

# 2017

## SERVICE MANUAL



VLX 700

# 2017 VLX 700 Service Manual

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## General Information/Foreword

This Service Manual contains service, maintenance, and troubleshooting information for certain 2017 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 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 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 the manufacturer 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 Rear - 25 x 10-12
Tire Inflation Pressure (cold w/operator) (cold w/operator and cargo)	34.5 kPa (5 psi) 48.3 kPa (7.0 psi)
Spark Plug Type	NGK CPR8E
Spark Plug Gap	0.5-0.6 mm (0.019-0.024 in.)
Gas Tank Capacity	21.6 L (5.7 U.S. gal.)
Coolant Capacity	2.9 L (3.0 U.S. qt)
Rear Drive Capacity	198 ml (6.7 fl oz)*
Front Differential Capacity	198 ml (6.7 fl oz)**
Engine Oil Capacity (approx)	2.5 L (2.6 U.S. qt) - Overhaul 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 (standard)	35.0 mm (1.38 in.)
Brake Fluid	DOT 4
Taillight/Brakelight	12V/8W/27W
Headlight	12V/27W (4) -
ELECTRICAL SYSTEM	
Ignition Timing (at full operating temperature)	14° BTDC @ 1300 RPM
Spark Plug Cap	4000-6000 ohms
Ignition Coil Resistance (primary) (secondary)	0.75 ohms ± 10% N/A
Ignition Coil Primary Voltage	Battery Voltage
Stator Coil (CKP sensor) Resistance (AC generator)	104-156 ohms Less than 1 ohm
Crankshaft Position Sensor AC Voltage	2.0 volts or more
AC Generator Output (no load)	60 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 ft-lb N-m	
Exhaust Pipe	Engine	20	27
Spark Arrester	Muffler	48 in.-lb	5.5
O <sub>2</sub> Sensor	Muffler	19	26
ELECTRICAL COMPONENTS			
Coil	Air Filter Housing	10 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 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 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 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 Mounting Through-Bolt	Frame	40	54
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)	Crankcase (step 1) (step 2) (final)	20 30 37	27 41 50
Cylinder Head Nut (6 mm)	Cylinder	8.5	11.5
Cylinder Head Nut (8 mm)	Cylinder	18	24.5
Clutch Shoe**	Crankshaft	221	300
Driven Pulley**	Driveshaft	162	220
Ground Wire	Engine	8	11
Magneto Cover	Crankcase	9.5	13
Speed Sensor Housing	Crankcase	8.5	11.5
Oil Drain Plug	Engine	16	22
Movable Drive Face**	Centrifugal Clutch Housing	162	220
Starter Clutch**	Flywheel	26	35
Output Shaft Nut**	Output Shaft	59	80
Output Yoke Nut**	Output Shaft	200	270
Stator Coil**	Magneto Cover (New)	13	18
Stator Coil	Magneto Cover (Existing)	11.5	15
Oil Strainer	Crankcase	54 in.-lb	6
Rotor/Flywheel**	Crankshaft	107	145
Oil Pump**	Crankcase	8.5	11.5
Crankcase Half (6 mm)	Crankcase Half	10	14
Crankcase Half (8 mm)	Crankcase Half	21	28
Shift Cam Stopper	Crankcase	8	11
Starter Motor	Crankcase	10	14
Shift Cam Plate	Shift Cam Shaft	8	11
Inner Clutch Cover/Housing	Crankcase	10	14
V-Belt Cover	Inner Clutch Cover	44 in.-lb	5
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
Water Pump/Housing	Magneto Cover	8.5	11.5

## 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 approved gasoline additives should be used.

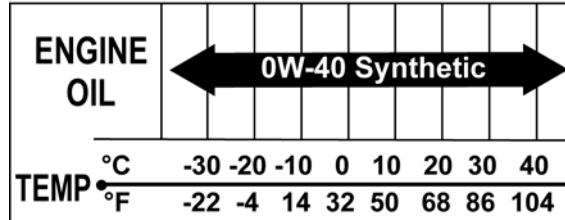
### RECOMMENDED ENGINE/ TRANSMISSION OIL

#### **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 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 ATV front differentials and rear drives.

#### **CAUTION**

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

## Preparation For Storage

#### **CAUTION**

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

Use 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.

**■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 after Storage**

Taking the ATV out of storage and correctly preparing it will assure many miles and hours of trouble-free riding. Use 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

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.**

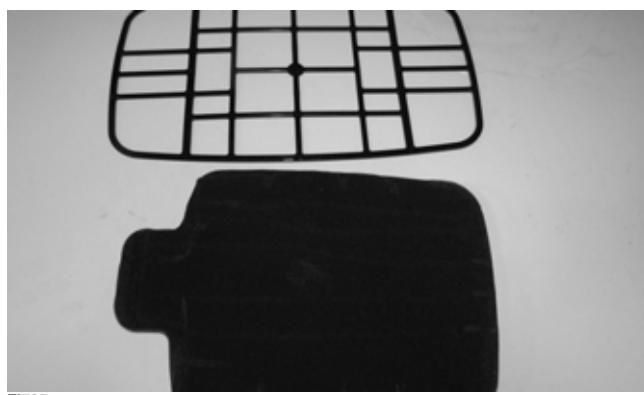
Description	p/n
Compression Tester Kit	0444-213
Oil Filter Wrench	0644-389
Spanner Wrench	0444-240
Valve Clearance Adjuster	0444-255

**■NOTE: Special tools are available from the 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.



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4. Place the element in a pan larger than the element and spray both sides generously with cleaning solvent. Let sit approximately three minutes.

**■NOTE: Foam Air Filter Cleaner and Foam Air Filter Oil Aerosol are available.**

5. In a pan larger than the element, with a mild detergent (dish soap) and water, wash all the dirt and oil off by squeezing the element, not twisting it wringing out or twisting the filter can cause damage).
6. Rinse off any remaining soap.
7. Remove any excess water from the element by pressing it with a towel.
8. Allow the element to dry completely.

### 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. Spray oil generously onto the air filter and work the oil into the element.
10. Squeeze the element to remove excess oil.
11. Clean any dirt or debris from inside the air cleaner.
12. Install the air filter/frame assembly and cover.
13. 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.



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 (for more detailed information, see Engine/Transmission - Servicing Top-Side Components).
2. Rotate the crankshaft to the TDC position on the compression stroke.



■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

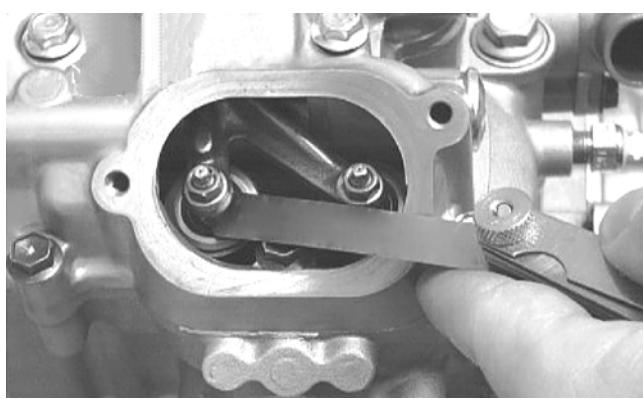
Using a feeler gauge, check each valve/tappet clearance. If clearance is not within specifications, loosen the jam nut and rotate the tappet adjuster screw until the clearance is within specifications. Tighten each jam nut securely after completing the adjustment.

#### 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

0.08-0.12 mm (0.003-0.005 in.) - Intake
0.13-0.17 mm (0.005-0.007 in.) - Exhaust



### 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.

- A. 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.
- B. 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.
- C. Align the valve adjuster handle with one of the marks on the valve adjuster dial.
- D. 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.

- E. While holding the adjuster dial at the proper clearance setting, tighten the jam nut securely with the valve adjuster handle.
4. Install the spark plugs and timing inspection plug; then 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 from the spark plug.
2. Using compressed air, blow any debris from around the spark plug.

#### ⚠ WARNING

Always wear safety glasses when using compressed air.

3. Remove the spark plug; then attach the high tension lead to the plug and ground the plug on the cylinder head well away from the spark plug hole.
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	
PSI Hot (WOT)	PSI Cold (WOT)
125-145	100-140

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

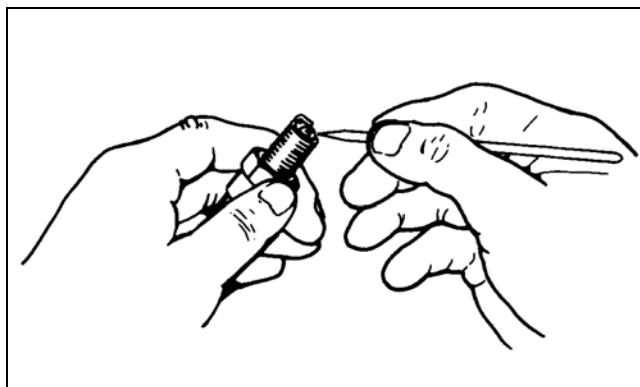
- A. Verify starter cranks engine over at normal speed (approximately 400 RPM).
- B. Gauge functioning properly.
- C. Throttle lever in the full-open position.
- D. Valve/tappet clearance correct.
- E. Engine warmed up.
- F. Intake not restricted.

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

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

## Spark Plug

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.

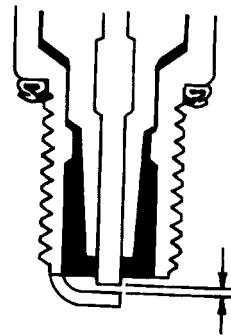


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### CAUTION

**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.



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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.

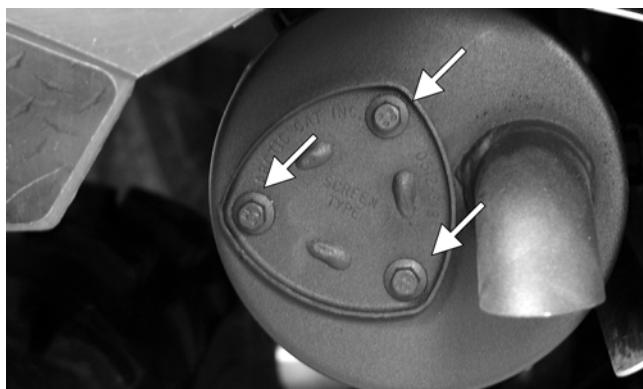
## Muffler/Spark Arrester

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.

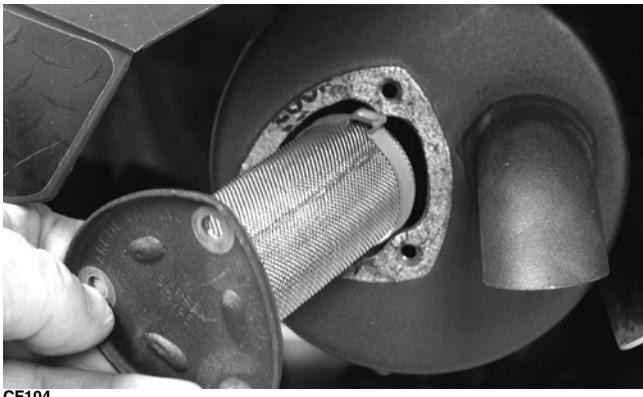


CF105A

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.



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## 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.

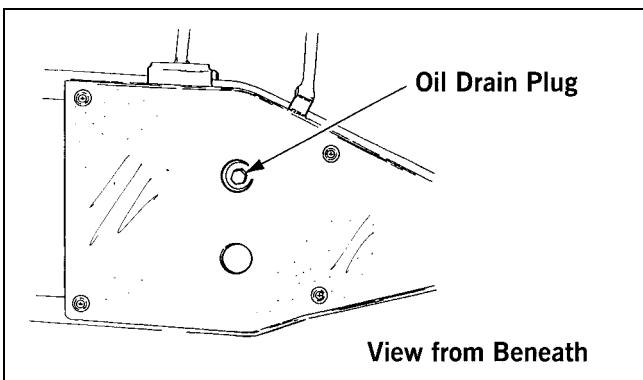


CF109M

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. Thoroughly clean the oil filter mating surface on the crankcase.**

5. Apply fresh oil to the O-ring of a new oil filter and make sure it is positioned correctly; then install the new oil filter. Tighten securely.
6. Place a new drain plug gasket onto the engine drain plug; then 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.



XR234A

### 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

### 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.

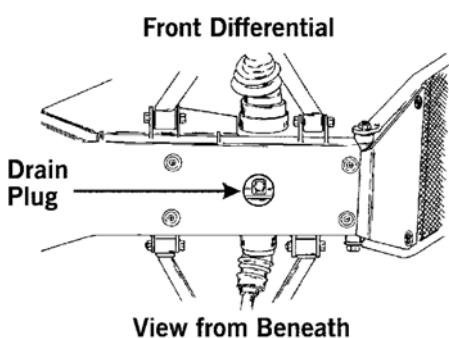
To check lubricant, remove the fill plug; the lubricant level should be 1 in. below the threads of the plug. If low, add SAE approved 80W-90 hypoid gear lubricant as necessary.

To change the lubricant, use the following procedure.

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

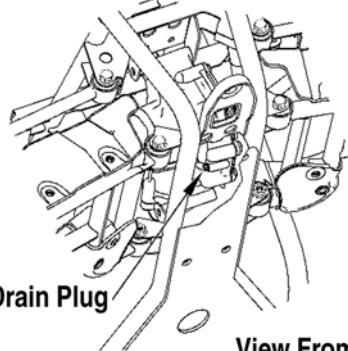


3. Drain the lubricant into a drain pan by removing in turn the drain plug from each.



ATV0082A

### Rear Drive



View From Beneath

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. The fluid should be level with the bottom threads of the Level Plug.
6. Install the fill plugs; then tighten to 16 ft-lb. Install the level plugs and tighten to 45 in.-lb.

■**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. Install the level plugs and tighten to 45 in.-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



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

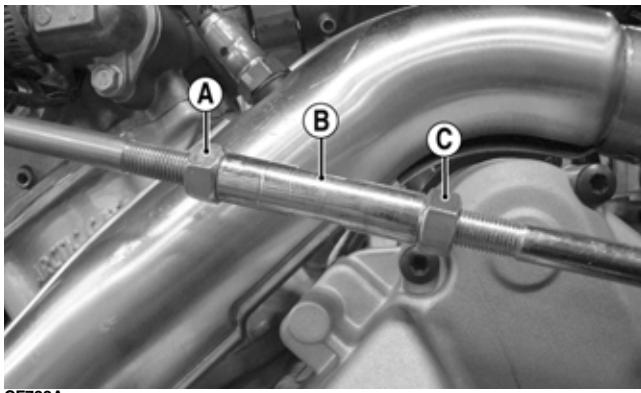
### WARNING

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.

- 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.



CF722A

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

**■NOTE: If all three gear position lights flash a sequence of one second ON, and then one second OFF, the gear position sensor/wiring is faulty or disconnected. Troubleshoot the harness connectors, gear position switch connector, gear position switch, and indicator light panel.**



CF723

- Compress the brake lever/pedal several times to check for a firm brake. If the brake is not firm, the system must be bled.
- To bleed the main brake system, use the following procedure.
  - Remove the cover and fill the reservoir with DOT 4 Brake Fluid; then install and secure the cover.
  - Slowly compress the brake lever several times.
  - 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.



XR262A

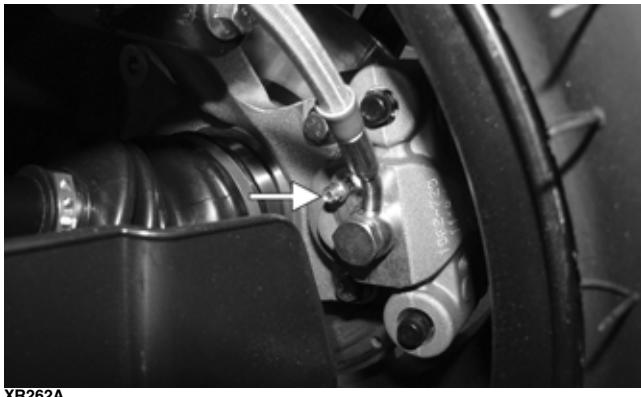
**■NOTE: During the bleeding procedure, watch the sight glass very closely to make sure there is always a sufficient amount of brake fluid. If low, refill the reservoir before the bleeding procedure is continued. Failure to maintain a sufficient amount of fluid in the reservoir will result in air in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



CF295A

- 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 located beneath the seat.
- At this point, perform step B and C on the FRONT RIGHT bleeder screw; then move to the FRONT LEFT bleeder screw and follow the same procedure.
- Repeat step D until the brake lever is firm.
- To bleed the auxiliary brake system, use the following procedure.
  - Remove the cover and fill the reservoir with DOT 4 Brake Fluid; then install and secure the cover.
  - 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.



XR262A

**■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

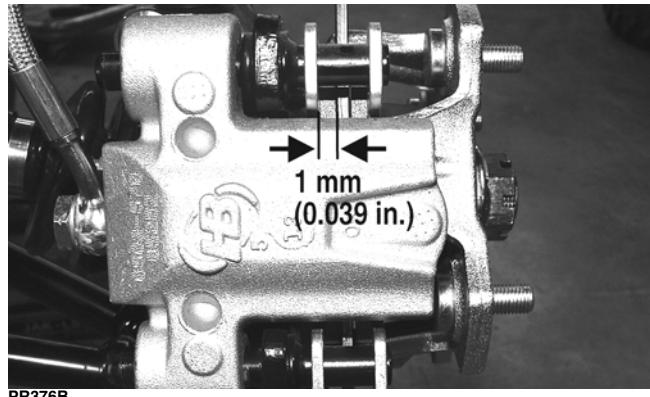
Carefully inspect the hydraulic brake hoses for cracks or other damage. If found, the brake hoses must be replaced.

### 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.

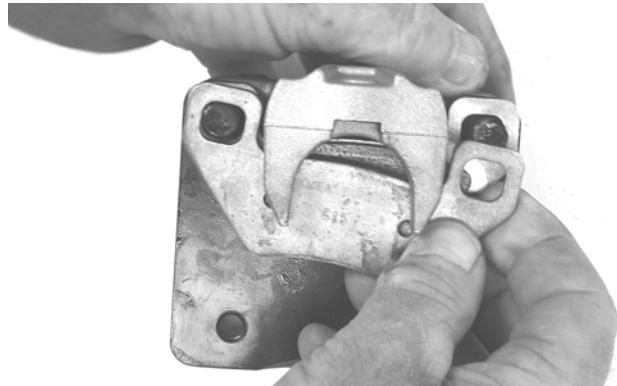
1. Remove a front wheel.
2. Measure the thickness of each brake pad.
3. If thickness of either brake pad friction material is less than 1.0 mm (0.039 in.), the brake pads must be replaced.



PR376B

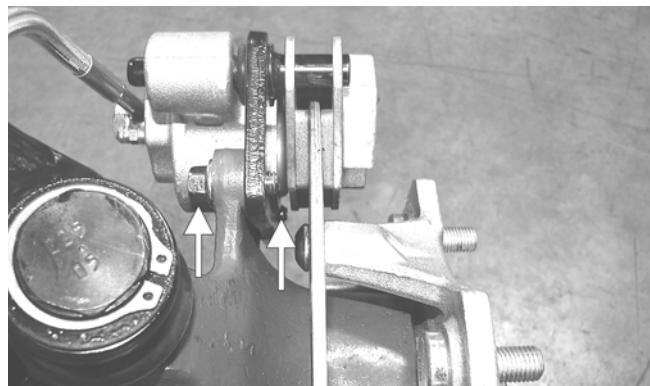
**■NOTE:** The brake pads should be replaced as a set.

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.



PR237

- 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.



PR377B

- 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).

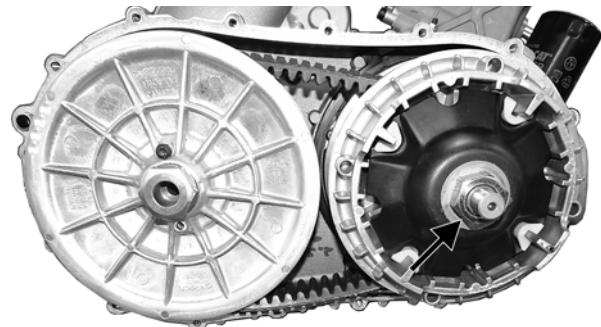
## Burnishing Brake Pads

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.

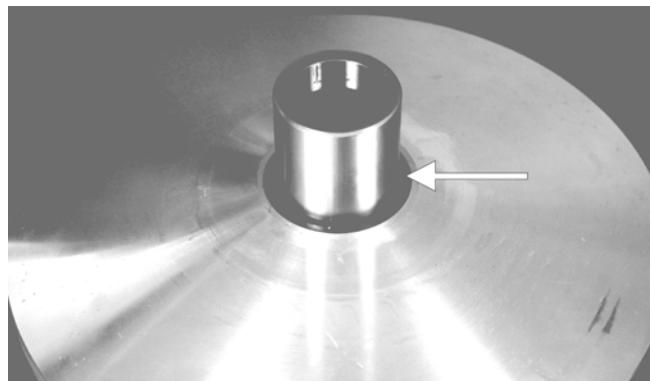
### **WARNING**

**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

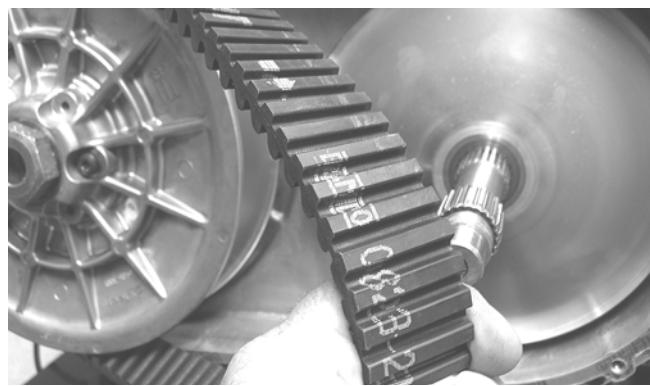


CD966A

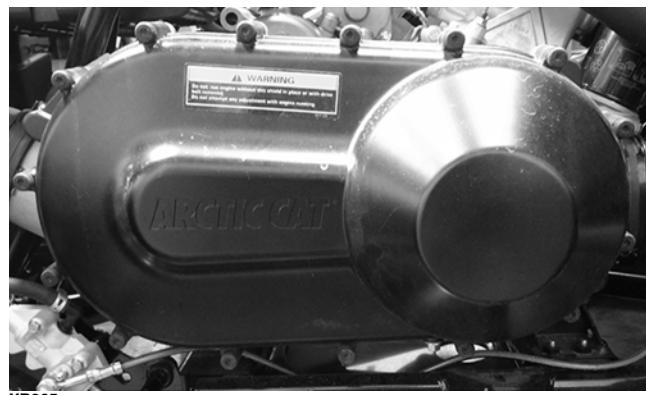
4. Install an M6 x 1.0 cap screw into the driven pulley fixed face; then turn the cap screw clockwise to spread the pulley faces. Remove the V-belt.



GZ076



GZ085



XR265

3. Remove the nut (account for the washer located behind the nut) securing the movable drive face; then remove the face. Account for the spacer.

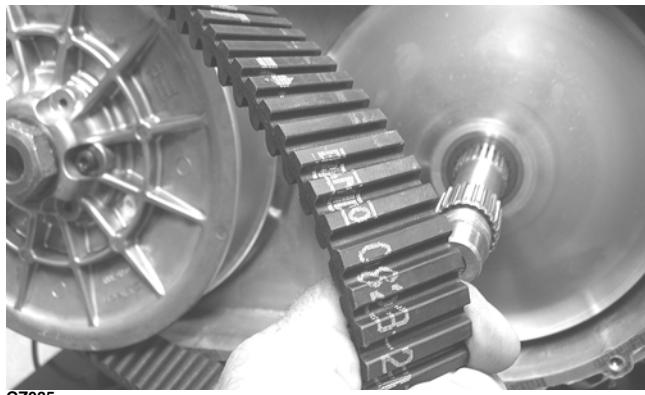
**■NOTE: Keep the drive face plate in contact with the drive face when removing or installing the drive face to prevent the rollers from falling out.**

## 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 standard V-belt measurement is 35.0 mm.

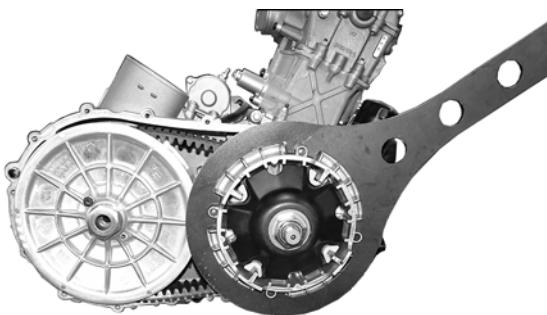
## INSTALLING

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



■**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. Install the washer; then secure the drive face with a new nut. Using an appropriate spanner wrench to hold the movable sheave, tighten the nut to 162 ft-lb.



CF366

### CAUTION

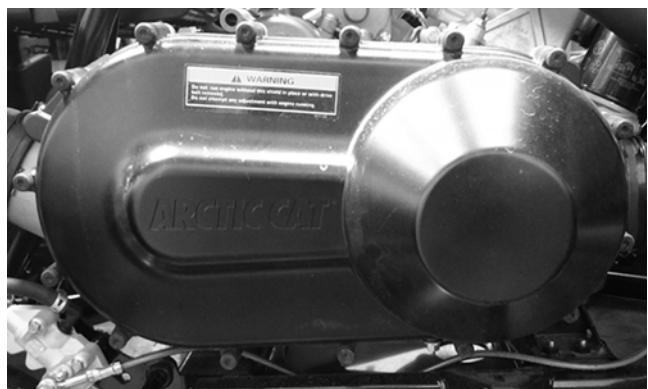
**Make sure the movable drive face plate is fully engaged onto the splines of the clutch shaft before tightening the nut or false torque readings may occur. This will cause the assembly to loosen damaging the shaft and clutch face plate.**



CF379

■**NOTE:** At this point, the M6 x 1.0 cap screw that was used to separate the sheaves of the driven clutch 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. With the two dowels installed, 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. Verify the fibrous washers are installed onto each cap screw. Tighten the cap screws to 44 in.-lb.



XR265

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.

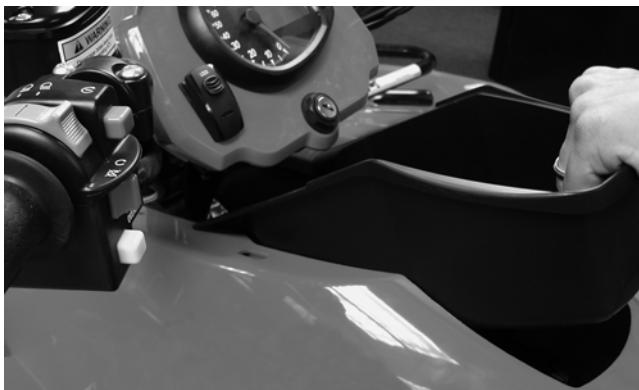
- A. Handlebar grips not worn, broken, or loose.
- B. Handlebar not bent, cracked, and has equal and complete full-left and full-right turning capability.
- C. Steering post bearing assembly/bearing housing not broken, worn, or binding.
- D. Ball joints not worn, cracked, or damaged.
- E. Tie rods not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

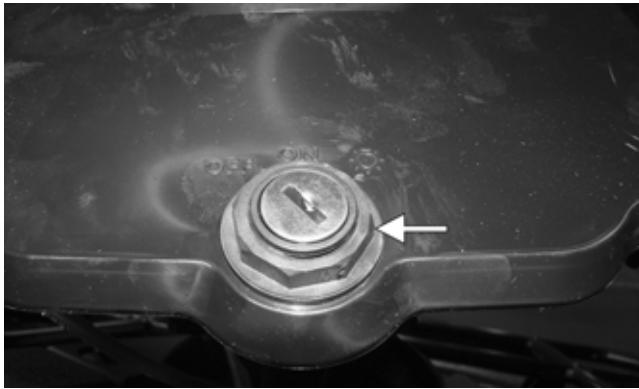
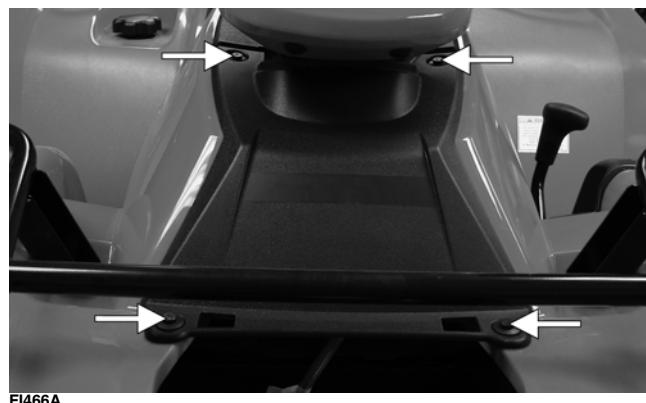
2. Unlock the storage compartment lid; then slide the storage compartment cover assembly forward and lift off the storage compartment.

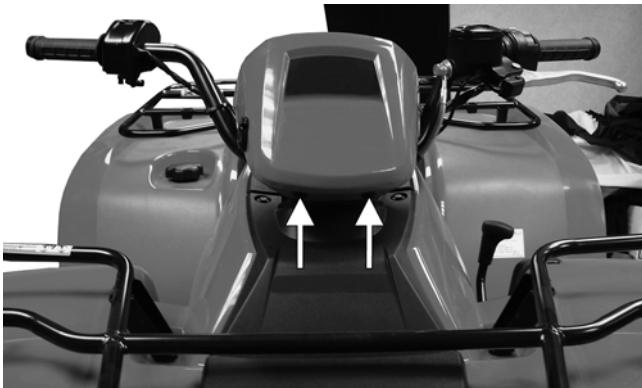


3. Remove the storage compartment box; then remove the seat.



4. Remove the ignition switch retaining ring and two reinstallable rivets securing the instrument pod. Disconnect the harness from the instrument pod and accessory plug; then remove the instrument pod.





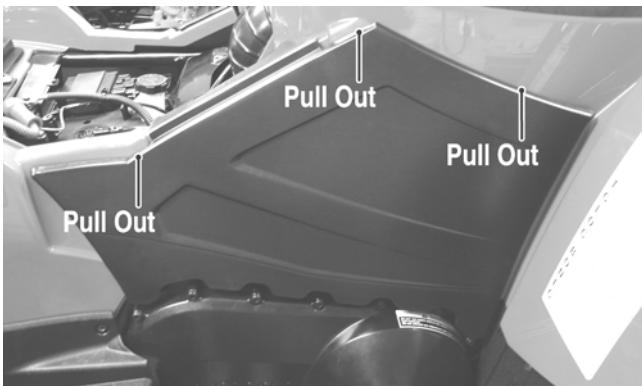
FI464A

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.

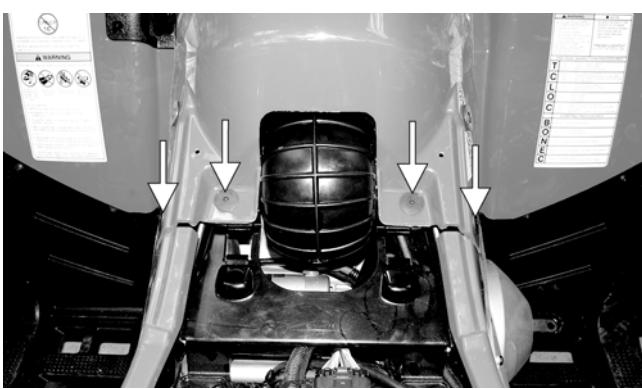


FI469A

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.

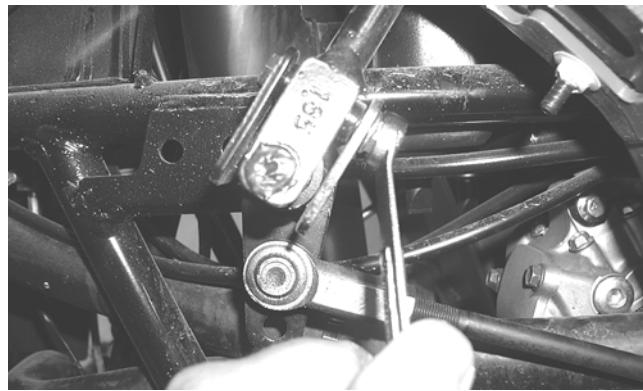


CF237A

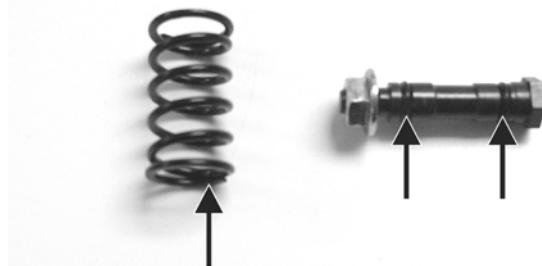


FI470A

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.

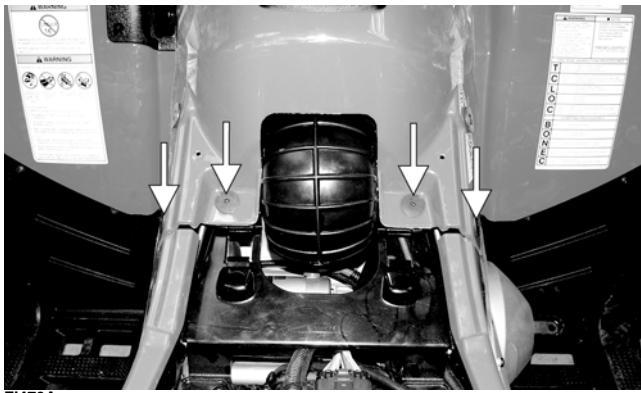


2. Connect the headlight connectors to the appropriate headlights and the front accessory plug wires to the accessory plug.



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.

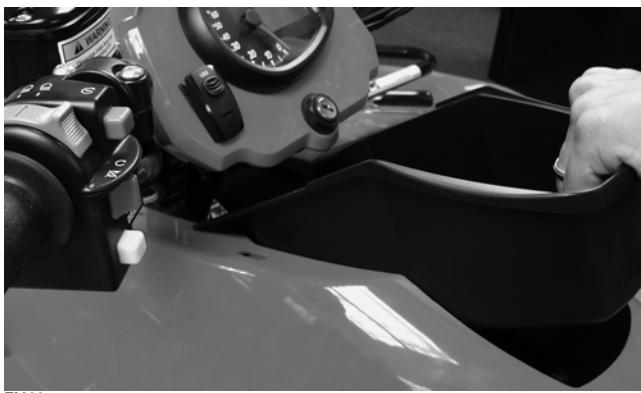
4. Install the footwells and footrests. Tighten securely.
5. Install the cap screws securing the front body panel to the frame and rear panel.



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



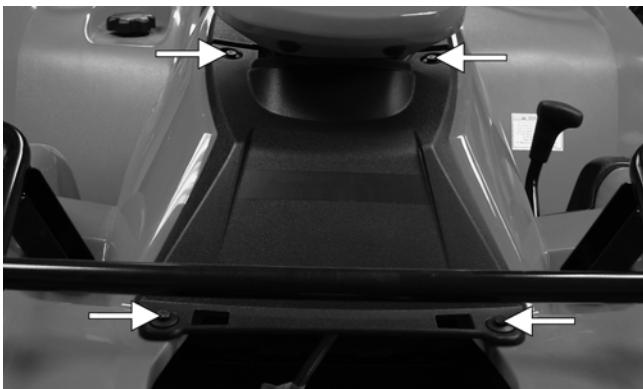
7. Connect the wire harness to the indicator display and accessory outlet. Install the instrument pod and ignition switch; then secure with two reinstallable rivets and the ignition switch retaining ring.
8. Set the storage compartment box into position; then install the storage compartment cover making 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.

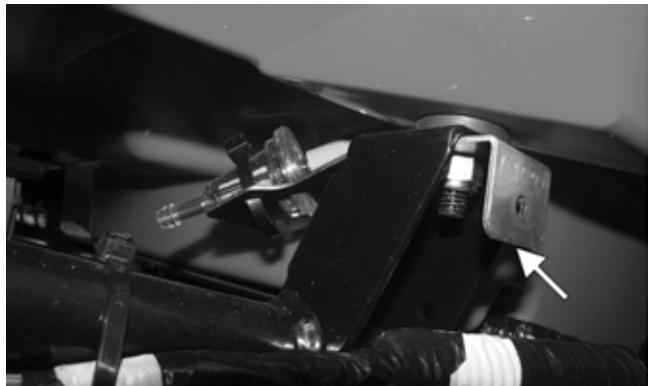
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## Rear Body Panel/Rack

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### REMOVING

1. Remove the cap screws and lock nuts securing the rear rack; then remove the rear rack. Account for the bushings. Note the gas tank ventilation bracket installed location.



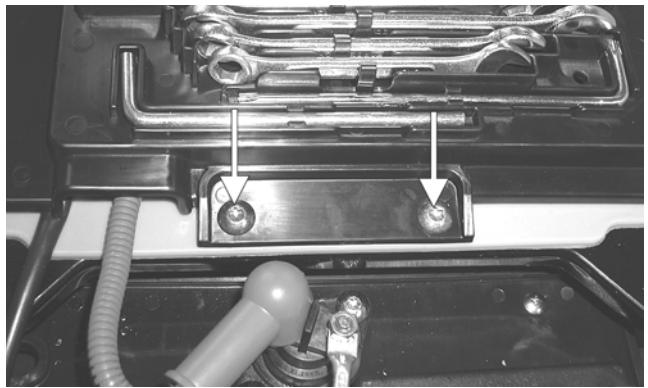
CF668A

2. Remove the cap screws and lock nuts securing the rear body panel to each footwell.



CF669

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.

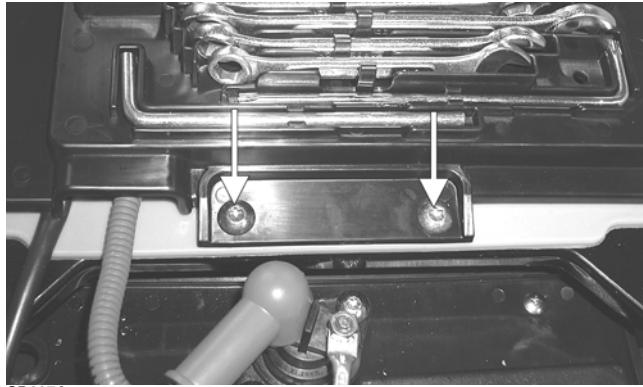
## INSTALLING

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. Secure the gas tank ventilation bracket to the frame using the rear rack cap screw and lock nut.
3. Secure the cap screws and lock nuts securing the rear body panel to each foot well.



CF669

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.

## Indicator Display

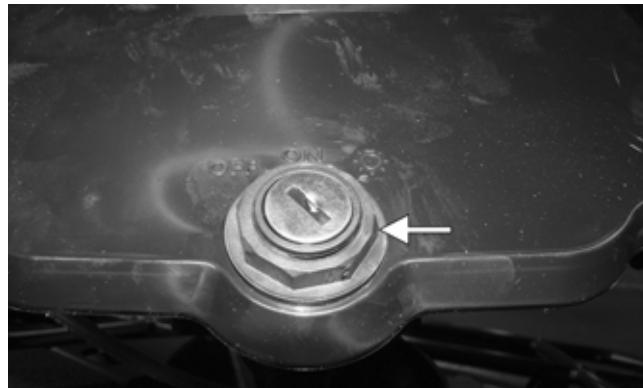
### REPLACING

1. Remove the two reinstallable rivets securing the indicator display; then remove the ignition switch retaining ring. Disconnect the harness from the accessory outlet.
2. Remove the two nuts securing the mounting studs; then remove the indicator and disconnect the multi-pin connector.
3. Mount the indicator and secure with the two nuts; then connect the multi-pin connector and accessory outlet.
4. Install the indicator display and secure with the reinstallable rivets.
5. Secure the ignition switch with the retaining ring.

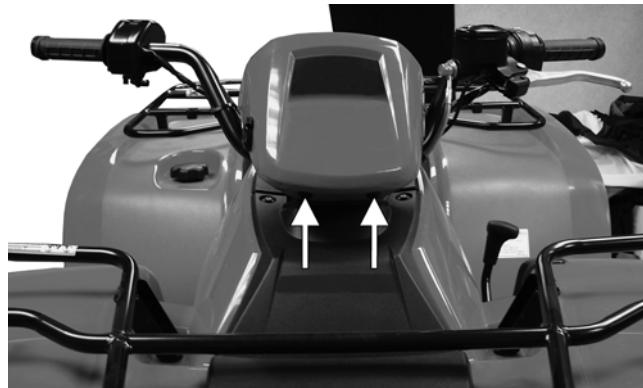
## Steering Post/Tie Rods

### 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 indicator display.

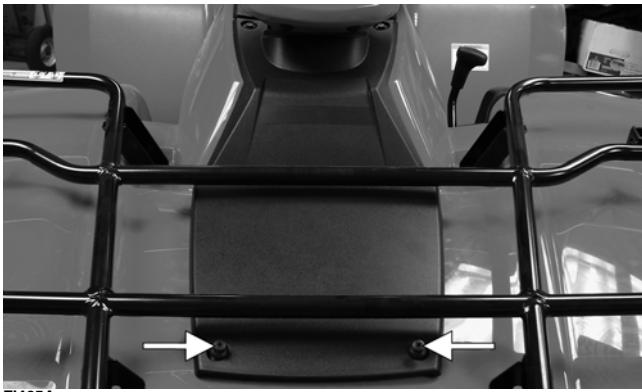


CF724A

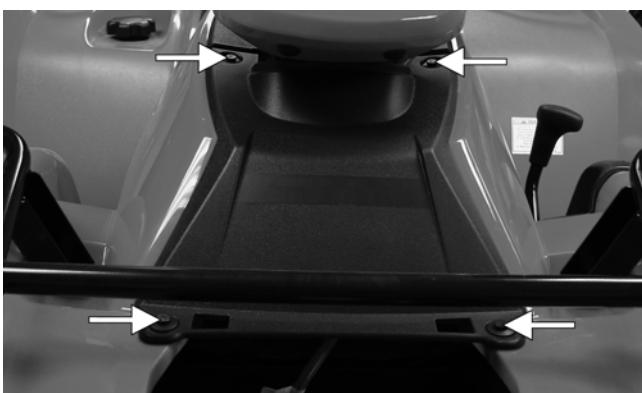


FI464A

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



3. Remove four re/installable rivets securing the steering post cover and remove the cover.



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



5. Remove the storage compartment.



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

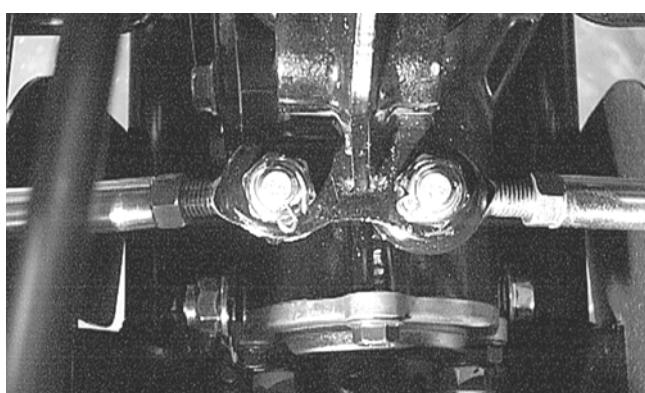


7. Remove two cap screws securing the upper steering post bearing to the frame. Account for two steering post mounting blocks and steering post mounting bracket.



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

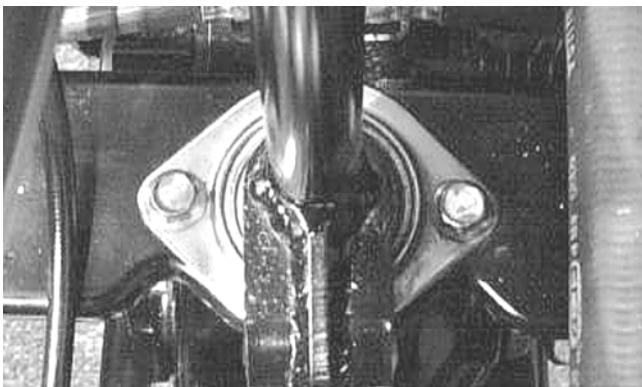
9. Remove the cotter pins and slotted nuts from the inner and outer tie rod ends; then remove the tie rods from the steering post arm and the left-side and right-side steering knuckles.





KX039

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



AL600D

## CLEANING AND INSPECTING

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

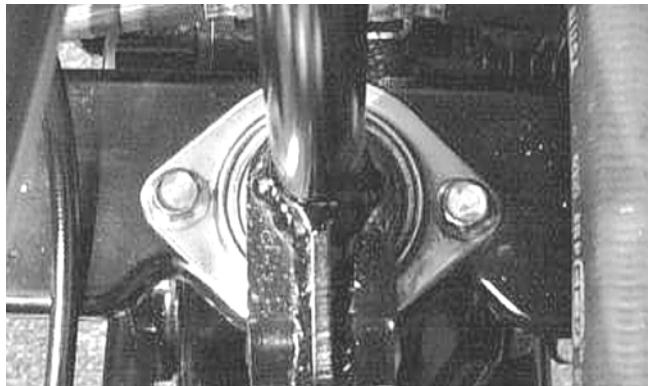
### **WARNING**

**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.

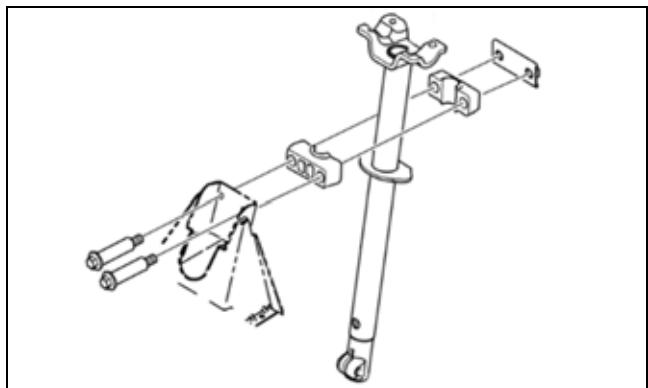
## INSTALLING

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.



AL600D

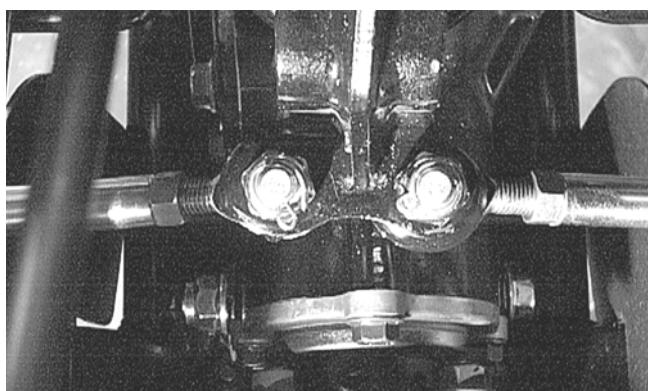
2. Place the upper steering post mounting blocks into position; then insert the two shoulder screws through the frame and thread them into the steering post mounting bracket. Tighten to 20 ft-lb.



CF671

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.**

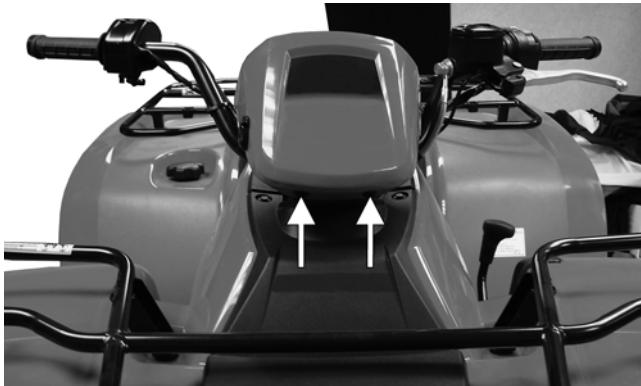


AF778D

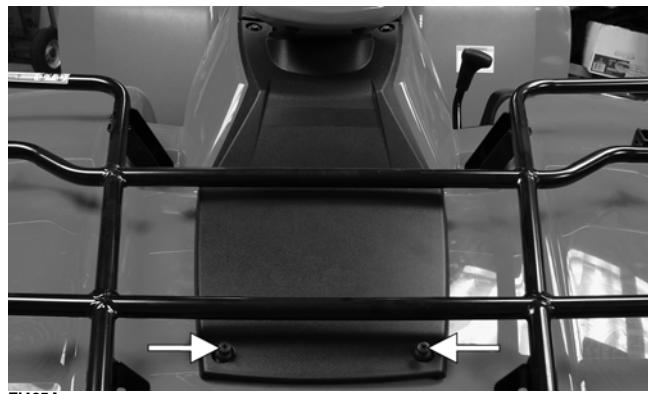
4. Install the front wheels using a crisscross pattern, tighten the wheel nuts in 20 ft-lb increments to a final torque of 40 ft-lb (steel wheel), 60 ft-lb (aluminum wheel w/black nuts), or 80 ft-lb (aluminum wheel w/chrome nuts).
5. Lower the ATV and place the handlebar and caps into position on the 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.

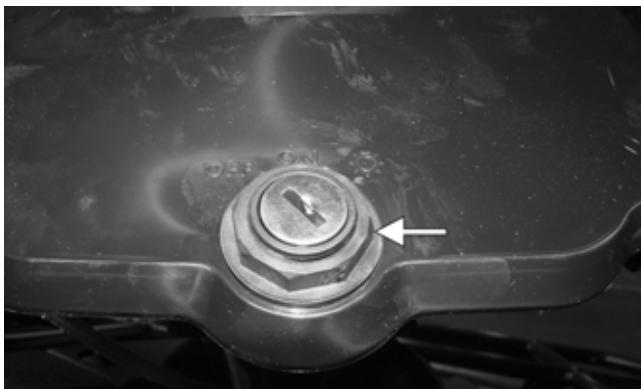
7. Place the instrument pod into position; then secure with two reinstallable rivets and the ignition switch retaining ring.



FI464A

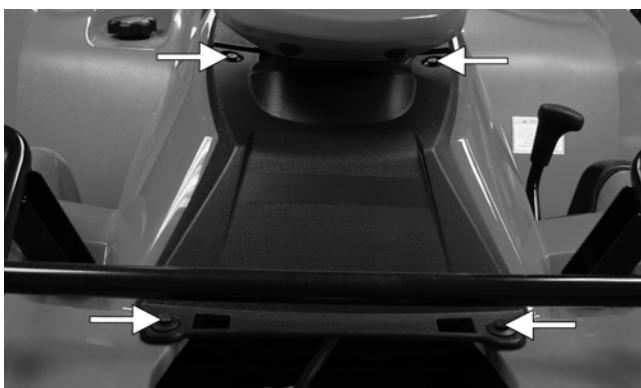


FI465A



CF724A

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



FI466A



CF747

3. If a grip is damaged, cut the grip lengthwise using a sharp knife or box cutter; then peel off the grip.

## INSTALLING

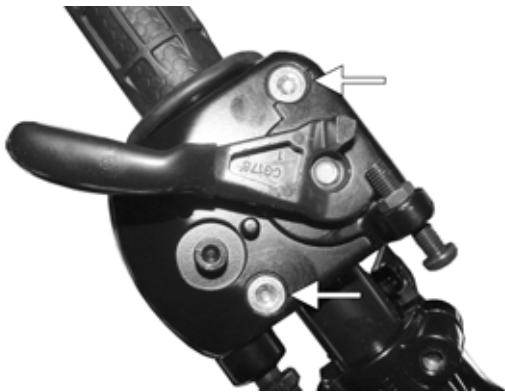
■**NOTE:** Before installing a grip, use contact removal spray or alcohol to clean the handlebar of glue residue, oil, or any other contaminant.

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.

## Throttle Control

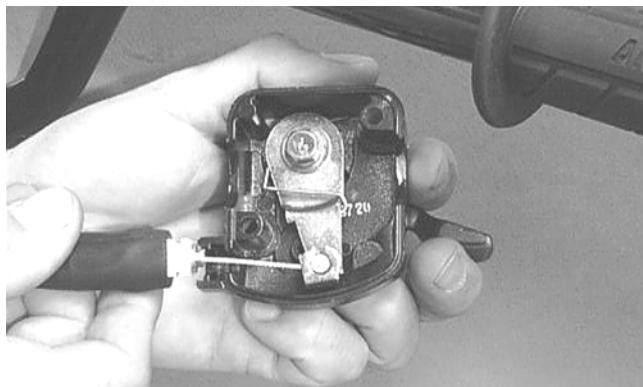
### REMOVING

1. Remove the two machine screws securing the throttle control to the handlebar.



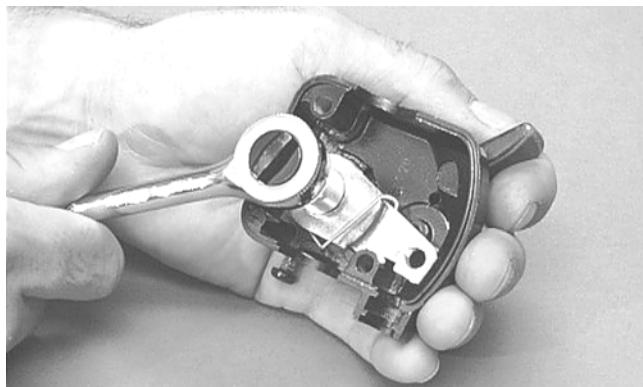
CF725A

2. Slide the grommet out of the lower half of the throttle control; then remove the cable from the actuator arm.



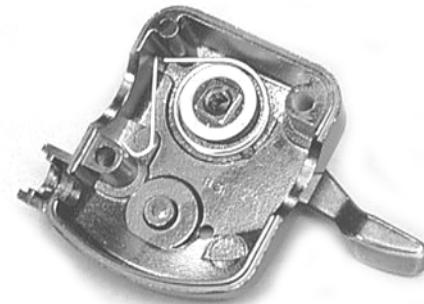
AF676D

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



AF677D

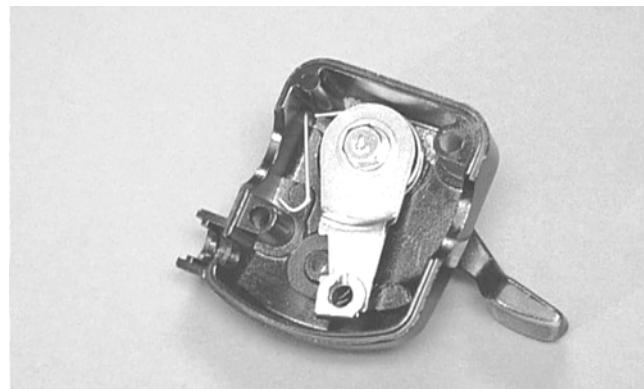
4. Remove the actuator arm and account for a bushing. Note the position of the return spring for installing purposes.



AF678D

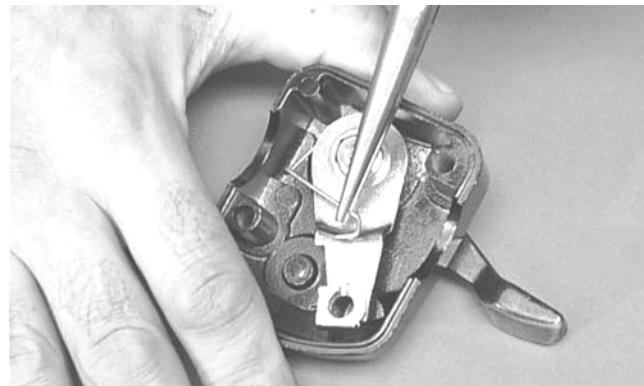
## INSTALLING

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.



CF725A

## 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.

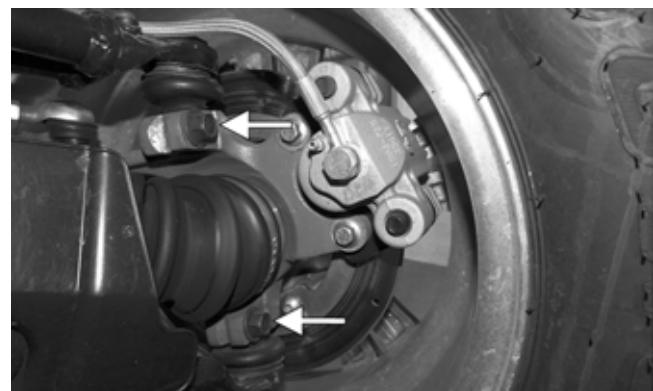
### ASSEMBLING AND INSTALLING

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



PR287A

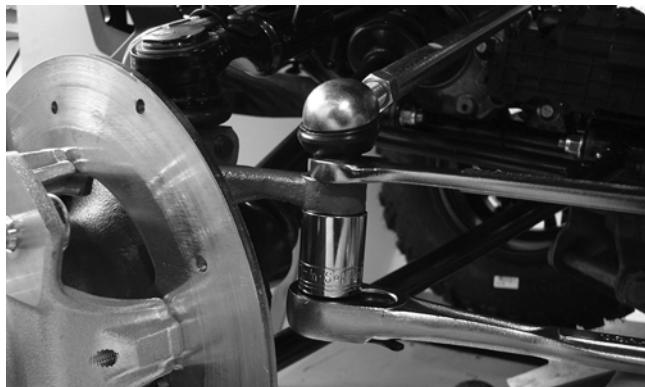
2. Install the knuckle to the upper and lower ball joints and secure with the two cap screws. Tighten to 35 ft-lb.



CF299A

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.**



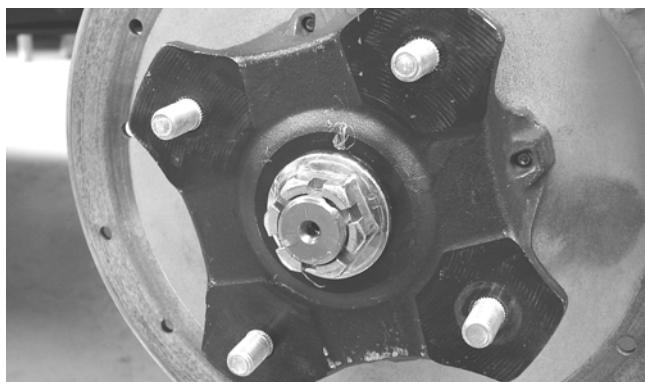
XR338

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



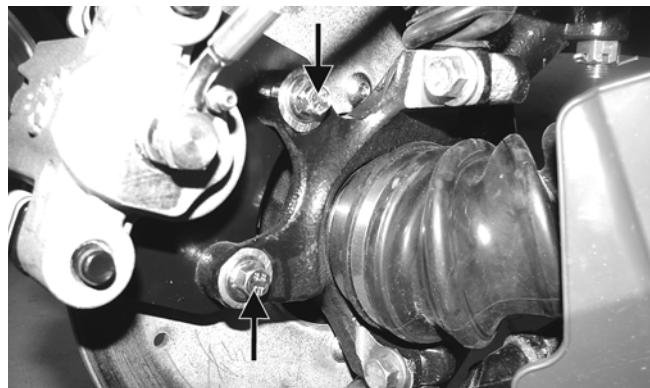
PR290A

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

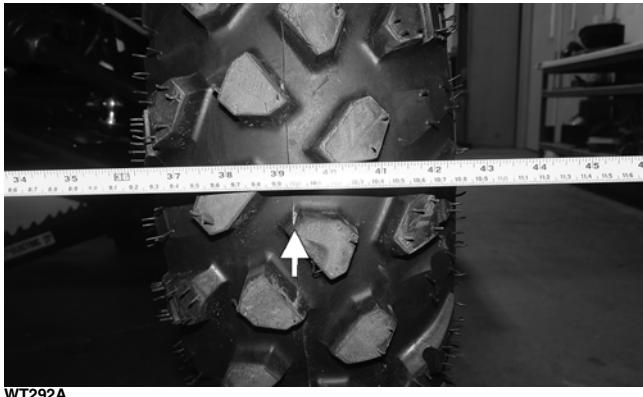
1. Thoroughly wash the ATV to remove excess weight (mud, etc.); then ensure the tires are properly inflated to the recommended pressure.
2. Place the unloaded ATV in a level position taking care not to push down or lift up on the front end; then turn the handlebar to the straight ahead position.
3. Measure 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.**



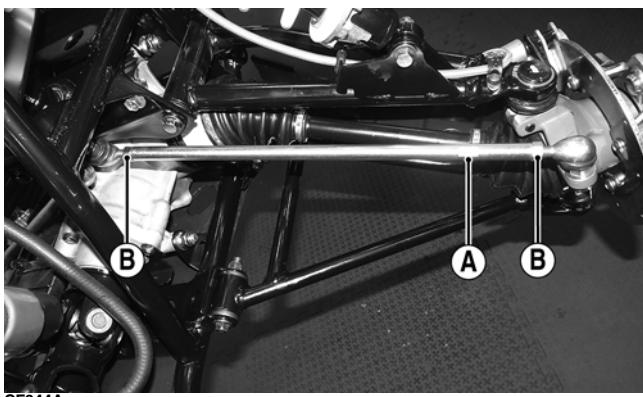
CF685A

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).



WT292A

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

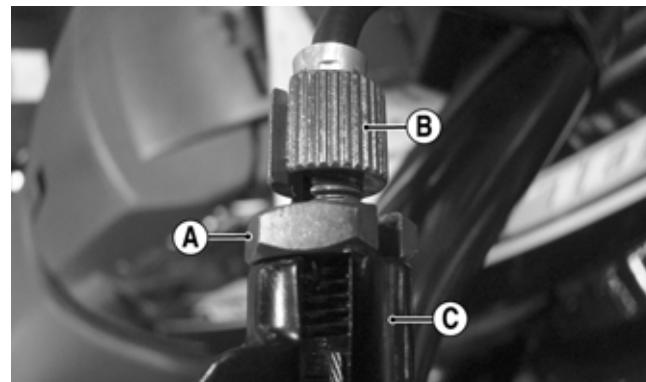
1. Place the spring into position between the upper shift arm and shift lever; then making sure the O-rings are in place on the axle, secure the shift lever to the arm with the existing axle and nut.
2. Place the shift rod into position on the shift lever and secure with the existing E-clip.
3. Check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

## 2WD/4WD Shift Lever

### REMOVING

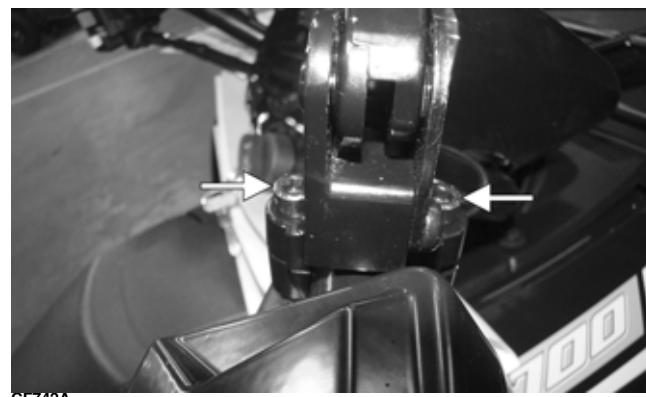
**■NOTE: Prior to loosening the jam nut (A), measure the set length of the adjuster (B).**

1. Loosen the jam nut (A); then align the slots in the adjuster (B), jam nut, and shift lever mount (C). Remove the cable from the shift lever.



CF741A

2. Remove the two cap screws securing the shift lever assembly to the handlebar.

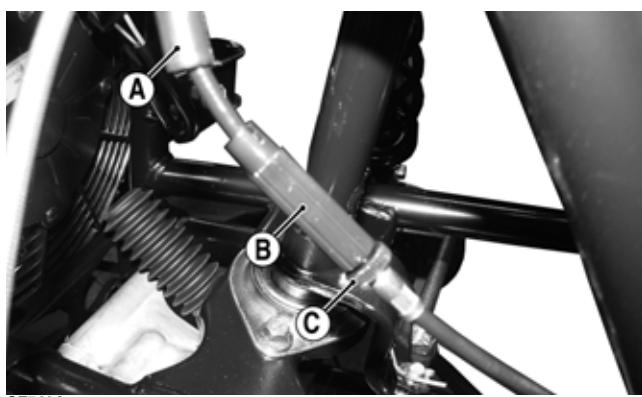


CF742A

### INSTALLING

1. Place the lower clamp under the handlebar; then secure the main assembly on top with the two cap screws. Tighten securely.
2. Place the cable end into the lever. With the slots from the jam nut and adjuster aligned, lower the cable in place. Place the end of the cable housing into the adjuster and tighten the jam nut. Adjust the set length at the lever assembly.

3. Adjust the cable. The main cable adjuster is located within the front left wheel well. Pull the rubber cover (A) away, loosen the jam nut (B), and turn the adjuster (C).



2. Install the two flange bolts and lock nuts on the upper supports. Tighten all hardware securely.

## Footrests

### REMOVING

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



2. Remove the screws and flange nuts 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. 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 two flange bolts securing the upper bumper supports to the frame bracket.
2. 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.

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

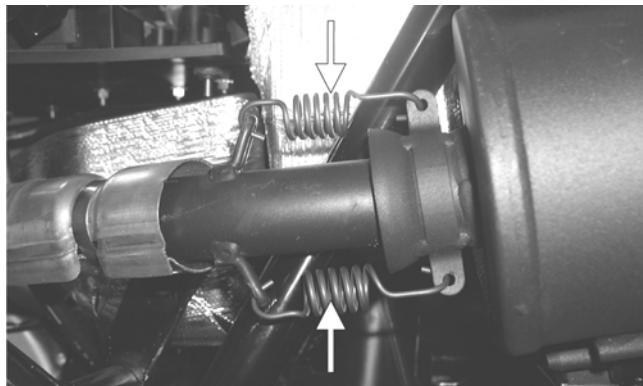
### REMOVING/INSTALLING

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.



CF138A

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.

## Seat

### REMOVING/INSTALLING

1. To remove the seat, lift up on the latch release (located at the rear of the seat). Raise the rear of the seat and slide it rearward.
2. To lock the seat into position, slide the front of the seat into the seat retainers and push down firmly on the rear of seat. The seat should 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

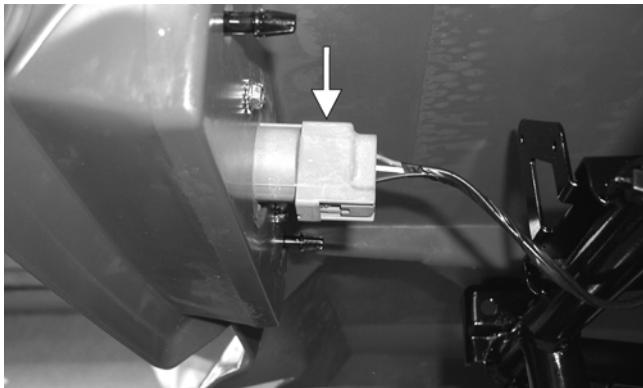
**Do not attempt to remove a bulb when it is hot. Severe burns may result.**

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.

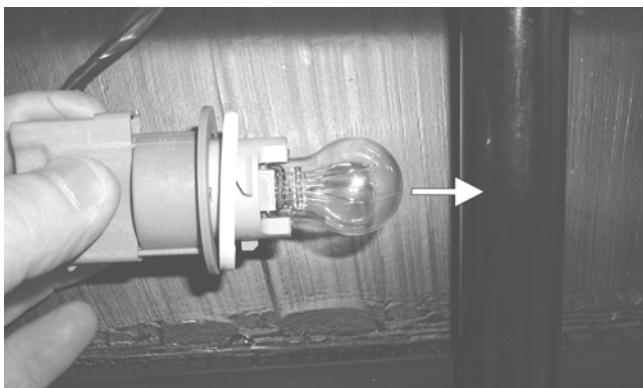
To replace the taillight-brakelight bulb, use the following procedure.

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.



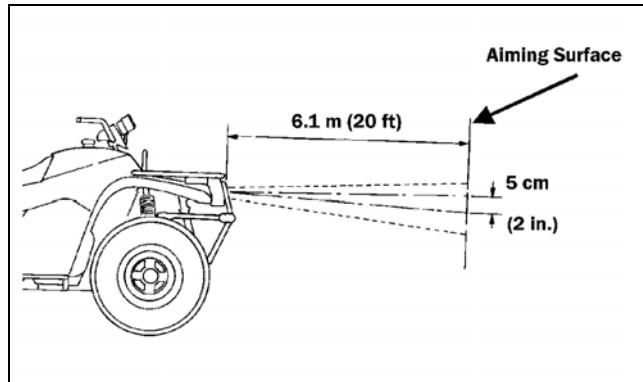
CF132A

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.

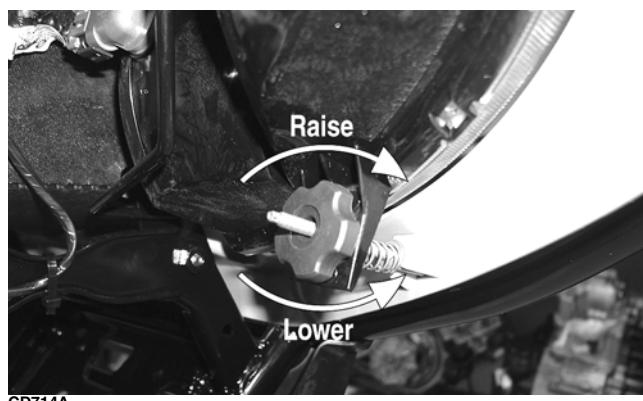
1. Position the ATV on a level floor so the headlights are approximately 6.1 m (20 ft) from an aiming surface (wall or similar aiming surface).



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
1. <b>Front wheel alignment</b> incorrect 2. <b>Lubrication</b> inadequate 3. <b>Tire inflation pressure</b> low 4. <b>Tie rod ends</b> seizing 5. <b>Linkage connections</b> seizing	1. Adjust alignment 2. Lubricate appropriate components 3. Adjust pressure 4. Replace tie rod ends 5. Repair - replace connections

### Problem: Steering oscillation

Condition	Remedy
1. <b>Tires</b> inflated unequally 2. <b>Wheel(s)</b> wobbly 3. <b>Wheel hub cap screw(s)</b> loose - missing 4. <b>Wheel hub bearing</b> worn - damaged 5. <b>Tie rod ends</b> worn - loose 6. <b>Tires</b> defective - incorrect 7. <b>A-arm bushings</b> damaged 8. <b>Bolts - nuts (frame)</b> loose	1. Adjust pressure 2. Replace wheel(s) 3. Tighten - replace cap screws 4. Replace bearing 5. Replace - tighten tie rod ends 6. Replace tires 7. Replace bushings 8. Tighten bolts - nuts

### Problem: Steering pulling to one side

Condition	Remedy
1. <b>Tires</b> inflated unequally 2. <b>Front wheel alignment</b> incorrect 3. <b>Wheel hub bearings</b> worn - broken 4. <b>Frame</b> distorted 5. <b>Shock absorber</b> defective	1. Adjust pressure 2. Adjust alignment 3. Replace bearings 4. Repair - replace frame 5. Replace shock absorber

### Problem: Tire wear rapid or uneven

Condition	Remedy
1. <b>Wheel hub bearings</b> worn - loose 2. <b>Front wheel alignment</b> incorrect 3. <b>Tire inflation pressure</b> incorrect	1. Replace bearings 2. Adjust alignment 3. Adjust pressure

### Problem: Steering noise

Condition	Remedy
1. <b>Cap screws - nuts</b> loose 2. <b>Wheel hub bearings</b> broken - damaged 3. <b>Lubrication</b> inadequate	1. Tighten cap screws - nuts 2. Replace bearings 3. Lubricate appropriate components

## Engine/Transmission

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

**■NOTE: Use new gaskets, lock nuts, and seals and lubricate 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 Operator's 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 Service Department.**

## Specifications

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

VALVES AND GUIDES	
Valve Face Diameter (max)	(intake) 31.6 mm (exhaust) 27.9 mm
Valve/Tappet Clearance (max)	(intake) 0.1016 mm (cold engine) (exhaust) 0.1524 mm
Valve Guide/Stem Clearance (max)	0.013 mm
Valve Guide Inside Diameter	5.000-5.023 mm
Valve Head Thickness (min)	2.3 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)	21.98-22.04 mm
Inside Diameter (left)	17.48-17.53 mm
Camshaft Journal Outside (right & center)	21.96-21.98 mm
Diameter (left)	17.48-17.53 mm
Camshaft Runout (max)	0.05 mm
Cylinder Head/Cover Distortion (max)	0.05 mm
CYLINDER, PISTON, AND RINGS	
Piston Skirt/Cylinder Clearance (max)	0.019-0.053 mm
Piston Diameter 10 mm from Skirt End	101.955-101.973 mm
Cylinder Bore	101.992-102.008 mm
Piston Ring Free End Gap (1st/2nd)	12.5 mm
Bore x Stroke	102 x 85.0 mm
Cylinder Trueness (max)	0.02 mm
Piston Ring End Gap - Installed (min)	0.38 mm
Piston Ring to Groove Clearance (max)	(1st/2nd) 0.065 mm
Piston Ring Groove Width (1st/2nd)	1.22-1.24 mm
(3rd)	2.51-2.53 mm
Piston Ring Thickness (1st/2nd)	1.225-1.240 mm
Piston Pin Bore (max)	23.012 mm
Piston Pin Outside Diameter (min)	22.99 mm
CRANKSHAFT	
Connecting Rod (small end inside diameter)	(max) 23.021 mm
Connecting Rod (big end side-to-side) (max)	0.80 mm
Connecting Rod (small end deflection) (max)	0.3 mm
Crankshaft (web-to-web) (max)	71 mm
Crankshaft Runout (max)	0.20 mm (0.008") PTO 0.25 mm (0.010") MAG

# 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 2. <b>Backlash</b> incorrect 3. <b>Tooth contact</b> improper 4. <b>Bearing</b> damaged 5. <b>Gears</b> worn 6. <b>Splines</b> worn	1. Replace gears 2. Adjust backlash 3. Adjust contact 4. Replace bearing 5. Replace gears 6. Replace shaft(s)

**Problem: Engine idles poorly**

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

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

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

**Problem: Exhaust smoke dirty or heavy**

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

**Problem: Engine lacks power**

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

**Problem: Engine overheats**

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

## Removing Engine/Transmission

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

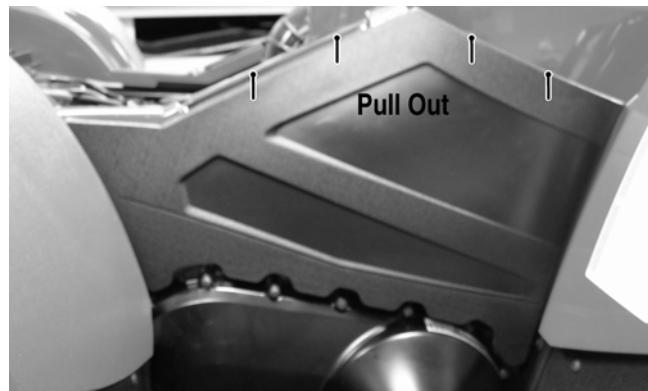
Make sure the ATV is solidly supported on the support stand to avoid injury.

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

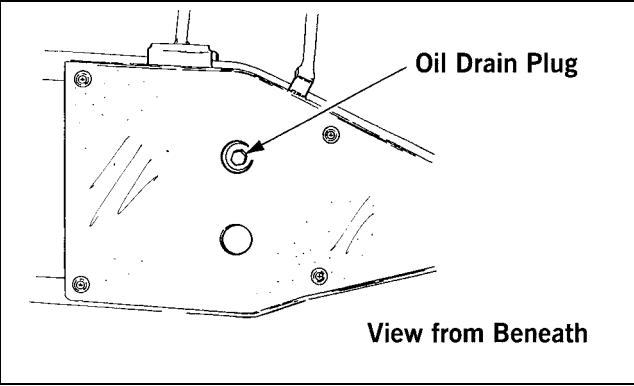
### CAUTION

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.

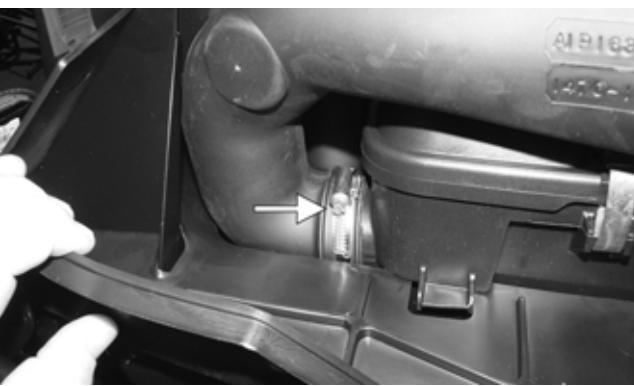


733-441A



CD799A

7. Remove the air filter (see Periodic Maintenance/Tune-Up).
8. Loosen the clamp securing the air intake duct to the air filter housing.



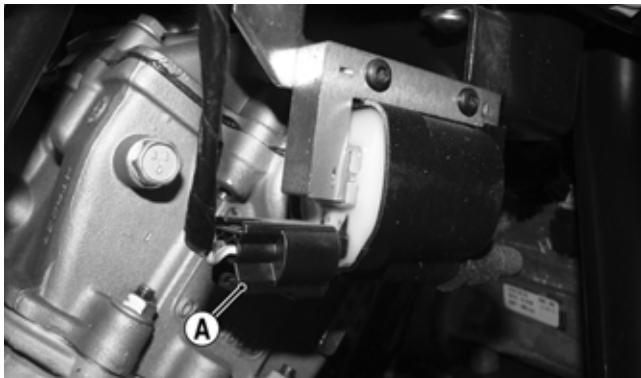
CF726A

9. Disconnect the intake air temperature sensor connector.



CD674

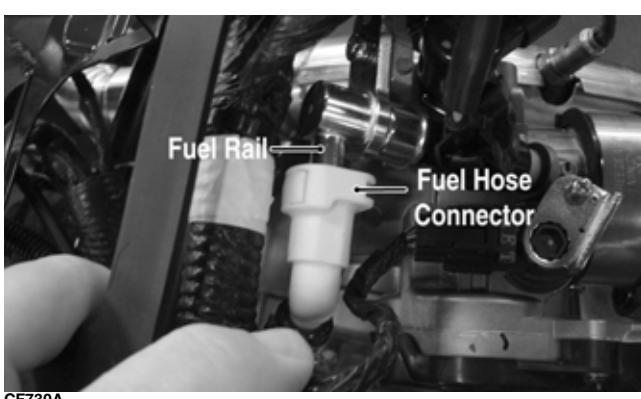
10. Remove the spark plug cap from the spark plug; then disconnect the primary connector (A) from the ignition coil.



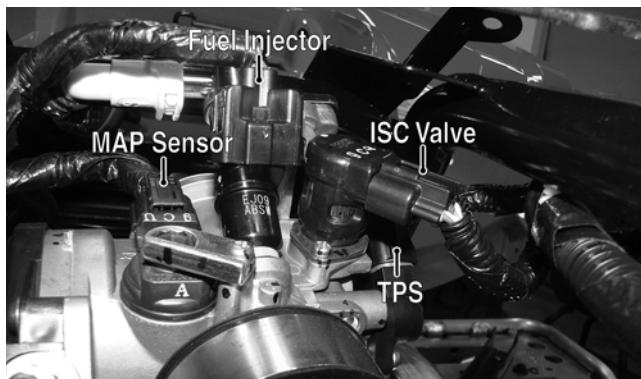
11. Loosen the clamp securing the throttle body intake duct to the air filter housing. Disconnect the crank-case vent hose from the air filter housing; then remove the air filter housing.



12. Remove the fuel hose connector from the fuel rail.



13. Disconnect the connectors from the TPS, ISC valve, fuel injector, and MAP sensor. Loosen the intake boot clamp; then move the throttle body out of the way.



14. 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.



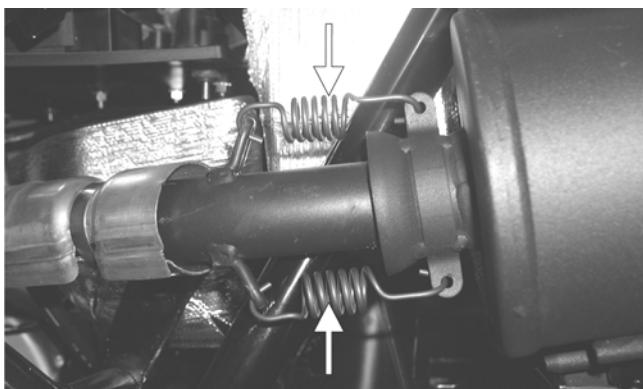
15. Remove the left-side foot peg and footwell (see Steering/Body/Controls).

16. 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. Account for the washer located behind the E-clip and the bushing behind the shift rod.



XR302

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



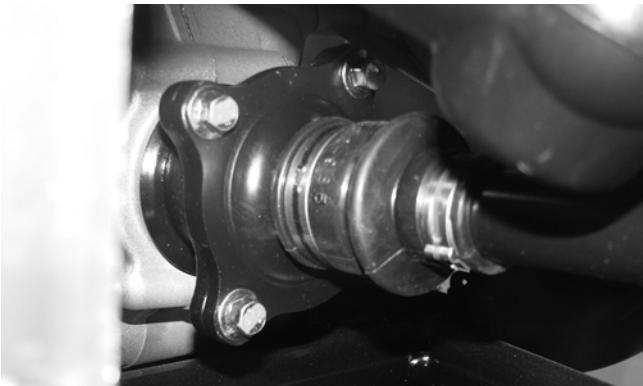
CF138A

18. Remove the two cap screws securing the exhaust pipe to the cylinder head; then disconnect the O2 sensor connector (right side) and remove the pipe. Note the location of any cable tie that is removed for assembly purposes.



CD803

19. Remove the two coolant hoses from the engine; then route the hoses out of the way. One coolant hose is located on the outer water pump cover. The second coolant hose is connected to the thermostat housing.
20. Remove the cap screws securing the rear driveshaft/output flange to the rear output joint flange.



XR303

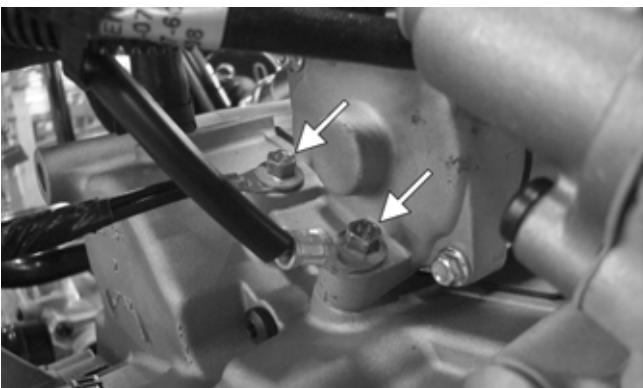
■**NOTE: It is advisable to lock the brake when loosening the cap screws securing the rear driveshaft.**

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



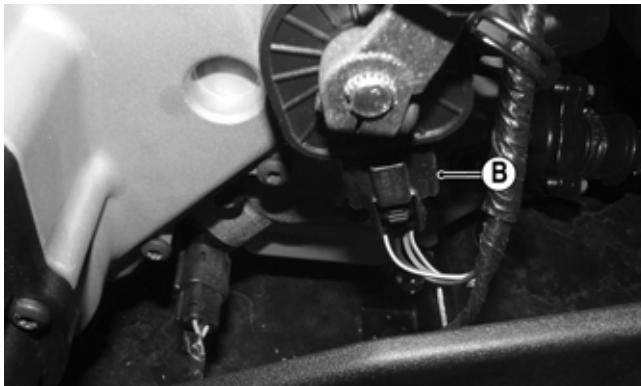
XR304

22. Remove the cap screws securing the engine and harness ground wires to the engine. Temporarily reinstall the cap screws.



CF727A

23. Disconnect the connector from the gear position switch.



CF676B

24. On the right side, disconnect the stator coil and crankshaft position sensor connectors.
25. Disconnect the coolant temperature sensor connector from the sensor.
26. Remove the engine mounting through-bolts. Account for all mounting hardware.



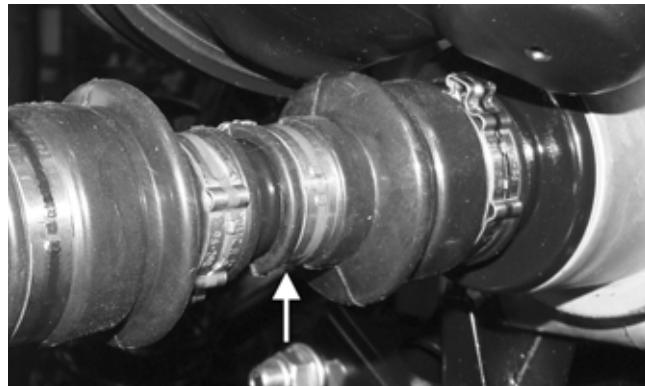
CD809

27. 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

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



CF728A



CD813

29. Remove the block from under the engine and lower the engine; then remove the boot clamp from the front output drive yoke.
30. Move the engine to the rear enough to allow the front driveshaft to clear the front output yoke. Account for the spring; then move the engine forward and to the left. The engine will come out the left side of the frame.



CD618



CD773

# Servicing Engine

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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.



CC001D

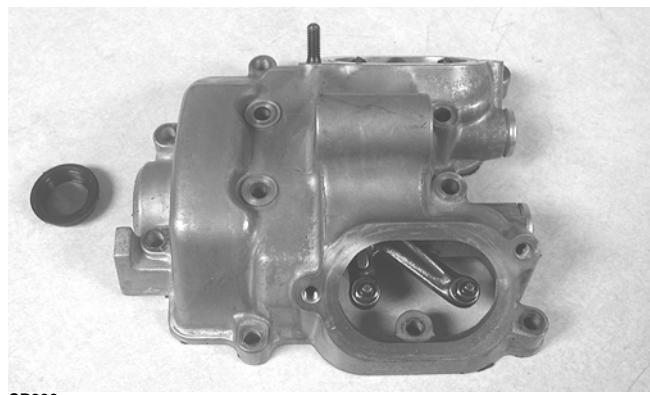
■**NOTE:** Keep the mounting hardware with the covers for assembly purposes or thread them back into the head to keep them separated.

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.

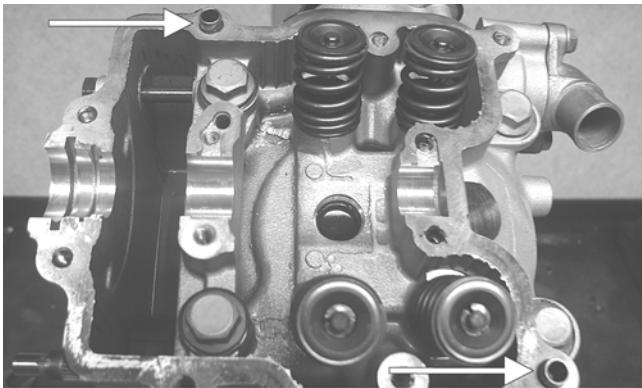


H1-013A

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



CD206



CD211A

5. Remove 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.



CC009D

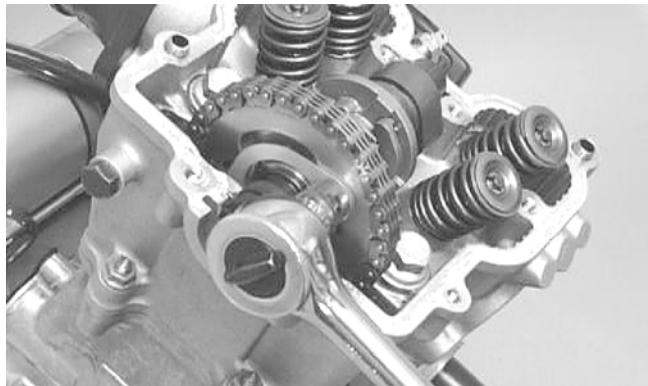
6. Using an awl, rotate the C-ring in its groove until it is out of the cylinder head; then remove the C-ring.

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



CC012D

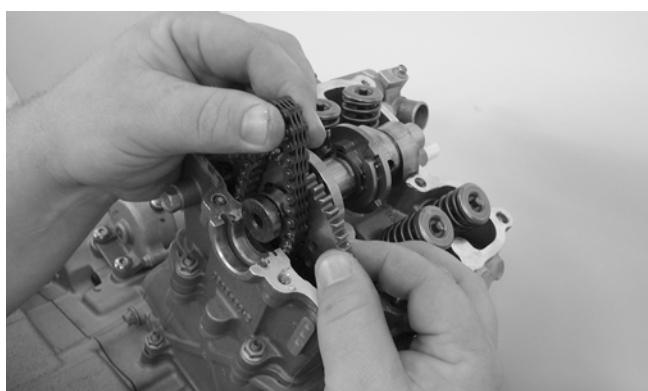
7. Bend the washer tabs down and remove the two cap screws securing the sprocket to the camshaft; then drop the sprocket off the camshaft.



CC013D

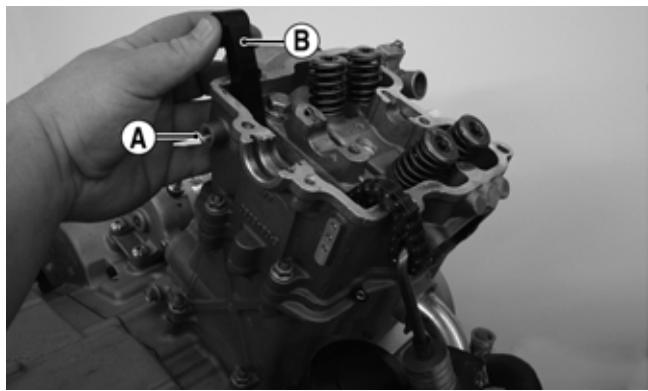
8. While holding the chain, slide the sprocket and cam-shaft out of the cylinder head.

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



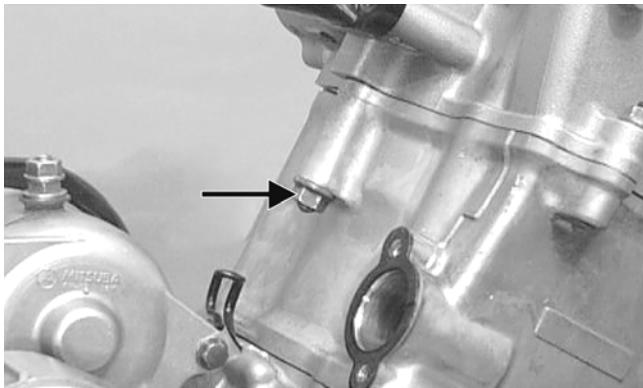
HI-036

9. Remove the cap screw (A) securing the chain tensioner (B) inside of the cylinder head (account for a washer). Remove the chain tensioner.

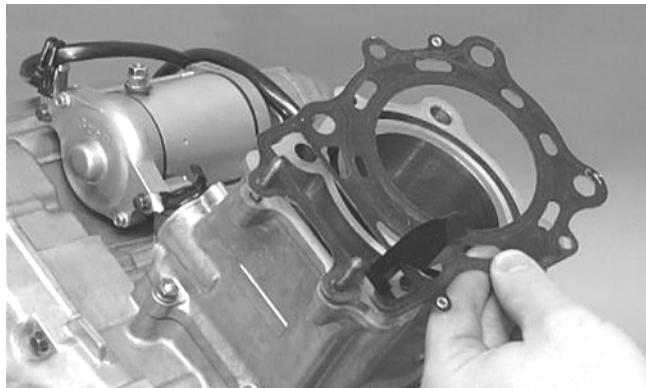


HI-037B

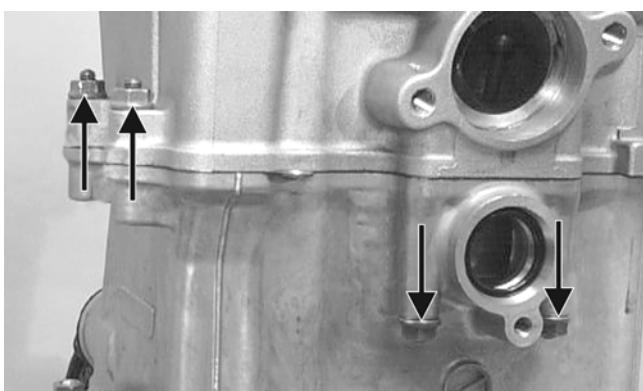
10. Remove the five nuts securing the cylinder head to the cylinder.



CC017D



CC020D



CC018D

11. Remove the four cylinder head bolts. Account for the washers.



CD211

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

<b>AT THIS POINT</b>
To service valves and cylinder head, see <a href="#">Servicing Top-Side Components</a> sub-section.
<b>AT THIS POINT</b>
To inspect cam chain guide, see <a href="#">Servicing Top-Side Components</a> sub-section.



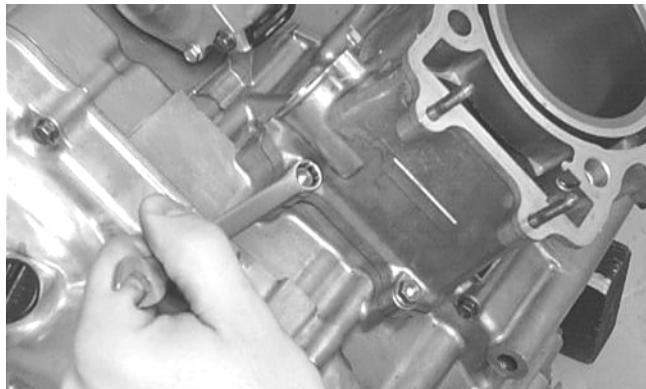
CC022D

## C. Cylinder

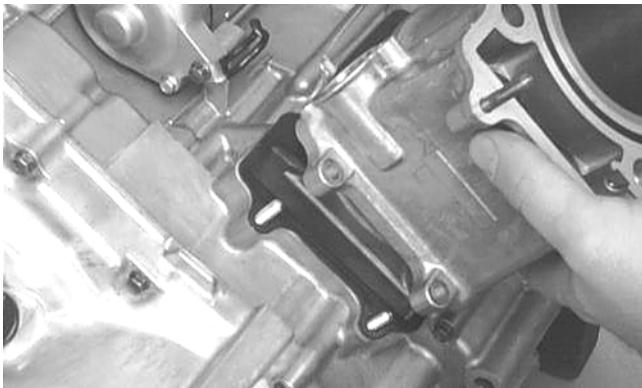
### D. Piston

■**NOTE:** Steps 1-12 in the preceding sub-section must precede this procedure.

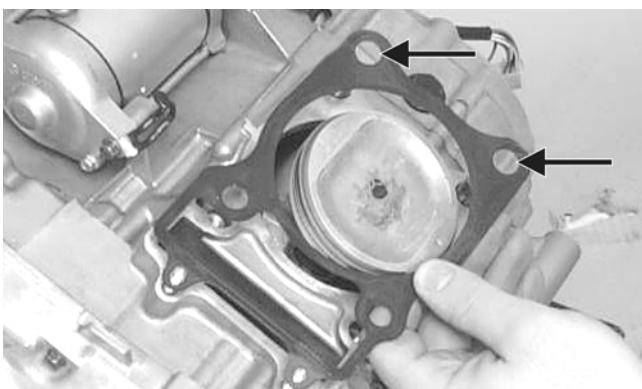
13. Loosen the clamp securing the coolant hose to the union; then detach the hose.
14. Remove the two nuts securing the cylinder to the crankcase.



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.



CC024D



CC025D



CC026D

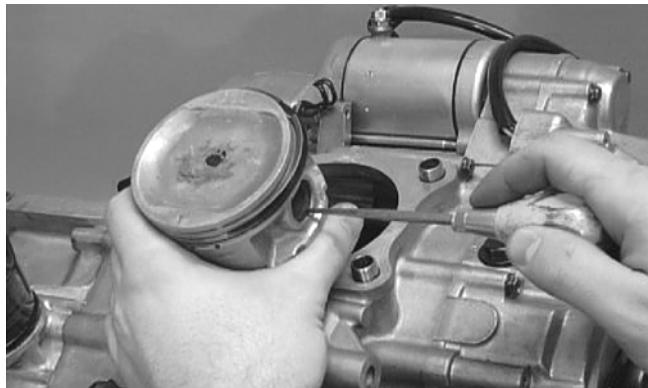
#### ☞ AT THIS POINT

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.

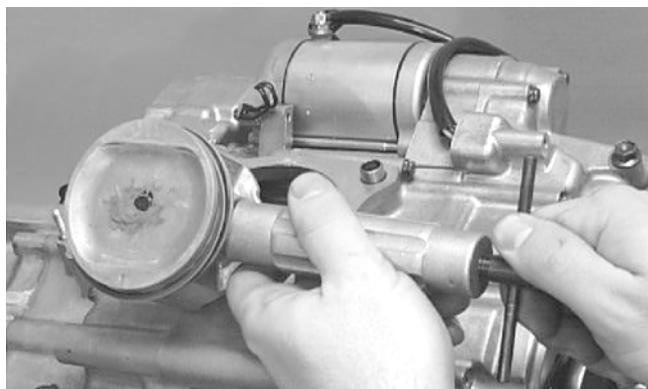
16. Using an awl, remove one piston-pin circlip.



CC032D

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.



CC033D

■**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.

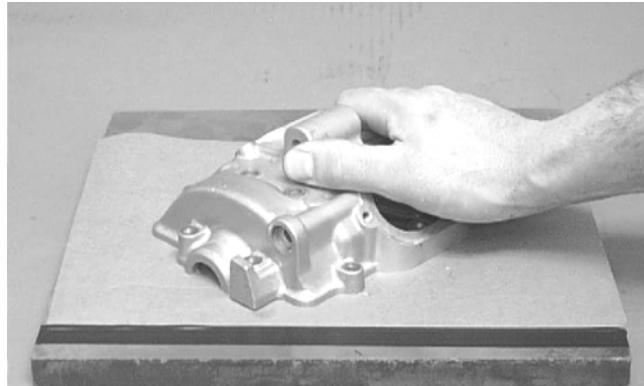
## Cleaning/Inspecting Valve Cover

■**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.**



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

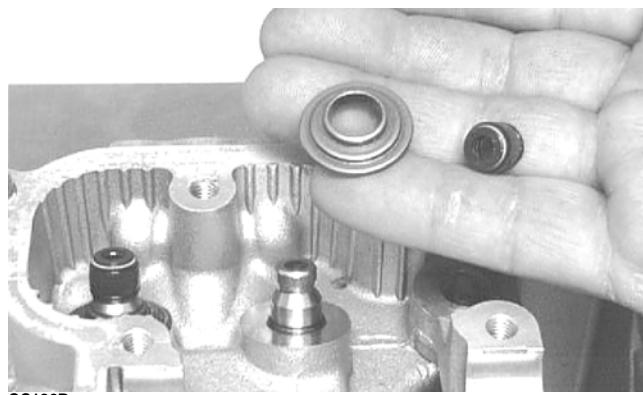
■**NOTE:** Index all valves, springs, and cotters to their original position when removing. When installing, all valve components should be installed in their original position.

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 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, take the components 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.

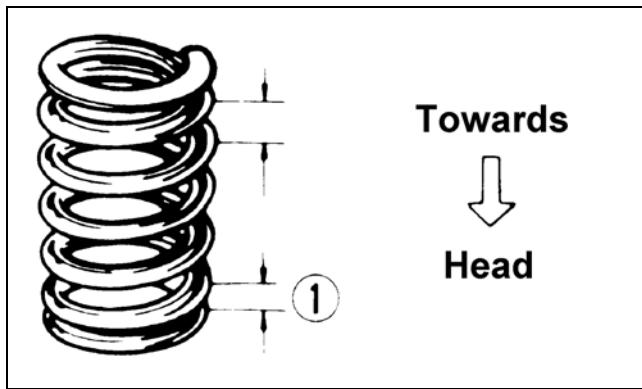


CC144D

2. Insert each valve into its original location.

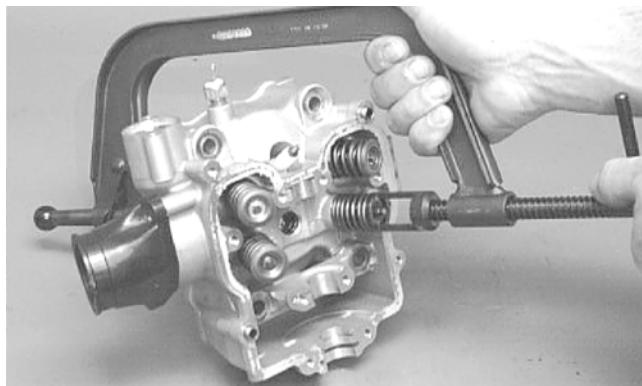
3. Install the valve springs with the painted end of the spring facing away from the cylinder head.

■**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.
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.



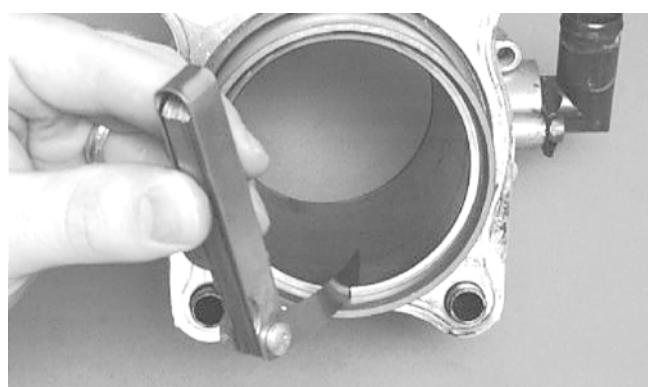
CC400D

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)

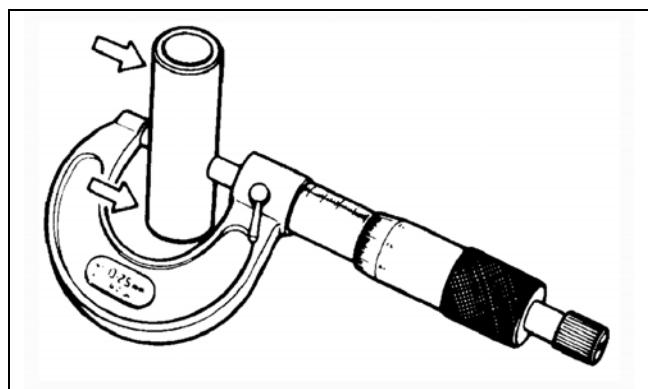
1. Place each compression ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must not exceed specifications.



CC280D

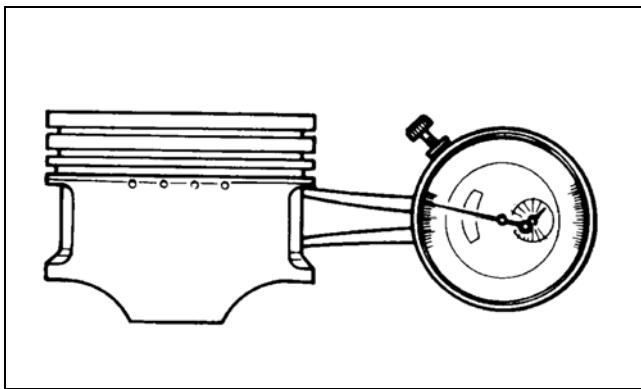
### Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

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



ATV-1070

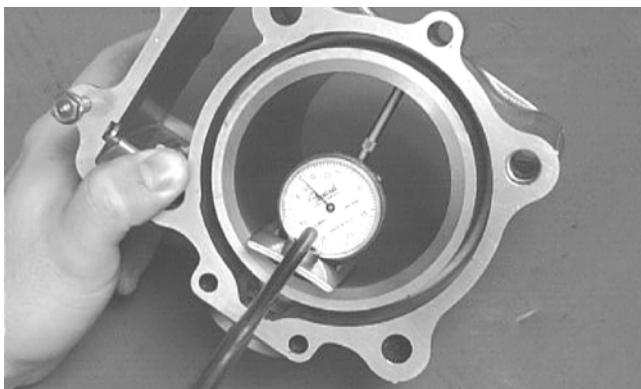
2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



ATV-1069

### Measuring Piston Skirt/Cylinder Clearance

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



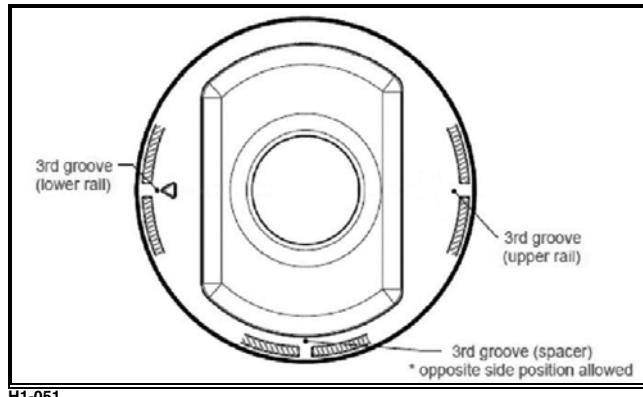
CC127D

2. Measure the corresponding piston diameter at 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

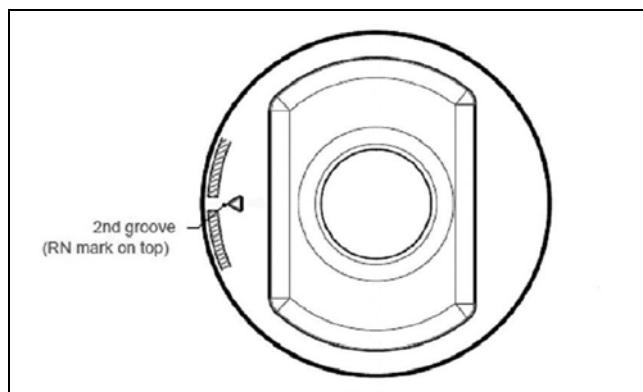
1. Install the oil expander (spacer) making sure the open end is positioned 90° away from the directional arrow as indicated. Install the lower oil control (lower rail) ring at 0° from the directional arrow; then position the opening of the upper oil control (upper rail) ring 180° away from the piston directional arrow.

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



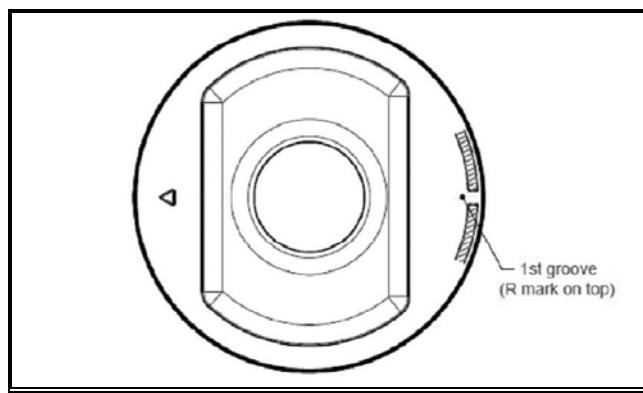
H1-051

2. Install the second compression ring with the marking “RN” directed toward the top of the piston. Orientate the opening of the ring at 0° from the piston directional arrow.



H1-052

3. Install the first compression ring with the marking “R” directed toward the top of the piston; then rotate the ring so the ring gap is 180° away from the piston directional arrow.



H1-053

### 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

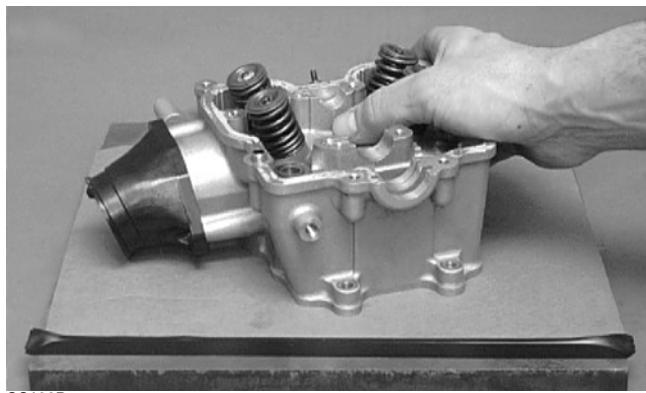
### CAUTION

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.



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

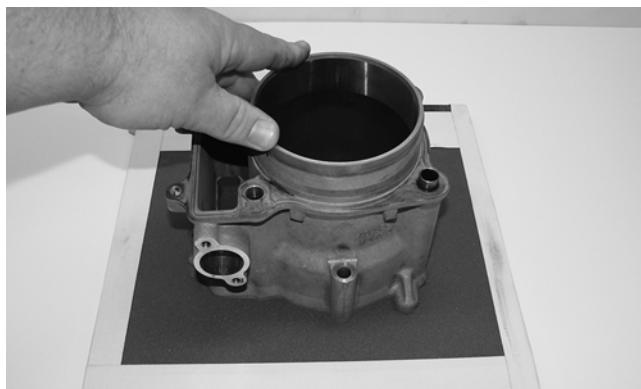
1. Wash the cylinder in parts-cleaning solvent.

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.



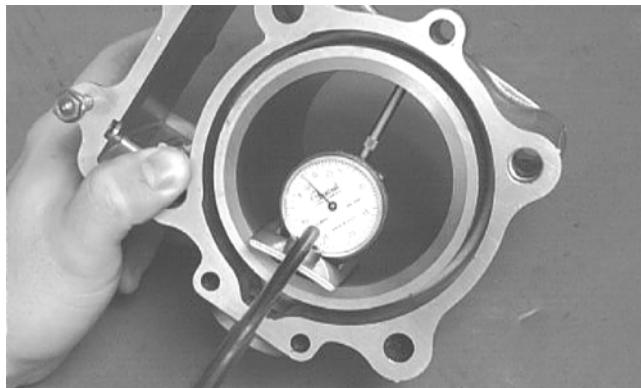
H1-039

## 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.



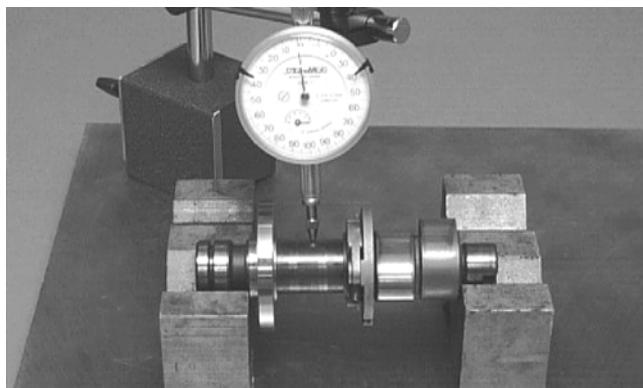
H1-038

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.

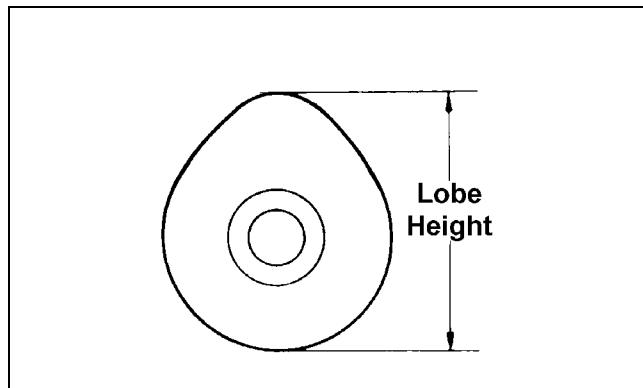


CC283D

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.

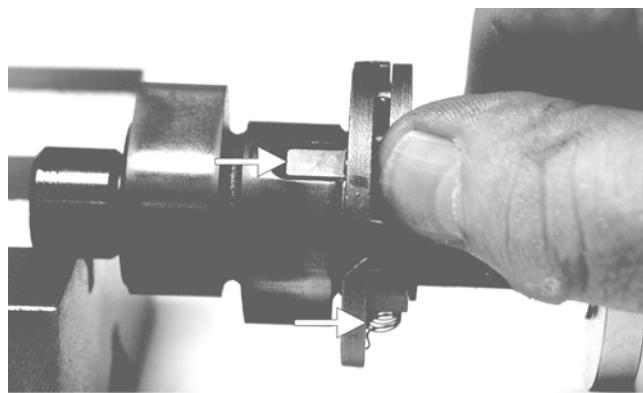
### Inspecting Camshaft Bearing Journal

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.

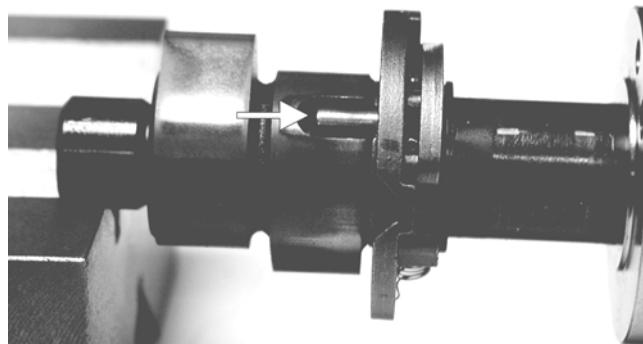
**■NOTE:** If the journals are worn, replace the cam-shaft.

### Inspecting Camshaft Spring/Drive Pin

1. Inspect the spring and drive pin for damage.



CF061A



CF060A

2. If damaged, the camshaft must be replaced.

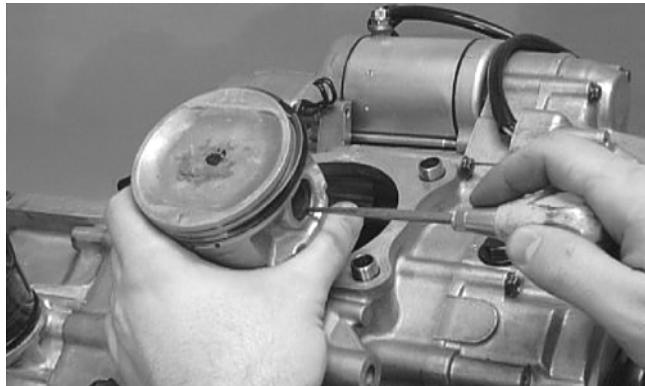
## Installing Top-Side Components

### 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 the crankcase. Place the cylinder base gasket onto the crankcase; then place a piston holder (or suitable substitute) beneath the piston skirt and square the piston in respect to the crankcase.



CC026D

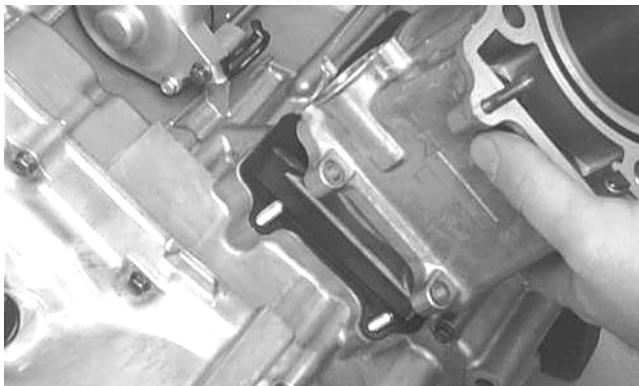


CC025

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.



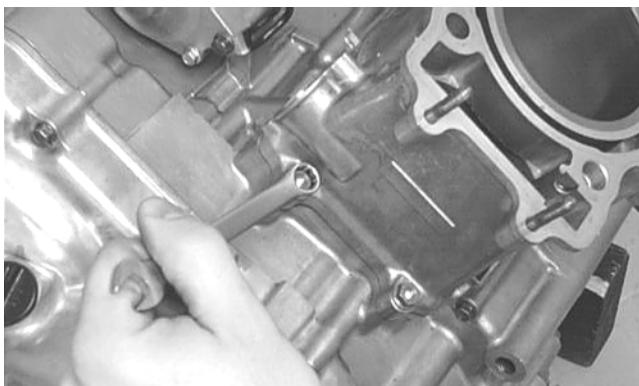
CC024D



CF083

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

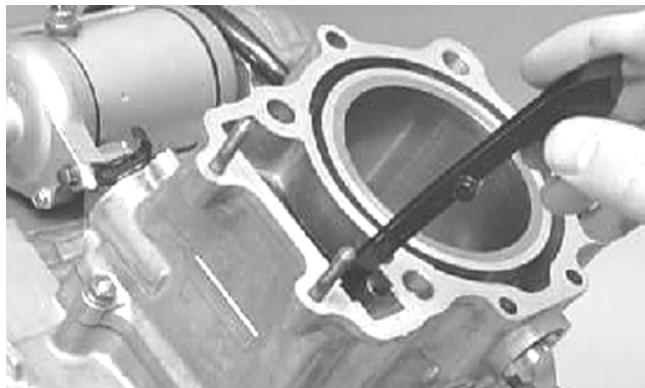
### D. Valve Cover

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

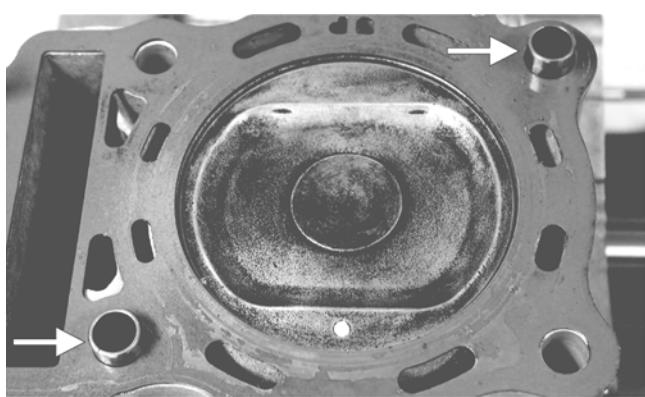
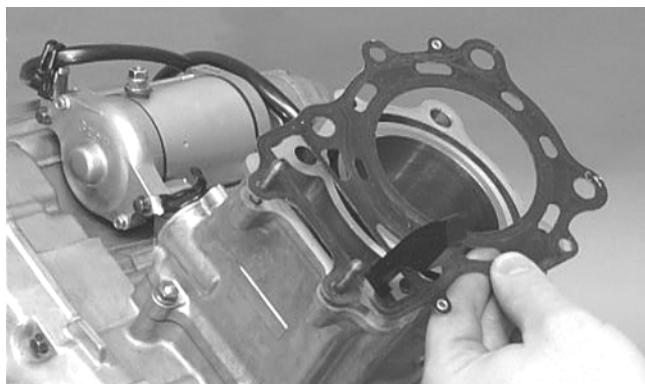
6. Place the chain guide into the cylinder.

#### CAUTION

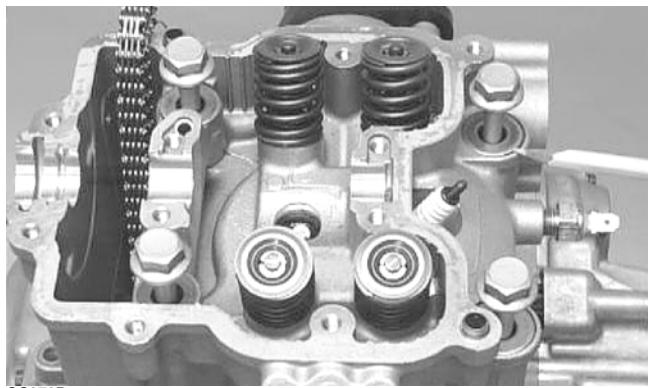
Care should be taken that the bottom of the chain guide is secured in the crankcase boss.



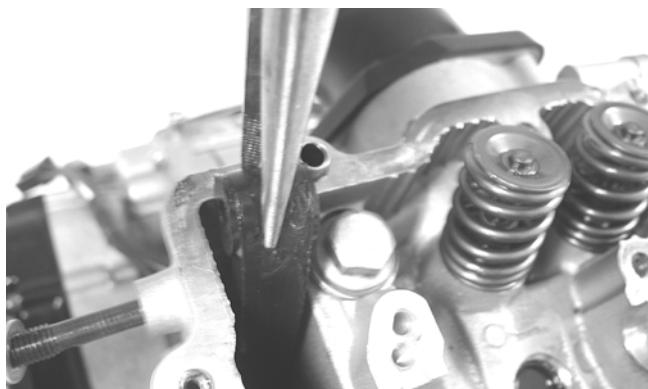
7. Place a new head gasket into position on the cylinder. Place the alignment pins into position; then place the head assembly into position on the cylinder.



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

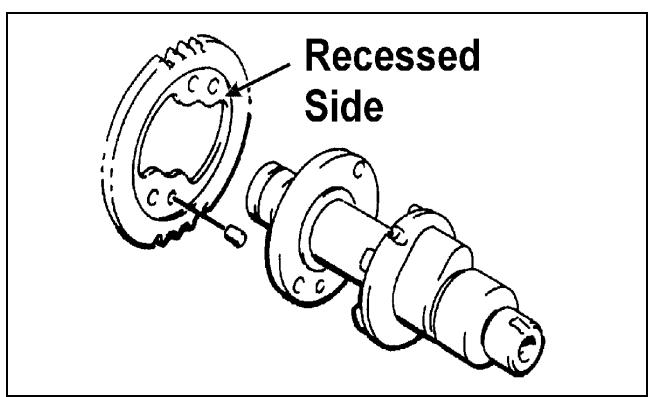


9. Loosely install the five cylinder head nuts.
10. Using a crisscross pattern, tighten the four cap screws (from step 8) initially to 20 ft-lb; then in 10 ft-lb increments, tighten to a final torque of 37 ft-lb.
11. Tighten the 8 mm nuts from step 9 to 18 ft-lb and the 6 mm nuts to 8.5 ft-lb; then tighten 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.



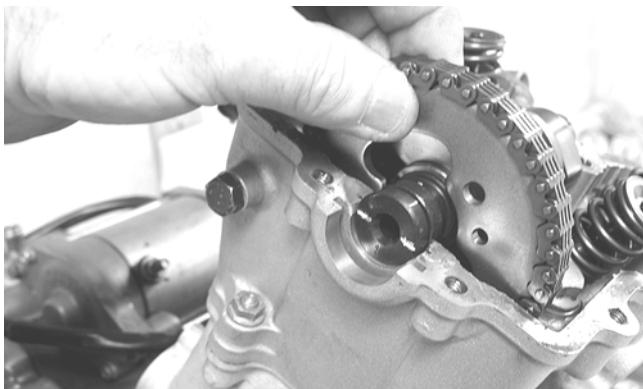
■NOTE: At this point, oil the camshaft journals, cam lobes, and the three seating surfaces on the cylinder.

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.

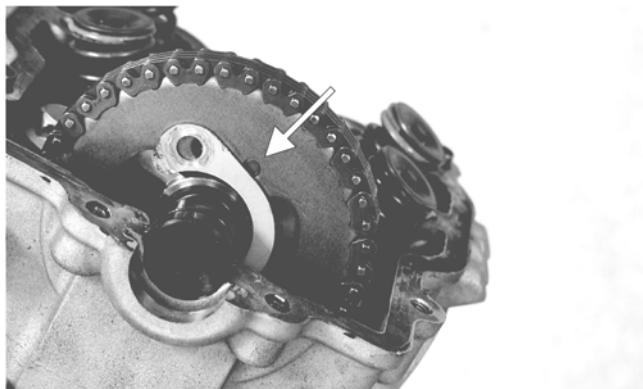


15. With the cam lobes directed down (toward the piston), maneuver the camshaft/sprocket assembly through the chain and towards its seating position; then loop the chain over the sprocket.

**■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.



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.

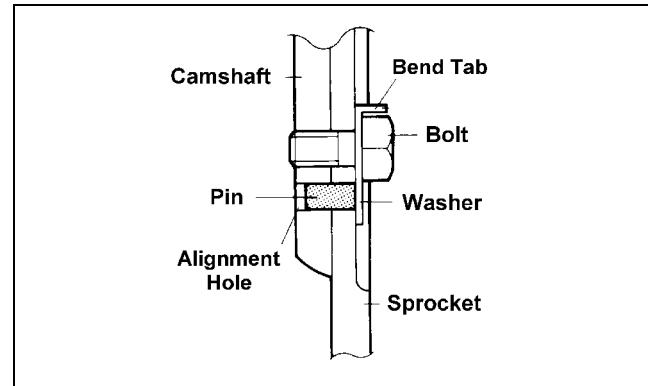


- A. Piston still at top-dead-center.
- B. Camshaft lobes directed down (toward the piston).
- C. Camshaft alignment marks parallel to the valve cover mating surface.
- D. Recessed side of the sprocket directed toward the cam lobes.
- E. Camshaft alignment pin and sprocket alignment hole (smallest) are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

### CAUTION

If any of the above factors are not as stated, go back to step 12 and carefully proceed.

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

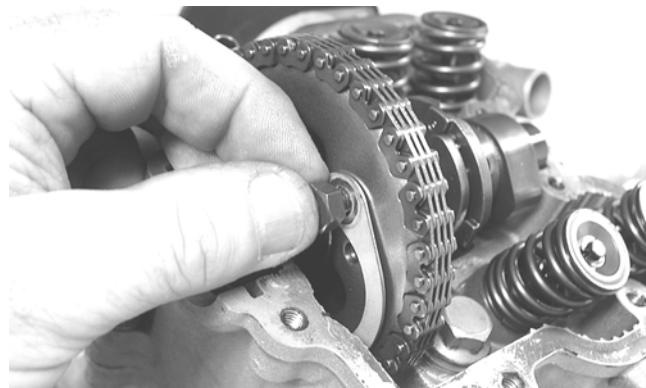


ATV1027

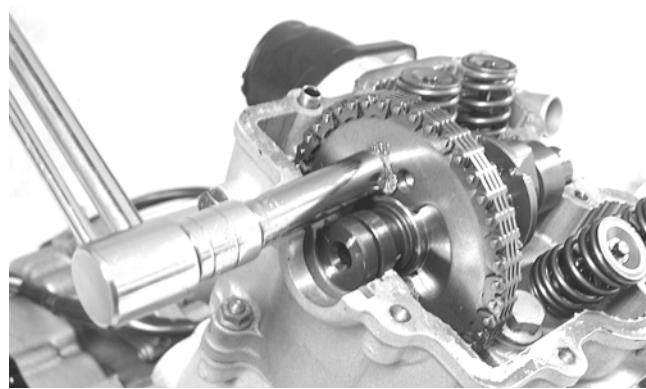
### CAUTION

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.



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.



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.

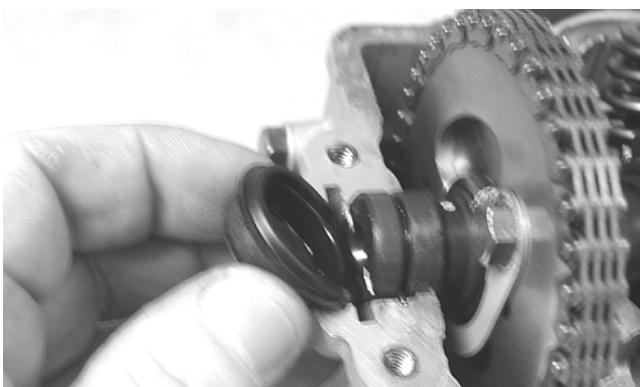


CC012D

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

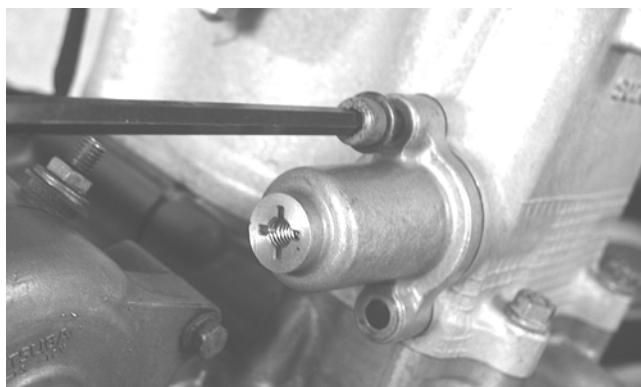
23. With the cap screw removed from the end of the chain tensioner and using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner clockwise until the screw bottoms and the adjuster shaft is held in place.



CD501

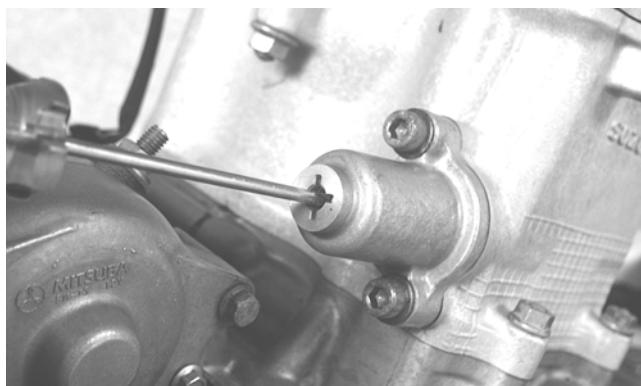
■**NOTE:** The adjuster shaft will be drawn into the tensioner as the adjuster screw is rotated clockwise. The adjuster shaft tension will be released in step 25.

24. Place the chain tensioner adjuster assembly and gasket into position on the cylinder and secure with the two cap screws.

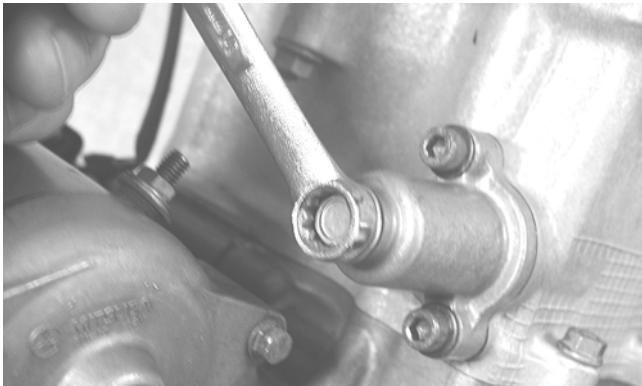


CD469

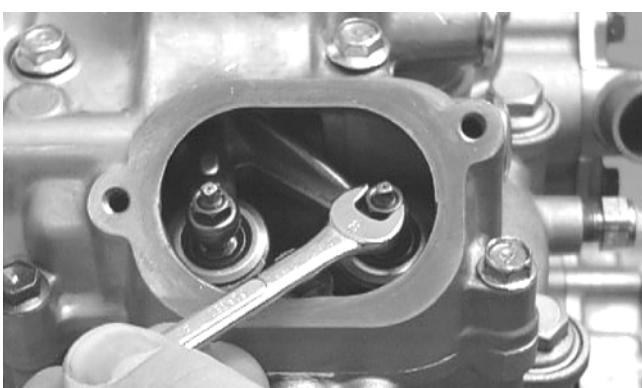
25. Using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner counterclockwise until the tensioner spring bears tension; then remove the screw driver to apply tension to the cam chain. Install the cap screw into the end of the chain tensioner.



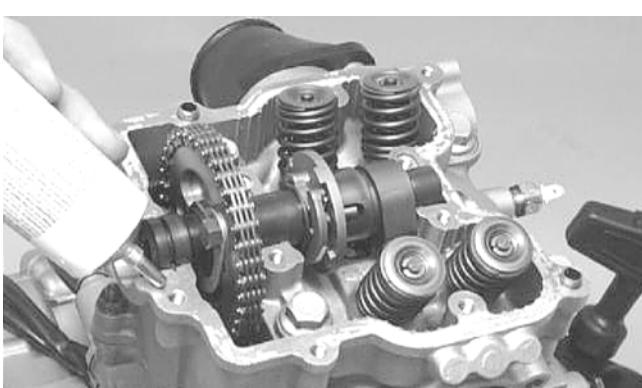
CD470



26. Loosen the four adjuster screw jam nuts; then loosen the four adjuster screws on the rocker arms in the valve cover.



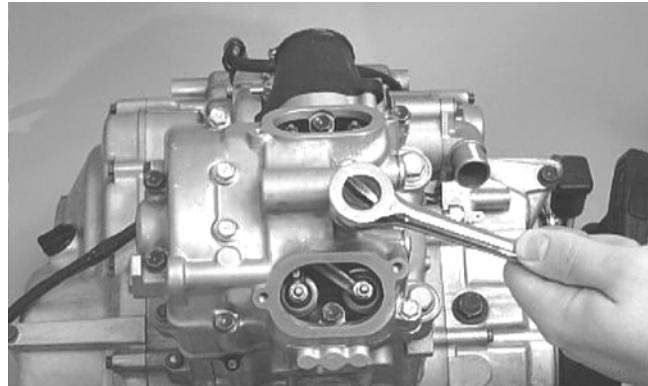
27. Apply a thin coat of Three Bond Sealant to the mating surfaces of the cylinder head and valve cover.



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.



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.



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.



CF677

2. Remove the flange nut securing the bushing to the crankshaft; then remove the bushing. Account for the O-ring inside the spacer.



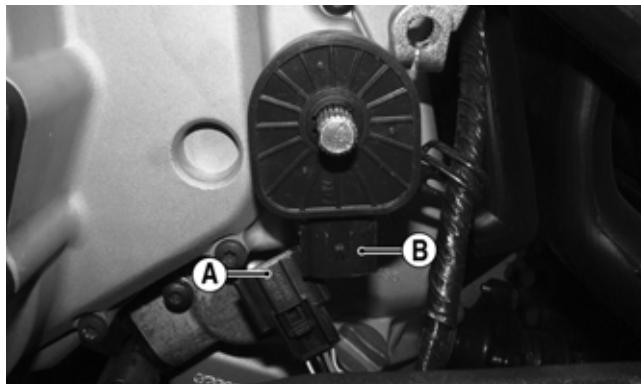
CF678

3. Identify the alignment marks on the shift arm and shift arm shaft to aid in installing; then remove the cap screw securing the shift arm to the shift arm shaft. Remove the shift arm from the shift arm shaft.



CF679A

4. Disconnect the harness connector (A) from the gear shift selector switch (B).



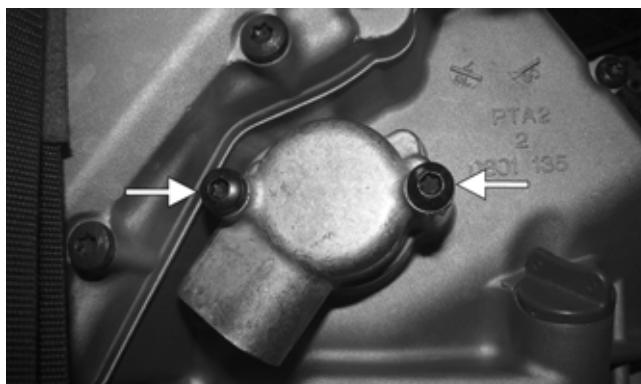
CF680A

5. Remove the gear shift selector switch from the shift arm shaft. Note the protrusion extending out the backside of the gear shift selector switch and the recess in the magneto cover for assembly purposes. Slide the aluminum spacer (A) off of the shift arm shaft.



CF681A

6. Remove the cap screws securing the housing cover to the crankcase and remove the housing assembly. Account for the gasket.



CF729A

7. 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.
8. Remove the two cap screws securing the water pump to the engine; then remove the water pump.
9. Remove the cap screws securing the left-side cover to the crankcase noting the location of the different-sized cap screws for installing purposes.

10. Using an appropriate side case puller, remove the side cover. Account for a gasket and two alignment pins.
11. Remove the nut securing the magneto rotor to the crankshaft; then install the magneto rotor puller adapter.

■**NOTE: The puller has left-hand threads.**

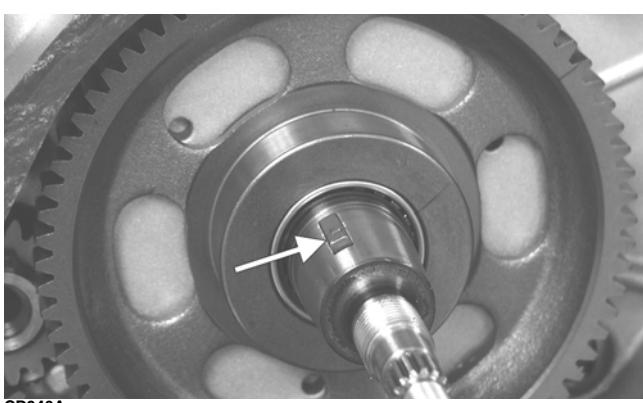
12. Using Magneto Rotor Remover Set and the appropriate crankshaft protector, remove the rotor/flywheel assembly from the crankshaft. Account for the key; then remove the starter clutch gear assembly and washer.



PR441

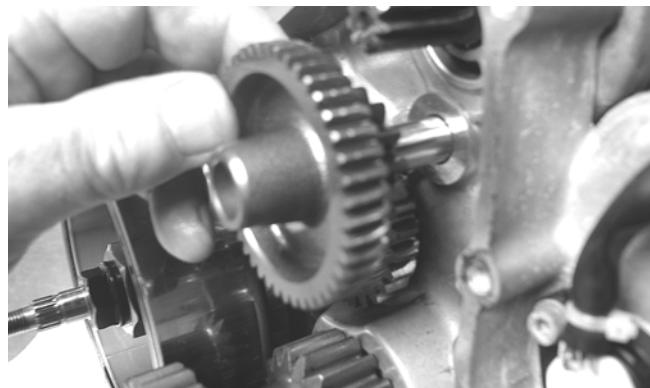


CD939A



CD940A

13. 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



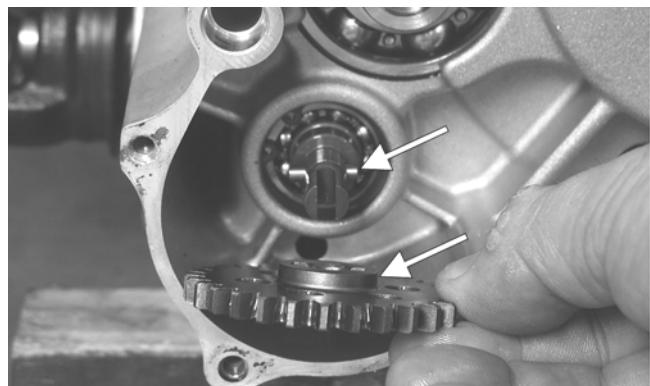
CD140

14. 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

15. 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

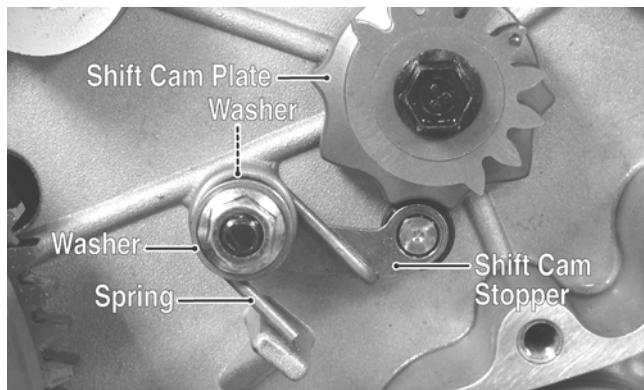
**NOTE: There is an oil passage beneath the driven gear/drive gear assembly. This passage should be plugged prior to removing the driven gear and drive gear. Failure to do so could result in the loss of an alignment pin into the crankcase.**

16. Remove the shift shaft noting the timing marks for assembling purposes. Account for two washers.



PR430A

17. 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

## 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 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.



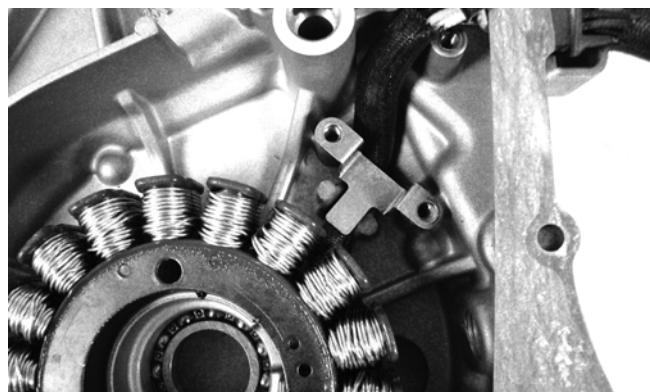
FI580

### INSPECTING STATOR 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.

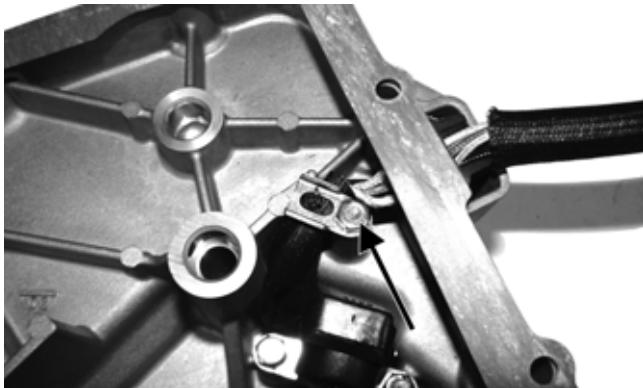


FI590

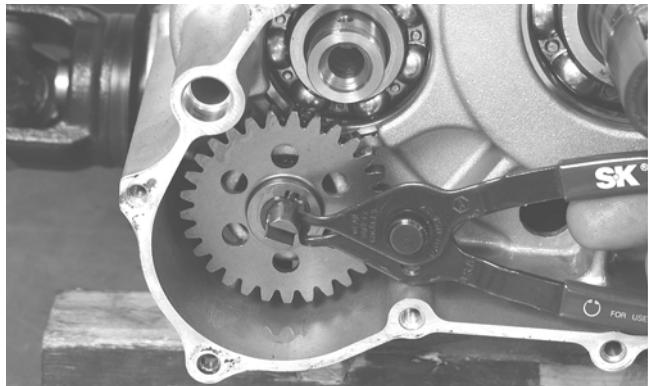
3. Install the new stator coil assembly and secure with three cap screws using a drop of red Loctite #271 on each. Tighten according to the chart.

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

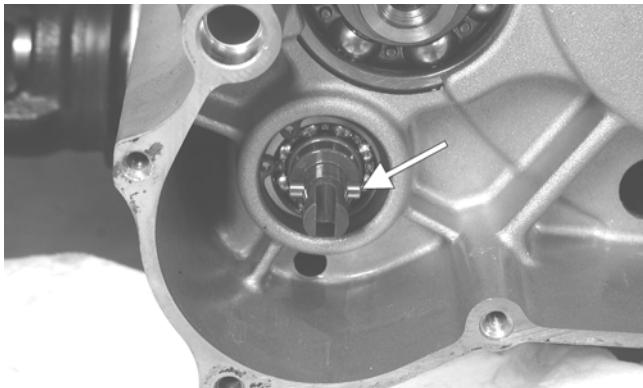


CD949

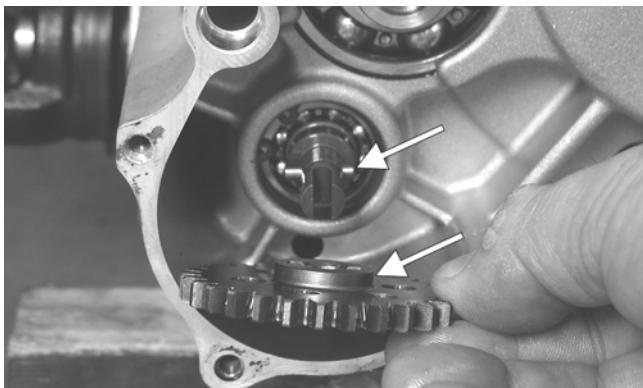
## Installing Left-Side Components

■**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



CD946A

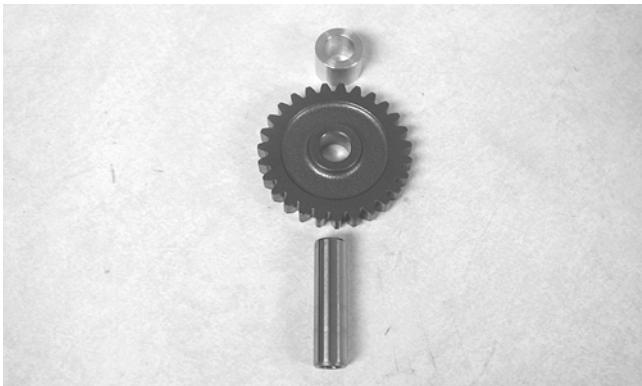


CD944

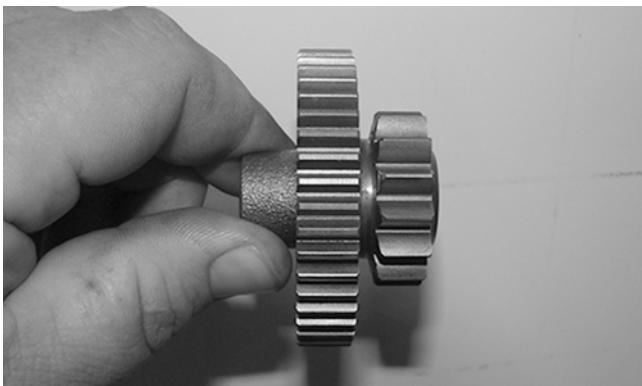
■**NOTE:** The sharp side of the snap ring should be facing outward.

■**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.

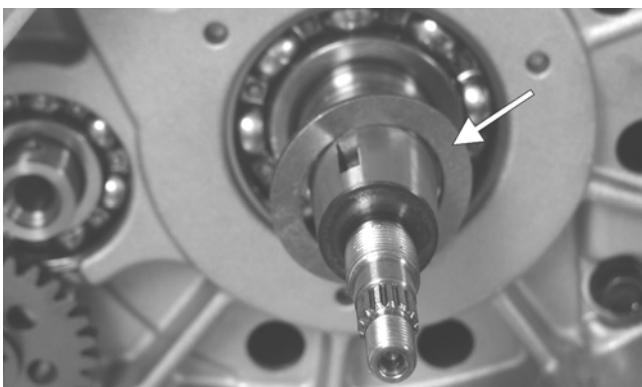


CD139

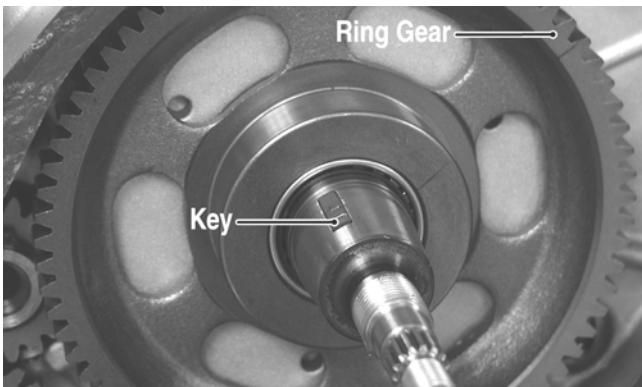


H2-045

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.

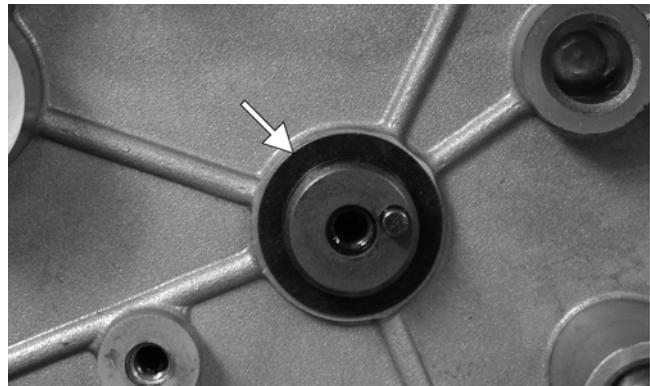


CD948A



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.

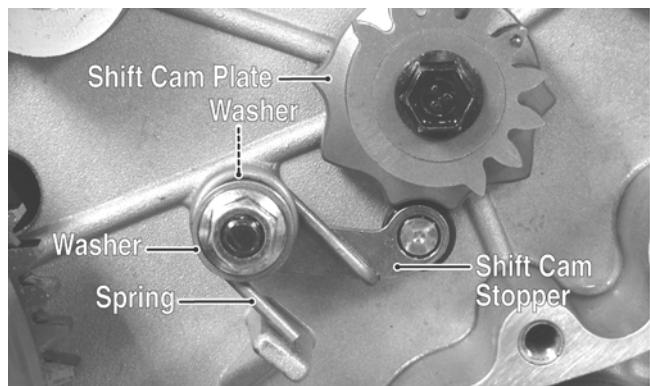


PR433A



CD934

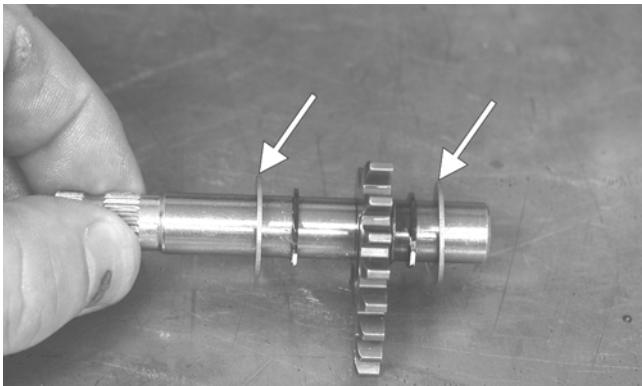
6. Install the shift cam stopper, spring, and two washers (thick washer closest to the nut); then coat the threads on the mounting stud with red Loctite #271 and install the nut. Tighten to 8 ft-lb.



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.



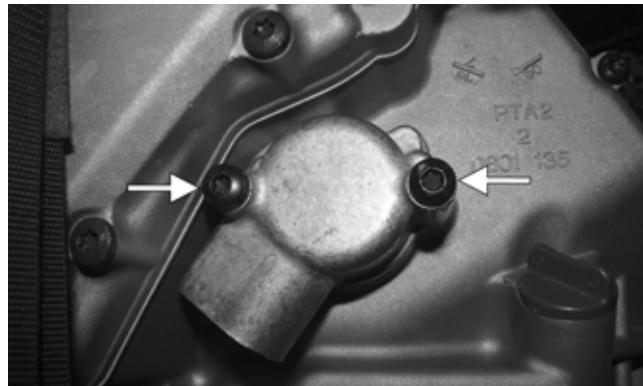
PR431A

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 9.5 ft-lb.

123. Using a new gasket, install the housing cover onto the crankcase and secure with two cap screws. Tighten to 8.5 ft-lb.



CF729A

13. 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.**

14. Install the crossover tube on the water pump and cylinder head making sure the O-ring is properly positioned.

15. Install the aluminum spacer (A) then the gear shift selector switch onto the shift arm shaft. When installing the gear shift selector switch onto the shaft, align the protrusion on the back of the switch into the recess in the magneto cover.



CF681A

16. Install the shift arm on the shift arm shaft making sure the markings are aligned. Tighten the cap screw securely.



CF679A

17. Place the plastic outer magneto cover into position on the left-side cover; then tighten four cap screws to 8.5 ft-lb.

## 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. Driven Pulley

### C. Clutch Cover

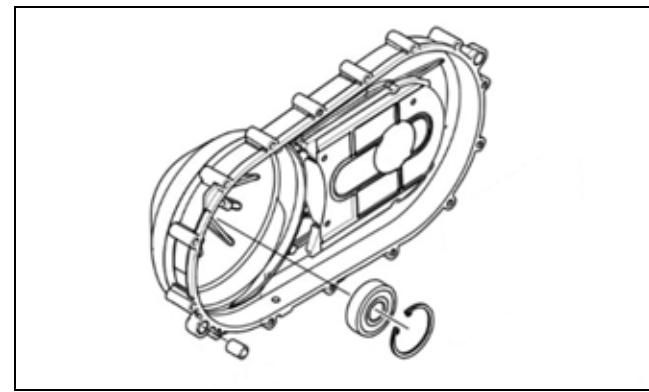
### D. Oil Pump

1. Remove the cap screws securing the V-belt cover noting the location of the different-lengthed cap screws for installing purposes and account for each washer; then using a rubber mallet, gently tap on the cover tabs to loosen the cover. Account for two alignment pins and a gasket.



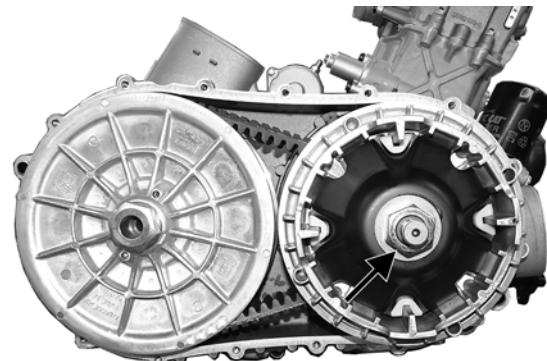
H1-017

2. If the support bearing in the V-belt cover is in need of servicing; remove the snap ring securing the bearing into the cover; then using a blind hole bearing remover, remove the bearing from the V-belt cover.

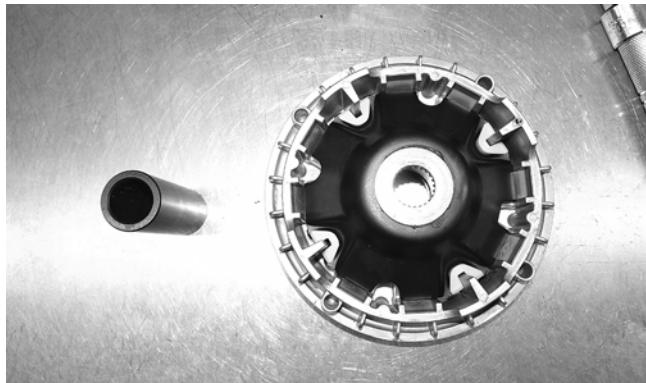


H1-041

3. Remove and discard the nut securing the movable drive face; then remove the drive face and movable face assembly. Account for a spacer.

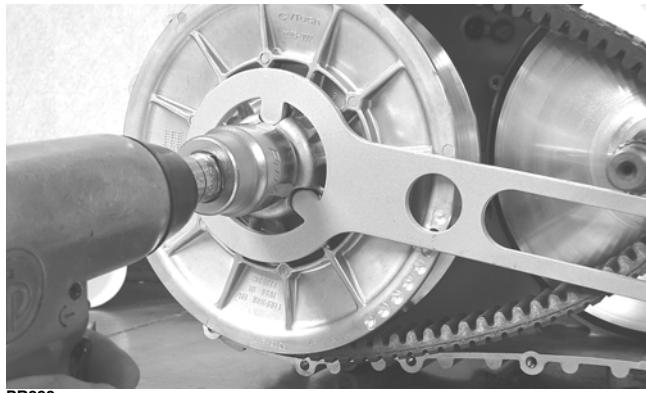


CF373A



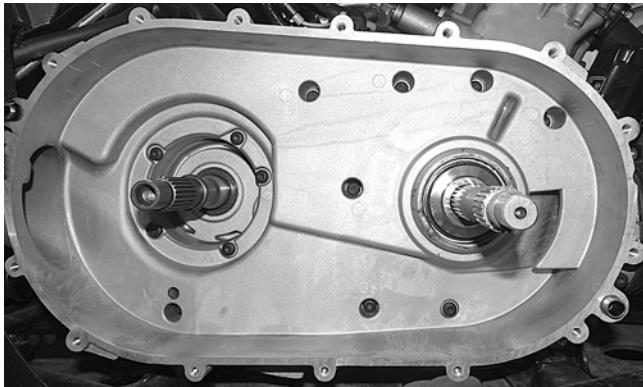
CF378

4. Remove the V-belt.
5. Remove the nut securing the fixed driven assembly; then remove the assembly.

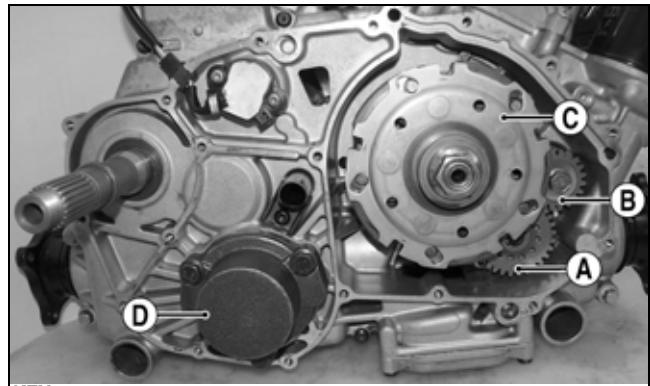


PR388

6. Remove the fixed drive face from the drive clutch assembly.
7. Remove all cap screws securing the inner clutch cover. Note the location of the different-lengthed cap screws for installing purposes. Five cap screws are located outside of the mating surface of the two clutch covers. Two are located below, and three located in front of the cover. Using a rubber mallet, carefully remove the cover. Account for two alignment pins in the locations shown. Remove the gasket.



H1-026



KEY

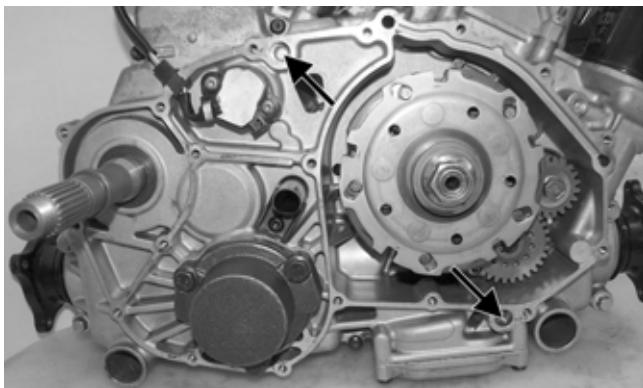
A. Oil Pump Driven Gear	C. Clutch Shoe Assembly
B. Oil Pump Drive Gear	D. Final Drive Carrier Bearing Housing

H1-029A

8. Using a hydraulic press, remove the clutch housing assembly from the clutch cover. Account for the right fixed drive spacer and an O-ring inside the fixed drive spacer.



CF085



H1-029B

■NOTE: For steps 8-13, refer to illustration H1-029A.

■NOTE: To aid in installing, it is recommended that the assemblies are kept together and IN ORDER.



CC596

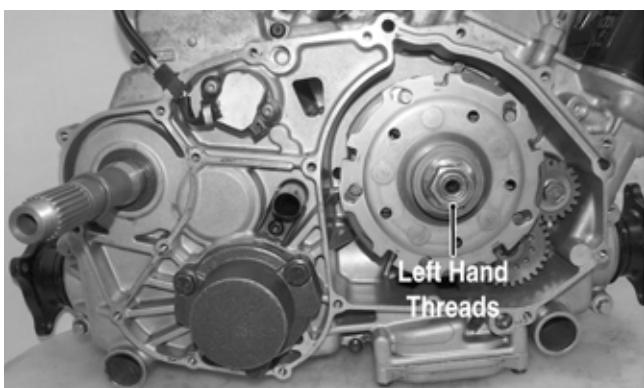
■NOTE: Account for and inspect the clutch housing seal.



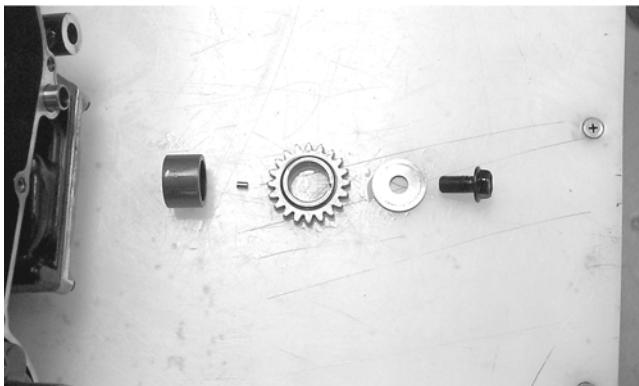
9. Remove the two cap screws securing the gear position switch; then remove the switch.
10. Use the Spanner Wrench to hold the clutch shoe assembly in place; then remove the nut (left-hand threads) securing the clutch shoe assembly (C) to the crankshaft.



HDX450



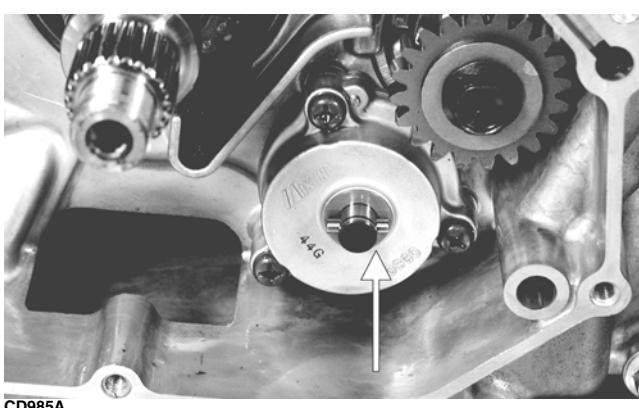
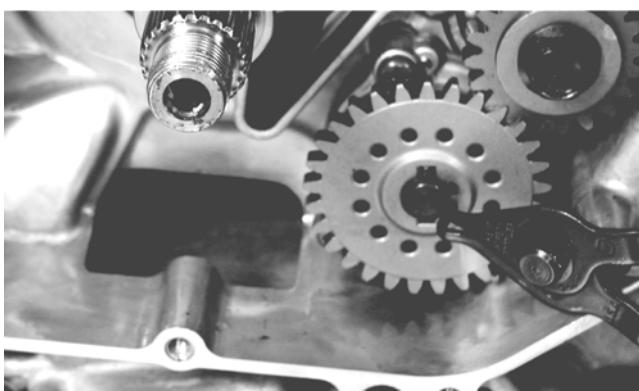
11. Remove the cap screw securing the oil pump drive gear (B). Account for a cap screw, washer, pin, and spacer.



12. Using an impact wrench, remove the cap screws securing the final drive carrier bearing housing (D); then remove the housing and account for two alignment pins.



13. 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.



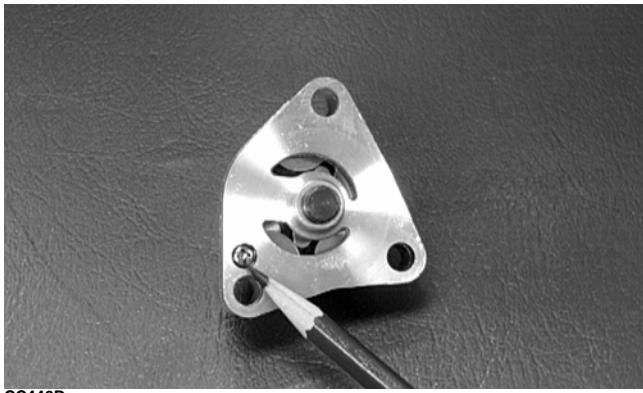
14. Using an impact driver, remove the three torx-head screws securing the oil pump; then remove the pump.



## Servicing Right-Side Components

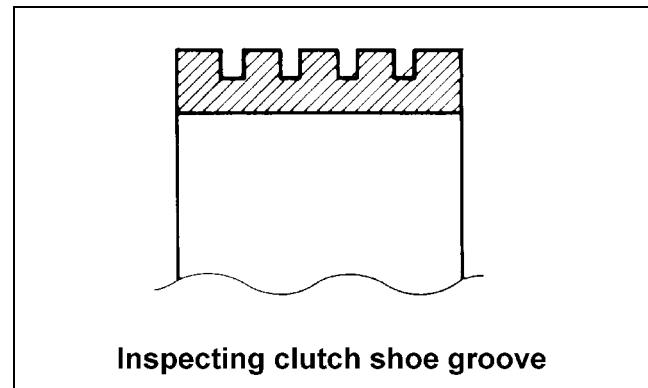
### INSPECTING OIL PUMP

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



### 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.



**Inspecting clutch shoe groove**

ATV1014

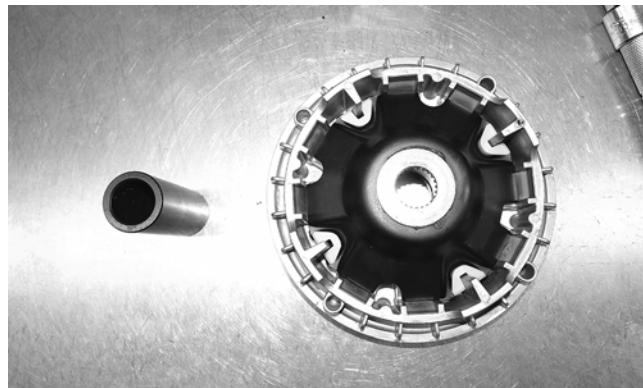
### INSPECTING CLUTCH HOUSING

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.

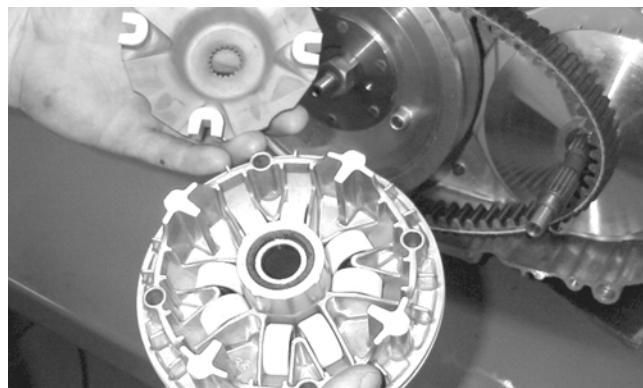
### DRIVE CLUTCH ASSEMBLY

#### 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



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

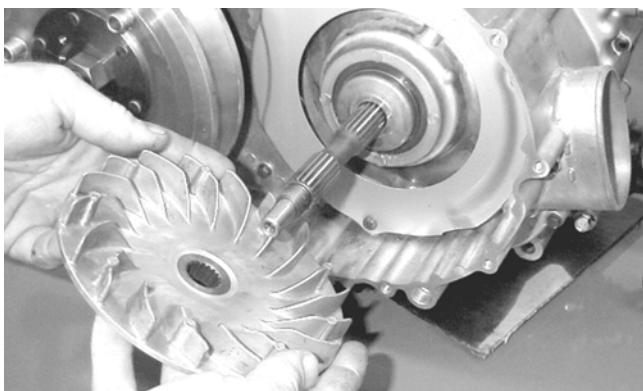
3. Check the internal bushing of the movable drive sheave and surface of the spacer. Replace as necessary. Check the fixed drive sheave internal splines for excessive wear. Check for any broken cooling fins and replace as necessary.



MD1094

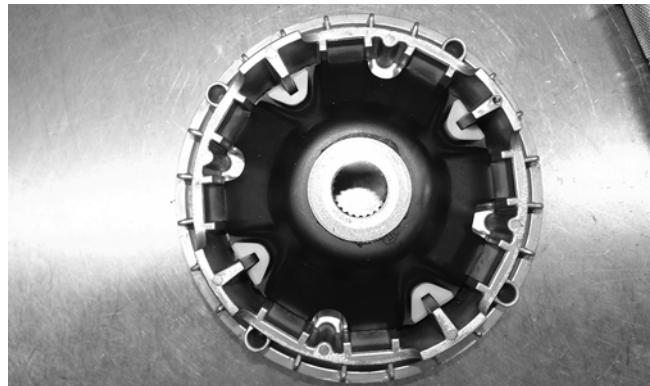
## Assembling

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

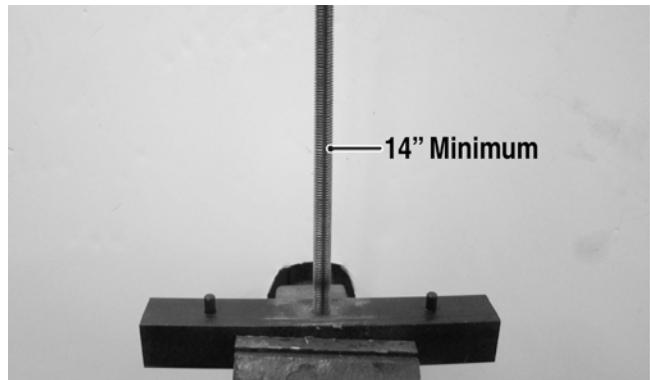
## DRIVEN CLUTCH ASSEMBLY

### Disassembling

1. Secure the clutch spring compressor base in a work vise attached to a stable work table or work bench.

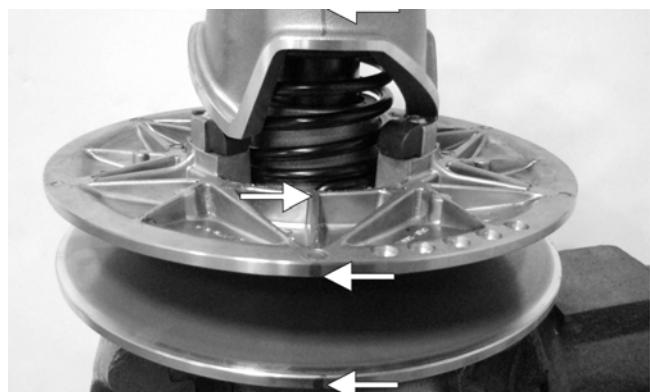
#### ⚠ WARNING

Use only a spring compressor tool base with a screw length of 14" or greater or serious injury could occur.



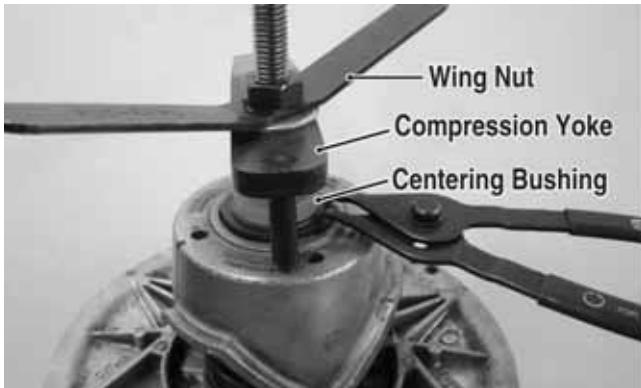
WC422A

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.

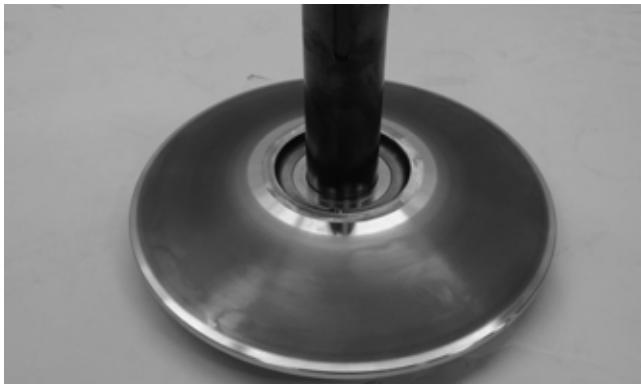
**⚠️ WARNING**

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

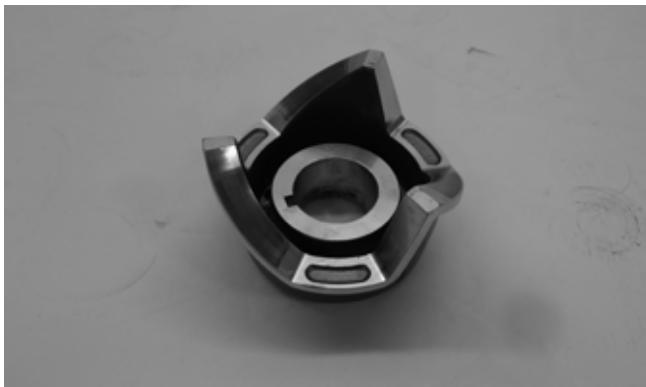
2. Inspect the cam shoes on the movable driven sheave for chipping, excessive scoring, or general condition.



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.



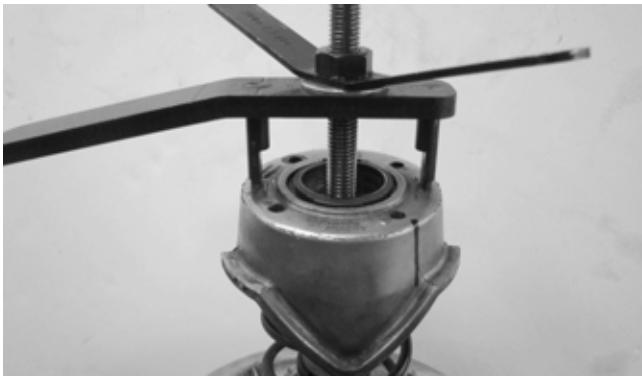
WC391A

4. Place the cam over the spring and align the spring tip to the previously marked anchor hole.



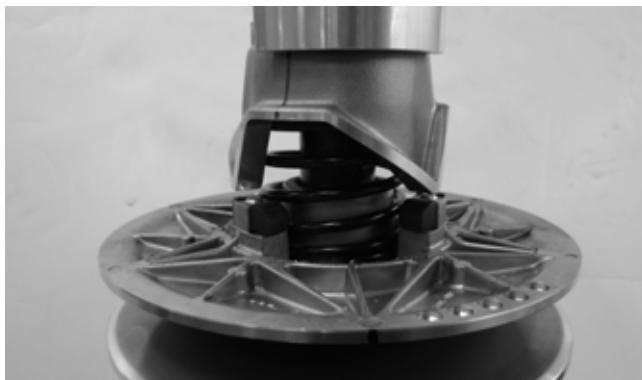
WC753

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.



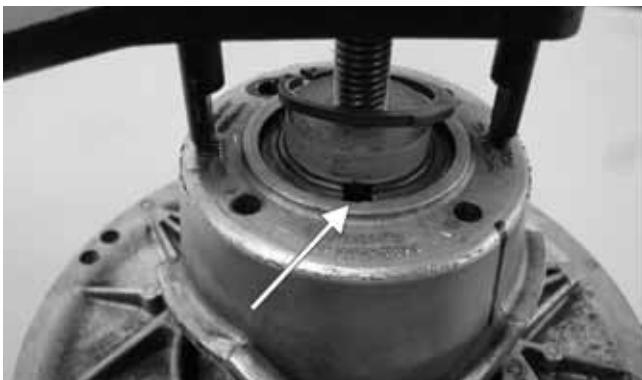
WC414

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.

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## Installing Right-Side Components

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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.

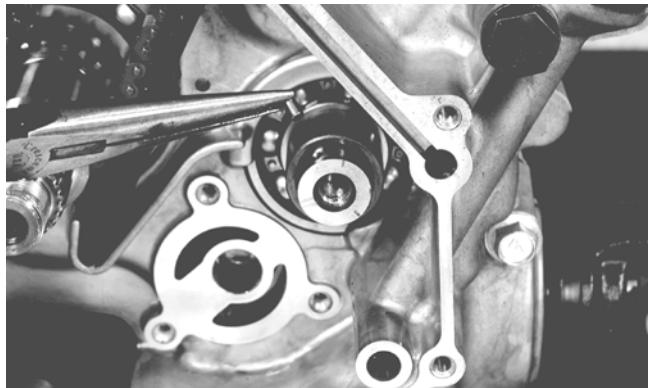


CD988

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.

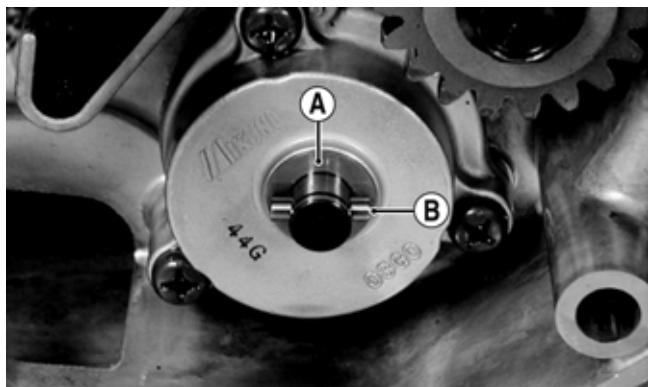


CD992



CD991

4. Place the washer (A) onto the oil pump driveshaft; then grease the driven gear pin (B) and insert it into the oil pump driveshaft. Install the driven gear noting the direction on the sides of the gear from removing. Secure with a new snap ring.



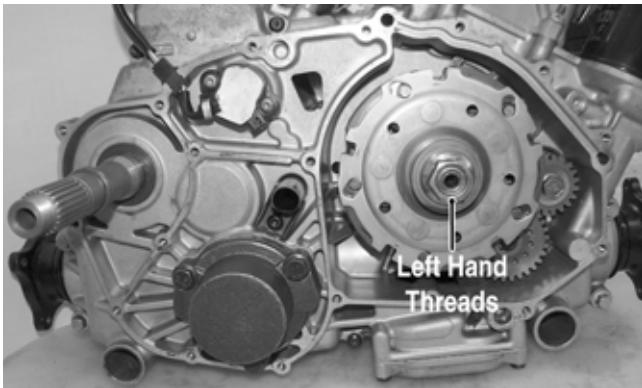
CF682A



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. Use the Spanner Wrench to hold the clutch shoe assembly in place.



6. Install the clutch cover alignment pins into the crankcase, apply oil to the cover gasket, and install the gasket onto the crankcase.

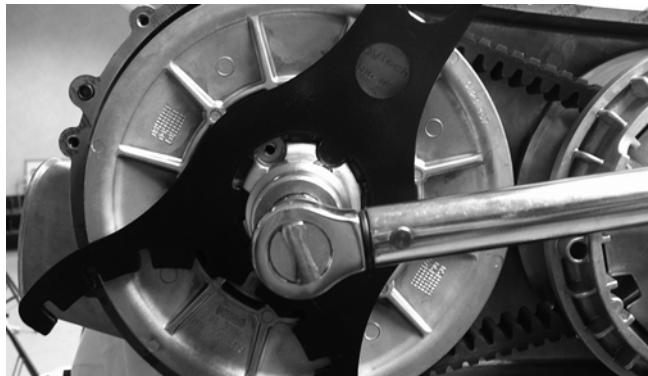
### CAUTION

When installed correctly, the green alignment dot (or the word OUTSIDE) on the one-way clutch is visible.

7. Lightly grease the clutch housing seal; then insert the left fixed-drive spacer.

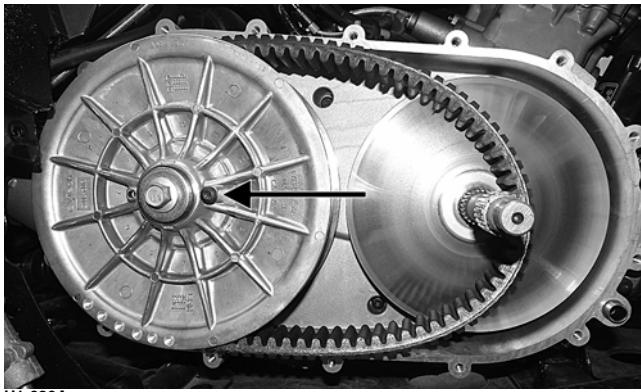


8. Apply grease to the outer edges of the clutch housing; then from inside the clutch cover, install the clutch housing into the cover using a rubber mallet.
9. Place the clutch cover/housing assembly into position on the crankcase; then secure with the cap screws making sure the different-lengthed cap screws are in their proper location. Tighten to 8 ft-lb.
10. Place the driven pulley assembly into position and secure with nut. Tighten to 162 ft-lb.

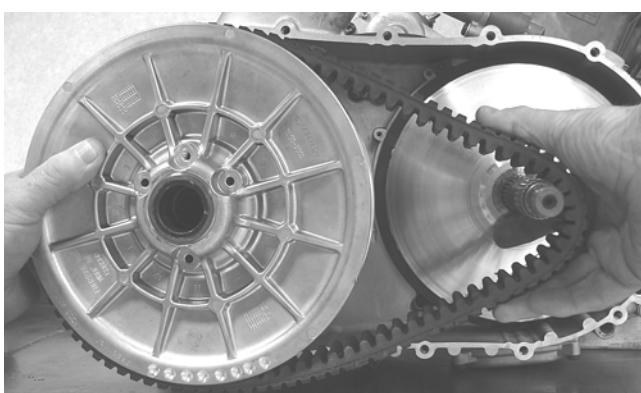


11. Slide the fixed drive face onto the centrifugal clutch housing shaft.
12. Spread the faces of the driven pulley by threading a M6x1 cap screw into one of the bosses of the driven fixed face; then tighten the cap screw until the V-belt drops into the driven pulley 1/2 to 3/4 inch.



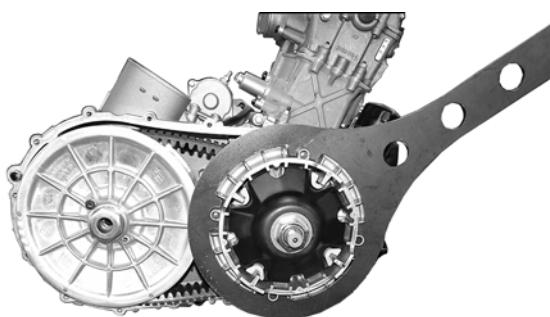


13. Place the V-belt into position on the driven pulley and over the front shaft.



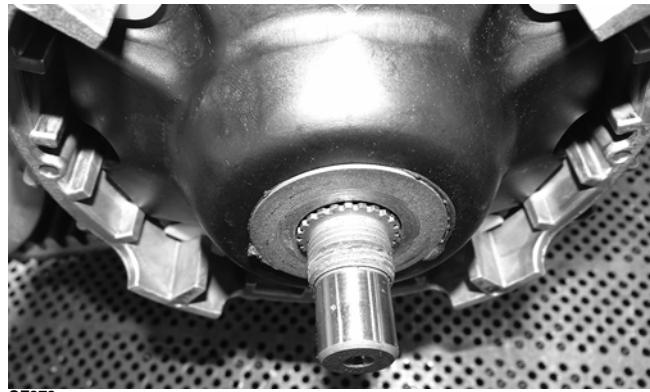
■**NOTE: The arrows on the V-belt should point in the direction of rotation.**

14. 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.



#### 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.



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

15. 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.
16. Place the V-belt cover gasket and dowel pins into position; then install the cover and secure with the cap screws with fibrous washers making sure the different-lengthed cap screws are in their proper location. Tighten the cap screws to 44 in.-lb.



## 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.**

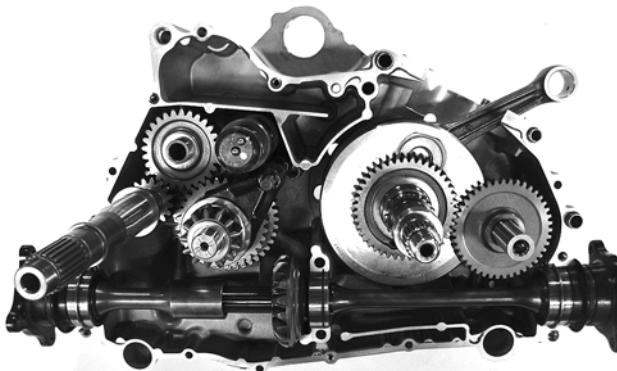
■**NOTE: For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.**

## 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.**

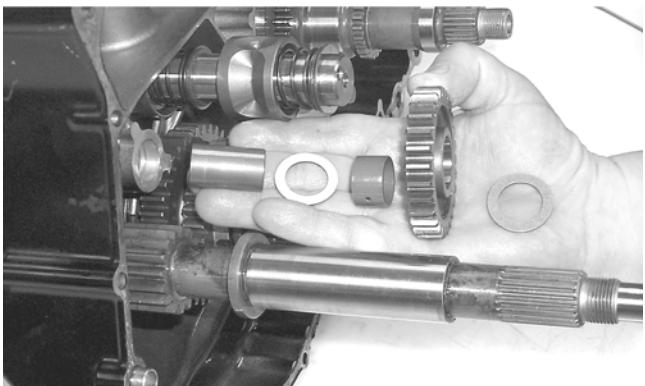


PR786



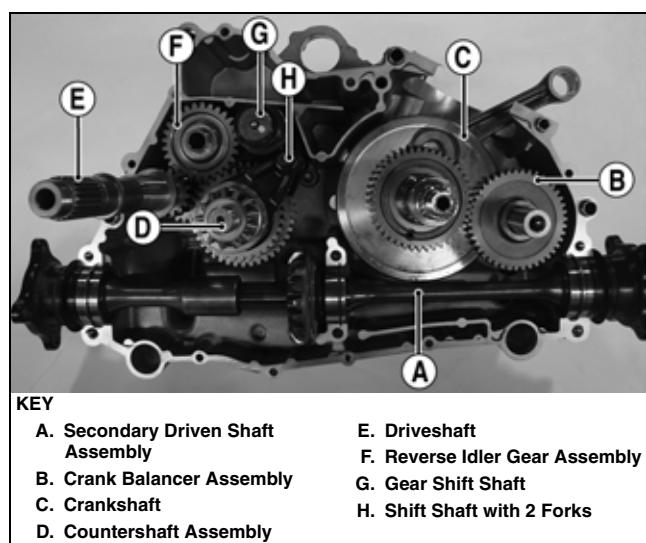
PR787B

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.



PR787A

1. Remove the secondary driven shaft assembly (A) noting the location of the bearing locating pins. Account for the bearing C-ring.



DE677A

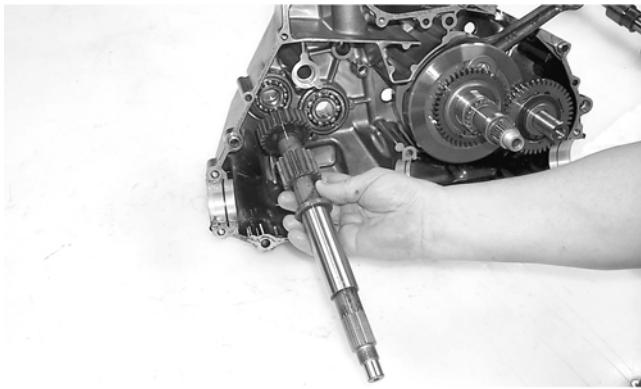
5. Remove the countershaft assembly (D). Account for a washer on each end of the countershaft.



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.**



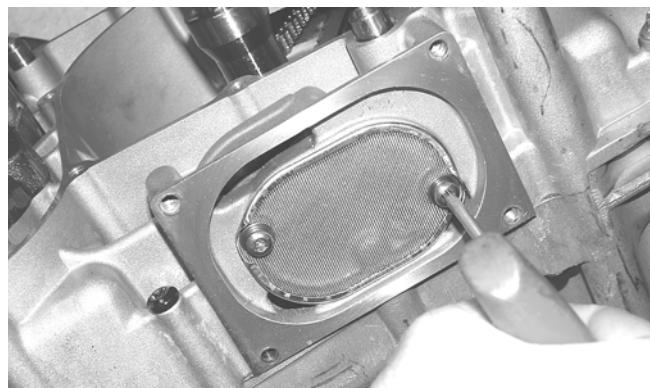
CD832B

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.**

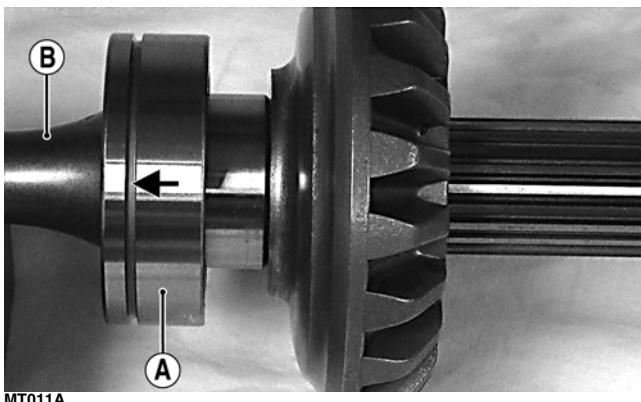
# Servicing Center Crankcase Components

## SECONDARY OUTPUT DRIVE GEARS

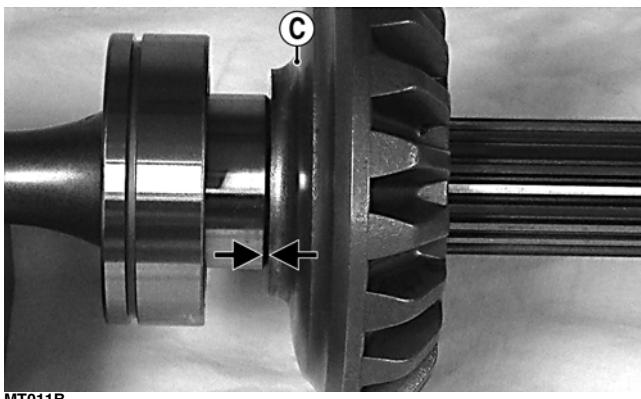
### Initial Set-Up

■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 driveshaft or secondary output driven gear is replaced, proceed to Correcting Backlash in this sub-section.

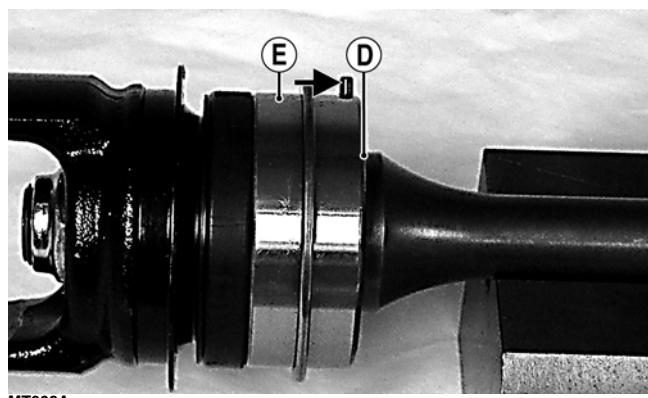
1. Install a new bearing (A) onto the secondary driven shaft (B) making sure the bearing locating groove is directed away from the driven gear splines.



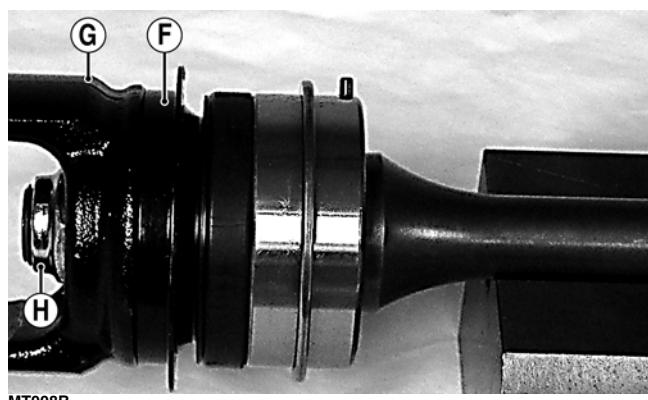
2. Using a suitable press, install the driven gear (C) on the shaft until the gear firmly seats on the shoulder of the shaft.



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.

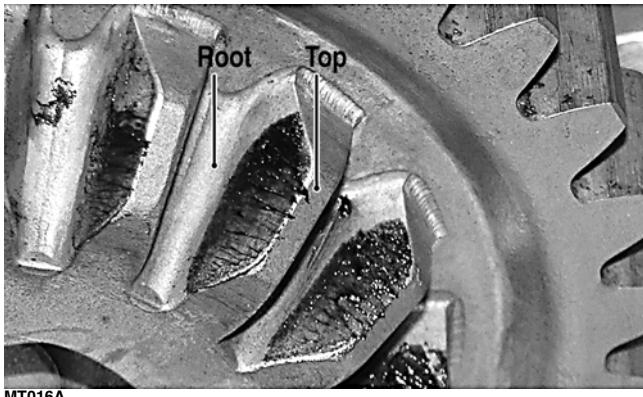


4. Install a new seal (F), output yoke (G), and nut (H) and tighten to 74 ft-lb.



■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

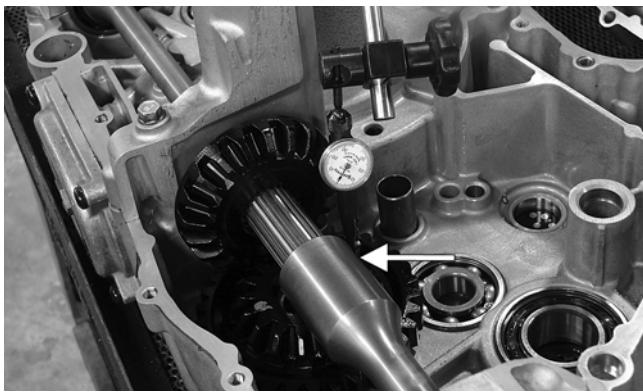
6. To adjust tooth contact, use the following chart to correctly shim the driven shaft.

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

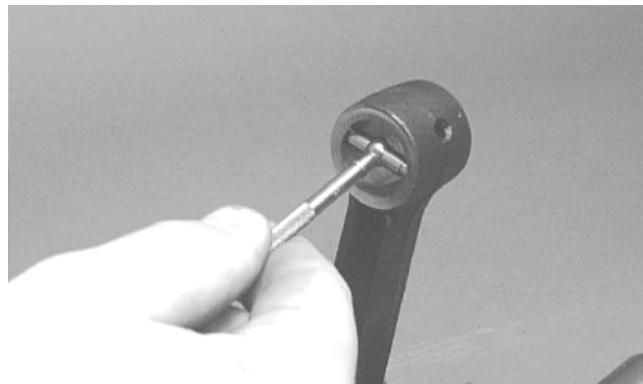
After backlash and tooth contact are within specifications, apply red Loctite #271 to the driveshaft threads and driven output shaft threads; then using new nuts, tighten the output shaft nut to 59 ft-lb and the output yoke nut to 200 ft-lb.

## 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

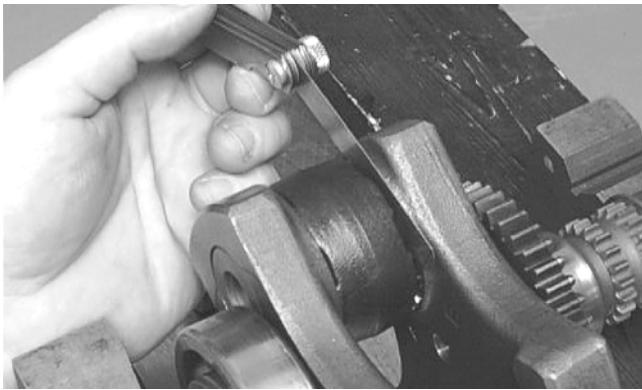
2. Maximum diameter must not exceed specifications.

### 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.

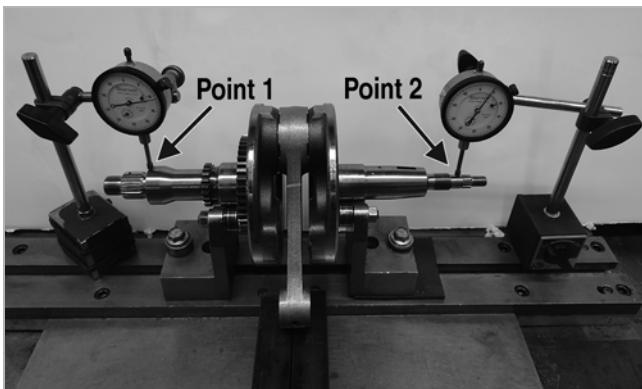


CC289D

- 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

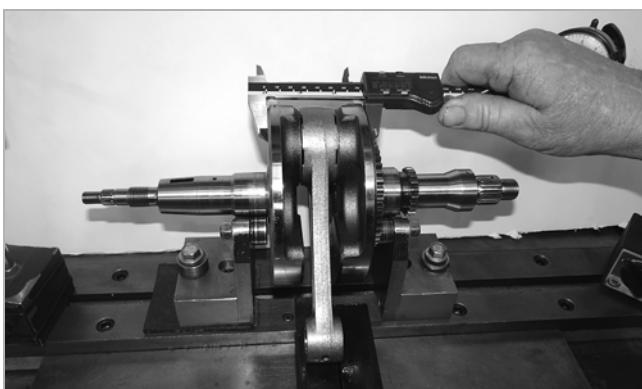
Care should be taken to support the connecting rod when rotating the crankshaft.

- 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)

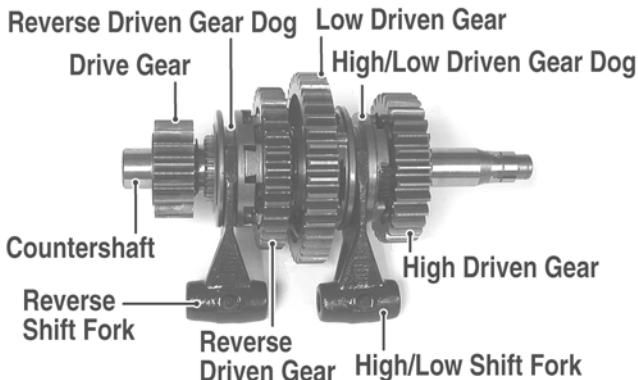
- Using a calipers, measure the distance from the outside edge of one web to the outside edge of the other web.



H1-005

- Acceptable width range must not exceed specifications.

### COUNTERSHAFT



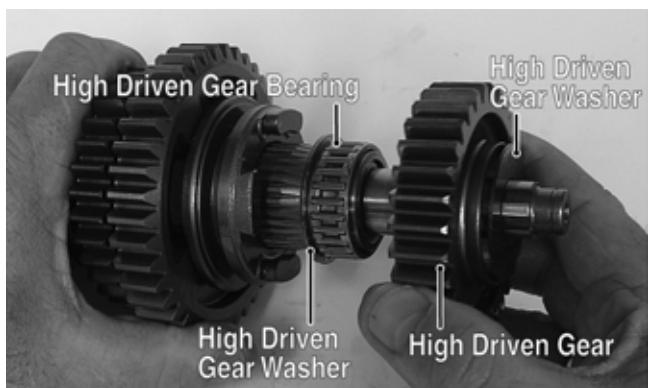
GZ281A

#### 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.

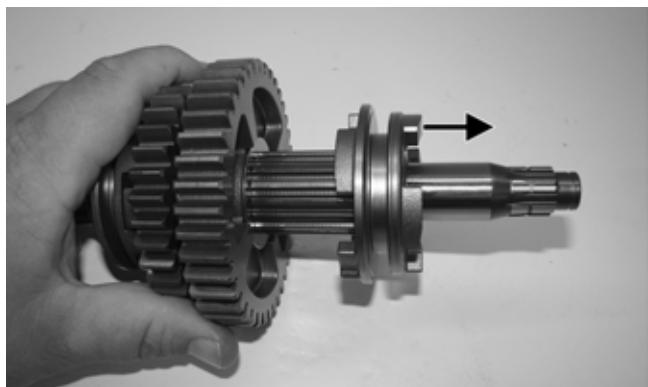
### Disassembling

- Remove the shift forks noting the positions for assembling; then remove the high driven gear outer washer, high driven gear, high driven gear bearing, and high driven gear inner washer.



GZ283C

- Remove the high/low driven gear dog.

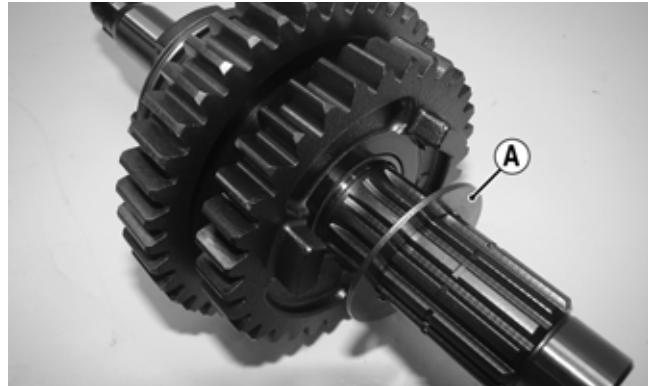


H1-042A

- On the opposite side of the countershaft, remove the drive gear; then remove the snap ring securing the reverse driven gear dog to the countershaft.



GZ296

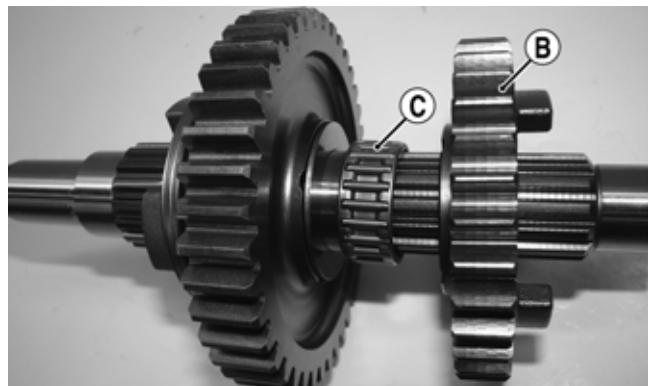


H1-045A



H1-043

4. Remove the reverse driven gear dog.



H1-046A

6. Remove the reverse driven washer (D); then remove the low driven gear (E).

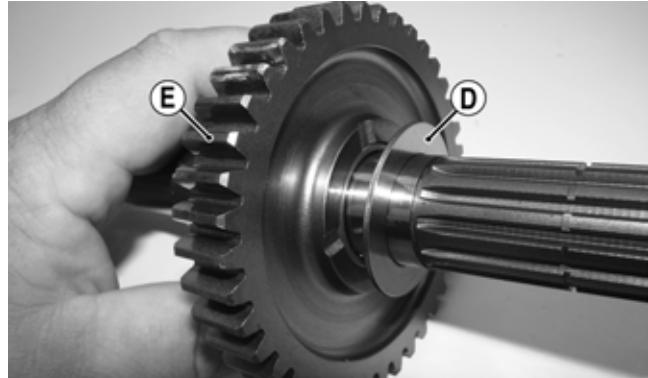


GZ313A

5. Remove the snap ring securing the reverse driven gear and washer; then remove the washer (A), reverse driven gear (B), and needle bearing (C).

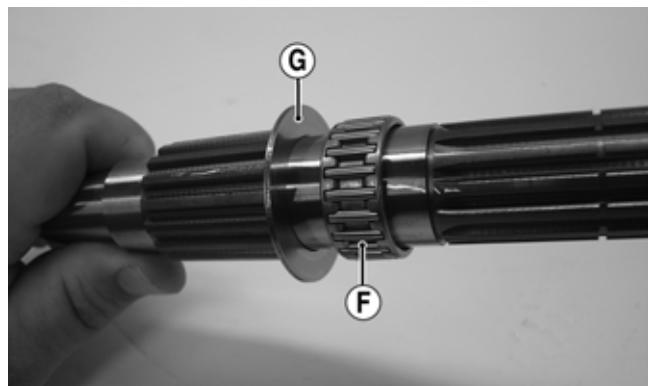


H1-044



H1-047A

7. Remove the low driven gear needle bearing (F); then remove the low driven gear washer (G).



H1-048A

## Assembling

1. From the drive gear end, install a thrust washer, and bearing; then install the low driven gear and washer.



H1-049A

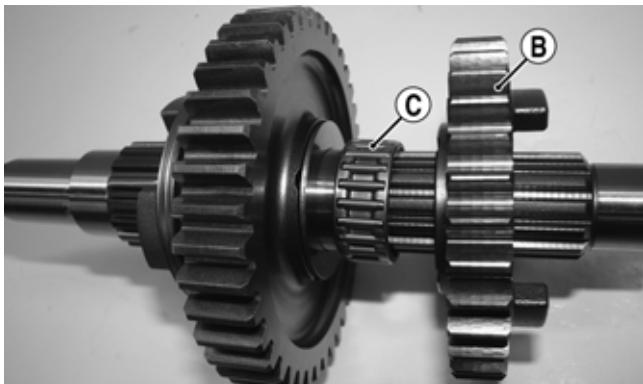


H1-048



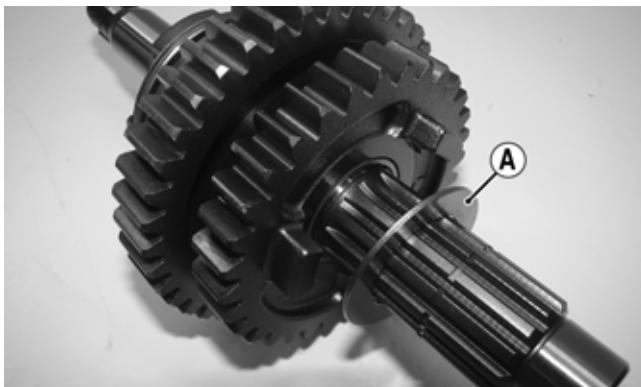
H1-047

2. Install the reverse driven gear needle bearing (C) then the reverse driven gear (B).



H1-046A

3. Install the outer reverse driven gear washer (A); then secure the reverse driven gear assembly with a new snap ring.

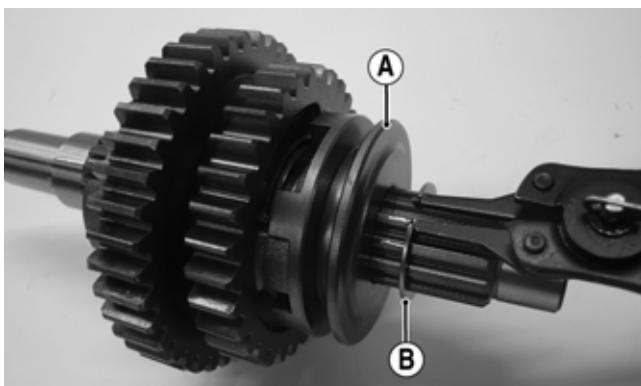


H1-045A



H1-044

4. Install the reverse driven dog (A) onto the counter-shaft and secure with a new snap ring (B).



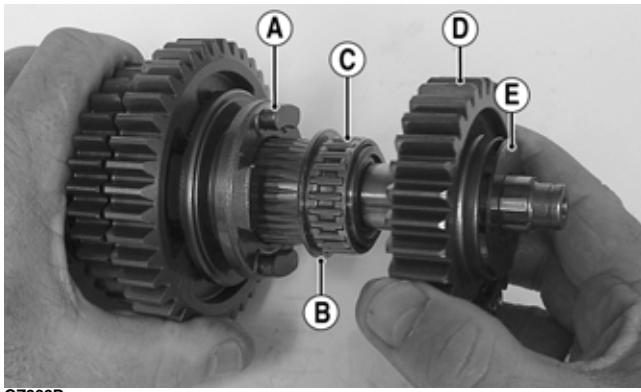
H1-043A

5. Install the drive gear.



GZ296

6. From the opposite end of the countershaft, install the high/low driven gear dog (A), thrust washer (B), bearing (C), high driven gear (D), and spacer washer (E).



GZ283D

7. Install the drive gear washer 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.

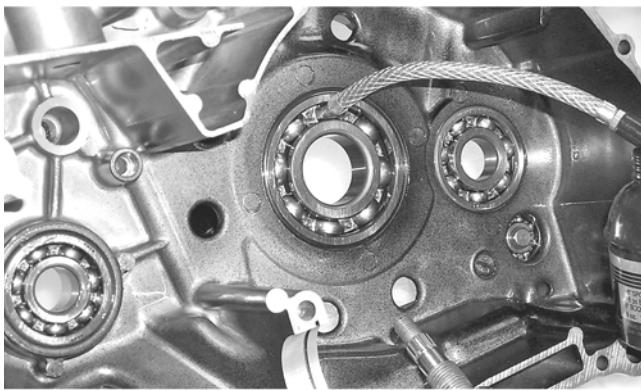
## Assembling Crankcase Half

1. Install the secondary drive gear assembly into the crankcase.

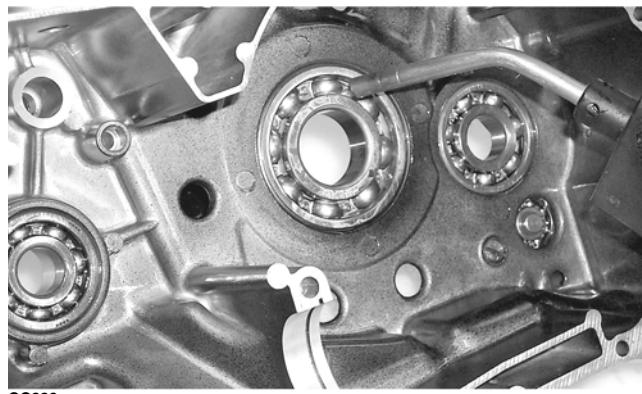


MT014

2. Apply a liberal amount of engine 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.



CC688



CC689

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

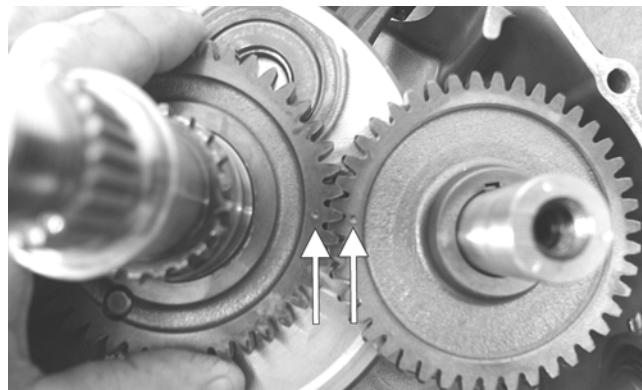
3. Install the crank balancer.



CD832B

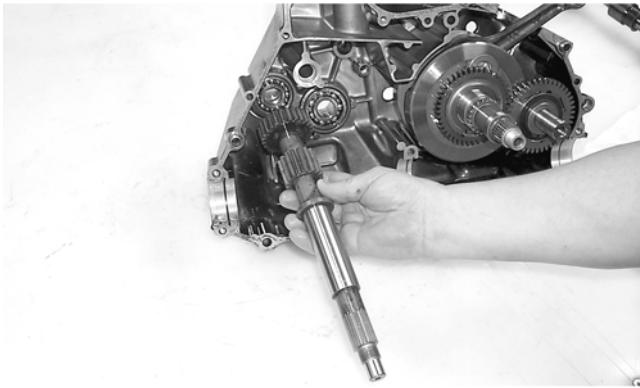
■**NOTE:** It will be necessary to rotate the crank balancer until the counterweight is facing away from the crankshaft; then rotate the crankshaft clockwise into the journal area to allow the crank balancer to be fully seated.

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.



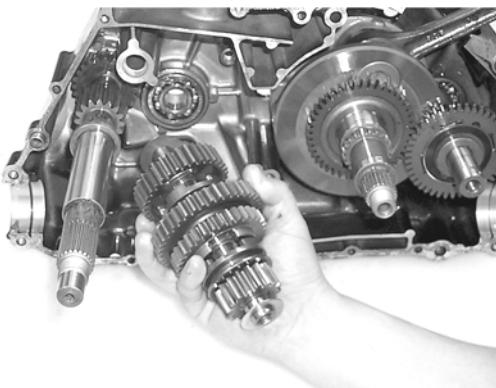
CD826A

5. Install the driveshaft.



CC675

6. Place a washer on each end of the countershaft assembly; then install the assembly.



CC674

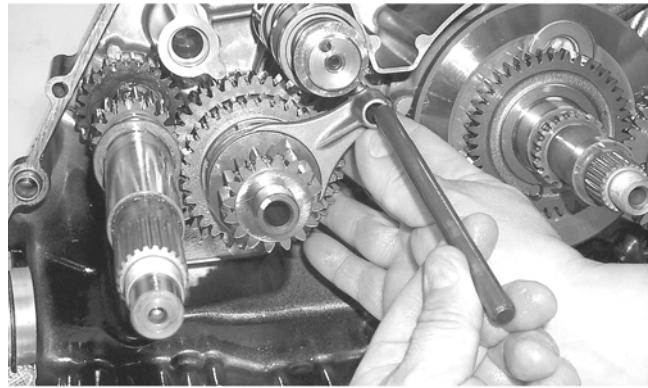
7. Place a washer on the end of the gear shift shaft; then install the shaft assembly making sure the two holes on the end of the shaft are positioned vertically. Install the spacer on the shift shaft.



DE677A

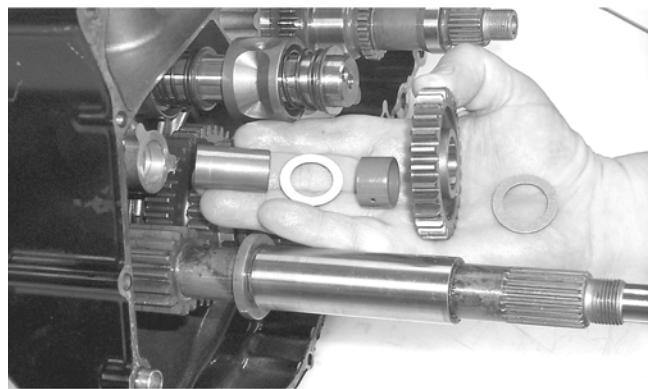
8. Insert the two shift forks into the sliding dogs noting the direction of the tabs from disassembling; then install the shift fork shaft.

**■NOTE: Make sure the shift fork tabs face upward and that they are properly seated into the shift cams.**



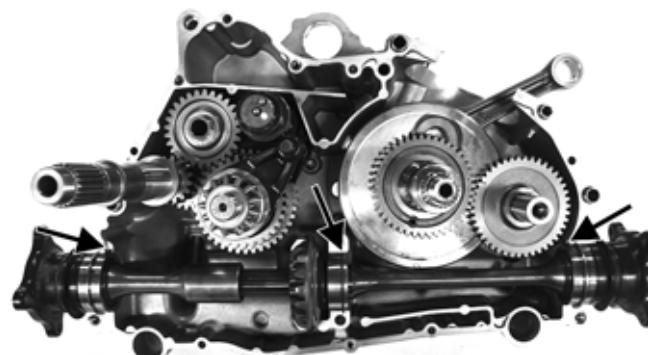
CC669

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

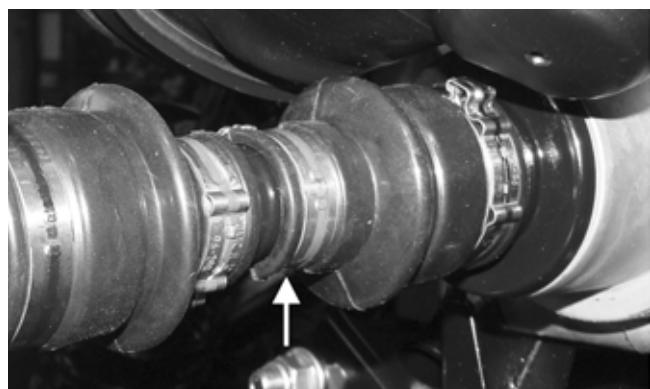
**■NOTE: Always use new gaskets and O-rings whenever servicing the ATV.**

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.



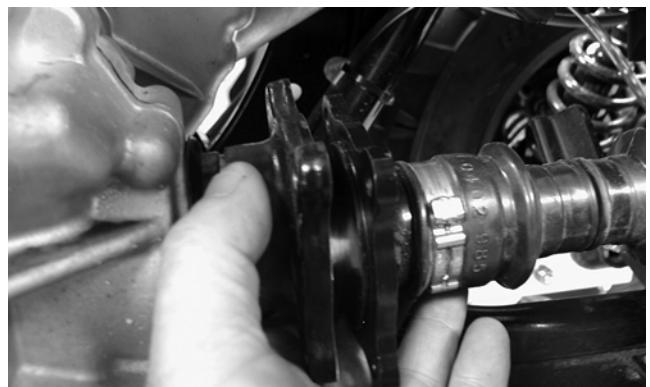
CD818

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.



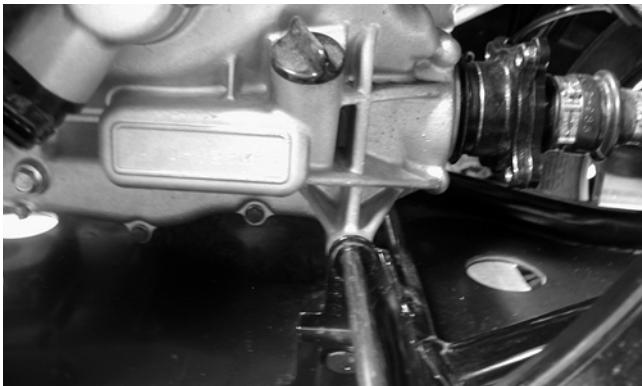
CF728A

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 42 ft-lb.

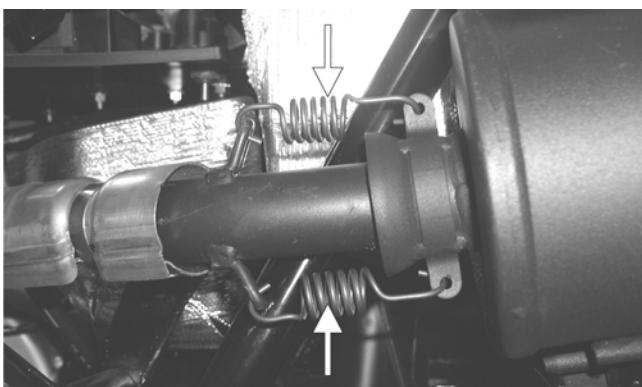


CD809

6. Using a new exhaust gasket, secure the exhaust pipe to the engine with two cap screws; then install the muffler making sure the mounting brackets engage the frame grommets. Tighten the cap screws securing the exhaust pipe to the cylinder head to 20 ft-lb. Connect the O2 sensor. Secure the O2 sensor wires to the frame using new cable ties in the locations noted during disassembly.

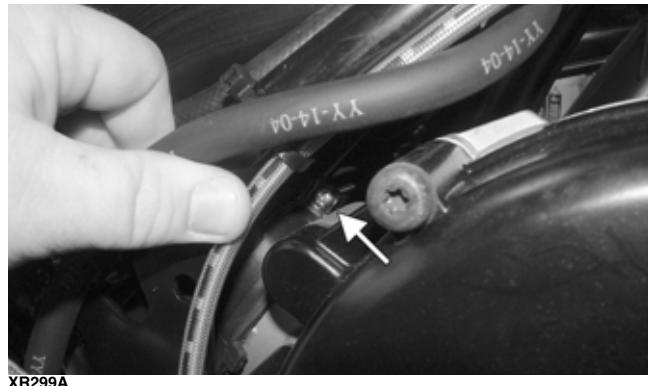


CD803



CF138A

7. Install the cooling ducts with clamps and tighten the clamps securely.

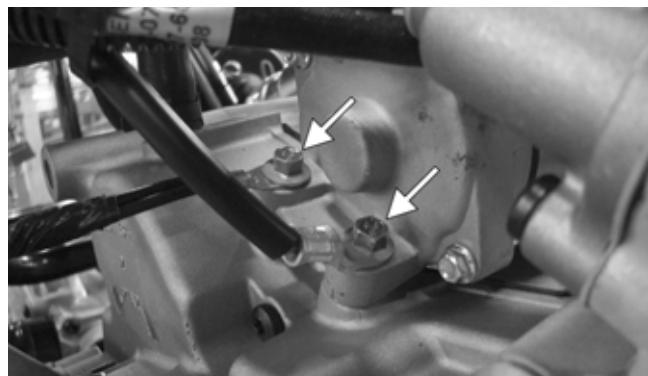


XR299A



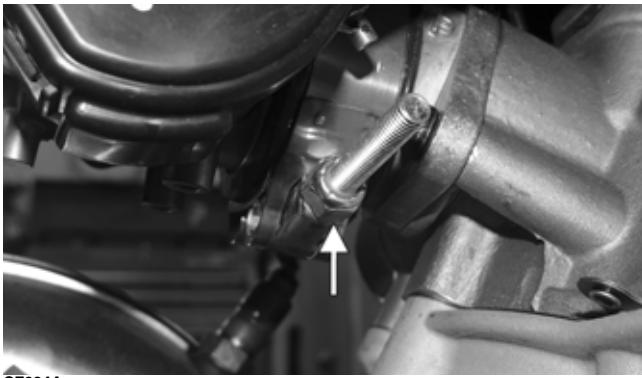
CF731A

8. Secure the engine and harness ground wires to the engine with the two starter motor mounting cap screws. Tighten to 8 ft-lb.



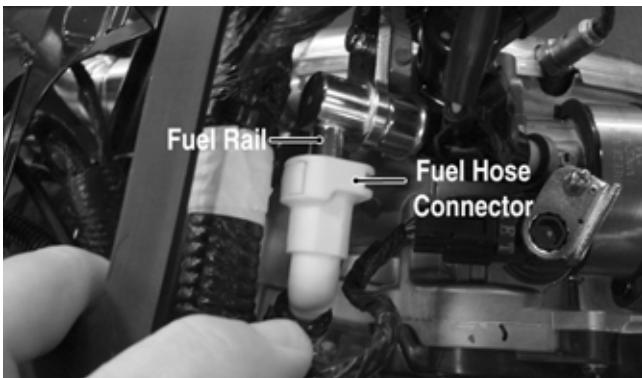
CF727A

9. Connect the stator coil and crankshaft position sensor connectors.
10. Secure the coolant temperature sensor connector to the main wiring harness.
11. Secure the wires to the frame with nylon ties.
12. Connect the gear position switch connectors 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. Insert the throttle body into the intake boot and secure the clamp via the nut.



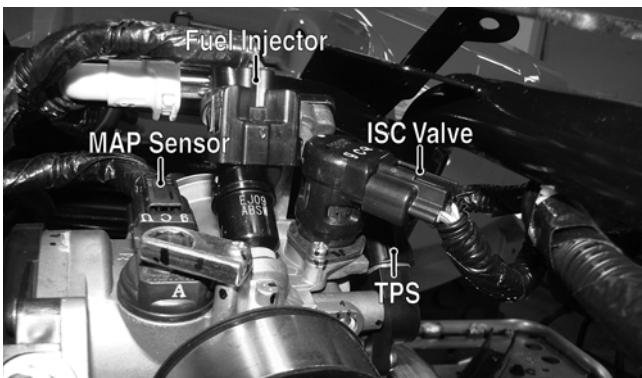
CF684A

17. Connect the fuel hose connector to the fuel rail.



CF730A

18. Connect the connectors from the TPS, ISC valve, fuel injector, and MAP sensor.



XR298A

19. Secure the crankcase vent hose to the air cleaner housing; then secure the inlet boot and throttle body to the air filter housing. Install the air filter (see Periodic Maintenance/Tune-Up).



CD787



CF731A



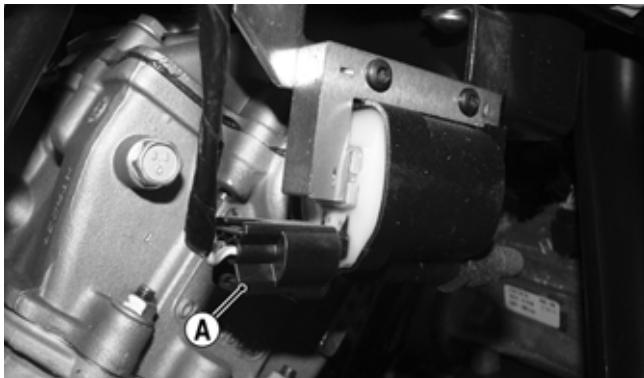
CD786

20. Connect the intake air temperature sensor connector.



CD674

21. Connect the primary connector (A) to the ignition coil; then connect the spark plug cap to the spark plug.



CF675A

22. Secure the shift rod to the engine with a new E-clip.



XR302

23. Place the left-side footwell and foot peg in position on the frame; then secure with existing hardware. Tighten securely.
24. Install the front body panel with existing hardware.
25. Install the storage compartment box, storage compartment cover assembly, steering post cover, and radiator access cover; then install the instrument pod.

26. Install the side panels into position.
27. Place the battery into position in the battery compartment; then install the battery cables (positive cable first). 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.**

28. Add proper amounts of engine/transmission oil and coolant.
29. 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.**

## Fuel/Lubrication/ Cooling

**■NOTE:** Use new gaskets, lock nuts, and seals and lubricate 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 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

1. Turn the ignition switch to the OFF position; then remove the ignition switch key.

### **⚠ WARNING**

Do not turn the ignition switch to the ON position with the hoses removed and the battery connected. Gasoline will be pumped by the electric fuel pump causing a safety hazard.

2. Remove the seat and tool tray; then disconnect the battery.

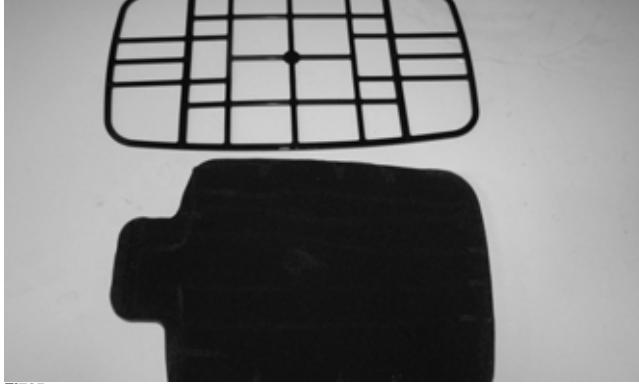
3. Remove the storage compartment cover and storage compartment. Remove the air filter housing cover; then remove the air filter. Account for the air filter frame.



FI467A



FI468A



FI705

4. Loosen the clamps securing the intake pipe which joins the air box to the throttle body boots; then remove the pipe.



CF687A

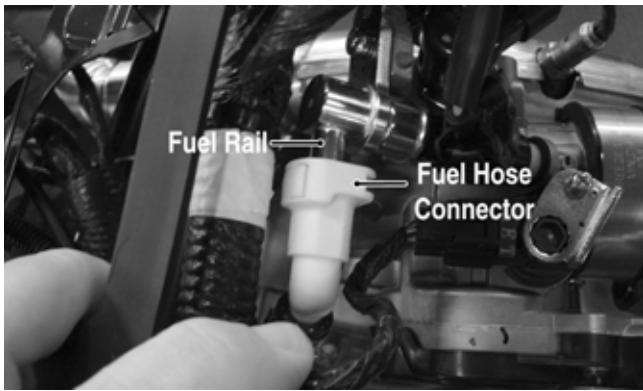


CF688

5. Slowly disconnect the fuel hose connector from the fuel rail.

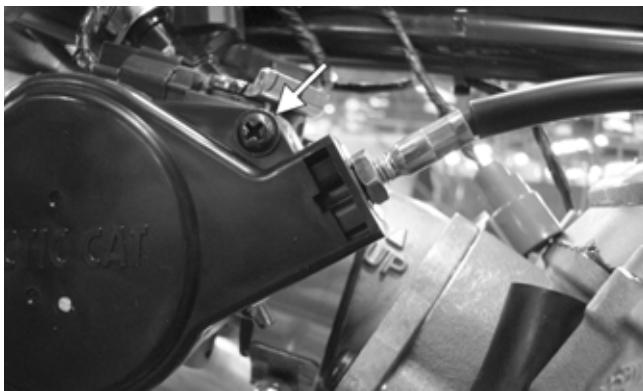
#### **WARNING**

**Gasoline may be under pressure. Place an absorbent towel under the connector to absorb any gasoline spray when disconnecting.**



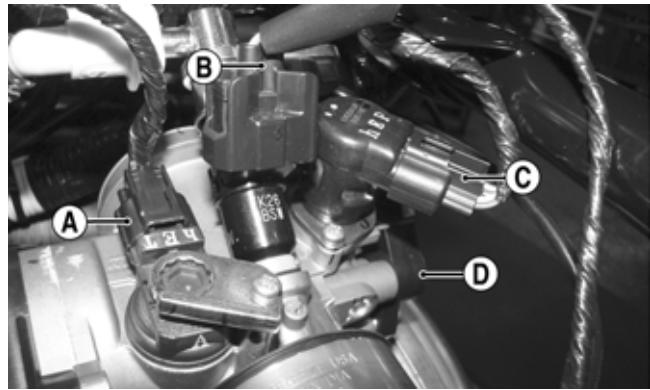
CF730A

6. Remove the screw securing the throttle actuator cover to the throttle body; then remove the cover.



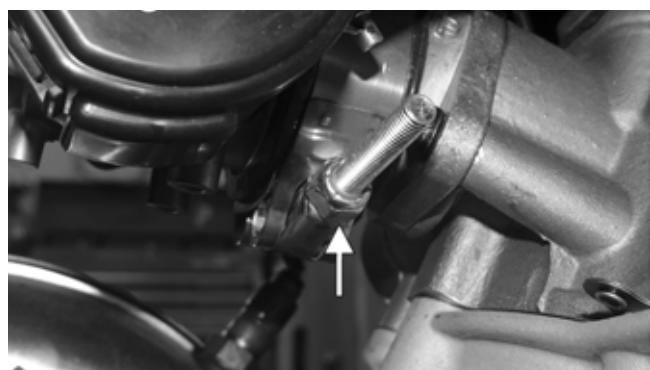
CF732A

7. Loosen the outer jam nut securing the throttle cable to the throttle body.
8. Remove the throttle cable from the actuator arm; then route the cable out of the way.
9. Remove the MAP sensor (A), fuel injector connector (B), ISC connector (C), and TPS connector (D).



CF733A

10. Loosen the clamp securing the throttle body to the intake manifold flange. Remove the throttle body.



CF684A

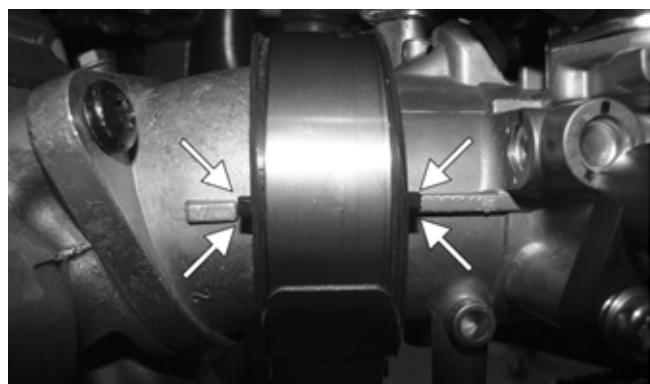
11. Remove the cap screws securing the intake manifold flange to the cylinder head. Account for an O-ring.
12. Use tape to cover and seal the intake opening.

#### **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**

1. Place a new O-ring onto the intake pipe; then position the pipe onto the engine and secure with two cap screws.
2. Using the alignment markings, install the intake pipe boot then the throttle body. Tighten the clamp securely.



CF694A

3. Connect the throttle cable to the throttle body and adjust throttle cable free-play (see Throttle Cable Free-Play); then connect the fuel hose.

4. Connect the four electrical connectors to the throttle body components.
5. Install the intake pipe that joins the air filter housing to the throttle body boot and secure with the clamps. Install the air filter, air filter frame, and air filter cover. Install the storage compartment and storage compartment cover.
6. Connect the battery (positive cable first) and install the tool tray; then install the seat making sure it locks securely in place.

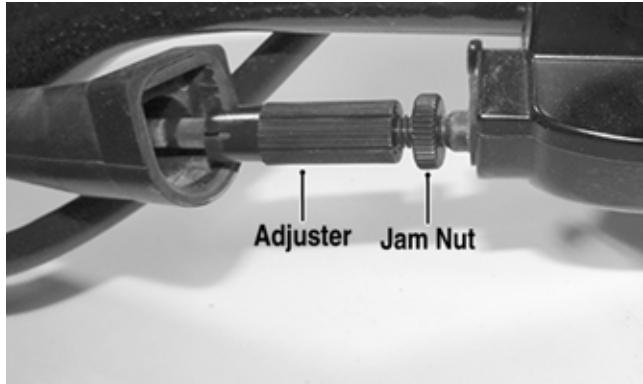
■**NOTE: If the throttle body, ECM, TPS, or ISC are replaced, the EFI system must be synchronized. Use the following procedure.**

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.

## 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.



CF705A

2. Turn the adjuster until the throttle cable has proper free-play of 3-6 mm (1/8-1/4 in.) at the lever.
3. Tighten the jam nut against the throttle cable adjuster securely; then slide the rubber boot over the adjuster.

## Gas Tank

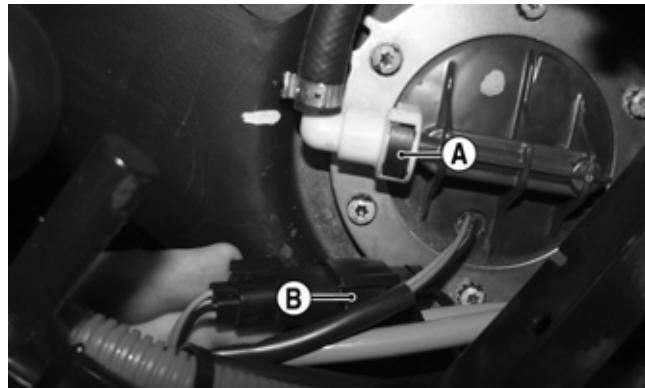
### ⚠ WARNING

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. Using an absorbent towel under the hose, disconnect the fuel hose from the fuel pump by compressing the release on the connector (A). Disconnect the fuel gauge connector (B).



CF695A

4. Remove the cap screws securing the gas tank to the frame.
5. 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. Place the gas tank into position in the frame; then install the cap screws. Tighten securely.
2. Connect the fuel hose from the throttle body; then connect the fuel gauge connector.
3. Fill the gas tank with gasoline.
4. Start the engine and inspect for leakage.
5. Install the rear fenders and rack (see Steering/Body/Controls); then install the seat making sure it latches securely.

## Oil Pressure

■**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.



CF264C

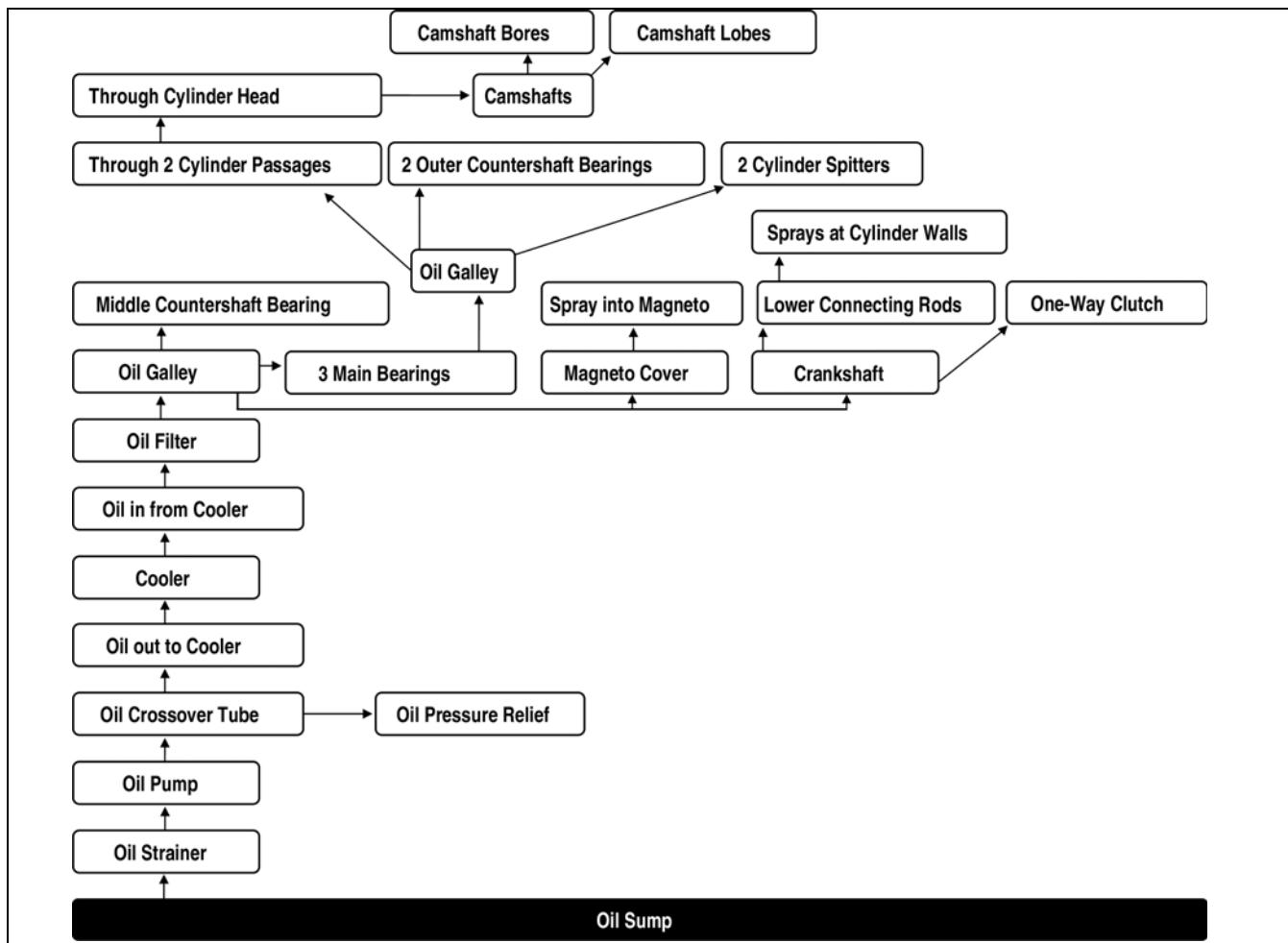
■**NOTE:** Some oil seepage may occur when installing the oil pressure gauge. Wipe up oil residue with a cloth.

3. Start the engine and run at 3000 RPM. With the oil temperature at 60° C (140° F), the oil pressure gauge must read 1.2-1.5 kg/cm<sup>2</sup> (17-21 psi).

■**NOTE:** If the oil pressure is lower than specified, check for low oil level or defective oil pump.

■**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 Flow Chart



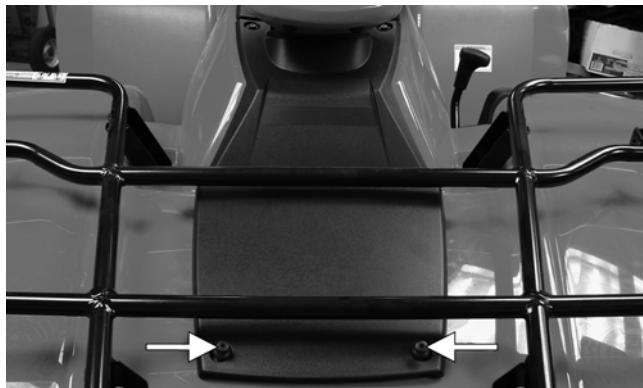
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## Liquid Cooling System

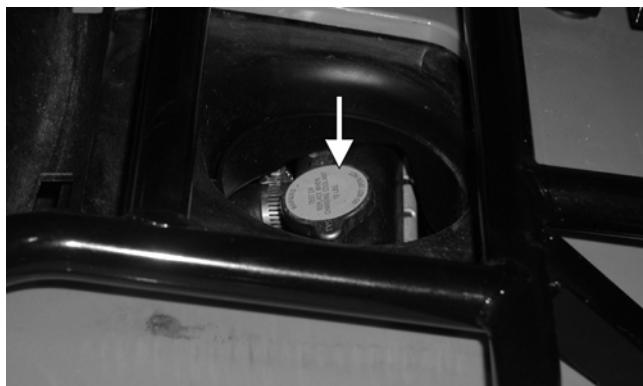
When filling the cooling system, use a coolant/water mixture which will satisfy the coldest anticipated weather conditions of the area in accordance with the coolant manufacturer's recommendations. While the cooling system is being filled, air pockets may develop; therefore, run the engine for five minutes 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. Remove the two screws from the front of the radiator access panel.



2. Lift the front of the access panel; then slide the panel forward to disengage the two rear tabs.
3. Move the panel rearward until free of the rack.
4. Carefully rotate the radiator cap counterclockwise to release pressure; then remove the cap.



5. 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

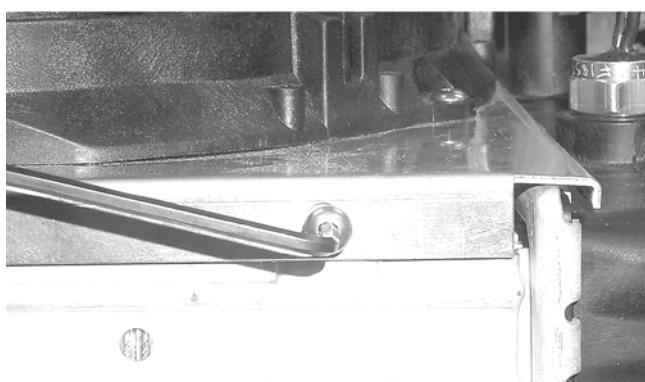
#### Removing

1. Drain the coolant by removing the drain screw found on the water pump. Account for the washer.



■**NOTE:** Removing the radiator cap will help evacuate the majority of the coolant.

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. Remove the fan/fan shroud assembly from the radiator.

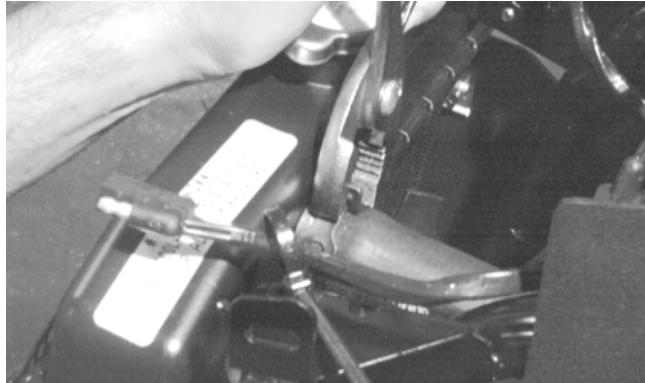


### Cleaning and Inspecting

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.



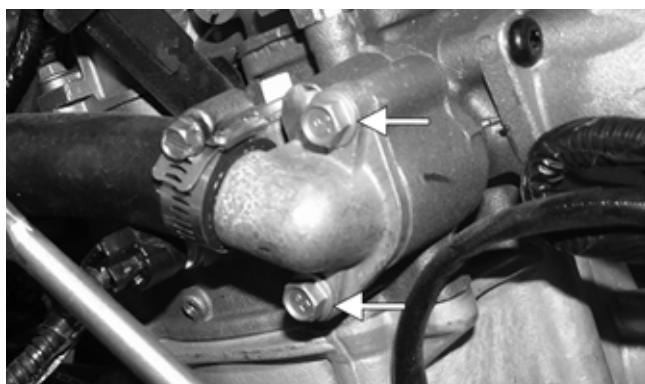
AF734D

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

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.



CF734A

### 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 146-151°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

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 (see Periodic Maintenance/Tune-Up). 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

**■NOTE:** The water pump is a non-serviceable component. It must be replaced as an assembly.

### Removing

1. Remove the radiator cap; then remove the water pump drain and drain the coolant.



XR318A

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.



XR318B

## Installing

1. Align the water pump shaft with the slot in the water pump driven gear shaft. Secure the water pump to the engine with the two cap screws to 8.5 ft-lb.
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.**

## 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 indicator panel is 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.**

## 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
Fluke Model 77 Multimeter	0644-559
MaxiClips	0744-041
Tachometer	0644-275
CATT II Tool	0544-029

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

## Battery



**Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.**

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: Use 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 dealer to connect directly to your vehicle from the recommended chargers to simplify the maintenance charging process. Check with your authorized 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:** Use 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.

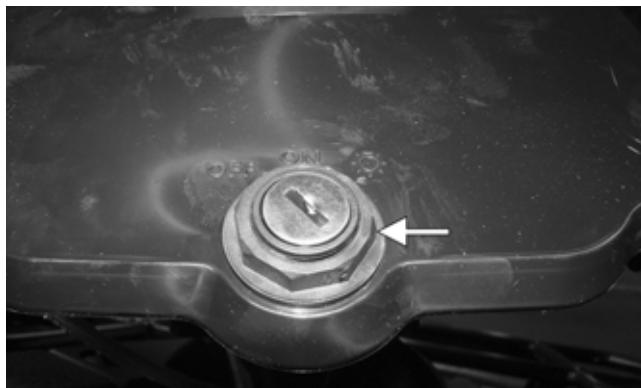
■**NOTE:** The sealing strip should NOT be removed and NO fluid should be added.

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.

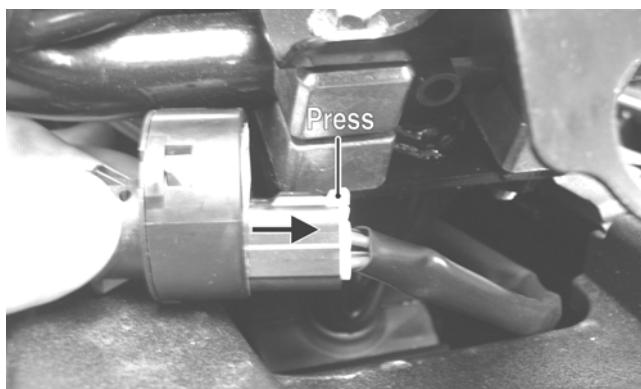
■**NOTE:** For optimal charge and performance, leave the charger connected to the battery for a minimum 1 hour after the Maintenance Charge Indicator (D) illuminates. If the battery becomes hot to the touch, stop charging. Resume after it has cooled.

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 dealer for further troubleshooting.



CF724A



CF273A

### VOLTAGE

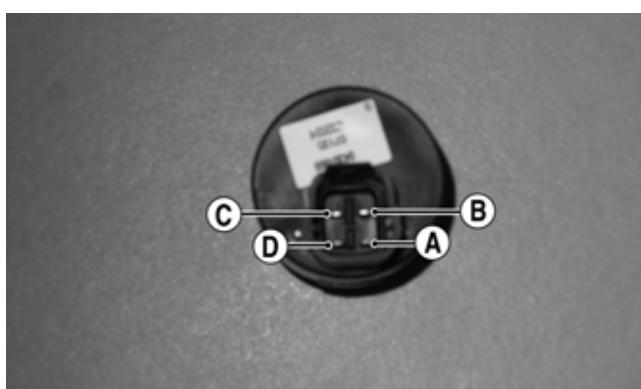
■**NOTE:** Perform this test on the harness connector.

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.



CF274B

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 B.
4. The meter must show less than 1 ohm.

## 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.

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 D.
7. The meter must show less than 1 ohm.
8. Connect either tester lead to pin C; then connect the other test lead to pin B.
9. The meter must show less than 1 ohm.
10. 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

The ignition coil is on the frame above the engine. To access the coil, the left 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

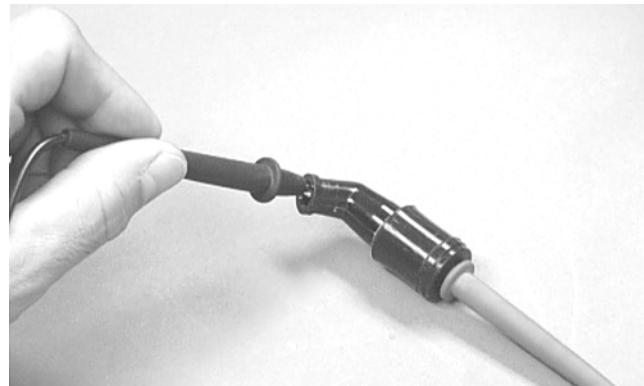
1. Disconnect the coil connector. Connect the red tester lead to either terminal; then connect the black tester lead to the other terminal.
2. Resistance must be less than 1 ohm.

■**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

### CATT II

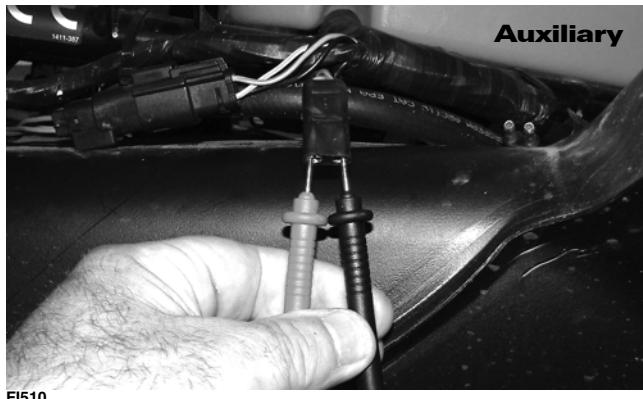
Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

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.

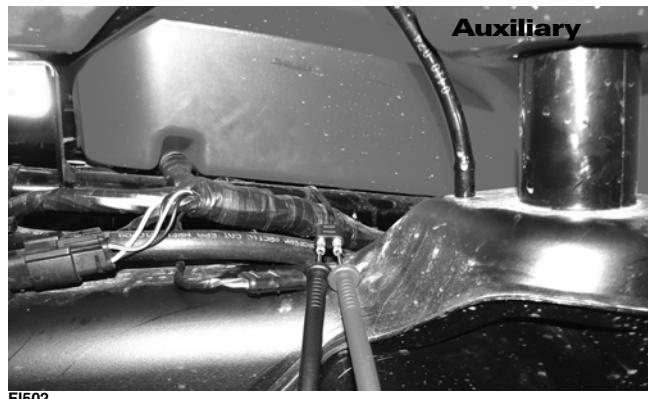
■**NOTE: If the meter shows no battery voltage, troubleshoot the battery, fuse, switch, or the main wiring harness.**

■**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.**

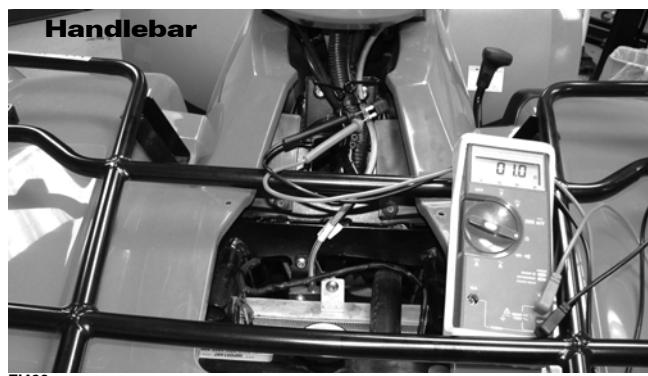
## **RESISTANCE (Brakelight)**

■**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.
6. 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)

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to the orange wire; then connect the black tester lead to the orange/white wire.
3. With the switch in the OFF position, the meter must show an open circuit.
4. 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).

1. Set the meter selector to the OHMS position.
2. 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.
3. Depress and hold the reverse override button. The meter must show an open circuit.
4. 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.
5. Depress and hold the reverse override button. The meter must show less than 1 ohm.

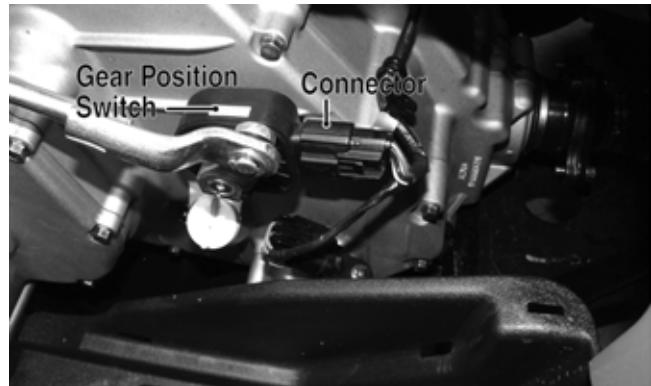
**■NOTE: If the meter does not show as specified, replace the switch.**

### RESISTANCE (Gear Position)



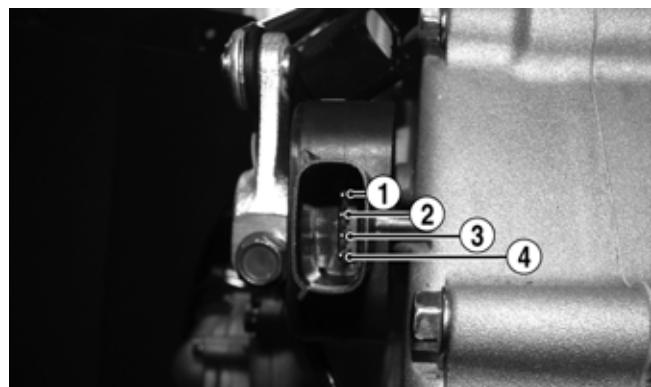
Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

The gear position switch is located on the engine/transmission next to the shift arm.



FI525B

1. 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

- A. 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.

## **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.

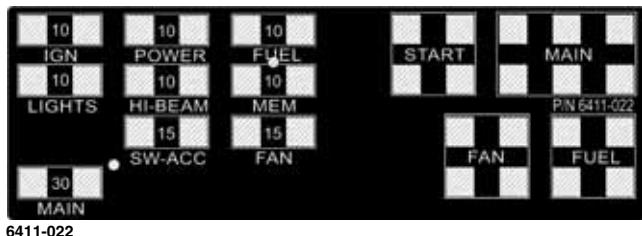
■**NOTE:** Battery voltage will be indicated from only one side of the fuse holder connector terminal; the other side will show no voltage.

■**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 replace a blown fuse with a fuse of the same type and rating.

### 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 and test as follows.

WIRE COLOR	RESISTANCE
Red to White	500 Ohms
Black to Brown	

■NOTE: The battery must be at full charge for the voltage test.

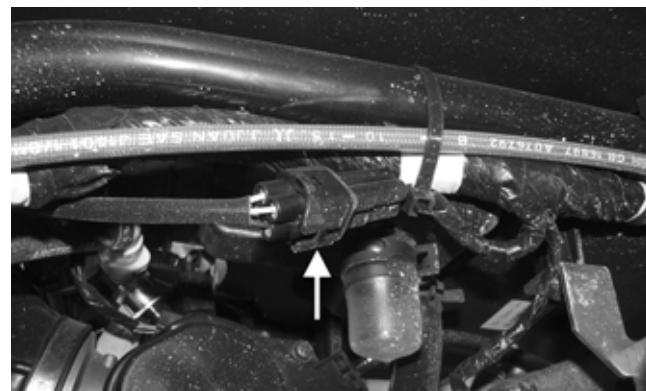
2. Set the meter selector to the AC Voltage position.
3. Connect the red tester lead to the blue wire; then connect the black tester lead to the green wire.
4. Crank the engine over using the electric starter. The meter should read 2.0 or more.

### 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  $68^\circ\text{ F}$ ) when performing this test or an incorrect reading will occur.

1. On the right side of the ATV, unplug the connector.



CF735A

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.

### MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR



Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

1. Disconnect the MAP 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 sensor to the harness; then using MaxiClips, 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).

■**NOTE:** If the meter does not read as specified, replace the sensor.

## INLET AIR TEMPERATURE (IAT) SENSOR



Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

■**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.

### Resistance

1. Disconnect the harness connector from the sensor at the air box assembly.
2. Connect the meter leads (selector in OHMS position) to the IAT sensor terminals.
3. At an ambient air temperature of 68°F, the meter will read approximately 2300 Ohms.

■**NOTE:** If the sensor is subjected to a decreased ambient air temperature, the resulting meter reading will increase. The opposite is true if the ambient air temperature is increased.

■**NOTE:** If the meter does not read as specified, replace the sensor.

### Voltage

1. With the connector still disconnected from the IAT sensor, set the meter to DC volts.
2. Connect the red meter lead to the green/red wire and the black meter lead to ground. With the ignition switch set to the ON position the meter will read approximately 5 DC volts.
3. Connect the red meter lead to the pink/black wire and the black meter lead to ground. With the ignition switch set to the ON position, the meter will read approximately 0.003 DC volts.
4. Connect the harness connector to the IAT sensor, then using Maxi Clips, connect the red tester lead to the green/red wire. Connect the black tester lead to the pink/black wire. With the engine at idle, the meter should read approximately 2.9 DC volts.

■**NOTE:** If the specifications provided in steps 2 and 3 are not observed on the meter, troubleshoot the harness pins, harness wires, or the ECM.

## ENGINE COOLANT TEMPERATURE (ECT) SENSOR



Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

1. Connect the meter leads (selector in OHMS position) to the sensor terminals.
2. Suspend the sensor and a thermometer in a container of engine 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.

TEMPERATURE	RESISTANCE
-20° C (-4° F)	18.8k Ohms
40° C (105° F)	1.14k Ohms
100° C (212° F)	155 Ohms

3. If the readings are not as indicated, the sensor must be replaced.
4. Install the sensor and tighten securely.
5. Connect the leads.

## FUEL PUMP/FUEL LEVEL SENSOR



Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

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

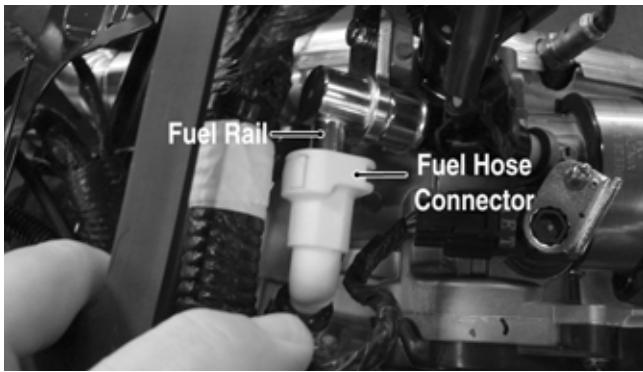
Prior to removing the electric fuel pump, the following check should be performed to determine that removal is necessary.

- 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. De-pressurize 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.**

- Disconnect the fuel hose from the fuel rail; then install a suitable pressure gauge.



- 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  $3.0 \text{ kg-cm}^2$  (43 psi).
- If the pump is not running, disconnect the fuel pump/sensor connector.
- 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**

- Remove the rear rack and fenders (see Steering/Body/Controls); then disconnect the power supply/fuel hose connector.
- Disconnect the fuel hose and fuel pump connector.
- Remove the screws securing the fuel pump to the gas tank; then make a reference mark on the fuel pump and tank.
- 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.**

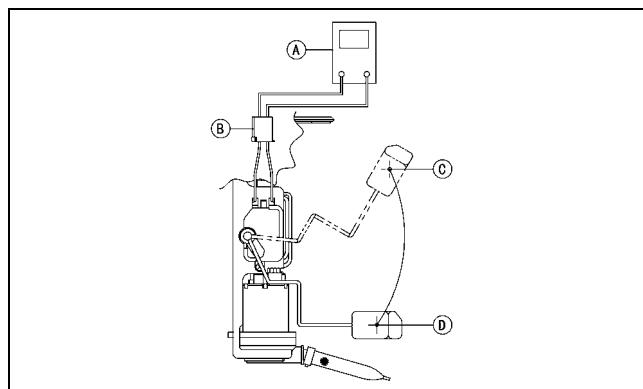
- Using duct tape or other suitable means, cover the fuel pump opening.

### **INSPECTING**

#### **AT THIS POINT**

**If the pump has failed earlier test and must be replaced, proceed to INSTALLING.**

- Inspect the fuel screen and blow clean with low pressure compressed air.
- 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.
- 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).

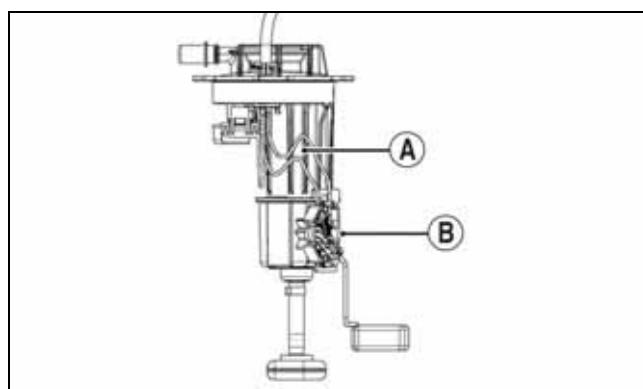


**■NOTE:** If readings are erratic, clean the resistor wiper and resistor with clean alcohol and retest. If still not correct, replace the fuel level sensor.

### **Replacing Fuel Level Sensor**

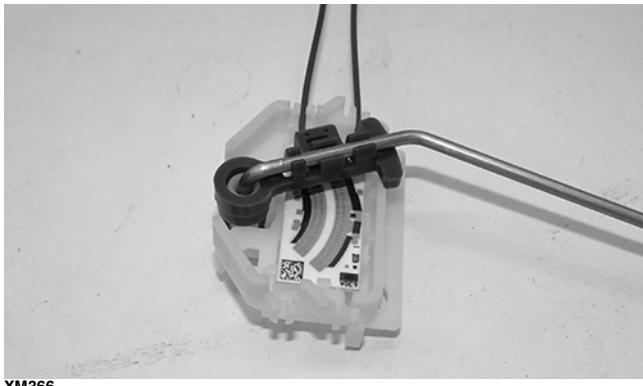
To replace the fuel level sensor, use the following procedure.

- Cut the two blue wires (A) in the location shown.
- Slide the existing fuel level sensor assembly (B) up and off the fuel pump assembly housing.



XR257A

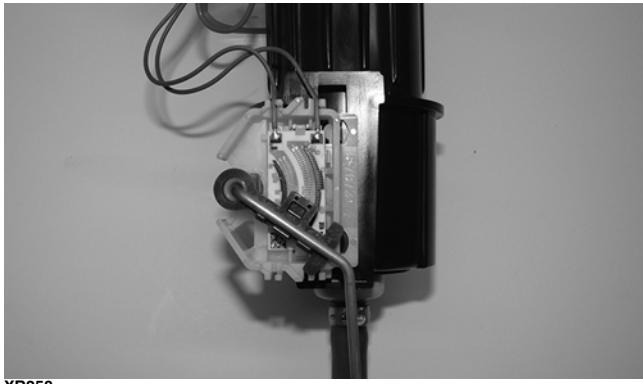
- Keeping the float attached to the float arm; then remove the float arm from the existing fuel level sensor. Press the float arm into the new fuel level sensor assembly. Ensure it locks into place.



XM366

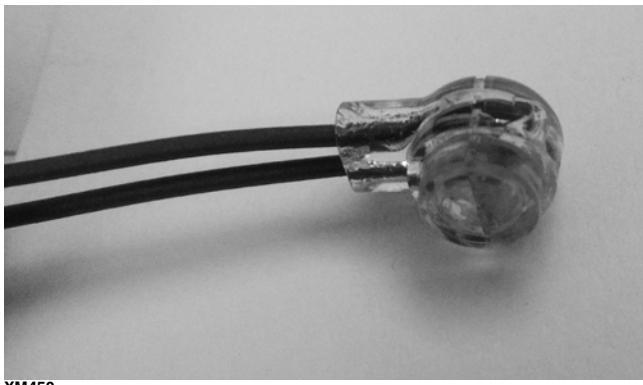
■**NOTE: Inspect the float for any damage or leaking by submerging in water and looking for any air bubbles. Replace if damaged.**

4. Install the fuel level sensor assembly onto the fuel pump assembly housing. Once inserted, press down to make sure it locks into place.



XR258

5. Shorten the wires from the fuel level sensor to approximately the same length as the previously used sensor.
6. Connect the blue wires using the supplied splice connectors from the fuel level sensor kit. Secure the wires.



XM450

## 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.

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 and fuel hose; 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.

## TIILT SENSOR

The tilt sensor is located below the taillight.

### WARNING

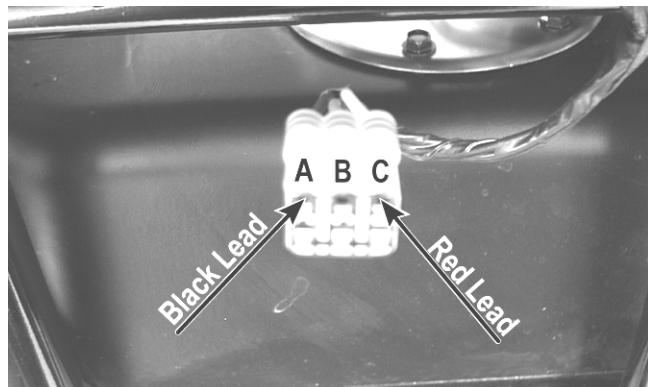
Incorrect installation of the tilt sensor could cause sudden loss of engine power which could result in loss of vehicle control resulting in injury or death.

### CAUTION

Do not drop the tilt sensor as shock can damage the internal mechanism.

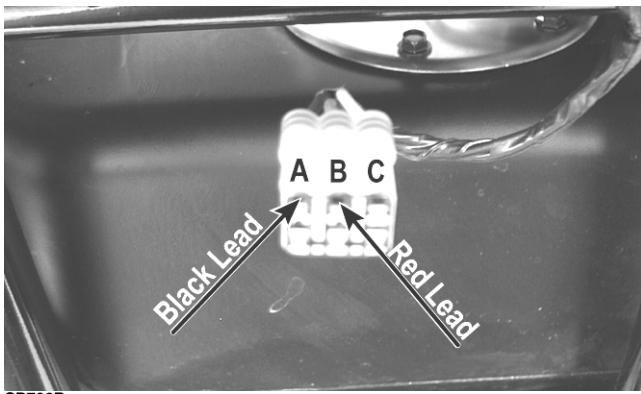
## Supply Voltage

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).



CD706A

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.

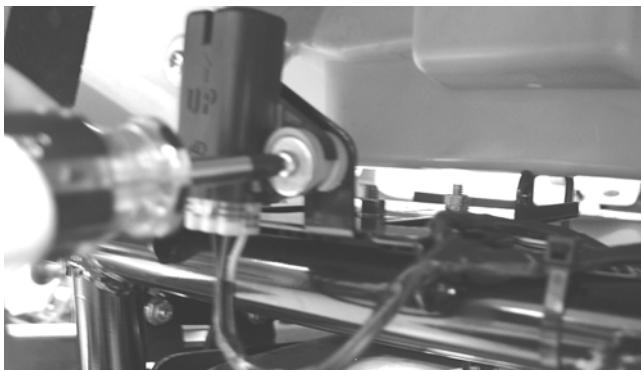


CD706B

### Output Voltage

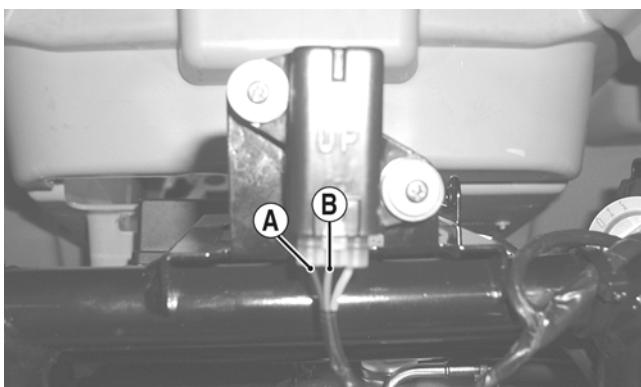
■NOTE: Needle adapters, Maxi-Clips or a “break-out” harness will be required on the multimeter leads as the following tests are made with the sensor connected.

1. Connect the three-wire plug to the sensor; then remove the right-side mounting screw securing the sensor to the rear frame.



CD707

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.



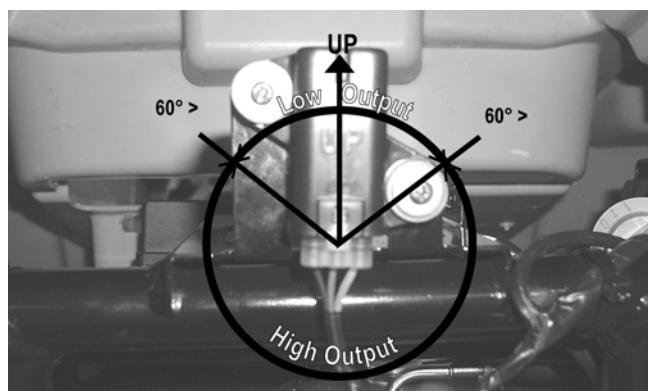
CD705B

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.



CD709

■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.

#### 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. 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.



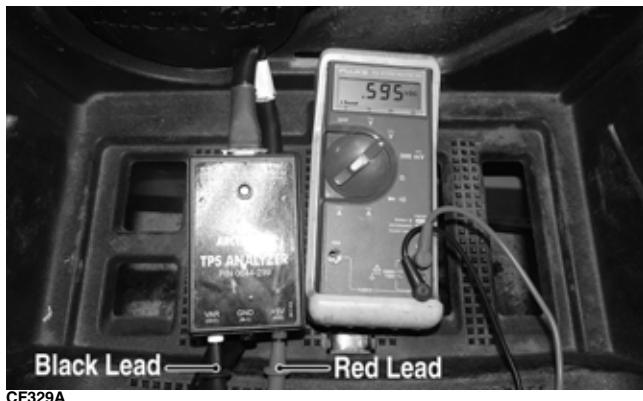
■**NOTE:** Prior to testing the TPS, inspect the three-wire plug connector on the main harness and the three-pin plug on the TPS for contamination, broken pins, and/or corrosion.

■**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.



4. Connect the black test lead to the (VAR) and the red test lead into the (+5V) sockets on the analyzer. Select the DC Voltage position on the multimeter. With the vehicle off and the throttle plate fully closed, the gauge should read 0.58-0.62 DC volts and at Wide-Open Throttle it should read up to approximately 3.7 DC volts.



### 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.

Gear	Park	Neutral	Reverse	High/Low	Fail-Safe Mode
2WD	2250	6500	4000	7250 (700)	4000
4WD					
4WD Lock					
2WD Override			5000 (700)		
4WD Override			7000		
Differential-Lock Override					

## 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.

## 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.

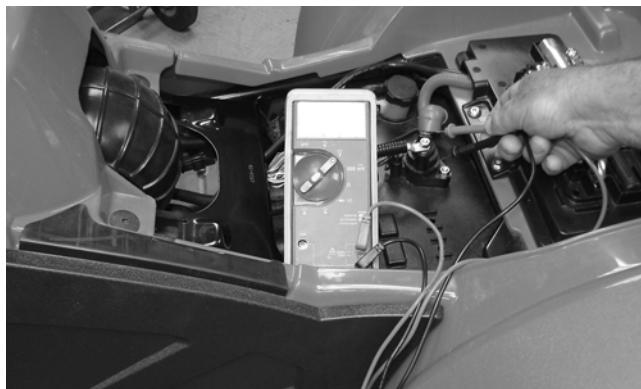
2. Remove the nut securing the positive cable to the starter motor; then remove the cable from the starter motor.
3. Remove the two cap screws securing the starter motor to the crankcase; then remove the starter motor. Account for the wiring forms and an O-ring.

## 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).

## 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.

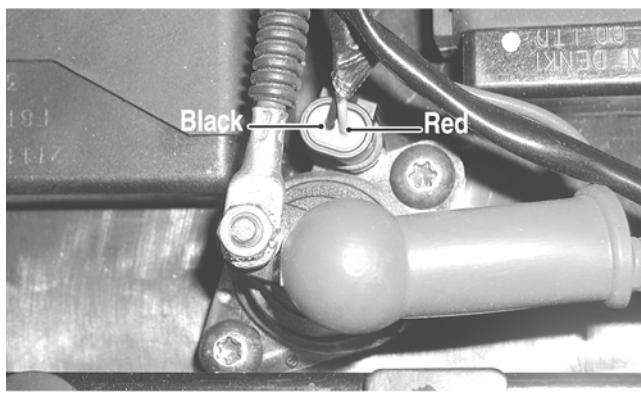


■**NOTE:** Make sure that the ignition switch is in the ON position, transmission in neutral, brake lock released, and the engine stop switch in the RUN position.

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.

■**NOTE:** If a "click" is heard and more than 1 volt is indicated by the multimeter, replace the starter relay. If no "click" is heard and the multimeter continues to indicate battery voltage, proceed to step 4.

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.



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.

## Electronic Control Module (ECM)

The electronic control module (ECM) is located beneath the seat near the battery.

■**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.

## Indicator Display



Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

### Master Warning Light

The Master Warning Indicator light located on the indicator display will illuminate and/or show a sequence of flashes to indicate a malfunction. The sequence of flash codes will continue until the malfunction is corrected and the code cleared.



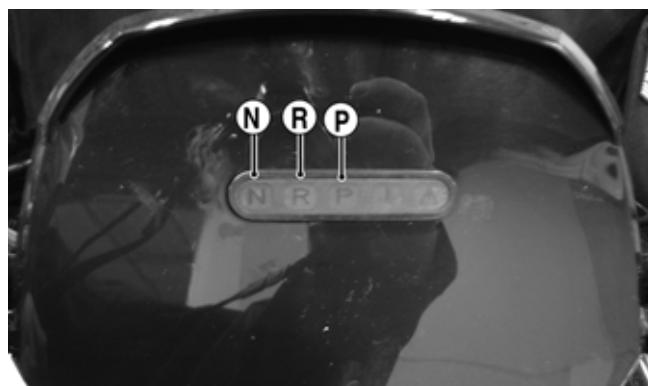
CF714B

If the Master Warning Light illuminates a flash sequence of one second ON and one second OFF, a tip-over has been detected or there are multiple system malfunctions. If a tip-over has not occurred, use the CATT II diagnostic tool to determine the specific malfunction/s.

To clear a flash sequence if a tip-over has occurred, move the ATV to an upright position; then turn the key switch to the OFF position for 30 seconds then back to the ON position. If a malfunction persists, see Tilt Sensor.

### Gear Position Lights

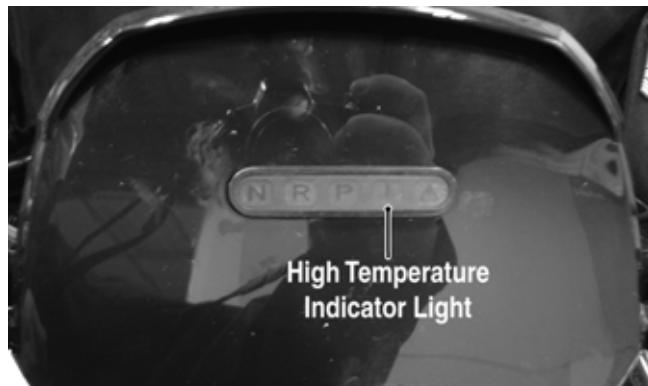
If all three gear position lights (N), (R), and (P) flash a sequence of one second ON, one second OFF, the gear position sensor/wiring is faulty or disconnected. See Gear Position Switch.



CF714D

■**NOTE:** During normal operation, no indicator display lights will illuminate when the gear shift lever is set to the HIGH or LOW gear positions. (N), (R), and (P) will illuminate ~~—~~ individually when the gear shift lever is set to those respective positions.

### High Temperature Indicator Light



CF714E

The High Temperature Indicator Light illuminates (continuously ON) when the engine has reached a temperature of 230°F (110°C). This light will not be visible during normal operation.

The thermostat opening temperature is approximately 146° F (63° C). Fan ON @ 185° F, OFF @ 176° F.

## EFI Diagnostic System



Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

## 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. These codes can be retrieved by using the CATT II advanced tool.

### 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 Indicator Panel 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*
C1400	Fuel Level Sensor Circuit Open	Sensor or interconnect harness open or intermittent	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**
P0480	Fan-Primary/Right Relay Control Circuit	Relay erratic or intermittent	Correct condition*
P0481	Fan-Secondary/Left Relay Control Circuit High	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*

Code	Fault Description	Possible Cause	Fault Recovery Method
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*
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*
P0630	VIN Not Programmed or Incompatible	Verify the Indicator Display and ECM part numbers are correct for the vehicle model number and VIN	Correct Indicator Display 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	Indicator Display to EFI ECM CAN Communication Lost	Indicator Display 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 2. Spark plug defective 3. Magneto defective 4. ECM defective 5. Pick-up coil defective	1. Replace ignition coil 2. Replace plug 3. Replace stator coil 4. Replace ECM 5. Replace stator coil
Problem: Spark plug fouled with carbon	
Condition	Remedy
1. Gasoline incorrect 2. Air cleaner element dirty 3. Spark plug incorrect (too cold) 4. Valve seals cracked - missing 5. Oil rings worn - broken	1. Change to correct gasoline 2. Clean element 3. Replace plug 4. Replace seals 5. Replace rings
Problem: Spark plug electrodes overheat or burn	
Condition	Remedy
1. Spark plug incorrect (too hot) 2. Engine overheats 3. Spark plug loose	1. Replace plug 2. Service cooling system 3. Tighten plug
Problem: Battery does not charge	
Condition	Remedy
1. Lead wires/connections shorted - loose - open 2. Magneto coils shorted - grounded - open 3. Regulator/rectifier defective	1. Repair - replace - tighten lead wires 2. Replace magneto coils 3. Replace regulator/rectifier
Problem: Battery charges, but charging rate is below the specification	
Condition	Remedy
1. Lead wires shorted - open - loose (at terminals) 2. Stator coil (magneto) grounded - open 3. Regulator/rectifier defective 4. Cell plates (battery) defective	1. Repair - tighten lead wires 2. Replace stator coil 3. Replace regulator/rectifier 4. Replace battery
Problem: Battery overcharges	
Condition	Remedy
1. Internal battery short circuited 2. Regulator/rectifier resistor damaged - defective 3. Regulator/rectifier poorly grounded	1. Replace battery 2. Replace resistor 3. Clean - tighten ground connection
Problem: Charging unstable	
Condition	Remedy
1. Lead wire intermittently shorting 2. Magneto internally shorted 3. Regulator/rectifier defective	1. Replace lead wire 2. Replace stator coil 3. Replace regulator/rectifier
Problem: Starter button not effective	
Condition	Remedy
1. Battery charge low 2. Switch contacts defective 3. Starter relay defective 4. Emergency stop - ignition switch off 5. Wiring connections loose - disconnected	1. Charge - replace battery 2. Replace switch 3. Replace relay 4. Turn on switches 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 2. Battery run-down - damaged 3. Electrolyte contaminated	1. Replace battery 2. Replace battery 3. Replace battery
Problem: Battery discharges too rapidly	
Condition	Remedy
1. Charging system not charging 2. Cell plates overcharged - damaged 3. Battery short-circuited 4. Electrolyte contaminated	1. Check magneto - regulator/rectifier - circuit connections 2. Replace battery - correct charging system 3. Replace battery 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 Service Department.

## Front Differential

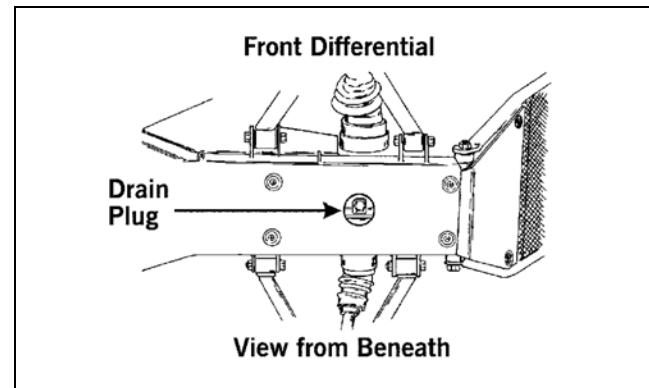
### REMOVING DIFFERENTIAL

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

#### ⚠ WARNING

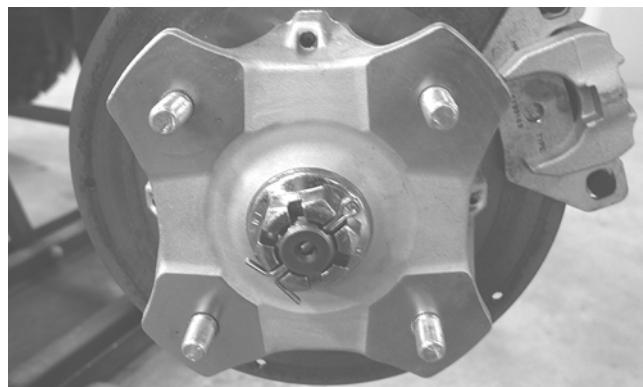
Make sure the ATV is solidly supported on the support stand to avoid injury.

2. Remove the drain plug and drain the gear lubricant into a drain pan; then reinstall the plug and tighten to 45 in.-lb.



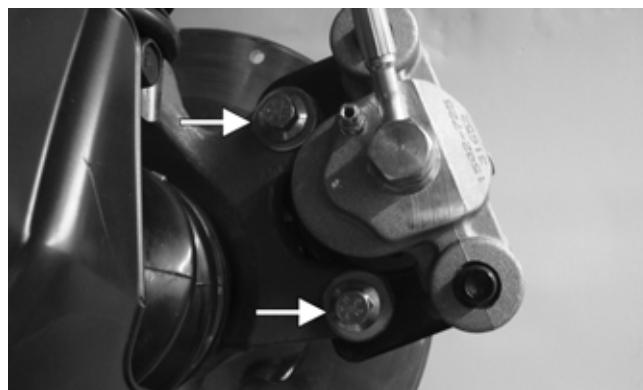
ATV0082A

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.



KX041

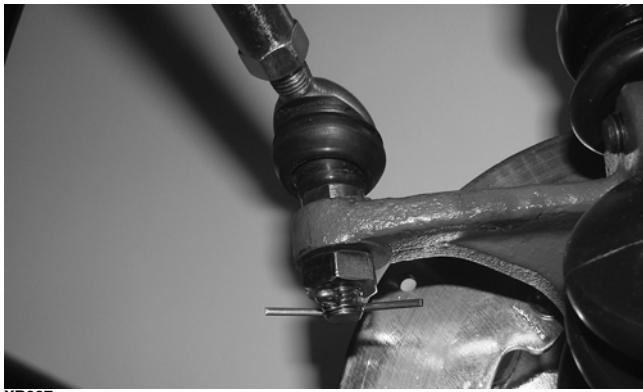
6. Release the brake lever lock.
- NOTE:** It is not necessary to remove the brake hoses from the calipers for this procedure.
7. Remove the two brake calipers. Account for the four cap screws.



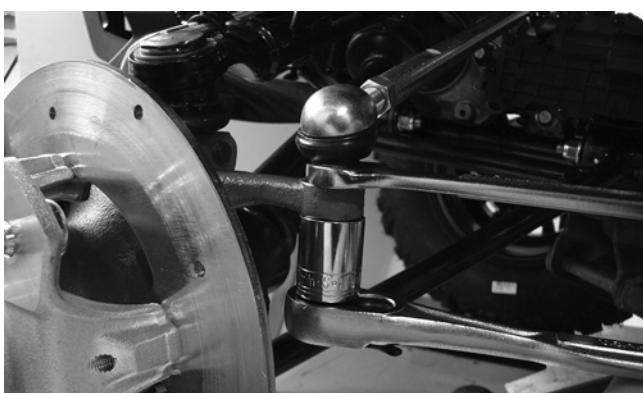
XR263A

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

8. Remove the tie rod cotter pins and discard the pins.



9. Remove the tie rod lock nuts.



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.



11. Pull the steering knuckle away from the axle.

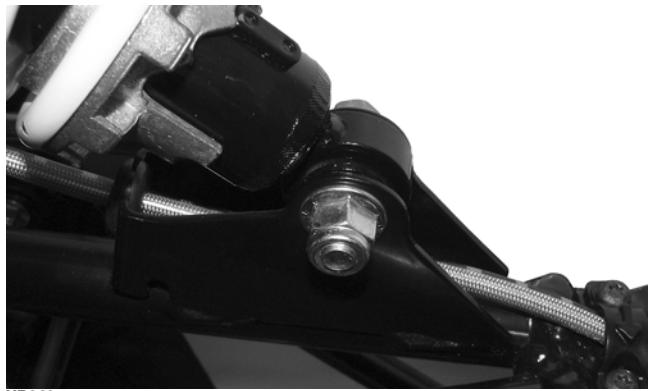


12. Support the axle to not allow it to drop or hang.

#### 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.



14. Remove the upper A-arm lock nuts and cap screws; then remove the A-arms.

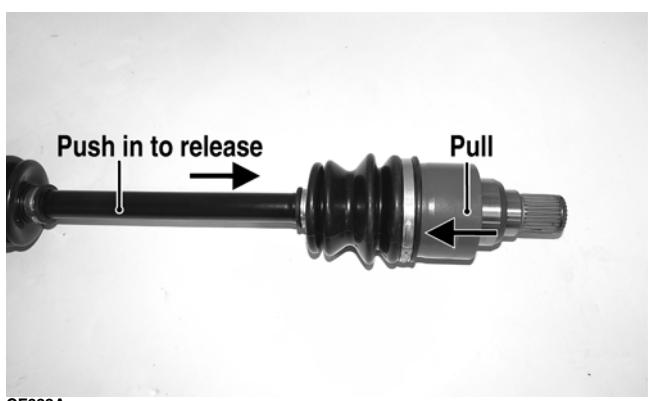


15. Push the axle shaft firmly toward the differential to release the internal lock; then while holding the axle in, pull the CV cup from the differential.

■**NOTE: Keeping the axle level will aid in removal.**

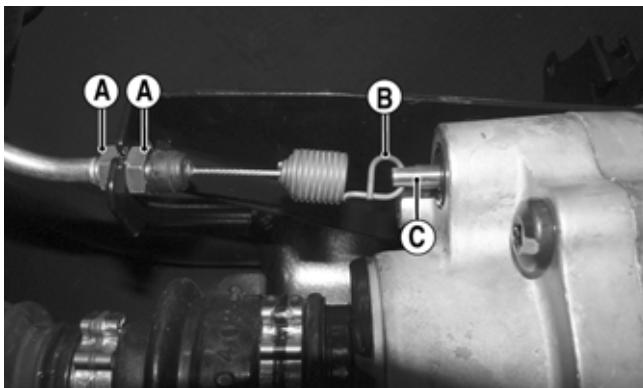
#### CAUTION

**Do not attempt to use a slide hammer or differential/axle damage will occur.**

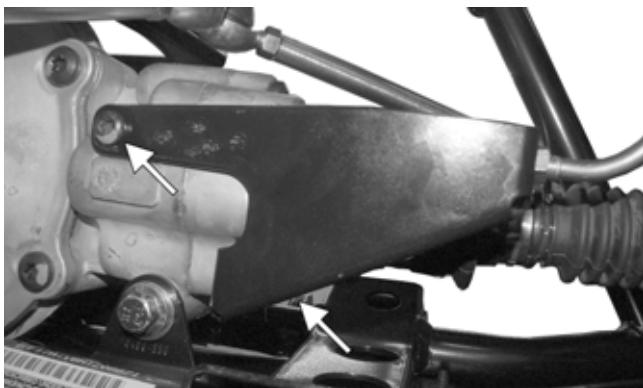


16. Loosen the two jam nuts (A) securing the four wheel drive selector cable housing to the bracket. Remove the four wheel drive tensioner spring (B) from the selector shaft (C).

■**NOTE:** Record the set length of the four wheel drive cable housing for assembly purposes.



17. Remove the two cap screws securing the four wheel drive cable bracket to the front differential.



18. Release the two front output shaft boot clamps.



19. Free the differential assembly from the frame; then shift the differential assembly forward enough to disengage the front driveshaft from the output yoke.



20. Place the differential on its right side; then remove it from the frame.

### Disassembling Input Shaft

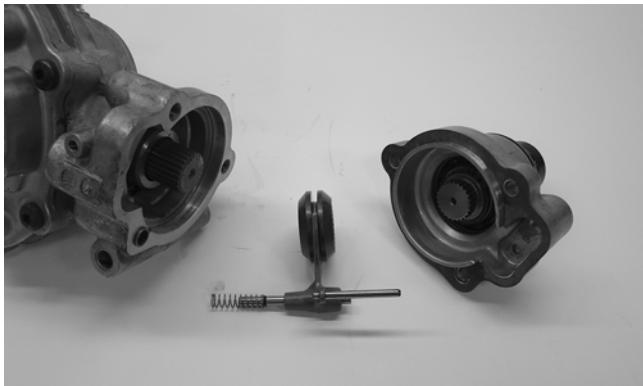
■**NOTE:** This procedure can be performed on a rear gear case; however, some components may vary from model to model. The technician should use discretion and sound judgment.

1. Using a T-40 torx wrench, remove the cap screws securing the pinion housing.



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.





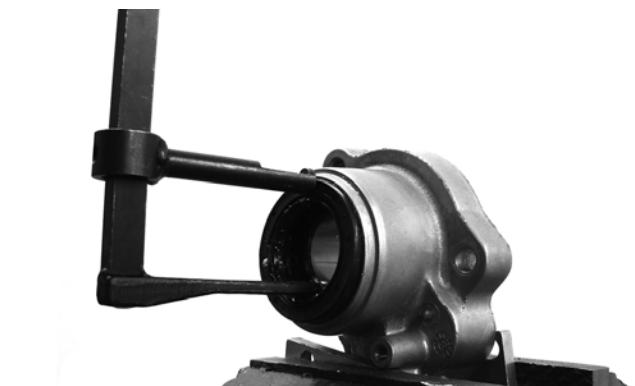
XR348

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.



XR349

5. Using a seal removal tool, remove the input shaft seal. Account for a spacer.

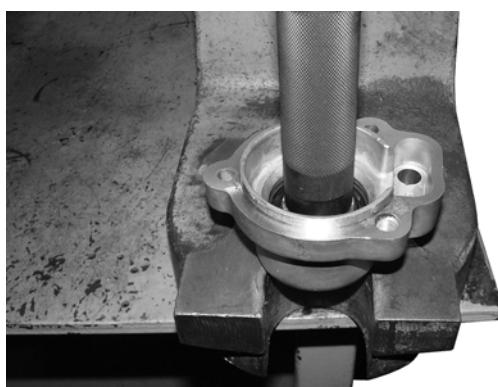


GC010

6. Remove the snap ring securing the input shaft bearing; then place the pinion housing in a press and remove the bearing.



GC011



XR350



XR351

### 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

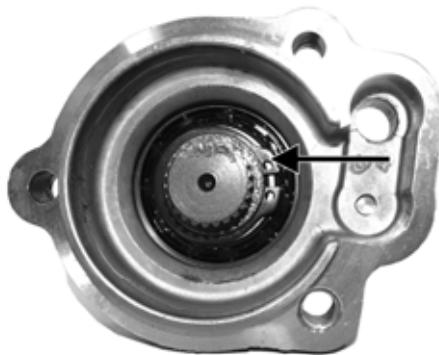
2. Install the input shaft seal making sure it is fully seated in the housing.



GC014

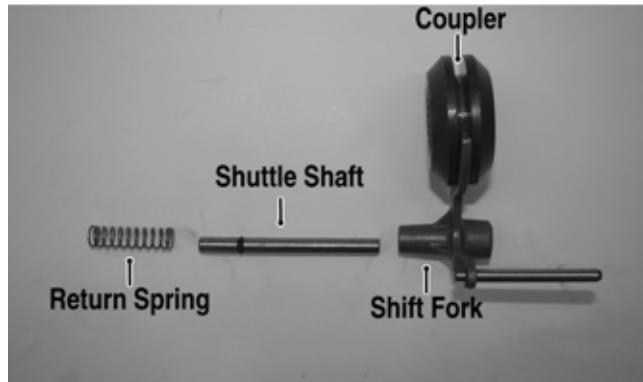
3. Lubricate the input shaft with High-Performance #2 Molybdenum Disulfide Grease packing the boot ribs and splines; then assemble allowing excess grease to freely escape. Slight pressure on the boot will be present during assembly. Secure with new clamps. Grease the pinion housing seal; then install the input shaft into the pinion housing and secure with the snap ring.

**■NOTE: Any time drive splines are separated, clean all splines with parts-cleaning solvent and dry with compressed air; then lubricate with recommended grease.**

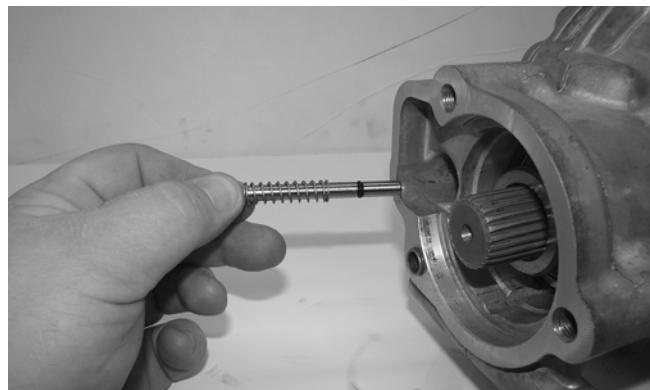


GC009A

4. With the return spring over the shuttle shaft, place the shuttle shaft with O-ring into the differential housing.

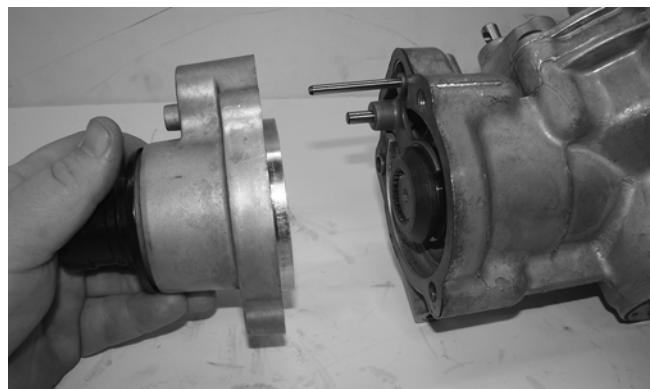


XR352A



XR354

5. Place the dowel pin into the differential housing; then install a new gasket. Place the coupler onto the shift fork; then simultaneously engage the shift fork to the shuttle shaft and the internal splines of the coupler to the splines of the pinion gear shaft.



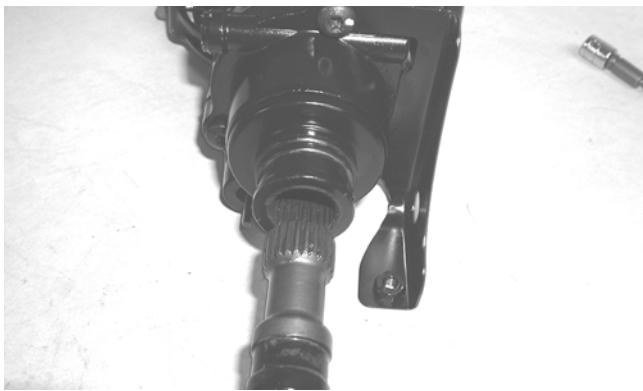
XR353

6. Align the splines of the output shaft to the internal splines of the coupler; then place the pinion housing onto the differential housing. If applicable, place the drive actuator bracket into position, secure the assembly with three cap screws and tighten to 23 ft-lb (existing) or 28 ft-lb (new differential housing).



XR347

7. Install the input shaft into the pinion housing; then install the front boot and secure with the appropriate boot clamps and then the rear boot.



CD112

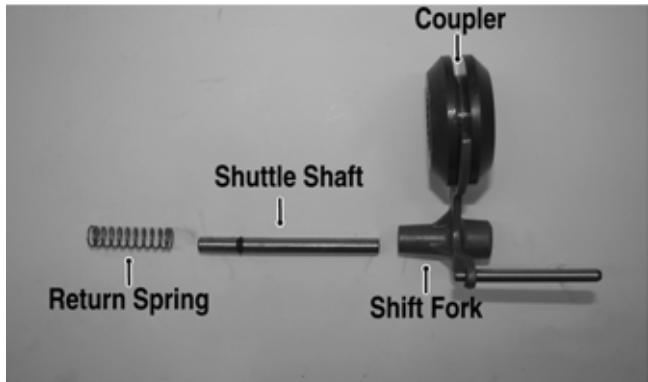


CF739

### Disassembling Differential Assembly

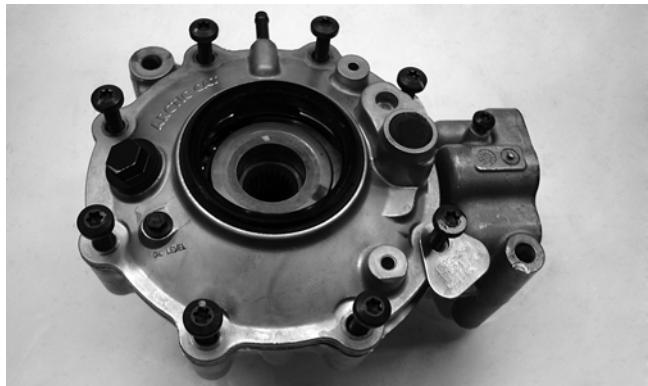
■**NOTE:** This procedure can be performed on a rear gear case.

1. Using a T-40 torx wrench, remove the cap screws securing the pinion housing. Account for the coupler, fork, shuttle shaft with O-ring, and spring (differential only).



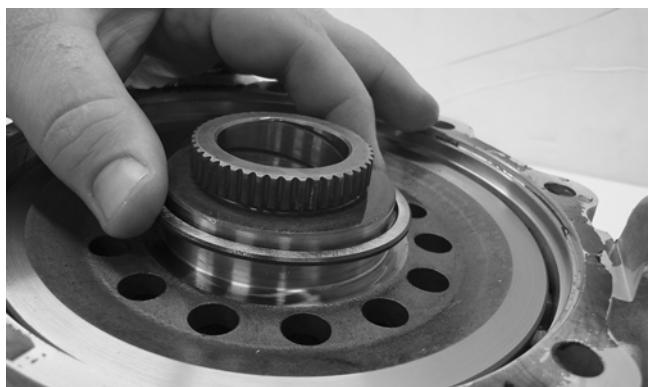
XR352A

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. Once removed, account for a shim. Mark the shim as left-side.



GC054A

■**NOTE:** If the cover is difficult to remove, pry on the cover in more than one recessed location.



XR357

4. 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.



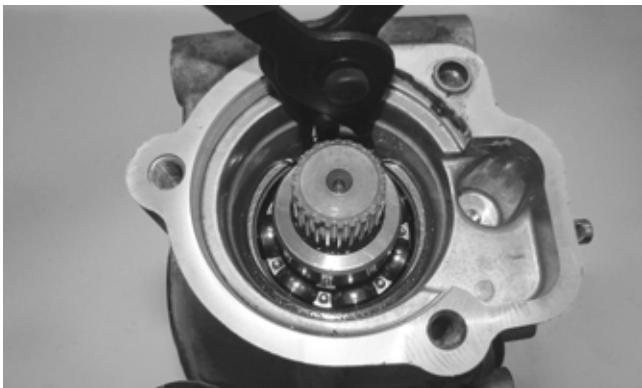
XR358



KX181

### Disassembling Pinion Gear

1. Remove the internal snap ring securing the pinion bearing in the housing.



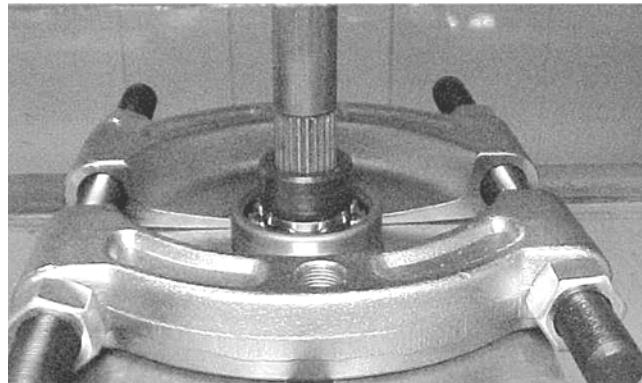
WC430

2. Using the Pinion Gear/Shaft Removal Tool and hammer, remove the pinion gear from the gear case housing.



XR359

3. Secure the pinion gear in a bearing puller; then remove the pinion bearing using a press. Account for a collar and a bearing.

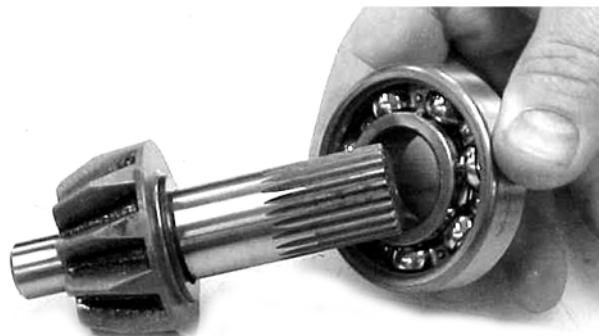


CC879

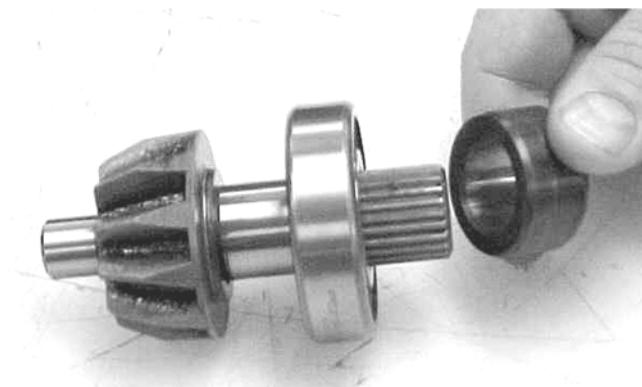
4. Remove any reusable parts from the gear case housing; then discard the housing and lock collar.

### Assembling Pinion Gear

1. Install the bearing onto the pinion shaft. Install the pinion shaft collar.

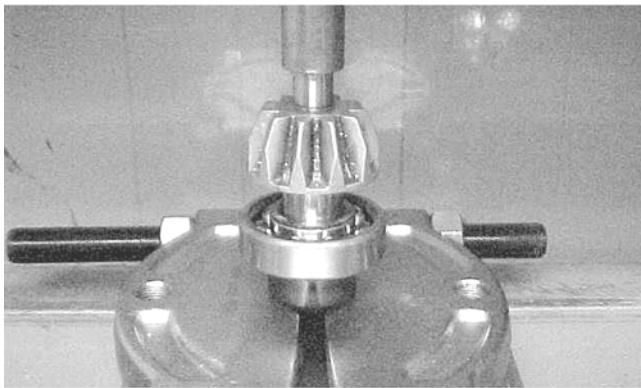


CC882



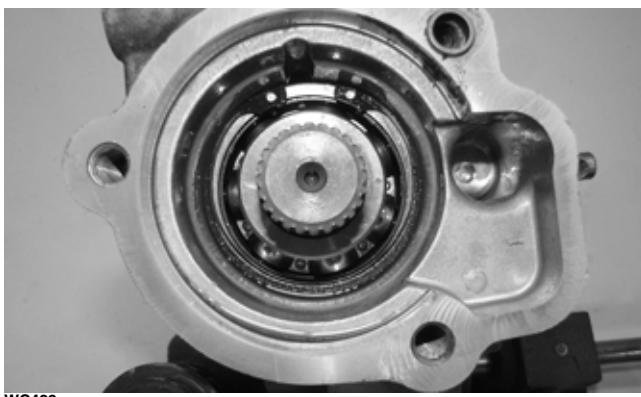
CC883

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.



### 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.



GC036A

3. 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.

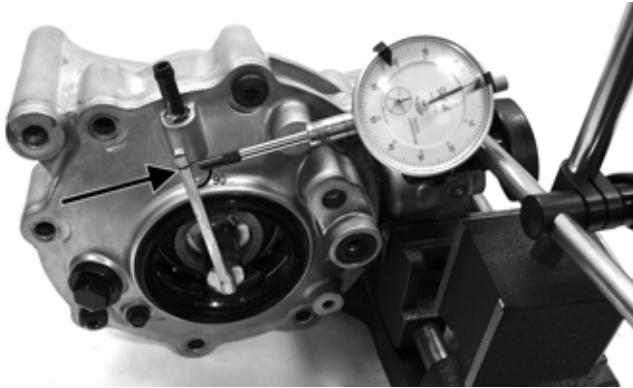


GC036B

4. 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.



GC040



GC039A

5. 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.

1. 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

2. Zero the dial indicator; then push the ring gear toward the dial indicator and release. End-play should be 0.004-0.008 in.
3. 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).

### Assembling Differential Assembly

1. 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

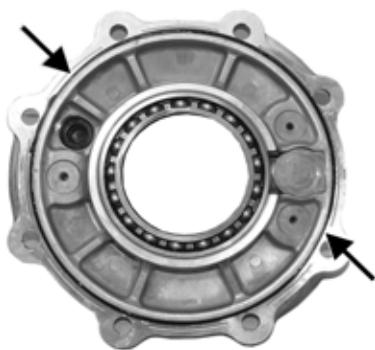
2. Place the selected (end-play) shim, chamfered side toward the gear, onto the cover side of the ring gear.



GC036B

■**NOTE:** The spider and ring gear assembly must be replaced as a complete unit.

3. 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 inner cover.



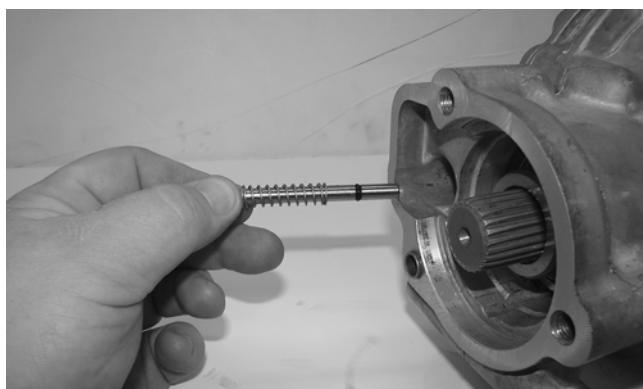
GC075B

4. Making sure the O-ring is properly positioned on the differential housing cover assembly, install the cover with existing cap screws. Tighten the cap screws evenly to 23 ft-lb.

■**NOTE:** Grease can be applied to the O-ring for ease of assembling.

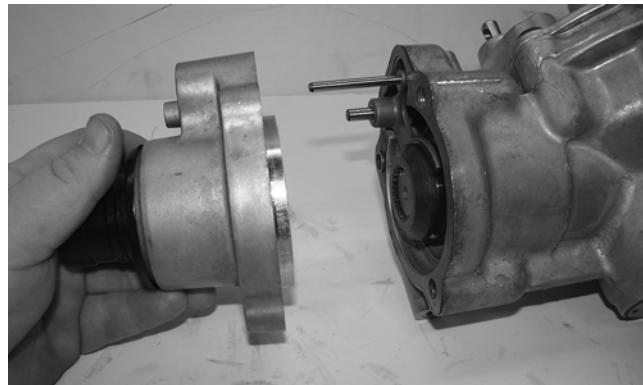
■**NOTE:** If a new housing is being installed, tighten the cap screws to 28 ft-lb.

5. Install the shift fork shaft w/spring into the housing making sure the shaft O-ring is positioned to the inside.



XR354

6. 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.



XR353

7. Place the input shaft assembly onto the gear case housing; then with the actuator bracket in place, 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.

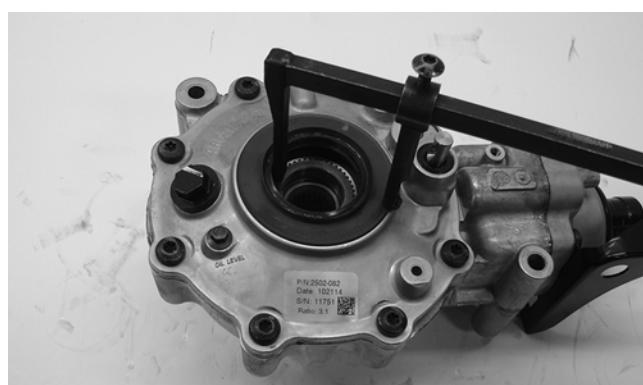


XR347

### Removing/Installing Axle Seal

■**NOTE:** This procedure can be performed on a rear gear case.

1. Remove the seal using a seal removal tool.



XR360

■**NOTE:** Prior to installing the seal, apply High-Performance #2 Molybdenum Disulfide 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.

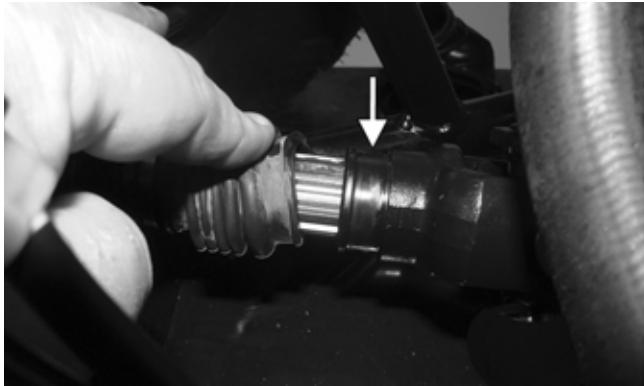
### INSTALLING DIFFERENTIAL

1. Place the tension spring into the front yoke; then align the splined input yoke (splines greased with molybdenum grease) with the front output splines. Place the differential into position on the frame and install the cap screws, washers, and new lock nuts. Tighten to 38 ft-lb.



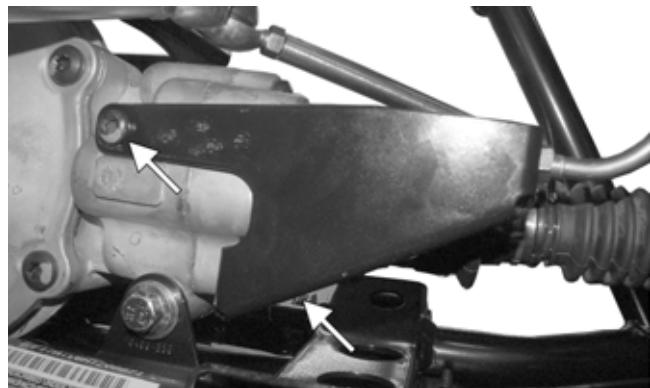
CD857

2. Make sure the rubber boot is properly seated on the input yoke.



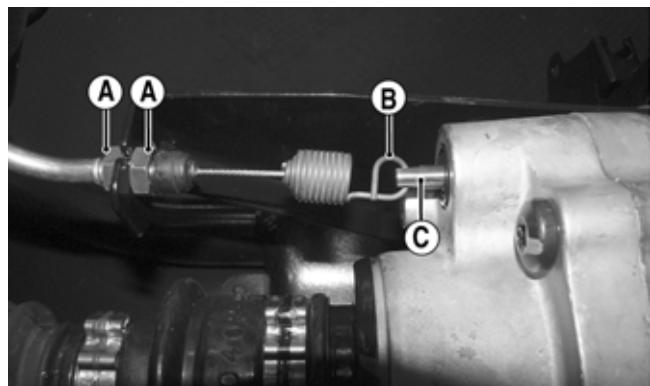
XR361A

3. Pour 189 ml (6.7 fl oz) of SAE 80W-90 hypoid gear lubricant into the differential and install the fill plug. Tighten to 16 ft-lb.
4. Secure the 2WD/4WD cable bracket to the front differential.



CF737A

5. Pull the rubber seal off the end of the cable housing then un-thread the very next jam nut off the end of the cable housing. Slide the cable through the slot on top of the bracket then insert the threaded section of the cable housing into the bracket. Adjust the two jam nuts (A) to the pre-recorded set position, then position the rubber seal onto the housing. Install the tensioner spring (B) to the eyelet on the end of the selector shaft (C).



CF738A

6. Install the front axles (see Drive Axles in this section).
7. Secure the upper A-arms with cap screws and lock nuts. Tighten to 50 ft-lb.



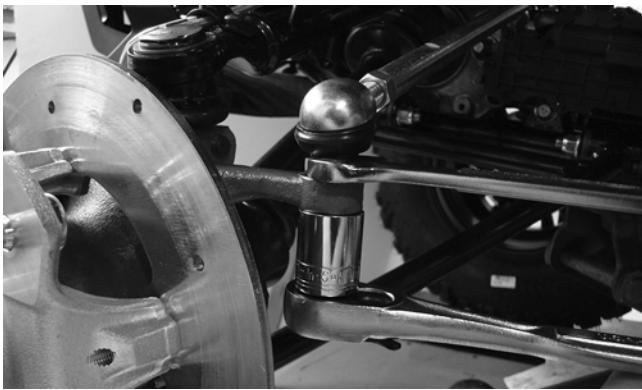
CF661

8. Secure the lower shock eyelets with cap screws and lock nuts. Tighten to 50 ft-lb.

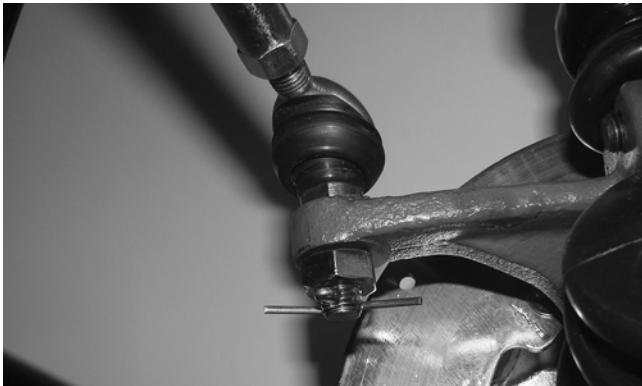


XR340

9. Secure the tie rods with the lock nuts. Tighten to 30 ft-lb; then install and spread the cotter pins.

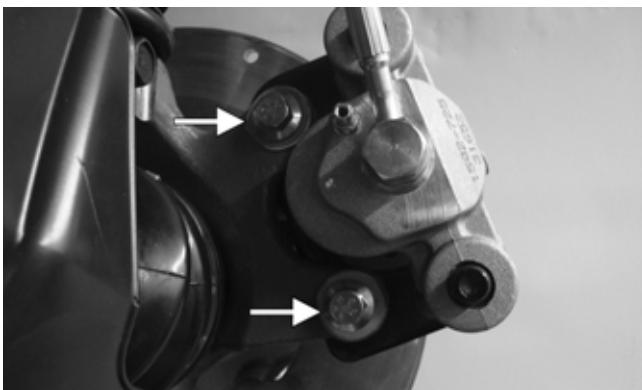


XR338



XR337

10. Install the brake calipers and secure with new "patch-lock" cap screws tightened to 20 ft-lb.



XR263A

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. Check the front differential for normal 2WD/4WD operation. If adjustment is necessary recheck the set length at the cable housing bracket, then adjust the screw and lock-nut located on the shift lever.



CF740

13. Remove the ATV from the support stand.

## Drive Axles

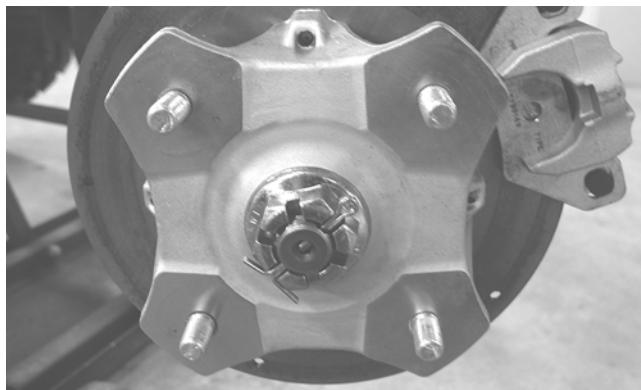
### REMOVING REAR DRIVE AXLE

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.

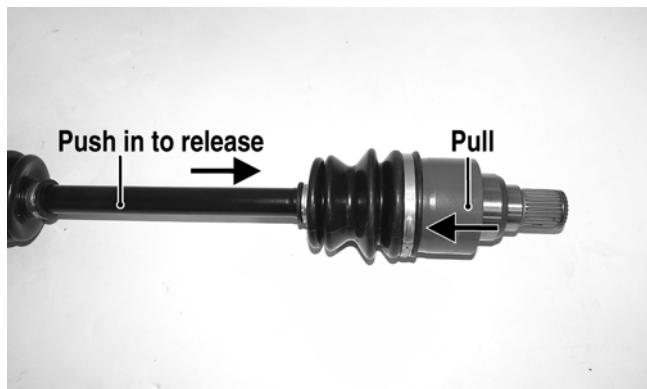
■**NOTE:** Never reuse a lock nut. Once a lock nut has been removed, it must be replaced with a new lock nut.

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.



CF633A

## 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. Using soft jaws or a strip of rubber around the outer diameter of the CV joint, place the in-board side CV joint into a vise.



CF638

3. To disengage the axle from the CV joint, sharply pull back on the axle; then slide the boot off of the axle.



CF637

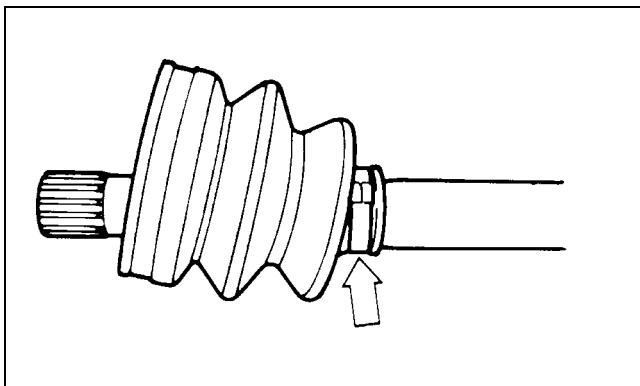
■**NOTE:** Steps 1-3 can be used to replace the outboard boot.

### ASSEMBLING AXLES

1. 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.

2. Using the boot clamp tool, secure the small clamp of the inner boot.



ATV-1048

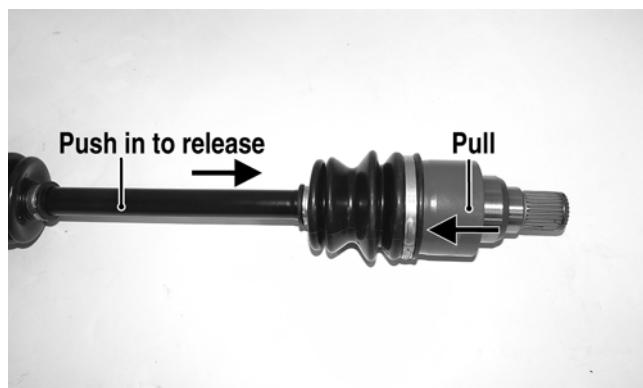
3. Apply 80 grams (2/3 of contents) of grease from the pack into the bearing housing.

■**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

1. 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.

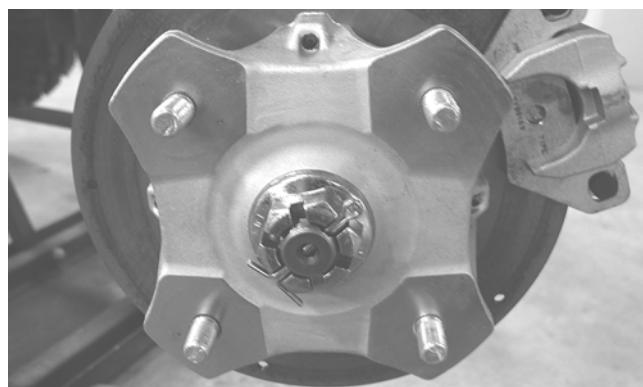


CF633A

■**NOTE:** To assure proper seating of the axle, give it a light pull; the axle should remain "clipped" in place.

2. 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.
3. Place the hub into position on the axle followed by a hex nut. Tighten the hex nut only until snug at this time.
4. If the brake calipers were removed, position them on the knuckle and secure with new "patch-lock" cap screws. Tighten to 20 ft-lb.
5. Pump up the hand brake lever; then engage the brake lever lock.
6. 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.



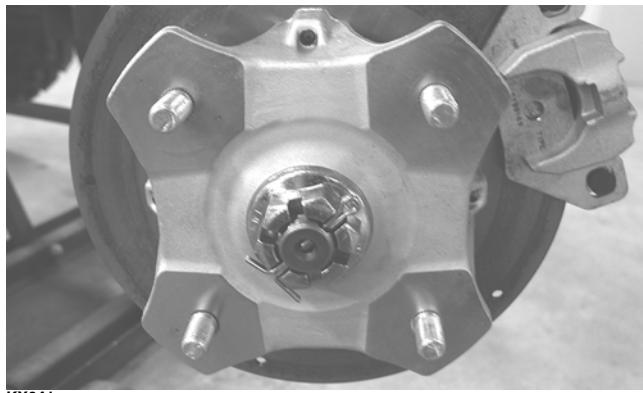
KX041

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.

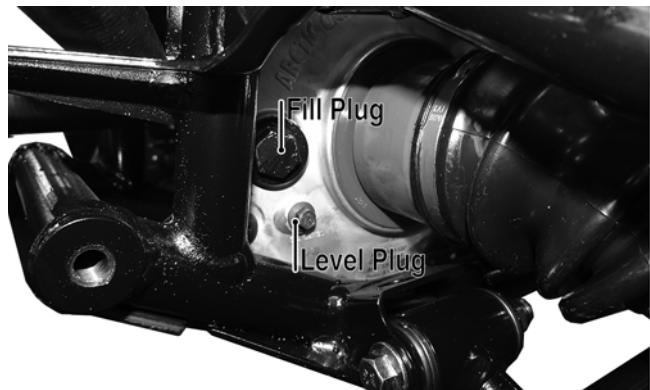
## INSTALLING FRONT DRIVE AXLE

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.**



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.

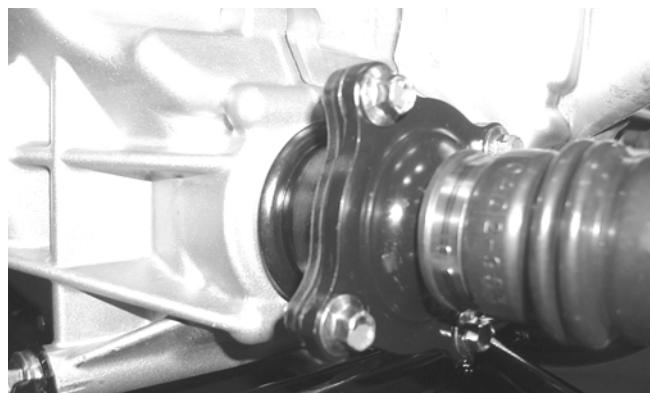


## Rear Gear Case

**■NOTE: To check/adjust backlash and end-play see Front Differential in this section.**

### 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.



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.



XR435A

### 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

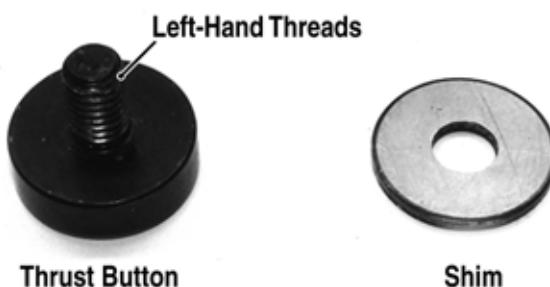
1. Inspect the ring gear for excessive wear, missing or chipped teeth, or discoloration.
2. Inspect the thrust button for excessive wear or discoloration.
3. Inspect the bearings for discoloration, roughness, or excessive wear.

■NOTE: For servicing bearings or seals, see Front Differential in this section.

### Installing/Shimming

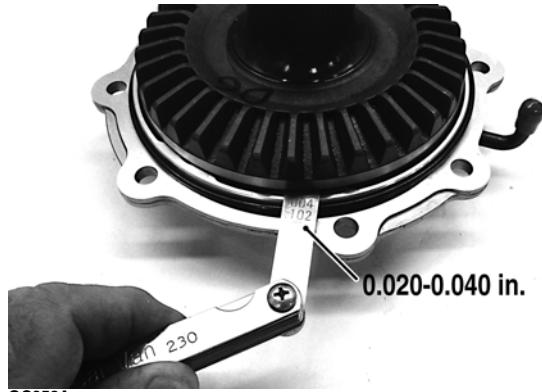
■NOTE: Ring gear clearance must be adjusted prior to selecting shim for the thrust button.

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

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.

## 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.

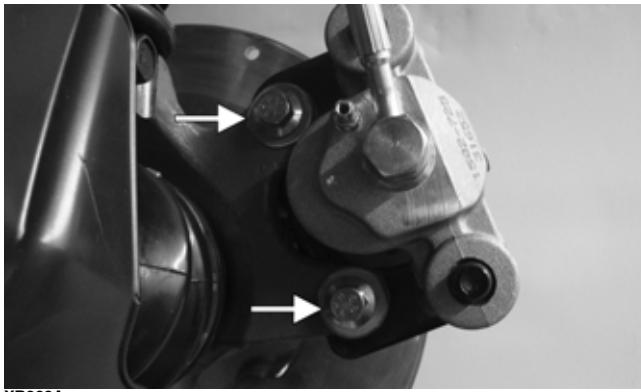
2. Remove the cotter pin from the nut.

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



XR291

3. Remove the nut securing the hub.
4. Remove the brake caliper.



■**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

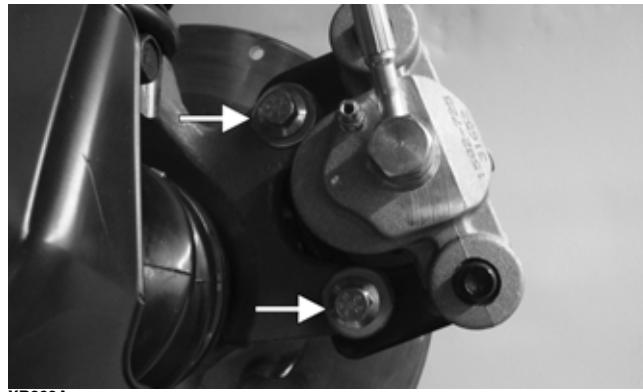
1. Clean all hub components.
2. Inspect all threads for stripping or damage.
3. Inspect the brake disc for cracks or warping.
4. Inspect the hub for pits, cracks, loose studs, or spline wear.

### 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.

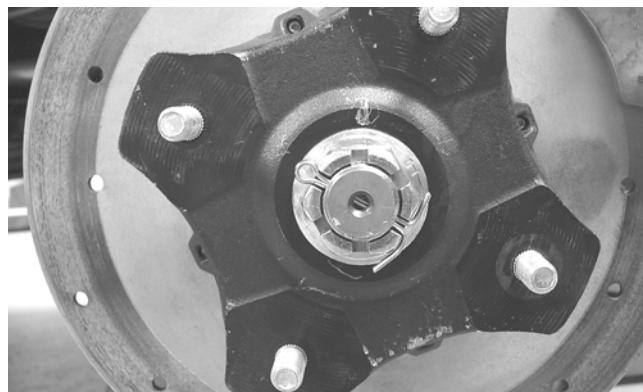


4. Secure the hub assembly with the hex nut. Tighten only until snug.
5. Secure the brake caliper to the knuckle with two new “patch-lock” cap screws. Tighten to 20 ft-lb.



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.**



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.

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## Hand Brake Lever/Master Cylinder Assembly

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■**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.

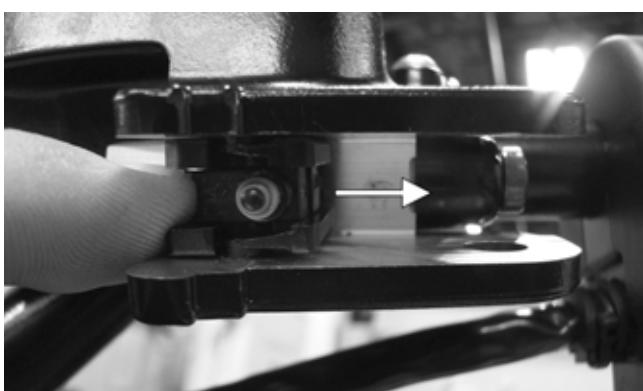


DE059A

### CAUTION

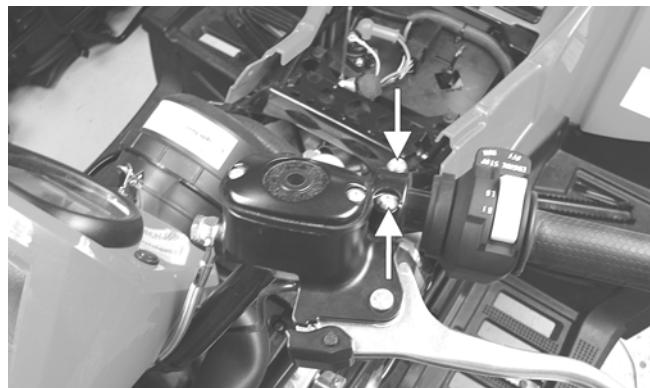
**Brake fluid is highly corrosive. Do not spill brake fluid on any surface of the ATV.**

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.



XR365A

5. Remove the clamp screws securing the brake housing to the handlebar; then remove the assembly from the handlebar.



DE058A

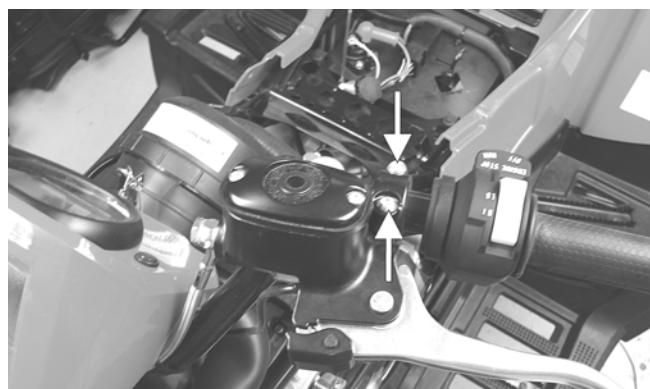
### INSPECTING

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.**

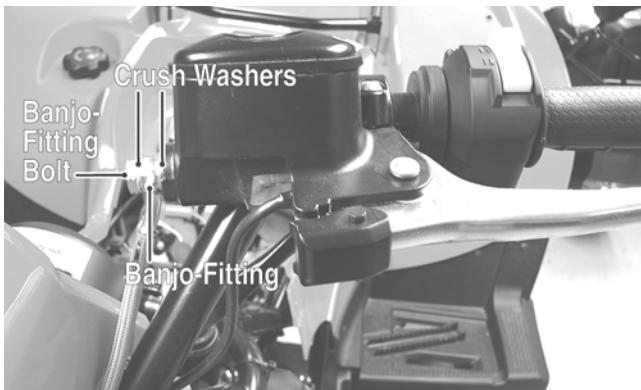
### INSTALLING

1. Position the brake housing on the handlebar. Secure with clamp screws; then tighten securely.



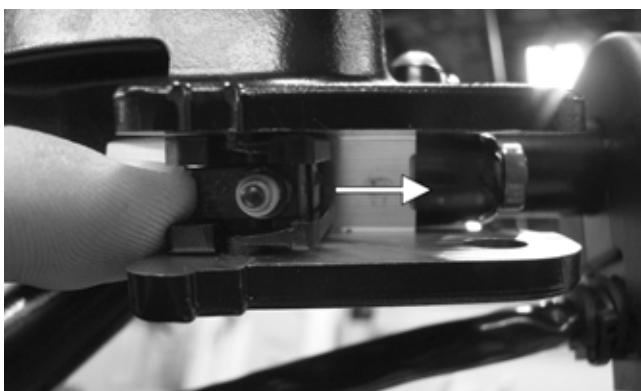
DE058A

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.



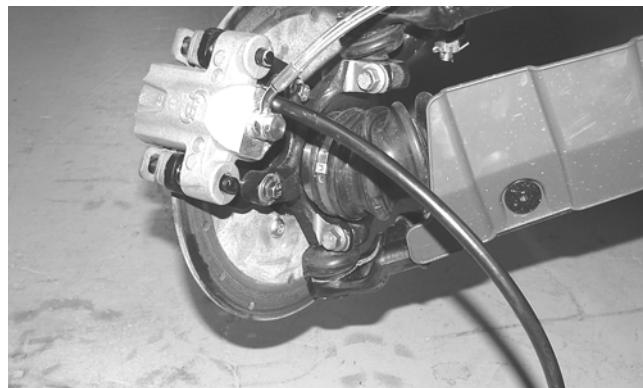
DE059A

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.



XR365A

4. Bleed the brake system (see Periodic Maintenance/Tune-Up).



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



PR238

## Hydraulic Brake Caliper

### ⚠ WARNING

Only authorized ATV dealers should 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

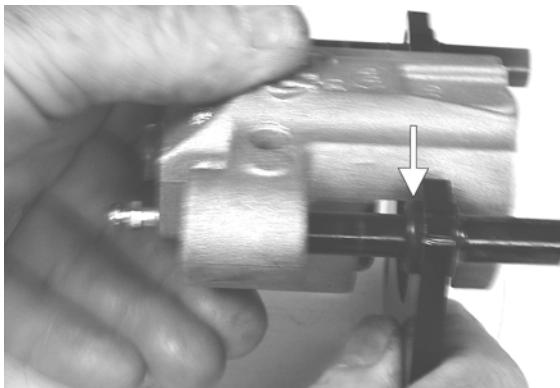
Make sure the ATV is solidly supported on the support stand to avoid injury.

### ⚠ 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.

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.



PR713A



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



PR717A

2. Press the piston into the caliper housing using hand pressure only. Completely seat the piston; then wipe off any excessive brake fluid.

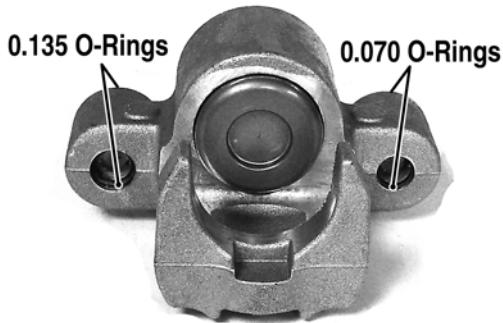


PR711A



PR712

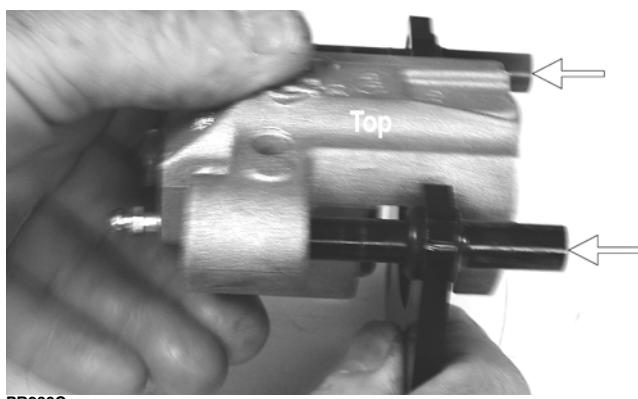
3. Apply high-temperature silicone grease (supplied with the O-ring kit) to the inside of the caliper holder bores and O-rings; then install the four O-rings into the caliper.



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.**



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.



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 2. <b>Propeller</b> shaft serration worn - broken 3. <b>Coupling</b> damaged 4. <b>Coupling joint</b> serration worn - damaged 5. <b>Front drive</b> - driven bevel gears broken - damaged 6. <b>Front differential</b> gears/pinions broken - damaged 7. <b>Sliding dogs/shaft fork</b> worn - damaged 8. <b>Front drive</b> axle worn - damaged 9. <b>Front drive</b> axle serration worn - damaged	1. Replace gear(s) 2. Replace shaft 3. Replace coupling 4. Replace joint 5. Replace gear(s) 6. Replace gears - pinions 7. Replace gear(s) 8. Replace axle 9. Replace axle

## Troubleshooting Brake System

### Problem: Braking poor

Condition	Remedy
1. <b>Pad</b> worn 2. <b>Pedal</b> free-play excessive 3. <b>Brake</b> fluid leaking 4. <b>Hydraulic</b> system spongy 5. <b>Master cylinder/brake cylinder</b> seal worn	1. Replace pads 2. Replace pads 3. Repair - replace hydraulic system component(s) 4. Bleed hydraulic system - correct or repair leaks 5. Replace master cylinder

### Problem: Brake lever travel excessive

Condition	Remedy
1. <b>Hydraulic</b> system entrapped air 2. <b>Brake</b> fluid low 3. <b>Brake</b> fluid incorrect 4. <b>Piston</b> seal - cup worn	1. Bleed hydraulic system 2. Add fluid to proper level 3. Drain system - replace with correct fluid 4. Replace master cylinder

### Problem: Brake fluid leaking

Condition	Remedy
1. <b>Connection</b> joints loose 2. <b>Hose</b> cracked 3. <b>Piston</b> seal worn	1. Tighten joint 2. Replace hose 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 Service Department.**

## Shock Absorbers

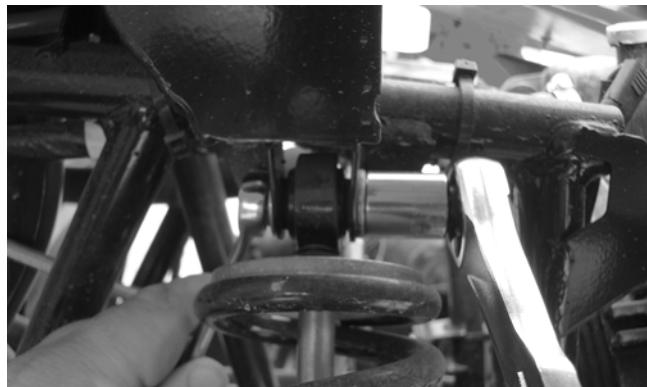
### REMOVING

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.



#### **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.



4. Using Spring Tool, compress the shock absorber spring, remove the retainer, and remove the spring.



### 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

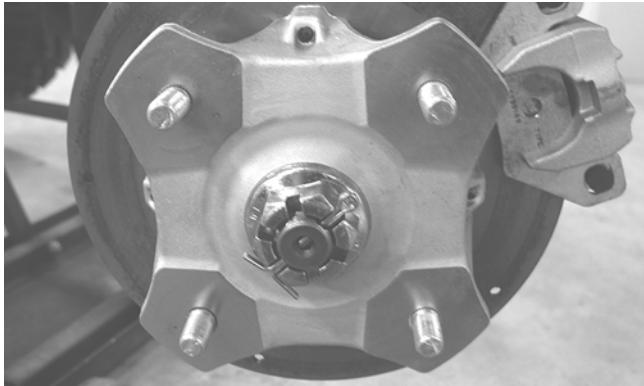
### REMOVING

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

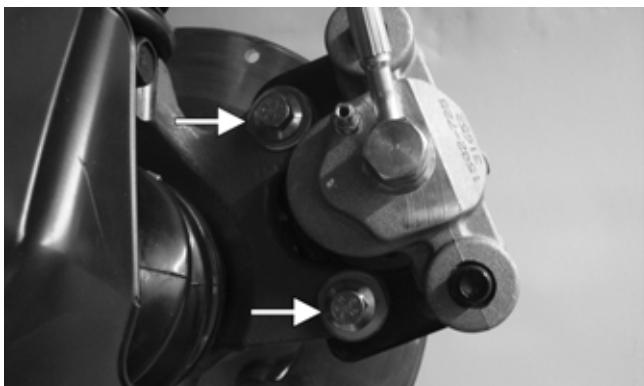
#### ⚠ WARNING

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.

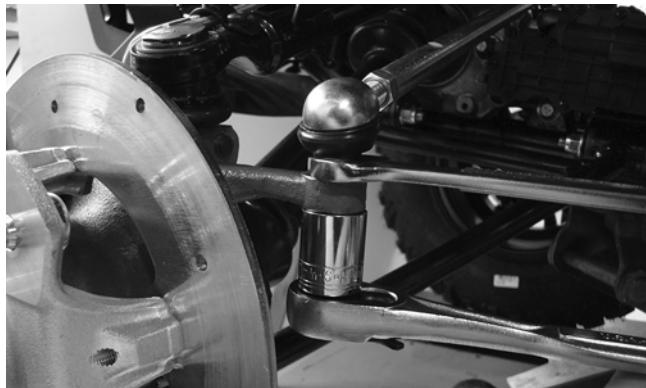


3. Remove the nut securing the hub.
4. Remove the brake caliper. Account for two cap screws.



■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.



XR368

## 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.

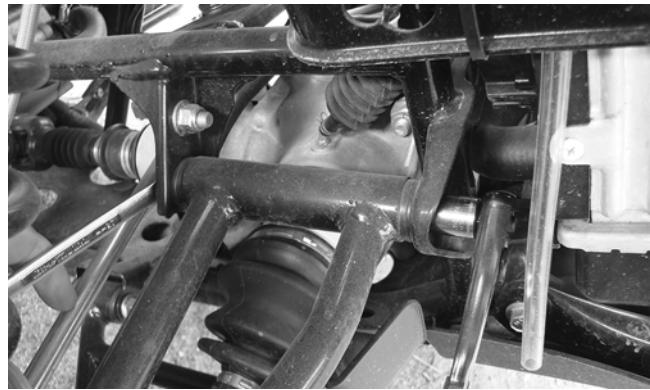
## INSTALLING

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.



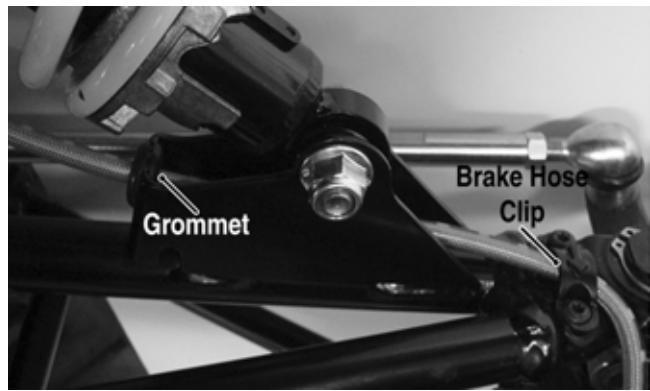
XR368

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 brake hose clip and grommet.



XR369A

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.**

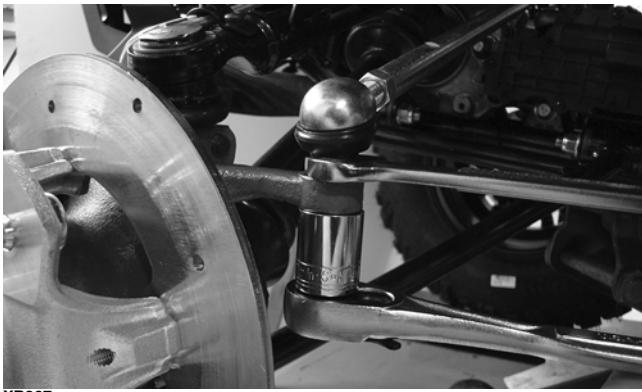
6. Install the knuckle assembly onto the ball joints and secure with cap screws. Tighten to 35 ft-lb.



XR339B

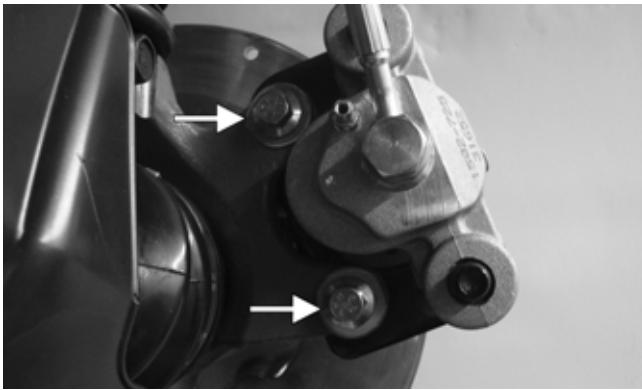
7. Install the tie rod end and secure with the nut. Tighten to 30 ft-lb; then install a new cotter pin and spread the pin to secure the nut.

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



XR367

8. Apply grease to the hub and drive axle splines; then install the hub assembly onto the drive axle.
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.



XR263A

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

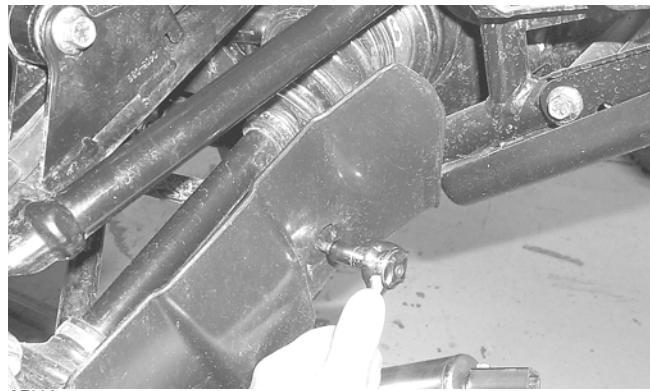
Make sure the ATV is solidly supported on the support stand to avoid injury.

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

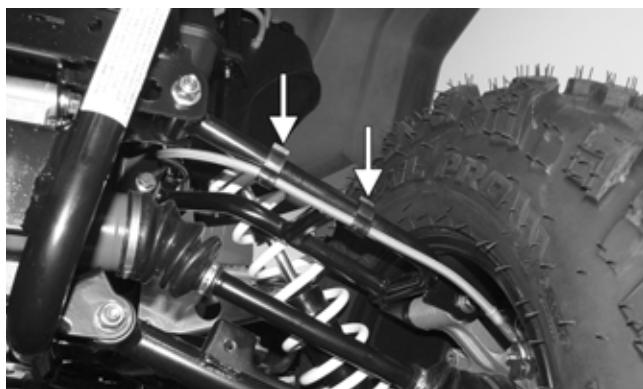
1. Install the A-arm assemblies into the frame and secure with the cap screws and new lock nuts. Only finger-tighten at this time.
2. Slide the knuckle onto the drive axle and into position on the A-arms; then secure the knuckle to the A-arms with cap screws and new lock nuts. Tighten to 35 ft-lb.
3. 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.**



XR412A

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 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 tire inflation pressure is 5.0 psi (34.5 kPa). Rear tire inflation pressure is 7.0 psi (48.3 kPa).

### 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; 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).

■**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

### Problem: Suspension too soft

Condition	Remedy
<ol style="list-style-type: none"> <li>1. <b>Spring(s)</b> weak</li> <li>2. <b>Shock absorber</b> damaged</li> <li>3. <b>Shock absorber</b> preload too low</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace spring(s)</li> <li>2. Replace shock absorber</li> <li>3. Adjust shock absorber preload</li> </ol>

### Problem: Suspension too stiff

Condition	Remedy
<ol style="list-style-type: none"> <li>1. <b>A-arm</b>-related bushings worn</li> <li>2. <b>Shock absorber</b> preload too high</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace bushing</li> <li>2. Adjust shock absorber preload</li> </ol>

### Problem: Suspension noisy

Condition	Remedy
<ol style="list-style-type: none"> <li>1. <b>Cap screws</b> (suspension system) loose</li> <li>2. <b>A-arm</b>-related bushings worn</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten cap screws</li> <li>2. Replace bushings</li> </ol>

### Problem: Rear wheel oscillation

Condition	Remedy
<ol style="list-style-type: none"> <li>1. <b>Rear wheel</b> hub bearings worn - loose</li> <li>2. <b>Tires</b> defective - incorrect</li> <li>3. <b>Wheel</b> rim distorted</li> <li>4. <b>Wheel</b> hub cap screws loose</li> <li>5. <b>Auxiliary brake</b> adjusted incorrectly</li> <li>6. <b>Rear suspension</b> arm-related bushing worn</li> <li>7. <b>Rear shock absorber</b> damaged</li> <li>8. <b>Rear suspension</b> arm nut loose</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace bearings</li> <li>2. Replace tires</li> <li>3. Replace rim</li> <li>4. Tighten cap screws</li> <li>5. Adjust brake</li> <li>6. Replace bushing</li> <li>7. Replace shock absorber</li> <li>8. Tighten nut</li> </ol>

### Problem: Vehicle pulling or steering erratic

Condition	Remedy
<ol style="list-style-type: none"> <li>1. <b>Vehicle</b> steering is erratic on dry, level surface</li> <li>2. <b>Vehicle</b> pulls left or right on dry, level surface</li> </ol>	<ol style="list-style-type: none"> <li>1. Check front wheel alignment and adjust if necessary (see Steering/Body/Controls)</li> <li>2. Check air pressure in tires and adjust to specifications</li> </ol>

## **NOTES**



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