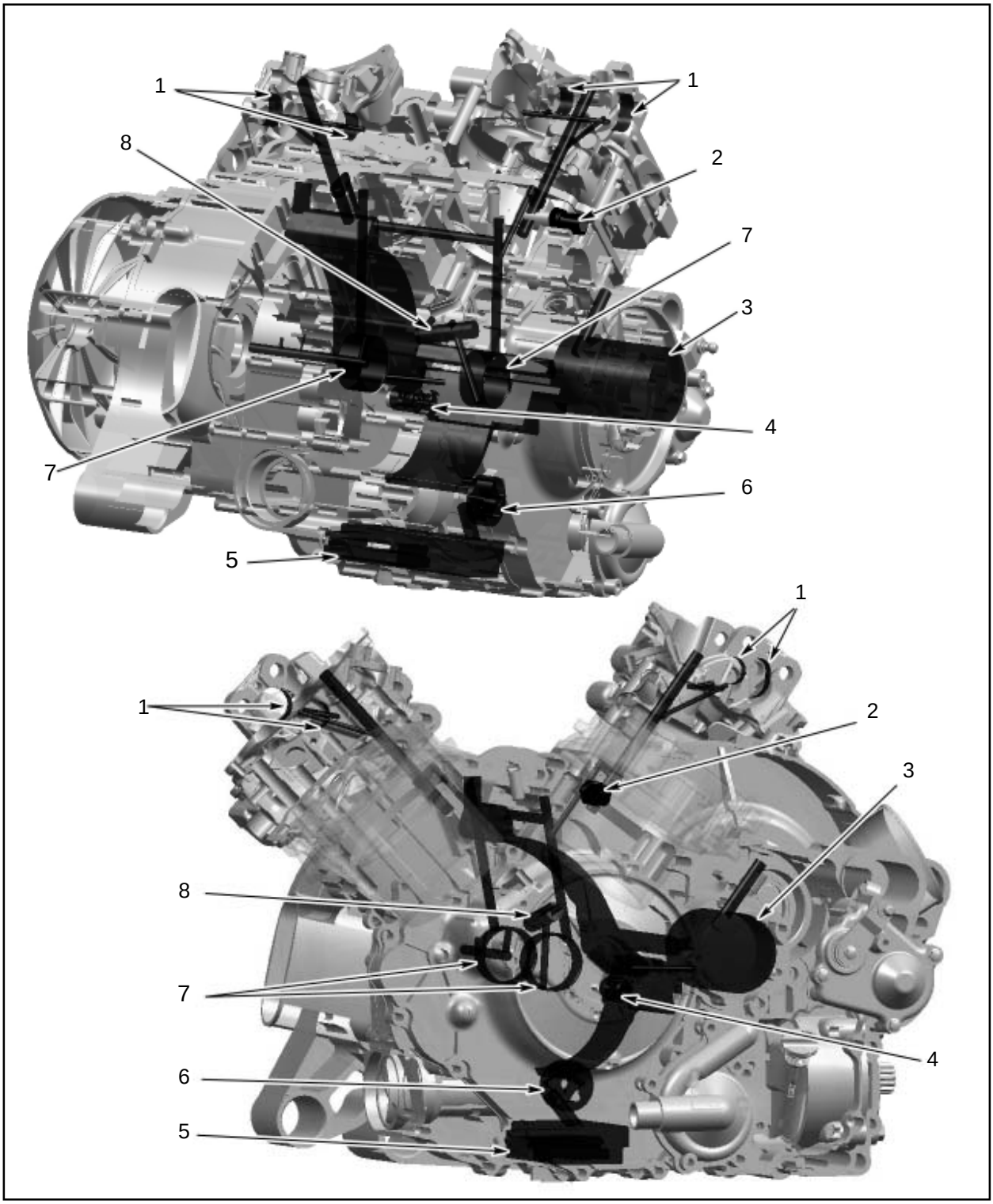
| Description | P/N | Page |
|---|---|---|
| Engine Oil | | |
| Threadlocker | | |

## COMPONENTS




| | |
|---|---|
| T1 | 20N • m(15lbf • in) |
| T2 | 12N • m(107lbf • in) |
| T3 | 10N • m(89lbf • in) |
| T4 | 6N • m(15lbf • in) |

## ENGINE LUBRICATION




1.Camshaft Bearings
2.Oil Pressure Switch
3.Oil Filter
4.Oil Pressure Regulator Valve
5.Oil Strainer
6.Oil Pump
7.Crankshaft Main Bearings
8.Connecting Rod Bearing

## GENERAL

Lubrication is employed to reduce the wear of some components,such as piston,crankshaft,camshaft,etc, which moves relative against other parts.Proper lubrication is the basis for engine normal operation.
Recommended engine oil is required for this engine.
Engine oil has cleaning,anti-rust,sealing,cooling and other functions besides lubrication.

**WARNING**

**Torque wrench must be used when tightening. Locking devices(e.g.: locking tabs, elastic stop nuts,cotter pin,etc.)must be replaced with new ones.**

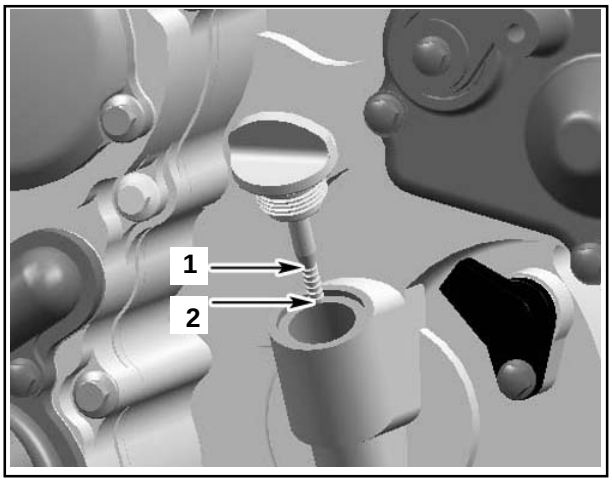
### Engine Oil Level Check

Start the engine and allow it to idle for a few minutes, then shut it off.Wait a few minutes to allow oil flow down to crankcase then check oil level;

Ensure vehicle is on a level surface;

Unscrew dipstick and wipe the oil residue off,then put dipstick in the hole.Don't screw in dipstick to read oil level,just make dipstick threads contact the hole surface;

Remove dipstick and read oil level;
Engine oil level must be between "upper" and "lower" marks;
If oil level is below "lower",refill.




*Oil Level Mark:1.Upper 2.Lower*

**NOTE:**

*Strictly follow the procedure above,otherwise wrong oil level may be indicated;*
*Vehicle must be placed on a level surface;*
*Don't screw in dipstick to read oil level.*

### Engine Oil Change

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

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

Place a drain pan under the engine oil drain plug area;

Clean the drain plug area;

Unscrew oil dipstick,drain plug and discard the gasket ring;

Allow oil to drain completely from crankcase;

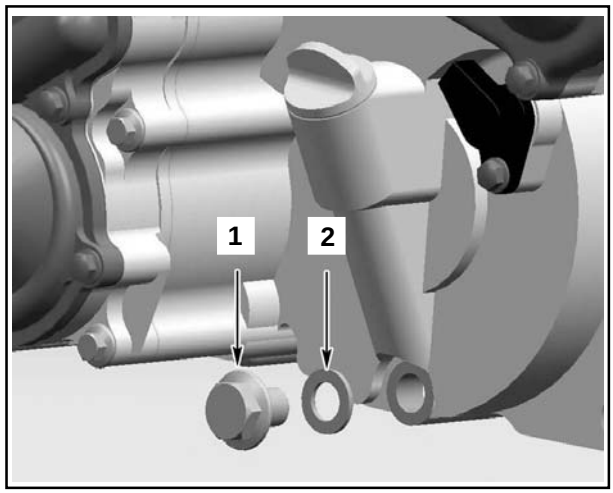
Intall washer and drain plug;

Drain plug tightening torque:20**N • m**
Replace oil filter element,refer to ***OIL FILTER*** further in this section;

Refill engine with about 3.4 L recommended engine oil through dipstick hole;

Install dipstick.Run the engine to ensure oil filter and drain plug areas are not leaking;

After filling,check engine oil level with dipstick**.**
Refer to ***Engine Oil Level Check*** above.




*1.Drain Plug*
*2.Washer*

**NOTE:**
*Oil condition gives information about the engine condition.See **TROUBLESHOOTING** section. Check the drained engine oil for engine shavings and residue.Presence of debris indicates a failure inside the engine.Check engine to correct the proplem.*

## ENGINE OIL PRESSURE

The engine oil pressure test should be done with a warm engine 90℃ ( 194℉ ) and the recommended engine oil.

Remove engine oil pressure switch;

Install engine oil pressure gauge and adapter hose.

The engine oil pressure should be within the following values:

| Oil Pressure | 1250 RPM | 6000RPM |
|---|---|---|
| Minimal | 70 KPa | 350 KPa |
| Nominal | 180 KPa | 420 KPa |
| Maximal | 300 KPa | 550 KPa |

If the engine oil is out of specifications,check the points described in ***THROUBLESHOOTING*** section.
Remove engine oil pressure gauge and adapter hose.
Reinstall the engine oil pressure switch.

**NOTE:***To remove adapter hose from engine oil pressure gauge,use the service tool.*

*Engine Oil Pressure Gauge*

*Adapter Hose*

## OIL FILTER ELEMENT

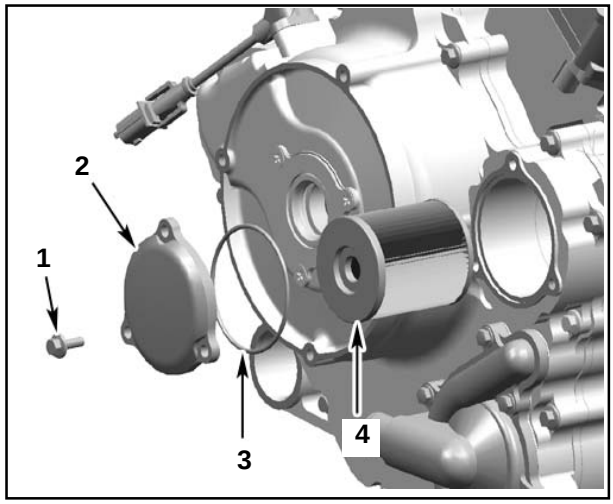
### Removal

Remove oil filter cover screws;

Remove oil filter cover;

Remove o-ring;

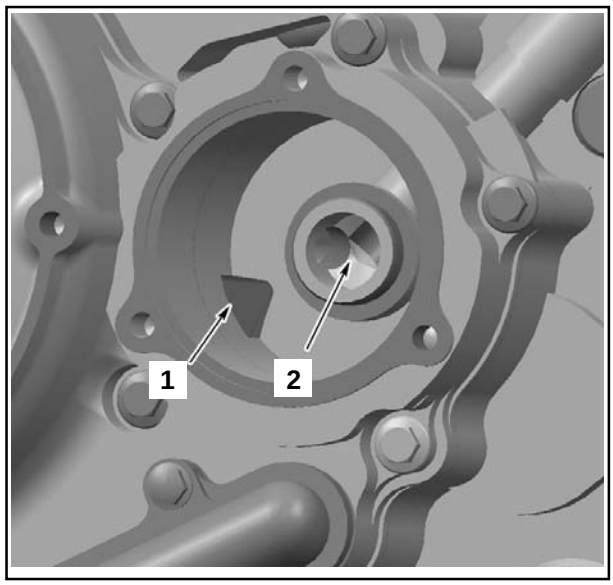
Remove oil filter element.




*1.Screw*
*2.Oil Filter Cover*
*3.O-ring*
*4.Oil Filter Element*

### Oil Filter Element Inspection

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




*1.Inlet bore from the oil pump to the oil pump*
*2.Outlet to the engine oil providing system*

### Oil Filter Element Installation

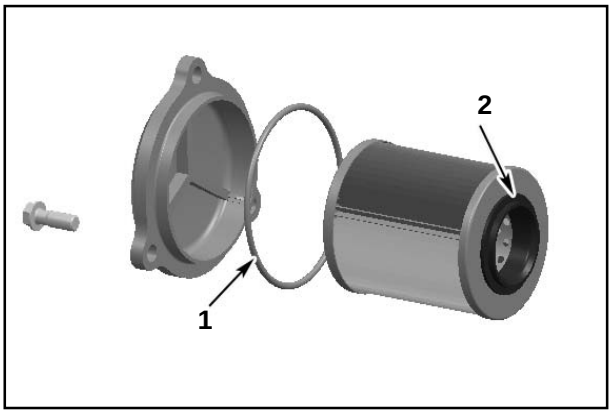
Install a **NEW** o-ring on oil filter cover;

Apply engine oil on o-ring and the end of filter;

Install the element into oil filter bore;

Install the oil filter cover on the engine.

Torque screws to 10**N • m**(89**lbf • in**).



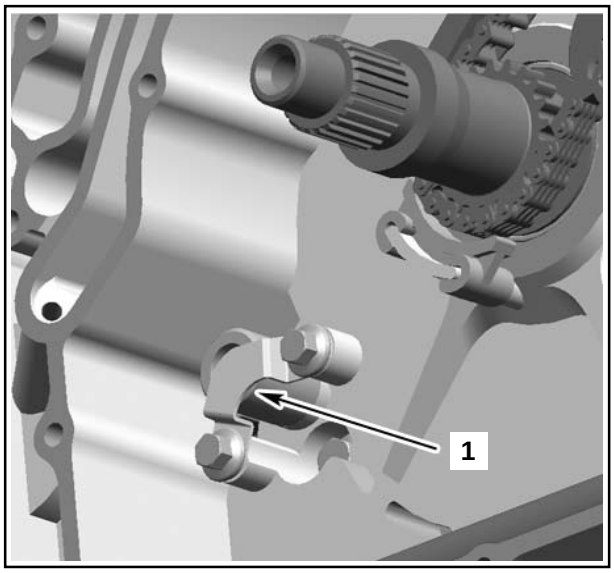

*1.Apply a light coating of oil here*
*2.Apply a light coating of oil here*

## OIL PRESSURE REGULATOR VALVE

Engine oil pressure valve is located on engine PTO side(under CVT air guide).
The oil pressure regulator valve works when the oil pressure exceeds 450kPa(65PSI).

### Removal

Remove screws no.1 and the holding strip;
Remove oil pressure regulator valve.

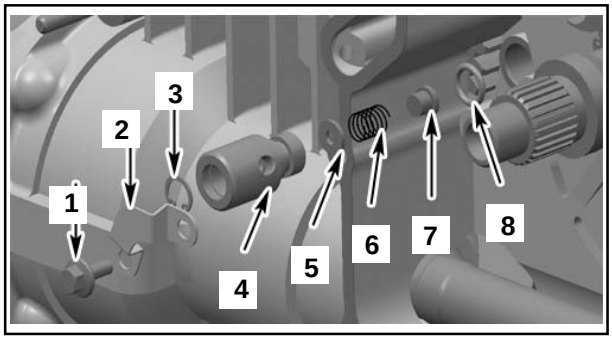



*1.Engine Oil Pressure Regulator Valve*

### Inspection

Inspect oil pressure regulator valve no.4,spring seat no.5,plunger no.7,o-ring no.8 for damages.Replace if necessary.Circlip no.3 must be replaced.Check spring no.6 for free length.If the length is out of the following values,replace it.

| Spring Free Length | |
|---|---|
| New Nominal | 17mm |
| Service Limit | 16mm |



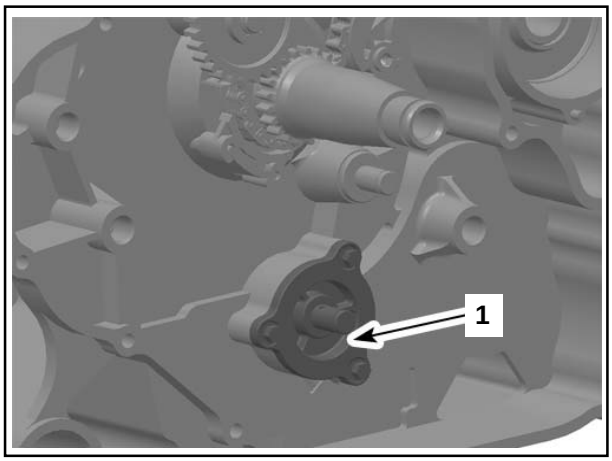

*1.Bolt 2.Holding Strip 3.Circlip*
*4.Oil Pressure Regulator Valve*
*5.Spring Seat 6.Spring*
*7.Oil Plunger 8.O-ring*

### Installation

Reverse the removal procedure for installation.

## OIL PUMP

Oil pump is located on the engine MAG side(under magneto cover).



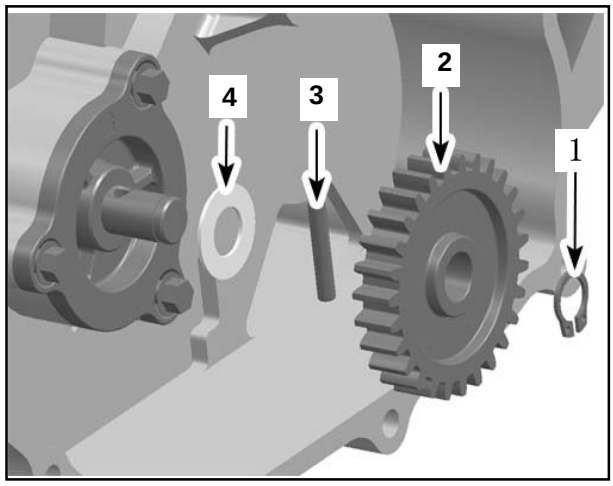

*1.Oil Pump*

### Removal

Remove magneto cover and related parts(see ***Magneto Cover Removal***);

Remove magneto rotor(see ***Rotor Removal***);

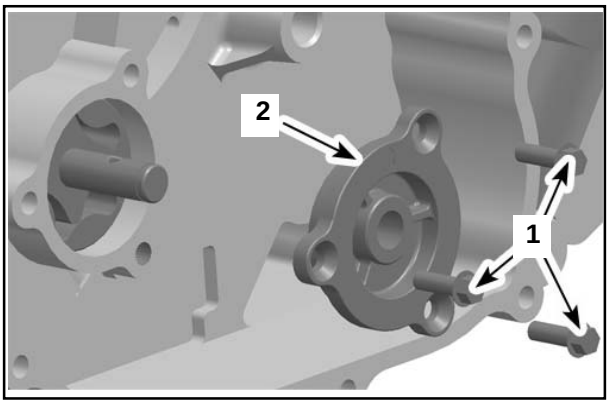
Remove circlip,oil pump gear,needle pin,thrust washer in turn;




*1.Circlip 2.Oil Pump Gear*
*3.Needle Pin 4.Thrust Washer*

Remove oil pump cover screws and oil pump cover;

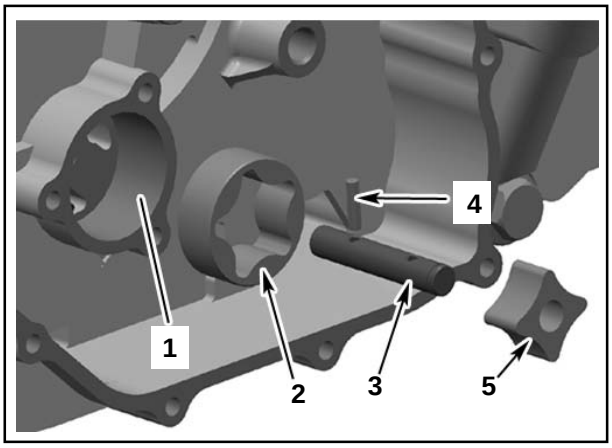
Remove pump shaft with inner rotor and outer rotor.




*1.Screws 2.Oil Pump Cover*

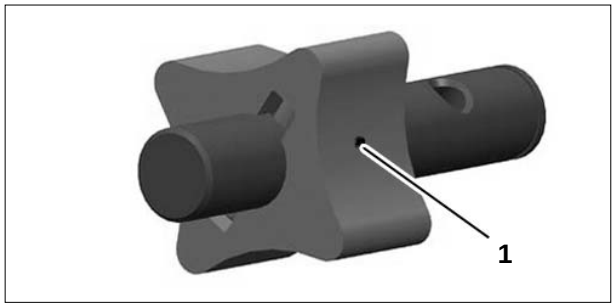
## Inspection

Inspect oil pump for marks or other damages.Check for scratches in crankcase between outer rotor and oil pump bore.If so,replace damaged parts;



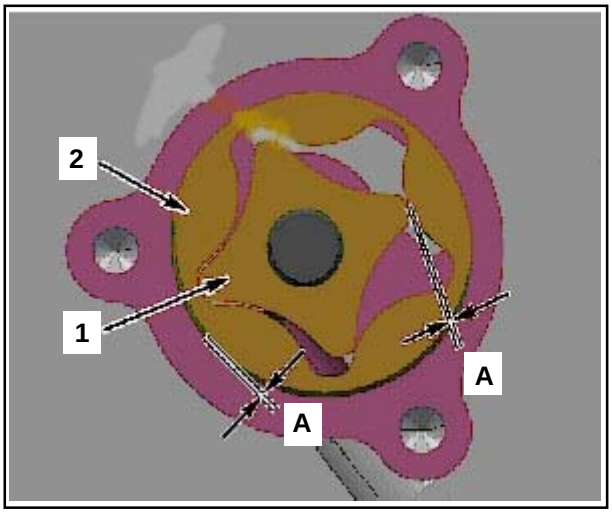

*1.Oil Pump Bore* *2.Outer Rotor*
*3.Oil Pump Shaft* *4.Needle Pin*
*5.Inner Rotor*

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




*1.Pittings on the teeth*

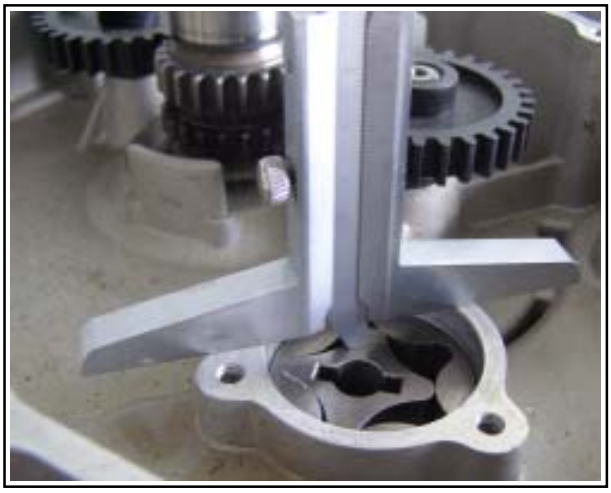
Using a feeler gauge,measure the clearance of inner and outer rotors plus the clearance between outer rotor and oil pump bore as shown.




*1.Inner Rotor* *2.Outer Rotor*
*A.Service Limit:0.25mm*

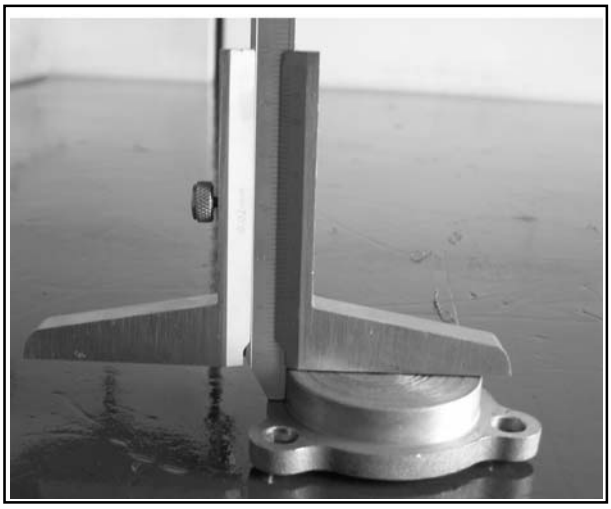
If clearance between inner rotor and outer rotor exceeds the tolerance,replace the inner and outer rotor.
Ensure to also check oil pump cover,if damaged, replace the oil pump cover.

If clearance between outer rotor and its bore in crankcase exceeds the tolerance,replace outer rotor assembly and/or crankcase.



*Measurement "A"*

Using a depth gauge,measure the axial clearance of the oil pump as shown.Difference between measurements should not exceed 0.1mm(0.008in).If so, replace the inner and outer rotor.



*Measurement "B"*

Using a depth gauge,measure the axial depth of the part that extends to oil pump bore as shown.

A-B $\leqslant$ 0.2mm

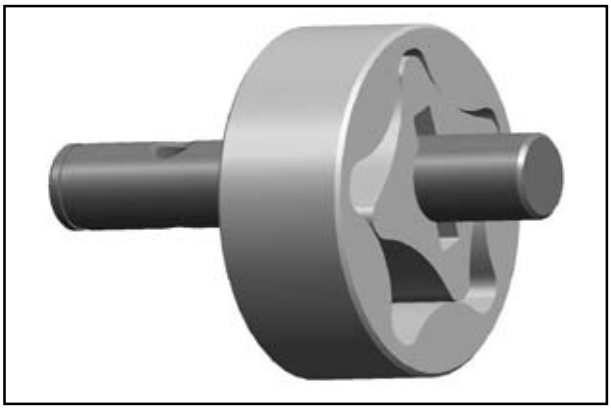
**NOTE**:*When the axial clearance of the oil pump shaft assembly increases,the oil pressure decreases.*

### Installation

Reverse the removal procedure for installation.

**NOTE**:*No marks on inner and outer rotor.When installating outer rotor,no secified direction for outer rotor.*

After installation,check for smooth operation of the oil pump assembly.



### Final Test

After engine is completely reassembled,start engine and make sure oil pressure is within specifications (refer to Engine Oil Pressure above.)

## ENGINE OIL STRAINER

The engine oil strainer no.7 is located on the bottom of left crankcase half.

### Removal

Refer to Chapter 8.

### Cleaning and Inspection

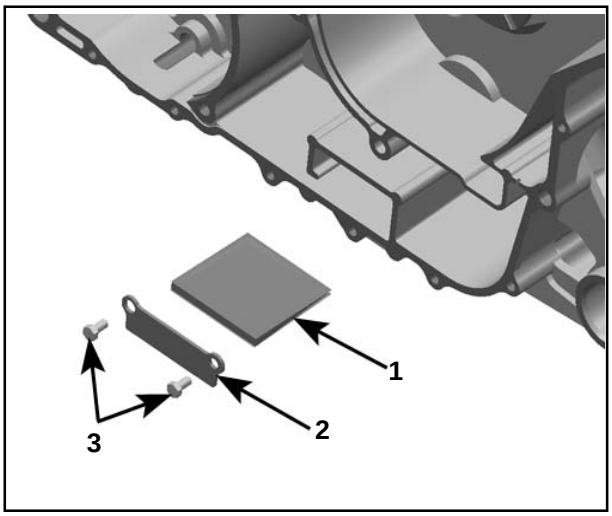
Clean engine oil strainer with a part cleaner then use an air gun to dry it.

**WARNING**

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

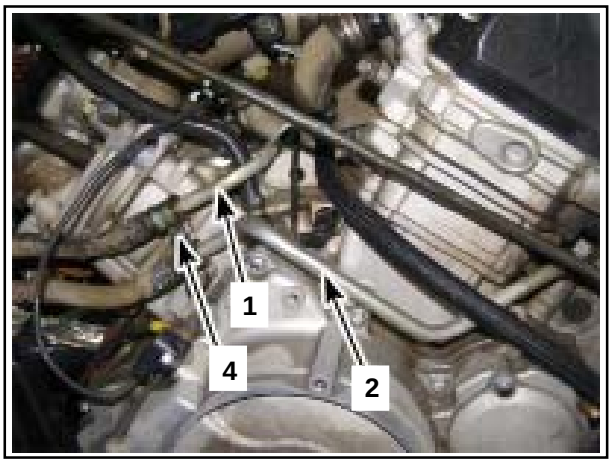
### Installation

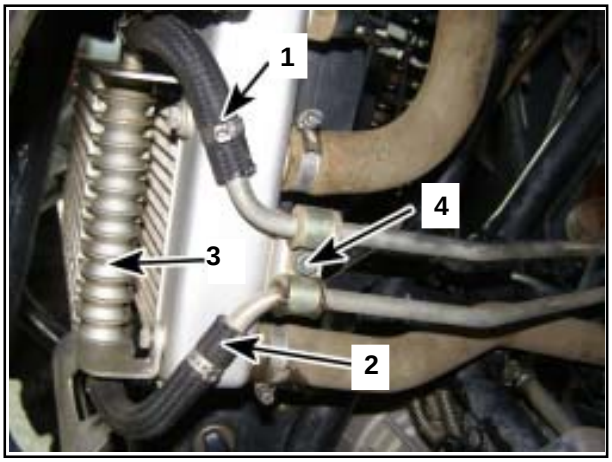
Reverse the removal procedure for installation.




*1.Oil Strainer*
*2.Retaining Plate*
*3.Screws*

## OIL DELIVERY PIPE AND OIL RADIATOR



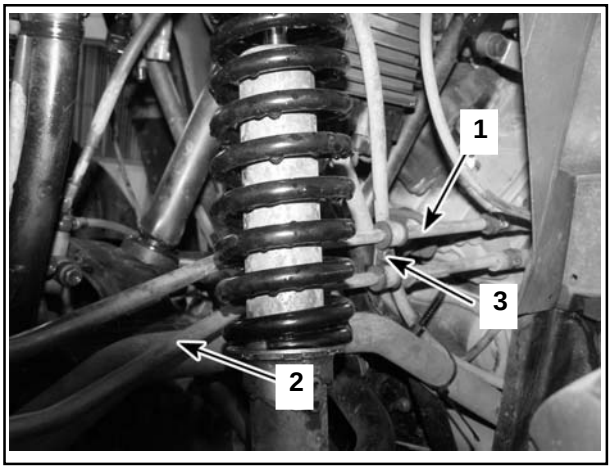




*1. Inlet Oil Delivery Pipe*
*2.Outlet oil Delivery Pipe*
*3.Oil Radiator*
*4.Oil Delivery Pipe Holding Screw*

**Removal**

Remove engine inlet and outlet oil delivery pipe retaining screws;

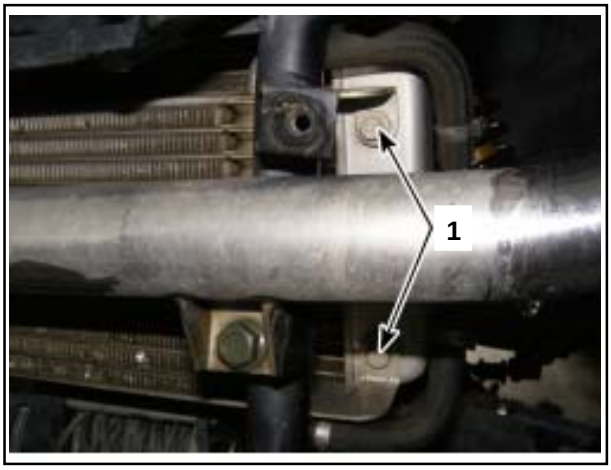
Remove engine inlet and outlet oil delivery pipes.




*1.Inlet Oil Delivery Pipe*
*2.Outlet Oil Delivery Pipe*
*3.Holding Screw*

Remove the 4 mounting bolts then oil radiator;

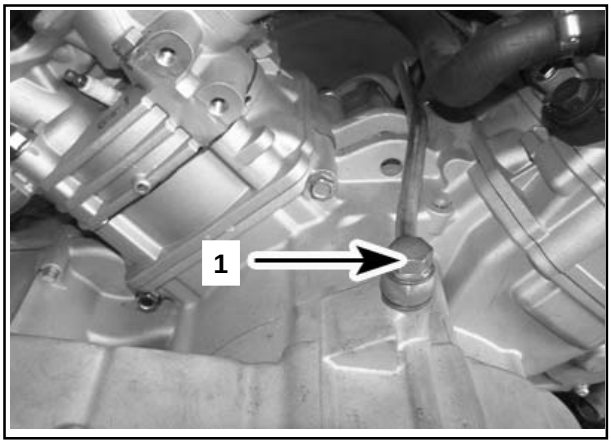
**CAUTION**:**Drain the oil in the oil delivery pipe and oil radiator before removal**.



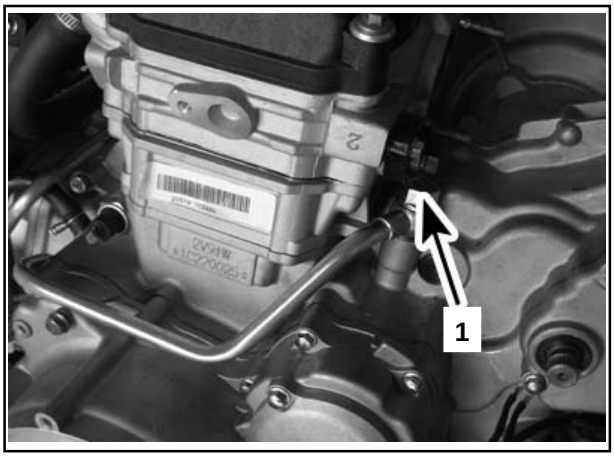

*1.Oil Radiator Mounting Bolts*

Remove engine inlet and outlet union bolts no.1;

Remove inlet and outlet oil delivery pipes.




*1.Union Bolt*




*1.Engine Oil Outlet Union Bolt*

### Oil Delivery Pipe Inspection

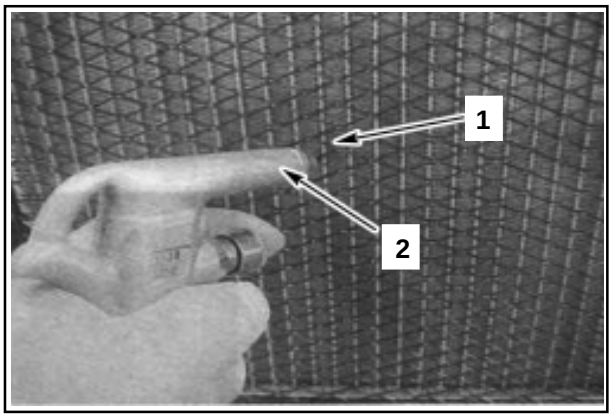
Inspect oil delivery pipe for leaks,cracks and other damages.If so,replace it;

Always replace oil pipe clamp after removal.

### Oil Radiator Inspection and Cleaning

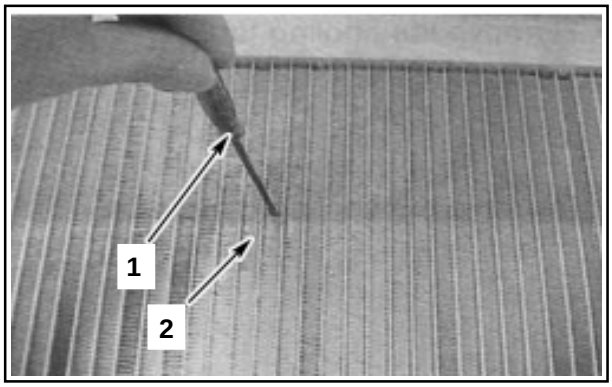
Inspect radiator for deformation and bulge.If so,replace it;

Use an air gun to clean the dirt on radiator fins;




*1.Oil Radiator*
*2.Air Gun*

Inspect radiator fins for deformation.If so,use a small screw driver to repair the fins.




*1.Screw Driver*
*2.Oil Radiator*

### Oil Delivery Pipe and Oil Radiator Installation

Reverse the removal procedure for installation.

Union bolt tightening torque：25**N • m.**

# MAGNETO SYSTEM

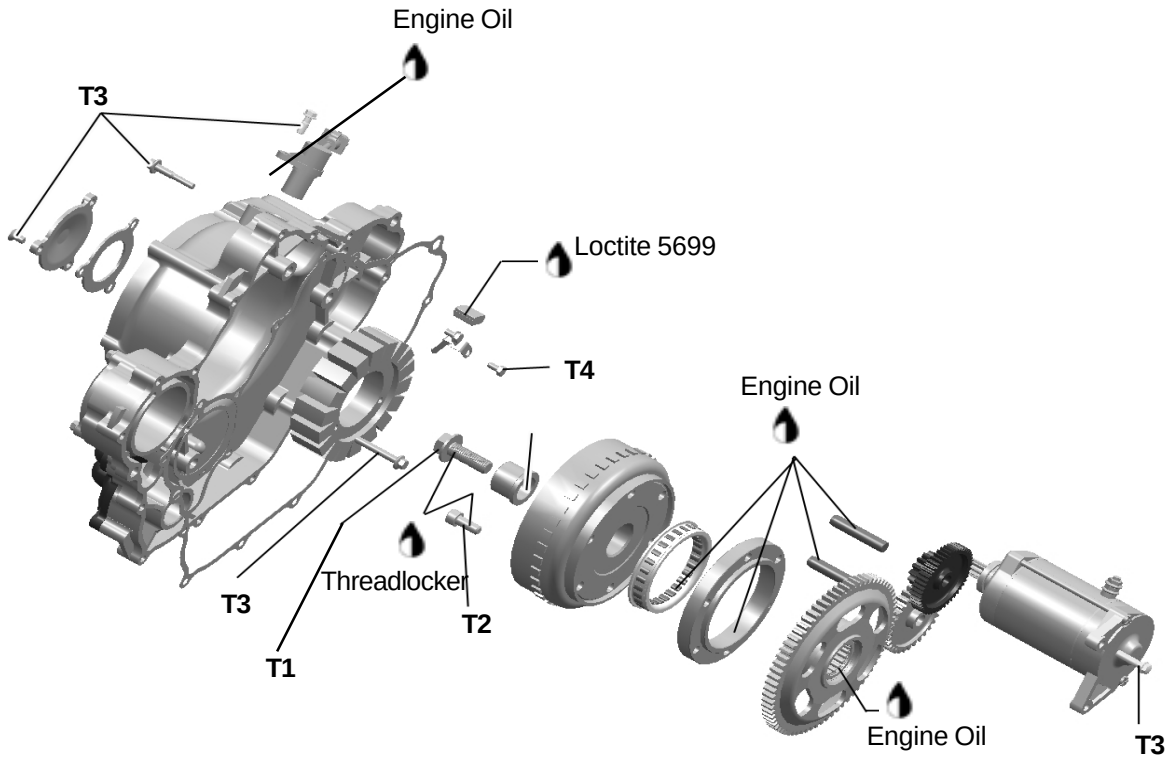


## SERVICE TOOLS

| Description | P/N | Page |
|---|---|---|
| Magneto Rotor Remover | 0800-031000-922-001 | 6 |

## SERVICE PRODUCTS

| Description | P/N | Page |
|---|---|---|
| Engine Oil | | |
| Threadlocker | | |
| Loctite 5699(Silicone Sealant) | | |




| | |
|---|---|
| T1 | 105N • m(78lbf • ft) |
| T2 | 30N • m(22lbf • ft) |
| T3 | 10N • m(89lbf • in) |
| T4 | 4N • m(36lbf • in) |

## GENERAL

Always perform the electric tests before removing or installing whatever component.
During assembly/installation,use the torque values and service products as in the exploded view. Clean threads before applying threadlocker.Refer to ***LUBRICANTS AND SERVICE PRODUCTS*** at the begining of this manual for complete procedure.

**WARNING**

**Torque wrench tightening specification must strictly be adhered to.Locking devices.(e. g .: locking tabs ,elastic stop nuts,cotter pins , etc.) must be installed or replaced with new ones where specified.If the efficiency of a locking device is impaired ,it must be renewed.**

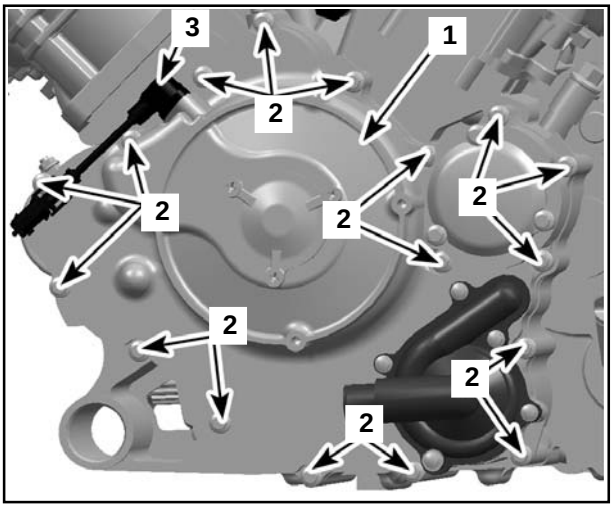
## MAGENTO COVER

### Removal

Drain engine oil (refer to ***LUBRICATION SYSTEM*** and cooling system) and coolant;

Remove crankshaft position sensor(CPS);
Disconnect magneto connector;
Remove magneto cover retaining screws;

Remove magneto cover.




*1.Magneto Cover*
*2.Retaining screws*
*3.CPS(crankshaft position sensor)*

### Inspection and Cleaning

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

Check working condition of rolling bearing.Replace if necessary.

**NOTE:**

*Clean all metal components in a nonferrous metal cleaner.Use suitable tool to remove gasket.*

**WARNING**

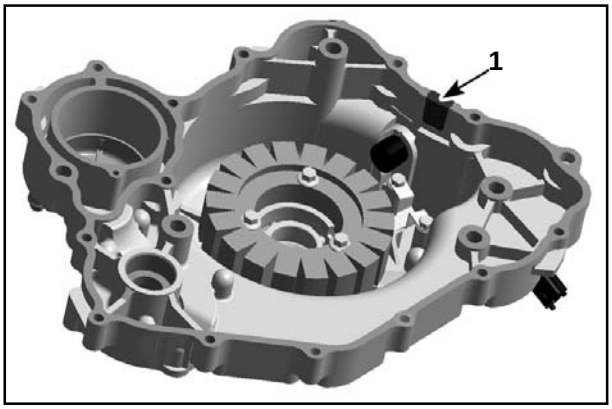
**Wear safety glasses and work in a well ventilated area when working with strong chemical products. Aslo wear suitable non-absorbent gloves to protect your hands.**

## Installation

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

**NOTE:**

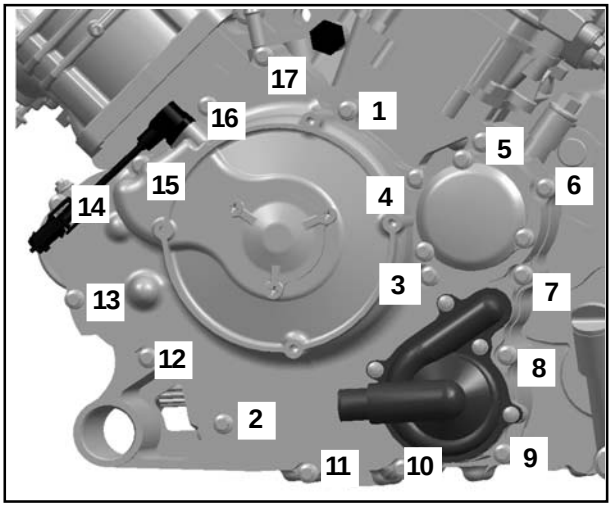
*At installation replace magneto cover gasket.*
*Apply sealing compound on startor cable grommet as shown on the right.*
*apply grease on bearing*




*1.Apply Loctite 5699(Silicone Sealant)*

Tightening sequence for screws on magneto cover is as per following illustration.

Refill engine with recommended oil and coolant.




Tightening Sequence

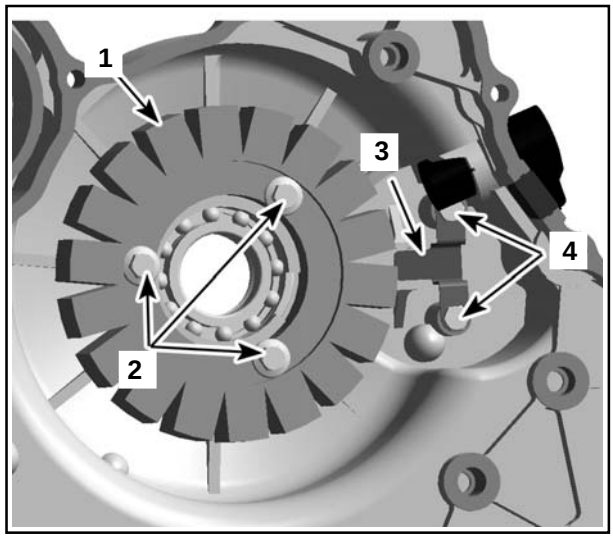
## STATOR

### Removal

Remove magneto cover(Refer to left ***Magneto Cover Removal*** above);

Remove screws securing holding strip;

Remove stator retaining screws then the stator.




*1.Stator*
*2.Stator retaining Screws*
*3.Holding Strip*
*4.Holding Strip screws*

### Inspection

Check stator condition, if damaged replace it.

Check if stator wires are brittle ,hard or otherwise damaged.

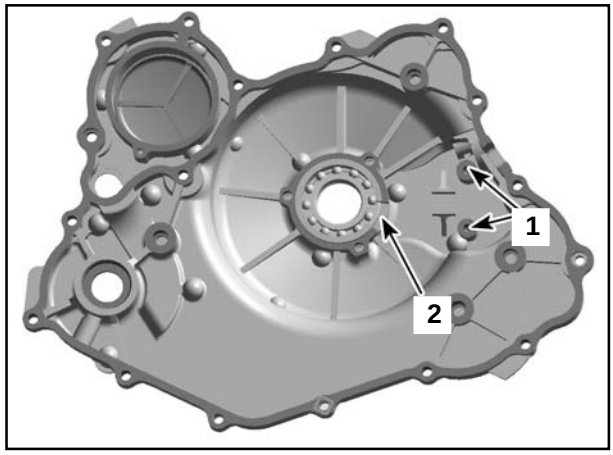
*1.Stator*

### Stator Installation

For installation, reverse the removal procedure.

**CAUTION:**
**When installing the stator take care that the cable is in place(guide for the wire).**

**NOTE:**
*There is only one position for the stator(notch in the magneto housing cover )*



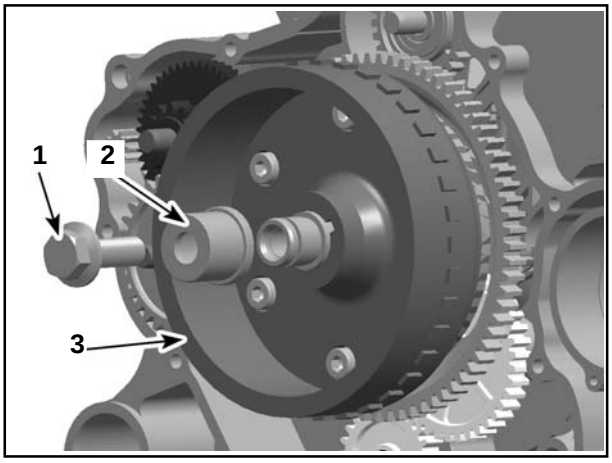

*1.Threads for cable holding strip*
*2.Notch for stator*

## ROTOR

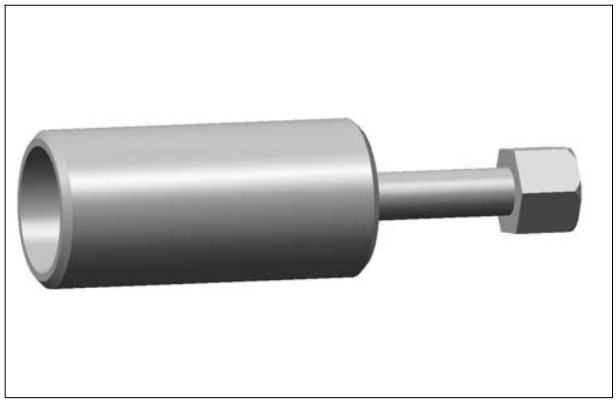
### Removal

Remove magneto cover.(Refer to ***MAGNETO COVER*** above );

Remove screw and washer securing rotor to crankshaft.




*1.Bolt*
*2.Washer*
*3.Rotor*

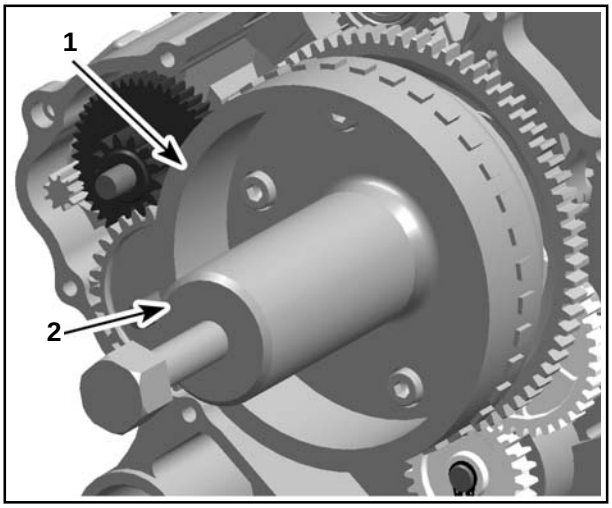


Install magneto puller and then remove rotor.

*1.Magneto Puller*

**NOTE:**

*Use grease to magneto puller end prior to install rotor puller in order to protect crankshaft.*
*Screw magneto puller bolt to remove rotor.*



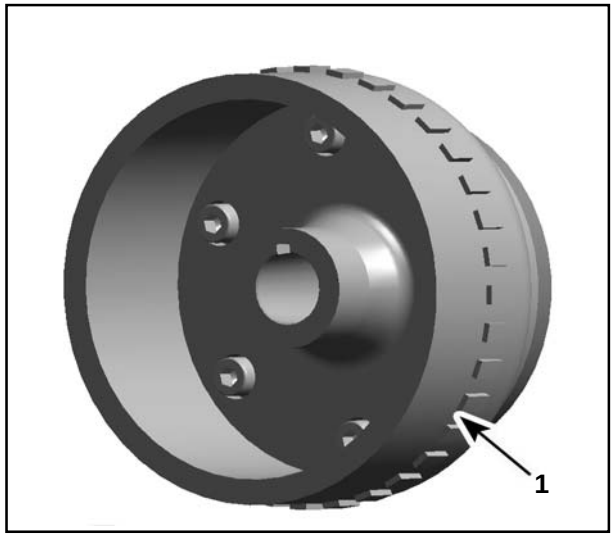

*1.Rotor*
*2.Magneto Puller*

### Inspection

Check inner side of rotor for scratches or other damages.

Check keyway of rotor for wear or damages.

Check if trigger wheel teeth are bent or otherwise damaged.




*1.Rotor with trigger wheel*

Check woodruff key and keyway on the crankshaft for wear or damages.

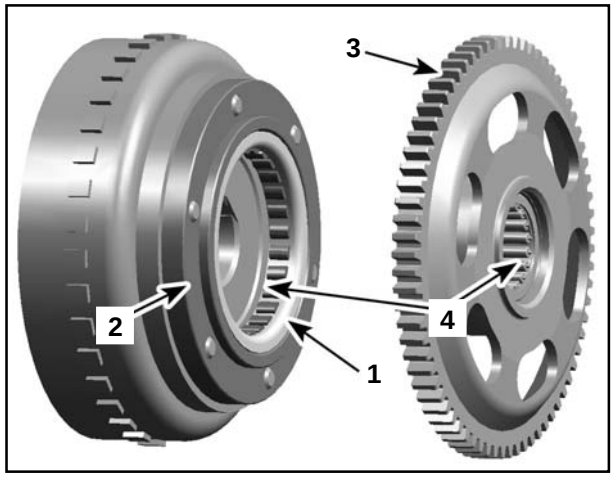
Replace parts as necessary.

### Installation

For installation,reverse the removal procedure.
Pay attention to the following.
Clean crankshaft taper and rotor with cleaner.

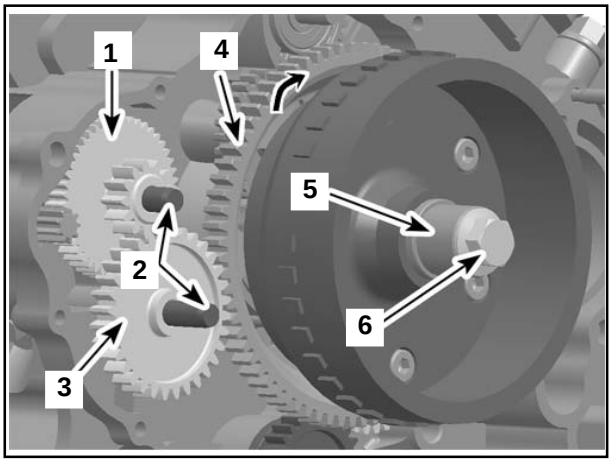
Oil sprag clutch in sprag clutch housing and install sprag clutch gear.

Slide rotor onto crankshaft.The woodruff key and the keyway must be aligned.




*1.Sprag Clutch*
*2.Sprag clutch housing*
*3.Sprag clutch gear*
*4.Apply engine oil here*

Slide spacer bush onto crankshaft and torque the bolt to specified value.
Bolt tightening torque:105**N • m**
Rotate starter double gear counterclockwise to align intermediate gear teeth with clutch sprag gear teeth.




*1.Double Gear 2.Breather Gear Shaft*
*3.Intermediate Gear 4.Sprag Clutch Gear*
*5.Spacer Bush 6.Bolt*

**NOTE:***Breather shaft end with chamfer should faces outside.*

## SPRAG CLUTCH

**NOTE**:*It is not necessary to remove if sprag clutch has no problem.*

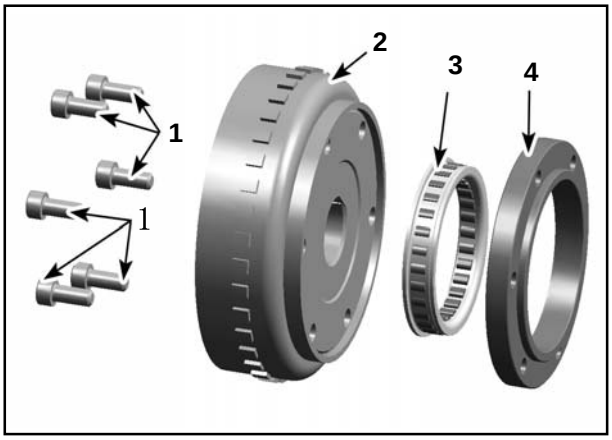
### Sprag Clutch Removal

Remove magneto cover (refer to ***MAGNETO COVER*** above);

Remove rotor(refer to ***ROTOR*** above);

Remove sprag clutch gear;

Remove sprag clutch housing screws and sprag clutch housing.




*1.Bolt*
*2.Rotor*
*3.Sprag Clutch*
*4.Sprag Clutch Housing*

### Sprag Clutch Inspection

Perform a functional test of the sprag clutch.To do so ,rotate driven gear in sprag clutch.

Inspect sprag clutch and sprag clutch housing for wear and damage.

**NOTE:**
*Sprag clutch must look in counterclockwise direction. Sprag clutch,housing and gear must be replaced at the same time ,if damaged.*

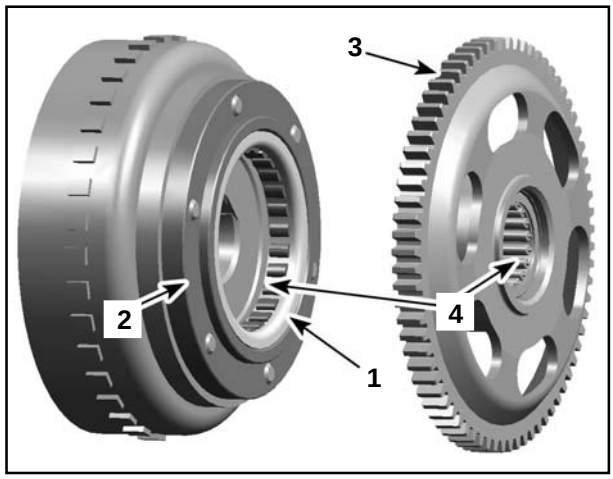

**Sprag Clutch Functional Test**
*1.Lock Direction*

### Sprag Clutch Installation

For installation,reverse the removal procedure .

Pay attention to the following details.
Apply threadlocker on threads of sprag clutch housing screws.

Install rotor then torque sprag clutch housing screws to 30**N • m**.
Apply engine oil on sprag clutch and inside sprag clutch gear hole.



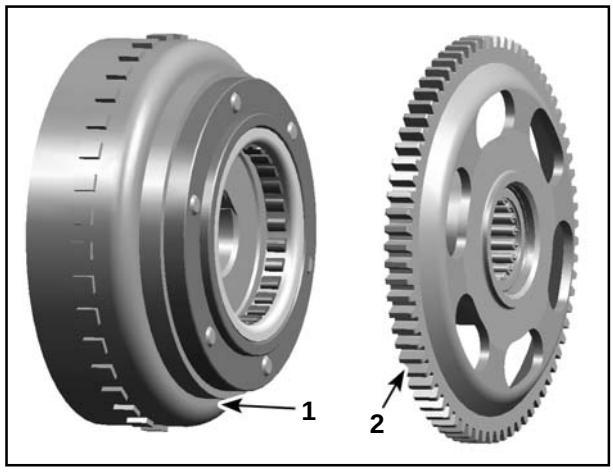

*1.Sprag Clutch* *2.Sprag Clutch Housing*
*3.Sprag Clutch Gear* *4.Apply engine oil here*

## SPRAG CLUTCH GEAR

### Removal

Remove rotor (refer to ***ROTOR*** above);

Pull sprag clutch gear from the rotor.




*1.Rotor*
*2.Sprag Clutch Gear*

### Inspection

Inspect gear,especially teeth and sprag clutch collar,for wear and other damages.

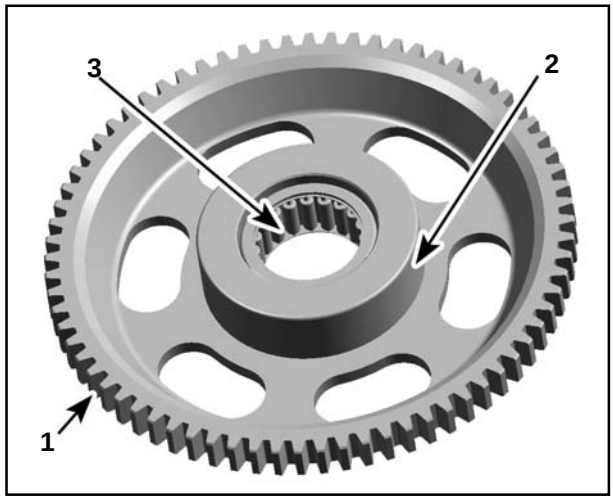
Check needle bearing condition;

Replace Drive Gear if necessary.

### Installation

Reverse the removal procedure for installation.

**NOTE:**
*Apply engine oil on needle bearing and collar of drive gear.*




**INSPECT**
*1.Teeth*
*2.Collar*
*3.Needle Bearing*

## STARTER DRIVE GEARS

The starter gears are located on the engine MAG side behind the magneto cover.

### Removal

Remove magneto cover (refer to ***MAGNETO COVER*** above);

Remove breather shafts,double gear,intermediate gear.

### Inspection

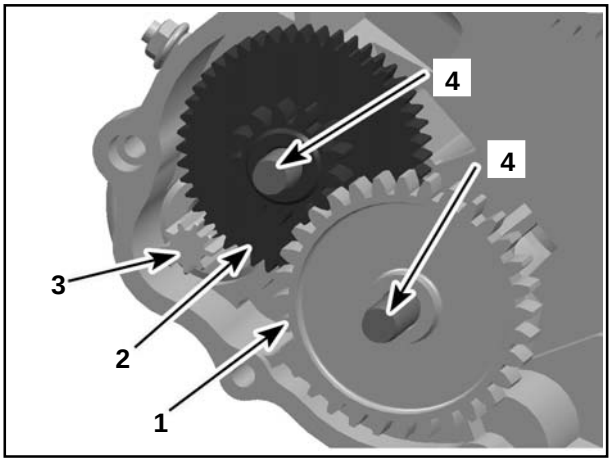
Inspect gears and shafts for wear and damage.

### Installation

Reverse the removal procedure for installation.

**NOTE:**

*Apply engine oil on every gear shaft and teeth.*




*1.Intermediate Gear*
*2.Starter Double Gear*
*3.Starter Gear*
*4.Breather Shaft*

## MAINTENANCE INFORMATION

### Operation Cautions:

### CAUTIONS:

- **Securely support the vehicle when doing check and repair**.
- **Do not overexert on the wheel, avoid any damage to the wheel**.
- **When removing tire, use the special tire lever and rim protector**.

### Maintenance Standard

| Item | | | Standards | Service Limit |
|---|---|---|---|---|
| Front Wheel | Wheel Runout | Radial | 0.8mm | 2.0mm |
| | | Axial | 0.8mm | 2.0mm |
| | Tire | Tread Depth | - | 3.0mm |
| | | Tire Pressure | 45kPa | - |
| Front Brake | Brake Lever Free Play | | 0 mm | - |

### Tightening Torque

| | | | |
|---|---|---|---|
| Nut, steering tie-rod | GB9457 M10x1.25 | (30~40) | **N•m** |
| Lock nut, steering stem | GB6187 M14x1.5 | (100~120) | **N•m** |
| Bolt, front brake disc | 901-08.00.03 | (25~35) | **N•m** |
| Bolt, front caliper | GB5789 M8x16 | (15~25) | **N•m** |
| Axle nut | 901-07.00.03 | (15~25) | **N•m** |
| Bolt, front shock absorber | GB5789 M10x1.25x50,GB5789 M10x1.25x70 | (15~25) | **N•m** |
| Wheel nut | 901-07.00.02B | (70~80) | **N•m** |
| Bolt, A-arm | GB5789 M10X1.25X70 | (40~50) | **N•m** |

## SERVICE TOOLS

- Rod, bearing remover
- Head 10mm, bearing remover
- Handle A, driving tool
- Sleeve 28x30, driving tool
- Guide tool 10mm
- Locknut spanner
- Bearing remover set
- Rotor puller
- Remover shaft
- Remover hammer
- Assembling tool shaft

## TROUBLESHOOTING

### Heavy steering

- Upper thread is over tightened
- Steering bearing is damaged or worn
- Inner&outer bearing races are damaged or not well tightened.
- Steering stem is distorted
- Low tire pressure
- Tire worn

### Excessive handlebar free play

- Steering bearing is damaged or not well tightened.
- LH and RH shock absorber not matched
- Deflected tires
- Deformed frame
- Worn tire
- Shaking wheel bearing

### Severe front wheel runout

- Wheel rim distorted
- Faulty wheel bearing
- Faulty tires
- mproper balance of wheels
- Imporper tightening of wheel shaft

### Wheel cannot turn freely

- Faulty wheel bearing
- Wheel installed improperly
- Brake drag

### Front suspension too shoft

- Weakened front shock absorber
- Tire pressure is too low

### Front suspension too hard

- Front shock absorber is damaged
- Tire pressure is too high

### Noise from front shock absorber

- Faulty front shock absorber
- Loosened tightening parts of front shock absorber

### Poor brake performance

- Faulty brake adjustment
- Stained brake disc
- Brake pads worn

## FRONT WHEEL


### Removal

Securely support front wheels;
Remove wheel cap;
Remove the 4 wheel nuts no.1;
Remove front wheel.

### Rim&Inspection

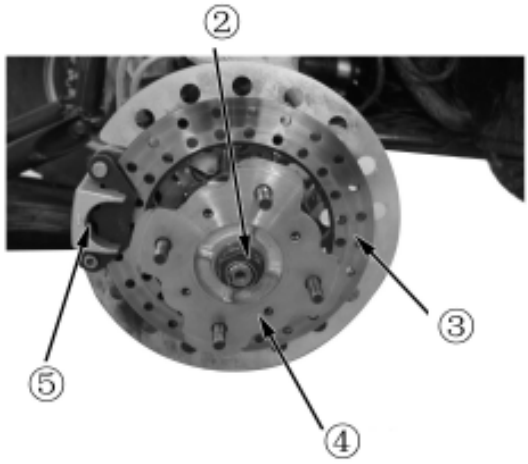
Check rim for damages,deformation,nicks.If any abnormal condition has been found,replace it.
Slowly turn wheel,use a dial gauge to measure the rim runout.

**Service limit: 2.0mm (Axial)**
**2.0mm (Radial)**

### Installation

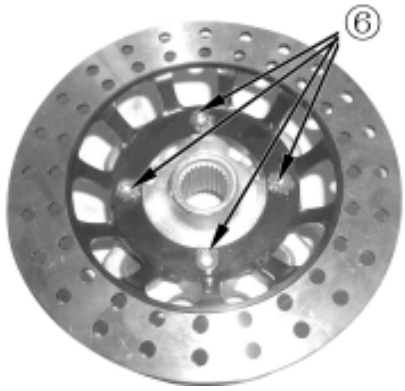
Press rim into tire with special tool;
Fix wheel on the hub;
**Wheel nuts tightening torque:70-80 N • m**

## FRONT WHEEL HUB




### Removal

Remove front wheel (→12-3);
Remove front brake caliper 5 (→12-4);
Remove rim axle nut no.2;
Remove brake disc and hub together;
Remove the 4 brake disc bolts no.6;
Remove front wheel hub no.4.




### Installation

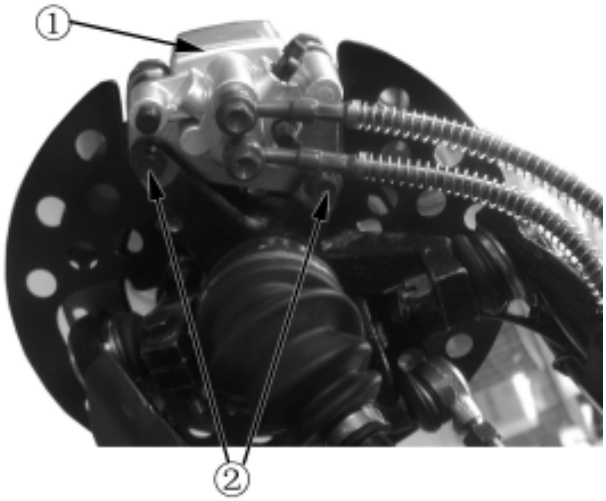
Reverse the removal procedure for installation.
Tightening torque of axle nut : 110-130N.m
Tightening torque of brake disc bolts no.6: 25-35**N. m (apply threadlocker)**

## FRONT BRAKE SYSTEM

### Front Brake Caliper

### Removal

Remove front wheel(→12-3);
Remove the two bolts no.2;
Remove caliper no.1.




### Inspection

Check any cracks of brake calipers and oil leaks from tightening areas.Replace if necessary.

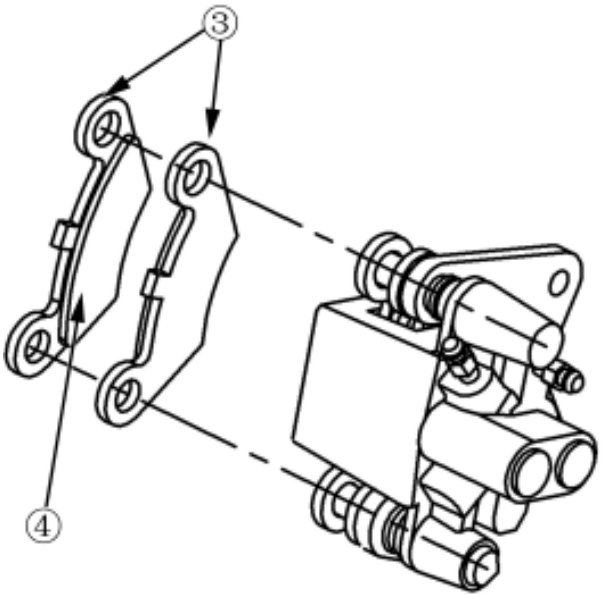
### Installation

Tightening torque of brake caliper bolt: 15-25**N.m**
**(Apply threadlocker)**

## BRAKE PADS

### Removal

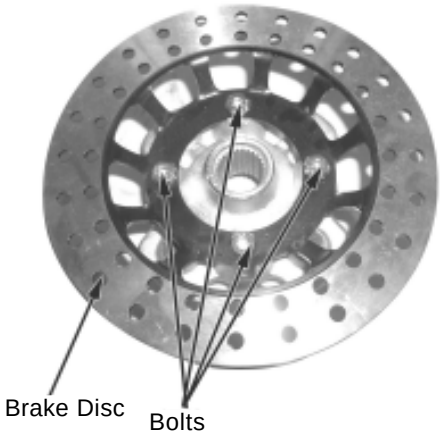
Remove brake caliper (→12-4);
Remove main sliding shaft of brake pads with allen wrench;
Remove brake pads;
Measure thickness of brake pad friction surface no.4, if it is less than 1mm, then replace both pads at the same time.



## BRAKE DISC

### Removal

Remove front wheel (→12-3);
Remove brake calipers (→12-4);
Remove brake disc and wheel hub from vehicle
Remove the 4 brake disc bolts shown in the right picture, then remove brake disc.




### Inspection

Thickness of brake disc:
If less than 2.50mm,replace it.

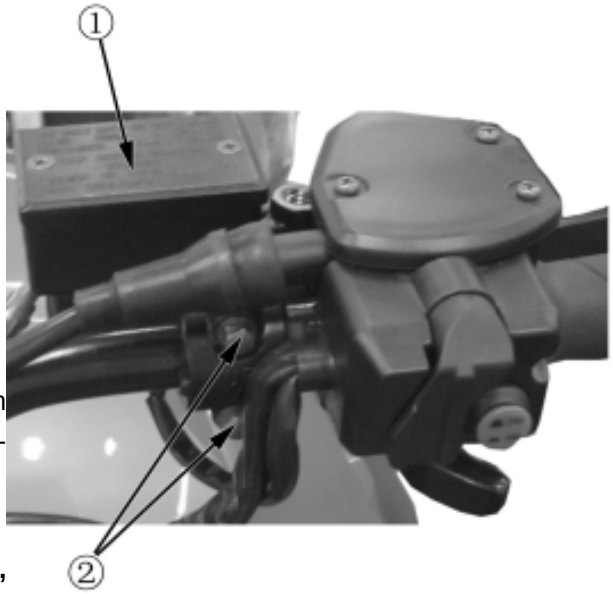
### Installation

Reverse the removal procedure for installation.
Tightening torque of brake disc bolts: 25-30**N.m**

## FRONT BRAKE MASTER CYLINDER

### Removal

Remove top cover of handlebar;
Remove right hand guard;
Remove bolt no.2;
Seperate master cylinder no.1 of front brake from handlebar. It's not necessary to remove it if replacement is not required.




### Attention:

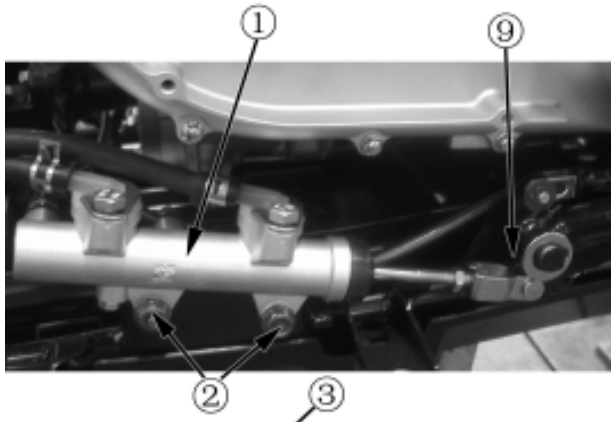
**Do not hang the master cylinder by brake line, keep master cylinder in place (not inclined) while installing it to avoid air entering brake line.**

**Keep brake line routed properly (refer to Chapter 1) and ensure it is not kinked.**
**After installation of brake system, check brake performance.**

## 4-WHEEL MASTER CYLINDER

### Revoval

Remove brake pedal (→2-11);
Remove bolts no.2;
Remove bolts no.4;
Remove cotter pin no.9;
Remove master cylinder no.1 from vehicle.

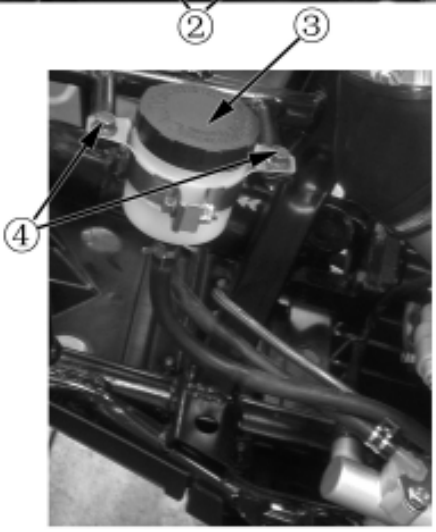



### Installation

Reverse the removal procedure for installation.

### Attention:

**In order to avoid air entering 4-wheel master cylinder, keep it in place while installing it.**
**Keep brake line routed properly (refer to Chapter 1) and ensure it is not kinked.**
**After installation, check brake performance.**




## T-FITTING

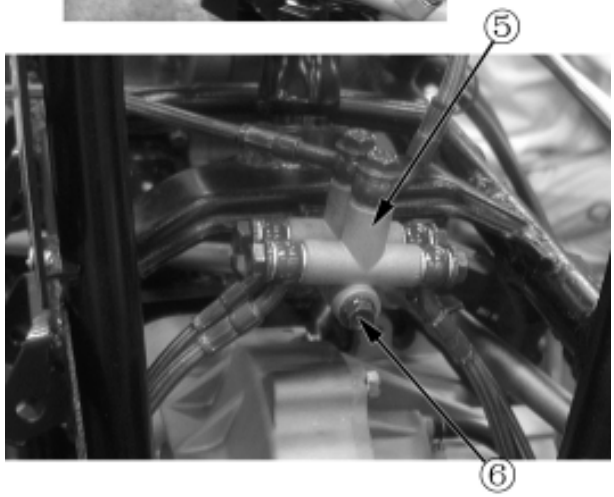
### Removal

Remove bolt no.6 and T-fitting.

### Installation

Reverse the removal procedure for installation.

**Attention: Keep brake line routed properly (refer to Chapter 1) and ensure it is not kinked.**
**After installation, check if 4-wheel brake lever or brake pedal can control front brake.**




## REAR BRAKE CALIPER

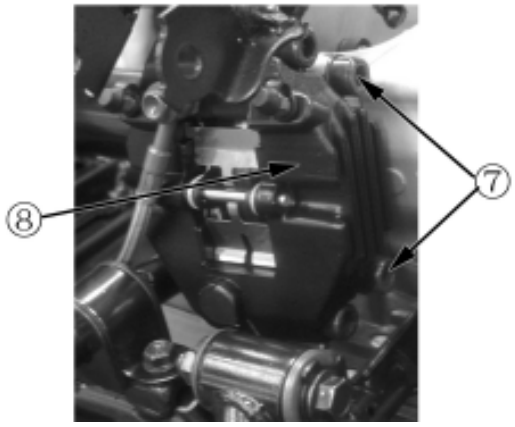
### Disassembly

Remove bolt 7 and then disassemble rear brake caliper 8

### Installation

Reverse the removal procedure for installation.

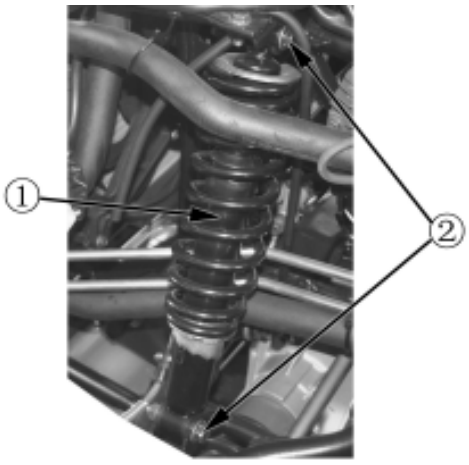
**Attention: Keep brake line routed properly (refer to Chapter 1) and ensure it is not kinked.**
**After installation, check if 4-wheel brake lever or brake pedal can control front brake.**
**Mainten brake fluid level between "UPPER" and "LOWER", if necessary, add DOT 4 fluid (CFMOTO recommended) into brake fluid reservoir. Check brake light and switch.**



## FRONT SUSPENSION

### Front LH Suspension

**ATTENTION:**Do not remove left and right suspension at the same time, otherwise vehicle may tip or fall.




### Removal

Park the vehicle on a level ground and securely support the front part of vehicle.

Remove LH front protector of suspension (→2-15);

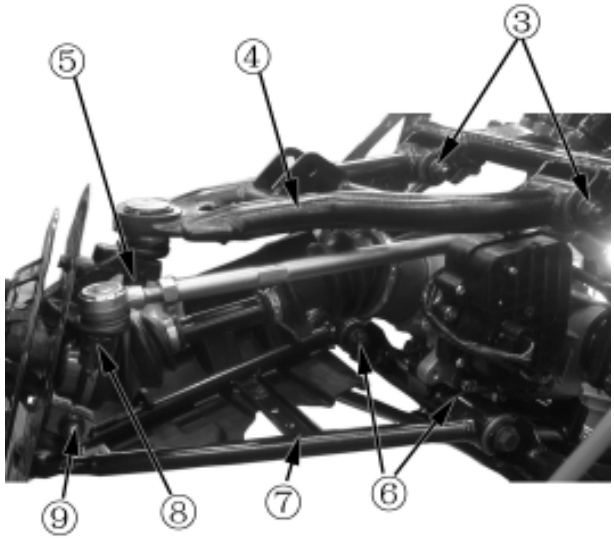
Remove front wheel (→12-3);

Remove brake caliper (→12-4);

Remove front wheel hub (→12-3);

Remove bolts and nuts no.2 of front LH shock absorber and LH upper A-arm;

Remove front shock absorber no.1;




Remove bolts and nuts no.3 of LH front A-arm;

Remove cotter pin and nut no.5 assembled on left steering knuckle;

Remove front LH upper A-arm 4;

Remove cotter pin and locking nut no.8 of steering tie-rod;

Remove bolts and nuts no.6 of LH front A-arm assembled on frame;

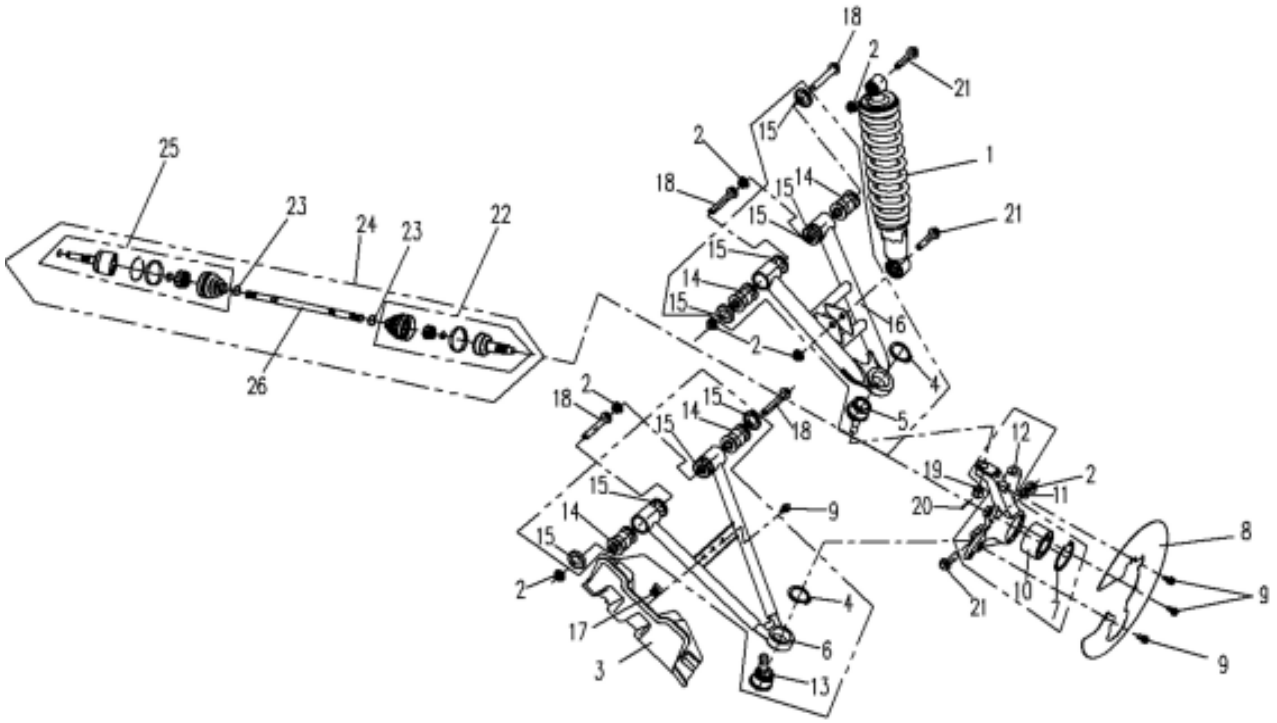
Remove locking bolt no.9 of LH front A-arm;

Remove front LH lower A-arm no.7;

Remove steering knuckle from drive shaft;

There are optional shock absorbers available for different markets.

The procedure above is for basic configuration. As for other optional shock absorbers,refer to the procedure above.




1.Front shock absorber 2.Nut 3. LH protector 4.Circlip 5. Top ball pin 6.LH front lower A-arm 7.Circlip 8. Guard,brake disc 9.Bolt 10.Hub bearing 11.Washer 12.LH steering knuckle 13. Bottom ball pin 14.Buffering collar 15.Cap, buffering collar 16.LH front upper A-arm 17.M6 Nut clip 18. Bolt 19. Slot nut 20. Cotter pin 21. Bolt 22. Bearing kit, fixing end 23. Small clamp 24.Front LH drive shaft assy 25.Bearing kit,motion end 26. Front LH drive shaft

## FRONT SHOCK ABSORBER

### Removal

**NOTE:** *If only replacing front shock absorber,it's not necessary to remove other parts.*

Remove bolt no.21 and nut no.2, then finally remove front shock absorber (LH) no.1.

### Inspection

Check shock absorber for oil leaks,oil seal aging and other damages.Replace if necessary.

### Installation

Reverse the removal procedure for installation.

As for removal, installation and check procedure of front shock absorber (RH),refer to front shock absorber (LH).

## A-ARM

**NOTE:** *There are totally 8 units of A-arm, procedure of removal, disassembly, check and installation is same, so only front upper A-arm (LH) and fron lower A-arm(LH) are introduced.*

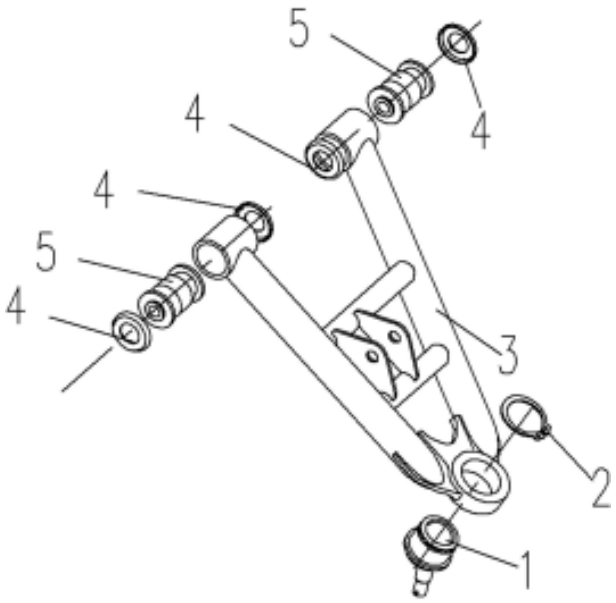
### Front LH A-arm

### Removal

Remove front shock absorber(LH) (→12-7);
Remove bolt no.18 and tightening nut no.2 mounting front LH upper A-arm on frame;
Remove bolt 18 and tightening nut mounting front LH lower A-arm on fram;
Remove front wheel, brake caliper and wheel hub before disassembling shock absorber;
Remove steering tie-rod before the removal of bolts;
Remove steering knuckle from drive shaft before removal of front LH A-arm ;
Finally remove front LH A-arm.

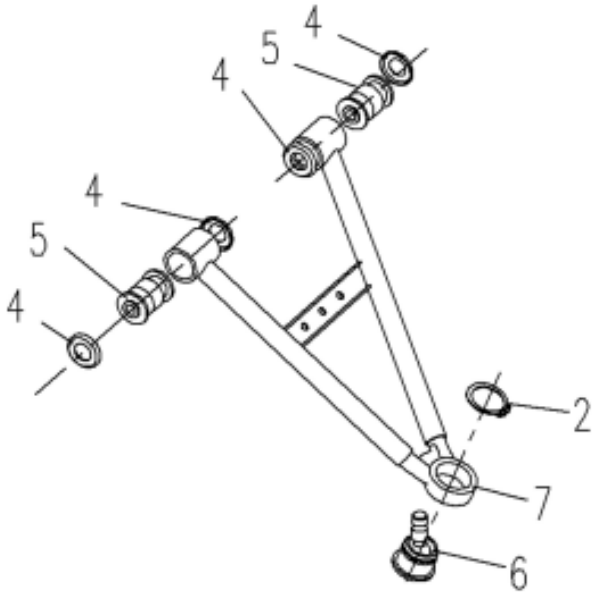
### Inspection of upper A-arm

Remove front Upper A-arm (LH) no.3(→12-7);
Remove circlip no.2 (Type: GB894.1 34)
Remove top ball pin no.1;
Check top ball pin no.1 if it can move freely and also check its clearance. If it cannot move frelly or too big clearance, replace it. At the same time, check grease inside top ball pin if it is deteroirated. Check dust boot of ball pin if damaged or aging;
Remove bushing no.5 of front upper A-arm(LH);
Check bushing no.5 if damaged or aging, replace if necessary.




### Inspection of Lower A-arm

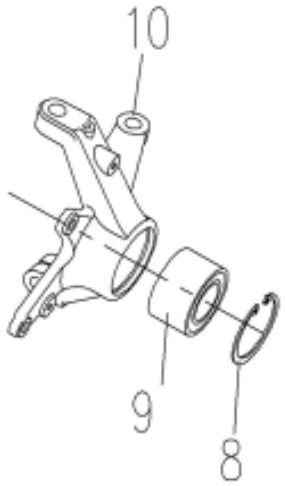
Remove front Lower A-arm (LH) no.3(→12-7);
Remove circlip no.2 (Type: GB894.1 34)
Remove top ball pin no.6;
Check top ball pin no.6 if it can move freely and also check its clearance. If it cannot move frelly or too big gap, replace it. At the same time, check grease inside top ball pin if it is deteroirated. Check dust boot of ball pin if damaged or aging.
Remove bushing no.5 of front upper A-arm(LH)
Check bushing no.5 if damaged or aging, replace it if necessary.




### Installation

Use special tool to press ball pin into A-arm;
Install as reverse procedures of disassembly.

**Attention: Upper and Lower A-arms should not vibrate after installation, otherwise replace bushing no.5.**

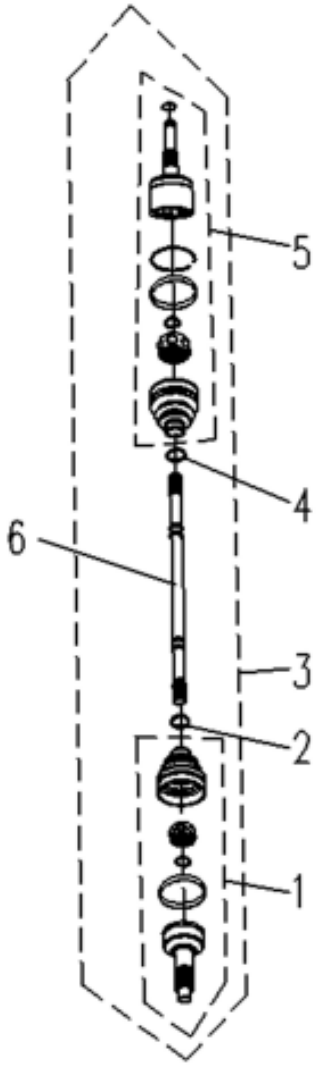



### Inspection of Left Steering Knuckle

Remove left steering knuckle no.10 (→12-7);
Remove circlip no.8 (Type: GB893.1 55);
Use special tool to remove hub bearing no.9 (Type: DAC3055);
Check hub bearing if any damaged and move freely, or big clearance.Replace it if necessary.

## DRIVE SHAFT

**NOTE:***Method and procedure of removal, inspection and installation between front and rear drive shafts (LH &RH) are silimar,therefore only front drive shaft (LH) is introduced.*




### Front LH Drive Shaft

### Removal

**NOTE:** *If only repairing front LH driveshaft, it's not necessary to remove front LH suspension from vehicle.*

Remove front wheel(LH)(→12-3);

Remove front caliper (LH)(→12-4);

Remove front wheel hub (LH)(→12-3);

Remove front LH drive shaft no.3 from left side of front differential;

Check dust boot if any damaged. If damaged, replace it.

Check bearing kit of fixed and motion end if it can move flexibly. Also check there is any clearance between universal joint and splines. If it cannot move freely and there is noise, replace it.

**CAUTION:Universal joint must move freely, otherwise it can damage drive shaft and cause out of control of tire and accident.**

### Installation

Reverse the removal procedure for installation.

## STEERING

**Handlebar**

**Master cylinderof front brake** (→ 12-15);

**Top cover of handlebar**

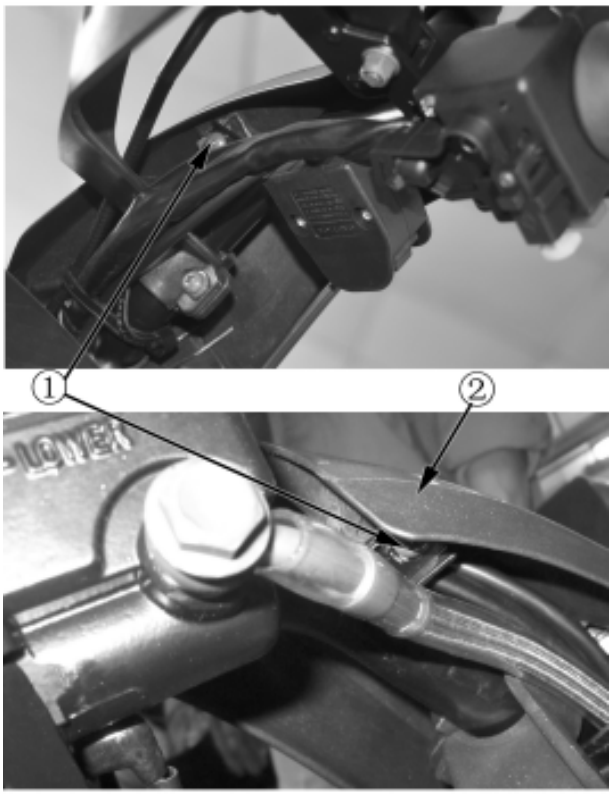
### Removal

Remove tapping screw no.1;

Remove top cover of handlebar.

### Installation

Reverse the removal procedure for installation.




## 4-WHEEL HAND BRAKE LEVER

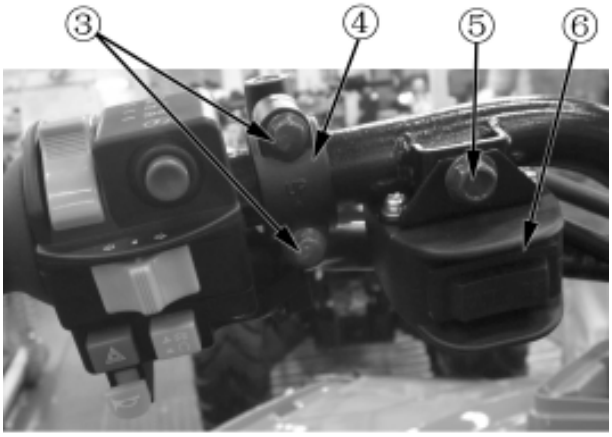
### Removal

Remove bolts no.3;

Remove 4-wheel hand brake lever;

### Installation

Reverse the removal procedure for installation.




## WINCH CONTROL SWITCH

### Removal

Remove bolt no.5;

Remove winch control switch no.6.

### Installation

Reverse the removal procedure for installation.

## LH HANDLEBAR SWITCHES

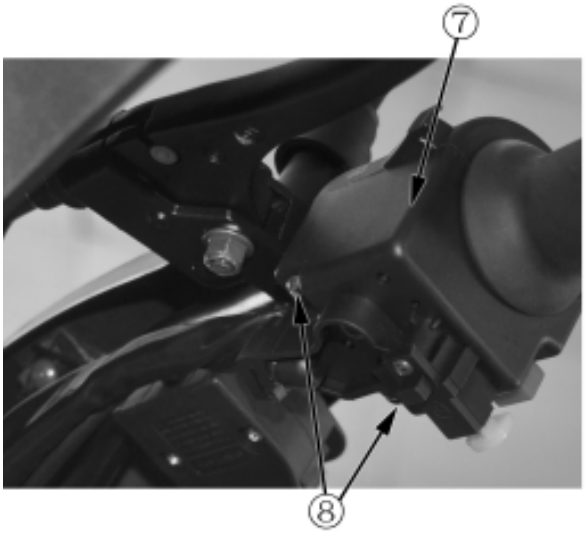
### Removal

Remove bolts no.8;

Remove left handlebar switches no.7.

### Installation

Reverse the removal procedure for installation.



## RH HANDLEBAR SWITCHES

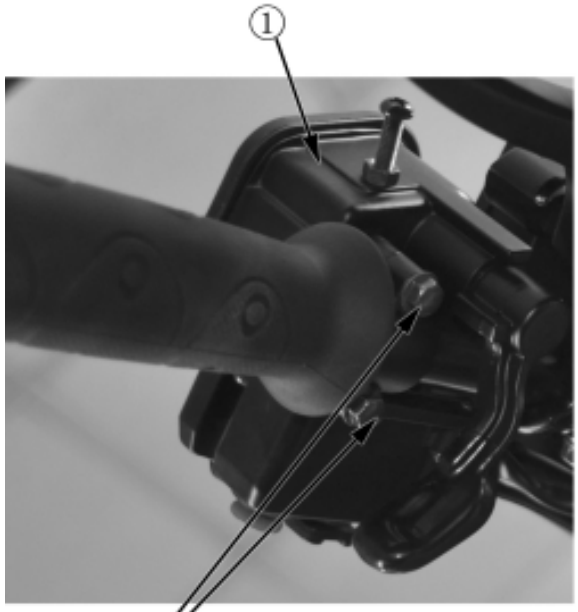
### Removal

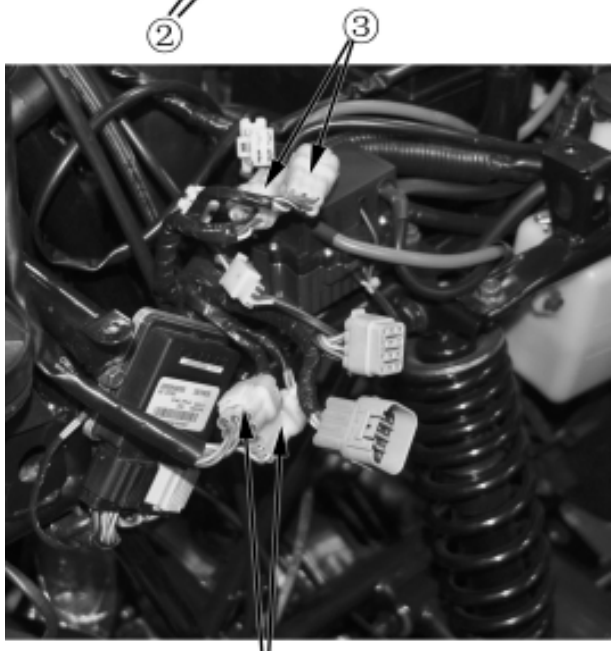
Remove bolts no.2;

Remove right handlebar switches no.1;

Unplug connector no.3 of left handlebar switches,

Unplug connector no.4 of right handlebar switches.




### Installation

Reverse the removal procedure for installation.

## REAR VIEW MIRROR

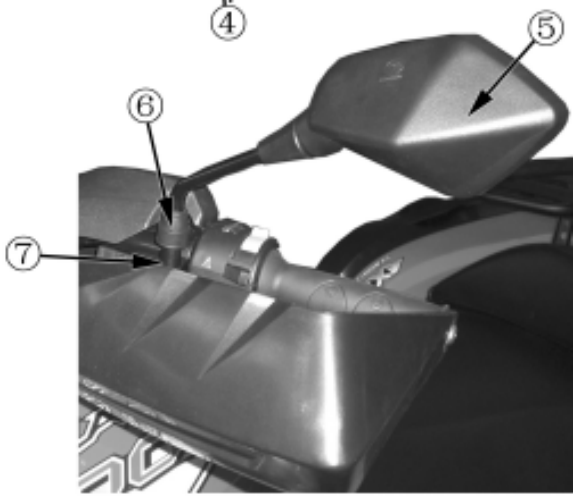
### Removal

Slide sleeve no.6 out place and unscrew no.nut 7, then remove rear view mirror no.5 in anti-clockwise direction.

**NOTE:** *As for rear view mirror (LH), the threads are right hand, so remove it by turning it counter-clockwise.*

Unscrew nut in clockwise direction and unscrew rear view mirror (RH) to remove.

**NOTE:** *As for rear view mirror (RH),the threads are left hand, so remove it by turning it counter-clockwise.*




### Installation

Reverse the removal procedure for installation.

## HANDLEBAR

### Removal

Remove top cover of handlebar (→12-12);
Remove left and right handlebar switch (→12-12);
Remove left and right brake pump from handlebar;
Remove left and right hand protector;
Remove bolt 1 of handlebar cover;
Remove handlebar no.2.


### Installation

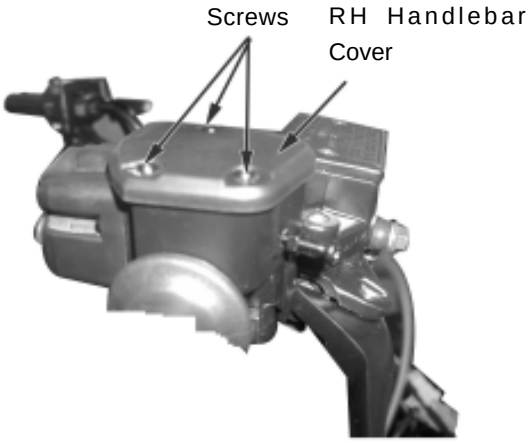
Reverse the removal procedure for installation.
Handlebar cover bolt: GB5789 M8x55
Tightening torque: 15-25**N•m** (1.5-2.5**kgf•m**)

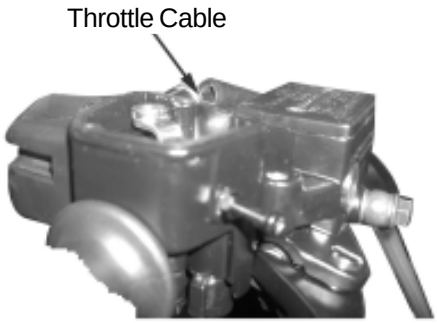
**ATTENTION:**

**Keep Main cable, throttle cable, brake line properly routed.**

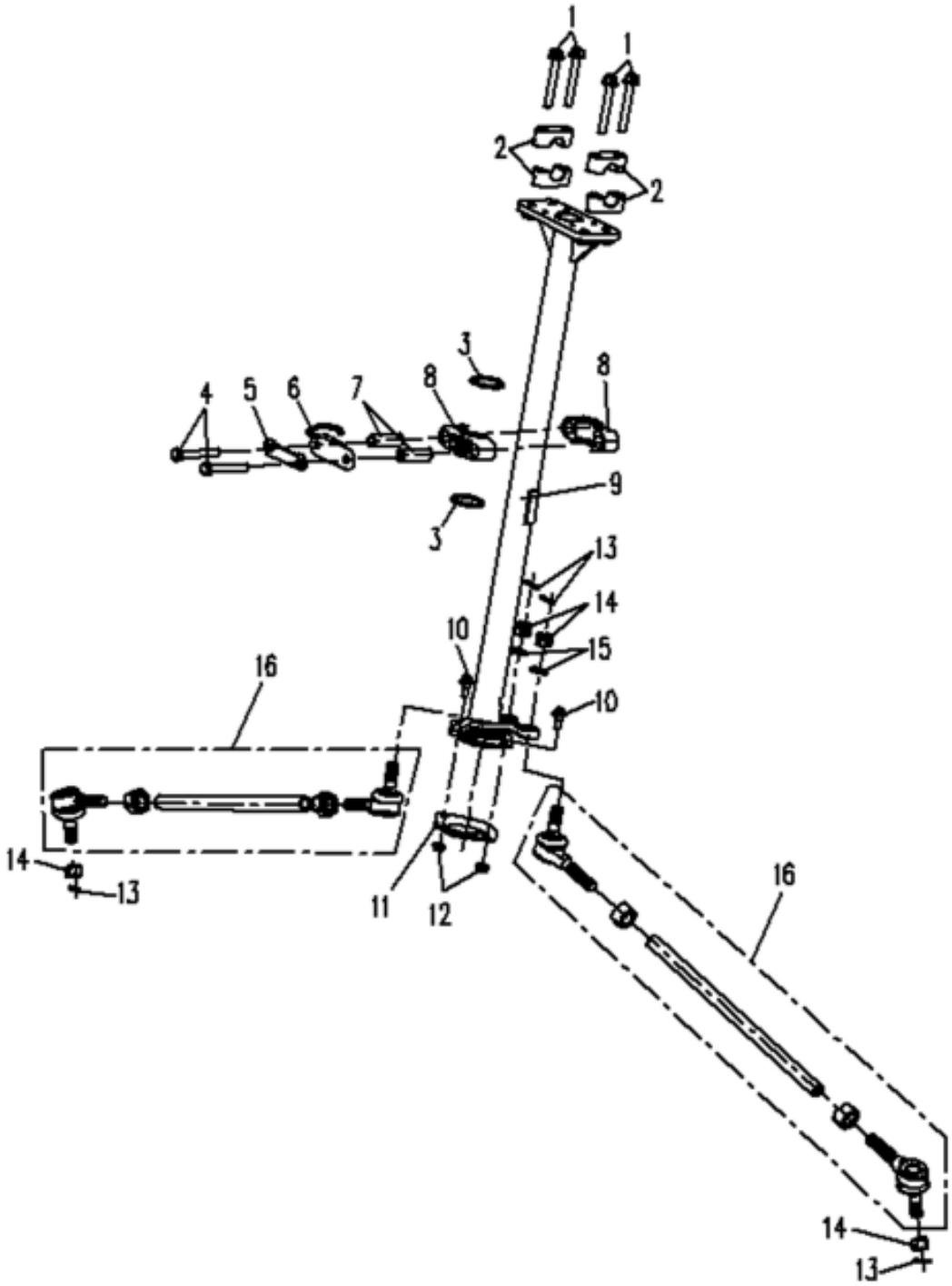
### Throttle Cable Installation

Remove the 3 screws illustrated in the right picture and remove top cover of right handlebar;
Install throttle cable;
Install top cover of right handlebar.



## STEERING EXPLODED VIEW




1.Bolt 2.Alum. cover, handlebar 3. Seal ring 4. Bolt 5.Lock clip 6.Adapter plate 7.Bush 8.Support bush, steering bearing 9.Steering stem 10. Flange bolt M6x17 11. Steering bearing seat 12. Nut 13. Cotter pin 14.Nut 15. Washer 16. Steering tie-rod

## STEERING COLUMN

### Removal

Remove plastics(→Chapter 2);

Remove upper cover of handlebar (→8-12);

Remove front wheel (→8-2);

Remove handlebar (→8-14);

Remove 4-wheel hand brake lever(→8-12);

Remove connector of handlebar switches;

Remove nut of steering tie-rod and steering column;

Use slotted screw driver and hammer to fix lock clip;

Remove bolt no.1;

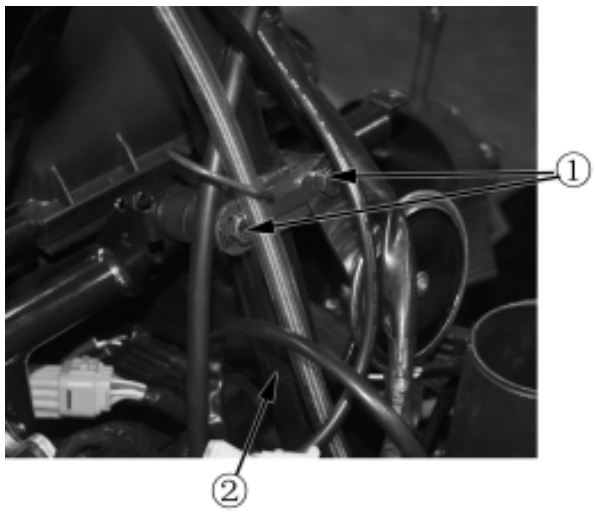
Remove cotter pin;

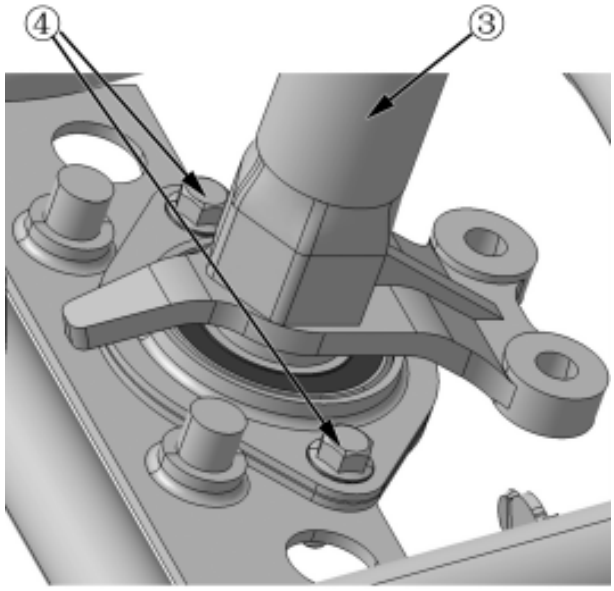
Remove steering tie-rod nut and washer;

Press steering tie-rod away from steering column;

Remove bolt no.14;

Lift steering bearing away from steering stem;




### Installation

Reverse the removal procedure for installation.

**NOTE:** *After installation, be sure to check steering agility.*

## STEERING BEARING & OIL SEAL

### Removal

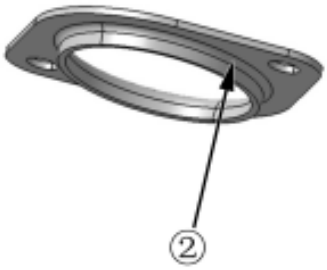
Remove steering bearing (→8-16);

Steering bearing and oil seal are pressed onto steering column, check if any damaged. If damaged, please replace it.


### Installation

Reverse the removal procedure for installation.

**NOTE:** *After installation, it is necessary to check steering agility.*



## MAINTENANCE INFORMATION

### Operation Cautions

**CAUTION:**

- **When performing rim,suspension maintenance,jack or other suitable stand is required to raise the vehicle body off the ground.**
- **Rim,suspension mounting bolts,nuts should be genuine parts.**
- **Never exert an excess force on the wheels.Be careful not to damage wheels.**
- **when removing tires from wheels,use special tools,such as tire removal rod and tire protector to avoid damages to rims.**

### Maintenance Specifications:

| Item | | | Standards | Service Limit |
|---|---|---|---|---|
| Rear Wheel | Wheel Runout | Radial | - | 2.0mm |
| | | Axial | - | 2.0mm |
| | Tire | Tread Depth | - | 3.0mm |
| | | Tire Pressure | 45kPa | - |
| Rear Brake | Brake Lever Free Play | | 10-20mm | - |

### Tightening Torque:

| | |
|---|---|
| Axle Nuts: | 110-130**N • m** |
| Wheel Nuts: | 70-80**N • m** |
| Upper Shock Mounting Bolts&Nuts: | 40-50 **N • m** |
| Lower Shock Mounting Bolts&Nuts: | 40-50 **N • m** |

## Rear wheel runout

- Wheel deformation
- Defective tire
- Tire pressure is excessively low
- Wheel is unbalanced
- Axle nut is loose
- Wheel nuts are loose

## Too soft rear shock

- Weakened spring tension
- Rear shock leak

## Too stiff rear shock

- Rear shock bending
- Too high tire pressure

## Poor braking performance

- Improperly adjusted braking
- Brake pads or disc is damaged or stained
- Brake pads is worn

## REAR WHEEL

### Removal

See the front wheel removal.(→12-3)

## RIM&CHECK

Check rim for damages,deformation,nicks.If any abnormal condition has been found,replce it.
Slowly turn wheel,use a dial gauge to measure the rim runout.

**Service Limit:**

**Radial:2.0mm**

**Axle:2.0mm**

### Installation

See front wheel installation(→12-3).

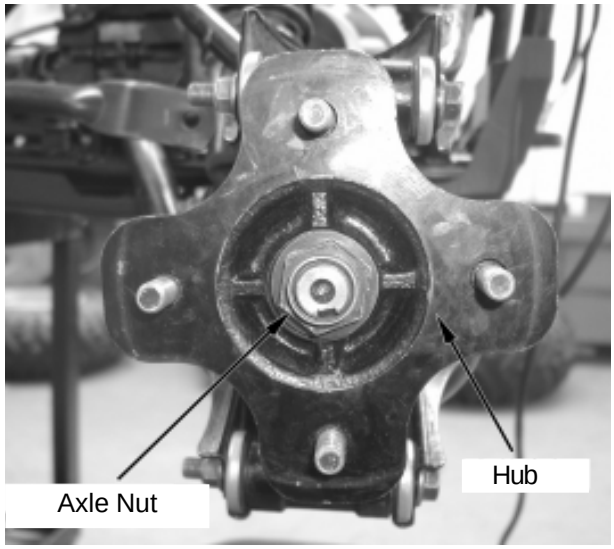
## WHEEL HUB

### Removal

Remove rear wheel(→13-3);

Remove rear axle nut;

Remove wheel hub.




### Installation

Reverse the removal procedure for installation.

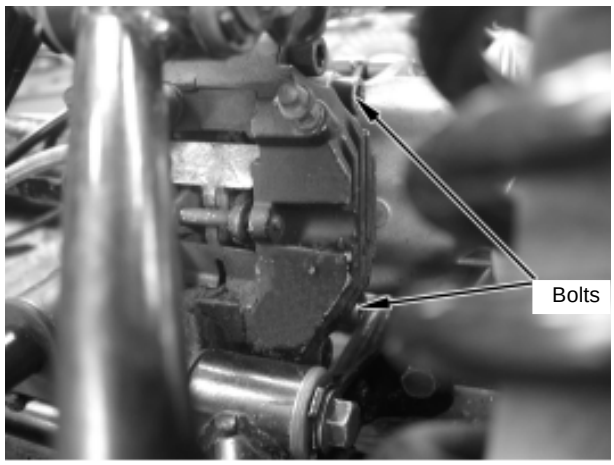
Axle Nut Tightening Torque:110-130**N • m**

## REAR BRAKE SYSTEM

### Rear Brake Caliper

### Removal

Remove rear wheel,LH(→13-3);
Remove the 2 bolts fitted on A-arm;
Remove brake caliper.




### Inspection

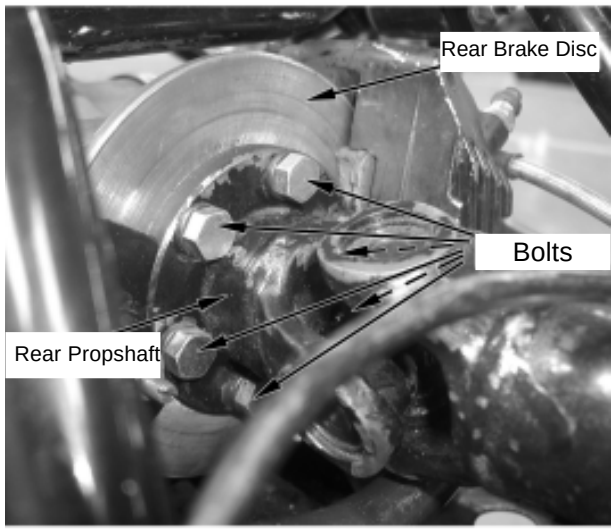
Visually inspect caliper for cracks and brake fluid leaks.
Replace the part if any damage has been found.

### Installation

Reverse the removal procedure for installation.
**NOTE:***Refer to Chapter 1 for brake line routing.*

### Brake Disc

Chapter 1
Remove the drive shaft;
Remove rear caliper(→3-4);
Remove the 6 rear brake disc mounting 6 bolts ;
Remove brake disc(→ 13-3).

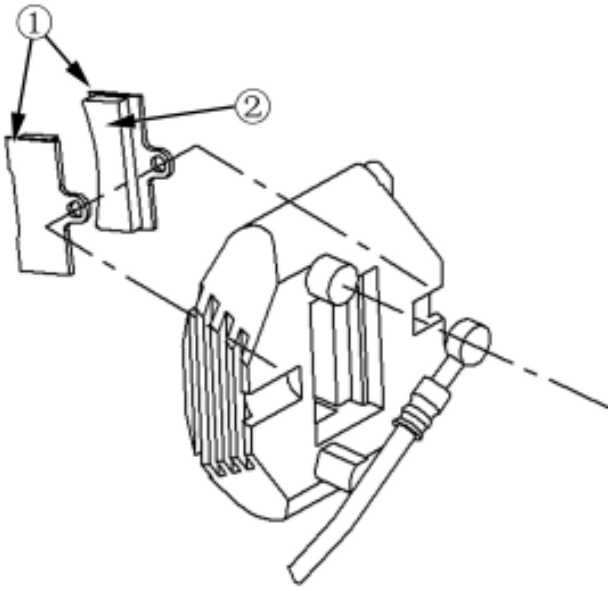



### Inspection

Replace the brake disc if it's thickness is less than 6.5mm.

### Measuring Rear Brake Pads no.1

If the brake pad friction surface no.2≤1mm,replace the 2 brake pads no.1 as an assembly.



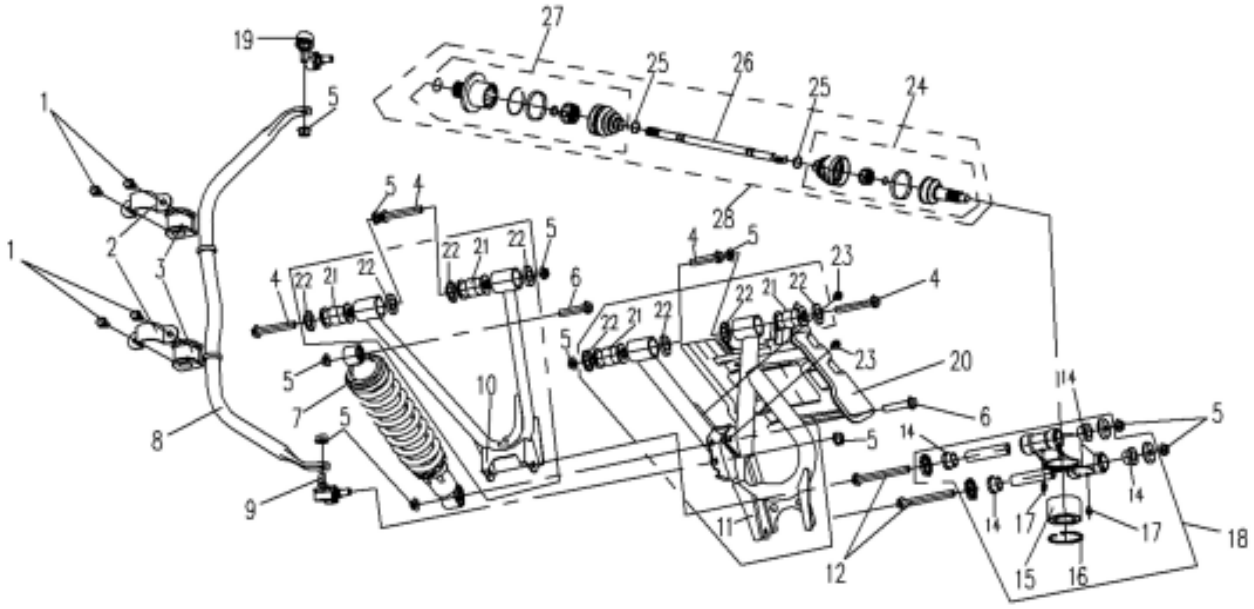

### Installation

Reverse the removal procedure for installation.
**NOTE:***Refer to Chapter 1 for brake line routing.*
**A whole brake system replacement:**(→Chapter 12, Brake System)

## REAR SUSPENSION

### Rear Suspension,LH

**NOTE:***When servicing suspension,don't remove LH suspension and RH suspension at the same time. Otherwise,vehicle may tip or fall.*




1.Bolts 2.Gland Cover 3.Rubber Support 4.Bolt 5.Self-locking Nut 6.Bolt 7.Rear Shock,LH 8.Stabilizer Bar 9.Rear LH Ball Pin 10.Real LH A-arm 11.Rear Upper A-arm,LH 12.Rear Lower A-arm,LH 13.Bolt 14.Bushing 15.Bearing 16.Circlip 17.Grease Fittings 18.Bearing Carrier 19.Rear RH Ball Pin 20.Rear LH Suspension protector 21.Buffering Collar 22.Cap,Buffering Collar 23.Bolt 24.Bearing Kit,Fixed End 25.Small Clamp,Fixed End 26.Rear LH Axle 27.Rear Bell Boot,Motion End,LH 28.Front Axle,LH

**Disassembly**

## STABILIZER BAR

### Removal

Remove bolt no.1;Remove gland cover no.2 and rubber support no.3;Remove self-locking nut no.2;Remove LH ball pin no.9 and RH ball pin no.26;Remove stabilizer bar.

### Installation

Reverse the removal procedure for installation.

## REAR LH SHOCK ABSORBER

**NOTE**：*When removing LH&RH shock,use appropriate tool to support and raise the vehicle body.*

*If only shock requires maintenance,it's not necessary to remove the complete suspension system before service.*

Remove rear LH shock mounting bolt and nut;
Remove rear LH shock.

### Installation

Reverse the removal procedure for installation.

## REAR A-ARMS,LH

See ***Front LH Upper/Lower A-arm Removal, Inspection,Installation*** in Chapter 8.

## REAR SUSPENSION,RH

See rear ***LH Suspension Removal,Inspection,and Installation***.

## MAINTENANCE INFORMATION

### ● Standards

| Lubricating Period | | | | |
|---|---|---|---|---|
| Item | Type | Capacity | Interval | |
| | | | Initial | Next |
| Front Differential | SAE15W/40 SG or SAE80W/90 GL-4 | Initial:0.33L /Replace:0.28L | 350km | 5000km |
| Rear Gearcase | | Initial:0.30L/Replace:0.25L | | |

| Item | Qty | Specification | Toque(N.m) | Remark |
|---|---|---|---|---|
| Bolt,F/D | 6 | M8X28 | 25 | |
| Motor Screw,F/D | 4 | M8X20 | 13 | |
| Bolt,Shift Fork Rack Stopper | 1 | M8X10 | 13 | Apply threadlocker |
| Nut,F/D | 1 | M14X1.5 | 62 | |
| Bolt,R/G | 6 | M10X1.25X22 | 45 | |
| Fill Bolt,F/D | 1 | M10X1.25X12 | 25 | |
| Drain Bolt,F/D | 1 | M10X1.25 | 25 | |
| Retainer,F/D | 1 | M64X1.5X7 | 80 | |
| Bolt,R/G | 2 | M10X1.25X25 | 40 | |
| Bolt,R/G | 6 | M8X25 | 25 | |
| Nut,Drive Pinion Gear Shaft,R/G | 1 | M12X1.25 | 70 | |
| Bolt,Bearing Carrier,R/G | 4 | M8X30 | 25 | |
| Retainer,R/G | 1 | M65X1.5X10 | 70 | |
| Nut | 1 | M8 | 16 | |
| Fill Bolt,R/G | 1 | M20X1.5X12 | 25 | |
| Drain Bolt,R/G | 1 | M14X1.25X12 | 25 | |

F=Front,D=Differential,G=Gearcase,R=Rear

## ● Inspection & Maintenance

Inspection and maintenance is required if any of problems below happened to front differential and rear gearcase.

| Problem Description | Possible Causes |
|---|---|
| 1.A pronounced hesitation or "jerky" movement during acceleration,deceleration,or sustained speed.<br><br>2. Abnormal noise in front differential and/or rear gearcase.<br><br>3.No power transmitted from the engine to the front and/ or rear wheel. | A.Bearing damage;<br>B.Improper gear lash;<br>C.Gear severely worn;<br>D.Gear blocked<br>E.Drive shaft broken<br>F.lack of lubrication<br>G.Foreiggn objects in the front differential and/or rear gearcase |

**NOTE:** *Problems A,B and C above may be difficult to diagnose.The symptoms are quite subtle and difficult to distinguish from normal machine operating noise.If there is reason to believe these components are damaged,remove the components and inspect them.*

### Observnation and Judgement

1.Investigate any unusual noises:

a. Unstable noise during acceleration or deceleration.The noise increases with front and/or rear wheel speed,but it does not increase with higher engine or transmission speed.

Diagnosis:Possible wheel bearing damage.

b. Constant abnormal noise during acceleration or deceleration might be caused by improper gear lash during assembly.

**NOTE:***Improper assembly or adjustment of the front differential and/or rear gearcase will aggravate gear wear and block;*

c.Slight noise would be noticed during low-speed driving, while may not be heard during high-speed driving. This symptom might be caused by gear block.

**WARNING:In case of above mentioned itmes, stop riding immediately for inspection and fix the problem before successive use.otherwise it will cause loss of control of the machine and possible injury to the rider.**

2.Check lubrication condition;

Often check if the consumption of lubricant is normal and the metal particles in lubricant is normal.

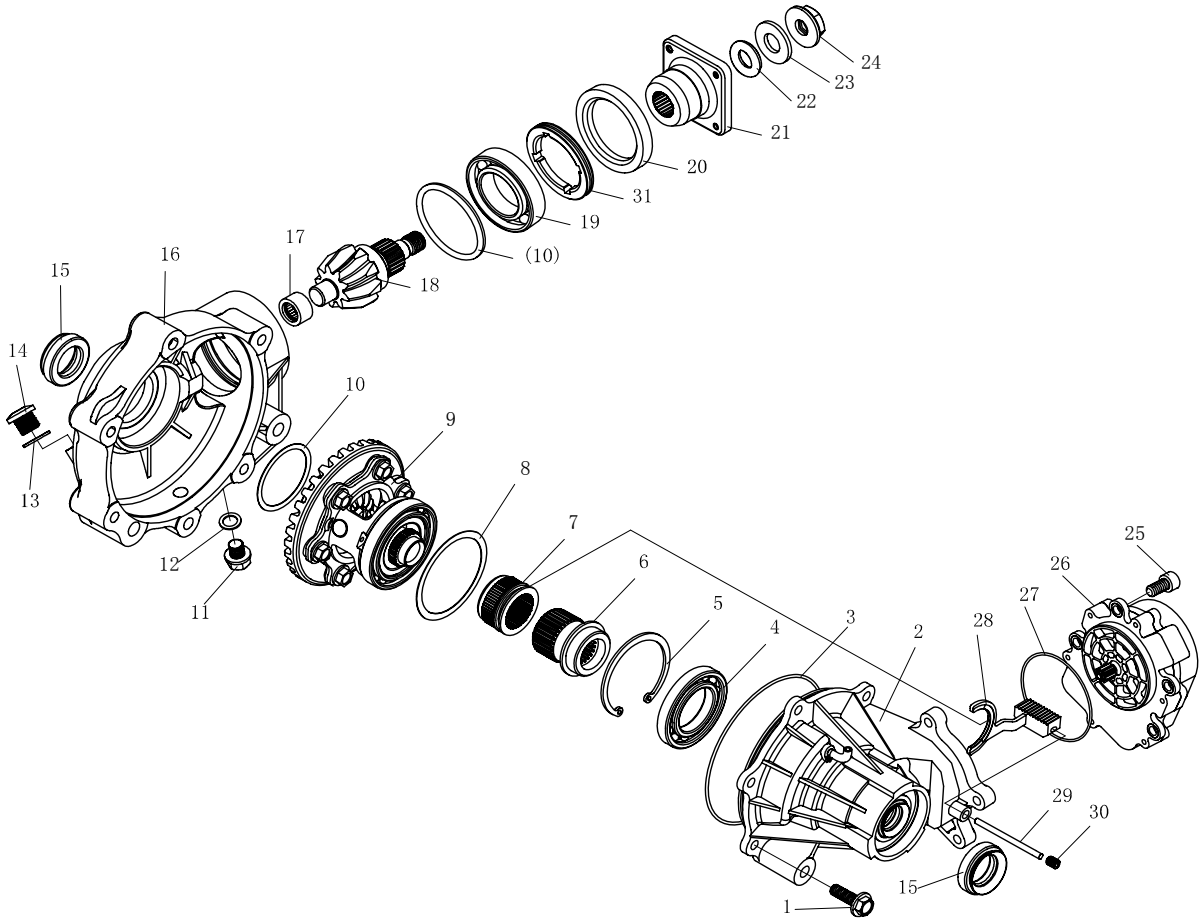
3.Chcek lubricant leakage;

a.Check front differential and rear gearcase housing for oil residue throughly;

b.Oil residue on ground on the parking lot;

c.Lubricant splash inspection.Check if there is gear case or oil seal leakage. Replace broken parts if necessary.

## FRONT DIFFERENTIAL EXPLODED VIEW




| Item | Part Name | QTY | Item | Part Name | QTY |
|---|---|---|---|---|---|
| 1 | Bolt M8X28 | 6 | 17 | Bearing F1512 | 1 |
| 2 | Differential Gear Case,LH | 1 | 18 | Drive Pinion Gear | 1 |
| 3 | O-ring 141X2.4 | 1 | 19 | Bearing 6007 | 1 |
| 4 | Bearing 16007 | 1 | 20 | Oil Seal 48X65X9 | 1 |
| 5 | Circlip 62 | 1 | 21 | Coupler | 1 |
| 6 | Drive Clutch Cover | 1 | 22 | O-ring 14X6.8 | 1 |
| 7 | Drive Clutch | 1 | 23 | Nut Washer | 1 |
| 8 | Shimφ83X71 | 1-2 | 24 | Nut M14X1.5 | 1 |
| 9 | Differential Gear Assembly | 1 | 25 | Screw M8X20 | 4 |
| 10 | Shim φ61X48 | 2-4 | 26 | Gear Motor | 1 |
| 11 | Drain Bolt M10X1.25 | 1 | 27 | O-ring 81.2X1.9 | 1 |
| 12 | Washer 10,Drain Bolt | 1 | 28 | Shift Fork Rack | 1 |
| 13 | Washer 14,Fill Bolt | 1 | 29 | Stopper Shaft | 1 |
| 14 | Bolt M14X1.25 | 1 | 30 | Screw M8X10 | 1 |
| 15 | Oil Seal 24X38X8 | 2 | 31 | Retainer M64x1.5X7 | 1 |
| 16 | Differential Gear Case,RH | 1 | 32 | | |

### Inspection After Front Differential Disassembly

- Check if there is damage or cracks on the front diffrential gear case and the condition of bearing seats. Replace if necessary.

- Check front differential bearing free play,rotation,bearing cage,steel balls,needles conditions. Replace if necessary(Using special tools).

- Check if oil seal lips and O-ring shape are normal. Replace if necessary.

- Check cylndrical surface that contacts oil seal lips condition.Replace if necessary.

- Check teeth of front differential drive pinion gear and ring gear. Replace if necessary.

- Check differential spider gears teeth,gear carrier for wears. Replace if necessary.

- Check differential inside and outside splines for wears. Replace if necessary.

- Check rack face, inspect worn surface. Replace broken parts if necessary.

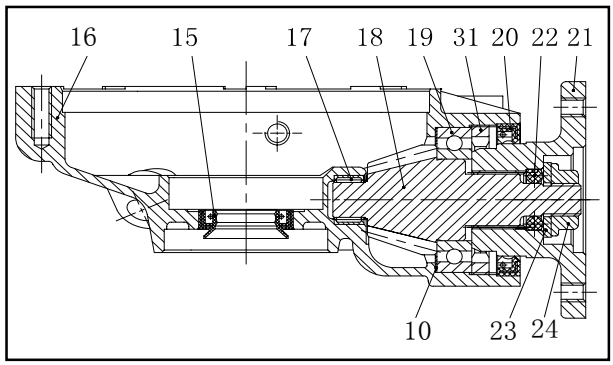
- Check gear motor working status. Replace with new parts if necessary.

  Gear motor inspection must be carried out with special equipment or acted on the vehicle.

- Check other parts. Replace broken parts if necessary.

## Front Differential Assembly and Adjustment

### ● Front RH Differential Gear Case Assembly

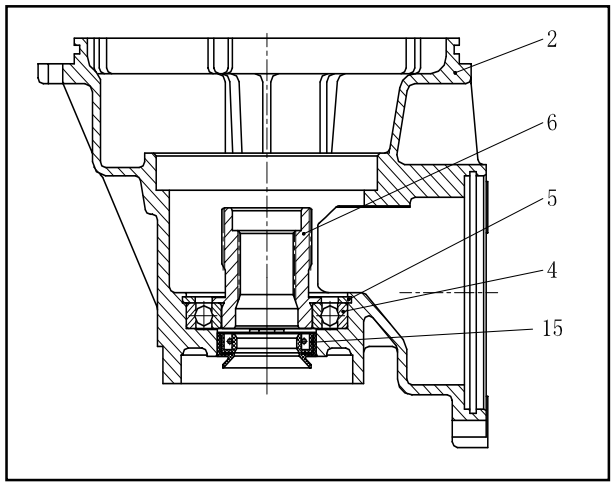



| Item “31” tightening torque: 80**N • m** |
|---|

| Item “24” tightening torque 62**N • m** |
|---|

**NOTE**: *Apply engine oil on oil seal, bearing and drive clutch assembly;*
*Apply threadlocker on item “24” .*

### ● Front LH Differential Gear Case Assembly

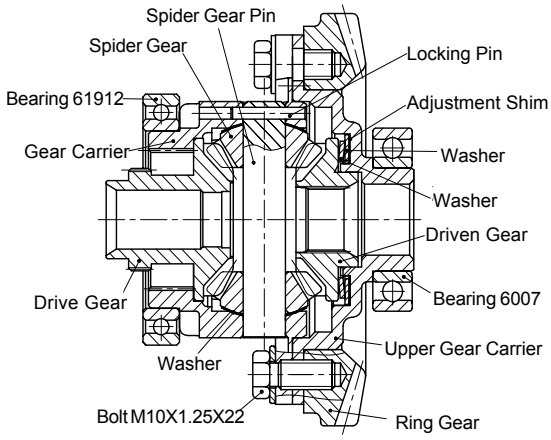



**NOTE:***Use engine oil for oil seal or bearing assembly.*

### ● Differential Gear Assembly

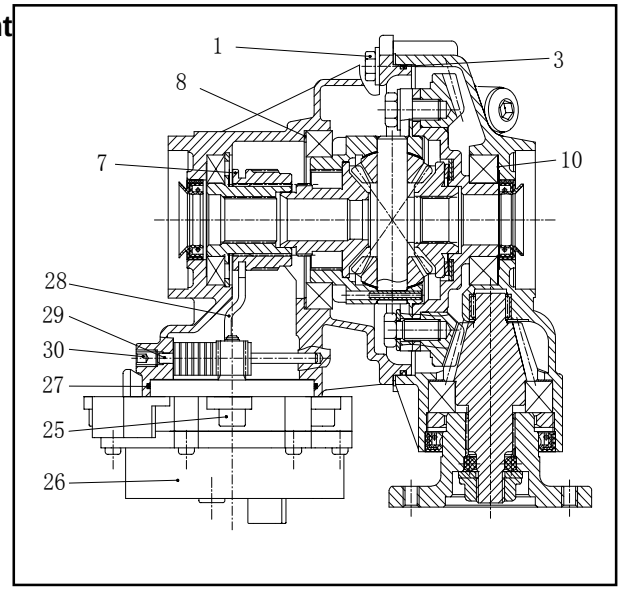
| Bolt M10 X 1.25 X 22 tightening torque 45**N • m** |
|---|

**NOTE:** *Use engine oil for bearing and differential gear;*
*Use proper shim to make gear work freely;*




| Shim thickness | 0.1 0.2 0.3 0.4 0.5 1.0 |
|---|---|

## ●Front Differential Assembly and Adjustment

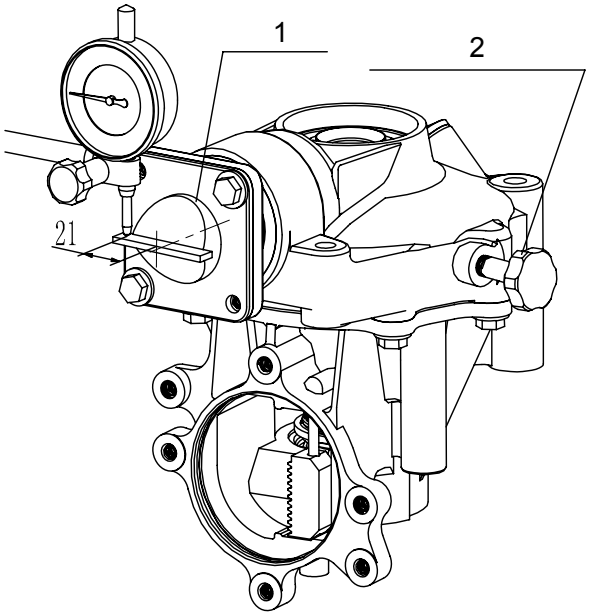



Assemble front differential as illustrated:

| Tightening Torque | |
|---|---|
| Item “1” | 25N•m |
| Item “25” | 13N•m |
| Item “30” | 13N•m |
| Fill Bolt | 25N•m |
| Drain Bolt | 25N•m |

Use threadlocker for item “30” assembly.

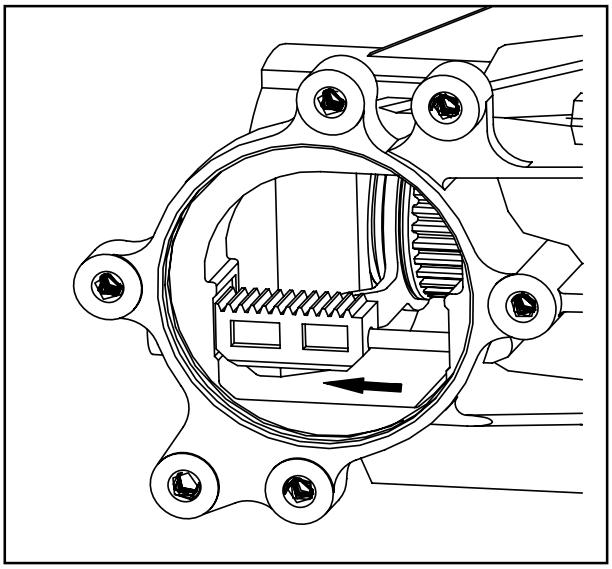
**a** Use proper shim no.8 and no.10 to adjust gear lash between drive pinion gear and ring gear.




Measure the lash between drive bevel gear and driven bevel gear as inllutrated: Install gear lash measurement tool no.1,locking bolt(M10X1.25X60) no.2.Using a dial gauge, make sure the measuring point is 21mm (0.83 in).Rotate gear lash measurement tool from engagement to engagement.

Standard: 0.10 ~ 0.25

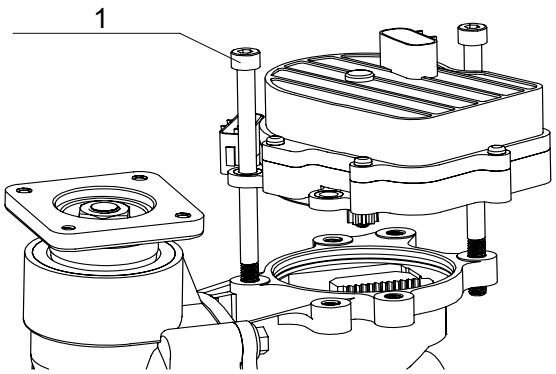
| | |
|---|---|
| Shim thickness | 0.1 0.2 0.3 0.4 0.5 1.0 |



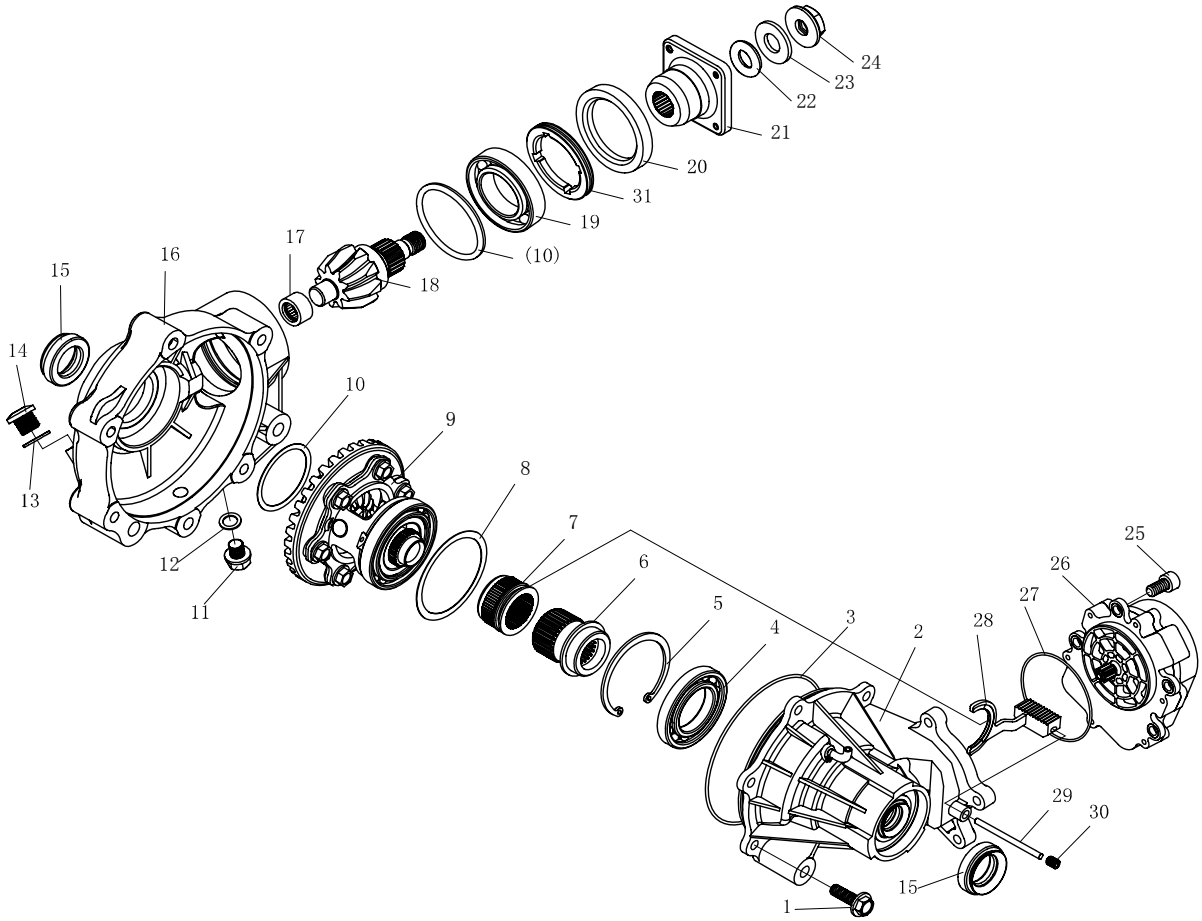
**b** When assembling front differential gear motor,shift fork rack and drive clutch should be against tightly as the arrow points.

**c** Using special equipment or vehicle control circuit, switch diff. motor to 2WD before assembly.

**d** Make sure b and c is assembled properly and use illustrated position screw M8X100 no.1 to assemble differential gear motor and front differential.



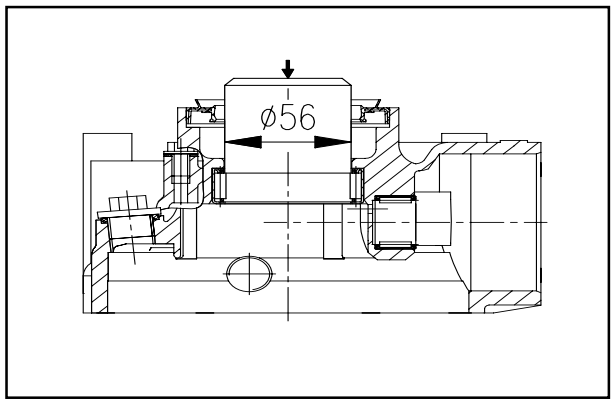
## FRONT DIFFERENTIAL EXPLODED VIEW



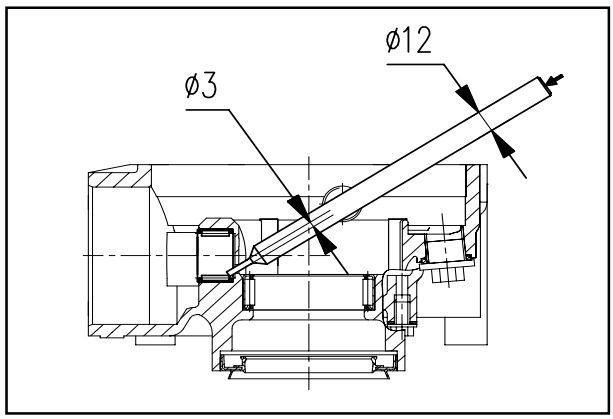

| Item | P/N | Qty | Item | P/N | Qty |
|---|---|---|---|---|---|
| 1 | Bolt M8X28 | 6 | 17 | Bearing F1512 | 1 |
| 2 | Differential Gear Case,LH | 1 | 18 | Drive Pinion Gear | 1 |
| 3 | O-ring 141X24 | 1 | 19 | Bearing 6007 | 1 |
| 4 | Bearing 16007 | 1 | 20 | Oil Seal 48X65X9 | 1 |
| 5 | Circlip 62 | 1 | 21 | Coupler | 1 |
| 6 | Driver Clutch Cover | 1 | 22 | O-ring 14X6.8 | 1 |
| 7 | Driver Clutch | 1 | 23 | Nut Washer | 1 |
| 8 | Shim 83X71 | 1-2 | 24 | Nut M14X1.5 | 1 |
| 9 | Differential Gear Assy | 1 | 25 | Screw M8X20 | 4 |
| 10 | Shim 61X48 | 2-4 | 26 | Gear Motor | 1 |
| 11 | Drain Bolt M10X1.25 | 1 | 27 | O-ring 81.2X1.9 | 1 |
| 12 | Washer 10,Drain Bolt | 1 | 28 | Shift Fork Rack | 1 |
| 13 | Washer 14,Fill Bolt | 1 | 29 | Stopper Shaft | 1 |
| 14 | Bolt M14X1.25 | 1 | 30 | Screw M8X10 | 1 |
| 15 | Oil Seal 24X38X8 | 2 | 31 | Retainer M64X1.5X7 | 1 |
| 16 | Differential Gear Case,RH | 1 | 32 | | |

### Bearing Disassembly

**a** Disassemble needle bearing 55BTM6720 as shown when necessary.




**b** When replacing needle bearing NA5903, rear gearcase should be heated to 150℃ before replacement.



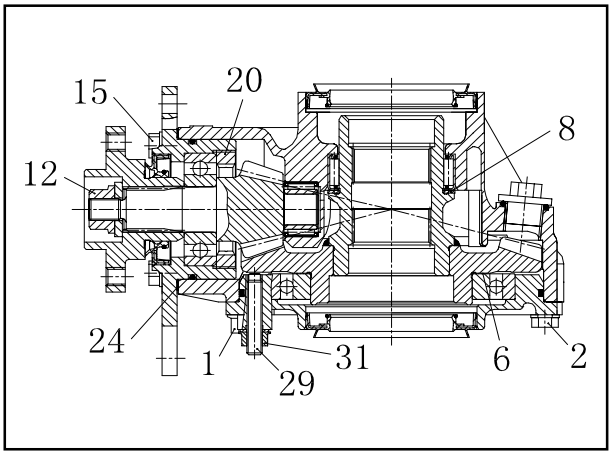

## Rear Gearcase Inspection after Disassembly

- Check if there is damage or cracks on the rear gear case and the condition of bearing seats.Replace if necessary.
- Check rear gearcase bearing free play,rotation,bearing cage,steel balls,needles conditions. Replace if necessary(Using special tools).
- Check teeth of gearcase drive pinion gear and ring gear. Replace if necessary.
- Check if oil seal lips and O-ring shape are normal. Replace if necessary.
- Check cylndrical surface that contacts oil seal lips.Replace if necessary.
- Check gearcase inside and outside splines for wears. Replace if necessary.
- Check other parts. Replace if necessary.

## Rear Gearcase Assembly and Adjustment

● Illustration

| Tightening Torque | |
|---|---|
| Item "1" | 40N•m |
| Item "2" | 25N•m |
| Item "12" | 70N•m |
| Item "15" | 25N•m |
| Item "20" | 70N•m |
| Item "31" | 16N•m |
| Bolt | 25N•m |
| Bolt | 25N•m |




Use threadlocker for Item "29" assembly.

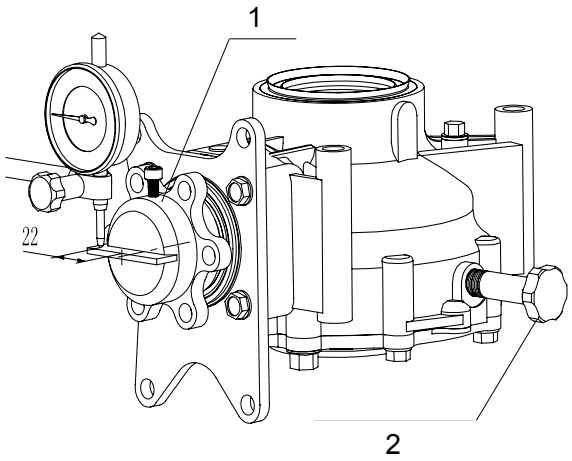
● Assembly and gear lash adjustment between drive pinion gear and ring gear of rear gearcase.

**a** Adjust installation gear lash by choosing "24"washer.

**b** Adjust gear lash by choosing "6" washer.

**C** Check tooth contact between drive pinion gear and ring gear by coloring.

**d** Measure installation gear lash between drive pinion gear and ring gear as illustrated: Install gear lash measurement tool no.1,locking bolt(M14X1.25X60) no. 2.Using a dial gauge,make sure the measuring point is 22mm.Turn gear lash measurement tool from engagement to engagement.

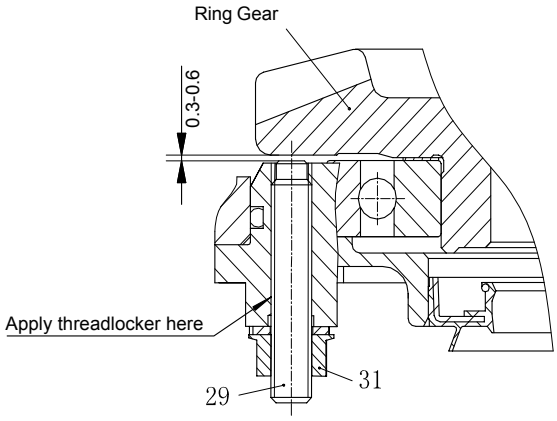



Standard: 0.1~0.2

**e** Keep the axial gear lash within 0.1~0.2 by choosing washer "8" .

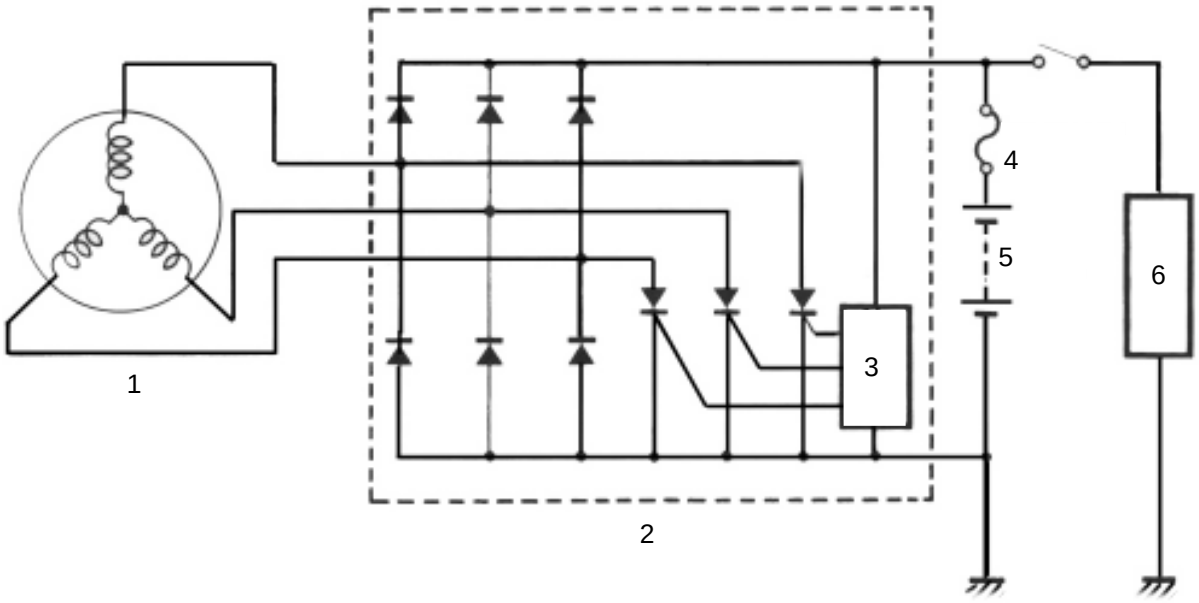
| | |
|---|---|
| Washer "6" | 0.2 0.3 0.4 |
| Washer "8" | 1.0 1.2 1.4 1.6 1.8 |
| Washer "24" | 0.4 0.5 0.6 |

**f** Adjust item “29” as illustrated, and make sure the distance between its end and back of the ring gear is 0.3~0.6. Tighten item “31”.



## △ CHARGING SYSTEM

### Charging Circuit

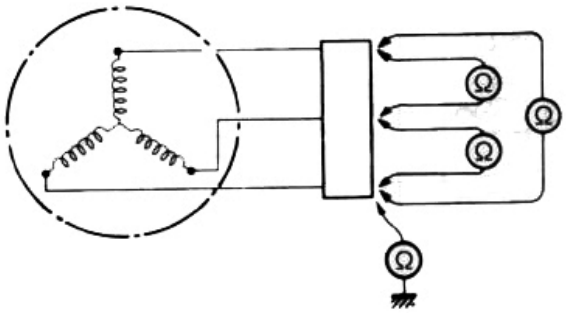



1.Magneto 2.Voltage Regulator/Rectifier 3.Voltage Stablizing 4.Fuse 5.Battery 6.Load

### Magneto Coil Resistance

- Measure 3-phase magneto stator coil resistance;
- If the resistance is out of specification,replace with a new stator;
- Check for the insulation between stator coil and core.

Turn multimeter to **1X10** Ω

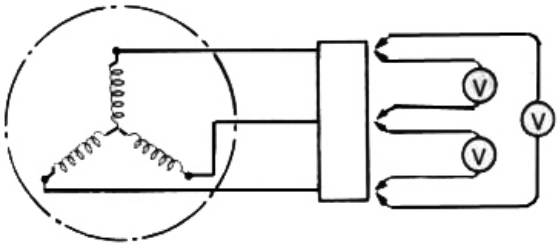



MAG Coil Resistance: **0.5-1.5** Ω
(**Yellow-Yellow**)
Resistance between Stator Coil and Core: ∞ Ω
(**Yellow-Ground**)

### MAG Non-loaded Performance

- Start the engine and allow it run at 5000r/min;
- Use multimeter to measure the voltage between 3 output lines.
- Ifthe reading is below specification,replace with a new magneto.

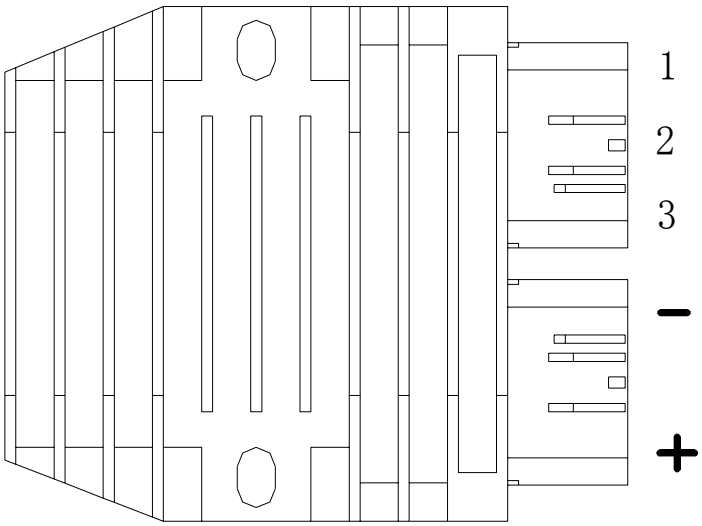
Turn Multimeter to V(AC)




Voltage between Output Lines When MAG Non-loaded:

**>200V(AC) at 5000r/min**

## VOLTAGE REGULATOR/RECTIFIER




- Connect multimeter between terminals;
- Read resistance;
- If any reading is out of specification, replace with a new regulator.

Turn multimeter to DIODE.

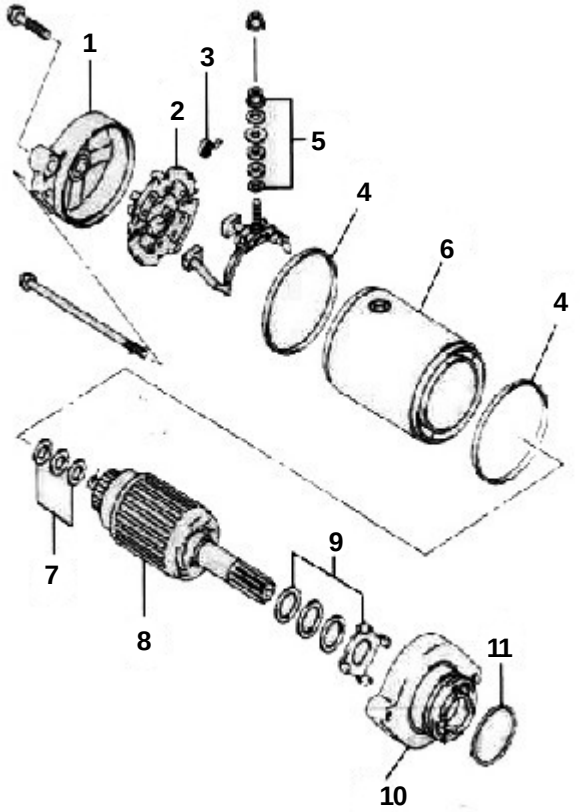
**NOTE:**
*If multimeter reads below 1.4v when probes unconnected,replace its battery.*

- After engine running and at the state of battery full charged,if the voltage between positive and negative terminal exceeds 15v or is lower 12v, replace with a new MAG.

| | | (+) | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | (-) | (+) |
| (-) | 1 | | ∞ | ∞ | 400-500 | ∞ |
| | 2 | ∞ | | ∞ | 400-500 | ∞ |
| | 3 | ∞ | ∞ | | 400-500 | ∞ |
| | (-) | ∞ | ∞ | ∞ | | ∞ |
| | (+) | 400-500 | 400-500 | 400-501 | 750-850 | |

## △ STARTING SYSTEM

### Starting Circuit Diagram

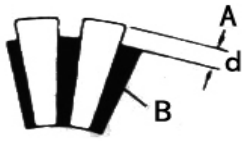



1.Outer Cover
2.Brush Holder
3.Brush Spring
4.O-ring
5.Brush Terminal
6.Main Housing(yoke)
7.Washer
8.Armature
9.Washer
10.Cover Inner
11.O-ring

## BRUSH

- Check brush for damages,cracks.
- If any damages,replace with a new brush.

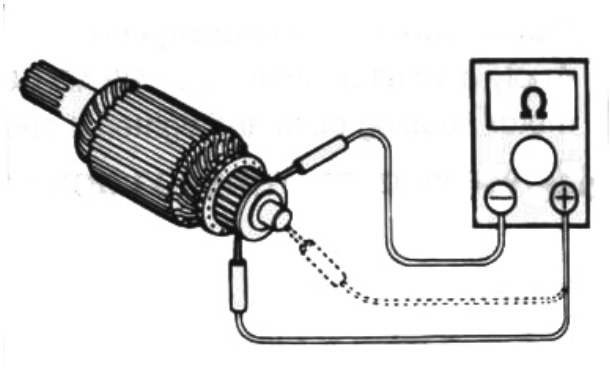
## COMMUTATOR




- Check for color change,damages,wear;
- If any damages,replace with a new commutator;
- If the color changes,poslish the commutator sur face with sand paper and wipe it up with a clean, dry cloth.
- If over wear,cut a part of insulator B and main tain the distance betwen A nd B as d.

$d \leqslant 1.5mm$

## ARMATURE

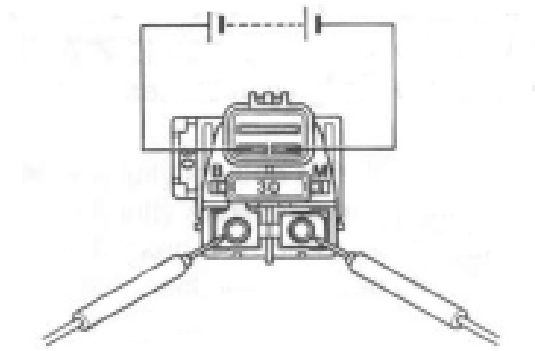



Use a multimeter to check the armature coil continuity and the one between coil and the shaft.If armature coil has no continuity or there is continuity between the coil and the shaft,replace the armature with a new one.

## OIL SEAL

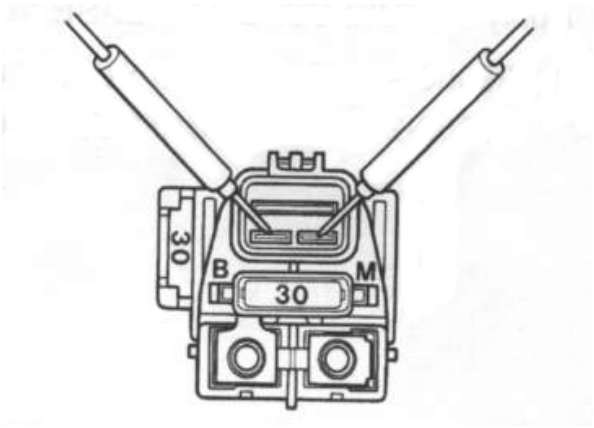
Check for damages or leaks.
If damages or leaks,replace with a new starter motor.

## STARTER RELAY



●Put 12V between positive and negative terminal.
Use multimeter to check if there is continuity between 2 contacts.
●If multimeter clicks,there is continuity between contacts.
●If 12V is removed,no continuity remains between contacts.
●If both above 2 items are ok,it indicates the replay is ok.
Turn mulitimeter to DIODE.

**CAUTION:**
**The voltage loaded between terminals can not exceed 2 mins,otherwise,starter relay may over-heat or burn.**

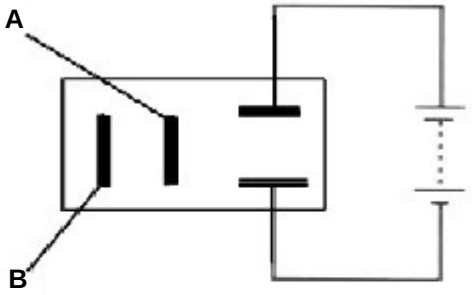



●Use multimeter to measure starter relay coil resistance,if the reading is out of specification, replace a new relay.

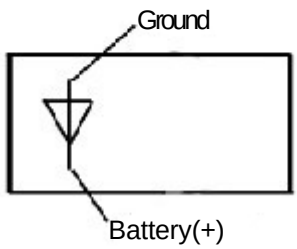
●Turn multimeter to 1X10Ω.

Starter Relay Coil Resistance:3-5Ω

## AUXILIARY STARTER RELAY,FUEL PUMP RELAY




●Put 12V between auxiliary starter relay positive and negative terminal;use multimeter to cheack the continuity between A and B.
Turn multimeter to DIODE.
● If multimeter clicks,it indicates there is continuity between A and B.
●If 12V is removed,no continuity remains between contacts.
●If both above 2 items are ok,it indicates the replay is ok.
● Turn multimeter to 1X100 Ω;measure auxiliary starter relay resistance.
Auxiliary starter relay resistance：90-100 Ω




**NOTE:***At the back of auxiliary starter relay,parallel to diode,it's the relay coil positive terminal.*

## ENGINE STARTING NOTICE

- Poperly route according to starting schematic diagram.
- Before starting,check if all parts are fitted correct; Regarding EFI components connection,refer to EFI section.
- Check air intake system.
- Check fuel supply system;ensure there is no bolck or leaks.
- Test fuel presure with fuel pressure gauge.

**Pressure in fuel pump outlet:0.33 ± 0.01Bar.**

- Place the transmission in Neutral.
- Check EFI with PDA for faut;if there is,eliminate the trouble according to DTC(Diagnostic Trouble Code).

- Close the throttle and turn the engine stop switch to “RUN”,then push starter switch to run the engine.
- After starting,warm up until idle speed is stable and check it.

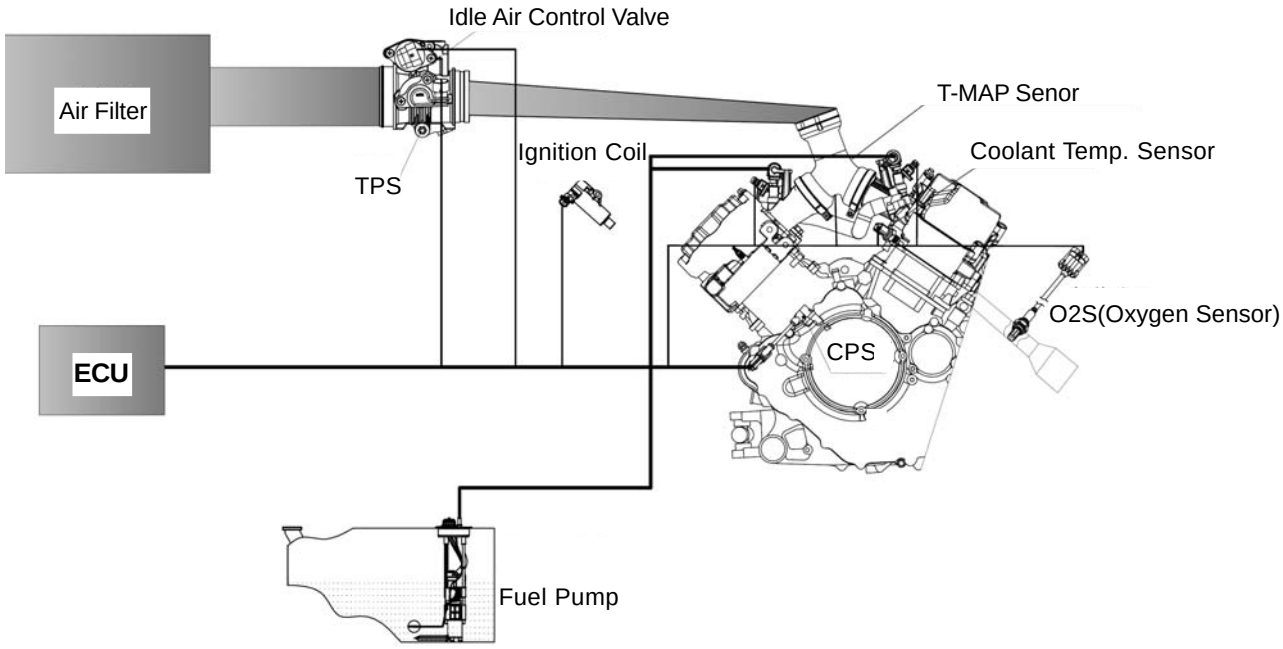
**NOTE:**

*If idle speed is unstable or too high,shut off the engine,and then start it.*

**Idle Speed:1250 ± 100rpm.**

Fuel Pressure Gauge

## △ EFI Structure




**EFI system is composed of three subsystems:**

(1) **Sensors:**

A sensor is a device that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument.Sensors in EFI system include:

- Throttle Position Sensor(**TPS**)
- Crankshaft Position Sensor(**CPS**)
- Coolant Temp. Sensor
- Speed Sensor
- Gear Positon Sensor and Reverse Gear Sensor
- Oxygen Sensor
- 4WD/LOCK
- Over-ride Switch

**(2)ECU:**

Electronic Control Unit,the brain of EFI system,which determines the amount of fuel injection, ignition timing and other parameters a engine needs to keep running by calculating and analysing values provided by sensors.

**(3)Actuator:**

Execute the EFI instruction.Main actuators include:

- Fuel Pump
- Fuel Injector
- Ingnition Coil
- Idle Air Control Valve

## EFI System Maintenance Notice

- Always use genuine CFMOTO parts for maintenace, otherwise it can not assure a normal performance to EFI system.
- During the maintenance procedure,never try to break down the EFI components.
- In the course of maintenance,EFI parts must be handled carefully.
- Ignition switch must be shut off before connecting or disconnecting connectors,otherwise,it may cause the EFI parts damage.
- When removing fuel pump from fuel tank,do not energize the fuel pump,otherwise,a spark can cause a fire.
- Fuel pump is not allowed to operate in a dry enviroment or under water,otherwise,it's life would be shortened.Besides, reverse connections between positive and negative terminal of fuel pump is not permitted.
- The fuel pressure in EFI fuel supply system is very high(about 330kPa),accordingly,all fuel lines are high pressure resisting.Even if the engine is not running,the fuel pressure is high.Therefore,do not disassemble the fuel line unless it's necessary. When the fuel line needs to be repaired,release the fuel pressure as follow shows:
  Remove fuel pump relay,start the engine and allow it to idle until the engine stalls automatically.
  Fuel line removal and fuel filter replace ment should be practiced by a proffessional person in a well-ventilated place.
- If possible,don't do the spark test.If spark test is done unavoidably,try to complete the test as soon as possible.Besides,don't open the throttle,otherwise,a large quantity of unburnt fuel would enter muffler,causing the catalytic converter damage.
- Idle speed is controlled by ECU,so it's unadjustable. The throttle limiter screw has been adjusted by manufacturer before sale,therefore,it's not recommended to adjust it by the user.
- Don't reverse the battery cable connections.This may damage electrical components.
- Never remove the battery cables When the engine is running.
- Always remove cables and electrical control units which are connected with battery terminals.
- Never test the component input and output electric signal by piercing the cable plastic jacket.
- Respect the environment and dispose of the waste left during maintenance.

**Tool Name:PDA**

**Function**:
Read/clear EFI system trouble codes,observe datastream.

**Tool Name:Digital Multimeter**

**Function**:
measure voltage, current and resistance and other parameters in EFI system.

**Tool Name:Vaccum Gauge**

**Function**:
Check the manifold for air pressure.

**Tool name:Timing Light**

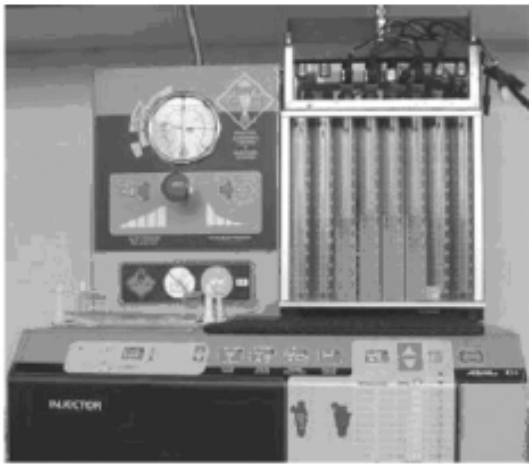
**Function**:
This light is used to check engine ignition timing.

**Tool name:Compression Tester**

**Function**:
This tester is used to check cylinder compression,so as to determine if the rings or valves are bad and leaking pressure.

**Tool Name:Fuel Pressure Gauge**

**Function**:
This gauge is used to test the fuel pressure,so as to check fuel pump and fuel pressure regulator working conditions.

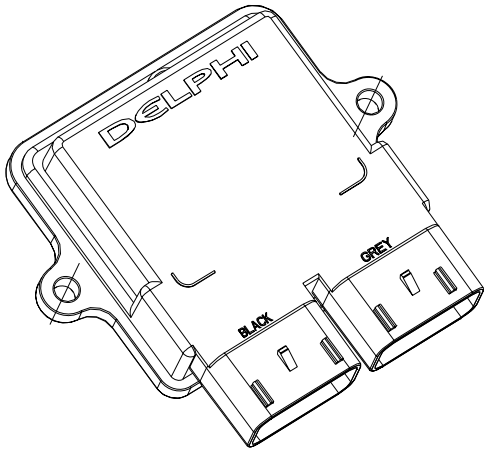


**Tool Name:Fuel Injector Analyser**

**Function**:
This analyser is used to clean and analyse fuel injectors.

## EFI COMPONENTS AND FUNCTION

**(1)ECU:**

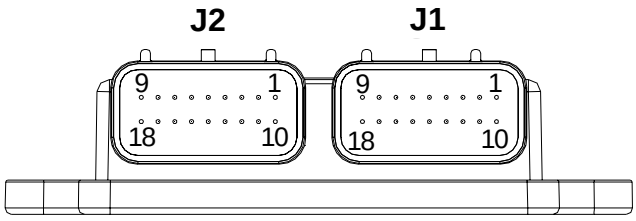



**ECU**

**ECU pins and function:**

| PINOUT CHART | | | |
|---|---|---|---|
| J1 CONNECTOR | | | |
| PIN# | Description | PIN# | Description |
| J1-1 | IACVHI/IAV | J1-10 | COILB/ESTB |
| J1-2 | MAGNETO CUT RELAY/CLTL/ESTC | J1-11 | IACALO |
| J1-3 | MIL | J1-12 | IACBHI |
| J1-4 | DEAD BATT BYPASS/O2BHTR/INJC | J1-13 | IACBLO |
| J1-5 | SPARE ANALOG | J1-14 | ROLLOVER |
| J1-6 | TACHOMETER | J1-15 | VSS/02B SENSOR |
| J1-7 | CANLO | J1-16 | DIAG |
| J1-8 | CANHI | J1-17 | FUEL PUMP RE-CIR |
| J1-9 | GND(POWER) | J1-18 | PNSW |
| J2 CONNECTOR | | | |
| Pin# | | Pin# | Description |
| J2-1 | COILA/ESTA | J2-10 | 5VRTN |
| J2-2 | GND(POWER) | J2-11 | MAP |
| J2-3 | KW2000 | J2-12 | TPS |
| J2-4 | CRANK VR HI(23XHIFI) | J2-13 | CRANK VR LO(23XLOFI) |
| J2-5 | INJA | J2-14 | CLT |
| J2-6 | INJA | J2-15 | IGN |
| J2-7 | O2A HTR | J2-16 | 5VREF |
| J2-8 | IAT-MAT | J2-17 | O2A SENSOR |
| J2-9 | FUEL PUMP RELAY | J2-18 | VBATT |

**ECU Pin Locations:**



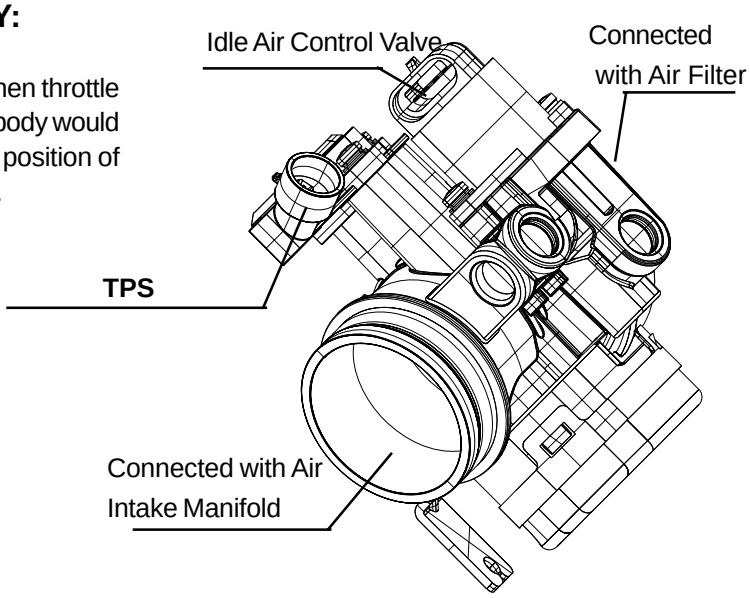

## Limit Data:

| Item | | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min | Standard | Max | |
| Battery Voltage | Operation Normal | 9.0 | 14.0±1 | 16.0 | V |
| | Function Limited | 6.0-9.0 | | 16.0-18.0 | V |
| Withstanded Overvoltage and Time | 26.0V | Limited Function Such As Diagnosis | | 5.0 | Min |
| Working Temp | | -40 | | +70 | ℃ |
| Storage Temp | | -40 | | +70 | ℃ |

- It's not allowed to apply a heavy load on ECU housing,or it may deform and damage ECU.
- Always handle ECU gentlely.Never drop it,especially on a hard surface.

## (2)THROTTLE BODY ASSEMBLY:

Connected between air filter and engine.When throttle lever is applied,the valve butterfly in throttle body would spin at a certain angle.Tps can monitor the position of valve butterfly and send the signal to ECU.



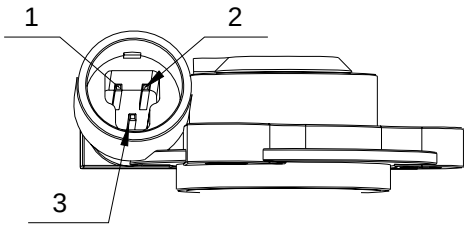

**Throttle Body Assembly**

### Pins and function:

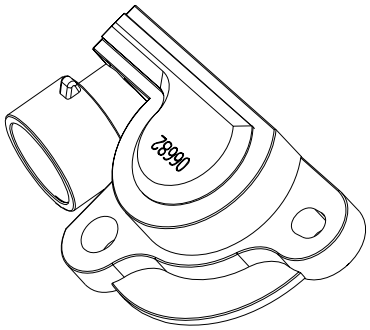
1.Connected to 5V power

2.Ground

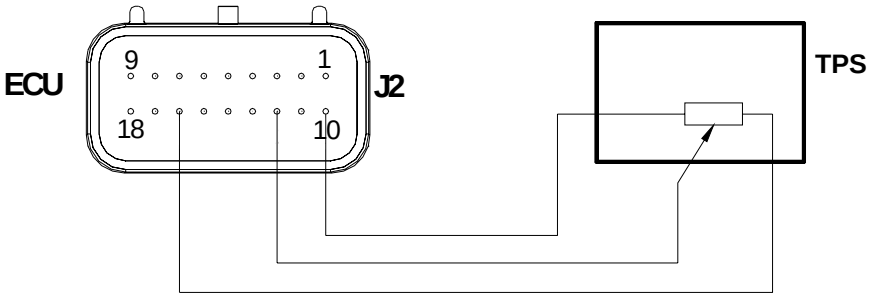
3.Outout voltage signal




**TPS**

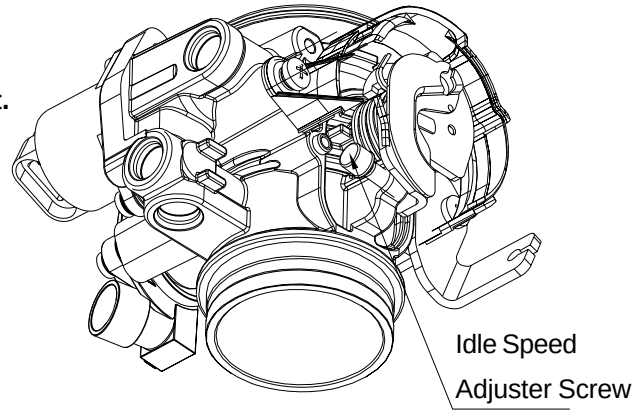



### TPS Circuit:



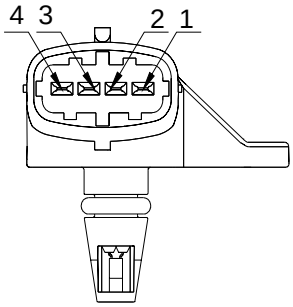

**Idle speed limiter screw is not allowed to adjust.**

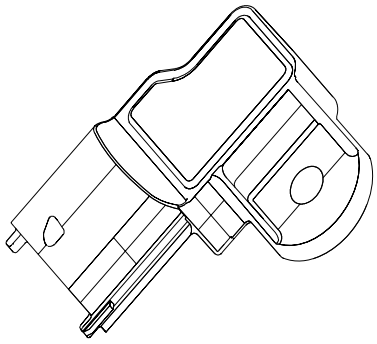
●Idle speed is regulated by ECU.



## (3)T-MAP SENSOR:

This sensor integrates Inlet Air Temperature Sensor and Manifold Absolute Sensor.It's used to detect both inlet air temperature and maifold absolute pressure, providing ECU the signal of engien load.



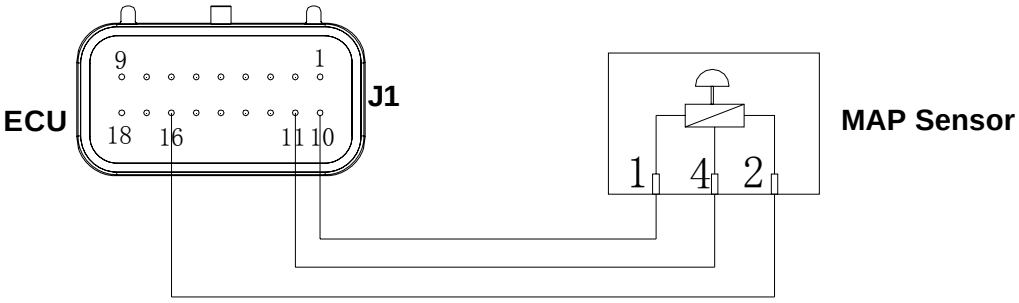



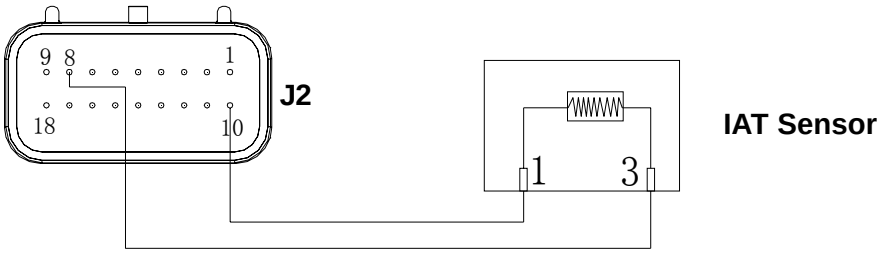
T-MAP Sensor

### Pins and Function:

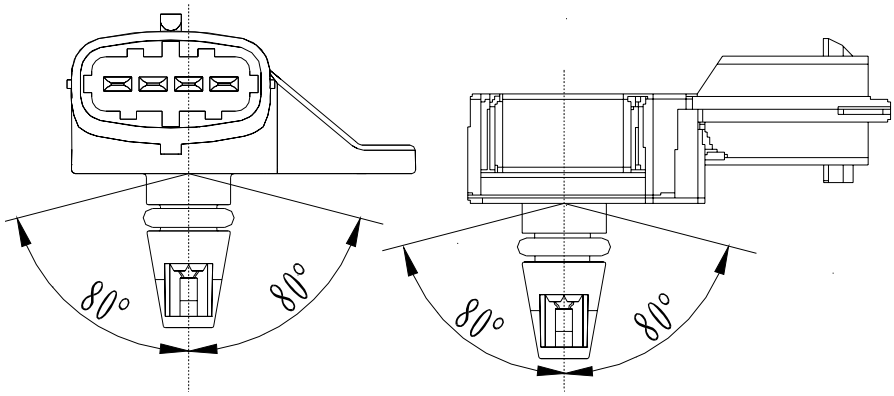
1.Ground
2.Connected with 5V power
3.Voltage signal output

### T-MAP Sensor Circuit:

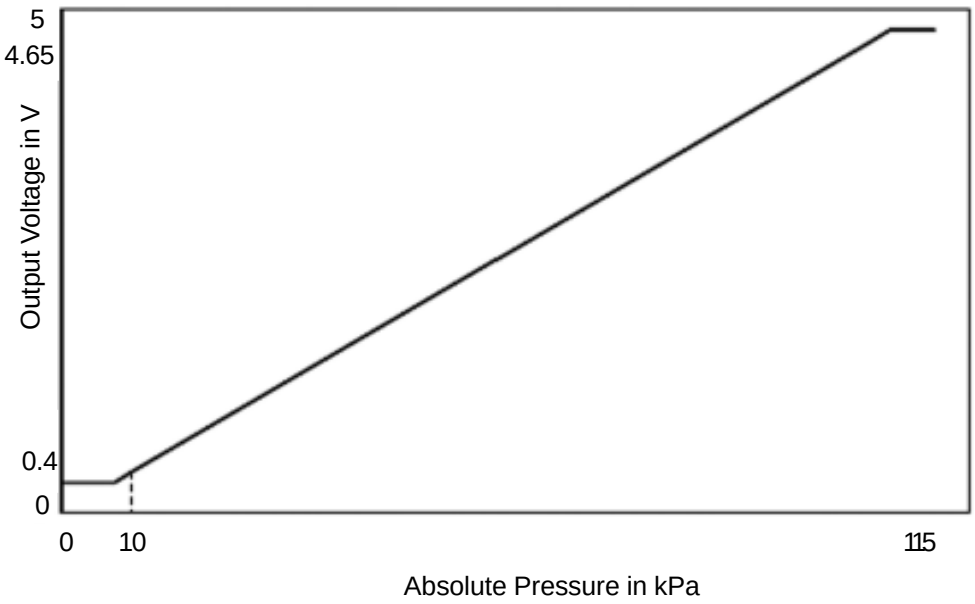


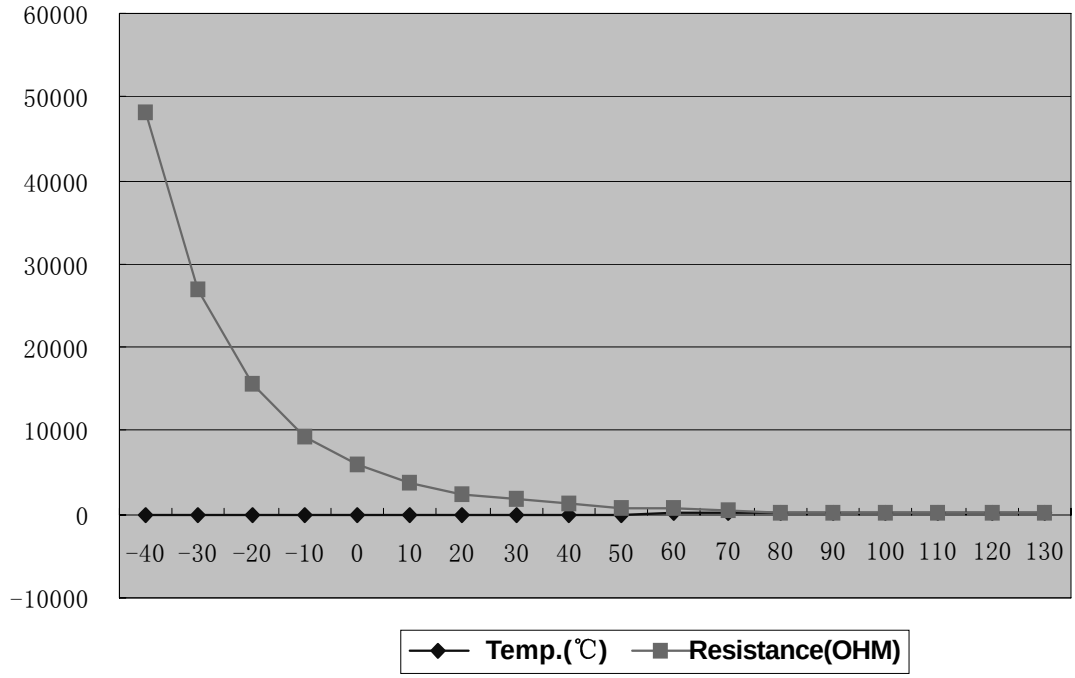

The right figure illustrates the allowed installation angle to avoid condensated water built up in T-MAP sensor, causing pressure sensitive elements damage.



The following figure refers to output volatge-pressure relation.




The following chart explains resistance-temperature relation.

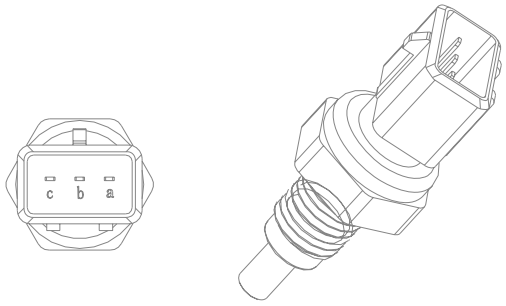


## (4)COOLANT TEMPERATURE SENSOR (CTS):

This sensor is a negative temperature coefficient(NTC) thermistance,whose resistance increases with the temperature of coolant decreases.It outputs 2 set of coefficients,one is for ECU to monitor the temperature of coolant,the other is for meter dispaly.

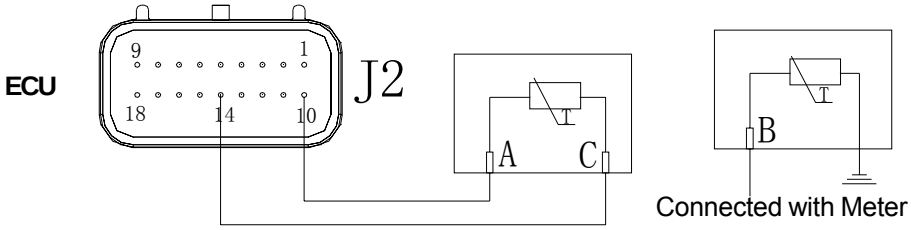
**A** and **C** consists of one group,which provids signal for ECU.

**B** and **threaded portion** consists of one group,which provides sigal for coolant temperature gauge.




Coolant Temperature Sensor

### Coolant Temperature Sensor Circuit:




The right chart explains pin B and threaded portion-coolant temperature relation.

| Meter Channel Resistance(b-Threaded Portion) | |
|---|---|
| Temp.(℃) | Resistance(Ω) |
| 45 | 265.0-323.0 |
| 80 | 74.6-90.6 |
| 115 | 25.7-31.7 |

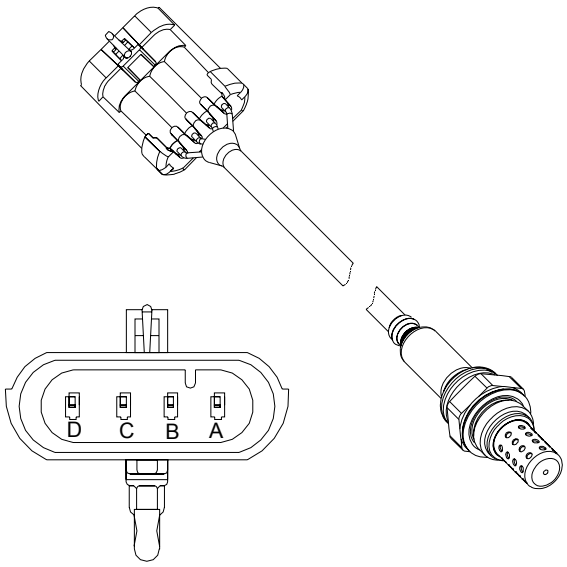
The right chart explains pin A,C-coolant temperature relation. The siganl is for ECU.

| ECU Channel Resistance(a-c) | |
|---|---|
| Temp.(℃) | Resistance(Ω) |
| -25 | 38,583 |
| 0 | 9,399 |
| 25 | 2,795 |
| 80 | 334 |
| 115 | 115.7 |

## (5)OXYGEN SENSOR:

This sensor is used in closed-loop feedback-controlled fuel injection to improve the air-to-fuel ratio accuracy and control the emission.

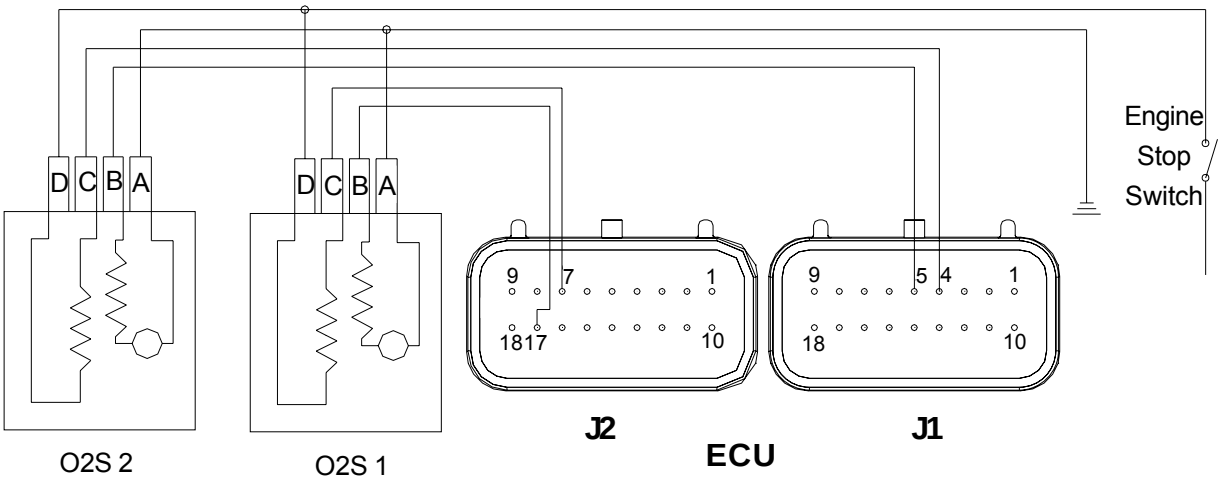
It's located in the exhaust stream to measure the amount of oxygen in exhaust and send the signal to ECU,which can revise the fuel injector output ,so as to reduce the amounts of both unburnt fuel and oxides of nitrogen entering the atmosphere.




### Pins and Function:

1.Connected with positive terminal,heating power(white)
2.Connected with negative terminal,heating power(white)
3.Connected with negative terminal,signal output(grey)
4.Connected with positive terminal,signal output(black)

### Oxygen Sensor Circuit:

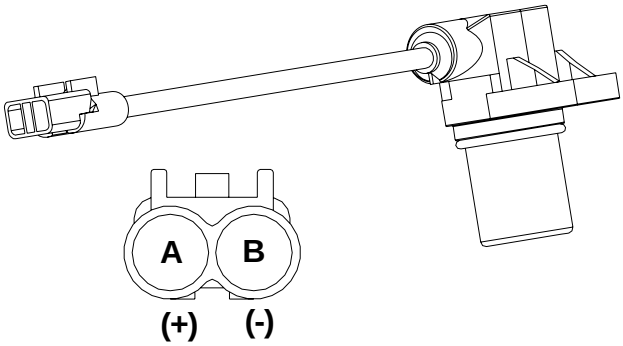



### The following table explains the oxygen sensor working parameters.

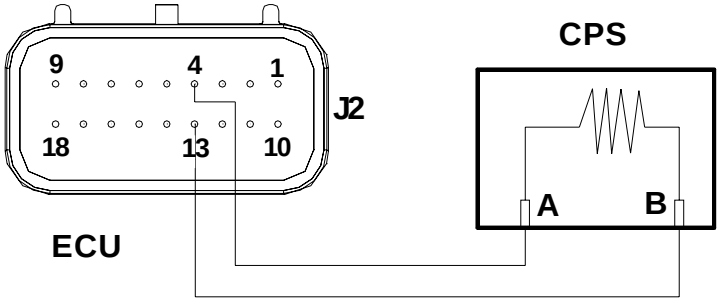
| Parameter | New oxygen sensor | | After 500 hours bench test | |
|---|---|---|---|---|
| Exhaust temp. at a certain duty ratio | 350℃ | 850℃ | 350℃ | 850℃ |
| Sensor voltage (mv) when λ=0.97(Co=1%) | 840±70 | 710±70 | 840±70 | 710±70 |
| Sensor voltage (mv) when λ=1.10 | 20±50 | 55±30 | 20±50 | 40±40 |
| Sensor inner resistance | ≦1.0 | ≦0.1 | ≦1.5 | ≦0.3 |
| Response time(ms)(600mv-300mv) | ≦150 | ≦150 | ≦300 | ≦200 |
| Response time(ms)(300mv-600mv | ≦150 | ≦150 | ≦300 | ≦200 |

## (6)CRANKSHAFT POSITION SENSOR (CPS):

Detects the rate at which the crankshaft is spinning and provides the signal for ECU to determine ignition and fuel injection.




## CPS Circuit:

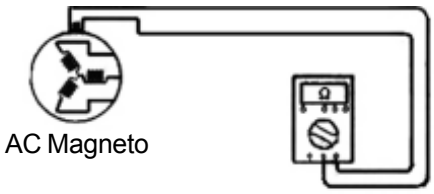



### CPS Resistance:

● Set multimeter to **1X2K** Ω range;

**CPS resistance:950 ± 50 Ω (20℃)**

● If the CPS resistance reading is out of specifi cation above,replace.




### Test CPS Peak Voltage

● Connect multimeter and peak voltage adapter as right wiring diagram illustrates;

**+Probe: Green Lead**

**- Probe: Blue Lead**

**NOTE:**

*When using peak voltage adapter,refer to some instructions.*

● Set multimeter to **V** range;

● Place the transmission in **N** and turn the ignition switch to "**ON**";

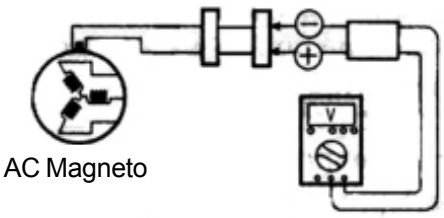
● Push starter switch and allow the engine to run for seconds,then test CPS peak voltage;

● Repeat above procedure and get the highest CPS peak voltage;

**CPS peak voltage : ⩾ 2V (300rpm)**

● If the CPS peak voltage reading is out of above specification,replace.

CPS Peak Voltage Tester

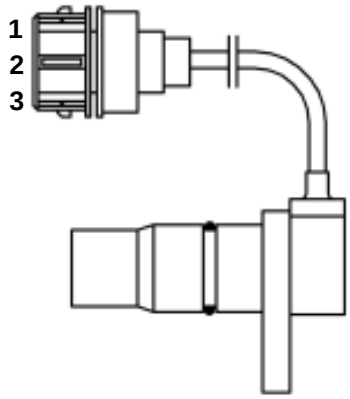


## (7)SPEED SENSOR:

This sensor is used to detect the rotating speed of the engine output shaft and provide the signal for ECU to determine the vehicle speed. It belongs to Hall effect sensor,that varies its output voltage in response to a magnetic field.

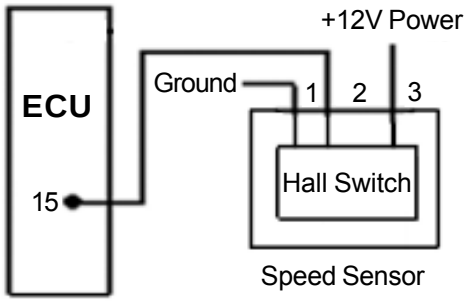
**Pins and Function:**

1.Ground
2.Output voltage signal (>80% input power voltage)
3.Power+DC12V




Speed Sensor Exterior

**The right figure refers to speed sensor wiring:**




## Speed Sensor Test:

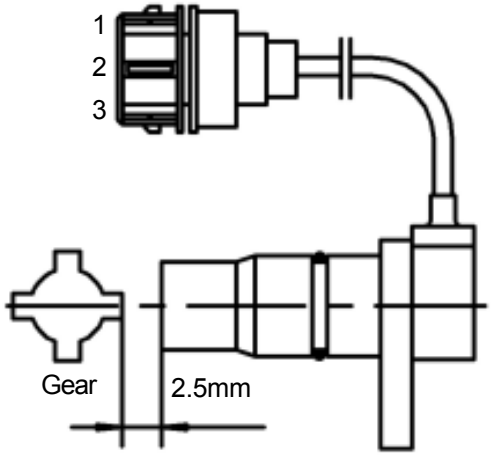
● Ground pin 1and connect pin 3 with +12V power;

● Fix a gear 2.5mm away from a speed sensor as the right figure illustrates;

● Turn multimeter to DCV range;

● Slowly turn the gear and measure the voltage between pin 2 and pin 3 to determine that if the reading varies from 0V-12V;

● If the reading doesn't vary,that indicates the sensor is defective and needs to be replaced.



## (8)GEAR POSITION SENSOR:

This sensor is used to provide the gear position signal for meter display.

**Pins and Function:**

Yellow/Blue-L(Low Gear)

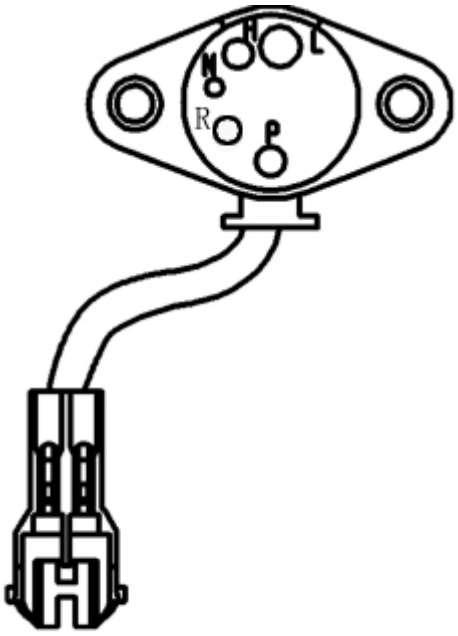
Orange/Blue-H(High Gear)

Yellow/Black-P(Park Gear)

White/Yellow-N(Neutral)

Sky Blue/White-R (Reverse Gear)

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



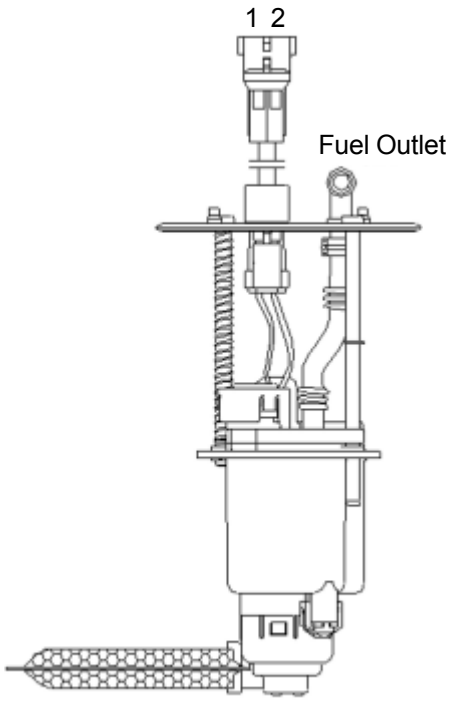

Gear Position Sensor

### (10)CAUTION when driving in reverse

●When driving in reverse,gear position sensor sends the reverse signal to ECU and meter.ECU would limit the vehicle speed in response to the reverse signal.

## (10)FUEL PUMP ASSEMBLY:

This fuel pump assembly includes fuel pump,plastic support,preliminary filter,fine filter and pressure regulator.It suppies fuel for engine under a certain pressure and flow.



Fuel Pump Assembly

### Pins and Function:

1.Blue(Ground)

2.Red(Connected with fuel pump relay output terminal)

### Parameters:

Pressure regulator opening pressure:**0.33±0.01MPa**

Flow:>**35L/h**

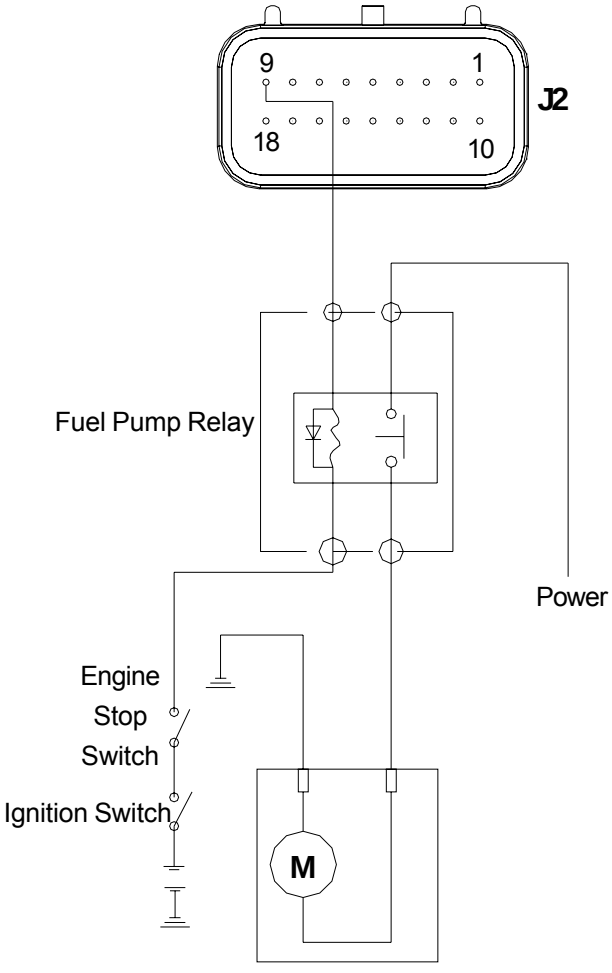
●This fuel pump is located in fuel tank;

●Don't operate the fuel pump in dry condition in order to prevent damage.

●Always handle the fuel pump gently.Never drop the fuel pump,especially on a hard surface.Such a shock to pump can damage it.

### Fuel Pump Wiring:

●Battery supplies power for fuel pump assembly via fuel pump relay,which connects the fuel pump circuit only with the engine started.




### Fuel Pressure Test:

● Connect the fuel pressure gauge with fuel outlet and tighten the joint with a clamp to prevent fuel leaks;

●Route according to the right circuit;

●Turn both ignition switch engine stop switch on;

● At this moment,fuel pump will operate for 5 seconds.After the fuel pump stops running,fuel pressure should be in specification,otherwise replace it;

● After the engine stops running,0.25MPa fuel pressue should be kept for more than 5minutes,otherwise replace the fuel pump;

### Pressure Relief in Fuel System:

In an EFI model,the pressure in fuel system is very high,so all the line is high pressure resistant.Even though the engine is not started,the pressure in fuel system remains high.Therefore,it's not recommended to remove fuel lines before pressure relief.

Follow the procedure below to perform pressure relief:

Remove fuel pump relay.Start the engine and allow it to idle until the engine stops automatically.

## (11)FUEL INJECTOR:

One end of fuel injector mounts into fuel injector seat, and the other end attaches to the injector cap,which connects with a fuel line.Fuel injector is controlled by ECU to inject fuel at stated time into the engine.

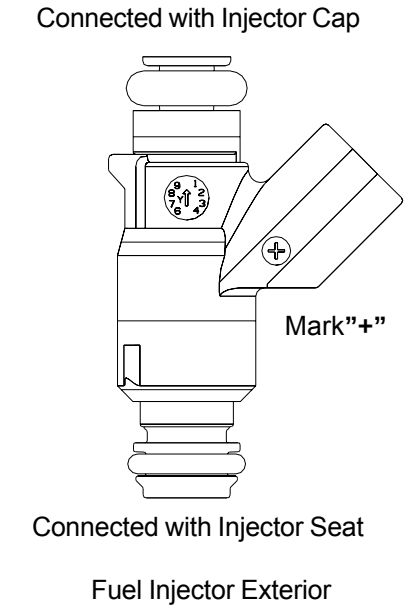
This injector nozzle is a 4-hole style.Don't turn injector after the joint between injector and injector cap is installed.

### Pins and Function:

● Connector with the mark"+":connected with fuel pump relay output terminal.

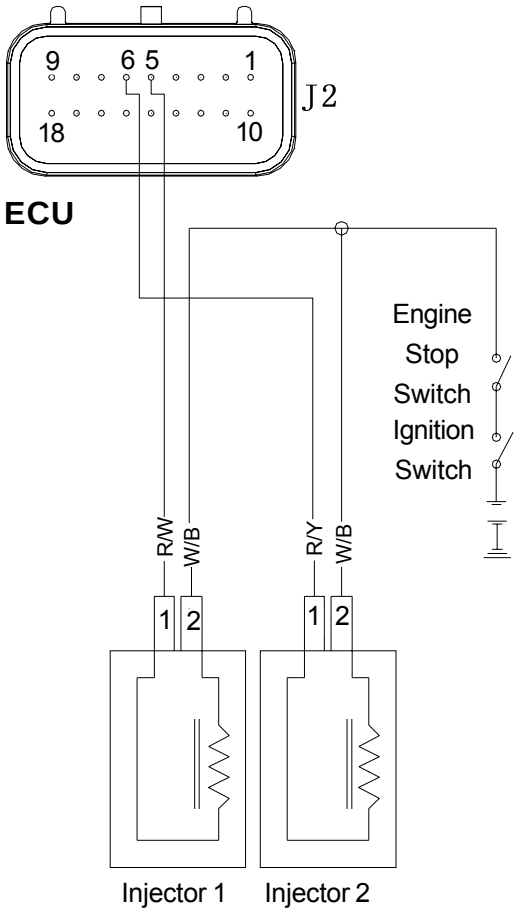
Connector without mark:connected with ECU pin 14.

**Fuel Injector Resistance:12 ± 1 Ω (20℃)**




Fuel Injector Exterior

### Fuel Injector Circuit:




### Fuel Injector Installation:

● Install fuel injector manually.Never knock fuel injector with a hammer.

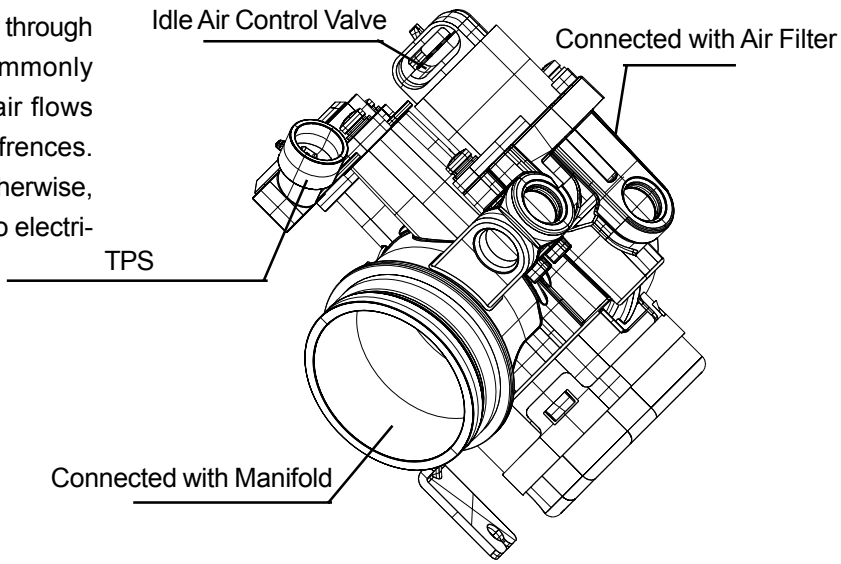
● When removing and installing fuel injector,the o-rings on both ends must be replaced;

●Perform pressure relief before fuel injector removal if necessary;

● Test the fuel injector sealing after installation to ensure no leaks.

## (12)IDLE AIR CONTROL VALVE:

IACV is used to control the air flow of by-pass.ECU calculates the engine load and controLs IACV through electrical pulse durationand frequency(commonly known as duty ratio).IACV allows diffrent air flows passed through under different pressure diffrences. Therefore,it should be connected properly,otherwise, idle speed may be incorrect.When there is no electrical pulse,IACV would be closed.




### Pins and Function:

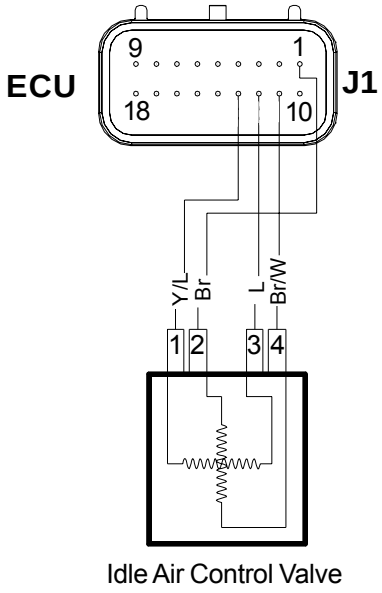
1.Pin A:IACBLO-ECU J1-13;

2.Pin B:IACBHI-ECU J1-12;

3.Pin C:IACALO-ECU J1-11;

4.Pin D:IACAHI/IAV-ECU J1-1;

### Idle Air Control Valve Circuit:



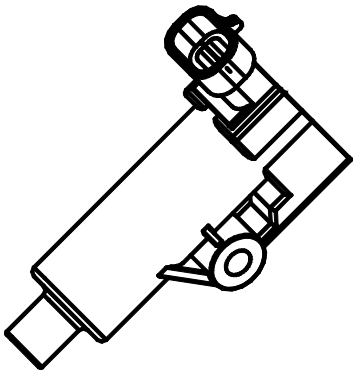

Idle Air Control Valve

### Idle Air Control Valve Parameters:

| Item | Value | | | Unit |
|---|---|---|---|---|
| | Min | Standard | Max | |
| Rated Voltage | | 13.5 | | V |
| Resistance(+20℃) | | 16 | | Ω |
| Rated Current | | 0.85 | | A |
| Control Pulse Frequency | | | 30 | Hz |
| Standard Control Pulse Width | | ≈8 | | ms |
| Air Flow(When Pressure Difference=700mbr, Duty Ratio=100%) | | 5.0 | | m3/h |

## (13)IGNITION COIL

Ignition coil transforms the low voltage of primary coil to high voltage of secondary coil needed to spark the spark plug and ignite the mixture of air and fuel in cylinder.

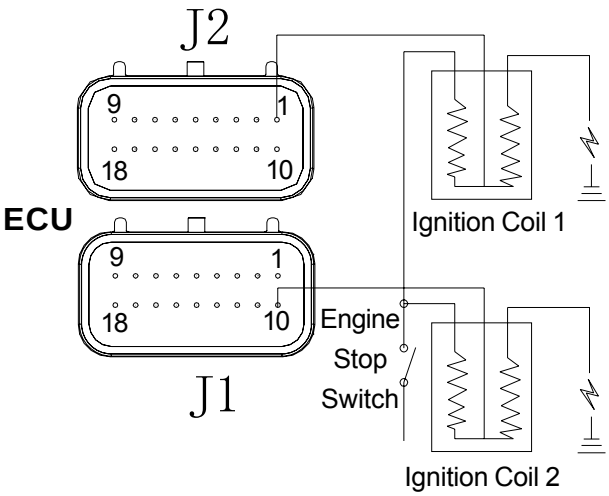


Connected with High Tnesion Lead

### Pins and Function:

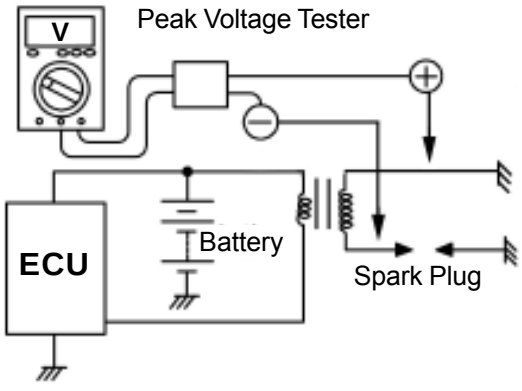
1.Ignition coil (-) of cylinder 1 connected with pin 1,ECU J2;
1.Ignition coil (+) of cylinder 1 connected with battery(+);
3.Ignition coil (-) of cylinder 2 connected with pin 10,ECU J1;
4.Ignition coil (+) of cylinder 2 connected with battery(+);

### Ignition Coil Circuit:




### Secondary Ignition Voltage Test:

- Connect the engine according to EFI wiring diagram;
- Connect the peak voltage tester according to the right diagram;
- Start the engine;
- Secondary ignition voltage should be **>15000V**.




### Ignition Coil Parameters:

| Item | | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min | Standard | Max | |
| Stated Voltage | | | 14 | | V |
| Operating Voltage | | 6 | | 16.5 | V |
| Resistance （20-25℃） | Primary Winding Resistance | 0.74 | 0.76 | 0.78 | Ω |
| | Secondary Winding Resistance | 10.1 | 10.6 | 11.1 | KΩ |
| Primary Current | | | 7 | | A |

## (14)EFI SELF-DIAGNOSIS:

ECU constantly monitors sensors,actuators,circuits,MIL and battery voltage,etc,even itself.It also tests sensors output signal,actuator drive signal and inner signal(such as closed-loop control,coolant temp. signal,idle speed control and battery voltage control,etc for reliability ).If any malfunction or suspectable signal found, ECU would record the fault information in RAM.

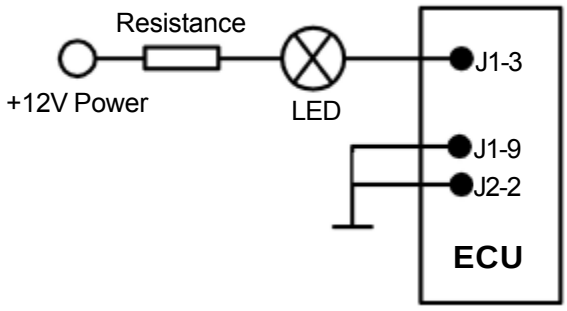
Fault information comes in form of fault codes,which are then displayed on PDA, in sequence of which fault comes first.

Fualt can be divided into “steady fault” and “occasional fault” (such as a fault caused by harness short or loose connection.)

PDA or MIL can be used to locate the part in trouble immediately after fault happens.

### (1)MIL(or FI Indicator):

MIL is a light-emitting diode and located on instrument panel. It indicates different fault codes through the flashes in differ ent frequency.




**MIL Circuit:**The current in pin 3,ECU J1 should be less than0.1A.

**MIL Flash Principles:**

**(1):Turn ignition switch on and depress kill switch.Don’t run the engine.If no malfunction happens.**

MIL turns on for 5 seconds,then turns off.

**(2):Turn ignition switch on and depress kill switch.Don’t run the engine.If malfunction happens.**

MIL turns on for 5 seconds and turns off.Then MIL flashes to indicate a fault code:

The interval between fault codes is 3.5s,between digits is 1.2s,and a flash lasts for 0.4s as well as the interval between 2 flashes.

MIL fashes 10 times to indicate 0.From 1-9,how much it counts,how many times MIL flashes.

Take fault codes P0117 and P0232 for example:

MIL lights up for 5 seconds→turns off and lasts for 3. 5s → flashes for 10 times(the frequency is 0.4s)→ turns off and lasts for 1.2s→flashes once→turns off and lasts for 1.2s→flashes once→turns off and lasts for 1.2s→flashes for 7 times →turns off and lasts for 3.5s → flashes for 10 times → turns off and lasts for 1.2s→flashes for 2 times→turns off and lasts for 1. 2s→flashes for 3 times →turns off and lasts for 1.2s →flashes for 2 times.

**(3):Turn ignition switch on and run the engine.Malfunction happens.**

MIL lights up until malfunction disappears.

**(2)PDA:**PDA has 3 pins-power,ground wire and data cable K.Thses pins are connected with related ECU pins.

The right photoe refers to operation panel of PDA.When it comes to detailed keys function,refer to PDA instruction book.


### Pins and Function:

1.Connected with pin 3,ECU J2;

2.Ground

3.Connected with +12V power

### Keys and Function:

**LH Key:**Page up

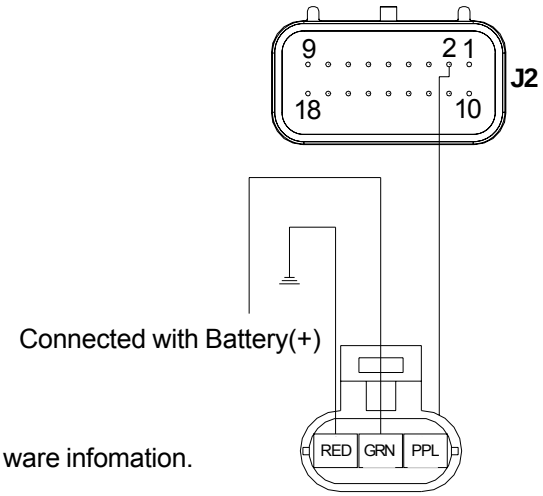
**UP Key:**Scroll Up

**RH Key:**Page Down

**Down Key:**Scroll Down

**OK Key:**Entrance

**EXIT Key:**Exit




### PDA Function:

#### (1)Version Infomation Display

PDA can display engine,ECU hardware and soft ware infomation.

#### (2)Fault Display

PDA monitors IAP sensor,IAT sensor,coolant temperature sensor,TPS,O2S,O2S heater circuit,air-to-fuel ratio revision,fuel injector,fuel pump relay,CPS,speed signal,idle speed,idle air control valve,system voltage, ECU,FI indicator and displays the fault code.

#### (3)Engine Data stream Display

PDA can display battery voltage,RPM,desired idle speed,vehicle speed,coolant temperature,coolant temperature sensor signal voltage,inlet air temperature,IAT sensor signal voltage,inlet air pressure,inlet air flow, IACV target position,TPS signal voltage,throttle body position,throttle body relative position,canister duty, charging time,FI pulse width,park

advance angle,O2S voltage,engine relative load,cansiter load,IACV position,atmospheric pressure,altitude multiplier,engine operation time.

#### (4)EFI Status Display

Starter switch,main relay,fuel pump relay,idle speed,idle speed,full load status,deceleration activation, acceleration activation,FI close loop activation,lambda control activation,canister control valve activation, MIL status.

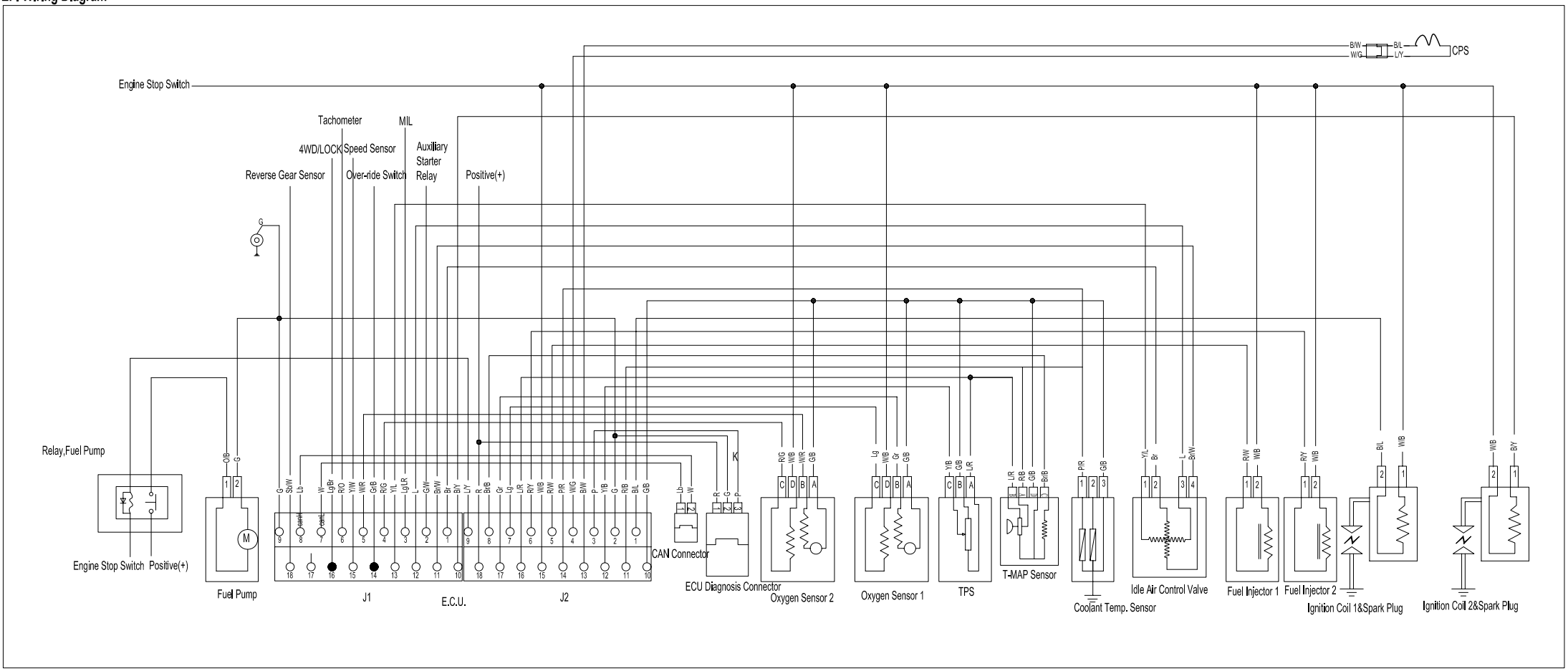
#### (5)Actuator Test Function

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

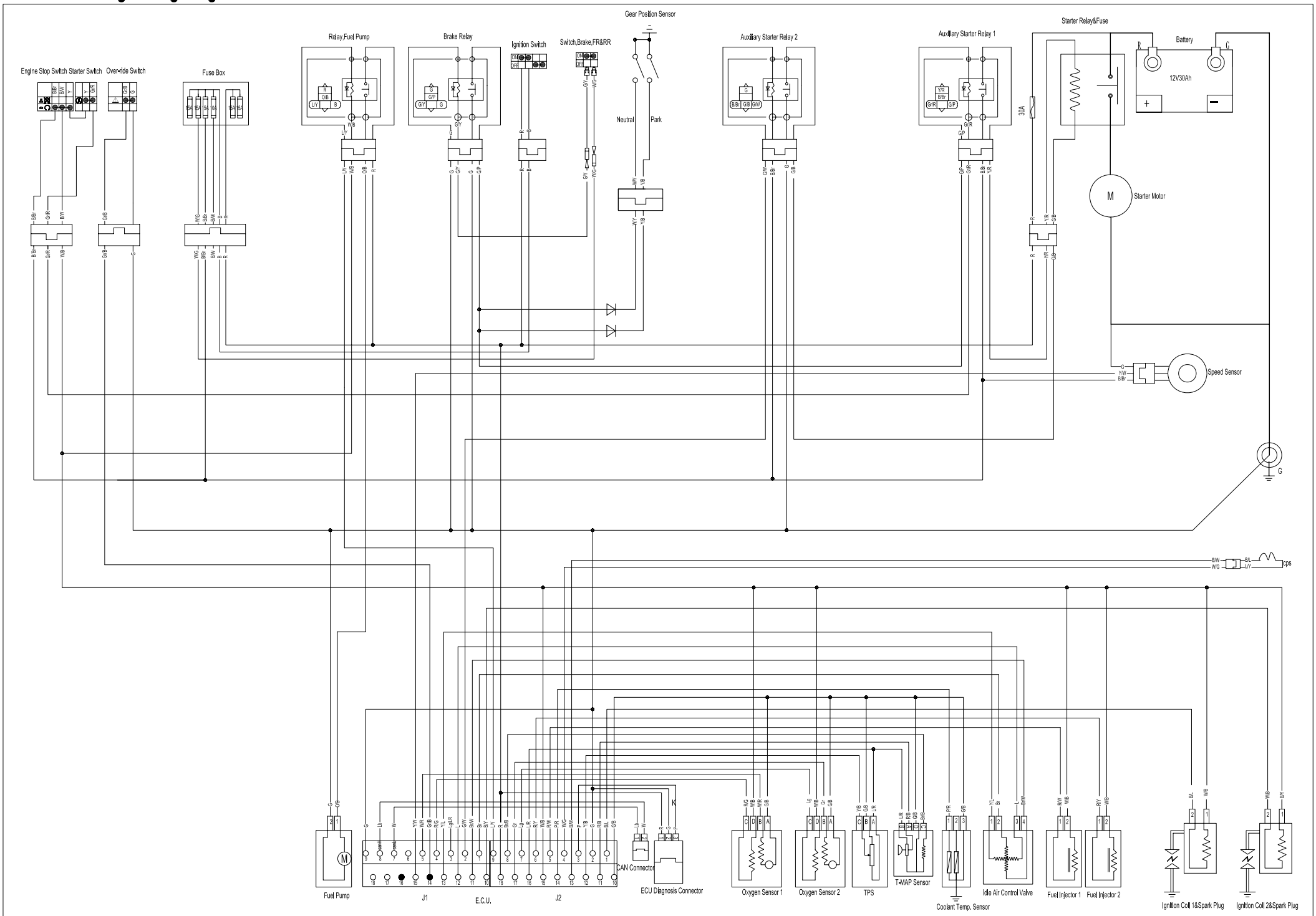
## FAULT CODE TABLE:

| | | |
|---|---|---|
| P0107 | MAP Circuit Low Voltage or Open | MAP-Manifold Absolute Pressure |
| P0108 | MAP Circuit High Voltage | |
| P0112 | IAT Circuit Low Voltage | IAT-Inlet Air Temperature |
| P0113 | IAT Circuit High Voltage or Open | |
| P0117 | Coolant/Oil Temperature Sensor Circuit Low Voltage | |
| P0118 | Coolant/Oil Temperature Sensor Circuit High Voltage or Open | |
| P0122 | TPS Circuit Low Voltage or Open | TPS-Throttle Body Position |
| P0123 | TPS Circuit High Voltage | |
| P0131 | O2S 1 Circuit Low Voltage | O2S-Oxygen Sensor |
| P0132 | O2S 1 Circuit High Voltage | |
| P0032 | O2S 1 Heater Circuit High Voltage | |
| P0031 | O2S 1 Heater Circuit Low Voltage | |
| P0201 | Injector 1 Circuit Malfunction | |
| P0202 | Injector 2 Circuit Malfunction | |
| P0230 | FPR Coil Circuit Low Voltage or Open | FPR-Fuel Pump Relay |
| P0231 | FPR Coil Circuit Low Voltage or Open | |
| P0232 | FPR Coil Circuit High Voltage | |
| P0336 | CKP Sensor Noisy Signal | CKP-Crankshaft Position |
| P0337 | CKP Sensor No Signal | |
| P0351 | Cylinder 1 Ignition Coil Malfunction | |
| P0352 | Cylinder 2 Ignition Coil Malfunction | |
| P0505 | Idle Speed Control Error | |
| P0562 | System Voltage Low | |
| P0563 | System Voltage High | |
| P0650 | MIL Circuit Malfunction | MIL-Malfunction Indicator Light |
| P1693 | Tachometer Circuit Low Voltage | |
| P1694 | Tachometer Circuit High Voltage | |
| P0137 | O2S 2 Circuit Low Voltage | |
| P0138 | O2S 2 Circuit High Voltage | |
| P0038 | O2S Heater 2 Circuit High Voltage | |
| P0037 | O2S Heater 2 Circuit Low Voltage | |
| P0500 | VSS No Signal | VSS-Vehicle Speed Sensor |
| P0850 | Park Neutral Switch Error | |
| P0445 | CCP short to high | |
| P0444 | CCP short to low/open | |

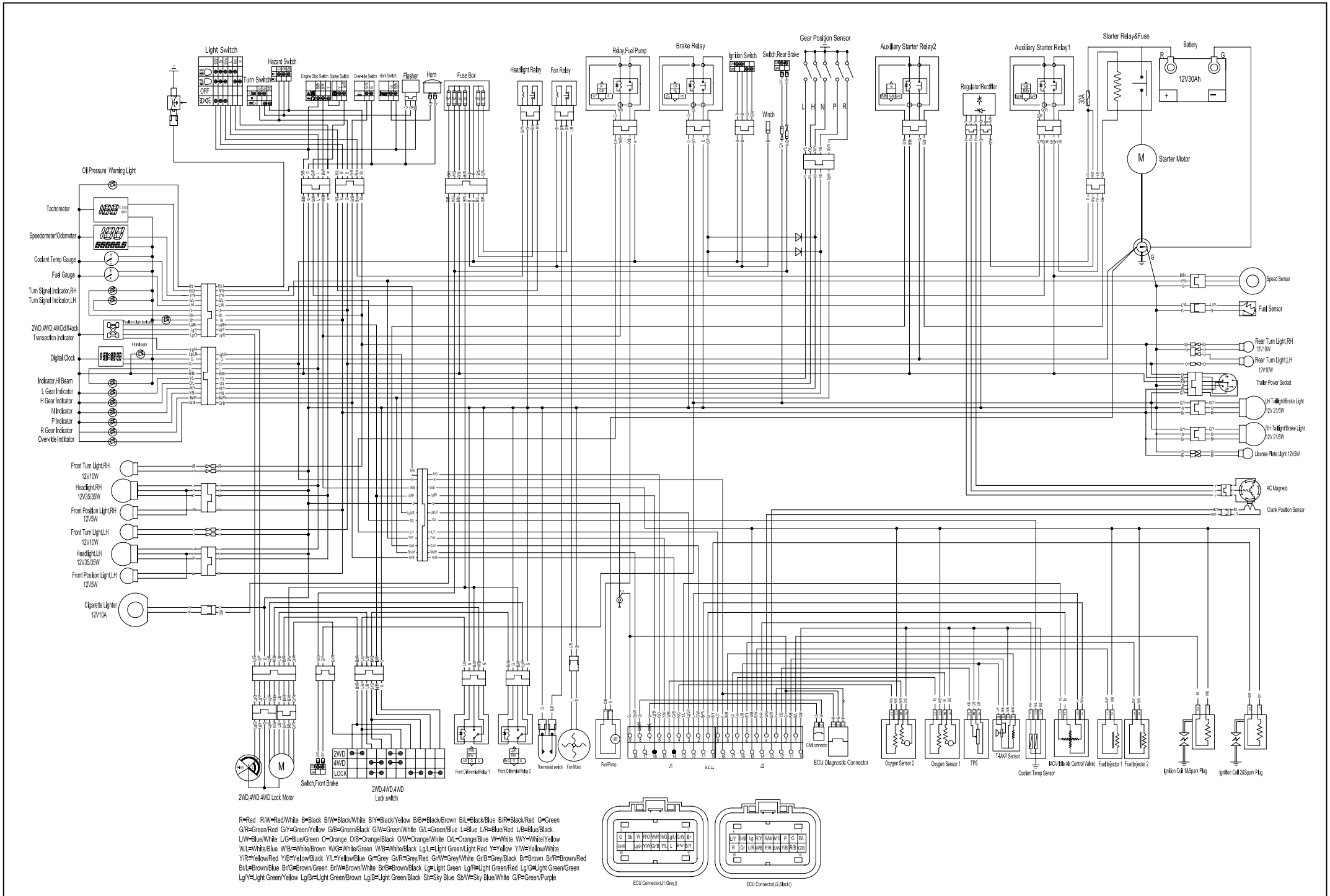
## EFI Wiring Diagram



# CF800-2 Starting Wiring Diagram

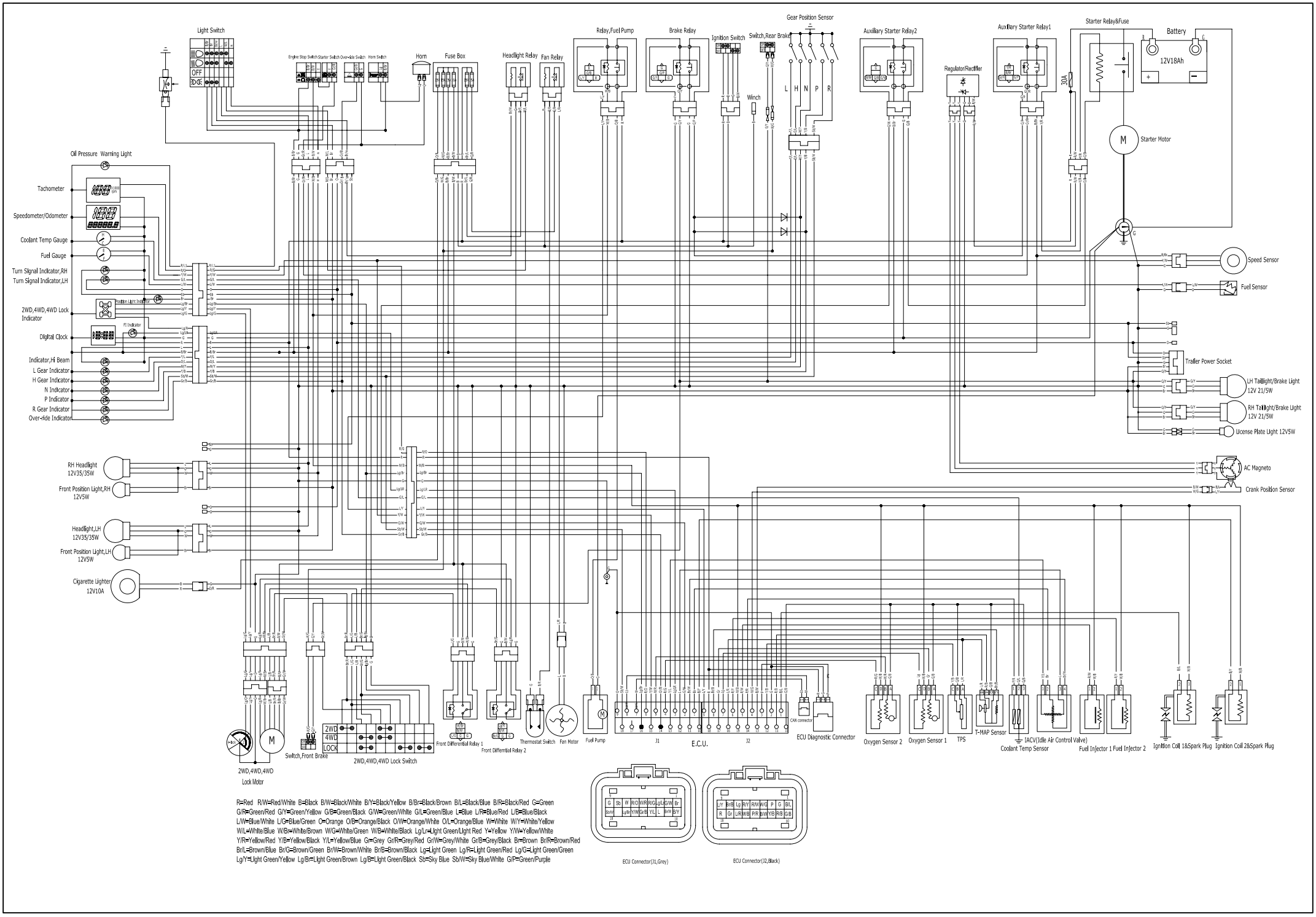


# CF800-2 Wiring Diagram(EU)




R=Red R/W=Red/White B=Black B/W=Black/White B/Y=Black/Yellow B/Bl=Black/Blue B/L=Black/Blue B/R=Black/Red G=Green
G/R=Green/Red G/Y=Green/Yellow G/B=Green/Black G/W=Green/White G/L=Green/Blue L=Blue L/R=Blue/Red L/B=Blue/Black
L/W=Blue/White L/G=Blue/Green O=Orange O/B=Orange/Black O/W=Orange/White O/L=Orange/Blue W=White W/Y=White/Yellow
W/L=White/Blue W/B=White/Brown W/G=White/Green W/B=White/Black Lg/L=Light Green/Light Red Y=Yellow Y/W=Yellow/White
Y/R=Yellow/Red Y/B=Yellow/Black Y/L=Yellow/Blue Gr=Grey Gr/R=Grey/Red Gr/W=Grey/White Gr/B=Grey/Black Br=Brown Br/R=Brown/Red
Br/L=Brown/Blue Br/G=Brown/Green Br/W=Brown/White Br/B=Brown/Black Lg=Light Green Lg/R=Light Green/Red Lg/G=Light Green/Green
Lg/Y=Light Green/Yellow Lg/Bl=Light Green/Brown Lg/B=Light Green/Black Sb=Sky Blue Sb/W=Sky Blue/White G/P=Green/Purple

# CF800-2 Wiring Diagram(US)




R=Red R/W=Red/White B=Black B/W=Black/White B/Y=Black/Yellow B/Br=Black/Brown B/L=Black/Blue B/R=Black/Red G=Green G/R=Green/Red G/Y=Green/Yellow G/B=Green/Black G/W=Green/White G/L=Green/Blue L=Blue L/R=Blue/Red L/B=Blue/Black L/W=Blue/White L/G=Blue/Green O=Orange O/B=Orange/Black O/W=Orange/White O/L=Orange/Blue W=White W/Y=White/Yellow W/L=White/Blue W/Br=White/Brown W/G=White/Green W/B=White/Black Lg/L=Light Green/Light Red Y=Yellow Y/W=Yellow/White Y/R=Yellow/Red Y/B=Yellow/Black Y/L=Yellow/Blue Gr=Grey Gr/R=Grey/Red Gr/W=Grey/White Gr/B=Grey/Black Br=Brown Br/R=Brown/Red Br/L=Brown/Blue Br/G=Brown/Green Br/W=Brown/White Br/B=Brown/Black Lg=Light Green Lg/R=Light Green/Red Lg/G=Light Green/Green Lg/Y=Light Green/Yellow Lg/B=Light Green/Brown Lg/B=Light Green/Black Sb=Sky Blue Sb/W=Sky Blue/White G/P=Green/Purple




ECU Connector(J1,Grey)




ECU Connector(J2,Black)

**Maintenance Information**

**Operation Cautions**

**WARNING**

- Headlight bulb will be very hot when it is turned on. Do not touch it after it is just turned off. Operation should be done when the bulb is cooled down.
- The temperature of headlight is quite high when turned on. Replacing with bare hand or stained glove will leave oil residue on the glass face which may form hot spot and cause deformation of glass face and damage to bulb.
- Pay attention to the following when replacing the bulb.

Do not replace the bulb when it is turned on. Keep ignition switch in the OFF position, and replace after the bulb is cooled down.

-Replace the bulb with hands in clean gloves to avoid oil rsidue on the glass surface.

-Clean the glass with a clean rag dipped in alcohol or isoamyl acetate in case of any oil residue on the glass surface.

- If the inspection has to be done with battery, check if the battery is normal.

Inspection of switch continuity can be done without removing switches from the vehicle.

- After the inspecting and maintenance of each part, cables and wires should be routed properly (chapter 1).

Refer to Chapter 2 for removal and installation of taillight and rear turning lights.

## Maintenance Specifications

| Item | | Standard |
|---|---|---|
| Fuse | Main | 20A |
| | Auxiliary | 10A×1 15A×5 |
| Light | Headlight（Hi/Lo） | 12V-35/35W×2 |
| | Brake light/Taillight | 12V-21/5W×2 |
| | Turn Light | 12V-10W×4 |
| | Panel Light | LED |
| | Coolant temp.,Fuel level,2WD/4WD indicator light | LCD |
| | MIL | LED |

## Troubleshooting

### Head Light Cannot Turn On

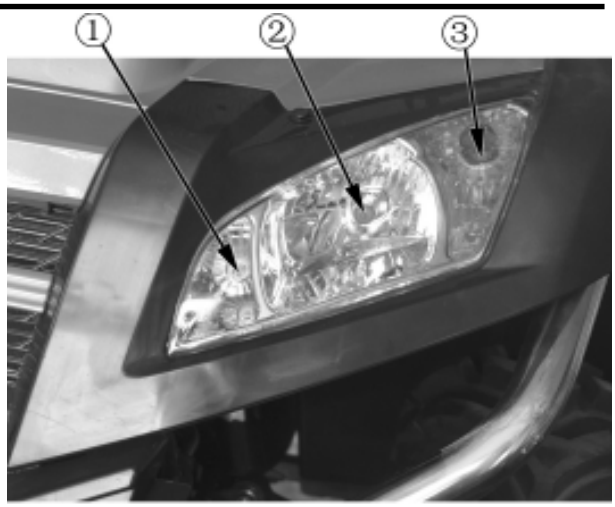
- Blown fuse
- Open circuit of main cable
- Burnt bulb
- Defective switch

## Bulb Replacement

### Headlight Bulb

### Cautions

Headlight bulb will be very hot when it is turned on. Do not touch it after it is just turned off. Operation should be done when the bulb is cooled down.




Remove left headlight protector (→2-11);

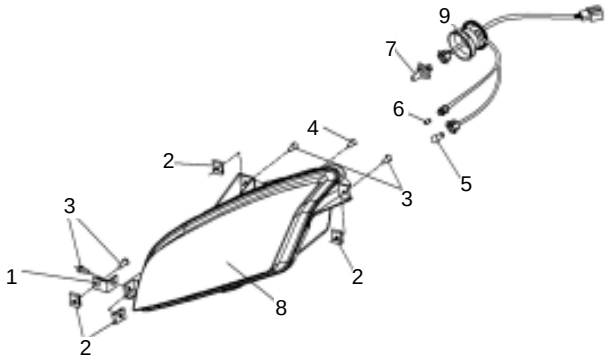
Remove headlight(→16-5);

Remove left position light(front) no.1;
Remove headlight bulb (left) no.2;
Remove left turn light no.3;

Unplug headlight connector;
Remove dust-proof cap, headlight connector, circlip and replace with a new bulb.

**WARNING:**

Wear clean gloves when replacing bulb.
Oil residue on the glass surface may cause the bulb break.Clean the stained surface with alcohol or isoamyl acetate.
Align the three pins of the bulb with the three positioning holes in the
socket when replacing the bulb.




Bulb no.7 specification:12V-35/35W
Bulb no.6 specification:12V-5W
Bulb no.5 specification :12V-10W

Reverse the removal procedure for installation
After replacing the bulb, adjust headlight beam (→ 3-14).

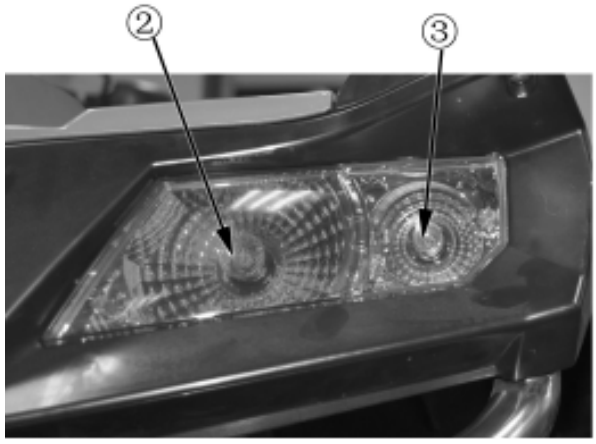
## Headlight Inspection

Turn the ignition switch to ON position, turn light switch to the illumination position and check if the headlight is on.
-ON: Normal
-Still off: short circuit of main cable or broken main cable

## Front Turn Light Bulbs

Remove LH headlight protector(→2-11);
Remove headlight(→16-5);
Remove front turn llight no.1;
Rmove front turn light bulbs.

Bulb Specification:12V-10W


## Rear Turn Light Bulbs

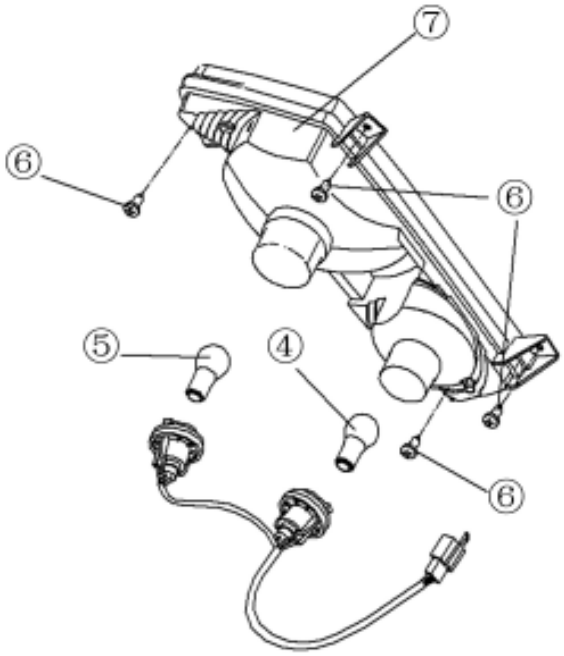
Remove rear turn light cover;
Remove rear turn light bulbs;
Replace rear turn light bulbs no.4;
Bulb Specification:12V-10W

Reverse the removal procedure for installation.

## Brake Light/Tail Light Bulb

Remove tail light cover;
Remove brake light/tail light bulb no.5;

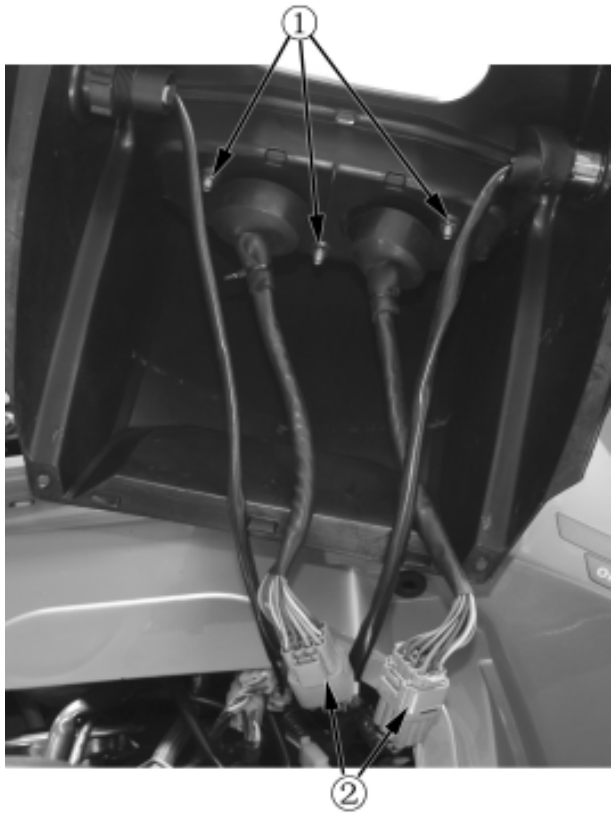
Replace brake light/tail light bulb;
Bulb Specification:12V-21/5W
Reverse the removal procedure for installation.




**NOTE:**

*Main cable,wiring and tube should be routed properly( →**Chapter 1).***

## Dashboard



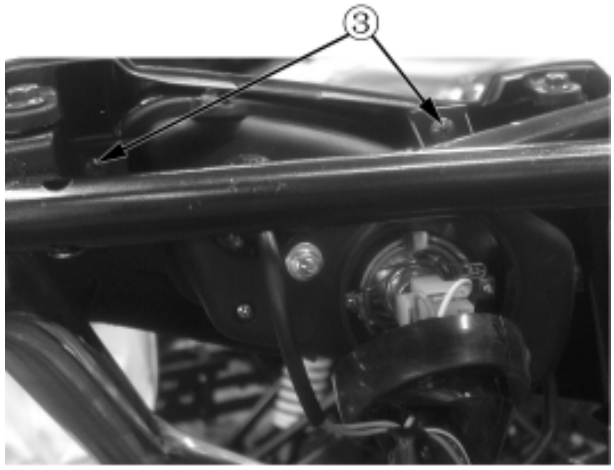

Remove cover of dashboard(→2-5);
Remove nuts no.1;
Remove dashboard connectors no.2;

Remove dashboard.

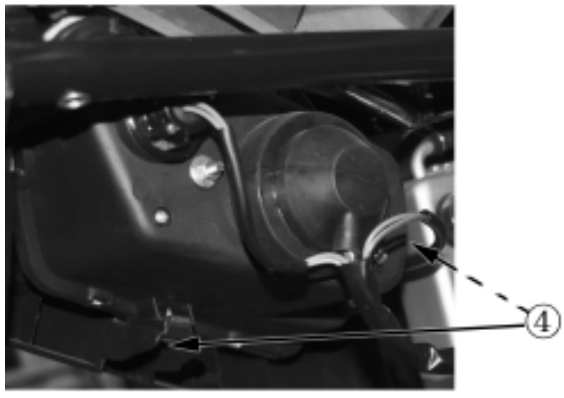
**NOTE:** *If dashboard has something wrong, it's recommended to replace the whole dashboard.*

Reverse the removal procedure for installation.

## Headlight




Remove cover of headlight (-2-11);
Remove screw no.3;
Remove screw o.4;
Disconnect headlight connector;
Disassemble headlight comp.




Reverse the removal procedure for installation

**NOTE:**

*Be careful not to damage main cable when assembling.*

After replacment, adjust the headlight beam(→3-14);

**NOTE:**

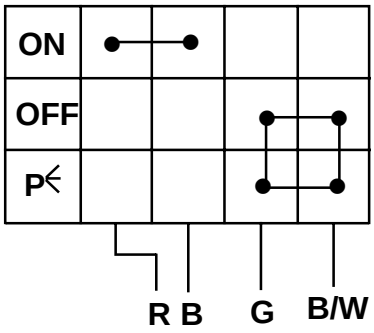
*Main cables and wires should be routed properly.(→1-20)*

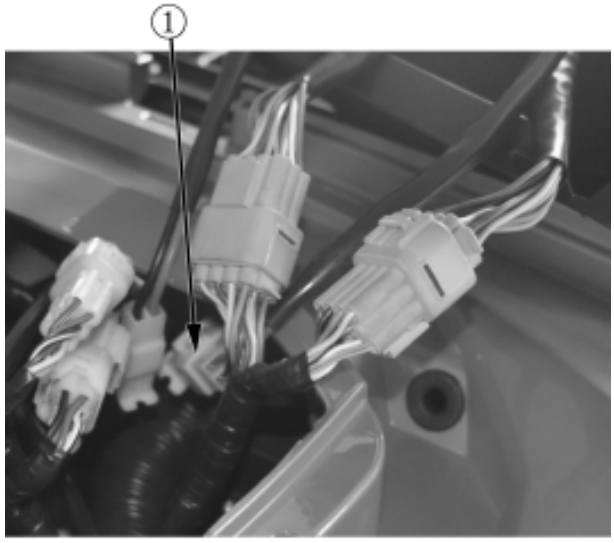
## Ignition Switch

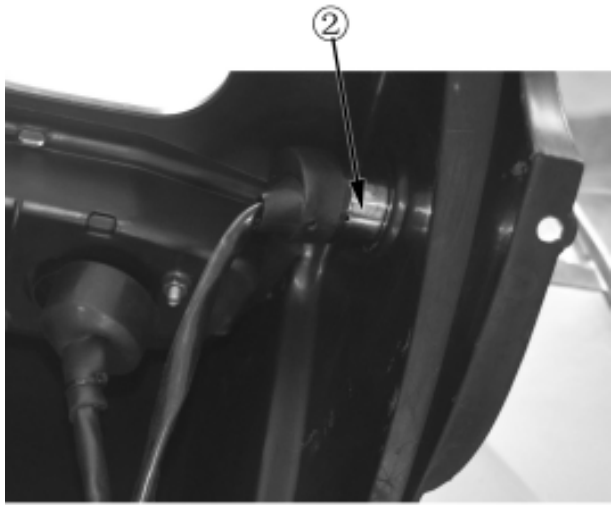
### Inspection

Remove dashboard cover(→2-5);
Disconnect 4P connector of ignition switch;
Check according to the following table if
the connector terminals are in continuity.

●——● :Continuity




### Removal

Remove dashboard cover(→2-5);
Disconnect 4P connector of ignition switch;

Remove bolt and remove ignition switch;

### Installation

Reverse the removal procedure for installation.

**Handlebar Switches**

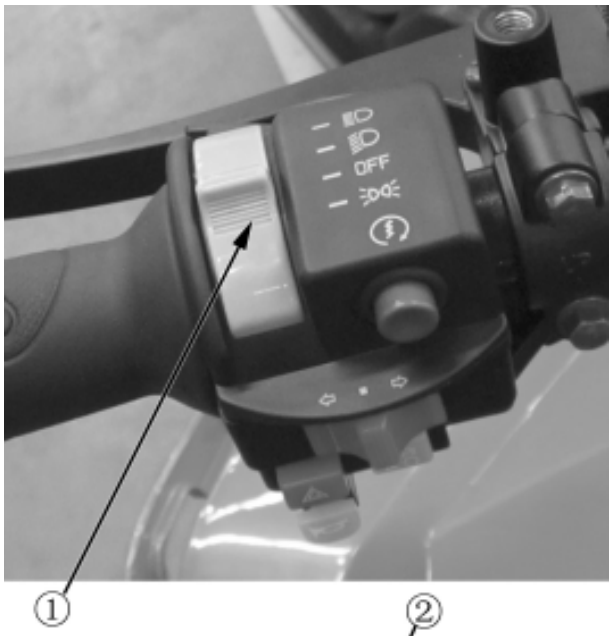
Remove dashboard cover(→2-5);
Disconnect left handlebar switch connectors;
Check according to the following table if
the connector terminals are in continuity.

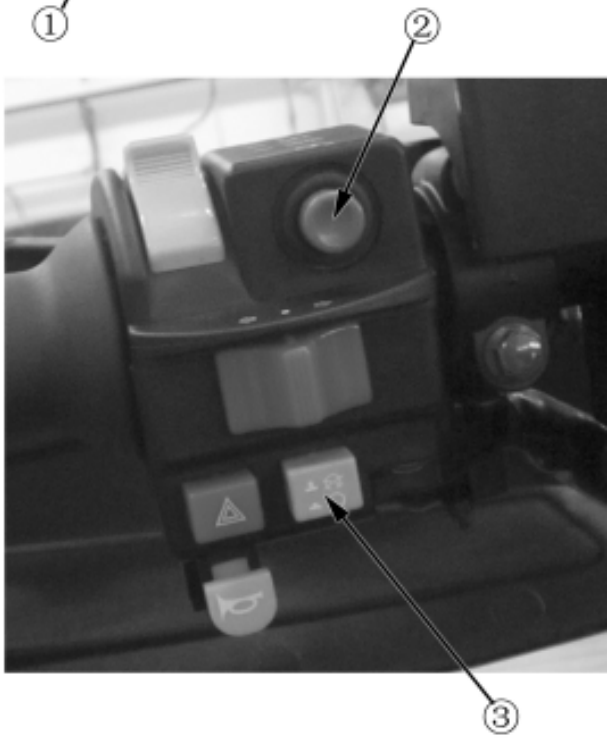
●——●Continuity

## Light Switch no.1

| | B/Br | Br | Br/W | L | W/L | W |
|---|---|---|---|---|---|---|
| ≡D | ● | ● | ● | ● | ● | |
| ≡D | ● | ● | ● | | ● | ● |
| OFF | | | | | | |
| ≡DC | ● | ● | ● | | | |

B=Black Br=Brown W=White L=Blue G=Green
Gr=Grey R=Red O=Orange Sb=Sky Blue
Lg=Light Green




**Kill Switch no.3**

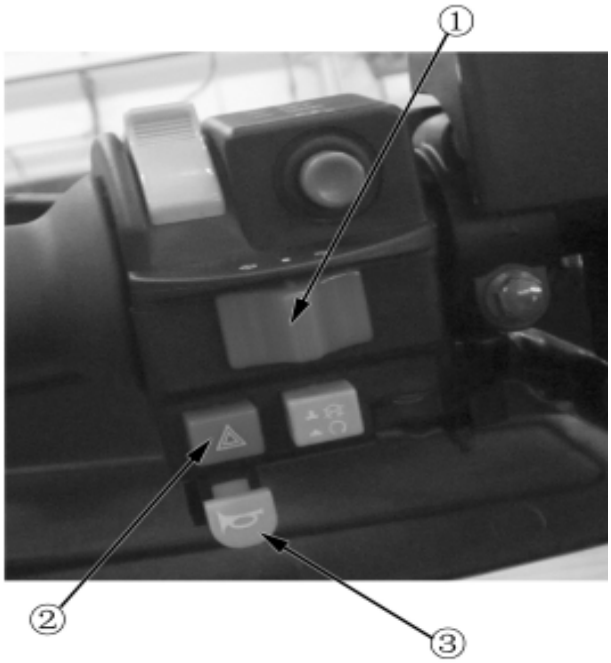
| | B/W | G | B/Br | Y |
|---|---|---|---|---|
| | ● | ● | | |
| | | | ● | ● |

**Starter Switch no.2**

| | Y | Gr/R |
|---|---|---|
| | ● | ● |
| | | |

## Turn Switch no.1

| | O | Gr | Sb |
|---|---|---|---|
| L | ● | ● | |
| PUSH | | | |
| R | | ● | ● |




## Horn switch no.3 Over-ride Switch no.4

| | |
|---|---|
| OFF | |
| ON | ● ● |

| | |
|---|---|
| OFF | |
| ON | ● ● |

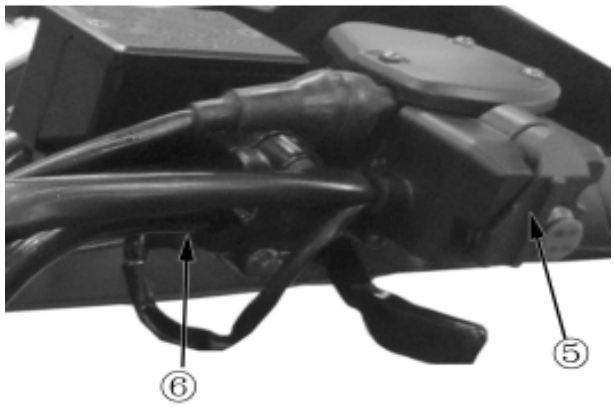
## Right Handlbar Switch no.5

| | Br/B | L/G | L/B | Br/G | Gr/W | L/G | Br/R | Br/G | Lg/Br | G |
|---|---|---|---|---|---|---|---|---|---|---|
| 2WD | ● | ● | | | ● | ● | | | | |
| 4WD | | | ● | ● | ● | ● | | | | |
| LOCK | | | ● | ● | | | ● | ● | ● | ● |


If something above wrong, replace handlebar switches(→12-12).

## Hazard Light Switch no.2

| | Gr/B | B/Br |
|---|---|---|
| | | |
| ! | ● ● | |




## Brake Light Switch no.6

Disconnect brake light switch connector and check terminals for continuity.
Brake lever applied:continuity
Brake lever released. no continuity
**No continuity: Replace brake light switch**


## Horn no.7

### Inspection

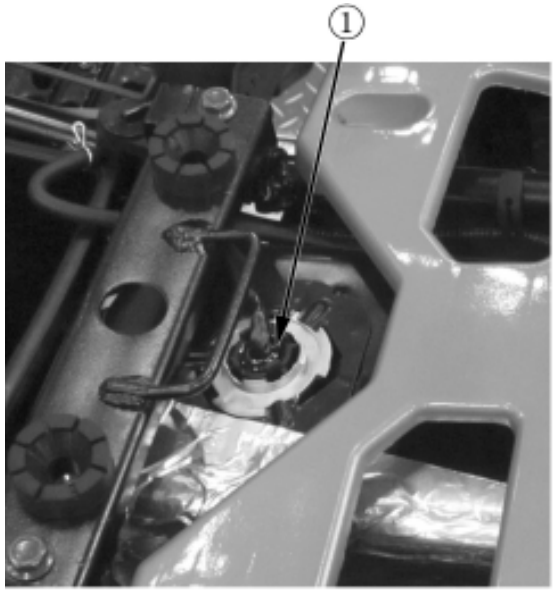
Remove front vent grille (→2-13);
Disconnect horn;
Connect with a fully charged 12V battery and check if the horn sounds.

Defective Horn: Replace

## Fuel Sensor

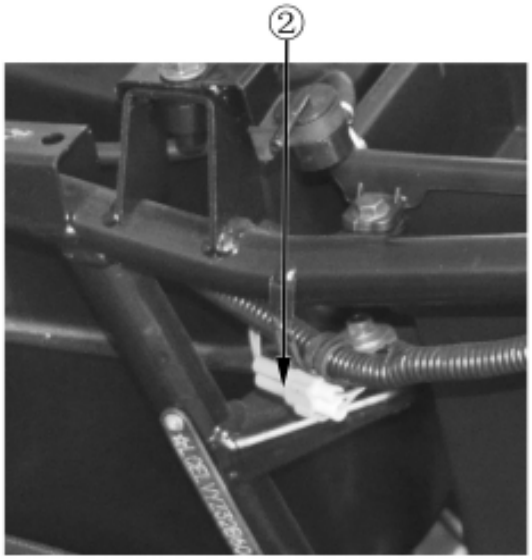
Remove:
Remove passenger seat (→2-4);
Remove driver seat (→2-4);
Remove fuel sensor;

Disconnect 2P connector.

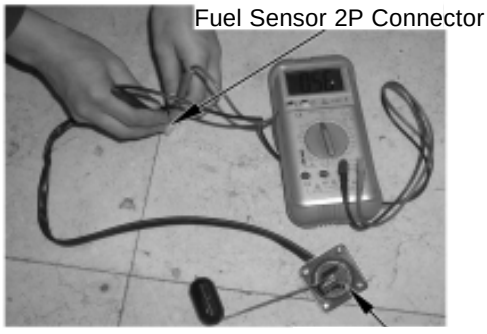



## Inspection

Remove fuel sensor (refer to above steps);
Connect 2P connector;
Turn ignition switch to ON;
Shake fuel sensor float with hand, locate the float position and check if it conforms to the fuel gauge reading.
**Non-conformity:** -check main cable for damage or short circuit
-Check fuel sensor and fuelgauge.




Remove fuel sensor 2P connector;
Connect multimeter between 2P connector terminals;
Shake float with hand and measure the resistance of float at different positions.
**Connection Terminal:**
**Upper: Blue/White-Green:**
4-10Ω(20℃)
Lower: Blue /White-Green:
90-100Ω(20℃)
Faulty fuel sensor: Replace




## Installation

Put fuel sensor into installation hole of fuel tank.
Fuel sensor should be fitted properly.
No fuel leakage is allowed.

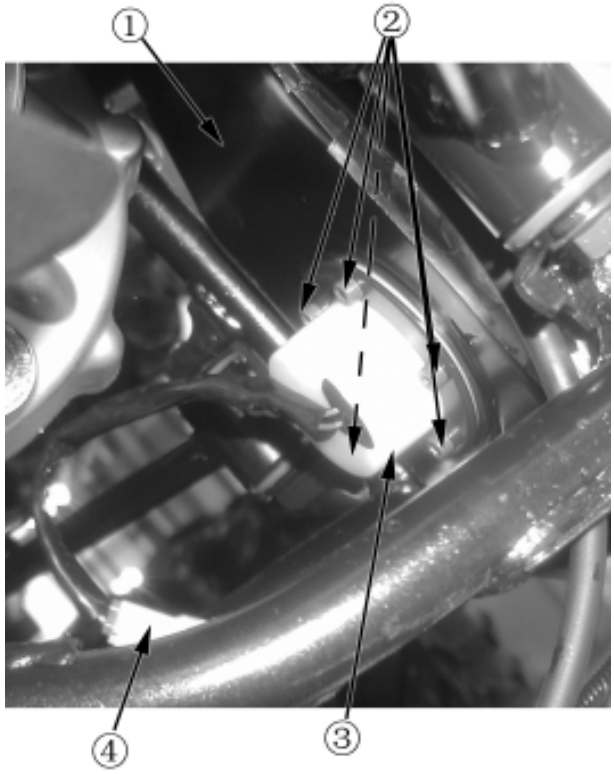
## Inspection of Fuel Gauge

Switch on power supply and check if fuel level gauge functions normally.
If fuel gauge works normally,
Reverse the removal procedure for installation of plastic parts and seat.

## Fuel Pump

### Removal

Remove rear seat(→2-4);
Remove front seat(→2-4);
Remove related plastics(see ***Chapter 2***);
Drain fuel in fuel tank ;
Remove the 5 bolts no. 2;
Remove fuel pump no.3 from fuel tank no.1;
Disconnect fuel pump connector.




### Fuel Pump Specifications

Voltage:DC13.5 ± 0.3V,

Pressure:0.2 ± 0.01MPa,

Rate of flow ≥ 45L/h,

Current ≤ 2A,

Regulator working pressure: 0.25 ± 0.01MPa,

Current ≤ 2.2A.

### Inspection of Fuel Pump

Turn ignition switch to ON and check if fuel pump functions normally.
If fuel fuel works abnormally,please check if circuit is open circuit or if EFI system has any problem.

**NOTE:**

*If any probelm of electrical equipment and electrical system in this chapter ,please refer to chapter of electrical equipment .*

## 1.Engine troubleshooting

| Trouble | Possible causes | Countermeasures |
|---|---|---|
| Engine cannot be started | 1.Check electrical system | |
| | 1) Fuse defective | Check or replace |
| | 2) Battery low voltage | Check or recharge |
| | 3)Bad wiring connection | Check or replace |
| | 2.Check spark plug | |
| | 1) Ignition coil bad connection or defective | Check or replace |
| | 2) High-tension cable bad connection or defective | Check or replace |
| | 3) Speed sensor defective | Check or replace |
| | 4) Flywheel defective | Check or replace |
| | 5) Gap of spark plug incorrect | Adjust or replace |
| | 6) Spark plug dirty | Clean or replace |
| | 7) Spark plug wet | Dry it or replace |
| | 3. Check fuel supply system | |
| | 1) Canister | |
| | 2) Fuel pump leakage or defective | Repair or replace |
| | 3) Fuel hose leakage | Tighten |
| | 4) Fuel insufficient | Check fuel tank |
| | 5) Injector blocked or defective | Replace |
| | 4.Check cylinder pressure | |
| | 1) Cylinder worn | Replace |
| | 2) Piston ring worn | Replace |
| | 3) Cylinder gasket broken | Replace |
| | 4) Valve stem worn | Replace |
| | 5) Valve seat seal unsuitable | Repair or replace |
| | 6) Valve worn | Replace |
| | 7) Spark plug loose | Tighten |
| | 8) Starting RPM too low | Check or replace |
| | 9) Valve timing incorrect | Adjust |
| | 10) Valve clearance incorrect | Adjust |
| | 5. Air bypass valve blocked or defective | Clean or replace |
| | 6. Not shift to “N” gear | Shift to “N” gear |
| | 7. Check trouble code | Check |
| Difficult to start engine | 1. Air bypass valve adjustment failure | See engine control system |
| | 2. TPS not reset | See engine control system |
| | 3. Adjust throttle cable | |
| | 4. Cylinder pressure insufficient | |
| | 5. Check spark plug | Check or replace |
| | 1) Spark plug defective | |
| | 2) Spark plug improper installation | Replace defective part |
| | 3) Spark plug damaged | |
| | 4) Spark plug dirty | |
| | 6. Fuel insufficient or fuel pressure not enough | |

| Trouble | Possible causes | Countermeasures |
|---|---|---|
| Engine overheating | 1. Coolant insufficient (lower than LOWER line) | Refill coolant |
| | 2. Air bubbles inside cooling system | Remove air bubbles and refill |
| | 3. Water temp. sensor defective | Replace sensor |
| | 4. Thermostat defective(cannot open when coolant is very hot) | Replace thermostat |
| | 5. Coolant leakage | a. Check and replace water pump seal |
| | | b. Check and replace water hose and clamp |
| | ● Water hose broken or aging | Replace |
| | ● Clamp loosen | Tighten |
| | 6. Water impeller damaged | Replace |
| | 7. Water pump cover leaking | Tighten or replace |
| | 8. Cylinder head cover/Cylinder gasket leakage | Replace |
| | 9. Water pump cover washer leakage | Replace |
| | 10. Water pump gear wear or damaged | Replace |
| | 11. Water pump shaft defective | |

| Troubles | Possible causes | Countermeasures |
|---|---|---|
| Engine oil consumption too high or oil pressure too low | 1. Check oil level and if any leakage of crankcase or oil seal | Replace and reassembly |
| | ● Crankcase damaged | Replace |
| | ● Tightening bolt loosen | Tighten |
| | ● Seal ring or O-ring/washer damaged or broken | Replace |
| | ● Piston ring wear (blue spark can be seen) | |
| | ● Piston ring damaged (compression ratio too low) | Replace |
| | ● Oil seal of valve damaged or aging | Replace |
| | 2. Oil filter blocked | |
| | 3. Check oil drain plug screw of crankcase | Replace all oil seal of valves |
| | ● Oil drain plug screw loosen | Replace and change oil |
| | ● Oil drain plug screw of left crankcase loosen or washer is missing | Tighten |
| | 4. Oil seal of indicator hole is leaking | Tighten or install washer |
| | 5. Oil strainer blocked | Replace oil seal |
| | 6. Check oil pump | Clean or replace |
| | ● Oil pump rotor over-worn | Replace |
| | ● Oil pump leakage or damaged by air into oil pump | Replace |
| | ● Oil pump gear damaged | Replace |
| | ● Engine oil is unsuitable | Use recommended oil |
| Engine oil whitening | 1. Coolant and oil leaking from leakage indicator hole | Replace oil seal and water seal |
| | 2. Cylinder head cover and cylinder gasket damaged | Tighten or replace |
| | 3. Bolt of cylinder head cover loosen | Tighten and change oil |
| | 4. Engine oil impure | Replace damaged parts (including oil filter and oil) |

| | | |
|---|---|---|
| Abnormal acceleration | 1. CVT belt getting narrow | Replace |
| | 2. Check drive pulley | |
| | ● Rollers wear | Replace |
| | ● Drive pulley track wear | Replace |
| | 3. Drive/driven pulley shaft move not flexibly | Clean or replace |
| | 4. Spring of driven pulley too strong | Replace |
| | 5. Sliders of driven pulley wear | Replace |
| | 6. Groove of drive/driven pulley damaged | Replace |
| | 7. Intake&exhaust valve clearance incorrect | Replace |
| | 8. Compression ratio too low | Adjust |
| | 9. Ignition of spark plug abnormal | Replace |
| Max. speed too low | 1. Check point 1,2 and 3 of “abnormal acceleration” | |
| | 2. CVT system polluted by water, oil and dust | |
| | 3. Drive pulley blocked | Clean and replace |
| | 4. Spring of driven pulley weak or damaged | Clean or replace |
| | | Replace |
| Transmission not good | 1. Check bush of drive pulley | |
| | 2. Check point 1and 2 of “abnormal acceleration” | |
| | ● Bush blocked on shaft | Clean and Replace |
| | 3. Check driven pulley | |
| | ● Spring of driven pulley weak or damaged | Replace |
| | ● Sliders wear or damaged | Replace |
| CVT belt over-worn or burned | 1. Check CVT inlet&outlet air pipe | |
| | ● CVT overheating | Clean |
| | ● Drive fixing sheave impeller blocked | Clean |
| | 2. Check pulley groove | |
| | ● Dirty oil inside groove | Clean and replace belt |
| | ● Water into CVT case | Clean and replace belt |
| CVT belt not good | 1. Belt over-worn and getting narrow | Replace |
| | 2. Wrong belt | Replace |
| | 3. Part of belt wear | Replace |
| | 4. Belt broken or over-used | Clean CVT system and |
| | 5. Dirty oil inside groove | replace belt |
| | 6. Drive/driven pulley groove damaged by stone or other | Clean |
| | foreign objects | Clean or replace |
| | 7. Belt aging and getting fragile | Replace |

| | | |
|---|---|---|
| Noise from cylinder head | 1. Valve clearance incorrect<br>2. Tensioner failure<br>3. Chain guide wear<br>4. Chain extended or chain sprocket wear<br>5. Bolt of sprocket loosen<br>6. Valve rocker arm or camshaft wear<br>7. Camshaft timing incorrect | Adjust or replace<br>Replace<br>Replace<br>Replace<br>Tighten<br>Adjust or replace<br>Adjust or replace |
| Noise from crankshaft and connecting rod | 1. Bearing damaged<br>2. Plain bearing damaged<br>3. Flywheel rotor loosen<br>4. Bearing of left crankcase cover wear | Replace<br>Replace<br>Tighten or replace<br>Replace |
| Noise from crankcase | 1. Engine oil leaking<br>2. Gear damaged or wear | Replace, tighten and add oil<br>Replace |
| Noise from CVT when at idle speed | 1. Bush of driven pulley blocked or wear<br>2. Check drive pulley<br>3. Rollers wear<br>4. Drive pulley track wear<br>5. Drive moving sheave wear<br>6. Nylon sliders wear<br>7. Axial move blocked<br>8. Nut of drive pulley loosen | Replace driven pulley<br><br>Replace at the same times<br>Replace<br>Replace<br>Replace<br>Clean or replace<br>Tighten |
| Noise from CVT when at transmission | 1. Check point 1~3 of idle abnormal noise<br>2. Drive pulley dirty and wet<br>3. Nut of drive/driven loosen<br>4. Driven sliders over-worn<br>5. Belt and cone surface damaged by outside materials | <br>Clean and dry<br>Tighten<br>Replace<br>Clean or replace |
| CVT drive pulley vibration | 1. Nut of drive pulley loosen<br>2. Gap of bush of drive pulley too big<br>3. Rollers missing or over-worn | Tighten<br>Replace<br>Replace at the same times |
| CVT driven pulley vibration | Gap of bush of driven pulley too big | Replace |

## 2.Trouble code table

| Trouble Code | Trouble Description | Remarks |
|---|---|---|
| P0107 | MAP Circuit Low Voltage or Open | MAP-Manifold Absolute Pressure |
| P0108 | MAP Circuit High Voltage | |
| P0112 | IAT Circuit Low Voltage | IAT-Inlet Air Temperature |
| P0113 | IAT Circuit High Voltage or Open | |
| P0117 | Coolant/Oil Temperature Sensor Circuit Low Voltage | |
| P0118 | Coolant/Oil Temperature Sensor Circuit High Voltage or Open | |
| P0122 | TPS Circuit Low Voltage or Open | TPS-Throttle Body Position |
| P0123 | TPS Circuit High Voltage | |
| P0131 | O2S 1 Circuit Low Voltage | O2S-Oxygen Sensor |
| P0132 | O2S 1 Circuit High Voltage | |
| P0032 | O2S 1 Heater Circuit High Voltage | |
| P0031 | O2S 1 Heater Circuit Low Voltage | |
| P0201 | Injector 1 Circuit Malfunction | |
| P0202 | Injector 2 Circuit Malfunction | |
| P0230 | FPR Coil Circuit Low Voltage or Open | FPR-Fuel Pump Relay |
| P0231 | FPR Coil Circuit Low Voltage or Open | |
| P0232 | FPR Coil Circuit High Voltage | |
| P0336 | CKP Sensor Noisy Signal | CKP-Crankshaft Position |
| P0337 | CKP Sensor No Signal | |
| P0351 | Cylinder 1 Ignition Coil Malfunction | |
| P0352 | Cylinder 2 Ignition Coil Malfunction | |
| P0505 | Idle Speed Control Error | |
| P0562 | System Voltage Low | |
| P0563 | System Voltage High | |
| P0650 | MIL Circuit Malfunction | MIL-Malfunction Indicator Light |
| P1693 | Tachometer Circuit Low Voltage | |
| P1694 | Tachometer Circuit High Voltage | |
| P0137 | O2S 2 Circuit Low Voltage | |
| P0138 | O2S 2 Circuit High Voltage | |
| P0038 | O2S Heater 2 Circuit High Voltage | |
| P0037 | O2S Heater 2 Circuit Low Voltage | |
| P0500 | VSS No Signal | VSS-Vehicle Speed Sensor |

# 3. EFI troubleshooting by trouble code

**Instructions：**

1.Only after stable trouble is confirmed, then do checking and repair. Otherwise it will bring mistakes.

2.Below mentioned multimeter is only for digital multimeter, pointer multimeter is not allowed for checking EFI circuit.

3.If trouble code means voltage too low, it is short circuit to ground or open circuit. If trouble code means voltage toot high, it is short circuit to power. If trouble code means circuit has something wrong, then there is open circuit or many circuits in trouble.

**Diagnosis helps：**

1. If trouble code cannot be removed, then it is stable trouble.
   If it is temporary trouble, please check wiring connectors
2. During checking, do not neglect influences of vehicle maintenance, cylinder pressure and valve timing.
3. Replace ECU and test.
   If trouble code can be removed by replacement of ECU, thenitis a trouble originated from ECU. If trouble code still exists, then install original ECU and check other parts step by step.

**In the following, there are detailed descriptions about trouble codes and diagnosis procedures.**

**Trouble code:P0032/P0038：Heater coil high voltage of Cylinder 1 and 2 oxygen sensor**

| Possible causes | Checking procedures |
|---|---|
| 1）Open circuit between ECU and oxygen sensor C pin | 1）Measure resistance between ECU pins and oxygen sensor C pin, check if it's ok. |
| 2）Open circuit between main relay and oxygen sensor C pin. | 2）Measure resistance between main relay and oxygen sensor D pin, check if it's ok. |
| 3) Open circuit between oxygen sensor C and D pin | 3) Measure resistance (9.6KΩ) between oxygen sensor C pin and D pin. |

**Trouble code P0031/P0037：Heater coil low voltage of Cylinder 1 and 2 oxygen sensor**

| Possible causes | Checking procedures |
|---|---|
| 1）Short circuit between ECU and ground. | 1)Measure resistance between ECU and ground |
| 2）Short circuit between ECU and oxygen sensor D pin | 2）Measure ECU voltage and check if it's ok. |
| 3）Short circuit between ECU and other circuits. | 3）Measure resistance (9.6KΩ) between oxygen sensor D pin and ECU |

**Trouble code :P0131/P0137：Oxygen sensor low voltage of cylinder 1 and 2**

Tips: EFI system can judge output signal if it's ok by measuring voltage between oxygen sensor A pin and B pin. Oxygen sensor sometimes will be broken during cold starting.

| Possible causes | Checking procedures |
|---|---|
| 1）Short circuit between ECU and ground | 1） Measure resistance between ECU and ground and check if it's ok. |
| 2）Short circuit between ECU and oxygen sensor D pin. | 2）Measure ECU voltage and check if it's ok. |
| 3）Short circuit between ECU and other circuits. | 3) Measure resistance (9.6KΩ) between oxygen sensor D pin and ECU |
| 4）Oxygen sensor defective, replace it. | |

**Trouble code : P0132/P0138：Oxygen sensor high voltage of cylinder 1 and 2**

| Possible causes: | Checking procedures |
|---|---|
| 1）Open circuit between ECU and oxygen sensor A and B pins. | 1) Replace oxygen sensor |
| 2) Open circuit between oxygen sensor A pin and B pin | **2)** Replace ECU |
| | **3)** Wiring checking. |

**Trouble code P0107：Intake air temp. sensor low voltage or open circuit**

| Possible causes： | Repair procedures： |
|---|---|
| 1）The sensor short circuit to ground | 1）Measure resistance between ECU and ground |

**Trouble code P0108：Intake air temp. sensor high voltage**

| Possible causes： | Repair procedures： |
|---|---|
| 1）The sensor short circuit to ground | 1）Measure ECU pin voltage |

**Trouble code P0112： Intake air temp. sensor low voltage**

| Possible causes： | Repair procedures： |
|---|---|
| 1）The sensor connected with ECU pin short circuit to ground | 1）Measure resistance between ECU pin and ground |

**Trouble code P0113：Intake air temp. sensor high voltage or open circuit**

| Possible causes： | Repair procedures： |
|---|---|
| 1）The sensor connected with ECU pin short circuit to power | 1）Measure sensor voltage connected with ECU pin if it's ok. |

**Trouble code P0117：Water temp. sensor low voltage**

| Possible causes： | Repair procedures： |
|---|---|
| 1)The sensor connected with ECU pin short circuit to ground | 1) Measure resistance between ECU pin and ground. |

**Trouble code P0118：Water temp. sensor high voltage or open circuit**

| Possible causes： | Repair procedures： |
|---|---|
| 1）The sensor connected with ECU pin short circuit to other circuit. | 1) Measure voltage of ECU pin if it's ok. |

**Trouble code P0122：TPS low voltage or open circuit**

| Possible causes： | Repair procedures： |
|---|---|
| 1）ECU pin short circuit to ground | 1）Measure resistance between ECU pin and ground |

**Trouble code P0123：TPS high voltage**

| Possible causes： | Repair procedures： |
|---|---|
| 1）Short circuit between ECU pin and other circuit | 1）Measure voltage connected with ECU pin if it's ok. |

**Trouble code P0201/ P0202: 1/2 cylinder injector coil defective**

| Possible causes： | Repair procedures： |
|---|---|
| 1） Injector coil if it's open circuit.<br>2） Improper connection between injector pin and ECU pin<br>3） Improper connection between injector pin and relay<br>4）All drive circuit connected with ECU short to ground<br>5）Short circuit between ECU pin and other circuit. | 1） Measure injector resistance<br>2） Check continuity of all wirings<br>3）Measure resistance between ECU pin and ground<br>4）Measure voltage connected with ECU pin. |

**Trouble code P0336： Pick-up (Crankshaft phase sensor) signal incorrect**

| Possible causes： | Repair procedures： |
|---|---|
| 1） Wiring continuity short circuit or open circuit from time to time<br>2） Installation of crankshaft signal wheel improperly<br>3） RPM sensor installation improperly | 1） Check wiring continuity if it's ok.<br>2） Check flywheel rotor gear quantity. |

**Trouble code P0337：Pick-up (crankshaft phase sensor) no signal**

After engine is started, ECU will monitor pick-up signal and other signals at the same time.

It will judge if pick-up signal is missing or not by signal reasonability.

| Possible causes： | Repair procedures： |
|---|---|
| 1）Open circuit between RPM sensor and ECU<br>2）Short circuit between pick-up and ECU<br>3）Open circuit of pick-up coil. | 1） Measure resistance between pick-up and ECU<br>2） Measure resistance of pick-up<br>3） Measure peak voltage of pick-up. |

**Trouble code P0230：Fuel pump relay coil low voltage or open circuit**

**Trouble code P0232：Fuel pump relay coil high voltage**

| Possible causes： | Repair procedures： |
|---|---|
| 1) Open circuit/short to ground/short to power between control circuit of fuel pump relay connected with ECU and fuel pump replay<br>2）Open circuit between fuel pump relay and main relay.<br>3）Open circuit between relay coils. | 1）Measure resistance or voltage between ECU and fuel pump relay.<br>2）Measure resistance between fuel pump relay and main relay.<br>3）Measure resistance between two pins of fuel pump relay. |

**Trouble code P0505：Out of idle speed when at idle condition**

Engine idle speed is controlled by ECU close-loop. In case ECU gives idle instruction, but engine idle speed still is higher than targeted idle speed set by ECU, then it's trouble.

| Possible causes： | Repair procedures： |
|---|---|
| 1） Check adjust screw of throttle, throttle cable and throttle working condition if it's ok.<br>2）Too dirty inside throttle body. | 1）Switch off ignition more than 3 seconds and restart engine. |

**Trouble code P0562：Battery low voltage**

**Trouble code P0563：Battery high voltage**

| Possible causes： | Repair procedures： |
|---|---|
| 1）Flywheel already broken and cannot generate power or battery power leakage<br>2）Open circuit of flywheel stator coil.<br>3）Regulator already damaged | 1) Check flywheel power generation ( By measuring flywheel voltage)<br>2) Measure regulator voltage |

**Trouble code P0650：MIL light drive circuit defective**

| Possible causes： | Repair procedures： |
|---|---|
| 1) Open circuit/short to ground/short to power between ECU and MIL light drive circuit.<br>2）Open circuit between MIL and main relay<br>3）MIL light burnt | 1）Measure resistance or voltage between ECU and MIL light drive circuit. |

**Trouble code P0500: Speed sensor no signal**

When vehicle is running with gear and with loose throttle body, ECU will monitor engine RPM and speed sensor. In case engine has high RPM, but speedometer shows 0 or very low, then it's a trouble of speed sensor.

| Possible causes： | Repair procedures： |
|---|---|
| 1）Short or open circuit between ECU and speed sensor | 1) Measure resistance between ECU pins and speed sensor.<br>2）Measure resistance between ECU pins and ground |

**Trouble code：P0850 Nuetral gear sensor defective**

Engine cannot be started when at “N” gear position.

| Possible causes: | Repair procedures: |
|---|---|
| 1）Open circuit between N gear sensor and ground | 1) Measure resistance between ECU pin and N gear sensor |

**Trouble code：P0445 Starter auxiliary relay high voltage**

**Trouble code：P0444 Starter auxiliary relay low voltage or open circuit**

| Possible causes: | Repair procedures: |
|---|---|
| 1）Open circuit/short to ground/short to power between ECU and auxiliary relay. | 1）Measure resistance or voltage between ECU and auxiliary relay. |
| 2）Open circuit between auxiliary relay and power. | 2）Measure resistance between auxiliary relay and power. |
| 3）Open circuit between relay coils. | 3）Measure resistance between auxiliary relay two pins. |

**Trouble code P1693：RPM low output voltage**

**Trouble code P1694：RPM high output voltage**

After engine is started, ECU will monitor pick-up signal and other signals.

It will judge if pick-up signal is missing or not by signal reasonability.

| Possible causes: | Repair procedures: |
|---|---|
| 1） Short circuit or open circuit between wirings from time to time. | 1） Check wiring continuity. |
| 2） Improper installation of crankshaft signal wheel. | 2） Check flywheel rotor gear quantity. |
| 3） Improper installation of RPM sensor | 3） Measure resistance between pick-up and ECU |
| 4） Open circuit between RPM sensor and ECU | 4） Measure resistance of pick-up |
| 5） Short circuit between pick-up and ECU | 5） Measure peak voltage of pick-up. |
| 6） Open circuit between pick-up coils | |

**Trouble code P0351/ P0352：1/2 ignition coil defective**

| Possible causes: | Repair procedures: |
|---|---|
| 1） Ignition coil open circuit | 1） Measure resistance of ignition coil |
| 2） Improper connection between ignition coil and ECU pins. | 2） Check wiring continuity. |
| 3） Improper connection between ignition coil and relay. | 3）Measure resistance between ECU pin and ground |
| 4）Short circuit between drive circuit connected with ECU and ground. | 4）Measure voltage between ECU pins |
| 5）Short circuit between ECU pin and other circuits | |

### 4. Trouble diagnosis by engine problems

Before trouble diagnosis by engine problems, initial checking should be done as follows.

1. Confirm if trouble light is ok;
2. Confirm there's no trouble code record by PDA checking.
3. Confirm there's really trouble existing complained by end-users.

Then check the following points.

（1） Check fuel hoses if any fuel leakage；

（2） Check vacuum pipes if any broken, twist or improper connection；

（3） Check intake manifold if any blocked, air leakage or damaged；

（4） Check high-tension cable if any damaged, aging； or ignition order is correct.

（5） Check wiring close to ground if it's clean and firm；

（6） Check connector of all sensors and actuator if any loose or improper connection.

**Important note**： In case there're some problems as above-mentioned, then removal work should be done firstly, then go to next diagnosis.

Diagnosis helps：

1. Confirm engine without any trouble record.；
2. Confirm there's really trouble existing；
3. During checking, do not neglect vehicle periodic maintenance, cylinder pressure, valve timing, fuel supply and so on；
4. Replace ECU to test.

In case trouble disappears, then it's a problem of ECU. If trouble still exists, then assemble original ECU and check other points.

Frequent troubles list：

- When starting engine, engine cannot rotate or rotate slowly.
- When starting engine, starter motor can rotate but cannot start engine.
- Difficult to start warm or hot engine
- Difficult to start cold engine
- RPM is ok, but difficult to start engine.
- Starting is ok, but idle speed is unstable at any time.
- Starting is ok, but idle speed is unstable during engine warm-up period.
- Starting is ok, but idle speed is unstable after engine warm-up.
- Starting is ok, idle speed is unstable or engine stop when switch on some lights or other electric components.
- Starting is ok, but too high idle speed.
- RPM cannot go up or engine stop when acceleration.
- Slow acceleration.
- Insufficient power and bad performance when acceleration.

（1）When starting, engine cannot rotate or rotate slowly.

Possible causes：1. battery；2. starter motor；3. wiring or ignition switch；4. engine mechanical part.

General operation procedures：

| Item No. | operation procedures | Result | Then |
|---|---|---|---|
| 1 | Use multimeter to measure voltage between positive and negative terminals of battery, normal value should be 8-12V when starting engine. | Yes | Next step |
| | | No | Replace battery |
| 2 | Keep ignition switch on starting position, then use multimeter to measure voltage of positive terminal of starter motor. Normal value should be more than 8V. | Yes | Next step |
| | | No | Repair or replace wiring |
| 3 | Remove starter motor and check if any open circuit or blocked by bad lubrication | Yes | Repair or replace starter motor |
| | | No | Next step |
| 4 | If trouble only exists in winter, then resistance of starter motor is too big by unsuitable engine oil. | Yes | Change good engine oil |
| | | No | Next step |
| 5 | Check if mechanical resistance is too big inside engine | Yes | Check resistance inside engine |
| | | No | Repeat above procedures |

（**2**）When starting, starter motor can rotate but engine cannot be started.

Possible causes：1. No fuel inside fuel tank；2. Fuel pump；3. Pick-up；4. Ignition coil；

5. Engine mechanical part.

General operation procedures：

| Item No. | Operation procedures | Result | Then |
|---|---|---|---|
| 1 | Switch on ignition switch(repeat several times if necessary) or start engine and use fuel pressure meter to measure fuel pressure of fuel pump. Correct value should be around 330Kpa (3.30Bar) | Yes | Next step |
| | | No | Check fuel supply system |
| 2 | Use PDA to see RPM data, and start engine to check if any RPM signal output. | Yes | Next step |
| | | No | Check RPM sensor wiring |
| 3 | Disconnect high-tension cable and connect spark plug, keep spark plug 5mm away from engine body, then start engine to check if any white/blue spark occurs. | Yes | Next step |
| | | No | Check ignition system |

| | | | |
|---|---|---|---|
| 4 | Check cylinder pressure if it's enough or not | Yes | Remove engine mechanical trouble |
| | | No | Next step |
| 5 | Connect PDA and switch on ignition to check ECU-J2-15 pin and J2-18 pin if it is powered normally; Check ECU-J1-9 pin and J2-2 pin if it is connected to ground normally. | Yes | Use PDA to diagnose |
| | | No | Check and repair wiring circuit |

（**3**）Difficult to start hot or warm-up engine

Possible causes：1. Fuel with water；2. Fuel pump；3. Water temp. sensor；4. Ignition coil.

General operation procedures：

| Item No. | Operation procedures | Result | Then |
|---|---|---|---|
| 1 | Connect fuel pressure meter and start engine to measure fuel pressure if it's around 330Kpa (3.30Bar) | Yes | Next step |
| | | No | Check and repair fuel supply system |
| 2 | Disconnect high-tension cable and connect spark plug, keep spark plug 5mm away from engine body, then start engine to see if there's blue and white spark. | Yes | Next step |
| | | No | Check and repair ignition system |
| 3 | Disconnect connector of water temp. sensor and start engine, check if engine can be started successfully. (or use a 300Ω resistant to connect water temp. sensor connector and check if engine can be started successfully. | Yes | Check and repair wiring or replace sensor |
| | | No | Next step |
| | | No | Next step |
| 4 | Check fuel quality and if it's caused only after filling fuel. | Yes | Change fuel |
| | | No | Next step |
| 5 | Connect PDA and switch on ignition to check ECU-J2-15 pin and J2-18 pin if it is powered normally; Check ECU-J1-9 pin and J2-2 pin if it is connected to ground normally. | Yes | Use PDA to diagnose |
| | | No | Check & repair wiring |

（**4**）Difficult to start cold engine

Possible causes：1. Fuel with water；2. Fuel pump；3. Water temp. sensor；4. Injector；5. Ignition coil；6.Throttle body and air by-pass valve；7. Engine mechanical part

General operation procedures：

| Item no. | Operation procedures | Result | Then |
|---|---|---|---|
| 1 | Use fuel pressure meter and start engine to measure if fuel pressure is around 330Kpa (3.30Bar) | Yes | Next step |
| | | No | Check and repair fuel supply system |
| 2 | Disconnect high-tension cable and connect spark plug, keep it 5mm away from engine body, then start engine to check if there's blue and white spark. | Yes | Next step |
| | | No | Check and repair ignition system |
| 3 | Disconnect connector of water temp. sensor, start engine and check if it can be started successfully. (or use 2500Ω resistant to connect sensor and check if engine can be started successfully. | Yes | Check and repair wiring or sensor |
| | | No | Next step |
| 4 | Open throttle very slowly to check if it can be started easily. | Yes | Clean throttle body and air by-pass valve |
| | | No | Next step |
| 5 | Remove injector and use special cleaning equipment to check if any leakage or blocked | Yes | Replace injector |
| | | No | Next step |
| 6 | Check fuel quality and if it is caused just after filling fuel | Yes | Change fuel |
| | | No | Next step |
| 7 | Check cylinder pressure if it is enough or not. | Yes | Remove engine mechanical problem |
| | | No | Next step |
| 8 | Connect PDA and switch on ignition to check ECU-J2-15 pin and J2-18 pin if it is powered normally; Check ECU-J1-9 pin and J2-2 pin if it is connected to ground normally. | Yes | Use PDA to diagnose |
| | | No | Check and repair wiring |

（5）RPM is ok, but difficult to start engine at any time.

Possible causes：1. Fuel with water；2. Fuel pump；3.Water temp. sensor；4. Injector；5. Ignition coil；6.Throttle body and air by-pass valve；7. Intake manifold；8. Ignition timing；9. Spark plug；10. Engine mechanical part

General operation procedures：

| Item No. | Operation procedures | Result | Then |
|---|---|---|---|
| 1 | Check air filter if any blocked, or intake manifold if any blocked or leakage | Yes | Check and repair intake manifold |
| | | No | Next step |

| | | | |
|---|---|---|---|
| 2 | Use fuel pressure meter and start engine to check if fuel pressure is around 330Kpa (3.30Bar) | Yes | Next step |
| | | No | Check and repair fuel supply system |
| 3 | Disconnect spark plug cap and connect spark plug, keep it 5mm away from engine body, then start engine to check if there’s blue and white spark. | Yes | Next step |
| | | No | Check and repair ignition system |
| 4 | Check spark plug if it is under technical specifications. | Yes | Next step |
| | | No | Adjust or replace |
| 5 | Disconnect water temp. sensor connector and start engine to check if it can be started successfully. | Yes | Check and repair wiring or replace sensor |
| | | No | Next step |
| 6 | Open throttle very slowly to check if engine can be started easily. | Yes | Clean throttle body |
| | | No | Next step |
| 7 | Remove injector and use special cleaning equipment to check if any leakage or blocked. | Yes | Replace injector |
| | | No | Next step |
| 8 | Check fuel quality and if it is caused just after filling fuel. | Yes | Change fuel |
| | | No | Next step |
| 9 | Check cylinder pressure if it is enough. | Yes | Remove engine mechanical part |
| | | No | Next step |
| 10 | Check ignition timing if it is ok. | Yes | Next step |
| | | No | Check and repair ignition timing |
| 11 | Connect PDA and switch on ignition to check ECU-J2-15 pin and J2-18 pin if it is powered normally; Check ECU-J1-9 pin and J2-2 pin if it is connected to ground normally. | Yes | Use PDA to diagnose |
| | | No | Check and repair wiring |

（6）Starting is ok, but idle speed is unstable at any time

Possible causes：1. Fuel with water；2. Injector；3. Spark plug；4.Throttle body；5.Intake manifold；6. Air by-pass valve；7.Ignition timing；8.Spark plug；9. Engine mechanical part

General operation procedures：

| Item No | Operation procedures | Result | Then |
|---|---|---|---|
| 1 | Check air filter if any blocked, or intake manifold if any air leakage. | Yes | Check and repair intake manifold system |
| | | No | Next step |

| | | | |
|---|---|---|---|
| 2 | Check if air by-pass valve is blocked | Yes | Clean or replace |
| | | No | Next step |
| 3 | Check spark plug if it's under technical specifications. | Yes | Next step |
| | | No | Adjust or replace |
| 4 | Check throttle body and by-pass air pipe if any carbon deposit. | Yes | Clean |
| | | No | Next step |
| 5 | Remove injector and use special cleaning equipment to check if any leakage, blocked or incorrect fuel flow and so on. | Yes | Replace |
| | | No | Next step |
| 6 | Check fuel quality and judge it's caused just after filling fuel. | Yes | Change fuel |
| | | No | Next step |
| 7 | Check cylinder pressure if it's not enough. | Yes | Remove mechanical problem |
| | | No | Next step |
| 8 | Check mechanical ignition timing if it's under technical specifications. | Yes | Next step |
| | | No | Check and repair ignition timing |
| 9 | Connect PDA and switch on ignition to check ECU-J2-15 pin and J2-18 pin if it is powered normally; Check ECU-J1-9 pin and J1-2 pin if it is connected to ground normally. | Yes | Use PDA to diagnose |
| | | No | Check and repair wiring |

（7）Starting is ok, but idle speed is unstable during engine warming-up.

Possible causes：1. Fuel with water；2. Water temp. sensor；3. Spark plug；4. Throttle body and by-pass air pipe；5.Intake manifold；6.Air by-pass valve；7. Engine mechanical part

General operation procedures：

| Item No. | Operation procedures | Result | Then |
|---|---|---|---|
| 1 | Check air filter if any blocked or intake manifold any leakage | Yes | Check air filter and intake manifold |
| | | No | Next step |
| 2 | Check spark plug if it's under technical specifications. | Yes | Next step |
| | | No | Adjust or replace |
| 3 | Remove air by-pass valve and check throttle body, air by-pass valve and idle by-pass pipe if any carbon deposit. | Yes | Clean it |
| | | No | Next step |
| 4 | Remove water temp. sensor and start engine to check if engine can keep stable idle during warming-up. | Yes | Check wiring or replace sensor |
| | | No | Next step |
| 5 | Remove injector and use special cleaning equipment to check if any leakage, blocked or incorrect fuel flow and so on. | Yes | Replace |
| | | No | Next step |

| | | | |
|---|---|---|---|
| 6 | Check fuel quality and if it's caused just after filling fuel. | Yes | Change fuel |
| | | No | Next step |
| 7 | Check cylinder pressure if it's out of range. | Yes | Remove engine mechanical problem |
| | | No | Next step |
| 8 | Connect PDA and switch on ignition to check ECU-J2-15 pin and J2-18 pin if it is powered normally; Check ECU-J1-9 pin and J2-2 pin if it is connected to ground normally. | Yes | Use PDA to diagnose |
| | | No | Check and repair wiring |

（8）Starting is ok, but idle speed is unstable after engine warming up.

Possible causes：1. Fuel with water；2. Water temp. sensor；3. Spark plug；4. Throttle body and idle by-pass pipe；5. Intake manifold；6. Air by-pass valve；7. Engine mechanical part

General operation procedures：

| Item No. | Operation procedures | Re-sult | Then |
|---|---|---|---|
| 1 | Check air filter if any blocked, and intake manifold if any leakage. | Yes | Check&repair air filter &intake manifold |
| | | No | Next step |
| 2 | Check spark plug if it's under technical specifications. | Yes | Next step |
| | | No | Adjust or replace |
| 3 | Remove air by-pass valve, check throttle body, air by-pass valve and it pipe if any carbon deposit. | Yes | Clean it |
| | | No | Next step |
| 4 | Disconnect connector of water temp. sensor and start engine to see if any unstable idle during warming up | Yes | Check & repair wiring or replace sensor |
| | | No | Next step |
| 5 | Remove injector and use special cleaning equipment to check if any leakage, blocked or incorrect fuel flow and so on. | Yes | Replace it |
| | | No | Next step |
| 6 | Check fuel quality if it's caused just after filling fuel. | Yes | Change fuel |
| | | No | Next step |
| 7 | Check cylinder pressure if it's out of range. | Yes | Remove mechanical problem |
| | | No | Next step |
| 8 | Connect PDA and switch on ignition to check ECU-J2-15 pin and J2-18 pin if it is powered normally; Check ECU-J1-9 pin and J2-2 pin if it is connected to ground normally. | Yes | Use PDA to diagnose |
| | | No | Check & repair wiring |
| 9 | Turn off ignition, and switch on ignition to restart engine after 3 seconds. | Yes | |
| | | No | Check & repair wiring |

（9）Starting is ok, but idle speed is unstable or killed off when lights (or other electrical components) switched on.

Possible causes： 1. Air by-pass valve；2. Injector

General operation procedures：

| Item No. | Operation procedures | Results | Then |
|---|---|---|---|
| 1 | Remove air by-pass valve, check throttle body, air by-pass valve and it pipe if any carbon deposit. | Yes | Clean it |
| | | No | Next step |
| 2 | Check engine output power if it is too big when switching on electric components. And use PDA to check advanced ignition angle, fuel spray width and air intake flow. | Yes | Operate step 4 |
| | | No | Next step |
| 3 | Remove injector and use special cleaning equipment to check if any leakage, blocked or incorrect fuel flow and so on. | Yes | Replace it |
| | | No | Next step |
| 4 | Connect PDA and switch on ignition to check ECU-J2-15 pin and J2-18 pin if it is powered normally; Check ECU-J1-9 pin and J2-2 pin if it is connected to ground normally. | Yes | Use PDA to diagnose |
| | | No | Check&repair wiring |

（10）Starting is ok, but idle speed is too high.

Possible causes：1.Throttle body and idle pipe； 2.Injector seat；3. Air by-pass valve；4. Water temp. sensor；5. Ignition timing

General operation procedures：

| Item No. | Operation procedures | Result | Then |
|---|---|---|---|
| 1 | Check throttle cable if it is blocked or too tight. | Yes | Adjust |
| | | No | Next step |
| 2 | Check air intake system and injector seat if any leakage | Yes | Check&repair air intake system |
| | | No | Next step |
| 3 | Remove air by-pass valve, check throttle body, air by-pass valve and its pipe if any carbon deposit. | Yes | Clean it |
| | | No | Next step |
| 4 | Disconnect connector of water temp. sensor and start engine to check if idle speed is too high. | Yes | Check&repair wiring or replace sensors |
| | | No | Next step |
| 5 | Check ignition timing if it is under technical specifications. | Yes | Next step |
| | | No | Check & repair ignition timing |
| 6 | Turn off ignition, switch on ignition after 3 seconds and restart engine. | Yes | |
| | | No | Check & repair wiring |

| | | | |
|---|---|---|---|
| 6 | Connect PDA and switch on ignition to check ECU-J2-15 pin and J2-18 pin if it is powered normally; Check ECU-J1-9 pin and J2-2 pin if it is connected to ground normally. | Yes | Use PDA to diagnose |
| | | No | Check &repair wiring |

（**11**）RPM cannot go up or engine stop when acceleration

Possible causes：1. Fuel with water；；2.Air intake sensor and TPS；3. Spark plug；4.Throttle body and its idle pipe；5.Intake manifold；6.Air by-pass valve；7. Injector；8.Ignition timing；9. Exhaust pipe

General diagnosis procedures：

| Item No. | Operation procedures | Result | Then |
|---|---|---|---|
| 1 | Check air filter if any blocked, and intake manifold if any leakage. | Yes | Check&repair air intake system |
| | | No | Next step |
| 2 | Use fuel pressure meter and start engine to measure fuel pump pressure. Normal value should be around 330Kpa (3.30Bar) | Yes | Next step |
| | | No | Check&repair fuel supply system |
| 3 | Check spark plug if it's under technical specifications. | Yes | Next step |
| | | No | Adjust or replace |
| 4 | Remove air by-pass valve, check throttle body, air by-pass valve and it pipe if any carbon deposit. | Yes | Clean it |
| | | No | Next step |
| 5 | Check air intake temp. sensor, TPS and its wiring if it is ok. | Yes | Next step |
| | | No | Check&repair wiring or replace sensor |
| 6 | Remove injector and use special cleaning equipment to check if any leakage, blocked or incorrect fuel flow and so on. | Yes | Replace it |
| | | No | Next step |
| 7 | Check fuel quality and if it's caused just after filling fuel. | Yes | Change fuel |
| | | No | Next step |
| 8 | Check ignition order and ignition timing if it is under technical specifications. | Yes | Next step |
| | | No | Check&repair ignition timing |
| 9 | Check exhaust pipe if any leakage or blocked. | Yes | Next step |
| | | No | Repair & replace exhaust pipe |
| 10 | Connect PDA and switch on ignition to check ECU-J2-15 pin and J2-18 pin if it is powered normally; Check ECU-J1-9 pin and J2-2 pin if it is connected to ground normally. | Yes | Use PDA to diagnose |
| | | No | Check&repair wiring |

**（12）Slow acceleration**

Possible causes：1.Fuel with water；2. Air intake pressure sensor and TPS；3. Spark plug；4. Throttle body and its idle pipe；5. Intake manifold；6. Air by-pass valve；7. Injector；8. Ignition timing；9. Exhaust pipe

General operation procedures：

| Item No. | Operation procedures | Result | Then |
|---|---|---|---|
| 1 | Check air filter if any blocked, and intake manifold if any leakage. | Yes | Check&replace air intake system |
| | | No | Next step |
| 2 | Use fuel pressure meter and start engine to measure fuel pump pressure. Normal value should be around 330Kpa (3.30Bar) | Yes | Next step |
| | | No | Check&repair fuel supply system |
| 3 | Check spark plug if it's under technical specifications. | Yes | Next step |
| | | No | Adjust or replace |
| 4 | Remove air by-pass valve, check throttle body, air by-pass valve and it pipe if any carbon deposit.。 | Yes | Clean it |
| | | No | Next step |
| 5 | Check air intake temp. sensor, TPS and its wiring if it is ok. | Yes | Next step |
| | | No | Check&repair wiring or replace sensor |
| 6 | Remove injector and use special cleaning equipment to check if any leakage, blocked or incorrect fuel flow and so on. | Yes | Replace it |
| | | No | Next step |
| 7 | Check fuel quality and if it's caused just after filling fuel. | Yes | Change fuel |
| | | No | Next step |
| 8 | Check ignition order and ignition timing if it is under technical specifications. | Yes | Next step |
| | | No | Check&repair ignition timing |
| 9 | Check exhaust pipe if any leakage or blocked. | Yes | Next step |
| | | No | Repair or replace exhaust pipe |
| 10 | Connect PDA and switch on ignition to check ECU-J2-15 pin and J2-18 pin if it is powered normally; Check ECU-J1-9 pin and J2-2 pin if it is connected to ground normally. | Yes | Use PDA to diagnose |
| | | No | Check&repair wiring |

（13）Power not enough when acceleration and bad performance

Possible causes：1.Fuel with water；2. Air intake pressure sensor and TPS；3. Spark plug；4. Ignition coil；5. Throttle body and its idle pipe；6.Intake manifold；7.Air by-pass valve；8. Injector；9. Ignition timing；10. Exhaust pipe

General operation procedures：

| Item No. | Operation procedures | Result | Then |
|---|---|---|---|
| 1 | Check if any clutch slippery, or tire pressure too low, or brake too tight, or tire size incorrect and so on. | Yes | Repair |
| | | No | Next step |
| 2 | Check air filter if any blocked, and intake manifold if any leakage. | Yes | Check&repair air intake system |
| | | No | Next step |
| 3 | Use fuel pressure meter and start engine to measure fuel pump pressure. Normal value should be around 330Kpa (3.30Bar) | Yes | Next step |
| | | No | Check&repair fuel supply system |
| 4 | Disconnect high-tension cable, and connect spark plug, keep it 5mm away from engine body to check if spark is ok. | Yes | Next step |
| | | No | Check&repair ignition system |
| 5 | Check spark plug if it's under technical specifications. | Yes | Next step |
| | | No | Adjust or replace |
| 6 | Remove air by-pass valve, check throttle body, air by-pass valve and it pipe if any carbon deposit.。 | Yes | Clean it |
| | | No | Next step |
| 7 | Check air intake temp. sensor, TPS and its wiring if it is ok. | Yes | Next step |
| | | No | Check&repair wiring or replace sensor |
| 8 | Remove injector and use special cleaning equipment to check if any leakage, blocked or incorrect fuel flow and so on. | Yes | Replace it |
| | | No | Next step |
| 9 | Check fuel quality and if it's caused just after filling fuel. | Yes | Change fuel |
| | | No | Next step |
| 10 | Check ignition order and ignition timing if it is under technical specifications. | Yes | Next step |
| | | No | Check&repair ignition timing |
| 11 | Check exhaust pipe if any leakage or blocked. | Yes | Next step |
| | | No | Repair or replace exhaust pipe |
| 12 | Connect PDA and switch on ignition to check ECU-J2-15 pin and J2-18 pin if it is powered normally; Check ECU-J1-9 pin and J2-2 pin if it is connected to ground normally. | Yes | Use PDA to diagnose |
| | | No | Check&repair wiring |