

# 2016

## SERVICE MANUAL



**500/700 TBX™/700 TRV®/**  
**700 MUD PRO/1000**



# 2016 500/700 TBX/700 TRV/ 700 Mud Pro/1000 Service Manual

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## General Information/Foreword

This Arctic Cat Service Manual contains service, maintenance, and troubleshooting information for certain 2016 Arctic Cat ATV models (see cover). The complete manual is designed to aid service personnel in service-oriented applications.

This manual is divided into sections. Each section covers a specific ATV component or system and, in addition to the standard service procedures, includes disassembling, inspecting, and assembling instructions. When using this manual as a guide, the technician should use discretion as to how much disassembly is needed to correct any given condition.

This service manual is designed primarily for use by an Arctic Cat CatMaster Basic Level technician. The procedures found in this manual are of varying difficulty, and certain service procedures in this manual require one or more special tools to be completed. The technician should use sound judgment when determining which procedures can be completed based on their skill level and access to appropriate special tools.

### ■NOTE: Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

When replacement of parts is necessary, use only genuine Arctic Cat ATV parts. They are precision-made to ensure high quality and correct fit. Refer to the appropriate Illustrated Parts Manual for the correct part number, quantity, and description.

All Arctic Cat ATV publications and decals display the words Warning, Caution, Note, and At This Point to emphasize important information. The symbol  **WARNING** identifies personal safety-related information. Be sure to follow the directive because it deals with the possibility of severe personal injury or even death. A **CAUTION** identifies unsafe practices which may result in ATV-related damage. Follow the directive because it deals with the possibility of damaging part or parts of the ATV. The symbol ■ **NOTE:** identifies supplementary information worthy of particular attention. The symbol  **AT THIS POINT** directs the technician to certain and specific procedures to promote efficiency and to improve clarity.

At the time of publication, all information, photographs, and illustrations were technically correct. Some photographs used in this manual are used for clarity purposes only and are not designed to depict actual conditions. Because Arctic Cat Inc. constantly refines and improves its products, no retroactive obligation is incurred.

All materials and specifications are subject to change without notice.

Product Service and  
Warranty Department  
Arctic Cat Inc.

## Specifications

### ■NOTE: Specifications subject to change without notice.

| MISCELLANY  |  |
|---|--|
| Tire Size   | Front - 25 x 8-12<br>(Mud Pro) Rear - 25 x 10-12<br>(Mud Pro) Front - 28 x 9-14<br>(Mud Pro) Rear - 28 x 11-14   |
| Tire Inflation Pressure                               | 0.35 kg/cm <sup>2</sup> (5 psi) - FIS/Mud Pro<br>0.49 kg/cm <sup>2</sup> (7 psi) - TRV   |
| Spark Plug Type                                       | NGK CR7E (500)<br>NGK CPR8E (700/1000)   |
| Spark Plug Gap  | 0.7-0.8 mm (0.028-0.031 in.) - 500<br>0.5-0.6 mm (0.019-0.024 in.) - 700/1000  |
| Gas Tank Capacity                                     | 21.6 L (5.7 U.S. gal.) - FIS<br>22 L (5.8 U.S. gal.) - TBX<br>20.1 L (5.3 U.S. gal.) - TRV   |
| Coolant Capacity                                      | 2.9 L (3.0 U.S. qt) - 500/700<br>3.3 L (3.5 U.S. qt) - 1000  |
| Rear Drive Capacity                                   | 250 ml (8.5 fl oz)*  |
| Front Differential Capacity                           | 275 ml (9.3 fl oz)**   |
| Engine Oil Capacity (approx)                          | (500) 2.8 L (3.0 U.S. qt) - Overhaul<br>2.5 L (2.6 U.S. qt) - Change<br>(700) 2.5 L (2.6 U.S. qt) - Overhaul<br>1.9 L (2.0 U.S. qt) - Change<br>(1000) 2.6 L (2.75 U.S. qt) - Overhaul<br>1.9 L (2.0 U.S. qt) - Change |
| Gasoline (recommended)                                | 87 Octane Regular Unleaded   |
| Engine Oil (recommended)                              | Arctic Cat ACX All Weather (Synthetic)   |
| Differential/Rear Drive Lubricant                     | SAE Approved 80W-90 Hypoid   |
| Drive Belt Width                                      | 28.5 mm (1.12 in.) - 500<br>35.0 mm (1.38 in.) - 700<br>35.1 mm (1.38 in.) - 1000  |
| Brake Fluid   | DOT 4  |
| Taillight/Brakelight                                  | 12V/8W/27W   |
| Headlight   | 12V/37W (2) - 500/700<br>12V/27W (2) - 1000  |
| ELECTRICAL SYSTEM                                     |  |
| Ignition Timing                                       | 10° BTDC @ 1500 RPM  |
| Spark Plug Cap  | 4000-6000 ohms   |
| Ignition Coil Resistance (primary)<br>(secondary)     | 0.75 ohms ± 10%<br>N/A   |
| Ignition Coil Primary Voltage                         | Battery Voltage  |
| Stator Coil Resistance (CKP sensor)<br>(AC generator) | 104-156 ohms<br>Less than 1 ohm  |
| Crankshaft Position Sensor AC Voltage                 | 2.0 volts or more  |
| AC Generator Output (no load)                         | 75 AC volts @ 5000 RPM   |

\* One inch below plug threads. \*\* At the plug threads.

# Torque Specifications

■NOTE: Torque specifications have the following tolerances:

| Torque (ft-lb)                 |                               | Tolerance           |     |
|--------------------------------|-------------------------------|---------------------|-----|
| 0-15                           |                               | ±20%                |     |
| 16-39                          |                               | ±15%                |     |
| 40+                            |                               | ±10%                |     |
| EXHAUST COMPONENTS             |                               |                     |     |
| Part                           | Part Bolted To                | Torque<br>ft-lb N-m |     |
| Exhaust Pipe                   | Engine                        | 20                  | 27  |
| Spark Arrester                 | Muffler                       | 48<br>in.-lb        | 5.5 |
| O <sub>2</sub> Sensor          | Muffler                       | 19                  | 26  |
| ELECTRICAL COMPONENTS          |                               |                     |     |
| Coil                           | Air Filter Housing            | 10<br>in.-lb        | 1   |
| STEERING COMPONENTS            |                               |                     |     |
| Bearing Housing                | Frame                         | 20                  | 27  |
| Bearing Flange                 | Frame                         | 20                  | 27  |
| Steering Post Support          | Frame                         | 20                  | 27  |
| Tie Rod End                    | Knuckle/Steering Post         | 30                  | 41  |
| Jam Nut                        | Tie Rod                       | 35                  | 47  |
| EPS Housing                    | Frame                         | 35                  | 47  |
| Steering Post                  | EPS Unit                      | 11                  | 15  |
| Steering Arm                   | EPS Unit                      | 11                  | 15  |
| BRAKE COMPONENTS               |                               |                     |     |
| Brake Disc*                    | Hub                           | 15                  | 20  |
| Brake Hose                     | Caliper/Cylinder              | 20                  | 27  |
| Master Cylinder                | Frame                         | 12                  | 16  |
| Caliper*****                   | Knuckle                       | 20                  | 27  |
| CHASSIS COMPONENTS             |                               |                     |     |
| Brake Pedal                    | Pedal Axle                    | 25                  | 34  |
| Footrest                       | Frame (8 mm)                  | 20                  | 27  |
| Footrest                       | Frame (10 mm)                 | 40                  | 54  |
| Master Cylinder                | Handlebar                     | 72<br>in.-lb        | 8   |
| SUSPENSION COMPONENTS (Front)  |                               |                     |     |
| A-Arm                          | Frame                         | 50                  | 68  |
| Knuckle                        | Ball Joint                    | 35                  | 47  |
| Shock Absorber                 | Frame/Upper A-Arm             | 50                  | 68  |
| Ball Joint                     | A-Arm                         | 50                  | 68  |
| SUSPENSION COMPONENTS (Rear)   |                               |                     |     |
| Shock Absorber (Upper)         | Frame                         | 50                  | 68  |
| Shock Absorber (Lower)         | Lower A-Arm                   | 20                  | 27  |
| A-Arm                          | Frame                         | 50                  | 68  |
| Knuckle                        | A-Arm                         | 50                  | 68  |
| DRIVE TRAIN COMPONENTS         |                               |                     |     |
| Front Differential             | Frame/Differential Bracket    | 38                  | 52  |
| Oil Fill Plug                  | Front Differential/Rear Drive | 16                  | 22  |
| Wheel (Steel)                  | Hub                           | 40                  | 54  |
| Wheel (Aluminum w/black nuts)  | Hub                           | 60                  | 81  |
| Wheel (Aluminum w/chrome nuts) | Hub                           | 80                  | 108 |
| Rear Gear Case                 | Frame                         | 38                  | 52  |
| Hub                            | Shaft/Axle                    | 200                 | 272 |
| Oil Drain Plug                 | Front Differential/Rear Drive | 45<br>in.-lb        | 5   |
| Pinion Housing                 | Differential Housing          | 23                  | 31  |
| Differential Housing Cover***  | Differential Housing          | 23                  | 31  |
| Input Shaft Assembly           | Differential Housing          | 23                  | 31  |

\* w/Blue Loctite #243   \*\* w/Red Loctite #271   \*\*\* w/Green Loctite #609  
\*\*\*\* w/Three Bond Sealant \*\*\*\*\* w/ "Patch-Lock"

| DRIVE TRAIN COMPONENTS (cont)        |  |                            |      |
|--------------------------------------|--|----------------------------|------|
| Part                                 | Part Bolted To                               | Torque<br>ft-lb N-m        |      |
| Thrust Button**                      | Gear Case Cover                              | 8                          | 11   |
| Input Shaft/Housing                  | Gear Case                                    | 23                         | 31   |
| Output Shaft**                       | Rear Gear Case Flange                        | 20                         | 27   |
| Bead Lock                            | Wheel  | 13                         | 17   |
| ENGINE/TRANSMISSION                  |  |                            |      |
| Engine (TRV)                         | Engine Cradle                                | 40                         | 54   |
| Engine Cradle** (TRV)                | Rubber Mount                                 | 25                         | 34   |
| Rubber Mount (TRV)                   | Frame Bracket                                | 35                         | 47   |
| Engine Mounting Through-Bolt (500)   | Frame  | 35                         | 47   |
| Engine Mounting Through-Bolt (700)   | Frame  | 40                         | 54   |
| Engine Mount (Rear) (1000)           | Frame  | 45                         | 61   |
| Cam Sprocket**                       | Camshaft                                     | 10                         | 14   |
| Cylinder                             | Crankcase                                    | 8                          | 11   |
| Valve Cover                          | Cylinder Head                                | 8.5                        | 11.5 |
| Tappet Cover                         | Valve Cover                                  | 8.5                        | 11.5 |
| Cylinder Head (Cap Screw)(500)       | Crankcase                                    | 28                         | 38   |
| Cylinder Head (Cap Screw) (700/1000) | Crankcase<br>(step 1)<br>(step 2)<br>(final) | 20<br>30<br>41<br>37<br>50 | 27   |
| Cylinder Head (Nut) (500)            | Cylinder                                     | 20                         | 27   |
| Cylinder Head Nut (6 mm) (700/1000)  | Cylinder                                     | 8.5                        | 11.5 |
| Cylinder Head Nut (8 mm) (700/1000)  | Cylinder                                     | 18                         | 24.5 |
| Clutch Shoe** (500)                  | Crankshaft                                   | 147                        | 199  |
| Clutch Shoe** (700/1000)             | Crankshaft                                   | 221                        | 300  |
| Driven Pulley** (500)                | Driveshaft                                   | 147                        | 199  |
| Driven Pulley** (700/1000)           | Driveshaft                                   | 162                        | 220  |
| Ground Wire                          | Engine                                       | 8                          | 11   |
| Magneto Cover                        | Crankcase                                    | 10                         | 14   |
| Speed Sensor Housing (700)           | Crankcase                                    | 8.5                        | 11.5 |
| Speed Sensor Housing (1000)          | Crankcase                                    | 10                         | 11   |
| Oil Drain Plug                       | Engine                                       | 16                         | 22   |
| Inner Clutch Cover/Housing (1000)    | Crankcase                                    | 10                         | 14   |
| V-Belt Cover                         | Clutch Cover/Housing                         | 10                         | 14   |
| Movable Drive Face (500)             | Centrifugal Clutch Housing                   | 147                        | 199  |
| Movable Drive Face** (700/1000)      | Centrifugal Clutch Housing                   | 162                        | 220  |
| Starter Clutch**                     | Flywheel                                     | 26                         | 35   |
| Output Shaft Nut**                   | Output Shaft                                 | 59                         | 80   |
| Output Yoke Nut** (700/1000)         | Output Shaft                                 | 200                        | 270  |
| Stator Coil**                        | Magneto Cover (New)                          | 13                         | 18   |
| Stator Coil                          | Magneto Cover (Existing)                     | 11.5                       | 15   |
| Oil Strainer                         | Crankcase                                    | 54<br>in.-lb               | 6    |
| Rotor/Flywheel** (1000)              | Crankshaft                                   | 107                        | 145  |
| Oil Pump** (500/700)                 | Crankcase                                    | 8.5                        | 11.5 |
| Water Pump/Housing (500/700)         | Magneto Cover                                | 8                          | 11   |
| Crankcase Half (6 mm)                | Crankcase Half                               | 10                         | 14   |
| Crankcase Half (8 mm)                | Crankcase Half                               | 21                         | 28   |
| Shift Cam Stopper (700/1000)         | Crankcase                                    | 8                          | 11   |
| Starter Motor                        | Crankcase                                    | 10                         | 14   |
| Shift Cam Plate                      | Shift Cam Shaft                              | 8                          | 11   |
| ENGINE/TRANSMISSION (500)            |  |                            |      |
| Oil Pump Drive Gear**                | Crankshaft                                   | 63                         | 85   |
| Cam Chain Tensioner Guide            | Cylinder Head                                | 11                         | 15   |
| Cam Chain Tensioner                  | Cylinder                                     | 10                         | 14   |
| Water Pump Drive Gear                | Crankshaft                                   | 28                         | 38   |
| Water Pump Cover                     | Water Pump Housing                           | 8                          | 11   |

| ENGINE/TRANSMISSION (700)         |                      |        |      |
|-----------------------------------|----------------------|--------|------|
| Part                              | Part Bolted To       | Torque |      |
|                                   |                      | ft-lb  | N-m  |
| Crankshaft Bushing                | Crankshaft           | 25     | 34   |
| Oil Pump Drive Gear**             | Crank Balancer Shaft | 63     | 85   |
| Outer Magneto Cover               | Left-Side Cover      | 8.5    | 11.5 |
| Secondary Shaft Bearing Housing** | Crankcase Half       | 25     | 34   |
| ENGINE/TRANSMISSION (1000)        |                      |        |      |
| Crankcase Lower Cover (6 mm)      | Crankcase            | 10     | 14   |
| Crankcase Lower Cover (8 mm)      | Crankcase            | 21     | 28   |
| Oil Filler Cover                  | Crankcase            | 8      | 11   |
| V-Belt Housing*                   | Crankcase            | 10     | 14   |
| Intake Manifold                   | Cylinder             | 8      | 11   |
| Oil Pump Cover*                   | Crankcase            | 8      | 11   |
| Shift Cam Stopper Spring          | Shift Cam Stopper    | 8      | 11   |
| Shifter Housing                   | Crankcase            | 10     | 14   |
| Secondary Drive Gear Nut          | Gear                 | 74     | 100  |

## Torque Conversions (ft-lb/N-m)

| ft-lb | N-m  | ft-lb | N-m  | ft-lb | N-m   | ft-lb | N-m   |
|-------|------|-------|------|-------|-------|-------|-------|
| 1     | 1.4  | 26    | 35.4 | 51    | 69.4  | 76    | 103.4 |
| 2     | 2.7  | 27    | 36.7 | 52    | 70.7  | 77    | 104.7 |
| 3     | 4.1  | 28    | 38.1 | 53    | 72.1  | 78    | 106.1 |
| 4     | 5.4  | 29    | 39.4 | 54    | 73.4  | 79    | 107.4 |
| 5     | 6.8  | 30    | 40.8 | 55    | 74.8  | 80    | 108.8 |
| 6     | 8.2  | 31    | 42.2 | 56    | 76.2  | 81    | 110.2 |
| 7     | 9.5  | 32    | 43.5 | 57    | 77.5  | 82    | 111.5 |
| 8     | 10.9 | 33    | 44.9 | 58    | 78.9  | 83    | 112.9 |
| 9     | 12.2 | 34    | 46.2 | 59    | 80.2  | 84    | 114.2 |
| 10    | 13.6 | 35    | 47.6 | 60    | 81.6  | 85    | 115.6 |
| 11    | 15   | 36    | 49   | 61    | 83    | 86    | 117   |
| 12    | 16.3 | 37    | 50.3 | 62    | 84.3  | 87    | 118.3 |
| 13    | 17.7 | 38    | 51.7 | 63    | 85.7  | 88    | 119.7 |
| 14    | 19   | 39    | 53   | 64    | 87    | 89    | 121   |
| 15    | 20.4 | 40    | 54.4 | 65    | 88.4  | 90    | 122.4 |
| 16    | 21.8 | 41    | 55.8 | 66    | 89.8  | 91    | 123.8 |
| 17    | 23.1 | 42    | 57.1 | 67    | 91.1  | 92    | 125.1 |
| 18    | 24.5 | 43    | 58.5 | 68    | 92.5  | 93    | 126.5 |
| 19    | 25.8 | 44    | 59.8 | 69    | 93.8  | 94    | 127.8 |
| 20    | 27.2 | 45    | 61.2 | 70    | 95.2  | 95    | 129.2 |
| 21    | 28.6 | 46    | 62.6 | 71    | 96.6  | 96    | 130.6 |
| 22    | 29.9 | 47    | 63.9 | 72    | 97.9  | 97    | 131.9 |
| 23    | 31.3 | 48    | 65.3 | 73    | 99.3  | 98    | 133.3 |
| 24    | 32.6 | 49    | 66.6 | 74    | 100.6 | 99    | 134.6 |
| 25    | 34   | 50    | 68   | 75    | 102   | 100   | 136   |

## Gasoline - Oil - Lubricant

### FILLING GAS TANK

#### ⚠ WARNING

Always fill the gas tank in a well-ventilated area. Never add gasoline to the ATV gas tank near any open flames or with the engine running. DO NOT SMOKE while filling the gas tank.

Since gasoline expands as its temperature rises, the gas tank must be filled to its rated capacity only. Expansion room must be maintained in the tank particularly if the tank is filled with cold gasoline and then moved to a warm area.

Tighten the gas tank cap securely after filling the tank.

#### ⚠ WARNING

**Do not overflow gasoline when filling the gas tank. A fire hazard could materialize. Always allow the engine to cool before filling the gas tank.**

#### ⚠ WARNING

**Do not over-fill the gas tank.**

### RECOMMENDED GASOLINE

The recommended gasoline to use is 87 minimum octane regular unleaded. In many areas, oxygenates are added to the gasoline. Oxygenated gasolines containing up to 10% ethanol or 5% methane are acceptable gasolines.

When using ethanol blended gasoline, it is not necessary to add a gasoline antifreeze since ethanol will prevent the accumulation of moisture in the fuel system.

#### CAUTION

**Do not use white gas. Only Arctic Cat approved gasoline additives should be used.**

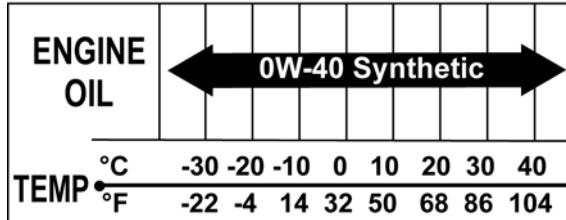
### RECOMMENDED ENGINE/ TRANSMISSION OIL

#### CAUTION

**Any oil used in place of the recommended oil could cause serious engine damage. Do not use oils which contain graphite or molybdenum additives. These oils can adversely affect clutch operation. Also, not recommended are racing, vegetable, non-detergent, and castor-based oils.**

The recommended oil to use is Arctic Cat ACX All Weather synthetic which has been specifically formulated for use in this Arctic Cat engine. Although Arctic Cat ACX All Weather synthetic engine oil is the only oil recommended for use in this engine, use of any API certified SM 0W-40 oil is acceptable.

### Multi-Grade Engine Oil



OILCHARTJ

## **RECOMMENDED FRONT DIFFERENTIAL/REAR DRIVE LUBRICANT**

The recommended lubricant is Arctic Cat Gear Lube or an equivalent gear lube which is SAE approved 80W-90 hypoid. This lubricant meets all of the lubrication requirements of the Arctic Cat ATV front differentials and rear drives.

### **CAUTION**

**Any lubricant used in place of the recommended lubricant could cause serious front differential/rear drive damage.**

**■NOTE: For storage, use a battery maintainer or make sure the battery is fully charged (see Battery section in this manual).**

10. Store the ATV indoors in a level position.

### **CAUTION**

**Avoid storing outside in direct sunlight and avoid using a plastic cover as moisture will collect on the ATV causing rusting.**

## **Preparation For Storage**

### **CAUTION**

**Prior to storing the ATV, it must be properly serviced to prevent rusting and component deterioration.**

Arctic Cat recommends the following procedure to prepare the ATV for storage.

1. Clean the seat cushion (cover and base) with a damp cloth and allow it to dry.
2. Clean the ATV thoroughly by washing dirt, oil, grass, and other foreign matter from the entire ATV. Allow the ATV to dry thoroughly. DO NOT get water into any part of the engine or air intake.
3. Either drain the gas tank or add a fuel stabilizer to the gas in the gas tank.
4. Clean the interior of the air filter housing.
5. Plug the hole in the exhaust system with a clean cloth.
6. Apply light oil to the upper steering post bushing and plungers of the shock absorbers.
7. Tighten all nuts, bolts, cap screws, and screws. Care must be taken that all calibrated nuts, cap screws, and bolts are tightened to specifications.
8. Fill the cooling system to the bottom of the stand pipe in the radiator neck with properly mixed coolant.
9. Disconnect the battery cables (negative cable first); then remove the battery, clean the battery posts and cables, and store in a clean, dry area.

## **Preparation after Storage**

Taking the ATV out of storage and correctly preparing it will assure many miles and hours of trouble-free riding. Arctic Cat recommends the following procedure to prepare the ATV.

1. Clean the ATV thoroughly.
2. Clean the engine. Remove the cloth from the exhaust system.
3. Check all control wires and cables for signs of wear or fraying. Replace if necessary.
4. Change the engine/transmission oil and filter.
5. Check the coolant level and add properly mixed coolant as necessary.
6. Charge the battery; then install. Connect the battery cables making sure to connect the positive cable first.

### **CAUTION**

**Before installing the battery, make sure the ignition switch is in the OFF position.**

7. Check the entire brake systems (fluid level, pads, etc.), all controls, headlights, taillight, brakelight, and headlight aim; adjust or replace if necessary.
8. Check the tire pressure. Inflate to recommended pressure as necessary.
9. Tighten all nuts, bolts, cap screws, and screws making sure all calibrated nuts, cap screws, and bolts are tightened to specifications.
10. Make sure the steering moves freely and does not bind.
11. Check the spark plug. Clean or replace as necessary.
12. Check the air filter and the air filter housing. Clean or replace as necessary.

## Periodic Maintenance/Tune-Up

700

Tighten all nuts, bolts, and cap screws. Care must be taken that all calibrated nuts, bolts, and cap screws are tightened to specifications.

It is advisable to lubricate certain components periodically to ensure free movement. Apply light oil to the components using the following list as reference.

- A. Throttle Lever Pivot/Cable Ends
- B. Brake Lever Pivot/Cable Ends

### SPECIAL TOOLS

A number of special tools must be available to the technician when performing service procedures in this section.

**■NOTE: When indicated for use, each special tool will be identified by its specific name, as shown in the chart below, and capitalized.**

| Description              | p/n      |
|--------------------------|----------|
| Compression Tester Kit   | 0444-213 |
| Oil Filter Wrench        | 0644-389 |
| Spanner Wrench           | 0444-240 |
| Valve Clearance Adjuster | 0444-255 |

**■NOTE: Special tools are available from the Arctic Cat Service Department.**

## Air Filter

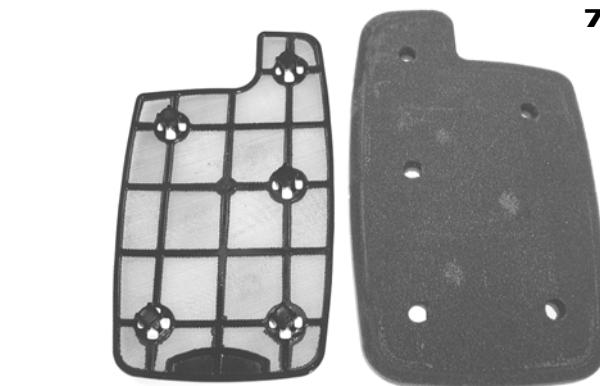
Use the following procedure to remove the filter and inspect and/or clean it.

1. Remove the fasteners securing the storage compartment and remove the storage compartment.
2. Remove the air filter housing cover and the air filter/frame assembly.
3. Remove the foam element from the frame making sure not to tear the element.

500



FI515



CD747



1000

GZ019

4. Fill a wash pan larger than the element with a non-flammable solvent; then dip the element in the solvent and wash it.

**■NOTE: Foam Air Filter Cleaner and Foam Air Filter Oil are available from Arctic Cat.**

5. Squeeze the element by pressing it between the palms of both hands to remove excess solvent. Do not twist or wring the element or it will develop cracks.
6. Dry the element.
7. Put the element in a plastic bag; then pour in air filter oil and work the oil into the element.
8. Squeeze the element to remove excess oil.

### CAUTION

**A torn air filter can cause damage to the ATV engine. Dirt and dust may get inside the engine if the element is torn. Carefully examine the element for tears before and after cleaning it. Replace the element with a new one if it is torn.**

9. Clean any dirt or debris from inside the air cleaner.
10. Install the air filter/frame assembly and cover.
11. Install the storage compartment and cover.

### CHECKING AND CLEANING DRAINS

1. Inspect the drains beneath the main housing for water/oil and for proper sealing.



FI704A

2. Replace any drain that is cracked or shows any signs of hardening or deterioration.

#### CAUTION

**The drain to the right is the clean air section of the filter housing. Any leak of this drain will allow dirt into the engine intake causing severe engine damage.**

3. Wipe any accumulation of oil or gas from the filter housing and drains.

## Valve/Tappet Clearance

To check and adjust valve/tappet clearance, use the following procedure.

1. Remove the timing inspection plug; then remove the tappet covers and spark plug(s) (for more detailed information, see Engine/Transmission - Servicing Top-Side Components).

**■NOTE: On the 1000 models, remove the crankshaft end cap and install the special cap screw (left-hand threads) to rotate the engine.**

2. Rotate the crankshaft to the TDC position on the compression stroke (front cylinder on the 1000 models).



GZ063

**■NOTE: At this point, the rocker arms and adjuster screws must not have pressure on them.**

3. Align the timing mark to the magneto cover mark.

## CHECKING

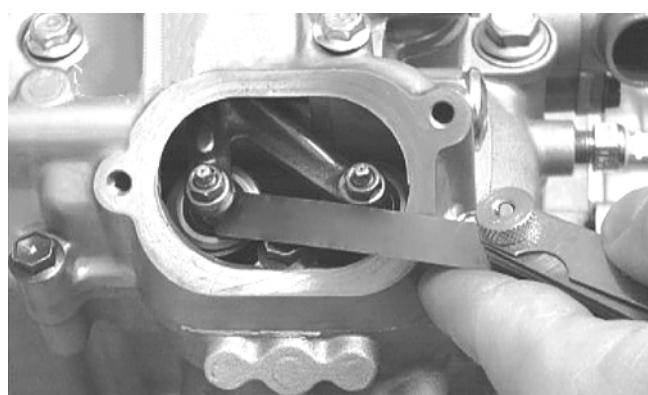
Using a feeler gauge, check each valve/tappet clearance. If clearance is not within specifications, loosen the jam nut and rotate the tappet adjuster screw until the clearance is within specifications. Tighten each jam nut securely after completing the adjustment.

#### CAUTION

**The feeler gauge must be positioned at the same angle as the valve and valve adjuster for an accurate measurement of clearance. Failure to measure the valve clearance accurately could cause valve component damage.**

#### VALVE/TAPPET CLEARANCE

| 500      | 0.08-0.12 mm (0.003-0.005 in.) - Intake<br>0.15-0.20 mm (0.006-0.008 in.) - Exhaust |
|----------|---|
| 700/1000 | 0.08-0.12 mm (0.003-0.005 in.) - Intake<br>0.13-0.17 mm (0.005-0.007 in.) - Exhaust |



CC007D

## ADJUSTING

**■NOTE: The seat, storage compartment cover assembly, compartment box, air filter/filter housing, and left-side/right-side splash panels must be removed for this procedure.**

- Place Valve Clearance Adjuster onto the jam nut securing the tappet adjuster screw; then rotate the valve adjuster dial clockwise until the end is seated in the tappet adjuster screw.
- While holding the valve adjuster dial in place, use the valve adjuster handle and loosen the jam nut; then rotate the tappet adjuster screw clockwise until friction is felt.
- Align the valve adjuster handle with one of the marks on the valve adjuster dial.
- While holding the valve adjuster handle in place, rotate the valve adjuster dial counterclockwise until proper valve/tappet clearance is attained.

**■NOTE: Refer to the appropriate specifications in CHECKING for the proper valve/tappet clearance.**

**■NOTE: Rotating the valve adjuster dial counterclockwise will open the valve/tappet clearance by 0.05 mm (0.002 in.) per mark.**

- While holding the adjuster dial at the proper clearance setting, tighten the jam nut securely with the valve adjuster handle.

F. On the 1000, rotate the engine 270° to the TDC position of the rear cylinder (the stamped "R" must be visible); then repeat steps A-E for the rear cylinder.



GZ059

4. Install the spark plugs and timing inspection plug; then on the 1000 models, remove the cap screw and install the crankcase end cap.

■**NOTE: Apply grease to the end cap to aid in installation.**

5. Place the tappet covers into position making sure the proper cap screws are with the proper cover. Tighten the cap screws securely.

## Testing Engine Compression

1. Remove the high tension lead(s) from the spark plug(s).
2. Using compressed air, blow any debris from around the spark plug(s).

### ⚠ WARNING

Always wear safety glasses when using compressed air.

3. Remove the spark plug(s); then attach the high tension lead(s) to the plug(s) and ground the plug(s) on the cylinder head(s) well away from the spark plug hole(s).
4. Attach the Compression Tester Kit.

■**NOTE: The engine should be warm (operating temperature) and the battery fully charged for an accurate compression test. Throttle must be in the wide-open throttle (WOT) position. In the event the engine cannot be run, cold values are included.**

5. While holding the throttle lever in the full-open position, crank the engine over with the electric starter until the gauge shows a peak reading (five to 10 compression strokes).

| COMPRESSION  |               |                |
|--------------|---------------|----------------|
| Model        | PSI Hot (WOT) | PSI Cold (WOT) |
| 500          | 95-115        | N/A            |
| 700          | 125-145       | 100-140        |
| 1000 (Front) | 125-145       | 80-120         |
| 1000 (Rear)  | 165-185       | 150-190        |

6. If compression is abnormally low, inspect the following items.

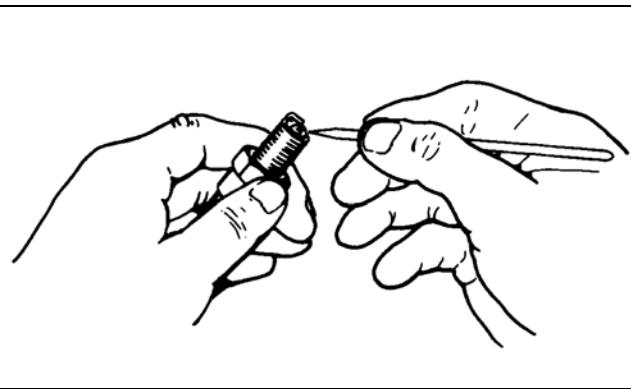
- Verify starter cranks engine over at normal speed (approximately 400 RPM).
- Gauge functioning properly.
- Throttle lever in the full-open position.
- Valve/tappet clearance correct.
- Engine warmed up.
- Intake not restricted.

■**NOTE: To service valves, see Engine/Transmission.**

- Pour 29.5 ml (1 fl oz) of oil into the spark plug hole, reattach the gauge, and retest compression.
- If compression is now evident, service the top end (see Engine/Transmission).

## Spark Plug(s)

A light brown insulator indicates that a plug and the fuel/air ratio are correct. A white or dark insulator indicates that the engine may need to be serviced. To maintain a hot, strong spark, keep the plug free of carbon.

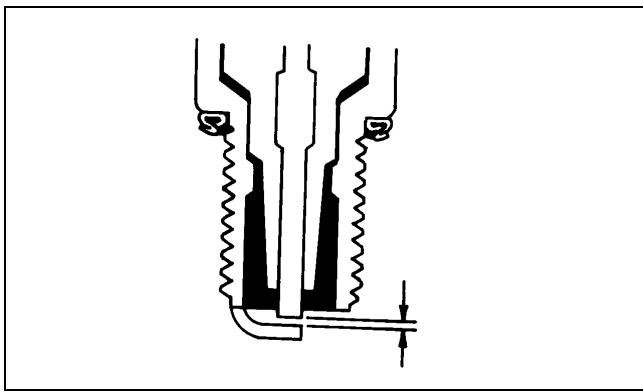


ATV-0051

### CAUTION

Before removing a spark plug, be sure to clean the area around the spark plug. Dirt could enter engine when removing or installing the spark plug.

Adjust the gap to correct specification (see General Information for proper type and gap). Use a feeler gauge to check the gap.



ATV0052

A new spark plug should be tightened 1/2 turn once the washer contacts the cylinder head. A used spark plug should be tightened 1/8 - 1/4 turn once the washer contacts the cylinder head.

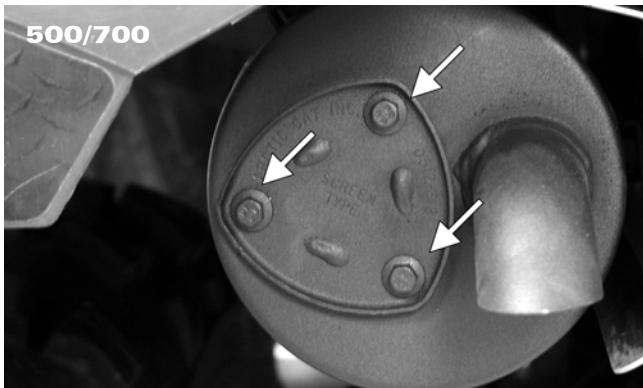
## Muffler/Spark Arrestor

Clean the spark arrester using the following procedure.

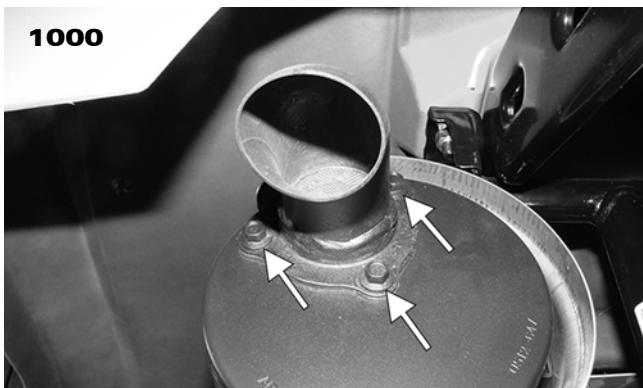
### ⚠ WARNING

**Wait until the muffler cools to avoid burns.**

1. Remove the three cap screws securing the spark arrester assembly to the muffler; then loosen and remove the arrester.



CF105A

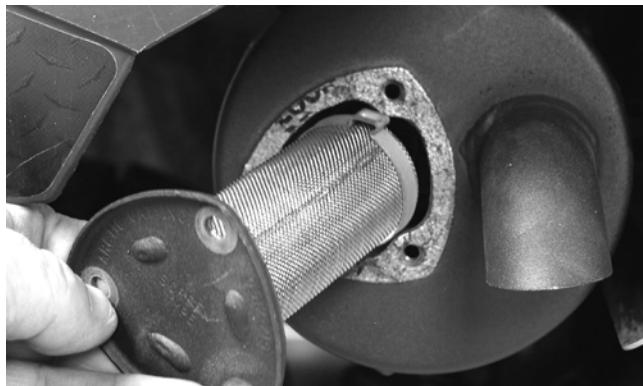


GZ534A

2. Using a suitable brush, clean the carbon deposits from the screen taking care not to damage the screen.

**■NOTE: If the screen or gasket is damaged in any way, it must be replaced.**

3. Install the spark arrester assembly with gasket; then secure with the three cap screws. Tighten to 48 in.-lb.



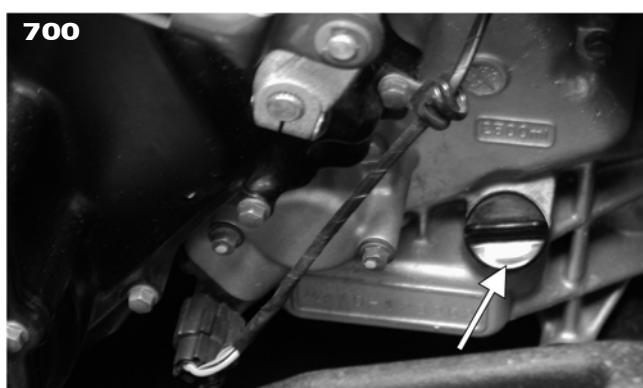
CF104

## Engine/Transmission Oil - Filter

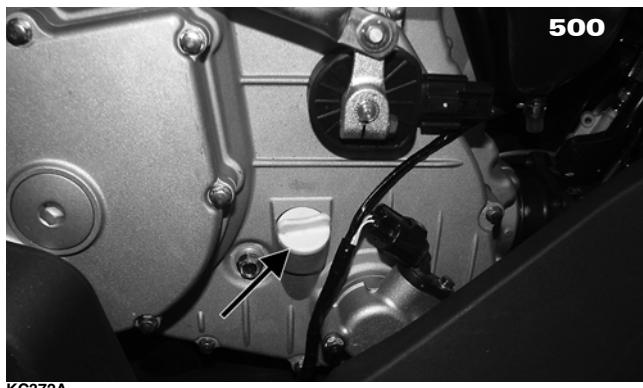
### OIL - FILTER

The engine should always be warm when the oil is changed so the oil will drain easily and completely.

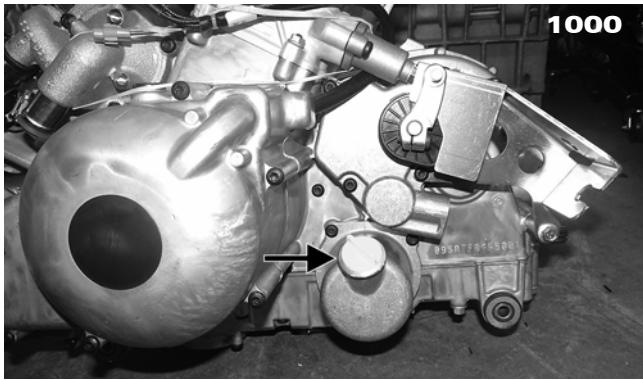
1. Park the ATV on level ground.
2. Remove the oil level stick/filler plug.



CF109M



KC372A

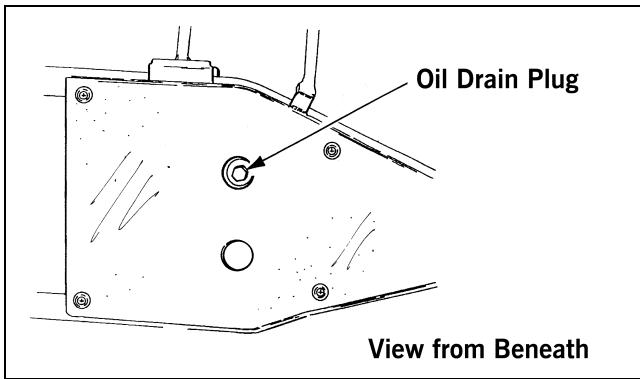


H2-037A

3. Remove the drain plug from the bottom of the engine and drain the oil into a drain pan. Account for and discard the gasket.

### ⚠️ WARNING

**Use extreme caution when removing the oil drain plug. Hot oil can cause severe injury and skin burns.**



733-441A

4. Using the adjustable Oil Filter Wrench and a suitable wrench, remove the old oil filter. Discard the oil filter and O-ring.

**■NOTE: Clean up any excess oil after removing the filter.**

5. Apply oil to a new filter O-ring and check to make sure it is positioned correctly; then install the new oil filter. Tighten securely.

**■NOTE: Install a new O-ring each time the filter is replaced.**

6. Install the engine drain plug and tighten to 16 ft-lb. Pour the specified amount of the recommended oil in the filler hole. Install the oil level stick/filler plug.

### CAUTION

**Any oil used in place of the recommended oil could cause serious engine damage. Do not use oils which contain graphite or molybdenum additives. These oils can adversely affect clutch operation. Also, not recommended are racing, vegetable, non-detergent, and castor-based oils.**

7. Start the engine (while the ATV is outside on level ground) and allow it to idle for a few minutes.
8. Turn the engine off and wait approximately one minute.

9. Remove the oil level stick and wipe it with a clean cloth.

10. Install the oil level stick and thread into the engine case.

11. Remove the oil level stick; the oil level must be within the operating range but not exceeding the upper mark.



GZ461A

### CAUTION

**Do not over-fill the engine with oil. Always make sure that the oil level is not above the upper mark.**

12. Inspect the area around the drain plug and oil filter for leaks.

## Front Differential/Rear Drive Lubricant

**■NOTE: On the 700 Mud Pro/1000 models, the rear drive incorporates a shock-limiting clutch pack in the gear case input assembly that is designed to cushion driveline shock.**

### CAUTION

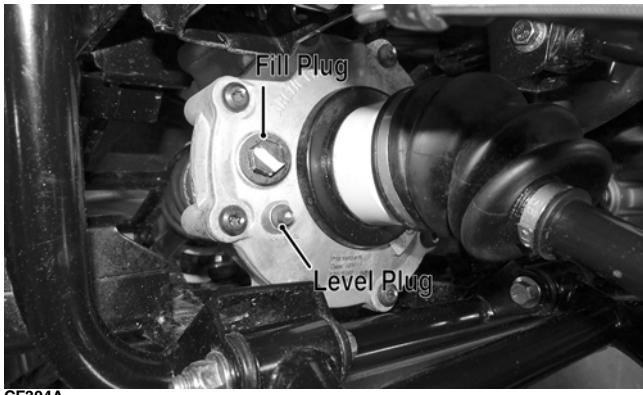
**Any lubricant used in place of the recommended gear lube could result in premature failure of the shock limiter. Do not use any lubricant containing graphite or molybdenum additives or other friction-modified lubricants as these may cause severe damage to shock limiter components.**

When changing the lubricant, use approved SAE 80W-90 hypoid gear lube.

To check lubricant, remove the fill plug; the lubricant level should be 1 in. below the threads of the plug. If low, add SAE approved 80W-90 hypoid gear lubricant as necessary.

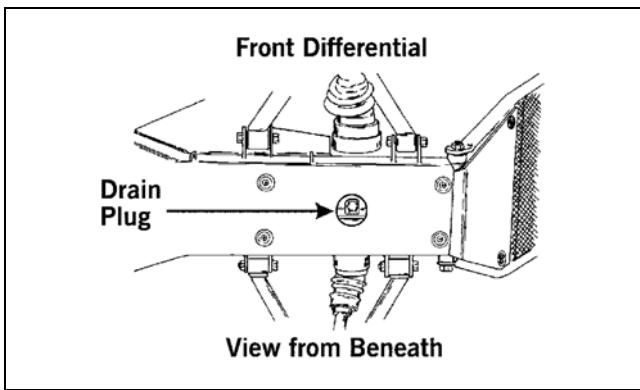
To change the lubricant, use the following procedure.

1. Place the ATV on level ground.
2. Remove each fill plug.

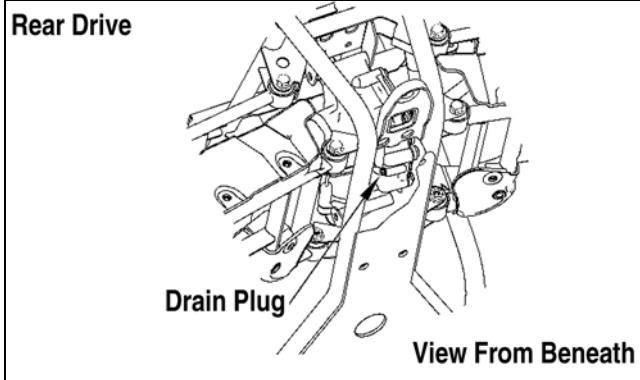


CF304A

3. Drain the lubricant into a drain pan by removing in turn the drain plug from each.



ATV0082A



737-651B

4. After all the lubricant has been drained, install the drain plugs and tighten to 45 in.-lb.
5. Pour the appropriate amount of approved SAE 80W-90 hypoid gear lubricant into the filler hole.
- NOTE: If the differential/rear drive lubricant is contaminated with water, inspect the drain plug, fill plug, and/or bladder.**
6. Install the fill plugs; then tighten to 16 ft-lb.

### CAUTION

**Water entering the outer end of the axle will not be able to enter the rear drive unless the seals are damaged.**

## Shift Lever

### CHECKING ADJUSTMENT



CF356A

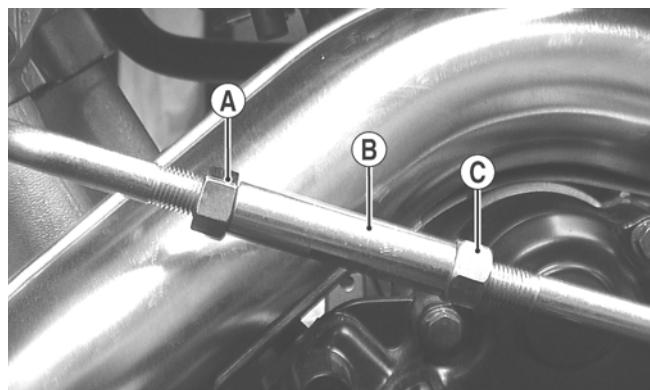
Stop the ATV completely and shift the transmission into the R position.

### WARNING

**Never shift the ATV into reverse gear when the ATV is moving as it could cause the ATV to stop suddenly throwing the operator from the ATV.**

### ADJUSTING SHIFT LEVER

1. Remove the seat; then remove the left-side engine cover.
2. With the ignition switch in the ON position, loosen jam nut (A) (left-hand threads); then loosen jam nut (C) and with the shift lever in the reverse position, adjust the coupler (B) until the transmission is in reverse and the (R) icon appears on the LCD.



CF258A

3. Tighten the jam nuts securely; then shift the transmission to each position and verify correct adjustment.
4. Install the left-side engine cover and seat making sure the seat locks securely in place.

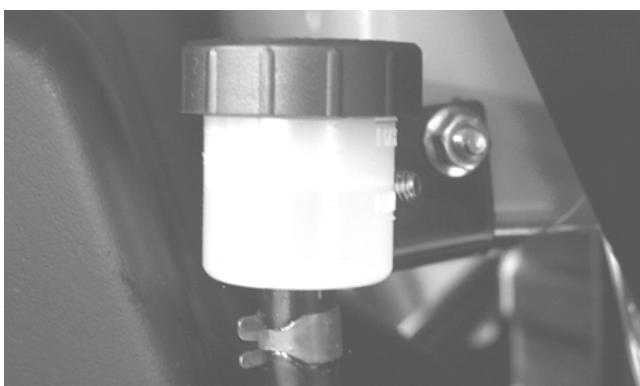
■**NOTE: An E (Error) in the gear position icon indicates no signal or a poor ground wire connection in the circuit. Troubleshoot the harness connectors, gear position switch connector, gear position switch, and LCD connector.**

# Hydraulic Brake Systems

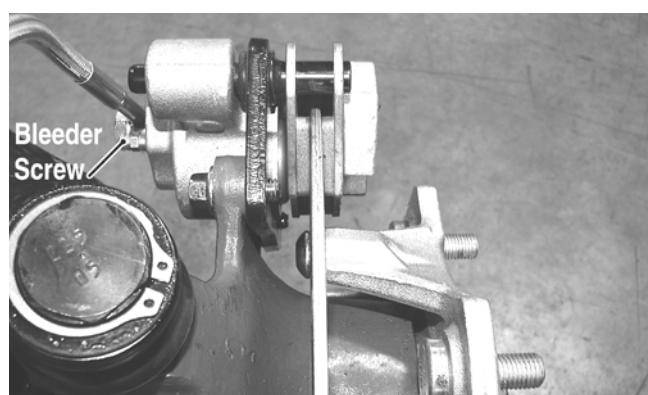
## CHECKING/BLEEDING

The hydraulic brake systems have been filled and bled at the factory. To check and/or bleed a hydraulic brake system, use the following procedure.

1. With the master cylinder in a level position, check the fluid level in the reservoir. On the hand brake if the level in the reservoir is adequate, the sight glass will appear dark. If the level is low, the sight glass will appear clear. On the auxiliary brake, the level must be between the MIN and MAX lines on the reservoir.



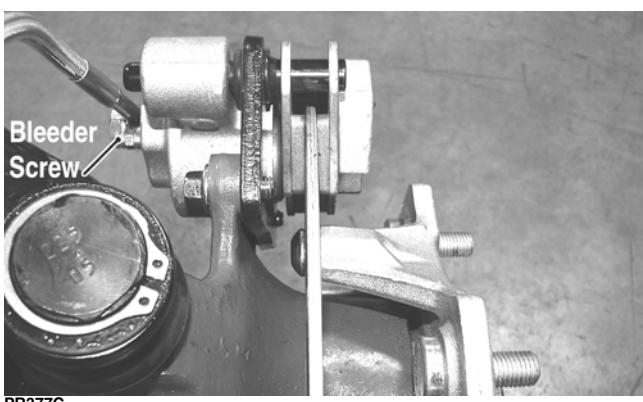
2. Compress the brake lever/pedal several times to check for a firm brake. If the brake is not firm, the system must be bled.
3. To bleed the main brake system, use the following procedure.
  - A. Remove the cover and fill the reservoir with DOT 4 Brake Fluid; then install and secure the cover.
  - B. Slowly compress the brake lever several times.
  - C. Remove the protective cap, install one end of a clear hose onto the REAR bleeder screw, and direct the other end into a container; then while holding slight pressure on the brake lever, open the bleeder screw and watch for air bubbles. Close the bleeder screw before releasing the brake lever. Repeat this procedure until no air bubbles are present.



■**NOTE:** During the bleeding procedure, watch the sight glass very closely to make sure there is always a sufficient amount of brake fluid. If low, refill the reservoir before the bleeding procedure is continued. Failure to maintain a sufficient amount of fluid in the reservoir will result in air in the system.

- D. At this point, perform step B and C on the FRONT LEFT bleeder screw; then move to the FRONT RIGHT bleeder screw and follow the same procedure.
- E. Repeat step D until the brake lever is firm.

4. To bleed the auxiliary brake system, use the following procedure.
  - A. Remove the cover and fill the reservoir with DOT 4 Brake Fluid; then install and secure the cover.
  - B. Slowly compress the brake pedal several times.
  - C. Remove the protective cap, install one end of a clear hose onto the REAR bleeder screw, and direct the other end into a container; then while holding slight pressure on the brake pedal, open the bleeder screw and watch for air bubbles. Close the bleeder screw before releasing the brake pedal. Repeat this procedure until no air bubbles are present.



**■NOTE:** During the bleeding procedure, watch the reservoir very closely to make sure there is always a sufficient amount of brake fluid. If low, refill the reservoir before the bleeding procedure is continued. Failure to maintain a sufficient amount of fluid in the reservoir will result in air in the system.

- D. Repeat step B and C until the brake pedal is firm.
5. Carefully check the entire hydraulic brake system that all hose connections are tight, the bleed screws are tight, the protective caps are installed, and no leakage is present.

### CAUTION

This hydraulic brake system is designed to use DOT 4 brake fluid only. If brake fluid must be added, care must be taken as brake fluid is very corrosive to painted surfaces.

### INSPECTING HOSES

Carefully inspect the hydraulic brake hoses for cracks or other damage. If found, the brake hoses must be replaced.

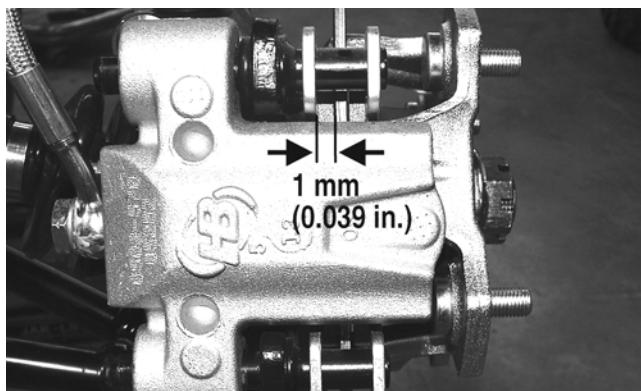
### CHECKING/REPLACING PADS

The clearance between the brake pads and brake discs is adjusted automatically as the brake pads wear. The only maintenance that is required is replacement of the brake pads when they show excessive wear. Check the thickness of each of the brake pads as follows.

**■NOTE:** As brake pads wear, it may be necessary to "top-off" the brake fluid in the reservoir.

1. Remove a front wheel.
2. Measure the thickness of each brake pad.

3. If thickness of either brake pad is less than 1.0 mm (0.039 in.), the brake pads must be replaced.

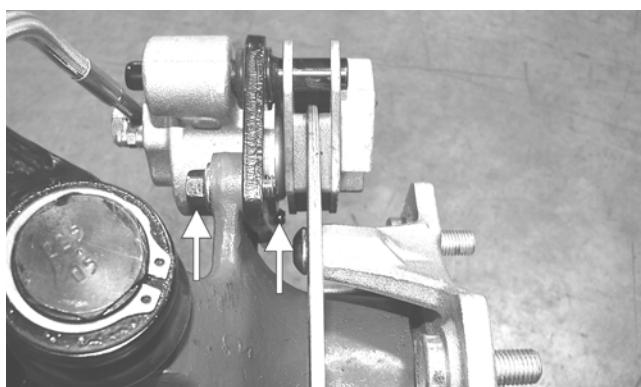


**■NOTE: The brake pads should be replaced as a set.**

4. To replace the brake pads, use the following procedure.
- A. Remove the wheel.
- B. Remove the cap screws securing the caliper holder to the knuckle; then remove the pads.



- C. Install the new brake pads.
- D. Secure the caliper to the knuckle and/or axle housing with new "patch-lock" cap screws. Tighten to 20 ft-lb.



- E. Install the wheel; then using a crisscross pattern, tighten the wheel nuts in 20 ft-lb increments to a final torque of 40 ft-lb (steel wheel), 60 ft-lb (aluminum wheel w/black nuts), or 80 ft-lb (aluminum wheel w/chrome nuts).
5. Burnish the brake pads (see Burnishing Brake Pads in this section).

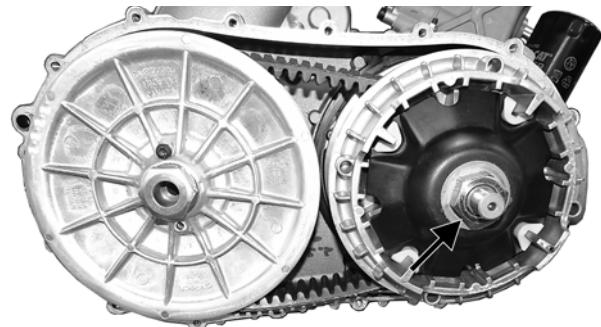
## Burnishing Brake Pads

Brake pads (both main and auxiliary) must be burnished to achieve full braking effectiveness. Braking distance will be extended until brake pads are properly burnished.

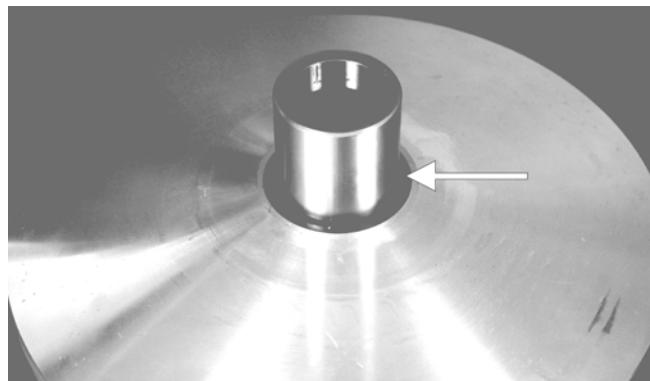
### **WARNING**

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

1. Choose an area large enough to safely accelerate the ATV to 30 mph and to brake to a stop.
2. Accelerate to 30 mph; then release the throttle lever and compress brake lever or apply the auxiliary brake to decelerate to 0-5 mph.
3. Repeat procedure on each brake system twenty times.
4. Verify that the brakelight illuminates when the hand lever is compressed or the brake pedal is depressed.



CF364A

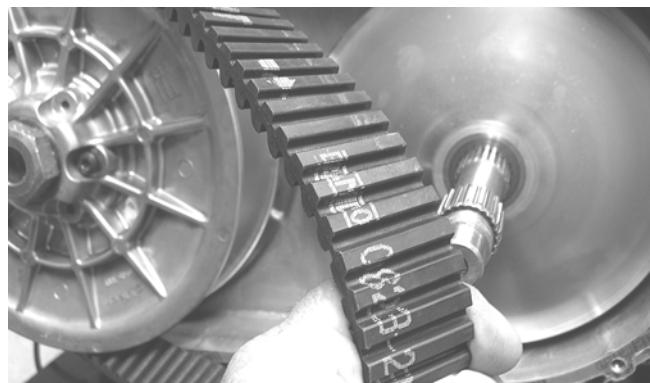


CD966A

4. Install one of the CVT cover cap screws into the driven pulley fixed face; then turn the cap screw clockwise to spread the pulley faces. Remove the V-belt.



GZ076



GZ085

CF363

3. Remove the nut securing the movable drive face; then remove the face. Account for the spacer.

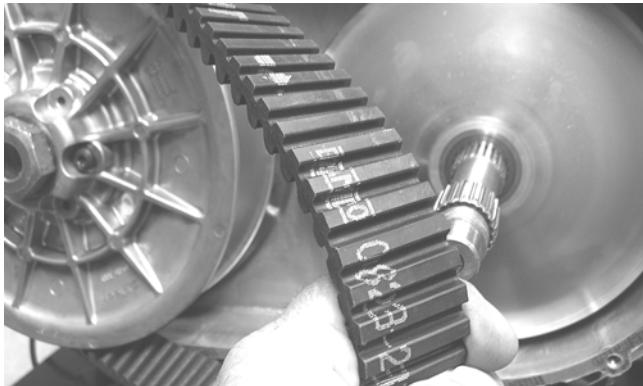
**■NOTE: Keep the drive face plate in contact with the drive face when removing or installing the drive face to prevent the rollers from falling out.**

## CHECKING

Use the Drive Belt Gauge to identify any abnormal wear. Measure across the top of the V-belt (in multiple locations) using a Vernier caliper. Do not squeeze the belt as doing so may produce an inaccurate measurement. The V-belt must be at least 28.5 mm (500), 35.0 mm (700), or 35.1 mm (1000) at any point.

## INSTALLING

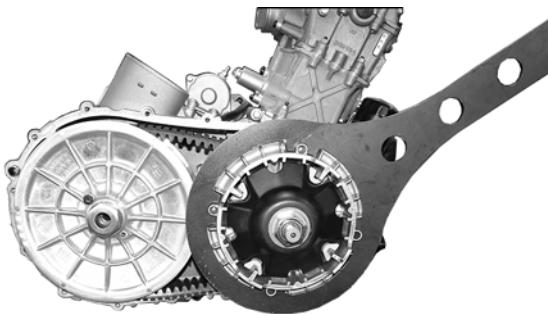
1. Place the V-belt into position on the driven pulley and over the front shaft.



GZ085

■**NOTE:** The arrows on the V-belt should point in direction of engine rotation (forward).

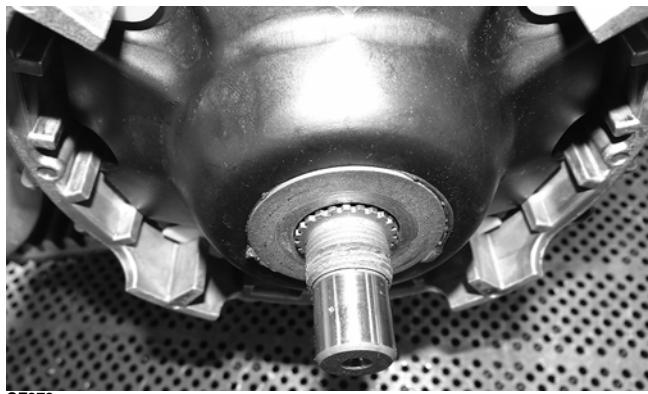
2. Pinch the V-belt together near its center and slide the spacer and movable drive face onto the front shaft. Secure the drive face with a new nut. Using an appropriate spanner wrench, tighten the nut to 147 ft-lb (500) or 162 ft-lb (700/1000).



CF366

### CAUTION

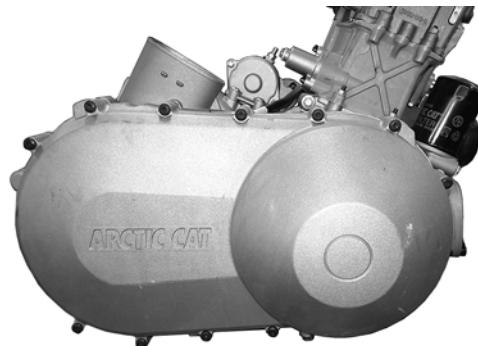
**Make sure the movable drive face plate is fully engaged onto the splines of the clutch shaft before tightening the nut or false torque readings may occur. This will cause the assembly to loosen damaging the shaft and clutch face plate.**



CF379

■**NOTE:** At this point, the CVT cover cap screw can be removed.

3. With the vehicle in neutral, rotate the V-belt and clutches counterclockwise until the V-belt is flush with the top of the driven pulley.
4. Place the CVT cover gasket into position; then install the cover and secure with the cap screws making sure the different-lengthed cap screws are in their proper location. Tighten the cap screws to 10 ft-lb.



CF363

5. Install the right-side footrest (see Steering/Body/Controls).
6. Secure the front fender to the footrest with the two cap screws. Tighten securely.

## Steering/Body/Controls

The following steering components should be inspected periodically to ensure safe and proper operation.

- A. Handlebar grips not worn, broken, or loose.
- B. Handlebar not bent, cracked, and has equal and complete full-left and full-right turning capability.
- C. Steering post bearing assembly/bearing housing not broken, worn, or binding.
- D. Ball joints not worn, cracked, or damaged.
- E. Tie rods not bent or cracked.
- F. Knuckles not worn, cracked, or damaged.
- G. Cotter pins not damaged or missing.

The frame, welds, and racks should be checked periodically for damage, bends, cracks, deterioration, broken components, and missing components.

2. Unlock the storage compartment lid; then slide the storage compartment cover assembly forward and lift off the storage compartment.



FI467

3. Remove the storage compartment box; then remove the seat.



FI468

4. Remove the ignition switch retaining ring and two reinstallable rivets securing the instrument pod; then remove the instrument pod.



FI463A



FI465A



FI466A



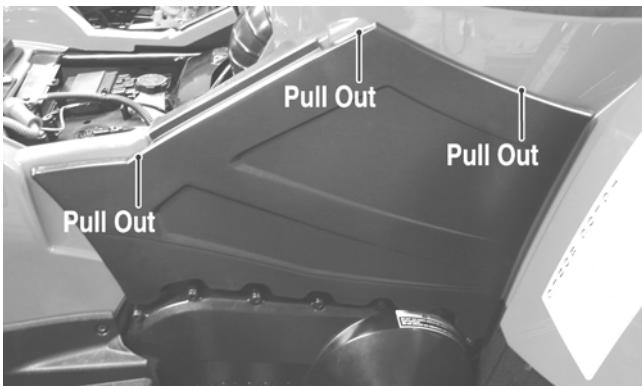
FI464A

5. Remove the cap screws and lock nuts securing the front rack to the frame; then remove the front rack. Account for the grommets and bushings.

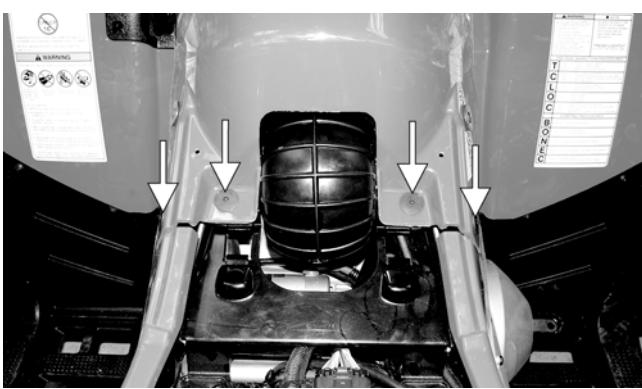


FI469A

6. Remove the side panels by pulling on them to release the tabs from the body; then remove the screws securing the rear of the front panel to the frame.

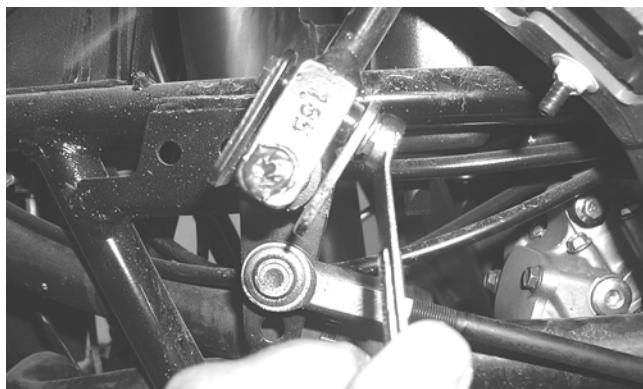


CF237A

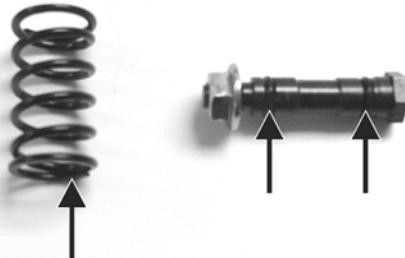


FI470A

7. Remove the left and right footwells; then remove the shift knob. Remove the shift lever pivot axle nut and remove the axle and shift lever. Account for a spring and two O-rings.



CD779



CD780A

8. Disconnect four headlight connectors and secure the wires out of the way; then disconnect the wires to the front accessory plug.



CD681

9. Rotate the handlebar to the full-left position; then lift and slide the panel to the rear and lift the rear up to clear the handlebar.



**■NOTE: It may be necessary to rotate the body panel to the right to align the opening with the handlebar.**

### CLEANING AND INSPECTING

1. Clean all fender components with warm soap and water.
2. Inspect fenders for cracks.
3. Inspect for any missing decals.

### INSTALLING

1. Rotate the handlebar to the full-left position; then place the front body panel over the handlebar and rotate and lower into position.

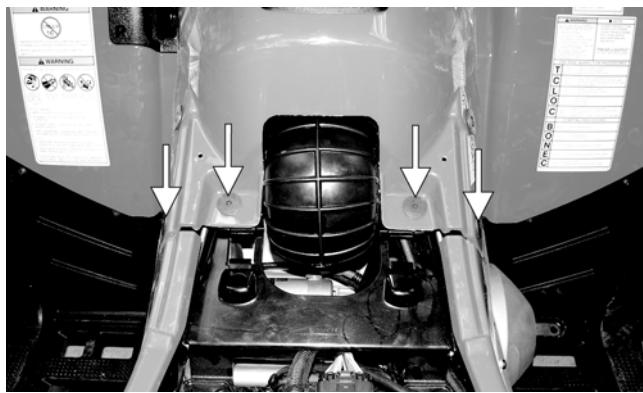


2. Connect the headlight connectors to the appropriate headlights and the front accessory plug wires to the accessory plug.

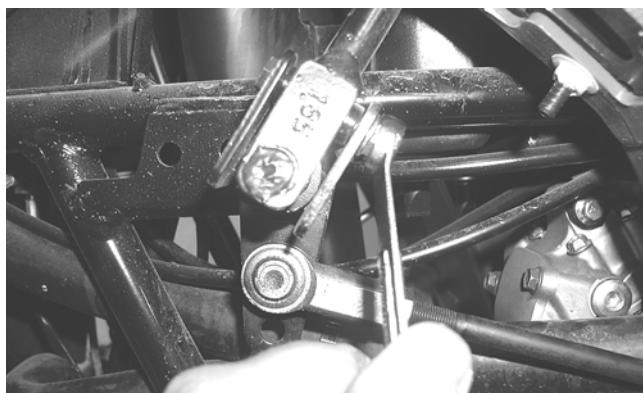


3. Make sure the rubber grommets and bushings are in place; then place the front rack into position and secure with the cap screws and lock nuts. Tighten securely.

4. Install the footwells and foot rests. Tighten securely.
5. Install the cap screws securing the front body panel to the frame and rear panel.



6. Install the shift lever spring, shift lever, and pivot axle; then tighten the axle nut securely.



7. Install the instrument pod and ignition switch; then secure with two reinstallable rivets and the ignition switch retaining ring.
8. Set the storage compartment box into position; then install the storage compartment cover making sure the mounting tabs engage the slots. Slide rearward to secure and lock by engaging the lid lock.





FI467

9. Install the steering post cover and secure with the reinstallable rivets; then install and secure the radiator access panel.



FI466A



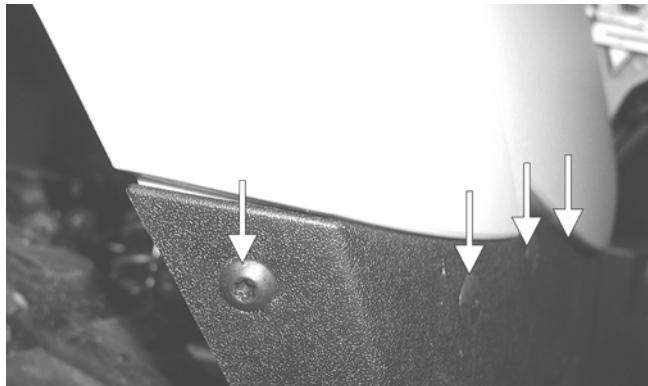
FI465A

10. Install the side panels.

## Rear Body Panel/Rack

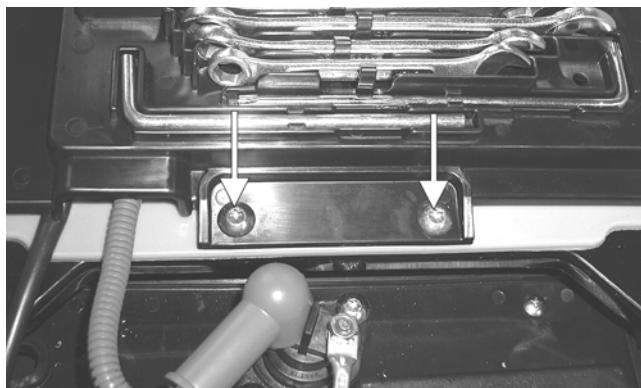
### REMOVING

1. Remove the cap screws and lock nuts securing the rear rack; then remove the rear rack. Account for the bushings.
2. Remove one shoulder screw and lock nut and three plastic rivets (on each side) securing the rear body panel to the footwells.



CD691A

3. Remove two machine screws securing the battery cover and remove the cover.



CD687A

4. Disconnect the battery (negative cable first); then remove the battery.
5. Disconnect the taillight/brakelight; then remove the gas tank cap and lift off the rear body panel. Install the gas tank cap.

■**NOTE: If the front body panel has not been removed, the left-side and right-side panels and the two machine screws must be removed (see Front Body Panel/Side Panels in this section).**

### CLEANING AND INSPECTING

1. Clean all rear body panel components with warm soap and water.
2. Inspect side panels and rear body panel for cracks.
3. Inspect threaded areas of all mounting bosses for stripping.
4. Inspect for missing decals.

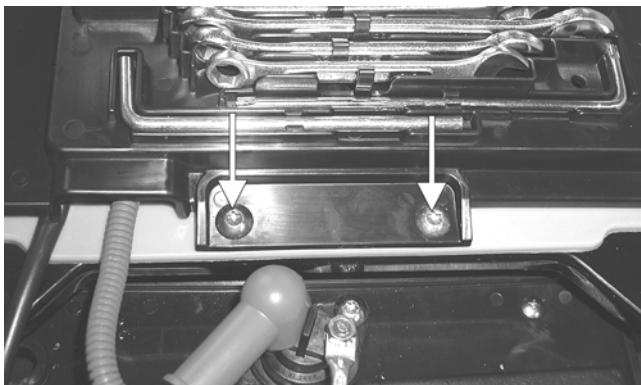
### INSTALLING

1. Remove the gas tank cap and set the rear body panel in position; then install the cap and connect the tail-light/brakelight connector.
2. Place the rear rack in position with the bushings and secure with the cap screws and lock nuts. Tighten securely.
3. Install one shoulder screw and three plastic rivets (on each side) to secure the front of the rear body panel to the footwells.



CD691

4. Place the battery into the battery box; then connect the battery (positive cable first) and secure with the battery cover.



CD687A

5. Secure the front and rear panels with two machine screws; then install the left and right side panels.

**■NOTE: If the front body panel has not been installed, see Front Body Panel/Side Panels in this section.**

6. Place the seat into position making sure it locks securely.

## LCD Gauge

### REPLACING

1. Remove the two reinstallable rivets securing the instrument pod; then remove the ignition switch retaining ring.
2. Remove the two nuts securing the mounting studs; then remove the gauge and disconnect the multi-pin connector.
3. Mount the gauge and secure with the two nuts; then connect the multi-pin connector.
4. Install the instrument pod and secure with the reinstallable rivets.
5. Secure the ignition switch with the retaining ring.

## Steering Post/Tie Rods

### REMOVING

1. Remove the ignition switch retaining ring; then remove the reinstallable rivets securing the instrument pod to the mounting bracket and remove the pod and LCD gauge.



FI463A



FI464A

2. Remove the reinstallable rivets securing the radiator access cover and remove the cover.



FI465A

3. Remove four reinstallable rivets securing the steering post cover and remove the cover.



FI466A

4. Unlatch the storage compartment lid; then slide the storage compartment cover assembly forward and lift off.



FI467A

5. Remove the storage compartment.



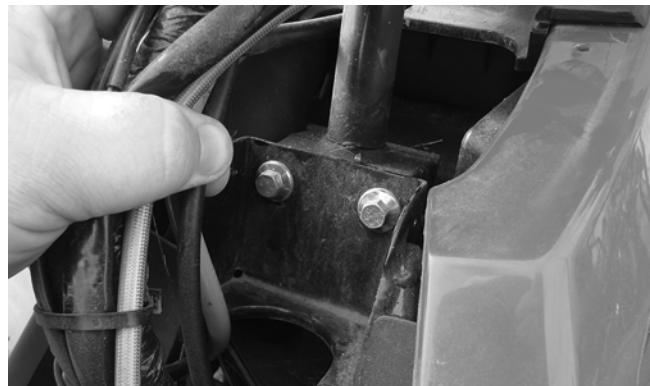
FI468

6. Remove the four cap screws securing the handlebar caps and LCD gauge bracket to the steering post; then move the handlebar and gauge out of the way. Account for four handlebar caps.



CF659

7. Remove two cap screws securing the upper steering post bearing to the frame. Account for two housings.

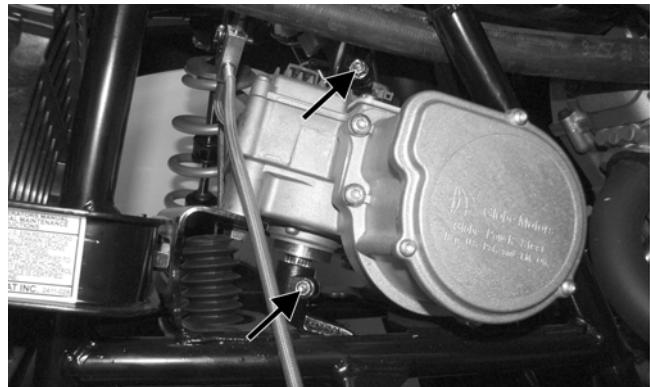


CF660

8. Using a suitable lift stand, raise the ATV enough to remove the front wheels.

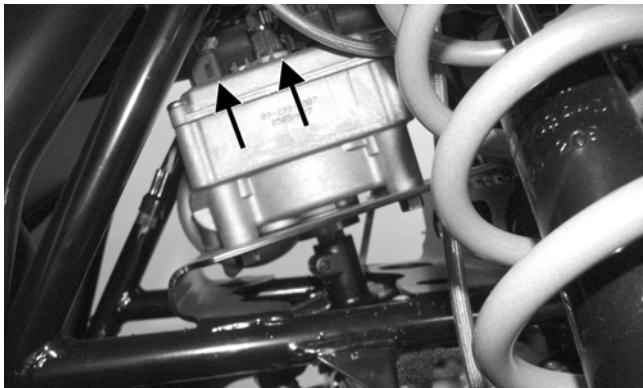
**■NOTE: For models not equipped with electronic power steering, proceed to step 13.**

9. Remove the left front shock absorber; then remove the cap screws and nuts from the steering post to the EPS couplers.



EPS005A

10. Pull upward on the handlebar to disengage the upper coupler from the EPS assembly.
11. Disconnect the 2-pin and 8-pin connectors from the top of the EPS housing.

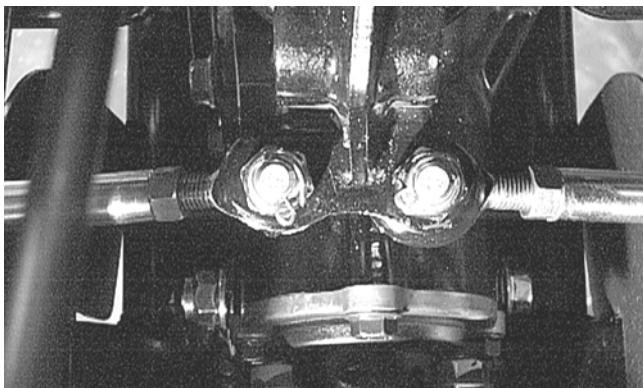


12. Remove four cap screws securing the EPS housing to the frame; then lift the assembly upward sufficiently to disengage the lower coupler and remove from the left side.

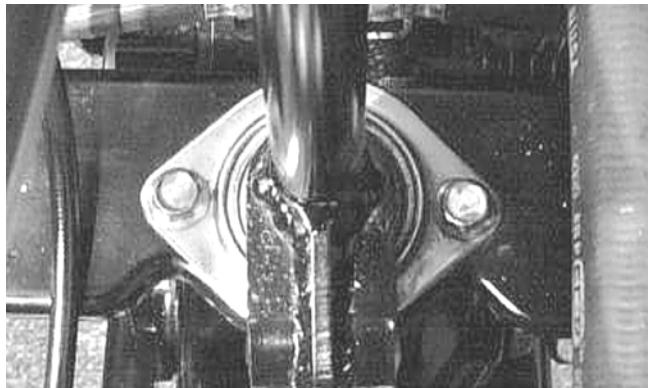
**CAUTION**

**Do not attempt to disassemble the EPS assembly as there are no serviceable components within the assembly and damage will occur voiding the EPS warranty.**

13. Remove the cotter pins and slotted nuts from the inner and outer tie rod ends; then remove the tie rods from the steering post arm and the left-side and right-side steering knuckles.



14. Remove two cap screws securing the lower steering post bearing flange to the frame; then remove the steering post.



**CLEANING AND INSPECTING**

1. Clean and inspect the pivot area for wear. Apply a low-temperature grease to the ends.

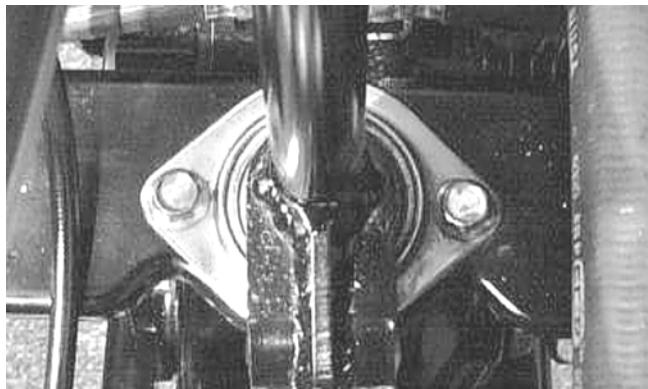
**WARNING**

**Always wear safety glasses when using compressed air.**

2. Inspect the tie rods for damaged threads or wear.
3. Inspect the tie rods for cracks or unusual bends.
4. Inspect all welded areas for cracks or deterioration.
5. Inspect the steering post and steering-post brackets for cracks, bends, or wear.
6. Inspect the bearing halves, bearing caps, and bearing housings for cracks or wear.
7. Inspect the handlebar tube for cracks, wear, or unusual bends.
8. Inspect the handlebar grips for damage or wear.

**INSTALLING (Models Without Electronic Power Steering)**

1. Place the steering post into position; then secure the lower bearing flange to the frame with two cap screws. Tighten to 20 ft-lb.



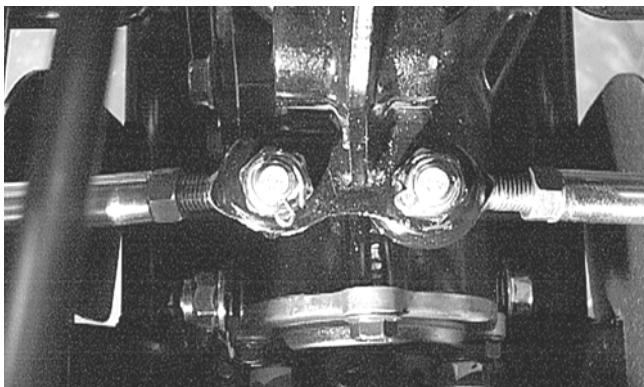
2. Place the upper steering post bearings into the housings; then position on the steering post and secure the housings to the frame with two cap screws. Tighten to 20 ft-lb.



CD760

3. Install the tie rods and secure with the slotted nuts. Tighten to 30 ft-lb; then install new cotter pins.

**■NOTE: If the slots do not align with the holes in the tie rod ends, tighten the nuts just enough to allow installation of the cotter pins.**



AF778D

4. Install the front wheels using a crisscross pattern, tighten the wheel nuts in 20 ft-lb increments to a final torque of 40 ft-lb (steel wheel), 60 ft-lb (aluminum wheel w/black nuts), or 80 ft-lb (aluminum wheel w/chrome nuts).
5. Lower the ATV and place the handlebar and caps into position on the steering post; then position the bracket on top of the caps and secure with the four cap screws. Tighten securely.
6. Install the storage compartment box; then attach the storage compartment cover assembly by engaging the tabs into the slots and sliding rearward. Lock the storage compartment lid to hold the assembly in place.
7. Place the instrument pod into position; then secure with two reinstallable rivets and the ignition switch retaining ring.



FI464A



FI463A

8. Install the steering post access cover and secure with four reinstallable rivets; then install and secure the radiator access cover.



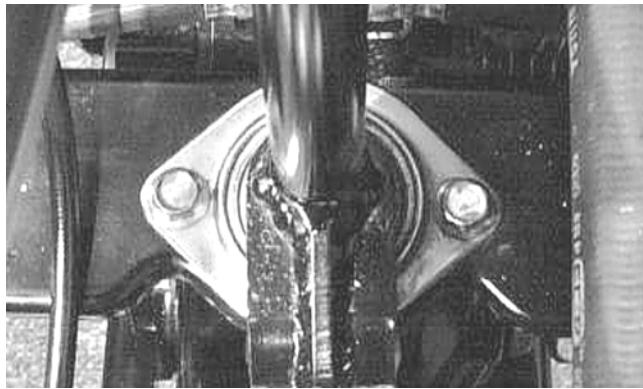
FI466A



FI465A

## INSTALLING (Electronic Power Steering Models)

1. Place the lower steering post into position; then secure the lower bearing flange to the frame with two cap screws. Tighten to 20 ft-lb.



2. Making sure the double spline is aligned to the slot in the lower coupler, install the EPS output shaft into the lower coupler; then install the four caps screws securing the EPS housing to the frame. Tighten to 35 ft-lb.

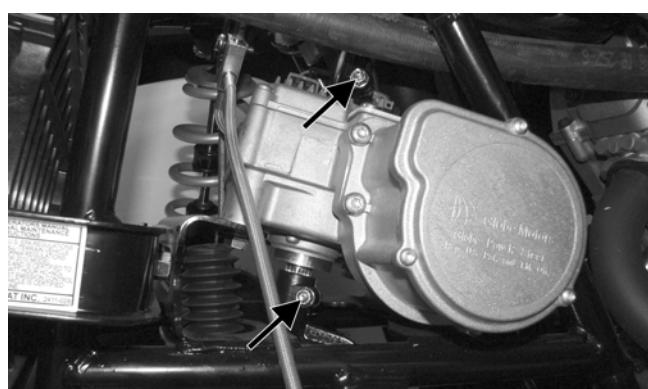
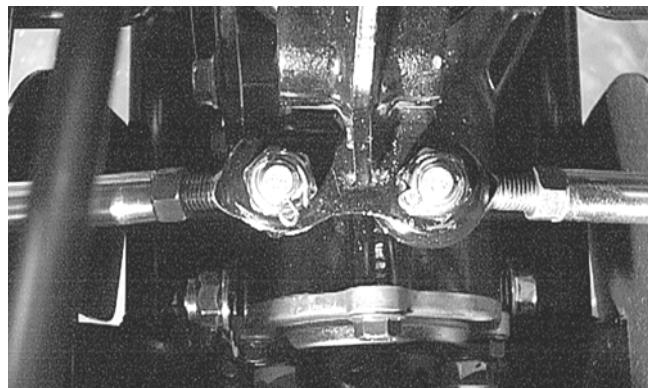


EPS008A



3. Install the tie rods and secure with the slotted nuts. Tighten to 30 ft-lb; then install new cotter pins.

**■NOTE: If the slots do not align with the holes in the tie rod ends, tighten the nuts just enough to allow installation of the cotter pins.**

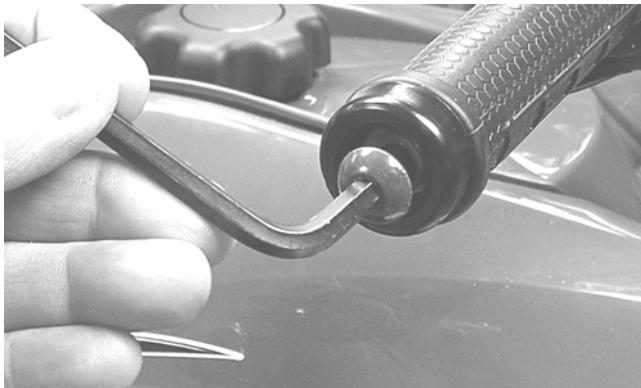


4. Connect the 2-pin and 8-pin connectors to the EPS assembly.
5. Install the upper steering post support to the frame and secure with two cap screws. Tighten to 20 ft-lb.
6. Install the storage compartment, steering post and radiator access panels, and storage compartment cover; then install the shock absorber and tighten to 50 ft-lb.
7. Install the front wheels using a crisscross pattern, tighten the wheel nuts in 20 ft-lb increments to a final torque of 40 ft-lb (steel wheel), 60 ft-lb (aluminum wheel w/black nuts), or 80 ft-lb (aluminum wheel w/chrome nuts).

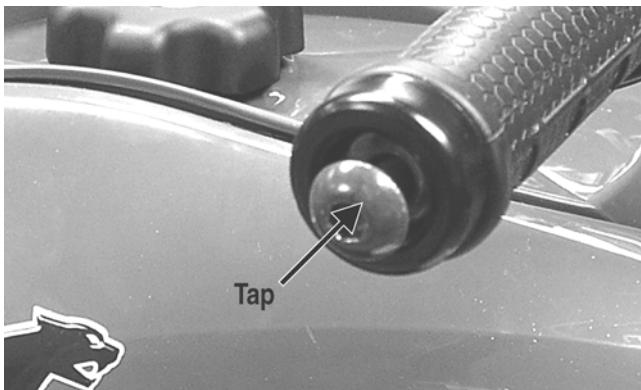
## Handlebar Grip

### REMOVING

1. Loosen but do not remove the cap screws in the end of the handlebar; then tap lightly on the head to dislodge the handlebar plug.



KC310



KC309A

2. Grasp the end and remove the cap screw, plug, and end cap.

## INSPECTING

1. Inspect the grip for wear, cuts, or cracks.
2. Inspect the grip for deterioration.
3. If a grip is damaged, cut the grip lengthwise using a sharp knife or box cutter; then peel off the grip.

## INSTALLING

**■NOTE: Before installing a grip, use contact removal spray or alcohol to clean the handlebar of glue residue, oil, or any other contaminant.**

1. Apply a liberal amount of Handlebar Grip Adhesive to the inside of a new grip.
2. Slide the grip onto the handlebar until it is fully seated with the smooth part of the grip facing up.
3. Wipe off any excess glue; then secure the grip with the handlebar end-cap.

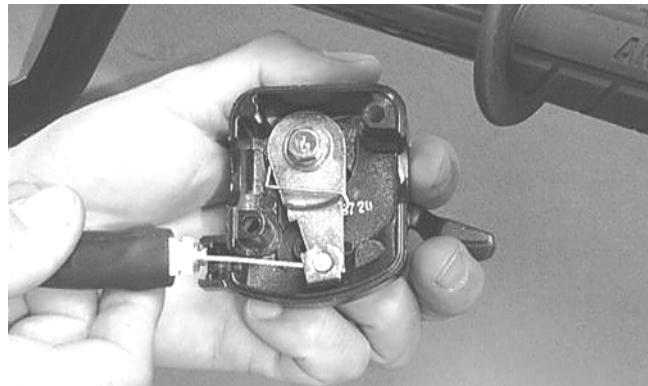
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## Throttle Control

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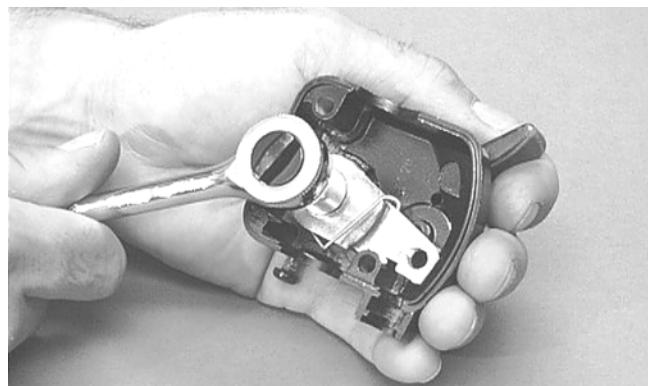
### REMOVING

1. Remove the two machine screws securing the throttle control to the handlebar.
2. Slide the grommet out of the lower half of the throttle control; then remove the cable from the actuator arm.



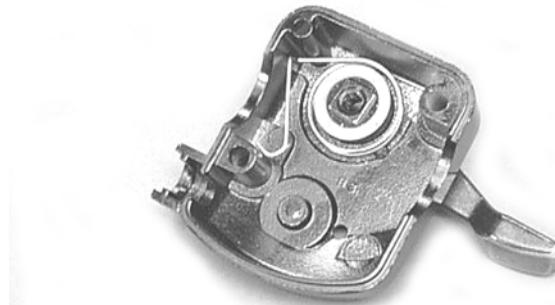
AF676D

3. Remove the cap screw, lock washer, and washer securing the actuator arm to the throttle control lever.



AF677D

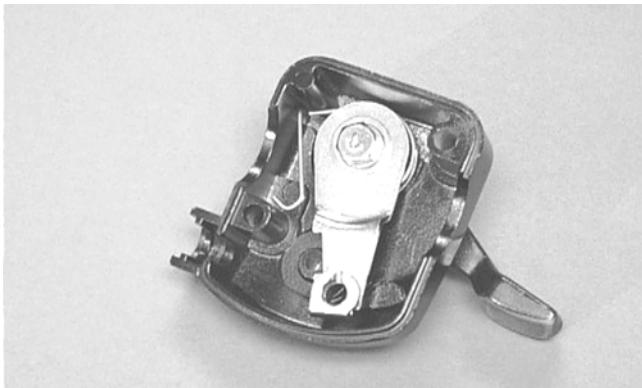
4. Remove the actuator arm and account for a bushing. Note the position of the return spring for installing purposes.



AF678D

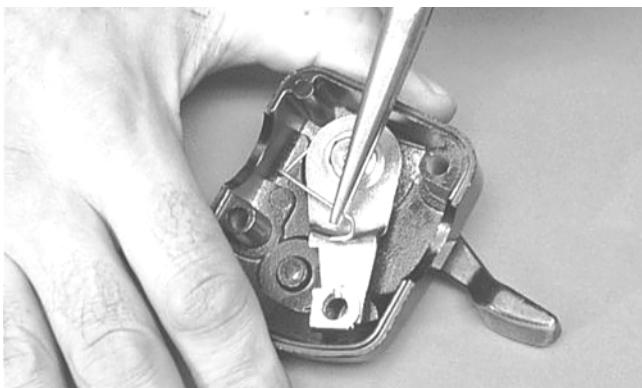
## INSTALLING

1. Place the return spring into the throttle control; then place the bushing and actuator arm into position. Secure with the cap screw, lock washer, and washer.



AF679D

2. Using a pair of needle-nose pliers, place the spring into position on the actuator arm.



AF680D

3. Place the two halves of the throttle control onto the handlebar and secure with the two machine screws.

## ADJUSTING

To adjust throttle cable free-play, see Fuel/Lubrication/Cooling.

## Steering Knuckles

### REMOVING AND DISASSEMBLING

1. Secure the ATV on a support stand to elevate the wheel; then remove the wheel.

#### ⚠ WARNING

Make sure the ATV is solidly supported on the support stand to avoid injury.

2. Remove the wheel cap from the hub; then remove the cotter pin from the nut.
3. Remove the nut securing the hub.
4. Remove the brake caliper.

■**NOTE: Do not allow the brake caliper to hang from the cable/hose.**

5. Remove the hub assembly.
6. Remove the cotter pin from the tie rod end and remove the tie rod end from the knuckle.
7. Remove the two cap screws securing the ball joints in the knuckle.

8. Tap the ball joint end out of the knuckle; then remove the knuckle.

9. Remove the snap ring from the knuckle; then remove the bearing.



PR287A



PR288

#### CAUTION

Use extreme care when removing the bearing. If the bearing is allowed to fall, it will be damaged and will have to be replaced.

### CLEANING AND INSPECTING

1. Clean all knuckle components.
2. Inspect the bearing for pits, gouges, rusting, or premature wear.
3. Inspect the knuckle for cracks, breaks, or porosity.
4. Inspect threads for stripping or damage.

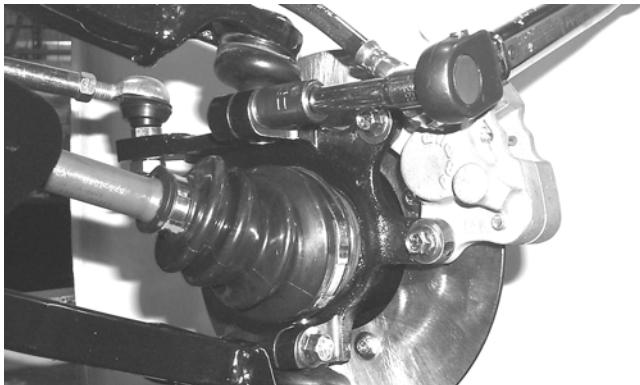
### ASSEMBLING AND INSTALLING

1. Install the bearing; then install the snap ring making sure it seats into the knuckle.



PR287A

2. Install the knuckle to the upper and lower ball joints and secure with the two cap screws. Tighten to 35 ft-lb.



AF628D

3. Install the tie rod end and secure with the nut. Tighten to 30 ft-lb; then install a new cotter pin and spread the pin.

**■NOTE: During assembling, new cotter pins should be installed.**



AF618D

4. Apply a small amount of grease to the hub splines.



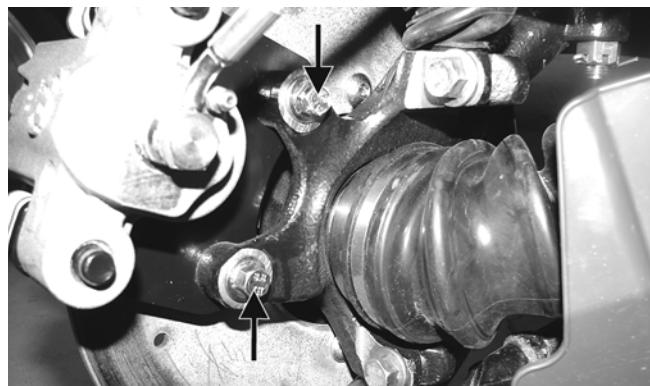
PR290A

5. Install the hub assembly onto the splines of the shaft.
6. Secure the hub assembly with the nut. Tighten only until snug.



PR257

7. Secure the brake caliper to the knuckle with new “patch-lock” cap screws. Tighten to 20 ft-lb.



PR264A

8. Pump the hand brake lever; then engage the brake lever lock.
9. Using an appropriate hub retaining wrench, secure the hub nut (from step 6) to the shaft. Tighten to 200 ft-lb.
10. Install a new cotter pin and spread the pin to secure the nut.
11. Install the wheel; then using a crisscross pattern, tighten the wheel nuts in 20 ft-lb increments to a final torque of 40 ft-lb (steel wheel), 60 ft-lb (aluminum wheel w/black nuts), or 80 ft-lb (aluminum wheel w/chrome nuts).
12. Remove the ATV from the support stand.

## Front Wheel Alignment

1. Thoroughly wash the ATV to remove excess weight (mud, etc.); then ensure the tires are properly inflated to the recommended pressure.
2. Place the unloaded ATV in a level position taking care not to push down or lift up on the front end; then turn the handlebar to the straight ahead position.
3. Measure the distance from the outside edge of each handlebar grip to equal reference points on each side.
4. Adjust the handlebar direction until the two measurements are equal; then secure the handlebar to the rear rack using tie-down straps.

**NOTE: Care must be taken not to allow the handlebar to turn while securing it.**



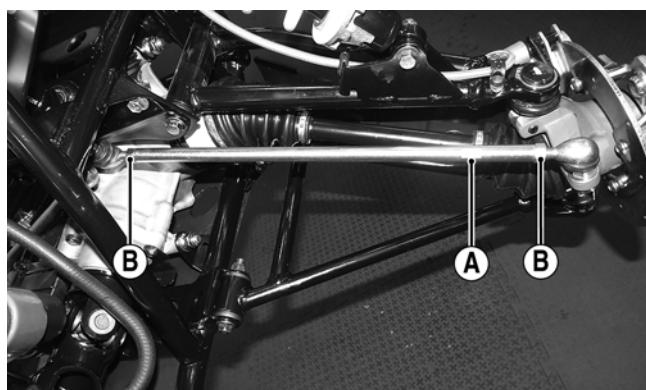
CF654A

5. Mark the center line of the front tires at the front and the rear of the tire; then using a tape measure, measure and record the distance between the marks at the front and rear. The front measurement should be 3-6 mm (1/8-1/4 in.) greater than the rear measurement (toe-out).



CF345

6. Using an open-ended wrench to hold the tie rod (A), loosen the right and left jam nuts (B).



CF344A

### CAUTION

**Always use a wrench to hold the tie rod in place when loosening either of the jam nuts or damage to the boots could occur.**

7. Turn the left- and right-side tie rods in equal increments to achieve proper toe out; then place a drop of red Loctite #271 on the threads and while holding the tie rod, tighten each jam nut to 35 ft-lb.

## Shift Lever

### REMOVING

1. Remove the E-clip securing the shift rod to the shift lever.
2. Remove two cap screws, two self-tapping screws, and three nylon ties securing the left-side splash panel and remove the panel.
3. Remove the axle and nut securing the shift lever to the upper shift arm; then remove the shift lever. Account for a spring and two O-rings.

### INSTALLING

1. Place the spring into position between the upper shift arm and shift lever; then making sure the O-rings are in place on the axle, secure the shift lever to the arm with the existing axle and nut.
2. Place the shift rod into position on the shift lever and secure with the existing E-clip.
3. Check shift lever adjustment (see Periodic Maintenance/Tune-Up); then tighten jam nut(s) securely.
4. Install the left-side splash panel.

## Front Rack

### REMOVING

1. Remove the cap screws and lock nuts securing the rack to the frame and front fender panel.
2. Remove the front rack from the ATV.

### CLEANING AND INSPECTING

1. Clean all rack components using a pressure washer.
2. Inspect all welds for cracking or bending.
3. Inspect threaded areas of all mounting bosses for stripping.
4. Inspect for missing decals and/or reflectors.

### INSTALLING

1. Place the rack into position on the frame and front fender panel. Install the cap screws and lock nuts and finger-tighten only.
2. Install the two cap screws and lock nuts securing the rack to the fenders. Tighten all hardware securely.

## Front Bumper Assembly

### REMOVING

1. Remove the front fascia.
2. Remove the two flange bolts and lock nuts securing the upper bumper supports to the bumper.

3. Remove the two lower cap screws securing the bumper to the frame; then remove the bumper.

## CLEANING AND INSPECTING

1. Clean all bumper components with parts-cleaning solvent.
2. Inspect all welds for cracking or bending.

## INSTALLING

1. Place the front bumper assembly into position and install the lower cap screws. Finger-tighten only.
2. Install the two flange bolts and lock nuts on the upper supports. Tighten all hardware securely.
3. Install the front fascia.

## Footrests

### REMOVING

1. Remove the machine screws and flange nuts securing the front and rear fenders to the footwells.



2. Remove the screws securing the foot pegs to the footrests; then remove the foot pegs and footwells.
3. Remove the cap screws and flange nuts securing the footrests to the frame; then remove the footrests.

## CLEANING AND INSPECTING

1. Clean the footrest in parts-cleaning solvent.
2. Inspect the footrest weldments for cracks or unusual bends.
3. Inspect all tubing for cracks or unusual bends.

## INSTALLING

1. Secure the footrests to the frame with four cap screws and two flange nuts; then tighten the 8 mm hardware to 20 ft-lb and the 10 mm hardware to 40 ft-lb.
2. Place the footwells onto the footrests; then put the foot pegs in position and secure with two cap screws.
3. Install the machine screws and flange nuts securing the front and rear fenders to the footwells.

## Belly Panel

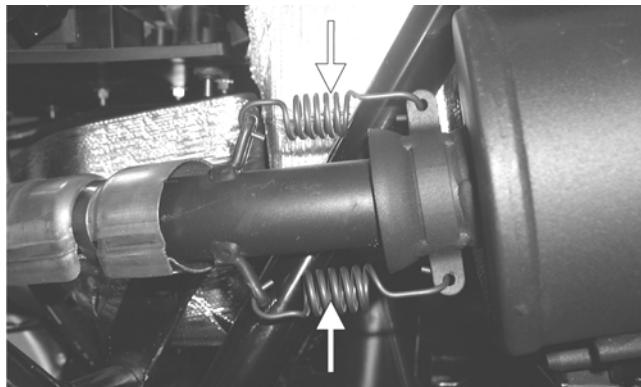
### REMOVING/INSTALLING

1. Remove the machine screws and shoulder washers securing the belly panel to the underside of the frame; then remove the belly panel.
2. Place the belly panel into position on the underside of the frame; then install the machine screws and shoulder washers. Tighten securely.

## Muffler

### REMOVING

1. Remove the two exhaust springs at the muffler/exhaust pipe juncture.



2. Slide the muffler rearward to clear the mounting lugs and remove the muffler.

## INSPECTING

1. Inspect muffler externally for cracks, holes, and dents.
2. Inspect the muffler internally by shaking the muffler back and forth and listening for rattles or loose debris inside the muffler.

■**NOTE: For additional details on cleaning the muffler/spark arrester, see Periodic Maintenance/Tune-Up.**

## INSTALLING

1. Place the muffler into position engaging the mounting lugs into the grommets; then slide the muffler forward.
2. Install the two exhaust springs.

## Taillight Assembly

### REMOVING

1. Unplug the three-prong connector and free the taillight wiring harness from the frame.

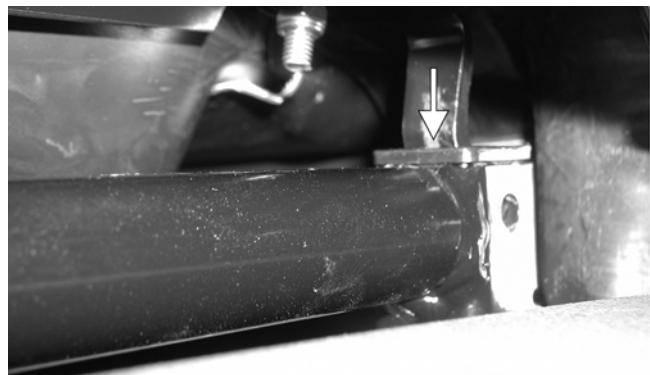
2. Remove the torx-head cap screws securing the taillight assembly to the body. Account for any washers.
3. Remove the taillight assembly.

## INSPECTING

1. Inspect wiring harness, three-prong connector, lens, base, cap screws, and socket for damage.
2. Inspect all wires for corrodng, pinching, and cracking.
3. Inspect the bulb for wattage, voltage, and proper operation.

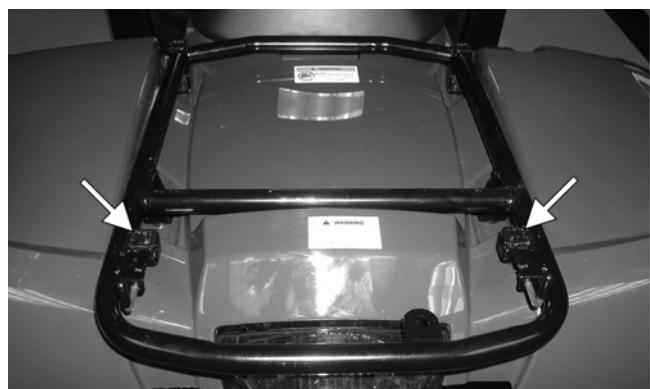
## INSTALLING

1. Place the assembly into position on the body and secure with torx-head cap screws and any washers.
2. Tighten the cap screws securely.
3. Route the wiring harness over the rear frame; then connect the three-prong connector.



CF227A

3. To lock the seat into position, engage the two front mounting lugs into the mounting rack; then holding down firmly on the front of the seat, push the seat forward until the rear tabs engage the rear mounting latches.



CF229A

4. Lock the seat into position by pulling the two latch handles to the rear and rotating them to the horizontal position.

## REMOVING/INSTALLING (TRV)

1. To remove the rear seat, pull the two latch handles to the rear and rotate them to the vertical position.



CF226

2. Lift the rear of the seat up; then pull slightly to the rear and lift the seat off the mountings.



CF226A

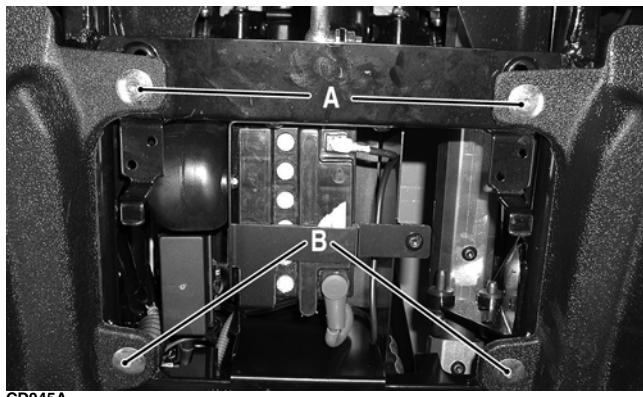
**■NOTE: The rear seat must be removed prior to removing the front seat.**

5. To remove the front seat, pull the seat lock lever up (located at the rear of the seat). Raise the rear end of the seat and slide it rearward.
6. To lock the seat into position, slide the front of the seat into the seat retainers and push down firmly on rear of seat. The seat should automatically lock into position.

## Side Storage Box (TBX)

### REMOVING

1. Rotate the cargo box latch handle (located on the left and right sides between the cargo box and the rear tire) and fully raise the cargo box.
2. Pull the seat lock lever forward (located below the right side of the seat), raise the front end of the seat, and slide it forward and off the ATV.
3. Remove the two cap screws (located inside the side storage box) securing the box to the footrest.
4. Remove the screw securing the box to the side panel.
5. Remove cap screws (A and B) securing the box to the frame.



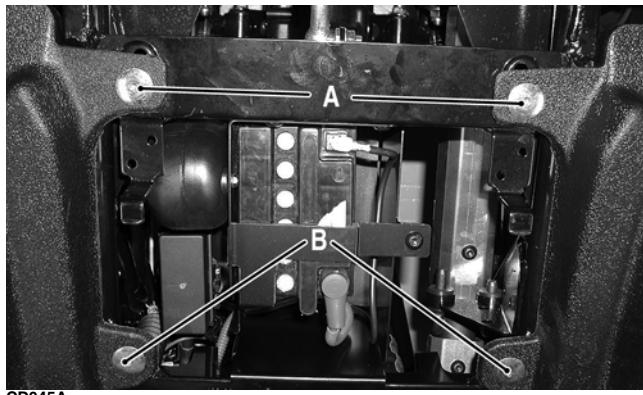
CD045A

### CLEANING AND INSPECTING

1. Clean all side storage box components with soap and warm water.
2. Inspect the box for cracks, tears, and loose mounting hardware.
3. Inspect the box hatch O-ring seals for cuts or tears.

### INSTALLING

1. Place the side storage box into position on the frame; then secure with the two cap screws (A and B). Tighten cap screws to specifications.



CD045A

2. Secure the box to the side panel with the existing screw.

3. Secure the box to the footrest with existing hardware. Tighten securely.
4. Install the seat.
5. Lower the cargo box and press down firmly on the front of the box. The cargo box will automatically lock into position.

## Cargo Box (TBX)

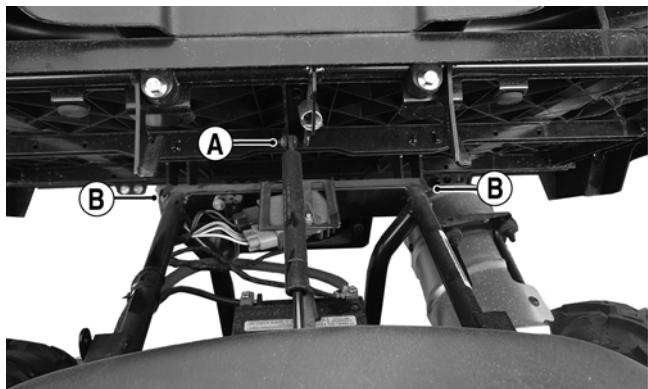
### REMOVING

1. Rotate the cargo box latch handle (located on the left and right sides between the cargo box and the rear tire) and fully raise the cargo box.



CD771

2. Remove and retain the cap screw and nut (A) from the end of the box lift support.



CF652A

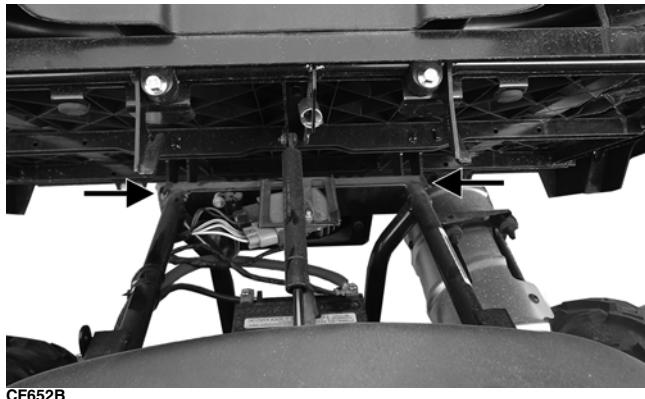
3. Remove the two cap screws and lock nuts (B) securing the cargo box to the frame; then remove the cargo box and discard the lock nuts.

### CLEANING AND INSPECTING

1. Clean all cargo box components with soap and warm water.
2. Inspect the cargo box for cracks, tears, and loose mounting hardware.
3. Inspect the welds of the cargo box frame for cracking or bending.
4. Inspect the cargo box gate latches for smooth operation.

## INSTALLING

1. Place the cargo box into position on the frame. Secure with cap screws and new lock nuts. Tighten securely.



CF652B

2. While an assistant holds the cargo box in the raised position, secure the end of the box lift support to the frame with the cap screw and nut.
3. Lower the cargo box and press down firmly on the front of the box. It will automatically lock into position.

## Headlights - Taillight/ Brakelight

**■NOTE:** The bulb portion of a headlight is fragile. **HANDLE WITH CARE.** When replacing a headlight bulb, do not touch the glass portion of the bulb. If the glass is touched, it must be cleaned with a dry cloth before installing. Skin oil residue on the bulb will shorten the life of the bulb.

### **WARNING**

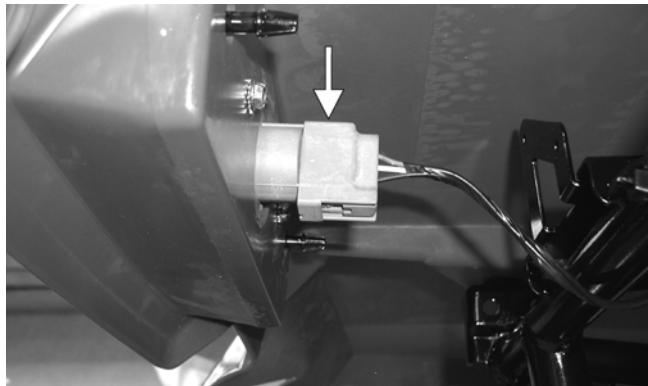
**Do not attempt to remove a bulb when it is hot. Severe burns may result.**

To replace a headlight bulb, use the following procedure.

1. Rotate the bulb assembly counterclockwise and remove from the headlight housing; then disconnect from the wiring harness.
2. Connect the new bulb assembly to the wiring harness connector; then insert into the headlight housing and rotate fully clockwise.

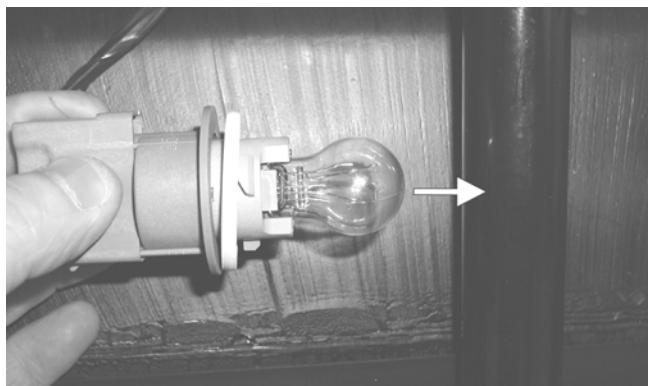
To replace the taillight-brakelight bulb, use the following procedure.

1. Turn the bulb socket assembly counterclockwise and remove from the housing.



CF135A

2. Pull the bulb straight out of the socket; then insert a new bulb.



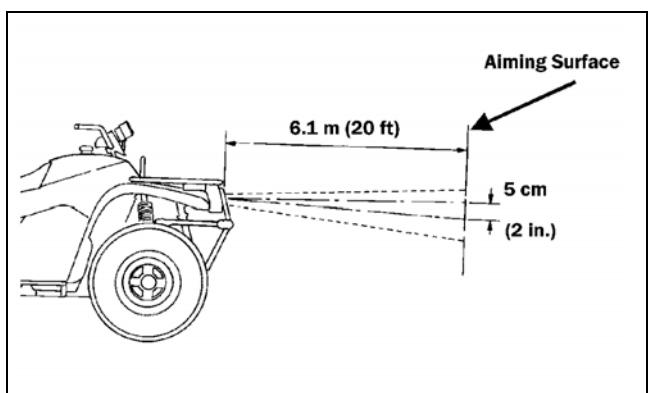
CF132A

3. Insert the bulb socket assembly into the housing and turn it clockwise to secure.

## CHECKING/ADJUSTING HEADLIGHT AIM

The headlights can be adjusted vertically and horizontally. The geometric center of the HIGH beam light zone is to be used for vertical and horizontal aiming.

1. Position the ATV on a level floor so the headlights are approximately 6.1 m (20 ft) from an aiming surface (wall or similar aiming surface).

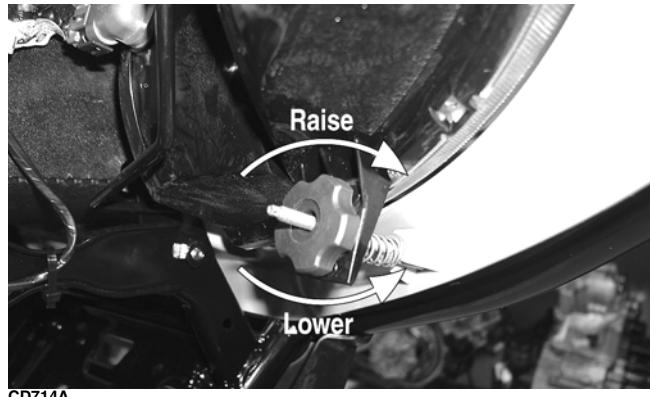


ATV-0070C

**■NOTE:** There should be an average operating load on the ATV when adjusting the headlight aim.

2. Measure the distance from the floor to the mid-point of each headlight.
3. Using the measurements obtained in step 2, make horizontal marks on the aiming surface.

4. Make vertical marks which intersect the horizontal marks on the aiming surface directly in front of the headlights.
5. Switch on the lights. Make sure the HIGH beam is on. DO NOT USE LOW BEAM.
6. Observe each headlight beam aim. Proper aim is when the most intense beam is centered on the vertical mark 5 cm (2 in.) below the horizontal mark on the aiming surface.
7. Adjust each headlight by turning the adjuster knob clockwise to raise the beam or counterclockwise to lower the beam.



CD714A

## Troubleshooting

### Problem: Handling too heavy or stiff

| Condition   | Remedy   |
|---|--|
| <ol style="list-style-type: none"> <li>1. <b>Front wheel alignment</b> incorrect</li> <li>2. <b>Lubrication</b> inadequate</li> <li>3. <b>Tire inflation pressure</b> low</li> <li>4. <b>Tie rod ends</b> seizing</li> <li>5. <b>Linkage connections</b> seizing</li> </ol> | <ol style="list-style-type: none"> <li>1. Adjust alignment</li> <li>2. Lubricate appropriate components</li> <li>3. Adjust pressure</li> <li>4. Replace tie rod ends</li> <li>5. Repair - replace connections</li> </ol> |

### Problem: Steering oscillation

| Condition   | Remedy  |
|---|---|
| <ol style="list-style-type: none"> <li>1. <b>Tires</b> inflated unequally</li> <li>2. <b>Wheel(s)</b> wobbly</li> <li>3. <b>Wheel hub cap screw(s)</b> loose - missing</li> <li>4. <b>Wheel hub bearing</b> worn - damaged</li> <li>5. <b>Tie rod ends</b> worn - loose</li> <li>6. <b>Tires</b> defective - incorrect</li> <li>7. <b>A-arm bushings</b> damaged</li> <li>8. <b>Bolts - nuts (frame)</b> loose</li> </ol> | <ol style="list-style-type: none"> <li>1. Adjust pressure</li> <li>2. Replace wheel(s)</li> <li>3. Tighten - replace cap screws</li> <li>4. Replace bearing</li> <li>5. Replace - tighten tie rod ends</li> <li>6. Replace tires</li> <li>7. Replace bushings</li> <li>8. Tighten bolts - nuts</li> </ol> |

### Problem: Steering pulling to one side

| Condition  | Remedy   |
|--|--|
| <ol style="list-style-type: none"> <li>1. <b>Tires</b> inflated unequally</li> <li>2. <b>Front wheel alignment</b> incorrect</li> <li>3. <b>Wheel hub bearings</b> worn - broken</li> <li>4. <b>Frame</b> distorted</li> <li>5. <b>Shock absorber</b> defective</li> </ol> | <ol style="list-style-type: none"> <li>1. Adjust pressure</li> <li>2. Adjust alignment</li> <li>3. Replace bearings</li> <li>4. Repair - replace frame</li> <li>5. Replace shock absorber</li> </ol> |

### Problem: Tire wear rapid or uneven

| Condition   | Remedy   |
|---|--|
| <ol style="list-style-type: none"> <li>1. <b>Wheel hub bearings</b> worn - loose</li> <li>2. <b>Front wheel alignment</b> incorrect</li> <li>3. <b>Tire inflation pressure</b> incorrect</li> </ol> | <ol style="list-style-type: none"> <li>1. Replace bearings</li> <li>2. Adjust alignment</li> <li>3. Adjust pressure</li> </ol> |

### Problem: Steering noise

| Condition  | Remedy   |
|--|--|
| <ol style="list-style-type: none"> <li>1. <b>Cap screws - nuts</b> loose</li> <li>2. <b>Wheel hub bearings</b> broken - damaged</li> <li>3. <b>Lubrication</b> inadequate</li> </ol> | <ol style="list-style-type: none"> <li>1. Tighten cap screws - nuts</li> <li>2. Replace bearings</li> <li>3. Lubricate appropriate components</li> </ol> |

## Engine/Transmission

This section has been organized into sub-sections which show a progression for the complete servicing of the Arctic Cat ATV engine/transmission.

**■NOTE:** Arctic Cat recommends the use of new gaskets, lock nuts, and seals and lubricating all internal components when servicing the engine/ transmission.

**■NOTE:** A new ATV and an overhauled ATV engine require a “break-in” period. The first 10 hours (or 200 miles) are most critical to the life of this ATV. Proper operation during this break-in period will help assure maximum life and performance from the ATV. Instruct the customer to follow the proper break-in procedure as described in the Operators Manual.

### SPECIAL TOOLS

A number of special tools must be available to the technician when performing service procedures in this section. Refer to the current Special Tools Catalog for the appropriate tool description.

**■NOTE:** When indicated for use, each special tool will be identified by its specific name, as shown in the chart below, and capitalized.

| Description                            | p/n      |
|--|----------|
| Clutch Sleeve Hub Holder               | 0444-007 |
| Connecting Rod Holder                  | 0444-006 |
| Crankcase Separator/Crankshaft Remover | 0444-152 |
| Driven Pulley Compressor               | 0444-121 |
| Driven Pulley Compressor               | 0444-140 |
| Magneto Rotor Remover Set              | 0444-254 |
| Oil Filter Wrench                      | 0644-389 |
| Piston Pin Puller                      | 0644-328 |
| Seal Protector Tool                    | 0444-252 |
| Spanner Wrench                         | 0444-240 |
| Surface Plate                          | 0644-016 |
| Valve Clearance Adjuster               | 0444-255 |
| V Blocks                               | 0644-535 |

**■NOTE:** Special tools are available from the Arctic Cat Service Department.

## Specifications (500)

**■ NOTE:** Specifications subject to change without notice.

| VALVES AND GUIDES                                |                  |                         |
|--|------------------|-------------------------|
| Valve Face Diameter (max)                        | (intake)         | 35.0 mm                 |
|  | (exhaust)        | 30.5 mm                 |
| Valve/Tappet Clearance (cold engine)             | (intake)         | 0.08-0.12 mm            |
|  | (exhaust)        | 0.15-0.20 mm            |
| Valve Guide/Stem Clearance (max)                 | (intake)         | 0.04 mm                 |
|  | (exhaust)        | 0.06 mm                 |
| Valve Guide Inside Diameter                      |                  | 5.000-5.015 mm          |
| Valve Margin (min) (intake)                      |                  | 1.1 mm                  |
| Valve Seat Angle                                 |                  | 45° +30°                |
| Valve Spring Free Length (min)                   |                  | 42.8 mm                 |
| Valve Spring Tension @ 32.5 mm (outer)           |                  | 18.6-21.4 kg (41-47 lb) |
| CAMSHAFT AND CYLINDER HEAD                       |                  |                         |
| Cam Lobe Height (min)                            | (intake)         | 34.71 mm                |
|  | (exhaust)        | 34.48 mm                |
| Camshaft Journal Holder                          | (right & center) | 22.01-22.04 mm          |
| Inside Diameter                                  | (left)           | 17.51-17.54 mm          |
| Camshaft Journal Outside Diameter                | (left)           | 17.466-17.480 mm        |
|  | (right & center) | 21.959-21.980 mm        |
| Camshaft Runout (max)                            |                  | 0.03 mm                 |
| Cylinder Head/Cover Distortion (max)             |                  | 0.05 mm                 |
| CYLINDER, PISTON, AND RINGS                      |                  |                         |
| Piston Skirt/Cylinder Clearance                  |                  | 0.060-0.073 mm          |
| Piston Diameter 8 mm from Skirt End              |                  | 88.96-88.98 mm          |
| Cylinder Bore                                    |                  | 89.005-89.015 mm        |
| Piston Ring Free End Gap (min)                   | (1st)            | 8.0 mm                  |
|  | (2nd)            | 8.3 mm                  |
| Bore x Stroke                                    |                  | 89.0 x 71.2 mm          |
| Cylinder Trueness (max)                          |                  | 0.01 mm                 |
| Piston Ring End Gap - Installed                  |                  | 0.15-0.30 mm            |
| Piston Ring to Groove Clearance (max)(1st/2nd)   |                  | 0.06 mm                 |
| Piston Ring Groove Width                         | (1st)            | 1.01-1.03 mm            |
|  | (2nd)            | 1.21-1.23 mm            |
|  | (oil)            | 2.01-2.03 mm            |
| Piston Ring Thickness                            | (1st)            | 1.01-1.03 mm            |
|  | (2nd)            | 1.17-1.19 mm            |
| Piston Pin Bore (max)                            |                  | 20.008 mm               |
| Piston Pin (min)                                 |                  | 19.994 mm               |
| CRANKSHAFT                                       |                  |                         |
| Connecting Rod (small end inside diameter) (max) |                  | 20.021 mm               |
| Connecting Rod (big end side-to-side)            |                  | 0.10-0.55 mm            |
| Connecting Rod (small end deflection) (max)      |                  | 0.3 mm                  |
| Crankshaft (web-to-web)                          |                  | 60.8-60.9 mm            |
| Crankshaft Runout (max)                          |                  | 0.03 mm                 |

# Specifications (700/1000)

■NOTE: Specifications subject to change without notice.

| VALVES AND GUIDES  |   |
|--|---|
| Valve Face Diameter (max)                                | (intake) 31.6 mm<br>(exhaust) 27.9 mm   |
| Valve/Tappet Clearance (cold engine) (max)               | (intake) 0.1016 mm<br>(exhaust) 0.1524 mm   |
| Valve Guide/Stem Clearance (max)                         | 0.013 mm  |
| Valve Guide Inside Diameter                              | 5.000-5.012 mm  |
| Valve Head Thickness (min)                               | 2.4 mm  |
| Valve Seat Angle   | 45° +15'/+30'   |
| Valve Spring Free Length (min)                           | 38.65 mm  |
| Valve Spring Tension @ 31.5 mm                           | 16.3 kg (35.96 lb)  |
| CAMSHAFT AND CYLINDER HEAD                               |   |
| Cam Lobe Height (min)                                    | 33.53 mm  |
| Camshaft Journal Holder (right & center) Inside Diameter | 21.98-22.04 mm<br>(left) 17.48-17.53 mm   |
| Camshaft Journal Outside (right & center) Diameter       | 21.96-21.98 mm<br>(left) 17.46-17.48mm  |
| Camshaft Runout (max)                                    | 0.05 mm   |
| Cylinder Head/Cover Distortion (max)                     | 0.05 mm   |
| CYLINDER, PISTON, AND RINGS                              |   |
| Piston Skirt/Cylinder Clearance (max)                    | 0.025 - 0.075 mm  |
| Piston Diameter 15 mm from Skirt End                     | 91.940-92.975 mm (1000)<br>101.956-101.994 mm (700)   |
| Cylinder Bore  | 101.992-102.008 mm (700)<br>91.992-92.008 mm (1000)   |
| Piston Ring Free End Gap (1st/2nd)                       | 12.5 mm   |
| Bore x Stroke  | 102 x 85.0 mm (700)<br>92 x 71.5 mm (1000)  |
| Cylinder Trueness (max)                                  | 0.02 mm   |
| Piston Ring End Gap - Installed (min)                    | 0.38 mm   |
| Piston Ring to Groove Clearance (max)                    | (1st/2nd) 0.035 mm  |
| Piston Ring Groove Width (1st/2nd)                       | 1.27-1.29 mm (700)<br>(1st) 2.51-2.53 mm (700/1000)<br>(2nd) 1.22-1.24 mm (1000)<br>(3rd) 1.21-1.23 mm (1000) |
| Piston Ring Thickness (1st/2nd)                          | 1.225-1.240 mm (700)<br>1.170-1.195 mm (1000)   |
| Piston Pin Bore (max)                                    | 23.012 mm (700)<br>20.012 mm (1000)   |
| Piston Pin Outside Diameter (min)                        | 22.99 mm (700)<br>19.995 mm (1000)  |
| CRANKSHAFT   |   |
| Connecting Rod (small end inside diameter)               | (max) 23.021 mm (700)<br>20.021 mm (1000)   |
| Connecting Rod (big end side-to-side) (max)              | 0.80 mm (700)<br>0.95 mm (1000)   |
| Connecting Rod (small end deflection) (max)              | 0.3 mm  |
| Crankshaft (web-to-web) (max)                            | 71 mm (700)<br>98 mm (1000)   |
| Crankshaft Runout (max)                                  | 0.03 mm   |
| Oil Pump Gerotor Clearance (1000) (max)                  | 0.15 mm   |

# Troubleshooting

## Problem: Engine will not start or is hard to start (Compression too low)

| Condition   | Remedy  |
|---|---|
| <ol style="list-style-type: none"> <li>1. <b>Gasoline</b> bad</li> <li>2. <b>Valve clearance</b> out of adjustment</li> <li>3. <b>Valve guides</b> worn</li> <li>4. <b>Valve timing</b> incorrect</li> <li>5. <b>Piston rings</b> worn excessively</li> <li>6. <b>Cylinder bore</b> worn</li> <li>7. Starter motor cranks too slowly - does not turn</li> </ol> | <ol style="list-style-type: none"> <li>1. Drain gas - replace with clean gas</li> <li>2. Adjust clearance</li> <li>3. Repair - replace guides</li> <li>4. Replace cam chain/sprocket and re-time engine</li> <li>5. Replace rings</li> <li>6. Replace cylinder</li> <li>7. See Electrical System - Troubleshooting</li> </ol> |

## Problem: Engine will not start or is hard to start (No spark)

| Condition  | Remedy  |
|--|---|
| <ol style="list-style-type: none"> <li>1. <b>Gasoline</b> bad</li> <li>2. <b>Spark plug</b> fouled</li> <li>3. <b>Spark plug</b> wet</li> <li>4. <b>Magneto</b> defective</li> <li>5. <b>ECM</b> defective</li> <li>6. <b>Ignition coil</b> defective</li> <li>7. <b>High-tension lead</b> open - shorted</li> </ol> | <ol style="list-style-type: none"> <li>1. Drain gas - replace with clean gas</li> <li>2. Clean - replace plug</li> <li>3. Clean - dry plug</li> <li>4. Replace stator coil</li> <li>5. Replace ECM</li> <li>6. Replace ignition coil</li> <li>7. Replace high tension lead</li> </ol> |

## Problem: Engine will not start or is hard to start (No fuel reaching the fuel injector)

| Condition   | Remedy   |
|---|--|
| <ol style="list-style-type: none"> <li>1. <b>Gasoline</b> bad</li> <li>2. <b>Gas tank vent hose</b> obstructed</li> <li>3. <b>Fuel hose</b> obstructed</li> <li>4. <b>Fuel screens</b> obstructed</li> <li>5. <b>Fuel pump</b> defective</li> </ol> | <ol style="list-style-type: none"> <li>1. Drain gas - replace with clean gas</li> <li>2. Clean vent hose</li> <li>3. Clean - replace hose</li> <li>4. Clean - replace inlet screen - valve screen</li> <li>5. Replace fuel pump</li> </ol> |

## Problem: Engine stalls easily

| Condition  | Remedy   |
|--|--|
| <ol style="list-style-type: none"> <li>1. <b>Spark plug</b> fouled</li> <li>2. <b>Magneto</b> defective</li> <li>3. <b>ECM</b> defective</li> <li>4. <b>Fuel injector</b> obstructed</li> <li>5. <b>Valve clearance</b> out of adjustment</li> </ol> | <ol style="list-style-type: none"> <li>1. Clean plug</li> <li>2. Replace magneto</li> <li>3. Replace ECM</li> <li>4. Replace fuel injector</li> <li>5. Adjust clearance</li> </ol> |

## Problem: Engine noisy (Excessive valve chatter)

| Condition   | Remedy   |
|---|--|
| <ol style="list-style-type: none"> <li>1. <b>Valve clearance</b> too large</li> <li>2. <b>Valve spring(s)</b> weak - broken</li> <li>3. <b>Rocker arm - rocker arm shaft</b> worn</li> <li>4. <b>Camshaft</b> worn</li> <li>5. <b>Valve tappets</b> worn</li> </ol> | <ol style="list-style-type: none"> <li>1. Adjust clearance</li> <li>2. Replace spring(s)</li> <li>3. Replace arm - shaft</li> <li>4. Replace camshaft</li> <li>5. Replace tappets</li> </ol> |

## Problem: Engine noisy (Noise seems to come from piston)

| Condition  | Remedy  |
|--|---|
| <ol style="list-style-type: none"> <li>1. <b>Piston - cylinder</b> worn</li> <li>2. <b>Combustion chamber</b> carbon buildup</li> <li>3. <b>Piston pin - piston pin bore</b> worn</li> <li>4. <b>Piston rings - ring groove(s)</b> worn</li> </ol> | <ol style="list-style-type: none"> <li>1. Replace - service piston - cylinder</li> <li>2. Clean cylinder head and piston</li> <li>3. Replace - service pin - bore</li> <li>4. Replace rings - piston</li> </ol> |

## Problem: Engine noisy (Noise seems to come from timing chain)

| Condition  | Remedy   |
|--|--|
| <ol style="list-style-type: none"> <li>1. <b>Chain</b> stretched</li> <li>2. <b>Sprockets</b> worn</li> <li>3. <b>Tension adjuster</b> malfunctioning</li> </ol> | <ol style="list-style-type: none"> <li>1. Replace chain</li> <li>2. Replace sprockets</li> <li>3. Repair - replace adjuster</li> </ol> |

## Problem: Engine noisy (Noise seems to come from crankshaft)

| Condition  | Remedy   |
|--|--|
| <ol style="list-style-type: none"> <li>1. <b>Main bearing</b> worn - burned</li> <li>2. <b>Lower rod-end bearing</b> worn - burned</li> <li>3. <b>Connecting rod side clearance</b> too large</li> </ol> | <ol style="list-style-type: none"> <li>1. Replace bearing</li> <li>2. Replace crankshaft assembly</li> <li>3. Replace crankshaft assembly</li> </ol> |

## Problem: Engine noisy (Noise seems to come from transmission)

| Condition   | Remedy   |
|---|--|
| <ol style="list-style-type: none"> <li>1. <b>Gears</b> worn</li> <li>2. <b>Splines</b> worn</li> <li>3. <b>Primary gears</b> worn</li> <li>4. <b>Bearings</b> worn</li> <li>5. <b>Bushing</b> worn</li> </ol> | <ol style="list-style-type: none"> <li>1. Replace gears</li> <li>2. Replace shaft(s)</li> <li>3. Replace gears</li> <li>4. Replace bearings</li> <li>5. Replace bushing</li> </ol> |

**Problem: Engine noisy (Noise seems to come from secondary bevel gear and final driven shaft)**

| Condition  | Remedy   |
|--|--|
| 1. <b>Drive - driven bevel gears</b> damaged - worn<br>2. <b>Backlash</b> incorrect<br>3. <b>Tooth contact</b> improper<br>4. <b>Bearing</b> damaged<br>5. <b>Gears</b> worn<br>6. <b>Splines</b> worn | 1. Replace gears<br>2. Adjust backlash<br>3. Adjust contact<br>4. Replace bearing<br>5. Replace gears<br>6. Replace shaft(s) |

**Problem: Engine idles poorly**

| Condition  | Remedy  |
|--|---|
| 1. <b>Gasoline</b> bad<br>2. <b>Valve clearance</b> incorrect<br>3. <b>Valve seating</b> poor<br>4. <b>Valve guides</b> defective<br>5. <b>Rocker arms - arm shaft</b> worn<br>6. <b>Magneto</b> defective<br>7. <b>ECM</b> defective<br>8. <b>Spark plug</b> fouled - gap incorrect<br>9. <b>Ignition coil</b> defective<br>10. <b>Fuel injector</b> obstructed | 1. Drain gas - replace with clean gas<br>2. Adjust clearance<br>3. Replace - service seats - valves<br>4. Replace guides<br>5. Replace arms - shafts<br>6. Replace stator coil<br>7. Replace ECM<br>8. Adjust gap - replace plug<br>9. Replace ignition coil<br>10. Replace fuel injector |

**Problem: Engine runs poorly at high speed**

| Condition   | Remedy   |
|---|--|
| 1. <b>High RPM</b> "cut out" against RPM limiter<br>2. <b>Valve springs</b> weak<br>3. <b>Valve timing</b> incorrect<br>4. <b>Cams - rocker arms - tappets</b> worn<br>5. <b>Spark plug gap</b> incorrect<br>6. <b>Ignition coil</b> defective<br>7. <b>Fuel pump</b> defective<br>8. <b>Air cleaner element</b> obstructed<br>9. <b>Fuel hose</b> obstructed | 1. Shift into higher gear - decrease speed<br>2. Replace springs<br>3. Time valves<br>4. Replace cams - arms - tappets<br>5. Adjust gap<br>6. Replace ignition oil<br>7. Replace fuel pump<br>8. Clean element<br>9. Clean or replace hose |

**Problem: Exhaust smoke dirty or heavy**

| Condition   | Remedy  |
|---|---|
| 1. <b>Engine oil</b> overfilled - contaminated<br>2. <b>Piston rings - cylinder</b> worn<br>3. <b>Valve guides</b> worn<br>4. <b>Cylinder wall</b> scored<br>5. <b>Valve stems</b> worn<br>6. <b>Stem seals</b> defective | 1. Drain excess oil - replace oil<br>2. Replace - service rings - cylinder<br>3. Replace guides<br>4. Replace - service cylinder<br>5. Replace valves<br>6. Replace seals |

**Problem: Engine lacks power**

| Condition  | Remedy  |
|--|---|
| 1. <b>Valve clearance</b> incorrect<br>2. <b>Valve springs</b> weak<br>3. <b>Valve timing</b> incorrect<br>4. <b>Piston ring(s) - cylinder</b> worn<br>5. <b>Valve seating</b> poor<br>6. <b>Spark plug</b> fouled<br>7. <b>Rocker arms - shafts</b> worn<br>8. <b>Spark plug gap</b> incorrect<br>9. <b>Fuel injector</b> obstructed<br>10. <b>Cam chain</b> worn<br>11. <b>Air cleaner element</b> obstructed<br>12. <b>Engine oil</b> overfilled - contaminated<br>13. <b>Intake manifold</b> leaking air | 1. Adjust clearance<br>2. Replace springs<br>3. Re-time valve gear<br>4. Replace - service rings - cylinder<br>5. Repair seats<br>6. Clean - replace plug<br>7. Replace arms - shafts<br>8. Adjust gap - replace plug<br>9. Replace injector<br>10. Replace cam chain<br>11. Clean element<br>12. Drain excess oil - change oil<br>13. Tighten - replace manifold |

**Problem: Engine overheats**

| Condition  | Remedy   |
|--|--|
| 1. <b>Carbon deposit (piston crown)</b> excessive<br>2. <b>Oil</b> low<br>3. <b>Octane</b> low - gasoline poor<br>4. <b>Oil pump</b> defective<br>5. <b>Oil circuit</b> obstructed<br>6. <b>Intake manifold</b> leaking air<br>7. <b>Fan</b> malfunctioning<br>8. <b>Fan relay</b> malfunctioning<br>9. <b>Radiator hoses - cap</b> damaged - obstructed<br>10. <b>Coolant level</b> low<br>11. <b>Thermostat</b> stuck - closed | 1. Clean piston<br>2. Add oil<br>3. Drain - replace gasoline<br>4. Replace pump<br>5. Clean circuit<br>6. Tighten - replace manifold<br>7. Replace fan relay<br>8. Check fan fuse - replace fan<br>9. Clear obstruction - replace hoses<br>10. Fill - examine system for leaks<br>11. Replace thermostat |

## Removing Engine/Transmission (500)

Many service procedures can be performed without removing the engine/transmission from the frame. Closely observe the note introducing each sub-section for this important information.

### AT THIS POINT

If the technician's objective is to service Top-Side Components, Left-Side Components, or Right-Side Components, the engine/transmission does not have to be removed from the frame.

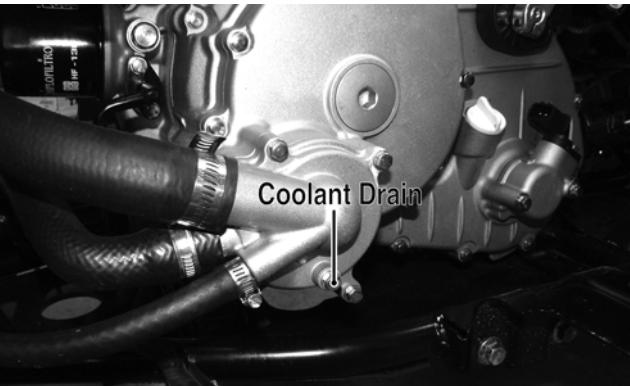
### AT THIS POINT

If the technician's objective is to service/replace magneto cover oil seals or the oil strainer (from beneath the engine/transmission), the engine/transmission does not have to be removed from the frame.

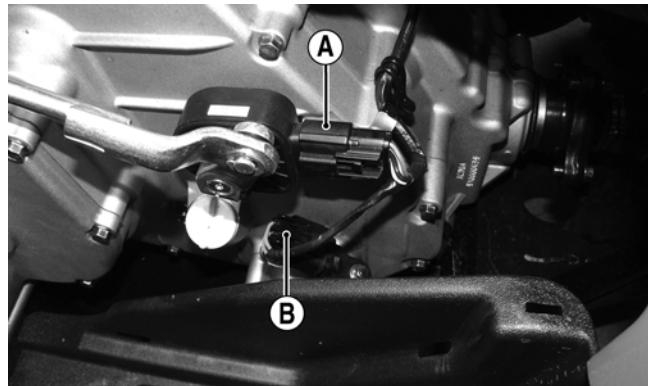
Secure the ATV on a support stand to elevate the wheels.

### WARNING

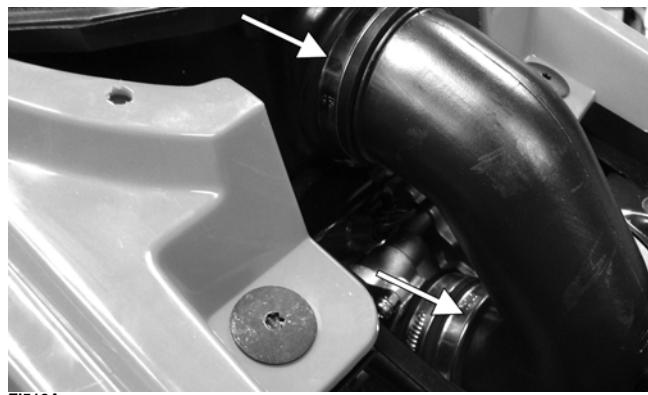
Make sure the ATV is solidly supported on the support stand to avoid injury.



3. From the left side, remove the gear position switch connector (A) and the speed sensor connector (B).



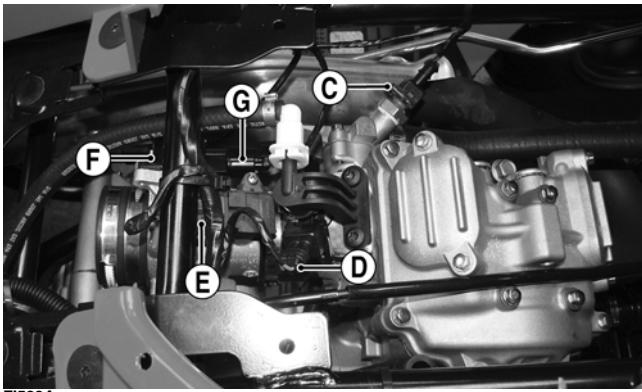
4. Drain the engine oil into a suitable container.
5. Remove the storage compartment; then remove the air inlet tube from air filter housing and throttle body.



6. Remove the air inlet and outlet ducts from the CVT housing.
7. Loosen the clamp securing the air filter housing to the front air inlet duct; then disconnect the coil connector and remove the spark plug cap from the spark plug.

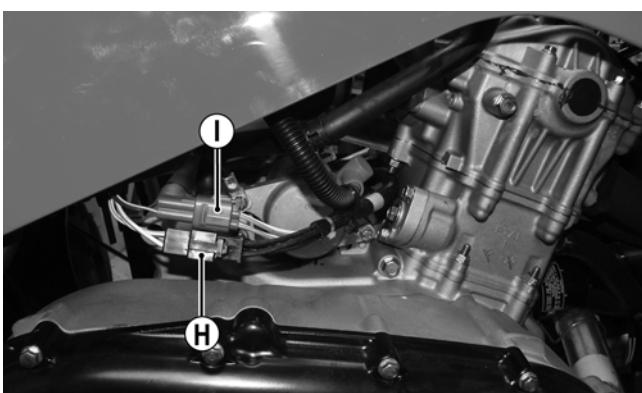


8. Disconnect the crankcase breather hose from the air filter housing and remove the air filter assembly.
9. From the top side, remove the engine coolant temperature (ECT) sensor connector (C), fuel injector connector (D), manifold absolute pressure/inlet air temperature (MAP/IAT) sensor connector (E), idle step control (ISC) connector (F), and throttle position sensor (TPS) connector (G).

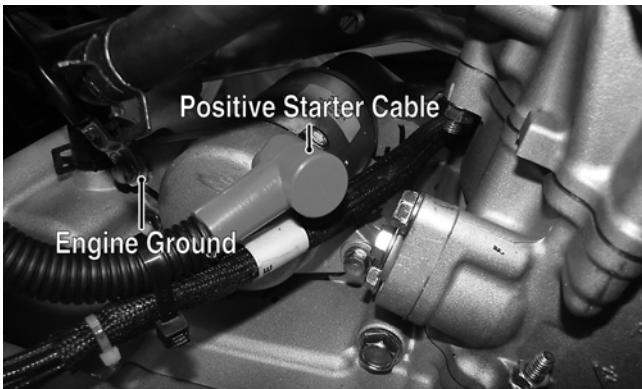


FI522A

10. From the right side, disconnect the stator connector (H) and crankshaft position sensor connector (I) from the main harness; then disconnect the positive cable from the starter motor and the engine ground cable from the starter mounting flange.

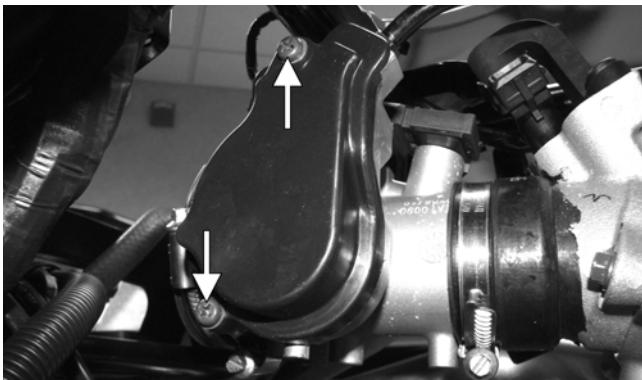


FI523A



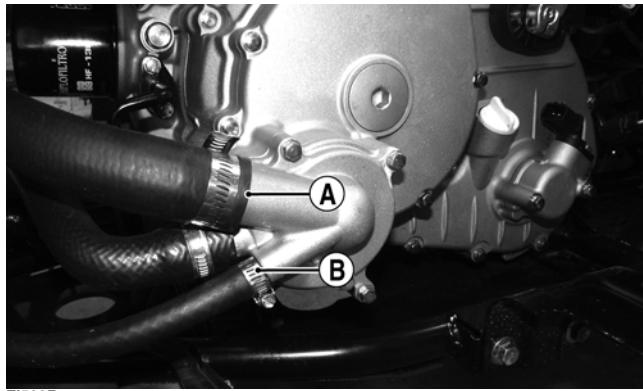
FI533A

11. Remove the screws securing throttle arm cover to the throttle body; then loosen the throttle cable jam-nut and remove the throttle cable.

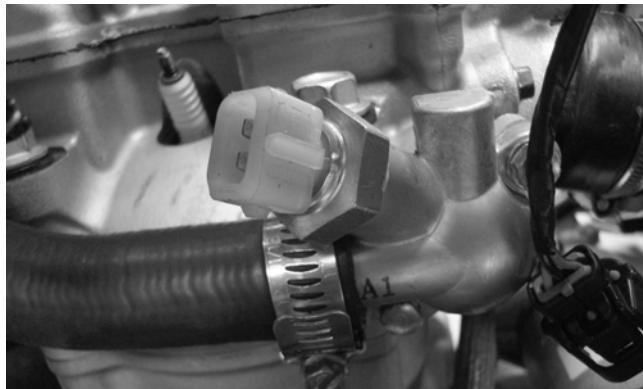


FI536A

12. Remove the cap screws securing the exhaust pipe to the engine; then remove the springs securing the muffler to the exhaust pipe. Disconnect the O2 sensor connector.
13. Remove the muffler and exhaust pipe. Account for a grafoil seal on each end of the exhaust pipe.
14. Remove coolant hoses (A) and (B) from the water pump; then remove the upper coolant hose from the thermostat housing.



FI530B



FI537

15. Remove the four cap screws securing the output shaft to the rear gear case flange.
16. Support the engine and remove the two through-bolts securing the engine assembly to the frame; then move the engine rearward sufficiently to disengage the front driveline and remove the engine from the left side.

# Servicing Engine (500)

|   |    |
|---|----|
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## Top-Side Components

■NOTE: For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

### ☞ AT THIS POINT

To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■NOTE: The engine/transmission does not have to be removed from the frame for this procedure.

## Removing Top-Side Components

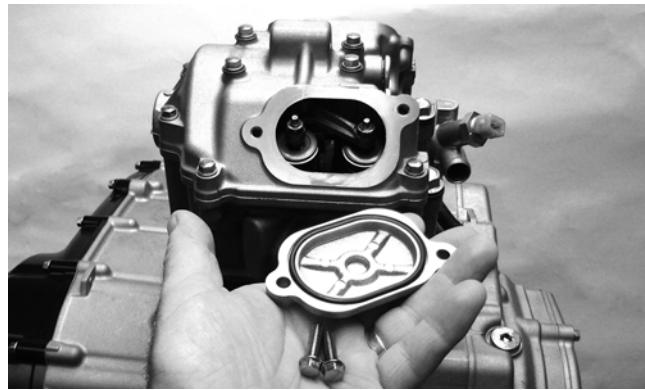
### A. Cylinder Head Cover/ Rocker Arms

### B. Cylinder Head/Camshaft

■NOTE: Remove the spark plug, timing inspection plug, and outer magneto cover; then using an appropriate wrench, rotate the crankshaft to top-dead-center of the compression stroke.

■NOTE: Arctic Cat recommends the use of new gaskets, lock nuts, and seals and lubricating all internal components when servicing the engine/transmission.

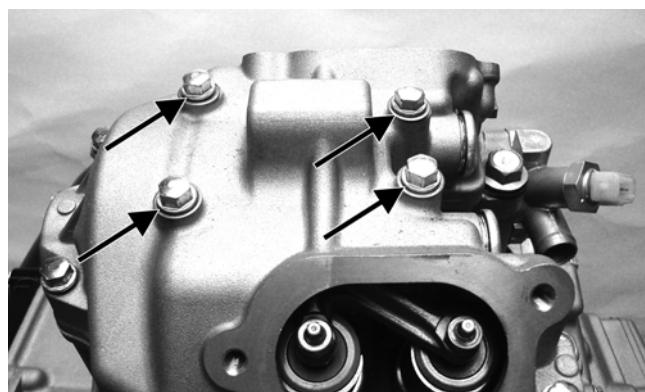
1. Remove the cap screws securing the two tappet covers. Remove the two tappet covers. Account for the O-rings.



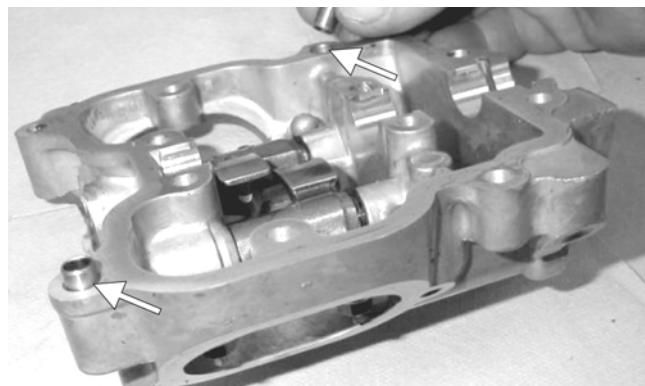
FI603

■NOTE: Keep the mounting hardware with the covers for assembly purposes.

2. Remove the cylinder head cover cap screws. Note the rubber washers on the four top-side cap screws; remove the cylinder head cover. Note the orientation of the cylinder head plug and remove it. Note the location of the two alignment pins.

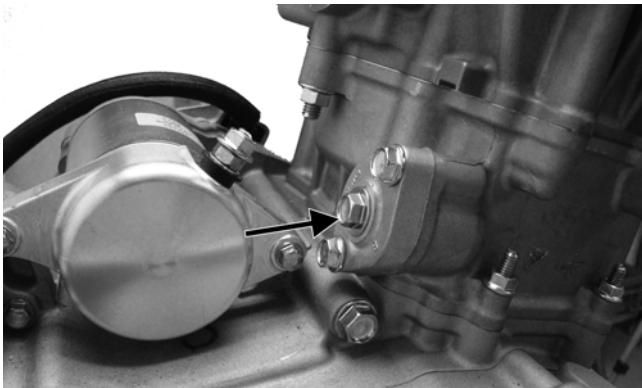


FI606A

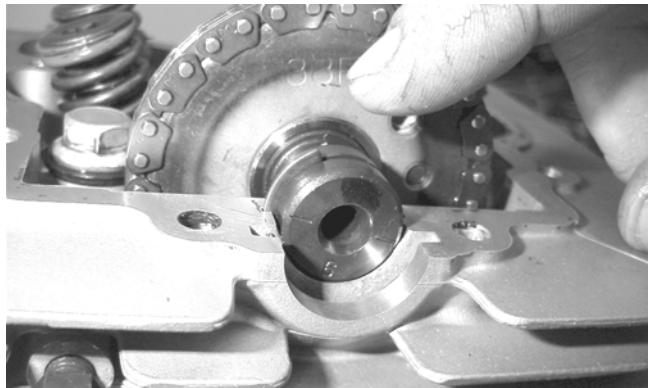


MD1354A

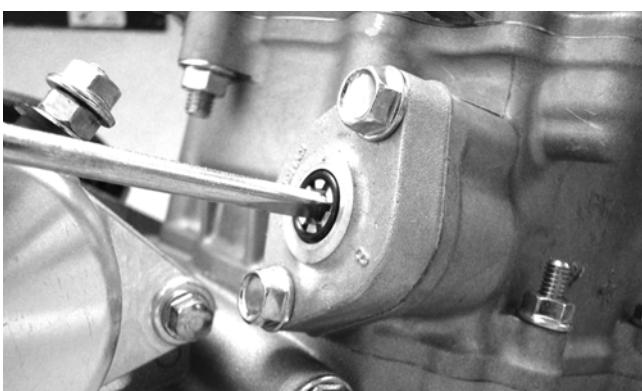
3. Remove the cap screw from the tension adjuster; then using a flat-blade screwdriver, relax the cam chain tension by rotating the adjuster screw clockwise until it locks.



FI607A



MD1131



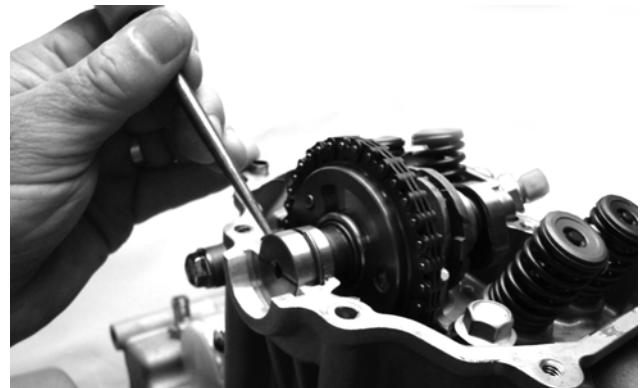
FI608

4. Bend the washer tabs and remove the two cap screws securing the sprocket to the camshaft.



FI612

5. Using an awl, rotate the C-ring in its groove until it is out of the cylinder head; then remove the C-ring.



FI613

■**NOTE:** Care should be taken not to drop the C-ring down into the crankcase.



FI620



FI617A

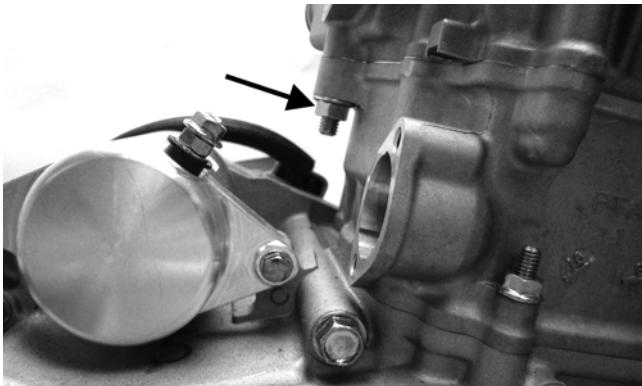
7. Remove the cam chain tensioner pivot bolt and remove the chain tensioner; then remove the two nuts securing the cylinder head to the cylinder.



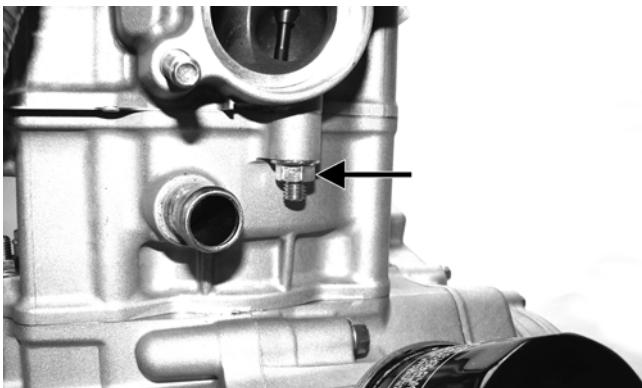
FI616



FI617



FI618A



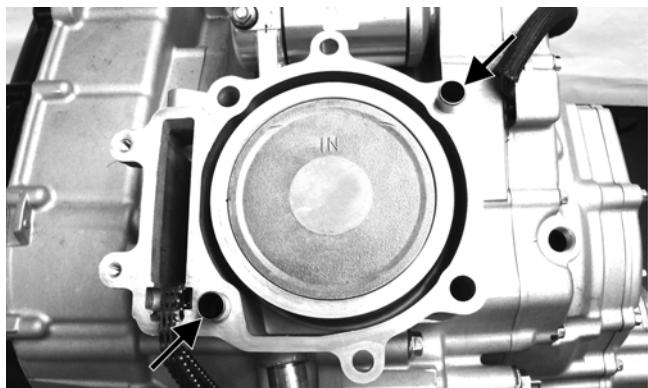
FI619A

8. Remove the four cylinder head cap screws and washers. Note that the two cap screws on the right side of the cylinder head nearest the cam sprocket are longer than the two cap screws on the left (spark plug) side.



CD211

9. Remove the cylinder head from the cylinder, remove the gasket, and account for two alignment pins.



FI623A

**☞ AT THIS POINT**

To service valves and cylinder head, see Servicing Top-Side Components sub-section.

10. Remove the cam chain guide.

**☞ AT THIS POINT**

To inspect cam chain guide, see Servicing Top-Side Components sub-section.

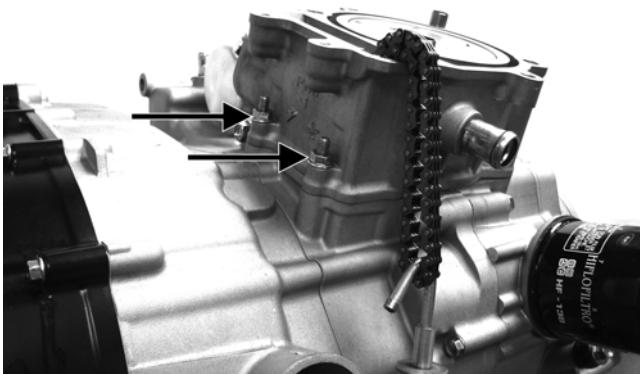


FI621

**C. Cylinder**  
**D. Piston**

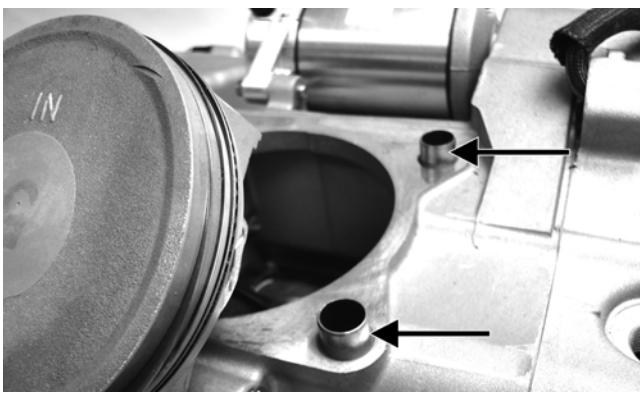
■NOTE: Steps 1-10 in the preceding sub-section must precede this procedure.

11. Remove the two nuts securing the right side of the cylinder to the right-side crankcase half.



FI622A

12. Lift the cylinder off the crankcase taking care not to allow the piston to drop against the crankcase. Account for the gasket and two alignment pins.



FI624A

#### ☞ AT THIS POINT

To service cylinder, see Servicing Top-Side Components sub-section.

#### CAUTION

When removing the cylinder, be sure to support the piston to prevent damage to the crankcase and piston.

13. Using an awl, remove one piston-pin circlip. Take care not to drop it into the crankcase.



14. Using Piston Pin Puller, remove the piston pin. Account for the opposite-side circlip. Remove the piston.

■NOTE: It is advisable to remove the opposite-side circlip prior to using the puller.



MD1219

■NOTE: Support the connecting rod with rubber bands to avoid damaging the rod or install a connecting rod holder.

#### CAUTION

Do not allow the connecting rod to go down inside the crankcase. If the rod is down inside the crankcase and the crankshaft is rotated, severe damage will result.

#### ☞ AT THIS POINT

To service piston, see Servicing Top-Side Components sub-section.

#### ☞ AT THIS POINT

To service center crankcase components only, proceed to Removing Left-Side Components.

## Servicing Top-Side Components

### VALVE ASSEMBLY

When servicing valve assembly, inspect valve seats, valve stems, valve faces, and valve stem ends for pits, burn marks, or other signs of abnormal wear.

■NOTE: Whenever a valve is out of tolerance, it must be replaced.

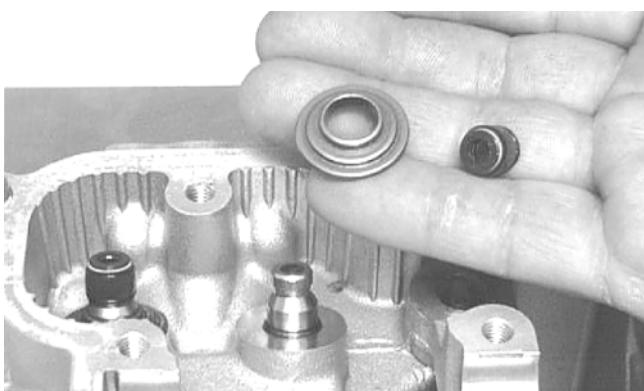
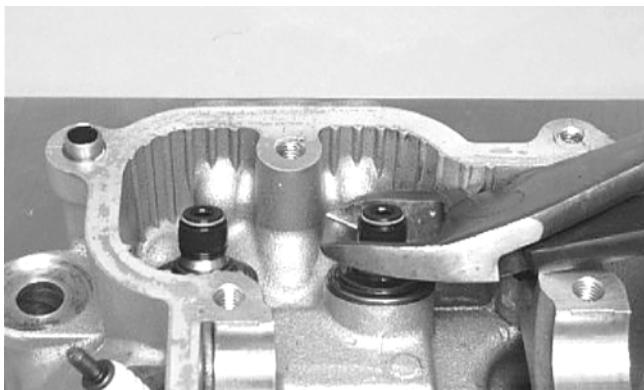
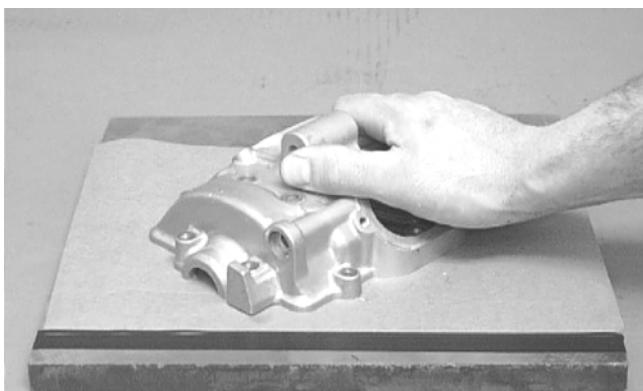
### Cleaning/Inspecting Cylinder Head Cover

■NOTE: If the cylinder head cover cannot be trued, the cylinder head assembly must be replaced.

1. Wash the cylinder head cover in parts-cleaning solvent.
2. Place the cylinder head cover on the Surface Plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the cylinder head cover in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the cylinder head cover in a figure eight motion until a uniform bright metallic finish is attained.

### CAUTION

Do not remove an excessive amount of the sealing surface or damage to the camshaft will result. Always check camshaft clearance when resurfacing the cylinder head cover.



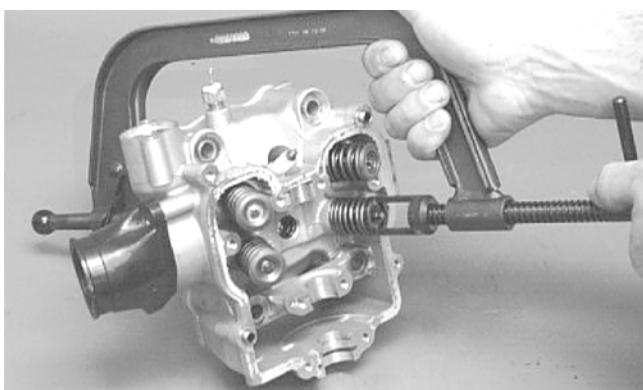
### CAUTION

Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.

## Removing Valves

■**NOTE:** Index all valves, springs, and cotters to their original position when removing. When installing, all valve components should be installed in their original position.

1. Using a valve spring compressor, compress the valve springs and remove the valve keepers. Account for an upper spring retainer.



2. Remove the valve seal and the lower remaining spring seat. Discard the valve seal.

■**NOTE:** The valve seals must be replaced.

3. Remove the valve springs; then invert the cylinder head and remove the valves.

## Measuring Valve Guide (Bore)

1. Insert a snap gauge 1/2 way down into each valve guide bore; then remove the gauge and measure it with a micrometer.
2. Acceptable inside diameter range must be within specifications.
3. If a valve guide is out of tolerance, the cylinder head must be replaced.

## Servicing Valves/Valve Guides/Valve Seats

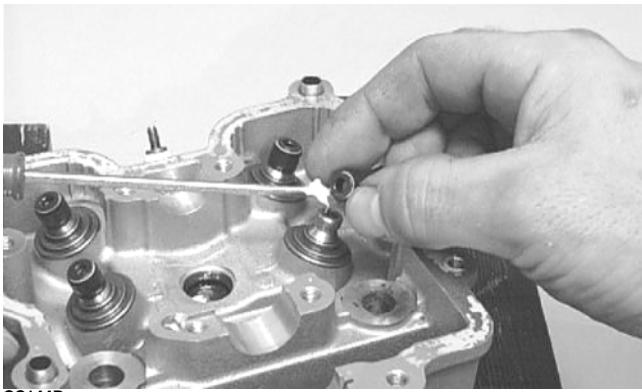
If valves, valve guides, or valve seats require servicing or replacement, Arctic Cat recommends that the components be taken to a qualified machine shop for servicing.

### CAUTION

If valves are discolored or pitted or if the seating surface is worn, the valve must be replaced. Do not attempt to grind the valves or severe engine damage may occur.

## Installing Valves

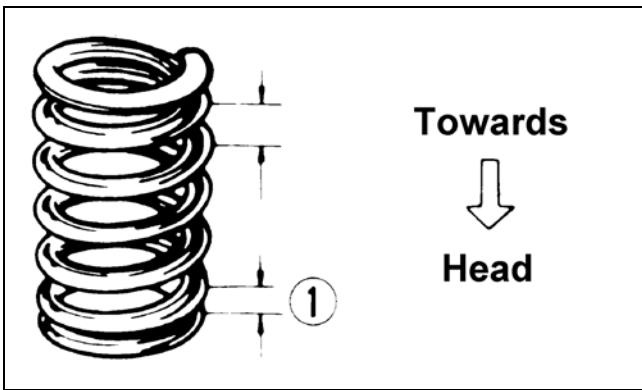
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



CC144D

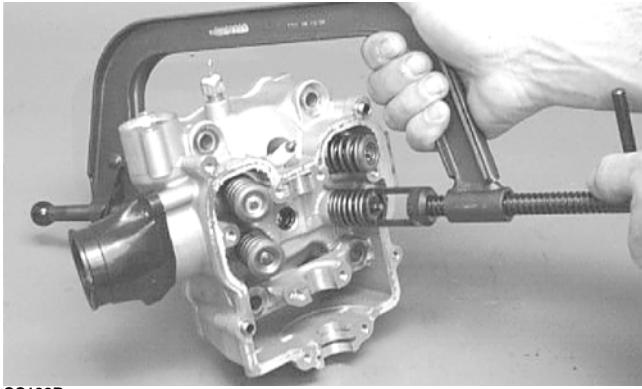
2. Insert each valve into its original valve location.
3. Install the valve springs with the painted end of the spring facing away from the cylinder head.

■**NOTE: If the paint is not visible, install the ends of the springs with the closest wound coils toward the head.**



ATV-1011A

4. Place a spring retainer over the valve springs; then using the valve spring compressor, compress the valve springs and install the valve keepers.



CC132D

## PISTON ASSEMBLY

■**NOTE: Whenever a piston, rings, or pin are out of tolerance, they must be replaced.**

### Inspecting Piston

1. Inspect the piston for cracks in the piston pin, boss, top, and skirt areas.
2. Inspect the piston for seizure marks or scuffing. If piston is scored or galled, replace it with a new one.

3. Inspect the perimeter of each piston for signs of "blowby" indicated by dark discoloration. "Blowby" is caused by worn piston rings, excessive carbon in ring grooves, or an out-of-round cylinder.

### Removing Piston Rings

1. Starting with the top ring, slide one end of the ring out of the ring-groove.



CC400D

2. Remove each ring by working it toward the top of the piston while rotating it out of the groove.

■**NOTE: When installing new rings, install as a complete set only.**

### Measuring Piston-Ring End Gap (Installed)

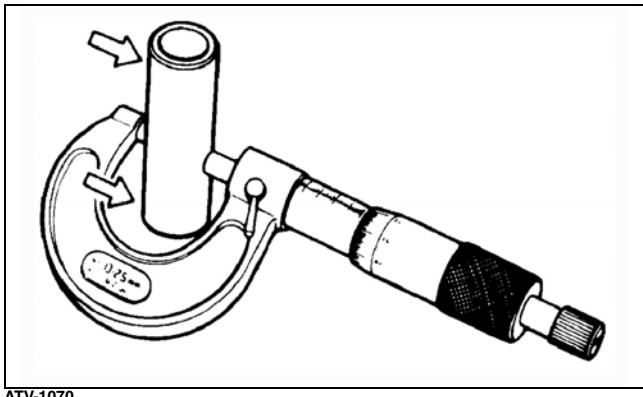
1. Place each piston ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must not exceed specifications.



CC995

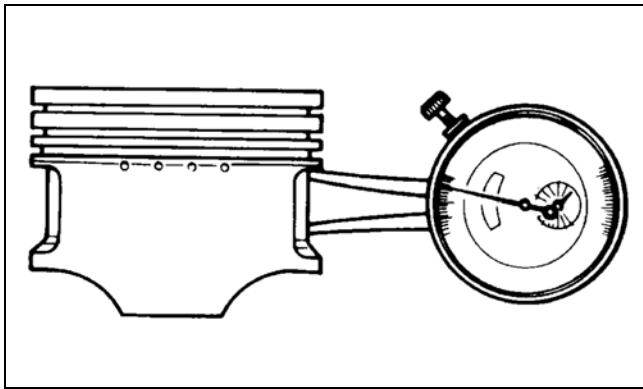
### Measuring Piston Pin, Connecting Rod Small End, and Piston-Pin Bore

1. Measure the piston pin outside diameter at each end and in the center. If measurement does not meet specifications, the piston pin must be replaced.



ATV-1070

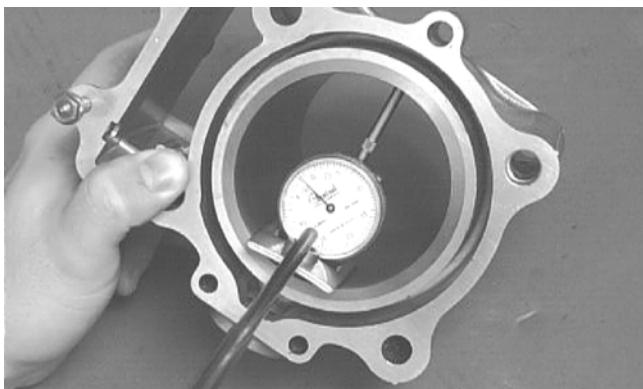
2. Inspect and measure the connecting rod small end inside diameter. If the measurement exceeds specifications, the connecting rod must be replaced (see Center Crankcase Components in this section).
3. Insert an inside dial indicator into the piston-pin bore. Take two measurements to ensure accuracy. The diameter must not exceed specifications. If the diameter exceeds specifications, the piston must be replaced.



ATV-1069

### Measuring Piston Skirt/ Cylinder Clearance

1. Measure the cylinder front to back in six places.



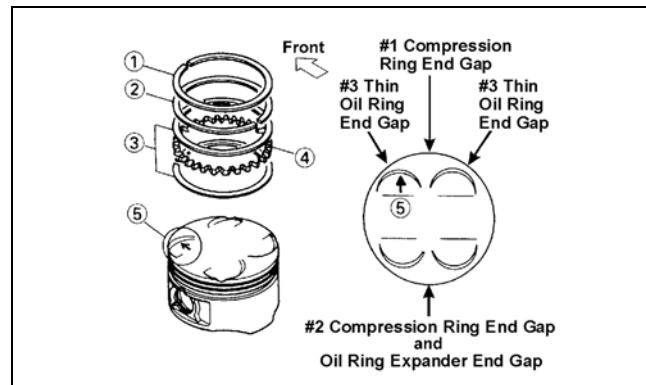
CC127D

2. Measure the corresponding piston diameter at a point 8 mm (0.3 in.) above the piston skirt at a right angle to the piston-pin bore. Subtract this measurement from the largest measurement in step 1. The difference (clearance) must be within specifications.

### Installing Piston Rings

1. Install ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap. Stagger the end gaps of the upper and lower thin oil rings according to the illustration.

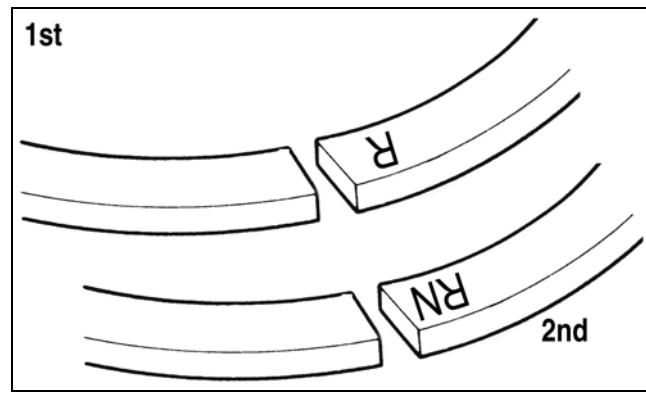
■**NOTE:** Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.



ATV-1085B

2. Install the compression rings (1 and 2) so the letter(s) on the top surface of each ring faces the dome of the piston. Rotate the rings until the ring end gaps are on directly opposite sides of the piston according to the illustration.

■**NOTE:** The chrome (silver) ring should be installed in the top position.



MD1343A

### CAUTION

Incorrect installation of the piston rings will result in engine damage.

### CYLINDER/CYLINDER HEAD ASSEMBLY

■**NOTE:** If the cylinder/cylinder head assembly cannot be trued, they must be replaced.

### Cleaning/Inspecting Cylinder Head

### CAUTION

The cylinder head studs must be removed for this procedure.

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the combustion chamber being careful not to nick, scrape, or damage the combustion chamber or the sealing surface.

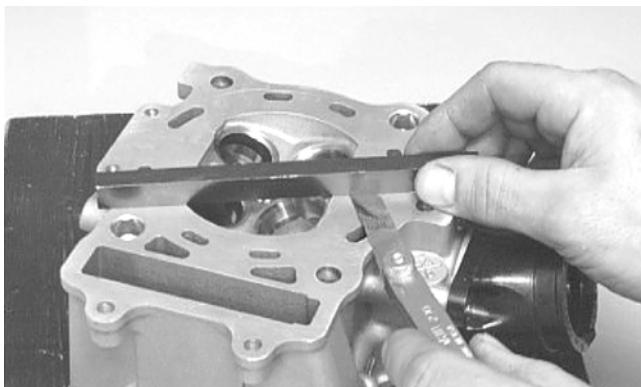
2. Inspect the spark plug hole for any damaged threads. Repair damaged threads using a “heli-coil” insert.
3. Place the cylinder head on the surface plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the cylinder head in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the cylinder head in a figure eight motion until a uniform bright metallic finish is attained.

### CAUTION

Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.

### Measuring Cylinder Head Distortion

1. Remove any carbon buildup in the combustion chamber.
2. Lay a straightedge across the cylinder head; then using a feeler gauge, check the distortion factor between the head and the straightedge.
3. Maximum distortion must not exceed specifications.



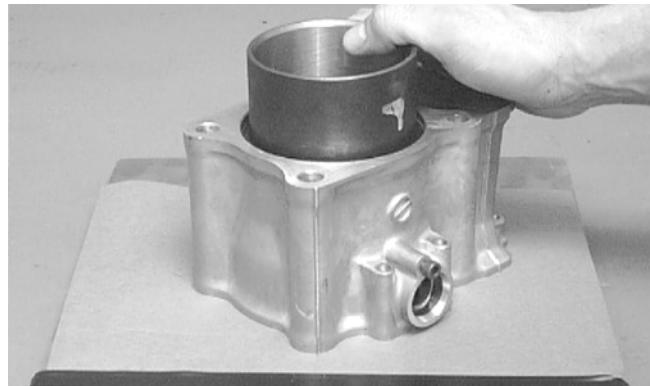
CC141D

### Cleaning/Inspecting Cylinder

1. Wash the cylinder in parts-cleaning solvent.
2. Inspect the cylinder for pitting, scoring, scuffing, warpage, and corrosion. If marks are found, repair the surface using a cylinder hone (see Honing Cylinder in this sub-section).
3. Place the cylinder on the surface plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the cylinder in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the cylinder in a figure eight motion until a uniform bright metallic finish is attained.

### CAUTION

Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.



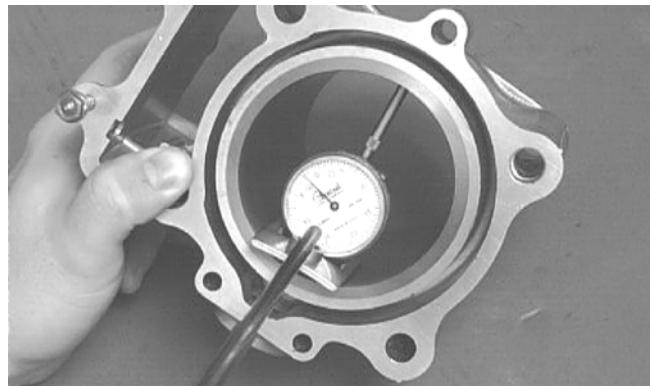
CC129D

### Inspecting Cam Chain Guide

1. Inspect cam chain guide for cuts, tears, breaks, or chips.
2. If the chain guide is damaged, it must be replaced.

### Honing Cylinder

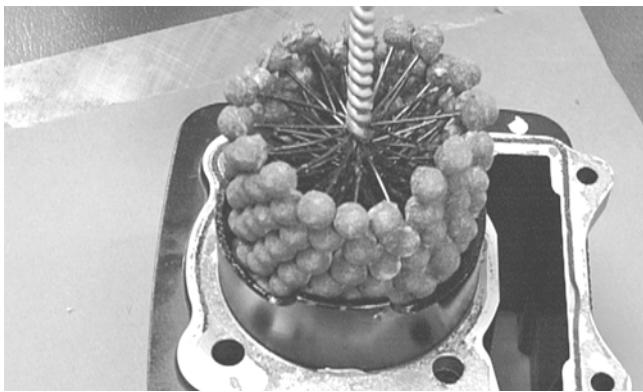
1. Using a slide gauge and a dial indicator or a snap gauge, measure the cylinder bore diameter in three locations from top to bottom and again from top to bottom at 90° from the first measurements for a total of six measurements. The trueness (out-of-roundness) is the difference between the highest and lowest reading. Maximum trueness (out-of-roundness) must not exceed specifications.



CC127D

2. Wash the cylinder in parts-cleaning solvent.
3. Inspect the cylinder for pitting, scoring, scuffing, and corrosion. If marks are found, repair the surface using a #320 grit ball hone.

■**NOTE: To produce the proper 60° cross-hatch pattern, use a low RPM drill (600 RPM) at the rate of 30 strokes per minute. If honing oil is not available, use a lightweight petroleum-based oil. Thoroughly clean cylinder after honing using soap and hot water. Dry with compressed air; then immediately apply oil to the cylinder bore. If the bore is severely damaged or gouged, replace the cylinder.**



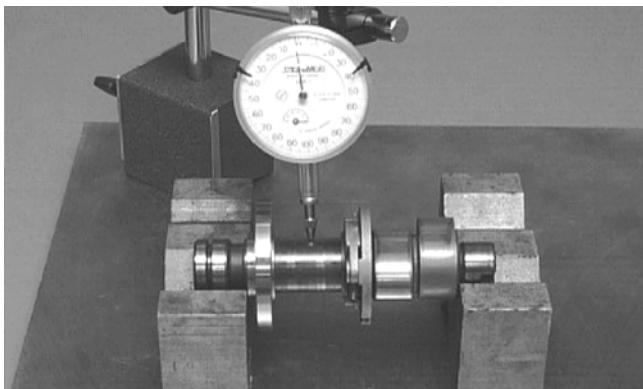
CC390D

4. If any measurement exceeds the limit, the cylinder must be replaced.

### Measuring Camshaft Runout

■**NOTE:** If the camshaft is out of tolerance, it must be replaced.

1. Place the camshaft on a set of V blocks; then position the dial indicator contact point against the shaft and zero the indicator.

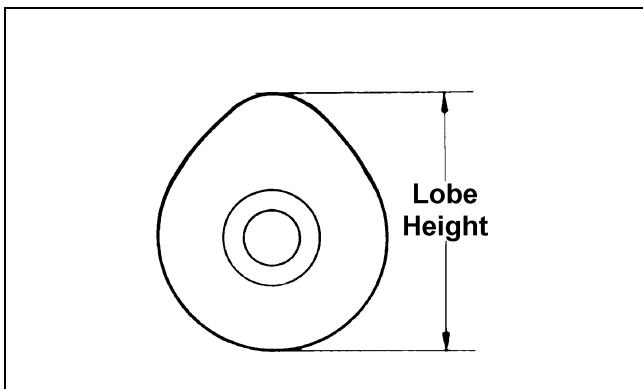


CC283D

2. Rotate the camshaft and note runout; maximum tolerance must not exceed specifications.

### Measuring Camshaft Lobe Height

1. Using a calipers, measure each cam lobe height.



2. The lobe heights must be greater than minimum specifications.

### Inspecting Camshaft Bearing Journal

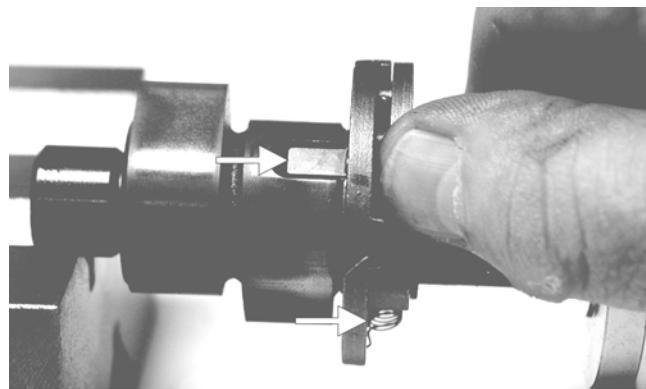
1. Inspect the bearing journal for scoring, seizure marks, or pitting.

2. If excessive scoring, seizure marks, or pitting is found, the cylinder head assembly must be replaced.

■**NOTE:** If the journals are worn, replace the cam-shaft.

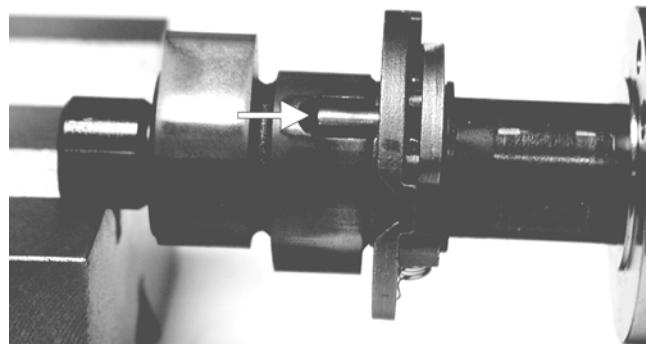
### Inspecting Camshaft Spring/Drive Pin

1. Inspect the spring and unloader pin for damage.



CF061A

■**NOTE:** With the weight extended, the unloader pin should be flat-side out; with the weight retracted, the unloader pin should be round-side out.



CF060A

2. If damaged, the camshaft must be replaced.

## Installing Top-Side Components

### A. Piston

### B. Cylinder

1. Lubricate the piston pin, connecting rod, and piston pin bore with motor oil; then install the piston on the connecting rod making sure there is a circlip on each side.



FI626

■NOTE: The piston should be installed so the IN points towards the intake side.

2. Place the two alignment pins into position. Place a new cylinder gasket into position; then place a piston holder (or suitable substitute) beneath the piston skirt and square the piston in respect to the crankcase.

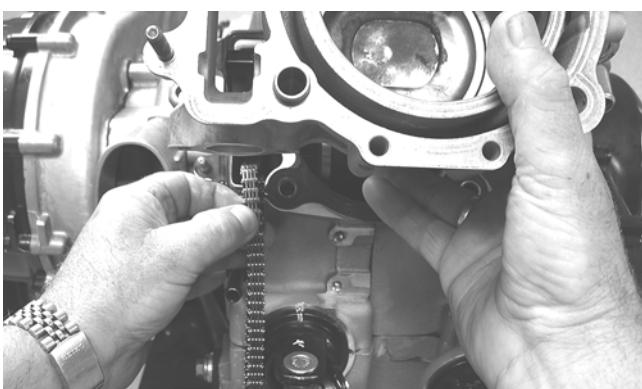


MD1344

3. Lubricate the inside wall of the cylinder; then using a ring compressor or the fingers, compress the rings and slide the cylinder over the piston. Route the cam chain up through the cylinder cam chain housing; then remove the piston holder and seat the cylinder firmly on the crankcase.

#### CAUTION

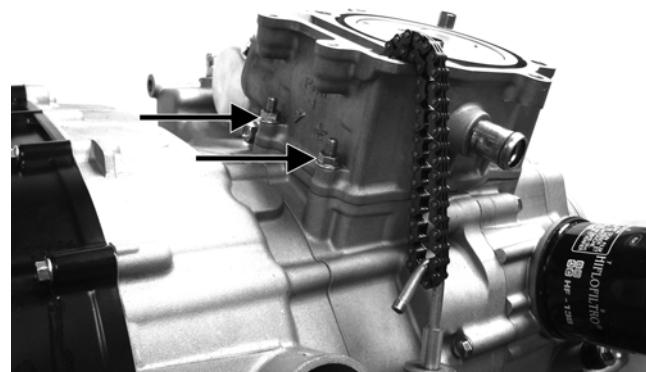
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



GZ142

4. Loosely install the two nuts securing the cylinder to the right-side crankcase half.

■NOTE: The two cylinder-to-crankcase nuts will be tightened in step 9.



FI622A

#### C. Cylinder Head/Camshaft

#### D. Cylinder Head Cover/ Rocker Arms

■NOTE: Steps 1-4 in the preceding sub-section must precede this procedure.

5. While keeping tension on the cam chain, place the front cam chain guide into the cylinder.

#### CAUTION

Care should be taken that the bottom of the chain guide is secured in the crankcase boss.

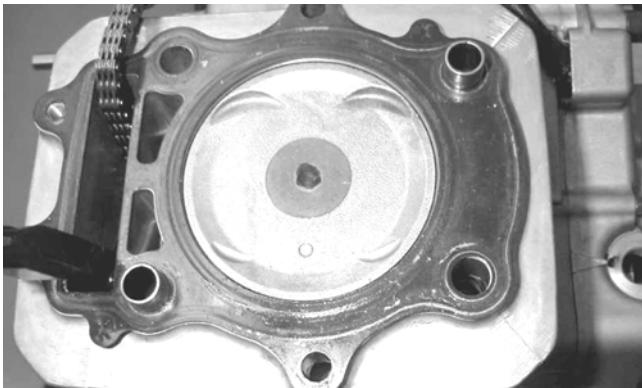


FI621

6. Place a new gasket into position on the cylinder. Place the alignment pins into position; then place the head assembly into position on the cylinder making sure the cam chain is routed through the chain cavity.

#### CAUTION

Keep tension on the cam chain to avoid damaging the crankcase boss.



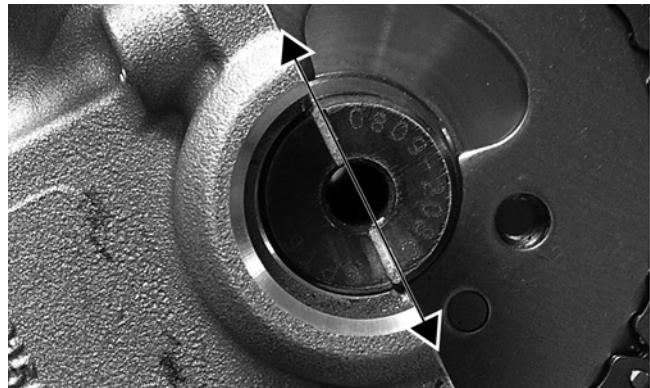
MD1347

7. Install the four cylinder head cap screws with washers. Note that the two cap screws on the right side of the cylinder head nearest the cam sprocket are longer than the two cap screws on the left (spark plug) side. Tighten only until snug.
8. Install the two lower nuts securing the cylinder head to the cylinder, one in front and one in rear.
9. In a crisscross pattern, tighten the four cylinder head cap screws (from step 7) to 28 ft-lb. Tighten the two lower cylinder head nuts (from step 8) to 20 ft-lb and the cylinder-to-crankcase nuts (from step 4) to 8 ft-lb.
10. With the timing inspection plug removed and the cam chain held tight, rotate the crankshaft until the piston is at top-dead-center.
11. While holding the cam chain to the front, install the rear cam chain tensioner guide into the cylinder head. Install the pivot cap screw and washer. Tighten to 11 ft-lb.



CD383

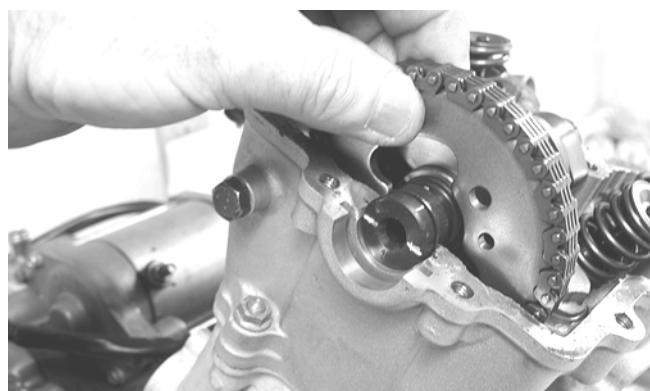
12. With the alignment pin installed in the camshaft and the cam lobes directed down (toward the piston), place the camshaft in position and verify that the timing mark on the magneto is visible through the inspection plug and that the timing marks on the camshaft sprocket are parallel with the valve cover mating surface.



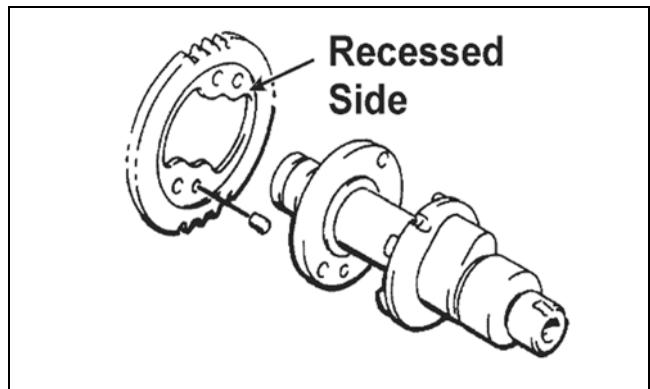
GZ190C

■**NOTE:** When the camshaft assembly is seated, make sure the alignment pin in the camshaft aligns with the smallest hole in the sprocket.

13. With the alignment pin installed in the camshaft, loosely place the cam sprocket (with the recessed side facing the camshaft lobes) onto the camshaft and place it into position with the cam chain over the sprocket.



CD463



MD1359

14. Place the C-ring into position in its groove in the cylinder head.



FI615

**■NOTE:** At this point, oil the camshaft bearings, cam lobes, and the three seating journals on the cylinder head.

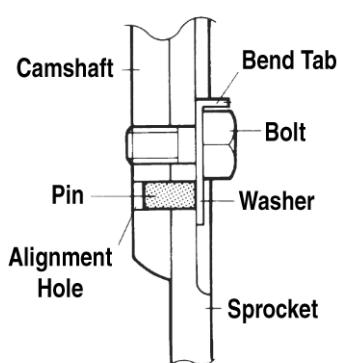
**■NOTE:** Note the position of the alignment marks on the end of the camshaft. They must be parallel with the valve cover mating surface. If rotating the camshaft and sprocket is necessary for alignment, do not allow the crankshaft to rotate and be sure the cam lobes end up in the down position.

15. When the camshaft assembly is seated, ensure the following.
  - A. Piston still at top-dead-center.
  - B. Camshaft lobes directed down (toward the piston).
  - C. Camshaft alignment marks parallel to the valve cover mating surface.
  - D. Recessed side of the sprocket directed toward the cam lobes.
  - E. Camshaft alignment pin and sprocket alignment hole (smallest) are aligned.

### CAUTION

If any of the above factors are not as stated, go back to step 13 and carefully proceed.

16. Place the tab washer onto the sprocket making sure it covers the pin in the alignment hole.

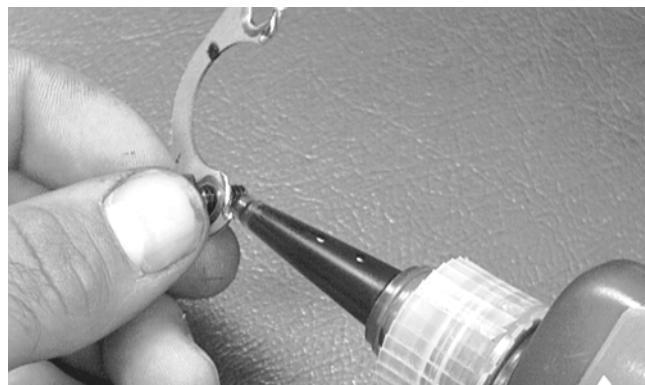


MD1363

### CAUTION

Care must be taken that the tab washer is installed correctly to cover the alignment hole on the sprocket. If the alignment pin falls out, severe engine damage will result.

17. Apply red Loctite #271 to the first cap screw securing the sprocket and tab washer to the camshaft; then install the cap screw and tab washer. Tighten cap screw only until snug.

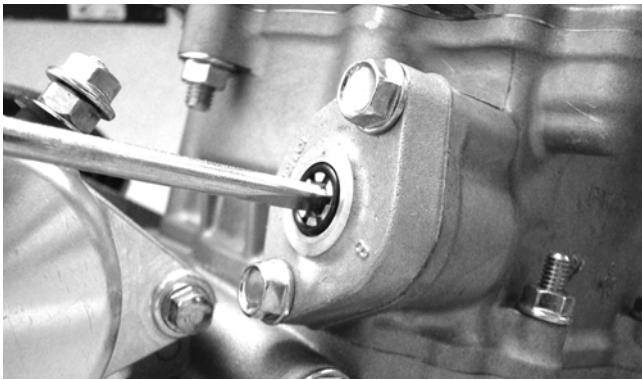


CC404D



FI612

18. Rotate the crankshaft until the second cap screw securing the sprocket to the camshaft can be installed; then install the cap screw (threads coated with red Loctite #271). Tighten to 10 ft-lb; then bend the tab to secure the cap screw.
19. Rotate the crankshaft until the first cap screw (from step 17) securing the sprocket to the camshaft can be addressed; then tighten to 10 ft-lb. Bend the tab to secure the cap screw.
20. Install the cylinder head plug with the cupped end facing the camshaft and the opening directed downwards.
21. Place the cam chain tensioner assembly and gasket into the cylinder. Tighten to 10 ft-lb.
22. Using a flat-blade screwdriver, turn the tensioner screw counterclockwise to apply tension to the cam chain; then install the cap screw plug and washer and tighten securely.

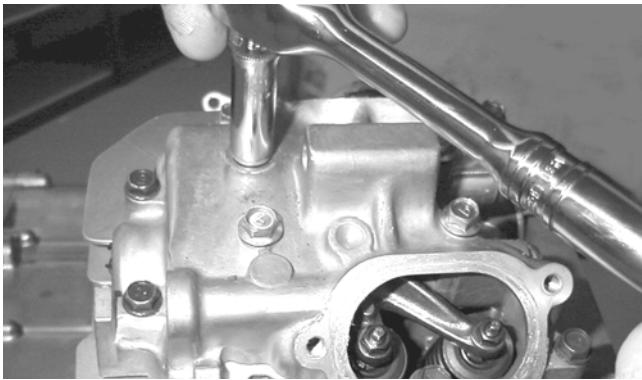


FI608

23. Loosen the adjuster screw jam nuts; then loosen the adjuster screws on the rocker arms in the valve cover.
24. Apply a thin coat of Three Bond Sealant to the mating surface of the valve cover; then place the valve cover into position. Note that the two alignment pins are properly positioned.

■NOTE: At this point, the rocker arms and adjuster screws must not have pressure on them.

25. Install the four top-side cap screws with rubber washers; then install the remaining cap screws. Tighten only until snug.



MD1261

26. In a crisscross pattern starting from the center and working outward, tighten the cap screws (from step 25) to 8.5 ft-lb.
27. Adjust valve/tappet clearance (see Periodic Maintenance/Tune-Up).
28. Place the two tappet covers with O-rings into position; then install and tighten the cap screws to 8.5 ft-lb.



FI602

29. Install the spark plug and tighten securely; then install the timing inspection plug.

## Left-Side Components

■NOTE: For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

### ☞ AT THIS POINT

To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■NOTE: The engine/transmission does not have to be removed from the frame for this procedure.

## Removing Left-Side Components

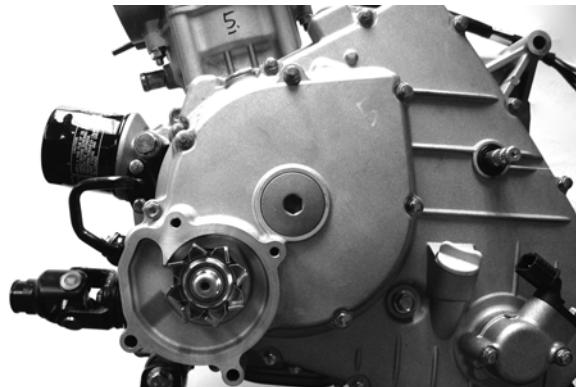
- A. Water Pump
- B. Speed Sensor
- C. Magneto Cover/Stator Assembly

1. Remove the coolant hose connecting the water pump to the cylinder; then remove the water pump cover.

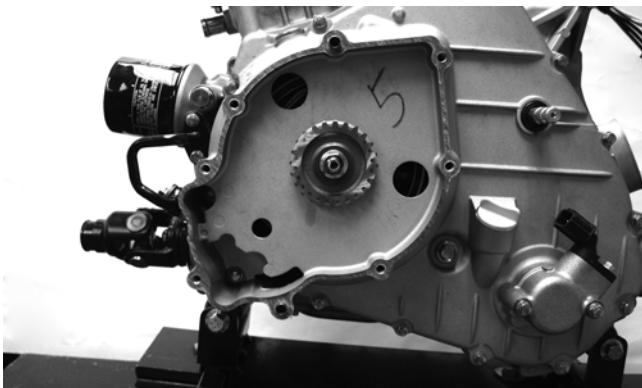


FI538

2. Remove the water pump housing assembly noting the location of the longer cap screw. Account for a gasket and two alignment pins.



FI539



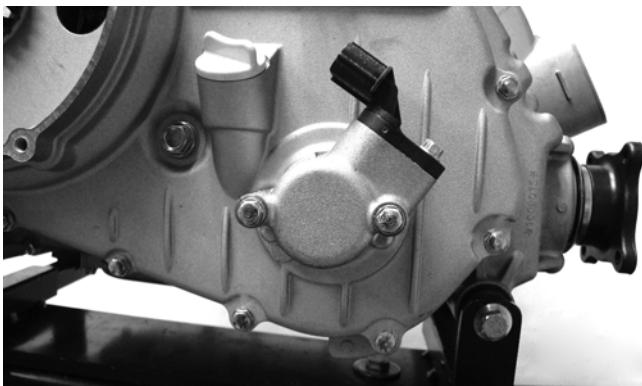
FI541

3. Remove two cap screws and the oil bolt securing the oil pressure relief line to the engine. Account for two crush washers and an O-ring.



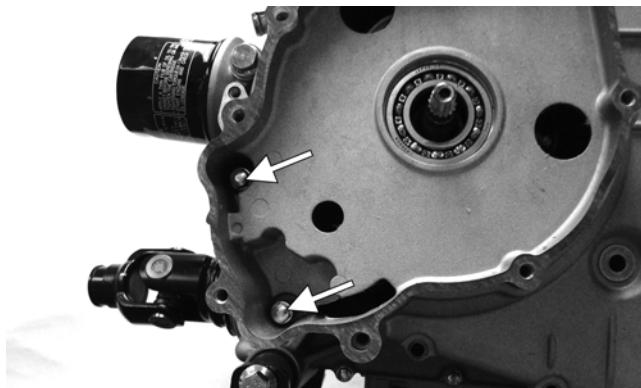
FI544

4. Remove the water pump drive gear; then remove the speed sensor housing assembly. Account for two alignment pins, a gasket, and two seal washers.



FI543

5. Remove the cap screws securing the magneto cover to the crankcase. Note the location of the two internal cap screws and the two longer cap screws.



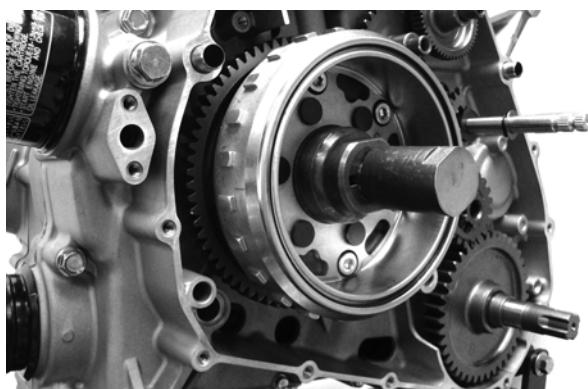
FI596A

6. Remove the magneto cover and account for two alignment pins and the gasket.

**D. Rotor/Flywheel**  
**E. Starter Clutch/Gear**  
**F. Starter Motor**

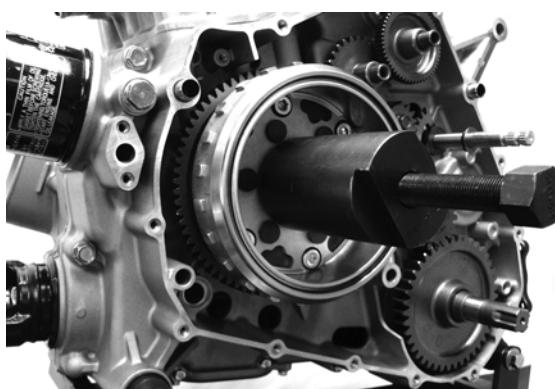
■**NOTE: Steps 1-6 in the preceding sub-section must precede this procedure.**

7. Remove the nut securing the rotor/flywheel on the crankshaft and install the crankshaft protector.



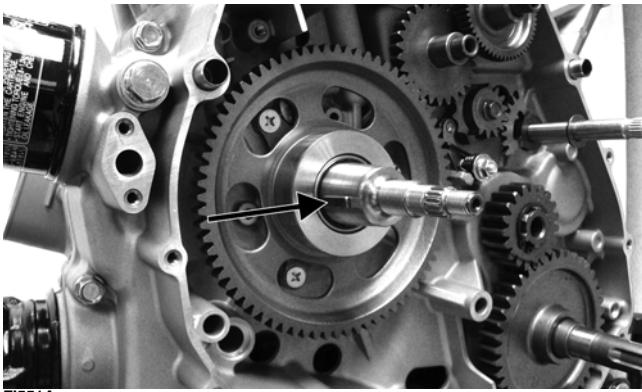
FI549

8. Using the Magneto Rotor Remover Set, break the rotor/flywheel loose from the crankshaft; then remove the puller and crankshaft protector and remove the rotor/flywheel.



FI550

9. Remove the flywheel key from the crankshaft; then remove the starter clutch gear.



FI551A

10. Remove starter idler gears and their respective shafts; then remove the starter motor. Account for an O-ring on the starter drive housing.



FI555

#### **G. Shift Shaft H. Drive Gear**

**■NOTE: Steps 1-10 in the preceding sub-sections must precede this procedure.**

11. Remove the shift shaft noting a washer on each end; then remove the cap screw securing the gear shift cam plate and remove the plate from the shaft.



FI559

12. Remove the shift detent cam arm and spring.

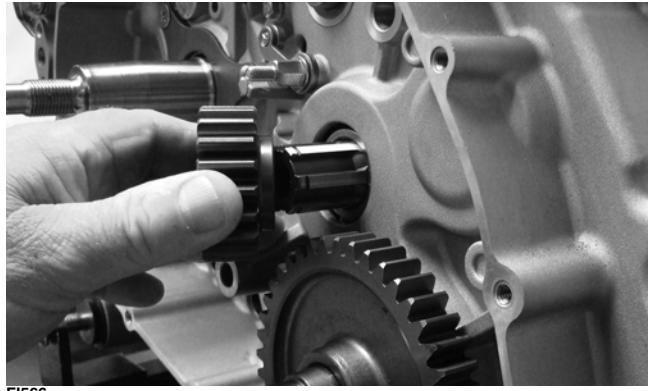


FI560

13. Remove the snap ring securing the output drive gear to the output shaft and remove the gear noting that the hub flange is directed toward the crankcase.



FI564



FI566

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## **Servicing Left-Side Components**

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### **INSPECTING STARTER CLUTCH/GEAR**

1. Place the starter clutch gear onto the rotor/flywheel and attempt to rotate the starter clutch gear clockwise. It should lock up to the rotor/flywheel. Rotate the gear counterclockwise and it should turn freely. If it moves or locks up both ways, the starter clutch must be replaced.
2. Inspect the starter clutch gear for chipped or missing teeth or discoloration/scoring of the clutch surface. Inspect the bearing for loose, worn, or discolored rollers. If bearing is damaged, it must be replaced.



FI569

3. Inspect the one-way bearing for chipped surfaces, missing rollers, or discoloration. If any of the above conditions exist, replace the starter clutch assembly.



FI572

## REPLACING STARTER CLUTCH ASSEMBLY

1. Remove the cap screws securing the starter clutch assembly to the flywheel; then remove from the flywheel.



FI570

2. Thoroughly clean the rotor/flywheel; then install the new clutch and secure with the cap screws after applying a drop of red Loctite #271 to the threads. Tighten to 26 ft-lb using a crisscross pattern. Make sure the one-way bearing is installed with the notches directed away from the rotor/flywheel.



FI576A



FI578

## REPLACING STARTER GEAR BEARING

1. Support the starter clutch gear in a press making sure to support the hub around the entire circumference; then using a suitable bearing driver, press the bearing from the gear.



FI583

2. Thoroughly clean the gear hub; then apply a drop of green Loctite #620 to the bearing outer race and press into the gear hub until even with the lower chamfer radius.



FI580

### INSPECTING STATOR/MAGNETO COVER ASSEMBLY

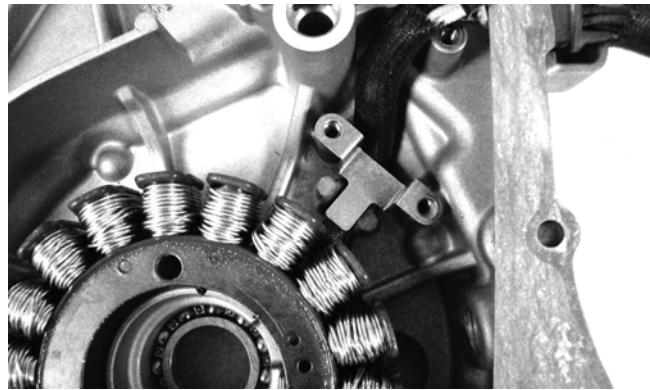
1. Inspect the stator for burned or discolored wiring, broken or missing hold-down clips, or loose cap screws.
2. Inspect the bearings in the magneto housing for discoloration, roughness when rotated, and secure fit in bearing bores.
3. Inspect the oil pressure relief valve for evidence of metal chips or contamination. Do not disassemble the valve.



FI588

### REPLACING STATOR COIL/CRANKSHAFT POSITION SENSOR

1. Remove the three cap screws securing the stator coil, two cap screws securing the crankshaft position sensor, and one cap screw from the harness hold-down.
2. Lift the rubber grommet out of the housing; then remove the stator coil/crankshaft position sensor. Account for and note the position of the harness hold-down under the crankshaft position sensor.



FI590

3. Install the new stator coil assembly and secure with three cap screws using a drop of red Loctite #271 on each. Tighten according to the chart.

| Cover    | Bolt Type | ft-lb | N·m |
|----------|-----------|-------|-----|
| Original | Hex-Head  | 11.5  | 15  |
| New      | Hex-Head  | 13    | 18  |

4. Place the stator wire harness hold-down into position; then install the crankshaft position sensor and secure with two cap screws. Tighten securely.
5. Install the upper cable hold-down and secure with a cap screw. Tighten securely.



FI595A

### REPLACING MAGNETO COVER BEARINGS

1. Using a suitable press and proper support, press the bearing from the housing as indicated (one from outside and one from inside).



FI593



FI594

2. Clean the bearing bores in the housing and inspect closely for cracks or shiny areas indicating bearing movement. Replace the housing if any of the above are evident.
3. With a drop of red Loctite #271 around the bearing bore, press a new bearing into the magneto cover until the bearing is firmly seated in the bearing bore.



MD1086

4. Install the shift detent cam arm and spring.
5. Install the gear shift shaft assembly and washer making sure to align the alignment marks.



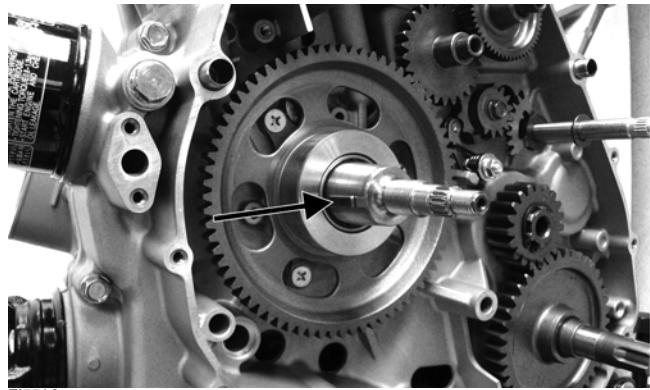
FI559

6. Install starter idler gears (1) and (2).



FI555A

7. Install the starter clutch gear onto the crankshaft; then install the rotor/flywheel key in the crankshaft.



FI551A

## Installing Left-Side Components

### A. Starter Clutch/Gear

### B. Rotor/Flywheel

1. If removed, place the crankshaft bearing retainer into position. Apply red Loctite #271 to the three cap screws. Install and tighten the three cap screws securely.



MD1122

2. Install the starter motor and tighten the two cap screws to 10 ft-lb.
3. Install the shift detent cam making sure the washer is installed.

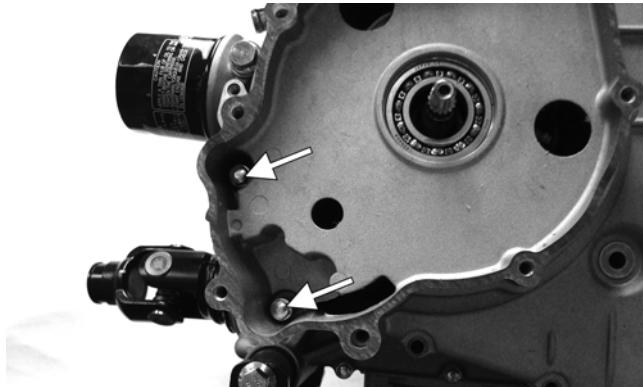
8. Install the rotor/flywheel and secure with the nut. Tighten to 107 ft-lb.

### C. Magneto Cover

### D. Water Pump

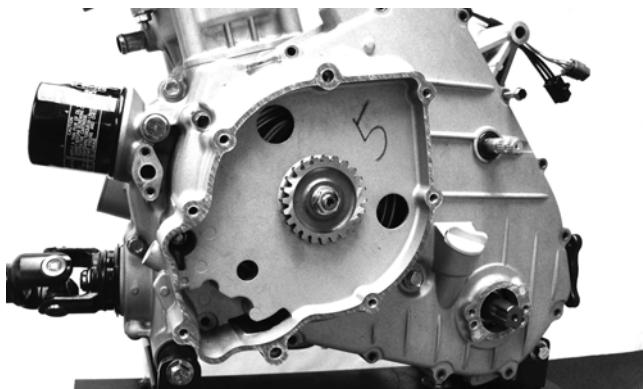
■NOTE: Steps 1-8 in the preceding sub-section must precede this procedure.

9. Install two alignment pins and place the magneto cover gasket into position. Install the magneto cover. Noting the different-lengthed 6 mm cap screws and the location of the two internal cap screws, tighten the cap screws in a crisscross pattern to 8 ft-lb.



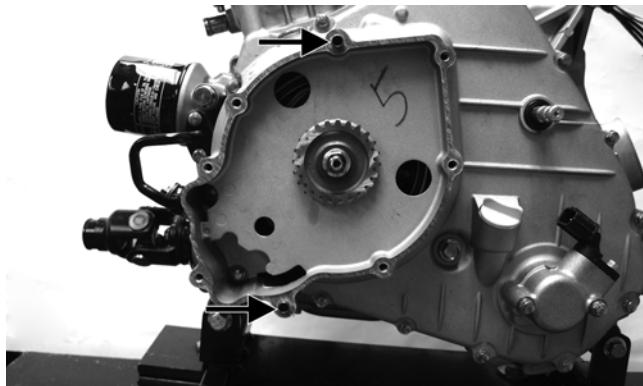
FI596A

10. Install the water pump drive gear and secure with the nut. Tighten to 28 ft-lb.

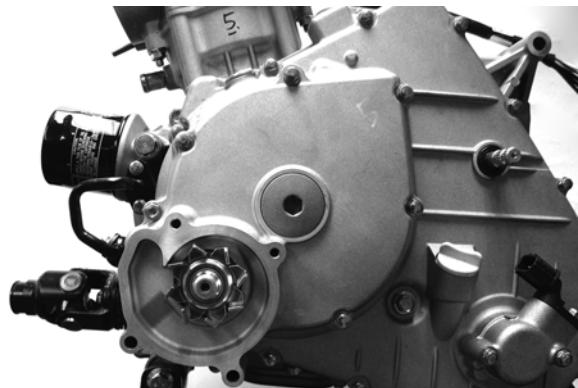


FI547

11. Install two alignment pins and a gasket on the magneto cover; then install the water pump housing assembly. Tighten the cap screws to 8 ft-lb.



FI541A



FI539

12. Install the water pump cover with a new O-ring and secure with the four cap screws. Tighten to 8 ft-lb.



FI538

13. Connect the coolant hoses to the water pump and secure with the hose clamps. Tighten securely.

## Right-Side Components

### ☞ AT THIS POINT

To service center crankcase components only, proceed to Removing Right-Side Components.

■NOTE: For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

### ☞ AT THIS POINT

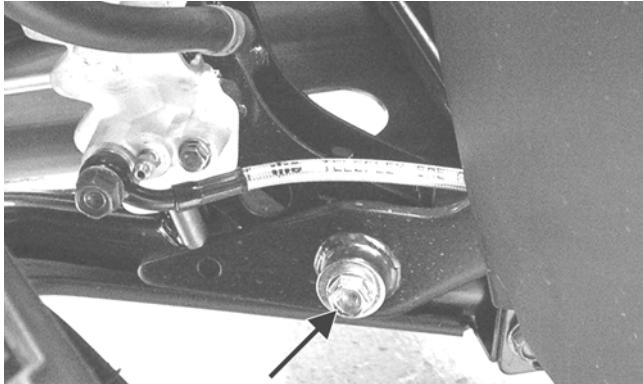
To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■NOTE: The engine/transmission does not have to be removed from the frame for this procedure.

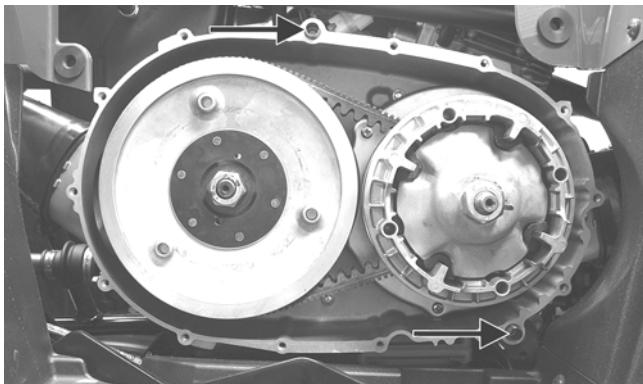
## Removing Right-Side Components

### A. V-Belt Cover B. Drive Clutch C. Driven Clutch D. Clutch Cover

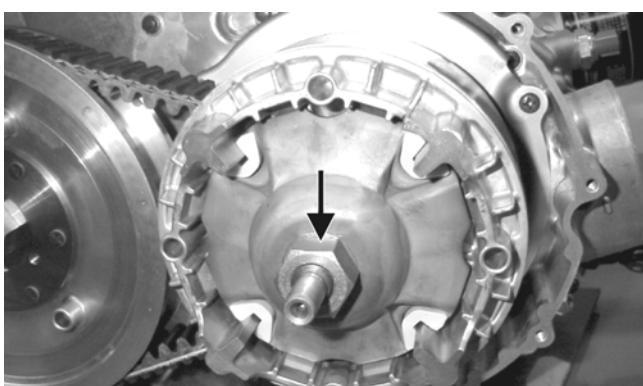
1. If the engine is still in the frame, remove the cap screw securing the brake pedal to the pedal axle. Account for a flat washer.



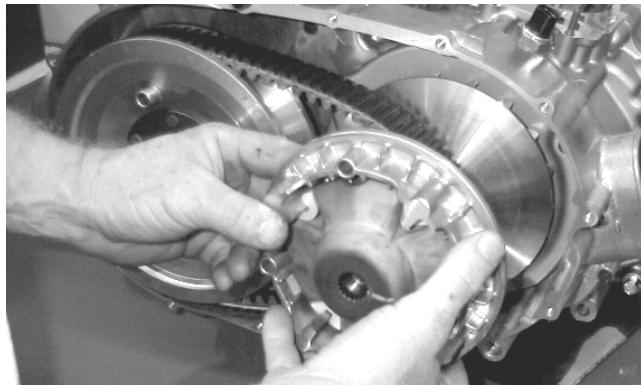
2. Remove the cap screws securing the V-belt cover to the clutch cover; then slide the brake pedal outward and remove the V-belt cover. Account for two alignment pins and a gasket.



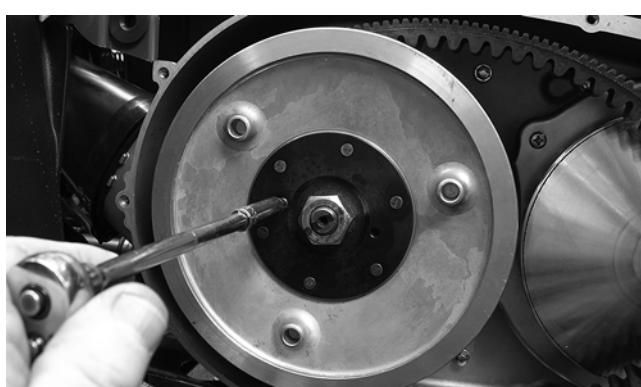
3. Mark the movable drive face and the fixed drive face for installing purposes; then remove the nut holding the movable drive face onto the crankshaft.



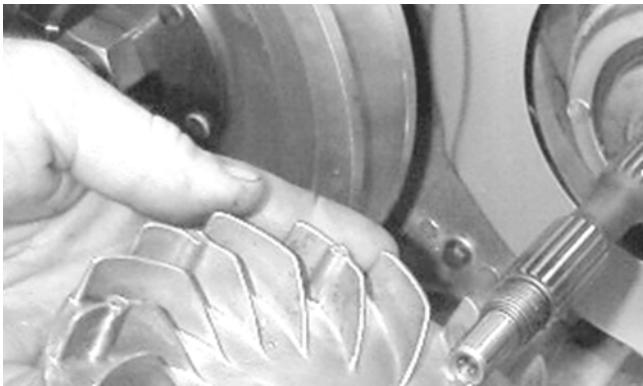
4. Remove the movable drive face and spacer. Account for the movable drive face rollers and outer drive face cover.



5. Using a 6 mm cap screw threaded into the fixed driven face, spread the driven pulley by turning the cap screw clockwise; then remove the V-belt.

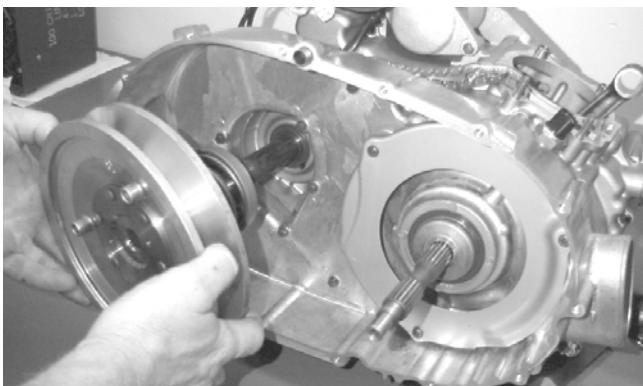


6. Remove the fixed drive face.



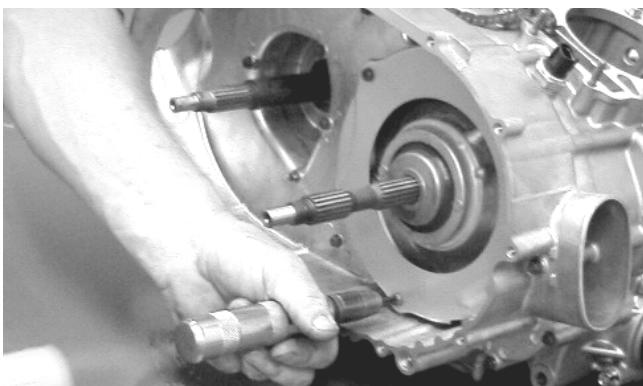
MD1094

7. Remove the nut holding the driven clutch assembly; then remove the driven clutch assembly.



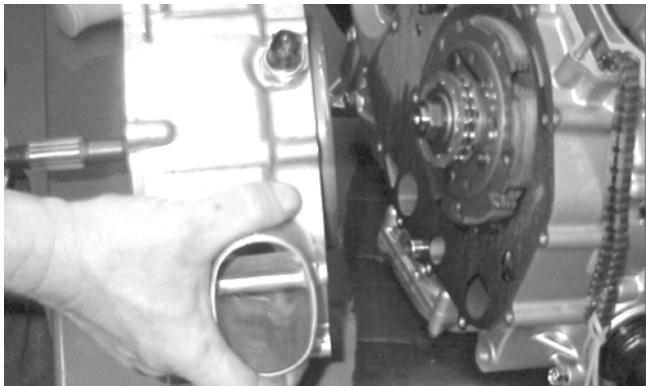
MD1068

8. Using an impact screwdriver, remove the three Phillips-head cap screws holding the air intake plate. Remove the air intake plate.



MD1092

9. Remove the cap screws holding the clutch cover onto the right-side crankcase half. Note the positions of the different-lengthed cap screws for installing purposes.
10. Using a rubber mallet, loosen the clutch cover; then pull it away from the right-side crankcase half. Account for two alignment pins and gasket.



MD1115

#### **E. Centrifugal Clutch Assembly** **F. Oil Pump Drive Gear** **G. Oil Pump Driven Gear**

■**NOTE:** Steps 1-10 in the preceding sub-section must precede this procedure.

11. Remove the one-way clutch noting the direction of the green dot or the word OUTSIDE for installing purposes.



MD1286

12. Remove the left-hand threaded nut holding the centrifugal clutch assembly.

#### **CAUTION**

Care must be taken when removing the nut; it has "left-hand" threads.



MD1014



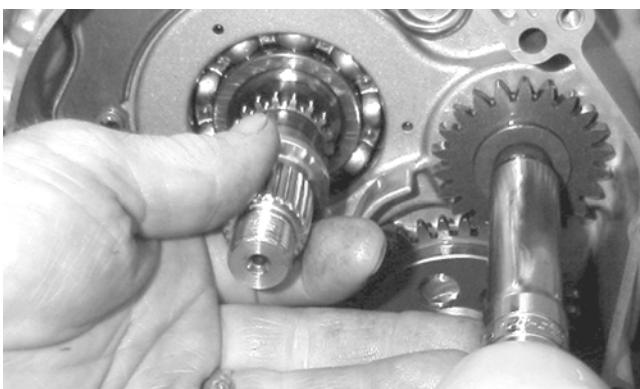
MD1016

13. Remove the cam chain.



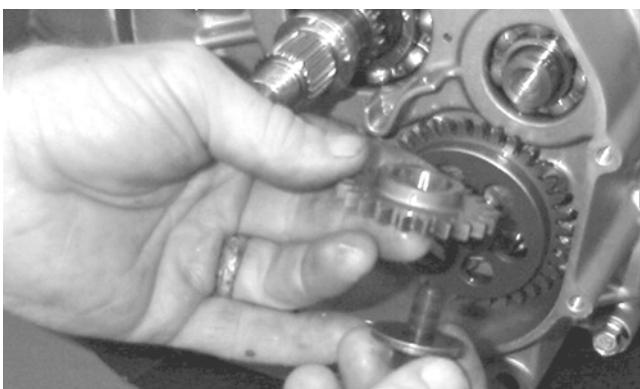
FI630

14. Remove the oil pump drive gear cap screw.



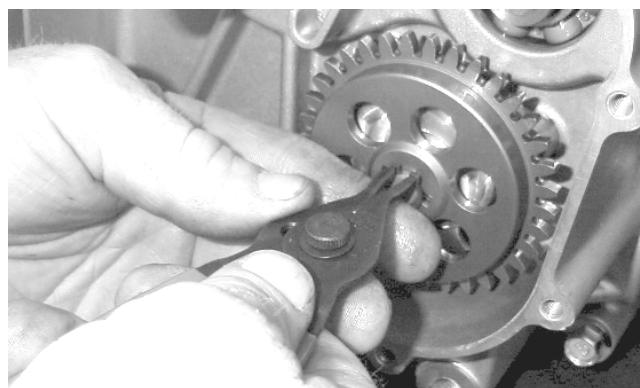
MD1018

15. Remove oil pump drive gear. Account for the pin.



MD1017

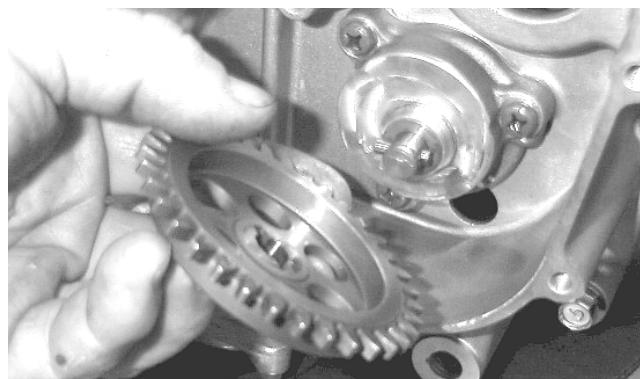
16. Remove the snap ring holding the oil pump driven gear.



MD1019

■**NOTE:** Always use a new snap ring when installing the oil pump driven gear.

17. Remove oil pump driven gear. Account for the drive pin and thrust washer.



MD1020

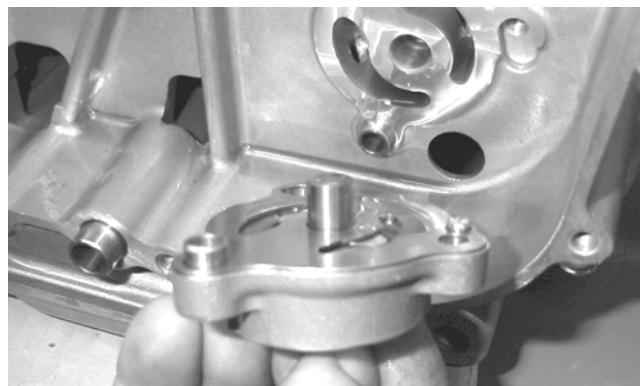
#### **AT THIS POINT**

To service clutch components, see Servicing Right-Side Components sub-section.

#### **H. Oil Pump/Oil Strainer**

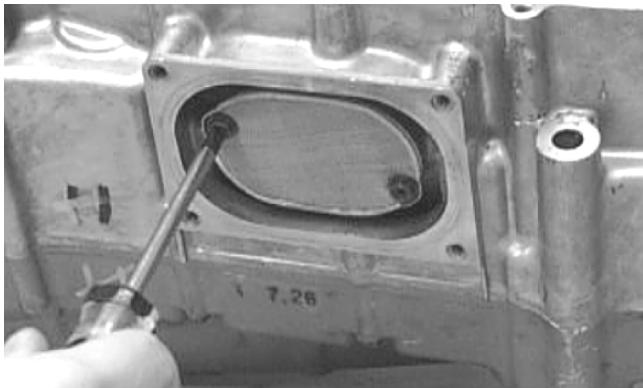
■**NOTE:** Steps 1-17 in the preceding sub-sections must precede this procedure.

18. Remove three cap screws holding the oil pump and remove the oil pump. Account for two alignment pins.

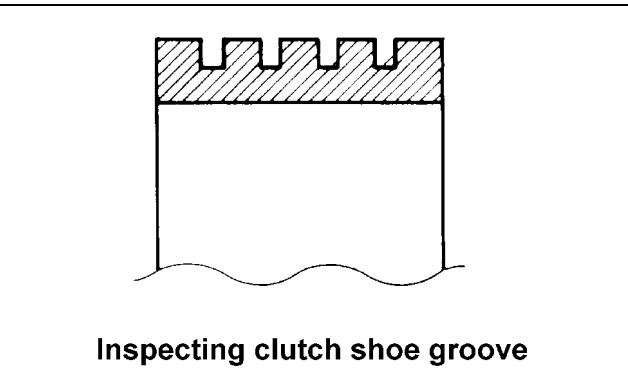


MD1060

19. Remove the four cap screws securing the oil strainer cap; then remove the Phillips-head screws securing the oil strainer. Account for the O-ring.



MD1337



Inspecting clutch shoe groove

ATV1014



MD1208

#### ☞ AT THIS POINT

To service center crankcase components only, proceed to Separating Crankcase Halves.

## Servicing Right-Side Components

### INSPECTING OIL PUMP

1. Inspect the pump for damage.
2. It is inadvisable to remove the screw securing the pump halves. If the oil pump is damaged, it must be replaced.

■**NOTE:** The oil pump is a non-serviceable component and must be replaced as a complete assembly.

### INSPECTING CENTRIFUGAL CLUTCH SHOE

Inspect the clutch shoe for uneven wear, chips, cracks, or discoloration. If wear is present, replace the clutch assembly.

### INSPECTING CLUTCH HOUSING

1. Inspect the clutch housing for burns, marks, scuffs, cracks, scratches, or uneven wear.
2. If the housing is damaged in any way, the housing must be replaced.

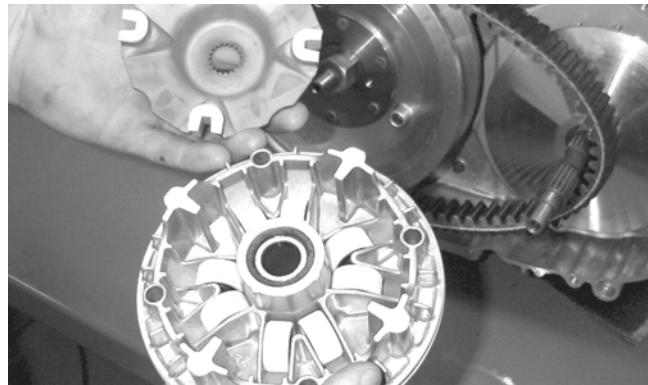
### DRIVE CLUTCH ASSEMBLY

#### Disassembling and Inspecting

1. Slide the sheave plate out of the movable drive sheave. Make note of each drive face plate damper orientation before removing. Check for excessive wear, warping or any cracks. Replace as necessary. Check the internal splines of the sheave plate for excessive or abnormal wear. Inspect the roller surface of the sheave plate for abnormal wear or pitting. Replace as necessary.



CF378



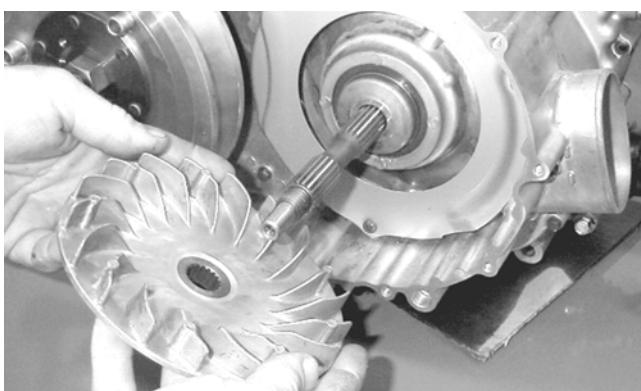
MD1036

2. Note the roller locations; then remove the rollers. Check for flat spots or abnormal wear. Measure the outside diameter; standard measurement is 30 mm. If excessively worn, replace as necessary.



ATV1152A

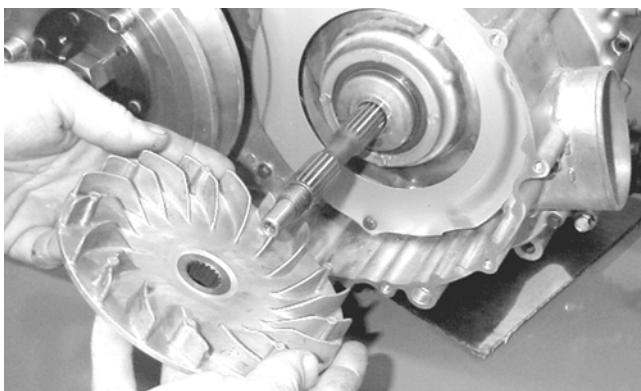
3. Check the internal bushing of the movable drive sheave and surface of the spacer. Replace as necessary. Check the fixed drive sheave internal splines for excessive wear. Check for any broken cooling fins and replace as necessary.



MD1094

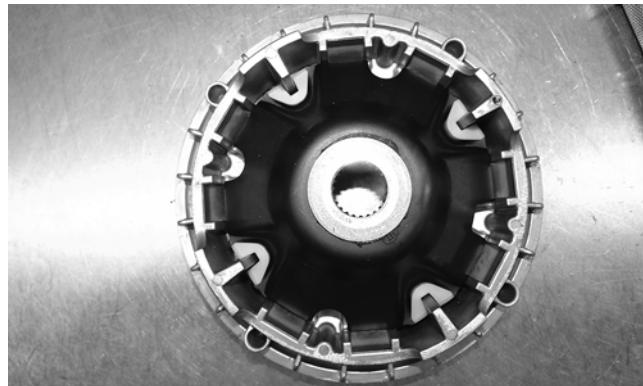
## Assembling

1. Install the fixed drive sheave to the centrifugal clutch housing shaft.



MD1094

2. As noted during disassembling, place each roller into each valley of the movable drive sheave. With the dampers installed onto the sheave plate, install the sheave plate into the movable drive sheave.



CF381

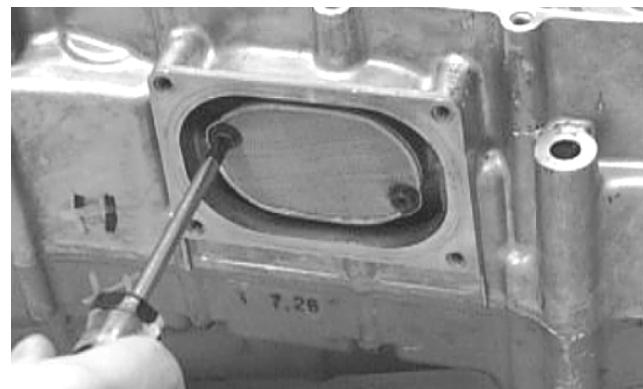
## DRIVEN CLUTCH ASSEMBLY

**■NOTE:** The driven clutch is a non-serviceable component. If the clutch faces, cam ramps, or sheave bushing are worn or loose, the clutch must be replaced as an assembly. Do not disassemble the driven clutch.

## Installing Right-Side Components

### A. Oil Strainer/Oil Pump

1. Place the oil strainer into position beneath the crankcase. Tighten the Phillips-head screws securely.



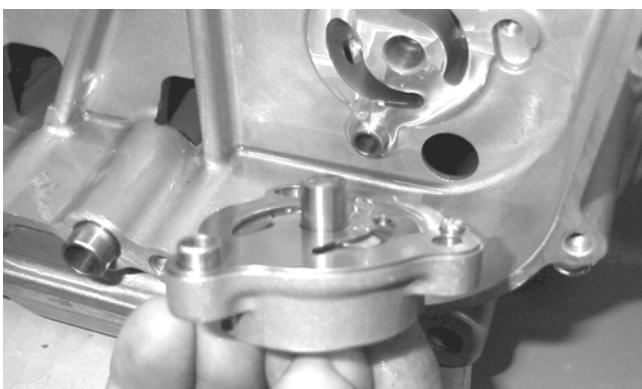
MD1337

2. Place the strainer cap into position on the crankcase making sure the O-ring is properly installed and secure with the four cap screws. Tighten the cap screws to 54 in-lb; then install the oil drain plug and tighten to 16 ft-lb.



MD1208

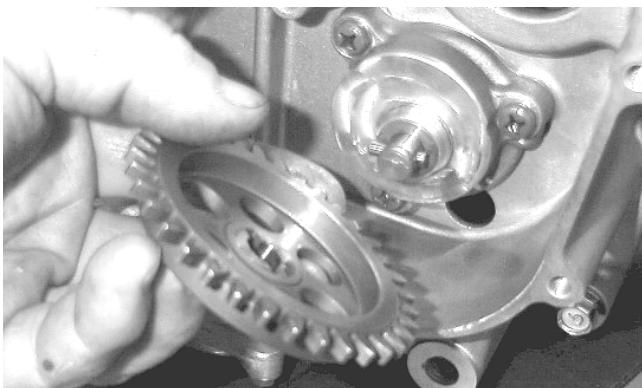
3. Place two alignment pins and the oil pump into position on the crankcase and secure with the Phillips-head screws coated with red Loctite #271. Tighten to 8.5 ft-lb.



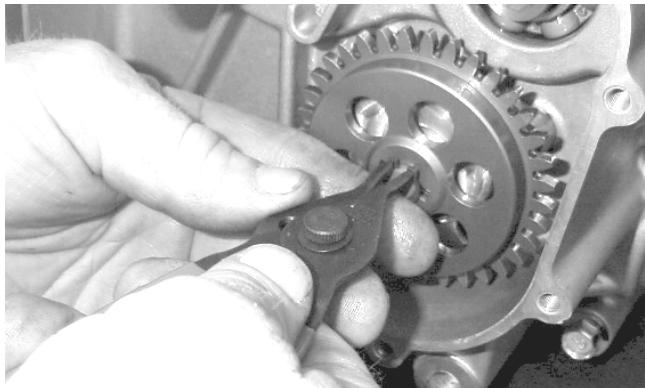
MD1060

4. Place the thrust washer and drive pin into position on the oil pump shaft, install the oil pump driven gear making sure the recessed side of the gear is directed inward, and secure with a new snap ring.

**■NOTE: Always use a new snap ring when installing the oil pump driven gear.**



MD1020

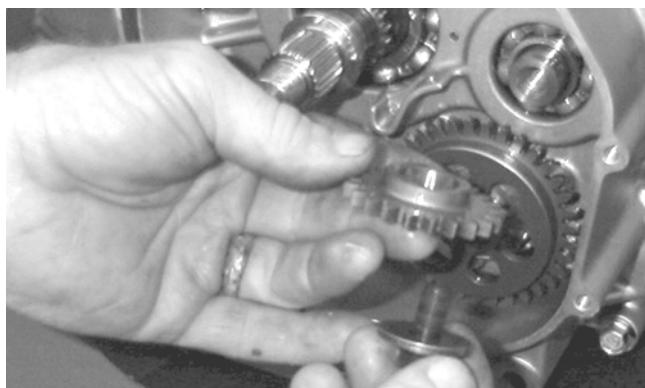


MD1019

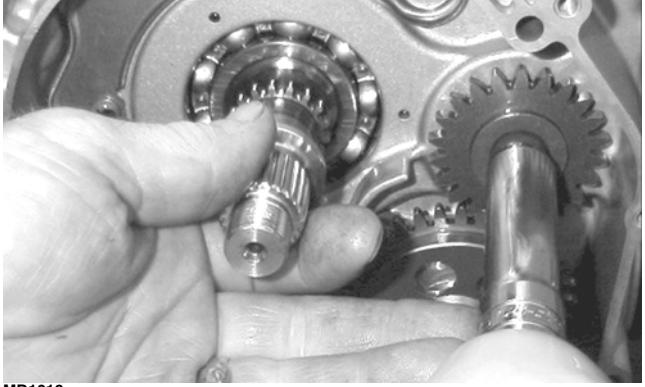
5. Install the cam chain.

**■NOTE: Keep tension on the cam chain to avoid damaging the crankcase boss.**

6. Place the pin into position, install the oil pump drive gear, and tighten the cap screw (coated with red Loctite #271) to 63 ft-lb.



MD1017



MD1018

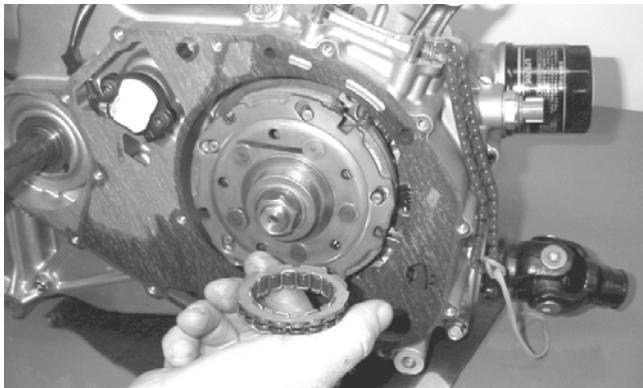
7. Install the clutch shoe assembly on the crankshaft; then install the flange nut (left-hand thread) (coated with red Loctite #271). Tighten to 147 ft-lb.

**■NOTE: The flat side of the flange nut should be directed towards the clutch shoe.**

#### CAUTION

**Care must be taken when installing the flange nut; it has "left-hand" threads.**

8. Install the one-way clutch making sure that the green dot or the word OUTSIDE is directed away from the crankcase.

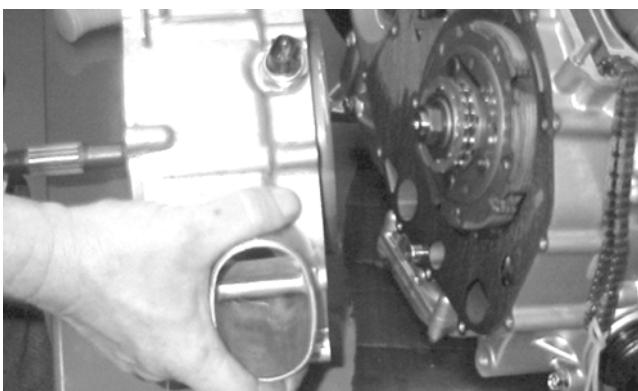


MD1286

**B. Clutch Cover**  
**C. Fixed Drive Face**  
**D. Movable Drive Face**

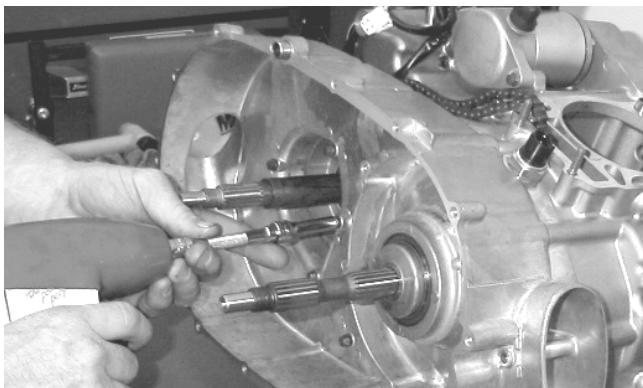
■**NOTE:** Steps 1-8 in the preceding sub-section must precede this procedure.

9. Install two alignment pins and place the clutch cover gasket into position. Install the clutch cover.



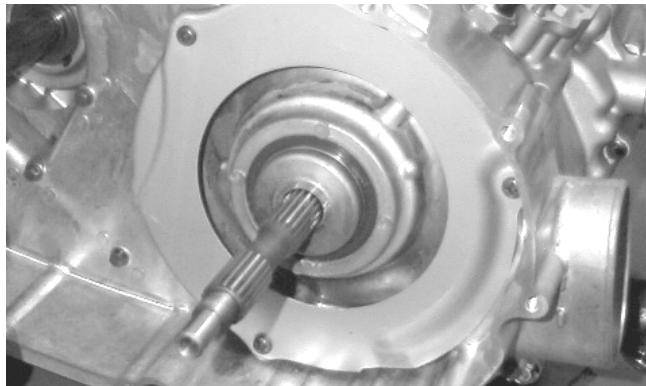
MD1115

10. Tighten the clutch cover cap screws to 8 ft-lb.



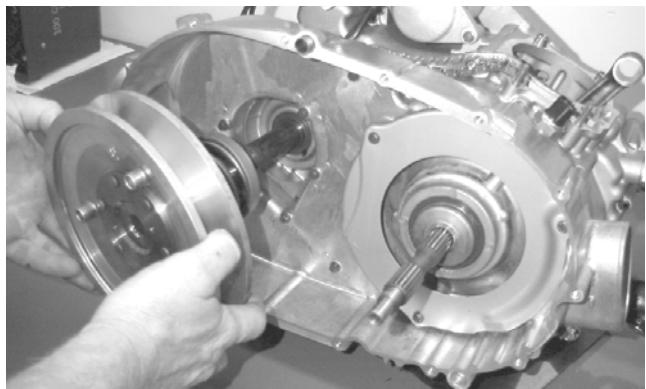
MD1117

11. Install the air intake plate. Apply red Loctite #271 to the threads of the three Phillips-head cap screws; then install and tighten securely.

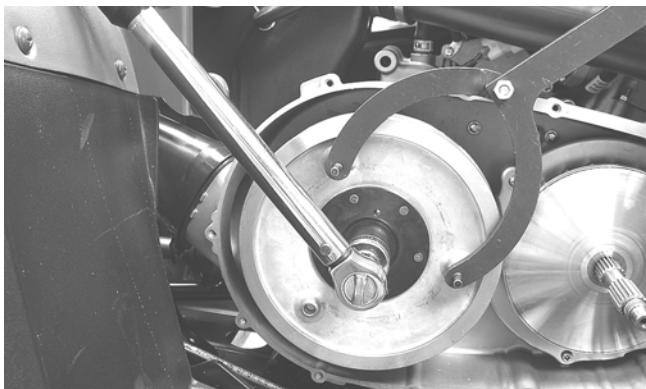


MD1342

12. Place the driven pulley assembly into position and secure with the nut (threads coated with red Loctite #271). Tighten to 147 ft-lb.

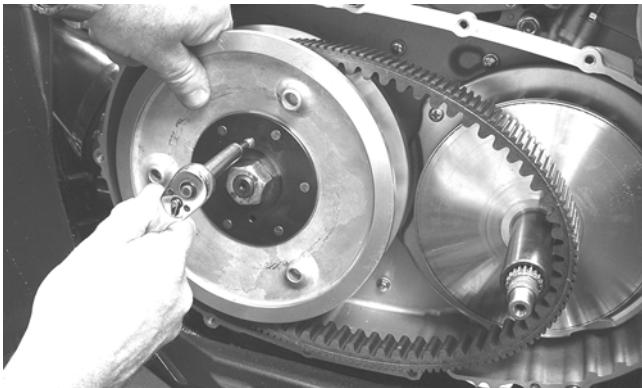


MD1068



KC134

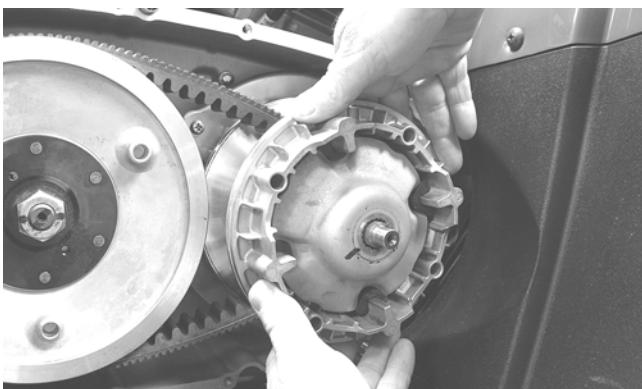
13. Slide the fixed drive face assembly onto the front shaft.
14. Spread the faces of the driven pulley by threading a V-belt cover cap screw into the fixed driven face and tightening until the faces open sufficiently to allow the V-belt to drop into the pulley approximately 3/4 in.



KC137

■NOTE: The arrows on the V-belt should point in direction of engine rotation.

15. Making sure the movable drive face rollers are in position, pinch the V-belt together near its center and slide the spacer and movable drive face onto the shaft.

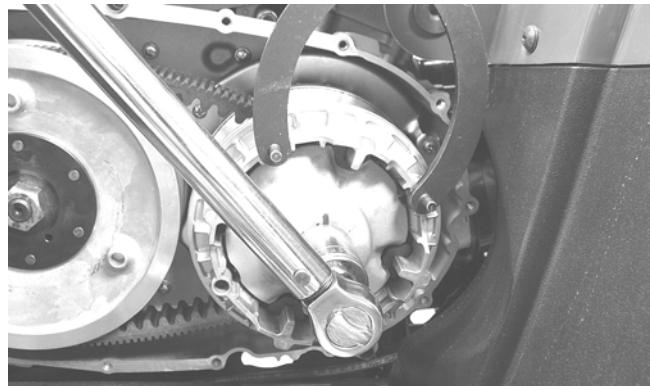


KC127

16. Making sure the splines of the clutch shaft protrude through the cover plate, secure with the nut and tighten to 147 ft-lb.



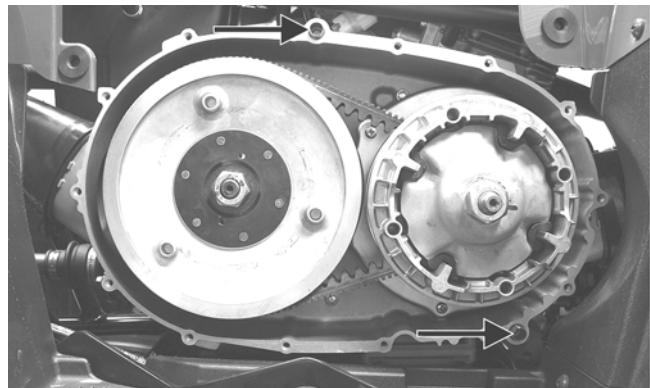
KC138



KC141

■NOTE: At this point, the cap screw can be removed from the driven pulley face.

17. Rotate the V-belt and drive/driven assemblies until the V-belt is flush with the top of the driven pulley.
18. Install two alignment pins and place a new V-belt cover gasket into position on the clutch cover. In a crisscross pattern, tighten cap screws to 8 ft-lb.



KC142A

19. If removed, install the brake pedal and tighten to 25 ft-lb.

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## Center Crankcase Components

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■NOTE: This procedure cannot be done with the engine/transmission in the frame. Complete Removing procedures for Top-Side, Left-Side, and Right-Side must precede this procedure.

■NOTE: For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

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## Separating Crankcase Halves

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1. Remove the left-side and right-side cap screws securing the crankcase halves noting the position of the different-sized cap screws for joining purposes.

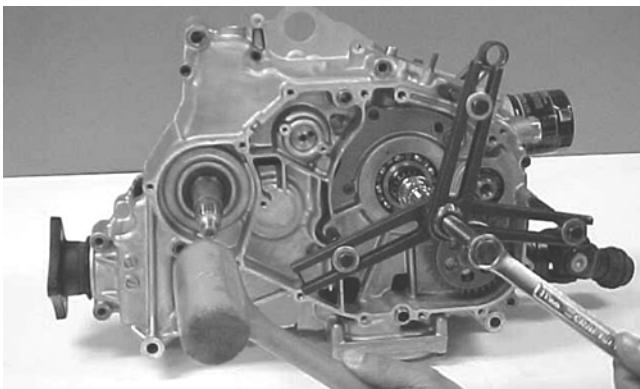


MD1006



MD1012

2. Using Crankcase Separator/Crankshaft Remover and tapping lightly with a rubber mallet, separate the crankcase halves. Account for two alignment pins.



CC869

■NOTE: To keep the shaft/gear assemblies intact for identification, tap the shafts toward the left-side crankcase half when separating the halves.

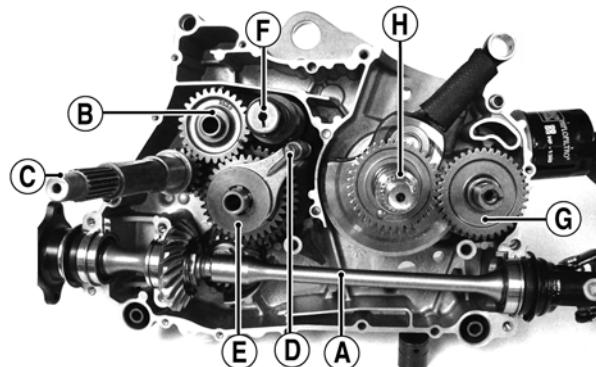


MD1313

## Disassembling Crankcase Half

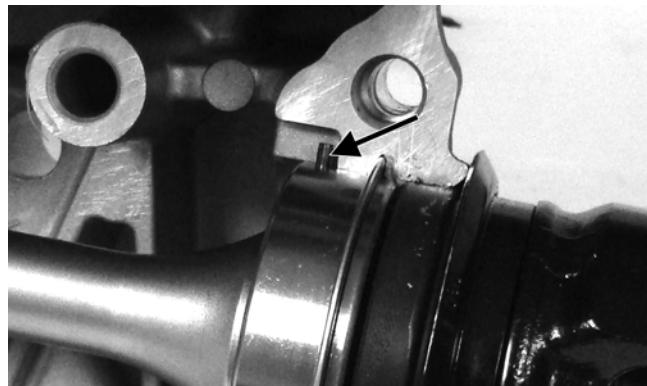
■NOTE: To aid in installing, it is recommended that the assemblies be kept together and in order.

■NOTE: For steps 1-6, refer to illustration FI639A.

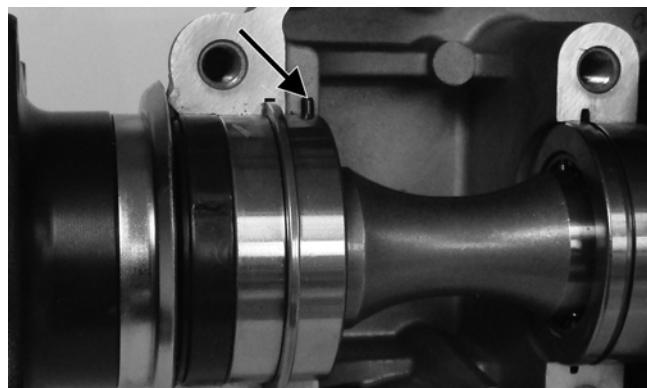


FI639A

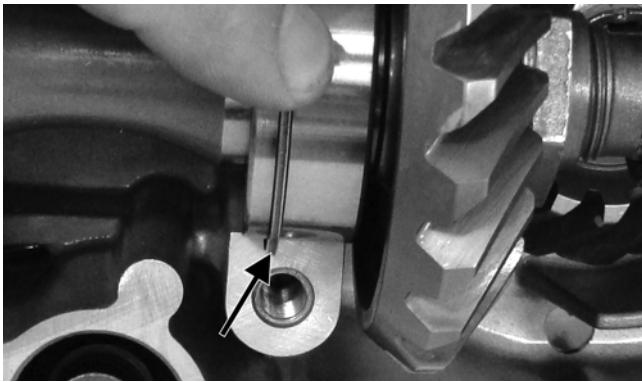
1. Remove the secondary driven shaft assembly (A) noting the location of the front and rear bearing locating pins and the center bearing locating ring.



FI660A

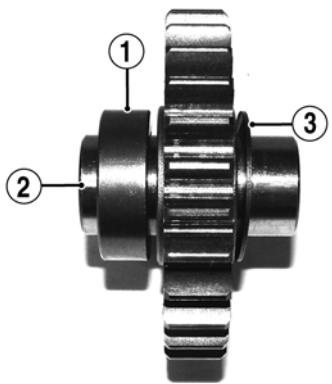


FI659A



FI661A

2. Remove the reverse idler assembly (B). Account for and note the location of the inner bushing (1), idler shaft (2), and outer washer (3).

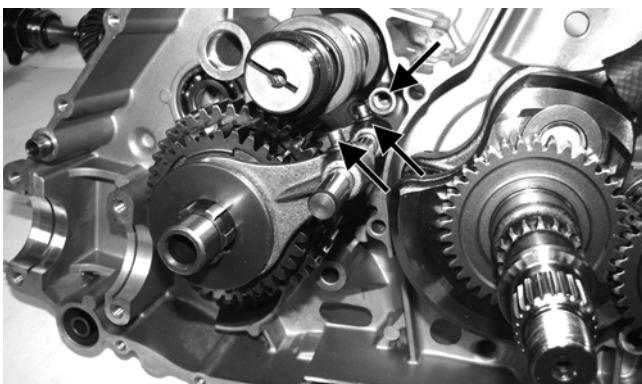


FI641A

3. Remove the driveshaft (C); then pull the shift fork locating shaft (D) out of the crankcase locating boss and allow the shift forks to disengage from the gear shift shaft (F).



FI646



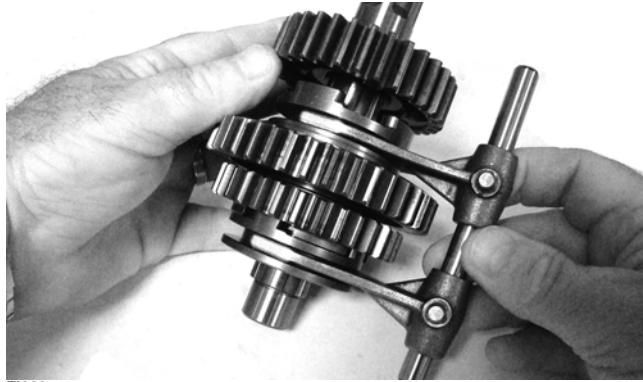
FI653A

4. Remove the gear shift shaft (F) noting the inner and outer washers.



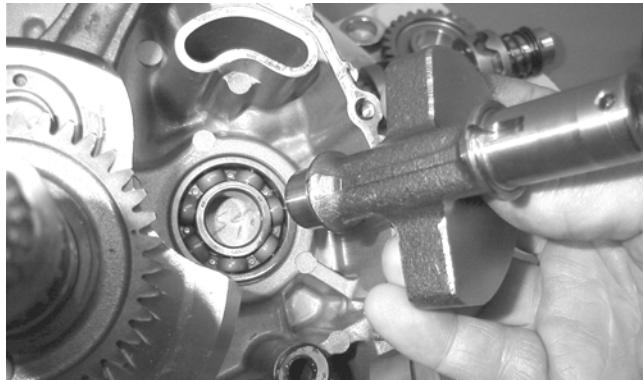
FI650A

5. Remove the countershaft assembly (E) along with the shift fork assembly.



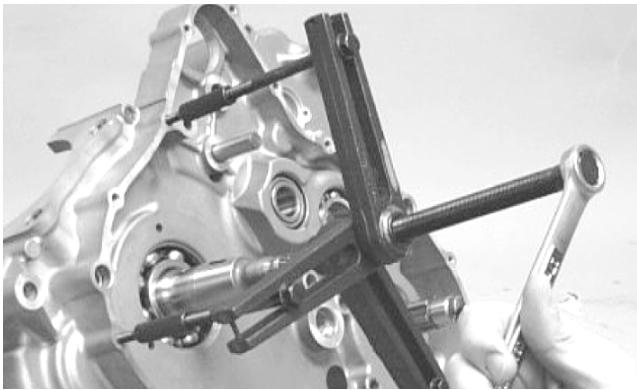
FI662

6. Remove the crank balancer driven gear (G) and account for a key; then remove the crankshaft balancer shaft.



MD1024

7. Using Crankcase Separator/Crankshaft Remover with the appropriate crankshaft protector, remove the crankshaft.



MD1330

### CAUTION

**Do not remove the remaining output shaft assembly unless absolutely necessary. If the shaft is removed, the shaft nut must be replaced with a new one and the shaft must be re-shimmed.**

8. Remove the secondary drive gear/secondary driven gear retaining nut. From inside the crankcase using a rubber mallet, drive out the output shaft assembly. Account for the output shaft, a shim, a washer, and the nut.

### ☞ AT THIS POINT

**To service crankshaft assembly, see Servicing Center Crankcase Components sub-section.**

## Servicing Center Crankcase Components

### SECONDARY GEARS

**■NOTE: When checking and correcting secondary gear backlash and tooth contact, the universal joint must be secured to the front shaft or false measurements will occur.**

#### Checking Backlash

**■NOTE: The rear shaft and bevel gear must be removed for this procedure. Also, always start with the original shims on the rear shaft.**

1. Place the left-side crankcase cover onto the left-side crankcase half to prevent runout of the secondary transmission output shaft.
2. Install the secondary driven output shaft assembly onto the crankcase.
3. Mount the indicator tip of the dial indicator on the secondary driven bevel gear (centered on the gear tooth).
4. While rocking the driven bevel gear back and forth, note the maximum backlash reading on the gauge.
5. Acceptable backlash range is 0.05-0.33 mm (0.002-0.013 in.).

#### Correcting Backlash

**■NOTE: If backlash measurement is within the acceptable range, no correction is necessary.**

1. If backlash measurement is less than specified, remove an existing shim, measure it, and install a new thinner shim.
2. If backlash measurement is more than specified, remove an existing shim, measure it, and install a thicker shim.

**■NOTE: Continue to remove, measure, and install until backlash measurement is within tolerance. Note the following chart.**

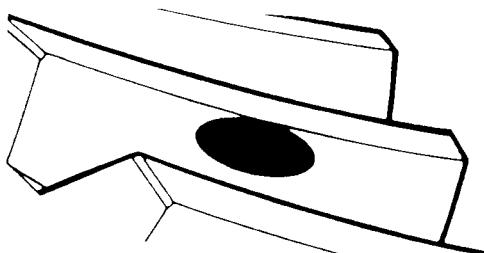
| Backlash Measurement              | Shim Correction         |
|-----------------------------------|-------------------------|
| Under 0.05 mm (0.002 in.)         | Decrease Shim Thickness |
| At 0.05-0.33 mm (0.002-0.013 in.) | No Correction Required  |
| Over 0.33 mm (0.013 in.)          | Increase Shim Thickness |

#### Checking Tooth Contact

**■NOTE: After correcting backlash of the secondary driven bevel gear, it is necessary to check tooth contact.**

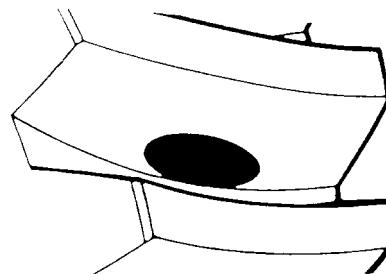
1. Remove the secondary driven output shaft assembly from the left-side crankcase half.
2. Clean the secondary driven bevel gear teeth of old oil and grease residue.
3. Apply a thin, even coat of a machinist-layout dye to several teeth of the gear.
4. Install the secondary driven output shaft assembly.
5. Rotate the secondary driven bevel gear several revolutions in both directions.
6. Examine the tooth contact pattern in the dye and compare the pattern to the illustrations.

**Incorrect (contact at tooth top)**

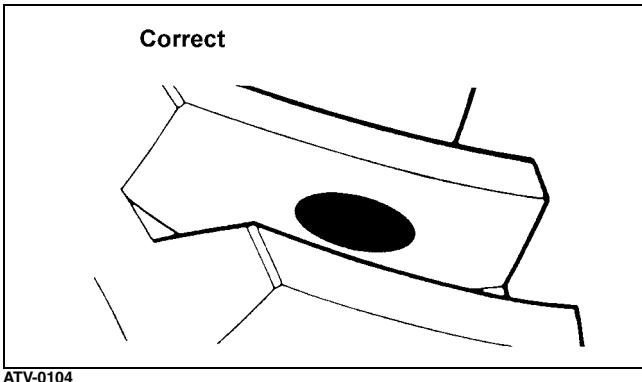


ATV-0103

**Incorrect (contact at tooth root)**



ATV-0105



ATV-0104

### Correcting Tooth Contact

■**NOTE:** If tooth contact pattern is comparable to the correct pattern illustration, no correction is necessary.

If tooth contact pattern is comparable to an incorrect pattern, correct tooth contact according to the following chart.

| Tooth Contact    | Shim Correction         |
|------------------|-------------------------|
| Contacts at Top  | Decrease Shim Thickness |
| Contacts at Root | Increase Shim Thickness |

■**NOTE:** To correct tooth contact, steps 1 and 2 (with NOTE) of "Correcting Backlash" must be followed and the above "Tooth Contact/Shim Correction" chart must be consulted.

#### CAUTION

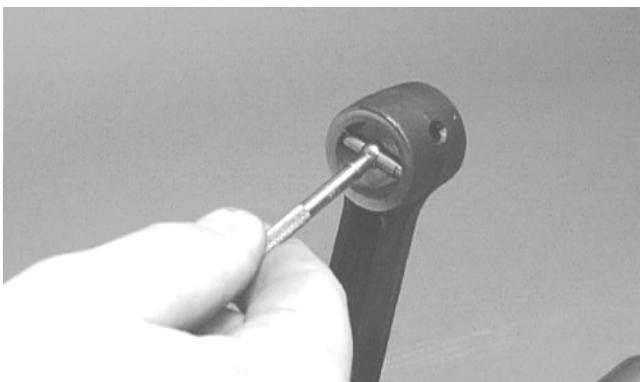
After correcting tooth contact, backlash must again be checked and corrected (if necessary). Continue the correcting backlash/correcting tooth contact procedures until they are both within tolerance values.

### CRANKSHAFT ASSEMBLY

■**NOTE:** The crankshaft and connecting rod is a non-serviceable assembly. If any component is out of specification, the assembly must be replaced.

### Measuring Connecting Rod (Small End Inside Diameter)

1. Insert a snap gauge into the upper connecting rod small end bore; then remove the gauge and measure it with micrometer.



CC290D

2. Maximum diameter must not exceed specifications.

### Measuring Connecting Rod (Small End Deflection)

1. Place the crankshaft on a set of V-blocks and mount a dial indicator and base on the surface plate. Position the indicator contact point against the center of the connecting rod small end journal.

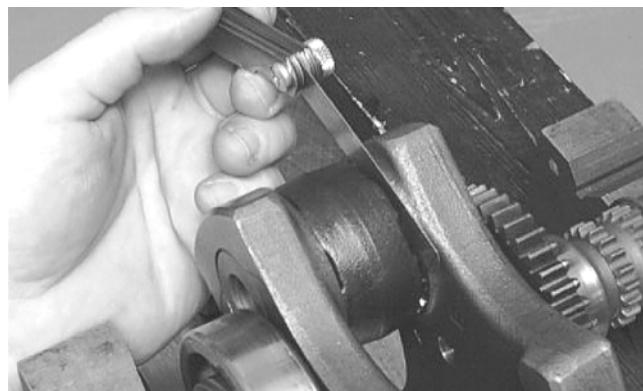
2. Zero the indicator and push the small end of the connecting rod away from the dial indicator.

3. Maximum deflection must not exceed specifications.

### Measuring Connecting Rod (Big End Side-to-Side)

1. Push the lower end of the connecting rod to one side of the crankshaft journal.

2. Using a feeler gauge, measure the gap between the connecting rod and crankshaft journal.

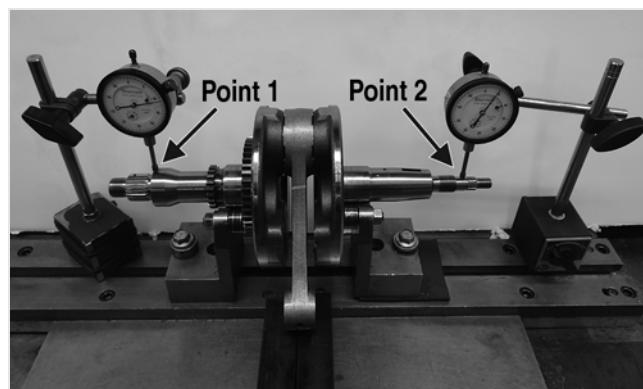


CC289D

3. Acceptable gap range must be within specifications.

### Measuring Crankshaft (Runout)

1. Place the crankshaft on a set of V blocks.
2. Mount a dial indicator and base on the surface plate. Position the indicator contact at point 1 of the crankshaft.



H1-003A

3. Zero the indicator and rotate the crankshaft slowly.

#### CAUTION

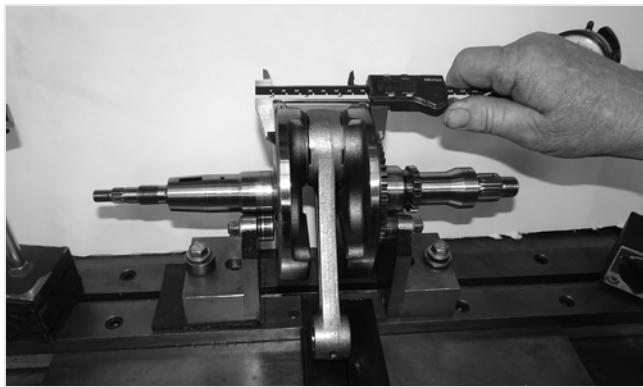
Care should be taken to support the connecting rod when rotating the crankshaft.

4. Maximum runout must not exceed specifications.

■**NOTE:** Proceed to check runout on the other end of the crankshaft by positioning the indicator contact at point 2 and following steps 3-4.

## Measuring Crankshaft (Web-to-Web)

1. Using a calipers, measure the distance from the outside edge of one web to the outside edge of the other web.



2. Acceptable width range must be within specifications.

## COUNTERSHAFT

### CAUTION

When disassembling the countershaft, care must be taken to note the direction each major component (dog, gear) faces. If a major component is installed facing the wrong direction, transmission damage may occur and/or the transmission will malfunction. In either case, complete disassembly and assembly will be required.

### Disassembling

1. Remove the reverse driven gear dog; then remove the circlip securing the reverse driven gear.

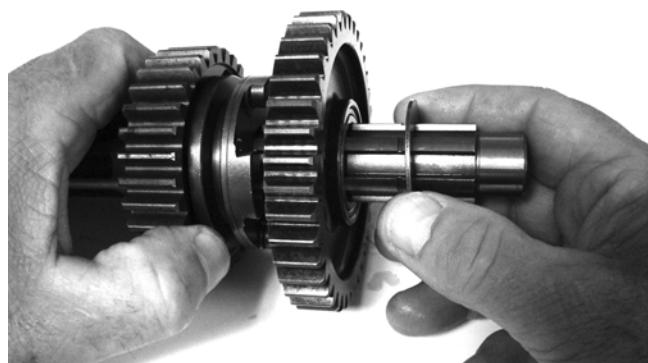


2. Remove the splined washer; then remove the reverse driven gear along with the bearing and bushing.



FI665

3. Remove the low driven gear washer; then remove the low driven gear along with the bearing and bushing.



FI667

4. Remove the splined washer; then remove the circlip securing the high-low sliding dog. Remove the sliding dog.





FI669

5. Remove the circlip securing the high driven gear; then remove a washer, the high driven gear along with the bearing and bushing, and remove the high driven washer.



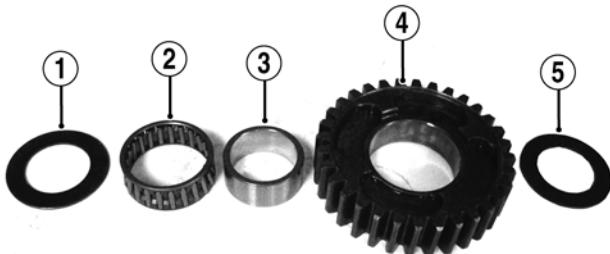
FI670



FI671

## ASSEMBLING

1. With the high driven washer (1) on the countershaft, install the high driven gear bushing (3), bearings (2), and gear (4) on the countershaft; then install the washers (5) and secure with the snap-ring.

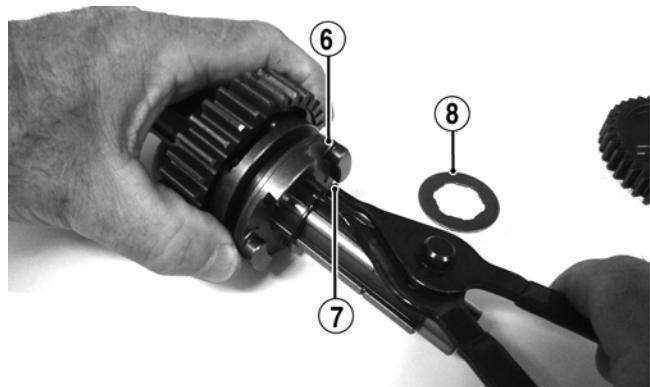


FI671A



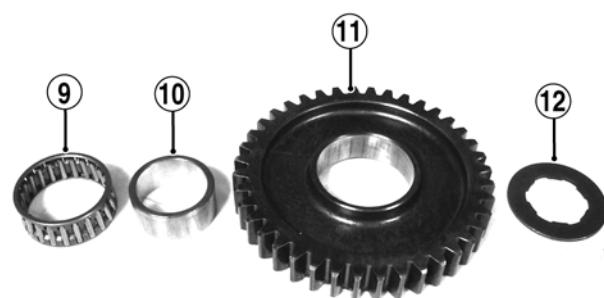
FI670

2. Install the high/low shift dog (6) on the countershaft and secure with snap-ring (7); then install the splined washer (8).



FI668A

3. Install the low driven bushing (10), bearing (9), and gear (11) on the countershaft; then install splined washer (12).



FI667A



FI666

4. Place the reverse driven bushing (13) onto the shaft; then install the bearing (14), gear (15), and splined washer (16). Secure with a snap-ring.



FI665A

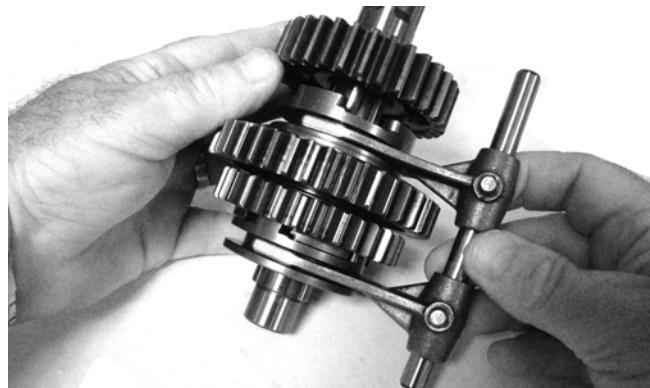


FI664

5. Install the reverse dog on the shaft; then place the shift forks and shift shaft into position.



FI663



FI662

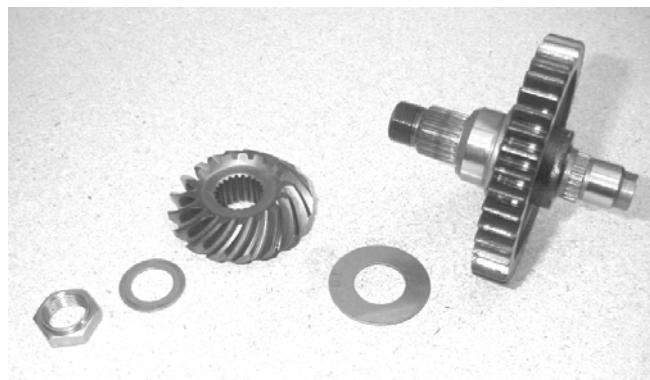
■NOTE: The countershaft assembly is now ready to be installed.

## Assembling Crankcase Half

■NOTE: For ease of assembly, install components on the right-side crankcase half.

■NOTE: If the output shaft was removed, make sure that the proper shim is installed.

1. Install the output shaft into the crankcase making sure the two gears, shim, washer, and nut are in the correct order.

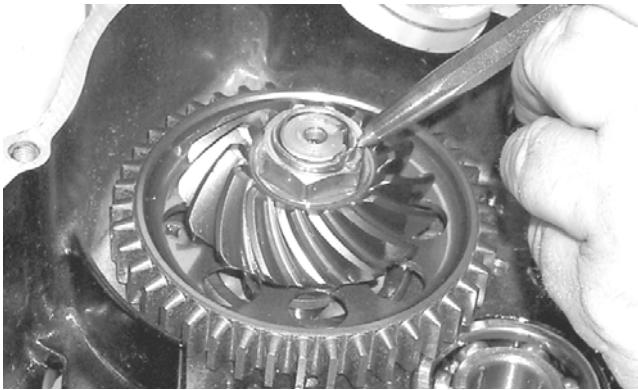


MD1199



MD1079

2. Install and tighten the output shaft flange nut to 59 ft-lb. Using a punch, peen the nut.



3. Apply a liberal amount of oil to the crankshaft bearing. Using a propane torch, heat the bearing until the oil begins to smoke; then slide the crankshaft assembly into place.



**■NOTE: If heating the bearing is not possible, the crankshaft can be installed using a crankshaft installer.**

4. Rotate the crankshaft so the counterweight is toward the rear of the engine. Install the crank balancer shaft.



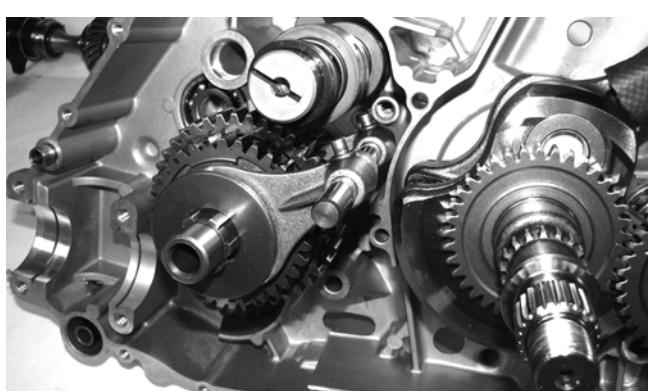
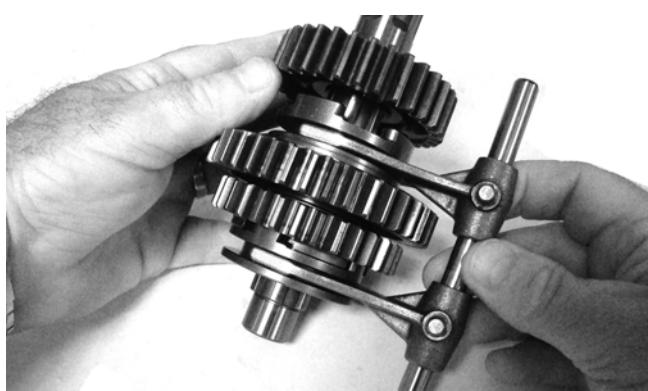
5. Install the key in the crank balancer shaft; then install the gear and aligning the timing marks, slide the gear into place.



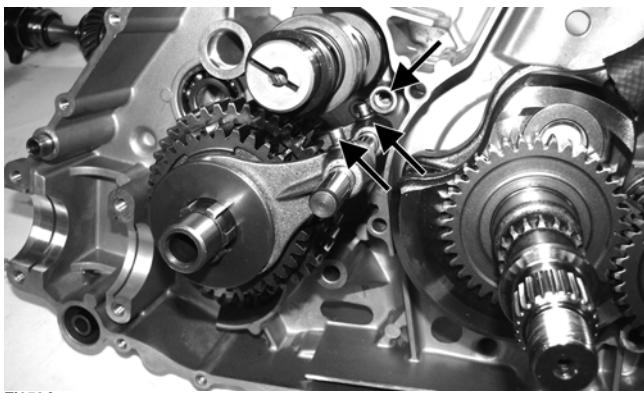
6. Align the shift cam fork slots with the shift fork shaft locating boss and with a washer on each end, install in the crankcase.



7. Place the shift forks into position on the assembled countershaft and install into the crankshaft as an assembly.



8. Align the shift forks to allow engagement with the shift cam; then engage the shift forks and slide the shift fork shaft into the locating boss in the crankcase.



FI653A



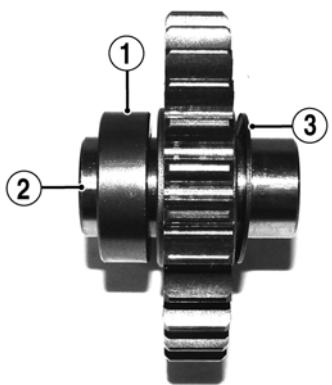
FI655A

9. Install the input driveshaft.

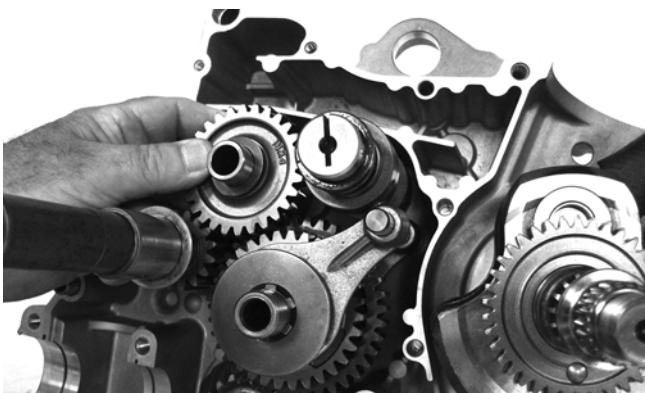


FI646

10. Install the spacer (1), shaft (2), reverse idler gear, and washer (3).

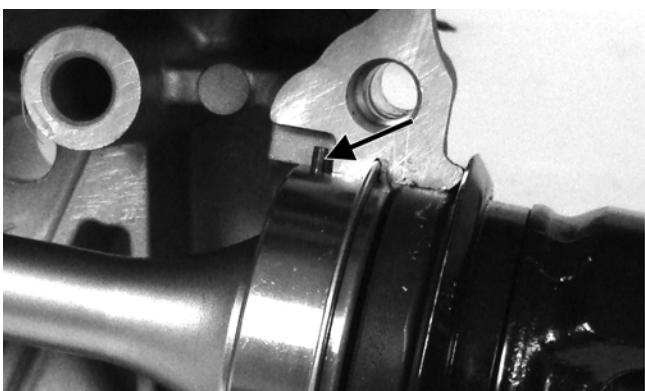


FI641A

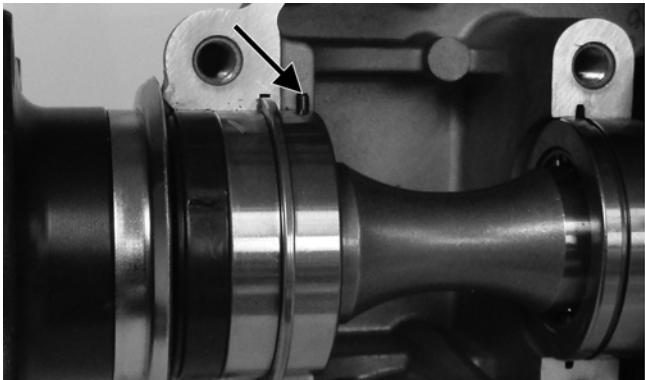


FI645

11. Install the secondary output driveshaft assembly into the crankcase half making sure the front and rear bearing alignment pins are seated in the recesses; then install the center carrier bearing alignment C-ring.



FI660A



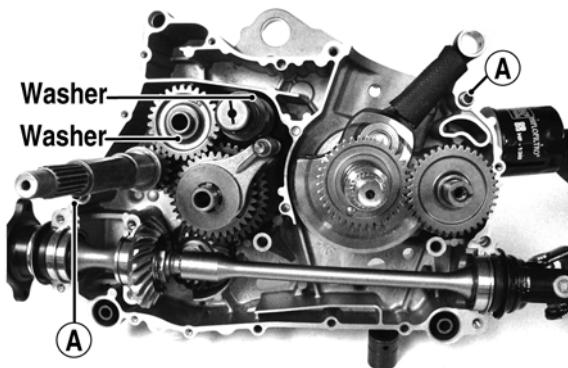
FI659A



FI661A

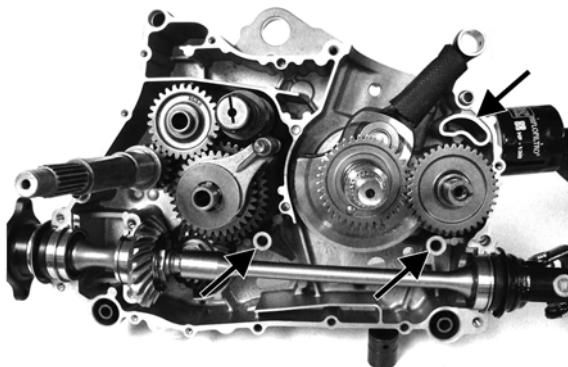
## Joining Crankcase Halves

1. Verify that the two alignment pins (A) are in place and that both case halves are clean and grease free. Apply Loctite #5900 or suitable substitute sealant to the mating surfaces. Place the right-side half onto the left-side half.



FI639B

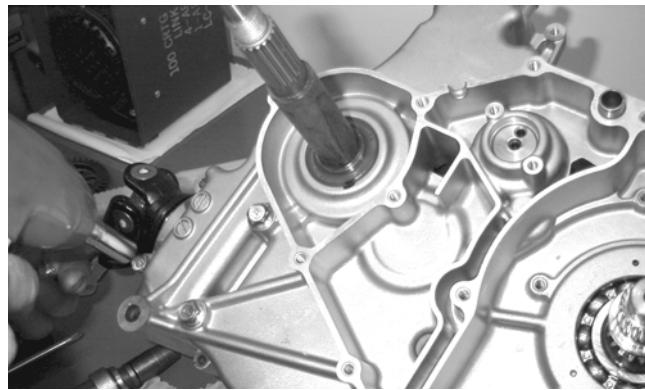
■**NOTE:** Be sure to apply silicone to the inside radius of all cap screw locations and the entire surface of the internal cap screw bosses.



FI639D

2. Using a plastic mallet, lightly tap the case halves together until cap screws can be installed.
3. From the right side, install the crankcase cap screws noting the location of the different-sized cap screws; then tighten only until snug.

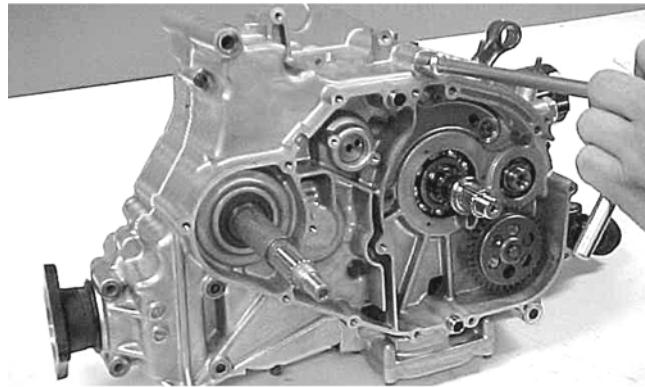
■**NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs while tightening the cap screws.



MD1008

4. From the left side, install the remaining crankcase cap screws; then tighten only until snug.

■**NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs while tightening the cap screws.



CC871

5. In a crisscross pattern, tighten the 8 mm cap screws until the halves are correctly joined; then tighten to 21 ft-lb.

■**NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

6. In a crisscross pattern, tighten the 6 mm cap screws to 10 ft-lb.

■**NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

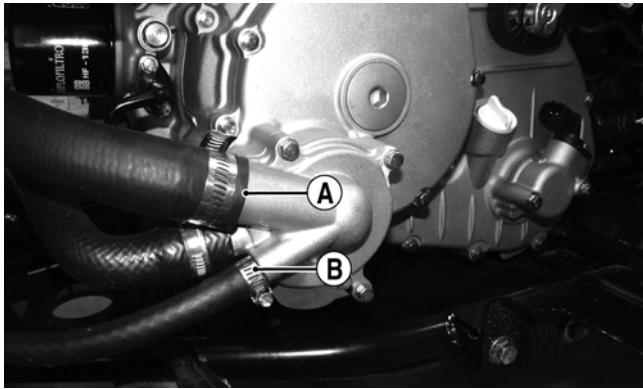
### AT THIS POINT

After completing center crankcase components, proceed to **Installing Right-Side Components**, to **Installing Left-Side Components**, and to **Installing Top-Side Components**.

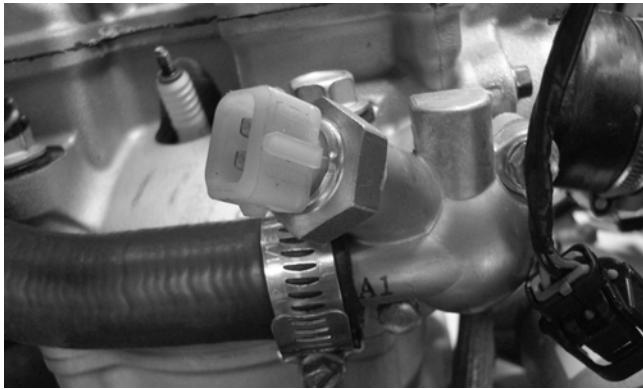
## Installing Engine/Transmission (500)

1. From the left side, place the engine into the frame (rear of engine first) tilting the rear up to allow cylinder head to clear frame.

- With engine moved rearward, engage the splines of the front driveline into the front output drive yoke; then move into position and install the two through-bolts. Secure with lock nuts and tighten to 35 ft-lb.
- Install the four cap screws (coated with red Loctite #271) securing the output shaft to the rear gear case flange and tighten to 20 ft-lb.
- Connect coolant hoses (A) and (B) to the water pump and connect the upper coolant hose to the thermostat housing. Tighten all clamps securely.

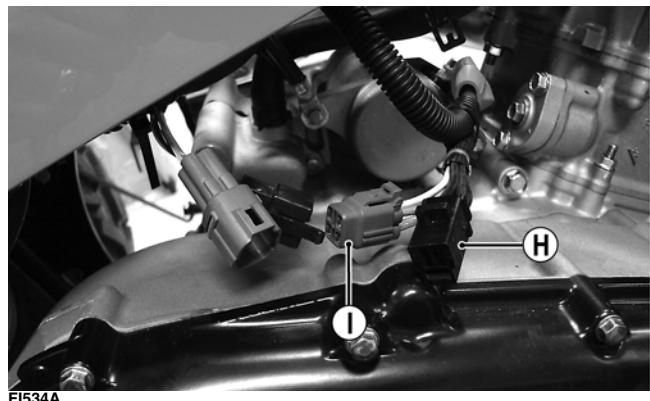


FI530B



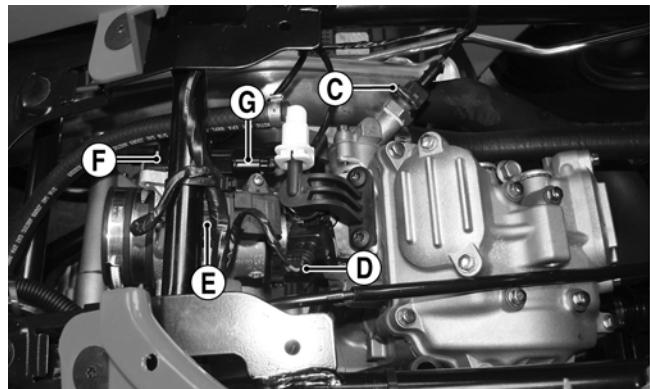
FI537

- Install the exhaust pipe using a new seal at the cylinder head and loosely install the retaining cap screws; then install the muffler with a new grafoil seal and secure with two springs. Tighten the exhaust pipe retainer cap screws to 20 ft-lb. Connect the O2 sensor.
- Connect the throttle cable and adjust free-play to specifications (see Fuel/Lubrication/ Cooling); then tighten the jam-nut securely and install the cover. Tighten the screws securely.
- Connect the stator connector (H) and crankshaft position sensor connector (I) to the main harness; then connect the positive cable to the starter motor and tighten securely.



FI534A

- Connect the engine ground wire to the starter mounting flange and secure with a cap screw tightened to 8 ft-lb.
- From the top side, install the ECT sensor connector (C), fuel injector connector (D), MAP/IAT sensor connector (E), ISC connector (F), and the TPS connector (G).



FI522A

- Place the air filter assembly into position and connect the crankcase breather securing with the clamp; then connect the front air inlet duct and secure with a hose clamp.
- Install the harness connector onto the coil and install the spark plug cap.
- Connect the air ducts to the CVT housing and tighten the clamps securely; then connect the air duct to the air filter housing and the throttle body and secure with the clamps.
- Install the storage compartment and connect the negative battery cable; then install the tool tray.
- Pour the specified amount of coolant into the radiator and the specified amount and grade of oil into the engine.
- Install the left footwell support assembly, footwell, and footrest. Tighten all fasteners securely.
- Install the seat making sure it locks securely in place; then start the engine and allow to warm up while checking for leaks.
- Shut engine off and inspect coolant and oil levels. Add fluids as required.

## Removing Engine/Transmission (700)

Many service procedures can be performed without removing the engine/transmission from the frame. Closely observe the note introducing each sub-section for this important information.

### AT THIS POINT

If the technician's objective is to service Top-Side Components, Left-Side Components, or Right-Side Components, the engine/transmission does not have to be removed from the frame.

### AT THIS POINT

If the technician's objective is to service/replace left-side cover oil seals, front output joint oil seal, rear output joint oil seal, and/or the oil strainer (from beneath the engine/transmission), the engine/transmission does not have to be removed from the frame.

Secure the ATV on a support stand to elevate the wheels.

### WARNING

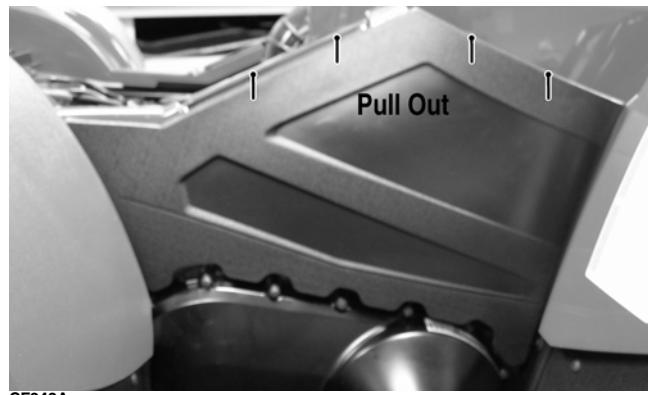
Make sure the ATV is solidly supported on the support stand to avoid injury.

1. Remove the seat.
2. Remove the negative cable from the battery; then remove the positive cable. Remove the battery and the battery vent hose; then remove the battery.

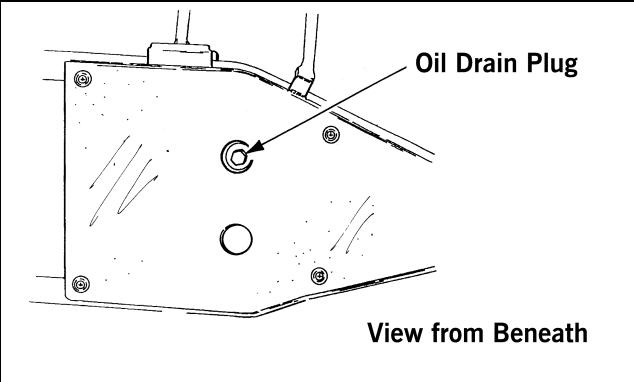
### CAUTION

Battery acid is harmful if it contacts eyes, skin, or clothing. Care must be taken whenever handling a battery.

3. Remove the radiator access cover, steering post cover, and storage compartment cover assembly; then remove the storage compartment box.
4. Remove the side panels.



5. Remove the instrument pod; then remove the front rack and front body panel (see Steering/Body/Controls).
6. Drain the oil from beneath the engine/transmission; then drain the coolant.

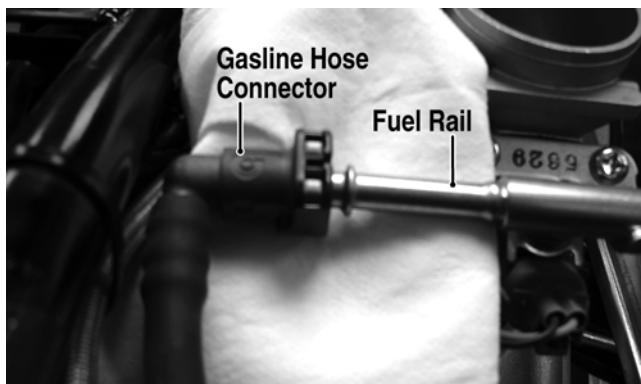


733-441A



CD799A

7. Remove the air filter (see Periodic Maintenance/Tune-Up).
8. Remove the gasoline hose connector from the fuel rail.



FI092E

9. Loosen the clamp securing the air intake duct to the air filter housing.

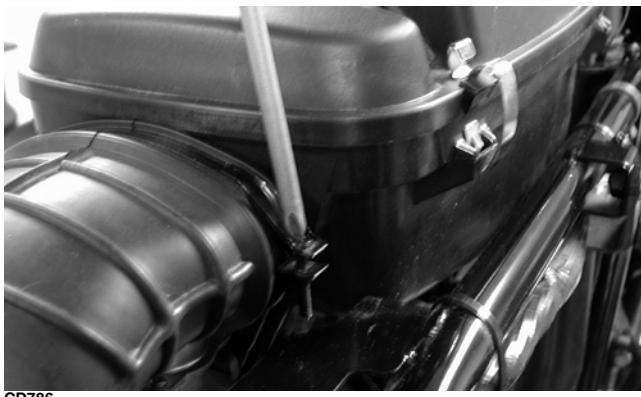


CD785

10. Disconnect the crankcase vent hose from the air filter housing. Remove the clamp securing the throttle body intake duct to the air filter housing; then remove the air filter housing.



CD787



CD786

11. Remove the clamp securing the cooling duct boot to the V-belt housing; then remove the cooling duct boot from the V-belt housing outlet.



CD793



CD515A

12. Remove the left-side foot peg and footwell (see Steering/Body/Controls).

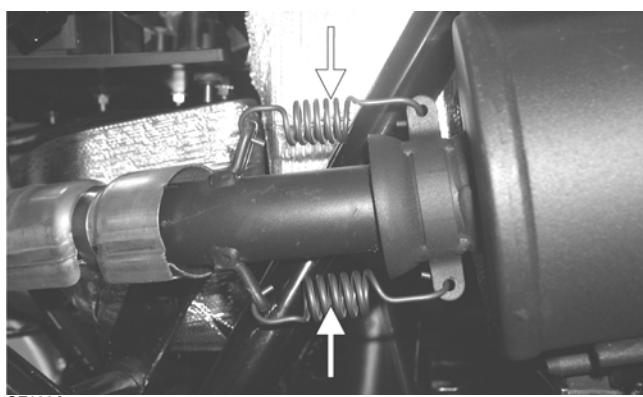
13. Secure the throttle body assembly up and away from the engine.

14. Remove the E-clip securing the shift rod to the engine shift arm; then allow the shift rod to swing forward and hang straight down from the shift lever.



CD774

15. Remove the springs securing the muffler to the exhaust pipe; then remove the muffler. Account for the two exhaust springs.



CF138A

16. Remove the two cap screws securing the exhaust pipe to the cylinder head; then disconnect the O2 sensor and remove the pipe.



CD803

17. Remove the two coolant hoses from the engine; then route the hoses out of the way.

18. Remove the cap screws securing the rear driveshaft/output flange to the rear output joint flange.



CD805

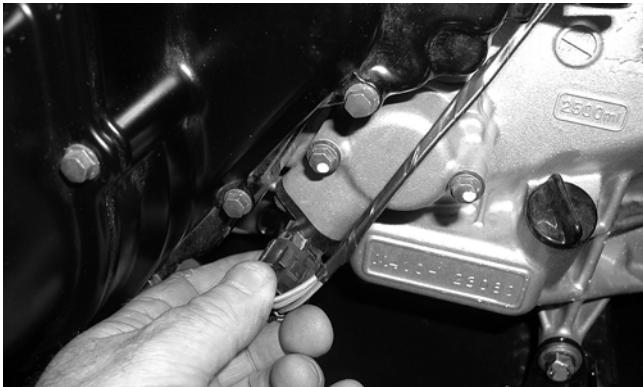
■**NOTE: It is advisable to lock the brake when loosening the cap screws securing the rear driveshaft.**

19. Remove the positive cable from the starter motor and route it out of the way.



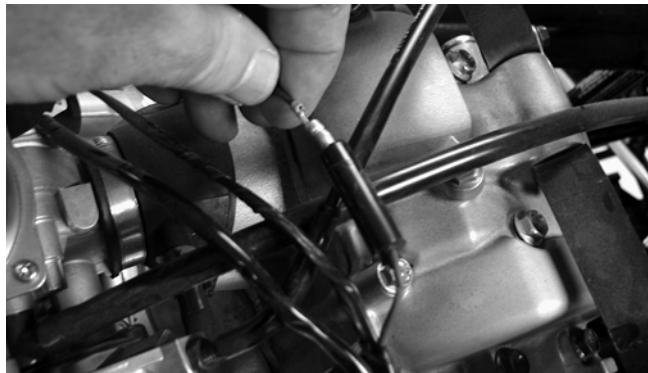
CD796

20. Disconnect the speed sensor connector from the sensor housing.



CD794

21. On the right-side, disconnect the stator coil and crankshaft position sensor connectors.
22. Disconnect the temperature sensor lead from the wiring harness.



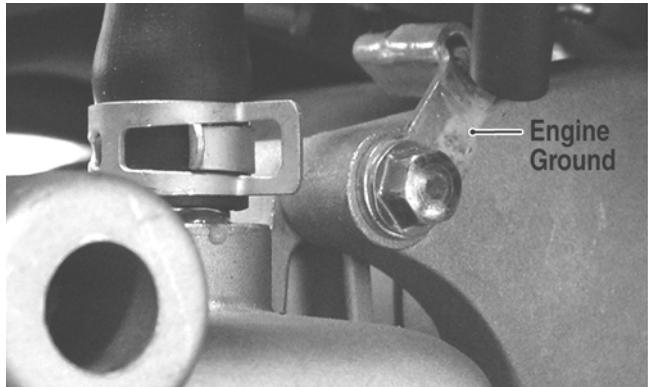
CD788

23. Remove the spark plug wire from the spark plug; then remove the coil from the frame.



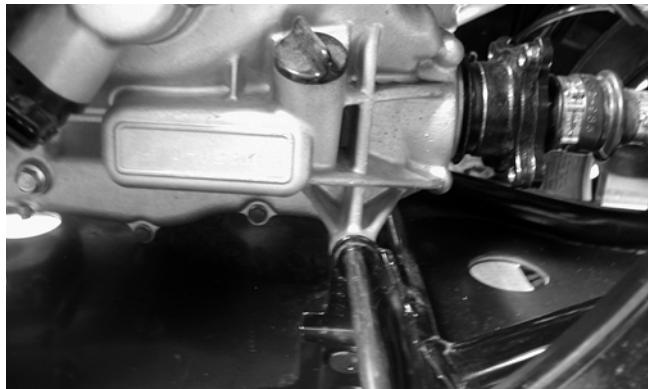
CD814

24. Remove the cap screw securing the engine ground wire to the engine.



KC201A

25. Remove the engine mounting through-bolts. Account for all mounting hardware.



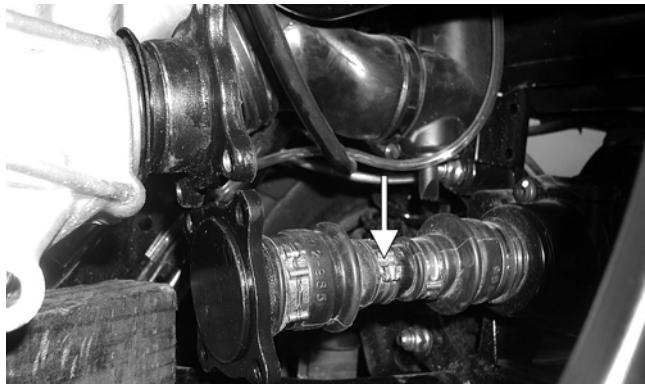
CD809

26. Raise the rear of the engine enough to allow the rear output flange to clear the output flange joint. Block the engine up in this position.

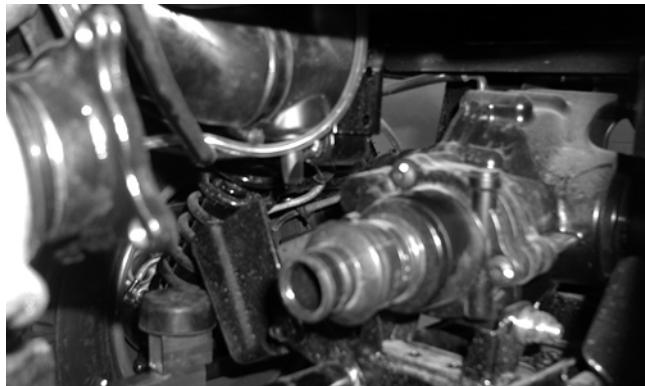


CD811

27. Remove the first small boot clamp; then remove the output flange and driveshaft from the rear drive coupler.



CD812A



CD813

28. Remove the block from under the engine and lower the engine; then remove the boot clamp from the front output drive yoke.

29. Move the engine to the rear enough to allow the front driveshaft to clear the front output yoke; then move the engine forward and to the left. The engine will come out the left side of the frame.



CD818



CD773

## Servicing Engine (700)

|   |     |
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## Top-Side Components

■**NOTE:** For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

### AT THIS POINT

To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■NOTE: The engine/transmission does not have to be removed from the frame for this procedure.

## Removing Top-Side Components

### A. Valve Cover/Rocker Arms

### B. Cylinder Head/Camshaft

■NOTE: Remove the spark plug and timing inspection plug; then using a socket and ratchet, rotate the crankshaft to top-dead-center of the compression stroke.

1. Remove the two tappet covers.

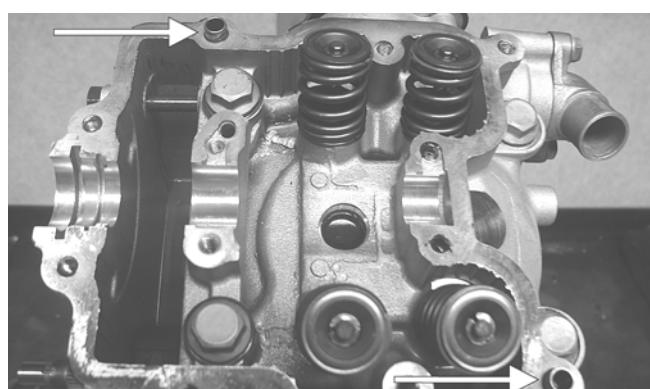
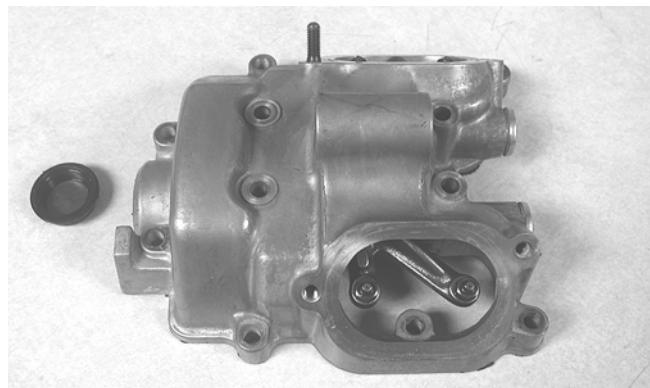


■NOTE: Keep the mounting hardware with the covers for assembly purposes or thread them back into the head to keep them separated.

2. Remove the twelve cap screws securing the valve cover to the head.
3. Remove all cap screws except the two top-side cap screws next to the spark plug. These will keep the alignment pins in place. Note the two rubber washers on the remaining cap screws.



4. Remove the valve cover. Account for and note the orientation of the cylinder head plug. Note the location of the two alignment pins.

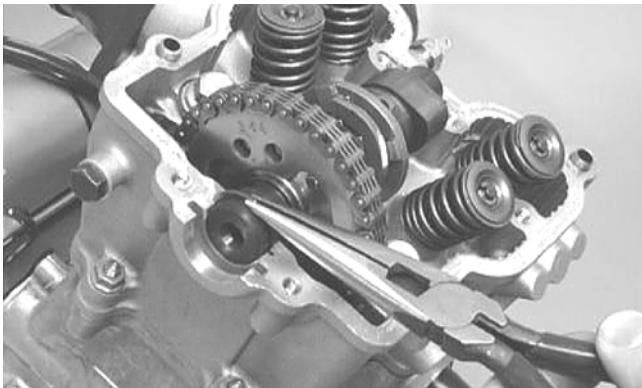


5. Loosen the cap screw on the end of the tensioner; then remove the two cap screws securing the tensioner adjuster assembly and remove the assembly. Account for a gasket.



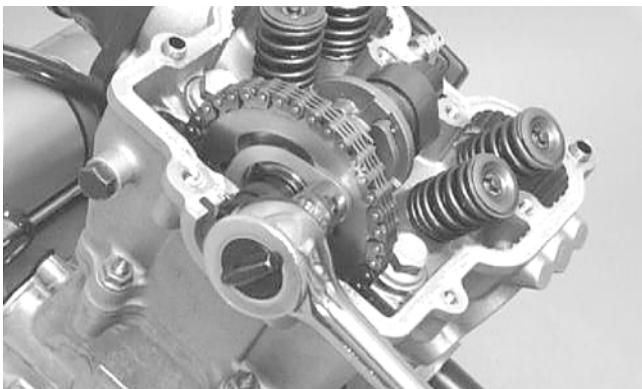
6. Using an awl, rotate the C-ring in its groove until it is out of the cylinder head; then remove the C-ring.

■NOTE: Care should be taken not to drop the C-ring down into the crankcase.



CC012D

7. Bend the washer tabs down and remove the two cap screws securing the sprocket to the camshaft; then drop the sprocket off the camshaft.



CC013D

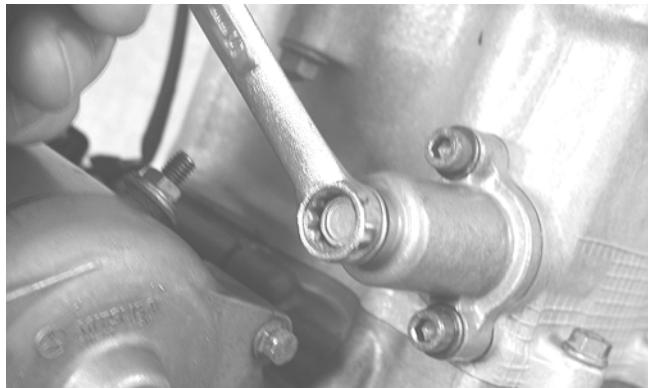
8. While holding the chain, slide the sprocket and cam-shaft out of the cylinder head.

**■NOTE: Loop the chain over the cylinder and secure it to keep it from falling into the crankcase.**



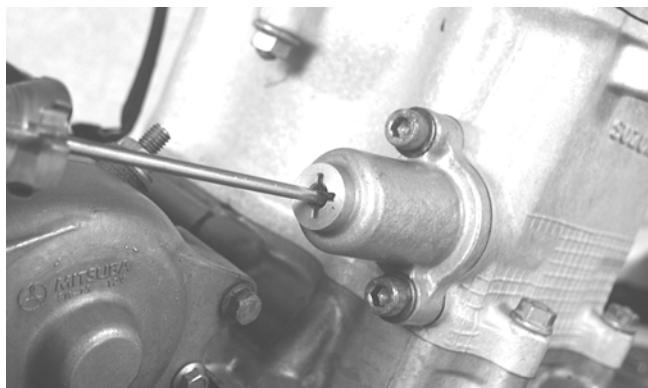
FI620

9. Remove the cap screw from the end of the chain tensioner (account for a washer).



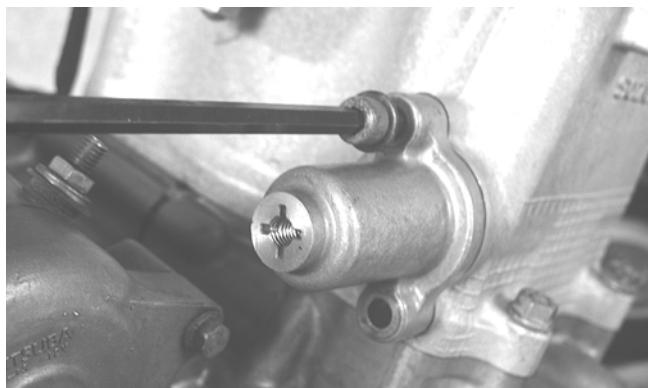
CD471

10. Using a flat-blade screwdriver, tighten the adjuster screw clockwise until tension is on the chain guide.



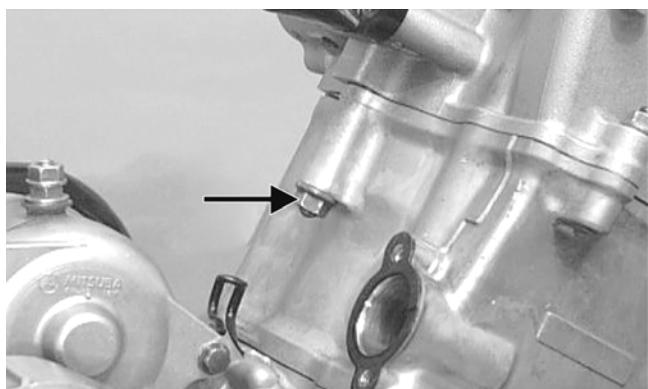
CD470

11. Remove the cap screws securing the chain tensioner; then remove the tensioner.

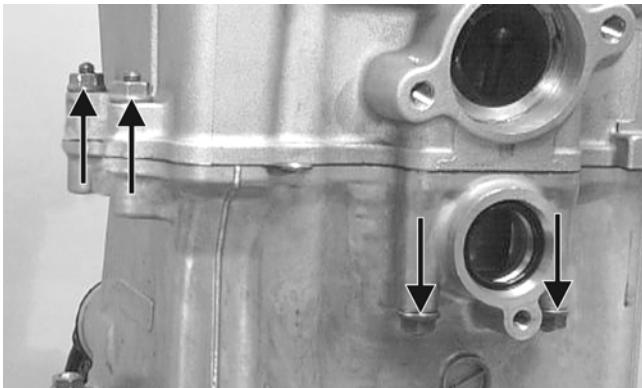


CD469

12. Remove the five nuts securing the cylinder head to the cylinder.



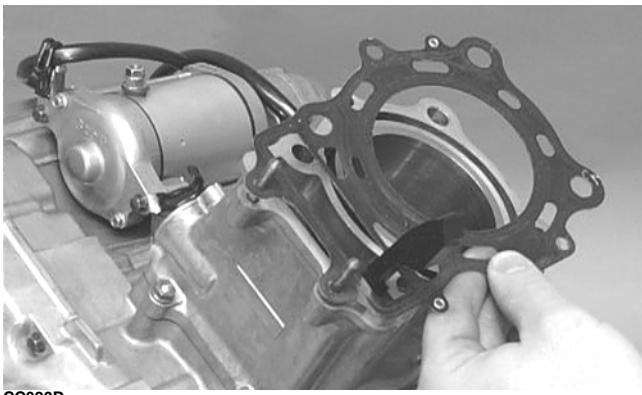
CC017D



CC018D

13. Remove the four cylinder head bolts.

14. Remove the cylinder head from the cylinder, remove the gasket, and account for two alignment pins; then remove the cam chain guide.



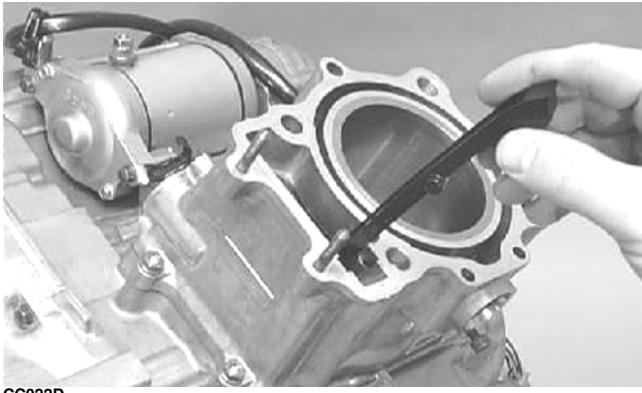
CC020D

#### **AT THIS POINT**

To service valves and cylinder head, see [Servicing Top-Side Components](#) sub-section.

#### **AT THIS POINT**

To inspect cam chain guide, see [Servicing Top-Side Components](#) sub-section.



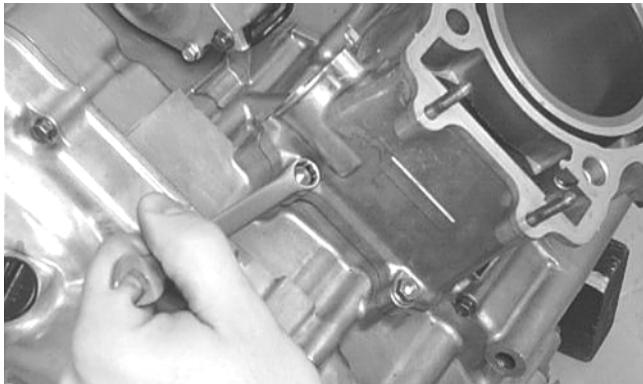
CC022D

### **C. Cylinder** **D. Piston**

■**NOTE:** Steps 1-14 in the preceding sub-section must precede this procedure.

15. Loosen the clamp securing the coolant hose to the union; then detach the hose.

16. Remove the two nuts securing the cylinder to the crankcase.



CC023D

17. Lift the cylinder off the crankcase taking care not to allow the piston to drop against the crankcase. Account for the gasket and two alignment pins.



CC024D



CC025D



CC026D

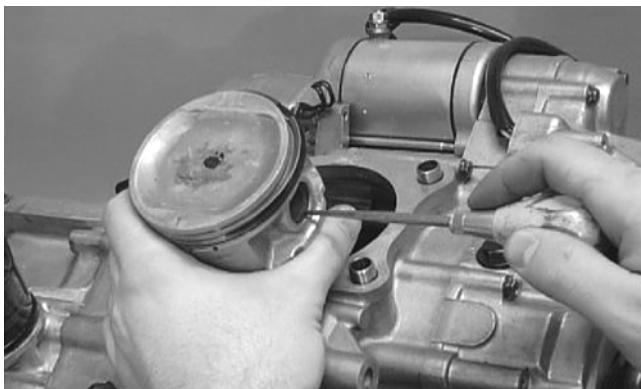
### ☞ AT THIS POINT

To service cylinder, see Installing Top-Side Components sub-section.

### CAUTION

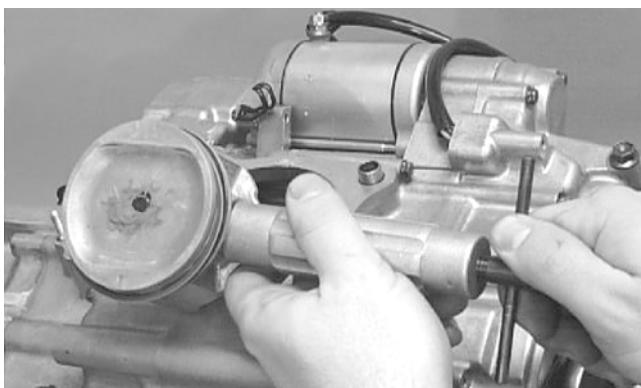
When removing the cylinder, be sure to support the piston to prevent damage to the crankcase and piston.

18. Using an awl, remove one piston-pin circlip.



19. Using the Piston Pin Puller, remove the piston pin. Account for the opposite-side circlip. Remove the piston.

■NOTE: It is advisable to remove the opposite-side circlip prior to using the puller.



■NOTE: Support the connecting rod with rubber bands to avoid damaging the rod or install the Connecting Rod Holder.

### CAUTION

Do not allow the connecting rod to go down inside the crankcase. If the rod is down inside the crankcase and the crankshaft is rotated, severe damage will result.

### ☞ AT THIS POINT

To service piston, see Servicing Top-Side Components sub-section.

### ☞ AT THIS POINT

To service center crankcase components only, proceed to Removing Left-Side Components.

## Servicing Top-Side Components

### VALVE ASSEMBLY

When servicing valve assembly, inspect valve seats, valve stems, valve faces, and valve stem ends for pits, burn marks, or other signs of abnormal wear.

■NOTE: Whenever a valve is out of tolerance, it must be replaced.

### Cleaning/Inspecting Valve Cover

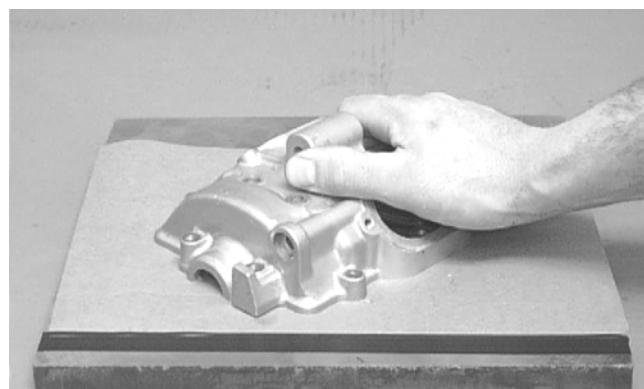
■NOTE: If the valve cover cannot be trued, the cylinder head assembly must be replaced.

1. Wash the valve cover in parts-cleaning solvent.

2. Place the valve cover on the Surface Plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the valve cover in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the valve cover in a figure eight motion until a uniform bright metallic finish is attained.

### CAUTION

Do not remove an excessive amount of the sealing surface or damage to the camshaft will result. Always check camshaft clearance when resurfacing the valve cover.



### CAUTION

Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.

### Removing Valves

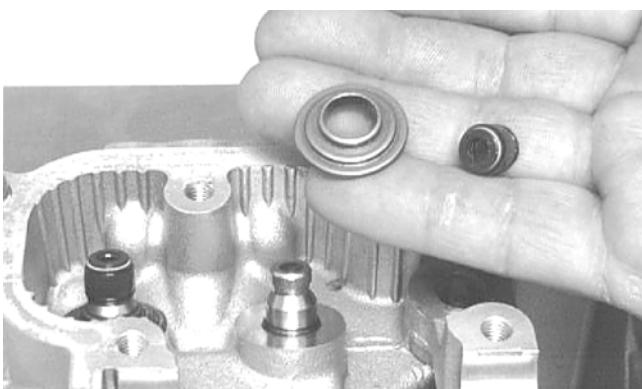
■NOTE: Index all valves, springs, and cotters to their original position when removing. When installing, all valve components should be installed in their original position.

1. Using a valve spring compressor, compress the valve springs and remove the valve cotters. Account for an upper spring retainer.



CC132D

2. Remove the valve seal and the lower remaining spring seat. Discard the valve seal.



CC136D

**■NOTE: The valve seals must be replaced.**

3. Remove the valve springs; then invert the cylinder head and remove the valves.

**Measuring Valve Guide (Bore)**

1. Insert a snap gauge 1/2 way down into each valve guide bore; then remove the gauge and measure it with a micrometer.
2. Acceptable inside diameter range must be within specifications.
3. If a valve guide is out of tolerance, it must be replaced.

**Servicing Valves/Valve Guides/Valve Seats**

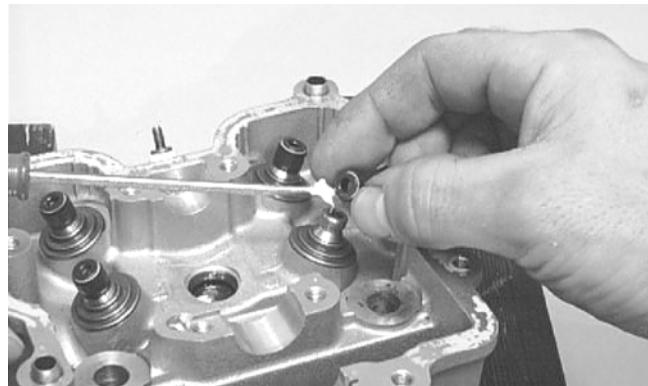
If valves, valve guides, or valve seats require servicing or replacement, Arctic Cat recommends that the components be taken to a qualified machine shop for servicing.

**CAUTION**

**If valves are discolored or pitted or if the seating surface is worn, the valve must be replaced. Do not attempt to grind the valves or severe engine damage may occur.**

**Installing Valves**

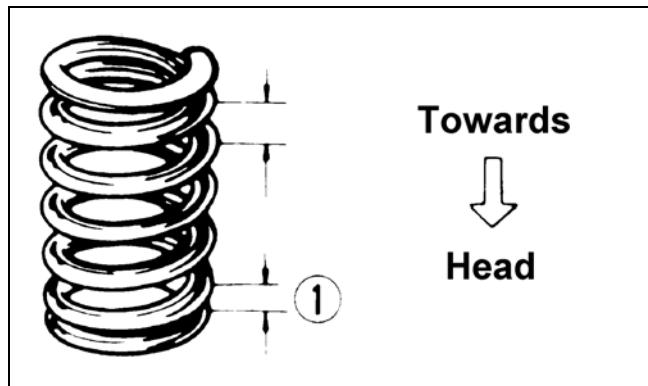
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



CC144D

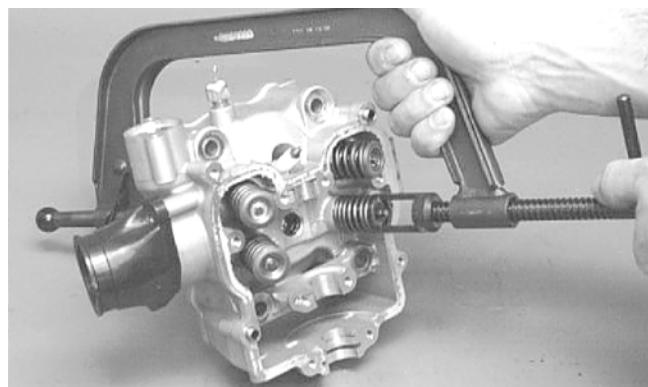
2. Insert each valve into its original location.
3. Install the valve springs with the painted end of the spring facing away from the cylinder head.

**■NOTE: If the paint is not visible, install the ends of the springs with the closest wound coils toward the head.**



ATV-1011A

4. Place a spring retainer over the valve springs; then using the valve spring compressor, compress the valve springs and install the valve cotters.



CC132D

**PISTON ASSEMBLY**

**■NOTE: Whenever a piston, rings, or pin are out of tolerance, they must be replaced.**

**Inspecting Piston**

1. Inspect the piston for cracks in the piston pin, dome, and skirt areas.
2. Inspect the piston for seizure marks or scuffing. Repair with #400 grit wet-or-dry sandpaper and water or honing oil.

**■NOTE: If scuffing or seizure marks are too deep to correct with the sandpaper, replace the piston.**

3. Inspect the perimeter of each piston for signs of excessive "blowby." Excessive "blowby" indicates worn piston rings or an out-of-round cylinder.

### Removing Piston Rings

1. Starting with the top ring, slide one end of the ring out of the ring-groove.

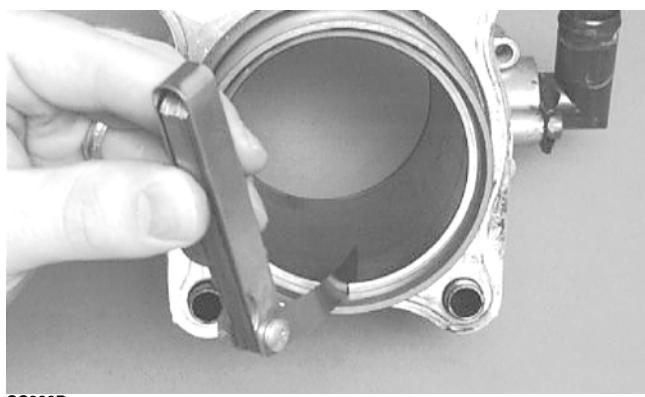


2. Remove each ring by working it toward the dome of the piston while rotating it out of the groove.

**■NOTE: If the existing rings will not be replaced with new ones, note the location of each ring for proper installation. When installing new rings, install as a complete set only.**

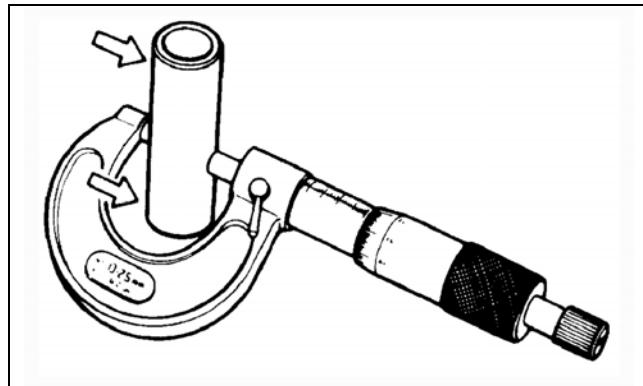
### Measuring Piston-Ring End Gap (Installed)

1. Place each compression ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must not exceed specifications.

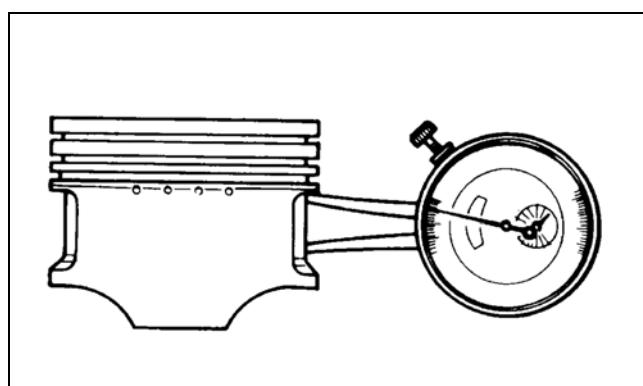


### Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

1. Measure the piston pin outside diameter at each end and in the center. If measurement is not within specifications, the piston pin must be replaced.

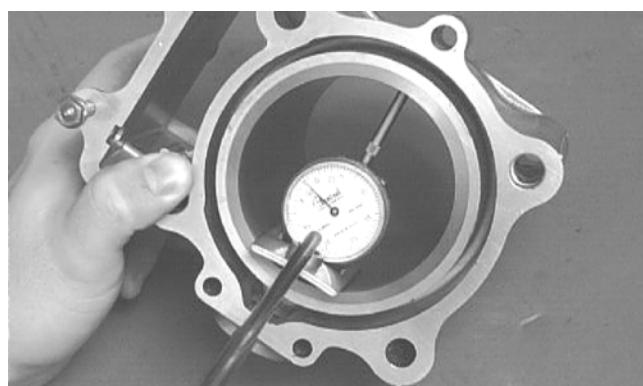


2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



### Measuring Piston Skirt/Cylinder Clearance

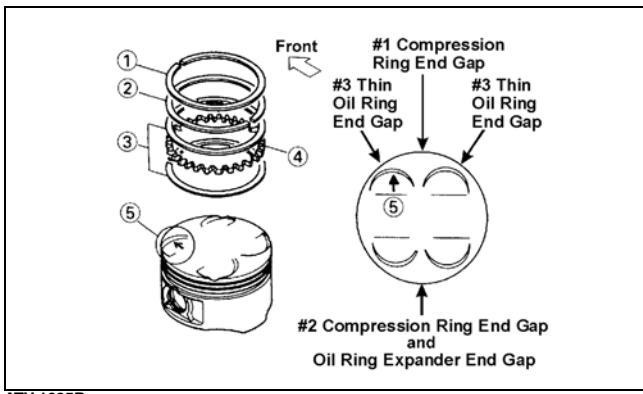
1. Measure the cylinder front to back in six places.



2. Measure the corresponding piston diameter at the recommended point above the piston skirt at a right angle to the piston-pin bore. Subtract this measurement from the largest measurement in step 1. The difference (clearance) must not exceed specifications.

### Installing Piston Rings

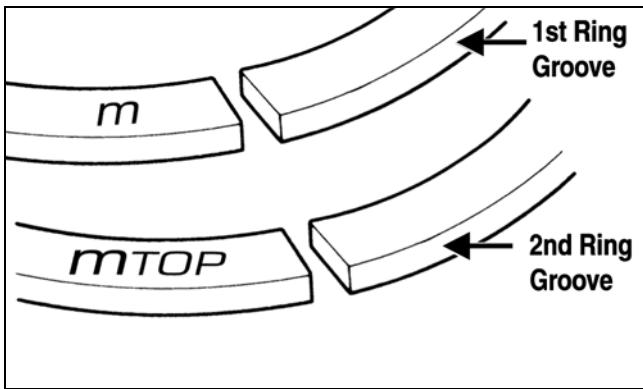
1. Install ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap. Stagger the end gaps of the upper and lower thin oil rings according to the illustration.



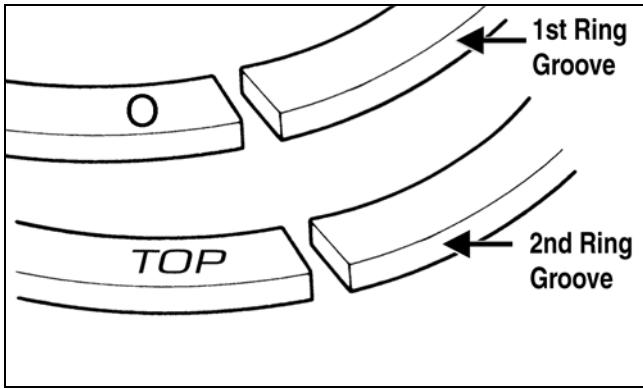
ATV-1085B

■NOTE: Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.

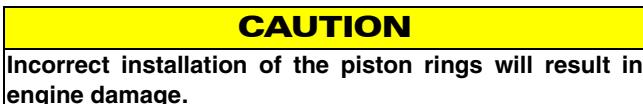
2. The ring with the orientation mark (MTOP or TOP) should be installed in the second (middle) groove and the ring with the orientation mark (M or O) should be installed in the first (top) groove.



ATV-1024A



ATV-1024B



## CYLINDER/CYLINDER HEAD ASSEMBLY

■NOTE: If the cylinder/cylinder head cannot be trued, they must be replaced as an assembly.

## Cleaning/Inspecting Cylinder Head

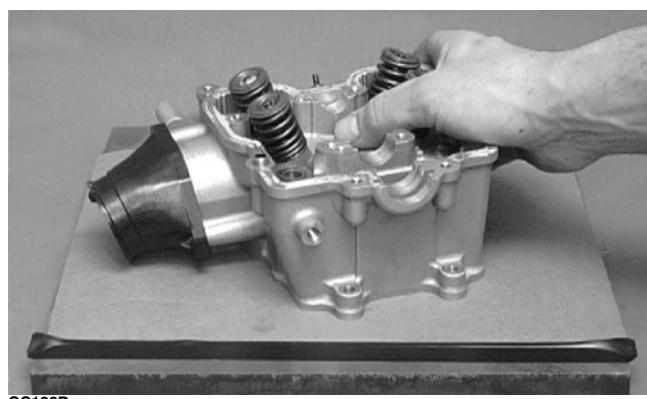
### CAUTION

The cylinder head studs must be removed for this procedure.

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the combustion chamber being careful not to nick, scrape, or damage the combustion chamber or the sealing surface.
2. Inspect the spark plug hole for any damaged threads. Repair damaged threads using a "heli-coil" insert.
3. Place the cylinder head on the Surface Plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the cylinder head in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the cylinder head in a figure eight motion until a uniform bright metallic finish is attained.

### CAUTION

Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.



CC128D

## Measuring Cylinder Head Distortion

1. Remove any carbon buildup in the combustion chamber.
2. Lay a straightedge across the cylinder head; then using a feeler gauge, check the distortion factor between the head and the straightedge.
3. Maximum distortion must not exceed specifications.



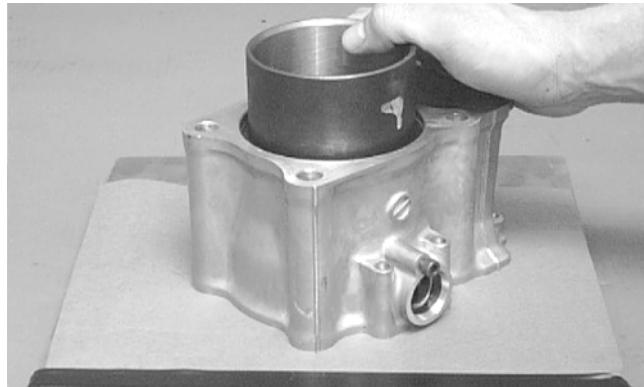
CC141D

## Cleaning/Inspecting Cylinder

1. Wash the cylinder in parts-cleaning solvent.
2. Inspect the cylinder for pitting, scoring, scuffing, warpage, and corrosion. If marks are found, repair the surface using a cylinder hone (see Inspecting Cylinder in this sub-section).
3. Place the cylinder on the surface plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the cylinder in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the cylinder in a figure eight motion until a uniform bright metallic finish is attained.

### CAUTION

Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.



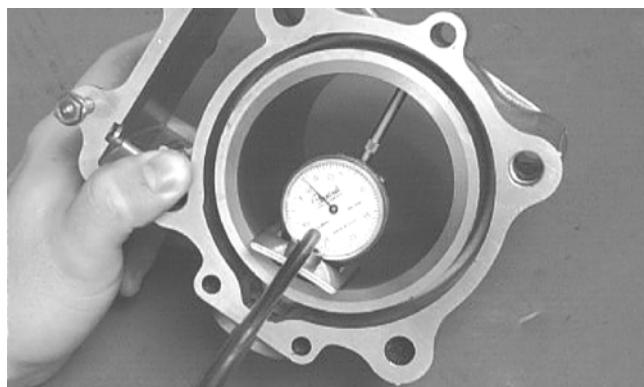
CC129D

## Inspecting Cam Chain Guide

1. Inspect cam chain guide for cuts, tears, breaks, or chips.
2. If the chain guide is damaged, it must be replaced.

## Inspecting Cylinder

1. Using a slide gauge and a dial indicator or a snap gauge, measure the cylinder bore diameter in three locations from top to bottom and again from top to bottom at 90° from the first measurements for a total of six measurements. The trueness (out-of-roundness) is the difference between the highest and lowest reading. Maximum trueness (out-of-roundness) must not exceed specifications.

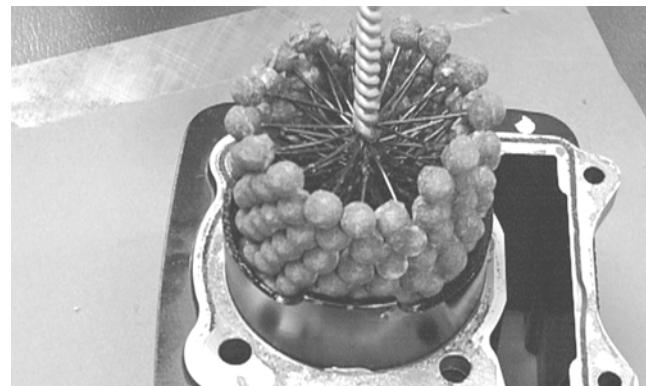


CC127D

2. Wash the cylinder in parts-cleaning solvent.

3. Inspect the cylinder for pitting, scoring, scuffing, and corrosion. If marks are found, repair the surface using a #320 grit ball hone.

■NOTE: To produce the proper 60° cross-hatch pattern, use a low RPM drill (600 RPM) at the rate of 30 strokes per minute. If honing oil is not available, use a lightweight petroleum-based oil. Thoroughly clean cylinder after honing using soap and hot water. Dry with compressed air; then immediately apply oil to the cylinder bore. If the bore is severely damaged or gouged, replace the cylinder.



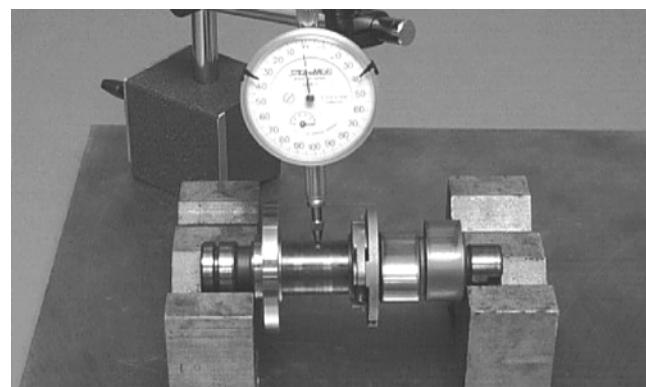
CC390D

4. If any measurement exceeds the limit, replace the cylinder and piston.

## Measuring Camshaft Runout

■NOTE: If the camshaft is out of tolerance, it must be replaced.

1. Place the camshaft on a set of V blocks; then position the dial indicator contact point against the shaft and zero the indicator.

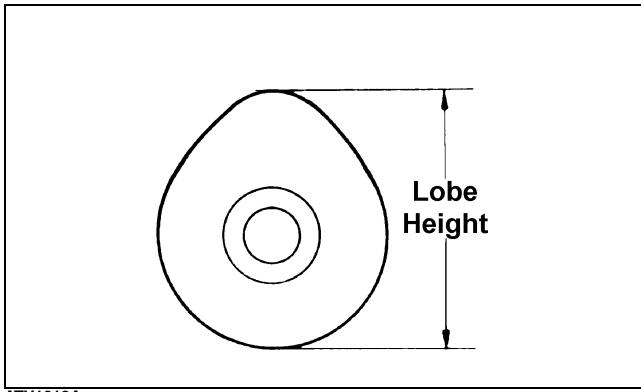


CC283D

2. Rotate the camshaft and note runout; maximum runout must not exceed specifications.

## Measuring Camshaft Lobe Height

1. Using a calipers, measure each cam lobe height.



ATV1013A

2. The lobe heights must be greater than minimum specifications.

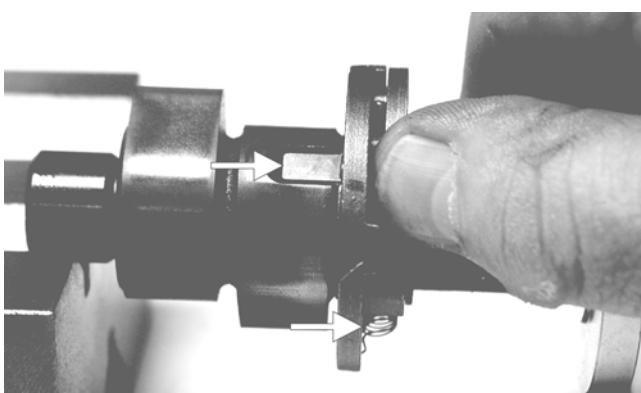
### Inspecting Camshaft Bearing Journal

1. Inspect the bearing journal for scoring, seizure marks, or pitting.
2. If excessive scoring, seizure marks, or pitting is found, the cylinder head assembly must be replaced.

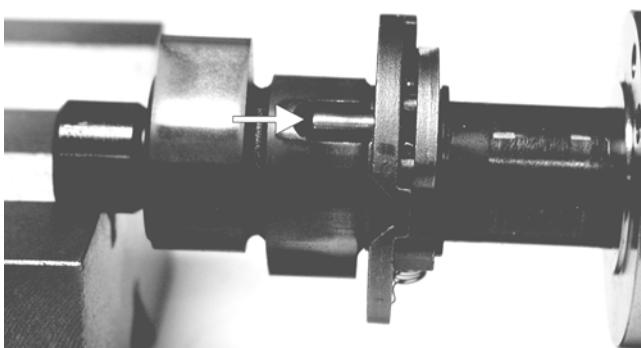
**■NOTE: If the journals are worn, replace the cam-shaft.**

### Inspecting Camshaft Spring/Drive Pin

1. Inspect the spring and drive pin for damage.



CF061A



CF060A

2. If damaged, the camshaft must be replaced.

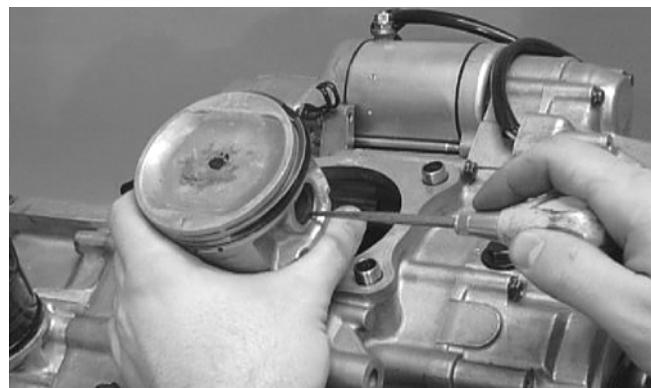
## Installing Top-Side Components

### A. Piston

### B. Cylinder

1. Install the piston on the connecting rod making sure the circlip on each side is fully seated in the piston.

**■NOTE: The piston should be installed so the arrow points toward the exhaust.**



CC032D

2. Place the two alignment pins into position. Place the cylinder gasket into position; then place a piston holder (or suitable substitute) beneath the piston skirt and square the piston in respect to the crankcase.

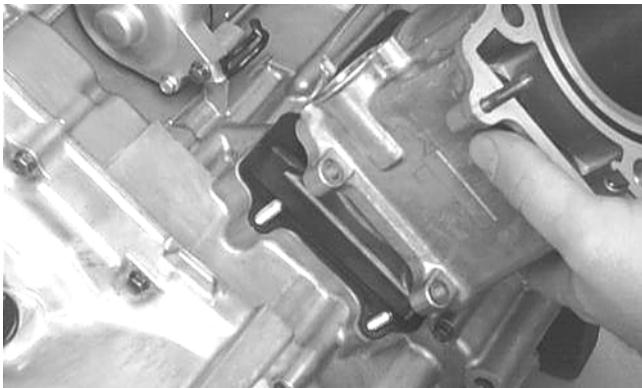


CF083

3. Lubricate the inside wall of the cylinder; then using a ring compressor or the fingers, compress the rings and slide the cylinder over the piston. Route the cam chain up through the cylinder cam chain housing; then remove the piston holder and seat the cylinder firmly on the crankcase.

### CAUTION

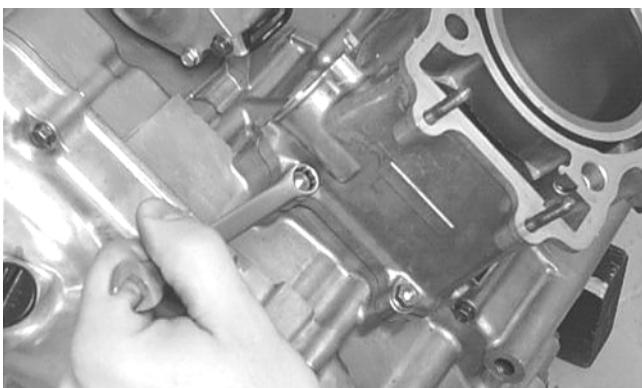
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crank-shaft assembly may occur.



CC024D

4. Loosely install the two nuts which secure the cylinder to the crankcase.

**■NOTE: The two cylinder-to-crankcase nuts will be tightened in step 11.**



CC023D

5. Install the coolant hose onto the crankcase union and tighten the clamp.

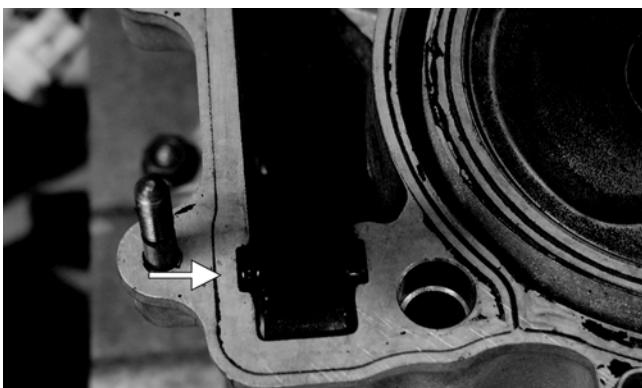
### **C. Cylinder Head D. Valve Cover**

**■NOTE: Steps 1-5 in the preceding sub-section must precede this procedure.**

6. Place the chain guide into the cylinder.

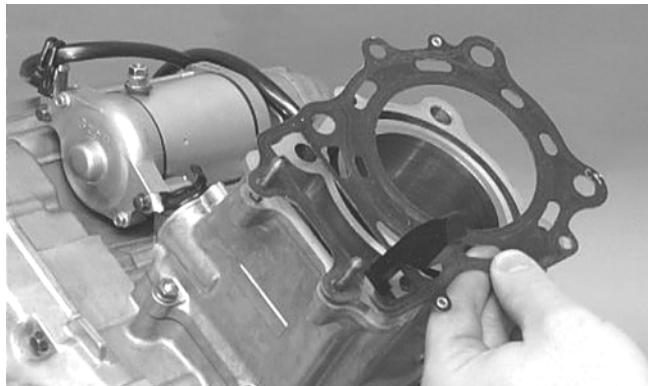
#### **CAUTION**

**Care should be taken that the bottom of the chain guide is secured in the crankcase boss.**

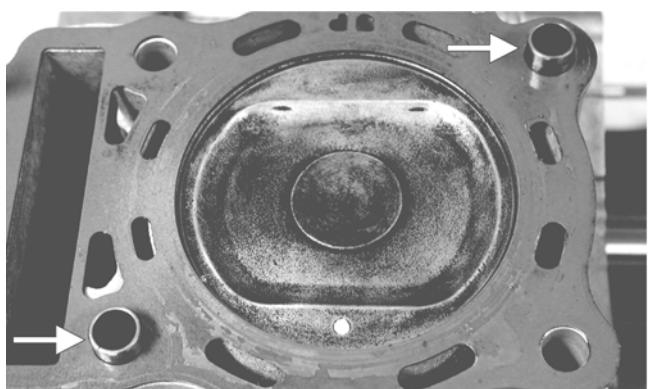


CF058A

7. Place a new head gasket into position on the cylinder. Place the alignment pins into position; then place the head assembly into position on the cylinder.

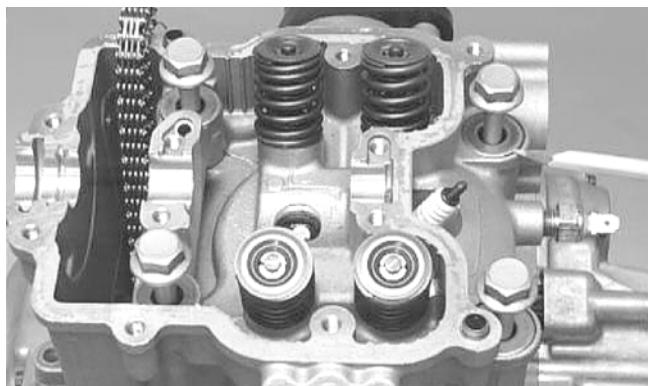


CC020D



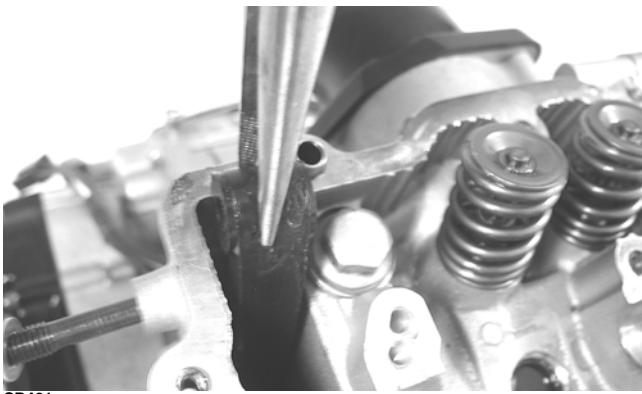
CF057A

8. Install the four cylinder head cap screws and washers. Tighten only until snug.



CC272D

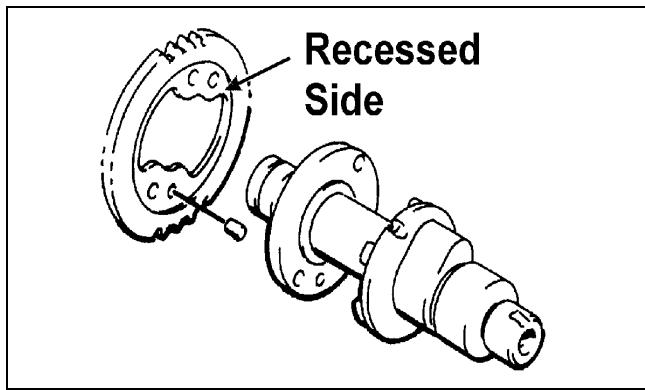
9. Loosely install the five cylinder head nuts.
10. Using a crisscross pattern, tighten the four cap screws (from step 8) initially to 20 ft-lb; then in 10 ft-lb increments, tighten to a final torque of 37 ft-lb.
11. Tighten the 8 mm nuts from step 9 to 18 ft-lb and the 6 mm nuts to 8.5 ft-lb; then tighten the two cylinder-to-crankcase nuts (from step 4) securely.
12. With the timing inspection plug removed and the chain held tight, rotate the crankshaft until the piston is at top-dead-center.
13. Install the rear cam chain tensioner guide into the cylinder head. Install the pivot cap screw and washer.



CD461

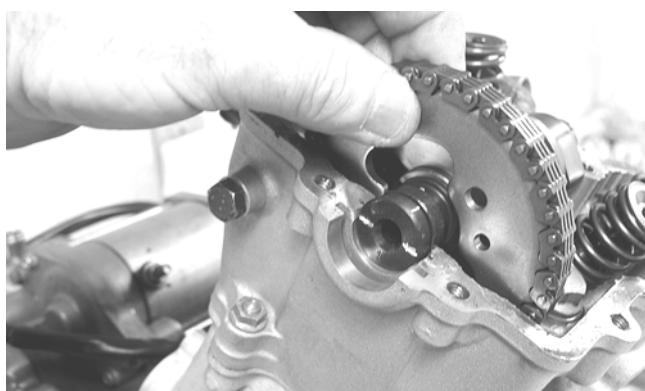
■**NOTE: At this point, oil the camshaft journals, cam lobes, and the three seating surfaces on the cylinder.**

14. With the alignment pin installed in the camshaft, loosely place the cam sprocket (with the recessed side facing the cam shaft lobes) onto the camshaft. At this point, do not “seat” the sprocket onto the shaft.



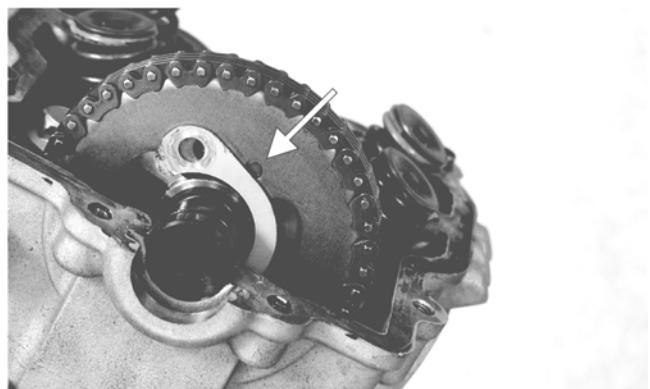
15. With the cam lobes directed down (toward the piston), maneuver the camshaft/sprocket assembly through the chain and towards its seating position; then loop the chain over the sprocket.

■**NOTE: Note the position of the alignment marks on the end of the camshaft. They must be parallel with the valve cover mating surface. If rotating the cam-shaft and sprocket is necessary for alignment, do not allow the crankshaft to rotate and be sure the cam lobes end up in the down position.**



CD463

16. Seat the cam sprocket onto the camshaft making sure the alignment pin in the camshaft aligns with the smallest hole in the sprocket; then place the cam-shaft/sprocket assembly onto the cylinder ensuring the following.



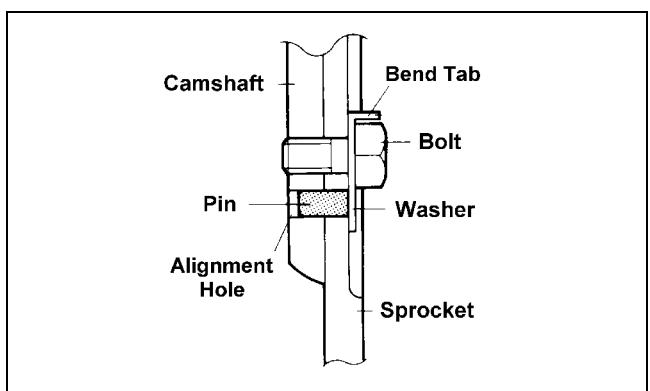
CF013A

- Piston still at top-dead-center.
- Camshaft lobes directed down (toward the piston).
- Camshaft alignment marks parallel to the valve cover mating surface.
- Recessed side of the sprocket directed toward the cam lobes.
- Camshaft alignment pin and sprocket alignment hole (smallest) are aligned.

#### CAUTION

If any of the above factors are not as stated, go back to step 12 and carefully proceed.

17. Place the tab-washer onto the sprocket making sure it covers the pin in the alignment hole.

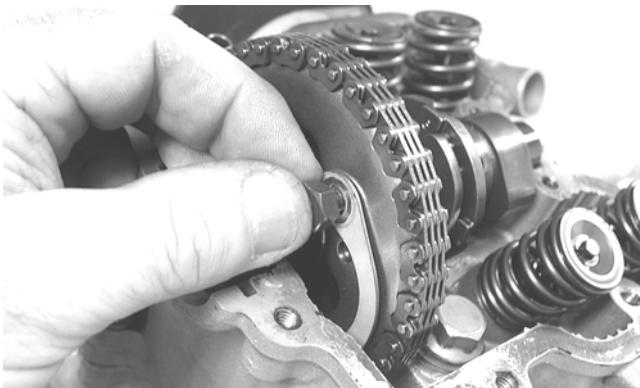


ATV1027

#### CAUTION

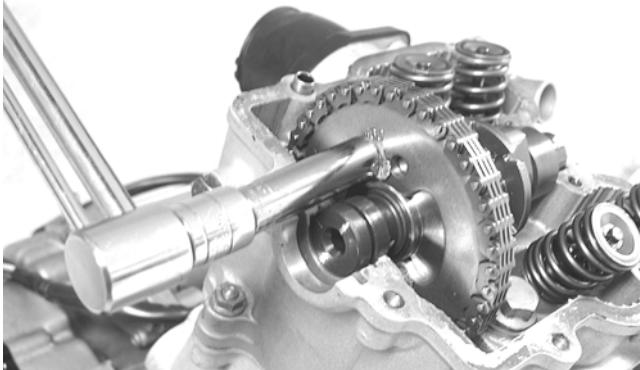
Care must be taken that the tab-washer is installed correctly to cover the alignment hole on the sprocket. If the alignment pin falls out, severe engine damage will result.

18. Install the first cap screw (threads coated with red Loctite #271) securing the sprocket and tab-washer to the camshaft. Tighten only until snug.



CD464

19. Rotate the crankshaft until the second cap screw securing the sprocket to the camshaft can be installed; then install the cap screw (threads coated with red Loctite #271) and tighten to 10 ft-lb. Bend the tab to secure the cap screw.



CD465

20. Rotate the crankshaft until the first cap screw (from step 18) can be accessed; then tighten to 10 ft-lb. Bend the tab to secure the cap screw.



CD466

21. Place the C-ring into position in its groove in the cylinder head.

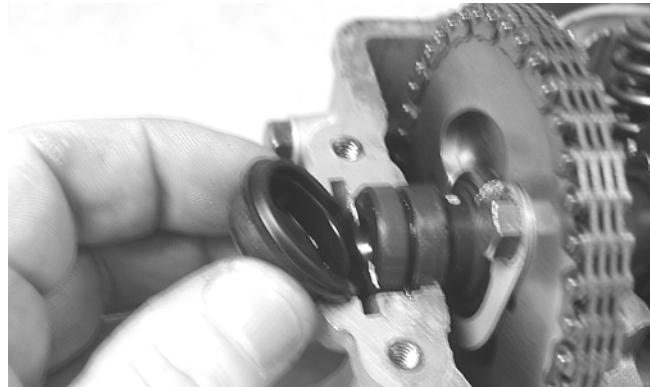


CC012D

22. Install the cylinder head plug in the cylinder head with the open end facing downward and toward the inside.

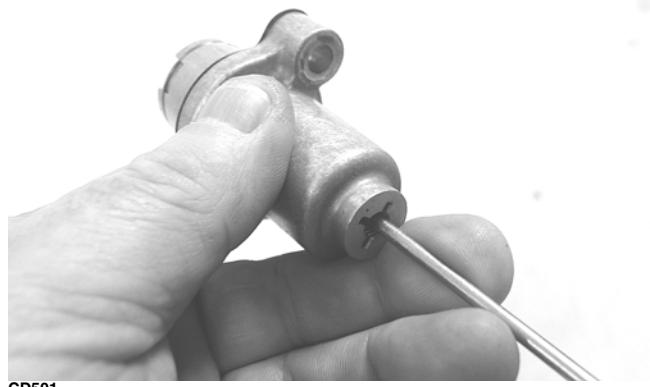
### CAUTION

The open end of the plug must be positioned downward.



CD468

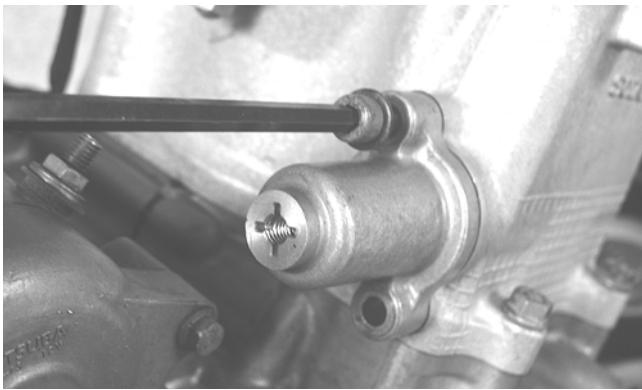
23. Remove the cap screw from the end of the chain tensioner; then using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner clockwise until the screw bottoms and the adjuster shaft is held in place.



CD501

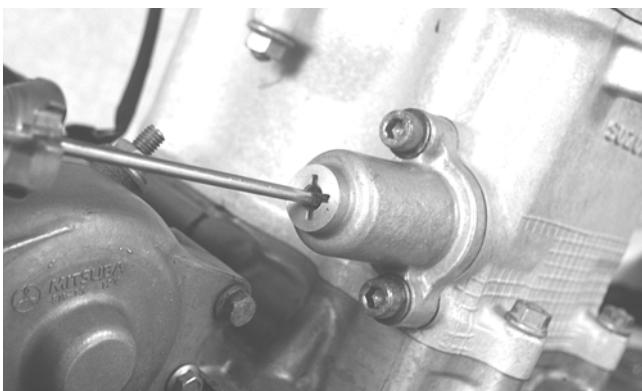
■**NOTE: The adjuster shaft will be drawn into the tensioner as the adjuster screw is rotated clockwise. The adjuster shaft tension will be released in step 25.**

24. Place the chain tensioner adjuster assembly and gasket into position on the cylinder and secure with the two cap screws.

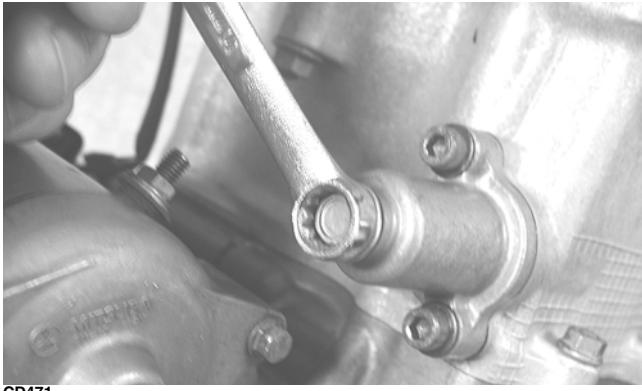


CD469

25. Using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner counterclockwise until the tensioner spring bears tension; then remove the screw driver to apply tension to the cam chain. Install the cap screw into the end of the chain tensioner.

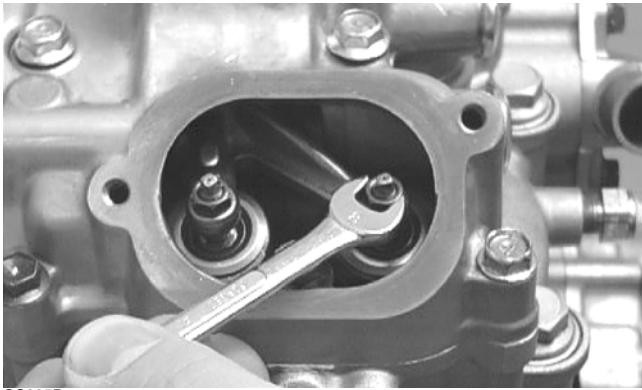


CD470



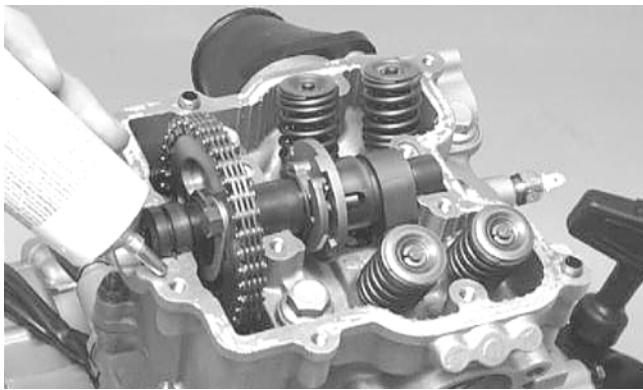
CD471

26. Loosen the four adjuster screw jam nuts; then loosen the four adjuster screws on the rocker arms in the valve cover.



CC005D

27. Apply a thin coat of Three Bond Sealant to the mating surfaces of the cylinder head and valve cover.

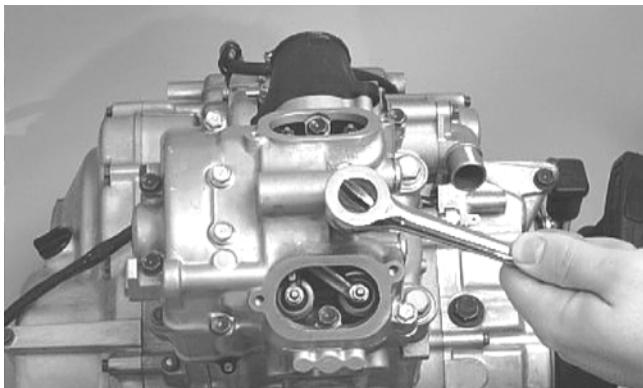


CC275D

28. Place the valve cover into position.

**■NOTE: At this point, the rocker arms and adjuster screws must not have pressure on them.**

29. Install the four top side cap screws with rubber washers; then install the remaining cap screws. Tighten only until snug.



CC003D

30. In a crisscross pattern starting from the center and working outward, tighten the cap screws (from step 29) to 8.5 ft-lb.

31. Adjust valve/tappet clearance (see Periodic Maintenance/Tune-Up).

32. Place the two tappet covers into position making sure the proper cap screws are with the proper cover. Tighten to 8.5 ft lb.



CC001D

33. If removed, install the spark plug. Tighten securely.

## Left-Side Components

■NOTE: For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

### ☞ AT THIS POINT

To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■NOTE: The engine/transmission does not have to be removed from the frame for this procedure.

## Removing Left-Side Components

### A. Outer Magneto Cover

#### B. Water Pump

#### C. Cover

#### D. Rotor/Flywheel

1. Remove the four cap screws securing the outer magneto cover to the left-side cover; then remove the outer magneto cover.
2. Remove the flange nut securing the bushing to the crankshaft; then remove the bushing. Account for the O-ring inside the spacer.
3. Using a cold chisel, scribe a mark showing the relative position of the shift arm to the shift arm shaft to aid in installing; then remove the shift arm.



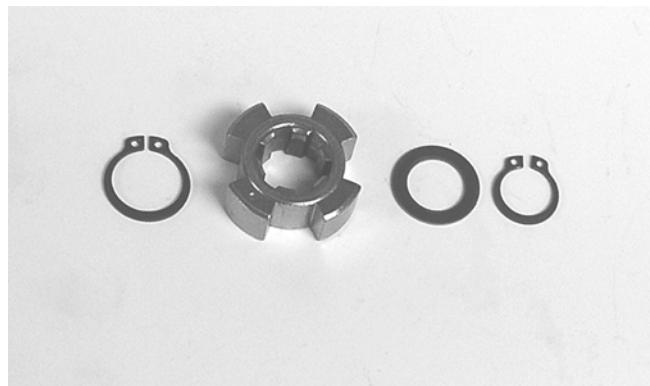
FI085A

4. Remove the cap screws securing the speed sensor housing to the crankcase and remove the housing assembly; then remove the snap ring securing the speed sensor trigger and thrust washer to the shaft. Remove the trigger. Account for the gasket snap ring, and dowel pins.

■NOTE: It may be necessary to use a small two-jaw puller to remove the trigger.



CD920



GZ254

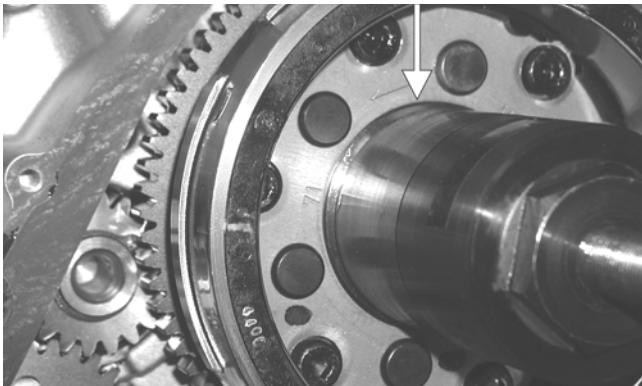
5. Loosen the clamps securing the coolant hose to the water pump; then remove the crossover tube from the cylinder head. Account for an O-ring.
6. Remove the two cap screws securing the water pump to the engine; then remove the water pump.
7. Remove the cap screws securing the left-side cover to the crankcase noting the location of the different-sized cap screws for installing purposes.
8. Using an appropriate side case puller, remove the side cover. Account for a gasket and two alignment pins.
9. Remove the nut securing the magneto rotor to the crankshaft; then install the magneto rotor puller adapter.

■NOTE: The puller has left-hand threads.

10. Using Magneto Rotor Remover Set and the appropriate crankshaft protector, remove the rotor/flywheel assembly from the crankshaft. Account for the key; then remove the starter clutch gear assembly and washer.



PR441

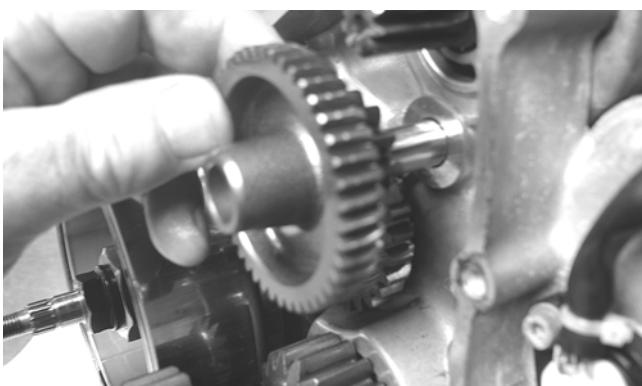


CD939A



CD940A

11. Remove the two starter gears from the crankcase noting the direction of the gears for installing purposes; then remove the two starter gear shafts.



CD136



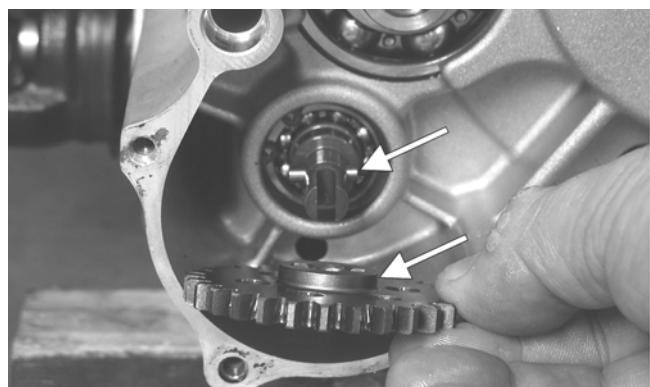
CD140

12. Remove the snap ring securing the water pump drive gear; then remove the gear noting the direction of the sides of the gear for installing purposes. Account for the drive gear alignment pin.



CD944

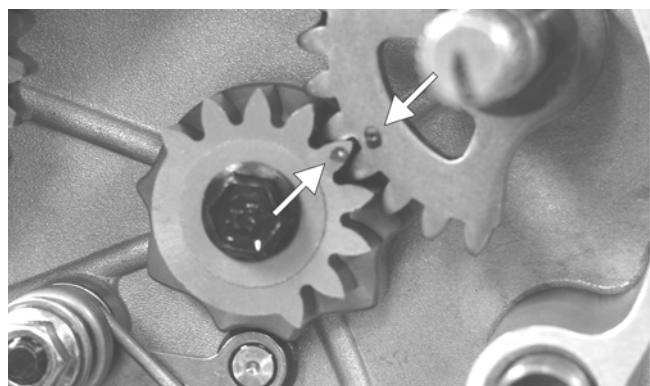
13. Remove the snap ring securing the water pump driven gear; then remove the gear noting the direction of the sides of the gear for installing purposes. Account for the driven gear alignment pin.



CD952A

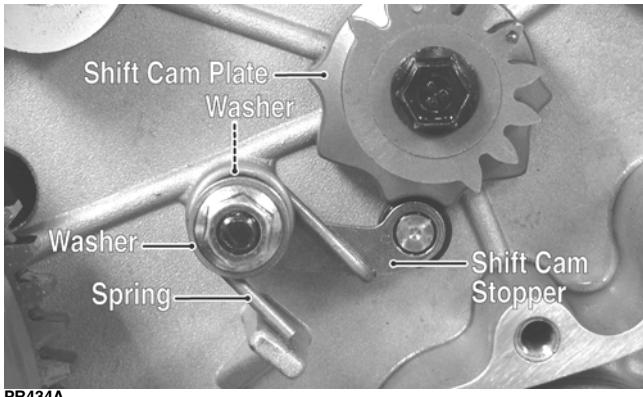
■**NOTE:** There is an oil passage beneath the driven gear/drive gear assembly. This passage should be plugged prior to removing the driven gear and drive gear. Failure to do so could result in the loss of an alignment pin into the crankcase.

14. Remove the shift shaft noting the timing marks for assembling purposes. Account for two washers.



PR430A

15. Remove the gear shift cam plate and account for a washer; then remove the cam stopper and cam stopper spring. Account for two washers.



PR434A

## REPLACING STARTER CLUTCH ASSEMBLY

1. Remove the cap screws securing the starter clutch assembly to the flywheel; then remove from the flywheel.



FI570

2. Thoroughly clean the rotor/flywheel; then install the new clutch and secure with the cap screws after applying a drop of red Loctite #271 to the threads. Tighten to 26 ft-lb using a crisscross pattern. Make sure the one-way bearing is installed with the notches directed away from the rotor/flywheel.



FI569

3. Inspect the one-way bearing for chipped surfaces, missing rollers, or discoloration. If any of the above conditions exist, replace the starter clutch assembly.



FI572



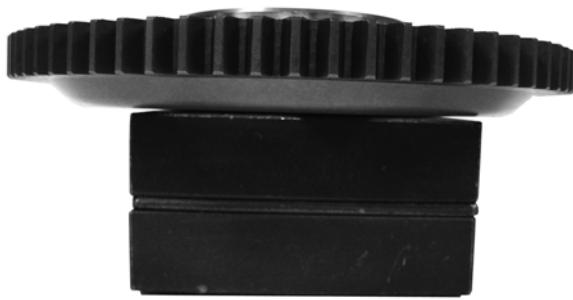
FI576A



FI578

## REPLACING STARTER GEAR BEARING

1. Support the starter clutch gear in a press making sure to support the hub around the entire circumference; then using a suitable bearing driver, press the bearing from the gear.



FI583

2. Thoroughly clean the gear hub; then apply a drop of green Loctite #620 to the bearing outer race and press into the gear hub until even with the lower chamfer radius.



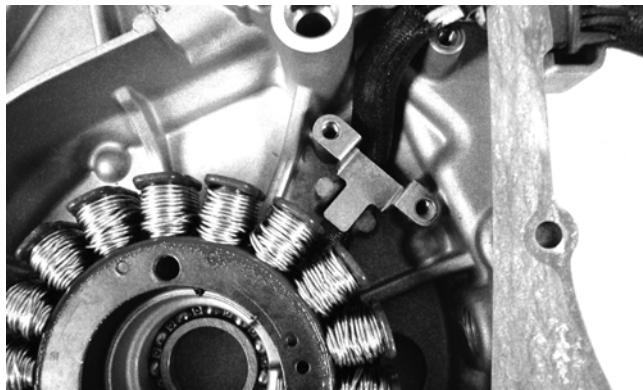
FI580

#### **INSPECTING STATOR COIL/MAGNETO COVER ASSEMBLY**

1. Inspect the stator coil for burned or discolored wiring, broken or missing hold-down clips, or loose cap screws.
2. Inspect the bearings in the magneto housing for discoloration, roughness when rotated, and secure fit in bearing bores.

#### **REPLACING STATOR COIL/CRANKSHAFT POSITION SENSOR**

1. Remove the three cap screws securing the stator coil, two cap screws securing the crankshaft position sensor, and one cap screw from the harness hold-down.
2. Lift the rubber grommet out of the housing; then remove the stator coil/crankshaft position sensor. Account for and note the position of the harness hold-down under the crankshaft position sensor.

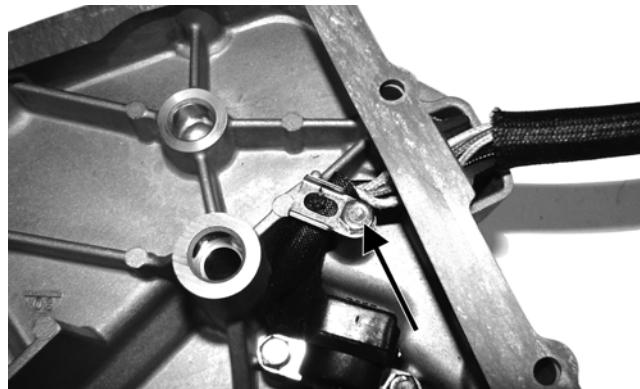


FI590

3. Install the new stator coil assembly and secure with three cap screws using a drop of red Loctite #271 on each. Tighten according to the chart.

| Cover    | Bolt Type | ft-lb | N·m |
|----------|-----------|-------|-----|
| Original | Hex-Head  | 11.5  | 15  |
| New      | Hex-Head  | 13    | 18  |

4. Place the stator wire harness hold-down into position; then install the crankshaft position sensor and secure with two cap screws. Tighten securely.
5. Install the upper cable hold-down and secure with a cap screw. Tighten securely.

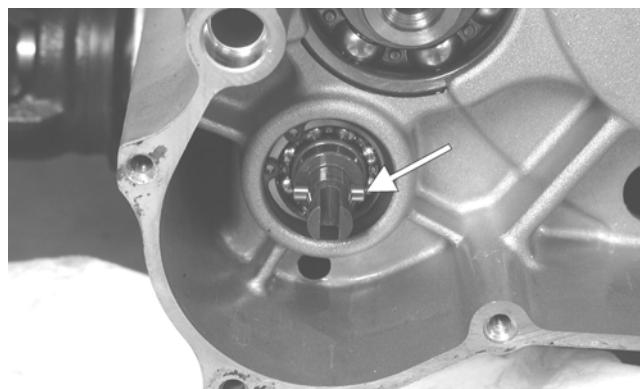


FI595A

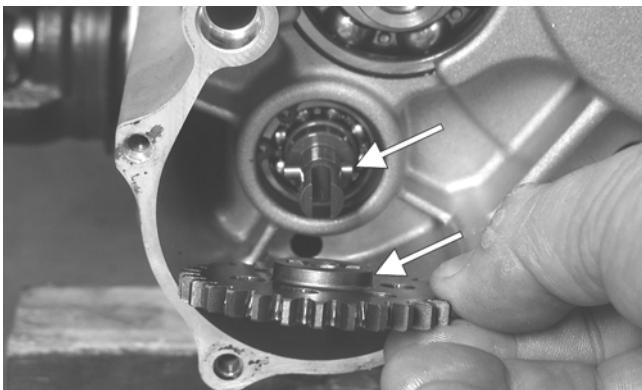
#### **Installing Left-Side Components**

■**NOTE: Plug the oil passage in the crankcase housing prior to installing the drive gear/driven gear assembly to prevent loss of an alignment pin.**

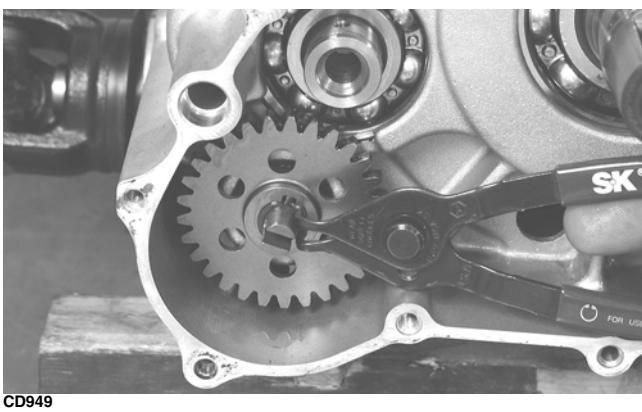
1. Install the water pump driven gear alignment pin and the driven gear (with the beveled side of the gear facing outward as noted in removing); then secure with the snap ring.



CD950A



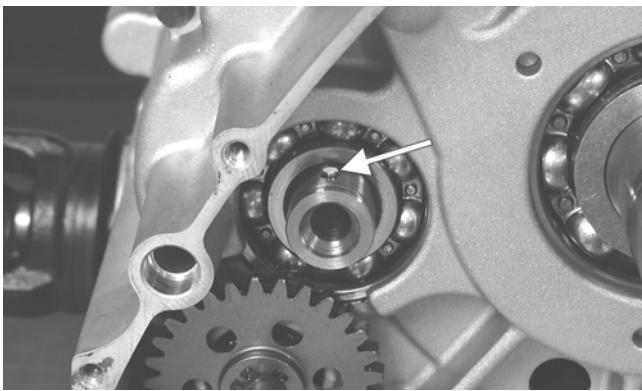
CD952A



CD949

■**NOTE:** The sharp side of the snap ring should be facing outward.

2. Install the water pump drive gear drive pin and the drive gear (with the flat side of the gear facing outward as noted in removing); then secure with the snap ring.



CD946A



CD944

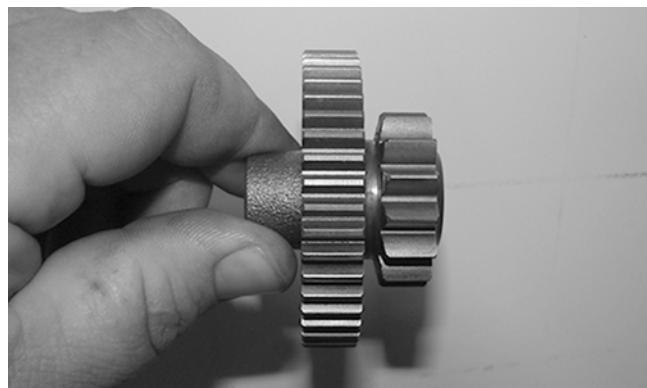
■**NOTE:** The sharp side of the snap ring should be facing outward.

■**NOTE:** Once the gears are secured, remove the oil passage plug from the crankcase.

3. Install the two starter gear shafts; then install the two starter gears.



CD139

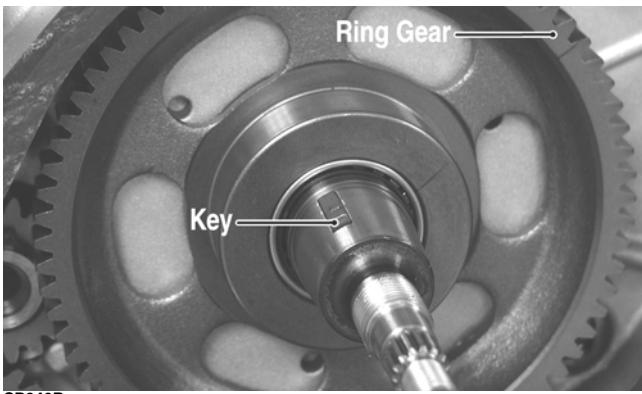


H2-045

4. In order on the crankshaft, install a washer, ring gear, key, and the magneto rotor. Secure with the nut. Tighten to 107 ft-lb.

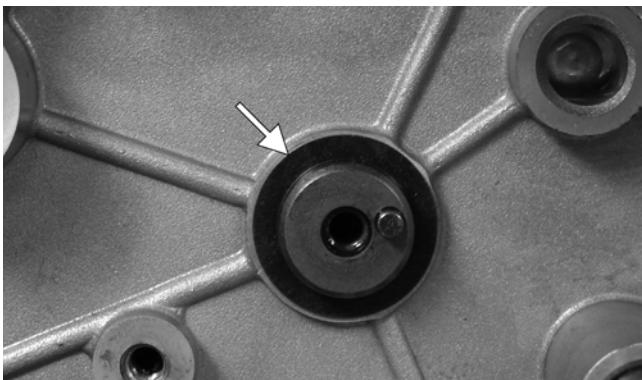


CD948A



CD940B

5. Install the thrust washer and shift cam plate onto the shift cam shaft; then coat the cap screw threads with red Loctite #271 and tighten to 8 ft-lb.

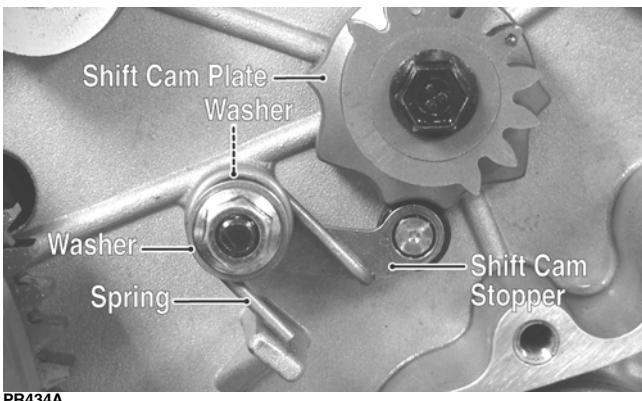


PR433A



CD934

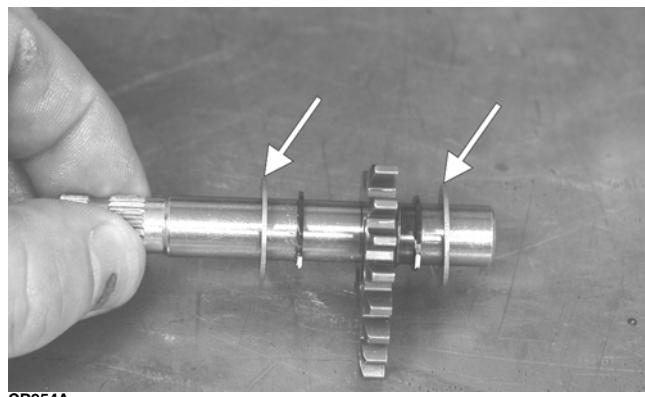
6. Install the shift cam stopper, spring, and two washers (thick washer closest to the nut); then coat the threads on the mounting stud with red Loctite #271 and install the nut. Tighten to 8 ft-lb.



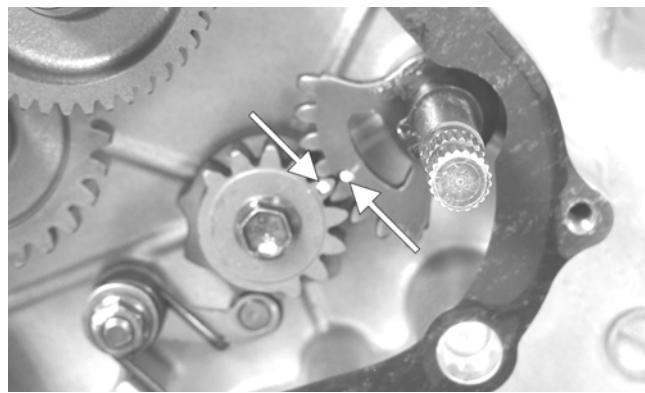
PR434A

■**NOTE: Rotate the shift cam plate to ensure it ratchets with no binding.**

7. Install the shift shaft with two washers making sure to align the timing mark on the shift shaft with the mark on the shift cam plate.

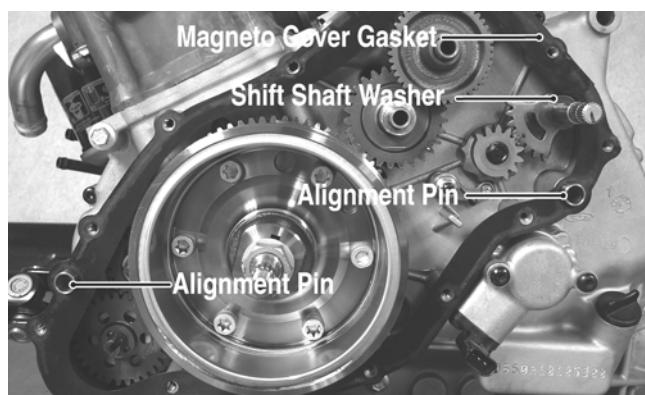


CD954A



CD927A

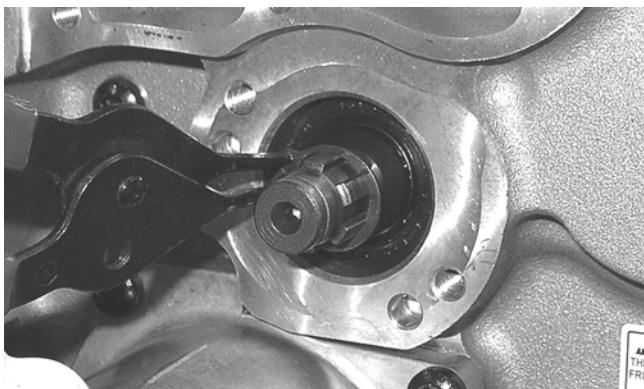
8. Lubricate the magneto cover gasket with fresh engine oil; then place it into position on the two alignment pins. Make sure the outer shift shaft washer is in place.



PR431A

9. Install the magneto cover and secure with the cap screws. Tighten only until snug.
10. Place the bushing into position on the crankshaft making sure a new, lubricated O-ring is inside the bushing. Tighten the flange nut to 25 ft-lb.
11. Using a crisscross pattern, tighten the cap screws (from step 9) to 10 ft-lb.

12. Clean the countershaft and trigger splines thoroughly and install the inner snap ring onto the shaft; then apply green Loctite #620 to the trigger and countershaft splines and install the trigger. Secure with a flat washer and outer snap ring. Install the dowel pins.



GZ253

17. Place the outer magneto cover into position on the left-side cover; then tighten four cap screws to 8.5 ft-lb.

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## Right-Side Components

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■**NOTE:** For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

|                      |
|----------------------|
| <b>AT THIS POINT</b> |
|----------------------|

To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■**NOTE:** The engine/transmission does not have to be removed from the frame for this procedure.

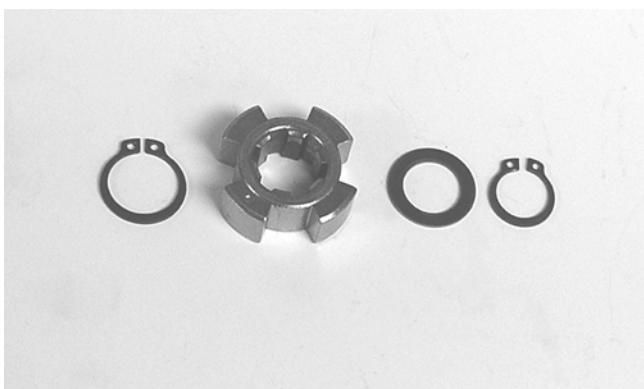
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## Removing Right-Side Components

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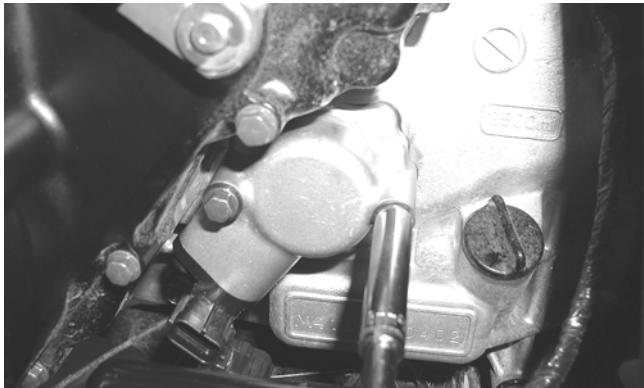
- A. V-Belt Cover**
- B. Driven Pulley**
- C. Clutch Cover**
- D. Oil Pump**

1. Remove the cap screws securing the V-belt cover noting the location of the different-lengthed cap screws for installing purposes; then using a rubber mallet, gently tap on the cover tabs to loosen the cover. Account for two alignment pins and a gasket.



GZ254

13. Using a new gasket, install the speed sensor housing onto the crankcase and secure with two cap screws. Tighten to 8.5 ft-lb.



CD069

14. Place the water pump into position and secure with two cap screws. Tighten to 8 ft-lb.

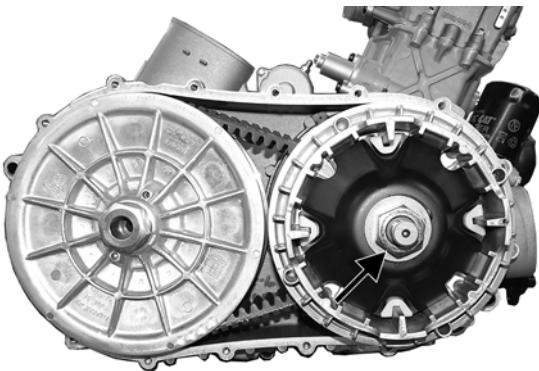
■**NOTE:** Ensure the slotted water pump shaft is aligned with the groove in the counter balancer shaft.

15. Install the crossover tube on the water pump and cylinder head making sure the O-ring is properly positioned.
16. Install the shift arm on the shift arm shaft making sure the scribed marks (from removing) are aligned. Tighten securely.

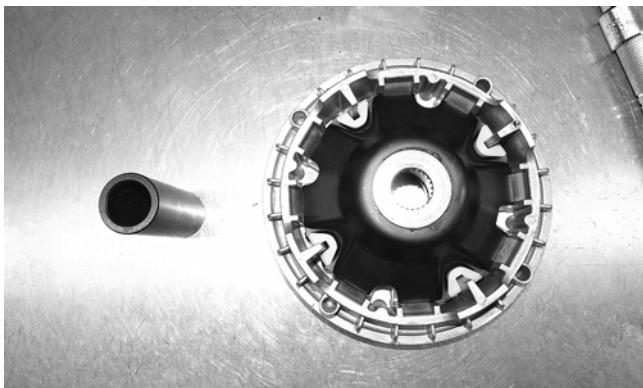


CF363

2. Remove and discard the nut securing the movable drive face; then remove the face. Account for a spacer.



CF373A



CF378

3. Remove the V-belt.
4. Remove the nut securing the fixed driven assembly; then remove the assembly.



PR388

5. Remove the fixed drive face.
6. Remove and discard the cap screws securing the windage plate.



CF632A

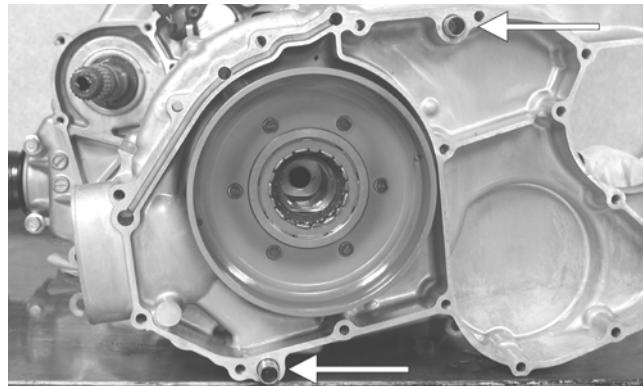
7. Remove the cap screws securing the clutch cover. Note the location of the different-lengthed cap screws for installing purposes. Using a rubber mallet, carefully remove the cover. Account for two alignment pins.



CD973A

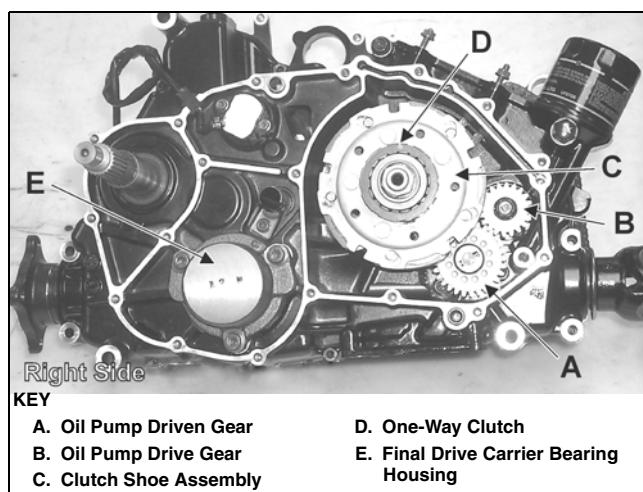
**CAUTION**

Care must be taken when removing the cover so the cover gasket is not damaged.



CD974A

■**NOTE:** For steps 8-14, refer to illustration CC829B.  
 ■**NOTE:** To aid in installing, it is recommended that the assemblies are kept together and IN ORDER.



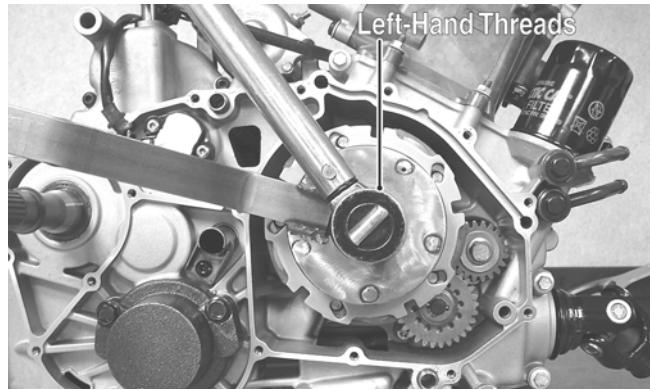
CC829B

8. Remove the one-way clutch (D) from the clutch housing. Note the location of the green alignment dot (or the word OUTSIDE) for installing purposes.

9. Using a hydraulic press, remove the clutch housing assembly from the clutch cover. Account for the left fixed drive spacer and an O-ring inside the fixed drive spacer.

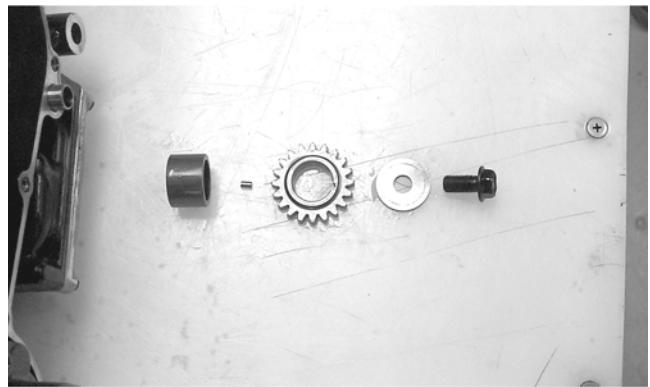


CF085



PR410A

12. Remove the cap screw securing the oil pump drive gear (B). Account for a cap screw, washer, pin, and spacer.



CC606

CC596

■**NOTE: Account for and inspect the clutch housing seal.**



CF088A

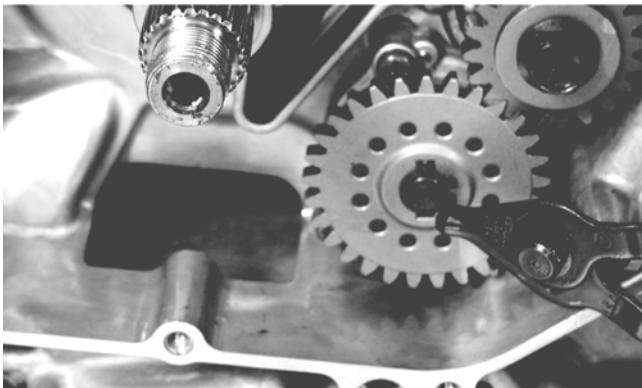
10. Remove the two cap screws securing the gear position switch; then remove the switch.

11. Remove the nut (left-hand threads) securing the clutch shoe assembly (C).

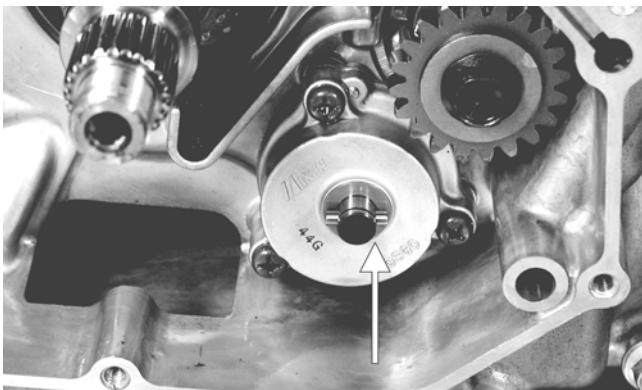


CD999

14. Remove the snap ring securing the oil pump driven gear (A); then remove the gear noting the direction of the sides of the gear for installing purposes. Account for a pin and a washer.



CD984



CD985A

15. Using an impact driver, remove the three torx-head screws securing the oil pump; then remove the pump.



CD988

## Servicing Right-Side Components

### INSPECTING OIL PUMP

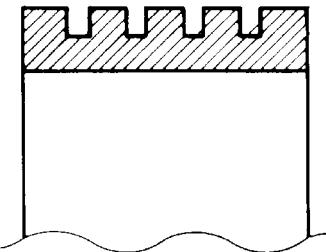
1. Inspect the pump for damage.
2. It is inadvisable to remove the screw securing the pump halves. If the oil pump is damaged, it must be replaced.



CC446D

### INSPECTING CENTRIFUGAL CLUTCH SHOE

1. Inspect the clutch shoes for uneven wear, chips, cracks, or discoloration. If any shoe is damaged, replace the complete set.
2. Inspect the clutch shoes for wear or damage. If any shoe is worn to the bottom of the groove, replace the clutch assembly.



ATV1014

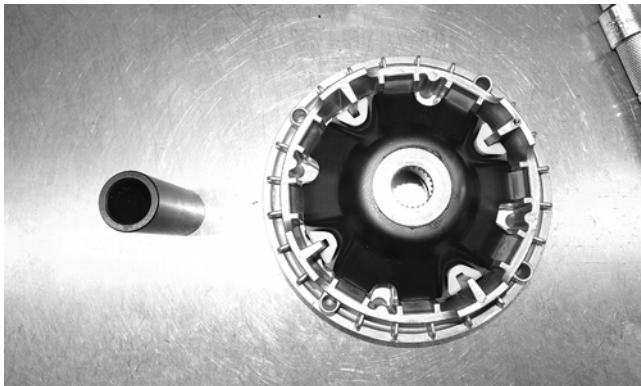
### INSPECTING CLUTCH HOUSING

1. Inspect the clutch housing for burns, grooving, cracks, or uneven wear.
2. If the housing is damaged in any way, the housing must be replaced.

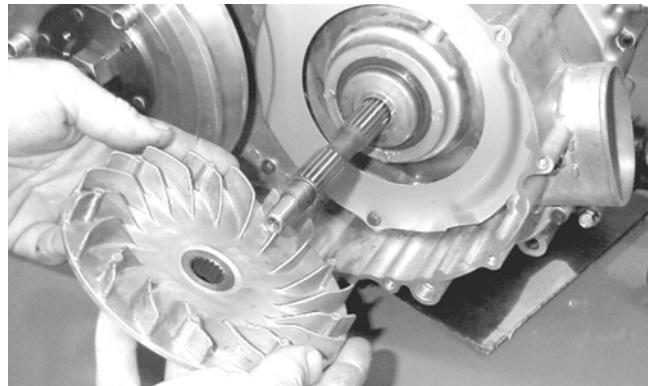
### DRIVE CLUTCH ASSEMBLY

#### Disassembling and Inspecting

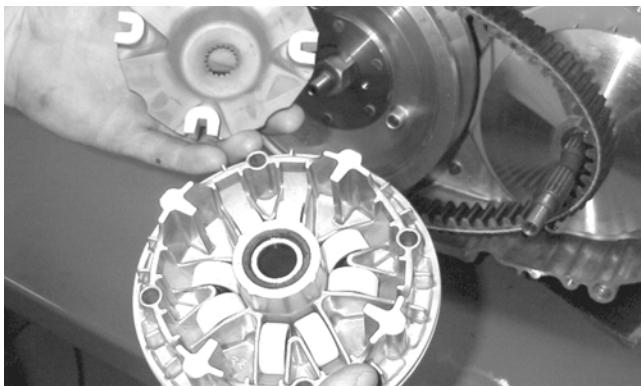
1. Slide the sheave plate out of the movable drive sheave. Make note of each drive face plate damper orientation before removing. Check for excessive wear, warping or any cracks. Replace as necessary. Check the internal splines of the sheave plate for excessive or abnormal wear. Inspect the roller surface of the sheave plate for abnormal wear or pitting. Replace as necessary.



CF378



MD1094



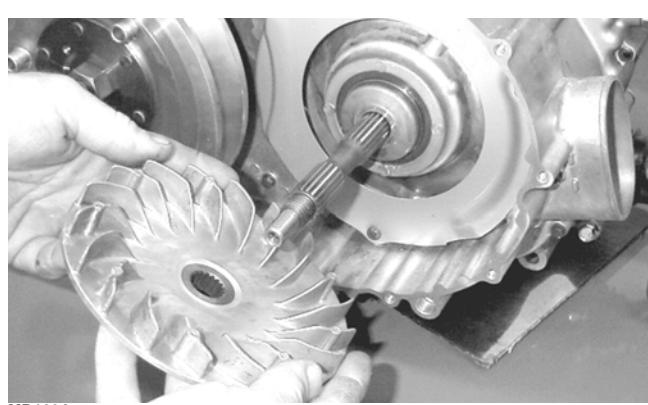
MD1036

2. Note the roller locations; then remove the rollers. Check for flat spots or abnormal wear. Measure the outside diameter; standard measurement is 30 mm. If excessively worn, replace as necessary.



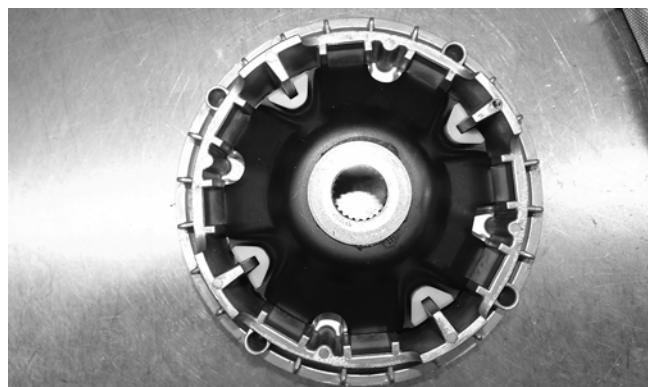
ATV1152A

3. Check the internal bushing of the movable drive sheave and surface of the spacer. Replace as necessary. Check the fixed drive sheave internal splines for excessive wear. Check for any broken cooling fins and replace as necessary.



MD1094

2. As noted during disassembling, place each roller into each valley of the movable drive sheave. With the dampers installed onto the sheave plate, install the sheave plate into the movable drive sheave.



CF381

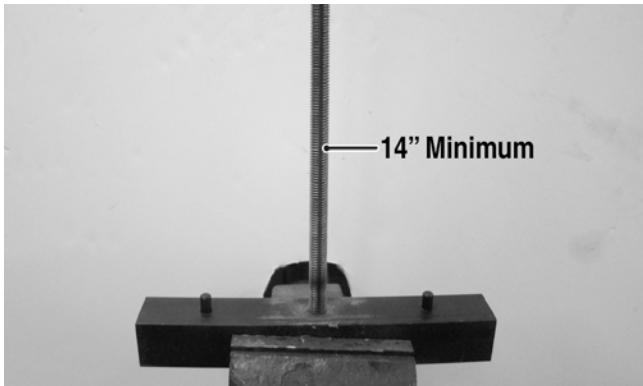
## DRIVEN CLUTCH ASSEMBLY

### Disassembling

1. Secure the clutch spring compressor base in a work vise attached to a stable work table or work bench.

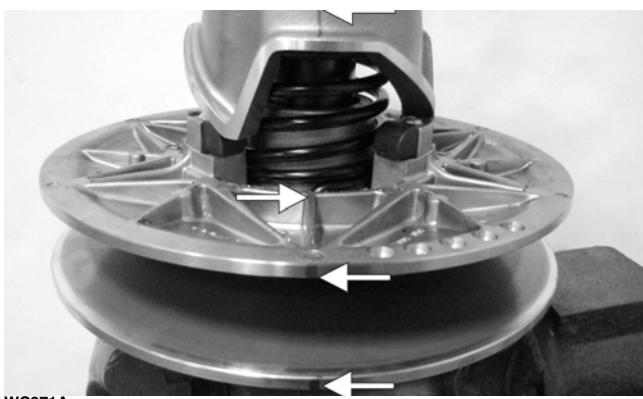
#### **WARNING**

Use only a spring compressor tool base with a screw length of 14" or greater or serious injury could occur.



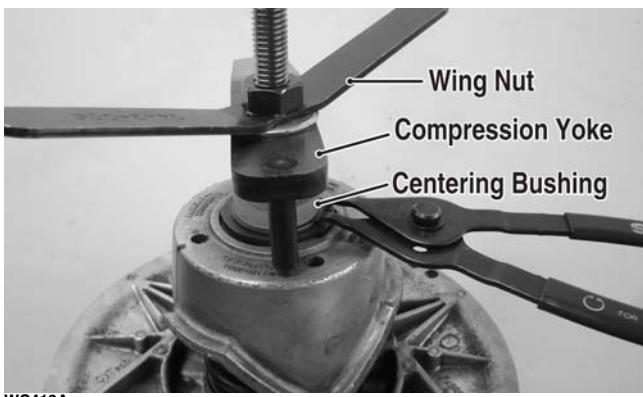
WC422A

2. Place the driven pulley assembly onto the base and mark the fixed sheave, movable sheave, and cam; then note the location of the spring anchors in the movable sheave and cam and mark them for assembly purposes.



WC371A

3. With the centering bushing, compression yoke, and wing nut in place, tighten the wing nut sufficiently to relax pressure on the snap ring and remove the snap ring.



WC418A

4. Turn the wing nut counterclockwise to relax the spring. As the cam clears the key in the fixed driven shaft, there will be a slight clockwise rotation of the cam. This is normal due to spring preload.

### **WARNING**

If at anytime the cam hangs up or the tool feels slack and the spring is not completely extended, stop and determine the cause. Failure to do so could result in the driven pulley assembly suddenly coming apart and severe injury or death could occur.

5. Completely relax the spring until all pressure is removed from the compression yoke; then remove the wing nut, compression yoke, snap ring, and centering bushing.
6. Remove the cam and spring; then remove the movable driven sheave. Account for a square key.
7. Remove the fixed driven sheave from the compression tool base.

### **INSPECTING**

1. Inspect the sheave faces for cracks, grooving, or "checking."



WC381



WC383

2. Inspect the cam shoes on the movable driven sheave for chipping, excessive scoring, or general condition.



WC384A

■**NOTE:** Always replace the cam shoes as a complete set.

3. Inspect the cam ramp faces for galling, scoring, or excessive wear.



WC382

4. Inspect the key and keyways in the cam and fixed driven sheave for excessive wear.
5. Inspect the wear bushings in the movable driven sheave for wear or loose fit in the sheave. Replace as a set.



WC383A

6. Inspect the spring for kinks by rolling on a flat surface. The spring should roll freely with no irregularities.
7. Inspect spring ends and spring anchors in cam and movable driven sheave for wear or enlarged spring anchor holes.

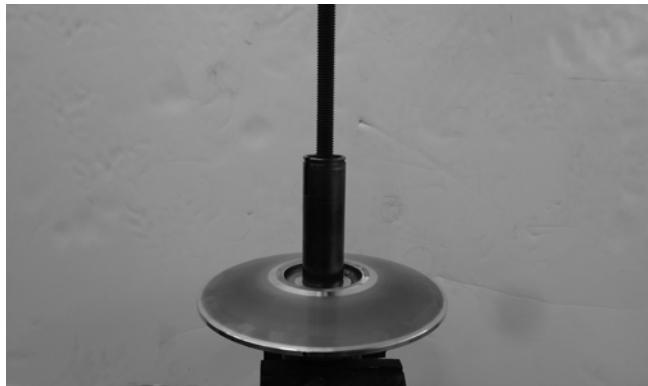
**■NOTE: If any of the components fail the above inspection, the driven pulley must be replaced.**

## ASSEMBLING

### **WARNING**

The clutch assemblies are under extreme spring pressure, and only experienced technicians using the proper tools should perform service on these components. Failure to follow proper procedures could result in serious injury or death. Always wear safety glasses and observe proper shop techniques. Keep bystanders clear of work area at all times.

1. Clamp the Clutch Spring Compressor in a suitable work vise; then set the fixed driven sheave on the base.



WC387

2. Install the movable driven sheave onto the fixed sheave shaft and align the match marks.



WC388

3. Install the spring over the hub of the movable driven sheave engaging the spring into the previously marked spring anchor hole.



WC391A

4. Place the cam over the spring and align the spring tip to the previously marked anchor hole.



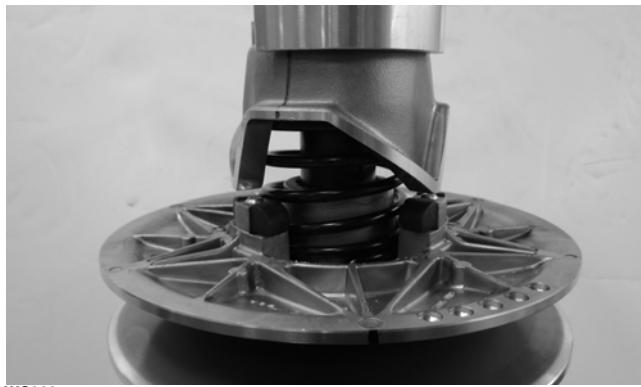
WC753

5. Install the centering bushing into the fixed driven hub; then with the sharp side upward, place the snap ring onto the assembly and install the compression yoke and wing nut.



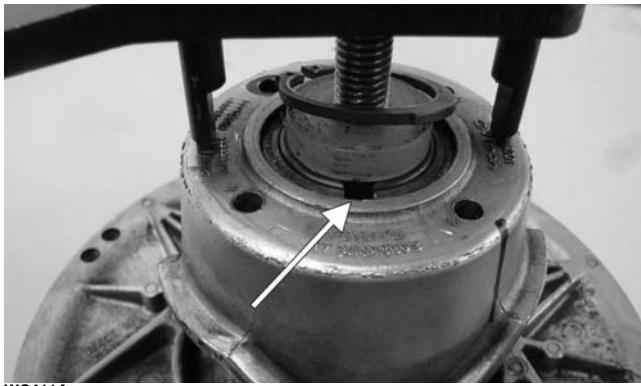
WC414

6. Turn the wing nut clockwise to compress the spring being very careful that the cam correctly engages the fixed driven hub; then continue to tighten until the cam ramps are just above the cam shoes.



WC398

7. Rotate the cam counterclockwise by hand enough to get the cam ramps on the correct side of the cam shoes; then continue to tighten the wing nut until the keyways align.



WC411A

8. Install the square key making sure it fits flush and clear of the snap ring groove; then install the snap ring making sure it is seated properly.



WC412



WC419

9. Turn the wing nut counterclockwise slowly allowing the cam to contact the snap ring; then loosen slightly and tap the cam with a plastic mallet to ensure the snap ring is securely seated.



WC408

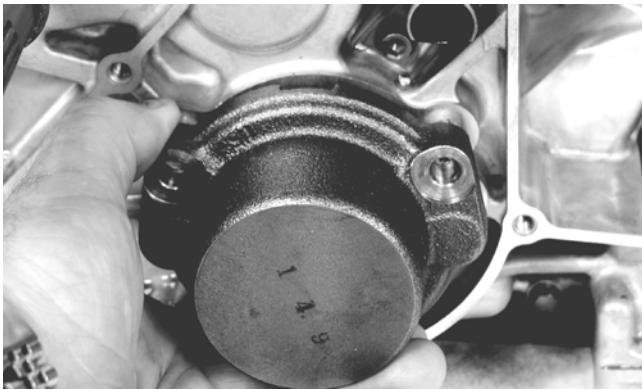
10. Remove the wing nut, compression yoke, and centering bushing; then remove the driven pulley assembly from the Clutch Spring Compressor.

---

## Installing Right-Side Components

---

1. Install the secondary shaft bearing housing making sure the two alignment pins are properly positioned. Tighten the new “patch-lock” cap screws to 25 ft-lb.



CD999

2. Install the oil pump onto the engine; then tighten the screws (coated with red Loctite #271) to 8.5 ft-lb.

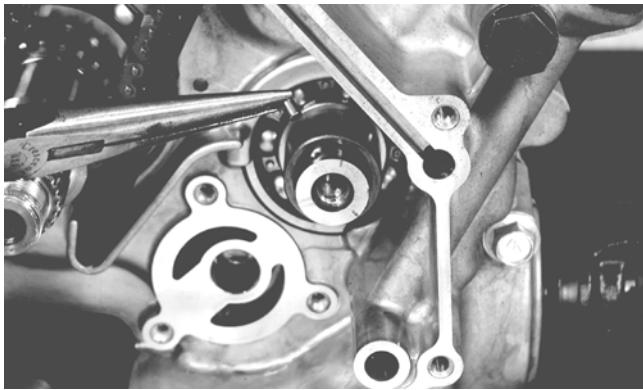


CD988

3. Install the oil pump drive gear spacer onto the crank balancer shaft. Grease the pin and insert it into the shaft; then install the drive gear making sure the raised side of the gear is facing toward the inside. Secure the gear with the cap screw (threads coated with red Loctite #271) and the washer. Tighten the cap screw to 63 ft-lb.

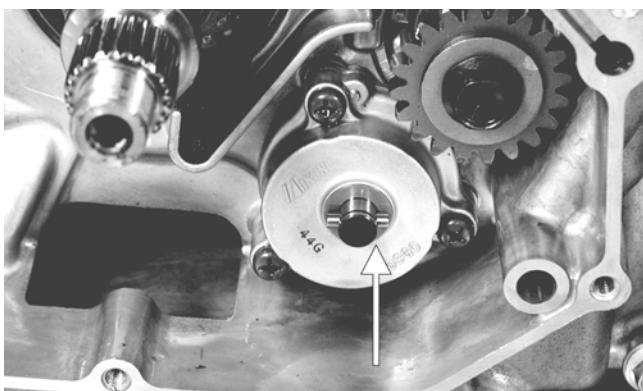


CD992

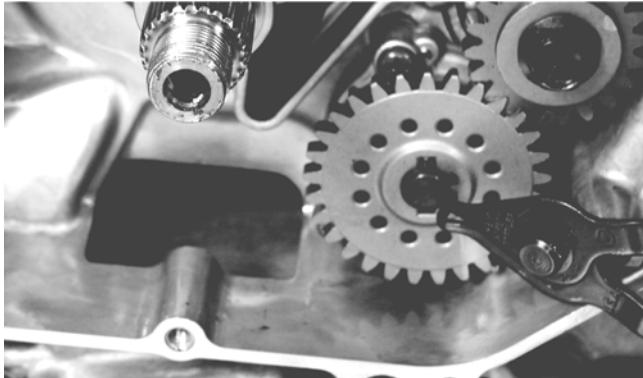


CD991

4. Grease the driven gear pin and insert the oil pump into the case. Tighten the oil pump screws to 8 ft-lb. Install the washer and pin; then install the driven gear noting the direction on the sides of the gear from removing). Secure with a snap ring.



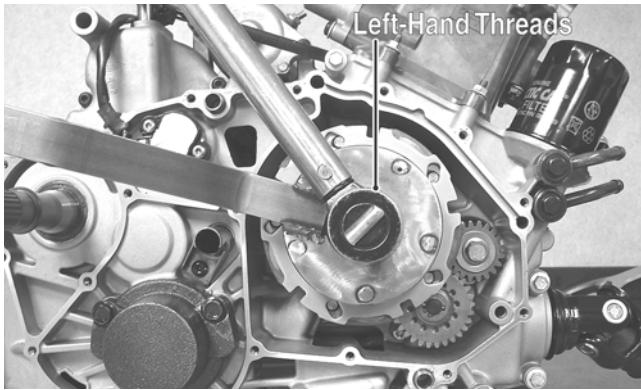
CD985A



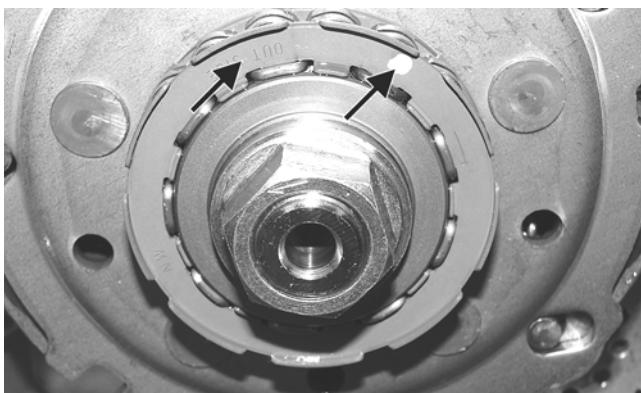
CD984

**■NOTE: When installed correctly, the sides of the drive and driven gears will be flush with each other.**

5. Install the clutch shoe assembly and secure with the flange nut (threads coated with red Loctite #271). Tighten to 221 ft-lb.



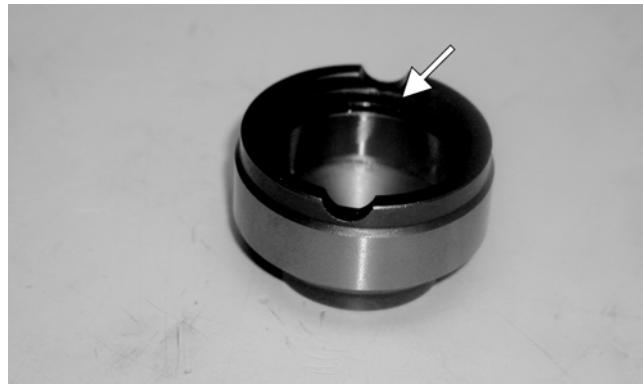
6. Install the clutch cover alignment pins into the crankcase, apply oil to the cover gasket, and install the gasket onto the crankcase.
7. Install the one-way clutch onto the clutch shoe assembly.



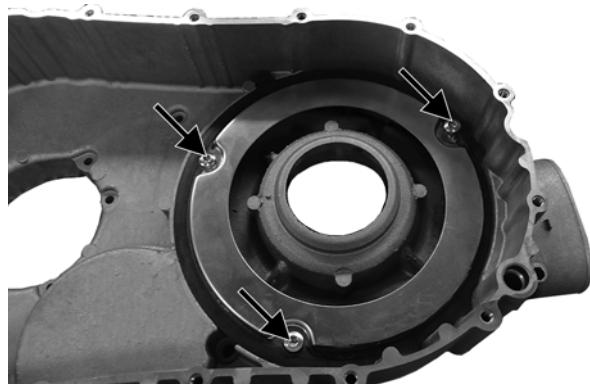
### CAUTION

When installed correctly, the green alignment dot (or the word OUTSIDE) on the one-way clutch is visible.

8. Lightly grease the clutch housing seal; then insert the left fixed-drive spacer.



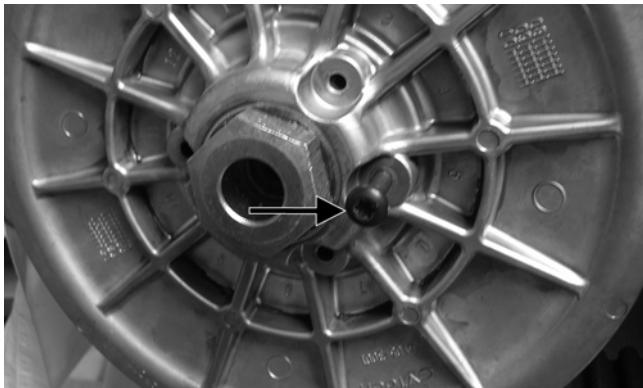
9. Apply grease to the outer edges of the clutch housing; then from inside the clutch cover, install the clutch housing into the cover using a rubber mallet.
10. Place the clutch cover/housing assembly into position on the crankcase; then secure with the cap screws making sure the different-lengthed cap screws are in their proper location. Tighten to 8 ft-lb.
11. Install the windage plate and secure with new "patch-lock" cap screws. Tighten to 7 ft-lb.



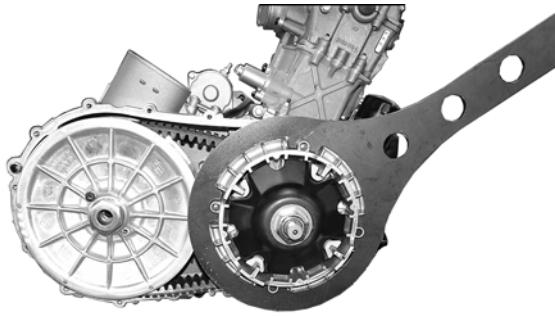
12. Place the driven pulley assembly into position and secure with nut. Tighten to 162 ft-lb.



13. Slide the fixed drive face onto the clutch shaft.
14. Spread the faces of the driven pulley by threading a cap screw into one of the bosses of the driven fixed face; then tighten the cap screw until the V-belt drops into the driven pulley 1/2 to 3/4 inch.



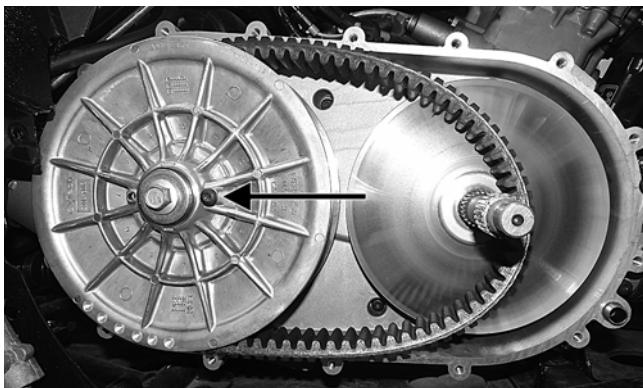
CF270A



CF366

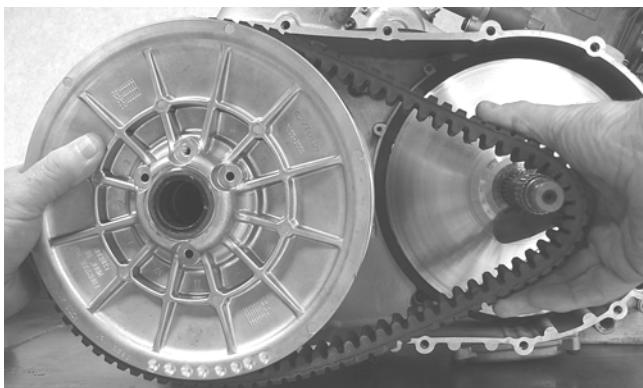
### CAUTION

Make sure the movable drive face plate is fully engaged onto the splines of the clutch shaft before tightening the nut or false torque readings may occur. This will cause the assembly to loosen damaging the shaft and clutch face plate.



H1-020A

15. Place the V-belt into position on the driven pulley and over the front shaft.



PR389

■**NOTE: The arrows on the V-belt should point in the direction of rotation.**

16. Pinch the V-belt together near its center and slide the spacer and movable drive face onto the driveshaft. Using an appropriate spanner wrench, secure the drive face with a new nut and tighten the nut to 162 ft-lb.



CF379

■**NOTE: At this point, the cap screw can be removed from between the driven pulley faces.**

17. With the vehicle in neutral, rotate the V-belt and clutches counterclockwise until the V-belt is flush with the top of the driven pulley.
18. Place the V-belt cover gasket into position; then install the cover and secure with the cap screws making sure the different-lengthed cap screws are in their proper location. Tighten the cap screws to 10 ft-lb.



CF363

## Center Crankcase Components

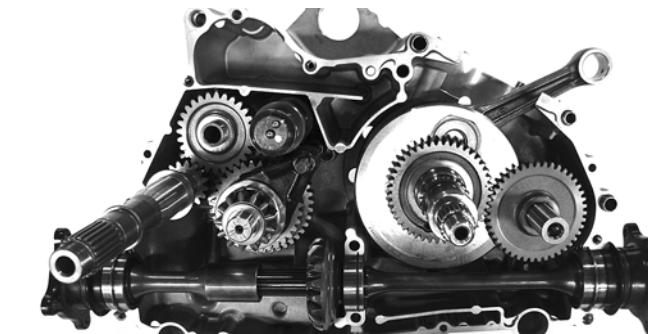
■NOTE: This procedure cannot be done with the engine/transmission in the frame. Complete Removing procedures for Top-Side, Left-Side, and Right-Side must precede this procedure.

■NOTE: For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

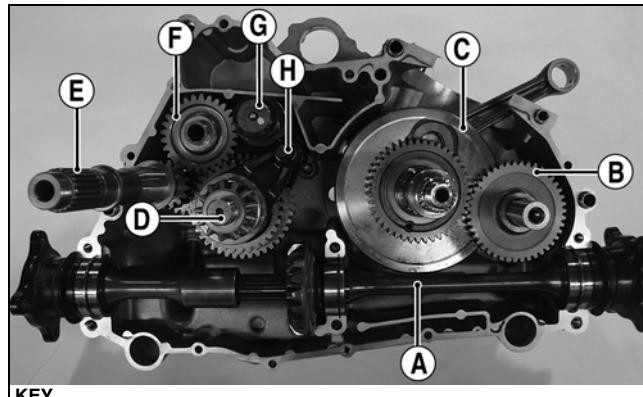
## Separating Crankcase Halves

1. Remove the right-side cap screws securing the crankcase halves. Note the location of the different-lengthed cap screws.
2. Remove the left-side cap screws securing the crankcase halves. Note the location of the different-lengthed cap screws.
3. Using the Crankcase Separator/Crankshaft Remover and tapping lightly with a rubber mallet, separate the crankcase halves. Account for two alignment pins.

■NOTE: To keep the shaft/gear assemblies intact for identification, tap the shafts toward the left-side crankcase half when separating the halves.



PR786

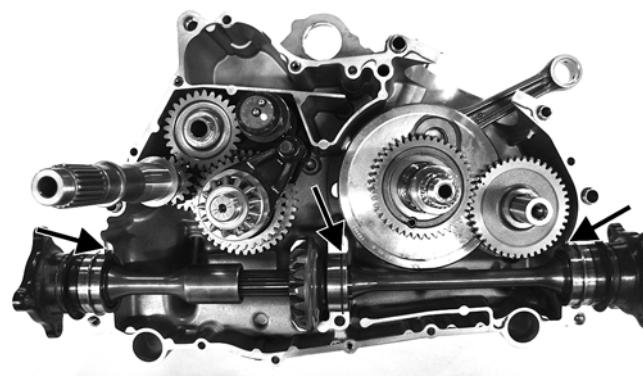


KEY

|                                    |                                |
|------------------------------------|--------------------------------|
| A. Secondary Driven Shaft Assembly | E. Driveshaft                  |
| B. Crank Balancer Assembly         | F. Reverse Idler Gear Assembly |
| C. Crankshaft                      | G. Gear Shift Shaft            |
| D. Countershaft Assembly           | H. Shift Shaft with 2 Forks    |

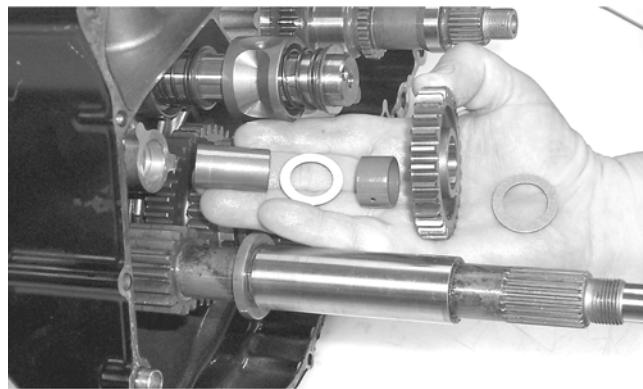
PR787A

1. Remove the secondary driven shaft assembly (A) noting the location of the bearing locating pins. Account for the bearing C-ring.



PR787B

2. Remove the reverse idler gear assembly (F). Account for all washers, shaft, bushing, and the gear.



CC668

3. Remove the shift shaft (H); then remove the two forks taking note of the direction of the tabs on the forks for assembling purposes.
4. Remove the gear shift shaft (G) noting the location of the two holes on the end of the shaft. Account for a spacer and a washer.

## Disassembling Crankcase Half

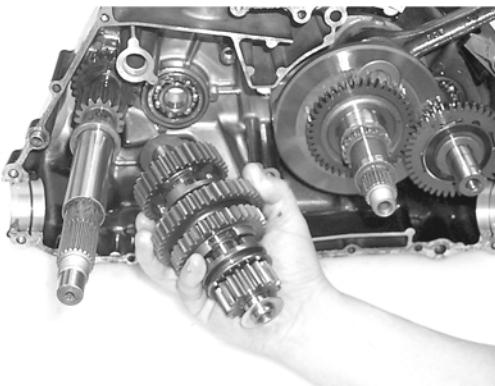
■NOTE: For steps 1-7, refer to illustration PR787A.

■NOTE: To aid in installing, it is recommended that the assemblies are kept together and IN ORDER.



DE677A

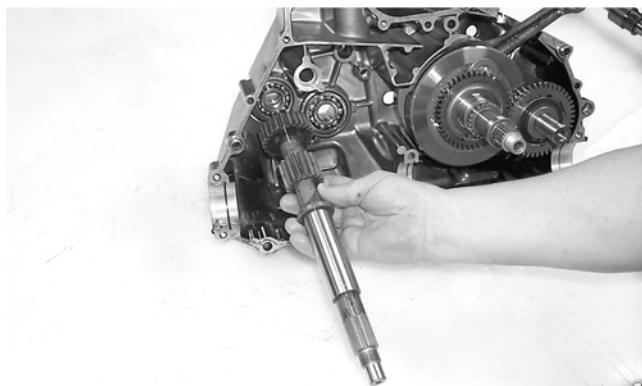
5. Remove the countershaft assembly (D). Account for a washer on each end of the countershaft.



CC674

■**NOTE: Do not disassemble the countershaft assembly unless necessary. If necessary, see Servicing Center Crankcase Components sub-section.**

6. Using a rubber mallet, tap on the crankcase to remove the driveshaft.



CC675

7. Note the timing marks on the crank balancer assembly (B) gear and crankshaft (C) gear for assembling purposes; then slide the crank balancer gear off the crank balancer. Account for the key in the keyway.



CD826

8. Remove the crank balancer.

■**NOTE: There is a flat spot on the crank balancer bearing flange to allow clearance past the crankshaft.**



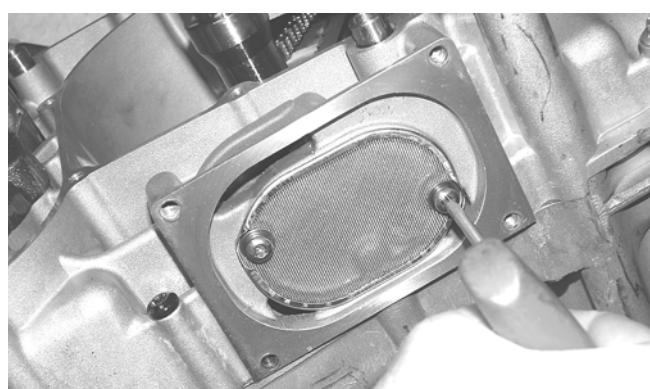
CD832B

9. Remove the snap ring securing the water pump driven gear shaft.
10. Using a hydraulic press, remove the crankshaft assembly.

■**NOTE: Use a protective end cap to prevent damage to the crankshaft threads.**

11. Remove the cap screws securing the oil strainer cap; then remove the cap.
12. Remove the two cap screws securing the oil strainer; then remove the strainer.

■**NOTE: Thoroughly clean any sealant from the oil strainer cap.**



PR406

### CAUTION

Unless the secondary drive gear, bevel gear, or bearings require service, do not remove the secondary drive assembly from the case. If removed, bevel gear backlash will have to be adjusted requiring re-shimming of the drive bevel gear shaft.

13. To remove the secondary drive/bevel gear, remove the secondary drive bearing housing; then remove the nut securing the drive/bevel gear shaft in the bearing and using a plastic mallet, drive the shaft out of the bearing. Account for shim/shims.

■**NOTE:** Shims should be measured and kept for a starting point in adjusting backlash.

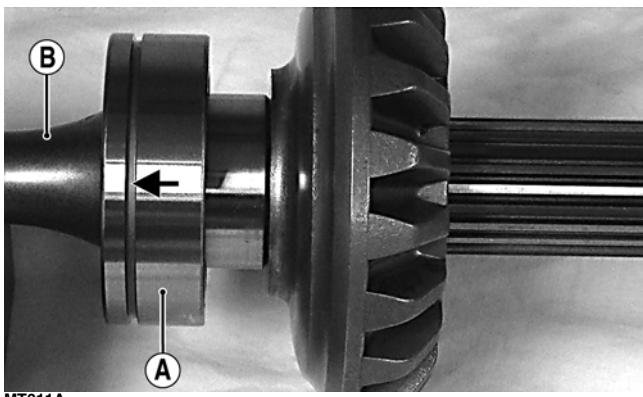
## Servicing Center Crankcase Components

### SECONDARY OUTPUT DRIVE GEARS

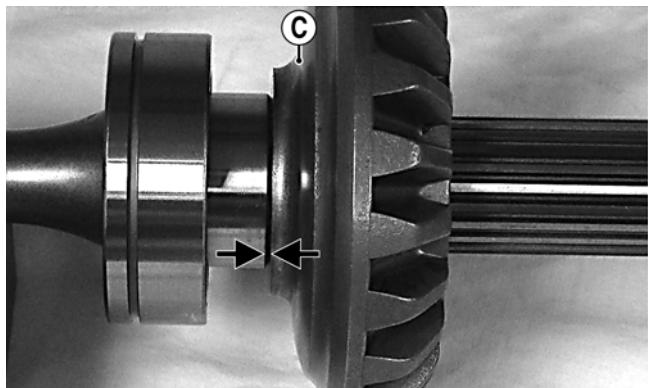
#### Initial Set-Up

■**NOTE:** If the secondary output driven shaft is replaced or disassembled, the initial set-up must be performed to establish correct gear tooth contact. If only the secondary output drive shaft or secondary output driven gear is replaced, proceed to Correcting Backlash in this sub-section.

1. Install a new bearing (A) onto the secondary driven shaft (B) making sure the bearing locating groove is directed away from the driven gear splines.



2. Using a suitable press, install the driven gear (C) on the shaft until the gear firmly seats on the shoulder of the shaft.

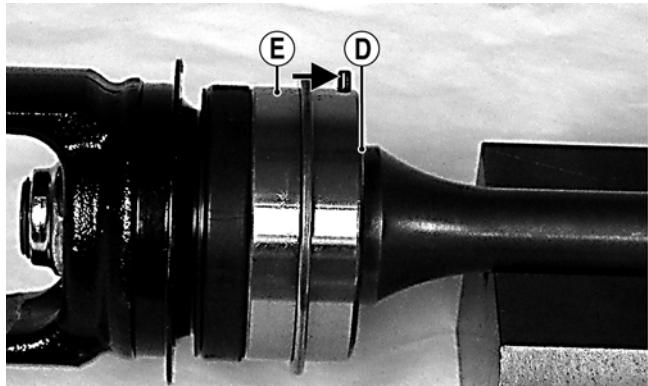


MT011B

3. If installing the existing shaft, start with the shims removed during disassembly or if installing a new shaft, start with approximately 1.0 mm shims at point (D); then install the output drive shaft bearing (E) making sure the locating pin is directed toward the center of the shaft.

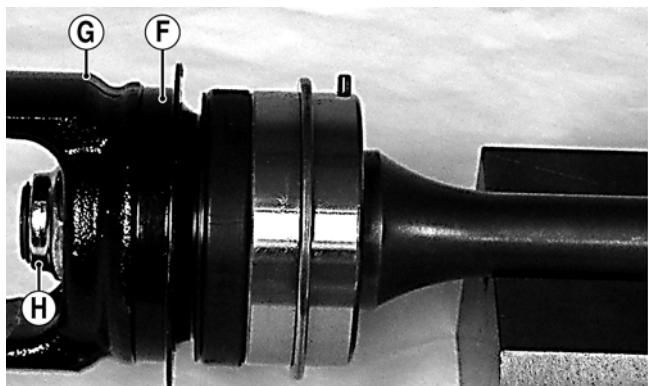


MT012



MT008A

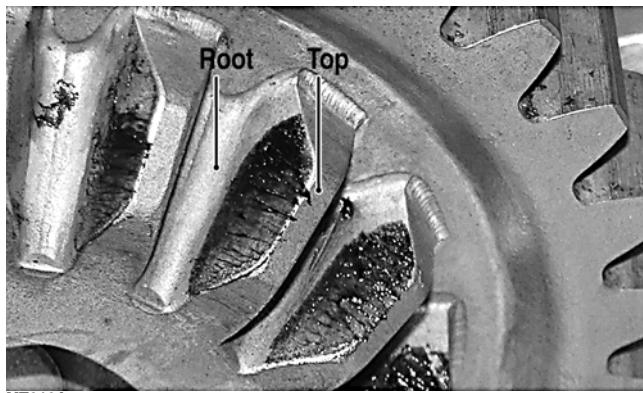
4. Install a new seal (F), output yoke (G), and nut (H) and tighten to 74 ft-lb.



MT008B

■**NOTE: Do not use a new lock nut at this time as this procedure may have to be repeated.**

5. Place the assembled shaft into the left crankshaft case; then lightly coat the gear teeth with machinist's lay-out dye. Rotate the shafts through several rotations in both directions. Gear contact should extend from the root to the top of the gear teeth.



MT016A

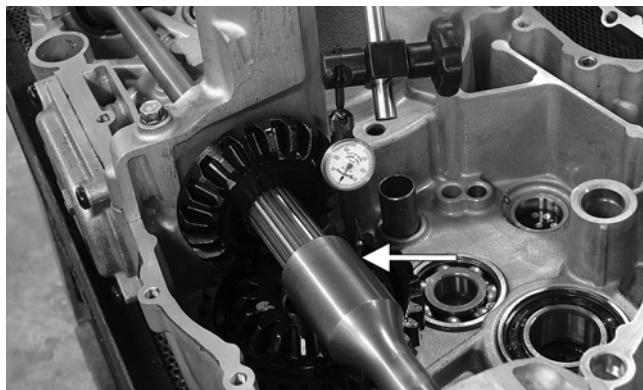
6. To adjust tooth contact, use the following chart to correctly shim the driven shaft.

| Tooth Contact   | Shim Correction         |
|-----------------|-------------------------|
| Contact at Top  | Increase Shim Thickness |
| Contact at Root | Decrease Shim Thickness |

7. After correct tooth contact is established, proceed to Checking Backlash in this sub-section.

### Checking Backlash

1. If removed, install the secondary drive/bevel gear shaft into the crankcase; then tighten the nut to 74 ft-lb.
2. Install the secondary drive bearing support; then install the secondary driven output shaft into the crankcase.
3. Mount the dial indicator so the tip is contacting a tooth on the secondary drive bevel gear.
4. While rocking the drive bevel gear back and forth, note the maximum backlash reading on the gauge.



MT005A

5. Acceptable backlash range is 0.127-0.381 mm (0.005-0.015 in.).

### Correcting Backlash

■**NOTE: If backlash measurement is within the acceptable range, no correction is necessary.**

1. If backlash measurement is less than specified, remove an existing shim, measure it, and install a new thinner shim.

2. If backlash measurement is more than specified, remove an existing shim, measure it, and install a thicker shim.

■**NOTE: Continue to remove, measure, and install until backlash measurement is within tolerance. Note the following chart.**

| Backlash Measurement                | Shim Correction         |
|-------------------------------------|-------------------------|
| Under 0.127 mm (0.005 in.)          | Decrease Shim Thickness |
| At 0.127-0.381 mm (0.005-0.015 in.) | No Correction Required  |
| Over 0.381 mm (0.015 in.)           | Increase Shim Thickness |

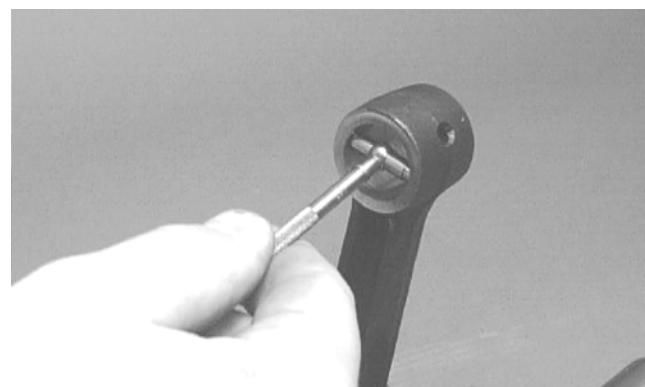
After backlash and tooth contact are within specifications, apply red Loctite #271 to the driveshaft threads and driven output shaft threads; then using new nuts, tighten the output shaft nut to 59 ft-lb and the output yoke nut to 200 ft-lb.

## CRANKSHAFT ASSEMBLY

■**NOTE: The crankshaft and connecting rod is a non-serviceable assembly. If any component is out of specification, the assembly must be replaced.**

### Measuring Connecting Rod (Small End Inside Diameter)

1. Insert a snap gauge into the upper connecting rod small end bore; then remove the gauge and measure it with micrometer.



CC290D

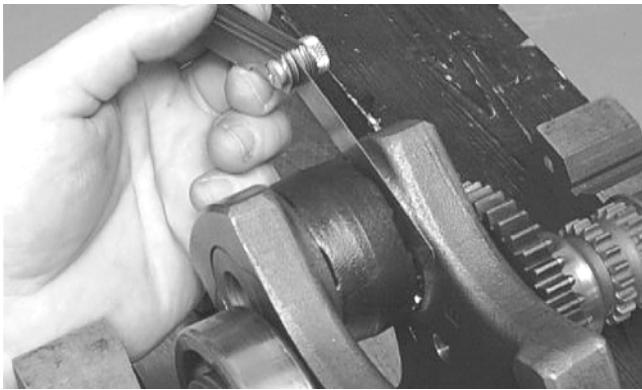
2. Maximum diameter must not exceed specifications.

### Measuring Connecting Rod (Small End Deflection)

1. Place the crankshaft on a set of V blocks and mount a dial indicator and base on the surface plate. Position the indicator contact point against the center of the connecting rod small end journal.
2. Zero the indicator and push the small end of the connecting rod away from the dial indicator.
3. Maximum deflection must not exceed specifications.

### Measuring Connecting Rod (Big End Side-to-Side)

1. Push the lower end of the connecting rod to one side of the crankshaft journal.
2. Using a feeler gauge, measure the gap between the connecting rod and crankshaft journal.

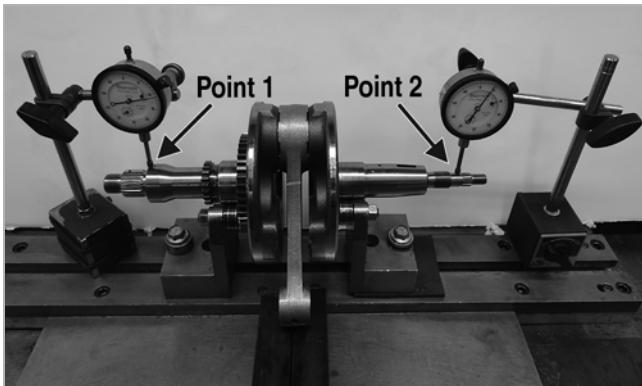


CC289D

- Acceptable gap range must not exceed specifications.

### Measuring Crankshaft (Runout)

- Place the crankshaft on a set of V blocks.
- Mount a dial indicator and base on the surface plate. Position the indicator contact at point 1 of the crankshaft.



H1-003A

- Zero the indicator and rotate the crankshaft slowly.

#### CAUTION

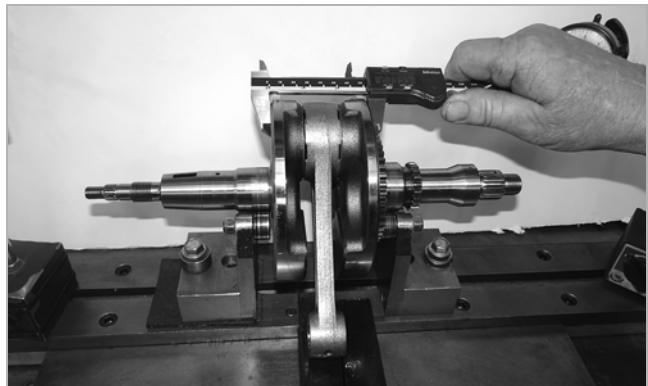
Care should be taken to support the connecting rod when rotating the crankshaft.

- Maximum runout must not exceed specifications.

**■NOTE: Proceed to check runout on the other end of the crankshaft by positioning the indicator contact at point 2 and following steps 3-4.**

### Measuring Crankshaft (Web-to-Web)

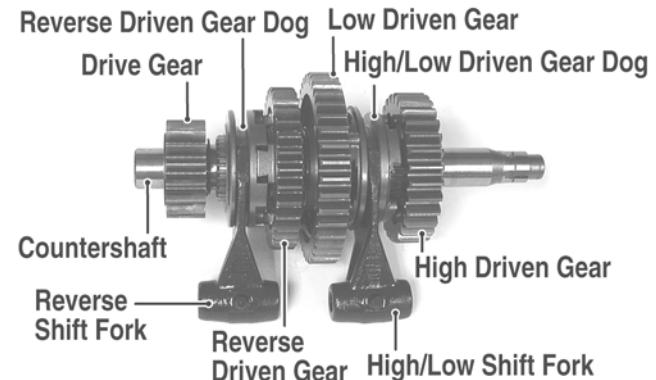
- Using a calipers, measure the distance from the outside edge of one web to the outside edge of the other web.



H1-005

- Acceptable width range must not exceed specifications.

### COUNTERSHAFT



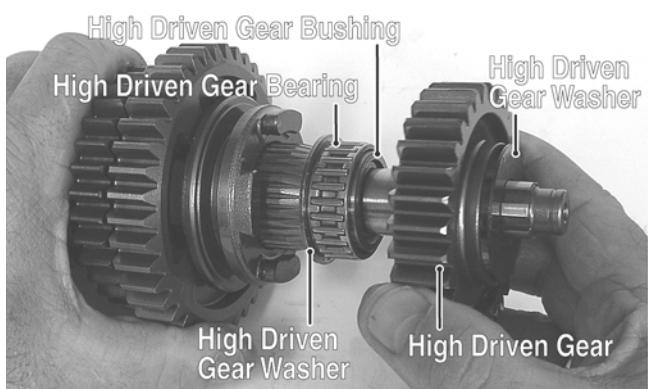
GZ281A

#### CAUTION

When disassembling the countershaft, care must be taken to note the direction each major component (dog, gear) faces. If a major component is installed facing the wrong direction, transmission damage may occur and/or the transmission will malfunction. In either case, complete disassembly and assembly will be required.

### Disassembling

- Remove the shift forks noting the positions for assembling; then remove the high driven gear outer washer, high driven gear, high driven gear bearing, high driven gear bushing, and high driven gear inner washer.



GZ283A

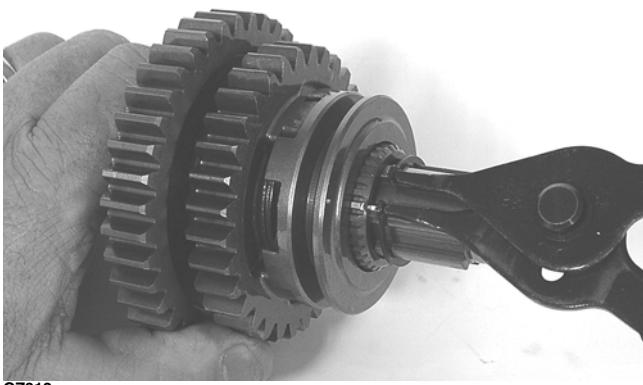
- Remove the drive gear; then remove the snap ring securing the reverse driven gear dog and bushing to the countershaft.



GZ296



GZ320



GZ312

3. Remove the reverse driven gear dog.

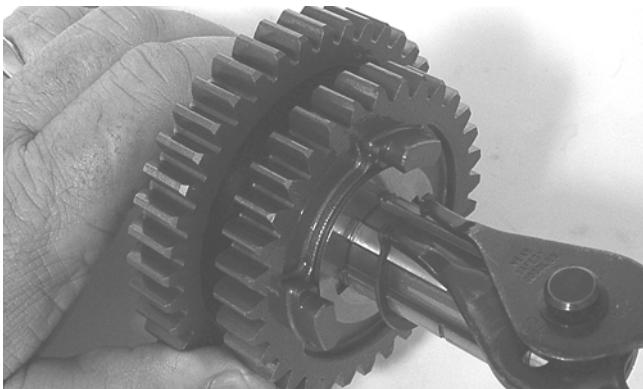


GZ319



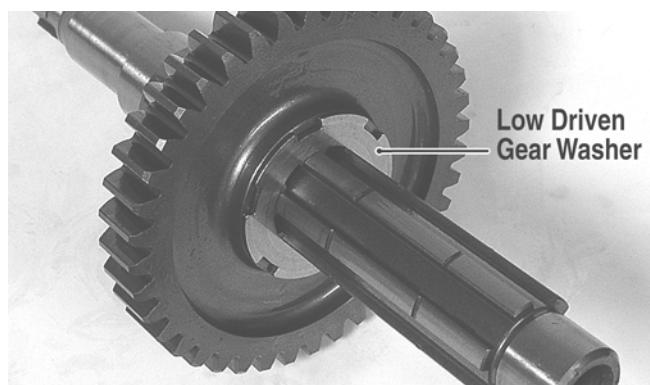
GZ313A

4. Remove the snap ring securing the reverse driven gear and washer; then remove the washer and gear.



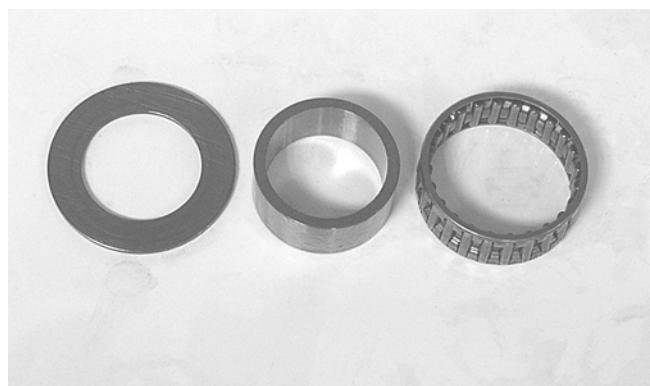
GZ314

5. Remove the reverse driven washer; then remove the low driven gear locking washer.



GZ318A

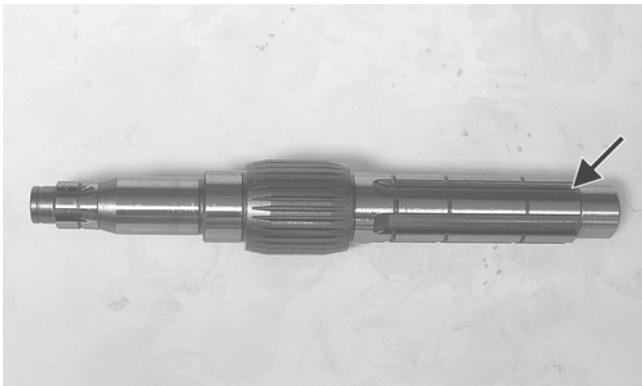
6. Remove the low driven gear. Account for a bearing, bushing, and thrust washer.



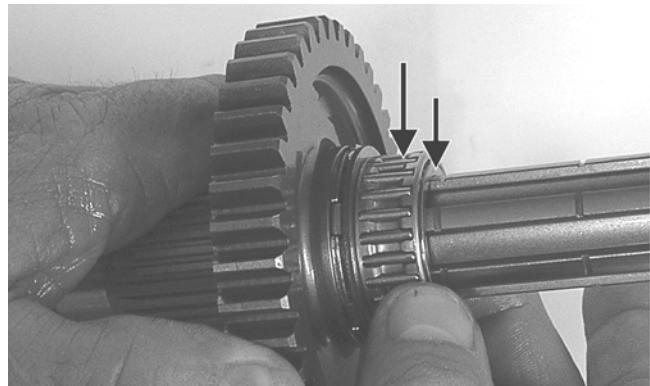
GZ316

## Assembling

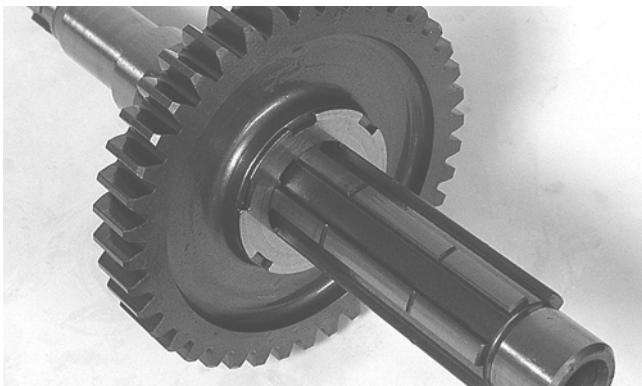
1. From the drive gear end, install a thrust washer, bushing, and bearing; then install the low driven gear and washer.



GZ317A



GZ286A



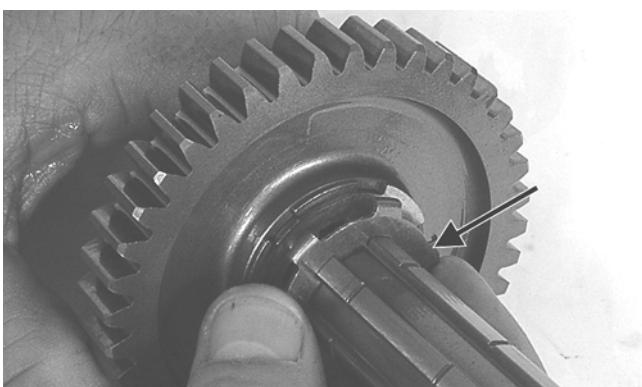
GZ318

2. Install the low driven gear locking washer; then install the inner reverse driven gear washer.

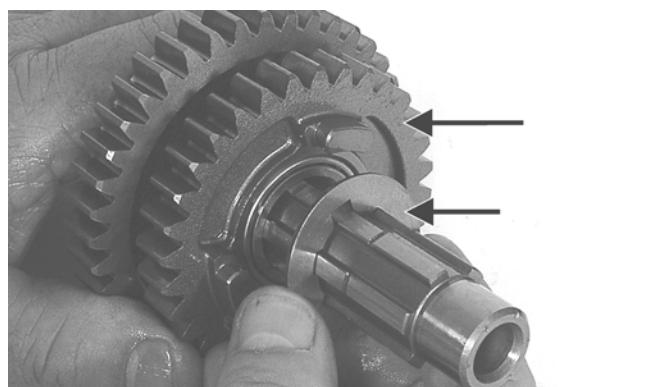


GZ287

4. Install the outer reverse driven washer; then secure the reverse driven gear assembly with a snap ring.



GZ319B



GZ288A



GZ320B

3. Install the reverse driven bushing and bearing; then install the reverse driven gear.



GZ314

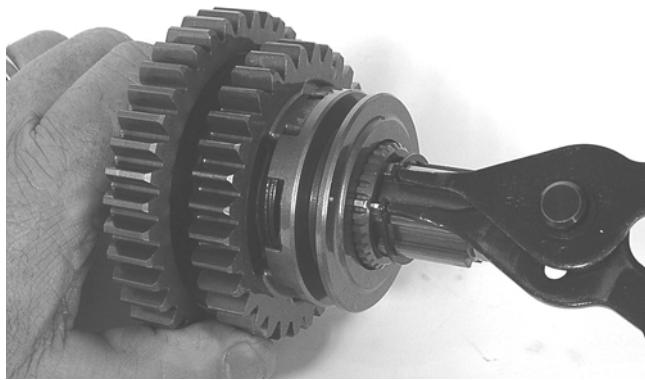
5. Install the reverse driven gear dog onto the counter-shaft and secure with a snap ring.



GZ313A

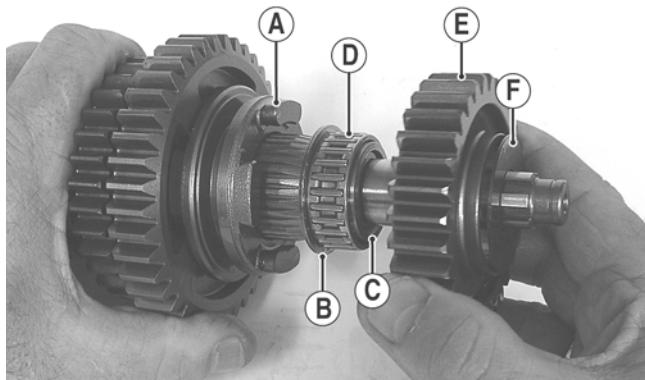


MT014



GZ312

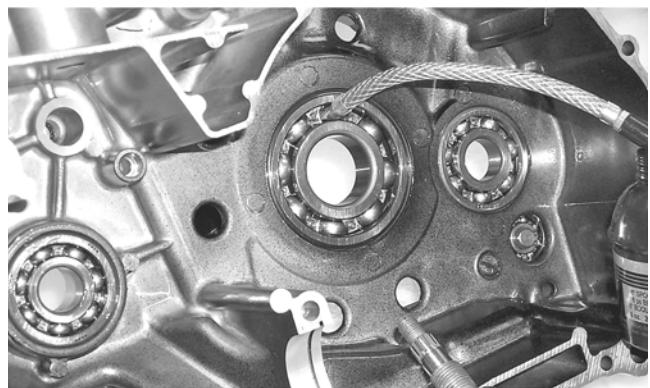
6. From the opposite end of the countershaft, install the high/low driven gear dog (A), thrust washer (B), bushing (C), bearing (D), high/low driven gear (E), and spacer washer (F).



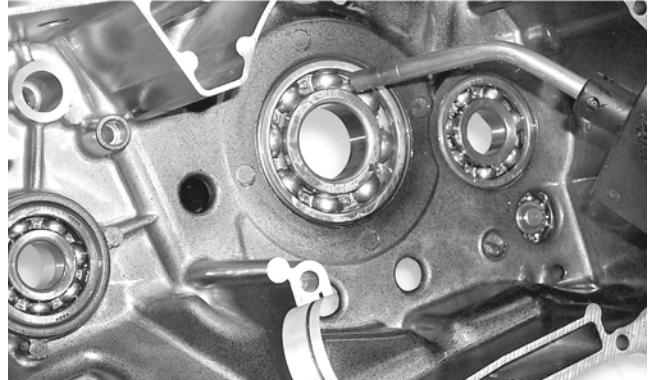
GZ283B

7. Install the two drive gear washers and the shift forks. The countershaft is now ready for installation.

**■NOTE: When installing the countershaft assembly, account for the washer on each end of the shaft.**



CC688



CC689

**■NOTE: If heating the bearing is not possible, the crankshaft can be installed using a crankshaft installing tool.**

3. Install the crank balancer.

## Assembling Crankcase Half

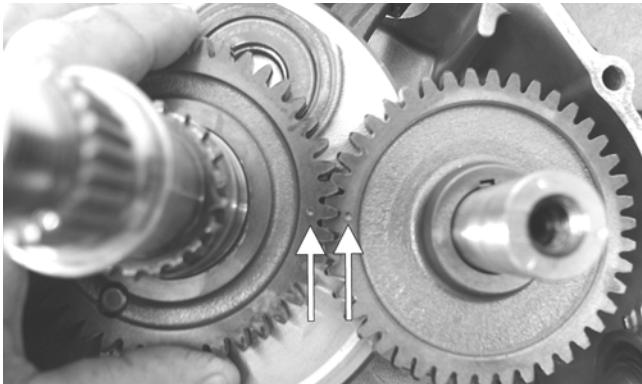
1. Install the secondary drive gear assembly into the crankcase.



CD832B

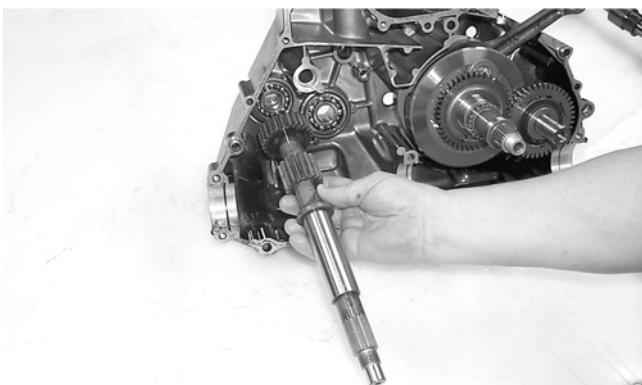
**■NOTE: It will be necessary to rotate the crank balancer until the counterweight is facing away from the crankshaft; then rotate the crankshaft clockwise into the journal area to allow the crank balancer to be fully seated.**

4. Place the key into the crank balancer keyway; then install the crank balancer gear making sure the alignment dots on the crank balancer gear and the crankshaft gear align.



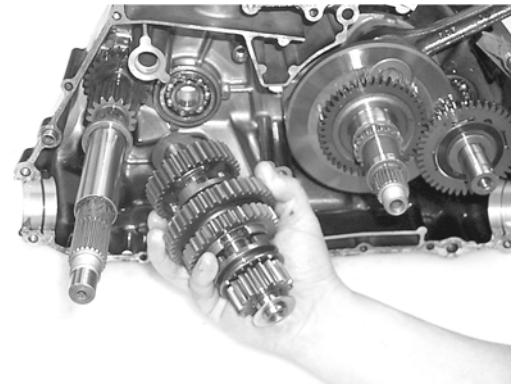
CD826A

5. Install the driveshaft.



CC675

6. Place a washer on each end of the countershaft assembly; then install the assembly.



CC674

7. Place a washer on the end of the gear shift shaft; then install the shaft assembly making sure the two holes on the end of the shaft are positioned vertically. Install the spacer on the shift shaft.



DE677A

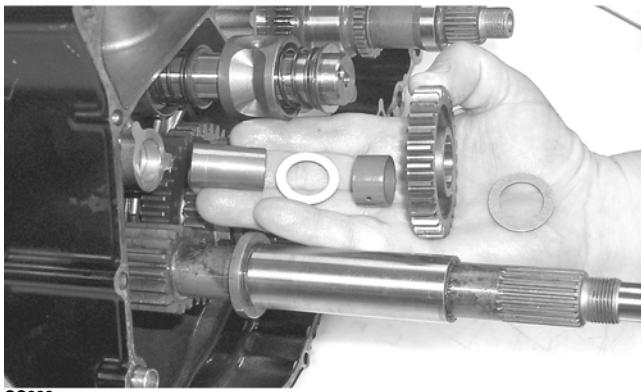
8. Insert the two shift forks into the sliding dogs noting the direction of the tabs from disassembling; then install the shift fork shaft.

**■NOTE: Make sure the shift fork tabs face upward and that they are properly seated into the shift cams.**



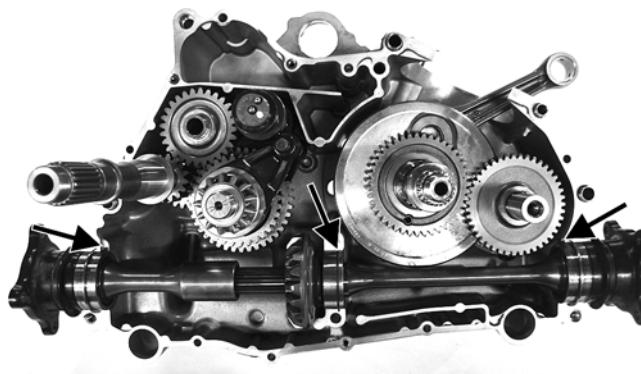
CC669

9. Install the reverse idler gear assembly noting the positioning of the two washers, gear, bushing, and shaft.



CC668

10. Install the front and rear secondary driven shaft assemblies into the left side of the crankcase making sure the bearing locating pins are toward the top of the crankcase and the bearing C-ring is fully seated in the crankcase.



PR787B

11. Place the oil strainer into position; then secure with the two screws.
12. Place the oil strainer cap into position making sure silicone sealant is applied; then secure the cap with cap screws. Tighten to 54 in.-lb.

## Joining Crankcase Halves

1. Apply High-Temp Sealant to the left-side mating surface smoothing out any build-up or bumps.
2. Lightly oil all bearings and grease all shafts in the right-side crankcase.
3. Using a plastic mallet, lightly tap the case halves together until cap screws can be installed.
4. From the right side, install the 8 mm cap screws; then tighten only until snug.

**■NOTE: Rotate the shafts back and forth to ensure no binding or sticking occurs.**

5. From the left side, install the remaining 8 mm cap screws (two inside the case); then tighten only until snug.

**■NOTE: Rotate the shafts back and forth to ensure no binding or sticking occurs.**

6. From the left side, install the case half 6 mm cap screws; then tighten only until snug.

**■NOTE: Rotate the shafts back and forth to ensure no binding or sticking occurs.**

7. From the right side, install the 6 mm cap screws; then tighten only until snug.

**■NOTE: Rotate the shafts back and forth to ensure no binding or sticking occurs.**

8. In a crisscross/case-to-case pattern, tighten the 8 mm cap screws (from steps 4-5) until the halves are correctly joined; then tighten to 21 ft-lb.

**■NOTE: Rotate the shafts back and forth to ensure no binding or sticking occurs.**

9. In a crisscross/case-to-case pattern, tighten the 6 mm cap screws (from steps 6-7) to 10 ft-lb.

**■NOTE: Rotate the shafts back and forth to ensure no binding or sticking occurs.**

### AT THIS POINT

After completing center crankcase components, proceed to **Installing Right-Side Components**, to **Installing Left-Side Components**, and to **Installing Top-Side Components**.

## Installing Engine/Transmission (700)

**■NOTE: Arctic Cat recommends that new gaskets and O-rings be installed whenever servicing the ATV.**

1. From the left side, place the engine/transmission into the frame; then slide the engine rearward as far as possible.
2. Slightly raise the rear of the engine and engage the front drive coupler into the splines of the front drive output yoke; then slide the engine forward as far as possible.



CD818

3. Raise the rear of the engine and place a block beneath it; then install the propeller shaft and output flange into the rear drive coupler securing the boot with new clamps.



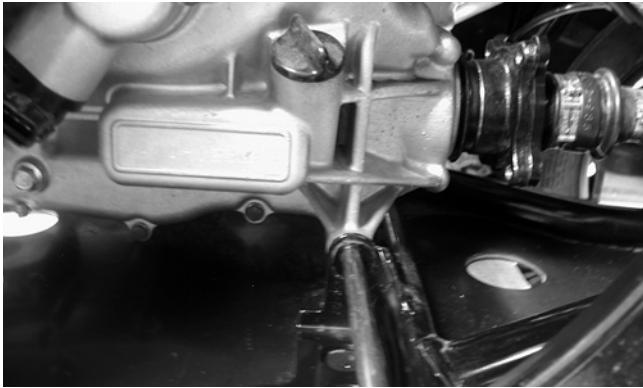
CD821

4. Remove the block from beneath the engine; then align the rear flanges and secure with four cap screws (coated with red Loctite #271). Tighten to 20 ft-lb.



CD824

5. Install the engine mounting through-bolts and mounting hardware; then tighten to 35 ft-lb.

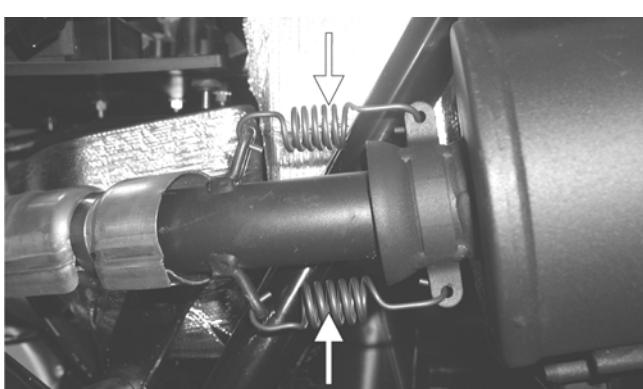


CD809

6. Secure the exhaust pipe to the engine with two cap screws making sure the mounting brackets engage the frame grommets; then install the muffler and tighten the nuts securing the exhaust pipe to 20 ft-lb. Connect the O2 sensor.



CD803



CF138A

7. Install the cooling ducts with clamps and tighten the clamps securely.



CD515



CD793

8. Secure the engine ground wire to the engine with a cap screw. Tighten to 8 ft-lb.



CD810

9. Connect the stator coil and crankshaft position sensor connectors.
10. Connect the temperature sensor wire to the main wiring harness.
11. Secure the wires to the frame with nylon ties.
12. Connect the speed sensor connector to the housing.
13. Secure the positive cable to the starter motor.
14. Secure all wiring to the frame and upper engine bracket with cable ties.
15. Secure the two coolant hoses to the engine.
16. Secure the crankcase vent hose to the air cleaner housing; then secure the inlet boot and throttle body to the air filter housing.



CD787



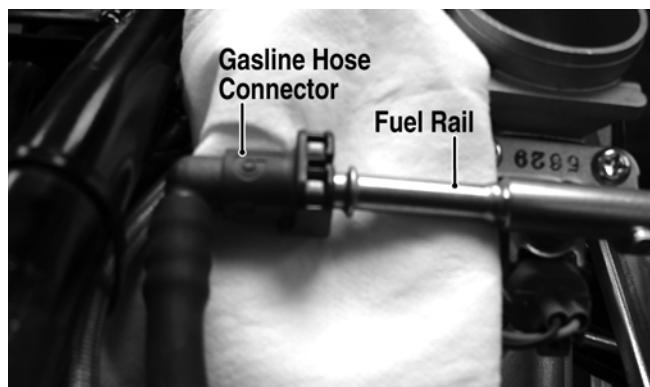
CD785

17. Secure the shift rod to the engine with a new E-clip.



CD774

18. Place the left-side footwell and foot peg in position on the frame; then secure with existing hardware. Tighten securely.
19. Install the front body panel with existing hardware.
20. Connect the gasline hose to the fuel rail; then connect the gasline hose connector to the fuel rail.



FI092E

21. Install the side panels into position.
22. Place the battery into position in the battery compartment; then install the battery cables and vent hose. Secure with the battery cover.

#### **CAUTION**

**Battery acid is harmful if it contacts eyes, skin, or clothing. Care must be taken whenever handling a battery.**

23. Add proper amounts of engine/transmission oil and coolant.
24. Install the seat.

#### **CAUTION**

**If the engine had a major overhaul or if any major part was replaced, proper engine break-in procedures must be followed (see General Information). If the proper engine break-in procedures are not followed, severe engine damage may result.**

## Removing Engine/Transmission (1000)

Many service procedures can be performed without removing the engine/transmission from the frame. Closely observe the note introducing each sub-section for this important information.

### ☞ AT THIS POINT

If the technician's objective is to service front Top-Side Components, Left-Side Components, or Right-Side Components, the engine/transmission does not have to be removed from the frame.

### ☞ AT THIS POINT

If the technician's objective is to service/replace the oil strainer (from beneath the engine/transmission), the engine/transmission does not have to be removed from the frame.

Secure the ATV on a support stand to elevate the wheels.

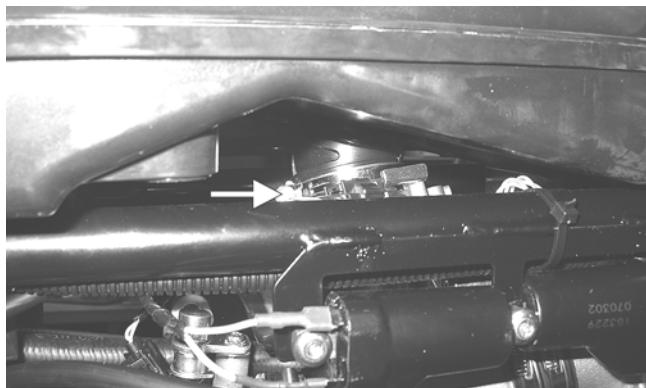
### ⚠ WARNING

Make sure the ATV is solidly supported on the support stand to avoid injury.

1. Remove the seat and tool tray; then remove the negative battery cable.
2. Remove the front rack, gauge pod, footwells and footrests; then remove the front body panel (see Steering/Body/Controls).
3. Disconnect the IAT sensor connector; then loosen the clamp securing the inlet air boot to the throttle body and remove the air filter housing assembly.



GZ013



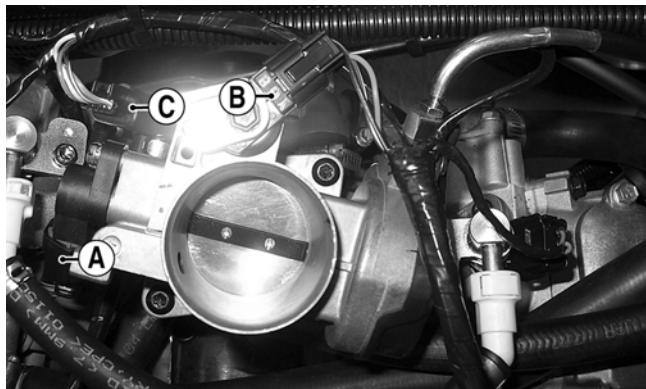
GZ091A

4. Using an absorbent towel, clean any spilled gasoline; then press the gasline hose connectors and remove from the fuel rails.



GZ124

5. Disconnect the TPS connector (A), TMAP sensor connector (B), and ISC valve connector (C) from the throttle body; then route the harness and connectors away from the engine.



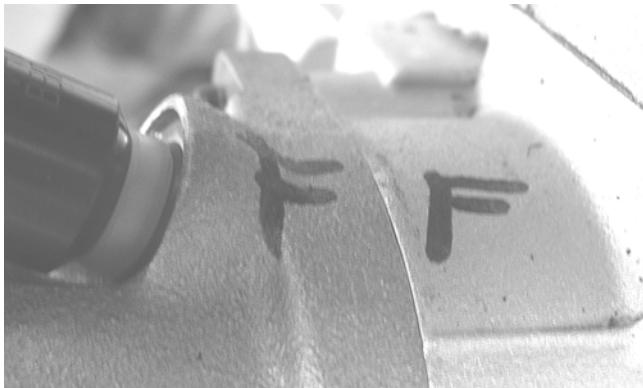
GZ094E

6. Disconnect the fuel injector wiring connectors leaving the injectors installed.

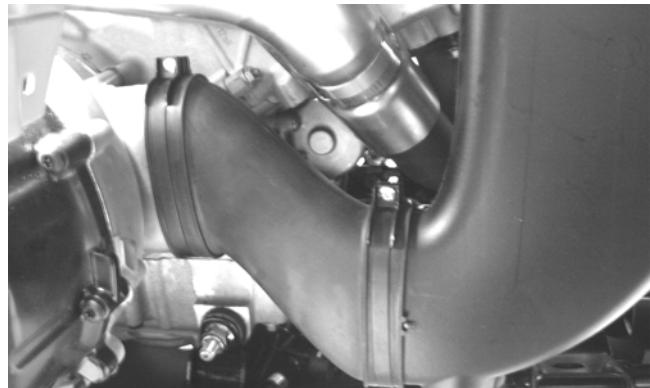
■**NOTE: Using a suitable marker, mark the locations of any ties that are removed to relocate wiring out of the way.**

7. Remove the cap screws securing the throttle body to the intake manifold; then remove the throttle body and leaving the throttle cable connected, lay the assembly over the handlebar.

■**NOTE: Match mark the manifold to each cylinder head for assembly purpose.**



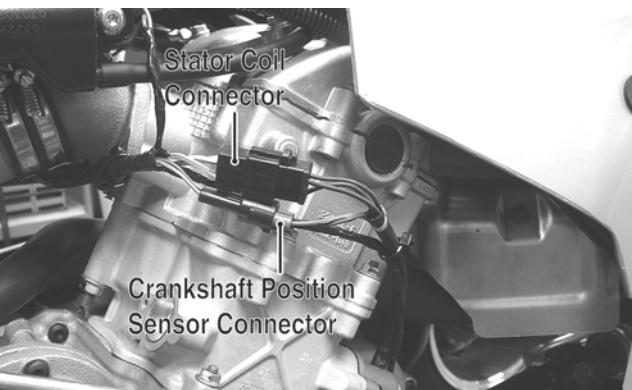
GZ106



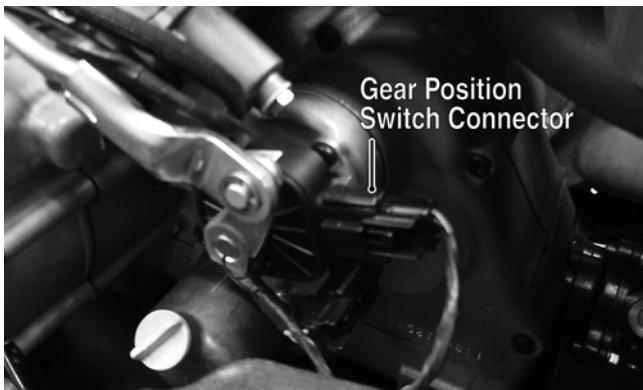
GZ037



GZ107



GZ069A



GZ493A

9. Loosen the clamps securing the V-belt cooling ducts to the V-belt housing; then disconnect the cooling ducts.



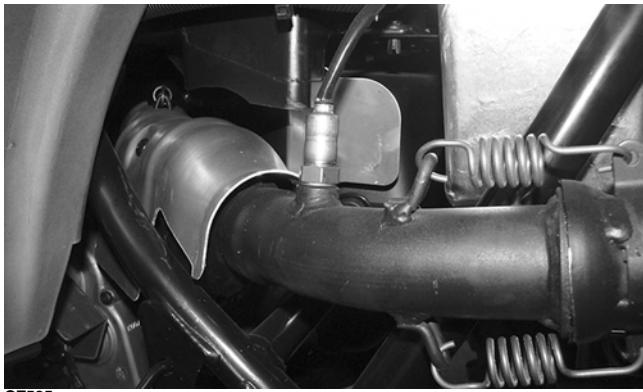
GZ103B

8. Disconnect the stator coil connector and the crankshaft position sensor connector; then disconnect the gear position switch connector from the gear position switch.
10. Remove the E-clips securing the shift linkage to the shift lever and shift shaft; then remove the shift linkage. Account for two bushings and two flat washers.
11. Remove the cap screws securing the rear driveshaft yoke flange to the rear output flange.



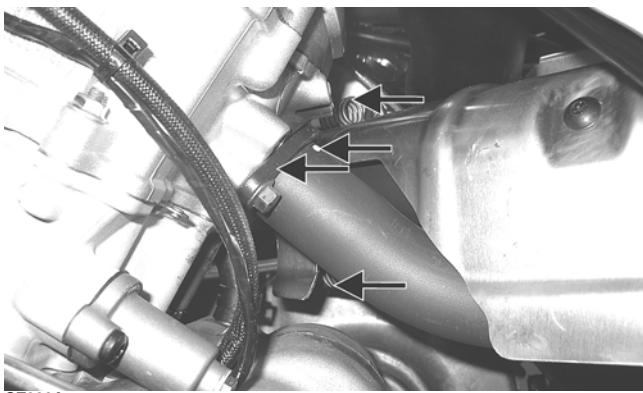
GZ374

12. Remove the exhaust pipe springs at the muffler and remove the muffler. Account for the grafoil seal. Disconnect the O2 sensor.



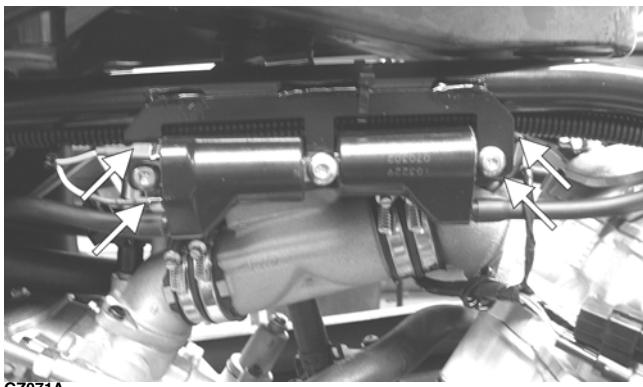
GZ535

13. Remove the nuts securing the rear exhaust pipe to the cylinder; then remove the springs securing the rear exhaust pipe to the front exhaust pipe and remove the rear exhaust pipe. Account for a grafoil seal on the pipe juncture and a seal in the cylinder.



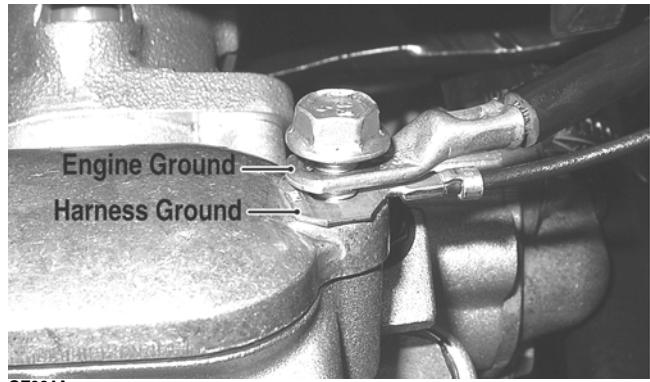
GZ099A

14. Remove the front and rear spark plug wires from the spark plugs; then disconnect the primary wire connectors from the coils and remove the coils from the left side of the frame.



GZ071A

15. Remove the cap screw securing the engine and harness grounds to the engine.



GZ064A

16. Remove the cap screws securing the upper bumper support to the frame and swing the bumper forward allowing access to the radiator drain plug.



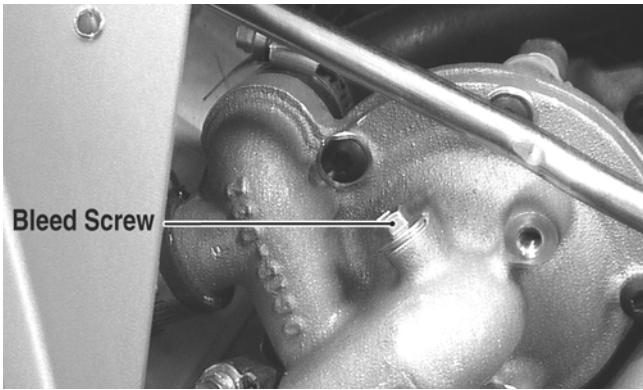
GZ068

17. Place a suitable drain pan under the radiator; then remove the radiator drain plug. Do not loosen the radiator cap at this time.



GZ086A

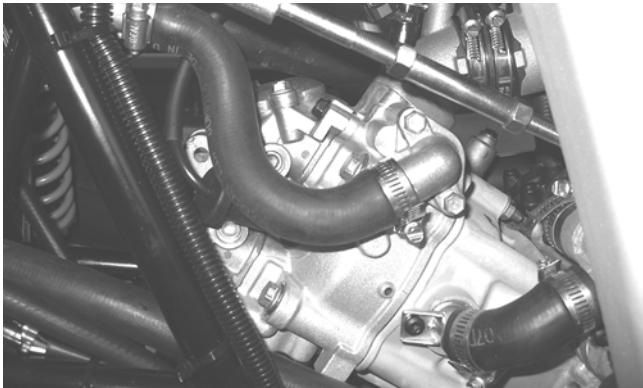
18. Remove the bleed screw from the water pump; then after coolant has drained, apply compressed air to the bleed opening to purge the remaining coolant from the system. Install the bleed screw and radiator drain plug and tighten securely.



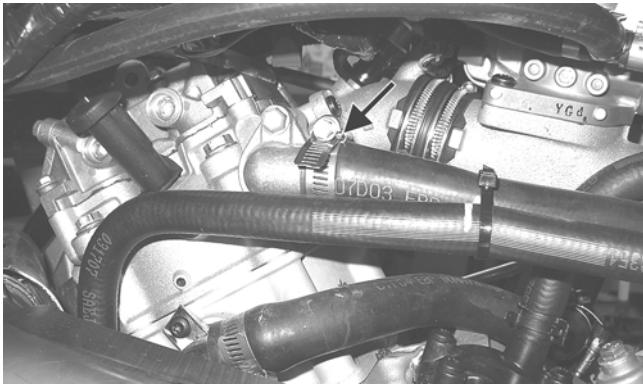
GZ009A

**WARNING**  
Always wear safety glasses when using compressed air.

19. Remove the coolant hoses from the upper engine coolant outlet pipes; then remove the lower coolant hose from the water pump.



GZ028

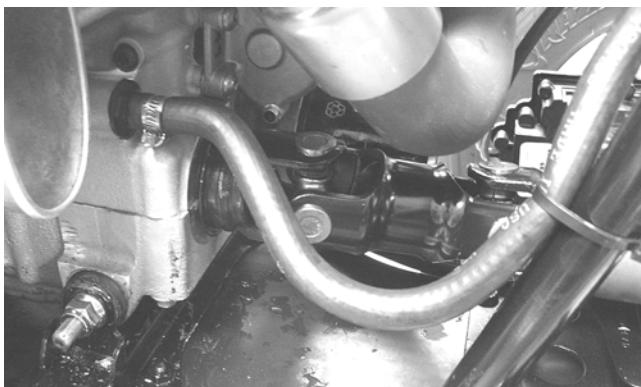


GZ369A

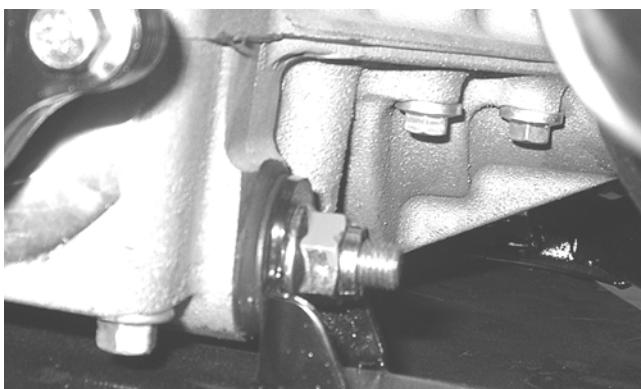


GZ008

20. Remove the flange nuts from the front and rear engine through-bolts; then rock the engine slightly to relieve engine mount pressure and remove the through-bolts.

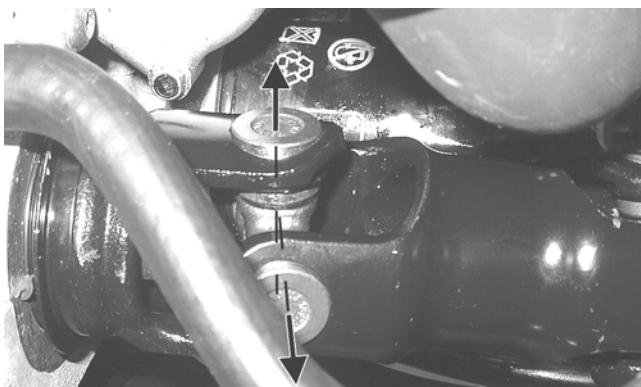


GZ118

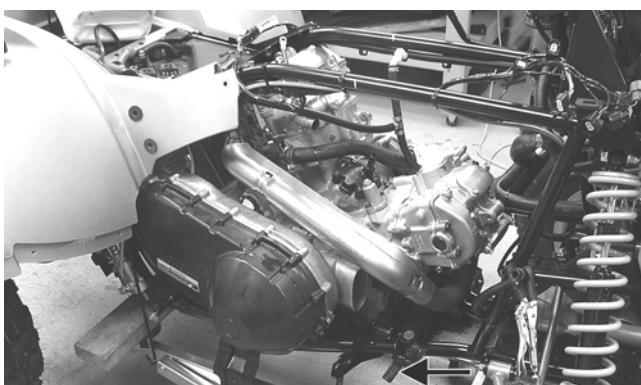


GZ104

21. Rotate the front driveshaft until the output yoke universal joint is in the vertical plane; then raise the front of the engine/transmission until the front drive splines disengage from the differential.



GZ 110A



GZ117A

22. Fold the front drive line up and secure against the front of the engine; then lift the engine clear of the mountings and remove from the right side of the frame.



GZ123

## Removing Top-Side Components

### A. Valve Cover/Rocker Arms B. Cylinder Head/Camshaft

1. Remove the timing inspection plug, spark plugs, and magneto housing cover; then install the 10 mm cap screw (left-hand threads) in the crankshaft and rotate the desired cylinder to top-dead-center of the compression stroke.



GZ027



GZ026

■**NOTE:** Timing marks on the rotor/flywheel are stamped with an "F" (front cylinder) and "R" (rear cylinder) adjacent to the mark.

## Top-Side Components

■**NOTE:** For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

### AT THIS POINT

To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■**NOTE:** The engine/transmission must be removed to service the rear cylinder head, cylinder, and piston.



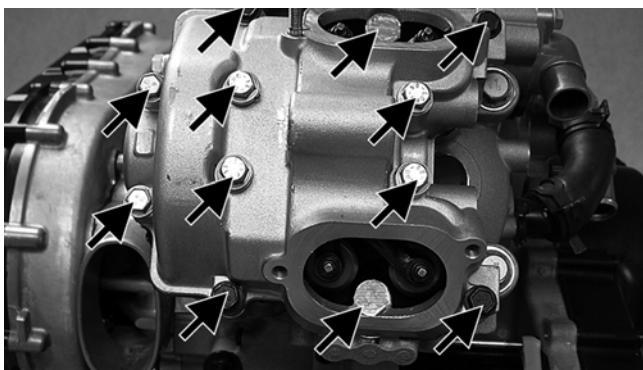
GZ063



GZ059

2. Remove the tappet covers on the cylinder being serviced. The tappets should not have pressure on them.

3. Loosen the cap screws securing the valve cover to the head.



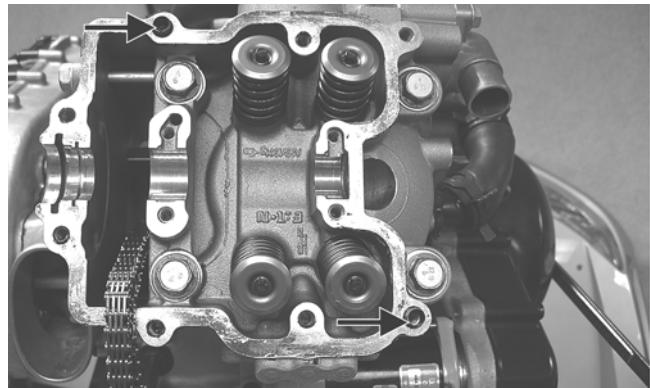
GZ126C

4. Remove all cap screws except the two top-side cap screws next to the spark plug. These will keep the alignment pins in place. Note the two rubber washers on the remaining cap screws.

5. Remove the valve cover. Account for and note the orientation of the cylinder head plug. Note the location of the two alignment pins.

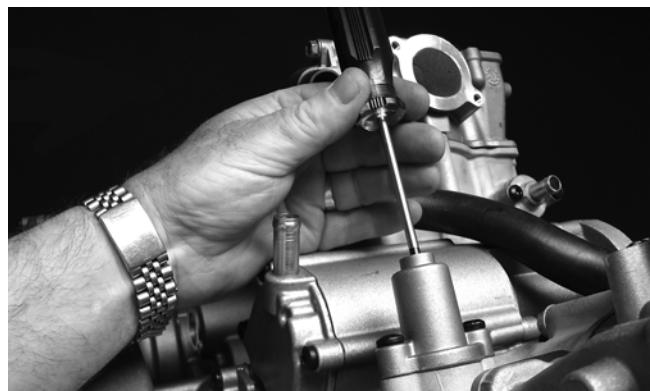


GZ162



GZ132A

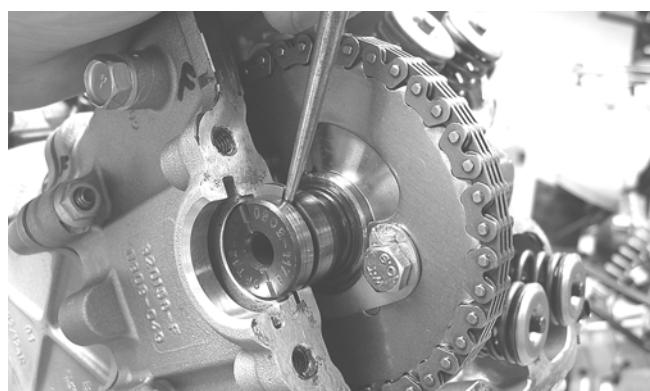
6. Remove the cap screw on the end of the tensioner; then using a flat-blade screwdriver, turn the tensioner clockwise to remove the tension. Remove the two cap screws securing the tensioner adjuster assembly and remove the assembly. Account for a gasket.



GZ405

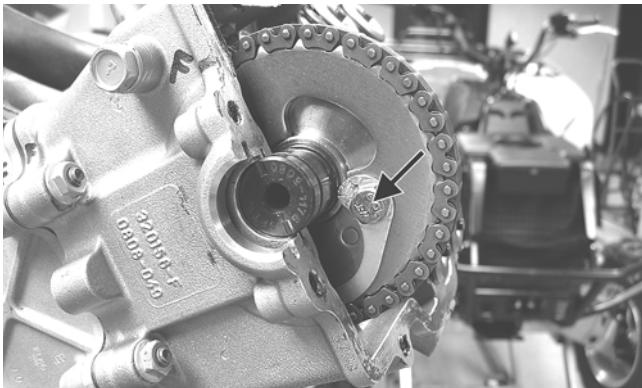
7. Using an awl, rotate the C-ring in its groove until it is out of the cylinder head; then remove the C-ring.

**■NOTE: Care should be taken not to drop the C-ring into the crankcase.**



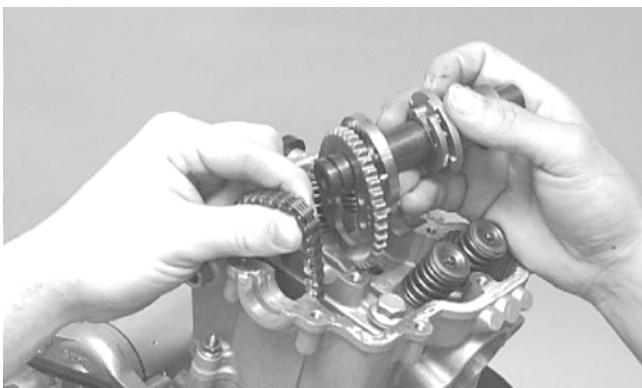
GZ155

8. Bend the washer tabs down and remove the two cap screws securing the sprocket to the camshaft; then drop the sprocket off the camshaft being careful not to drop the locating pin into the engine.



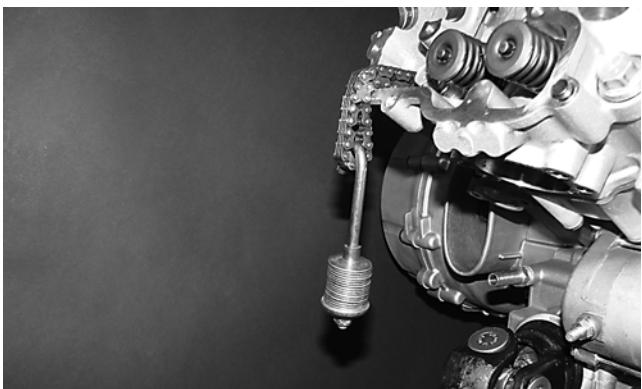
GZ154A

9. While holding the chain, slide the sprocket and cam-shaft out of the cylinder head.



CC266D

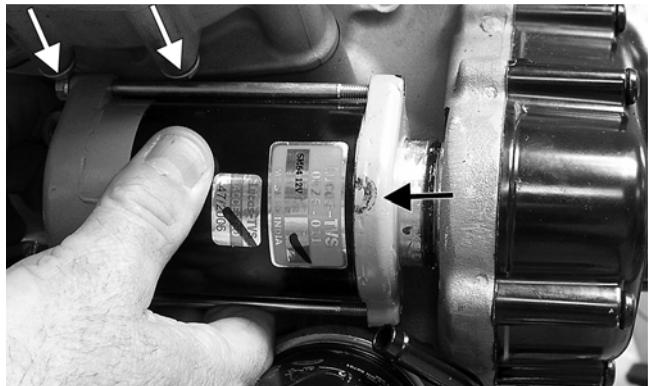
■**NOTE:** Loop the chain over the cylinder head and secure it to keep it from falling into the crankcase.



GZ408

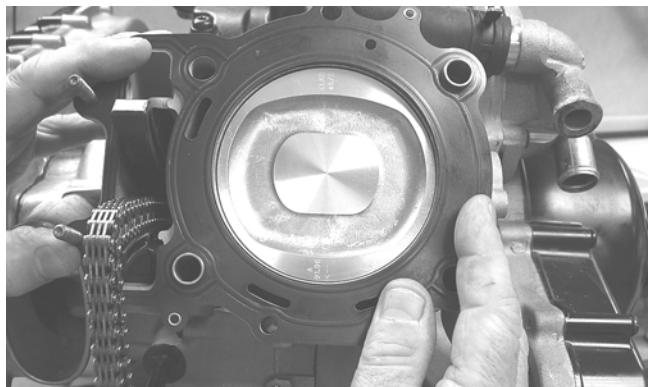
10. Remove the five nuts securing the cylinder head to the cylinder; then remove the four cylinder head cap screws and washers.

■**NOTE:** Removing the starter will simplify removal of the front cylinder base nuts.



GZ209A

11. Remove the cylinder head from the cylinder, remove the gasket, and account for two alignment pins; then remove the cam chain guide.



GZ151



GZ161

12. If the remaining cylinder head is to be serviced, apply tension to the loose timing chain and rotate the second cylinder to top-dead-center of the compression stroke; then repeat steps 2-11 on the other cylinder head.

#### ☞ **AT THIS POINT**

To service valves and cylinder head, see **Servicing Top-Side Components** sub-section.

#### ☞ **AT THIS POINT**

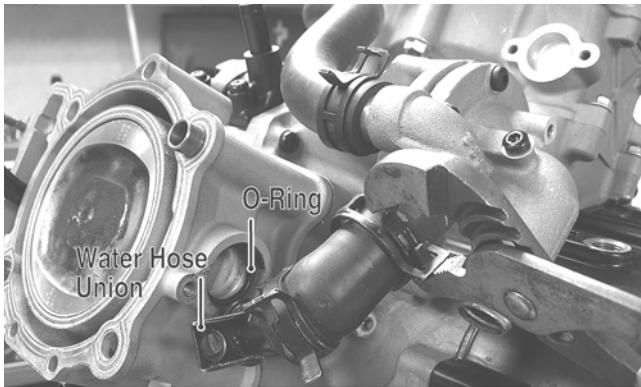
To inspect cam chain guide, see **Servicing Top-Side Components** sub-section.

### **C. Cylinders**

### **D. Pistons**

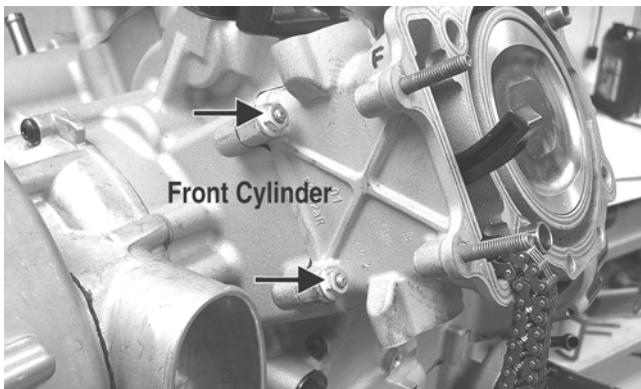
■**NOTE:** Steps 1-12 in the preceding sub-section must precede this procedure.

13. Remove the cap screws securing the water hose union to the cylinder; then remove the union from the cylinder. Account for an O-ring.

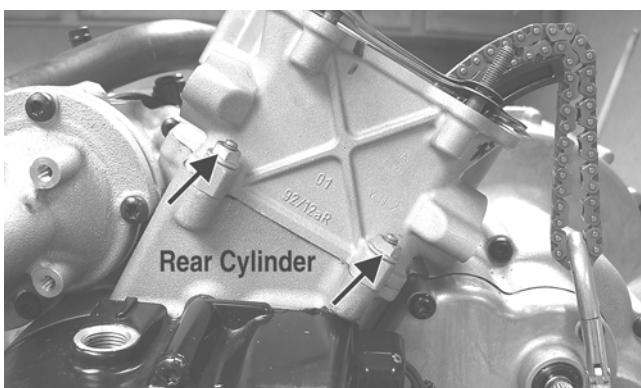


GZ140A

14. Remove the two nuts securing the cylinder to the crankcase.

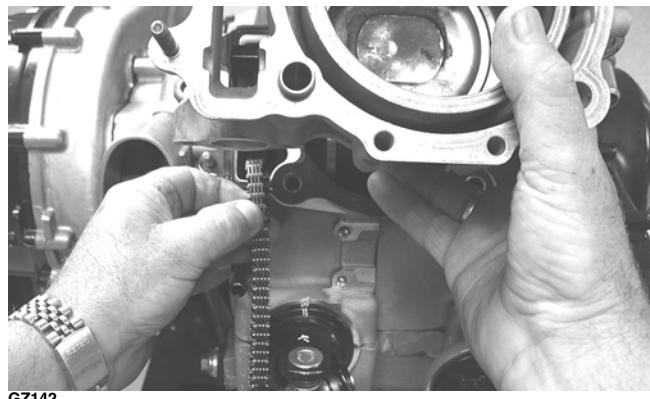


GZ141A



GZ160A

15. Lift the cylinder off the crankcase taking care not to allow the piston to drop against the crankcase. Account for the gasket and two alignment pins.



GZ142



GZ144

 **AT THIS POINT**

To service cylinder, see Servicing Top-Side Components sub-section.

**CAUTION**

When removing the cylinder, be sure to support the piston to prevent damage to the crankcase and piston.

16. Using an awl, remove one piston-pin circlip.

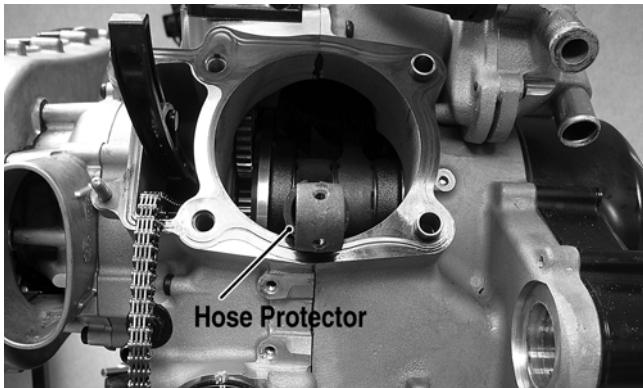


GZ145

17. Using the Piston Pin Puller, remove the piston pin. Account for the opposite-side circlip. Remove the piston.

■**NOTE:** It is advisable to remove the opposite-side circlip prior to using the puller.

■**NOTE:** Support the connecting rod with rubber bands or a piece of hose to avoid damaging the rod or install a suitable connecting rod holder.



GZ146A

### CAUTION

**Do not allow the connecting rod to go down inside the crankcase. If the rod is down inside the crankcase and the crankshaft is rotated, severe damage will result.**

#### ☞ AT THIS POINT

**To service piston, see Servicing Top-Side Components sub-section.**

#### ☞ AT THIS POINT

**To service center crankcase components only, proceed to Removing Left-Side Components.**

## Servicing Top-Side Components

### VALVE ASSEMBLY

When servicing valve assembly, inspect valve seats, valve stems, valve faces, and valve stem ends for pits, burn marks, or other signs of abnormal wear.

**■NOTE: Whenever a valve is out of tolerance, it must be replaced.**

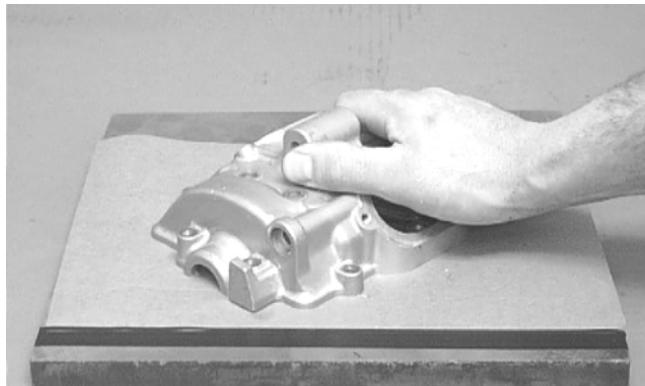
#### Cleaning/Inspecting Valve Cover

**■NOTE: If the valve cover cannot be trued, the cylinder head assembly must be replaced.**

1. Wash the valve cover in parts-cleaning solvent.
2. Place the valve cover on the Surface Plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the valve cover in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the valve cover in a figure eight motion until a uniform bright metallic finish is attained.

### CAUTION

**Do not remove an excessive amount of the sealing surface or damage to the camshaft will result. Always check camshaft clearance when resurfacing the valve cover.**



CC130D

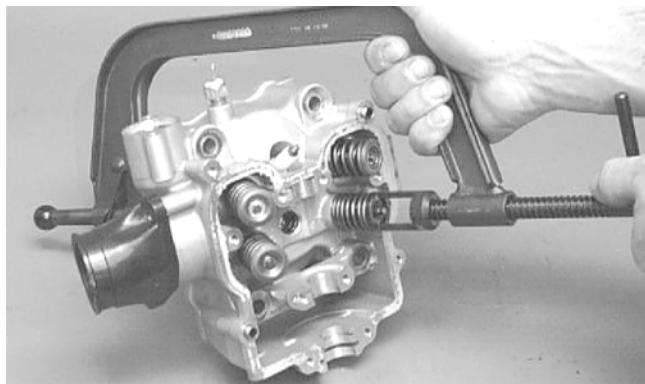
### CAUTION

**Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.**

### Removing Valves

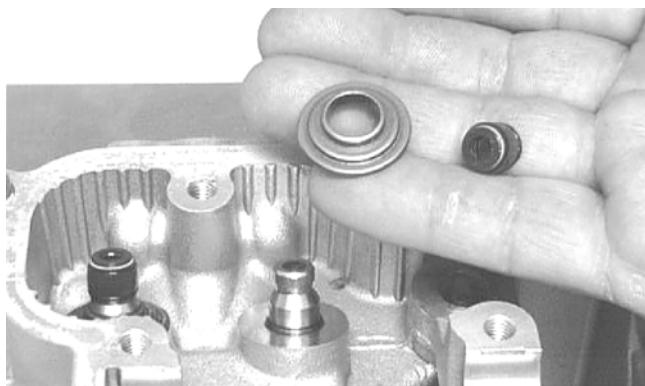
**■NOTE: Index all valves, springs, and cotters to their original position when removing. When installing, all valve components should be installed in their original position.**

1. Using a valve spring compressor, compress the valve springs and remove the valve cotters. Account for an upper spring retainer.



CC132D

2. Remove the valve seal and the lower remaining spring seat. Discard the valve seal.



CC136D

**■NOTE: The valve seals must be replaced.**

3. Remove the valve springs; then invert the cylinder head and remove the valves.

## Measuring Valve Guide (Bore)

1. Insert a suitable bore gauge 1/2 way into each valve guide bore and record the measurement.
2. Acceptable inside diameter range must be within specifications.
3. If a valve guide is out of tolerance, it must be replaced.

## Servicing Valves/Valve Guides/Valve Seats

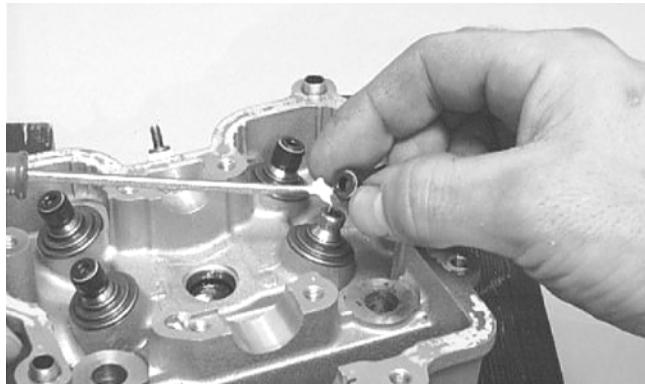
If valves, valve guides, or valve seats require servicing or replacement, Arctic Cat recommends the components be taken to a qualified machine shop for servicing.

### CAUTION

**If valves are discolored or pitted or if the seating surface is worn, the valve must be replaced. Do not attempt to grind the valves or severe engine damage may occur.**

## Installing Valves

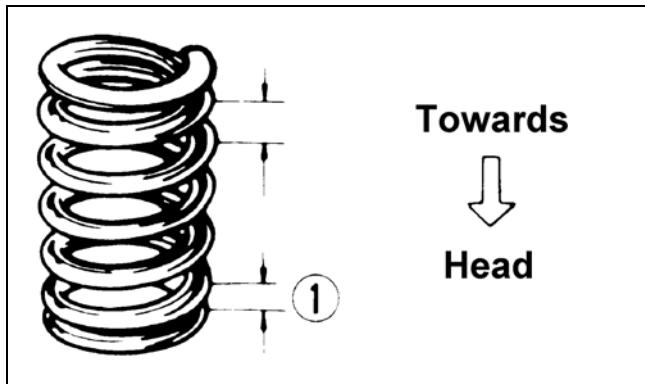
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



CC144D

2. Insert each valve into its original location.
3. Install the valve springs with the painted end of the spring facing away from the cylinder head.

**■NOTE: If the paint is not visible, install the ends of the springs with the closest wound coils toward the head.**



4. Place a spring retainer over the valve springs; then using the valve spring compressor, compress the valve springs and install the valve cotters.

## PISTON ASSEMBLY

**■NOTE: Whenever a piston or pin is out of tolerance, it must be replaced.**

## Removing Piston Rings

1. Starting with the top ring, slide one end of the ring out of the ring-groove.
2. Remove each ring by working it toward the dome of the piston while rotating it out of the groove.



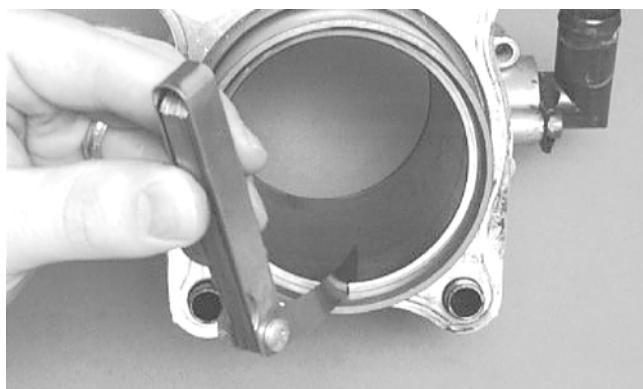
CC400D

## Inspecting Piston

1. Inspect the piston for cracks in the piston pin, dome, and skirt areas.
2. Inspect the piston for seizure marks or scuffing.
3. Inspect the perimeter of each piston for signs of excessive "blowby." Excessive "blowby" indicates worn piston rings or an out-of-round cylinder.

## Measuring Piston-Ring End Gap (Installed)

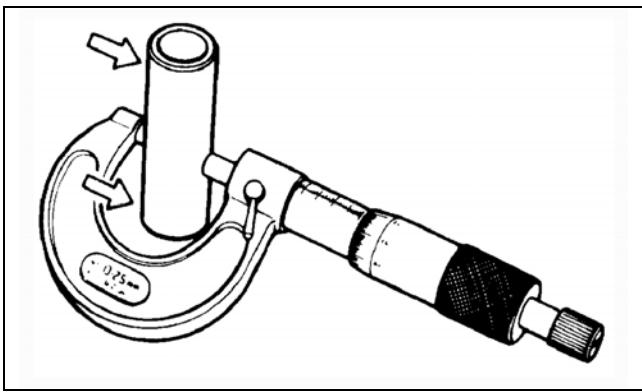
1. Place each compression ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must not exceed specifications.



CC280D

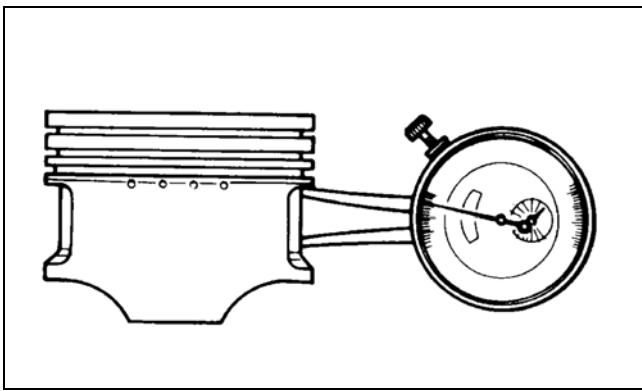
## Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

1. Measure the piston pin outside diameter at each end and in the center. If measurement exceeds specifications, the piston pin must be replaced.



ATV-1070

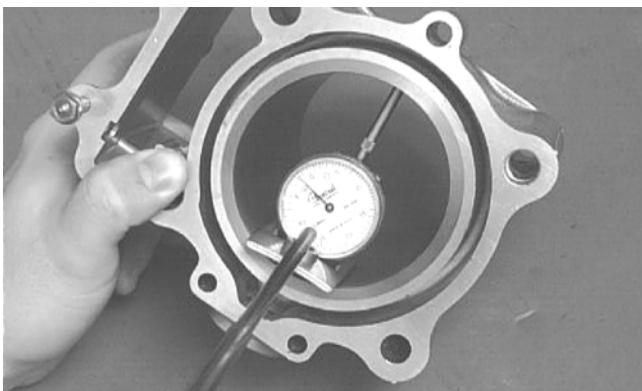
2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



ATV-1069

### Measuring Piston Skirt/Cylinder Clearance

1. Measure the cylinder front to back in six places.

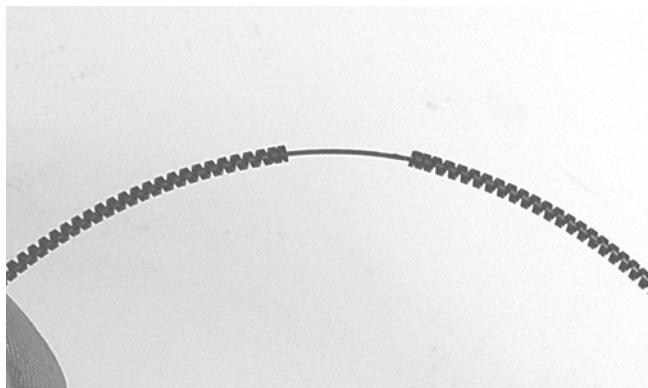


CC127D

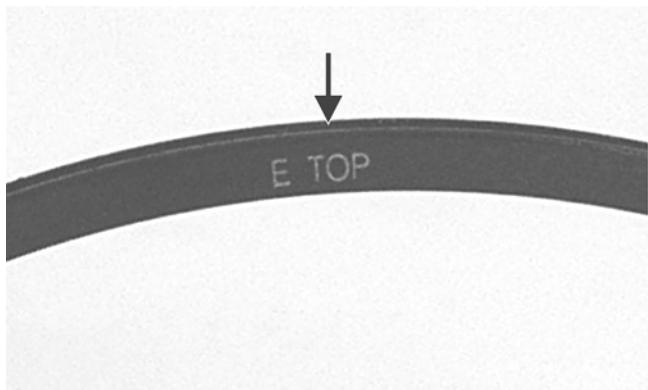
2. Measure the corresponding piston diameter at a point 15 mm (0.6 in.) above the piston skirt at a right angle to the piston-pin bore. Subtract this measurement from the largest measurement in step 1. The difference (clearance) must not exceed specifications.

### Installing Piston Rings

1. Install the expander spring making sure the ends are aligned on the wire; then install the oil ring with the ring gap 90° from the spring gap and the marking "E TOP" directed toward the top of the piston.



GZ168



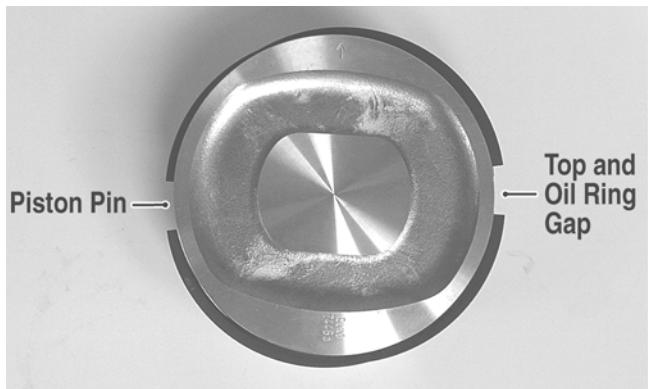
GZ169A

2. Install the second compression ring with the marking "E TOP" directed toward the top of the piston.



GZ167

3. Install the first (unmarked) compression ring; then rotate the rings so the ring gaps are approximately 180° apart and oriented to the piston pin.



GZ187A

## CAUTION

Incorrect installation of the piston rings will result in engine damage.

## CYLINDER/CYLINDER HEAD ASSEMBLY

■NOTE: If the cylinder/cylinder head cannot be trued, they must be replaced as an assembly.

### Cleaning/Inspecting Cylinder Head

## CAUTION

The cylinder head studs must be removed for this procedure.

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the combustion chamber being careful not to nick, scrape, or damage the combustion chamber or the sealing surface.
2. Inspect the spark plug hole for any damaged threads. Repair damaged threads using a “heli-coil” insert.
3. Place the cylinder head on the surface plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the cylinder head in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the cylinder head in a figure eight motion until a uniform bright metallic finish is attained.

## CAUTION

Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.

### Measuring Cylinder Head Distortion

1. Remove any carbon buildup in the combustion chamber.
2. Lay a straightedge across the cylinder head; then using a feeler gauge, check the distortion between the head and the straightedge.
3. Maximum distortion must not exceed specifications.



### Cleaning/Inspecting Cylinder

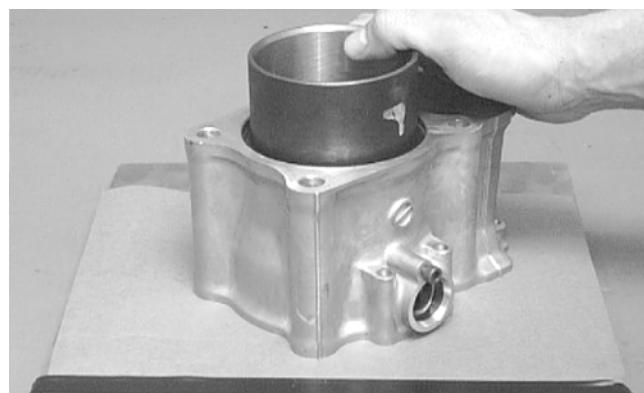
1. Wash the cylinder in parts-cleaning solvent.

2. Inspect the cylinder for pitting, scoring, scuffing, warpage, and corrosion. If marks are found, repair the surface using a cylinder hone (see Inspecting Cylinder in this sub-section).

3. Place the cylinder on the surface plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the cylinder in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the cylinder in a figure eight motion until a uniform bright metallic finish is attained.

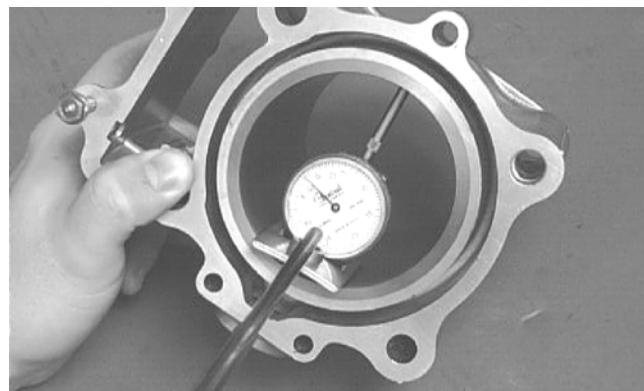
## CAUTION

Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.



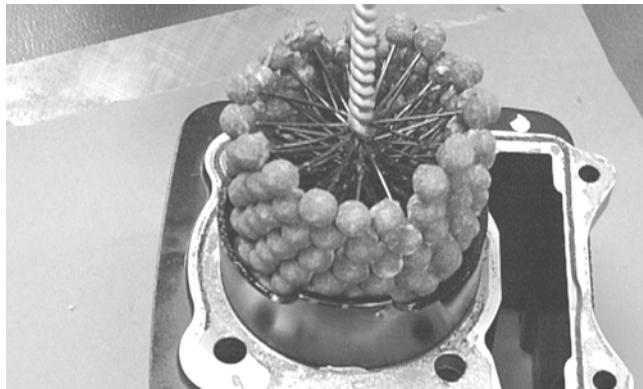
CC129B

4. Using a slide gauge and a dial indicator or a snap gauge, measure the cylinder bore diameter in three locations from top to bottom and again from top to bottom at 90° from the first measurements for a total of six measurements. The trueness (out-of-roundness) is the difference between the highest and lowest reading. Maximum trueness (out-of-roundness) must not exceed specifications.



5. Wash the cylinder in parts-cleaning solvent.
6. Inspect the cylinder for pitting, scoring, scuffing, and corrosion. If marks are found, repair the surface using a #320 grit ball hone.

**■NOTE:** To produce the proper 60° cross-hatch pattern, use a low RPM drill (600 RPM) at the rate of 30 strokes per minute. If honing oil is not available, use a lightweight petroleum-based oil. Thoroughly clean cylinder after honing using soap and hot water. Dry with compressed air; then immediately apply oil to the cylinder bore. If the bore is severely damaged or gouged, replace the cylinder.



CC390D

7. If any measurement exceeds the limit, replace the cylinder and piston.

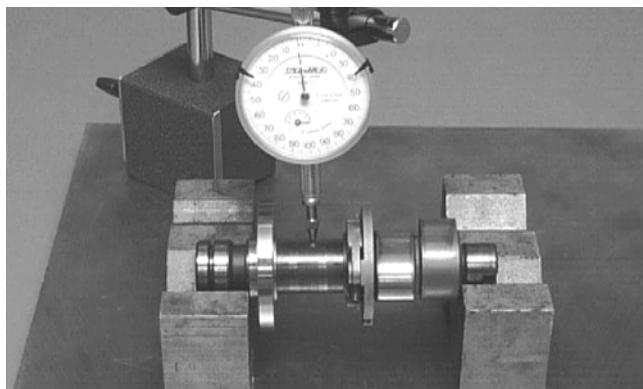
### Inspecting Cam Chain Guide

1. Inspect cam chain guide for cuts, tears, breaks, or chips.
2. If the chain guide is damaged, it must be replaced.

### Measuring Camshaft Runout

**■NOTE:** If the camshaft is out of tolerance, it must be replaced.

1. Place the camshaft on a set of V blocks; then position the dial indicator contact point against the shaft and zero the indicator.

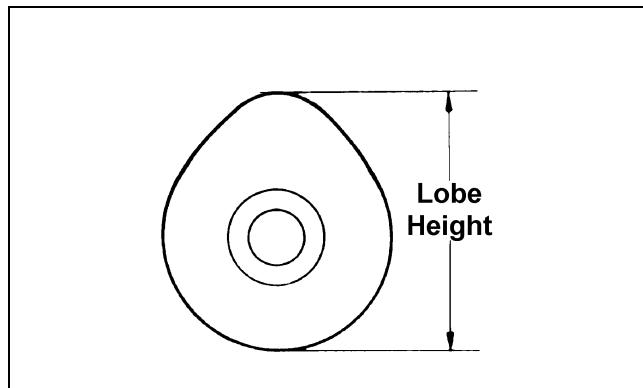


CC283D

2. Rotate the camshaft and note runout; maximum runout must not exceed specifications.

### Measuring Camshaft Lobe Height

1. Using a calipers, measure each cam lobe height.



ATV1013A

2. The lobe heights must be greater than minimum specifications.

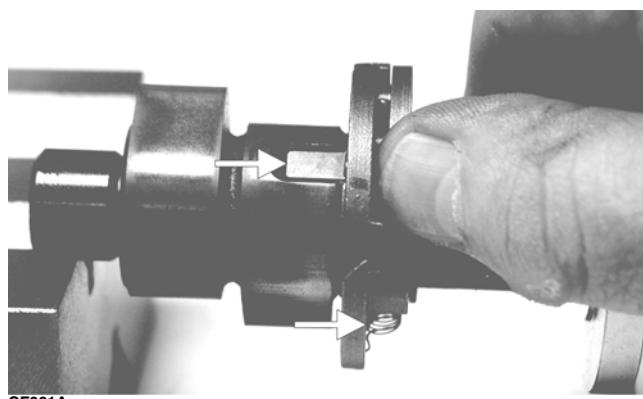
### Inspecting Camshaft Bearing Journal

1. Inspect the bearing journal for scoring, seizure marks, or pitting.
2. If excessive scoring, seizure marks, or pitting is found, the cylinder head assembly must be replaced.

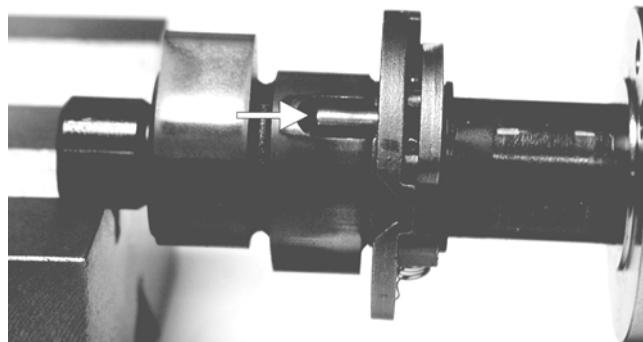
**■NOTE:** If the journals are worn, replace the camshaft.

### Inspecting Camshaft Spring/Drive Pin (Front Camshaft Only)

1. Inspect the spring and drive pin for damage.



CF061A



CF060A

2. If damaged, the camshaft must be replaced.

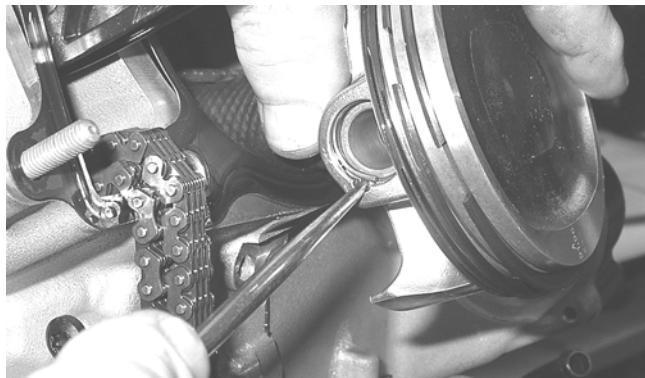
## Installing Top-Side Components

### A. Pistons

### B. Cylinders

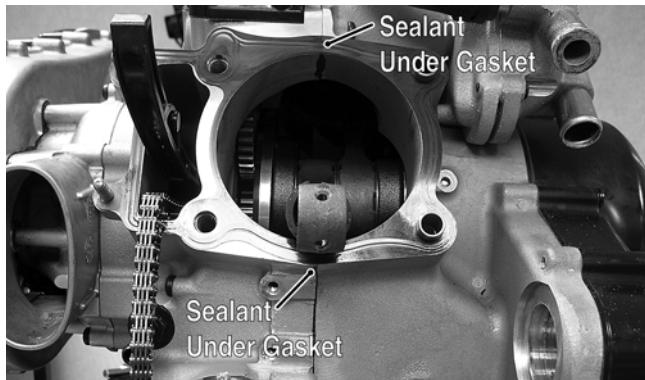
1. Install the piston on the connecting rod making sure the circlip on each side is fully seated in the piston.

■**NOTE:** The piston should be installed so the arrow points toward the exhaust of the respective cylinder.



GZ166

2. Place the two alignment pins into position. Place the cylinder gasket into position with a drop of silicone sealant at the front and rear crankcase junction; then place a piston holder (or suitable substitute) beneath the piston skirt and square the piston in respect to the crankcase.



GZ146B

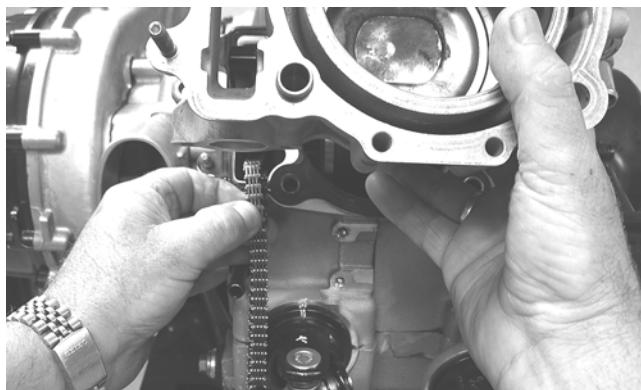


GZ159

3. Lubricate the inside wall of the cylinder; then using a ring compressor, compress the rings and slide the cylinder over the piston. Route the cam chain up through the cylinder cam chain housing; then remove the piston holder and seat the cylinder firmly on the crankcase.

### CAUTION

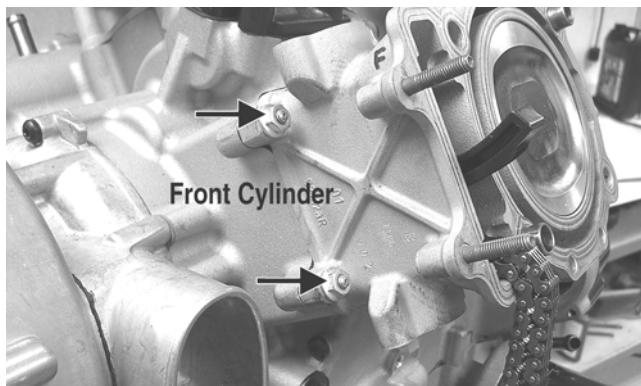
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



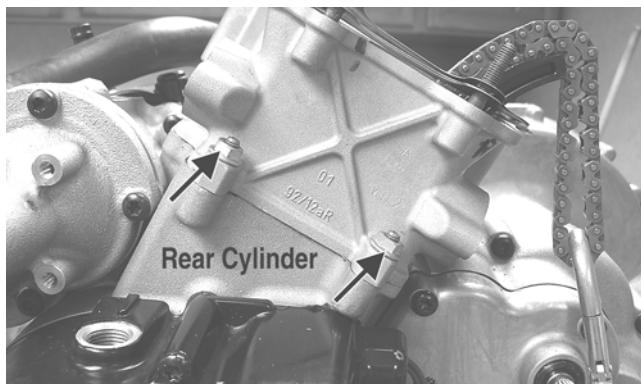
GZ142

4. Loosely install the two nuts securing the cylinder to the crankcase.

■**NOTE:** The two cylinder-to-crankcase nuts will be tightened in step 10.



GZ141A



GZ160A

5. Install the coolant hose onto the crankcase union and tighten the clamp.

## C. Cylinder Head

### D. Valve Cover

■NOTE: Steps 1-5 in the preceding sub-section must precede this procedure.

6. Place the chain guide into the cylinder.

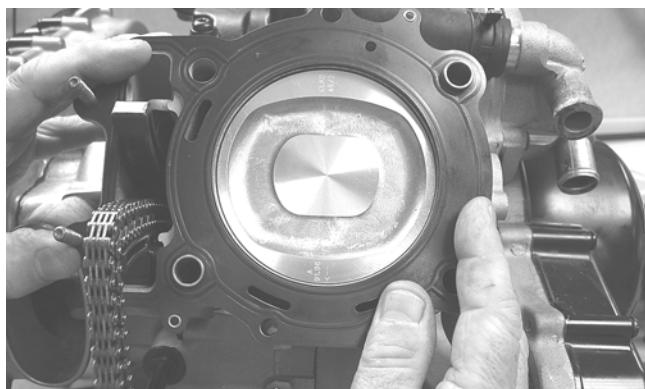
#### CAUTION

Care should be taken that the bottom of the chain guide is secured in the crankcase boss.



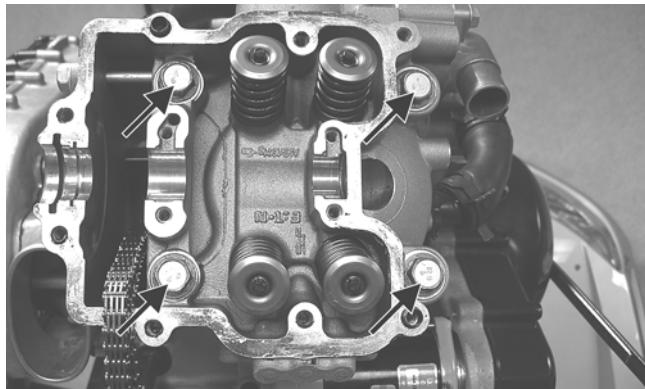
GZ161A

7. Place a new head gasket into position on the cylinder. Place the alignment pins into position; then place the head assembly into position on the cylinder while guiding the cam chain through the cylinder head.



GZ151

8. Install the cylinder head cap screws. Tighten only until snug.



9. Loosely install the five cylinder head nuts.

10. In a crisscross pattern, tighten the four cylinder head cap screws (from step 8) initially to 20 ft-lb; then increase to 30 ft-lb, and finally to 37 ft-lb. Tighten the 8 mm nut (from step 9) to 21 ft-lb; then using a crisscross pattern, tighten the 6 mm nuts (from step 9) to 8.5 ft-lb. Tighten the two cylinder-to-crankcase nuts (from step 4) to 8 ft-lb.

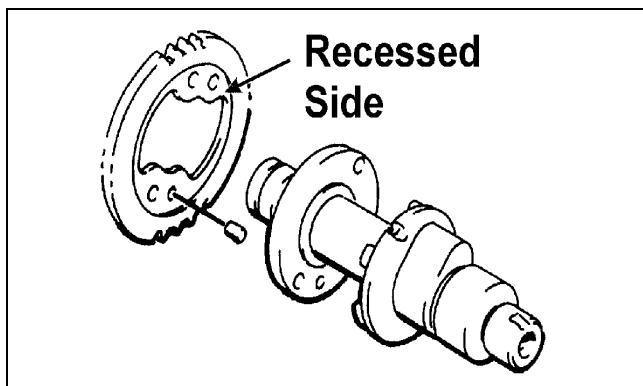
■NOTE: If both cylinders have been removed, repeat steps 1-10 for the remaining cylinder.

11. With the timing inspection plug removed and the front chain held tight, rotate the crankshaft until the front piston is at TDC indicated by timing mark F.

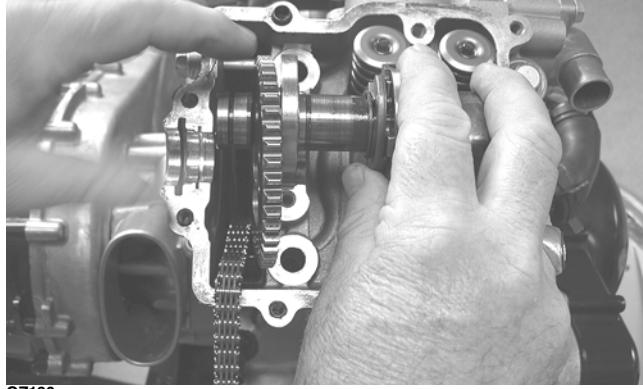


GZ063

12. With the alignment pin installed in the front camshaft, loosely place the cam sprocket (with the recessed side facing the cam shaft lobes) onto the camshaft. At this point, do not "seat" the sprocket onto the shaft.



732-307B

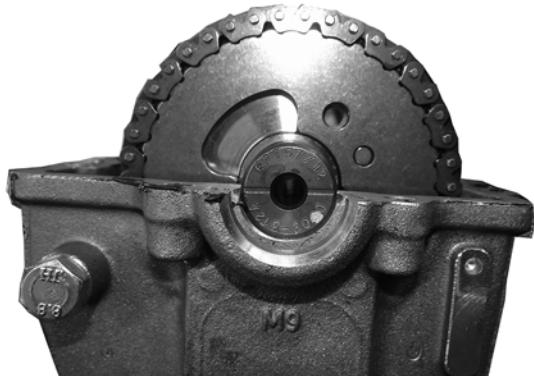


GZ130

■NOTE: At this point, oil the camshaft bearings, cam lobes, and the three seating journals on the cylinder.

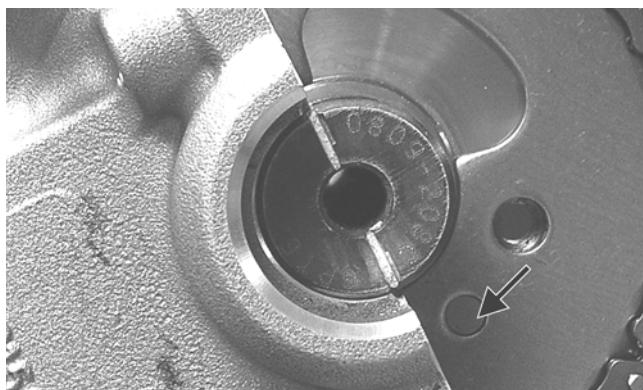
13. With the cam lobes directed down (toward the piston), maneuver the camshaft/sprocket assembly through the chain and towards its seating position; then loop the chain over the sprocket.

**■NOTE:** Note the position of the alignment marks on the end of the camshaft. They must be parallel to the valve cover mating surface. If rotating the camshaft is necessary for alignment, rotate the sprocket inside the chain until the alignment pin can be engaged in the sprocket with the camshaft properly aligned to the head.



GZ519

14. Seat the cam sprocket onto the camshaft making sure the alignment pin in the camshaft aligns with the smallest hole in the sprocket; then place the camshaft/sprocket assembly onto the cylinder ensuring the following.



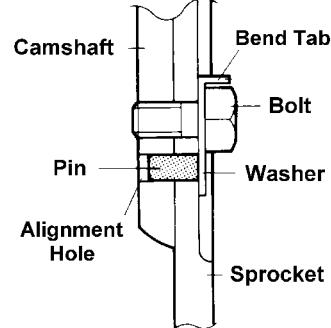
GZ190B

- Piston still at top-dead-center.
- Camshaft lobes directed down (toward the piston).
- Camshaft alignment marks parallel to the valve cover mating surface.
- Recessed side of the sprocket directed toward the cam lobes.
- Camshaft alignment pin and sprocket alignment hole (smallest) are aligned.

### CAUTION

If any of the above factors are not as stated, go back to step 11 and carefully proceed.

15. Place the tab-washer onto the sprocket making sure it covers the pin in the alignment hole.



ATV1027

### CAUTION

Care must be taken that the tab-washer is installed correctly to cover the alignment hole on the sprocket. If the alignment pin falls out, severe engine damage will result.

16. Install the first cap screw (threads coated with red Loctite #271) securing the sprocket and tab-washer to the camshaft. Tighten only until snug.

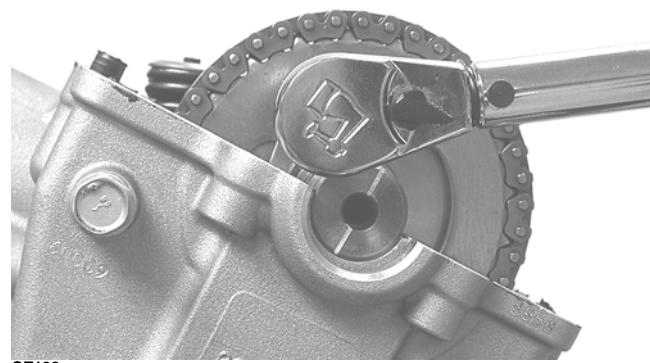


GZ195

17. Keeping tension on the opposite cam chain, rotate the crankshaft until the second cap screw securing the sprocket to the camshaft can be installed; then install the cap screw (threads coated with red Loctite #271) and tighten to 11 ft-lb. Bend the tab to secure the cap screw.

### CAUTION

Failure to keep tension on any loose cam chain may cause severe engine damage.



GZ193

18. Rotate the crankshaft until the first cap screw (from step 16) can be tightened; then tighten to 11 ft-lb. Bend the tab to secure the cap screw.

**AT THIS POINT**

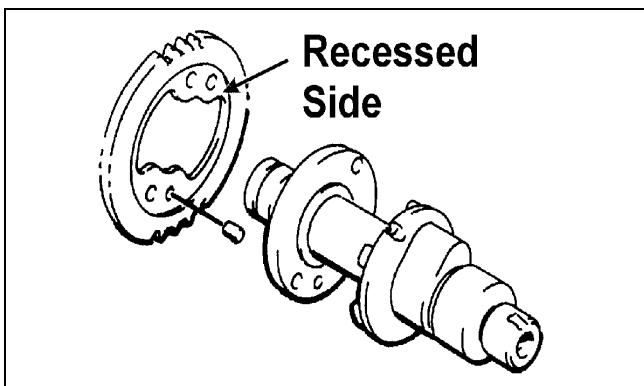
**Return the engine to TDC on the front cylinder making sure the cam lobes are directed downward to ensure correct starting point for step 19.**

19. Keeping tension on the rear cam chain, rotate the engine forward  $270^\circ$  until rear piston is at TDC indicated by timing mark R.

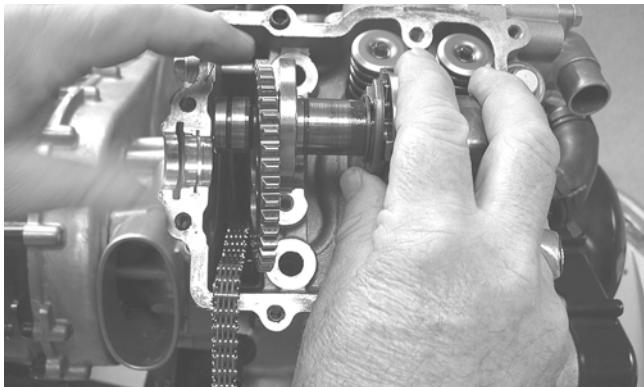


GZ059

20. With the alignment pin installed in the rear camshaft, loosely place the cam sprocket (with the recessed side facing the cam shaft lobes) onto the camshaft. At this point, do not “seat” the sprocket onto the shaft.



732-307B

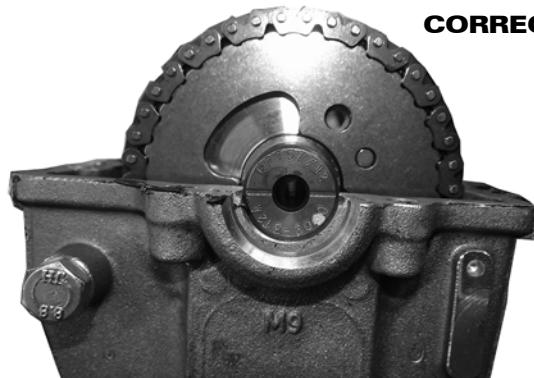


GZ130

**■NOTE: At this point, oil the camshaft bearings, cam lobes, and the three seating journals on the cylinder.**

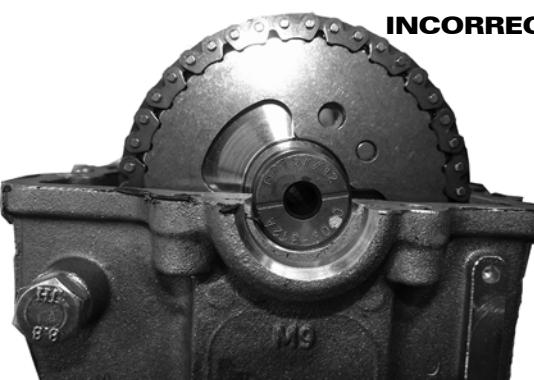
21. With the cam lobes directed down (toward the piston), maneuver the camshaft/sprocket assembly through the chain and towards its seating position; then loop the chain over the sprocket.

**■NOTE: Note the position of the alignment marks on the end of the camshaft. They should be parallel with the plane of the cylinder head. If rotating the camshaft is necessary for alignment, rotate the sprocket inside the chain until the alignment pin can be engaged in the sprocket with the camshaft in the nearest possible position to parallel.**



GZ519

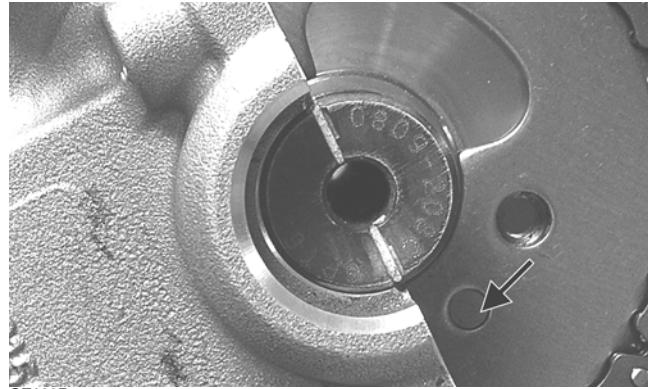
**CORRECT**



**INCORRECT**

GZ518

22. Seat the cam sprocket onto the camshaft making sure the alignment pin in the camshaft aligns with the smallest hole in the sprocket; then place the camshaft/sprocket assembly onto the cylinder ensuring the following.



GZ190B

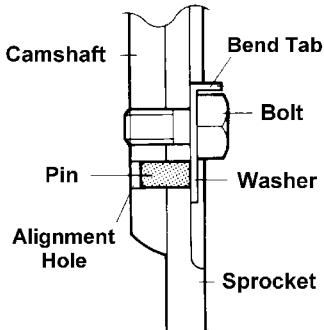
- Piston still at top-dead-center.
- Camshaft lobes directed down (toward the piston).
- Camshaft alignment marks parallel to the valve cover mating surface.

- D. Recessed side of the sprocket directed toward the cam lobes.
- E. Camshaft alignment pin and sprocket alignment hole (smallest) are aligned.

**CAUTION**

If any of the above factors are not as stated go back to step 19 and carefully proceed.

23. Place tab-washer onto the sprocket making sure it covers the pin in the alignment hole.

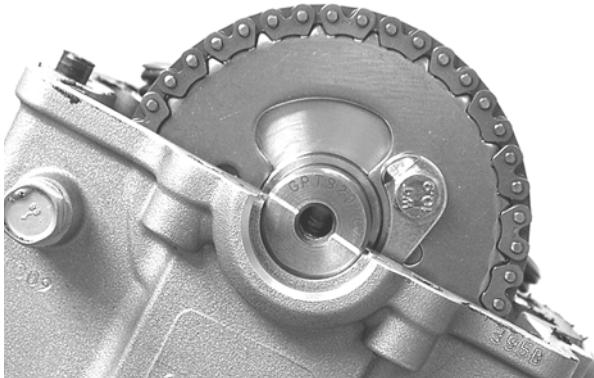


ATV-1027

**CAUTION**

Care must be taken that the tab-washer is installed correctly to cover the alignment hole on the sprocket. If the alignment pin falls out, severe engine damage will result.

24. Install the first cap screw (threads coated with red Loctite #271) securing the sprocket and tab-washer to the camshaft. Tighten only until snug.



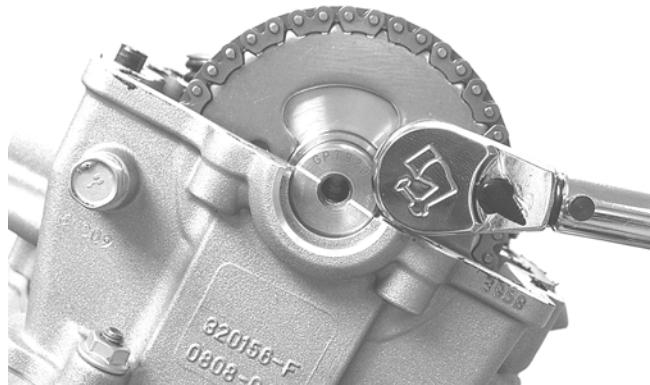
GZ195

25. Rotate the crankshaft until the second cap screw securing the sprocket to the camshaft can be installed; then install the cap screw (threads coated with red Loctite #271) and tighten to 11 ft-lb. Bend the tab to secure the cap screw.



GZ193

26. Rotate the crankshaft until the first cap screw (from step 23) can be addressed; then tighten to 11 ft-lb. Bend the tab to secure the cap screw.



GZ194

27. Place the C-rings into position in their grooves in the cylinder heads.

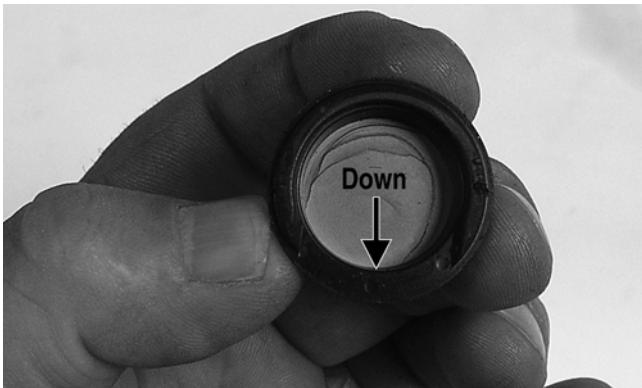


CC012D

28. Install the cylinder head plugs in the cylinder heads with the open end facing downward and toward the inside.

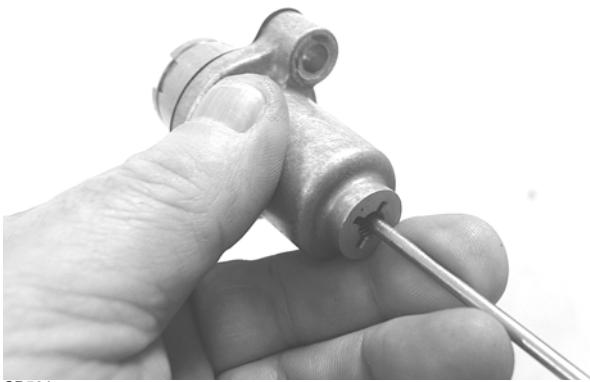
**CAUTION**

The open end of the plug must be positioned downward.



GZ162A

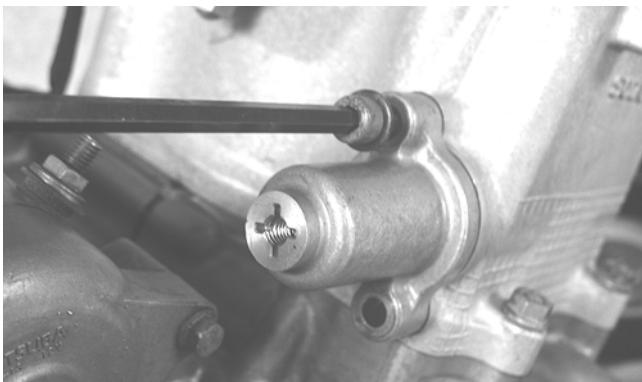
29. Remove the cap screw from the end of the chain tensioner; then using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner clockwise until the screw bottoms and the adjuster shaft is held in place.



CD501

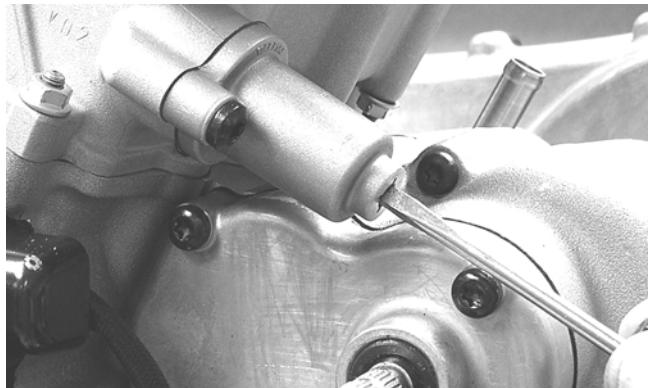
**■NOTE: The adjuster shaft will be drawn into the tensioner as the adjuster screw is rotated clockwise. The adjuster shaft tension will be released in step 31.**

30. Place the chain tensioner adjuster assembly and gasket into position on the cylinder and secure with the two cap screws.



CD469

31. Using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner counterclockwise until the tensioner spring bears tension; then remove the screw driver to apply tension to the cam chain. Install the cap screw into the end of the chain tensioner.

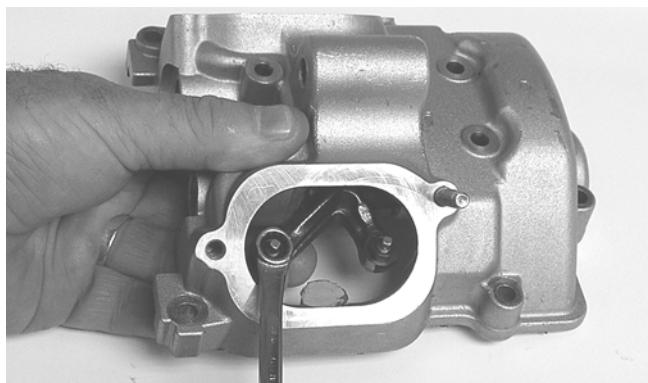


GZ201



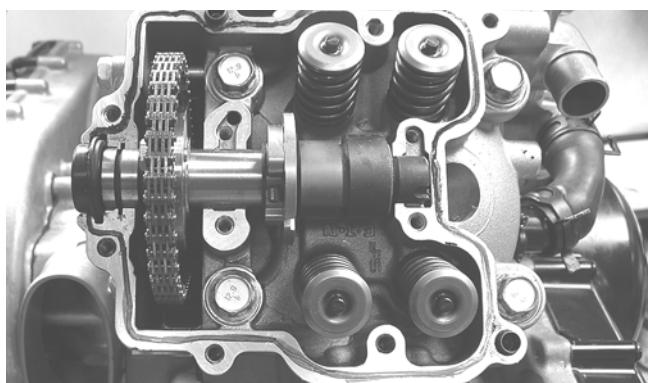
CD471

32. Loosen the four adjuster screw jam nuts; then loosen the four adjuster screws on the rocker arms in the valve cover.



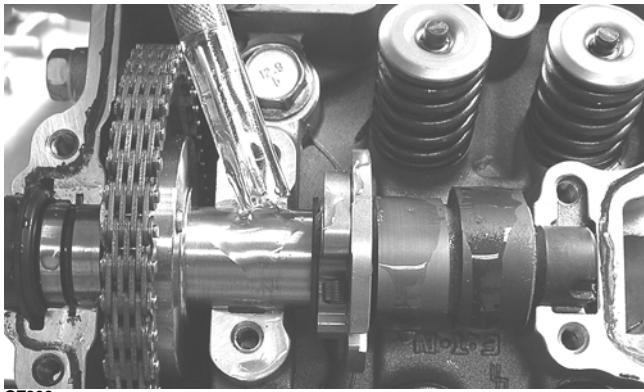
GZ199

33. Apply a thin coat of Three Bond Sealant to the mating surfaces of the cylinder heads.



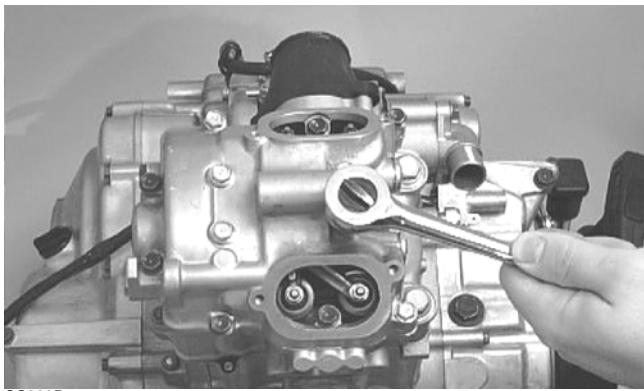
GZ202

34. Lubricate the camshaft journals and lobes with engine oil; then place the valve cover into position.



■NOTE: At this point, the rocker arms and adjuster screws must not have pressure on them.

35. Install the top side cap screws with rubber washers; then install the remaining cap screws. Tighten only until snug.



36. In a crisscross pattern starting from the center and working outward, tighten the cap screws on both valve covers to 8.5 ft-lb.
37. Adjust valve/tappet clearance (see Periodic Maintenance/Tune-Up).
38. Place the tappet covers into position on the valve cover making sure the O-rings are properly installed. Tighten the cap screws to 8.5 ft-lb.



39. If removed, install the spark plugs. Tighten securely.

## Left-Side Components

■NOTE: For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

### ☞ AT THIS POINT

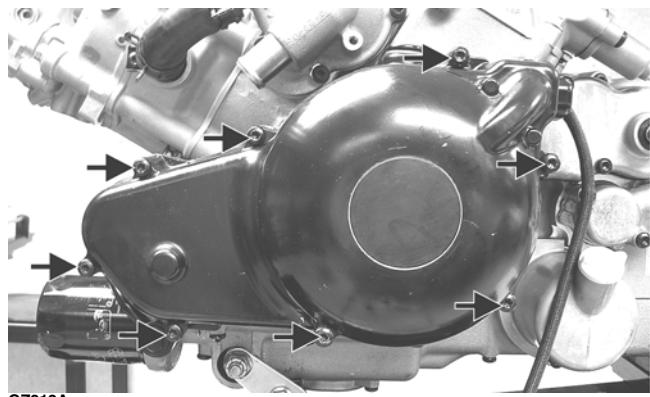
To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■NOTE: The engine/transmission does not have to be removed from the frame for this procedure.

## Removing Left-Side Components

- A. Magneto Cover/Stator Coils
- B. Water Pump
- C. Shifter Assembly
- D. Rotor/Flywheel/Starter Clutch
- E. Speed Sensor/Trigger Assembly

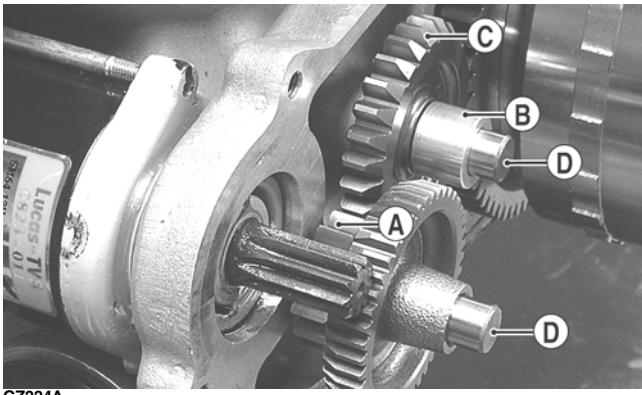
1. Remove the cap screws securing the magneto cover to the crankcase; then remove the magneto cover. Account for the gasket.



### ☞ AT THIS POINT

To replace stator coils/crankshaft position sensor, see Electrical System.

2. Remove the starter motor, starter driven gear (A), starter countershaft bushing (B), and starter countershaft gear (C); then remove the starter gear shafts (D) noting the longer shaft is nearest the starter.



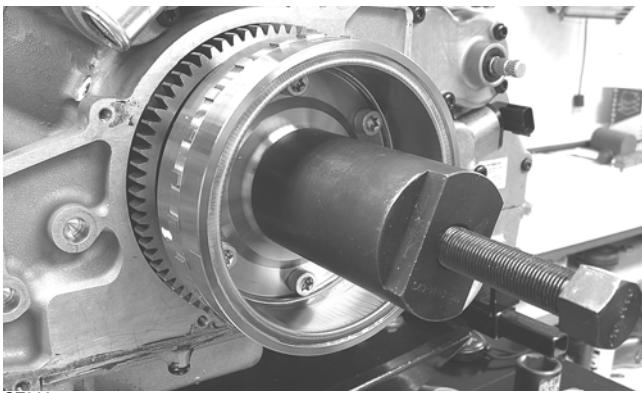
■**NOTE: The starter is not serviceable and must be replaced as a complete assembly.**

3. Remove the rotor/flywheel nut; then install the appropriate crankshaft protector into the crankshaft.



H2-018

4. Install Magneto Rotor Remover Set and loosen the rotor/flywheel; then remove the crankshaft protector and rotor/flywheel from the crankshaft. Account for the flywheel key.



GZ216



GZ217

5. With the flywheel key removed, remove the starter ring-gear and spacer washer.

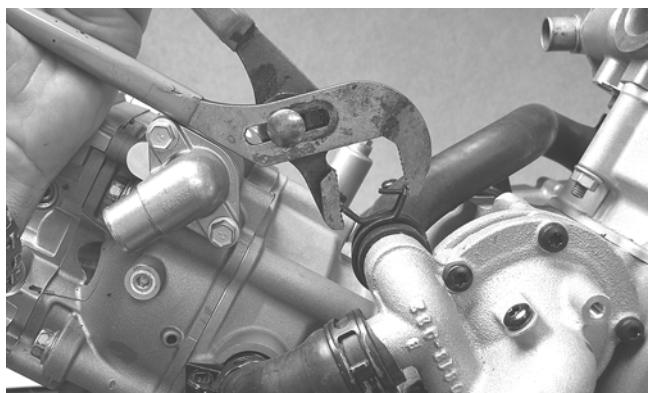


GZ226



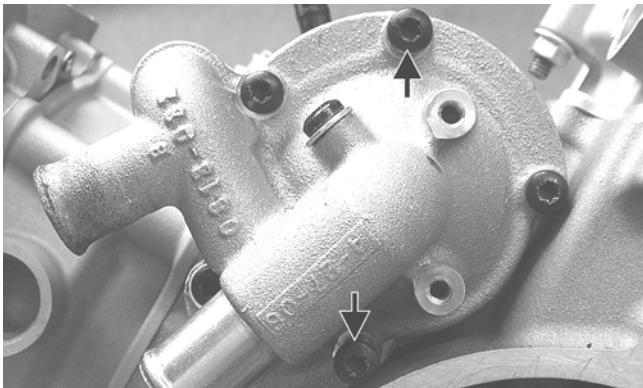
GZ249

6. Remove the hose clamps from the water pump; then remove the coolant hoses from the water pump outlets and coolant pipes.



GZ218

7. Remove the two cap screws securing the water pump to the crankcase.

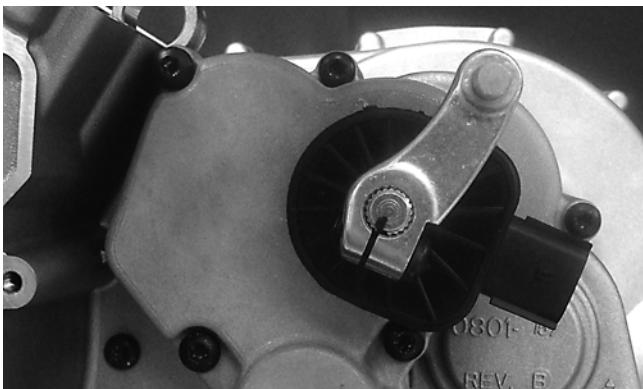


GZ230A

8. Remove the water pump. Account for an O-ring.

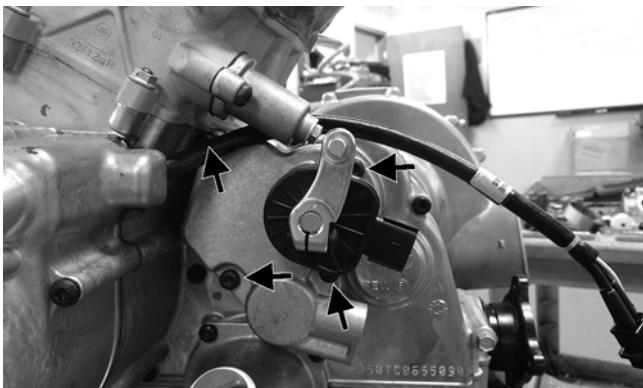
**■NOTE: The water pump is a non-serviceable component and must be replaced as a complete assembly.**

9. Match mark the shift select arm to the shift shaft for assembling. Remove the cap screw and shift select arm from the shift shaft; then remove the gear position switch.



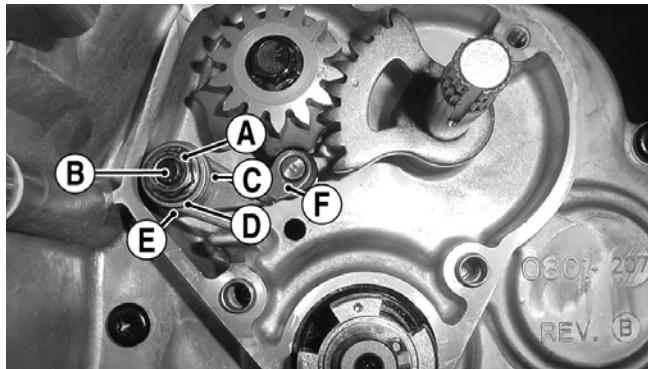
GZ488

10. Remove the cap screws securing the gear shift cover to the crankcase; then remove the gear shift cover. Account for a gasket.



H2-013A

11. Remove the nut (A) from the shift cam stopper support (B); then remove the cam stopper spring (C). Account for a flat washer (D), cam stopper (F), and shim (E).



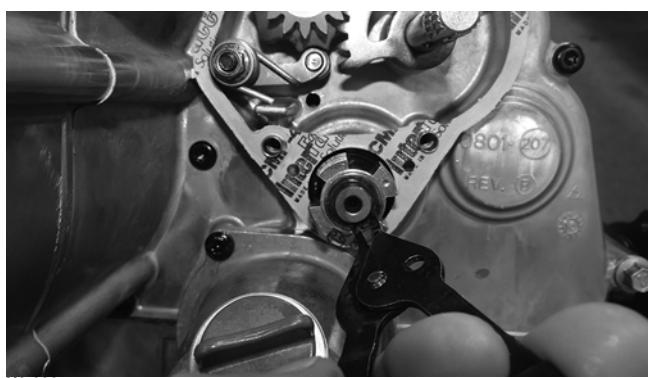
H2-019C

12. Remove the cap screw securing the shift cam plate to the shift cam shaft and remove the shift cam plate; then remove the shift shaft.



H2-022A

13. Remove the snap ring securing the speed sensor trigger to the shaft. Remove the thrust washer; then remove the trigger using a suitable "two-jawed" puller. Account for a gasket.



H2-023

14. Remove the cap screws securing the oil filler cover to the crankcase; then remove the cover. Account for an O-ring.



GZ250

## Servicing Left-Side Components

### INSPECTING STARTER CLUTCH/GEAR

1. Place the starter clutch gear onto the rotor/flywheel and attempt to rotate the starter clutch gear clockwise. It should lock up to the rotor/flywheel. Rotate the gear counterclockwise and it should turn freely. If it moves or locks up both ways, the starter clutch must be replaced.
2. Inspect the starter clutch gear for chipped or missing teeth or discoloration/scoring of the clutch surface. Inspect the bearing for loose, worn, or discolored rollers. If bearing is damaged, it must be replaced.



FI569

3. Inspect the one-way bearing for chipped surfaces, missing rollers, or discoloration. If any of the above conditions exist, replace the starter clutch assembly.



FI572

### REPLACING STARTER CLUTCH ASSEMBLY

1. Remove the cap screws securing the one-way clutch assembly to the flywheel; then remove from the flywheel.



FI570

2. Thoroughly clean the rotor/flywheel; then install the new starter one-way clutch and secure with the cap screws after applying a drop of red Loctite #271 to the threads. Tighten to 26 ft-lb using a crisscross pattern. Make sure the one-way bearing is installed with the notches directed away from the rotor/flywheel.



FI576A



FI578

### REPLACING STARTER GEAR BEARING

1. Support the starter clutch gear in a press making sure to support the hub around the entire circumference; then using a suitable bearing driver, press the bearing from the gear.



FI583

2. Thoroughly clean the gear hub; then apply a drop of green Loctite #620 to the bearing outer race and press into the gear hub until even with the lower chamfer radius.



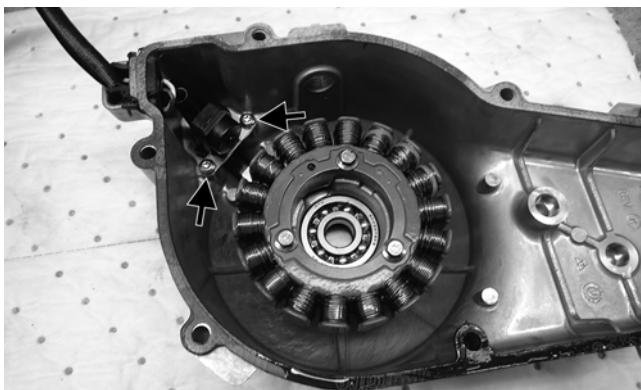
FI580

#### **INSPECTING STATOR COIL/ MAGNETO COVER ASSEMBLY**

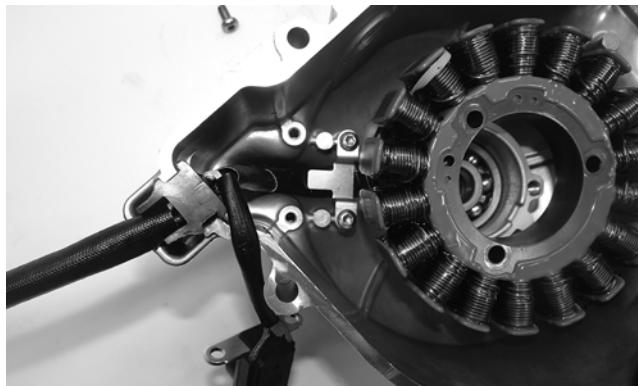
1. Inspect the stator coil for burned or discolored wiring, broken or missing hold-down clips, or loose cap screws.
2. Inspect the bearings in the magneto housing for discoloration, roughness when rotated, and secure fit in bearing bores.

#### **REPLACING STATOR COIL/ CRANKSHAFT POSITION SENSOR**

1. Remove the three cap screws securing the stator coil, two cap screws securing the crankshaft position sensor, and two cap screws from the harness hold-down.
2. Lift the rubber grommet out of the housing; then remove the stator coil/crankshaft position sensor. Account for and note the position of the harness hold-down under the crankshaft position sensor.



H2-017A



H2-027

3. Install the new stator coil assembly and secure with three cap screws using a drop of red Loctite #271 on each. Tighten according to the chart.

| Cover    | Bolt Type | ft-lb | N·m |
|----------|-----------|-------|-----|
| Original | Hex-Head  | 11.5  | 15  |
| New      | Hex-Head  | 13    | 18  |

4. Place the stator wire harness hold-down into position; then install the crankshaft position sensor and secure with two cap screws. Tighten securely.
5. Install the upper cable hold-down and secure with the cap screws. Tighten securely.



H2-017

#### **Installing Left-Side Components**

1. Thoroughly clean all gasket material and sealant from mating surfaces.
2. Install a new O-ring on the oil filler cover and coat it with clean engine oil; then install the oil filler cover into the crankcase and secure with the cap screws. Tighten to 8 ft-lb.

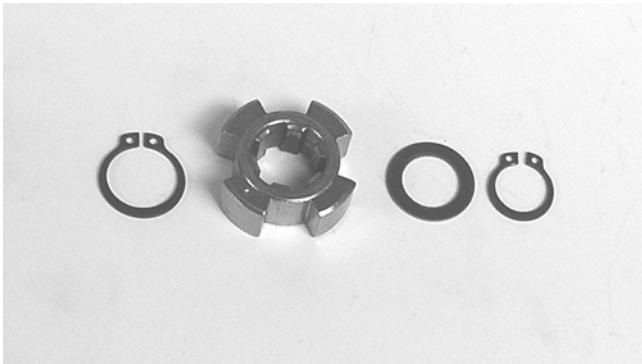


GZ250

3. Clean the countershaft and trigger splines thoroughly and install the inner snap ring onto the shaft; then apply green Loctite #620 to the trigger and countershaft splines and install the trigger. Secure with a flat washer and outer snap ring.

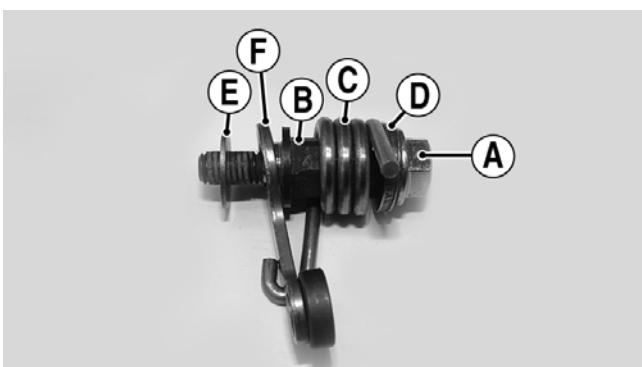


H2-023

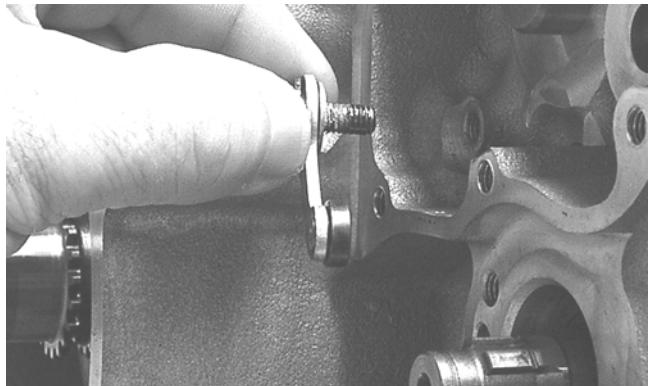


GZ254

4. If removed, install the shim (E) and cam stopper (F); then with the cam stopper support (B) in place, install the spring (C), washer (D), and nut (A). Tighten to 8 ft-lb.



FW-017B



GZ256

5. Install the shift cam stopper spring onto the shift cam stopper and secure with a flat washer and nut. Tighten to 8 ft-lb.



H2-019

6. Install the shift cam plate onto the shift cam shaft and secure with the cap screw. Tighten to 8 ft-lb.

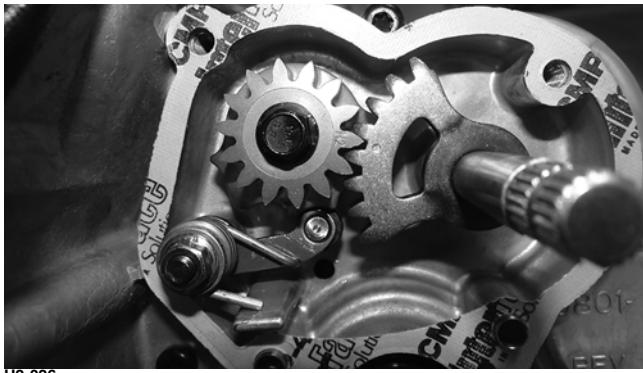


H2-022A

7. Install the shift shaft into the crankcase making sure the washer is properly located; then align the timing reference marks and completely seat the shift shaft.



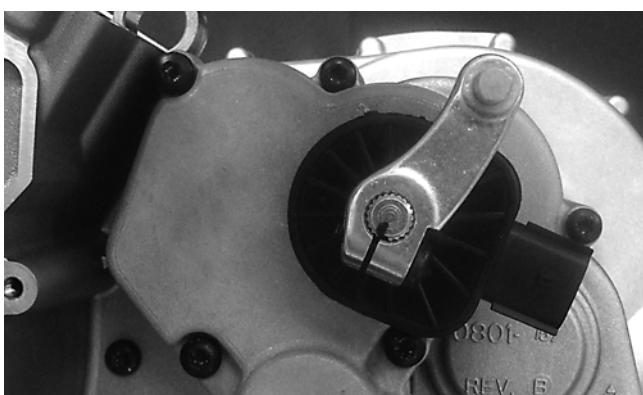
FW-019



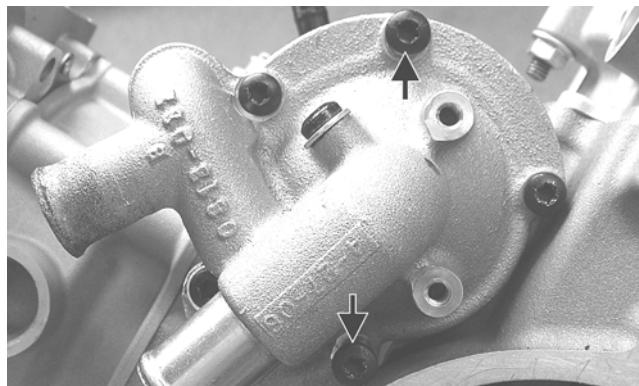
8. Apply grease to the lips of the shift shaft seal in the gear shift cover. Install the dowel pins; then using a new gasket, install the gear shift cover and secure with the cap screws. Tighten in a crisscross pattern to 8 ft-lb.



9. Install the gear position switch; then align and install the shift select arm to the shift shaft with match marks.



10. With the O-ring properly positioned, install the water pump. Secure using the two existing cap screws.

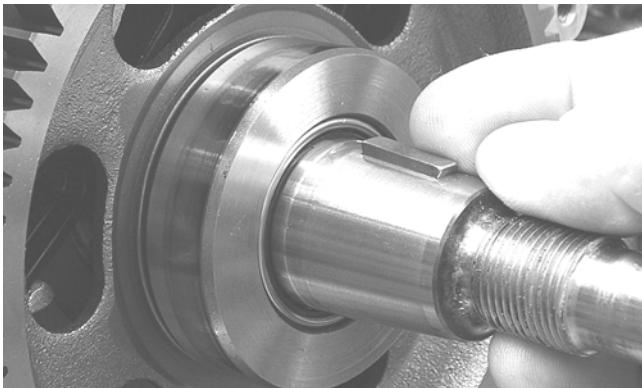


■**NOTE: The longer cap screw goes on the top of the water pump.**

11. Install the coolant hoses and secure with the hose clamps.
12. Install the spacer washer on the crankshaft; then install the starter ring gear.



13. Place the key into the keyway in the crankshaft; then wipe all oil from the crankshaft surface and rotor/flywheel bore and install the rotor/flywheel onto the crankshaft aligning the keyway with the key. Secure with the nut (coated with red Loctite #271) tightened to 107 ft-lb.

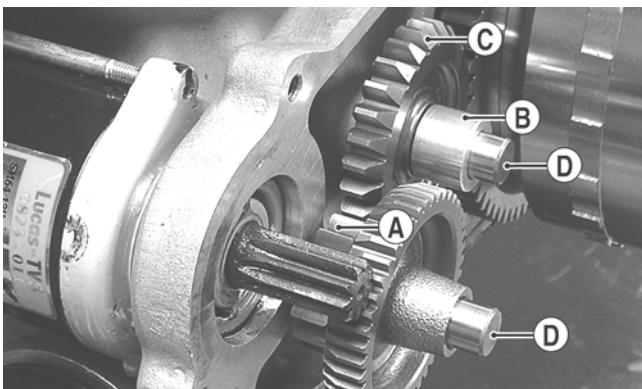


GZ225

### CAUTION

Make sure the one-way starter clutch is properly engaged with the starter ring gear before installing and tightening the rotor/flywheel nut or damage to the clutch assembly could occur.

14. Install the starter driven and counter gear shafts (D) into the crankcase (longer shaft to the front); then install the starter countershaft gear (C), starter driven gear (A), and bushing (B) making sure the chamfered gear teeth on the countershaft gear are directed outward.



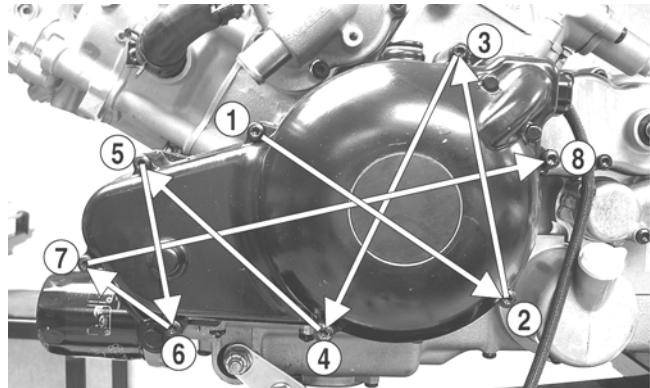
GZ224A

15. Install the starter motor with a new O-ring lightly lubricated with grease; then tighten the mounting cap screws to 10 ft-lb.



GZ251

16. Using Seal Protector Tool, install the outer magneto cover using a new gasket and secure with the cap screws. Using the pattern shown, tighten to 8.5 ft-lb.



GZ212B

## Right-Side Components

■NOTE: For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

### AT THIS POINT

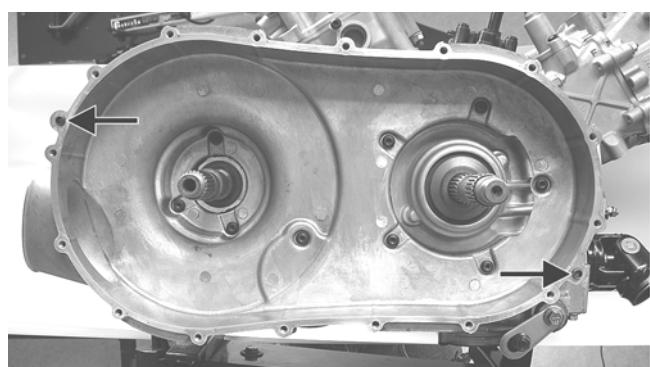
To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■NOTE: The engine/transmission does not have to be removed from the frame for this procedure.

## Removing Right-Side Components

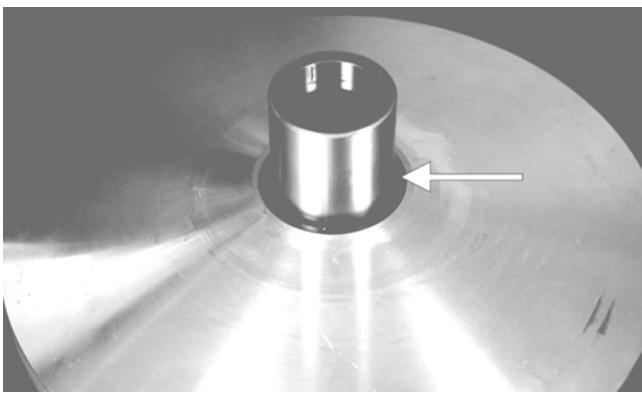
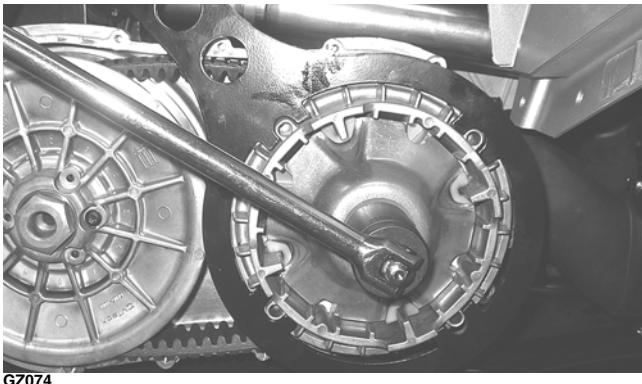
- A. CVT Cover**
- B. Driven Clutch**
- C. Clutch Cover**
- D. Centrifugal Clutch**

1. Remove the cap screws securing the CVT cover; then using a rubber mallet, gently tap on the cover tabs to loosen the cover. Account for a gasket and two alignment pins.



GZ244B

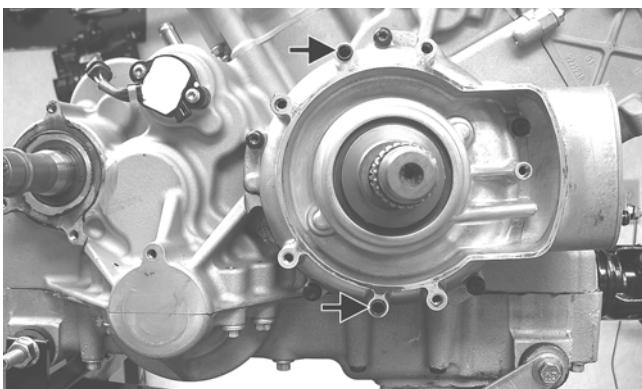
2. Remove the nut securing the movable drive face; then remove the face. Account for a spacer and a flat washer.



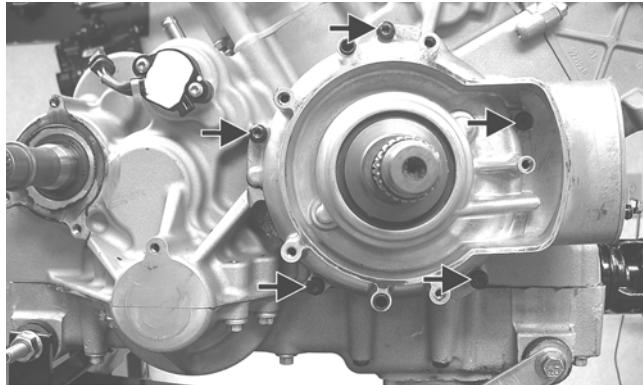
3. Remove the V-belt.
4. Remove the nut securing the fixed driven assembly; then remove the assembly.



5. Remove the fixed drive face.
6. Remove the cap screws securing the V-belt housing to the crankcase; then remove the V-belt housing. Account for two alignment pins.



7. Remove the cap screws securing the clutch cover; then using a rubber mallet, carefully remove the cover. Account for two alignment pins.



8. Using a suitable press, remove the clutch housing from clutch cover, account for fixed drive face spacer and O-ring.



CC596

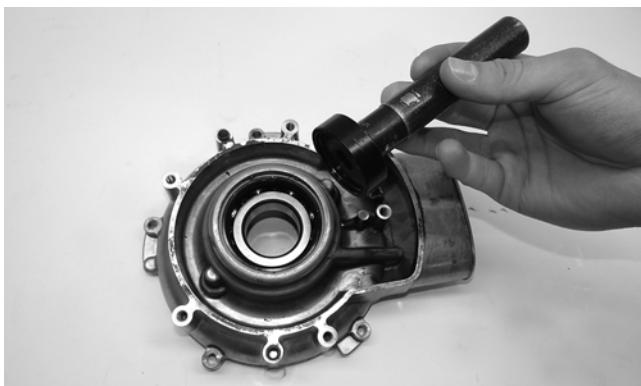
9. Remove and retain the two machine cap screws, and bearing retainers.





GZ500

10. Using a suitable press remove the bearing from the clutch cover.



GZ507

11. Carefully remove the existing clutch housing seal using caution not to damage the sealing surface of the cover.



GZ513

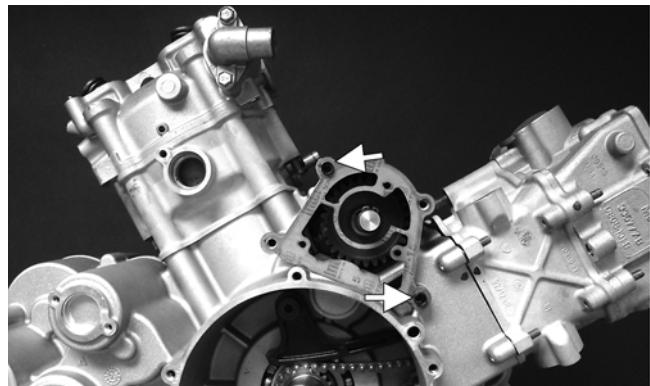
12. Remove the one-way clutch from the centrifugal clutch. Note the location of the green dot (or the word OUTSIDE) for installing purposes.
13. Remove the nut (left-hand threads) securing the clutch shoe assembly.



GZ438A

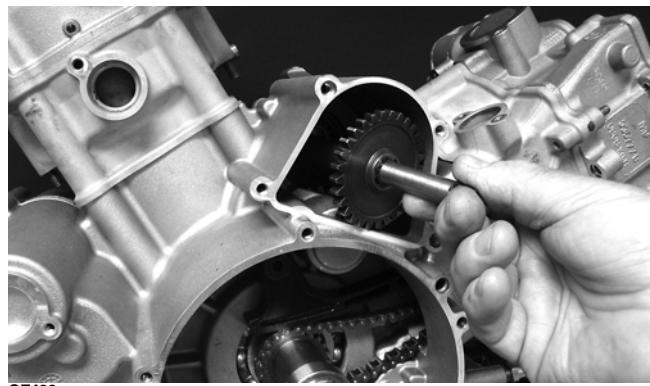
■**NOTE: Heating the nut will aid in removal.**

14. Remove the two cap screws securing the gear position switch; then remove the switch.
15. Remove the water pump drive housings. Account for a gasket and two locator pins.



GZ437A

16. Remove the water pump drive shaft and gear assembly from the engine.



GZ439

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## Servicing Right-Side Components

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### INSPECTING CENTRIFUGAL CLUTCH SHOES

Inspect the clutch shoes for wear, chips, cracks, damage, or discoloration. If any shoe is damaged, replace the centrifugal clutch.

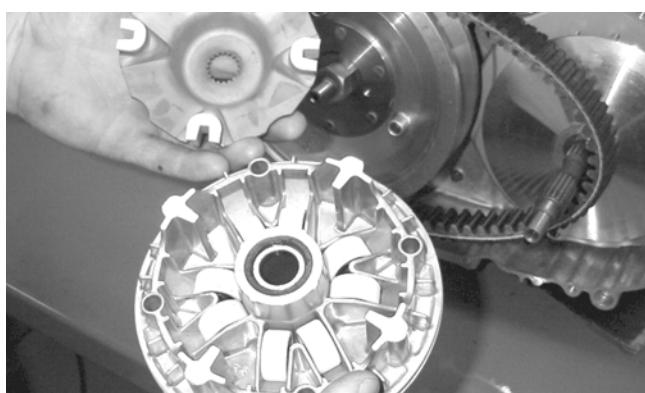
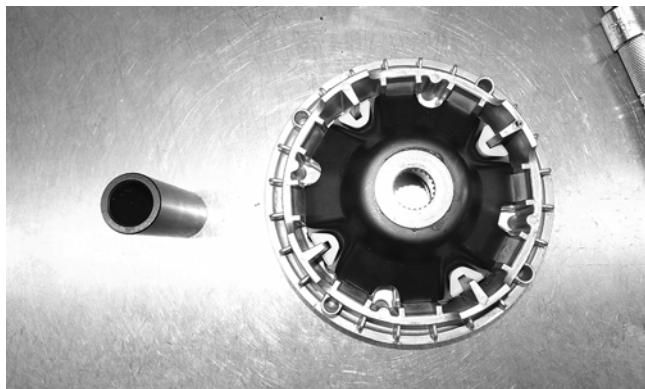
## INSPECTING CLUTCH HOUSING

1. Inspect the clutch housing for burns, grooving, cracks, or uneven wear.
2. If the housing is damaged in any way, the housing must be replaced.

## DRIVE CLUTCH ASSEMBLY

### Disassembling and Inspecting

1. Slide the sheave plate out of the movable drive sheave. Make note of each drive face plate damper orientation before removing. Check for excessive wear, warping or any cracks. Replace as necessary. Check the internal splines of the sheave plate for excessive or abnormal wear. Inspect the roller surface of the sheave plate for abnormal wear or pitting. Replace as necessary.



2. Note the roller locations; then remove the rollers. Check for flat spots or abnormal wear. Measure the outside diameter; standard measurement is 30 mm. If excessively worn, replace as necessary.



3. Check the internal bushing of the movable drive sheave and surface of the spacer. Replace as necessary. Check the fixed drive sheave internal splines for excessive wear. Check for any broken cooling fins and replace as necessary.

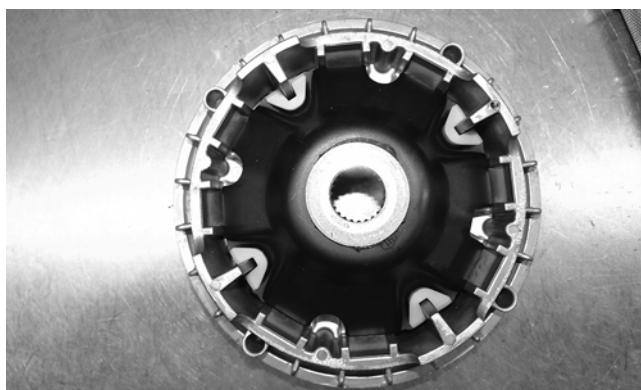


### Assembling

1. Install the fixed drive sheave to the centrifugal clutch housing shaft.



2. As noted during disassembling, place each roller into each valley of the movable drive sheave. With the dampers installed onto the sheave plate, install the sheave plate into the movable drive sheave.



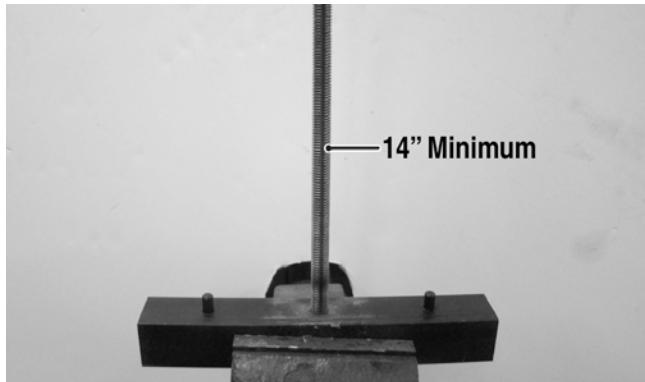
## DRIVEN CLUTCH ASSEMBLY

### Disassembling

1. Secure the clutch spring compressor base in a work vise attached to a stable work table or work bench.

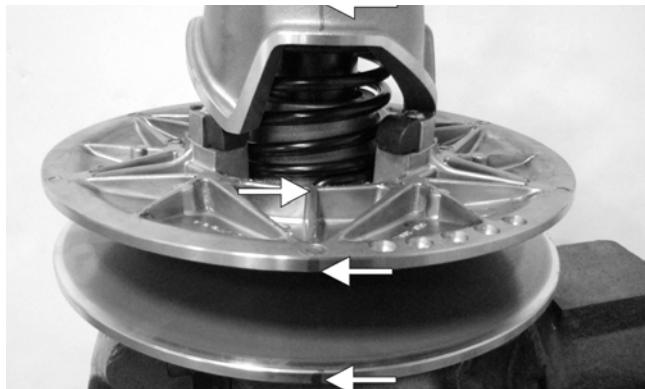
#### **⚠ WARNING**

**Use only a spring compressor tool base with a screw length of 14" or greater or serious injury could occur.**



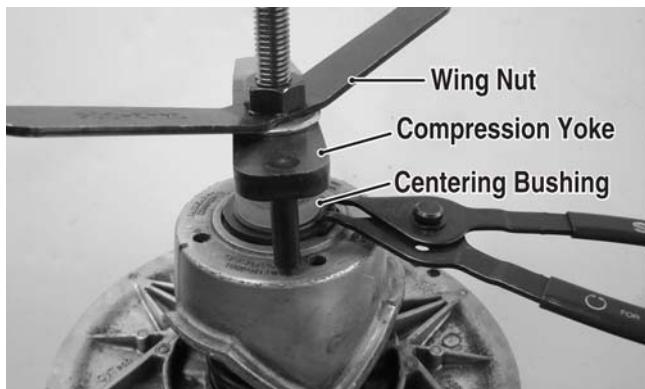
WC422A

2. Place the driven pulley assembly onto the base and mark the fixed sheave, movable sheave, and cam; then note the location of the spring anchors in the movable sheave and cam and mark them for assembly purposes.



WC371A

3. With the centering bushing, compression yoke, and wing nut in place, tighten the wing nut sufficiently to relax pressure on the snap ring and remove the snap ring.



WC418A

4. Turn the wing nut counterclockwise to relax the spring. As the cam clears the key in the fixed driven shaft, there will be a slight clockwise rotation of the cam. This is normal due to spring preload.

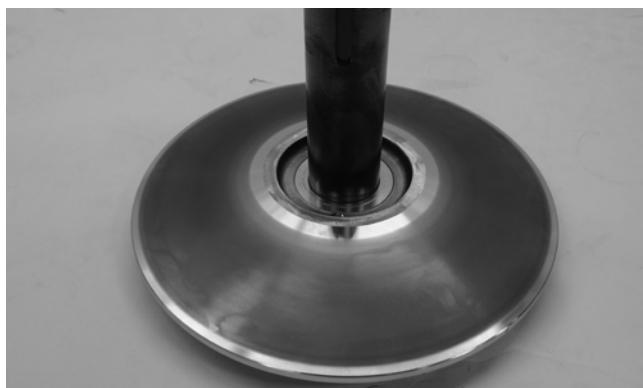
#### **⚠ WARNING**

**If at anytime the cam hangs up or the tool feels slack and the spring is not completely extended, stop and determine the cause. Failure to do so could result in the driven pulley assembly suddenly coming apart and severe injury or death could occur.**

5. Completely relax the spring until all pressure is removed from the compression yoke; then remove the wing nut, compression yoke, snap ring, and centering bushing.
6. Remove the cam and spring; then remove the movable driven sheave. Account for a square key.
7. Remove the fixed driven sheave from the compression tool base.

### Inspecting

1. Inspect the sheave faces for cracks, grooving, or "checking."



WC381



WC383

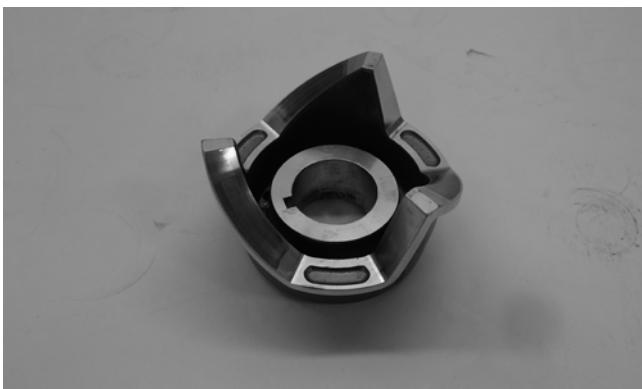
2. Inspect the cam shoes on the movable driven sheave for chipping, excessive scoring, or general condition.



WC384A

■**NOTE:** Always replace the cam shoes as a complete set.

3. Inspect the cam ramp faces for galling, scoring, or excessive wear.



WC382

4. Inspect the key and keyways in the cam and fixed driven sheave for excessive wear.
5. Inspect the wear bushings in the movable driven sheave for wear or loose fit in the sheave. Replace as a set.



WC383A

6. Inspect the spring for kinks by rolling on a flat surface. The spring should roll freely with no irregularities.
7. Inspect spring ends and spring anchors in cam and movable driven sheave for wear or enlarged spring anchor holes.

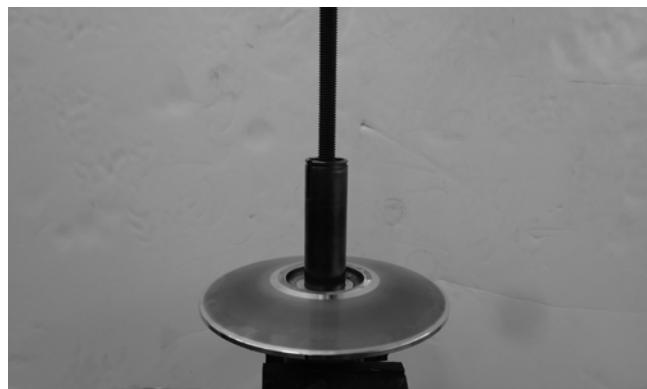
■**NOTE:** If any of the components fail the above inspection, the driven pulley must be replaced.

## Assembling

### ⚠ WARNING

The clutch assemblies are under extreme spring pressure, and only experienced technicians using the proper tools should perform service on these components. Failure to follow proper procedures could result in serious injury or death. Always wear safety glasses and observe proper shop techniques. Keep bystanders clear of work area at all times.

1. Clamp the Clutch Spring Compressor in a suitable work vise; then set the fixed driven sheave on the base.



WC387

2. Install the movable driven sheave onto the fixed sheave shaft and align the match marks.



WC388

3. Install the spring over the hub of the movable driven sheave engaging the spring into the previously marked spring anchor hole.



WC391A

4. Place the cam over the spring and align the spring tip to the previously marked anchor hole.



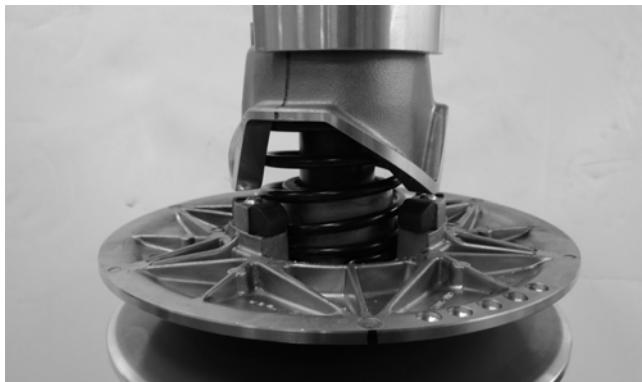
WC753

5. Install the centering bushing into the fixed driven hub; then with the sharp side upward, place the snap ring onto the assembly and install the compression yoke and wing nut.



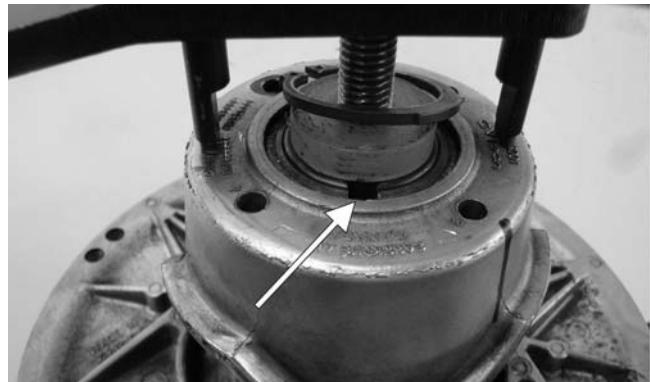
WC414

6. Turn the wing nut clockwise to compress the spring being very careful that the cam correctly engages the fixed driven hub; then continue to tighten until the cam ramps are just above the cam shoes.



WC398

7. Rotate the cam counterclockwise by hand enough to get the cam ramps on the correct side of the cam shoes; then continue to tighten the wing nut until the keyways align.



WC411A

8. Install the square key making sure it fits flush and clear of the snap ring groove; then install the snap ring making sure it is seated properly.



WC412



WC419

9. Turn the wing nut counterclockwise slowly allowing the cam to contact the snap ring; then loosen slightly and tap the cam with a plastic mallet to ensure the snap ring is securely seated.



WC408

10. Remove the wing nut, compression yoke, and centering bushing; then remove the driven pulley assembly from the Clutch Spring Compressor.

## WATER PUMP DRIVE ASSEMBLY

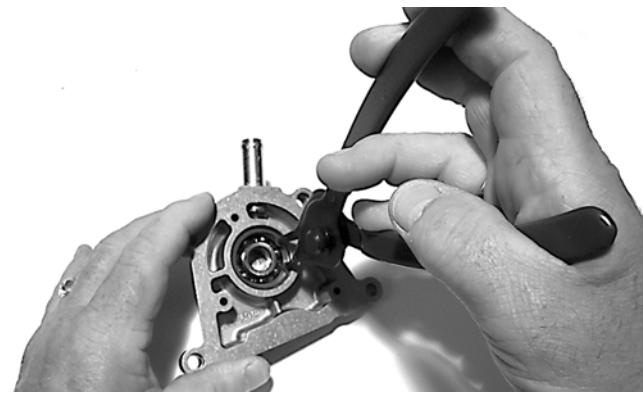
### Disassembling

1. Remove the two snap rings from the driveshaft; then remove the gear and drive pin noting the orientation of the gear for proper assembly.



GZ442

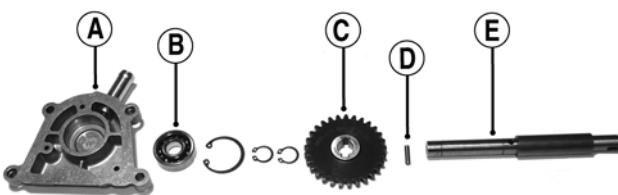
2. Remove the snap ring securing the bearing in the water pump drive cover; then remove the bearing using an appropriate blind bearing remover.



GZ441

### Inspecting

1. Inspect the water pump drive housing (A) for scoring or discoloration.



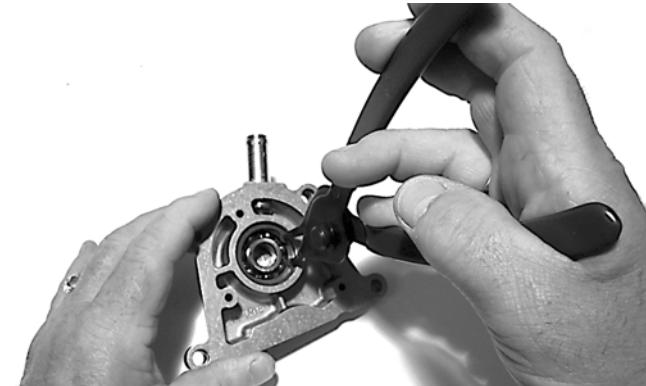
GZ440A

2. Inspect the bearing (B) for smooth rotation and no discoloration or scoring.

3. Inspect the gear (C) for chipped or missing teeth, excessive hub wear, or excessive wear in the drive pin slot.
4. Inspect the drive pin (D) and driveshaft (E) for excessive wear or looseness.

### Assembling

1. Install the bearing in the water pump drive cover and secure with the snap ring (flat side away from the bearing).



GZ441

2. Install the gear onto the driveshaft noting correct orientation (from step 1 of disassembling).

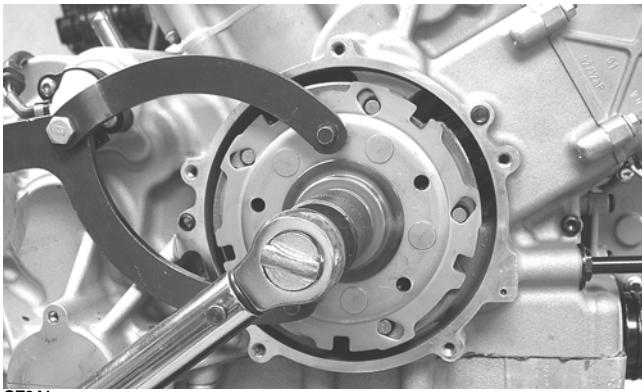


GZ442

3. Install the two snap rings on the driveshaft (flat side away from the gear).

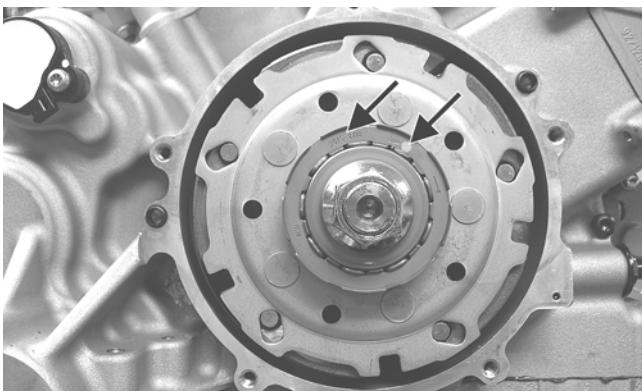
## Installing Right-Side Components

1. Install the clutch shoe assembly and secure with the flange nut (threads coated with red Loctite #271). Tighten to 221 ft-lb.



GZ241

2. Install the one-way clutch onto the clutch shoe assembly.

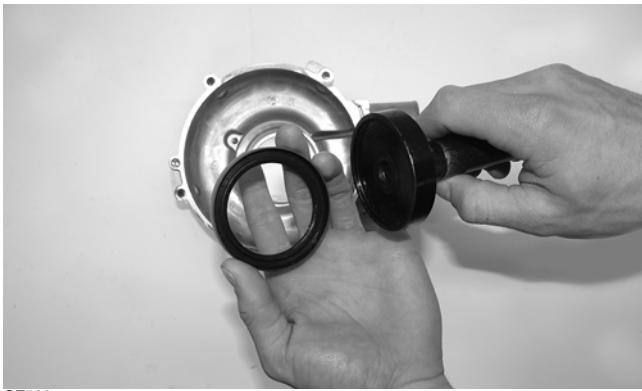


GZ247B

### CAUTION

Make sure the green dot (or the word OUTSIDE) is visible on the one-way clutch. Incorrect installation can result in damage to the engine.

3. Place a new clutch housing seal (with the spring side facing the clutch housing seal tool) into the clutch cover and secure with a rubber mallet or press.



GZ503

4. Using a suitable press, install the bearing into the clutch cover against the outer bearing face.



GZ501

■**NOTE: It is critical to verify the seal on the bearing faces the clutch cover seal before pressing in the new bearing.**

5. Secure the bearing in the clutch cover using existing bearing retainers and machine screws (threads coated with blue Loctite #242). Tighten to 8 ft-lb.



GZ508

6. Press the clutch housing assembly into the clutch cover until it is seated against the bearing.



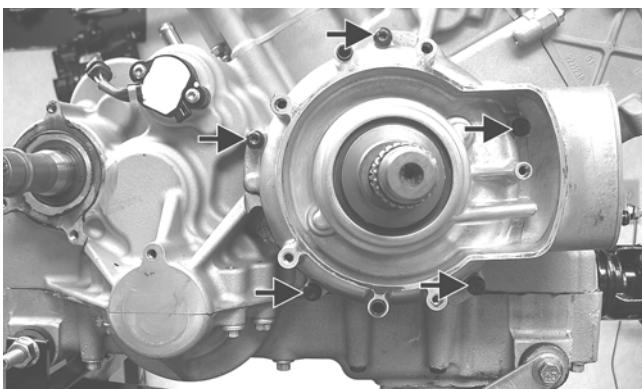
GZ512

7. Install a new O-ring into a new fixed drive spacer, then apply a thin coat of grease to the inner O-ring and outside sealing surface of the drive spacer. Place it over the clutch housing assembly.



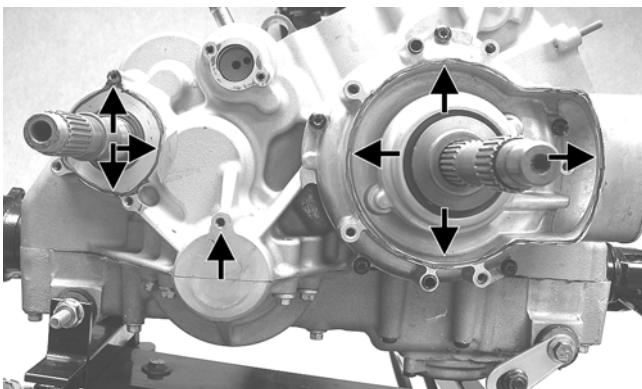
ATV2109

8. Place the clutch cover/clutch housing assembly into position on the crankcase; then secure with the cap screws. Tighten in a crisscross pattern to 10 ft-lb.

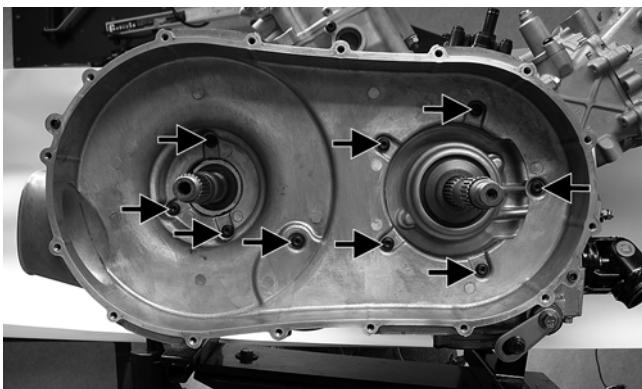


GZ246B

9. Making sure the alignment pins are correctly installed, place a bead of silicone sealant on the mating surfaces and install the V-belt cover. Secure with new "patch-lock" cap screws tightened to 10 ft-lb.



GZ263B



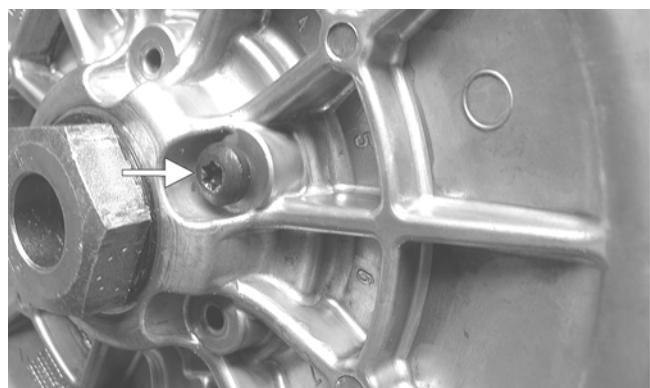
GZ244A

10. Place the driven clutch assembly into position and secure with the nut (coated with red Loctite #271). Tighten to 162 ft-lb.



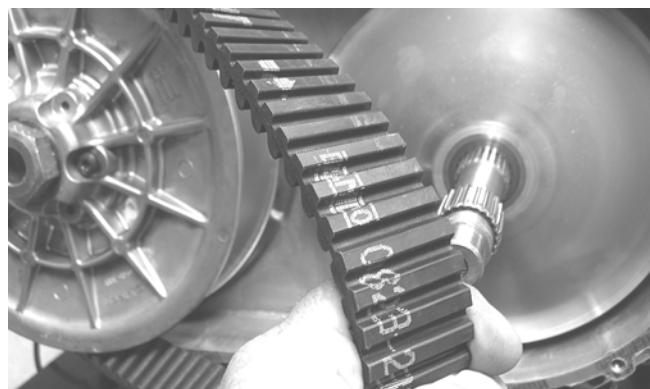
GZ066

11. Slide the fixed drive face onto the clutch shaft.
12. Spread the faces of the driven clutch by threading in a cap screw; then when the faces are separated, insert the belt and push down between the faces.



GZ065A

13. Place the V-belt into position on the driven clutch and over the front shaft.



GZ085

**■NOTE: The arrows on the V-belt should point forward.**

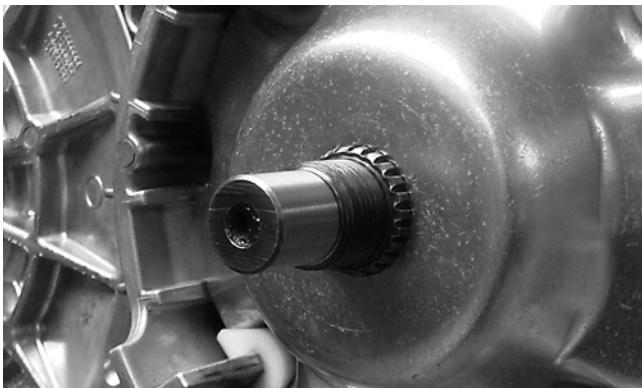
14. Pinch the V-belt together near its center and slide the spacer and movable drive face onto the shaft. Using an appropriate spanner wrench, secure the drive face with a flat washer and new nut. Tighten the nut to 162 ft-lb.



GZ075

### CAUTION

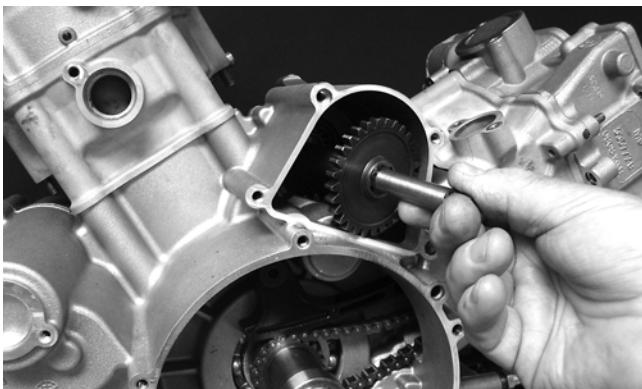
Make sure the movable drive face plate is fully engaged onto the splines of the clutch shaft before tightening the nut or false torque readings may occur. This will cause the assembly to loosen damaging the shaft and clutch face plate.



GZ485

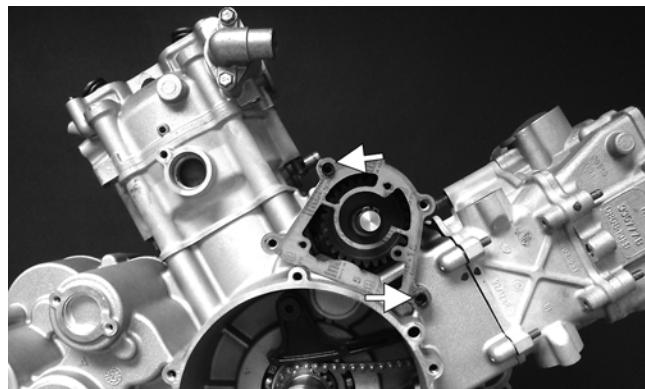
■NOTE: At this point, the cap screw can be removed from between the driven clutch faces.

15. With the engine in neutral, rotate the V-belt and clutches counterclockwise until the V-belt is flush with the top of the driven clutch.
16. Place the CVT cover gasket into position; then install the cover and secure with the cap screws. Tighten the cap screws to 8 ft-lb.
17. Install the water pump drive shaft/gear assembly into the engine.



GZ439

18. Install the two locating pins and a new gasket on the engine; then install the water pump drive housing cover and tighten the cap screws to 8 ft-lb.



GZ437A

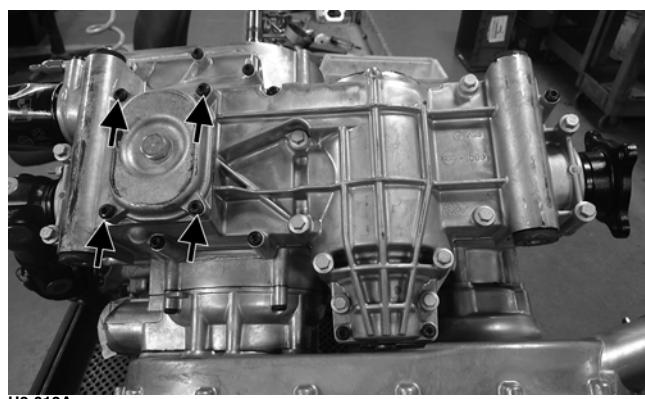
## Center Crankcase Components

■NOTE: This procedure cannot be done with the engine/transmission in the frame. Complete Removing procedures for Top-Side, Left-Side, and Right-Side must precede this procedure.

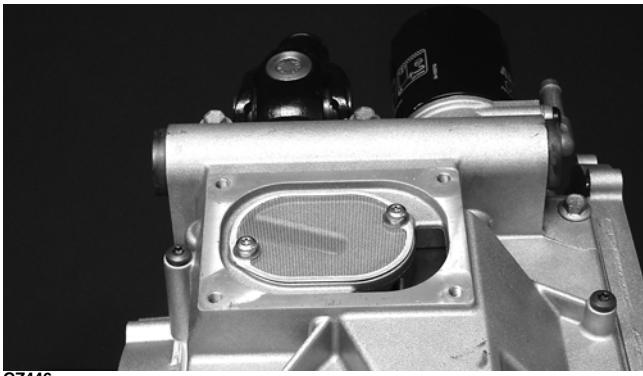
■NOTE: For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

## Separating Crankcase Halves

1. Remove the oil strainer cap; then remove the oil strainer.

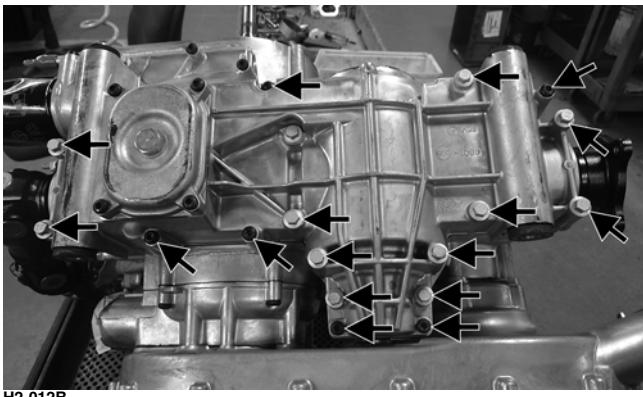


H2-012A



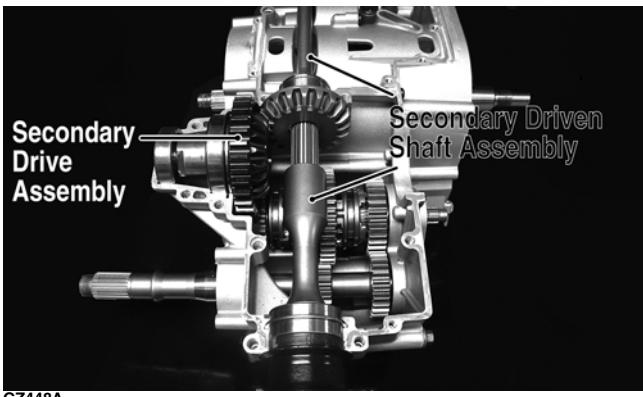
GZ446

2. Remove the cap screws securing the lower crankcase to the upper crankcase halves; then using a rubber hammer, free the lower crankcase and remove. Account for two alignment pins.

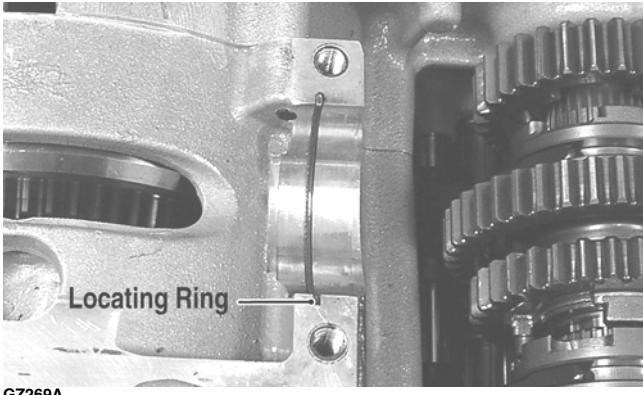


H2-012B

3. Remove the secondary drive assembly; then remove the secondary driven shaft assembly and set aside. Account for one locating ring.



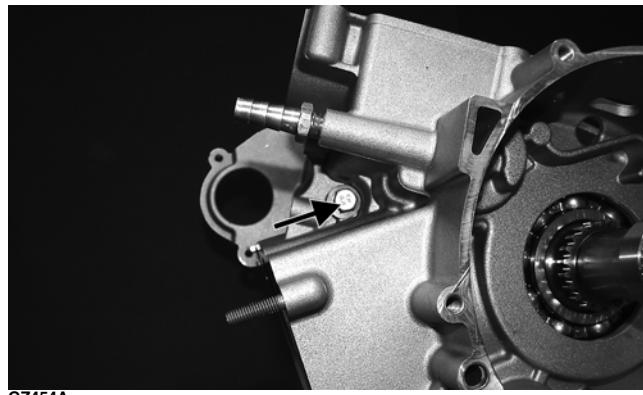
GZ448A



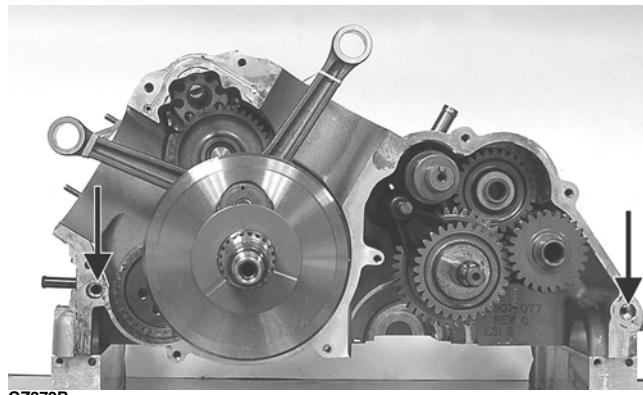
GZ269A

■**NOTE:** Do not disassemble these assemblies unless service is required. If disassembled, secondary gear sets will have to be reset for backlash and gear contact (see Servicing Center Crankcase Components sub-section).

4. Remove one cap screw from the right-side crankcase and eight cap screws from the left-side crankcase; then using a rubber mallet, separate the crankcase halves leaving all components in the right-side case. Account for a thrust washer on the crankshaft and flat washers on gear shift shaft, countershaft, and reverse idler. Note the location of two alignment pins.



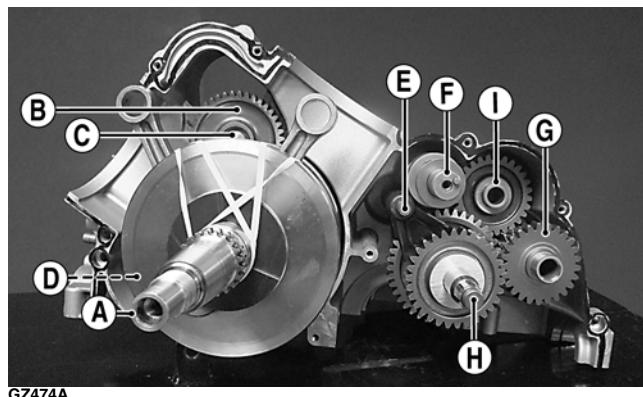
GZ454A



GZ272B

## Disassembling Crankcase Half

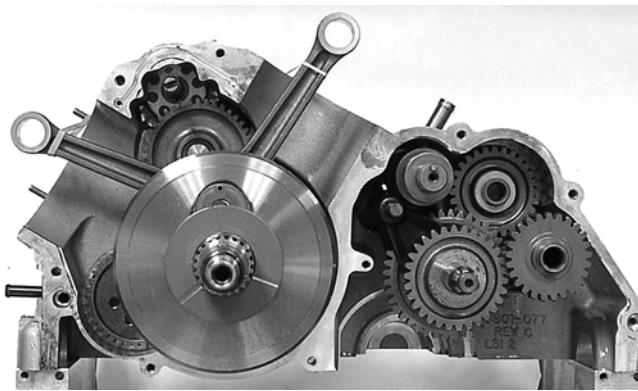
■**NOTE:** For steps 1-8, refer to illustration GZ474A.



GZ474A

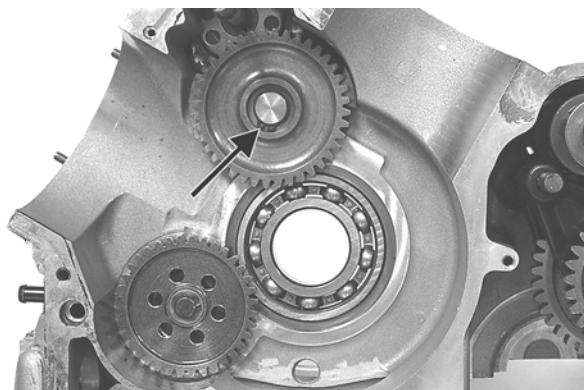
■**NOTE:** To aid in installing, it is recommended the assemblies are kept together and IN ORDER.

1. Support the right-side crankcase assembly on suitable support blocks; then carefully remove the crankshaft assembly (A) from the crankcase.



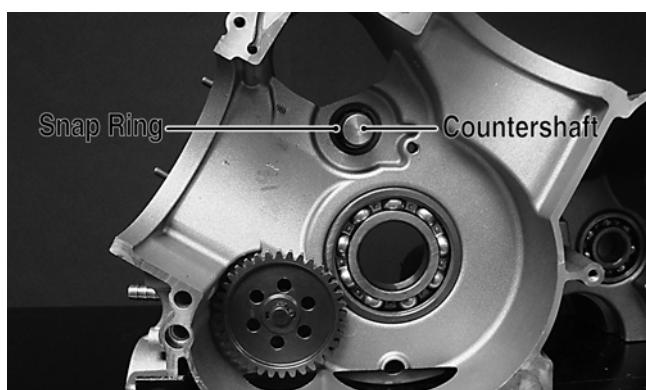
GZ298

2. Remove the snap ring securing the water pump drive idler (B) to the idler shaft; then remove the drive idler.



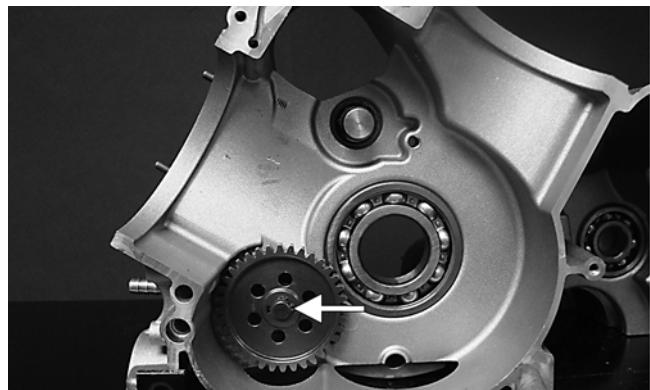
GZ299A

3. Rotate and align the flat surface of the water pump idler shaft towards the open end of the snap ring; then remove the snap ring securing the water pump idler shaft (C) in the crankcase; then remove the shaft and bearings.



GZ463A

4. Remove the snap ring securing the oil pump driven gear (D) to the oil pump driveshaft; then remove the gear. Account for a drive pin and washer.



GZ463B

5. Remove the shift fork shaft (E); then remove the gear shift shaft assembly (F). Account for a flat washer and a spacer.

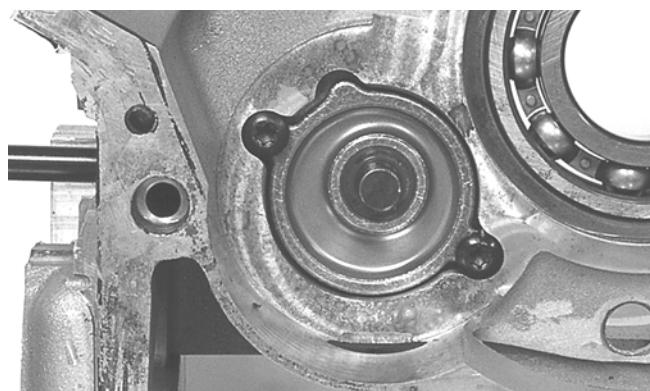


DE677A



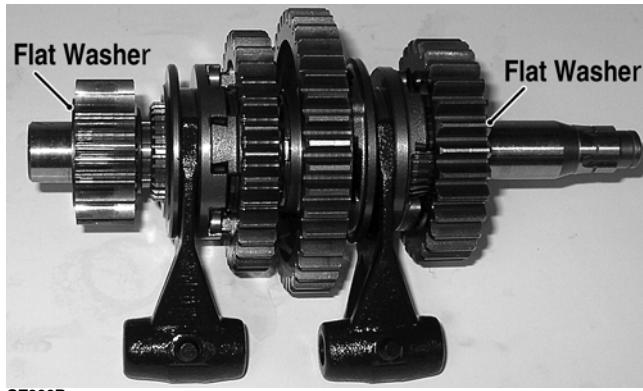
GZ276

6. Remove two cap screws securing the oil pump in the crankcase and remove the oil pump.



GZ305

7. Remove the driveshaft (G); then remove the countershaft assembly (with shift forks) (H). Account for two flat washers on the countershaft.



8. Remove the reverse idler gear (I), shaft bushing, and two washers.



**■NOTE: Do not disassemble the countershaft assembly unless necessary. If necessary, see Servicing Center Crankcase Components sub-section.**

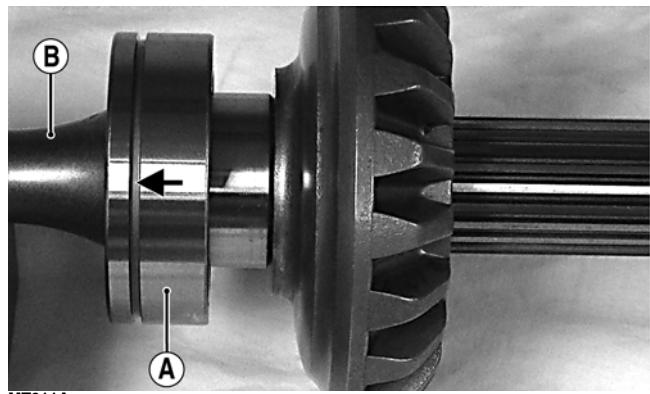
## Servicing Center Crankcase Components

### SECONDARY OUTPUT DRIVE GEARS

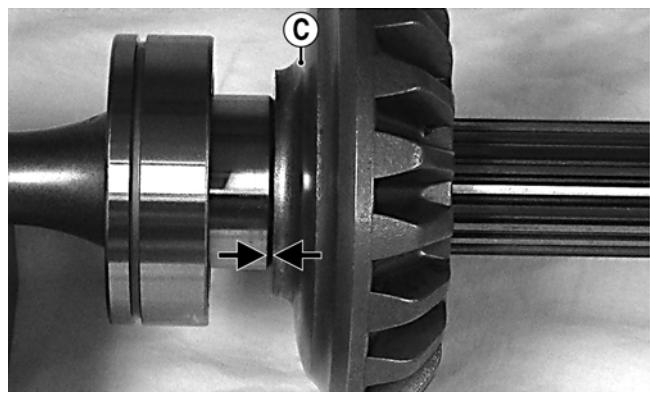
#### Initial Set-Up

**■NOTE: If the secondary output driven shaft is replaced or disassembled, the initial set-up must be performed to establish correct gear tooth contact. If only the secondary output driveshaft or secondary output driven gear are replaced, proceed to Correcting Backlash in this sub-section.**

1. Install a new bearing (A) onto the secondary driven shaft (B) making sure the bearing locating groove is directed away from the driven gear splines.

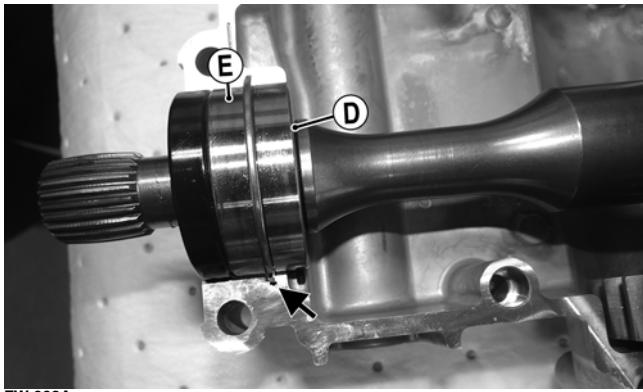


2. Using a suitable press, install the driven gear (C) on the shaft until the gear firmly seats on the shoulder of the shaft.



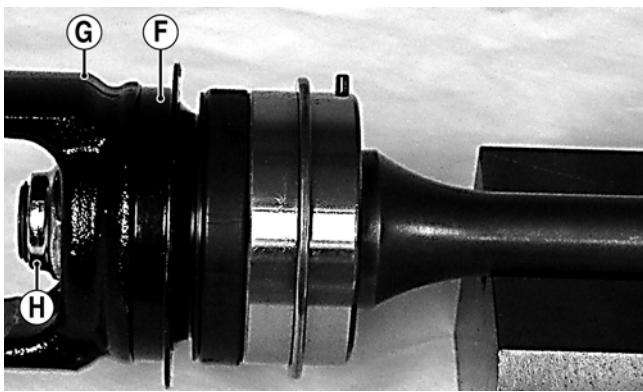
3. If installing the existing shaft, start with the shims removed during disassembly or if installing a new shaft, start with approximately 1.0 mm shims at point (D); then install the output driveshaft bearing (E) making sure the locating pin is directed toward the center of the shaft.





FW-003A

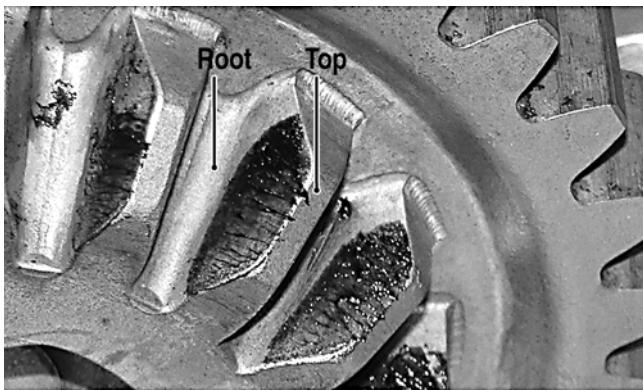
4. Install a new seal (F), output yoke (G), washer, and nut (H) and tighten to 200 ft-lb.



MT008B

■**NOTE: Do not use a new lock nut at this time as this procedure may have to be repeated.**

5. Place the assembled shaft into the left crankshaft case; then lightly coat the gear teeth with machinist's lay-out dye. Rotate the shafts through several rotations in both directions. Gear contact should extend from the root to the top of the gear teeth.



MT016A

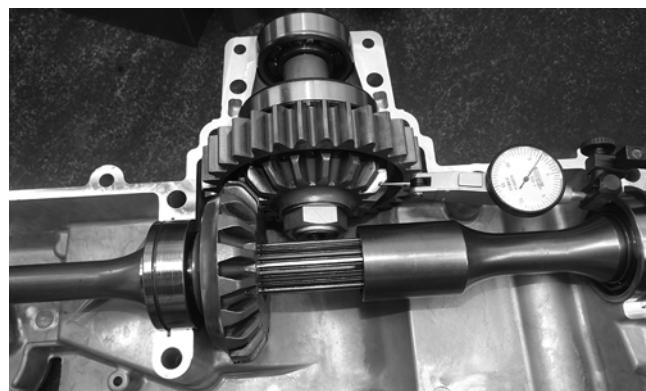
6. To adjust tooth contact, use the following chart to correctly shim the driven shaft.

| Tooth Contact   | Shim Correction         |
|-----------------|-------------------------|
| Contact at Top  | Increase Shim Thickness |
| Contact at Root | Decrease Shim Thickness |

7. After correct tooth contact is established, proceed to Checking Backlash in this sub-section.

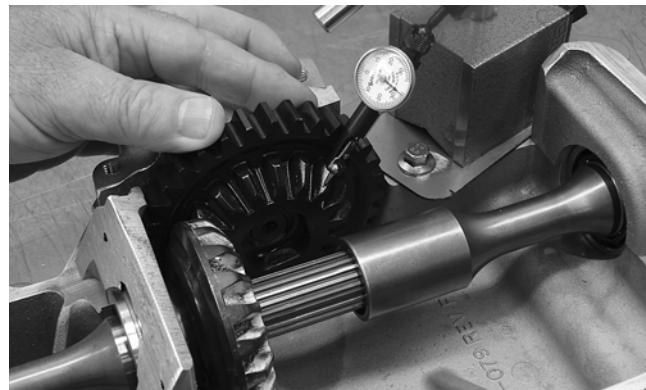
## Checking Backlash

1. Install the drive bevel gear assembly and driven bevel gear/output shaft assembly into the crankcase bottom cover.
2. Mount the dial indicator so the tip is contacting a tooth on the secondary drive bevel gear.



FW-008

3. Firmly hold the bearing down and while rocking the drive bevel gear back and forth, note the maximum backlash reading on the gauge.



GZ398

4. Acceptable backlash range is 0.127-0.381 mm (0.005-0.015 in.).

## Correcting Backlash

■**NOTE: If backlash measurement is within the acceptable range, no correction is necessary.**

1. If backlash measurement is less than specified, remove an existing shim, measure it, and install a new thinner shim.



GZ393A

2. If backlash measurement is more than specified, remove an existing shim, measure it, and install a thicker shim.

**■NOTE: Continue to remove, measure, and install until backlash measurement is within tolerance. Note the following chart.**

| Backlash Measurement                | Shim Correction         |
|-------------------------------------|-------------------------|
| Under 0.127 mm (0.005 in.)          | Decrease Shim Thickness |
| At 0.127-0.381 mm (0.005-0.015 in.) | No Correction Required  |
| Over 0.381 mm (0.015 in.)           | Increase Shim Thickness |

3. Once correct gear pattern and backlash are established, install a new lock nut (coated with red Loctite #271) on the output yoke and tighten to 200 ft-lb. Peen the lock nut to the shaft.



GZ393

4. Using an appropriate holding fixture and wrench adapter, install the secondary drive gear nut (threads coated with red Loctite #271) and tighten to 200 ft-lb. The output drive assembly is now ready for installation.

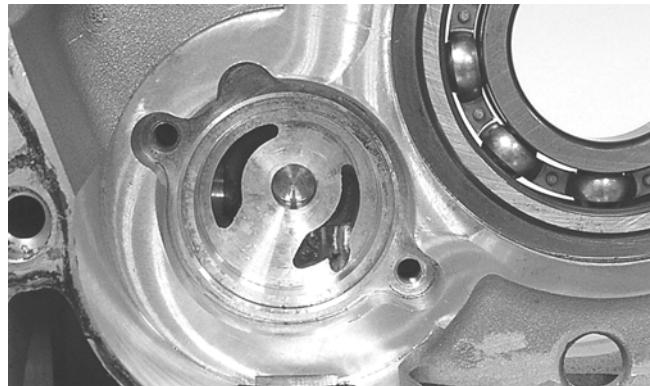


GZ393B

## OIL PUMP ASSEMBLY

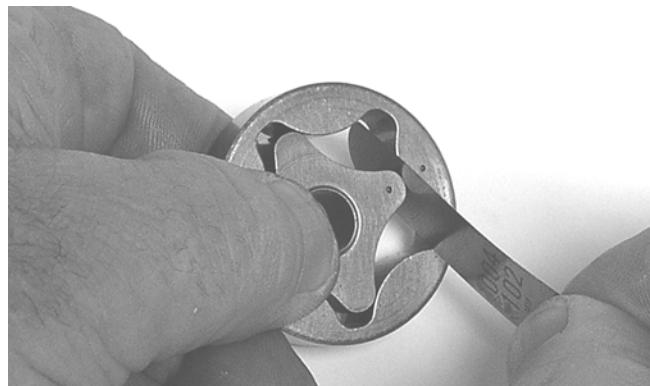
### Disassembling and Inspecting

1. Remove the oil pump cover; then remove the gerotor set, shaft, and pin (see Disassembling Crankcase Half in this sub-section).
2. Inspect the crankcase for scoring, discoloration, or cracks in the gerotor bore. If scored, crankcase assembly must be replaced.



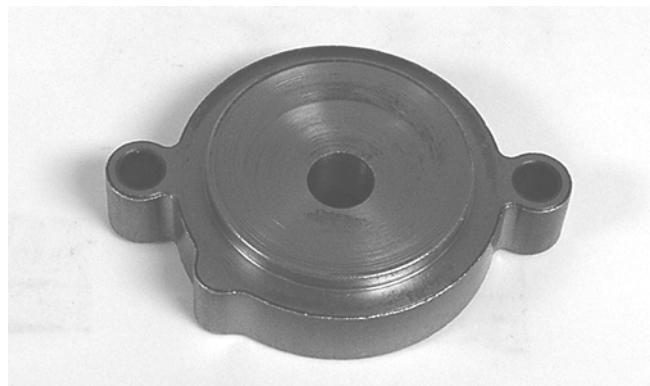
GZ357

3. Inspect the gerotor set for scoring, discoloration, or cracks; then using a feeler gauge, check the inner to outer rotor clearance. If measurements exceed specifications, the gerotor set must be replaced.



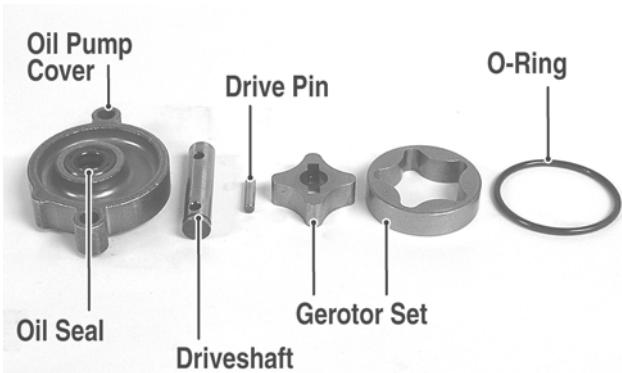
GZ355

4. Inspect the oil pump cover for scoring, discoloration, or cracks. Replace if damaged.



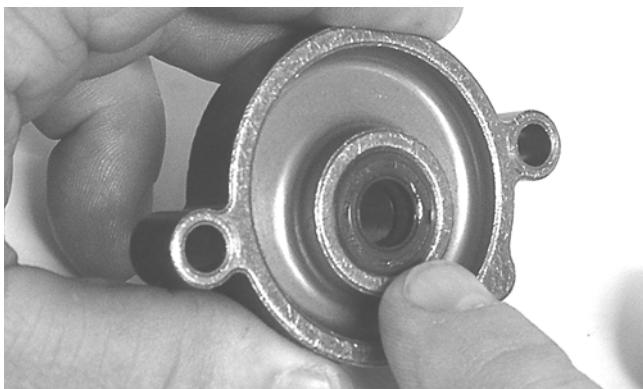
GZ358

5. Inspect the oil pump driveshaft and drive pin for excessive wear or grooving. Replace as required.



GZ354A

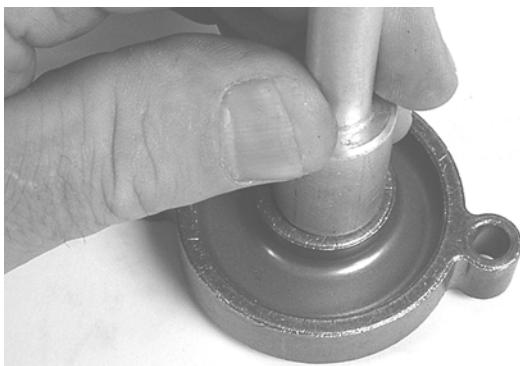
6. Remove the oil seal from the oil pump cover.



GZ365

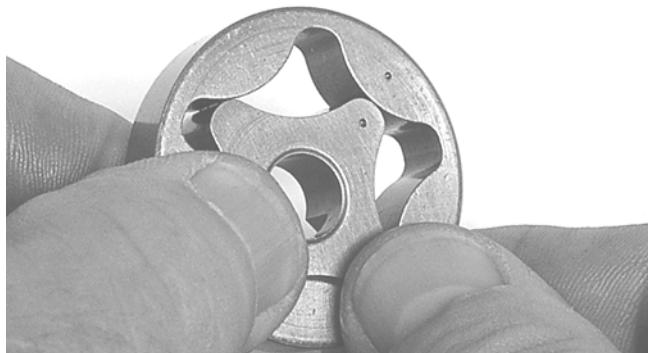
### Assembling

1. Install a new oil seal into the oil pump cover; then coat the lips of the seal with grease and install the pump driveshaft from the seal side.

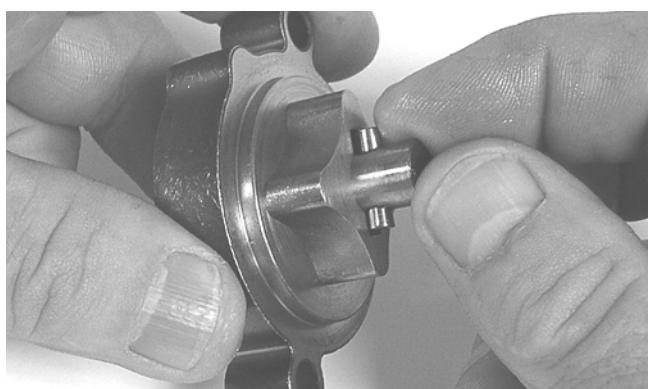


GZ359

2. Noting the reference dots on the gerotor set, separate the inner rotor from the outer rotor and with the reference dot directed toward the oil pump cover, place the rotor on the shaft; then install the drive pin and push the shaft into the rotor.



GZ356



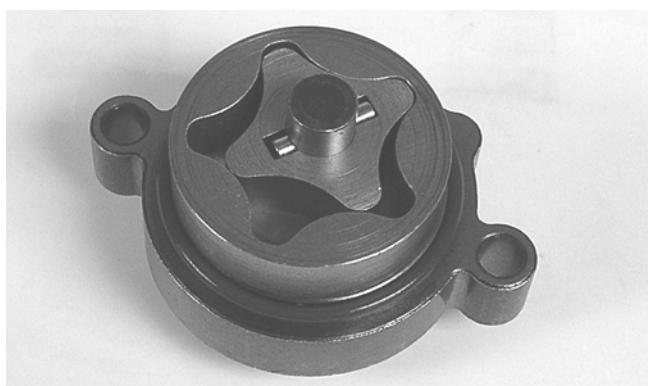
GZ363

3. With the outer rotor reference dot directed toward the oil pump cover, install the rotor onto the inner rotor.



GZ360

4. Place a new O-ring seal on the outside of the oil pump cover. The oil pump assembly is now ready for assembly into the crankcase.



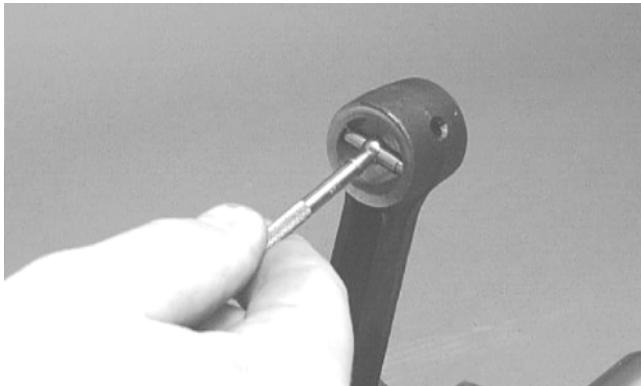
GZ362

## CRANKSHAFT ASSEMBLY

■NOTE: The crankshaft and connecting rod is a non-serviceable assembly. If any component is out of specification, the assembly must be replaced.

### Measuring Connecting Rod (Small End Inside Diameter)

1. Insert a snap gauge into the upper connecting rod small end bore; then remove the gauge and measure it with micrometer.



2. Maximum diameter must not exceed specifications.

### Measuring Connecting Rod (Small End Deflection)

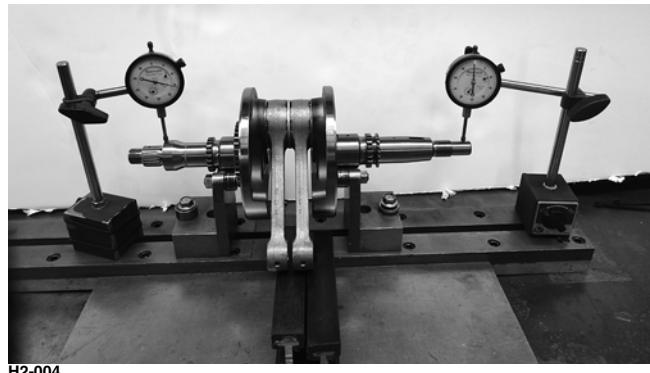
1. Place the crankshaft on a set of V blocks and mount a dial indicator and base on the surface plate. Position the indicator contact point against the center of the connecting rod small end journal.
2. Zero the indicator and push the small end of the connecting rod away from the dial indicator.
3. Maximum deflection must not exceed specifications.

### Measuring Connecting Rod (Big End Side-to-Side)

1. Push the lower end of the connecting rod to one side of the crankshaft journal.
2. Using a feeler gauge, measure the gap between the connecting rod and crankshaft journal.
3. Acceptable gap range must be within specifications.

### Measuring Crankshaft (Runout)

1. Place the crankshaft on a set of V blocks.
2. Mount a dial indicator and base on the surface plate. Position the indicator contact at point 1 of the crankshaft.



3. Zero the indicator and rotate the crankshaft slowly.

#### CAUTION

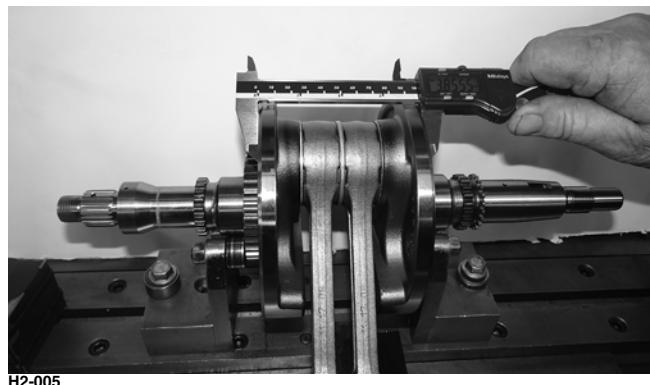
Care should be taken to support the connecting rod when rotating the crankshaft.

4. Maximum runout must not exceed specifications.

■NOTE: Proceed to check runout on the other end of the crankshaft by positioning the indicator contact at point 2 and following steps 3-4.

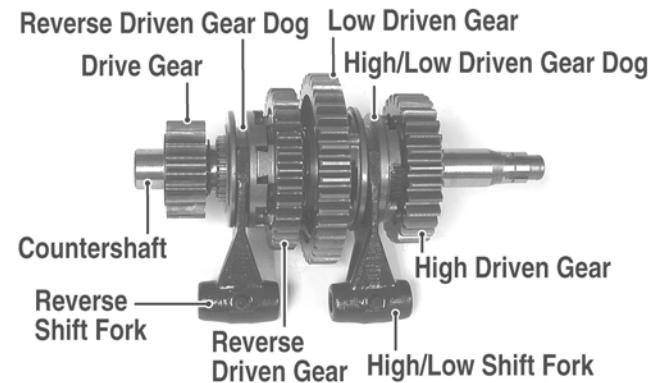
### Measuring Crankshaft (Web-to-Web)

1. Using a calipers, measure the distance from the outside edge of one web to the outside edge of the other web.



2. Acceptable width range must be within specifications.

## COUNTERSHAFT

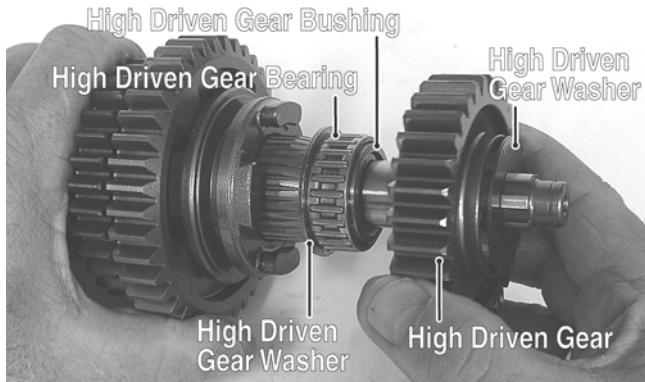


## CAUTION

When disassembling the countershaft, care must be taken to note the direction each major component (dog, gear) faces. If a major component is installed facing the wrong direction, transmission damage may occur and/or the transmission will malfunction. In either case, complete disassembly and assembly will be required.

### Disassembling

1. Remove the shift forks noting the positions for assembling; then remove the high driven gear outer washer, high driven gear, high driven gear bearing, high driven gear bushing, and high driven gear inner washer.

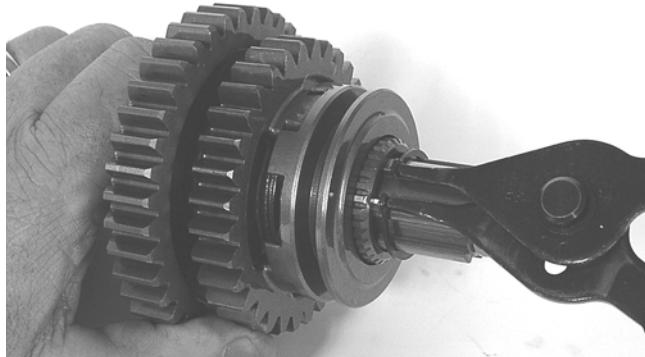


GZ283A

2. Remove the drive gear; then remove the snap ring securing the reverse driven gear dog and bushing to the countershaft.



GZ296



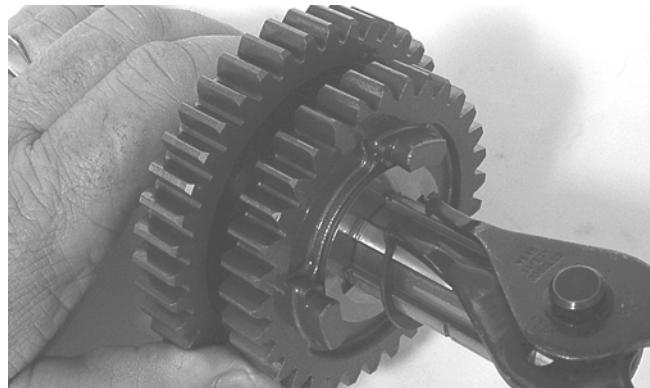
GZ312

3. Remove the reverse driven gear dog.



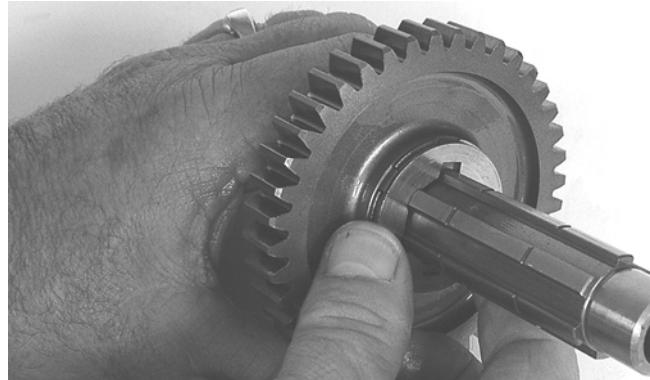
GZ313A

4. Remove the snap ring securing the reverse driven gear and washer; then remove the washer and gear.



GZ314

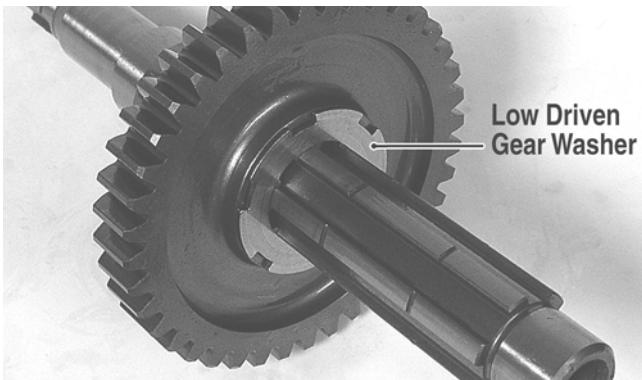
5. Remove the reverse driven washer; then remove the low driven gear locking washer.



GZ320

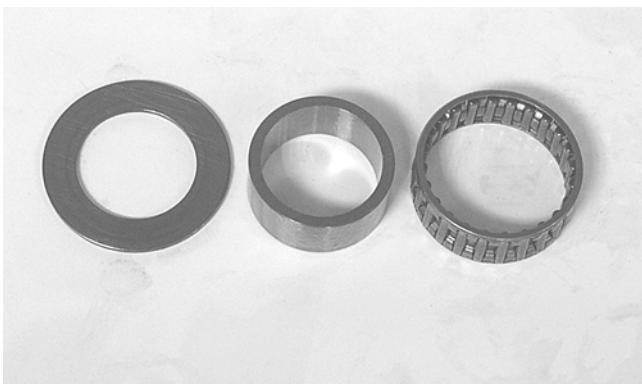


GZ319



GZ318A

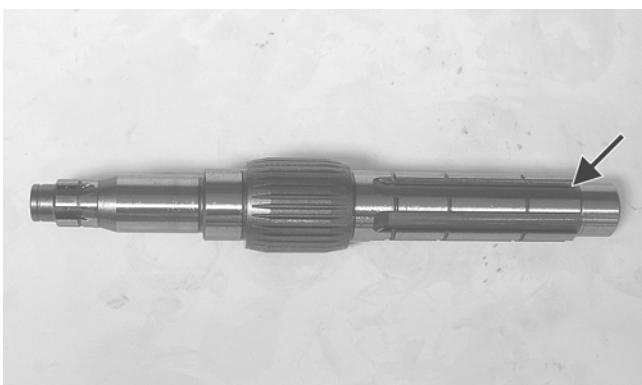
6. Remove the low driven gear. Account for a bearing, bushing, and thrust washer.



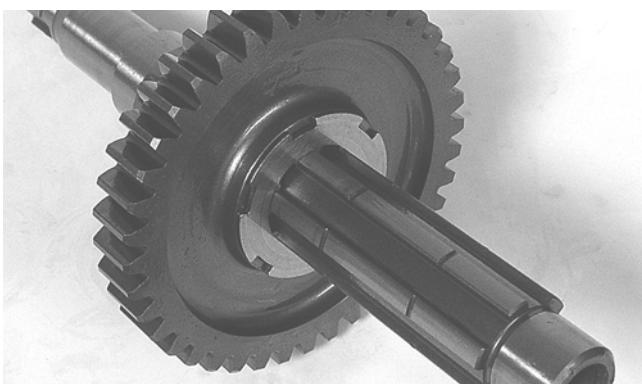
GZ316

## Assembling

1. From the drive gear end, install a thrust washer, bushing, and bearing; then install the low driven gear and washer.

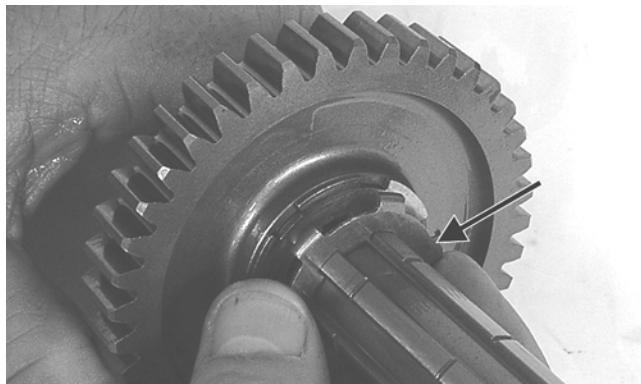


GZ317A



GZ318

2. Install the low driven gear locking washer; then install the inner reverse driven gear washer.

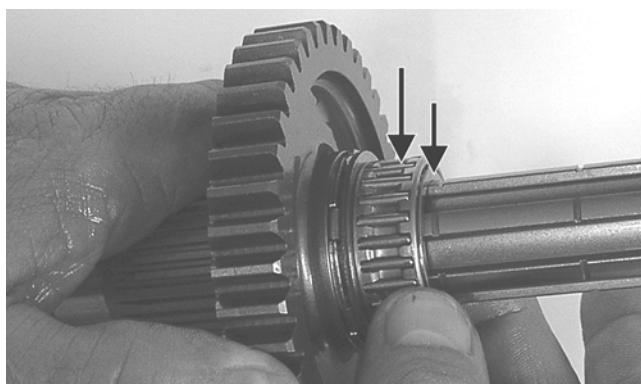


GZ319B



GZ320B

3. Install the reverse driven bushing and bearing; then install the reverse driven gear.

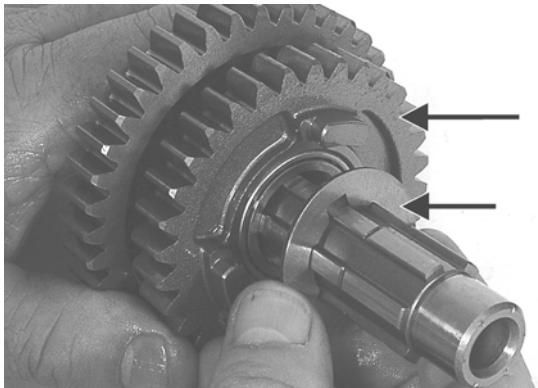


GZ286A



GZ287

4. Install the outer reverse driven washer; then secure the reverse driven gear assembly with a snap ring.



GZ288A

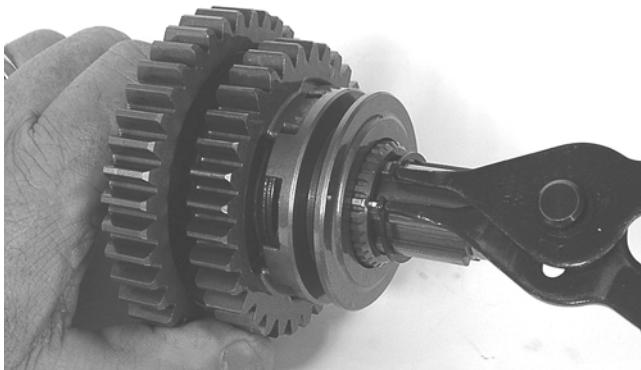


GZ314

5. Install the reverse driven gear dog onto the countershaft and secure with a snap ring.

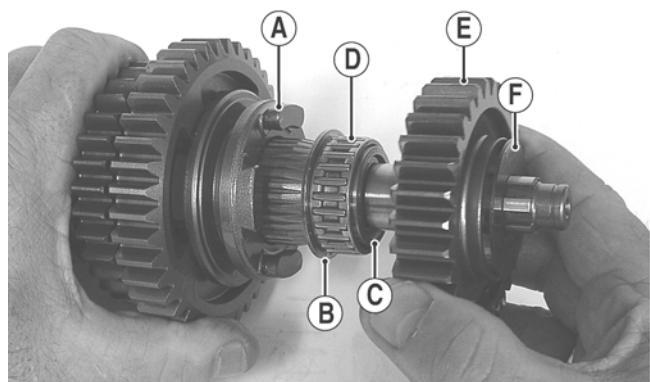


GZ313A



GZ312

6. From the opposite end of the countershaft, install the high/low driven gear dog (A), thrust washer (B), bushing (C), bearing (D), high/low driven gear (E), and spacer washer (F).

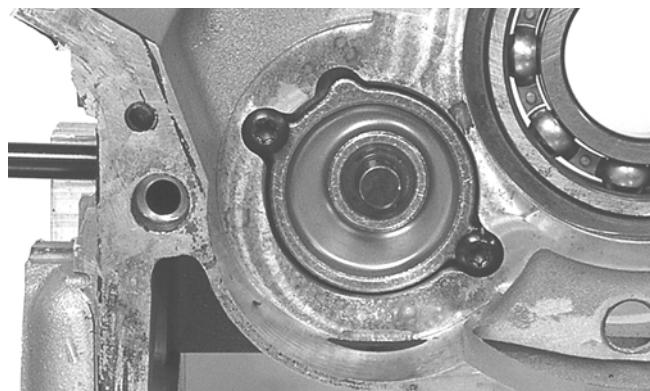


GZ283B

7. Install the drive gear washer and the shift forks. The countershaft is now ready for installation.

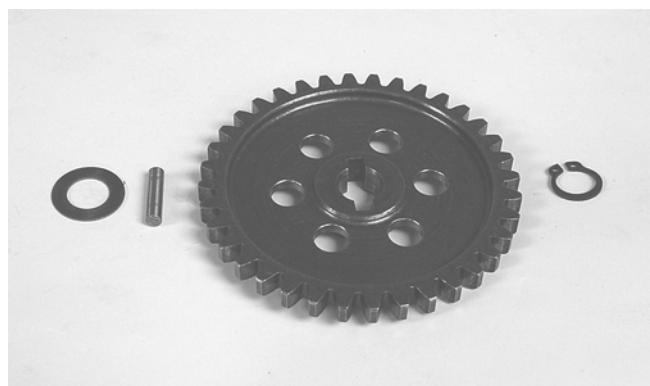
## Assembling Crankcase Half

1. Install the oil pump gerotor assembly and oil pump cover into the crankcase and secure with two cap screws. Coat the threads with blue Loctite #243 and tighten securely to 8 ft-lb.



GZ305

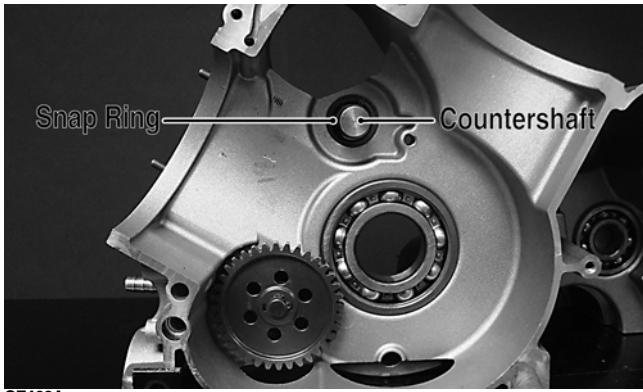
2. Install a flat washer, drive pin, and drive gear onto the oil pump shaft; then secure with a snap ring (flat-side away from the gear).



GZ347

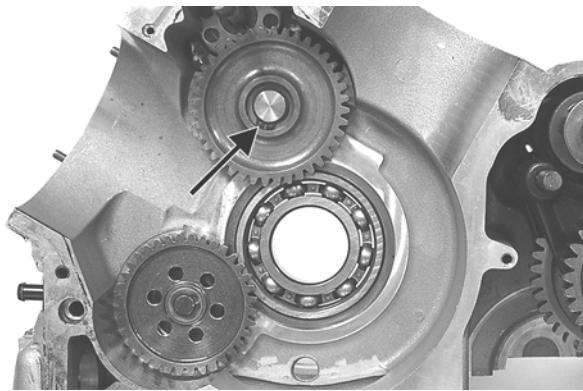
3. Install the countershaft into the crankcase and secure with the snap ring (flat side away from the bearing).

**■NOTE: To aid in installation, install the open end of the snap ring over the flat surface of the water pump countershaft.**



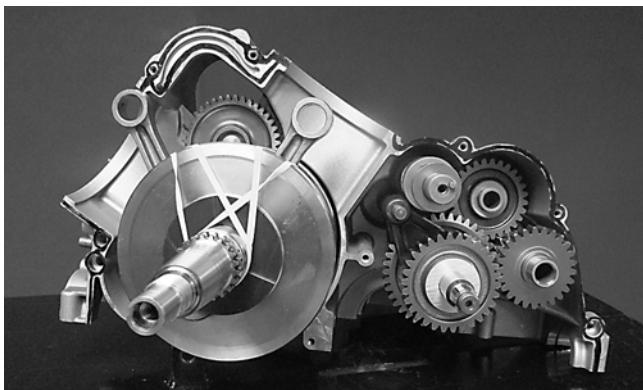
GZ463A

4. Install the countershaft gear onto the countershaft and secure with a snap ring (flat-side away from the gear).



GZ299A

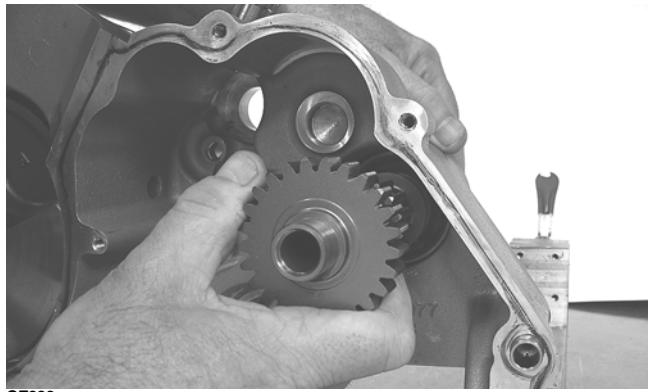
5. Using rubber bands to support the connecting rods, carefully install the crankshaft assembly into the crankcase.



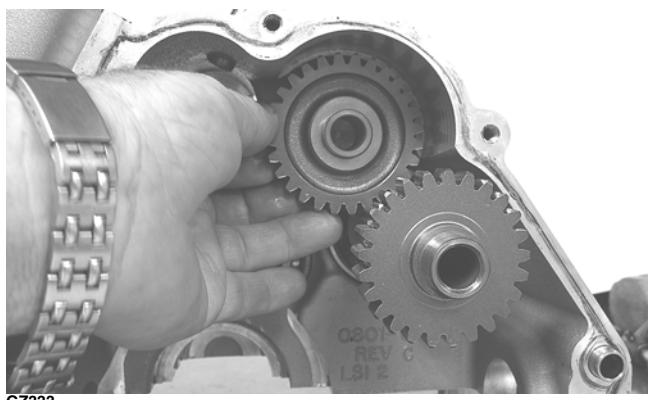
GZ474

**■NOTE: It will be necessary to rotate the crankshaft back and forth to engage the teeth of the oil pump and countershaft gears.**

6. Install the driveshaft; then with a flat washer on each end of the reverse idler assembly, install into the crankcase.



GZ332

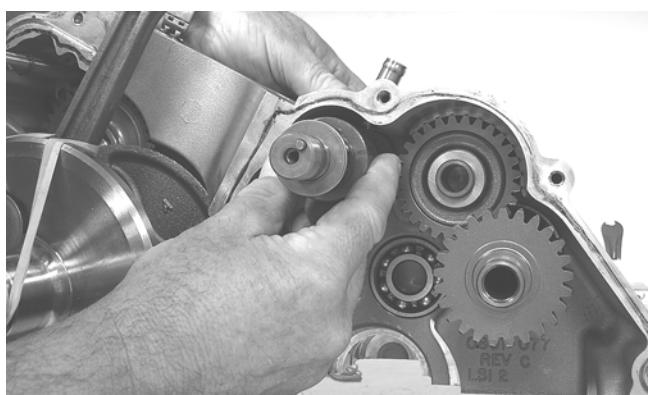


GZ333

7. Install the gear shift shaft into the crankcase making sure the flat washer is in place on the right case end and the spacer bearing assembly on the gear shift stop end.

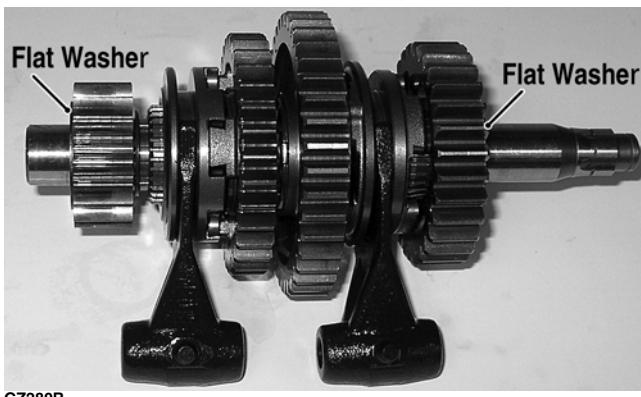


DE677A



GZ335

8. Place the larger flat washer on the drive gear end of the countershaft and the smaller flat washer on the high driven gear end; then with shift forks and shift fork shaft, install the countershaft assembly into the crankcase.

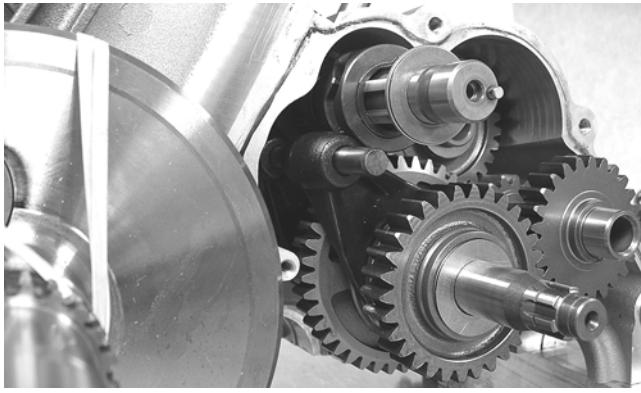


GZ280B



GZ336

9. Engage the shift forks into the gear shift shaft and push the shift fork shaft into the crankcase.



GZ339

#### ☞ AT THIS POINT

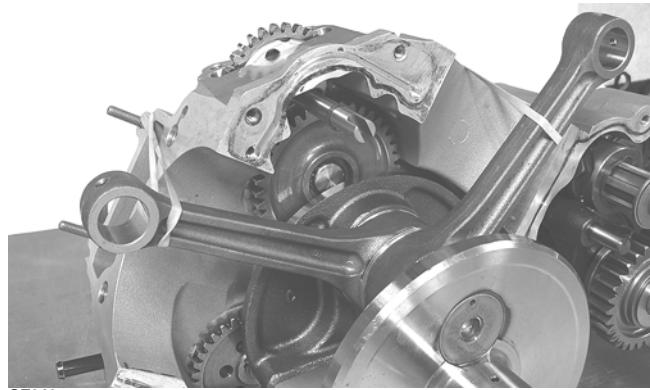
Proper transmission shifting should be verified by turning the gear shift shaft to select High, Low, Neutral, and Reverse while rotating the input shaft and observing the countershaft rotation.

#### ☞ AT THIS POINT

The right-side crankcase is now ready for installation to the left-side crankcase. Proceed to Joining Crankcase Halves.

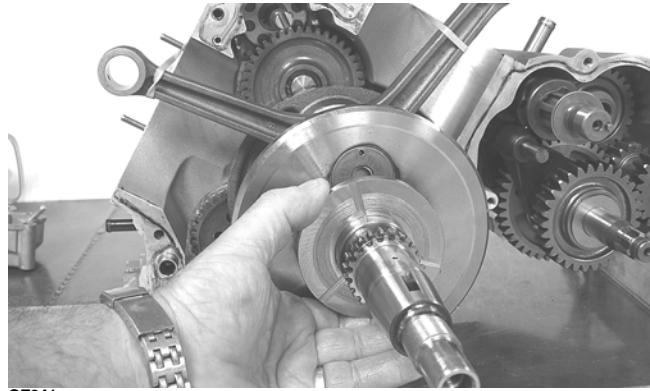
## Joining Crankcase Halves

1. Using rubber bands, support the connecting rods to align with the cylinder bores.



GZ340

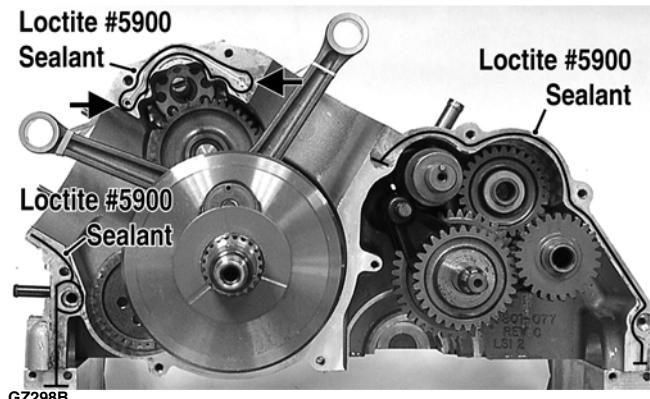
2. Coat both sides with engine oil; then install the spacer washer on the crankshaft with the radius directed toward the crankshaft.



GZ341

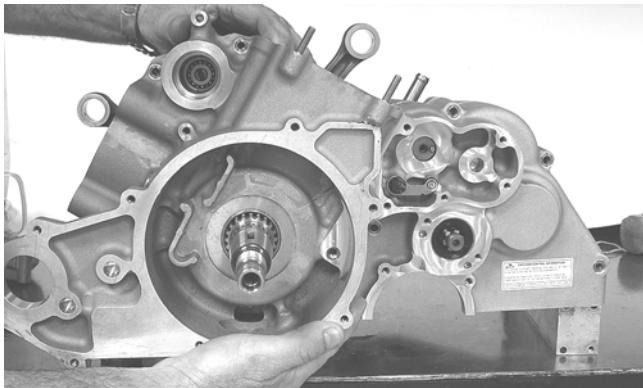
3. Install the two alignment pins; then apply a thin bead of Loctite #5900 or suitable substitute sealant to the crankcase mating surface.

■**NOTE: Apply sealant sparingly in areas depicted by arrows to avoid blocking the oil passage.**



GZ298B

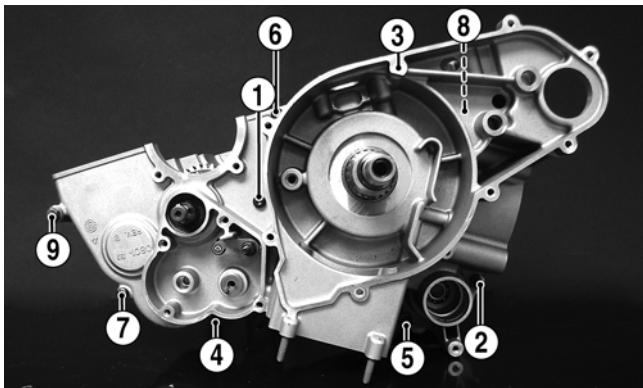
4. Carefully join the crankcase halves by placing the left-side crankcase onto the assembled right side. Secure with the cap screws (eight left side and one right side).



GZ342

5. Tighten the 6 mm cap screws to 10 ft-lb and the 8 mm cap screws to 21 ft-lb using the pattern shown and turning the shafts frequently to ensure there is no binding.

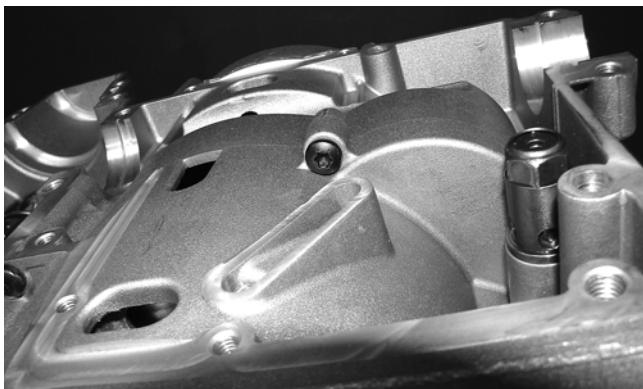
**■NOTE: Rotate the shafts back and forth to ensure no binding or sticking occurs.**



GZ457A

**■NOTE: Cap screw number eight (8) is installed from the right side.**

**■NOTE: Cap screw number three (3) is installed from under the case halves on the magneto side.**



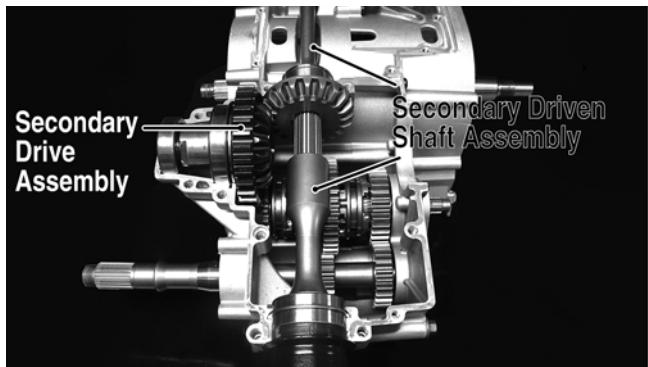
GZ455

**■NOTE: If the secondary drive/driven assemblies have been disassembled, refer to Servicing Center Crankcase Components for proper gear tooth contact and backlash.**

6. Install the locating ring in the crankcase assembly; then install the secondary driven shaft assembly and secondary drive assembly making sure the locating ring and bearing engage correctly.



GZ269A



GZ448A

7. Make sure the locating pins on the front and rear bearings are correctly seated in the crankcase.
8. Install two alignment pins into the upper crankcase assembly; then apply a thin bead of Loctite #5900 or suitable substitute sealant to the lower crankcase cover.

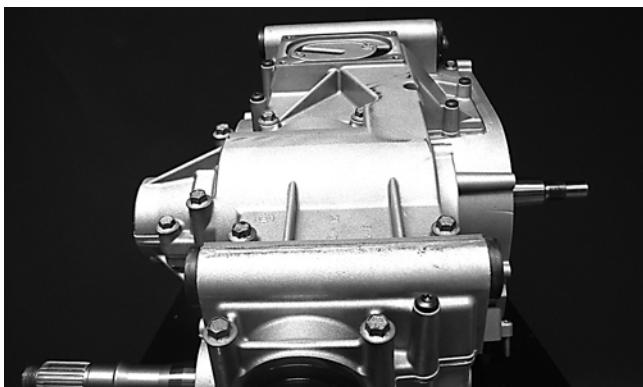


GZ452A



GZ451

- Carefully place the lower crankcase cover onto the joined crankcase halves; then secure with the cap screws. Tighten the 6 mm cap screws to 10 ft-lb and the 8 mm cap screws to 21 ft-lb.

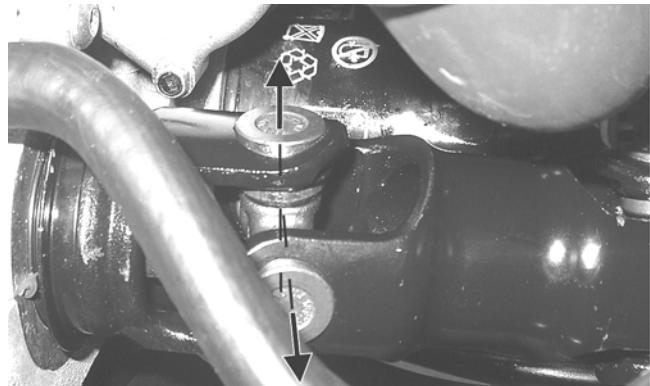


GZ447

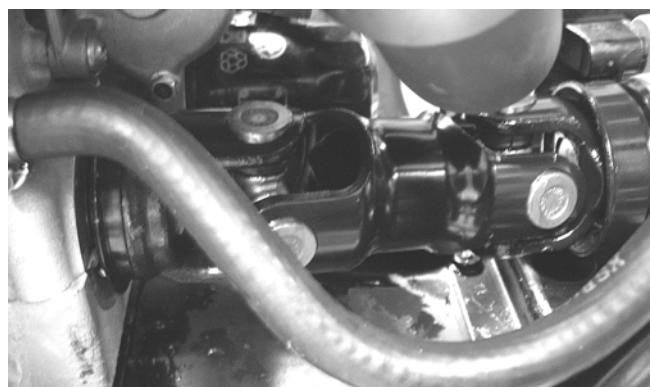
- Install the oil strainer; then apply a thin bead of silicone sealant to the oil strainer cap and secure with the cap screws. Tighten to 54 in.-lb.

#### **AT THIS POINT**

**After completing center crankcase components, proceed to Installing Right-Side Components, to Installing Left-Side Components, and to Installing Top-Side Components.**



GZ110A

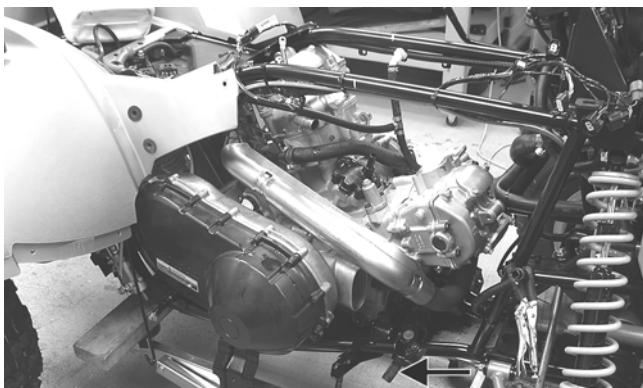


GZ119

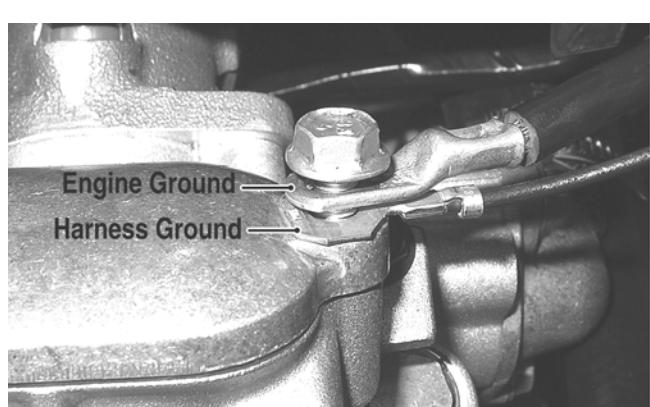
## **Installing Engine/Transmission (1000)**

**■NOTE: Arctic Cat recommends that new gaskets and O-rings be installed whenever servicing the ATV.**

- Turn the front driveline to place the output drive yoke universal joint in the horizontal plane; then secure the driveshaft to the right and against the engine.

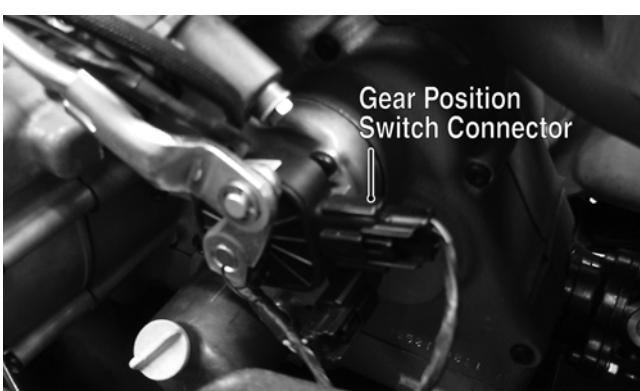
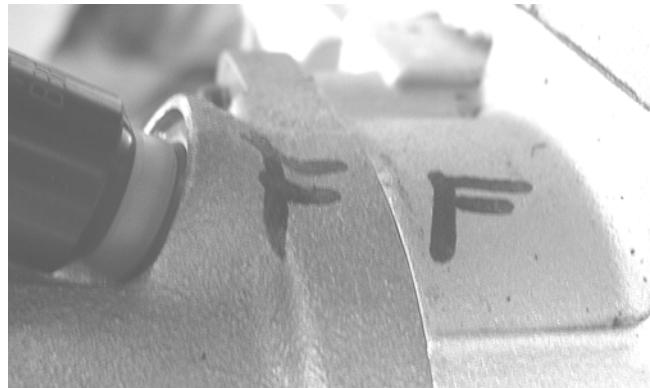
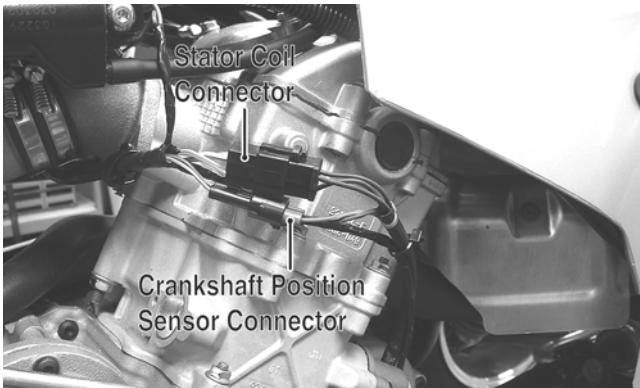


- Install the engine/transmission into the frame from the right side.
- Rotate the driveshaft 90°; then lift the front of the engine sufficiently to engage the splined shaft into the front differential. Lower the front of the engine.

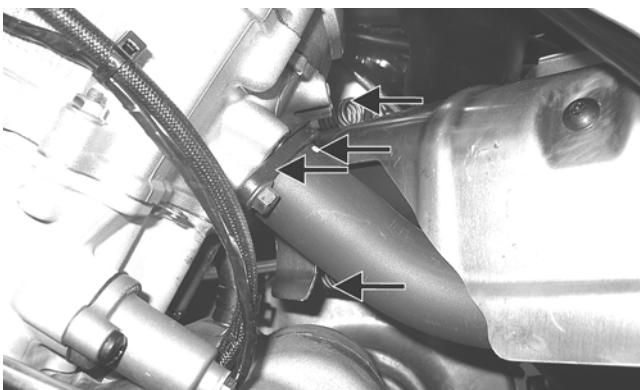


GZ064A

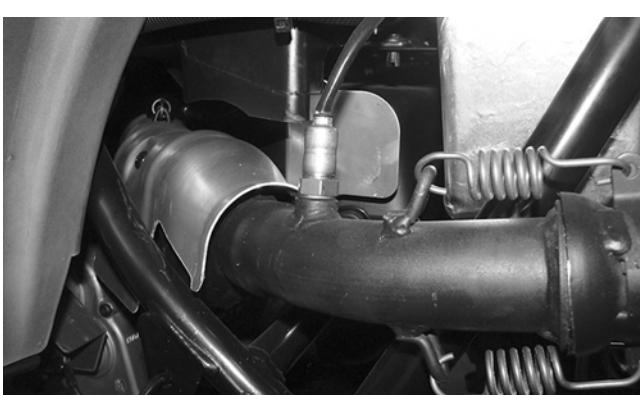
- Install the ignition coils and tighten the cap screws to 7 ft-lb; then connect the primary wires, grounds, and spark plug caps.
- Connect the stator coil connector and crankshaft position sensor connector; then connect the gear position switch connector.



10. Install the front and rear exhaust pipes with new gra-foil seals and tighten the retaining nuts to 20 ft-lb; then install the muffler and connect all exhaust junc-ture springs. Connect the O2 sensor.



12. Connect the fuel injectors (A), TPS connector (B), TMAP sensor connector (C), and ISC valve connec-tor (D).



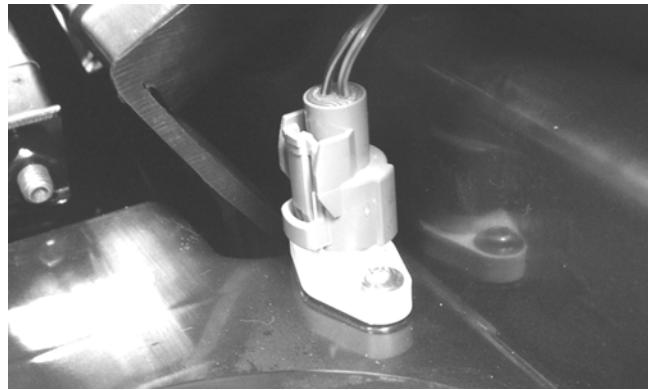
13. Install the shift linkage with bushings and secure with E-clips.

14. Connect the gasline hose connectors to the fuel rails; then install any nylon ties that were removed during disassembly.

11. Install the intake manifold with the throttle body assembly onto the engine (aligned as noted during removing). Tighten the cap screws securing the man-ifold to each cylinder head to 8.5 ft-lb.



15. Install the air filter housing and secure to the throttle body with a hose clamp; then connect the IAT sensor connector.



16. Install the V-belt cooling duct and boots. Tighten securely.
17. Install the front body panel, footrests, foot wells, and front rack; then install the upper bumper support-to-frame cap screws (see Steering/Body/Controls).
18. Connect the negative battery cable; then secure the battery with the tool tray and install the seat.
19. Pour in the proper quantities of engine/transmission oil and coolant; then start the engine and warm up to operating temperature.
20. Check for fluid leaks; then shut off engine and check fluid levels (see Periodic Maintenance/Tune-Up).

# Fuel/Lubrication/ Cooling

**NOTE:** Arctic Cat recommends the use of new gaskets, lock nuts, and seals and lubricating all internal components when servicing the engine/transmission.

## SPECIAL TOOLS

A number of special tools must be available to the technician when performing service procedures in this section. Refer to the current Special Tools Catalog for the appropriate tool description.

**NOTE:** When indicated for use, each special tool will be identified by its specific name, as shown in the chart below, and capitalized.

| Description           | p/n      |
|-----------------------|----------|
| Oil Pressure Test Kit | 0644-495 |
| Seal Removal Tool     | 0644-072 |
| Tachometer            | 0644-275 |

**NOTE:** Special tools are available from the Arctic Cat Service Department.

## TROUBLESHOOTING

1. Verify that the electric fuel pump is operating by listening for a "whirring" sound for several seconds after the ignition switch is turned to the ON position. If no sound can be heard, see Electrical System - EFI Sensors/Components.
2. Check for a flashing DTC (Diagnostic Trouble Code) on the LCD. If a code is flashing, see EFI Sensors/Components in Electrical System.
3. Make sure there is sufficient, clean gas in the gas tank.

## Throttle Body

### WARNING

Whenever any maintenance or inspection is performed on the fuel system during which there may be fuel leakage, there should be no welding, smoking, open flames, etc., in the area.

## REMOVING (500/700)

1. Turn the ignition switch to the OFF position; then remove the ignition switch key.
2. Remove the seat; then disconnect the battery.
3. Remove the storage compartment cover and air filter housing cover; then remove the air filter.

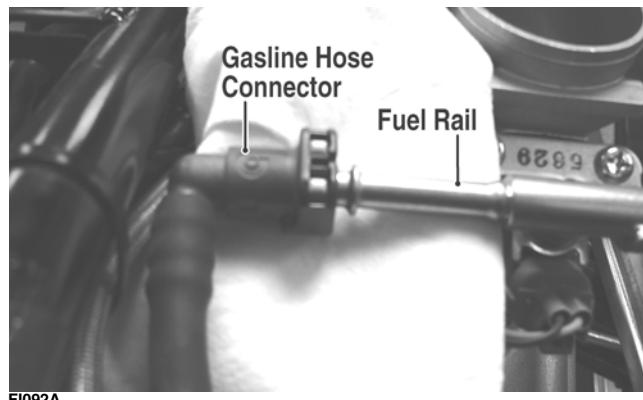
### WARNING

Do not turn the ignition switch to the ON position with the hoses removed. Gasoline will be pumped by the electric fuel pump causing a safety hazard.

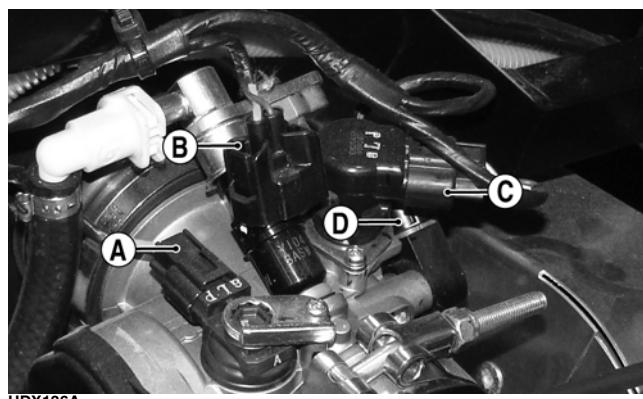
4. Loosen the clamp securing the air filter housing boot to the throttle body inlet; then remove the boot from the throttle body.
5. Slowly disconnect the gasline hose connector from the fuel rail.

### WARNING

Gasoline may be under pressure. Place an absorbent towel under the connector to absorb any gasoline spray when disconnecting.



6. Remove the screw securing the throttle actuator cover to the throttle body; then remove the cover.
7. Remove the throttle cable from the actuator arm.
8. Loosen the outer jam nut securing the throttle cable to the throttle body; then route the cable out of the way.
9. Remove the MAP/TMAP sensor (A), fuel injector connector (B), ISC connector (C), and TPS connector (D).



10. Remove the cap screws securing the intake pipe to the cylinder head and remove the throttle body assembly; then remove the intake pipe from the throttle body. Account for an O-ring.



FI104A

11. Use tape to cover and seal the intake opening.

### CAUTION

Any objects or liquid entering the intake opening will fall into the engine causing severe damage if the engine is turned over or started.

### REMOVING (1000)

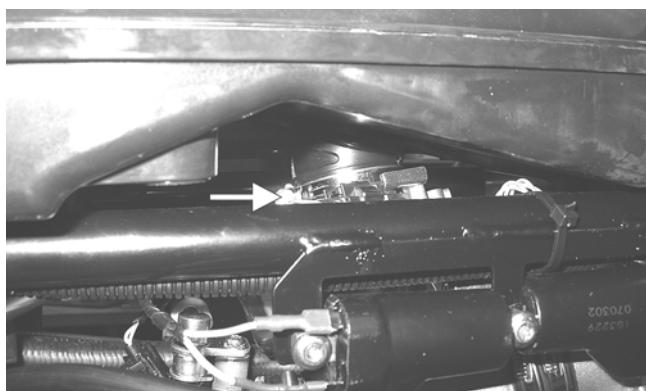
#### ⚠ WARNING

Whenever the gasoline hoses are removed (other than for pressure testing), the battery must be disconnected to prevent inadvertent activation of the electronic fuel pump.

1. Remove the front rack and body panel.
2. Disconnect the wires from the IAT sensor; then loosen the clamp and remove the inlet air boot from the air filter housing.

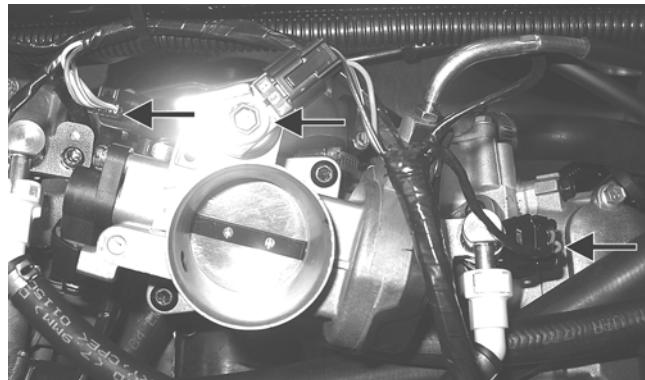


GZ379

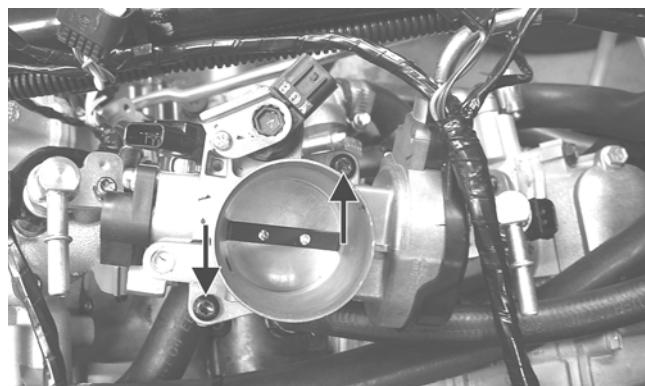


3. Loosen the clamp on the throttle body intake boot; then remove the air filter housing from the ATV.

4. Disconnect the three wiring connectors from the sensors on the throttle body; then remove the cap screws securing the throttle body to the intake manifold.



GZ094B



GZ381A

5. Remove the throttle arm cover and disconnect the throttle cable; then remove the throttle body from the ATV.



GZ383A

6. Use tape to cover and seal the intake opening.

### CAUTION

Any objects or liquid entering the intake opening will fall into the engine causing severe damage if the engine is turned over or started.

### INSTALLING (500/700)

1. Install the throttle body into the intake pipe and secure with the clamp. Tighten securely.
2. Place a new O-ring in the intake pipe; then position the pipe onto the engine and secure with two cap screws.

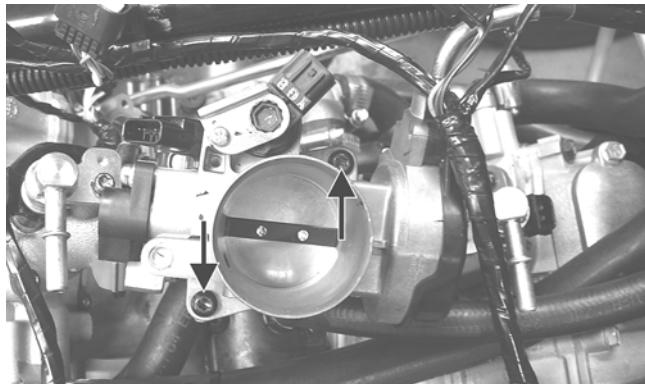
3. Connect the throttle cable to the throttle body and adjust throttle cable free-play (see Throttle Cable Free-Play); then connect the gasline hose.
4. Connect the four electrical connectors to the throttle body components.
5. Install the air filter housing boot and secure with the clamp; then install the air filter, air filter cover, storage compartment, and storage compartment cover.
6. Connect the battery (positive cable first); then install the seat making sure it locks securely in place.

**■NOTE: If the throttle body, ECM, TPS, or ISC are replaced, the EFI system must be synchronized. Use the following procedure.**

1. With the key off, depress the throttle lever to Wide Open Throttle (WOT).
2. Place the ignition key in the ON position and wait for 10 seconds.
3. Release the throttle lever and wait an additional 10 seconds.
4. Turn the key to the OFF position and allow the gauge to shut off.

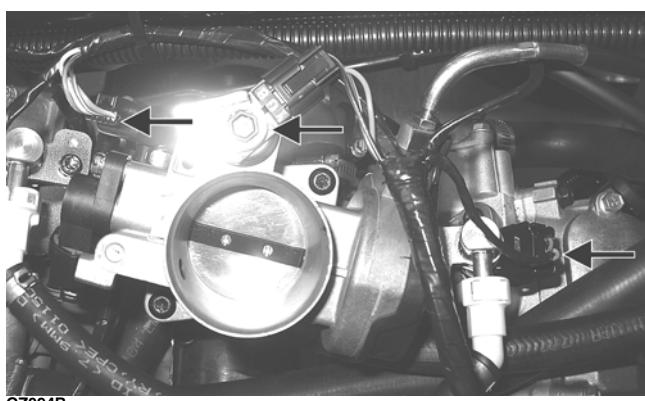
## INSTALLING (1000)

1. Connect the throttle cable to the throttle body; then remove the tape from the intake manifold and install the throttle body using a new O-ring. Tighten the cap screws securely.

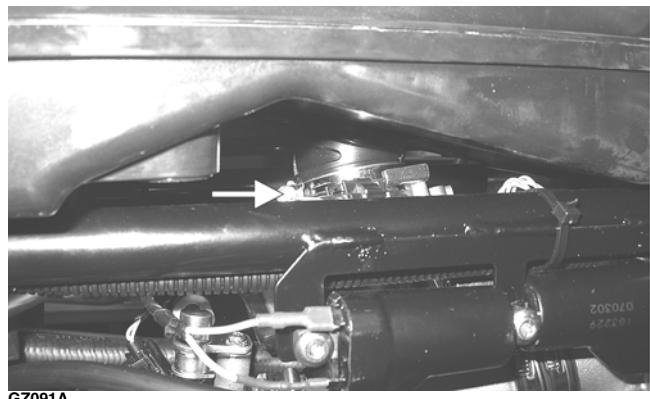


GZ381A

2. Connect the three wiring connectors to the sensors; then install the air filter housing and connect all hoses. Tighten all clamps securely.



GZ094B



GZ091A

3. Connect the wiring connector to the IAT sensor.
4. Install the front rack and body panel.
5. Install the seat making sure it locks securely in place.

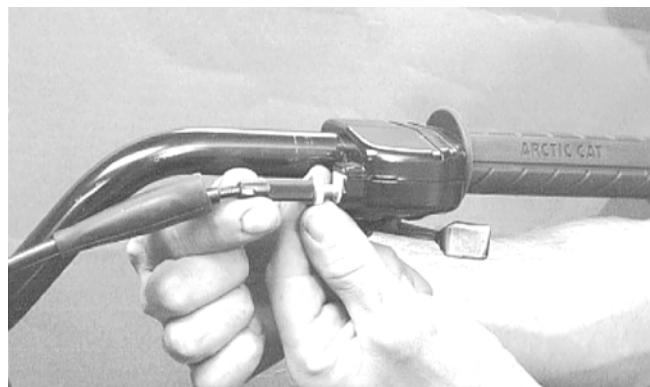
**■NOTE: If the throttle body, ECM, TPS, or ISC are replaced, the EFI system must be synchronized. Use the following procedure.**

1. With the key off, depress the throttle lever to Wide Open Throttle (WOT).
2. Place the ignition key in the ON position and wait for 10 seconds.
3. Release the throttle lever and wait an additional 10 seconds.
4. Turn the key to the OFF position and allow the gauge to shut off.

## Throttle Cable Free-Play

To adjust the throttle cable free-play, follow this procedure.

1. Slide the rubber boot away; then loosen the jam nut from the throttle cable adjuster.



AL611D

2. Turn the adjuster until the throttle cable has proper free-play of 3-6 mm (1/8-1/4 in.) at the lever.



CF297A

3. Tighten the jam nut against the throttle cable adjuster securely; then slide the rubber boot over the adjuster.

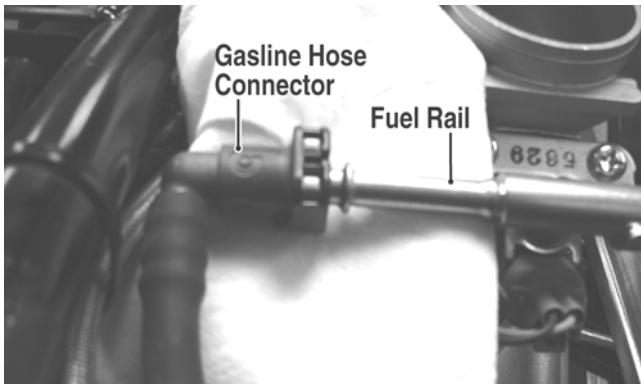
## Gas Tank

### WARNING

Whenever any maintenance or inspection is made on the fuel system during which there may be fuel leakage, there should be no welding, smoking, open flames, etc., in the area.

### REMOVING

1. Remove the seat.
2. Remove the rear rack and fenders (see Steering/Body/Controls).
3. Disconnect the hose from the fuel pump to the throttle body by compressing the release on the connector.



FI092A

4. Remove the cap screws securing the gas tank to the frame.
5. Disconnect the fuel gauge connector; then remove the gas tank.

### CLEANING AND INSPECTING

1. Clean all gas tank components with parts-cleaning solvent.
2. Inspect all hoses for cracks or leaks.
3. Inspect tank cap and tank for leaks, holes, and damaged threads.

4. Remove the fuel level sensor/fuel pick-up assembly and inspect the fuel level sensor and fuel screen.

■**NOTE:** If the fuel level sensor has failed or may be faulty, see FUEL PUMP/FUEL LEVEL SENSOR in this section.

### INSTALLING

1. Install the fuel level sensor/fuel pick-up assembly.
2. Place the gas tank into position in the frame; then install the cap screws. Tighten securely.
3. Connect the gasline hose from the throttle body; then connect the fuel gauge connector.
4. Fill the gas tank with gasoline.
5. Start the engine and inspect for leakage.
6. Install the rear fenders and rack (see Steering/Body/Controls); then install the seat making sure it latches securely.

## Oil Pump

■**NOTE:** Whenever internal engine components wear excessively or break and whenever oil is contaminated, the oil pump should be replaced (see Engine/Transmission). The oil pump is not a serviceable component.

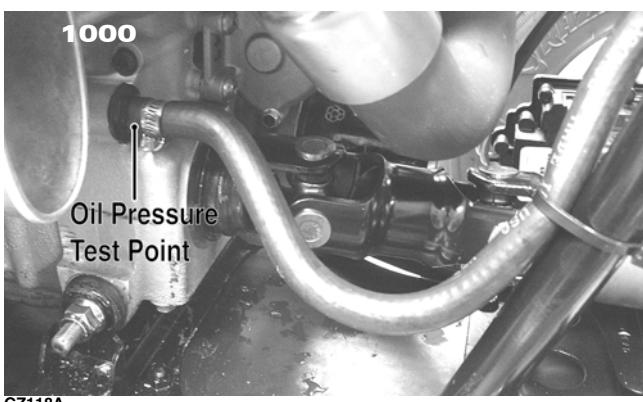
### TESTING OIL PUMP PRESSURE

■**NOTE:** The engine must be warmed up to the specified temperature for this test.

1. Connect the Tachometer to the engine or utilize the LCD (if equipped).
2. Connect the Oil Pressure Test Kit to the oil pressure test port (500/700) or the oil cooler to oil filter line (1000).



CF264C



■NOTE: Some oil seepage may occur when installing the oil pressure gauge. Wipe up oil residue with a cloth.

3. Start the engine and run at 3000 RPM. With the oil temperature at 60° C (140° F), the oil pressure gauge must read as specified.

|      |   |
|------|---|
| 500  | 0.6-0.7 kg/cm <sup>2</sup> (8.5-10 psi) |
| 700  | 1.2-1.5 kg/cm <sup>2</sup> (17-21 psi)  |
| 1000 | 1.05-1.2 kg/cm <sup>2</sup> (15-17 psi) |

■NOTE: If the oil pressure is lower than specified, check for low oil level, defective oil pump, or restricted oil cooler (1000).

■NOTE: If the oil pressure is higher than specified, check for too heavy engine oil weight (see General Information), clogged oil passage, clogged oil filter, or improper installation of the oil filter.

## Oil Cooler (1000)

### REMOVING

■NOTE: It is not necessary to drain the engine oil for this procedure.

1. Remove the input and output hoses from the fittings on the cooler.

#### CAUTION

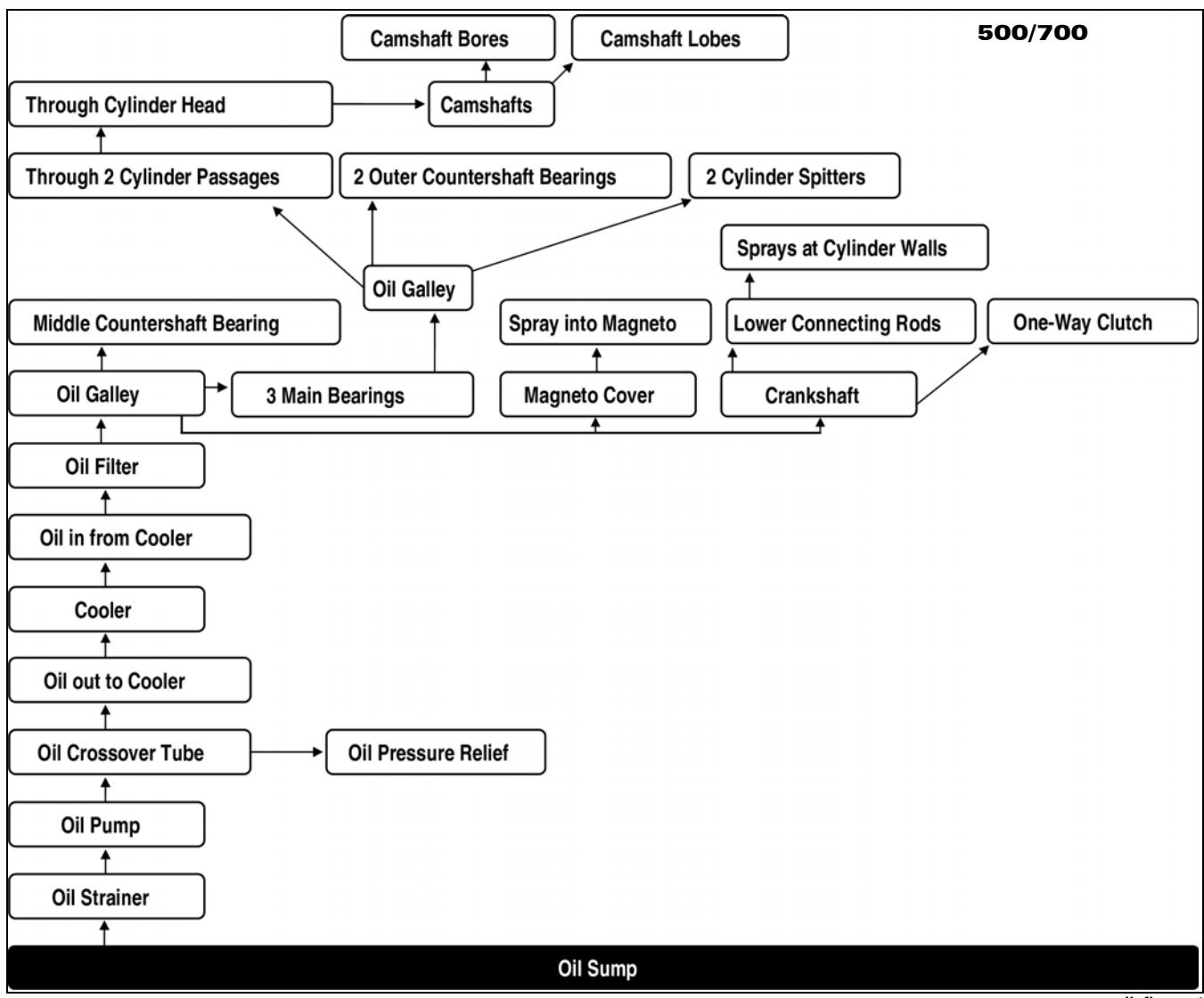
Elevate and secure the hoses to avoid oil spillage.

2. Remove the cap screws securing the oil cooler to the frame. Account for grommets.
3. Remove the oil cooler from the frame.

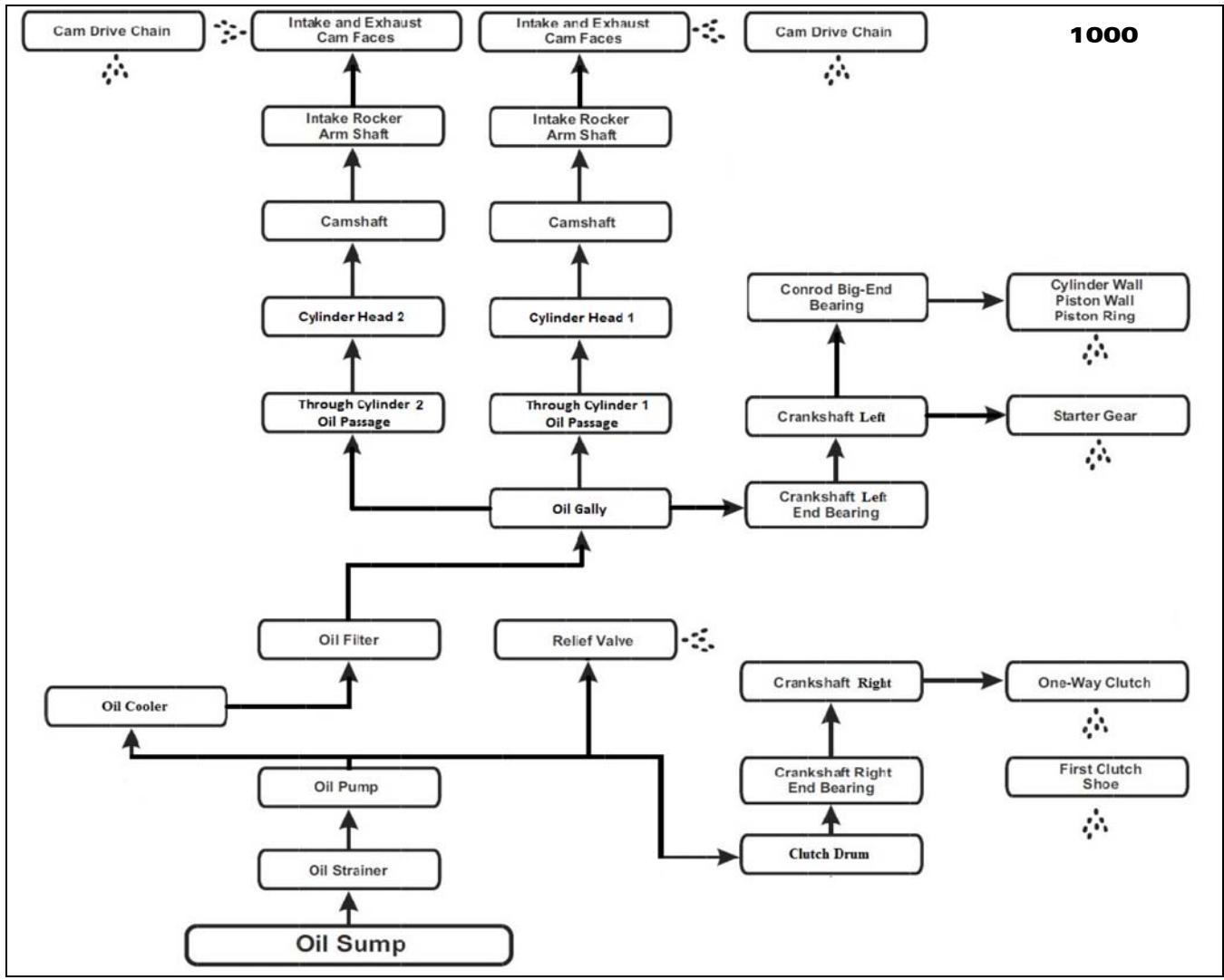
### INSTALLING

1. Place the cooler into position in the frame.
2. Secure the cooler to the frame with the cap screws and grommets.
3. Install the hoses onto their respective fittings and secure with the clamps.

## **Oil Flow Chart**



oil\_flow\_wt



## Liquid Cooling System

When filling the cooling system, use a coolant/water mixture which will satisfy the coldest anticipated weather conditions of the area in accordance with the coolant manufacturer's recommendations. While the cooling system is being filled, air pockets may develop; therefore, run the engine for five minutes after the initial fill, shut the engine off, and then fill the cooling system to the bottom of the stand pipe in the radiator neck.

### Checking/Filling

1. On the 700/1000 models, remove the two screws from the front of the radiator access panel. On the 500 models, remove the four screws securing the radiator access panel.





FI476

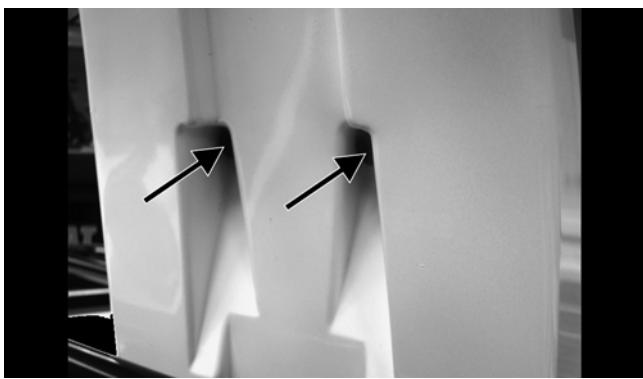
2. On the 700/1000 models, lift the front of the access panel; then slide the panel forward to disengage the two rear tabs.
3. On the 700/1000 models, move the panel rearward until free of the rack. On the 500 models, move the panel forward until free of the ATV.

■**NOTE: Steps 4-6 are for Mud Pro models; for other models, proceed to step 7.**

4. Remove four cap screws securing the snorkel housing to the front inspection panel; then remove two cap screws from the rear of the snorkel housing.



MP013A



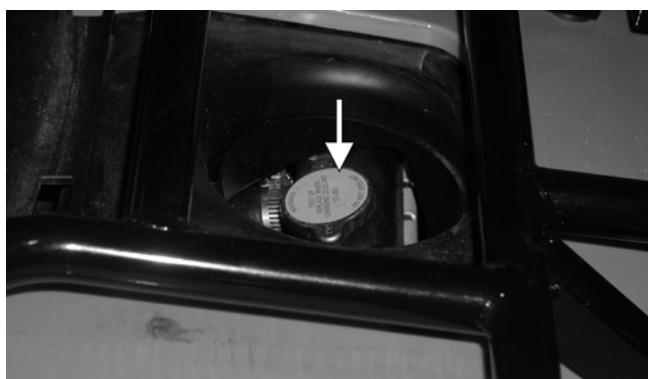
MP007A

5. Separate the front of the snorkel housing from the rear; then remove the snorkel housing.



MP003

6. Remove two reinstallable rivets and remove the splash guard. The radiator cap can now be accessed in front of the snorkels.
7. Carefully rotate the radiator cap counterclockwise to release pressure; then remove the cap.



CF142A

8. Add coolant as necessary; then install the radiator cap, splash guard (if applicable), and access panel or snorkel housing.

■**NOTE: Use a good quality, biodegradable glycol-based, automotive-type antifreeze.**

### **WARNING**

**Never check the coolant level when the engine is hot or the cooling system is under pressure.**

### **CAUTION**

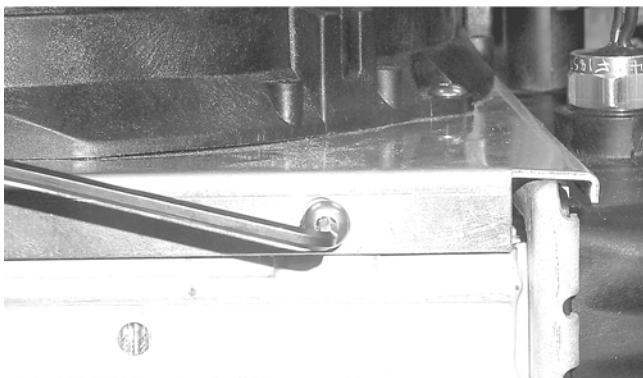
**After operating the ATV for the initial 5-10 minutes, stop the engine, allow the engine to cool down, and check the coolant level. Add coolant as necessary.**

## **RADIATOR**

### **Removing**

1. Drain the coolant at the engine.
2. Remove the front rack (see Steering/Body/Controls).
3. Remove the front bumper and front fender panel (see Steering/Body/Controls).
4. Remove the upper and lower coolant hoses.
5. Remove the cap screws and nuts securing the radiator to the frame.
6. Disconnect the fan wiring from the main wiring harness; then remove the radiator/fan assembly and account for the grommets and collars.

7. On the 500/700, remove the fan/fan shroud assembly from the radiator.



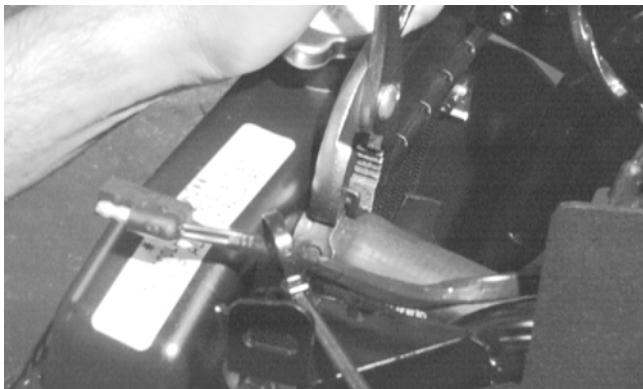
CC863

### Cleaning and Inspecting

1. Flush the radiator with water to remove any contaminants.
2. Inspect the radiator for leaks and damage.
3. Inspect all hoses for cracks and deterioration.
4. Inspect all fasteners and grommets for damage or wear.

### Installing

1. Position the fan/fan shroud assembly on the radiator; then secure with existing hardware.
2. Place the radiator with grommets and collars into position on the frame; then install the cap screws and nuts. Tighten securely.
3. Install the upper and lower coolant hoses; then secure with hose clamps.



AF734D

4. Install the front bumper and front fender panel (see Steering/Frame/Controls).
5. Install the front rack (see Steering/Body/Controls).
6. Fill the cooling system with the recommended amount of antifreeze. Check for leakage.
7. Connect the fan wiring to the main wiring harness.

### THERMOSTAT

#### Removing (500/700)

1. Drain approximately one quart of coolant from the cooling system.

2. Remove the two cap screws securing the thermostat housing to the cylinder head. Account for an O-ring and a thermostat.

#### Removing (1000)

■NOTE: The thermostat is located in a housing in-line with the upper radiator hoses under the air filter housing.



1. Drain approximately one quart of coolant from the cooling system.
2. Remove the machine screws securing the thermostat housing together. Remove the thermostat and account for an O-ring.

#### Inspecting

1. Inspect the thermostat for corrosion or spring damage.
2. Using the following procedure, inspect the thermostat for proper operation.
  - A. Suspend the thermostat in a container filled with water.
  - B. Heat the water and monitor the temperature with a thermometer.
  - C. The thermostat should start to open at 71-86° C (160-187° F).
  - D. If the thermostat does not open, it must be replaced.
3. Inspect all coolant hoses, connections, and clamps for deterioration, cracks, and wear.

■NOTE: All coolant hoses and clamps should be replaced every four years or 4000 miles.

#### Installing (500/700)

1. Place the thermostat and O-ring into the thermostat housing; then secure the thermostat housing to the cylinder head with the two cap screws.
2. Fill the cooling system with the recommended amount of antifreeze. Check for leakage.

#### Installing (1000)

1. Place the thermostat and O-ring into the thermostat housing; then secure the thermostat housing together with the machine screws.
2. Fill the cooling system with the recommended amount of antifreeze. Check for leakage.

## COOLING FAN

### Removing

1. Remove the radiator (see Radiator in this sub-section).
2. Remove the fan assembly from the radiator.

### Installing

1. Position the fan assembly on the radiator; then secure with existing hardware.

**■NOTE: The fan wiring must be in the upper-right position.**

2. Install the radiator.

## WATER PUMP (500/700)

**■NOTE: On the 700, the water pump is a non-serviceable component. It must be replaced as an assembly. To remove the water pump on the 500, see Servicing Left-Side Components.**

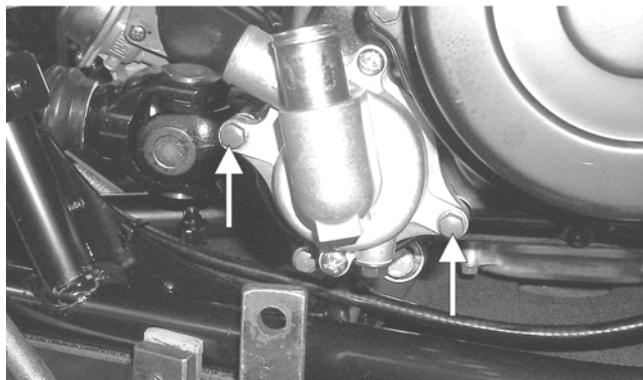
### Removing

1. Remove the radiator cap; then remove the water pump drain and drain the coolant.



CC789

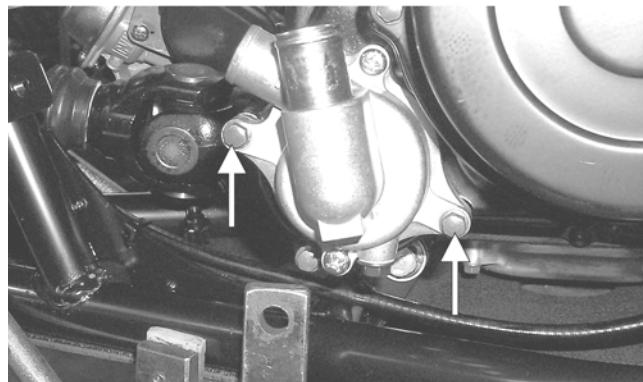
2. Drain the oil from the engine/transmission.
3. Remove the four torx-head cap screws securing the front and rear fenders to the footrest; then remove the four cap screws securing the footrest to the frame. Remove the footrest.
4. Loosen the hose clamps and slide the clamps away from the hose ends approximately 2 in.; then remove both hoses from the water pump.
5. Remove the two cap screws securing the water pump to the engine; then remove the water pump.



CC786A

### Installing

1. Secure the water pump to the engine with the two cap screws tightened securely.



CC786A

2. Connect the two coolant hoses to the water pump and secure with the clamps. Tighten securely.

3. Place the footrest into position on the frame and loosely secure with four cap screws; then secure the front and rear fenders to the footrest with the four torx-head cap screws. Tighten the four torx-head cap screws securely; then tighten the 8 mm cap screws to 20 ft-lb and the 10 mm cap screws to 40 ft-lb.

4. Fill the engine/transmission with the proper amount of recommended oil.

5. Fill the cooling system with the proper amount of recommended coolant.

**■NOTE: While the cooling system is being filled, air pockets may develop; therefore, run the engine for five minutes after the initial fill, shut the engine off, and then fill the cooling system.**

6. Check the entire cooling system for leakage.

### CAUTION

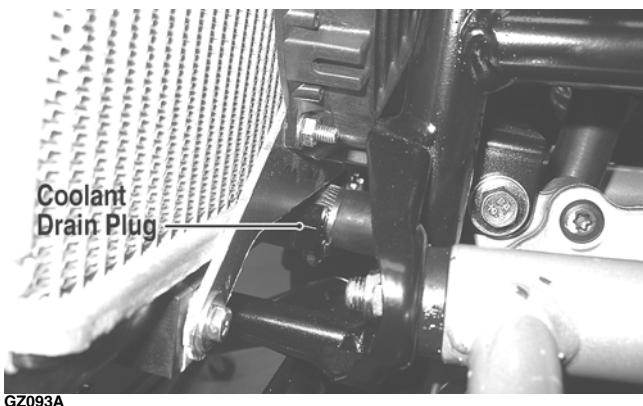
After operating the ATV for the initial 5-10 minutes, stop the engine, allow the engine to cool down, and check the coolant level. Add coolant as necessary.

## WATER PUMP (1000)

**■NOTE: The water pump is a non-serviceable component. It must be replaced as an assembly.**

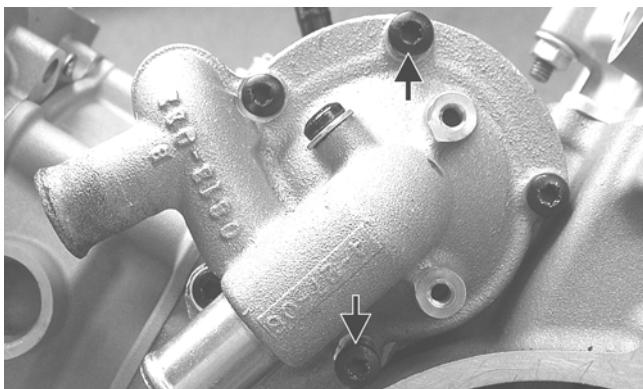
### Removing

1. Remove the coolant drain plug; then remove the radiator cap and drain the coolant into a suitable container.



**■NOTE:** Always use a large container and have sufficient floor drying material available when draining the coolant in case of coolant spillage.

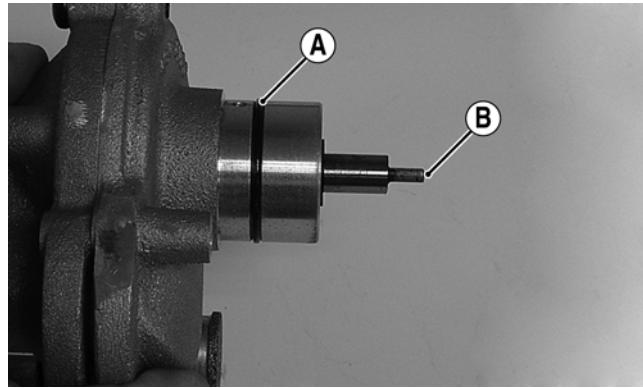
2. Remove the coolant hoses from the water pump; then remove two cap screws securing the water pump to the crankcase.



3. Remove the water pump from the engine.

## Installing

1. Install a new O-ring (A) onto the water pump and lightly coat with clean engine oil.



2. Install the water pump assembly onto the engine aligning the flat drive on the water pump to the slot in the driveshaft (B).

### CAUTION

**Do not force the water pump housing into the crankcase or severe engine damage may occur.**

3. Secure the water pump with the two cap screws and tighten securely; then connect the coolant hoses and secure with hose clamps.
4. Install and tighten the coolant drain plug securely; then fill the cooling system with the proper amount of recommended coolant and install the radiator cap.
5. Start the engine and check for coolant leaks; then add coolant if necessary to proper level.

### CAUTION

**After operating the ATV for the initial 5-10 minutes, stop the engine, allow the engine to cool down, and check the coolant level. Add coolant as necessary.**

## Troubleshooting

### Problem: Starting impaired

| Condition           | Remedy                                    |
|---------------------|---|
| 1. Gas contaminated | 1. Drain gas tank and fill with clean gas |

### Problem: Idling or low speed impaired

| Condition                | Remedy        |
|--------------------------|---------------|
| 1. TPS out of adjustment | 1. Adjust TPS |

### Problem: Medium or high speed impaired

| Condition                                 | Remedy                |
|---|-----------------------|
| 1. High RPM "cut out" against RPM limiter | 1. Decrease RPM speed |

# Electrical System

The electrical connections should be checked periodically for proper function.

## TESTING ELECTRICAL COMPONENTS

All electrical tests should be made using the CATT II or the Fluke Model 77 Multimeter. The CATT II can return data for certain components which are identified at the beginning of their respective sub-section. If any other type of meter is used, readings may vary due to internal circuitry. When troubleshooting a specific component, always verify first that the fuse(s) are good, that the LED(s) are good, that the connections are clean and tight, that the battery is fully charged, and that all appropriate switches are activated.

**■NOTE:** For absolute accuracy, all tests should be made at room temperature of 68° F.

**■NOTE:** Certain components and sensors can be checked by using the EFI diagnostic system (see EFI Diagnostic System in this section for more information).

## SPECIAL TOOLS

A number of special tools must be available to the technician when performing service procedures in this section. Refer to the current Special Tool Catalog for the appropriate tool description.

**■NOTE:** When indicated for use, each special tool will be identified by its specific name, as shown in the chart below, and capitalized.

| Description               | p/n      |
|---------------------------|----------|
| Diagnostic Harness        | 0486-219 |
| Fluke Model 77 Multimeter | 0644-559 |
| MaxiClips                 | 0744-041 |
| Tachometer                | 0644-275 |
| CATT II Tool              | 0544-029 |

**■NOTE:** Special tools are available from the Arctic Cat Service Department.

# Battery



Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

**■NOTE:** Preliminary checks may be performed on this component using the diagnostic mode on the LCD gauge (see EFI Diagnostic System in this section).

After being in service, batteries require regular cleaning and recharging in order to deliver peak performance and maximum service life. The following procedure is recommended for cleaning and maintaining a sealed battery. Always read and follow instructions provided with battery chargers and battery products.

**■NOTE:** Refer to all warnings and cautions provided with the battery or battery maintainer/charger.

Loss of battery charge may be caused by ambient temperature, ignition OFF current draw, corroded terminals, self discharge, frequent start/stops, and short engine run times. Frequent winch usage, snowplowing, extended low RPM operation, short trips, and high amperage accessory usage are also reasons for battery discharge.

## Maintenance Charging

**■NOTE:** Arctic Cat recommends the use of the CTEK Multi US 800 or the CTEK Multi US 3300 for battery maintenance charging. Maintenance charging is required on all batteries not used for more than two weeks or as required by battery drain.



800E

1. When charging a battery in the vehicle, be sure the ignition switch is in the OFF position.
2. Clean the battery terminals with a solution of baking soda and water.

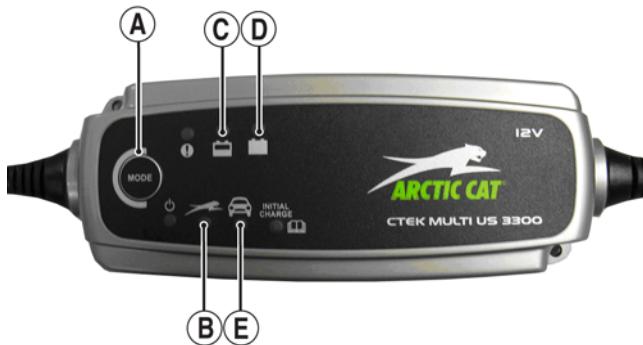
**■NOTE:** The sealing strip should NOT be removed and NO fluid should be added.

3. Be sure the charger and battery are in a well-ventilated area. Be sure the charger is unplugged from the 110-volt electrical outlet.
4. Connect the red terminal lead from the charger to the positive terminal of the battery; then connect the black terminal lead of the charger to the negative terminal of the battery.

**■NOTE:** Optional battery charging adapters are available from your authorized Arctic Cat dealer to connect directly to your vehicle from the recommended chargers to simplify the maintenance charging process. Check with your authorized Arctic Cat dealer for proper installation of these charging adapter connectors.

5. Plug the battery charger into a 110-volt electrical outlet.
6. If using the CTEK Multi US 800, there are no further buttons to push. If using the CTEK Multi US 3300, press the Mode button (A) at the left of the charger until the Maintenance Charge Icon (B) at the bottom illuminates. The Normal Charge Indicator (C) should illuminate on the upper portion of the battery charger.

■**NOTE:** The maintainer/charger will charge the battery to 95% capacity at which time the Maintenance Charge Indicator (D) will illuminate and the maintainer/charger will change to pulse/float maintenance. If the battery falls below 12.9 DC volts, the charger will automatically start again at the first step of the charge sequence.



3300A

■**NOTE:** Not using a battery charger with the proper float maintenance will damage the battery if connected over extended periods.

### Charging

■**NOTE:** Arctic Cat recommends the use of the CTEK Multi US 800 or the CTEK Multi US 3300 for battery maintenance charging.

1. Be sure the battery and terminals have been cleaned with a baking soda and water solution.

■**NOTE:** The sealing strip should NOT be removed and NO fluid should be added.

2. Be sure the charger and battery are in a well-ventilated area. Be sure the charger is unplugged from the 110-volt electrical outlet.
3. Connect the red terminal lead from the charger to the positive terminal of the battery; then connect the black terminal lead of the charger to the negative terminal of the battery.
4. Plug the charger into a 110-volt electrical outlet.
5. By pushing the Mode button (A) on the left side of the charger, select the Normal Charge Icon (E). The Normal Charge Indicator (C) should illuminate on the upper left portion of the charger.
6. The battery will charge to 95% of its capacity at which time the Maintenance Charge Indicator (D) will illuminate.

■**NOTE:** For optimal charge and performance, leave the charger connected to the battery for a minimum 1 hour after the Maintenance Charge Indicator (D) illuminates. If the battery becomes hot to the touch, stop charging. Resume after it has cooled.

7. Once the battery has reached full charge, unplug the charger from the 110-volt electrical outlet.

■**NOTE:** If, after charging, the battery does not perform to operator expectations, bring the battery to an authorized Arctic Cat dealer for further troubleshooting.

## Electronic Power Steering (EPS)



Component data and system updates can be retrieved/Performed using the CATT II. Navigate the screens as required.

■**NOTE:** Certain models have been produced with electronic power steering. The following information is intended to be used when servicing these models.

The electronic power steering (EPS) system is an electro-mechanical device that utilizes 12 volt DC power to drive a motor linked to the steering shaft to assist the rider when rotating the handlebar. Rider steering inputs are detected by a torque-sensing transducer assembly within the EPS housing. These inputs are converted to electronic signals by the transducer and control circuitry to tell the motor which way to drive the steering shaft. When no steering input (pressure on the handlebar) is detected, no torque signal is generated, and no steering assist is provided by the motor.

If an electrical-related EPS system malfunction occurs, a diagnostic trouble code (DTC) will be displayed on the LCD gauge. Check for updates and verify any active DTCs using the most up-to-date CATT II software. The following is a list of DTCs, possible conditions, and causes.

■**NOTE:** If no active codes are present on the LCD or verified through CATT II and the vehicle is experiencing steering-related issues, there may be a mechanical steering-related issue. In this case, the EPS is not the cause of the issue. Components that may contribute to this type of issue could be abnormal tire wear, bad wheel bearings, ball joints, tie rod ends, tie rods, or bushings. Check the complete steering system for any sign of wear or misalignment.

■**NOTE:** If any code C1306-C1315 or C1317-C1325 are active and verified with CATT II, EPS replacement is not necessary. Follow the instructions listed in the chart to correct the malfunction.

| Code  | Fault Description                       | Fault Condition   | Possible Cause   | Fault Recovery Method  |
|-------|---|---|--|--|
| C1301 | Over Current                            | EPS internal over-current condition has been detected   | Internal EPS Condition   | Correct EPS condition*   |
| C1302 | Excessive Current Error                 | EPS internal current measurement error has been detected  | Internal EPS Condition   | Correct EPS condition*   |
| C1303 | Torque Sensor Range Fault               | EPS internal torque sensor range condition has been detected  | Internal EPS Condition   | Correct EPS condition*   |
| C1304 | Torque Sensor Linearity Fault           | EPS internal torque sensor linearity condition has been detected  | Internal EPS Condition   | Correct EPS condition*   |
| C1305 | Rotor Position Encoder                  | EPS internal rotor position encoder condition has been detected   | Internal EPS Condition   | Correct EPS condition*   |
| C1306 | System Voltage Low                      | EPS battery power low-voltage condition has been detected   | System voltage low (less than 11 VDC at the EPS). Wire harness issue, faulty voltage regulator, weak battery or loose battery terminals. | EPS will auto-recover when the battery supply returns to normal  |
| C1307 | System Voltage High                     | EPS battery power over-voltage condition has been detected  | System voltage high (more than 16 VDC at the EPS). Wire harness issue, faulty voltage regulator or loose battery terminals.              | EPS will auto-recover when the battery supply returns to normal  |
| C1308 | Temperature Above 110° C                | EPS internal 110° C over-temp condition has been detected   | Debris in EPS housing/cooling fan.   | Clean the EPS housing and cooling fins. EPS will auto-recover when internal temperature drops below 105° C |
| C1309 | Temperature Above 120° C                | EPS internal 120° C over-temp condition has been detected   | Debris in EPS housing/cooling fan.   | Clean the EPS housing and cooling fins. EPS will auto-recover when internal temperature drops below 115° C |
| C1310 | Vehicle Speed High                      | Vehicle speed signal received by the EPS exceeds the maximum speed specification                              | Intermittent main harness wires, defective speed-sensor, or intermittent speed sensor wires.   | EPS will auto-recover when the vehicle speed signal drops below the maximum speed specification            |
| C1311 | Vehicle Speed Low                       | Vehicle speed signal received by the EPS is zero or missing   | Broken main harness wires, defective speed-sensor, or broken speed sensor wires.   | EPS will auto-recover when the vehicle speed signal returns to normal                                      |
| C1312 | Vehicle Speed Faulty                    | Vehicle speed CAN signal received by the EPS incorrect or missing   | Broken main harness CAN wires, defective speed-sensor, or broken speed sensor wires.   | EPS will auto-recover when the vehicle speed signal returns to normal                                      |
| C1313 | Engine RPM High                         | Engine RPM signal received by the EPS exceeds the maximum RPM specification                                   | Intermittent main harness RPM wires, intermittent voltage regulator, intermittent ACG stator wires.                                      | EPS will auto-recover when engine RPM signal drops below the maximum RPM specification                     |
| C1314 | Engine RPM Low                          | Engine RPM signal received by the EPS suddenly dropped below 500 RPM  | Handlebar switch in the "OFF" position, broken main harness RPM wires, defect voltage regulator, broken ACG stator wires.                | EPS will auto-recover when engine RPM signal returns to normal   |
| C1315 | Engine RPM Faulty                       | Engine RPM CAN signal received by the EPS incorrect or missing  | Broken main harness CAN wires or defective ECM.  | EPS will auto-recover when engine RPM signal returns to normal   |
| C1316 | EEPROM Error                            | EPS internal memory error has been detected   | Internal EPS condition   | Correct EPS condition*   |
| C1317 | CAN Bus Error                           | The EPS has lost CAN communication with the EFI ECM   | Broken CAN wires in the main harness. EFI ECM connector has been disconnected.   | Correct EPS condition*   |
| C1318 | Internal CRC Error                      | EPS internal CRC calculation condition has been detected  | EPS reflash has failed. Battery power was lost, or the key switch was turned off, during EPS reflash programming.                        | EPS must be reprogrammed   |
| C1319 | Boot Counter Exceeded                   | EPS internal application code condition has been detected   | Intermittent power has prevented a successful application code launch.   | Correct EPS power condition*   |
| C1320 | Incorrect Vehicle Speed-to-RPM Ratio    | Vehicle speed signal received by the EPS exceeds 10 MPH, but the engine RPM signal less than 500 RPM          | Intermittent or broken main harness RPM wires, intermittent voltage regulator, intermittent or broken ACG stator wires.                  | Correct EPS condition*   |
| C1321 | Vehicle Speed Erratic                   | Vehicle speed signal received by the EPS changing at an unrealistic rate                                      | Intermittent main harness, intermittent speed sensor, dirty speed sensor or trigger wheel.   | Correct EPS vehicle speed signal condition*  |
| C1322 | Engine RPM Lost                         | Engine RPM signal received by the EPS exceeds 500 RPM and then is zero or missing                             | Handlebar switch in the "OFF" position, broken main harness RPM wires, defect voltage regulator, broken ACG stator wires.                | EPS will auto-recover when engine RPM signal returns to normal   |
| C1323 | "EPS OFF" Gauge Display                 | Battery power has been applied to the EPS for more than 5-minutes, but no engine RPM signal has been detected | The EPS has been automatically disabled, after 5-minutes of inactivity, to conserve battery power.                                       | EPS will auto-recover when engine is started or the key switch is cycled On-Off-On                         |
| C1324 | Loss of CAN communication with EPS unit | The gauge has lost CAN communication with the EPS   | Broken CAN wires in the main harness or disconnected EPS. This is not an EPS generated DTC; gauge DTC display only.                      | Gauge DTC display will clear when the EPS-to-gauge CAN communication is restored.                          |
| C1325 | Dual Loss                               | EPS loss of both the vehicle speed and the engine RPM signals has been detected                               | Handlebar switch in the "OFF" position, the engine stalled (key switch "ON"), broken harness wires, loss of CAN data signal.             | EPS will auto-recover when either the vehicle speed or engine RPM signal is restored.                      |
| C1326 | Rotor Position Encoder                  | EPS internal rotor position encoder variance condition has been detected                                      | Internal EPS Condition   | Correct EPS condition*   |
| C1327 | Voltage Converter Error (Low)           | EPS internal voltage converter low-voltage condition has been detected  | Internal EPS Condition   | Correct EPS condition*   |
| C1328 | Voltage Converter Error (High)          | EPS internal voltage converter over-voltage condition has been detected                                       | Internal EPS Condition   | Correct EPS condition*   |
| C1329 | Internal Data Error                     | EPS internal preloaded data condition has been detected   | Internal EPS Condition   | EPS must be reprogrammed   |

\* After correcting condition, cycle key switch On-Off-On

## TROUBLESHOOTING

■NOTE: The EPS assembly is not serviceable and must not be disassembled or EPS warranty will be voided.

1. Check 30-amp EPS fuse and EPS relay (primary coil: 150 ohms  $\pm$  10%, secondary resistance  $<1$  ohm with primary energized).
2. With the ignition off, disconnect 2-pin connector on the EPS assembly and connect a volt meter set to DC voltage to the harness (black meter lead to BLK and red meter lead to ORG/BRN). With the ignition switch in the ON position, the meter should read battery voltage (if correct voltage is not present, check connections and wiring harness).

### CAUTION

**Do not attempt to check resistance of the EPS motor (2-pin input receptacle). There are internal capacitors holding a charge that can cause internal damage to an ohmmeter.**

3. With ignition switch off, disconnect the 8-pin connector on the EPS assembly and connect a volt meter set to DC voltage to the harness (red meter lead to the ORG wire and black meter lead to battery ground.) With the ignition switch in the on position, the meter should read battery voltage (if correct voltage is not present, check for loose fittings or connections in the wiring harness).

### CAUTION

**If CATT II has confirmed an active DTC relating to the CAN communication wires, use extreme caution when testing the wires. Do not probe the ECM connector with meter leads; instead use a small T-pin or other suitable testing component to make light and proper contact.**

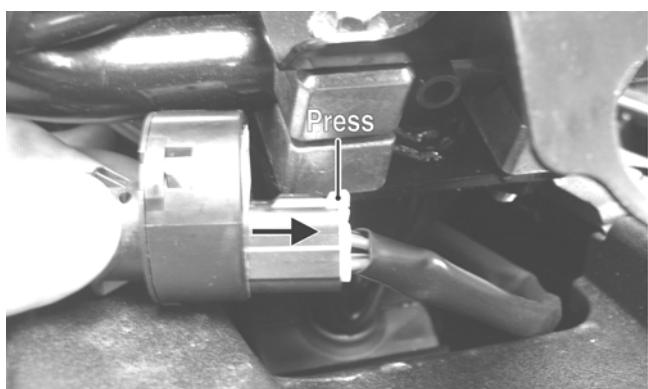
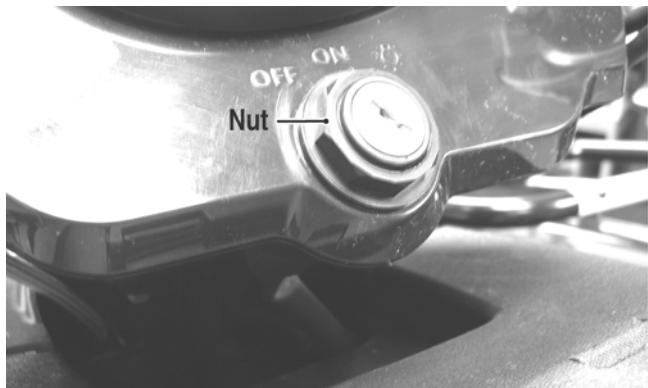
### CAUTION

**Never disconnect the ECM connector with the battery cables installed onto the battery.**

■NOTE: If after completing the preceding tests and possible solutions with normal results an EPS issue persists with active DTCs C1301-C1305, 1316, or C1326-C1329 confirmed by CATT II, the EPS assembly must be replaced (see Steering/Body/Controls).

## Ignition Switch

The ignition switch harness connects to the switch with a four-pin connector. To access the connector, remove the ignition switch nut, remove the switch, and press the connector release tab. Pull the connector from the switch.



## VOLTAGE

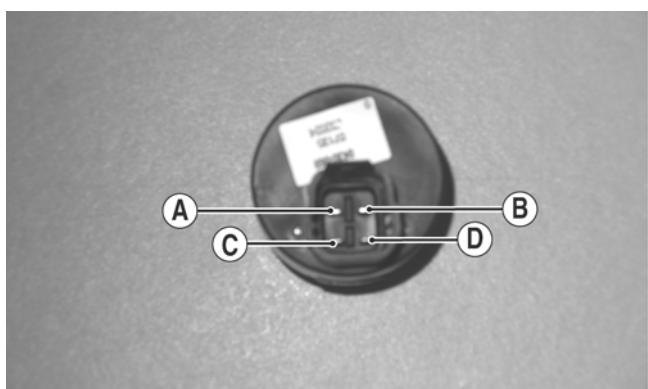
■NOTE: Perform this test on the harness connector.

1. Set the meter selector to the DC Voltage position.
2. Connect the red meter lead to either red wire; then connect the black meter lead to battery ground.
3. Meter must show battery voltage.

■NOTE: If the meter shows no battery voltage, troubleshoot the main wiring harness, fuse, or battery.

## RESISTANCE

■NOTE: Perform this test on the switch using the following procedure.



1. Turn the ignition switch to the ON position.
2. Set the meter selector to the OHMS position.
3. Connect either tester lead to pin C; then connect the other tester lead to pin D.
4. The meter must show less than 1 ohm.

5. Turn the ignition switch to the LIGHTS position.
6. Connect either tester lead to pin A; then connect the other tester lead to pin B.
7. The meter must show less than 1 ohm.
8. With the switch in the OFF position, connect the red tester lead and the black tester lead to each of the remaining pins. The meter must show an open circuit on all pins.

■**NOTE: If the meter shows more than 1 ohm of resistance, replace the switch.**

## Ignition Coil

■**NOTE: On the 1000 models, the following procedures should be performed on both ignition coils.**

The ignition coil is on the frame above the engine. To access the coil, the side panel must be removed.

### VOLTAGE

#### Primary Coil

1. Set the meter selector to the DC Voltage position; then disconnect the two wire connector from the coil.
2. Connect the red tester lead to the orange wire and the black tester lead to battery ground.
3. Turn the ignition switch to the ON position. The meter must show battery voltage.

#### Secondary Coil

##### CAUTION

**Disconnect the injector connector(s) before performing the following procedure.**

1. Connect the primary ignition coil connector. Remove the spark plug cap from the spark plug.
2. Connect the spark plug cap to Ignition Test Plug or other suitable tool; then ground the tool away from the spark plug hole. While turning the engine over, check for sufficient spark.

### RESISTANCE

##### CAUTION

**Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.**

■**NOTE: For these tests, the meter selector should be set to the OHMS position.**

#### Primary Winding

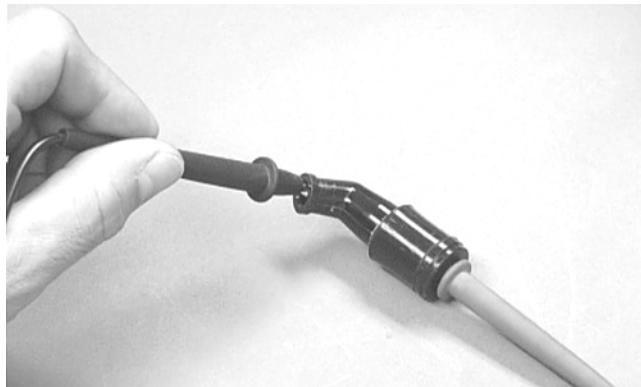
1. Disconnect the coil connector. Connect the red tester lead to either terminal; then connect the black tester lead to the other terminal.
2. Resistance must be less than 1 ohm.

■**NOTE: If the meter does not show as specified, replace ignition coil.**

■**NOTE: Secondary coil resistance checks are not recommended. An internal diode in the coil prevents accurate secondary resistance measurements.**

## Spark Plug Cap

1. Connect the red tester lead to one end of the cap; then connect the black tester lead to the other end of the cap.



AR603D

2. The meter must show 4000-6000 ohms.

■**NOTE: If the meter does not read as specified, replace the spark plug cap.**

## Accessory Receptacle/Connector

■**NOTE: This test procedure is for either the receptacle or the connector.**

### VOLTAGE

1. Turn the ignition switch to the ON position; then set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the red/white wire or the positive connector; then connect the black tester lead to battery ground.
3. The meter must show battery voltage.

■**NOTE: If the meter shows no battery voltage, troubleshoot the battery, fuse, receptacle, connector, or the main wiring harness.**

## Switches



**Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.**

The auxiliary switch connector is the two-prong connector on the brake switch lead above the gas tank on the right side. To access the handlebar control connector, remove the access panel.

■**NOTE: The ignition switch must be in the ON position.**

#### VOLTAGE (Brakelight)

1. Set the meter selector to the DC Voltage position.

2. Connect the red tester to the orange wire; then connect the black tester lead to the red/blue wire.



FI510



FI489

3. The meter must show battery voltage.

■**NOTE:** If the meter shows no battery voltage, troubleshoot the battery, fuse, switch, or the main wiring harness.

■**NOTE:** If the meter shows battery voltage, the main wiring harness is good; proceed to test the switch/component, the connector, and the switch wiring harness for resistance.

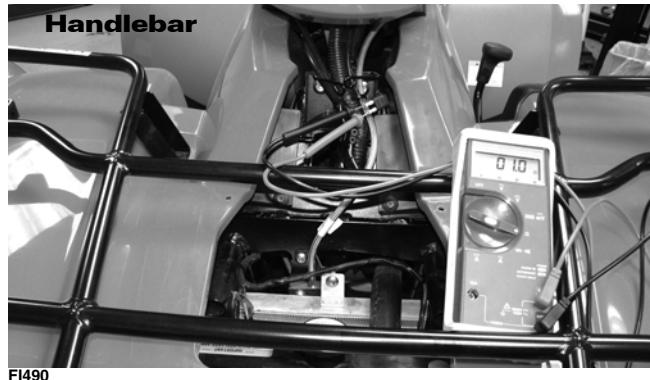
#### **RESISTANCE (Brakelight)**

■**NOTE:** The brake lever must be compressed for the handlebar switch test. Also, the ignition switch must be in the OFF position.

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to one black wire; then connect the black tester lead to the other black wire.



FI502



FI490

3. When the brake pedal/lever is depressed, the meter must show less than 1 ohm.

■**NOTE:** If the meter shows more than 1 ohm of resistance, replace the switch.

#### **RESISTANCE (HI Beam)**

The connector is the yellow one next to the steering post. To access the connector, the steering post cover and the right-side fender splash shield must be removed (see Steering/Body/Controls).

■**NOTE:** These tests should be made on the top side of the connector.

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to the yellow wire; then connect the black tester lead to the gray wire.
3. With the dimmer switch in the HI position, the meter must show less than 1 ohm.

■**NOTE:** If the meter shows more than 1 ohm of resistance, replace the switch.

#### **RESISTANCE (LO Beam)**

1. Connect the red tester lead to the white wire; then connect the black tester lead to the gray wire.
2. With the dimmer switch in the LO position, the meter must show an open circuit.

■**NOTE:** If the meter reads resistance, replace the switch.

#### **DIODE (Starter Button)**

■**NOTE:** If voltage is not as specified, check the condition of the battery in the meter prior to replacing the switch. A low battery will result in a low voltage reading during a diode test.

1. Set the meter selector to the Diode position.
2. Connect the red tester lead to the orange/white wire; then connect the black tester lead to the yellow/green wire.
3. With the starter button depressed, the meter must show 0.5-0.7 DC volt.
4. With the starter button released, the meter must show .OL.
5. Connect the red tester lead to the yellow/green wire; then connect the black tester lead to the orange/white wire.

- With the starter button depressed, the meter must show .OL.

**■NOTE: If the meter does not show as specified, replace the switch.**

### RESISTANCE (Engine Stop Switch)

- Set the meter selector to the OHMS position.
- Connect the red tester lead to the orange wire; then connect the black tester lead to the orange/white wire.
- With the switch in the OFF position, the meter must show an open circuit.
- With the switch in the RUN position, the meter must show less than 1 ohm.

**■NOTE: If the meter shows more than 1 ohm of resistance, replace the switch.**

### RESISTANCE (Reverse Override)



Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

The connector is the four-prong white one next to the steering post. To access the connector, the front rack and front fenders must be removed (see Steering/Body/Controls).

- Set the meter selector to the OHMS position.
- Connect the red tester lead to one red/yellow wire; then connect the black tester wire to the other red/yellow wire. The meter must show less than 1 ohm.
- Depress and hold the reverse override button. The meter must show an open circuit.
- Connect the red tester lead to the blue wire; then connect the black meter lead to the black wire. The meter must show an open circuit.
- Depress and hold the reverse override button. The meter must show less than 1 ohm.

**■NOTE: If the meter does not show as specified, replace the switch.**

### RESISTANCE (Drive Select)



Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

The connector is the three-wire white triangular one in front of the upper steering post.

**■NOTE: Resistance tests should be made with the switch disconnected.**

- Set the meter selector to the OHMS position.
- Connect the red tester lead to the green/white wire terminal; then connect the black tester lead to the black wire terminal.

- With the switch in the 2WD position, the meter must show an open circuit. With the switch in the 4WD position, the meter must show less than 1 ohm. With the switch in the 4WD Lock position, the meter must show less than 1 ohm.

- Connect the red tester lead to the orange/white wire terminal; then connect the black tester lead to the black wire terminal.

- With the switch in the 2WD position, the meter must show an open circuit. With the switch in the 4WD position, the meter must show an open circuit. With the switch in the 4WD Lock position, the meter must show less than 1 ohm.

**■NOTE: If the meter does not show as specified, replace the drive select switch.**

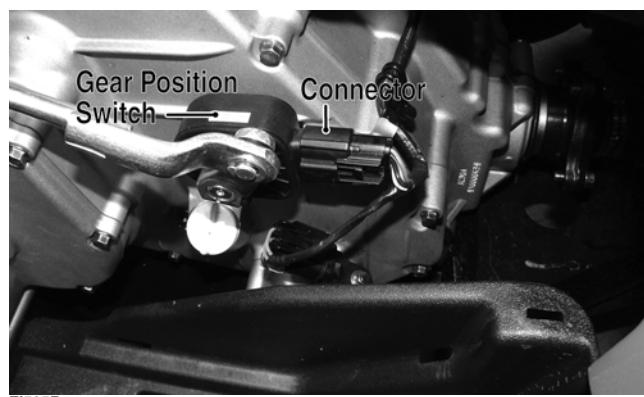
**■NOTE: If the meter shows other than specified, check the harness, connector, 30 amp fuse, and battery connections.**

### RESISTANCE (Gear Position)



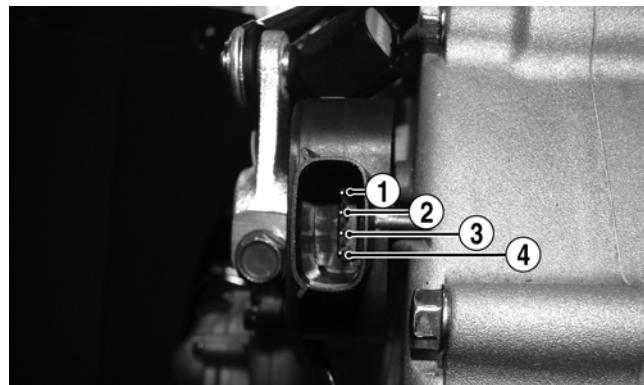
Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

The gear position switch is located on the engine/transmission next to the shift arm.



FI525B

- Disconnect the gear position switch connector; then using a multimeter, test the switch in each position as follows. Resistance must be less than 1 ohm for all tests.



KC410A

- Neutral (N) Pins 3 to 4

- B. Reverse (R) Pins 3 to 4 and 3 to 2
- C. High (H) Pins 3 to 4 and 3 to 1
- D. Low (L) Pins 3 to 1
- 2. Connect the harness to the gear position switch.

## Fan Motor



This component can be tested using the CATT II. Utilize the Test screen.

The connector is the black two-prong one located above the oil cooler/radiator.

■NOTE: To determine if the fan motor is good, connect the red wire from the fan connector to the positive side of a 12 volt battery; then connect the black wire from the fan connector to the negative side. The fan should operate.

### WARNING

Care should be taken to keep clear of the fan blades.

■NOTE: Fan motor resistance checks are not recommended. Resistance values change with the motor commutator position.

## Front Drive/Differential Lock Actuator

■NOTE: With the engine stopped and the ignition switch in the ON position, a momentary "whirring" sound must be noticeable each time the drive select switch is moved between positions. The LCD gauge will display 4WD and 4WD Lock in the corresponding switch positions. Test the switch, 30 amp fuse, and wiring connections prior to testing the actuator system.

■NOTE: Voltage tests must be made with the switch and the actuator connected to the main harness. The meter can be connected at the actuator connector using a break-out harness or MaxiClips.

### VOLTAGE

1. Turn the ignition switch to the ON position, but do not start the engine.
2. Connect the black tester lead to the black wire.
3. Select the DC Volts position on the tester and observe the meter readings for each of the three switch positions.

| WIRE COLOR          | 2WD             | 4WD              | DIFFERENTIAL LOCK |
|---------------------|-----------------|------------------|-------------------|
| Red to Orange       | Battery Voltage | 0 DC Volts       | 0 DC Volts        |
| Red to White/Green  | Battery Voltage | Battery Voltage  | 0 DC Volts        |
| Red to White/Orange | Battery Voltage | Battery Voltages | Battery Voltage   |

■NOTE: If the meter does not show voltages according to the chart, make sure the switch and front drive actuator are both plugged into the main harness; then troubleshoot the switch, ignition fuses, battery connections, or wiring harness.

■NOTE: If the voltage readings are as specified and the actuator does not function correctly, replace the actuator (see Drive System/Brake System).

## Lights

### VOLTAGE (HEADLIGHT)

These four 2-prong connectors are plugged into the headlight bulbs (two on each side).

■NOTE: Perform this test in turn on the main harness side of all four connectors. Also, the ignition switch must be in the LIGHTS position.

■NOTE: The LO beam is the outside bulb, and the HI beam is the inside bulb.

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to one wire; then connect the black tester lead to the other wire.
3. With the dimmer switch in the LO position, test the two outside connectors (LO beam). The meter must show battery voltage.
4. With the dimmer switch in the HI position, test the two inside connectors (HI beam). The meter must show battery voltage.

■NOTE: If battery voltage is not shown in any test, inspect the LIGHTS fuse, battery, main wiring harness, connectors, or the left handlebar switch.

### VOLTAGE (Taillight)

This 3-prong connector is located under the rear fender assembly.

■NOTE: Perform this test on the main harness side of the connector. Also, the ignition switch should be in the LIGHTS position.

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the white wire; then connect the black tester lead to the black wire.
3. With the ignition key in the LIGHTS position, the meter must show battery voltage.

■NOTE: If the meter shows no voltage, inspect fuses, wiring harness, connectors, and switches.

### VOLTAGE (Brakelight)

■NOTE: Perform this test on the main harness side of the connector. Also, the ignition switch should be in the ON position and the brake (either foot pedal or hand lever) must be applied.

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the red/blue wire; then connect the black tester lead to the black wire.

3. With either brake applied, the meter must show battery voltage.

■**NOTE: If the meter shows no voltage, inspect fuses, wiring harness, connectors, and switches.**

## Power Distribution Module (PDM)

The fuses are located in a power distribution module under the seat. If there is any type of electrical system failure, always check the fuses first.

■**NOTE: The ignition switch must be in the LIGHTS position.**

The 4-pin relays are identical plug-in type. Relay function can be checked by switching relay positions. The relays are interchangeable.

■**NOTE: The PDM base and wiring harness are not a serviceable components and must be replaced as an assembly.**

1. Remove all fuses from the distribution module.
2. Set the meter selector to the DC Voltage position.
3. Connect the black tester lead to battery ground.
4. Using the red tester lead, contact each end of the fuse holder connector terminals individually.
5. The meter must show battery voltage from one side of the connector terminal ends.

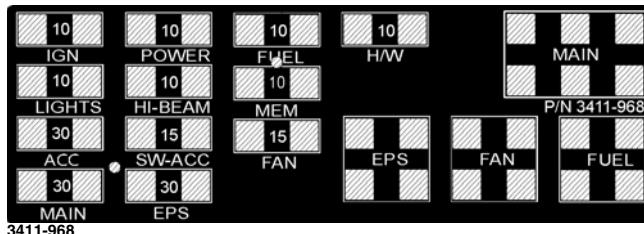
■**NOTE: Battery voltage will be indicated from only one side of the fuse holder connector terminal; the other side will show no voltage.**

■**NOTE: When testing the HI-BEAM fuse holder, the headlight dimmer switch must be in the HI position; when testing the LIGHTS fuse holder, the headlight dimmer switch can be in either position.**

■**NOTE: If the meter shows no battery voltage, troubleshoot the battery, switches, distribution module, or the main wiring harness.**

### FUSES

■**NOTE: To access a fuse, compress the locking tabs on either side of the fuse case and lift out.**



### CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to one spade end of the fuse; then connect the black tester lead to the other spade end.
3. The meter must show less than 1 ohm resistance. If the meter reads open, replace the fuse.

■**NOTE: Make sure the fuses are returned to their proper position according to amperage. Refer to the fuse block decal for fuse placement.**

## EFI Sensors/Components

### FUEL INJECTOR



Component data can be tested using the CATT II. Utilize the Test screen.

### Voltage

Remove the connector from the fuel injector. Place the red meter lead to the orange wire and black meter lead to ground. With the ignition switch in the on position the meter must read battery voltage.

### Resistance

With the connector still removed from the injector, place the red meter lead to either terminal; then connect the black tester lead to the other terminal. Reading is typically  $12\text{ ohms} \pm 10\%$  (500/1000) or  $9.78\text{--}10.82\text{ ohms}$  (700).

■**NOTE: If voltage is not present, troubleshoot the battery, connector pins, wiring harness, fuses, or relay. If resistance is not present or largely out of specification, replace the injector.**

### CRANKSHAFT POSITION (CKP) SENSOR

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to the blue wire; then connect the black tester lead to the green wire. The reading should be between 104-156 ohms.

■**NOTE: The battery must be at full charge for the voltage test.**

3. Set the meter selector to the AC Voltage position.
4. Connect the red tester lead to the blue wire; then connect the black tester lead to the green wire.
5. Crank the engine over using the electric starter. The meter should read 2.0 or more.

### OXYGEN (O2) SENSOR

The sensor is located in the exhaust pipe.

■NOTE: The ambient temperature of the engine and in the intake and exhaust system must be at room temperature (approximately 68° F) when performing this test or an incorrect reading will occur.

1. On the right side of the ATV, unplug the connector.



KC518A

2. On the sensor side of connector, connect the black (negative) test lead to one white wire pin; then connect the red (positive) test lead to the other white wire pin.
3. With the meter in the OHMS position, the reading should be between 6.7-10.1 ohms.

■NOTE: If the meter does not read as specified, replace sensor.

#### TEMPERATURE/MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR (500)



Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

■NOTE: Preliminary checks may be performed on this component using the diagnostic mode on the LCD gauge (see EFI Diagnostic System in this section).

1. Disconnect the TMAP connector from the sensor located on top of the throttle body.
2. Select DC Voltage on the tester and turn the ignition switch to the ON position.
3. Connect the black tester lead to the pink/black wire and the red tester lead to the orange/blue wire. The meter should read 4.5-5.5 DC volts. If the meter does not read as specified, check the ECM connector or wiring.
4. Connect the sensor to the harness; then using Maxi-Clips, connect the red tester lead to the brown/white wire and the black tester lead to the pink/black wire. With the engine running at idle speed, the meter should read approximately 2.5 DC volts.
5. Connect the red tester lead to the green/red wire. With the engine at idle and at room temperature (approximately 60° F), the meter should read approximately 2.9 DC volts.

■NOTE: If the meter does not read as specified, replace the sensor.

#### MANIFOLD ABSOLUTE PRESSURE/INLET AIR TEMPERATURE (MAP/IAT) SENSOR (700/1000)



Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

■NOTE: Preliminary checks may be performed on this component using the diagnostic mode on the LCD gauge (see EFI Diagnostic System in this section).

■NOTE: The ambient temperature of the engine and in the intake and exhaust system must be at room temperature (approximately 68° F) when performing this test or an incorrect reading will occur.

1. Disconnect the MAP/IAT connector from the sensor located on top of the throttle body.
2. Select DC Voltage on the tester and turn the ignition switch to the ON position.
3. Connect the black tester lead to the black/pink wire and the red tester lead to the orange/blue wire. The meter should read 4.5-5.5 DC volts. If the meter does not read as specified, check the ECM connector or wiring.
4. Connect the MAP/IAT to the harness; then using Maxi-Clips, connect the red tester lead to the brown/white wire and the black tester lead to the black/pink wire. With the engine running at idle speed, the meter should read approximately 2.5 DC volts (MAP sensor signal).
5. Connect the red tester lead to the green/red wire. With the engine at idle, the meter should read approximately 2.9 DC volts.

■NOTE: If the meter does not read as specified, replace the sensor.

#### ENGINE COOLANT TEMPERATURE (ECT) SENSOR



Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

■NOTE: Preliminary checks may be performed on this component using the diagnostic mode on the LCD gauge (see EFI Diagnostic System in this section).

1. Connect the meter leads (selector in OHMS position) to the sensor terminals.
2. Suspend the sensor and a thermometer in a container of cooking oil; then heat the oil.

■NOTE: Neither the sensor nor the thermometer should be allowed to touch the bottom of the container or inaccurate readings will occur. Use wire holders to suspend the sensor and thermometer.

#### ⚠ WARNING

Wear insulated gloves and safety glasses. Heated oil can cause severe burns.

3. On the ECT sensor when the temperature reaches 20° C (68° F), the meter should read approximately 2.45k ohms.
4. On the ECT sensor when the temperature reaches 50° C (122° F), the meter should read approximately 800 ohms.
5. On the ECT sensor when the temperature reaches 80° C (176° F), the meter should read approximately 318 ohms.
6. On the ECT sensor when the temperature reaches 110° C (230° F), the meter should read approximately 142 ohms.
7. If the readings are not as indicated, the sensor must be replaced.
8. Install the sensor and tighten securely.
9. Connect the leads.

## SPEED SENSOR

### Testing

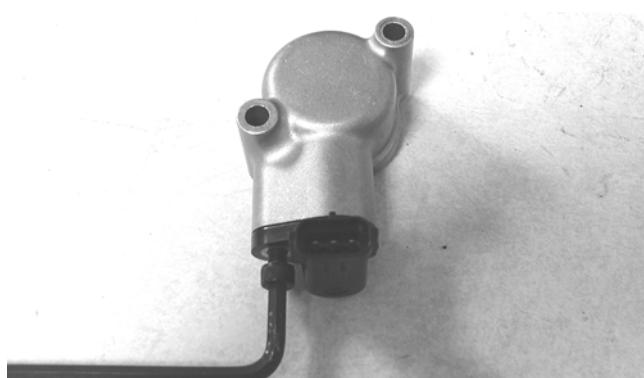
**■NOTE:** Prior to testing the speed sensor, inspect the three-wire connector on the speed sensor for contamination, broken pins, and/or corrosion.

1. Set the meter selector to the DC Voltage position.
2. With appropriate needle adapters on the meter leads, connect the red tester lead to the pink/blue (700) or orange (1000) wire; then connect the black tester lead to the black wire.
3. Turn the ignition switch to the ON position.
4. The meter must show battery voltage.
5. Leave the black tester lead connected; then connect the red tester lead to the pink/white wire.
6. Slowly move the vehicle forward or backward; the meter must show 0 and battery voltage alternately.

**■NOTE:** If the sensor tests are within specifications, the LCD gauge must be replaced.

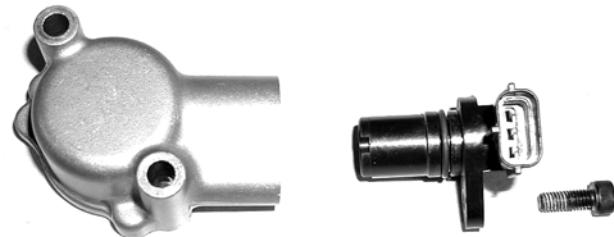
### Replacing (700)

1. Disconnect the three-wire connector from the speed sensor harness or from the speed sensor; then remove the cap screw securing the sensor to the sensor housing.
2. Remove the sensor from the sensor housing accounting for an O-ring.



CD070

3. Install the new speed sensor into the housing with new O-ring lightly coated with multi-purpose grease; then secure the sensor with the cap screw (threads coated with blue Loctite #242). Tighten securely.



CD071

## FUEL PUMP/FUEL LEVEL SENSOR



Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

**■NOTE:** Preliminary checks may be performed on this component using the diagnostic mode on the LCD gauge (see **EFI Diagnostic System** in the **Electrical System** section).

The electric fuel pump and fuel level sensor are not serviceable components. If either component fails, it must be replaced.

### TESTING

#### **WARNING**

Whenever any maintenance or inspection is made on the fuel system during which there may be fuel leakage, there should be no welding, smoking, open flames, etc., in the area.

#### **AT THIS POINT**

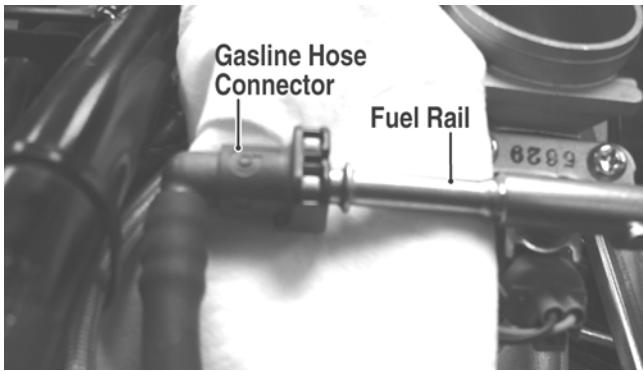
Prior to removing the electric fuel pump, the following check should be performed to determine that removal is necessary.

1. Turn the ignition switch ON and listen for a momentary "whirring" sound of the pump building pressure. If the sound is heard (10 seconds), no electrical checks are necessary. Turn the ignition switch OFF.

#### **WARNING**

Gasoline may be under pressure. Depressurize the fuel system by disconnecting the fuel pump electrical connector and running the engine until it stalls. Place an absorbent towel around the connector to absorb any gasoline when disconnecting.

2. Disconnect the gasline hose from the fuel rail; then install a suitable pressure gauge.



FI092A

3. Reconnect the fuel pump electrical connector; then turn the ignition switch to the ON position. The fuel pressure should build until the pump shuts off. Pressure should read 3.0 kg-cm<sup>2</sup> (43 psi).
4. If the pump is not running, disconnect the fuel pump/sensor connector.
5. Connect a multimeter to the power supply leads with the red tester lead to the orange/red wire and the black tester lead to the black wire; then turn the ignition switch to the ON position. The meter should read battery voltage. If battery voltage is indicated and the fuel pump does not run, replace the pump assembly. If no battery voltage is indicated, check the ECM and the vehicle tilt sensor.

## REMOVING

1. Remove the rear rack and fenders (see Steering/Body/Controls); then disconnect the power supply/fuel hose connector.
2. Remove the spring clamp; then remove the fuel hose.
3. Remove the screws securing the fuel pump to the gas tank; then make a reference mark on the fuel pump and tank.
4. Lift out the fuel pump assembly carefully tilting it forward to clear the voltage regulator; then guide the pump and float lever through the opening in the gas tank.

### CAUTION

Take care not to damage the float or float arm or replacement of the entire assembly will be necessary.

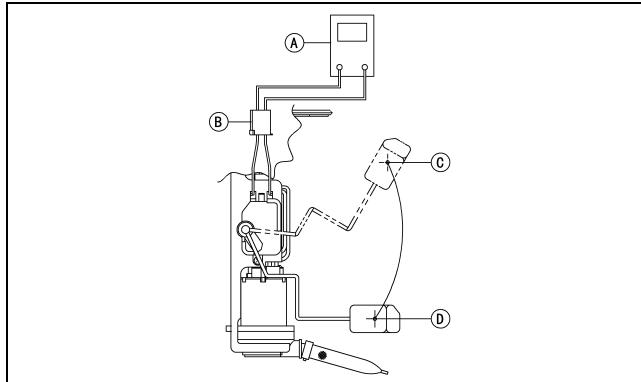
5. Using duct tape or other suitable means, cover the fuel pump opening.

## INSPECTING

### ☞ AT THIS POINT

If the pump has failed earlier test and must be replaced, proceed to **INSTALLING**.

1. Inspect the fuel screen and blow clean with low pressure compressed air.
2. Move the float lever and check for free movement. The float assembly should return to the lower position without force. If not, replace the fuel pump assembly.
3. Test the fuel level sensor by connecting a multimeter (A) to the fuel level sensor leads (B); then select OHMS. The multimeter should show 5 ohms at full fuel position (C) and 95 ohms at empty fuel position (D).

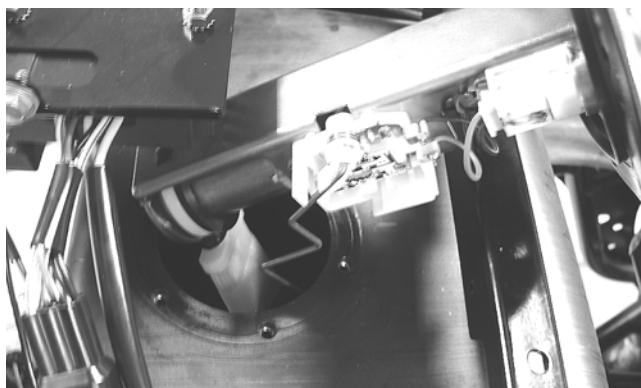


ATV2116

■**NOTE:** If readings are erratic, clean the resistor wiper and resistor with clean alcohol and retest. If still not correct, replace the fuel level sensor.

## INSTALLING

1. Mark the new fuel pump with a reference mark in the same location as the removed pump; then place the new gasket on the pump.
2. Remove the material covering the fuel pump opening; then carefully guide the fuel pump into position taking care not to damage the float or float lever.



KX190

3. Rotate the fuel pump until the match marks align; then install the mounting screws and tighten securely using a crisscross pattern.

■**NOTE:** It is critical to install the fuel pump with the correct orientation to ensure adequate float lever clearance.

4. Connect the wires, fuel hose, and spring clamp; then turn the ignition switch to the ON position. Note that the fuel pump runs momentarily and the fuel gauge indicates the proper fuel level.
5. With the transmission in neutral and brake lever lock engaged, start the engine and check for normal operation. Check for any fuel leaks.
6. Install any wire ties that were removed; then install the rear fenders, rack, and seat making sure the seat locks securely.

## TILT SENSOR

The tilt sensor is located below the taillight.

### WARNING

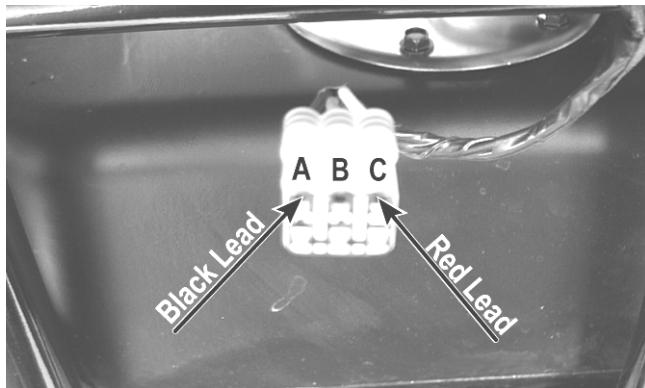
Incorrect installation of the tilt sensor could cause sudden loss of engine power which could result in loss of vehicle control resulting in injury or death.

### CAUTION

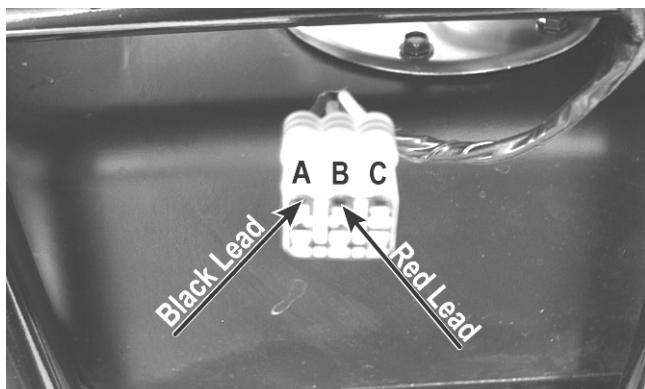
Do not drop the tilt sensor as shock can damage the internal mechanism.

### Supply Voltage

1. Disconnect the three-wire connector from the sensor; then select DC Voltage on the multimeter and connect the red tester lead to the orange wire (C) and the black tester lead to the black wire (A).



2. Turn the ignition switch to the ON position. The multimeter should read battery voltage. If battery voltage is not indicated, check the 30-amp main and 10-amp ignition fuses, wiring harness, or the ignition switch.
3. Remove the red tester lead and connect to the blue/brown wire (B). The multimeter should read 0.2 DC volts or less. If the specified voltage is not indicated, check wire connections at the ECM or substitute another ECM to verify the test.



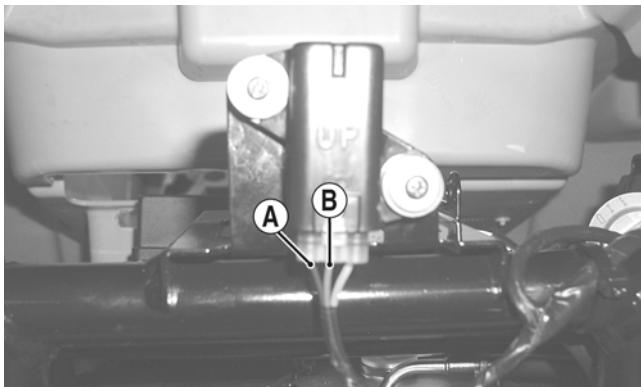
### Output Voltage

■NOTE: Needle adapters or a "break-out" harness will be required on the multimeter leads as the following tests are made with the sensor connected.

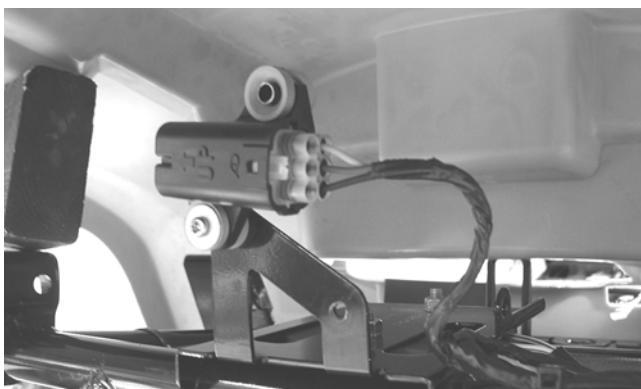
1. Connect the three-wire plug to the sensor; then remove the right-side mounting screw securing the sensor to the rear frame.



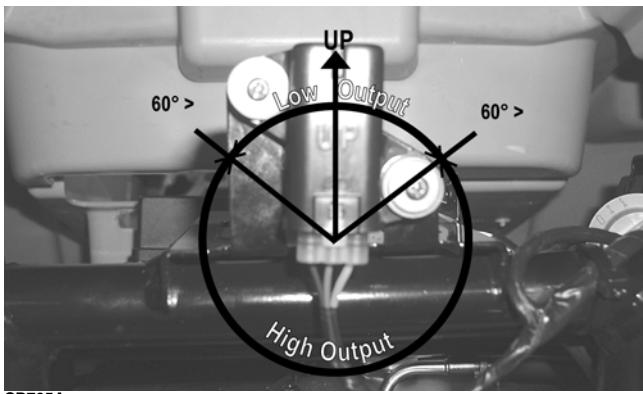
2. Install the needle adapters to the multimeter leads; then select DC Voltage on the multimeter.
3. Connect the red tester lead to the blue/brown wire (B) and the black tester lead to the black/yellow wire (A); then turn the ignition switch ON and observe the meter. The meter should read 0.3-2.9 DC volt.



4. Tilt the sensor 60° or more to the left and right observing the meter. The meter should read 3.0-8.0 DC volts after approximately one second in the tilted position. If the meter readings are not as specified, the tilt sensor is defective.



■NOTE: When replacing the sensor after testing, make sure the arrow marking is directed up.



CD705A

## THROTTLE POSITION SENSOR (TPS)



Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

■**NOTE:** Preliminary checks may be performed on this component using the diagnostic mode on the LCD gauge (see EFI Diagnostic System in this section).

### Verifying TPS Adjustment Tool

Before using the TPS adjustment tool, verify its battery condition. The battery used in the tool is a 9-volt battery. To check battery condition, use a digital volt/ohmmeter set on DC volt scale. Test between the adjustment tool black and red jacks. Insert the red lead of the digital voltmeter into the red jack of the adjustment tool and the black lead of the digital voltmeter into the black jack of the adjustment tool. The green power light of the analyzer should now be illuminated. If voltage is found below 4.9 volts, replace the battery.

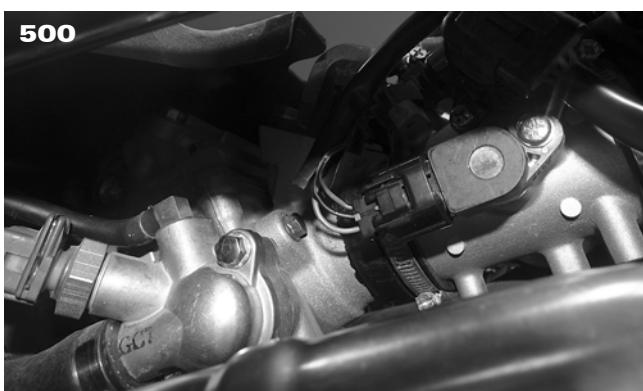
■**NOTE:** The Test Harness must be plugged into the analyzer for testing voltage. Always verify battery voltage is at least 4.9 DC volts before testing TPS.

### Testing

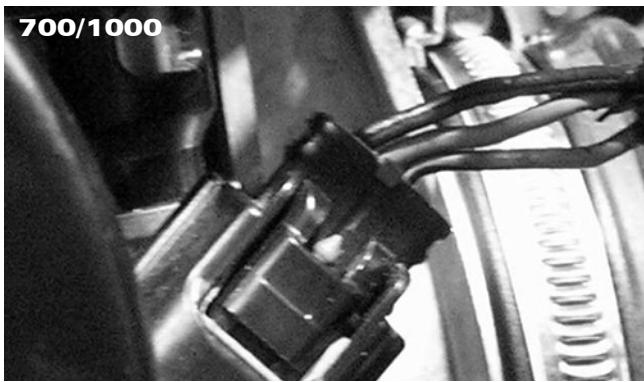
1. On the 500, remove the left-side engine cover. On the 700/1000, remove the seat, side covers, front rack, and front body panel (see Steering/Body/Controls); then remove the air filter assembly.

2. Disconnect the TPS connector plug.

500



KC517



PR544

■**NOTE:** Prior to testing the TPS, inspect the three-wire plug connector on the main harness and the three-pin plug on the TPS for contamination, broken pins, and/or corrosion.

■**NOTE:** If the vehicle is in warranty, removing or adjusting the TPS will void warranty. If the TPS is tested out of specification, the throttle body must be replaced. If the vehicle is out of warranty, the TPS may be adjusted.

3. Connect the TPS Multi-Analyzer Harness connector #8 to the TPS; then connect the harness to the TPS Analyzer Tool.

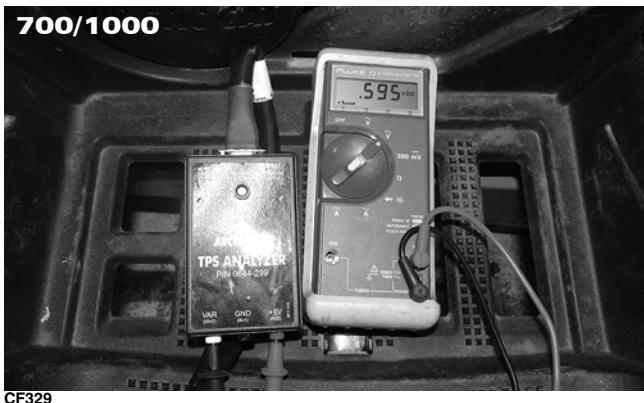


FI672

4. Using a multimeter, connect the black tester lead to the black socket (GND) on the analyzer and the red tester lead to the white socket (VAR); then select the DC Voltage position. With the vehicle off and the throttle lever in the idle position, the gauge should read 0.66-0.70 DC volts (500) or 0.58-0.62 DC volts (700/1000) and at Wide-Open Throttle it should read up to approximately 3.88 DC volts (500) or 3.70 DC volts (700/1000).



FI673A



CF329

## Adjusting

1. Loosen the screw securing the TPS to the throttle body.

2. Adjust the TPS until the correct reading is obtained; then tighten the screw securely. Open and close the throttle and determine the reading at idle the correct voltage. Readjust as necessary.

3. Tighten the mounting screw securely.

■**NOTE: If the throttle body, ECM, TPS, or ISC are replaced, the EFI system must be synchronized. Use the following procedure.**

1. With the key off, depress throttle lever to Wide Open Throttle (WOT).
2. Place the ignition key in the ON position and wait for 10 seconds.
3. Release the throttle lever and wait an additional 10 seconds.
4. Turn the key to the OFF position and allow the gauge to shut off.

## RPM Limiter



Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

■**NOTE: The ATV is equipped with an ECM that cuts fuel spray and spark when maximum RPM is approached. When the RPM limiter is activated, it could be misinterpreted as a high-speed misfire.**

| 500/700                    |      |         |                          |                          |                |                             |                               |  |  |  |  |
|----------------------------|------|---------|--------------------------|--------------------------|----------------|-----------------------------|-------------------------------|--|--|--|--|
| Gear                       | Park | Neutral | Reverse                  | High/Low                 | Fail-Safe Mode | Incorrect ECU/Gauge (P0630) | Warranty Registration (U1001) |  |  |  |  |
| 2WD                        | 2250 | 6500    | 4000                     | 7650 (500)<br>7250 (700) | 4000           | 6650                        | 4500                          |  |  |  |  |
| 4WD                        |      |         |                          |                          |                |                             |                               |  |  |  |  |
| 4WD Lock                   |      |         |                          |                          |                |                             |                               |  |  |  |  |
| 2WD Override               |      |         | 4500 (500)<br>5000 (700) |                          |                |                             |                               |  |  |  |  |
| 4WD Override               |      |         |                          |                          |                |                             |                               |  |  |  |  |
| Differential-Lock Override |      |         | 7000                     |                          |                |                             |                               |  |  |  |  |

| 1000                       |      |         |         |          |                |                             |                               |  |  |  |
|----------------------------|------|---------|---------|----------|----------------|-----------------------------|-------------------------------|--|--|--|
| Gear                       | Park | Neutral | Reverse | High/Low | Fail-Safe Mode | Incorrect ECU/Gauge (P0630) | Warranty Registration (U1001) |  |  |  |
| 2WD                        | 2000 | 6000    | 3500    | 7500     | 3500           | 4500                        | 4500                          |  |  |  |
| 4WD                        |      |         |         |          |                |                             |                               |  |  |  |
| 4WD Lock                   |      |         |         |          |                |                             |                               |  |  |  |
| 2WD Override               |      |         | 4000    | 7500     |                |                             |                               |  |  |  |
| 4WD Override               |      |         |         |          |                |                             |                               |  |  |  |
| Differential-Lock Override |      |         | 6000    |          |                |                             |                               |  |  |  |

## Stator Coil

### VOLTAGE (AC Generator - No Load)

The connector is a three-pin one in the harness coming from the generator.



CF651A

■**NOTE:** Test the connector that comes from the engine.

1. Set the meter selector to the AC Voltage position.
2. Test between the three black wires for a total of three tests.
3. With the engine running at a constant 5000 RPM, voltage must be approximately 75 volts.

### CAUTION

Do not run the engine at high RPM for more than 10 seconds.

■**NOTE:** If both stator coil tests failed, replace the stator assembly.

### RESISTANCE (AC Generator)

1. Set the meter selector to OHMS position.
2. Test between the three black wires for a total of three tests.
3. The meter reading must be within specification.

■**NOTE:** If the stator coil test failed, check all connections, etc., and test again. If no voltage is present, but resistance passes, check the physical condition of the rotor/flywheel. If the physical condition is good, replace the stator assembly.

## Regulator/Rectifier

The regulator/rectifier is located under the rear rack and rear fenders.

### TESTING

1. Start engine and warm up to normal operating temperature; then connect a multimeter to the battery as follows.

2. Select the DC Voltage position; then connect the red tester lead to the positive battery post and the black tester lead to battery ground.

3. Start the engine and slowly increase RPM. The voltage should increase with the engine RPM to a maximum of 15.5 DC volts.

### CAUTION

Do not run the engine at high RPM for more than 10 seconds.

■**NOTE:** If voltage rises above 15.5 DC volts, the regulator is faulty or a battery connection is loose or corroded. Clean and tighten battery connections or replace the regulator/rectifier. If voltage does not rise, see Stator Coil/Crankshaft Position (CKP) Sensor - Voltage in this section. If charging coil voltage is normal, replace the regulator/rectifier.

## Starter Motor

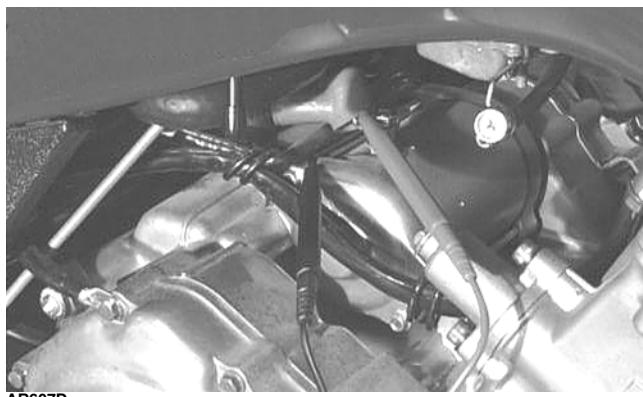
■**NOTE:** The starter motor is a non-serviceable component. If the following test does not result as specified, the starter motor must be replaced.

### TESTING VOLTAGE

Perform this test on the starter motor positive terminal. To access the terminal, slide the boot away.

■**NOTE:** The ignition switch must be in the ON position, the engine stop switch in the RUN position, and the shift lever in the NEUTRAL position.

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the starter motor terminal; then connect the black tester lead to battery ground.
3. With the starter button depressed, the meter must show battery voltage and the starter motor should operate.



■**NOTE:** If the meter showed correct voltage but the starter motor did not operate or operated slowly, troubleshoot all starting system components before replacing the starter motor.

■**NOTE:** If the meter showed no voltage, inspect the main fuse, ground connections, starter motor lead, battery voltage (at the battery), starter relay, or the neutral start relay.

## REMOVING

1. Disconnect the battery.

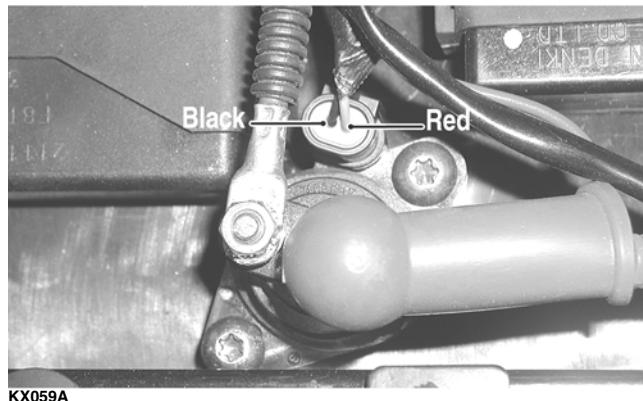
### CAUTION

**Always disconnect the negative battery cable from the battery first; then disconnect the positive cable.**

2. Remove the nut securing the positive cable to the starter motor; then remove the cable from the starter motor.
3. Remove the two cap screws securing the starter motor to the crankcase; then remove the starter motor. Account for the wiring forms and an O-ring.

## INSTALLING

1. Apply a small amount of grease to the O-ring seal on the starter motor; then install the starter motor into the crankcase. Secure with two machine screws and wiring forms.
2. Secure the positive cable to the starter motor with the nut.
3. Connect the battery (positive cable first).



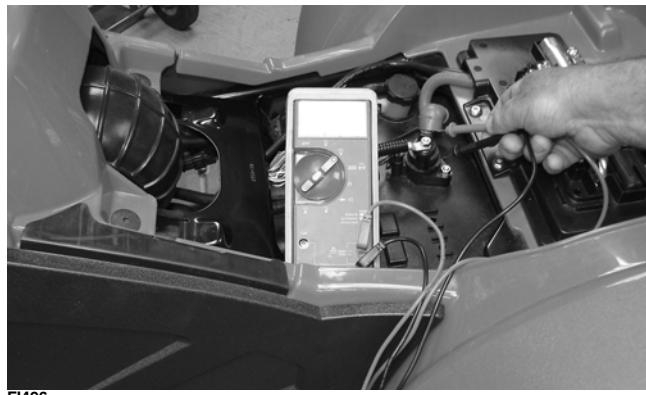
KX059A

5. Depress the starter button and observe the multimeter.

**■NOTE: If battery voltage is indicated, replace the starter relay. If no voltage is indicated, proceed to Power Distribution Module (PDM) check in this section.**

## Starter Relay

1. Remove the seat; then using the multimeter set to the DC Voltage position, check the relay as follows.
2. Connect the red tester lead to the positive battery terminal; then connect the black tester lead to the starter cable connection on the starter relay. The meter must show battery voltage.



FI496

**■NOTE: Make sure that the ignition switch is in the ON position, transmission in neutral, brake lock released, and the engine stop switch in the RUN position.**

3. Depress the starter button while observing the multimeter. The multimeter should drop to 0 volts and a "click" should be heard from the relay.
4. Disconnect the two-wire plug from the starter relay; then connect the red tester lead to the yellow/green wire and the black tester lead to the green wire.

## Electronic Control Module (ECM)

The electronic control module (ECM) is located beneath the seat near the battery (500/700) or under the fender near the taillight (1000).

**■NOTE: The ECM is not a serviceable component. If the unit is defective, it must be replaced.**

The ECM is rarely the cause for electrical problems; however, if the ECM is suspected, substitute another ECM of the same part number to verify the suspected one is defective.

Codes can be cleared by following the procedures located in EFI Diagnostic System in this section.

**■NOTE: If the throttle body, ECM, TPS, or ISC are replaced, the EFI system must be synchronized. Use the following procedure.**

1. With the key off, depress throttle lever to Wide Open Throttle (WOT).
2. Place the ignition key in the ON position and wait for 10 seconds.
3. Release the throttle lever and wait an additional 10 seconds.
4. Turn the key to the OFF position and allow the gauge to shut off.

## EFI Diagnostic System

### DIGITAL GAUGE

The digital gauge can be used as a diagnostic tool for many of the DTCs displayed. To place the gauge into the diagnostic mode, use the following procedure.

1. Turn the ignition switch ON.

- Depress and hold both Mode and Set buttons together for approximately 10 seconds after which the letters "dIAG" will appear on the LCD momentarily followed by COOL.



EFI002A

**■NOTE:** The display on the gauge will display in SAE (speedometer in MPH mode) or Metric (speedometer in km/h mode). For example to read temperature in degrees Celsius, select km/h mode on the gauge or to read Fahrenheit, select MPH mode.

- Cycle the display by depressing either the Set or Mode button to step to the desired function.



EFI004

**■NOTE:** The gauge can be utilized dynamically (engine running/vehicle moving) or statically (engine/vehicle stopped).

Examples of Static checks: Battery voltage, fuel gauge/sensor, and TPS (0% @ closed throttle, 95-100% @ WOT).



EFI007

Examples of Dynamic checks: Battery charging, coolant temperature including fans ON/OFF (see below), MAP/IAT, tachometer, and speedometer signal.



EFI003

### **Coolant (COOL) Diagnostic Mode**



EFI 003

Display: Engine coolant temperature as measured by the ECT sensor.

DTC: P0116, P0117, P0118, P0119

Usage: Monitor coolant temperature to verify the following.

- ECT sensor signal
- High Temperature indicator (on @ 230° F.)
- Thermostat opening @ approximately 180° F, indicated by a momentary drop or pause in the rising temperature reading.
- Fan ON @ 185° F, OFF @ 176° F (700) or fan ON @ 194° F, OFF @ 185° F (500/1000).
  - fan motor
  - fan relay
  - fan fuse
  - wiring connections
- High Temperature Rev Limiter 5000 RPM @ 230° F.

## Fuel Sensor (FUEL) Diagnostic Mode



Display: Fuel level signal from the fuel level sensor (measured in ohms).

DTC: C1400, C1401, C1402

Usage: Check output of the fuel level sensor

1. Full fuel is indicated by a reading of 0-26 ohms (FIS or 0-11 ohms (TRV))
2. Empty is indicated by a reading of 100-105 ohms (FIS) or 68-105 ohms (TRV)

\* 110-500 ohms, suspect the fuel level sensor or wiring

\* 0-100 ohms but no fuel gauge indication, suspect the fuel gauge

## Tachometer (tACH) Diagnostic Mode



Display: Engine RPM

DTC: P0336, P0337, P0339

Usage: Verify engine speed signal from the following.

1. CKP (crankshaft position) sensor to ECM
2. ECM (CAN) signal to gauge (tachometer)
3. ECM (CAN) signal to EPS

## Speed (SPd) Diagnostic Mode



Display: Vehicle speed signal.

DTC: P0500

Usage: Verify speedometer sensor signal from the following.

1. Speed sensor to ECM.
2. ECM (CAN) signal to gauge (speedometer/odometer).
3. ECM (CAN) signal to EPS unit.

## TPS (tPS) Diagnostic Mode



Display: % of TPS (0% closed, 95-100% WOT).

DTC: P0121, P0122, P0123

Usage: Verify TPS signal and adjust throttle cable.

## MAP (bArO) Diagnostic Mode



Display: MAP in millibars (1013 millibar = 29.92 in. mercury).

DTC: P0107, P0108

Usage: Verify barometric pressure signal correct.

**■Note:** Local barometric pressure is given in in./Hg (Inches of Mercury). 34 millibars are equal to 1 inch of mercury. Example: (Gauge reading in the BARO mode = 974 millibars, thus  $974/34 = 28.64$  in./Hg). Second example: (Local barometer reading is 29.87 in./Hg, therefore  $29.87 \times 34 = 1015$  millibars). The gauge should be reading very close to 1015.

### **Inlet Air Temperature (Air) Diagnostic Mode**



Display: Inlet air temperature in Fahrenheit or Celsius.

DTC: P0112, P0113, P0114

Usage: Verify correct output of IAT sensor.

**■NOTE:** After engine has been running, IAT readings will be higher than outside air temperature due to engine and engine compartment heat as well as intake manifold heating.

### **Battery (bAtt) Diagnostic Mode**



EFI004

Display: System DC voltage.

DTC: P0562, P0563, P2531, P2532

Usage: Verify system voltage under following conditions.

1. Battery voltage with engine and accessories off (>12.2 VDC for fully charged).
2. Battery voltage with engine running (charging = 13.8 VDC or greater).
3. Battery voltage with electrical accessories operating, engine idling (13.5 VDC or greater).
4. Battery voltage starter cranking (10.5-11.5 VDC).

### **DIAGNOSTIC TROUBLE CODES (DTC)**

If an EFI or related chassis component fails or an out-of-tolerance signal is detected by the ECM, a diagnostic trouble code (DTC) will be generated in the ECM and displayed on the LCD. The DTC will be displayed alternately with a wrench icon or malfunction indicator light (MIL). The DTC will continue to flash, until the malfunction is corrected and the code cleared.

#### **Code List**

**■NOTE:** Each of the following numerical codes will have a one-letter prefix of C, P, or U. A "C" prefix denotes a chassis malfunction, a "P" prefix denotes a power train malfunction, and a "U" prefix denotes a CAN communication related code.

**■NOTE:** Normal malfunction codes are cleared from the LCD when the component is replaced or the malfunction is corrected; however, intermittent codes must be cleared as noted in the code chart.

| Code  | Fault Description                                    | Possible Cause   | Fault Recovery Method                            |
|-------|--|--|--|
| C0063 | Tilt Sensor Circuit High                             | Sensor or interconnect harness shorted to battery power  | Correct condition*                               |
| C0064 | Tilt Sensor Circuit Low/SG/Open                      | Sensor or interconnect harness open or shorted to chassis ground   | Correct condition*                               |
| P0030 | O2 Heater Intermittent/Open                          | Heater or interconnect harness intermittent or open  | Correct condition*                               |
| P0031 | O2 Heater Low/SG                                     | Heater or interconnect harness shorted to chassis ground   | Correct condition*                               |
| P0032 | O2 Heater High/SP                                    | Heater or interconnect harness shorted to battery power  | Correct condition*                               |
| P0107 | MAP Sensor Circuit Low/SG/Open                       | Sensor or interconnect harness shorted to chassis ground   | Correct condition*                               |
| P0108 | MAP Sensor Circuit High/SP                           | Sensor or interconnect harness shorted to battery power  | Correct condition*                               |
| P0112 | IAT Sensor Circuit Low/SG                            | Sensor or interconnect harness shorted to chassis ground   | Correct condition*                               |
| P0113 | IAT Sensor Circuit High/Open                         | Sensor or interconnect harness open or shorted to battery power  | Correct condition*                               |
| P0114 | IAT Sensor Circuit Intermittent                      | Sensor or interconnect harness intermittent  | Correct condition*                               |
| P0116 | ECT Sensor Circuit Range/Performance                 | Sensor producing an out-of-range voltage   | Correct condition*                               |
| P0117 | ECT Sensor Circuit Low/SG                            | Sensor or interconnect harness shorted to chassis ground   | Correct condition*                               |
| P0118 | ECT Sensor Circuit High/Open/SP                      | Sensor or interconnect harness open or shorted to battery power  | Correct condition*                               |
| P0119 | ECT Sensor Circuit Intermittent                      | Sensor or interconnect harness intermittent  | Correct condition*                               |
| P0121 | TPS Range/Performance                                | Sensor producing an out-of-range voltage   | Correct condition*                               |
| P0122 | TPS Circuit Low/SG                                   | Sensor or interconnect harness shorted to chassis ground   | Correct condition*                               |
| P0123 | TPS Circuit High                                     | Sensor or interconnect harness open or shorted to battery power  | Correct condition*                               |
| P0130 | O2 Sensor Intermittent/Open                          | Sensor or interconnect harness intermittent or open  | Correct condition*                               |
| P0131 | O2 Sensor Low/SG or Air-Leak                         | Sensor or interconnect harness shorted to chassis ground or an air-leak exists   | Correct condition*                               |
| P0132 | O2 Sensor High/SP                                    | Sensor or interconnect harness shorted to battery power  | Correct condition*                               |
| P0171 | O2 Feedback Below Minimum Correction                 | Low fuel rail pressure, dirty fuel filter, or dirty injectors  | Correct condition*                               |
| P0172 | O2 Feedback Exceeds Maximum Correction               | Excessive fuel rail pressure, MAP or temp sensors out-of-spec  | Correct condition*                               |
| P0219 | Engine Over-Speed Condition                          | Engine speed (RPM) has exceeded the ECM over-speed setpoint/limit  | Reduce engine speed                              |
| P0231 | Fuel Pump Relay Circuit Low/SG/Open                  | Relay has been removed or interconnect harness shorted to chassis ground   | Correct condition*                               |
| P0232 | Fuel Pump Relay Circuit High                         | Relay or interconnect harness shorted to battery power   | Correct condition*                               |
| P0233 | Fuel Pump Relay Circuit                              | Relay circuit erratic or intermittent  | Correct condition*                               |
| P0261 | Rear Cylinder Fuel injector Circuit Low/SG           | Injector or interconnect harness shorted to chassis ground   | Correct condition**                              |
| P0262 | Rear Cylinder Fuel injector Circuit High             | Injector or interconnect harness shorted to battery power  | Correct condition**                              |
| P0263 | Rear Cylinder Fuel injector Balance/Open             | Injector has been disconnected or interconnect harness open  | Correct condition**                              |
| P0264 | Front Cylinder Fuel injector Circuit Low/SG          | Injector or interconnect harness shorted to chassis ground   | Correct condition**                              |
| P0265 | Front Cylinder Fuel injector Circuit High            | Injector or interconnect harness shorted to battery power  | Correct condition**                              |
| P0266 | Front Cylinder Fuel injector Balance/Open            | Injector has been disconnected or interconnect harness open  | Correct condition**                              |
| P0336 | Crankshaft Angle Sensor Synchronization              | Sensor or interconnect harness intermittent  | Correct condition**                              |
| P0337 | Crankshaft Angle Sensor Circuit/SG                   | Sensor or interconnect harness shorted to chassis ground   | Correct condition**                              |
| P0339 | Crankshaft Angle Sensor Intermittent/Erratic         | Sensor or interconnect harness intermittent  | Correct condition**                              |
| P0340 | Camshaft Angle Sensor Synchronization                | Sensor or interconnect harness intermittent  | Correct condition**                              |
| P0341 | Camshaft Angle Sensor Circuit/SG                     | Sensor or interconnect harness shorted to chassis ground   | Correct condition**                              |
| P0342 | Camshaft Angle Sensor Intermittent/Erratic           | Sensor or interconnect harness intermittent  | Correct condition**                              |
| P0480 | Fan-Primary/Right Relay Control Circuit              | Relay erratic or intermittent  | Correct condition*                               |
| P0481 | Fan-Secondary/Left Relay Control Circuit             | Relay or interconnect harness shorted to battery power   | Correct condition*                               |
| P0482 | Fan-Secondary/Left Relay Control Circuit Low/SG/Open | Secondary fan fuse has blown, the secondary fan relay has been removed or interconnect harness shorted to chassis ground | Correct condition*                               |
| P0483 | Fan-Secondary/Left Relay Control Circuit             | Relay erratic or intermittent  | Correct condition*                               |
| P0484 | Fan-Primary/Right Relay Control Circuit High         | Relay or interconnect harness shorted to battery power   | Correct condition*                               |
| P0485 | Fan-Primary/Right Relay Control Circuit Low/SG/Open  | Primary fan fuse has blown, the primary fan relay has been removed or interconnect harness shorted to chassis ground     | Correct condition*                               |
| P0500 | Vehicle Speed-Sensor                                 | Sensor circuit signal intermittent or missing  | Correct condition*, start and drive the vehicle* |
| P0508 | IAC System Circuit Low/SG                            | IAC interconnect harness shorted to chassis ground   | Correct condition*                               |
| P0509 | IAC System Circuit High/Open                         | IAC disconnected or the interconnect harness shorted to battery power  | Correct condition*                               |
| P0520 | Engine Oil Sensor/Switch                             | Sensor or interconnect harness erratic or intermittent   | Correct condition*                               |
| P0562 | System Voltage Low                                   | Battery charge condition low or the regulator/rectifier output low   | Correct condition*                               |
| P0563 | System Voltage High                                  | Battery cable connections are loose or the regulator/rectifier output high   | Correct condition*                               |
| P0601 | ECM CAN Communication Shutdown                       | Intermittent CAN connection or unstable CAN condition caused ECM to temporarily shut down CAN communication              | Correct CAN communication issue*                 |
| P0615 | Starter Relay Circuit                                | Start switch/button, starter relay, gear switch or interconnect harness erratic or intermittent                          | Correct condition*                               |
| P0616 | Starter Relay Circuit Low                            | Start switch/button, starter relay or interconnect harness intermittent or shorted to chassis ground                     | Correct condition*                               |
| P0617 | Starter Relay Circuit High                           | Start switch/button, starter relay or interconnect harness intermittent or shorted to battery power                      | Correct condition*                               |

| Code     | Fault Description                                 | Possible Cause   | Fault Recovery Method                               |
|----------|---|--|---|
| P0630    | VIN Not Programmed or Incompatible                | Verify the LCD gauge and ECM part numbers are correct for the vehicle model number and VIN | Correct gauge and ECM VIN compatibility issue*      |
| P0642    | Sensor Power Circuit Low                          | One or more of the sensors defective or shorted to chassis ground                          | Correct condition*                                  |
| P0643    | Sensor Power Circuit High                         | One or more of the sensors defective or shorted to battery power                           | Correct condition*                                  |
| P2300    | Rear Ignition Coil Primary Circuit Low/SG/Open    | Coil or interconnect harness open or shorted to chassis ground                             | Correct condition**                                 |
| P2301    | Rear Ignition Coil Primary Circuit High           | Coil or interconnect harness shorted to battery power                                      | Correct condition**                                 |
| P2303    | Front Ignition Coil Primary Circuit Low/Open      | Coil or interconnect harness open or shorted to chassis ground                             | Correct condition**                                 |
| P2304    | Front Ignition Coil Primary Circuit High          | Coil or interconnect harness shorted to battery power                                      | Correct condition**                                 |
| P2531    | Ignition Switch Circuit Low                       | Battery charge condition low or the regulator/rectifier output low                         | Correct condition*                                  |
| P2532    | Ignition Switch Circuit High                      | Battery cable connections are loose or the regulator/rectifier output high                 | Correct condition*                                  |
| U0155    | LCD Gauge to EFI ECM CAN Communication Lost       | Gauge CAN circuit or interconnect harness intermittent or has failed                       | Correct condition*                                  |
| U1000    | Vehicle Not Registered or Invalid PIN Entered     | An invalid registration PIN has been entered   | Enter the correct registration PIN*                 |
| U1001    | Vehicle Not Registered and Vehicle Limits Enabled | An invalid registration PIN has been entered   | Enter the correct registration PIN*                 |
| FUEL OFF | Tilt Sensor Activation Code                       | Sensor has been activated  | Restore the vehicle chassis to an upright position* |

High: A high voltage condition has been detected

Low: A low voltage condition has been detected

Intermittent: An intermittent circuit condition has been detected

Open: An open circuit condition has been detected

\* After correcting the condition, cycle the key switch On-Off-On

\*\*After correcting the condition, cycle the key switch On-Off-On, start the engine, then cycle the key switch On-Off-On.

# Troubleshooting

| Problem: Spark absent or weak  |  |
|--|--|
| Condition  | Remedy   |
| 1. Ignition coil defective<br>2. Spark plug defective<br>3. Magneto defective<br>4. ECM defective<br>5. Pick-up coil defective   | 1. Replace ignition coil<br>2. Replace plug<br>3. Replace stator coil<br>4. Replace ECM<br>5. Replace stator coil  |
| Problem: Spark plug fouled with carbon   |  |
| Condition  | Remedy   |
| 1. Gasoline incorrect<br>2. Air cleaner element dirty<br>3. Spark plug incorrect (too cold)<br>4. Valve seals cracked - missing<br>5. Oil rings worn - broken                | 1. Change to correct gasoline<br>2. Clean element<br>3. Replace plug<br>4. Replace seals<br>5. Replace rings   |
| Problem: Spark plug electrodes overheat or burn  |  |
| Condition  | Remedy   |
| 1. Spark plug incorrect (too hot)<br>2. Engine overheats<br>3. Spark plug loose  | 1. Replace plug<br>2. Service cooling system<br>3. Tighten plug  |
| Problem: Battery does not charge   |  |
| Condition  | Remedy   |
| 1. Lead wires/connections shorted - loose - open<br>2. Magneto coils shorted - grounded - open<br>3. Regulator/rectifier defective   | 1. Repair - replace - tighten lead wires<br>2. Replace magneto coils<br>3. Replace regulator/rectifier   |
| Problem: Battery charges, but charging rate is below the specification   |  |
| Condition  | Remedy   |
| 1. Lead wires shorted - open - loose (at terminals)<br>2. Stator coil (magneto) grounded - open<br>3. Regulator/rectifier defective<br>4. Cell plates (battery) defective    | 1. Repair - tighten lead wires<br>2. Replace stator coil<br>3. Replace regulator/rectifier<br>4. Replace battery   |
| Problem: Battery overcharges   |  |
| Condition  | Remedy   |
| 1. Internal battery short circuited<br>2. Regulator/rectifier resistor damaged - defective<br>3. Regulator/rectifier poorly grounded   | 1. Replace battery<br>2. Replace resistor<br>3. Clean - tighten ground connection  |
| Problem: Charging unstable   |  |
| Condition  | Remedy   |
| 1. Lead wire intermittently shorting<br>2. Magneto internally shorted<br>3. Regulator/rectifier defective  | 1. Replace lead wire<br>2. Replace stator coil<br>3. Replace regulator/rectifier   |
| Problem: Starter button not effective  |  |
| Condition  | Remedy   |
| 1. Battery charge low<br>2. Switch contacts defective<br>3. Starter relay defective<br>4. Emergency stop - ignition switch off<br>5. Wiring connections loose - disconnected | 1. Charge - replace battery<br>2. Replace switch<br>3. Replace relay<br>4. Turn on switches<br>5. Connect - tighten - repair connections                 |
| Problem: Battery "sulfation" (Acidic white powdery substance or spots on surfaces of cell plates)  |  |
| Condition  | Remedy   |
| 1. Charging rate too low - too high<br>2. Battery run-down - damaged<br>3. Electrolyte contaminated  | 1. Replace battery<br>2. Replace battery<br>3. Replace battery   |
| Problem: Battery discharges too rapidly  |  |
| Condition  | Remedy   |
| 1. Charging system not charging<br>2. Cell plates overcharged - damaged<br>3. Battery short-circuited<br>4. Electrolyte contaminated   | 1. Check magneto - regulator/rectifier - circuit connections<br>2. Replace battery - correct charging system<br>3. Replace battery<br>4. Replace battery |
| Problem: Battery polarity reversed   |  |
| Condition  | Remedy   |
| 1. Battery incorrectly connected   | 1. Reverse connections - replace battery - repair damage   |

# Drive System/Brake System

## GENERAL INFORMATION

The die-cast aluminum housings have been assembled with thread-rolling screws (trilobular). When assembling with these screws, start the screws carefully into the housing; then use the following torque values.

| Size                   | New Housing   | Reassembled Housing |
|------------------------|---------------|---------------------|
| M6 (Torx T-30 Recess)  | 8-9.5 ft-lb   | 6.5-9 ft-lb         |
| M8 (Torx T-40 Recess)  | 25-31 ft-lb   | 21-25 ft-lb         |
| M10 (Torx T-50 Recess) | 37-45.5 ft-lb | 31-38 ft-lb         |

## SPECIAL TOOLS

A number of special tools must be available to the technician when performing service procedures in this section.

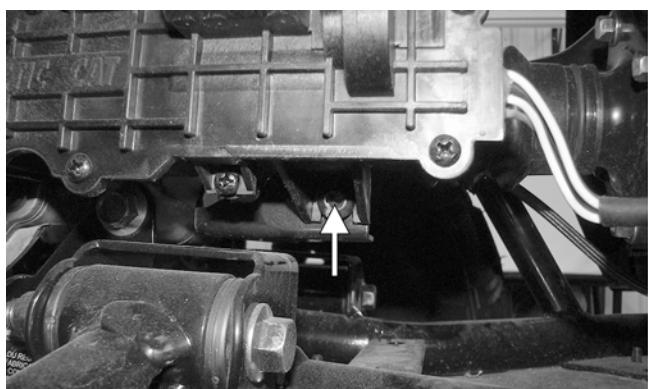
**■NOTE: When indicated for use, each special tool will be identified by its specific name, as shown in the chart below, and capitalized.**

| Description                              | p/n      |
|--|----------|
| Backlash Measuring Tool (24-Spline Axle) | 0544-010 |
| Backlash Measuring Tool (27-Spline Axle) | 0544-011 |
| CV Boot Clamp Tool                       | 0444-120 |
| Hub Retaining Wrench                     | 0444-270 |
| Internal Hex Socket                      | 0444-104 |
| Pinion Gear/Shft Removal Tool            | 0444-127 |
| Gear Case Seal Installer Tool            | 0444-273 |

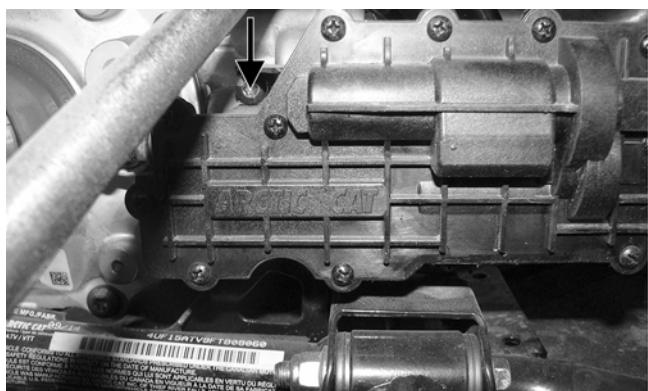
**■NOTE: Special tools are available from the Arctic Cat Service Department.**



3. Remove the mounting cap screw from below the actuator on the suspension side.



4. Loosen but do not remove the mounting cap screw at the front of the actuator; then slide the actuator to the rear enough to clear the slotted mounting tab and the selector shaft.



## INSTALLING

**■NOTE: Make sure to properly align the differential lock actuator lever with the hole in the differential lock plunger.**

1. Lubricate the O-rings on the actuator; then ensure that all mounting surfaces are clean and free of debris.
2. Align the actuator with the selector shaft and slide it forward onto the shaft taking care to engage the cap screw in the slot of the front mounting tab.

screws.

## Front Drive Actuator/Differential Lock

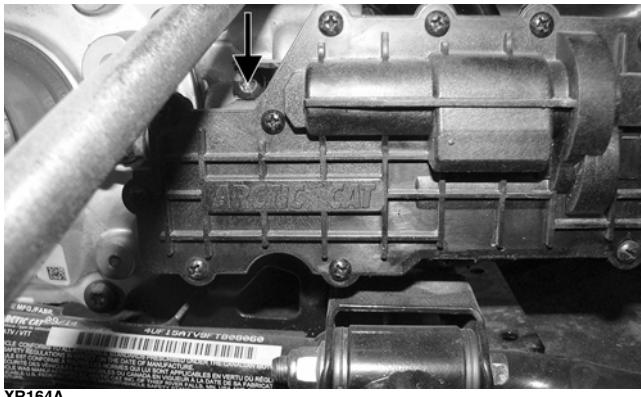
**■NOTE: The actuator is not a serviceable component. If it is defective, it must be replaced.**

**■NOTE: The actuator will operate only when the ignition switch is in the ON position.**

The front drive actuator is located on the side of the front drive input housing. With the engine stopped and the ignition switch in the ON position, a momentary "whirring" sound can be heard each time the drive select switch is shifted or the differential lock is activated. If no sound is heard, see Electrical System. If the actuator runs constantly or makes squealing or grinding sounds, the actuator must be replaced.

## REMOVING

1. Disconnect the connector on the actuator harness.
2. Using a T-30 torx wrench, remove the mounting cap screw from the driveshaft side of the actuator.
3. While holding the actuator firmly forward, tighten the front cap screw to hold the actuator in place; then install but do not tighten the two remaining cap



4. Loosen the front cap screw; then tighten the cap screw on the driveshaft side.



■**NOTE:** It is important to tighten this cap screw while the others are loose to ensure proper seating of the actuator.

5. Tighten the remaining cap screws; then connect the electrical plug to the main harness.
6. Turn the ignition switch to the ON position and check the operation by shifting the drive select switch several times.
7. Secure the wiring harness to the frame with a nylon cable tie.

## Front Differential

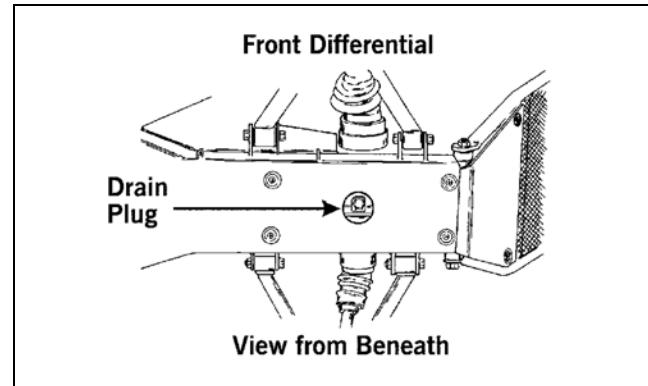
### REMOVING DIFFERENTIAL

1. Secure the ATV on a support stand to elevate the wheels.

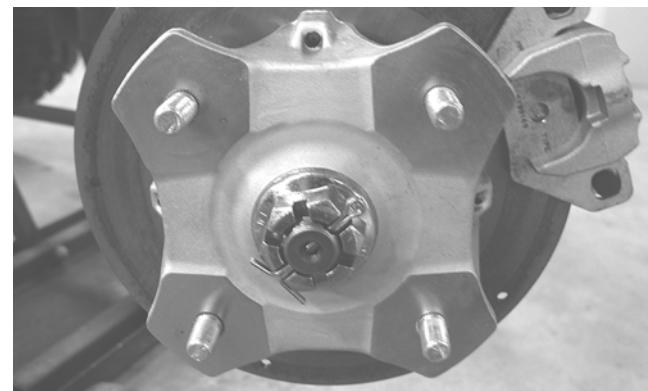
#### ⚠ WARNING

Make sure the ATV is solidly supported on the support stand to avoid injury.

2. Remove the drain plug and drain the gear lubricant into a drain pan; then reinstall the plug and tighten to 45 in.-lb.



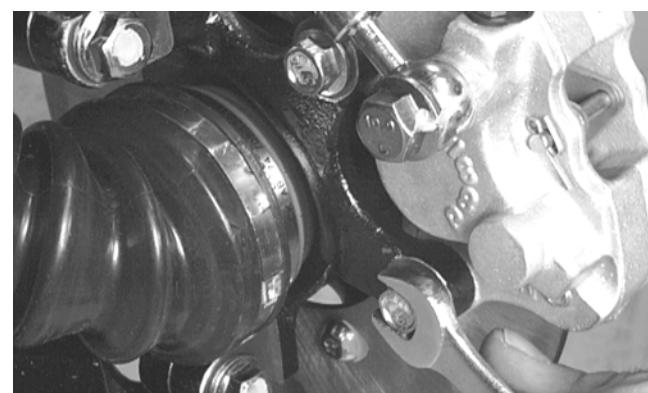
3. Remove the front wheels.
4. Pump up the hand brake; then engage the brake lever lock.
5. Remove and discard the cotter pin securing the hex nut; then remove the hex nut and washer.



6. Release the brake lever lock.

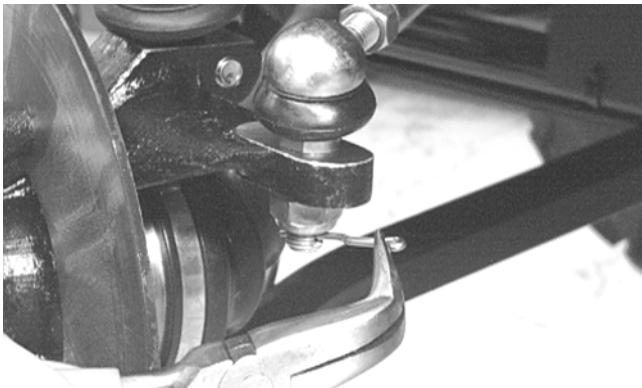
■**NOTE:** It is not necessary to remove the brake hoses from the calipers for this procedure.

7. Remove the two brake calipers. Account for the four cap screws.



■**NOTE:** Do not allow the brake calipers to hang from their cable/hose.

8. Remove the tie rod cotter pins and discard the pins.



AF895D

9. Remove the tie rod lock nuts.



AF896D

10. Remove the upper ball joint cap screws taking care not to strip the threads on the ball joint shaft; then using a rubber mallet, tap the end of the axle and free it from the knuckle assembly.



AF628D

11. Pull the steering knuckle away from the axle.



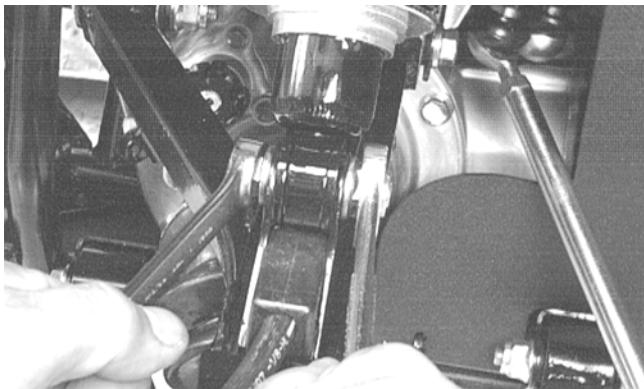
KX151

12. Support the axle to not allow it to drop or hang.

#### CAUTION

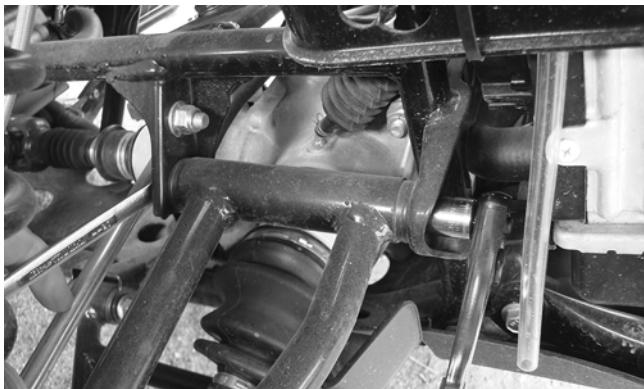
**The axle must be supported. If the axle is allowed to drop or hang, damage to the inner CV joint may occur.**

13. Remove the lower shock bolts. Account for the lock nuts; then move the shocks aside and secure them with a strap.



AF897D

14. Remove the upper A-arm lock nuts and cap screws; then remove the A-arms.



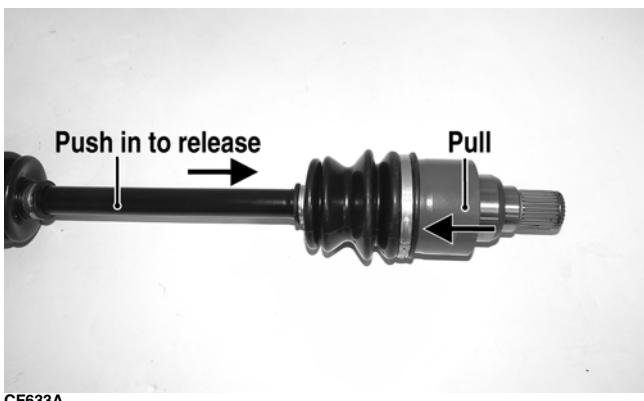
CF661

15. Push the axle shaft firmly toward the differential to release the internal lock; then while holding the axle in, pull the CV cup from the differential.

■**NOTE: Keeping the axle level will aid in removal.**

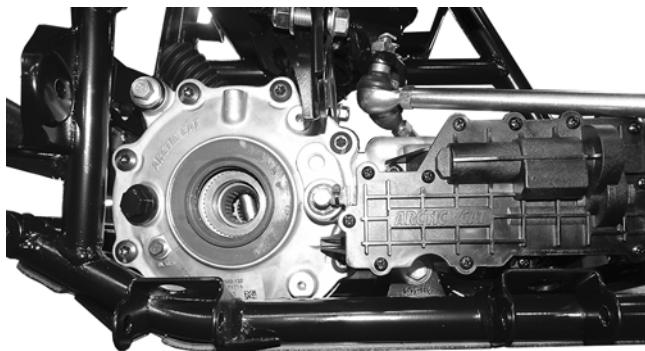
#### CAUTION

**Do not attempt to use a slide hammer or differential/axle damage will occur.**



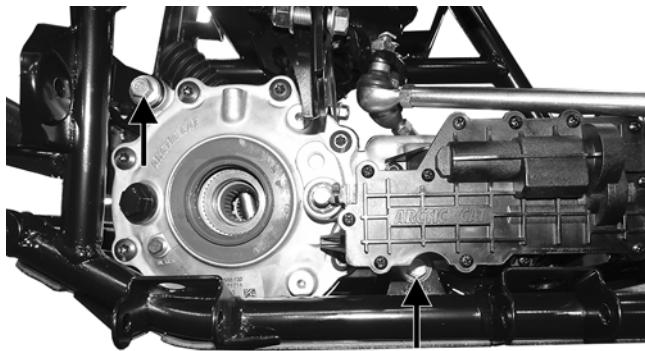
CF633A

16. Using a T-30 torx wrench, remove the three screws securing the front drive actuator to the gear case; then remove the actuator.



CF650

17. Remove the differential mounting cap screw. Account for the washers and discard the nuts.



CF650A

18. Free the differential assembly from the frame; then shift the differential assembly forward enough to disengage the front driveshaft from the output yoke.



KX161

19. Place the differential on its right side; then remove it from the frame.

### Disassembling Input Shaft

**■NOTE:** This procedure can be performed on a rear gear case; however, some components may vary from model to model. The technician should use discretion and sound judgment.

1. Using a T-40 torx wrench, remove the cap screws securing the pinion housing.

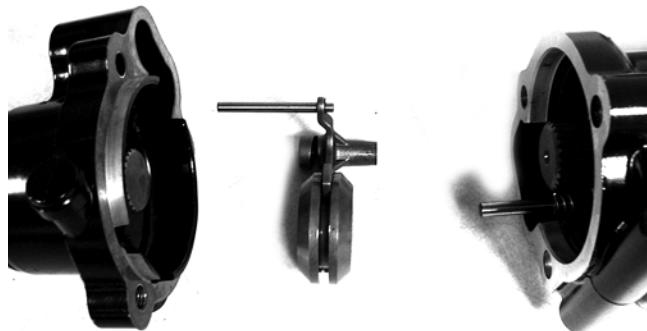


GC004A

2. Using a rubber mallet, remove the housing. Account for a gasket. Remove the fork, collar, and spring. Note the location of all the components for assembling purposes.



GC015



CD106

3. Using a boot-clamp pliers (or suitable substitute), remove the boot clamps; then remove the boots and splined drive from the input shaft.
4. Remove the snap ring; then remove the input shaft from the pinion housing.



CD107

5. Using a seal removal tool, remove the input shaft seal. Account for a spacer.



GC010

6. Remove the snap ring securing the input shaft bearing; then place the pinion housing in a press and remove the bearing.



KX219

### Assembling Input Shaft

1. Place the pinion housing in a press and install the input shaft bearing. Secure the bearing with the existing snap ring making sure the sharp edge of the snap ring faces to the outside.



GC012

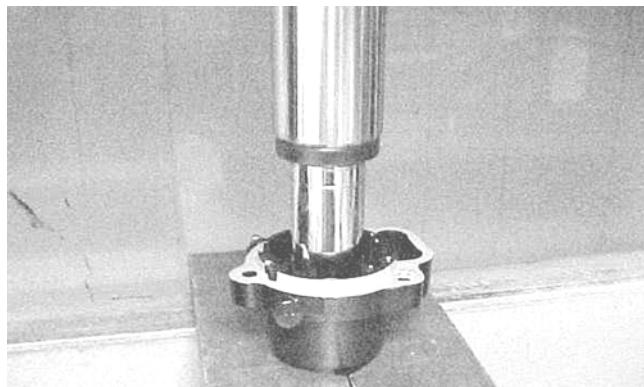


GC011

2. Install the input shaft seal making sure it is fully seated in the housing.



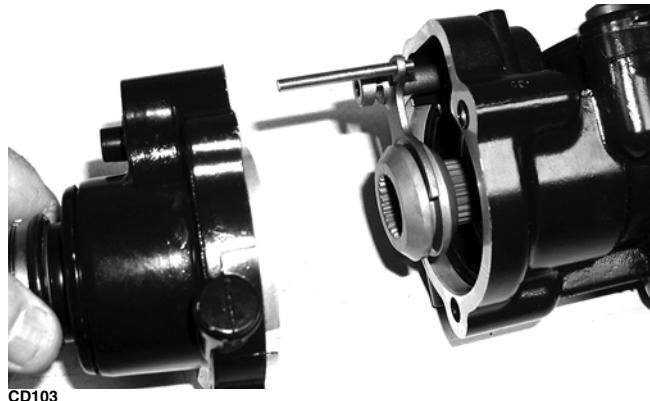
GC014



AF984

3. Lubricate the input shaft with High-Performance #2 Molybdenum Disulphide Grease packing the boot ribs and splines; then assemble allowing excess grease to freely escape. Slight pressure on the boot will be present during assembly. Secure with new clamps.

**■NOTE:** Any time drive splines are separated, clean all splines with parts-cleaning solvent and dry with compressed air; then lubricate with recommended grease.

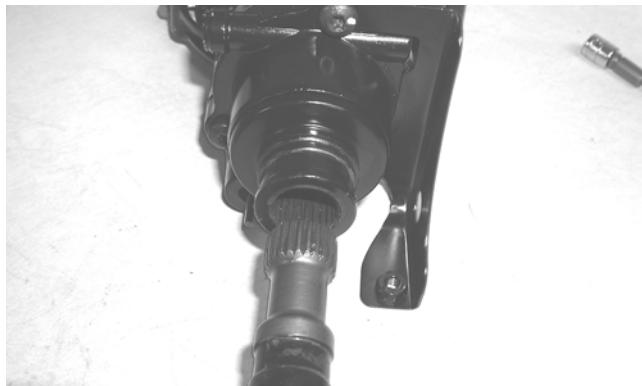


CD103



GC009A

4. Install the input shaft into the pinion housing and secure with the snap ring; then install the front boot and secure with an appropriate boot clamp and the rear boot with an appropriate boot clamp.



CD112



CD099

5. Place the pinion housing with new gasket onto the differential housing; then secure with the existing cap screws. Tighten to 23 ft-lb.

**■NOTE:** If a new differential housing is being installed, tighten the cap screws to 28 ft-lb.

### **Disassembling Differential Assembly**

**■NOTE:** This procedure can be performed on a rear gear case.

1. Using a T-40 torx wrench, remove the cap screws securing the pinion housing. Account for the coupler, fork, and spring (differential only).



GC015

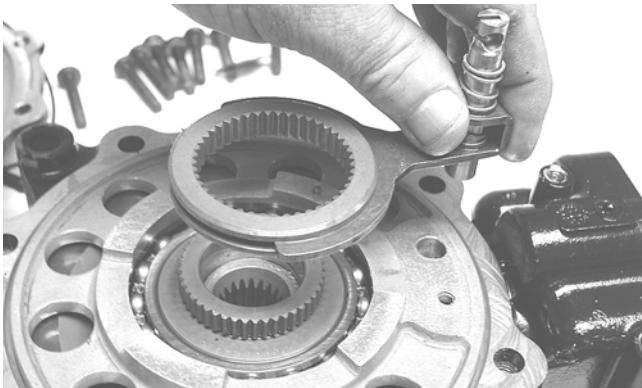
2. Using a T-40 torx wrench, remove the cap screws securing the differential cover.
3. Using a plastic mallet, tap lightly to remove the differential cover. Account for an O-ring.



KX174

**■NOTE:** If the cover is difficult to remove, pry on the cover in more than one recessed location.

4. Remove the splined coupler, shifter fork, pin, and spring of the differential lock assembly and set aside. Note position of parts for assembling purposes.



KX175



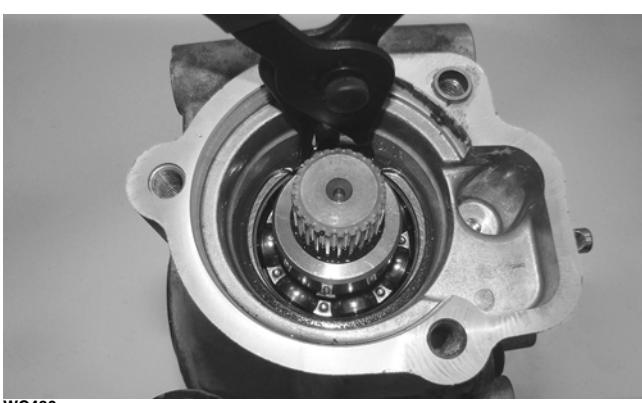
KX181

### Disassembling Pinion Gear

1. Remove the internal snap ring securing the pinion bearing in the housing.



KX177



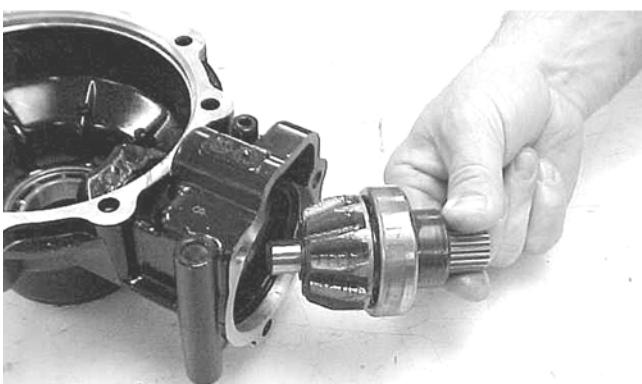
WC430

2. Using the Pinion Gear/Shaft Removal Tool and a hammer, remove the pinion gear from the gear case housing.



KX178

6. Place the differential with the open side down; then lift the housing off the spider assembly. Account for shim(s) and mark as right-side.

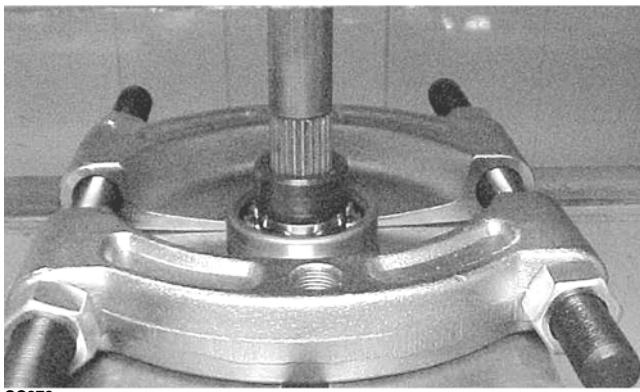


CC878

3. Secure the pinion gear in a bearing puller; then remove the pinion bearing using a press. Account for a collar and a bearing.



KX179

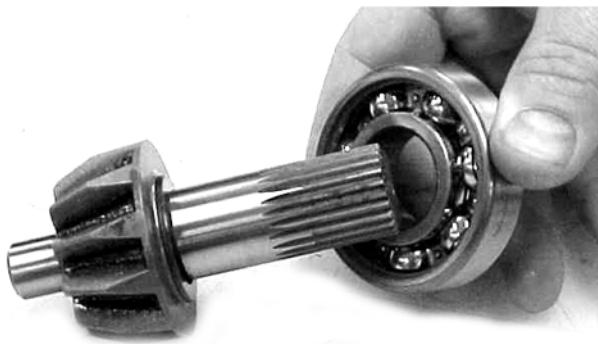


CC879

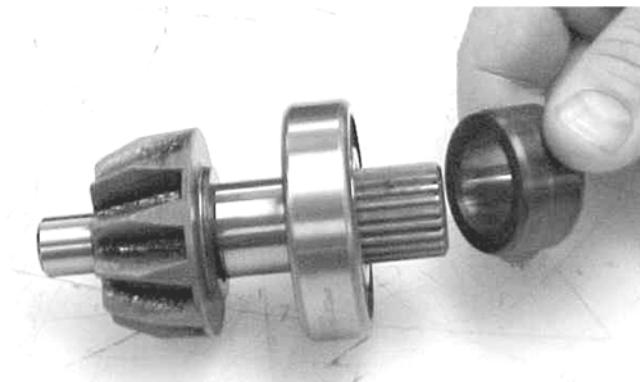
4. Remove any reusable parts from the gear case housing; then discard the housing and lock collar.

### Assembling Pinion Gear

1. Install the bearing onto the pinion shaft. Install the pinion shaft collar.

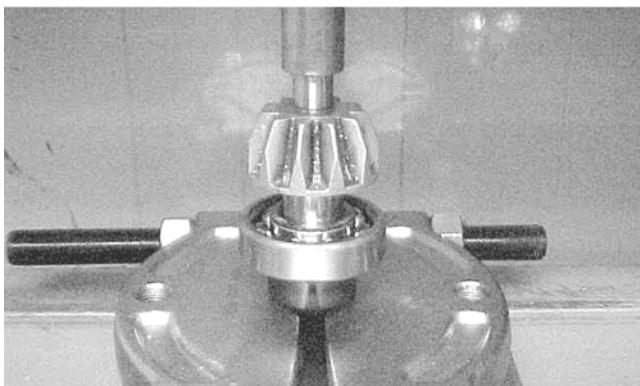


CC882



CC883

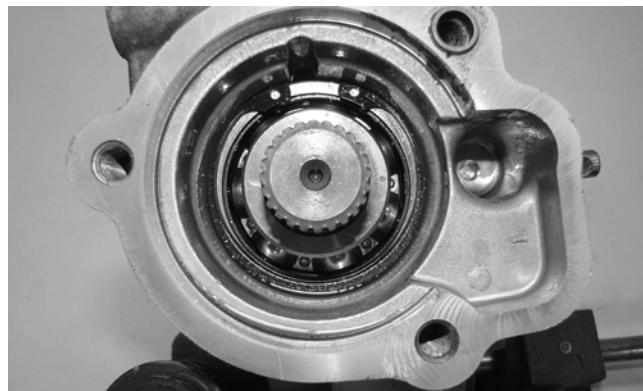
2. Place the pinion assembly in a bearing puller; then install the bearing using a press.



CC884

3. Using a propane torch, heat the gear case housing to approximately 200° F; then install the pinion assembly.

4. Install the internal snap ring with the sharp side directed away from the bearing.



WC429

### Shimming Procedure/Shim Selection

| Case-side Shims (Backlash) |     |       |
|----------------------------|-----|-------|
| p/n                        | mm  | in.   |
| 0402-405                   | 1.3 | 0.051 |
| 0402-406                   | 1.4 | 0.055 |
| 0402-407                   | 1.5 | 0.059 |
| 0402-408                   | 1.6 | 0.063 |
| 0402-409                   | 1.7 | 0.067 |

| Cover-side Shims (Ring Gear End-Play) |     |       |
|---------------------------------------|-----|-------|
| p/n                                   | mm  | in.   |
| 1402-074                              | 1.3 | 0.051 |
| 1402-075                              | 1.4 | 0.055 |
| 1402-076                              | 1.5 | 0.059 |
| 1402-077                              | 1.6 | 0.063 |
| 1402-078                              | 1.7 | 0.067 |

It is very important to adjust bevel gears for the proper running tolerances. Gear life and gear noise are greatly affected by these tolerances; therefore, it is very important to properly adjust any gear set prior to final assembly.

The following procedure can be used on both front differential or rear drive gear case.

**■NOTE: All bearings must be installed in the gear case and the pinion properly installed before proceeding.**

### Backlash

**■NOTE: Always set backlash prior to any other shimming.**

1. Install the existing shim or a 0.051-0.055-in. shim on the gear case side of the ring gear assembly.



GC031A

2. Install the ring gear with shim in the gear case; then while holding the pinion stationary, rock the ring gear forward and back to determine if any backlash exists. If no backlash exists, install a thicker shim and recheck.



GC033A

4. Install the existing shim or a 0.063 in. shim on the cover side of the ring gear; then place the assembled gear case cover onto the gear case and secure with three cap screws. Tighten evenly using a crisscross pattern.



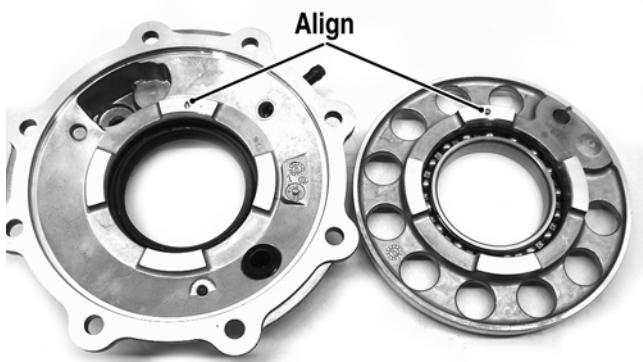
GC036A

3. Install the bearing flange onto the gear case cover making sure the alignment/locating pin engages the locating hole in the cover; then make sure the bearing flange is completely seated in the cover.



GC036B

5. Place the appropriate Backlash Measuring Tool into the splines of the ring gear and install a dial indicator making sure it contacts the gauge at a 90° angle and on the index mark.



GC032A



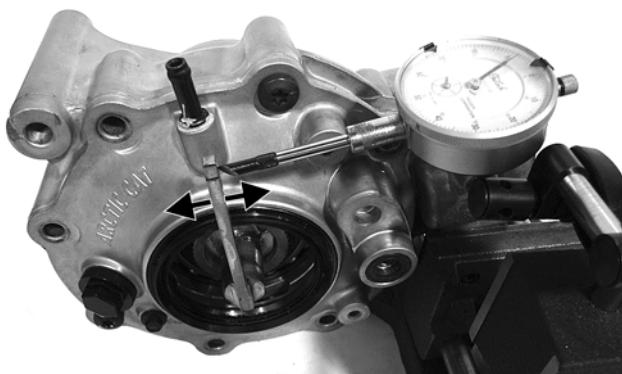
GC040



GC039A

- Zero the dial indicator; then while holding the pinion stationary, rock the ring gear assembly forward and back and record the backlash. Backlash must be 0.011-0.015 in. If backlash is within specifications, proceed to Ring Gear End-Play. If backlash is not within specifications, increase shim thickness to increase backlash or decrease shim thickness to decrease backlash.

**■NOTE: Higher backlash settings usually result in quieter gear operation.**



GC037A

### Ring Gear End-Play

After correcting backlash, ring gear end-play can be adjusted. To adjust end-play, use the following procedure.

- Secure the gear case in a holding fixture with the cover side up; then install a dial indicator contacting the ring gear axle flange.

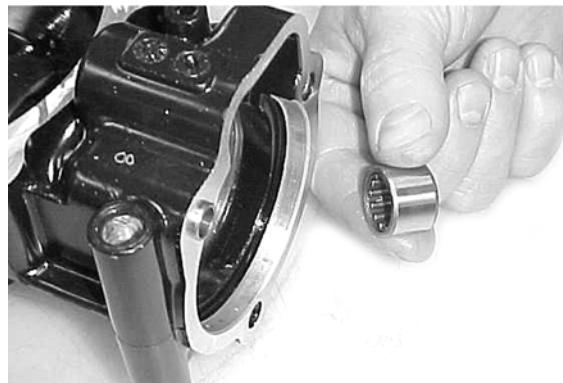


GC035

- Zero the dial indicator; then push the ring gear toward the dial indicator and release. End-play should be 0.004-0.008 in.

- To increase end-play, decrease the shim thickness. To decrease end-play, increase the shim thickness.

**■NOTE: Once proper backlash and end play are established, the gear case can be assembled (see Assembling Differential Assembly in this sub-section).**



CC888

### Assembling Differential Assembly

- With the pinion gear and new bearings installed, place the selected (backlash) shim on the gear case side of the ring gear with the chamfered side toward the ring gear; then install into gear case/differential housing.

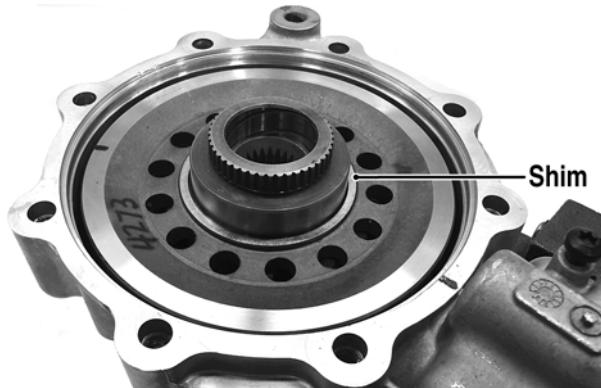


GC031A



GC020

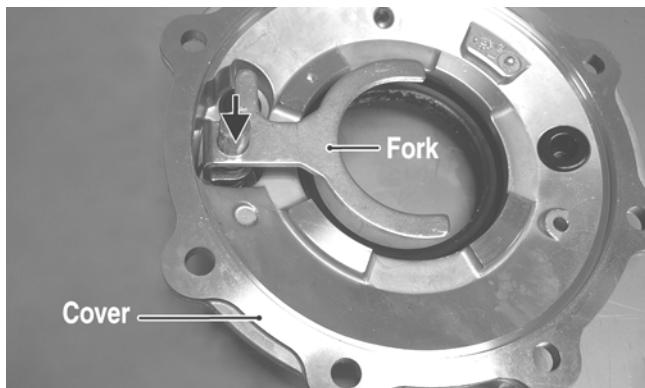
- Place the selected (end-play) shim, chamfered side toward the gear, onto the cover side of the ring gear.



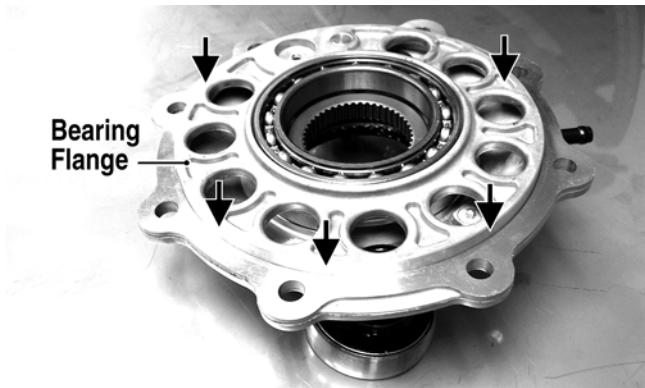
GC036B

■**NOTE:** The spider and ring gear assembly must be replaced as a complete unit.

3. Assemble the fork and sliding collar into the cover assembly; then install the left bearing flange/bearing assembly and seat firmly into the cover.



CF266A



CF267A

4. Apply a liberal coat of grease to the O-ring; then install it on the assembled cover assembly making sure to seat the O-ring completely down around the circumference of the bearing flange.



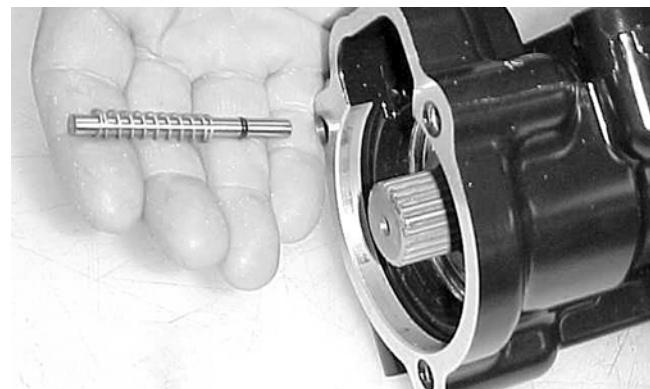
CF275A

5. Making sure the O-ring is properly positioned on the differential housing cover assembly, install the cover with existing cap screws (coated with green Loctite #609). Account for the ID tag. Tighten the cap screws evenly to 23 ft-lb.

■**NOTE:** Grease can be applied to the O-ring for ease of assembling.

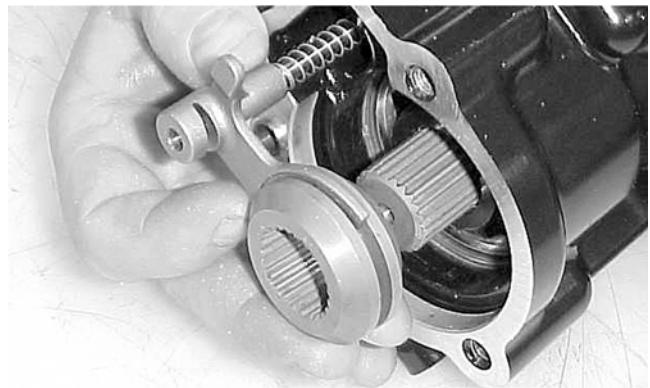
■**NOTE:** If a new housing is being installed, tighten the cap screws to 28 ft-lb.

6. Install the shift fork shaft w/spring into the housing making sure the shaft O-ring is positioned to the inside.



CC892

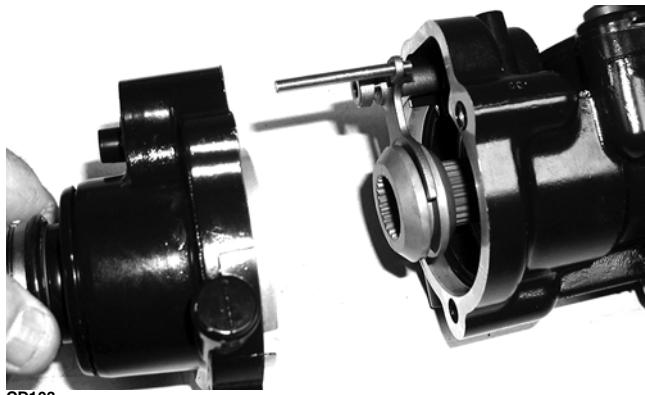
7. Install the shift fork assembly making sure the fork leg is facing upward. Apply a small amount of oil to the gasket; then install the gasket.



CC893

8. Place the input shaft assembly onto the gear case housing; then secure with the existing cap screws. Tighten to 23 ft-lb.

■**NOTE:** If a new housing is being installed, tighten the cap screws to 28 ft-lb.



CD103



CD110

### Removing/Installing Axle Seal

■**NOTE:** This procedure can be performed on a rear gear case.

1. Remove the seal using a seal removal tool.



GC066

■**NOTE:** Prior to installing the seal, apply High-Performance #2 Molybdenum Disulphide grease to the seal outside diameter.

2. Using Gear Case Seal Installer Tool, evenly press the seal into the cover bore until properly seated.



GC060

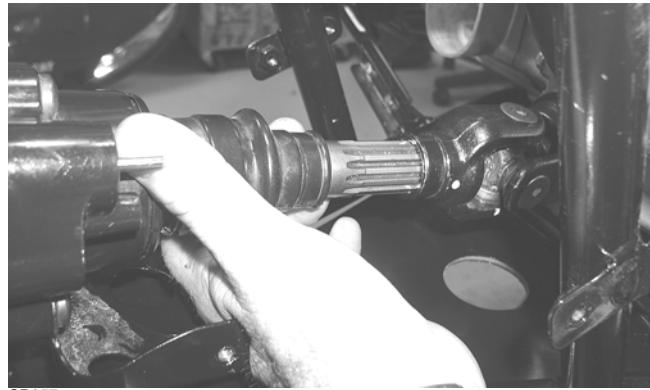
### CAUTION

Make sure the tool is free of nicks or sharp edges or damage to the seal may occur.

3. Repeat steps 1-2 for the opposite side.

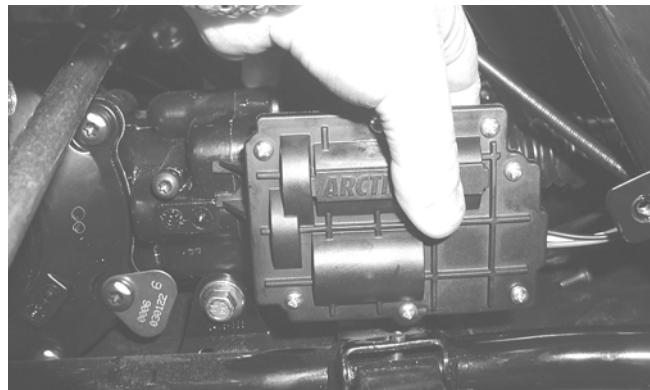
### INSTALLING DIFFERENTIAL

1. Align the splined input yoke (splines greased with molybdenum grease) with the front output splines; then place the differential into position on the frame and install the cap screws, washers, and new lock nuts. Tighten to 38 ft-lb. Make sure the rubber boot is properly seated on the input yoke.



CD857

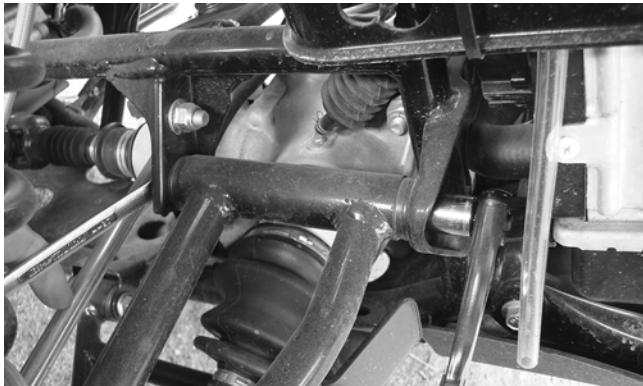
2. Pour 275 ml (9.3 fl oz) of SAE 80W-90 hypoid gear lubricant into the differential and install the fill plug. Tighten to 16 ft-lb.
3. Install the front drive actuator with the three torx-head cap screws; then connect the wire connector to the main wiring harness.



AG925

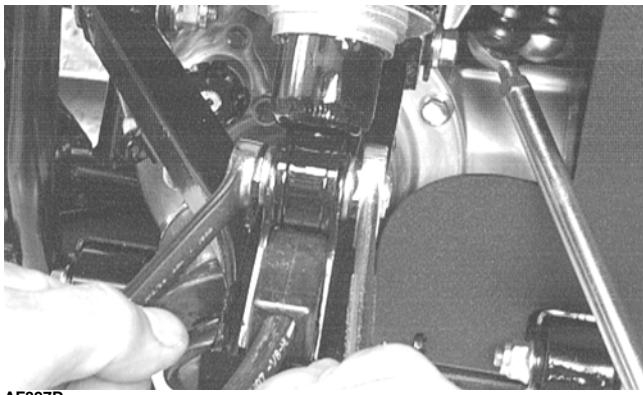
4. Install the front axles (see Drive Axles in this section).

5. Secure the upper A-arms with cap screws and lock nuts. Tighten to 50 ft-lb.



CF661

6. Secure the lower shock eyelets with cap screws and lock nuts. Tighten to 50 ft-lb.

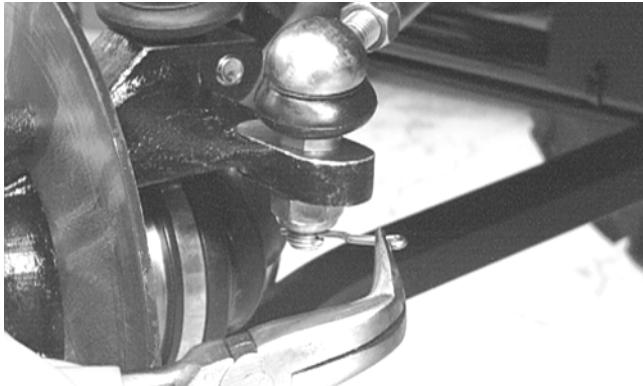


AF897D

7. Secure the tie rods with the lock nuts. Tighten to 30 ft-lb; then install and spread the cotter pins.



AF896D



AF895D

8. Install the brake calipers and secure with new “patch-lock” cap screws tightened to 20 ft-lb.



AF894D

9. Install the wheel; then using a crisscross pattern, tighten the wheel nuts in 20 ft-lb increments to a final torque of 40 ft-lb (steel wheel), 60 ft-lb (aluminum wheel w/black nuts), or 80 ft-lb (aluminum wheel w/chrome nuts).

10. Remove the ATV from the support stand.

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## Drive Axles

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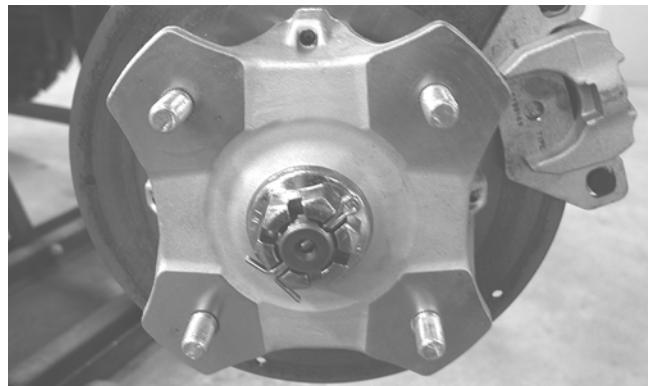
### REMOVING REAR DRIVE AXLE

1. Secure the ATV on a support stand to elevate the wheels.

 **WARNING**

**Make sure the ATV is solidly supported on the support stand to avoid injury.**

2. Pump up the hand brake; then engage the brake lever lock.  
3. Remove the wheel.  
4. Remove the cotter pin securing the hex nut; then remove the hex nut. Release the brake lever lock.



KX041

5. Remove the two brake calipers (right side only).

■**NOTE:** Do not allow the brake calipers to hang from their cable/hose.

### CAUTION

The calipers should be supported. If the calipers are allowed to hang from the cable/hose, damage may occur.

6. Slide the hub out of the knuckle and set aside.
7. Remove the cap screw and lock nut securing the knuckle to the upper A-arm. Discard the lock nut.

■**NOTE:** Never reuse a lock nut. Once a lock nut has been removed, it must be replaced with a new lock nut.

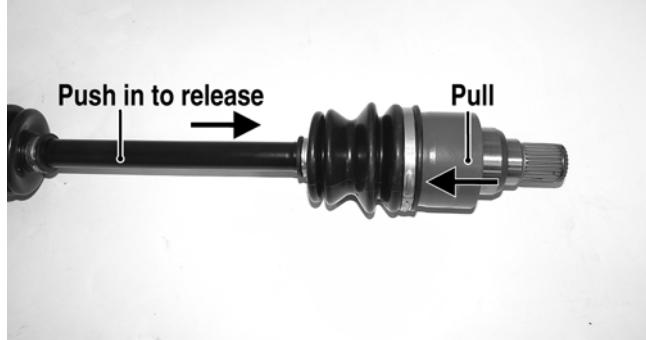
8. While holding the drive axle stationary, pull the top of the knuckle out and down until it is free of the drive axle.
9. Place a drain pan under the ATV to contain any oil leakage.
10. Push the axle shaft firmly toward the gear case to release the internal lock; then while holding the axle in, pull the CV cup from the gear case.

### CAUTION

Do not attempt to use a slide hammer or gear case/axle damage will occur.

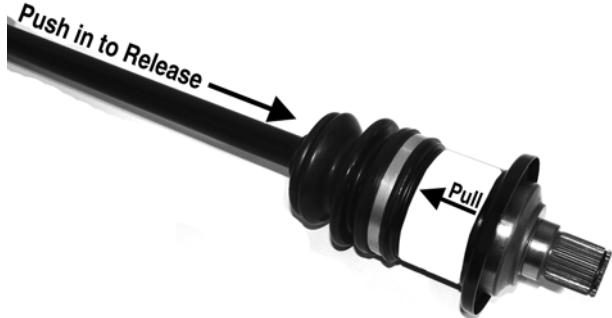
■**NOTE:** Keeping the axle level will aid in removal.

#### FIS/TRV



CF633A

#### Mud Pro



PR729C

## REMOVING FRONT DRIVE AXLE

■**NOTE:** For removing a front drive axle, see Front Differential in this section.

## CLEANING AND INSPECTING

■**NOTE:** Always clean and inspect the drive axle components to determine if any service or replacement is necessary.

1. Using a clean towel, wipe away any oil or grease from the axle components.



CF635

2. Inspect boots for any tears, cracks, or deterioration.

■**NOTE:** If a boot is damaged in any way, it must be replaced with a boot kit.

3. Inspect the gear case seals for nicks or damage.

## DISASSEMBLING AXLES

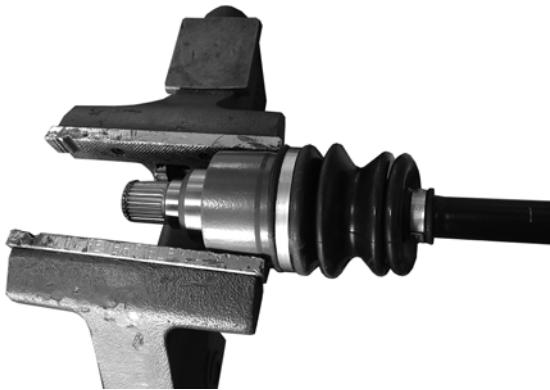
■**NOTE:** Only the boots are serviceable on the axles; if any other component is worn or damaged, the axle must be replaced.

1. Using CV Boot Clamp Tool, remove and retain both clamps for assembly purposes.



CF636

2. Place the white-striped end of the CV joint into a vise.



CF638

- To disengage the axle from the CV joint, sharply pull back on the axle; then slide the boot off of the axle.



CF637

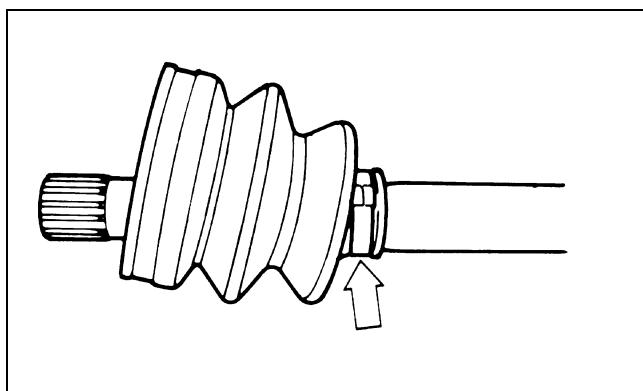
■NOTE: Steps 1-3 can be used to replace the outboard boot.

### ASSEMBLING AXLES

- Install the inner boot with the small clamp making sure the ends of the clamp are positioned correctly.

■NOTE: The boot is positioned correctly when the small end of the boot seats down into the recessed groove.

- Using the boot clamp tool, secure the small clamp of the inner boot.



ATV-1048

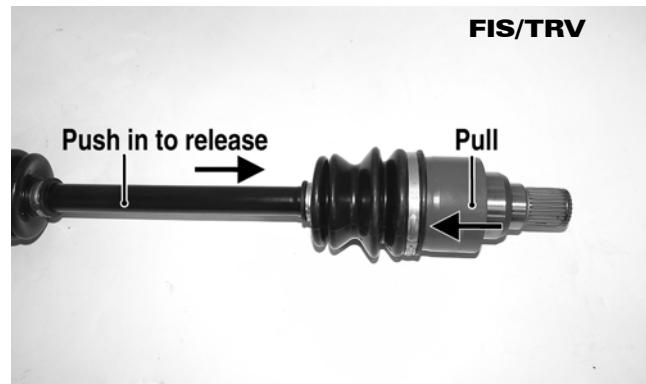
- Apply 80 grams (2/3 of contents) of grease from the pack into the bearing housing.

■NOTE: Steps 1-3 can be used to replace the outboard boot.

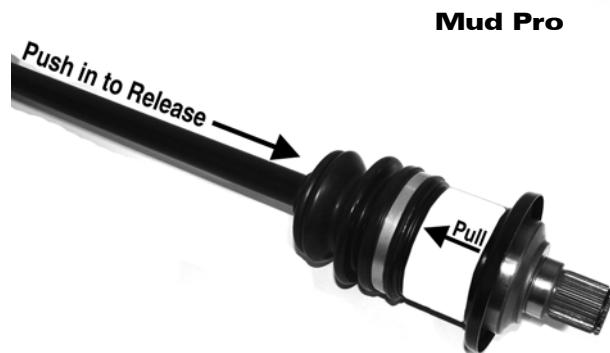
■NOTE: In the outboard boot, use the final 40 grams (1/3 of contents) of grease from the pack in the bearing housing.

### INSTALLING REAR DRIVE AXLE

- Push the axle shaft into the CV cup to release the detent balls; then while holding the axle firmly in, push the CV splined end into the gear case.



CF633A

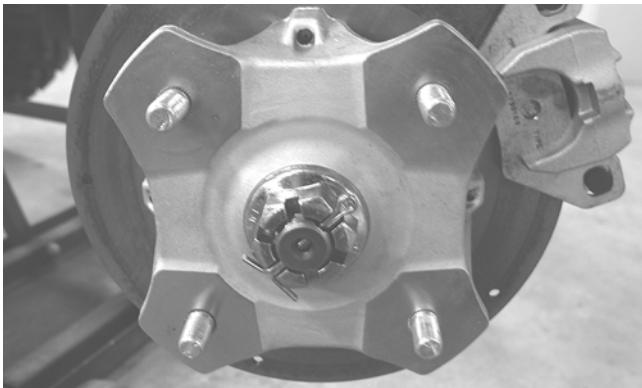


PR729C

■NOTE: To assure proper seating of the axle, give it a light pull; the axle should remain "clipped" in place.

- Swing the knuckle up and onto the drive axle; then place the knuckle into place in the upper A-arm. Secure the knuckle to the A-arm with a cap screw and a new lock nut. Tighten to 35 ft-lb.
- Place the hub into position on the axle followed by a hex nut. Tighten the hex nut only until snug at this time.
- If the brake calipers were removed, position them on the knuckle and secure with new "patch-lock" cap screws. Tighten to 20 ft-lb.
- Pump up the hand brake lever; then engage the brake lever lock.
- Using an appropriate spanner wrench, tighten the hub nut (from step 3) to 200 ft-lb; then install and spread a new cotter pin making sure each side of the pin is flush to the hex nut.

■NOTE: If the cotter pin does not line up, always tighten to the next alignment.



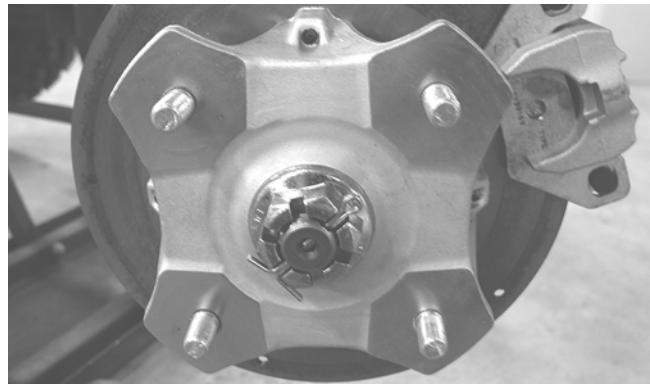
KX041

7. Install the wheel; then using a crisscross pattern, tighten the wheel nuts in 20 ft-lb increments to a final torque of 40 ft-lb (steel wheel), 60 ft-lb (aluminum wheel w/black nuts), or 80 ft-lb (aluminum wheel w/chrome nuts).
8. Remove the ATV from the support stand and release the brake lever lock.

### **INSTALLING FRONT DRIVE AXLE**

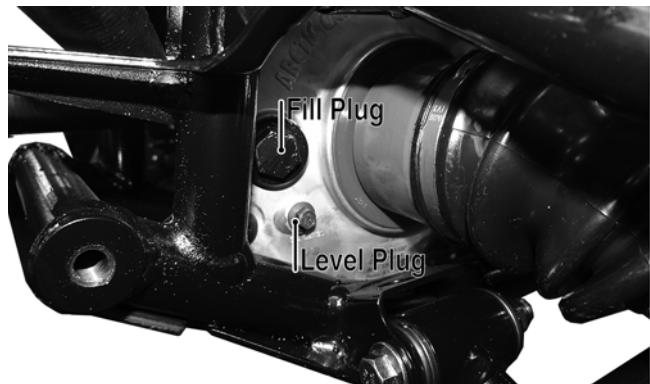
1. Position the drive axle in the gear case and steering knuckle; then insert the upper A-arm ball joint into the steering knuckle. Secure with a cap screw tightened to 50 ft-lb.
2. Place the brake hose into position on the upper A-arm; then secure the lower shock eyelet to the A-arm with a cap screw and a new lock nut. Tighten to 50 ft-lb.
3. Secure the tie rod to the steering knuckle with a new lock nut. Tighten securely; then install and spread a new cotter pin.
4. Slide the hub w/brake disc (splines greased with molybdenum grease) into position in the steering knuckle followed by a washer and hex nut. Tighten finger-tight at this time.
5. Install the brake caliper on the steering knuckle using new "patch-lock" cap screws. Tighten to 20 ft-lb; then pump up the hand brake lever and engage the brake lever lock.
6. Using an appropriate spanner wrench, tighten the hub nut (from step 4) to 200 ft-lb; then install and spread a new cotter pin making sure each side of the pin is flush to the hex nut.

**■NOTE: If the cotter pin does not line up, always tighten to the next alignment.**



KX041

7. Install the wheel; then using a crisscross pattern, tighten the wheel nuts in 20 ft-lb increments to a final torque of 40 ft-lb (steel wheel), 60 ft-lb (aluminum wheel w/black nuts), or 80 ft-lb (aluminum wheel w/chrome nuts).
8. Remove the ATV from the support stand and release the brake lever lock.
9. Check the front differential oil level and add oil as necessary.

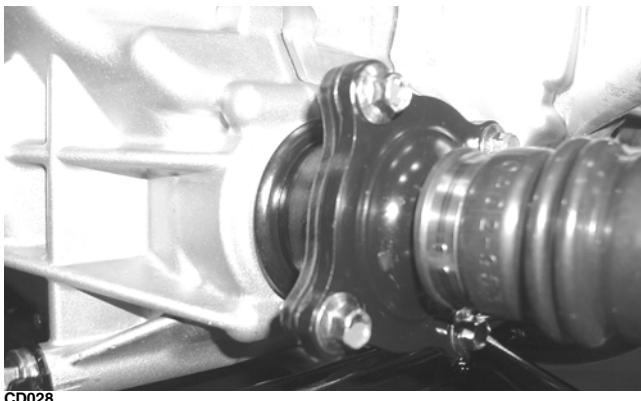


CF649A

## **Rear Gear Case**

### **REMOVING**

1. Remove the left-side rear A-arms (see Rear A-Arms in Suspension).
2. Remove both of the rear drive axles (see Drive Axles in this section).
3. Remove the four cap screws securing the output shaft to the rear gear case flange.

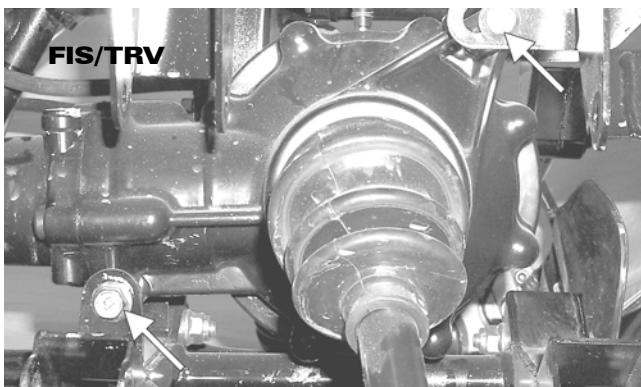


CD028

4. Remove the two cap screws and discard the lock nuts securing the rear gear case to the frame; then remove the gear case through the left side.



CF646A



AF960A

#### AT THIS POINT

For servicing the input shaft, pinion gear, needle bearing, ring gear, and axle seal, see Front Differential in this section.

#### RING GEAR/THRUST BUTTON

##### Removing

1. Remove the cap screws securing the gear case cover to the gear case; then remove the ring gear.
2. Remove the thrust button from the gear case cover (left-hand threads). Account for a shim.

##### Inspecting

1. Inspect the ring gear for excessive wear, missing or chipped teeth, or discoloration.
2. Inspect the thrust button for excessive wear or discoloration.

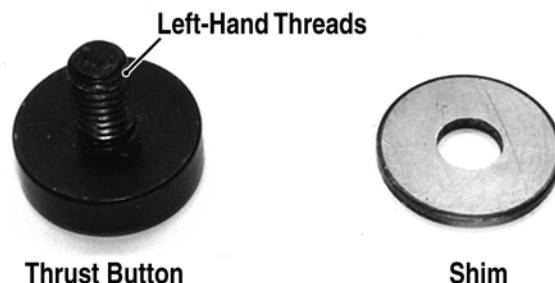
3. Inspect the bearings for discoloration, roughness, or excessive wear.

■NOTE: For servicing bearings or seals, see Front Differential in this section.

#### Installing/Shimming

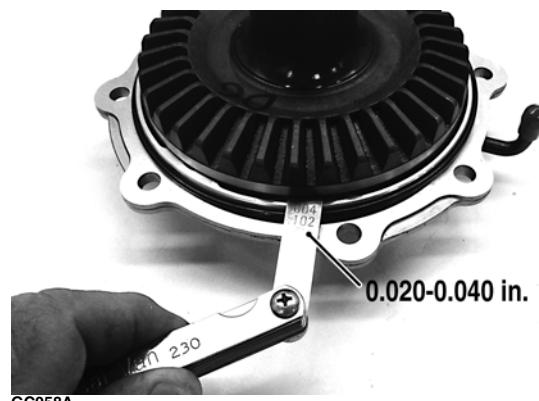
■NOTE: Ring gear clearance must be adjusted prior to selecting shim for the thrust button.

1. Install the thrust button with shim into the gear case cover and tighten securely (left-hand threads).



GC057A

2. Place the ring gear with selected shim into the cover and measure the ring gear to thrust button clearance with a thickness gauge. Clearance should be 0.020-0.040 in.



GC058A

3. If clearance is as specified, remove the ring gear and thrust button; then place a drop of red Loctite #271 on the threads and tighten to 8 ft-lb (left-hand threads).
4. If clearance is not as specified, repeat steps 1 and 2 using thicker (clearance too great) or thinner (clearance too small) until correct specification is reached.

#### REAR DRIVE INPUT SHAFT/ HOUSING (700 Mud Pro/1000)

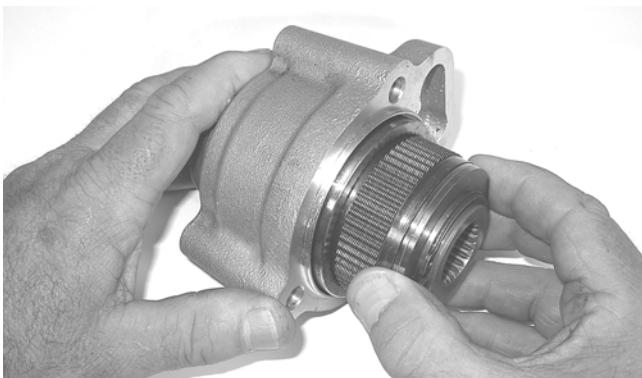
##### Removing/Disassembling

1. Remove the cap screws securing the input shaft/housing to the rear gear case; then remove the housing assembly.

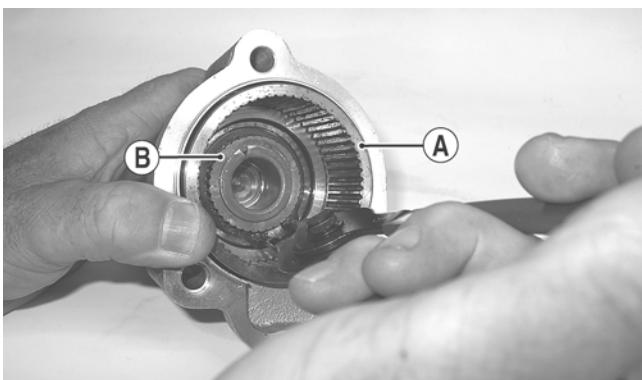


GZ183

2. Remove the clutch pack from the clutch basket; then remove the snap ring securing the clutch basket (A) to the input shaft (B) and remove the clutch basket.



GZ392



GZ176A



GZ177

3. Remove the input shaft from the housing; then remove the oil seal.



GZ180



GZ182A

4. Remove the snap ring retaining the input bearing and using an appropriate bearing driver, press the bearing from the housing.



GZ184A

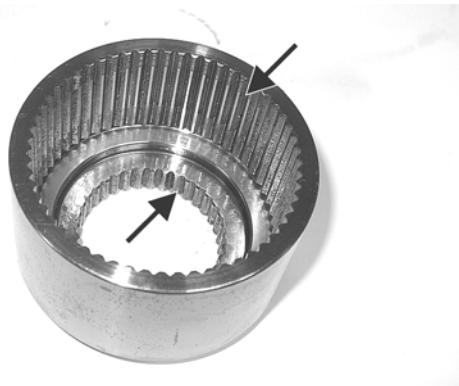
### Cleaning and Inspecting

1. Wash all parts in parts-cleaning solvent and dry with compressed air.

#### **WARNING**

**Always wear safety glasses when working with compressed air.**

2. Clean all gasket material and sealant from mating surfaces.
3. Inspect bearings, shafts, and housing for excessive wear, cracks, or discoloration.
4. Inspect the clutch basket for wear in splines or cracks in the housing.



GZ178A

5. Inspect the clutch pack for signs of discoloration.

**■NOTE: The clutch pack is not a serviceable component. If worn, discolored, or damaged in any way, it must be replaced.**

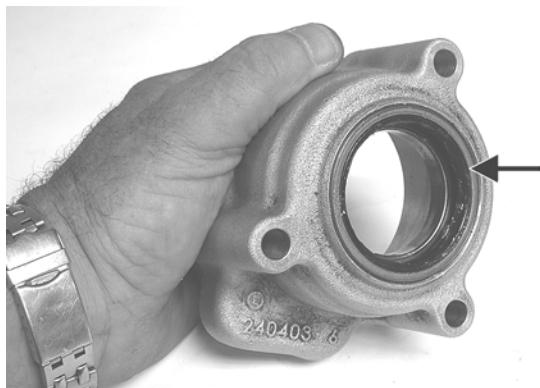
### Assembling/Installing

1. Install a new bearing into the housing and secure with the snap ring (flat side directed away from bearing).



GZ184

2. Using a suitable seal driver, install a new oil seal into the front of the housing until the seal flush with the housing.



GZ182A

3. Apply grease to the lips of the oil seal; then install the input shaft into the input bearing and housing.



GZ179A

4. Install the clutch basket onto the input shaft and secure with the snap ring (flat side directed outward); then install the clutch pack into the basket.



GZ176

5. Using a new gasket, install the assembled input shaft/housing onto the rear drive gear case and secure with the three cap screws. Tighten to 23 ft-lb.

### INSTALLING

1. Slide the gear case into position through the left side of the frame; then secure it to the frame with cap screws and new lock nuts. Tighten to 38 ft-lb.
2. Secure the output shaft to the rear gear case flange with four cap screws (coated with red Loctite #271) and lock nuts. Tighten to 20 ft-lb.
3. Install the rear drive axles (see Drive Axles in this section).
4. Install the left-side rear A-arms (see Rear A-Arms in Suspension).

## Hub

### REMOVING

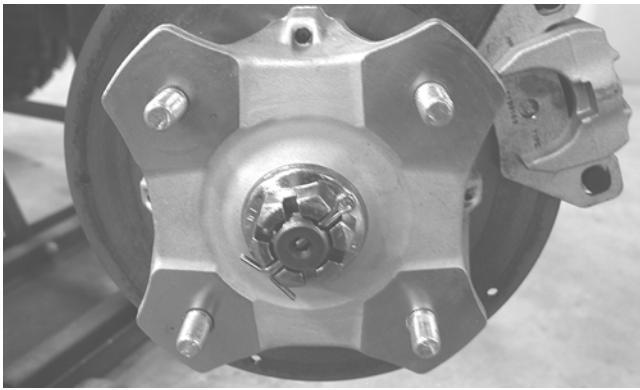
1. Secure the ATV on a support stand to elevate the wheel; then remove the wheel.

#### ⚠ WARNING

Make sure the ATV is solidly supported on the support stand to avoid injury.

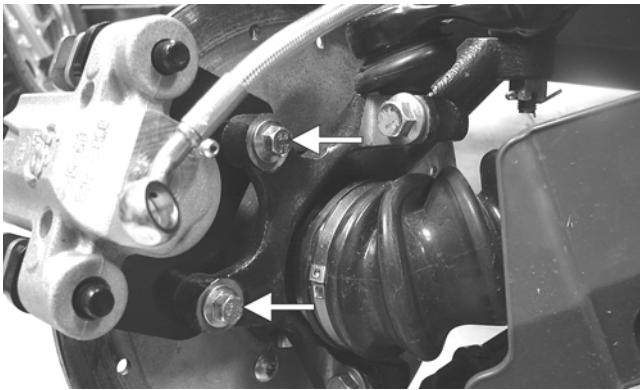
2. Remove the cotter pin from the nut.

**■NOTE: During assembly, new cotter pins should be installed.**



KX041

3. Remove the nut securing the hub.
4. Remove the brake caliper.



PR243A

■**NOTE: Do not allow the brake calipers to hang from their cable/hose.**

5. Remove the hub assembly.
6. Remove the four cap screws securing the brake disc.

### CLEANING AND INSPECTING

1. Clean all hub components.
2. Inspect all threads for stripping or damage.
3. Inspect the brake disc for cracks or warping.
4. Inspect the hub for pits, cracks, loose studs, or spline wear.

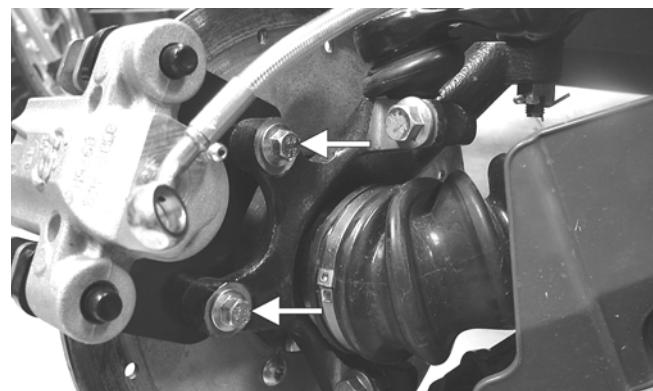
### INSTALLING

1. Secure the brake disc to the hub with the four cap screws (coated with blue Loctite #243). Tighten to 15 ft-lb.
2. Apply grease to the splines in the hub.
3. Install the hub assembly onto the shaft.



PR290

4. Secure the hub assembly with the hex nut. Tighten only until snug.
5. Secure the brake caliper to the knuckle with two new “patch-lock” cap screws. Tighten to 20 ft-lb.



PR243A

6. Using an appropriate hub retaining wrench, tighten the hub nut (from step 4) to 200 ft-lb; then install and spread a new cotter pin making sure each side of the pin is flush to the hex nut.

■**NOTE: If the cotter pin does not line up, always tighten to the next alignment.**



PR260

7. Install the wheel; then using a crisscross pattern, tighten the wheel nuts in 20 ft-lb increments to a final torque of 40 ft-lb (steel wheel), 60 ft-lb (aluminum wheel w/black nuts), or 80 ft-lb (aluminum wheel w/chrome nuts).
8. Remove the ATV from the support stand.

## Hand Brake Lever/Master Cylinder Assembly

■**NOTE:** The master cylinder is a non-serviceable component; it must be replaced as an assembly.

### REMOVING

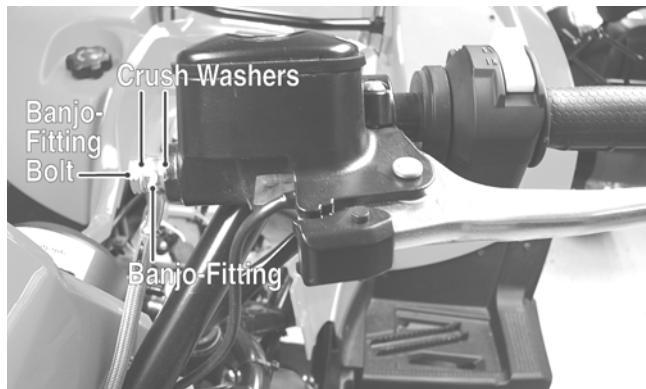
1. Slide a piece of flexible tubing over one of the wheel bleeder valves and direct the other end into a container. Remove the reservoir cover; then open the bleeder valve. Allow the brake fluid to drain completely.

■**NOTE:** Compressing the brake lever several times will quicken the draining process.



AF637D

2. Place an absorbent towel around the connection to absorb brake fluid. Remove the banjo-fitting from the master cylinder. Account for two crush washers and a banjo-fitting bolt.



DE059A

### CAUTION

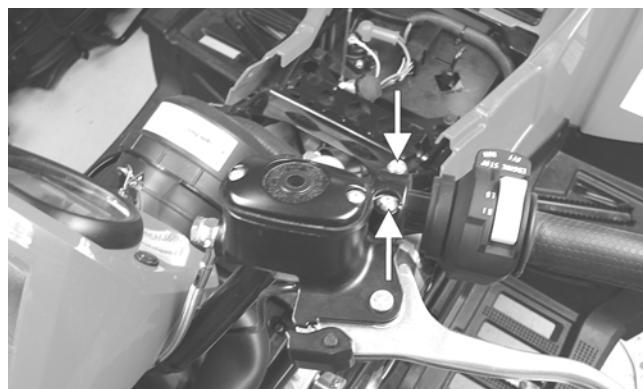
Brake fluid is highly corrosive. Do not spill brake fluid on any surface of the ATV.

3. Remove the snap ring and pivot pin securing the brake lever to the master cylinder housing; then remove the brake lever and set aside.
4. Dislodge the brakelight switch from the master cylinder housing by gently pressing it toward the pivot pin hole in the housing; then lay it aside leaving the switch and wiring harness connected.



BC205

5. Remove the clamp screws securing the brake housing to the handlebar; then remove the assembly from the handlebar.



DE058A

### INSPECTING

1. Inspect the pin securing the brake lever for wear.
2. Inspect the brake lever for elongation of the pivot hole.
3. Inspect the reservoir for cracks and leakage.
4. Inspect the banjo-fitting for cracks and deterioration and the condition of the fittings (threaded and compression).
5. Inspect the brakelight switch for corrosion, cracks, missing or broken mounting tabs, or broken and frayed wiring.

■**NOTE:** If the brakelight switch is determined to be not serviceable, see Electrical System.

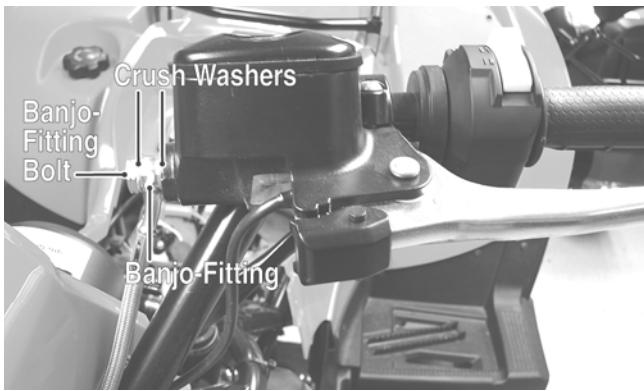
### INSTALLING

1. Position the brake housing on the handlebar. Secure with clamp screws; then tighten securely.



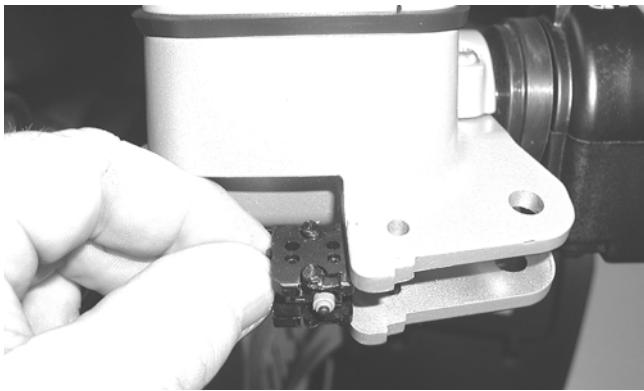
DE058A

2. Using two new crush washers, connect the banjo-fitting to the master cylinder; then secure with the banjo-fitting bolt. Tighten to 20 ft-lb.



DE059A

3. Gently press the brakelight switch into the housing (left to right) until the mounting tabs snap into the four locating holes; then install the brake lever, pivot pin, and snap ring.



BC206

4. Bleed the brake system (see Periodic Maintenance/Tune-Up).

## Hydraulic Brake Caliper

### WARNING

Arctic Cat recommends that only authorized Arctic Cat ATV dealers perform hydraulic brake service. Failure to properly repair brake systems can result in loss of control causing severe injury or death.

### REMOVING/DISASSEMBLING

1. Secure the ATV on a support stand to elevate the wheel; then remove the wheel.

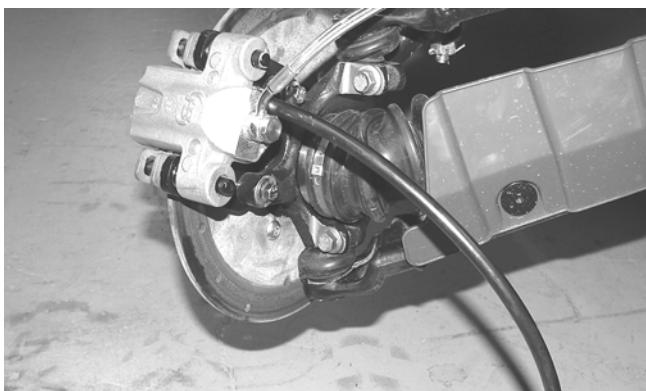
### WARNING

Make sure the ATV is solidly supported on the support stand to avoid injury.

### WARNING

Never let brake fluid contact the eyes. Damage to the eyes will occur. Always wear appropriate protective safety goggles and latex gloves when handling brake fluid.

2. Drain the brake fluid from the caliper, hose, and master cylinder through the bleed screw by pumping the brake lever/pedal.



PR235

### CAUTION

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

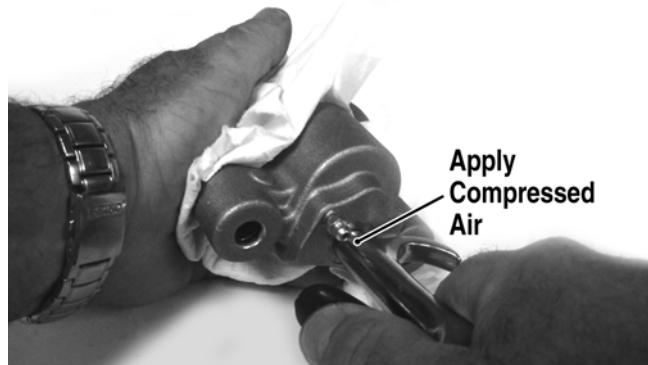
■**NOTE:** Whenever brake components are removed, disassembled, or repaired where brake fluid is exposed to air, drain all fluid and replace with new DOT 4 brake fluid from an unopened container. Brake fluid readily absorbs moisture from the air significantly lowering the boiling point. This increases the chance of vapor lock reducing braking power and increasing stopping distance.

3. Remove the brake hose from the caliper and close the bleed screw; then remove the caliper.
4. Compress the caliper holder against the caliper (opposite the O-ring side) and remove the outer brake pad; then remove the inner brake pad.

■**NOTE:** If brake pads are to be returned to service, do not allow brake fluid to contaminate them.



PR237A

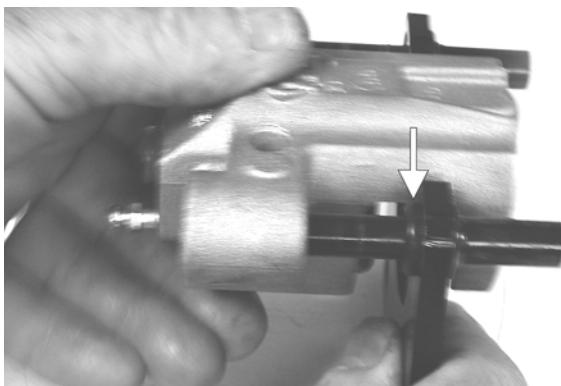


PR713A



PR238

5. Remove the caliper holder from the caliper and discard the O-ring.



PR239B

■**NOTE: The O-ring is used for shipping purposes and provides no function in operation.**

6. Cover the piston end of the housing with a shop towel; then keeping fingers clear of piston travel, apply compressed air to the fluid port to blow the piston free of the housing. Account for two seal rings in the housing.



PR715

### ⚠ WARNING

**Make sure to hold the towel firmly in place or the piston could be ejected from the housing causing injury.**

7. Using an appropriate seal removal tool, carefully remove the seals from the brake caliper housing; then remove four O-rings from the brake caliper housing noting the location of the different sized O-rings. Discard all seals, O-rings, and crush washers.

### CLEANING AND INSPECTING

1. Clean all caliper components (except the brake pads) with DOT 4 brake fluid. Do not wipe dry.
2. Inspect the brake pads for damage and excessive wear.

■**NOTE: For measuring brake pads, see Periodic Maintenance/Tune-Up.**

3. Inspect the brake caliper housings for scoring in the piston bores, chipped seal ring grooves, or signs of corrosion or discoloration.
4. Inspect the piston surface for scoring, discoloration, or evidence of binding or galling.
5. Inspect the caliper holder for wear or bending.

### ASSEMBLING/INSTALLING

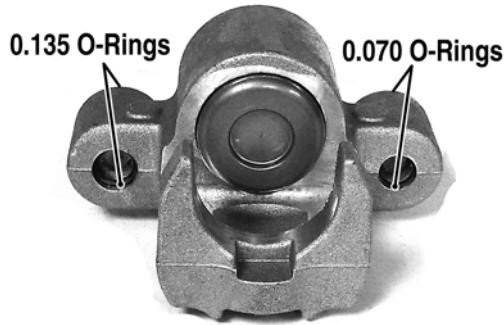
1. Install new seals into the brake caliper housing and apply a liberal amount of DOT 4 brake fluid to the cylinder bore of the housing, seals, and brake piston.

### CAUTION

**Make sure the seals are properly in place and did not twist or roll during installation.**



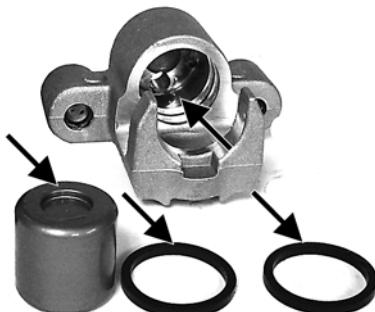
PR715



PR719C

4. Install the caliper onto the caliper holder making sure the caliper and holder are correctly oriented.

**■NOTE:** It is very important to apply silicone grease to the O-rings and caliper bores prior to assembly.

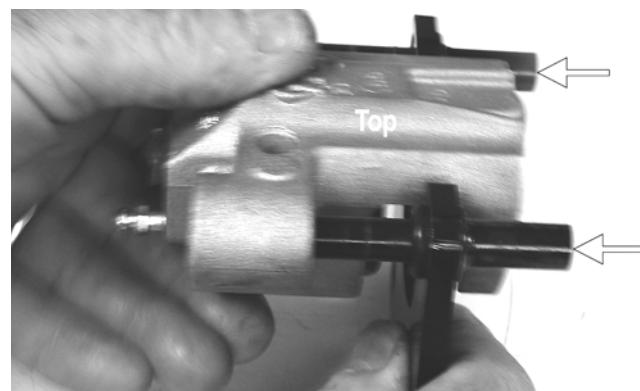


PR717A

2. Press the piston into the caliper housing using hand pressure only. Completely seat the piston; then wipe off any excessive brake fluid.



PR711A



PR239C

5. Making sure brake fluid does not contact the brake pads, compress the caliper holder toward the caliper and install the inner brake pad; then install the outer pad.

#### CAUTION

If brake pads become contaminated with brake fluid, they must be thoroughly cleaned with brake cleaning solvent or replaced with new pads. Failure to do so will result in reduced braking and premature brake pad failure.

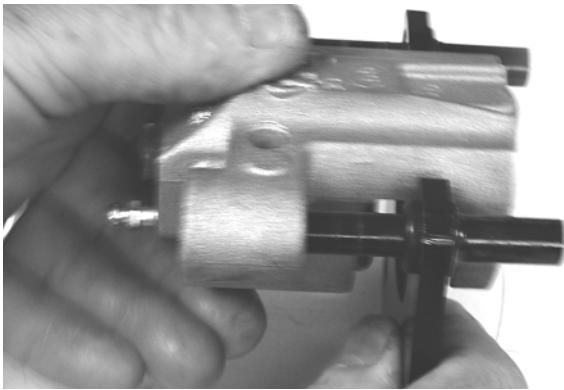


PR712

3. Apply high-temperature silicone grease (supplied with the O-ring kit) to the inside of the caliper holder bores and O-rings; then install the four O-rings into the caliper.



PR238



PR239

6. Place the brake caliper assembly into position and secure with new "patch-lock" cap screws. Tighten to 20 ft-lb.
7. Place a new crush washer on each side of the brake hose fitting and install it on the caliper. Tighten to 20 ft-lb.

8. Fill the reservoir; then bleed the brake system (see Periodic Maintenance/Tune-Up).

### ⚠ WARNING

Never use brake fluid from an open container or reuse brake fluid. Moisture-contaminated brake fluid could cause vapor build-up (expansion) during hard braking resulting in greatly increased stopping distance or loss of control leading to injury or death.

9. Install the wheel; then using a crisscross pattern, tighten the wheel nuts in 20 ft-lb increments to a final torque of 40 ft-lb (steel wheel), 60 ft-lb (aluminum wheel w/black nuts), or 80 ft-lb (aluminum wheel w/chrome nuts).
10. Remove the ATV from the support stand and verify brake operation.

## Troubleshooting Drive System

### Problem: Power not transmitted from engine to wheels

| Condition                                   | Remedy           |
|---|------------------|
| 1. Rear axle shafts serration worn - broken | 1. Replace shaft |

### Problem: Power not transmitted from engine to either front wheel

| Condition  | Remedy  |
|--|---|
| 1. <b>Secondary drive</b> - driven gear teeth broken<br>2. <b>Propeller</b> shaft serration worn - broken<br>3. <b>Coupling</b> damaged<br>4. <b>Coupling joint</b> serration worn - damaged<br>5. <b>Front drive</b> - driven bevel gears broken - damaged<br>6. <b>Front differential</b> gears/pinions broken - damaged<br>7. <b>Sliding dogs/shaft fork</b> worn - damaged<br>8. <b>Front drive</b> axle worn - damaged<br>9. <b>Front drive</b> axle serration worn - damaged | 1. Replace gear(s)<br>2. Replace shaft<br>3. Replace coupling<br>4. Replace joint<br>5. Replace gear(s)<br>6. Replace gears - pinions<br>7. Replace gear(s)<br>8. Replace axle<br>9. Replace axle |

## Troubleshooting Brake System

### Problem: Braking poor

| Condition   | Remedy   |
|---|--|
| 1. <b>Pad</b> worn<br>2. <b>Pedal</b> free-play excessive<br>3. <b>Brake</b> fluid leaking<br>4. <b>Hydraulic</b> system spongy<br>5. <b>Master cylinder/brake cylinder</b> seal worn | 1. Replace pads<br>2. Replace pads<br>3. Repair - replace hydraulic system component(s)<br>4. Bleed hydraulic system - correct or repair leaks<br>5. Replace master cylinder |

### Problem: Brake lever travel excessive

| Condition  | Remedy  |
|--|---|
| 1. <b>Hydraulic</b> system entrapped air<br>2. <b>Brake</b> fluid low<br>3. <b>Brake</b> fluid incorrect<br>4. <b>Piston</b> seal - cup worn | 1. Bleed hydraulic system<br>2. Add fluid to proper level<br>3. Drain system - replace with correct fluid<br>4. Replace master cylinder |

### Problem: Brake fluid leaking

| Condition   | Remedy  |
|---|---|
| 1. <b>Connection</b> joints loose<br>2. <b>Hose</b> cracked<br>3. <b>Piston</b> seal worn | 1. Tighten joint<br>2. Replace hose<br>3. Replace brake caliper |

## Suspension

The following suspension system components should be inspected periodically to ensure proper operation.

- A. Shock absorber rods not bent, pitted, or damaged.
- B. Rubber damper not cracked, broken, or missing.
- C. Shock absorber body not damaged, punctured, or leaking.
- D. Shock absorber eyelets not broken, bent, or cracked.
- E. Shock absorber eyelet bushings not worn, deteriorated, cracked, or missing.
- F. Shock absorber spring not broken or sagging.

### SPECIAL TOOL

A special tool must be available to the technician when performing service procedures in this section.

**■NOTE: When indicated for use, each special tool will be identified by its specific name, as shown in the chart below, and capitalized.**

| Description | p/n      |
|-------------|----------|
| Spring Tool | 0444-224 |

**■NOTE: Special tools are available from the Arctic Cat Service Department.**

## Shock Absorbers

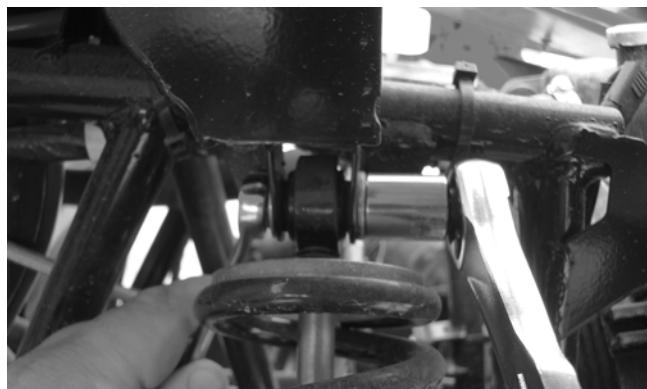
### REMOVING

1. Secure the ATV on a support stand to elevate the wheels and to release load on the suspension.

#### **WARNING**

**Make sure the ATV is solidly supported on the support stand to avoid injury.**

2. Remove the two cap screws and nuts securing each front shock absorber to the frame and the upper A-arm.



CF662

#### **CAUTION**

**Additional support stands are necessary to support the rear axle when the shock absorbers are removed or damage may occur.**

3. Remove the two cap screws and nut securing each rear shock absorber to the frame and lower A-arm. Account for bushings and sleeves from each.



AF626D

4. Using Spring Tool, compress the shock absorber spring, remove the retainer, and remove the spring.



CF341

### CLEANING AND INSPECTING

1. Clean all shock absorber components using a pressure washer.
2. Inspect each shock rod for nicks, pits, rust, bends, and oily residue.
3. Inspect all springs, spring retainers, shock rods, sleeves, bushings, shock bodies, and eyelets for cracks, leaks, and bends.

### INSTALLING

1. Place the shock absorber spring over the shock absorber, compress the spring, and install the retainer.
2. Install the shock with two cap screws and nuts. Tighten all front shock absorber nuts to 50 ft-lb. Tighten rear shock absorber nuts (upper) to 50 ft-lb; tighten lower shock absorber nuts to 20 ft-lb.

#### **CAUTION**

**Do not tighten the nuts beyond the recommended specification or the shock eyelet or mount WILL be damaged.**

3. Remove the ATV from the support stand.

## Front A-Arms

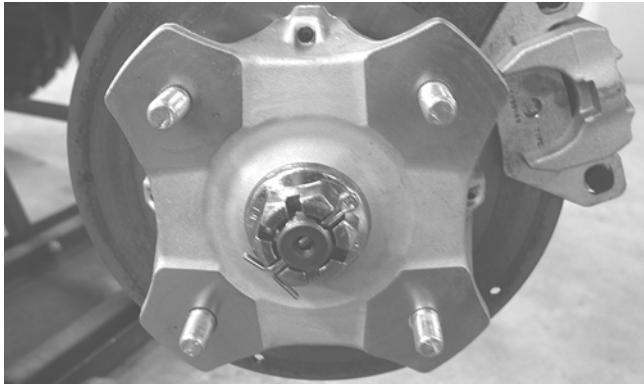
### REMOVING

1. Secure the ATV on a support stand to elevate the front wheels; then remove the wheels.

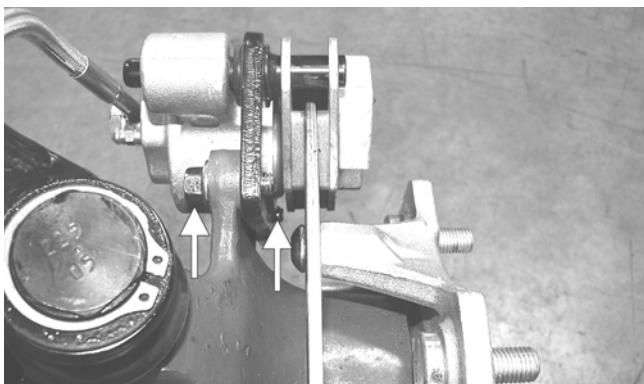
#### ⚠ WARNING

Make sure the ATV is solidly supported on the support stand to avoid injury.

2. Remove the cotter pin from the nut. Discard the cotter pin.

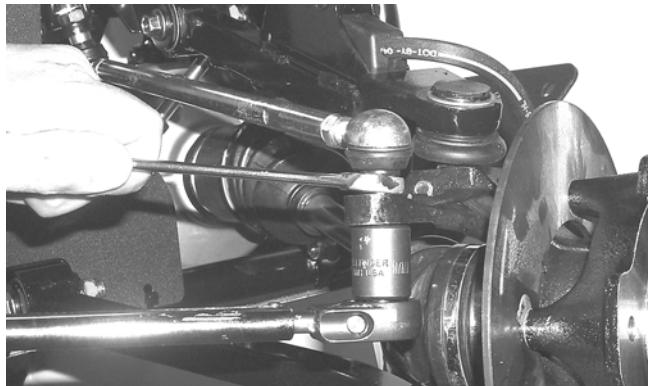


3. Remove the nut securing the hub.
4. Remove the brake caliper. Account for two cap screws.



■NOTE: Do not allow the brake caliper to hang from the cable/hose.

5. Remove the hub assembly.
6. Remove the cotter pin and slotted nut securing the tie rod end to the knuckle; then remove the tie rod end from the knuckle.



7. Remove the cap screws securing the ball joints to the knuckle.

#### CAUTION

Support the knuckle when removing the cap screws or damage to the threads will occur.



8. Tap the ball joints out of the knuckle; then remove the knuckle.
9. Remove the lower shock absorber eyelet from the upper A-arm.
10. Remove the cap screws securing the A-arms to the frame.



11. Remove the circlip from the ball joint; then remove the ball joint from the A-arm.



AF616D

## CLEANING AND INSPECTING

1. Clean all A-arm components using a pressure washer.
2. Clean the ball joint mounting hole of all residual Loctite, grease, oil, or dirt for installing purposes.
3. Inspect the A-arm for bends, cracks, and worn bushings.
4. Inspect the ball joint mounting holes for cracks or damage.
5. Inspect the frame mounts for signs of damage, wear, or weldment damage.

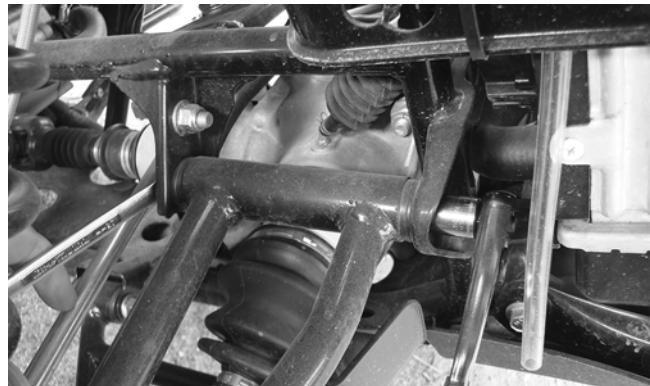
## INSTALLING

1. Apply Loctite Primer "T" to the arm socket; then apply green Loctite #609 to the entire outside diameter of the ball joint. Install the ball joint into the A-arm and secure with the snap ring.



AF616D

2. Install the A-arm assemblies into the frame mounts and secure with the cap screws. Only finger-tighten at this time.



CF661

3. Route the brake hose through the upper A-arm shock absorber mount; then secure the hose to the A-arm with a cable tie and grommet.



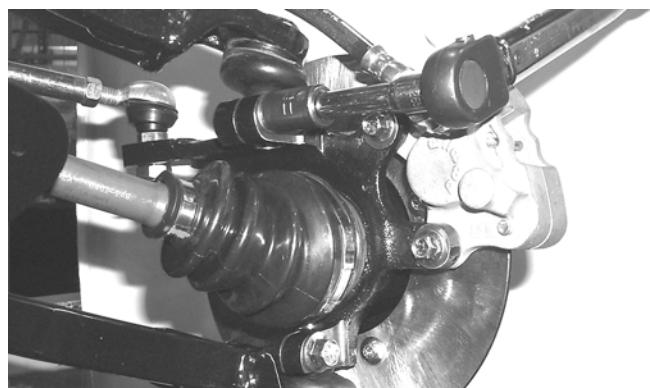
DE054A

4. Secure the lower eyelet of the shock absorber to the upper A-arm. Tighten nut to 50 ft-lb.
5. Secure the A-arm assemblies to the frame mounts (from step 2). Tighten the cap screws to 50 ft-lb.

### CAUTION

**Do not tighten the nut beyond the 50 ft-lb specification or the shock eyelet or mount WILL be damaged.**

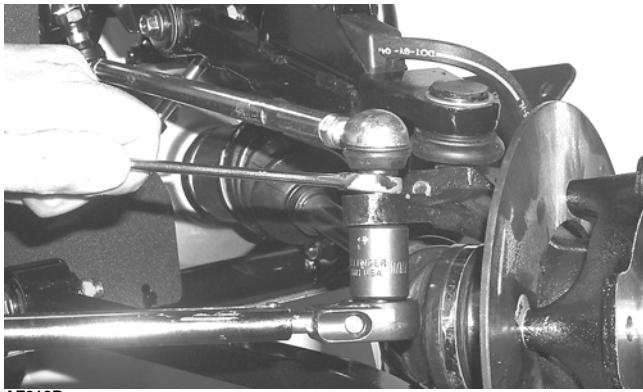
6. Install the knuckle assembly onto the ball joints and secure with cap screws. Tighten to 35 ft-lb.



AF628D

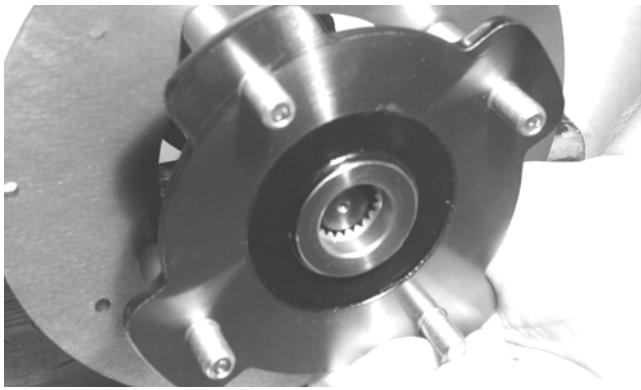
7. Install the tie rod end and secure with the nut. Tighten to 30 ft-lb; then install a new cotter pin and spread the pin to secure the nut.

**■NOTE: During assembly, new cotter pins should be installed.**



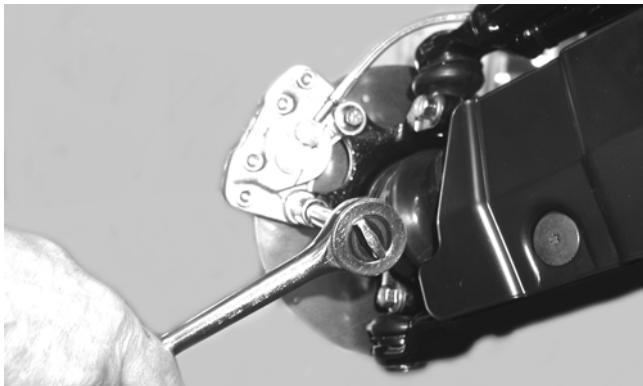
AF618D

8. Apply grease to the hub and drive axle splines; then install the hub assembly onto the drive axle.



CD009

9. Secure the hub assembly to the shaft/axle with the nut. Tighten only until snug at this point.
10. Secure the brake caliper to the knuckle with two new "patch-lock" cap screws. Tighten to 20 ft-lb.



CD007

11. Tighten the hub nut (from step 9) to 200 ft-lb.
- NOTE: If the cotter pin does not line up, always tighten to the next alignment.
12. Install a new cotter pin and spread the pin to secure the nut.
13. Install the wheel; then using a crisscross pattern, tighten the wheel nuts in 20 ft-lb increments to a final torque of 40 ft-lb (steel wheel), 60 ft-lb (aluminum wheel w/black nuts), or 80 ft-lb (aluminum wheel w/chrome nuts).
14. Remove the ATV from the support stand.

## Rear A-Arms

### REMOVING

1. Secure the ATV on a support stand to elevate the wheels.

#### ⚠️ ⚠️ WARNING

Make sure the ATV is solidly supported on the support stand to avoid injury.

2. Pump up the hand brake; then engage the brake lever lock.
3. Remove the wheel.
4. Remove the cotter pin securing the hex nut; then remove the hex nut. Release the brake lever lock.
5. Remove the caliper (right side only).

■NOTE: Do not allow the brake caliper to hang from the cable/hose.

6. Remove the cap screws and lock nut securing the shock absorber to the frame and lower A-arm; then remove the shock absorber.
7. Remove the cap screws securing the boot guard to the lower A-arm.



AF934

8. Slide the hub out of the knuckle and set aside.
9. Remove the cap screws and lock nuts securing the knuckle to the A-arms. Discard the lock nuts.

■NOTE: Never reuse a lock nut. Once a lock nut has been removed, it must be replaced with a new lock nut.

10. Remove the cap screws and lock nuts securing the A-arms to the frame; then remove the A-arms.

■NOTE: If removing the upper right A-arm, it will be necessary to disconnect the brake hose from the A-arm.

### CLEANING AND INSPECTING

1. Clean all A-arm components using a pressure washer.
2. Inspect the A-arm for bends, cracks, and worn bushings.

3. Inspect the frame mounts for signs of damage, wear, or weldment damage.

## INSTALLING

1. Install the A-arm assemblies into the frame and secure with the cap screws and new lock nuts. Only finger-tighten at this time.
2. Slide the knuckle onto the drive axle and into position on the A-arms; then secure the knuckle to the A-arms with cap screws and new lock nuts. Tighten to 35 ft-lb.
3. Tighten the hardware securing the A-arms to the frame (from step 1) to 50 ft-lb.
4. Apply grease on the drive axle splines; then install the hub assembly onto the drive axle.



PR290

5. Secure the hub assembly with the nut. Tighten only until snug.
6. Secure the brake caliper to the knuckle with two new "patch-lock" cap screws (right side only). Tighten the caliper to 20 ft-lb.

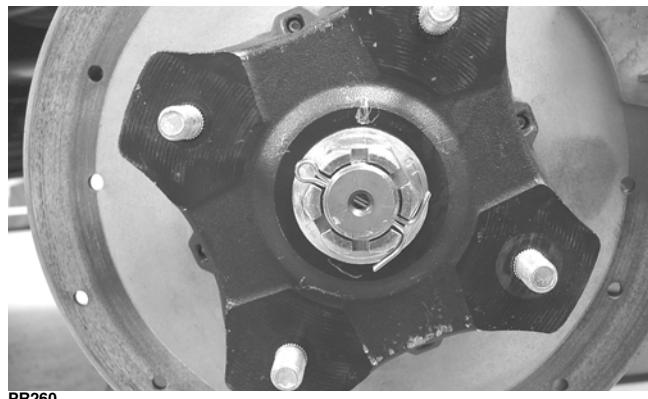
**■NOTE: Ensure the brake hose is properly routed and secured to the upper A-arm.**



DE054A

7. Compress the hand brake lever and engage the brake lever lock; then tighten the hub nut (from step 5) to ft-lb.
8. Install a new cotter pin and spread the pin to secure the nut.

**■NOTE: If the cotter pin does not line up, always tighten to the next alignment.**



PR260

9. Secure the shock absorber to the frame with a cap screw and new lock nut. Tighten to 50 ft-lb.
10. Secure the shock absorber to the lower A-arm with a cap screw and new lock nut. Tighten to 20 ft-lb.
11. Secure the boot guard to the lower A-arm with the two cap screws. Tighten securely.
12. Install the wheel; then using a crisscross pattern, tighten the wheel nuts in 20 ft-lb increments to a final torque of 40 ft-lb (steel wheel), 60 ft-lb (aluminum wheel w/black nuts), or 80 ft-lb (aluminum wheel w/chrome nuts).
13. Remove the ATV from the support stand.

## Wheels and Tires

### TIRE SIZE

#### ⚠ WARNING

**Use only Arctic Cat approved tires when replacing tires. Failure to do so could result in unstable ATV operation.**

The ATV is equipped with low-pressure tubeless tires of the size and type listed in General Information. Do not under any circumstances substitute tires of a different type or size.

#### ⚠ WARNING

**Do not mix tire tread patterns. Use the same pattern type on front and rear. Failure to heed warning could cause poor handling qualities of the ATV and could cause excessive drive train damage not covered by warranty.**

### TIRE INFLATION PRESSURE

Front and rear tire inflation pressure should be as specified in General Information.

### REMOVING

1. Secure the ATV on a support stand to elevate the wheels.

#### ⚠ WARNING

**Make sure the ATV is solidly supported on the support stand to avoid injury.**

2. Remove the wheels.

■**NOTE:** If equipped, the bead lock must be removed before attempting to remove the tire from the rim.

## CLEANING AND INSPECTING

1. Clean the wheels and hubs with parts-cleaning solvent.
2. Clean the tires with soap and water.
3. Inspect each wheel for cracks, dents, or bends.
4. Inspect each tire for cuts, wear, missing lugs, and leaks.

## INSTALLING

■**NOTE:** If a new tire is being installed, install the bead lock (if applicable) and tighten the existing screws to 11 ft-lb.

Install each wheel on its hub. Tighten to 40 ft-lb (steel wheels) or 80 ft-lb (aluminum wheels).

■**NOTE:** Make sure each wheel is installed on its proper hub as noted in removing (the “rotation arrow” (if applicable) must indicate forward direction of rotation).

## CHECKING/INFLATING

1. Using an air pressure gauge, measure the air pressure in each tire. Adjust the air pressure as necessary to meet the recommended inflation pressure.
2. Inspect the tires for damage, wear, or punctures.

### ⚠ WARNING

Do not operate the ATV if tire damage exists.

■**NOTE:** Be sure all tires are the specified size and have identical tread pattern.

■**NOTE:** If pulling is noted, measure the circumference of the front and rear tires on the pulling side. Compare the measurements with the tires on the opposite side. If pulling is noted during braking only, check and adjust the brakes as necessary and recheck operation (see Periodic Maintenance/Tune-Up).

## Troubleshooting

| <b>Problem: Suspension too soft</b>  |  |
|--|--|
| <b>Condition</b>   | <b>Remedy</b>  |
| 1. <b>Spring(s)</b> weak<br>2. <b>Shock absorber</b> damaged<br>3. <b>Shock absorber</b> preload too low   | 1. Replace spring(s)<br>2. Replace shock absorber<br>3. Adjust shock absorber preload  |
| <b>Problem: Suspension too stiff</b>   |  |
| <b>Condition</b>   | <b>Remedy</b>  |
| 1. <b>A-arm</b> -related bushings worn<br>2. <b>Shock absorber</b> preload too high  | 1. Replace bushing<br>2. Adjust shock absorber preload   |
| <b>Problem: Suspension noisy</b>   |  |
| <b>Condition</b>   | <b>Remedy</b>  |
| 1. <b>Cap screws</b> (suspension system) loose<br>2. <b>A-arm</b> -related bushings worn   | 1. Tighten cap screws<br>2. Replace bushings   |
| <b>Problem: Rear wheel oscillation</b>   |  |
| <b>Condition</b>   | <b>Remedy</b>  |
| 1. <b>Rear wheel</b> hub bearings worn - loose<br>2. <b>Tires</b> defective - incorrect<br>3. <b>Wheel</b> rim distorted<br>4. <b>Wheel</b> hub cap screws loose<br>5. <b>Auxiliary brake</b> adjusted incorrectly<br>6. <b>Rear suspension</b> arm-related bushing worn<br>7. <b>Rear shock</b> absorber damaged<br>8. <b>Rear suspension</b> arm nut loose | 1. Replace bearings<br>2. Replace tires<br>3. Replace rim<br>4. Tighten cap screws<br>5. Adjust brake<br>6. Replace bushing<br>7. Replace shock absorber<br>8. Tighten nut |
| <b>Problem: Vehicle pulling or steering erratic</b>  |  |
| <b>Condition</b>   | <b>Remedy</b>  |
| 1. <b>Vehicle</b> steering is erratic on dry, level surface<br>2. <b>Vehicle</b> pulls left or right on dry, level surface   | 1. Check front wheel alignment and adjust if necessary (see Steering/Body/Controls)<br>2. Check air pressure in tires and adjust to specifications                         |



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