

# 2016

## SERVICE MANUAL



**HDX**



# 2016 HDX Service Manual

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# General Information/ Foreword

This Arctic Cat Service Manual contains service, maintenance, and troubleshooting information for the 2016 Arctic Cat HDX. The complete manual is designed to aid service personnel in service-oriented applications.

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

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

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

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

All Arctic Cat 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 serious personal injury or even death. A **CAUTION** identifies unsafe practices which may result in vehicle-related damage. Follow the directive because it deals with the possibility of damaging part or parts of the vehicle. The symbol **■ NOTE:** identifies supplementary information worthy of particular attention. The symbol **☞ AT THIS POINT** directs the technician to certain and specific procedures to promote efficiency and to improve clarity.

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

All materials and specifications are subject to change without notice.

Product Service and  
Warranty Department  
Arctic Cat Inc.

# Specifications

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

MISCELLANY		
Tire Size	(front)	26 x 9R-14
	(rear)	26 x 11R-14
Tire Inflation Pressure		82.7 kPa (12 psi)
Spark Plug Type		NGK CR7E - 500 NGK CPR8E - 700
Spark Plug Gap	(500)	0.7-0.8 mm (0.028-0.031 in.)
	(700)	0.5-0.6 mm (0.019-0.024 in.)
Gas Tank Capacity		33 L (8.74 U.S. gal.)
Coolant Capacity		4.5 L (4.8 U.S. qt)
Front Differential Capacity		269 ml (9.1 fl oz)*
Rear Drive Capacity		269 ml (9.1 fl oz)*
Engine Oil Capacity (approx)	(500)	2.85 L (3.0 U.S. qt) - Overhaul 2.4 L (2.5 U.S. qt) - Change
	(700)	2.2 L (2.4 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
Front Differential/Rear Drive Lubricant (One inch below plug threads)		SAE Approved 80W-90 Hypoid
Drive Belt Width		28.5 mm (1.12 in.) - 500 35.0 mm (1.38 in.) - 700
Brake Fluid		DOT 4
Taillight/Brakelight		12V/8W/27W
Headlight		12V/60/55W
ELECTRICAL SYSTEM		
Ignition Timing		10° BTDC @ 1500 RPM
Spark Plug Cap		5000 ohms
Ignition Coil Resistance	(primary)	Less than 5.0 ohms - 500
	(secondary)	Less than 1 ohm - 700
		N/A
Ignition Coil Primary Voltage		Battery Voltage
Stator Coil Resistance	(CKP Sensor) (AC generator)	104-156 ohms Less than 1 ohm
AC Generator Output (no load)		60 AC volts @ 5000 RPM
Crankshaft Position Sensor AC Voltage		2.5 volts or more - 500 2.0 volts or more - 700
VALVES AND GUIDES (500)		
Valve Face Diameter	(intake) (exhaust)	30.6 mm 27.0 mm
Valve/Tappet Clearance	(intake) (cold engine)	0.10 mm 0.17 mm
Valve Guide/Stem Clearance (max)	(intake) (exhaust)	0.04 mm 0.06 mm
Valve Guide Inside Diameter		5.000-5.012 mm
Valve Seat Angle	(intake/exhaust)	45°
Valve Spring Free Length	(min)	42.8 mm
Valve Spring Tension @ 35.2 mm		18.6 kg (41.1 lb)
VALVES AND GUIDES (700)		
Valve Face Diameter	(intake) (exhaust)	31.6 mm 27.9 mm
Valve/Tappet Clearance	(intake) (cold engine)	0.1016 mm 0.1524 mm
Valve Guide/Stem Clearance	(intake)	0.051 mm
Valve Guide Inside Diameter		5.000-5.012 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		16.32 kg (35.97 lb)

<b>CYLINDER, PISTON, AND RINGS (500)</b>	
Piston Skirt/Cylinder Clearance	0.60-0.73 mm
Piston Diameter 15 mm from Skirt End	88.96-88.98 mm
Piston Ring Free End Gap (max)	(1st) 8.0 mm (2nd) 8.3 mm
Bore x Stroke	89.0 x 71.2 mm
Cylinder Trueness	(max) 0.01 mm
Piston Ring End Gap - Installed	(min) 0.30 mm
Piston Ring to Groove Clearance (max)	(1st/2nd) 0.06 mm
Piston Ring Groove Width	(1st) 1.01-1.03 mm (2nd) 1.21-1.23 mm (oil) 2.01-2.03 mm
Piston Ring Thickness	(1st) 1.01-1.03 mm (2nd) 1.17-1.19 mm
Piston Pin Bore	(max) 20.008 mm
Piston Pin	(min) 19.994 mm
<b>CYLINDER, PISTON, AND RINGS (700)</b>	
Piston Skirt/Cylinder Clearance (min)	0.06 mm
Cylinder Bore	101.992-102.008 mm
Piston Diameter 15 mm from Skirt End	101.956-101.994 mm
Piston Ring Free End Gap	(1st/2nd) 12.5 mm
Bore x Stroke	102 x 85 mm
Cylinder Trueness (max)	0.02 mm
Piston Ring End Gap - Installed (min)	0.15-0.35 mm
Piston Ring to Groove Clearance (max)	(1st/2nd) 0.065 mm
Piston Ring Groove Width	(1st/2nd) 1.27-1.29 mm (oil) 2.01-2.03 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
<b>CRANKSHAFT (500)</b>	
Connecting Rod (small end) (max)	20.021 mm
Connecting Rod (big end side-to-side)	0.10-0.55 mm
Connecting Rod (big end width)	21.95-22.00 mm
Connecting Rod (small end deflection) (max)	3.0 mm
Crankshaft (web-to-web)	60.9 mm
Crankshaft Runout (max)	0.03 mm
<b>CRANKSHAFT 700)</b>	
Connecting Rod (small end inside diameter) (max)	23.021 mm
Connecting Rod (big end side-to-side) (min)	0.6 mm
Connecting Rod @ 150 mm (small end deflection) (max)	0.3 mm
Crankshaft (web-to-web) (min)	71 mm
Crankshaft Runout (max)	0.03 mm
<b>CAMSHAFT AND CYLINDER HEAD (500)</b>	
Cam Lobe Height (min)	(intake) 34.71 mm (exhaust) 34.48 mm
Camshaft Journal Holder Inside Diameter	(right & center) 22.01-22.04 mm (left) 17.51-17.54 mm
Camshaft Journal Outside Diameter	(right & center) 17.466-17.480 mm (left) 21.959-21.980 mm
Camshaft Runout (max)	0.03 mm
Cylinder Head/Cover Distortion (max)	0.05 mm
<b>CAMSHAFT AND CYLINDER HEAD (700)</b>	
Cam Lobe Height (min)	33.53 mm
Camshaft Journal Oil Clearance (max)	0.04 mm
Camshaft Runout (max)	0.05 mm
Cylinder Head/Cover Distortion (max)	0.05 mm

## Torque Specifications

■NOTE: Torque specifications have the following tolerances:

Torque (ft-lb)	Tolerance		
0-15	±20%		
16-39	±15%		
40+	±10%		
<b>EXHAUST COMPONENTS</b>			
Part	Part Bolted To	Torque ft-lb	N-m
Exhaust Pipe	Cylinder Head	20	27
Spark Arrester	Muffler	50 in.-lb	5
O2 Sensor	Exhaust Pipe	19	26
<b>BRAKE COMPONENTS</b>			
Brake Disc**	Hub	15	20
Brake Hose	Caliper	20	27
Brake Hose	Master Cylinder	20	27
Master Cylinder	Frame	25	34
Caliper****	Knuckle	20	27
Brake Pedal	Frame	18	24
<b>ELECTRICAL COMPONENTS</b>			
Coil*	Bracket	8	11
<b>STEERING COMPONENTS</b>			
Steering Wheel**	Steering Shaft	25	34
Rack and Pinion Assembly	Frame	35	48
EPS/Rack Coupler	EPS Assembly	11	15
Tie Rod End**	Knuckle	30	41
Tie Rod	Tie Rod End	8	11
Steering Rack Bracket	EPS Cradle Bracket	20	27
EPS Cradle Bracket	Frame	20	27
EPS Assembly	Bracket	35	48
EPS/Rack Coupler	Rack	25	34
Intermediate Shaft	Rack(500)/EPS(700)	25	34
Tilt Assembly	Steering Support	20	27
Gas Spring	Steering Support	10	14
<b>CHASSIS/ROPS ASSEMBLY</b>			
Shift Axle Support	Frame	48 in.-lb	5
Front/Rear ROPS Tube	Arm Rest/Steering Support	35	48
Top ROPS Support	Front/Rear ROPS Tubes	35	48
Rear ROPS Tube	Lower ROPS Support	35	48
Shift Cable	Shift Arm Stud	8	34
Shift Cable Mounting/Adjuster	Shift Cable	20	27
Cargo Box Hinge	Cargo Box Frame	20	27
Side Panel/Spacer	Cargo Box Frame	25	34
Tilt Pivot Bushing	Cargo Box Frame	15	20
Latch Striker	Cargo Box Liner	60 in.-lb	7
Seat Belt Loop	ROPS	35	48
<b>SUSPENSION COMPONENTS (Front)</b>			
A-Arm	Frame	35	48
Knuckle	Ball Joint	35	48
Shock Absorber	Frame/Upper A-Arm	35	48
Knuckle	A-Arm	35	48
<b>SUSPENSION COMPONENTS (Rear)</b>			
Sway Bar Bracket	Frame	35	48
A-Arm	Frame	35	48
Shock Absorber	Lower A-Arm	35	48
Shock Absorber	Frame	35	48
Knuckle	A-Arm	35	48

DRIVE TRAIN COMPONENTS			
Part	Part Bolted To	Torque ft-lb N-m	
Rear Differential/Gear Case	Frame/Lower Bracket	38	48
Front Differential	Frame/Differential Bracket	38	52
Rear Output Flange	Rear Driven Flange	40	54
Pinion Housing	Differential Housing	23	31
Secondary Shaft Bearing Housing	Crankcase	28	38
Driveshaft (Front/Rear)	Engine	20	27
Front Input Drive Flange	Front Drive Yoke Flange	20	27
Differential Housing Cover***	Differential Housing	23	31
Thrust Button**	Gear Case Cover	8	11
Drive Bevel Gear Nut***	Shaft	87	118
Hub Nut	Front/Rear Shaft/Axle (min)	200	272
Oil Drain Plug	Front Differential - Rear Drive	45 in.-lb	5
Oil Fill Plug	Front Differential - Rear Drive	16	22
Oil Drain Plug	Engine	16	22
Wheel (Steel)	Hub	40	54
Wheel (Aluminum w/black nuts)	Hub	60	81
Wheel (Aluminum w/chrome nuts)	Hub	80	108
ENGINE/TRANSMISSION			
Engine Cradle	Rubber Mount	25	34
Engine Cradle	Frame	25	34
Engine Cradle	Engine	43	58
Cam Sprocket**	Camshaft	10	14
Cylinder	Crankcase	8	11
Valve Cover	Cylinder Head	8.5	11.5
Tappet Cover	Valve Cover	8.5	11.5
Cylinder Head (Cap Screw) (500)	Crankcase	28	38
Cylinder Head (Cap Screw) (700)	Crankcase (step 1) (step 2) (final)	20 30 41 37	27 41 50
Cylinder Head (Nut) (500)	Cylinder	20	27
Cylinder Head Nut (6 mm) (700)	Cylinder	8.5	11.5
Cylinder Head Nut (8 mm) (700)	Cylinder	18	24.5
Clutch Shoe** (500)	Crankshaft	147	199
Clutch Shoe** (700)	Crankshaft	221	300
Driven Pulley** (500)	Driveshaft	147	199
Driven Pulley** (700)	Driveshaft	162	220
Ground Wire	Engine	8	11
Magneto Cover	Crankcase	10	14
Speed Sensor Housing (700)	Crankcase	8.5	11.5
Oil Drain Plug	Engine	16	22
CVT Cover	Clutch Cover/Housing	48 in.-lb	5
Movable Drive Face (500)	Centrifugal Clutch Housing	147	199
Movable Drive Face** (700)	Centrifugal Clutch Housing	162	220
Starter Clutch**	Flywheel	26	35
Output Shaft Nut**	Output Shaft	59	80
Output Yoke Nut** (700)	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
Oil Pump**	Crankcase	8.5	11.5
Water Pump/Housing	Magneto Cover	8	11
Crankcase Half (6 mm)	Crankcase Half	10	14
Crankcase Half (8 mm)	Crankcase Half	21	28
Shift Cam Stopper (700)	Crankcase	8	11
Starter Motor	Crankcase	10	14
Shift Cam Plate	Shift Cam Shaft	8	11

ENGINE/TRANSMISSION (500)			
Oil Pump Drive Gear**	Crankshaft	63	85
Cam Chain Tensioner Guide	Cylinder Head	11	15
Cam Chain Tensioner	Cylinder	10	14
Water Pump Drive Gear	Crankshaft	28	38
Water Pump Cover	Water Pump Housing	8	11
ENGINE/TRANSMISSION (700)			
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

\* w/Blue Loctite #243 \*\* w/Red Loctite #271

\*\*\* w/Green Loctite #270 \*\*\*\* w/“Patch-Lock”

## 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 fuel to the 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 specified 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.

#### ⚠ 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.

Tighten the gas tank cap securely after filling the tank.

#### ⚠ WARNING

Do not over-fill the gas tank.

### RECOMMENDED GASOLINE

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

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

#### CAUTION

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

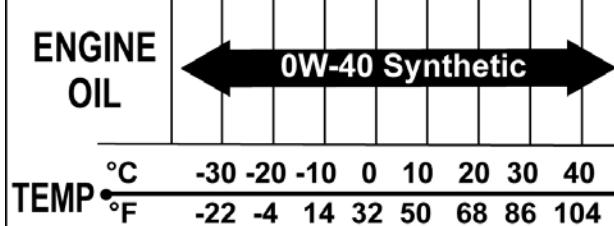
### RECOMMENDED ENGINE/ TRANSMISSION OIL

#### CAUTION

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

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

### Multi-Grade Engine Oil



OILCHART.J

### RECOMMENDED FRONT DIFFERENTIAL/REAR DRIVE LUBRICANT

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

#### CAUTION

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

## Preparation For Storage

Arctic Cat recommends the following procedure to prepare the vehicle for storage. An authorized Arctic Cat dealer should perform this service; however, the owner/operator may perform this service if desired.

#### CAUTION

Prior to storing this vehicle, it must be properly serviced to prevent rusting and component deterioration.

1. Clean the seat cushions with a damp cloth and allow to dry.
2. Clean the vehicle thoroughly by washing dirt, oil, grass, and other foreign matter from the entire vehicle. Allow the vehicle 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 shaft bushing and plungers of the shock absorbers.
7. Tighten all nuts, bolts, cap screws, and screws. Make sure rivets holding components together are tight. Replace all loose rivets. 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 vehicle indoors in a level position.

**CAUTION**

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

## **Preparation After Storage**

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

1. Clean the vehicle 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. Accelerator Pedal Pivot/Cable Ends
- B. Brake Pedal Pivot
- C. Shift Cable

### 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
Compression Tester Kit	0444-213
Oil Filter Wrench	0644-389
Timing Light	0644-296
Valve Clearance Adjuster	0444-255

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

## Air Inlet Pre-Filter

This vehicle is equipped with a foam pre-filter to filter dirt from the inlet air prior to reaching the main air filter.

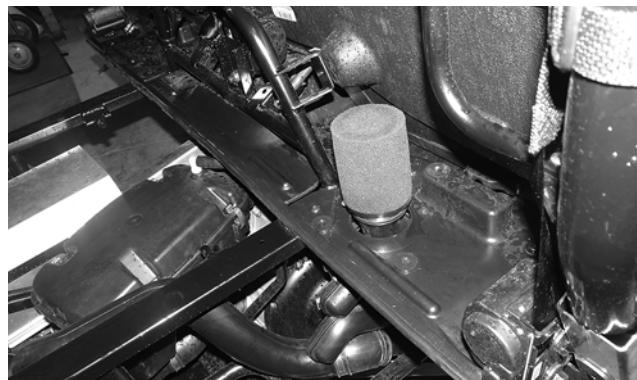
**■NOTE: To access the pre-filter, open the cargo box.**

1. Gently squeeze the pre-filter cover and lift it up to expose the pre-filter.



HDX237A

2. Loosen the clamp securing the pre-filter.



HDX235

3. Remove the pre-filter assembly and wash thoroughly in warm, soapy water; then rinse and dry.
4. Install and secure with the clamp. Tighten securely; then install the pre-filter cover.

## Air Filter

### CAUTION

Failure to inspect the air filter frequently if the vehicle is used in dusty, wet, or muddy conditions can damage the engine.

1. Remove any dust and debris from around the filter housing.
2. Unsnap the four spring-clip fasteners and remove the air filter cover.



HDX050A

3. Remove the two screws securing the filter; then remove the filter.
4. Fill a wash pan larger than the element with a non-flammable cleaning solvent; then dip the element in the solvent and wash it.

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

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

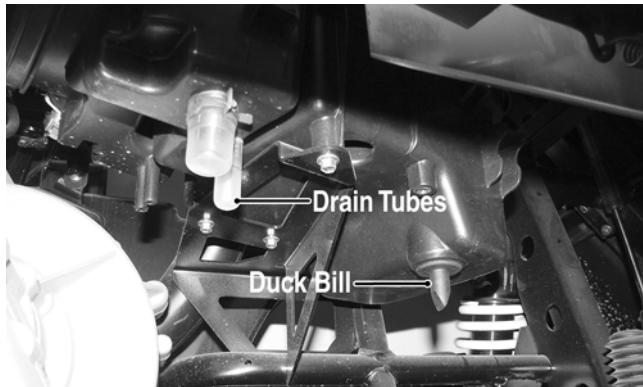
8. Carefully squeeze excess oil from the element.

### CAUTION

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

9. Clean any dirt or debris from inside the filter housing.
10. Install the air filter, secure with the two screws tighten to 12 ft-lb, and install the cover.

## CHECKING AND CLEANING DRAINS



1. Inspect the "duck-bill" drain beneath the main housing for debris and for proper sealing.
2. Remove the drain tube and clean out any water, oil, or debris. Reinstall and secure with the clamp.

## Valve/Tappet Clearance

■**NOTE: The engine must be cold for this procedure.**

■**NOTE: The seat, seat back, seat base, and spark plug must be removed for this procedure.**

1. Remove the spark plug and timing inspection plug; then remove the tappet covers (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.**

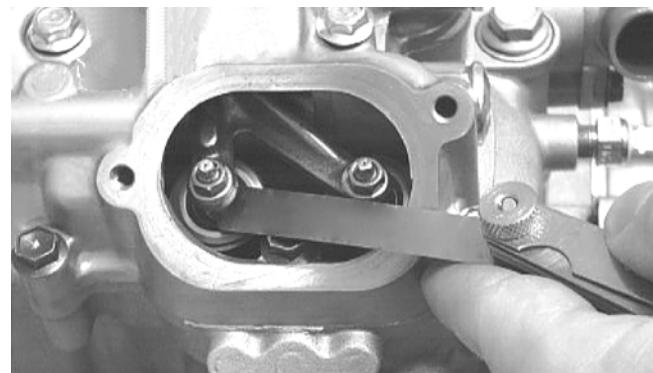
### CHECKING

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 to 7 ft-lb 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	
Intake	0.1016 mm (0.004 in.)
Exhaust	0.1524 mm (0.006 in.)



### ADJUSTING

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

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

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

- While holding the adjuster dial at the proper clearance setting, tighten the jam nut securely with the valve adjuster handle.
- Install the spark plug; then install the timing inspection plug.
- Place the two tappet covers with O-rings into position. Tighten the cap screws to 8 ft-lb.

## Testing Engine Compression

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

■**NOTE: The seat, seat back, and seat base must be removed for this procedure.**

1. Remove the high tension lead from the spark plug.

- Using compressed air, blow any debris from around the spark plug.

### ⚠ WARNING

Always wear safety glasses when using compressed air.

- 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.

- Attach the Compression Tester Kit.

- While holding the throttle in the full-open position, crank the engine over with the electric starter until the gauge stops climbing (five to 10 compression strokes).

PSI Hot (WOT)	PSI Cold (WOT)
125-145	100-140

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

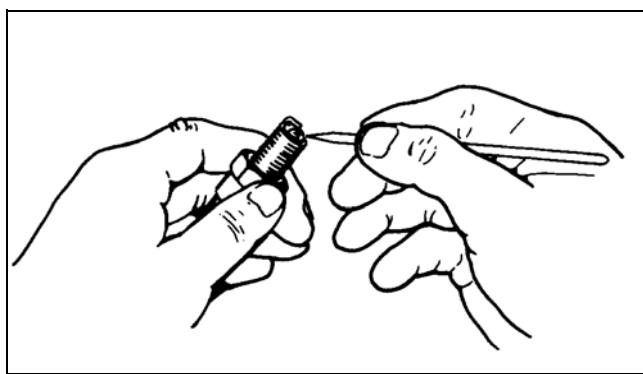
- Starter cranks engine over.
- Gauge is functioning properly.
- Throttle in the full-open position.
- Valve/tappet clearance correct.
- Engine warmed up.
- Intake obstructed.

■**NOTE: To service top-side components, see Engine/Transmission.**

- Pour approximately 30 ml (1 fl oz) of oil into the spark plug hole, reattach the gauge, and retest compression.
- If compression is now evident, service the top end (see the appropriate Engine/Transmission - Top-Side Components).

## Spark Plug

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

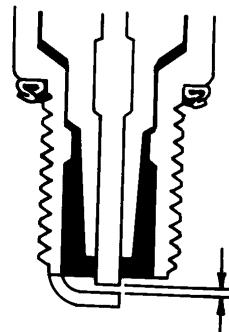


ATV-0051

### CAUTION

Before removing the 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 0.5-0.6 mm (0.019-0.024 in.).



ATV0052

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

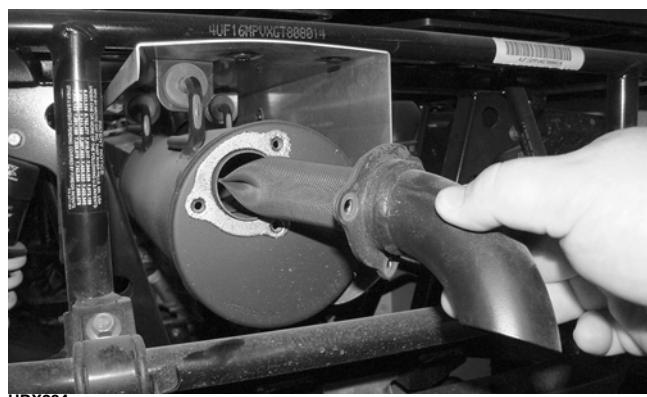
## Muffler/Spark Arrestor

Clean the spark arrester using the following procedure.

### ⚠ WARNING

Wait until the muffler cools to avoid burns.

- Remove the cap screws securing the spark arrester screen assembly to the muffler; then loosen and remove the spark arrester. Account for a gasket and wave washer.



HDX284

- 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.**

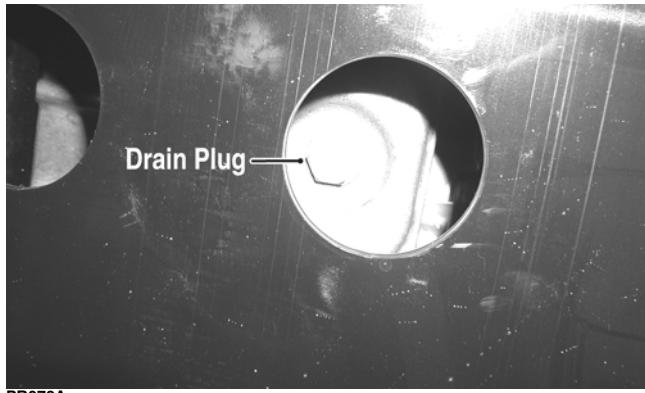
- Install the spark arrester assembly with wave washer and gasket and secure with the cap screws. Tighten the cap screws to 50 in.-lb.

## Engine/Transmission Oil - Filter

### OIL - FILTER

Change the engine oil and oil filter at the scheduled intervals. The engine should always be warm when the oil is changed so the oil will drain easily and completely.

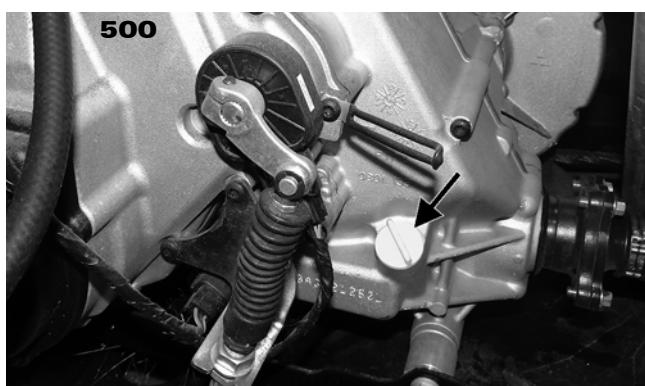
1. Park the vehicle on level ground.
2. Remove the drain plug from the bottom of the engine and drain the oil into a drain pan; then remove the center console, seat, seat back, and seat base. Account for and discard the drain plug gasket.



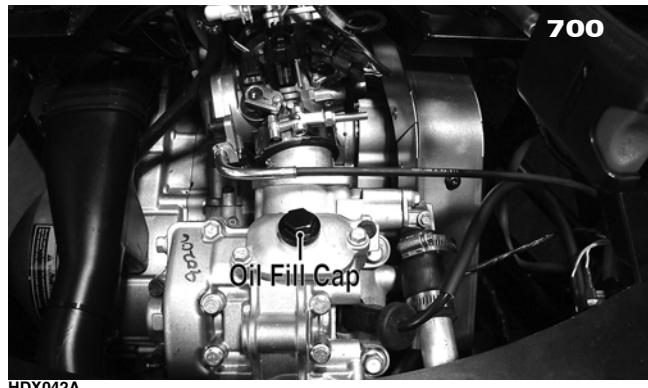
3. Using the Oil Filter Wrench and a ratchet handle (or a socket or box-end wrench), remove the oil filter and discard the O-ring.

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

4. Apply fresh oil to a new filter O-ring and check to make sure it is positioned correctly; then install the new oil filter. Tighten securely.
5. Install the engine drain plug with a new gasket and tighten to 16 ft-lb. Pour the specified amount of the recommended oil in the filler hole.



HDX251B



HDX042A

### 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.**

6. Start the engine (while the vehicle is outside on level ground) and allow it to idle for a few minutes.
7. Turn the engine off and wait approximately one minute; then unscrew the oil level stick and wipe it with a clean cloth.
8. Install the oil level stick and thread into the engine case.
9. Remove the oil level stick; the oil level must be within the operating range but not exceeding the upper mark.



GZ461A

### CAUTION

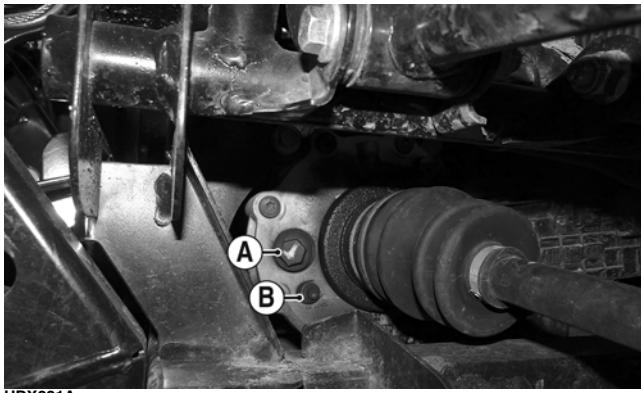
**Do not over-fill the engine with oil. Always make sure that the oil level is not above the upper mark.**

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

## Front Differential - Rear Drive Lubricant

To check lubricant, use the following procedure.

1. Remove the level plug (B); the lubricant should be level with the bottom threads.



HDX221A

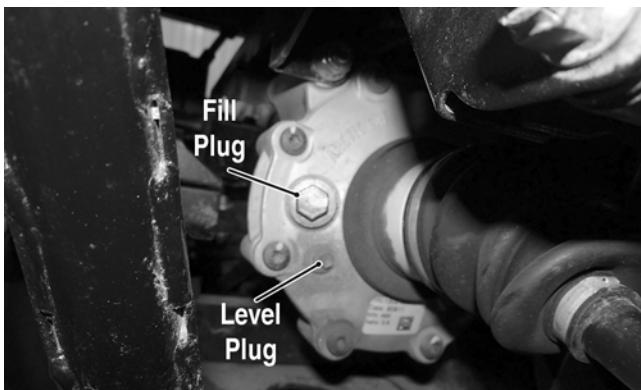
2. If low, remove the fill plug (A) and add the appropriate lubricant until it appears at the bottom of the level plug threads.

To change the lubricant, use the following procedure.

1. Place the vehicle on level ground.
2. Remove each fill plug.
3. Drain the lubricant into a drain pan by removing in turn the drain plug from each.



HDX255



HDX220A

4. After all the lubricant has been drained, install the drain plugs and tighten to 45 in.-lb.
5. Pour the appropriate amount of recommended lubricant into the fill hole.
6. Install the fill plug and tighten to 16 ft-lb.

**■NOTE: If the lubricant is contaminated with water, inspect the drain plug, fill plug, and/or bladder.**

## Driveshaft/Coupling

The following drive system components should be inspected periodically to ensure proper operation.

- A. Spline lateral movement (slop).
- B. Coupling cracked, damaged, or worn.
- C. Universal joints worn or missing bearings.

## Headlight - Taillight/ Brakelight

### HEADLIGHT

**■NOTE: The bulb portion of the headlight is fragile. HANDLE WITH CARE. When replacing the 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 the bulb when it is hot. Severe burns may result.**

To replace the headlight bulb, use the following procedure.

1. Remove the wiring harness connector from the back of the headlight.
2. Grasp the bulb socket, turn it counterclockwise, and remove. Discard the bulb.



XR065C

3. Install the new bulb into the socket and rotate it completely clockwise in the housing.
4. Install the wiring harness connector.

### TAILLIGHT-BRAKELIGHT

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

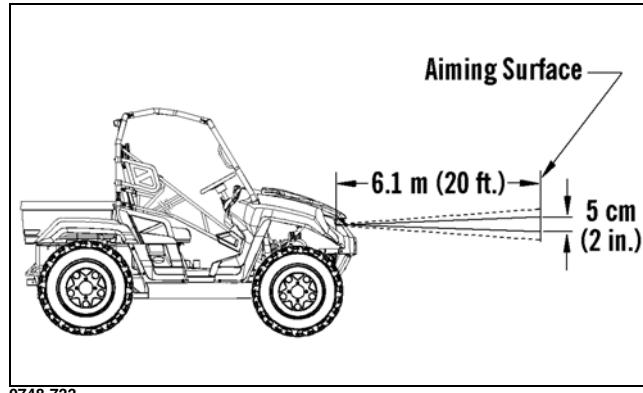
1. Remove the two cap screws and lock nuts and remove the light assembly.
2. Rotate the bulb socket counterclockwise to remove it from the light assembly; then pull straight out on the bulb. Push the new bulb straight into the socket.

3. Install the bulb and socket into the light assembly and turn clockwise to lock in place.
4. Install the taillight-brakelight assembly on the canopy support.

## CHECKING/ADJUSTING HEADLIGHT AIM

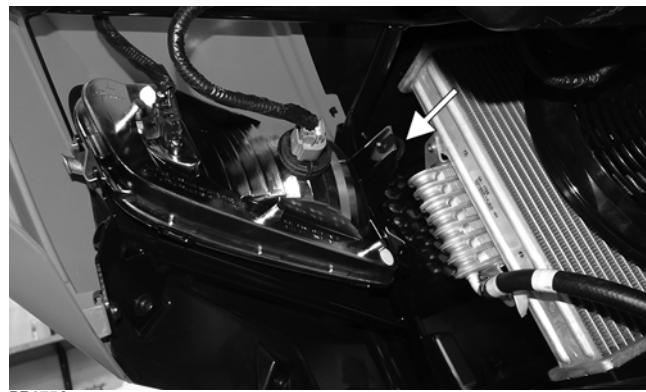
The headlights can be adjusted vertically. The geometric center of the HIGH beam light zone is to be used for aiming.

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



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

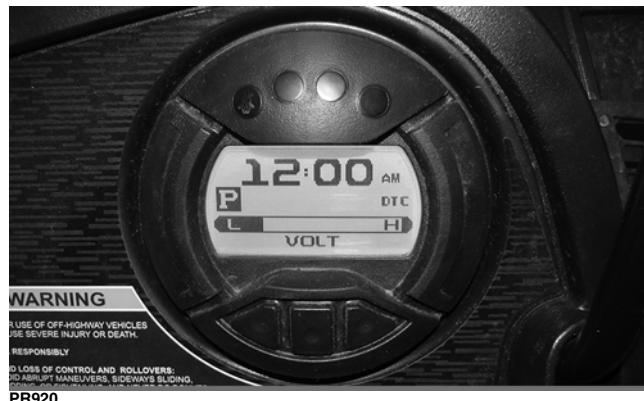
2. Measure the distance from the floor to the mid-point of each headlight.
3. Using the measurements obtained in step 2, make horizontal marks on the aiming surface.
4. Make vertical marks which intersect the horizontal marks on the aiming surface directly in front of the headlights.
5. Switch on the 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. Loosen the headlight adjustment screw; then adjust the headlight up or down as required. Tighten the headlight adjustment screw.



## Shift Cable

### CHECKING SHIFT CABLE

Turn the ignition switch on; then shift the transmission into park. The letter P should illuminate on the LCD gauge and the park icon (P) should illuminate. The vehicle should not be able to move.



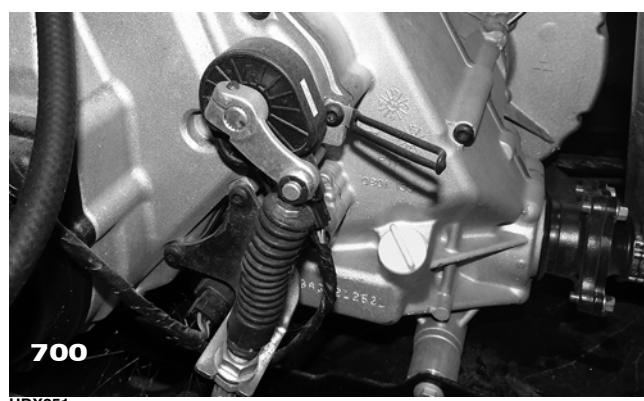
Move the shift lever all the way back. The letter L should illuminate on the LCD gauge.

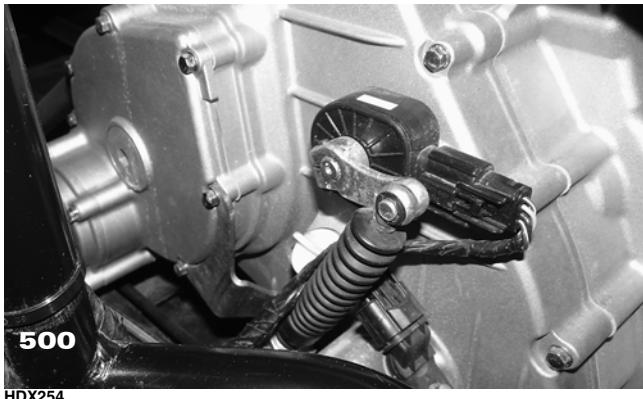


If either park or low range cannot be reached, the shift cable must be adjusted.

### ADJUSTING SHIFT CABLE

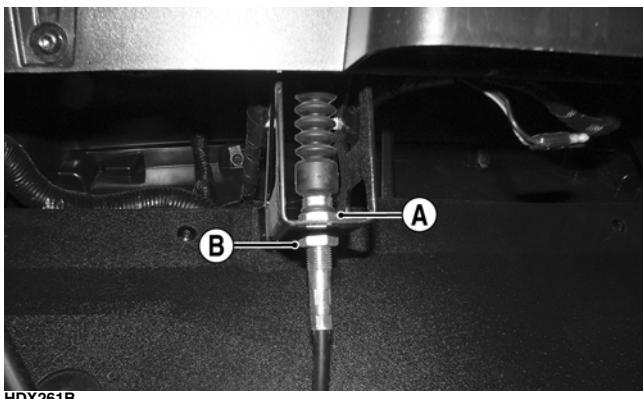
1. Place the transmission in park; then tilt the cargo box.
2. Make sure the shift lever is in park; then remove the E-clip securing the cable end to the shift arm stud.





HDX254

3. Loosen nuts (A) and (B) and adjust the cable housing to align the shift cable end to the shift arm stud.



HDX261B

4. Install the E-clip; then tighten the nuts (A) and (B) to 8 ft-lb.
5. Check each gear shift position for proper gear selection and make sure the proper icon illuminates on the LCD.

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## Hydraulic Brake System

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■**NOTE:** This ROV is equipped with hydraulic brakes at all four wheels.

### CHECKING/BLEEDING

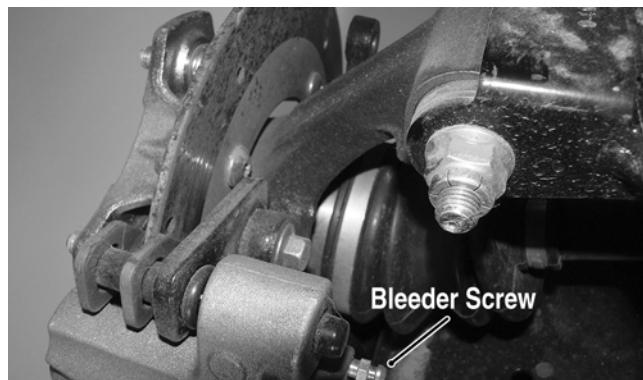
The hydraulic brake system has been filled and bled at the factory.

1. With the master cylinder in a level position, check the fluid level in the reservoir. If the level in the reservoir is not above the MIN, add DOT 4 brake fluid.



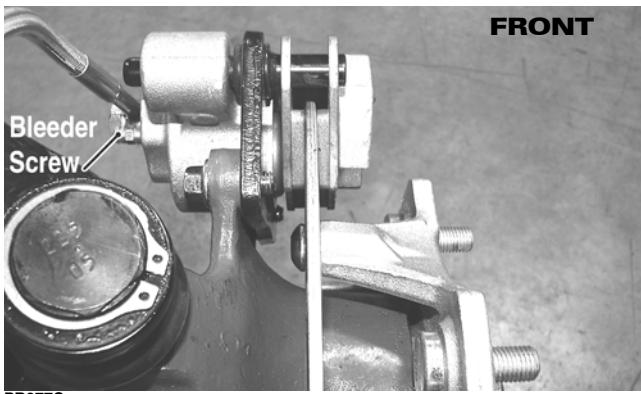
2. Depress the brake pedal several times to check for a firm brake. If the brake is not firm, the system must be bled. To bleed the brake system, use the following procedure.

- A. Remove the cover and fill the reservoir with DOT 4 brake fluid; then install and secure the cover.
- B. Slowly depress the brake pedal several times.
- C. Install one end of a clear hose onto the RIGHT REAR bleeder screw and direct the other end into a container; then while holding slight pressure on the brake pedal, open the bleeder screw and watch for air bubbles. Close the bleeder screw before releasing the brake pedal. Repeat this procedure until no air bubbles are present.



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

- D. At this point, perform steps B and C on the REAR LEFT bleeder screw; then move to the FRONT RIGHT bleeder screw and follow the same procedure. Finally, complete the procedure on the FRONT LEFT bleeder screw.



PR377C

**FRONT**

E. Repeat steps B and C until the brake pedal is firm.

3. Carefully check the entire hydraulic brake system to ensure 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.**

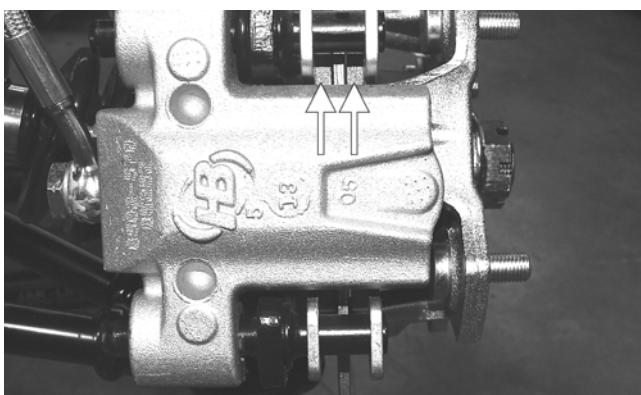
### INSPECTING HOSES

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.

1. Remove the wheel corresponding to the brake being checked.
2. Measure the thickness of each brake pad.



PR376A

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

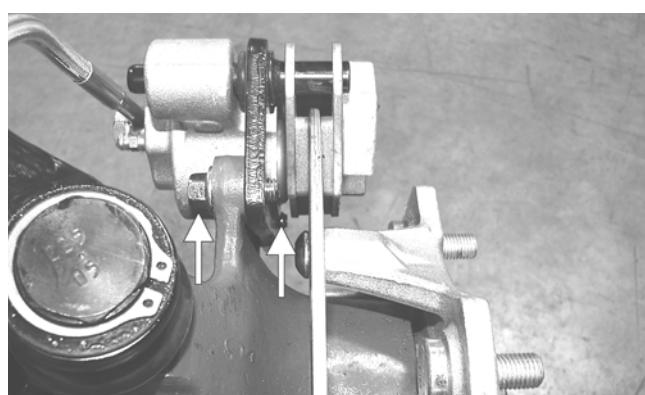
### ■NOTE: The brake pads should be replaced as a set.

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



PR237

- B. Install the new brake pads.
- C. Secure the caliper holder to the knuckle with new "patch-lock" cap screws. Tighten to 20 ft-lb.



PR377B

5. Install the wheels and 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).
6. Burnish the brake pads.

### BRAKE DISC

Using a micrometer, measure the thickness of the brake disc in the contact surface. If thickness is 0.125 in. or less, the disc must be replaced. To replace the brake disc, see Drive System – Hub.

## Burnishing Brake Pads

Brake pads 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 vehicle to 30 mph and to brake to a stop.
2. Accelerate to 30 mph; then release the accelerator pedal and depress the brake pedal to decelerate to 0-5 mph.
3. Repeat procedure 20 times until brake pads are burnished.

## Checking/Replacing V-Belt

### REMOVING

1. Remove the seat, seat back, and seat base; then remove the floor and gas tank.
2. Remove the right-side storage box.
3. Remove the cap screw, lock nut, and clamp securing the intake duct and duct tube assembly. Then remove the assembly.



4. Remove the cap screws securing the support tube to the frame.

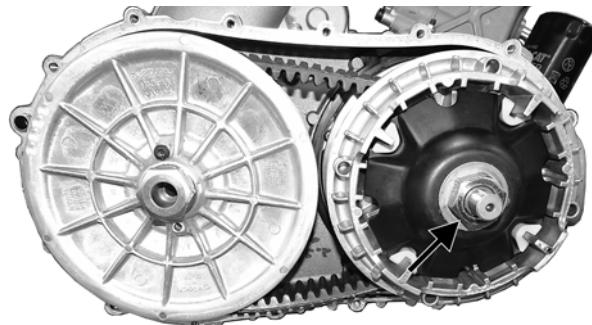


5. Remove the cap screws securing the CVT cover noting the location of the different-lengthed cap screws for installing purposes; then using a rubber mallet, gently tap on the cover tabs to loosen the cover. Remove the cover.

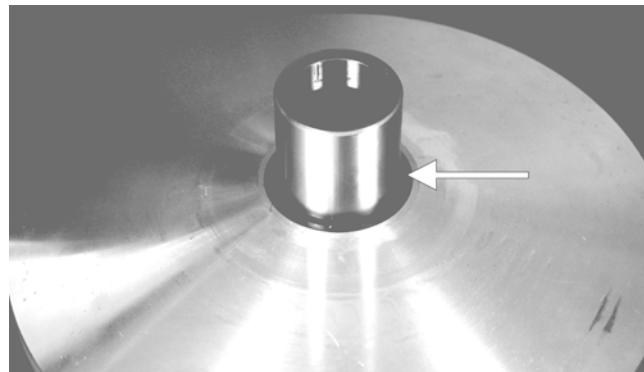


6. Remove the nut securing the movable drive face; then remove the face. Account for the spacer.

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



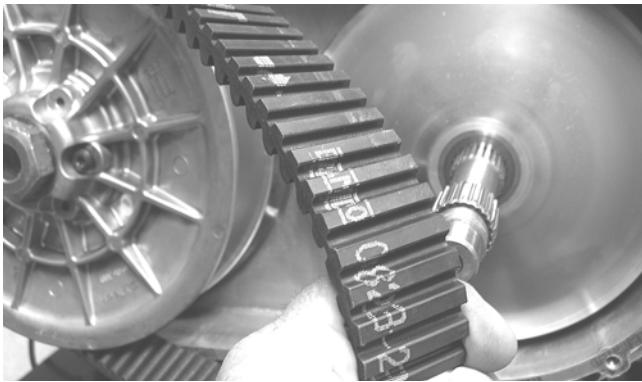
CF364A



CD966A

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





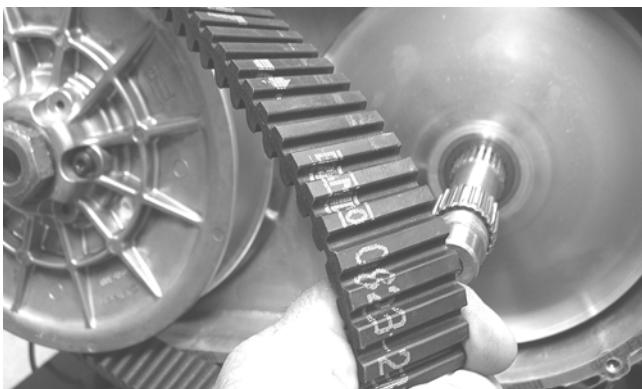
GZ085

## CHECKING

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

## INSTALLING

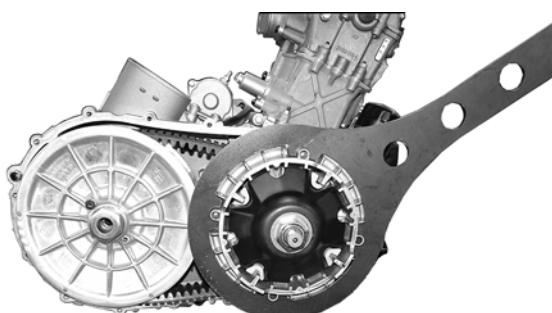
1. Place the V-belt into position on the driven pulley and over the front shaft.



GZ085

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

2. Pinch the V-belt together near its center and slide the spacer and movable drive face onto the front shaft. Secure the drive face with a new nut (on the 700, threads coated with red Loctite #271). Using an appropriate spanner wrench, tighten the nut to 147 ft-lb (500) or 162 ft-lb (700).



CF366

## CAUTION

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



CF379

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

3. With the vehicle in neutral, rotate the V-belt and clutches counterclockwise until the V-belt is flush with the top of the driven pulley.
4. Place the CVT cover gasket into position; then install the cover and secure with the cap screws making sure the different-lengthed cap screws are in their proper location. Tighten the cap screws to 48 in.-lb.



H1-017

5. Install the support tube to the frame; then position the intake duct and tube in place. Secure with the cap screw, lock nut, and clamp.
6. Install the right side storage box.
7. Install the gas tank and floor; then install the seat back, seat base, and seat.

## Steering/Body/Controls

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

- A. Steering wheel secure.
- B. Steering has equal and complete full-left and full-right turning capability.
- C. Steering sector mounting bolts tight.
- 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.
- H. Steering wheel tilt locks securely.

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

### Steering Wheel

#### REMOVING

1. Remove the steering wheel cover; then match mark the steering shaft and steering wheel.

**■NOTE: Any time steering components are disassembled, all connecting components should be marked for proper alignment during assembling.**

2. Remove the lock clip from the steering shaft; then remove the nut securing the steering wheel and remove the steering wheel.

#### INSPECTING

1. Inspect the steering wheel for cracks, missing padding, or broken spokes.
2. Inspect the splines for wear.
3. Check that the steering wheel is not bent.

#### INSTALLING

1. Install the steering wheel aligning the two match marks; then apply a drop of red Loctite #271 to the threads of the nut and secure the steering wheel. Tighten to 25 ft-lb.

**■NOTE: If a new steering wheel is being installed, mark the wheel as close as possible to the old wheel mark; then check for proper positioning with the front wheels straight forward.**

2. Install the lock clip on the steering shaft.

**■NOTE: If the hole in the steering shaft does not align with the slots in the castle nut, tighten the nut slightly until the next slot aligns with the hole.**

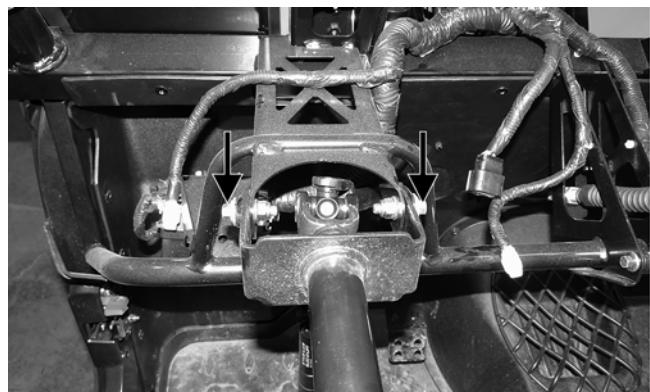


### Steering System

#### REMOVING STEERING SHAFT/EPS ASSEMBLY

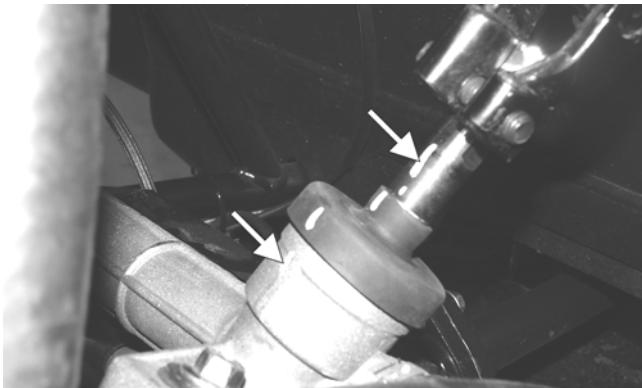
**■NOTE: Thoroughly troubleshoot the EPS system (if equipped) prior to replacing the EPS assembly (see Electrical System - Electronic Power Steering (EPS)) as there are several possible external causes for system failure.**

1. Remove the hood, front access panel, and front fenders; then disconnect the regulator/rectifier and remove the screws securing the coolant bottle to the front storage box.
2. Remove the front storage box; then remove the steering wheel.
3. Disconnect the tilt steering mechanism from the steering shaft; then remove the shift lever knob.
4. Disconnect the wiring harness connectors from the back of the dash; then remove the dash.
5. Remove the two cap screws securing the steering shaft housing to the frame.



**■NOTE: Steps 6 and 7 are for non-EPS models. For EPS models, complete steps 8-11.**

6. Make matching alignment marks on the pinion shaft and steering shaft joint.



PR333A

7. Remove the cap screw and lock nut securing the lower steering shaft joint to the pinion shaft; then slide the joint free of the pinion. Discard the lock nut.



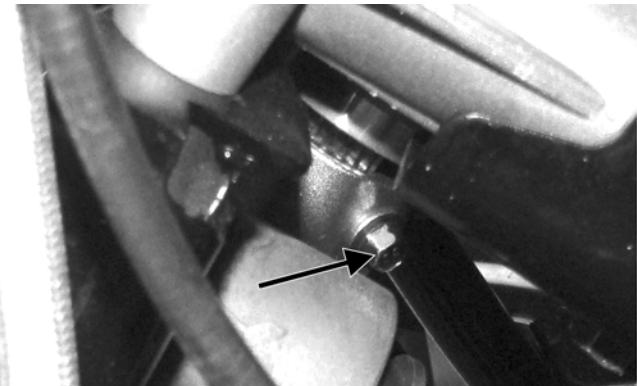
PR302

8. Make matching alignment marks; then disconnect the cap screw and lock nut securing the steering shaft to the EPS assembly. Discard the lock nut.



PR917

9. Disconnect the two EPS connectors.
10. Remove the cap screws securing the EPS assembly to the frame; then remove the cap screw securing the rack coupler to the EPS output shaft.



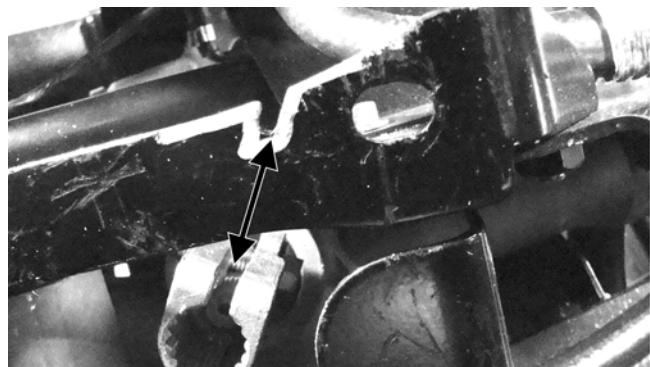
PR761A

■**NOTE:** The EPS assembly is not a serviceable component and must be replaced as a complete assembly.

11. Remove the EPS from the top side.

### **INSTALLING STEERING SHAFT/EPS ASSEMBLY**

1. Install the EPS into position.
2. Align the slot in the rack coupler to the notch in the frame (front wheels centered).

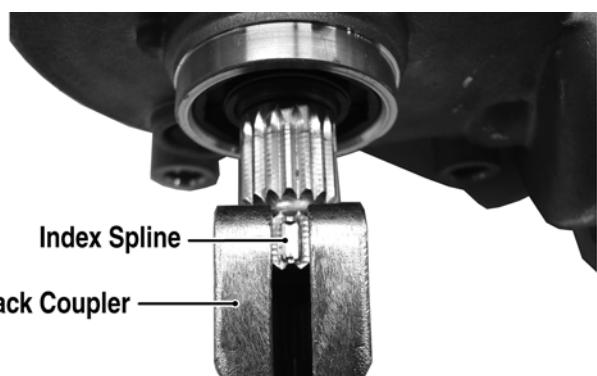


PR766A

3. On the non-EPS models, insert the steering rack coupler into the pinion shaft using the matching alignment marks. Secure with the cap screw and a new lock nut. Tighten to 25 ft-lb.

■**NOTE:** Steps 4-6 are for the EPS models only.

4. Rotate the EPS shaft to align the index (flattened) spline with the slot in the rack coupler and install the EPS assembly into the coupler; then seat the EPS firmly onto the frame.



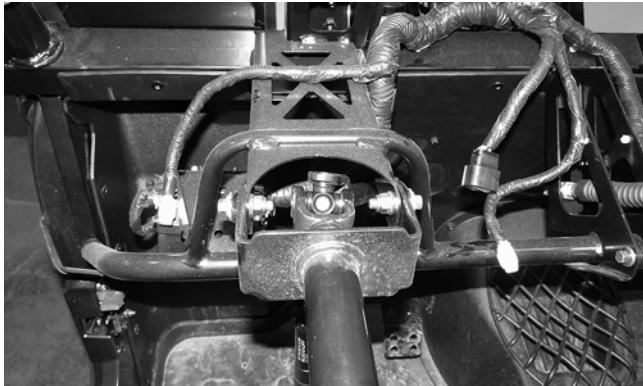
PR776A

5. Install the cap screws securing the EPS assembly to the frame and tighten to 35 ft-lb. Install the cap screw and new lock nut in the EPS to rack coupler and tighten to 11 ft-lb.
6. Connect the two electrical connectors; then align the slot in the steering shaft coupler to the index (flattened) spline on the EPS input shaft and install. Install but do not tighten the cap screw.



PR759B

7. Install the steering shaft housing. Secure to the frame with two cap screws and nuts. Tighten to 20 ft-lb.



PR897

8. Tighten the cap screw (from step 6) to 25 ft-lb.
9. Install the front storage box.
10. Connect the regulator/rectifier and install the coolant bottle to the front storage box. Tighten the regulator/rectifier to 8 ft-lb and the coolant bottle to 48 in.-lb.
11. Install the dash and connect the electrical connectors. Secure with screws and tighten securely. Do not over-tighten.
12. Connect the tilt steering mechanism and tighten securely. Install the shift knob.
13. Install the front access panel, front fenders, and hood.
14. Install the steering wheel (see Steering Wheel in this section).

### REMOVING RACK AND PINION

**■NOTE: If equipped, the EPS assembly must be removed prior to removing the steering assembly.**

1. Remove the front wheels.

2. Remove the cotter pins and nuts securing the tie rod ends to the knuckles; then remove the tie rod ends from the knuckles.



PR301

3. Remove the EPS cradle bracket; then remove the cap screws securing the steering rack assembly to the rack bracket and remove from the left side.

### INSPECTING RACK AND PINION

1. Inspect the tie rod ends for damaged threads, torn boots, or excessive wear.
2. Inspect the tie rods for bends or deformation.
3. Inspect the rack and pinion-to-tie rod boots for tears or deterioration.



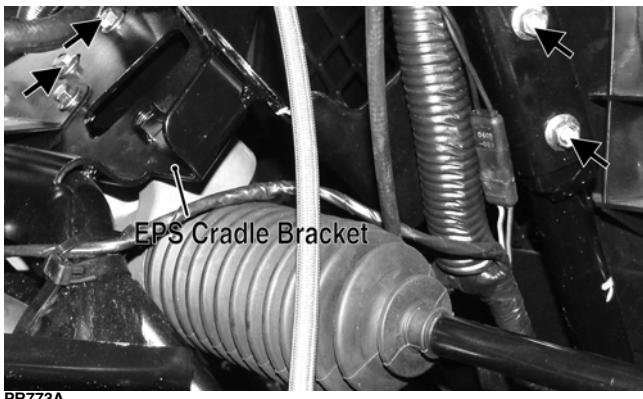
PR785

4. Check boot clamps for security.
5. Check that the steering assembly operates smoothly with no binding from full-left to full-right position.
6. Inspect for grease seepage from the steering assembly.

**■NOTE: The steering assembly (rack and pinion) is not repairable and must be replaced as an assembly; however, the tie rods and boots are replaceable.**

### INSTALLING RACK AND PINION

1. From the left side, install the steering assembly (rack and pinion) to the frame assembly and secure with two cap screws. Tighten to 35 ft-lb.
2. Install the EPS cradle bracket and secure with four cap screws. Do not tighten the cap screws at this time.



PR773A

3. Place the tie rod ends into the knuckles and secure with the castle nuts (coated with red Loctite #271). Tighten to 30 ft-lb; then install new cotter pins.

**■NOTE: If the slots in the castle nut are not aligned with the hole in the tie rod end, tighten until the cotter pin can be installed.**

4. Install the EPS assembly; then tighten the cap screws (from step 2) to 20 ft-lb.
5. Install the wheels and 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).

### REMOVING TIE RODS

1. Remove the steering rack assembly (see REMOVING RACK AND PINION in this section).
2. Support the steering rack assembly in a suitable holding fixture or bench vise; then cut the securing band and slide the boot toward the outer tie rod end.
3. Using a punch or chisel, bend the lock washer away from the flats on the tie rod joint.



PR780

4. Using an appropriate crow-foot and backing wrench, remove the tie rod assembly.

**■NOTE: Tie rods come as a complete assembly. No further disassembly is required.**

5. Remove and discard the lock washer.

### INSTALLING

1. Remove the tie rod end and lock nut from the tie rod; then install the tie rod boot onto the tie rod.
2. Install the tie rod lock nut and tie rod end.

3. Coat the tie rod joint threads with red Loctite #271; then with a new lock washer, thread the tie rod into the rack.



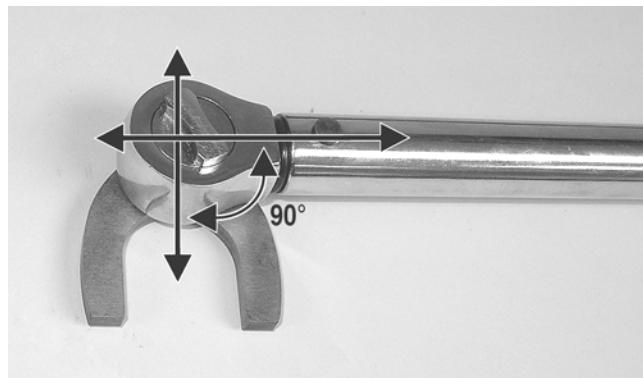
PR784

4. While holding the rack shaft with a wrench, tighten the tie rod joint to 37 ft-lb using an appropriate crow-foot.



PR781

**■NOTE: Always attach the crow-foot to the torque wrench with the open end 90° to the torque wrench handle to ensure accurate torque application.**



PR528A

5. Install the boot onto the rack and secure with the nylon tie.
6. Center the rack in the steering rack assembly and align the white paint line on the pinion with the mark on the rack housing.



PR785A

## Steering Knuckles

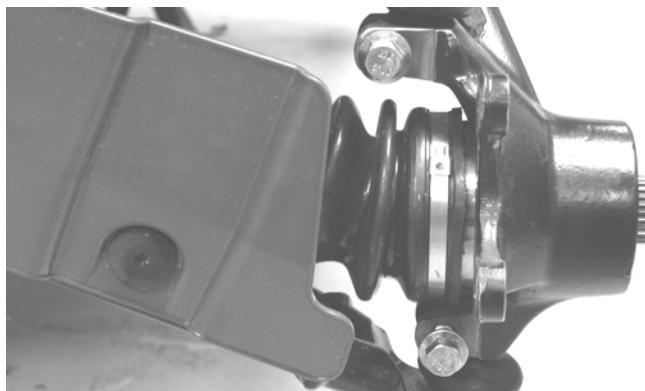
### REMOVING AND DISASSEMBLING

1. Secure the vehicle on a support stand to elevate the wheel; then remove the wheel and retaining plate.

#### **WARNING**

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

2. Remove the nut securing the hub.
3. Remove the brake caliper.
4. Remove the hub assembly.
5. Remove the cotter pin from the tie rod end and remove the tie rod end from the knuckle.
6. Remove the two cap screws securing the ball joints in the knuckle.



PR193

7. Tap the ball joint end out of the knuckle; then remove the knuckle.
8. Remove the snap ring securing the bearing in the knuckle; then press the bearing out of the knuckle.



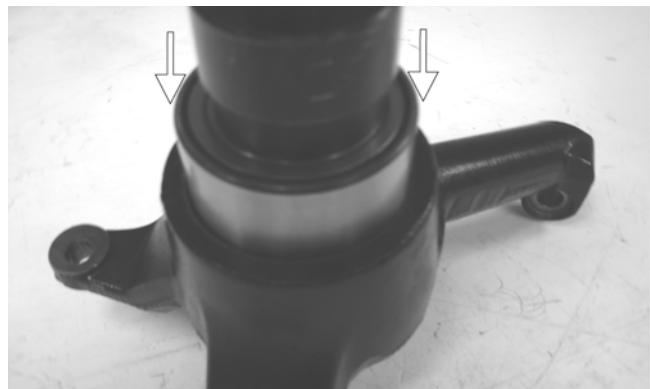
PR289

### CLEANING AND INSPECTING

1. Clean all knuckle components.
2. Inspect the bearing for pits, scoring, rusting, or premature wear.
3. Inspect the knuckle for cracks, breaks, or galling of the bearing surface.

### ASSEMBLING AND INSTALLING

1. Using a suitable press and driver, press the bearing into the knuckle until firmly seated; then install the snap ring.



PR292A



PR289

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



PR202



PR203

3. Install the tie rod end and secure with the nut (coated with red Loctite #271). Tighten to 30 ft-lb; then install a new cotter pin and spread the pin.

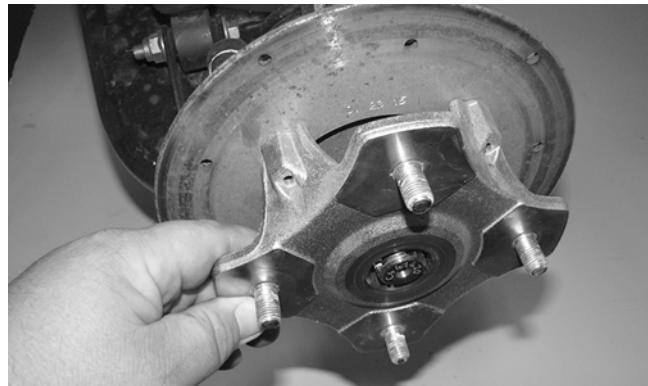
**■NOTE: During assembling, new cotter pins should be installed.**

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



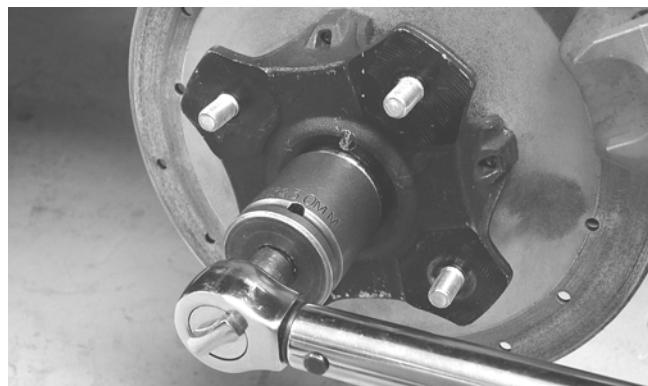
PR290A

5. Install the hub assembly onto the splines of the shaft.



PR961

6. Using Hub Retaining Wrench, secure the hub assembly with the nut. Tighten to 200 ft-lb.



PR256

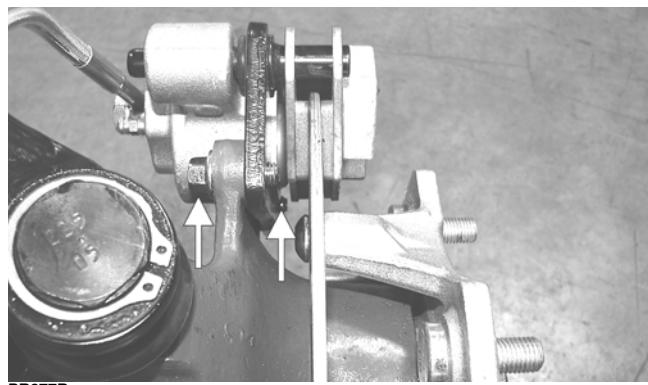
7. Install the retaining plate.

**■NOTE: If necessary, tighten the hub nut clockwise to allow the retaining plate to sit flush with the hub.**



PR965

8. Secure the brake caliper to the knuckle with the two new "patch-lock" cap screws. Tighten to 20 ft-lb.



PR377B

9. Install the wheels and 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 vehicle from the support stand.

## Accelerator Pedal

### REMOVING

Dislodge the throttle cable holding grommet from the actuator arm; then remove two torx-head screws and nuts securing the accelerator pedal assembly to the splash panel and remove the accelerator pedal.



### INSTALLING

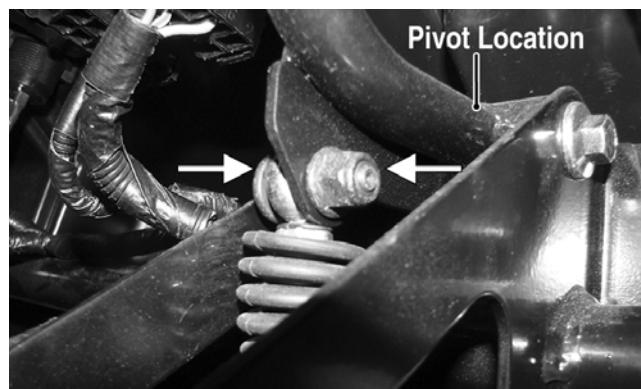
Align the mounting holes with the holes in the splash panel and secure with the two torx-head screws and nuts; then snap the throttle cable holding grommet into the actuator arm.

## Shift Lever

### REMOVING

1. Remove the plastic push-pin from the shift lever knob; then remove the knob.
2. Remove the cap screw and lock nut securing the shift lever to the shift cable. Discard the lock nut.

3. Remove the cap screw and lock nut securing the shift lever to bottom pivot location (underneath the dashboard). Slide the shift lever down and out. Discard the lock nut.



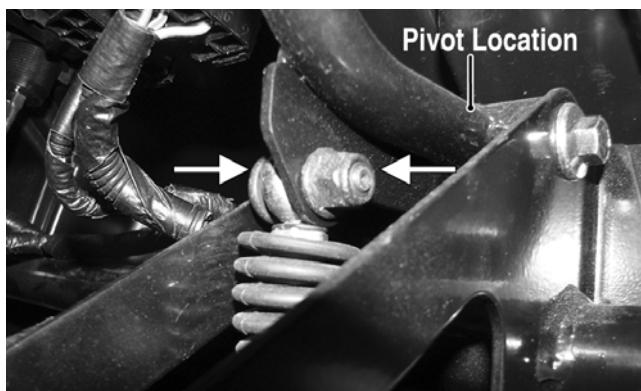
### INSTALLING

1. Slide the shift lever up through the opening; then secure to the pivot using the existing cap screw and new lock nut.
2. Secure the shift lever to the shift cable using the existing cap screw and a new lock nut.
3. With the knob in position, install the plastic push-pin.
4. Check for proper shifter operation (see Periodic Maintenance/Tune-Up - Shift Cable).

## Shift Cable

### REMOVING

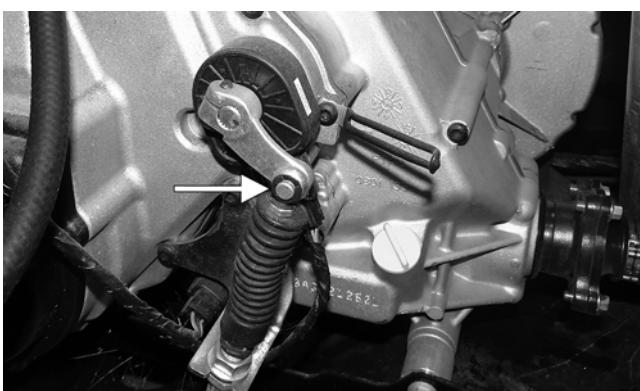
1. Remove the seat, seat back, seat base, and center footrest.
2. Remove the cap screw and lock nut securing the shift cable to the shift lever.



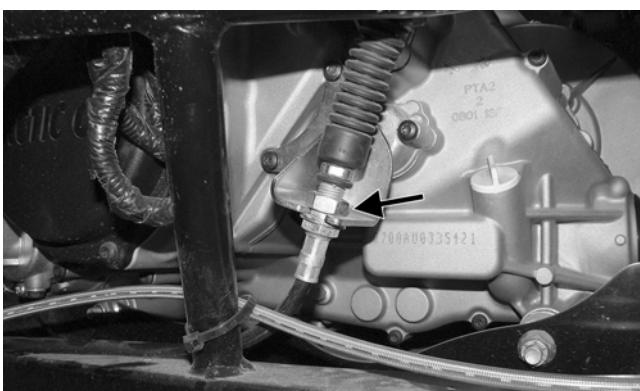
3. From under the dash, loosen the cable adjuster nut; then slide the cable forward out of the bracket.



4. Remove the E-clip securing the cable end to the shift arm stud.



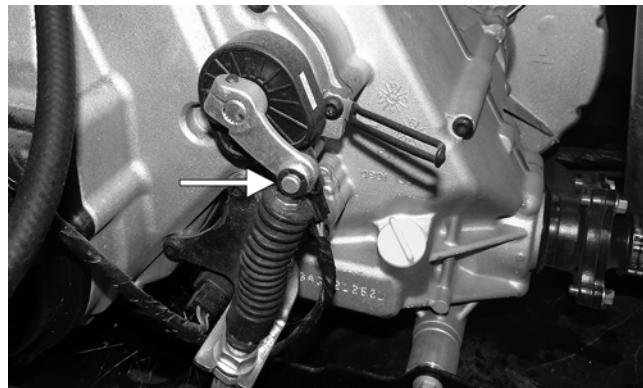
5. Loosen the adjuster nut; then remove the shift cable from the bracket. Remove any cable ties securing the shift cable to the chassis noting their location; then remove the shift cable.



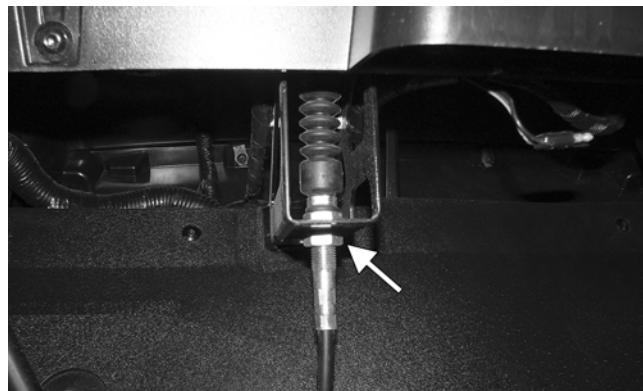
**■NOTE: If the cable is being replaced, connect the new cable to the end of the existing cable and pull the new cable into place.**

#### INSTALLING

1. Route the cable into position making sure there are no kinks or sharp bends.
2. Guide the shift cable into the shift cable bracket. Install the cable end to the shift arm stud and secure with a new E-clip. Secure the adjuster nut to the bracket.



3. From under the dash, guide the shift cable into the bracket and secure the cable end to the shift lever using a new locknut. Secure the adjuster nut to the bracket.



4. Fasten the shift cable to the chassis with the previously noted cable tie locations.
5. Shift the transmission through all positions making sure the each gear position illuminates the appropriate gears selected and that Park Indicator illuminates only when fully in Park. Adjust as necessary.
6. Install the center footrest, seat base, seat back, and seat.

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## LCD Gauge

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### REMOVING/INSTALLING

To remove the gauge, pull out on one side of it; then disconnect the multi-pin connector and remove the gauge.



To install the gauge, connect the multi-pin connector and press the gauge into the dash.

**■NOTE: Ensure the rubber mounting ring is oriented correctly on the tab and seats fully through the dash.**



WT601A

## Front Wheel Alignment

**■NOTE: All measurements and adjustments must be made with the vehicle unloaded.**

Mark the center-line of the front tires at the front and 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 6-12 mm (1/4-1/2 in.) greater than the rear measurement (toe-out).



PR087A

1. Center the steering wheel; then using an open-end wrench to hold the tie rod ends, loosen the right-side and left-side jam nuts.



UTV-374B



PR792

### CAUTION

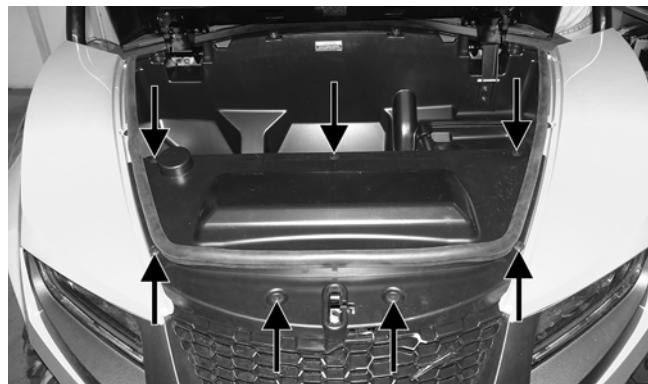
**Always use a wrench to hold the tie rod ends when loosening or tightening the jam nuts or damage to the boots could occur.**

2. Turn the left-side and right-side tie rods in equal increments to achieve the proper toe-out; then tighten the jam nuts to 8 ft-lb.

## Front Fascia/Front Bumper

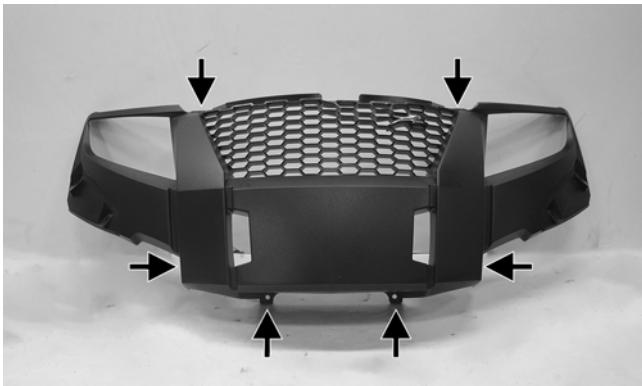
### REMOVING

1. Lift the hood and remove the access cover seal; then remove the push pins securing the front access panel and remove the panel.

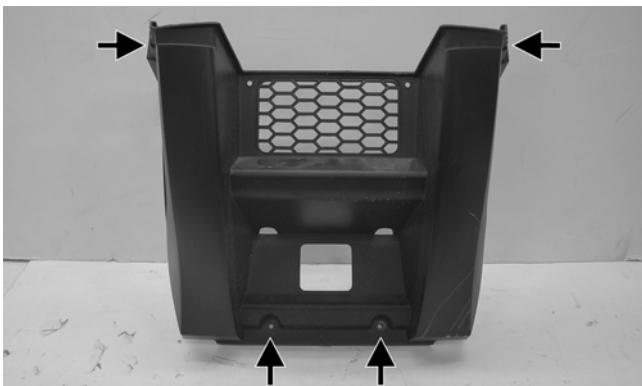


PR890A

2. Remove the cap screws securing the outer fender; then remove the inner front fenders from both sides of the vehicle.
3. Remove the cap screws securing the upper front fascia; then remove the cap screws securing the lower front fascia.



HDX302A

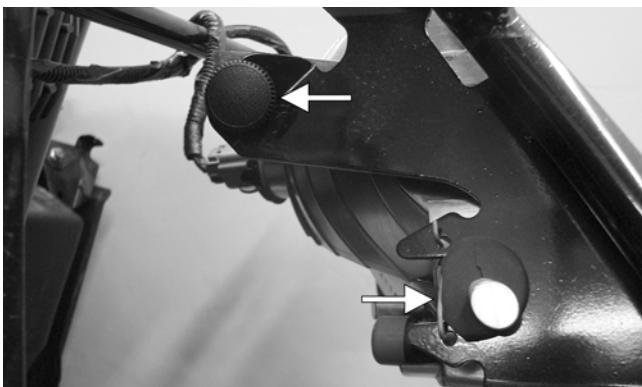


HDX303A

4. Disconnect the both headlight assemblies; then remove both headlight retaining clips and headlight adjuster screw from each assembly. Reference mark then release the headlight harness anchors from the front bumper.



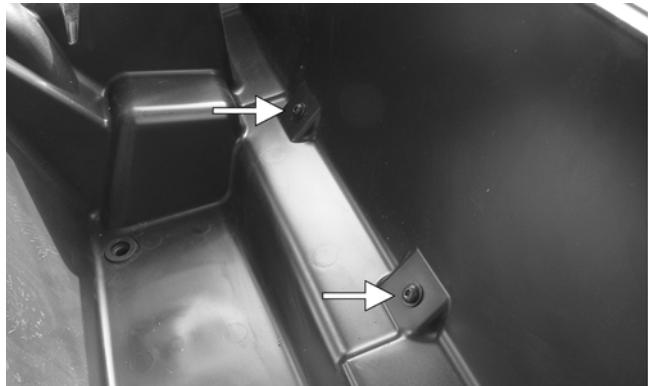
HDX304



HDX305A

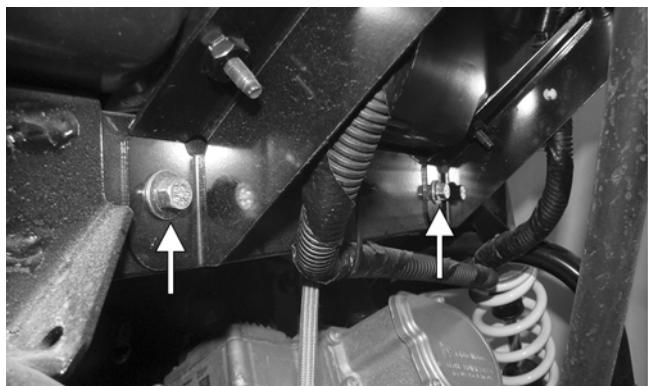
5. Remove the cap screws and nuts securing the top side of the radiator to the front bumper. Disconnect the radiator fan connector. Secure the radiator in place.

6. Reference mark then release any remaining harness anchors from the front bumper. From under the hood, remove the two cap screws securing the bottom of the front storage box to the front bumper.



HDX306A

7. Remove the four cap screws and two lock nuts securing the front bumper to the frame; then lift the bumper up and over the radiator to remove. Discard the lock nuts.



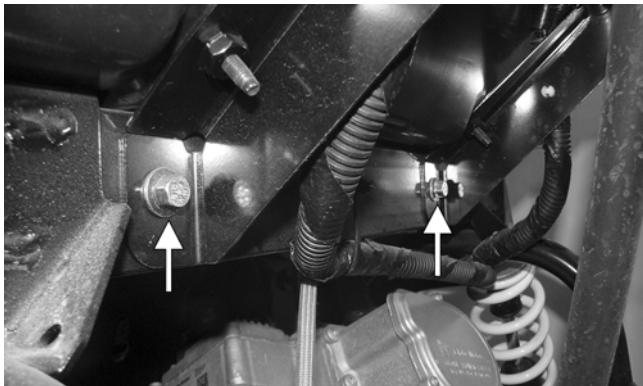
HDX307A



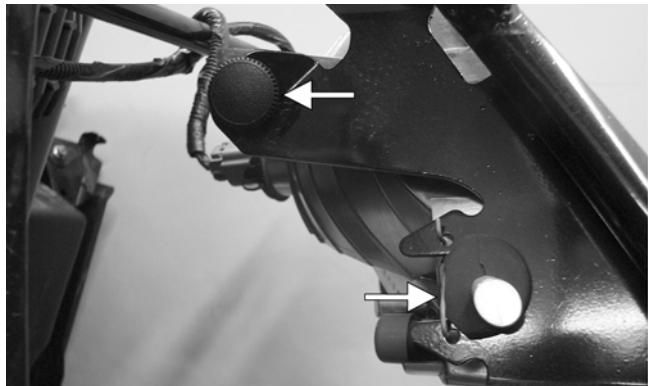
HDX308

## INSTALLING

1. Place the front bumper into position and secure with the four cap screws and new lock nuts. Tighten to 20 ft-lb.



HDX307A



HDX305A

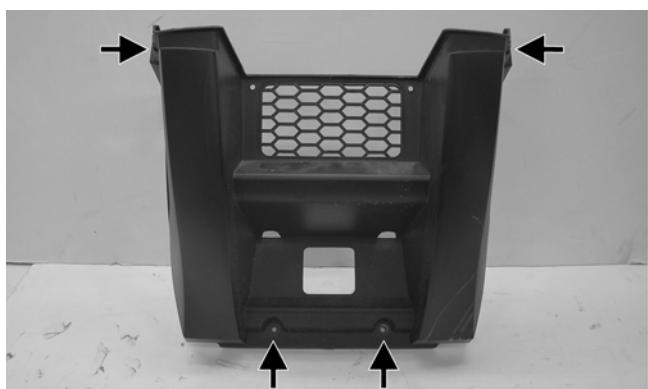


HDX308

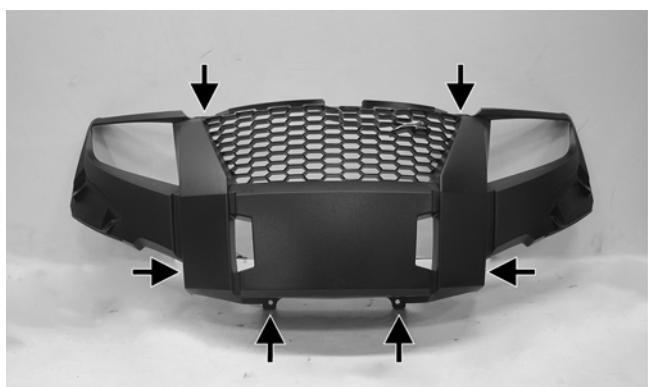
2. From under the hood, install the two cap screws securing the bottom of the front storage box to the front bumper. Using the previously marked harness anchor locations, install the anchors to the front bumper.
3. Secure the radiator to the front bumper and connect the radiator fan to the wiring harness.
4. Install both headlight assemblies onto the front bumper and secure with the retaining clips. Install the headlight adjuster screws.



HDX304



HDX303A



HDX302A

5. Secure the lower front fascia to the frame followed by the upper front fascia.
6. Install the inner then outer front fenders to the vehicle. Place the front access panel into position and secure with the plastic push pins. Install the access cover seal.
7. Check and adjust headlight aim (see Headlight - Tailight/ Brakelight section).

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## Hood

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### REMOVING

1. Open the hood; then remove the four cap screws securing the hood hinges to the frame.



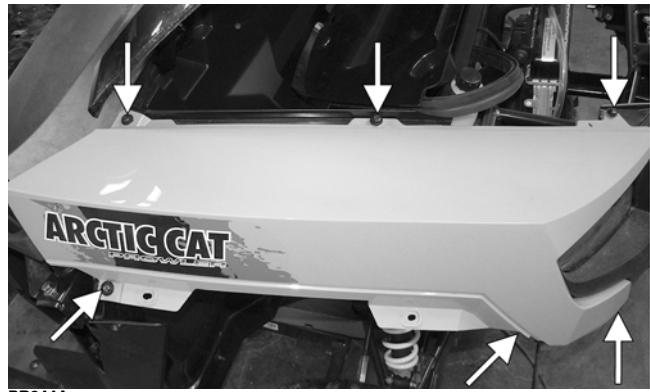
2. Remove the hood assembly.

### CLEANING AND INSPECTING

1. Clean all hood components with soap and water.
2. Inspect the hood for cracks and/or loose fasteners.
3. Inspect for any missing decals.

### INSTALLING

Place the hood into position on the vehicle; then secure with the cap screws. Tighten securely.



PR944A

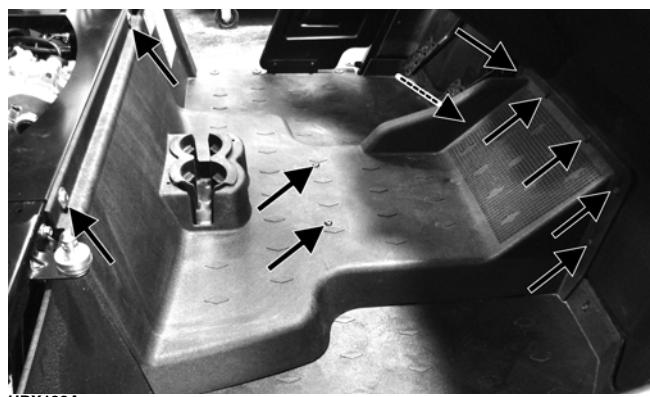
### INSTALLING

1. Install the inner fenders and secure using the existing cap screws.
2. Install the access panel and secure with the push pins.
3. Secure the outer fenders to the vehicle using the existing cap screws.

## Floor

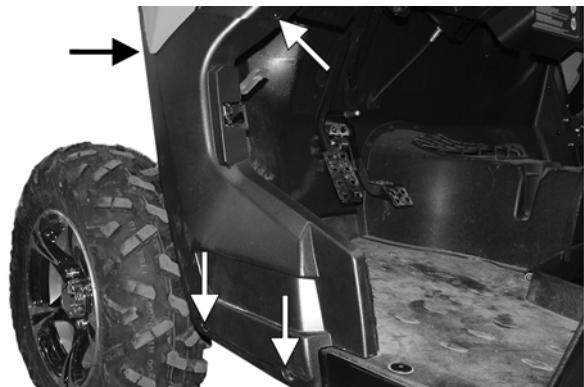
### REMOVING

1. Remove the seat, seat back, and seat base.
2. Remove the self-tapping screws securing both side panels to the frame.
3. Remove the center floorboard.



HDX132A

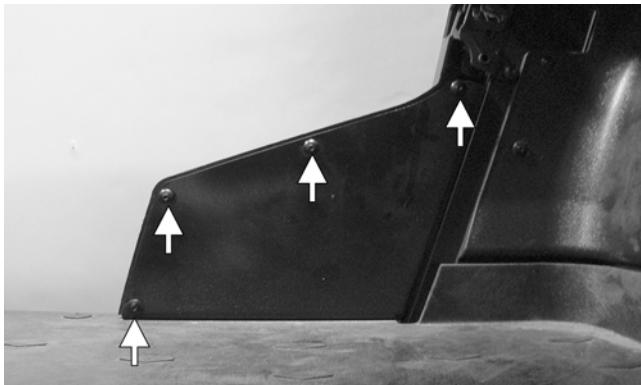
4. Remove the four cap screws securing the left side panel.



PR932A

3. Remove the remaining cap screws securing the inner fender from the inside of the headlight assembly, storage tray, and frame.

5. Remove the screws securing the side panel to the kick panel; then remove the cap screws securing the kick panel to the frame.

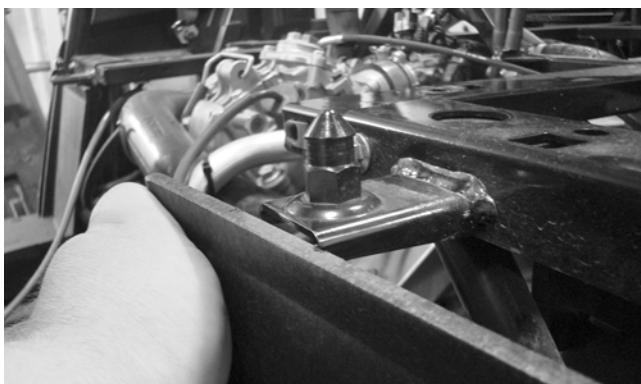


HDX265A



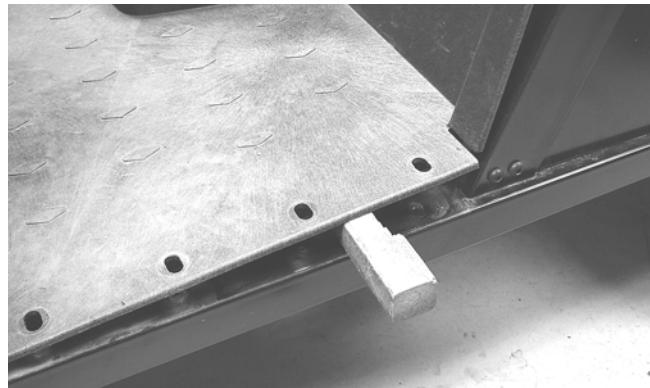
PR933

6. Repeat steps 4-5 for the right side.
7. Remove the remaining cap screws and self-tapping screws securing the floor board to the frame.
8. While pulling forward on the upper-rear of the floor board, lift the rear part of the floor above the seat locating stud.



HDX310

**■NOTE: To aid in removing, insert a small wood block to hold in position.**



PR164

9. From the opposite side of the vehicle, repeat step 8; then lift the rear of the floor up and lift the floor out of the vehicle.



PR945

## CLEANING AND INSPECTING

1. Clean the floor with soap and water.
2. Inspect the floor for cracks or holes.

## INSTALLING

1. Place the front of the floor into position in the vehicle first; then lower the rear and push past the seat locating studs.
2. Secure the floor with the cap screws and self-tapping screws.
3. Install the center floorboard.
4. Install the seat base, seat back, and seat.

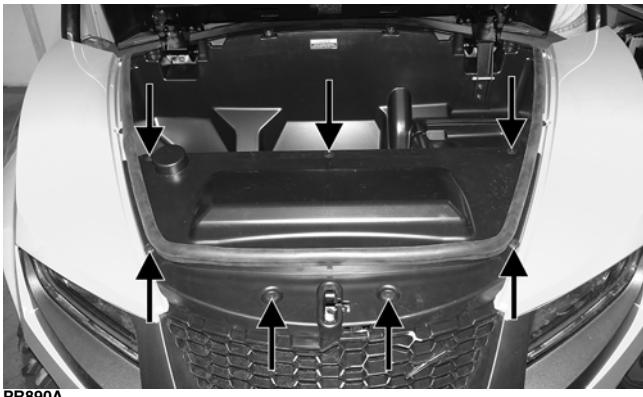
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## Dashboard

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### REMOVING

1. Remove the steering wheel, shift lever knob, and front access panel.

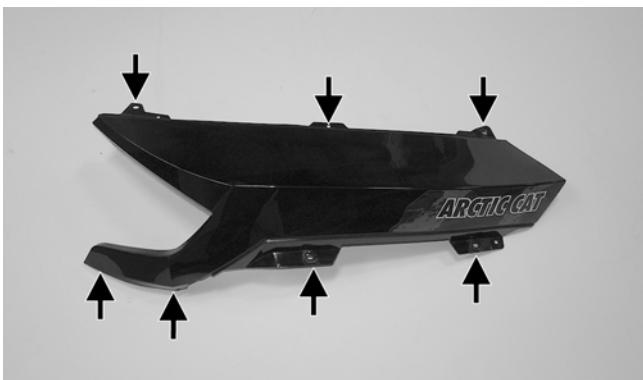


PR890A

2. Remove the hood seal; then disassemble and remove all four front fenders (outer fenders first).

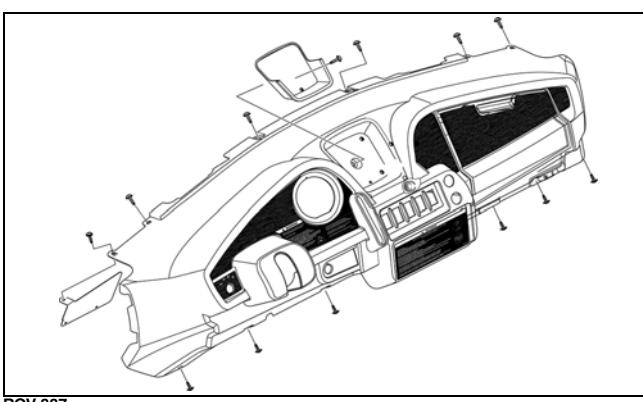


HDX267A



HDX268A

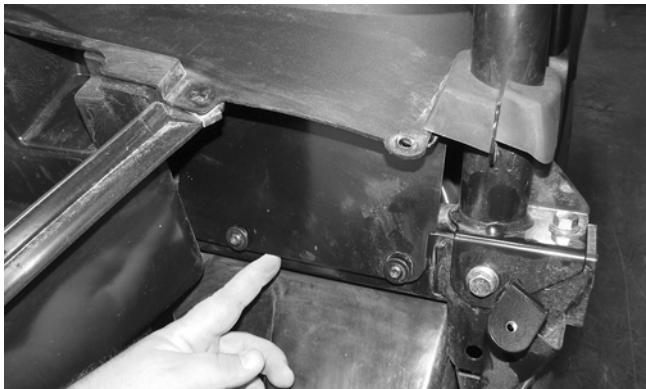
3. Remove the cap screws around the perimeter of the dashboard.



ROV-887

4. From under the dashboard, disconnect the accessory plugs, override switch, drive select switch, and ignition switch. Note the orientation of the connectors for installing purposes.

5. Remove the instrument gauge from the dashboard and disconnect it; then remove the cap screws securing the steel access plate on the driver's side behind the dashboard. Disconnect the headlight switch connector.



HDX269

6. Remove the upper cap screw and lock nut from the tilt steering sub-assembly and support lift. Discard the locknut.



HDX270

7. Slowly pull away the top of the center dash pad and remove the final cap screw. Remove the dashboard.



HDX271

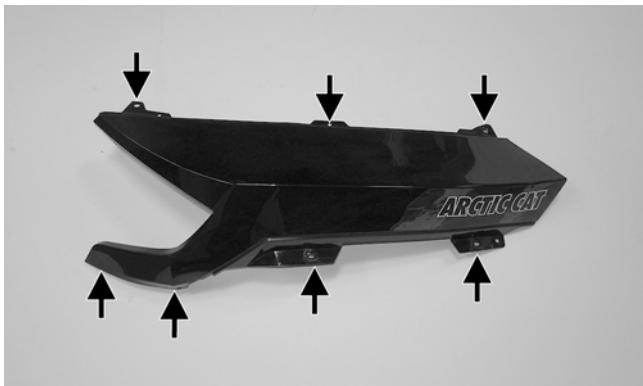
## INSTALLING

1. Install the dashboard into position. Install but do not tighten the cap screw behind the center dash pad.



HDX271

2. Secure the tilt steering sub-assembly to the support lift with the cap screw and new lock nut. Connect the headlight switch connector; then install the steel access panel with two cap screws.
3. Install and connect the gauge to the dashboard.
4. From under the dash, connect the ignition switch, drive select switch, override switch, and accessory plugs.
5. Install and secure the remaining cap screws around the perimeter of the dashboard including the one behind the center dash pad.
6. Install both inner front fenders; then install the outer fenders.



HDX268A



HDX267A

7. Install the front access panel, hood seal, and shift lever knob.
8. Align and install the steering wheel (see Steering Wheel in this section).

## Belly Panel

### REMOVING

1. Remove the body screws securing the belly panel to the underside of the frame.
2. Remove the belly panel.

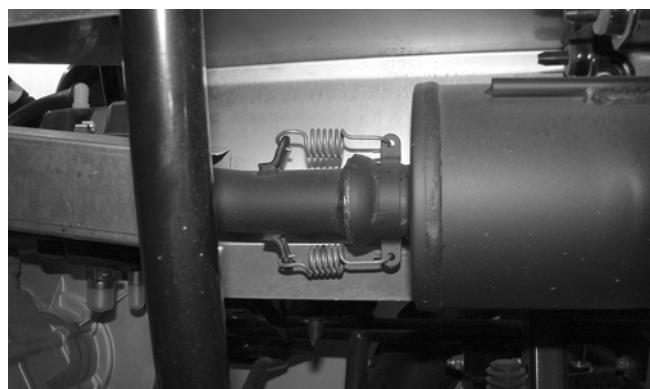
### INSTALLING

1. Place the belly panel into position on the underside of the frame.
2. Install the body screws. Tighten securely.

## Muffler

### REMOVING

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



HDX286

2. Slide the muffler assembly clear of the holder pins.

### 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.

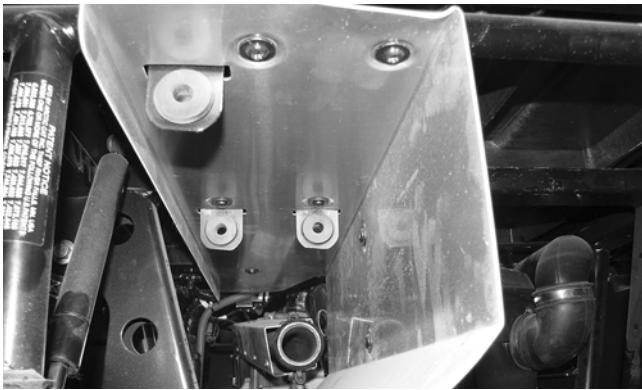
### INSTALLING

1. Place the muffler onto the holder pins and slide into position.
2. Secure the muffler to the exhaust pipe with the two exhaust springs.

## Cargo Box

### REMOVING

1. Remove the muffler and heat shield.



HDX298

2. Raise the cargo box; then remove the cap screw and nut securing the lower lift support to the frame. Account for the washer. The cargo box will tilt fully rearward.



HDX257

3. Loosen but do not remove the four shoulder cap screws securing the pivot housings to the cargo box.



HDX311

4. Lower the cargo box; then remove the four cap screws (from step 2).
5. With the help of an assistant or an adequate lift, remove the cargo box from the vehicle. Account for four pivot housings.
6. To remove the tilt box actuator (if equipped) from the cargo box, remove the remaining clip and clevis pin.



ROV578

## CLEANING AND INSPECTING

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

## INSTALLING

1. With the help of an assistant or an adequate lift, set the cargo box into position on the frame; then position the two upper pivot housings between the cargo box and frame. Lightly grease the pivot housings.
2. Align the holes in the upper pivot housings with the holes in the cargo box; then install the lower pivot housings and secure with the four shoulder cap screws. Tighten to 20 ft-lb.
3. Raise the cargo box; then connect the lift support to the frame, install the cap screw and nut, and tighten the nut securely.
4. Lower the cargo box and lock into position.
5. Install the muffler and heat shield.

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## Taillight Assembly

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### REMOVING

1. Remove the cap screws and lock nuts securing the taillight assembly to the ROPS tube.
2. Disconnect the wire connector; then remove the socket assembly and remove the bulb.

### INSPECTING

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

### INSTALLING

1. Install the new bulb in the socket and place the socket assembly into the taillight housing. Twist clockwise to lock.

2. Connect the wire connector; then install on the ROPS tube and secure with two cap screws and lock nuts. Tighten securely.

## Seat

### REMOVING/INSTALLING

1. To remove the seat, raise the front of the seat and slide it forward.
2. To install the seat, slide the rear of the seat into the seat retainers and push down firmly on the front of seat.

## Troubleshooting

### Problem: Handling too heavy or stiff

Condition	Remedy
<ol style="list-style-type: none"> <li>1. <b>Front wheel alignment</b> incorrect</li> <li>2. <b>Steering shaft</b> binding</li> <li>3. <b>Tire inflation pressure</b> incorrect</li> <li>4. <b>Tie rod ends</b> seizing</li> <li>5. <b>U-joints</b> seized</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust alignment</li> <li>2. Lubricate/replace steering shaft</li> <li>3. Adjust pressure</li> <li>4. Replace tie rod ends</li> <li>5. Replace U-joints</li> </ol>

### Problem: Steering oscillation

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

### Problem: Steering pulling to one side

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

### Problem: Steering impaired

Condition	Remedy
<ol style="list-style-type: none"> <li>1. <b>Tire pressure</b> too high</li> <li>2. <b>Steering linkage</b> worn</li> <li>3. <b>Cap screws</b> (suspension system) loose</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust pressure</li> <li>2. Replace linkage</li> <li>3. Tighten cap screws</li> </ol>

### Problem: Tire wear rapid or uneven

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

### Problem: Steering noise

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

### Problem: Rear wheel oscillation

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

## Engine/Transmission

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

**■NOTE:** Some photographs depict examples with Gen. I or Gen. II driveline components. Photos are used for clarification purposes only and may not depict exact situation.

To service the center crankcase halves, the engine/transmission must be removed from the frame. To service top-side, left-side, and right-side components, the engine/transmission does not have to be removed from the frame.

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

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

### SPECIAL TOOLS

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

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

Description	p/n
Seal Protector Tool	0444-252
Crankcase Separator/Crankshaft Remover	0444-152
Magneto Rotor Remover Set	0444-254
Piston Pin Puller	0644-328
Secondary Drive Gear Holder	0444-253
Spanner Wrench	0444-240
Surface Plate	0644-016
V Blocks	0644-535

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

# Troubleshooting

Problem: Engine will not start or is hard to start (Compression too low)	
Condition	Remedy
1. <b>Valve clearance</b> out of adjustment 2. <b>Valve guides</b> worn 3. <b>Valves</b> mistimed 4. <b>Piston rings</b> worn - broken 5. <b>Cylinder bore</b> worn 6. <b>Starter motor</b> cranks too slowly - does not turn	1. Adjust clearance 2. Replace guides 3. Retime engine 4. Replace rings 5. Replace cylinder 6. See Electrical System
Problem: Engine will not start or is hard to start (No spark)	
Condition	Remedy
1. <b>Spark plug</b> fouled 2. <b>Spark plug</b> wet 3. <b>Magneto</b> defective 4. <b>ECM</b> defective 5. <b>Ignition coil</b> defective 6. <b>High-tension lead</b> open - shorted	1. Clean - replace plug 2. Clean - dry plug 3. Replace stator coil 4. Replace ECM 5. Replace ignition coil 6. Replace high tension lead
Problem: Engine will not start or is hard to start (No fuel reaching the fuel injector)	
Condition	Remedy
1. <b>Gas tank vent hose</b> obstructed 2. <b>Fuel hose</b> obstructed 3. <b>Fuel screens</b> obstructed 4. <b>Fuel pump</b> defective	1. Clean vent hose 2. Clean - replace hose 3. Clean - replace inlet screen 4. Replace fuel pump
Problem: Engine stalls easily	
Condition	Remedy
1. <b>Spark plug</b> fouled 2. <b>Magneto</b> defective 3. <b>ECM</b> defective 4. <b>Fuel injector</b> obstructed 5. <b>Valve clearance</b> out of adjustment	1. Clean - replace plug 2. Replace stator coil 3. Replace ECM 4. Replace fuel injector 5. Adjust clearance
Problem: Engine noisy (Excessive valve chatter)	
Condition	Remedy
1. <b>Valve clearance</b> excessive 2. <b>Valve spring(s)</b> weak - broken 3. <b>Rocker arm - rocker arm shaft</b> worn 4. <b>Camshaft</b> worn	1. Adjust clearance 2. Replace spring(s) 3. Replace arm - shaft 4. Replace camshaft
Problem: Engine noisy (Noise seems to come from piston)	
Condition	Remedy
1. <b>Piston - cylinder</b> worn 2. <b>Combustion chamber</b> carbon buildup 3. <b>Piston pin - piston pin bore</b> worn 4. <b>Piston rings - ring groove(s)</b> worn	1. Replace cylinder - service piston 2. Clean cylinder head and piston 3. Replace - service pin - bore 4. Replace rings - piston
Problem: Engine noisy (Noise seems to come from timing chain)	
Condition	Remedy
1. <b>Chain</b> stretched 2. <b>Sprockets</b> worn 3. <b>Tension adjuster</b> malfunctioning	1. Replace chain 2. Replace sprockets 3. Repair - replace adjuster
Problem: Engine noisy (Noise seems to come from crankshaft)	
Condition	Remedy
1. <b>Main bearing</b> worn - burned 2. <b>Lower rod-end bearing</b> worn - burned 3. <b>Connecting rod side clearance</b> too large 4. <b>Centrifugal clutch</b> loose 5. <b>Rotor/flywheel</b> loose	1. Replace bearing 2. Replace crankshaft assembly 3. Replace crankshaft assembly 4. Tighten - replace clutch 5. Tighten - replace flywheel - crankshaft
Problem: Engine noisy (Noise seems to come from transmission)	
Condition	Remedy
1. <b>Gears</b> worn - chipped 2. <b>Splines</b> worn 3. <b>Primary gears</b> worn - chipped 4. <b>Bearings</b> worn 5. <b>Bushing</b> worn	1. Replace gears 2. Replace shaft(s) - gears 3. Replace gears 4. Replace bearings 5. Replace bushing

**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> excessive 3. <b>Tooth contact</b> improper 4. <b>Bearing</b> damaged 5. <b>Gears</b> worn - chipped 6. <b>Splines</b> worn 7. <b>Final driven shaft thrust clearance</b> too large	1. Replace gears 2. Adjust backlash 3. Adjust contact 4. Replace bearing 5. Replace gears 6. Replace shaft(s) - gears 7. Replace thrust washer(s)

**Problem: Engine idles poorly**

Condition	Remedy
1. <b>Valve clearance</b> out of adjustment 2. <b>Valve seating</b> poor 3. <b>Valve guides</b> defective 4. <b>Rocker arms - arm shaft</b> worn 5. <b>Magneto</b> defective 6. <b>ECM</b> defective 7. <b>Spark plug</b> fouled - gap too wide 8. <b>Ignition coil</b> defective 9. <b>Fuel injector</b> obstructed	1. Adjust clearance 2. Replace - service seats - valves 3. Replace guides 4. Replace arms - shafts 5. Replace stator coil 6. Replace ECM 7. Adjust gap - replace plug 8. Replace ignition coil 9. Replace fuel injector

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

Condition	Remedy
1. <b>High RPM "cut out"</b> against RPM limiter 2. <b>Valve springs</b> weak 3. <b>Valve timing</b> out of adjustment 4. <b>Cams - rocker arms</b> worn 5. <b>Spark plug gap</b> too narrow 6. <b>Ignition coil</b> defective 7. <b>Air cleaner element</b> obstructed 8. <b>Fuel hose</b> obstructed	1. Shift into higher gear - decrease speed 2. Replace springs 3. Adjust timing 4. Replace cams - arms 5. Adjust gap 6. Replace ignition oil 7. Clean element 8. Clean - prime hose

**Problem: Exhaust smoke dirty or heavy**

Condition	Remedy
1. <b>Engine oil</b> overfilled - contaminated 2. <b>Piston rings</b> - cylinder worn 3. <b>Valve guides</b> worn 4. <b>Cylinder wall</b> scored - scuffed 5. <b>Valve stems</b> worn 6. <b>Stem seals</b> defective	1. Drain excess oil - change oil 2. Replace cylinder - service rings 3. Replace guides 4. Replace 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> out of adjustment 4. <b>Piston ring(s)</b> - cylinder 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>Air cleaner element</b> obstructed 11. <b>Engine oil</b> overfilled - contaminated 12. <b>Intake manifold</b> leaking air 13. <b>Cam chain</b> worn	1. Adjust clearance 2. Replace springs 3. Time camshaft 4. Replace cylinder - service rings 5. Repair seats 6. Clean - replace plug 7. Replace arms - shafts 8. Adjust gap - replace plug 9. Replace fuel injector 10. Clean element 11. Drain excess oil - change oil 12. Tighten - replace manifold 13. Replace cam chain - sprockets

**Problem: Engine overheats**

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

## 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/replace right-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.

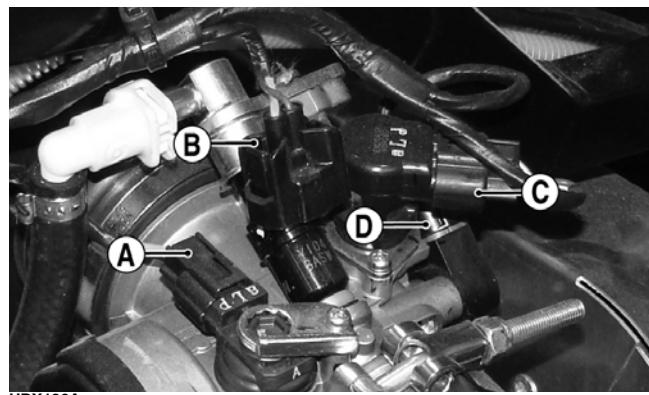
Support the vehicle on a suitable lift or jack stands allowing room to perform work from the underside.

■**NOTE:** Locate the jack stands to allow removing of the center belly panel.

### WARNING

Make sure the vehicle is solidly supported on the support stands to avoid injury.

1. Remove the seat, seat back, and seat base; then disconnect negative battery cable.
2. Remove the center skid plate; then drain the oil and coolant.
3. Remove the center floorboard.
4. Marking all nylon tie locations for installing purposes, from the right side disconnect the MAP sensor connector (A), fuel injector connector (B), ISC connector (C), and TPS connector (D).



HDX136A

5. Wrap the gasoline hose connector with a shop cloth; then remove the gasoline hose connector from the fuel rail.

### WARNING

Gasoline may be under pressure. Place an absorbant towel around the connector to absorb any gasoline spray when disconnected.



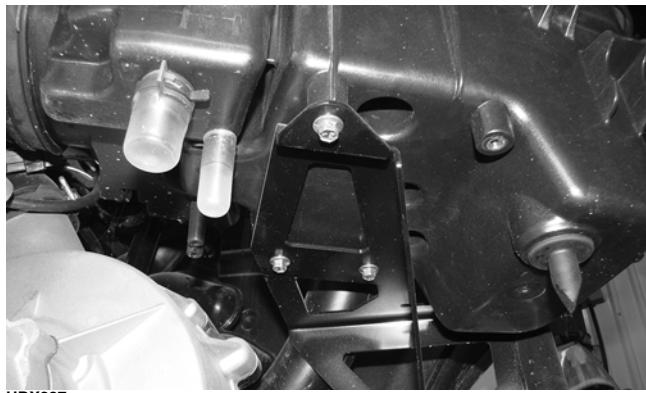
HDX138A

6. Loosen the clamp securing the air filter intake tube to the air filter; then remove the mounting screw and remove the intake tube.

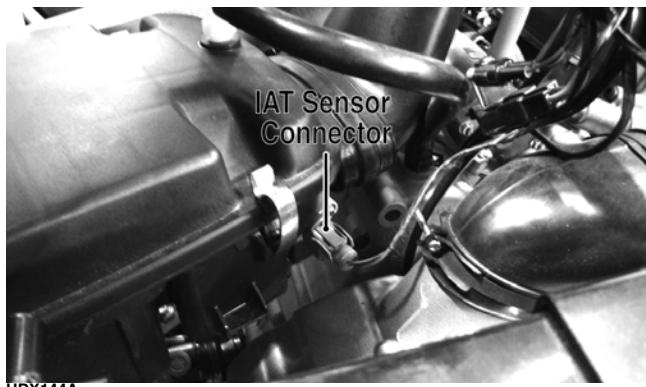


HDX031A

7. Remove the cap screws securing the air filter to the frame; then loosen the air inlet boot clamp and disconnect the IAT sensor connector and remove the air filter assembly.

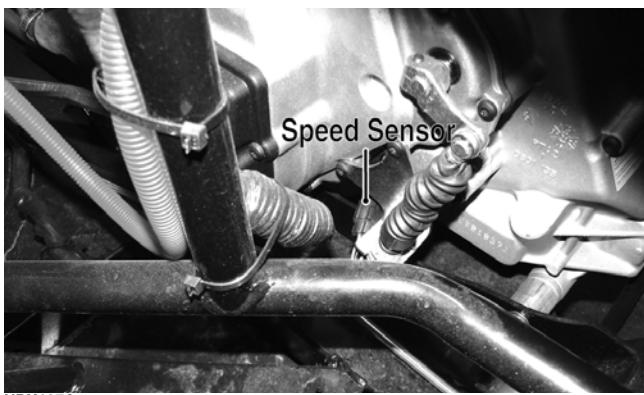


HDX287

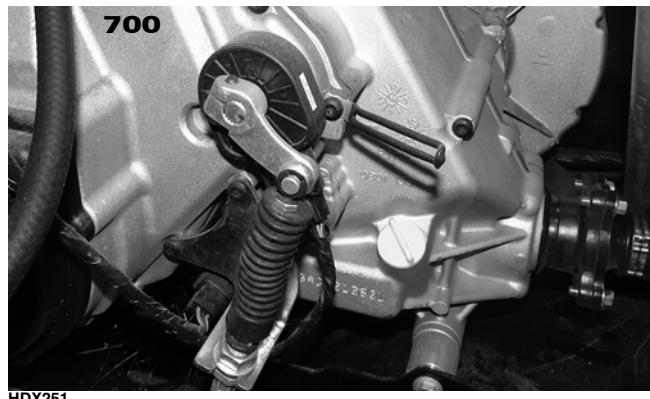
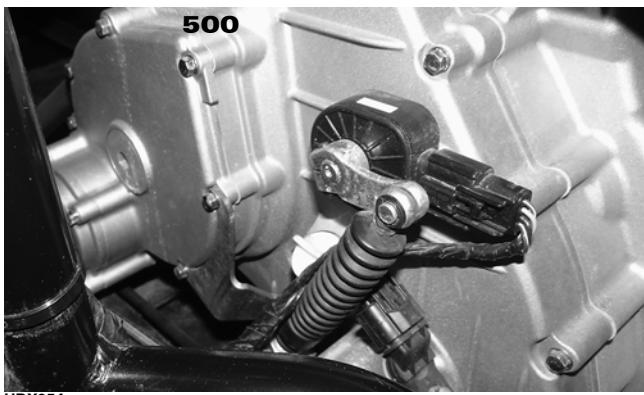


HDX144A

8. Loosen the clamp securing the throttle body to the intake manifold boot; then remove the throttle body and set aside.
9. From the left side, disconnect the ECT sensor connector, speed sensor connector, and spark plug cap.

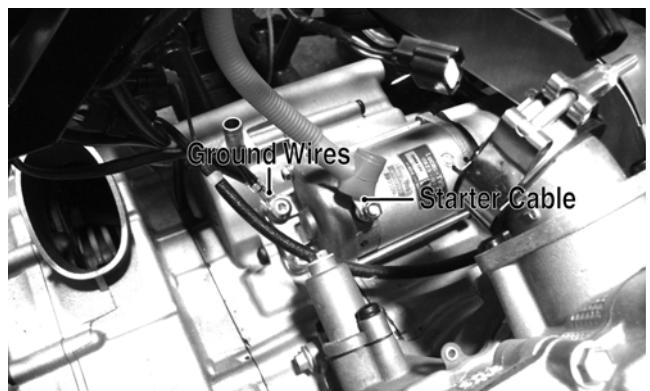


10. Remove the cap screws securing the shift cable bracket to the engine case. Remove the cap screw from the shift arm and disconnect the gear position switch connector. Slide the gear position switch off the engine.

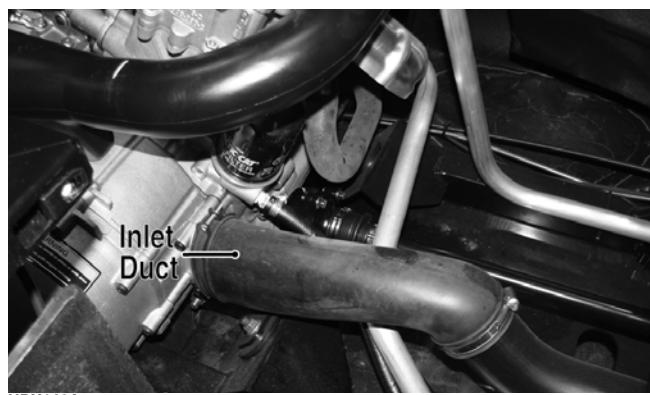


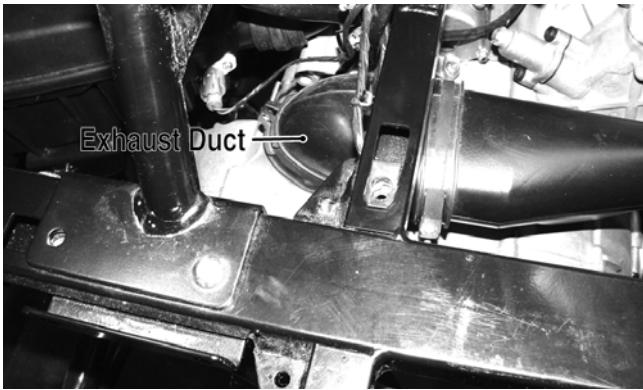
■**NOTE: On the 500, shifting the transmission into park will aid in accessing the shift arm cap screw.**

11. Disconnect the starter cable from the starter; then remove the cap screw securing the engine/harness ground wires to the engine case.

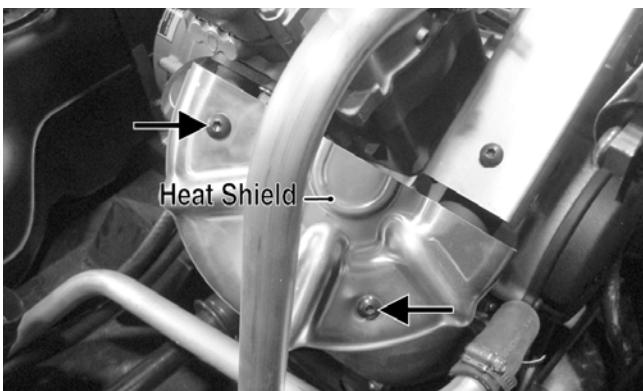


12. Remove the CVT inlet and exhaust ducts from the V-belt housing.





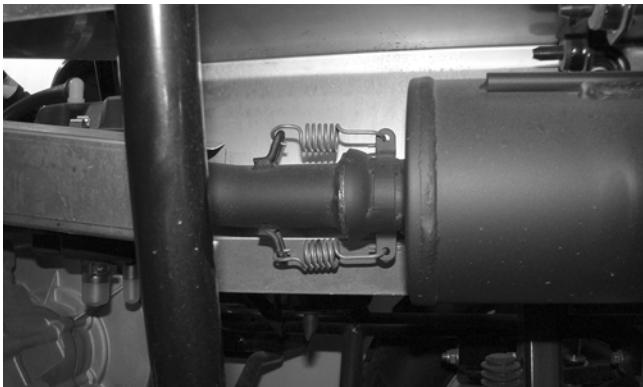
13. Remove the forward heat shield from the exhaust pipe; then remove the cap screws securing the exhaust pipe to the cylinder head.



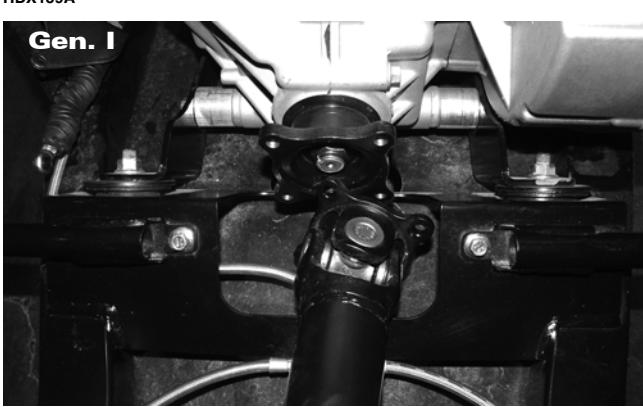
14. Disconnect the O2 sensor; then remove the O2 sensor.

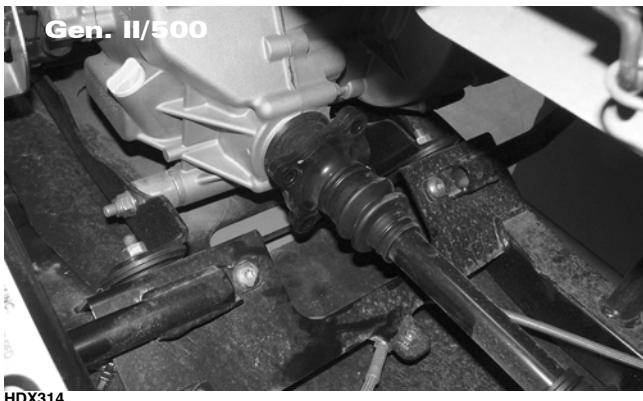


15. Remove the two exhaust springs at the muffler; then remove the exhaust pipe. Account for a grafoil seal in the cylinder head and a grafoil seal at the muffler.



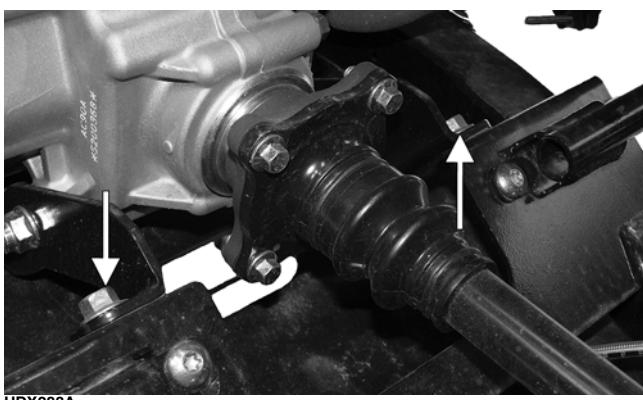
16. Remove the cap screws securing the driveshafts to the front and rear engine flanges; then disconnect the upper and lower coolant hoses.





HDX314

17. On the 700, remove the four nuts securing the left and right engine brackets to the motor mounts.
18. On the 500, remove the four cap screws securing the left and right brackets to the frame.



19. Attach a suitable lifting sling and with a suitable engine hoist, lift the engine from the vehicle.
20. Remove the cap screws and lock nuts securing the left and right engine brackets to the engine. Account for the spacers. Discard the lock nuts.

## Servicing Engine (500)

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## Top-Side Components

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

### ☞ AT THIS POINT

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

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

## Removing Top-Side Components

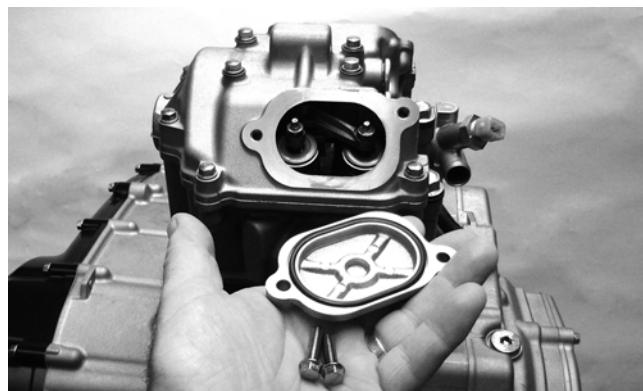
### A. Cylinder Head Cover/ Rocker Arms

#### B. Cylinder Head/Camshaft

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

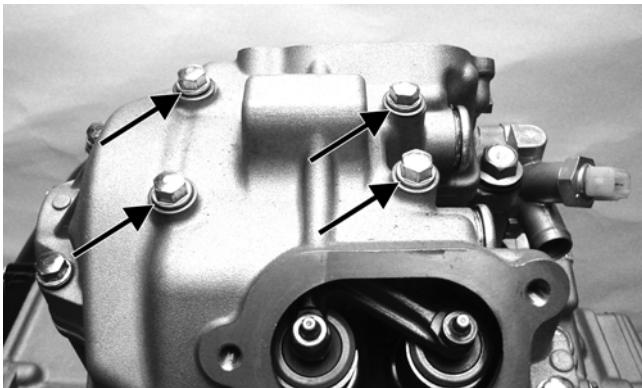
■NOTE: Arctic Cat recommends the use of new gaskets, lock nuts, and seals and lubricating all internal components when servicing the engine/transmission.

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

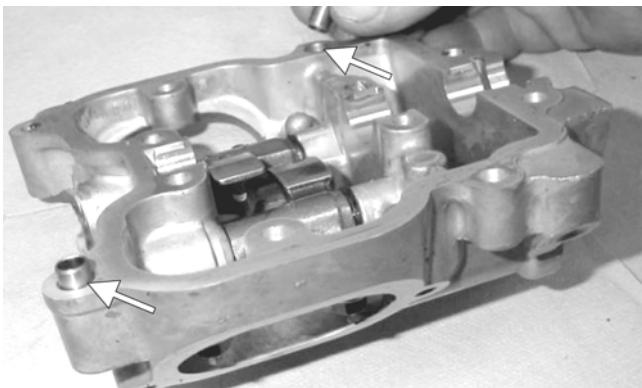


■NOTE: Keep the mounting hardware with the covers for assembly purposes.

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

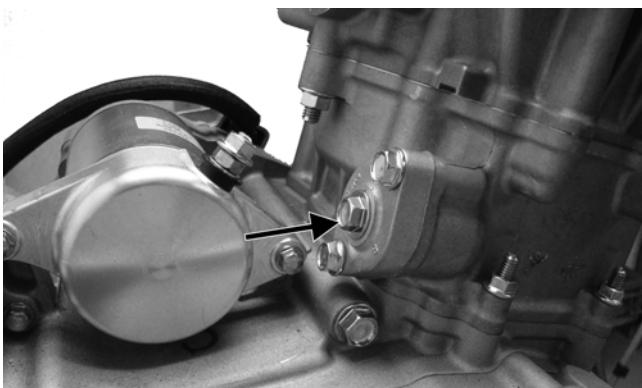


FI606A

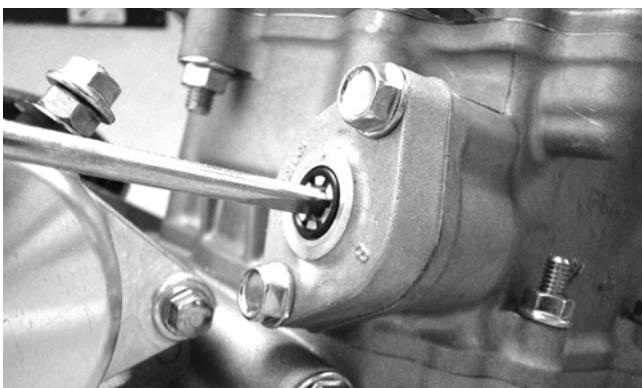


MD1354A

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



FI607A



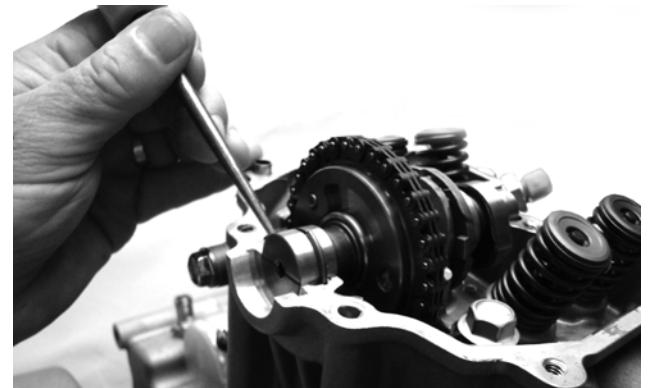
FI608

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



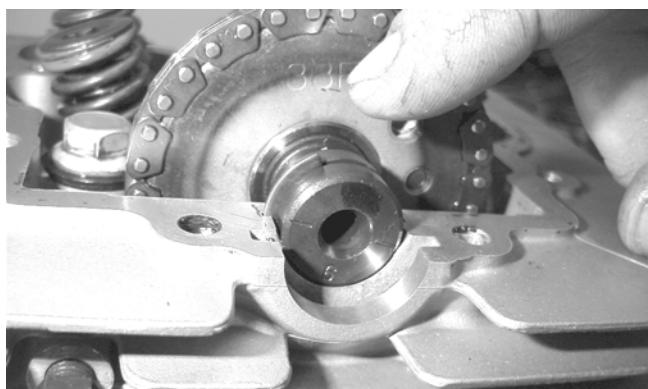
FI612

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



FI613

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



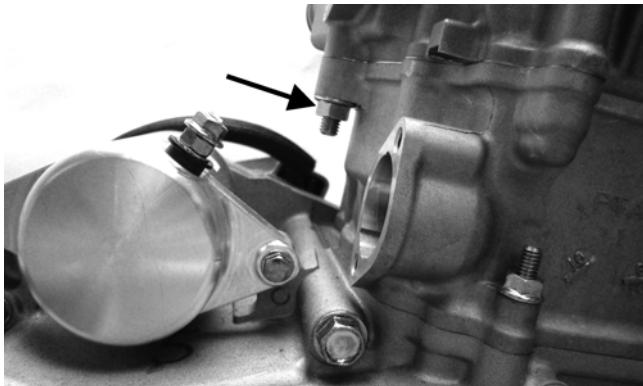
MD1131

6. Noting the timing marks for installing purposes, drop the sprocket off the camshaft. While holding the cam chain, slide the sprocket and camshaft out of the cylinder head. Account for an alignment pin.

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



FI620

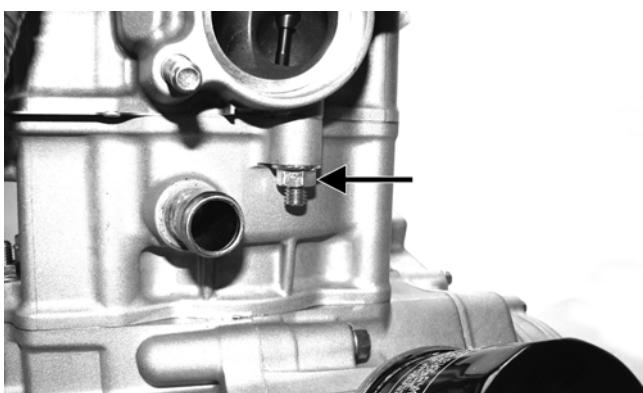


FI618A



FI617A

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

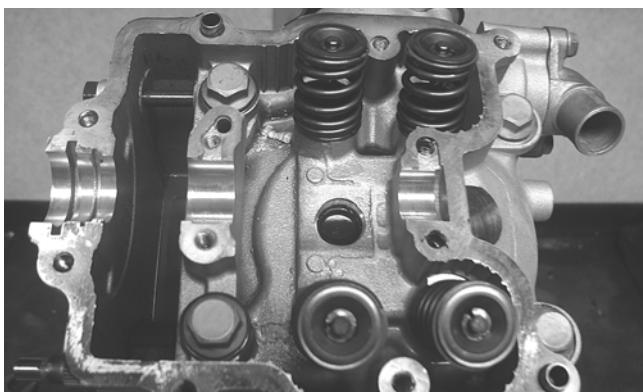


FI619A

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



FI616

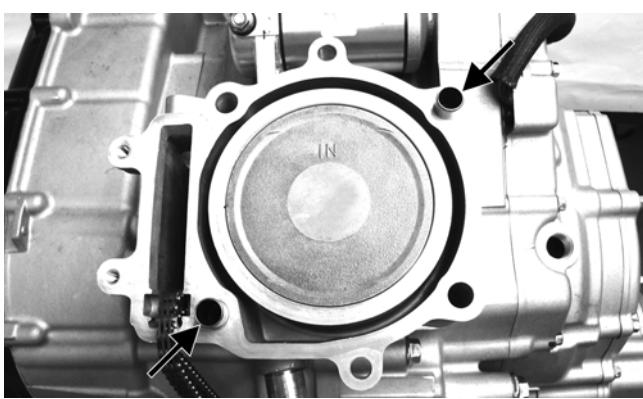


CD211

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



FI617



FI623A

### ☞ AT THIS POINT

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

10. Remove the cam chain guide.

### ☞ AT THIS POINT

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

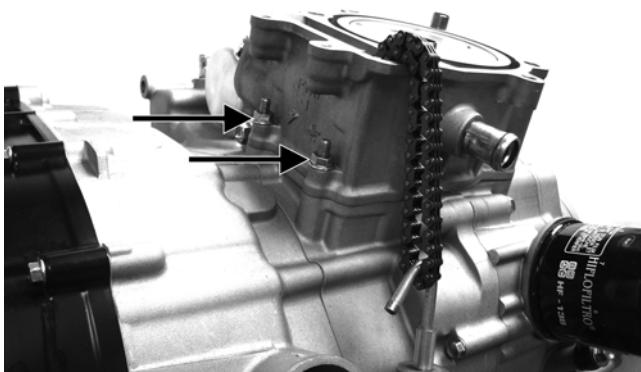


FI621

## C. Cylinder D. Piston

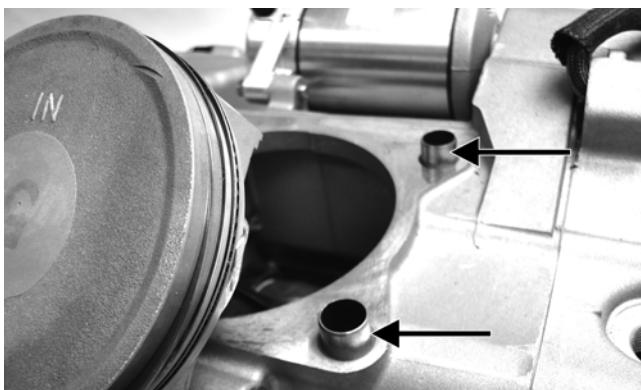
■NOTE: Steps 1-10 in the preceding sub-section must precede this procedure.

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



FI622A

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



FI624A

### ☞ AT THIS POINT

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

### CAUTION

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

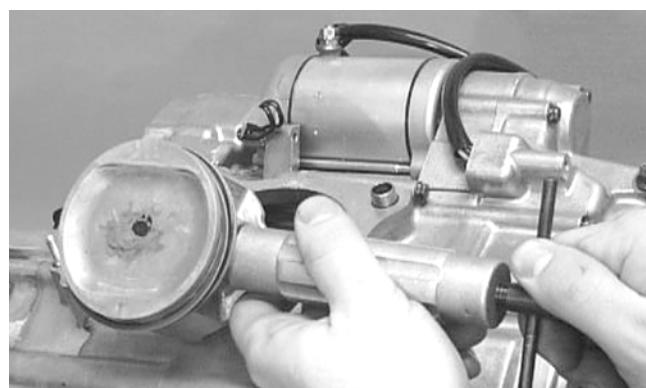
13. Using an awl, remove one piston-pin circlip. Take care not to drop it into the crankcase.



FI625

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

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



MD1219

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

### CAUTION

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

### ☞ AT THIS POINT

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

### ☞ AT THIS POINT

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

## Servicing Top-Side Components

### VALVE ASSEMBLY

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

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

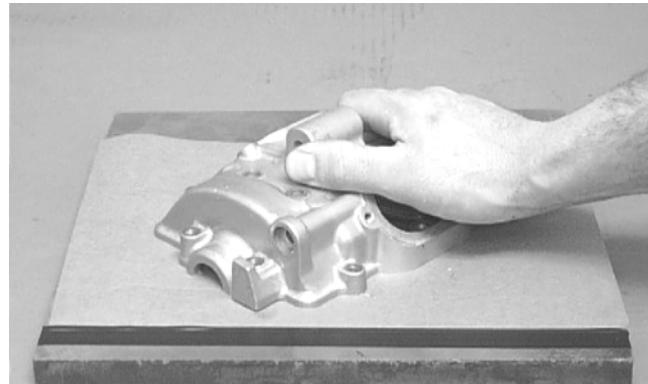
### Cleaning/Inspecting Cylinder Head Cover

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

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

#### CAUTION

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



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

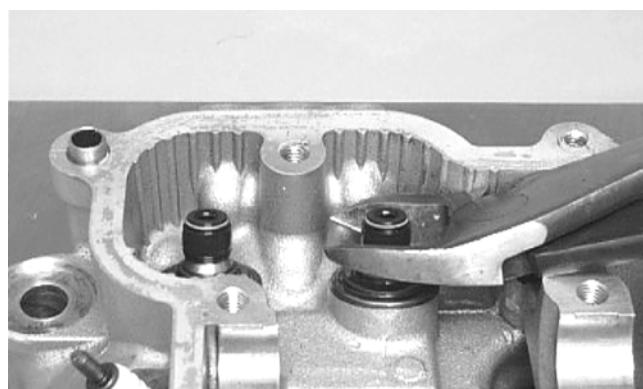
■**NOTE:** Index all valves, springs, and cotters to their original position when removing. When installing, all valve components should be installed in their original position.

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

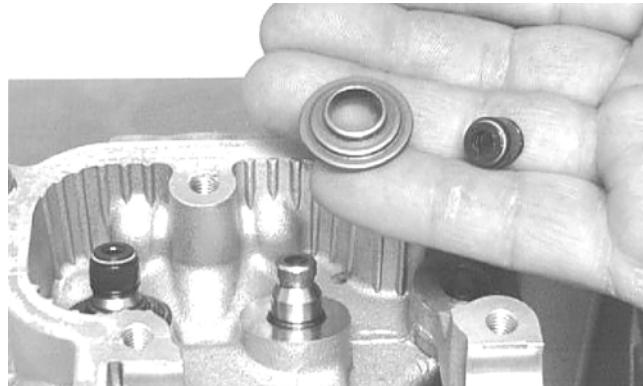


CC132D

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



CC134D



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, the cylinder head must be replaced.

## Servicing Valves/Valve Guides/Valve Seats

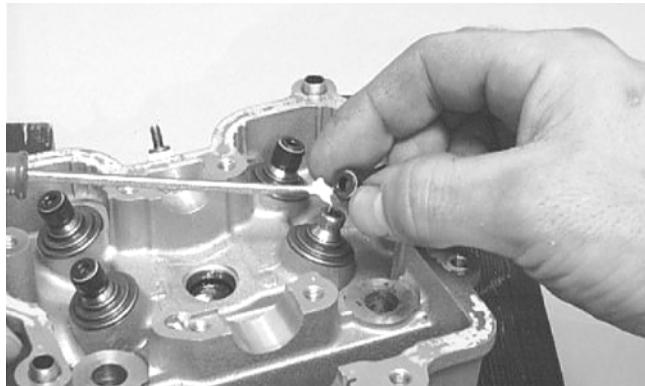
If valves, valve guides, or valve seats require servicing or replacement, Arctic Cat recommends that the components be taken to a qualified machine shop for servicing.

### CAUTION

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

## Installing Valves

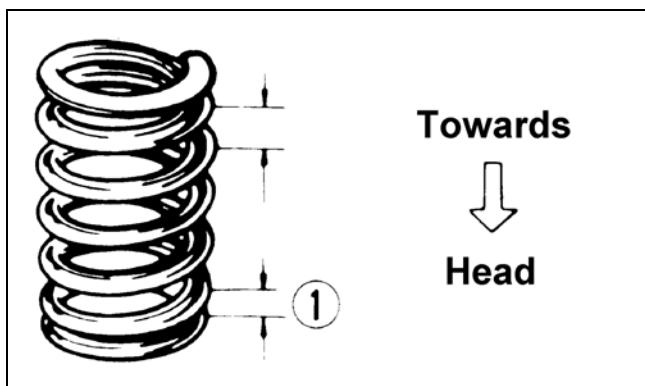
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



CC144D

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

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



ATV-1011A

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



CC132D

## PISTON ASSEMBLY

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

## Inspecting Piston

1. Inspect the piston for cracks in the piston pin, boss, top, and skirt areas.
2. Inspect the piston for seizure marks or scuffing. If piston is scored or galled, replace it with a new one.
3. Inspect the perimeter of each piston for signs of "blowby" indicated by dark discoloration. "Blowby" is caused by worn piston rings, excessive carbon in ring grooves, or an out-of-round cylinder.

## Removing Piston Rings

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



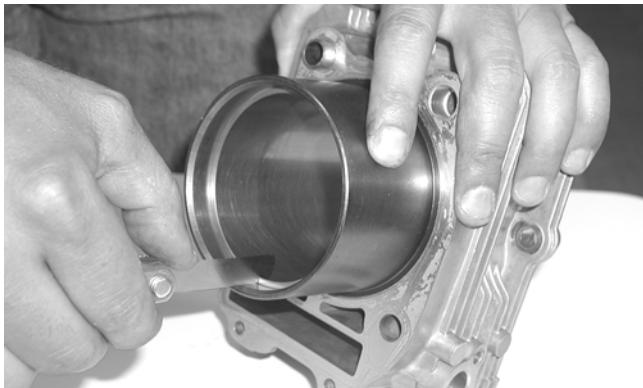
CC400D

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

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

## Measuring Piston-Ring End Gap (Installed)

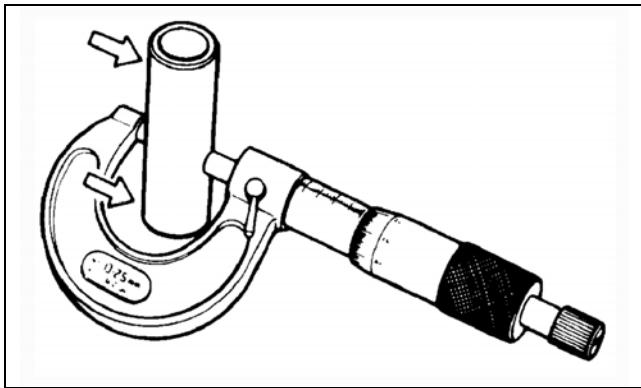
1. Place each piston ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must not exceed specifications.



CC995

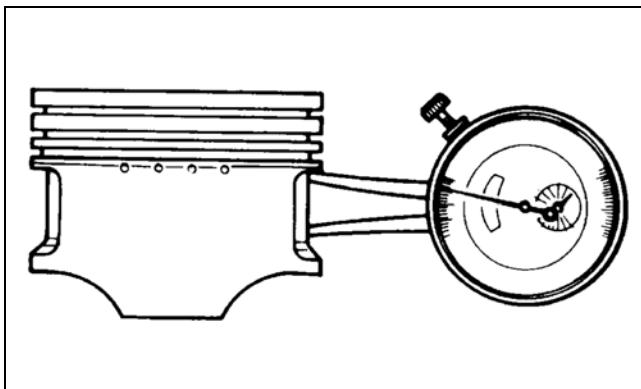
### Measuring Piston Pin, Connecting Rod Small End, and Piston-Pin Bore

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



ATV-1070

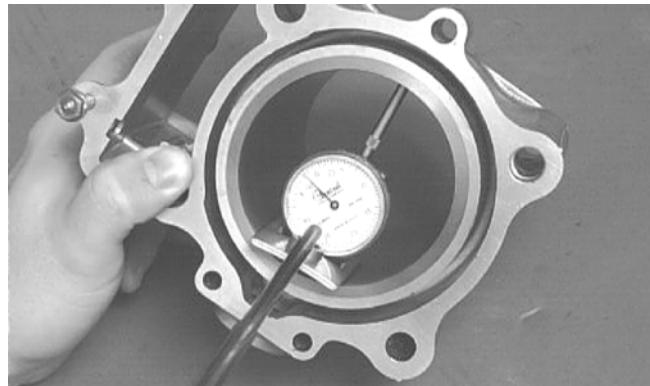
2. Inspect and measure the connecting rod small end inside diameter. If the measurement exceeds specifications, the connecting rod must be replaced (see Center Crankcase Components in this section).
3. Insert an inside dial indicator into the piston-pin bore. Take two measurements to ensure accuracy.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



ATV-1069

### Measuring Piston Skirt/Cylinder Clearance

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



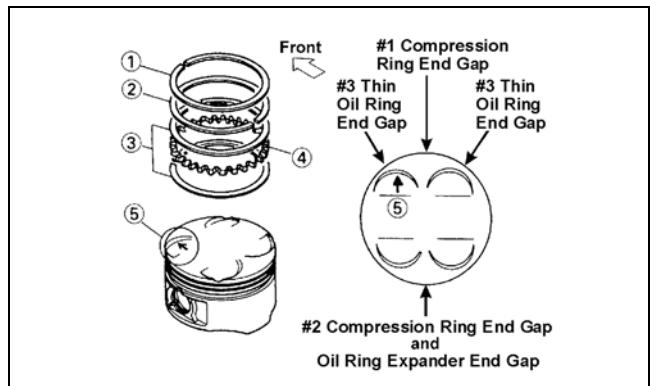
CC127D

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

### Installing Piston Rings

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

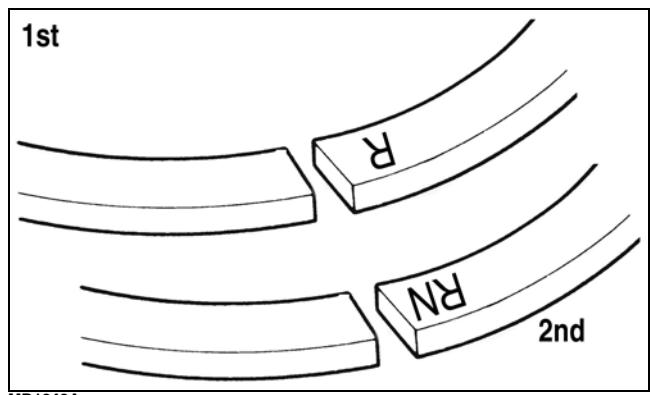
■**NOTE: Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.**



ATV-1085B

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

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



MD1343A

## CAUTION

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

## CYLINDER/CYLINDER HEAD ASSEMBLY

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

### Cleaning/Inspecting Cylinder Head

## CAUTION

The cylinder head studs must be removed for this procedure.

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

## CAUTION

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

### Measuring Cylinder Head Distortion

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



### Cleaning/Inspecting Cylinder

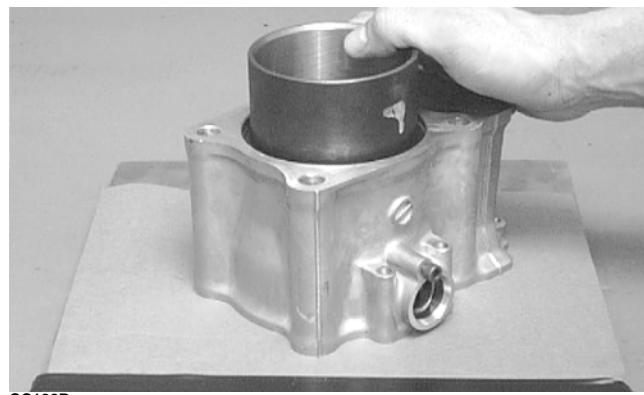
1. Wash the cylinder in parts-cleaning solvent.

2. Inspect the cylinder for pitting, scoring, scuffing, warpage, and corrosion. If marks are found, repair the surface using a cylinder hone (see Honing Cylinder in this sub-section).

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

## CAUTION

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



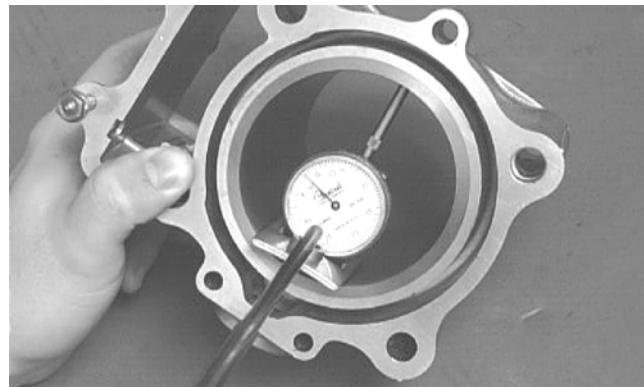
CC129D

### Inspecting Cam Chain Guide

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

### Honing Cylinder

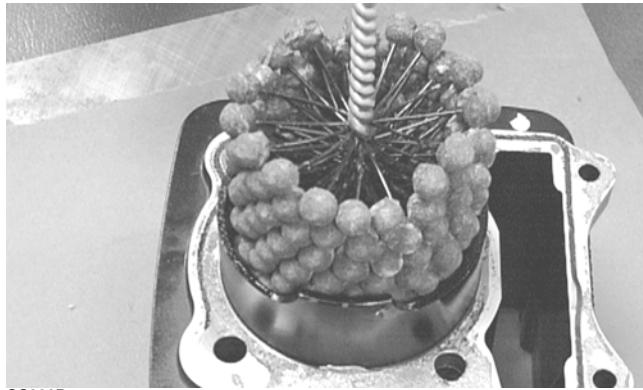
1. Using a slide gauge and a dial indicator or a snap gauge, measure the cylinder bore diameter in three locations from top to bottom and again from top to bottom at 90° from the first measurements for a total of six measurements. The trueness (out-of-roundness) is the difference between the highest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



2. Wash the cylinder in parts-cleaning solvent.

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

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



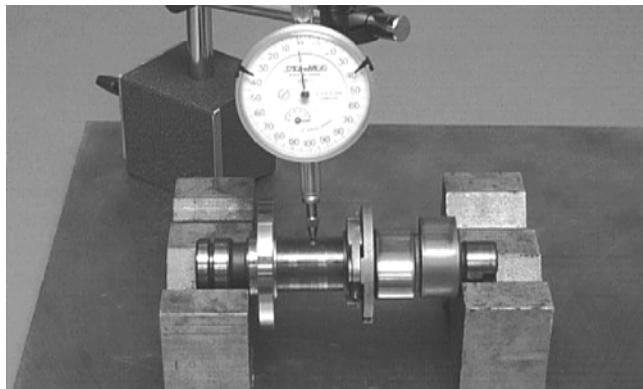
CC390D

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

### Measuring Camshaft Runout

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

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

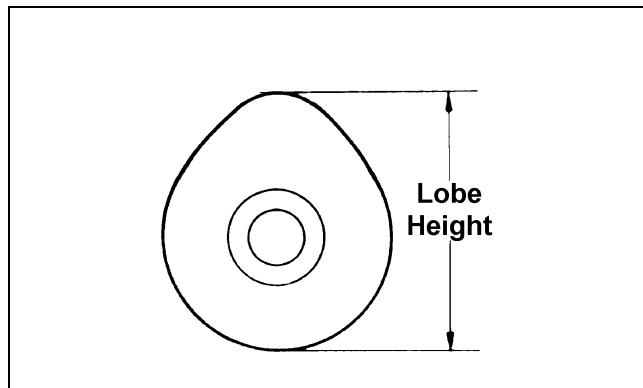


CC283D

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

### Measuring Camshaft Lobe Height

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



ATV1013A

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

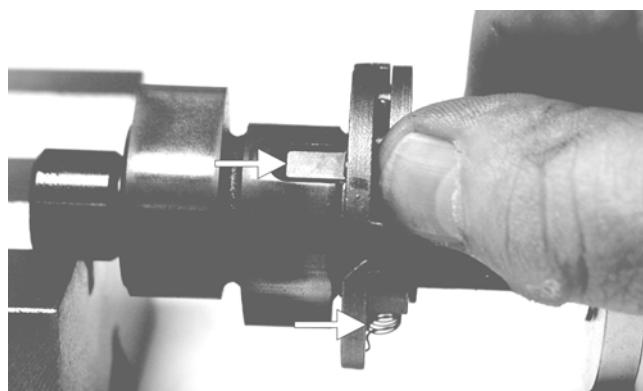
### Inspecting Camshaft Bearing Journal

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.

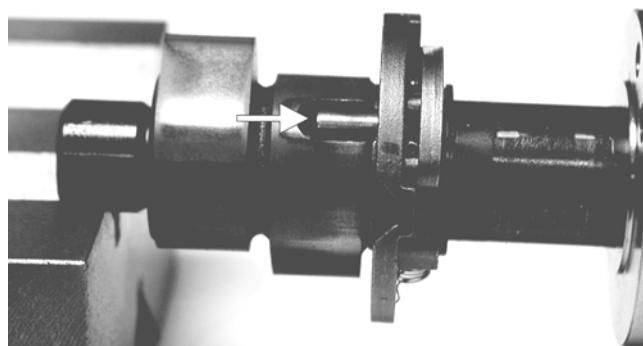
### Inspecting Camshaft Spring/Drive Pin

1. Inspect the spring and unloader pin for damage.



CF061A

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



CF060A

2. If damaged, the camshaft must be replaced.

## Installing Top-Side Components

### A. Piston

#### B. Cylinder

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



FI626

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

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

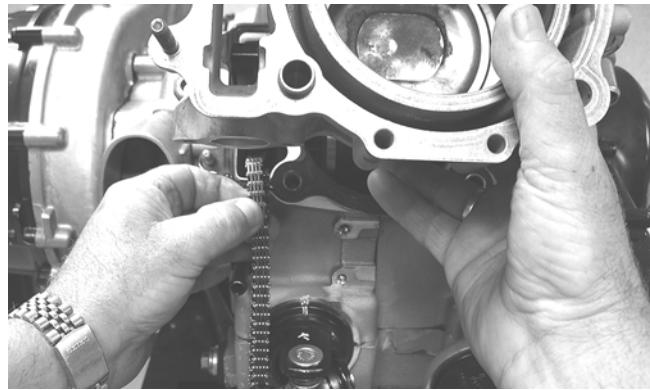


MD1344

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

#### CAUTION

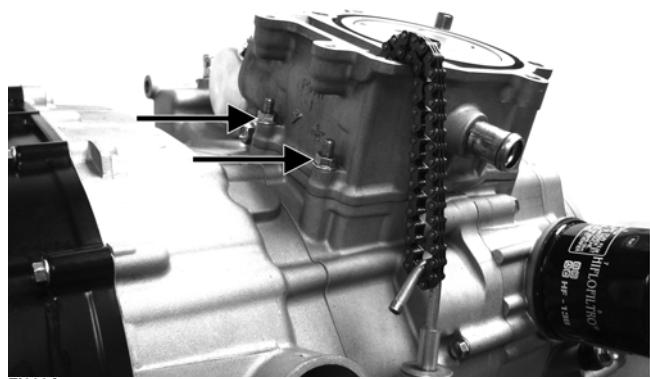
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



GZ142

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

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



FI622A

### C. Cylinder Head/Camshaft

### D. Cylinder Head Cover/Rocker Arms

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

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

#### CAUTION

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

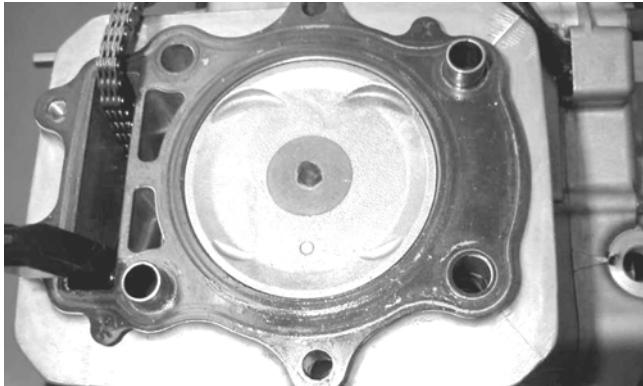


FI621

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

**CAUTION**

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



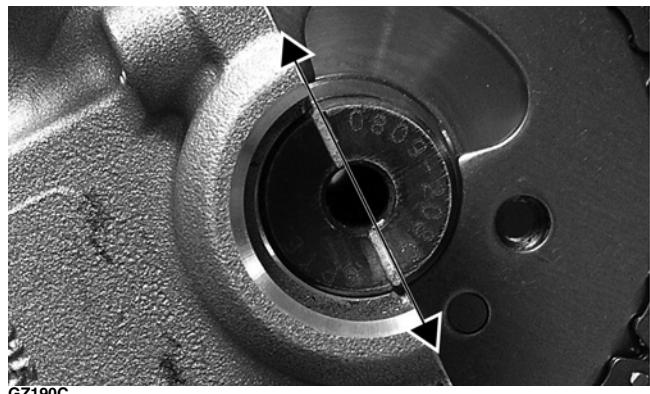
MD1347

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



CD383

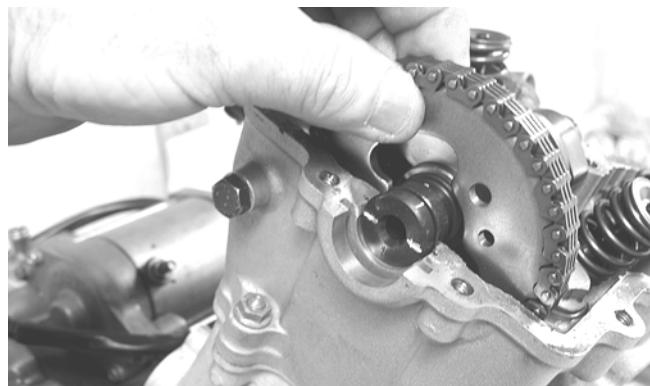
12. With the alignment pin installed in the camshaft and the cam lobes directed down (toward the piston), place the camshaft in position and verify that the timing mark on the magneto is visible through the inspection plug and that the timing marks on the camshaft sprocket are parallel with the valve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



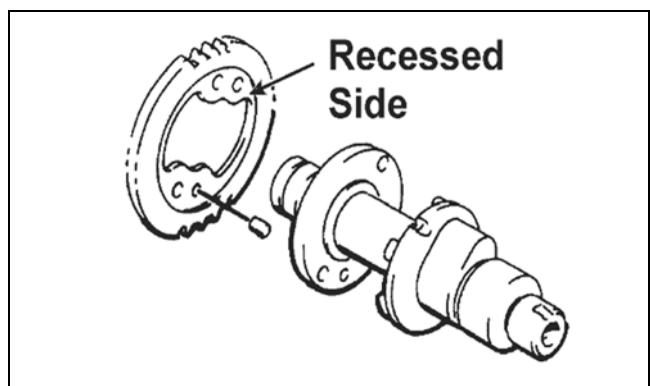
GZ190C

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

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



CD463



MD1359

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



FI615

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

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

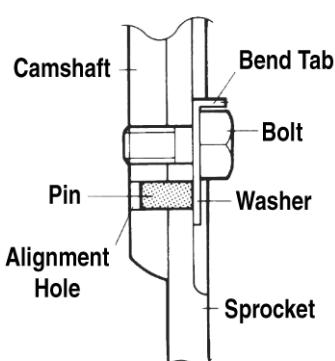
15. When the camshaft assembly is seated, ensure the following.

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

### CAUTION

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

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

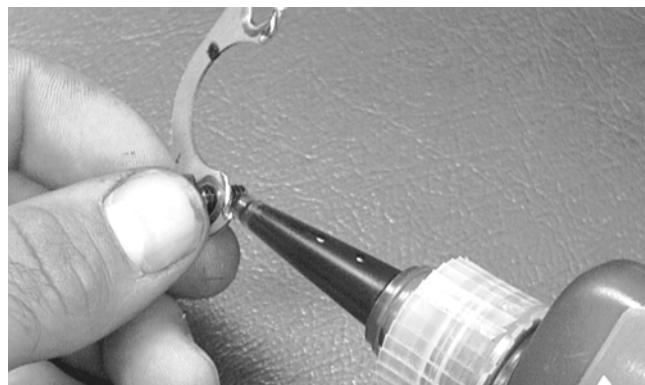


MD1363

### CAUTION

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

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



CC404D



FI612

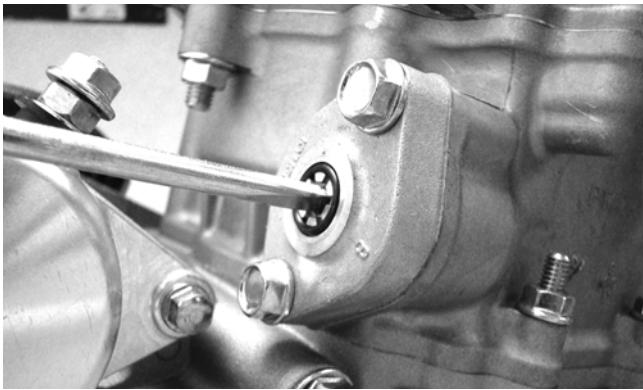
18. Rotate the crankshaft until the second cap screw securing the sprocket to the camshaft can be installed; then install the cap screw (threads coated with red Loctite #271). Tighten to 11 ft-lb; then bend the tab to secure the cap screw.

19. Rotate the crankshaft until the first cap screw (from step 17) securing the sprocket to the camshaft can be addressed; then tighten to 11 ft-lb. Bend the tab to secure the cap screw.

20. Install the cylinder head plug with the cupped end facing the camshaft and the opening directed downwards.

21. Place the cam chain tensioner assembly and gasket into the cylinder. Tighten to 10 ft-lb.

22. Using a flat-blade screwdriver, turn the tensioner screw counterclockwise to apply tension to the cam chain; then install the cap screw plug and washer and tighten securely.

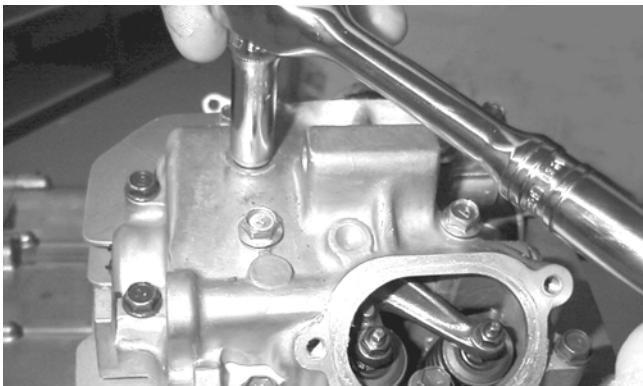


FI608

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

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

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



MD1261

26. In a crisscross pattern starting from the center and working outward, tighten the cap screws (from step 25) to 8 ft-lb.
27. Adjust valve/tappet clearance (see Periodic Maintenance/Tune-Up).
28. Place the two tappet covers with O-rings into position; then install and tighten the cap screws to 9 ft-lb.



FI602

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

## Left-Side Components

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

### AT THIS POINT

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

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

## Removing Left-Side Components

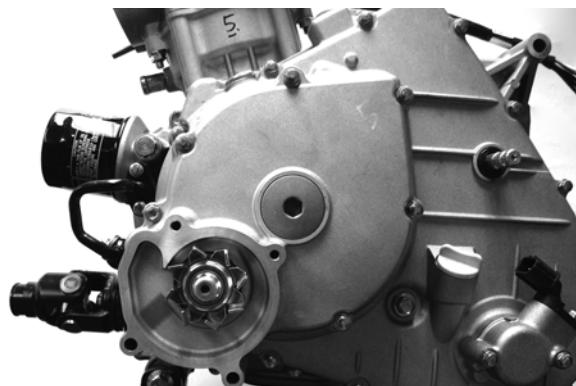
- A. Water Pump**
- B. Speed Sensor**
- C. Magneto Cover/Stator Assembly**

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

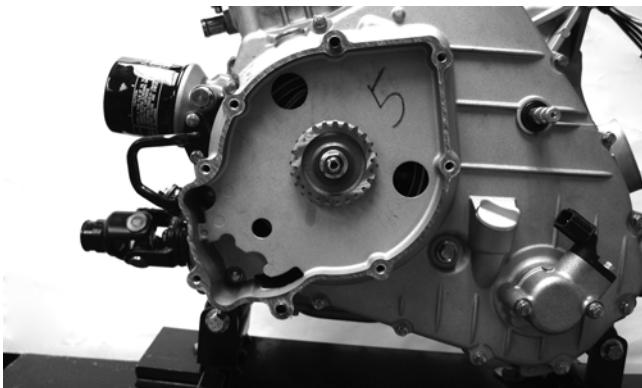


FI538

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



FI539



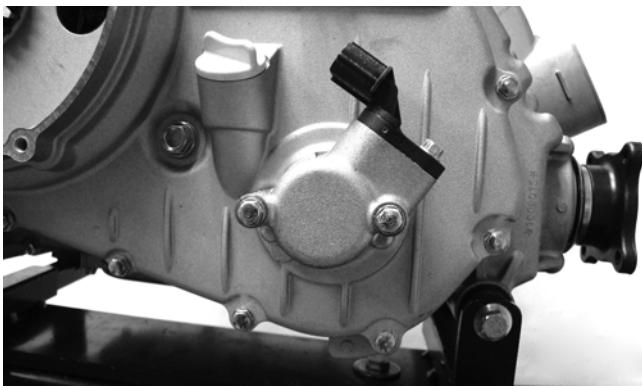
FI541

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



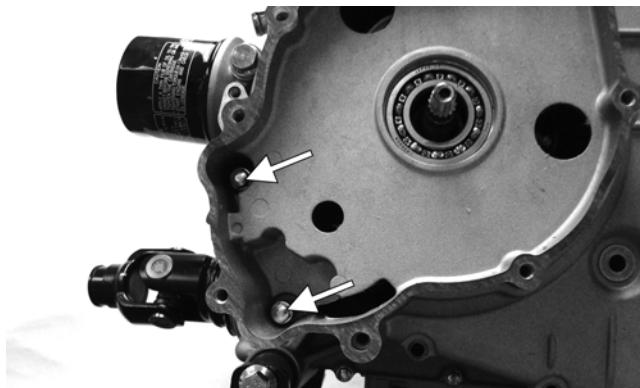
FI544

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



FI543

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



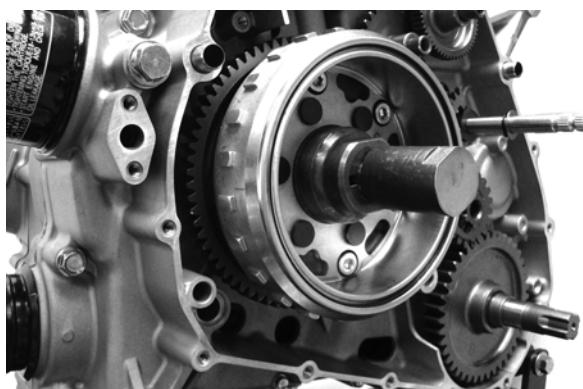
FI596A

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

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

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

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



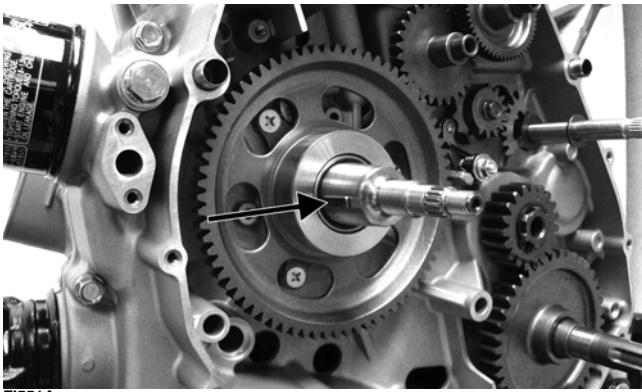
FI549

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



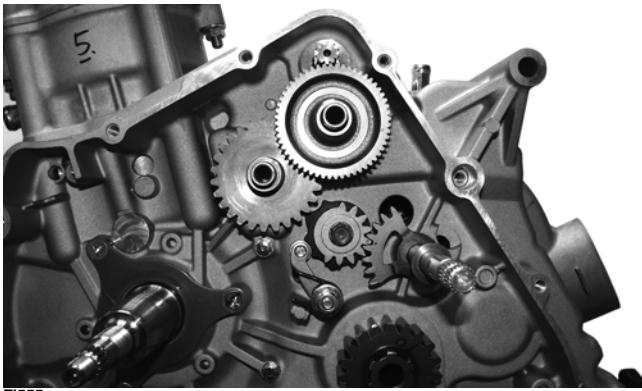
FI550

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



FI551A

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



FI555

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

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

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



FI559

12. Remove the shift detent cam arm and spring.

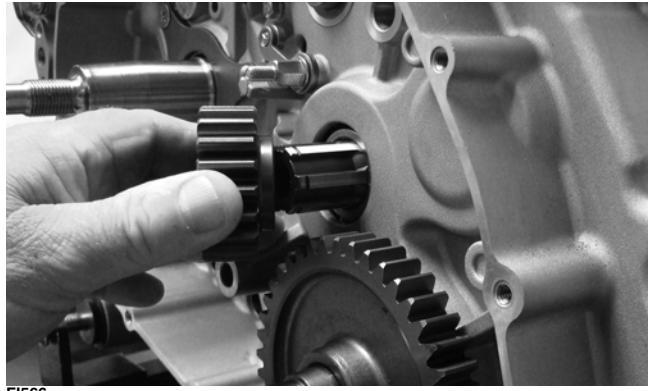


FI560

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



FI564



FI566

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## **Servicing Left-Side Components**

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

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



FI569

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



FI572

## REPLACING STARTER CLUTCH ASSEMBLY

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



FI570

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



FI576A



FI578

## REPLACING STARTER GEAR BEARING

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



FI583

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



### **INSPECTING STATOR/MAGNETO COVER ASSEMBLY**

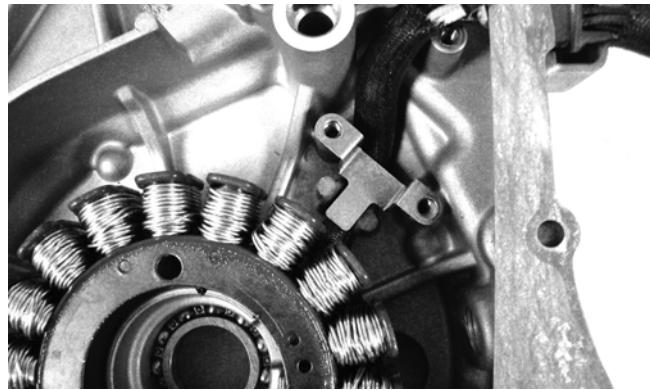
1. Inspect the stator for burned or discolored wiring, broken or missing hold-down clips, or loose cap screws.
2. Inspect the bearings in the magneto housing for discoloration, roughness when rotated, and secure fit in bearing bores.
3. Inspect the oil pressure relief valve for evidence of metal chips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



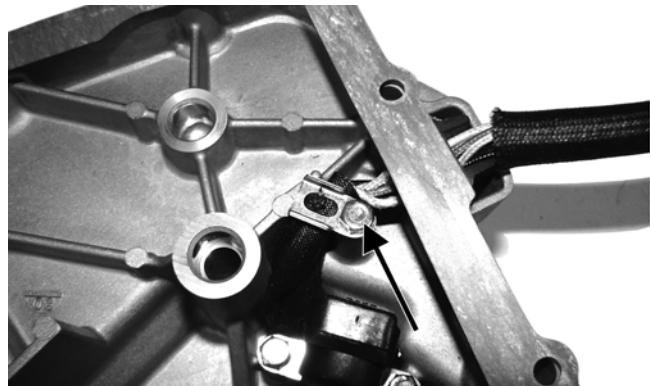
FI588

### **REPLACING STATOR COIL/CRANKSHAFT POSITION SENSOR**

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



3. Install the new stator coil assembly and apply blue Loctite #243 to the three cap screws. Install and tighten to 13 ft-lb.
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.



### **REPLACING MAGNETO COVER BEARINGS**

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





FI594

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



MD1086

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



FI559

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



FI555A

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



FI551A

## Installing Left-Side Components

### **A. Starter Clutch/Gear Rotor/Flywheel**

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



MD1122

2. Install the starter motor and tighten the two cap screws to 8 ft-lb.
3. Install the shift detent cam making sure the washer is installed.

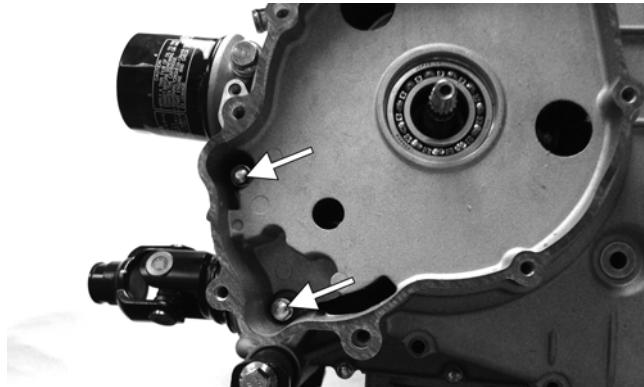
8. Install the rotor/flywheel and secure with the nut. Tighten to 107 ft-lb.

### C. Magneto Cover

### D. Water Pump

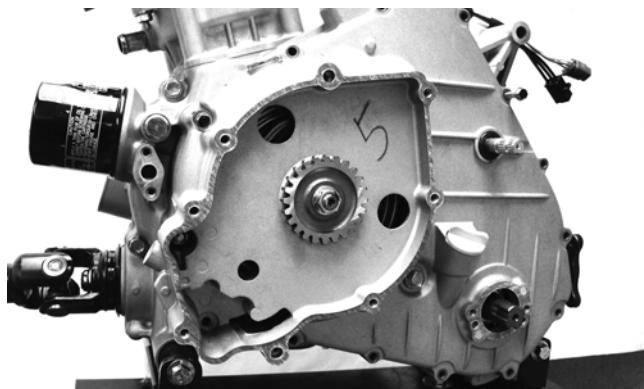
■NOTE: Steps 1-8 in the preceding sub-section must precede this procedure.

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



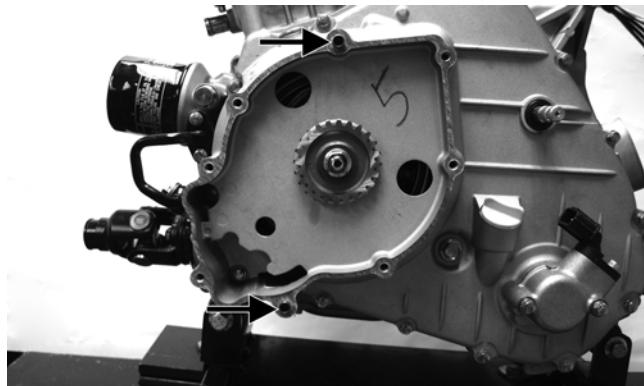
FI596A

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

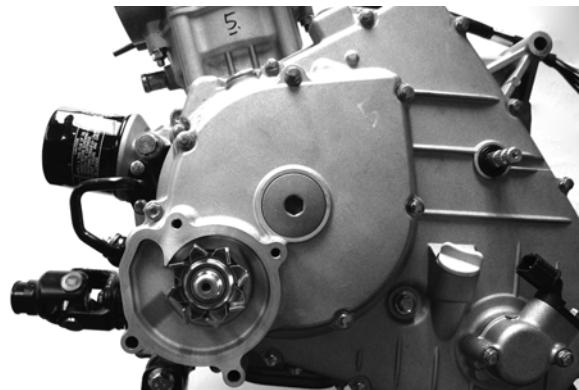


FI547

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



FI541A



FI539

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



FI538

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

## Right-Side Components

### AT THIS POINT

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

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

### AT THIS POINT

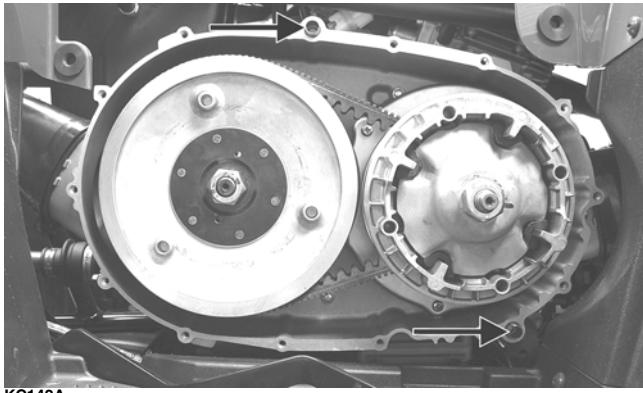
To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

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

## Removing Right-Side Components

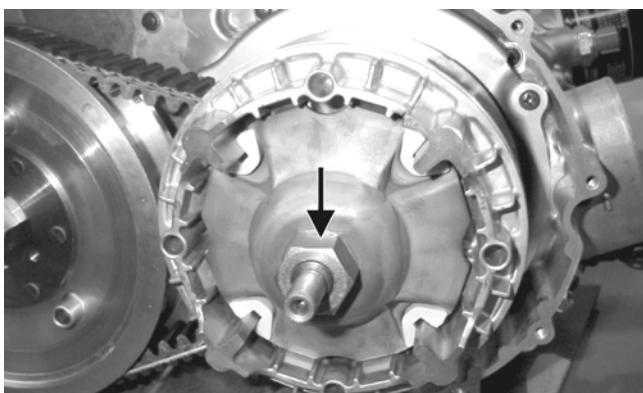
### A. V-Belt Cover B. Driven Pulley C. Clutch Cover

1. Remove the cap screws securing the V-belt cover to the clutch cover; then remove the V-belt cover. Account for two alignment pins and a gasket.



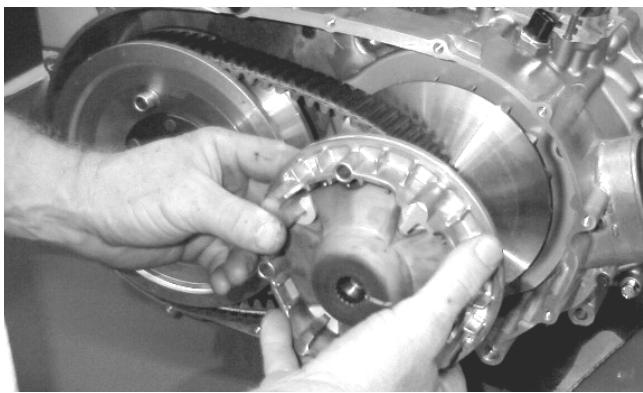
KC142A

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

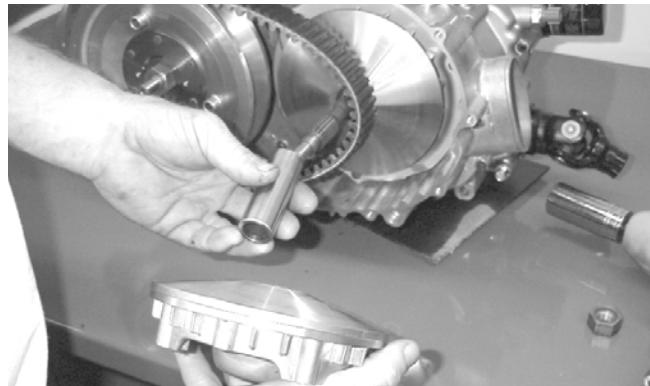


MD1033

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



MD1035



MD1034



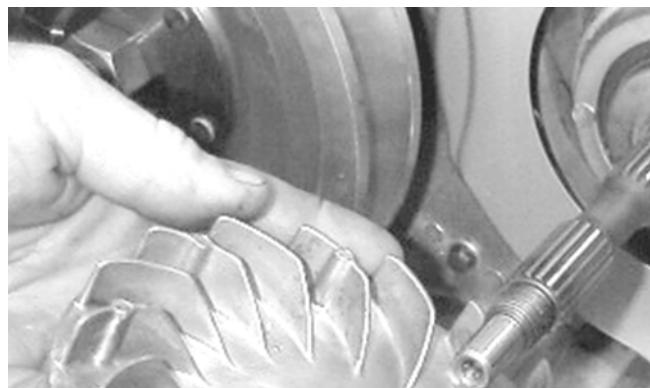
MD1036

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



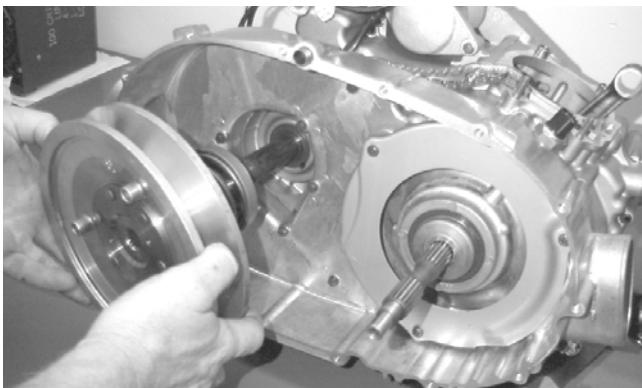
KC132

5. Remove the fixed drive face.



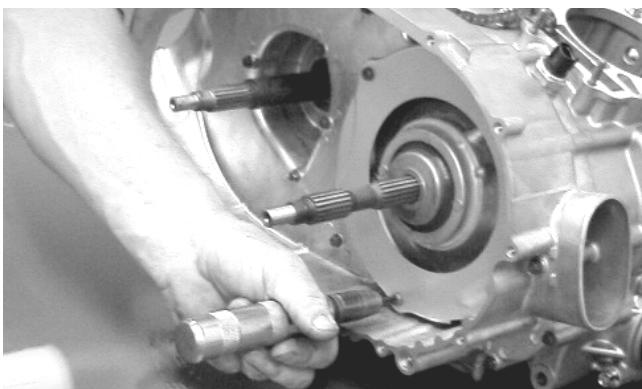
MD1094

6. Remove the nut holding the driven pulley assembly; then remove the driven pulley assembly.



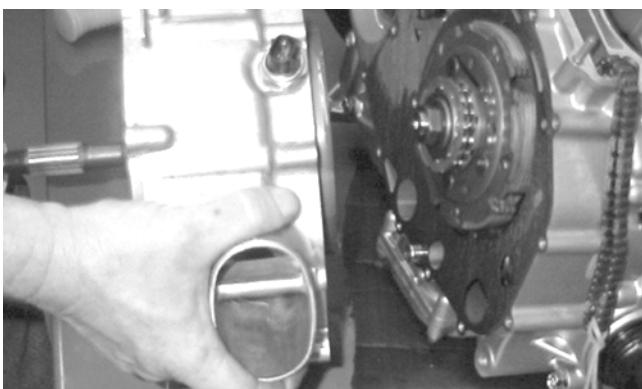
MD1068

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



MD1092

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



MD1115

#### **D. Centrifugal Clutch Assembly**

#### **E. Oil Pump Drive Gear**

#### **F. Oil Pump Driven Gear**

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

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

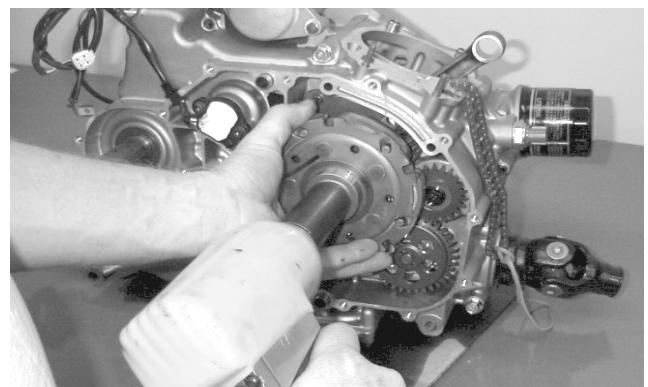


MD1286

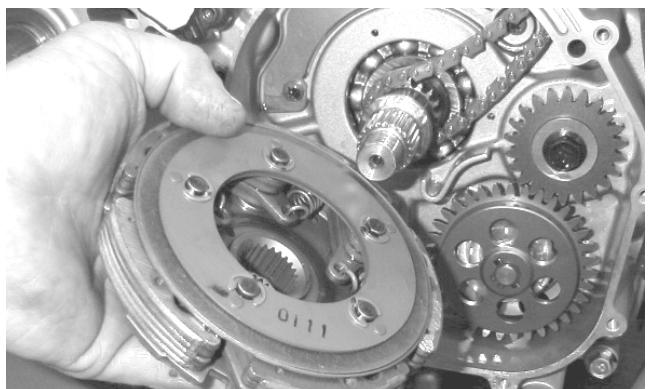
11. Remove the left-hand threaded nut holding the centrifugal clutch assembly.

#### **CAUTION**

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



MD1014



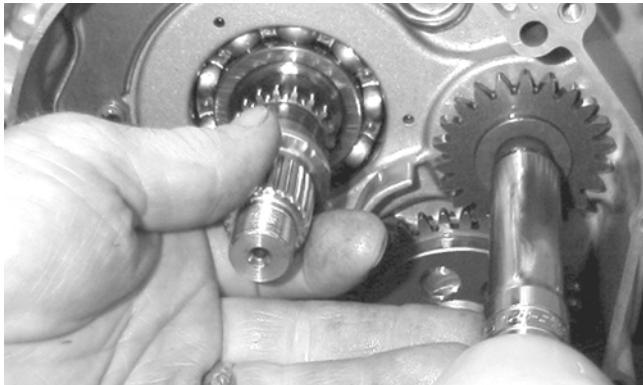
MD1016

12. Remove the cam chain.



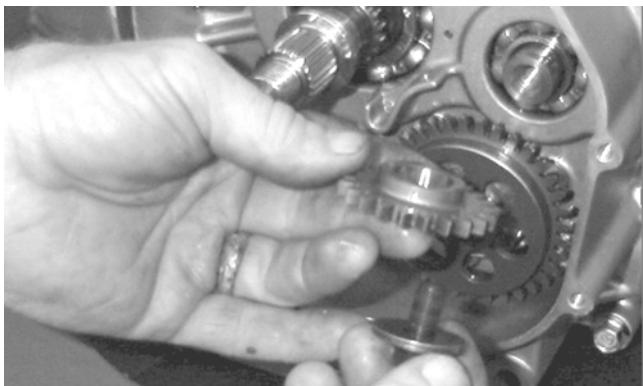
FI630

13. Remove the oil pump drive gear cap screw.



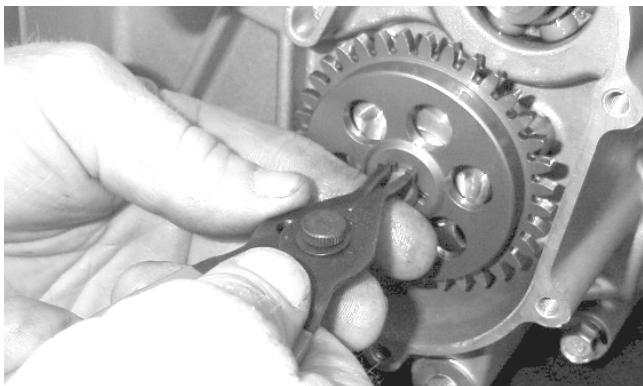
MD1018

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



MD1017

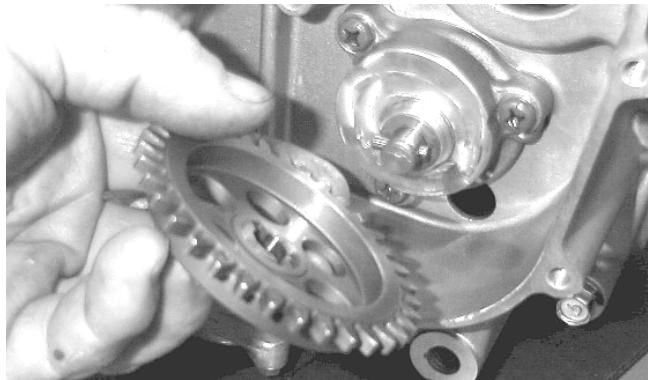
15. Remove the snap ring holding the oil pump driven gear.



MD1019

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

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



MD1020

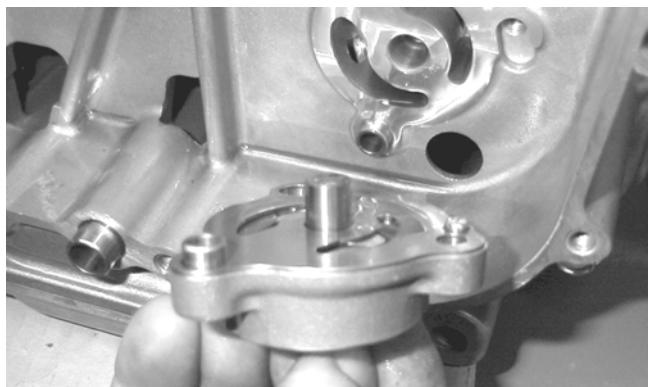
#### **AT THIS POINT**

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

#### **G. Oil Pump/Oil Strainer**

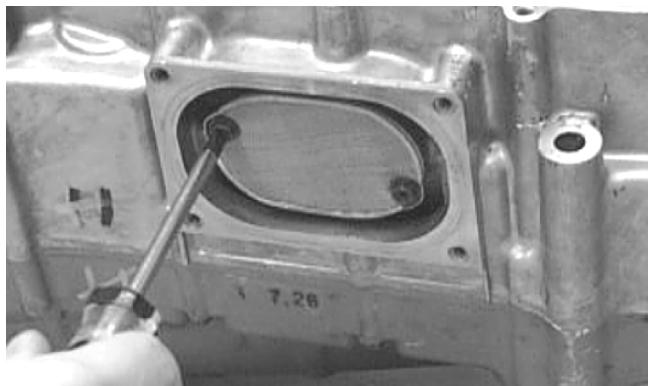
**■NOTE: Steps 1-17 in the preceding sub-sections must precede this procedure.**

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



MD1060

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



MD1337



MD1208

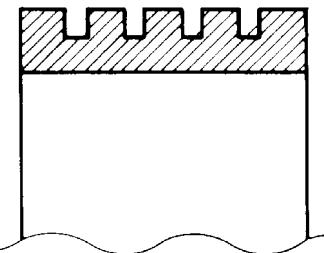
### ☞ AT THIS POINT

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

## Servicing Right-Side Components

### INSPECTING CENTRIFUGAL CLUTCH SHOE

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



Inspecting clutch shoe groove

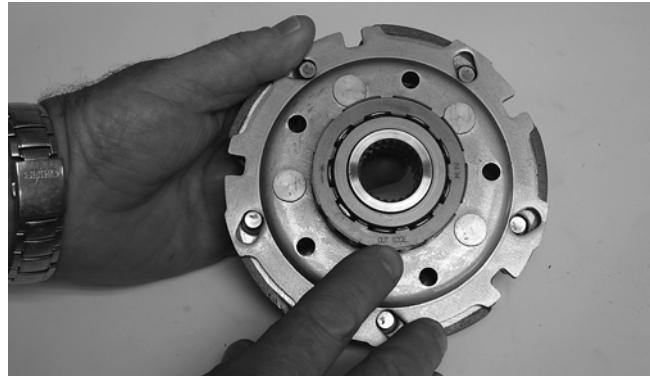
ATV1014

### INSPECTING CENTRIFUGAL CLUTCH HOUSING

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

### INSPECTING PRIMARY ONE-WAY DRIVE

1. Place the one-way clutch onto the clutch shoe assembly with the green dot or the word "OUTSIDE" directed away from the clutch shoe.



KC330

2. Place the clutch housing onto the clutch shoe/one-way clutch.

■NOTE: It will be necessary to rotate the clutch housing counterclockwise to properly seat the one-way clutch.



KC331A

3. Check that the clutch shoe can only be rotated counterclockwise in respect to the clutch housing. If the clutch shoe locks up or turns in both directions, the one-way clutch must be replaced.



KC332A

### INSPECTING OIL PUMP

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

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

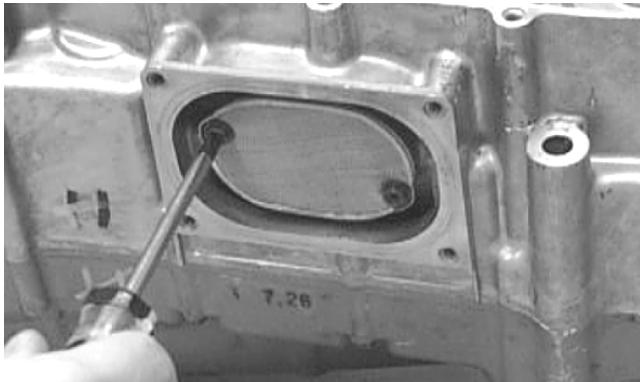
### DRIVEN PULLEY ASSEMBLY

■NOTE: The driven pulley assembly is a non-serviceable component and must be replaced as a complete assembly.

## Installing Right-Side Components

### A. Oil Strainer/Oil Pump

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



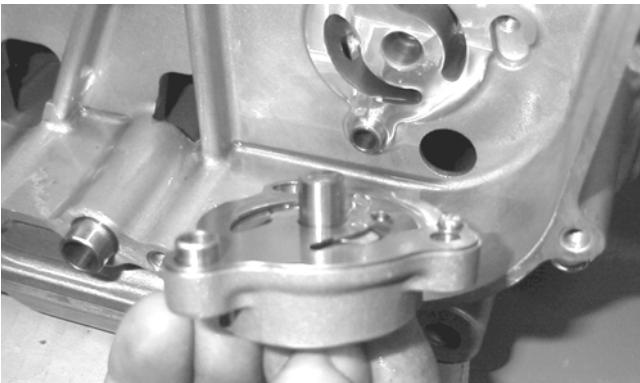
MD1337

2. Place the strainer cap into position on the crankcase making sure the O-ring is properly installed and secure with the four cap screws. Tighten the cap screws to 10 ft-lb; then install the oil drain plug and tighten to 16 ft-lb.



MD1208

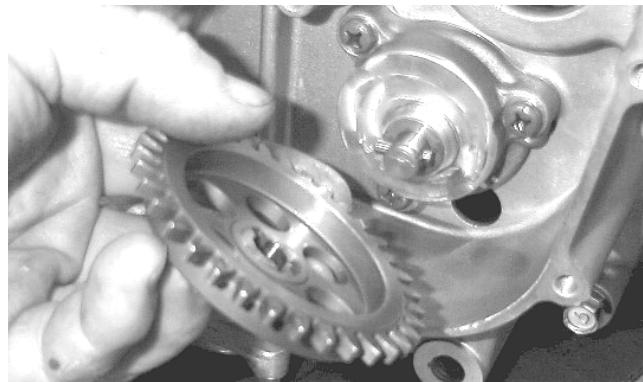
3. Place two alignment pins and the oil pump into position on the crankcase and secure with the Phillips-head screws coated with red Loctite #271. Tighten to 8 ft-lb.



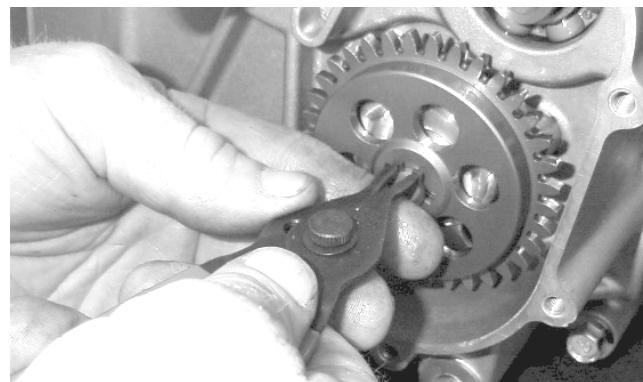
MD1060

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

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



MD1020



MD1019

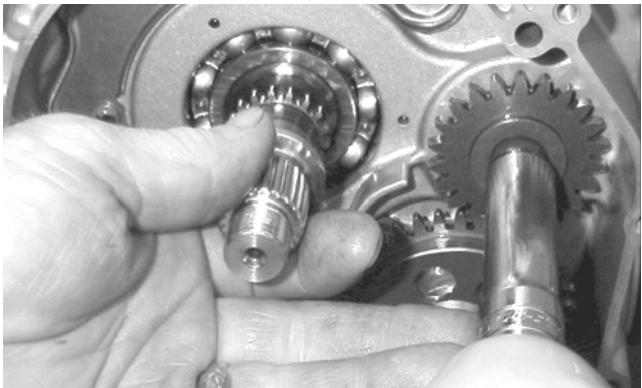
5. Install the cam chain.

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

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



MD1017



MD1018

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

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

### CAUTION

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

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



MD1286

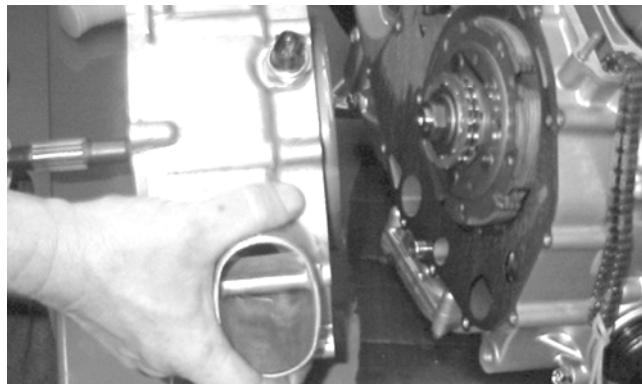
#### B. Clutch Cover

#### C. Fixed Drive Face

#### D. Movable Drive Face

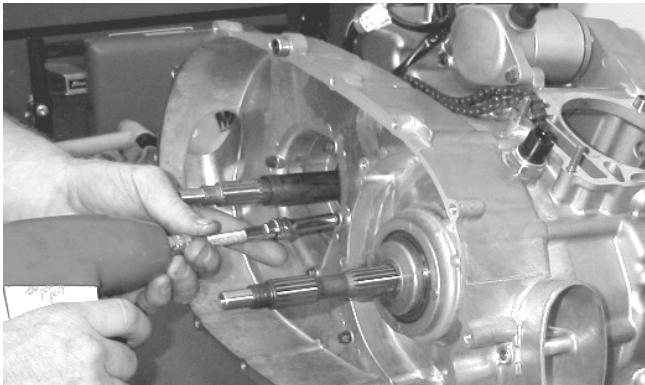
**■NOTE: Steps 1-8 in the preceding sub-section must precede this procedure.**

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



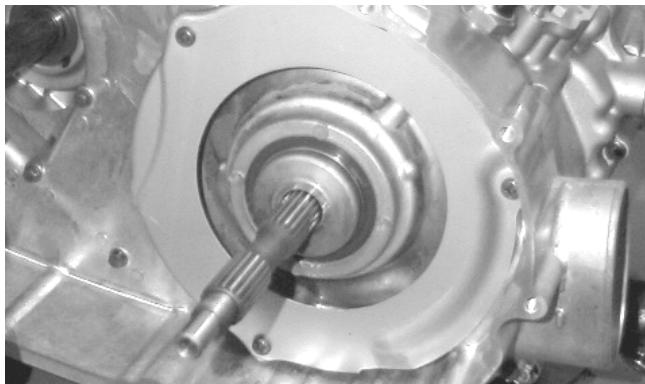
MD1115

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



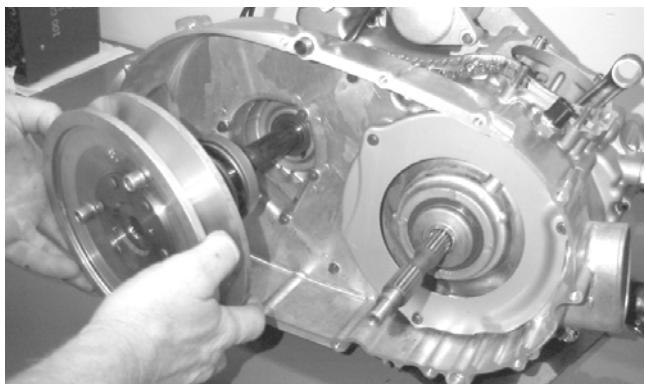
MD1117

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



MD1342

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

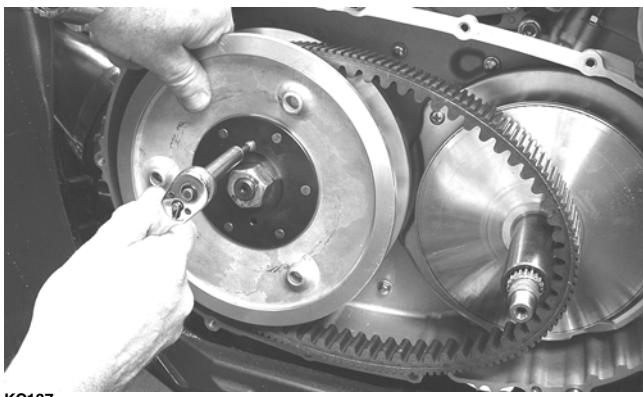


MD1068



KC134

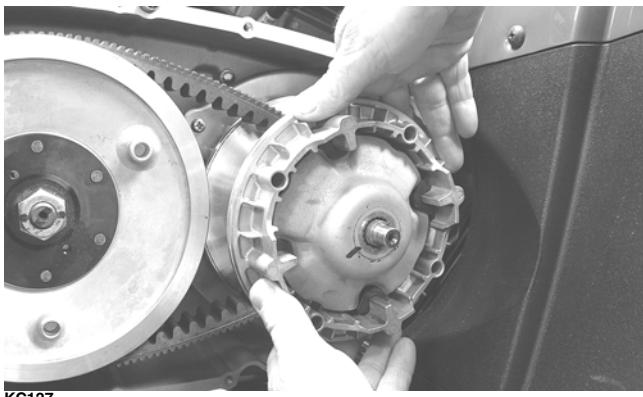
13. Slide the fixed drive face assembly onto the front shaft.
14. Spread the faces of the driven pulley by threading a V-belt cover cap screw into the fixed driven face and tightening until the faces open sufficiently to allow the V-belt to drop into the pulley approximately 3/4 in.



KC137

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

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

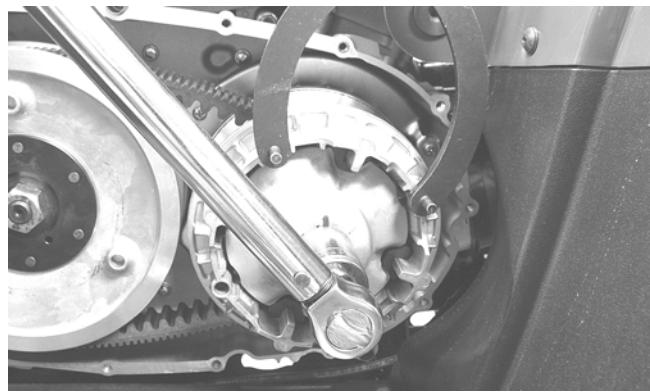


KC127

16. Coat the threads of the nut with red Loctite #271; then making sure the splines of the clutch shaft protrude through the cover plate, secure with the nut and tighten to 147 ft-lb.



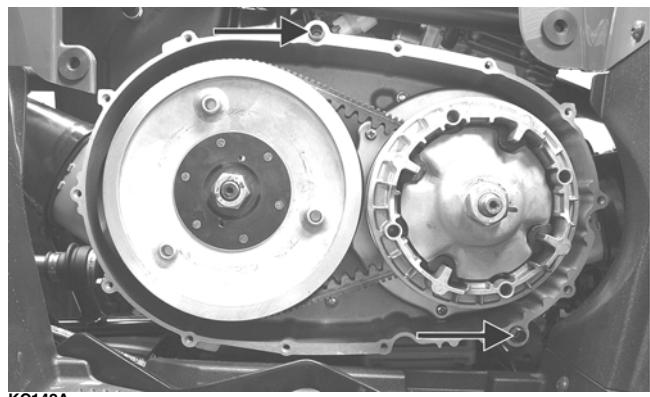
KC138



KC141

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

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



KC142A

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## Center Crankcase Components

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

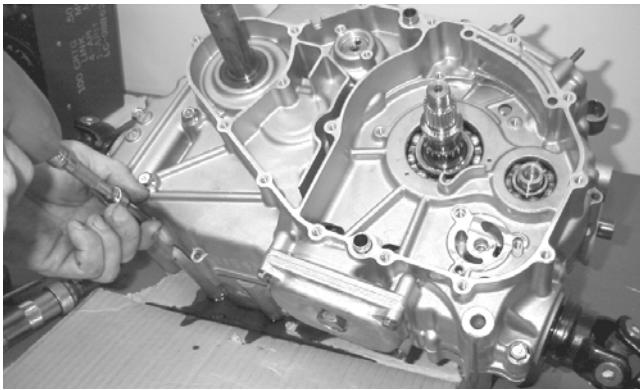
■**NOTE:** For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

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## Separating Crankcase Halves

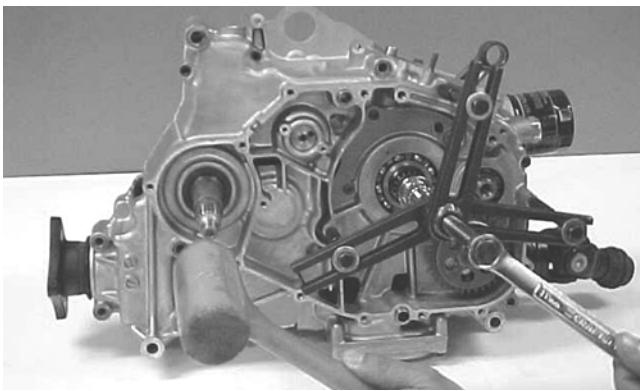
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1. Remove the left-side and right-side cap screws securing the crankcase halves noting the position of the different-sized cap screws for joining purposes.



MD1012

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



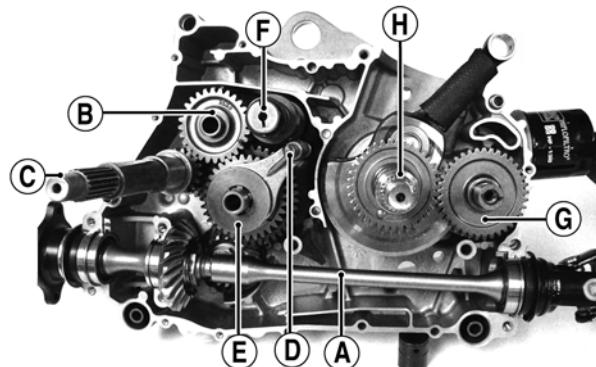
■NOTE: To keep the shaft/gear assemblies intact for identification, tap the shafts toward the left-side crankcase half when separating the halves.



## Disassembling Crankcase Half

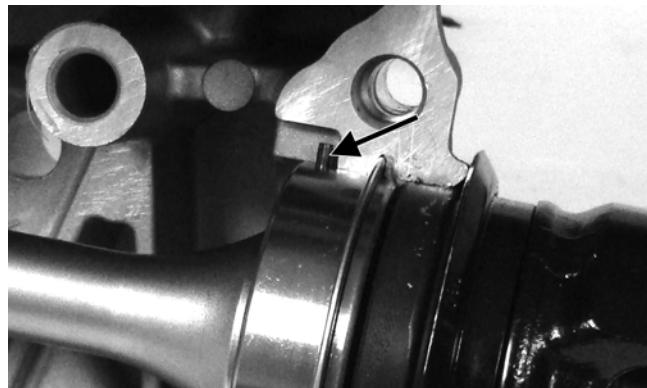
■NOTE: To aid in installing, it is recommended that the assemblies be kept together and in order.

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

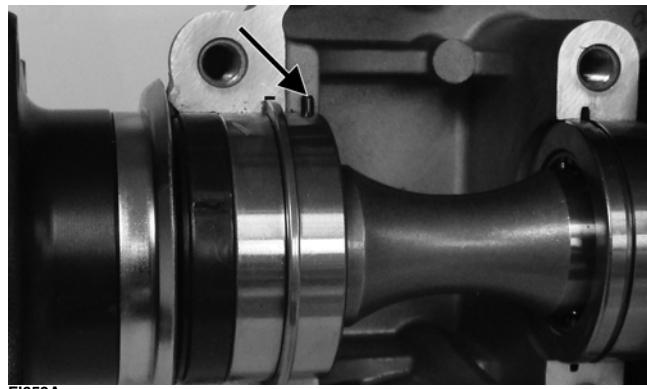


FI639A

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



FI660A



FI659A



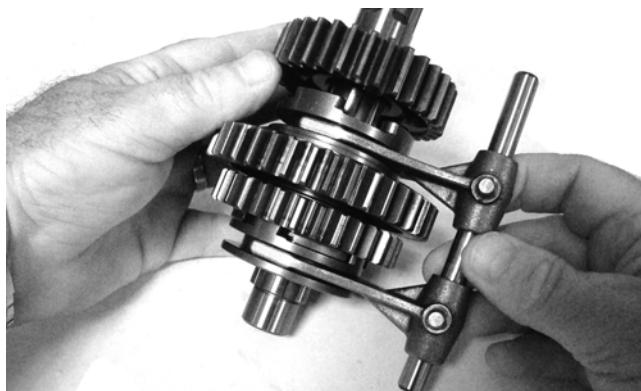
FI661A

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



FI650A

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



FI662

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

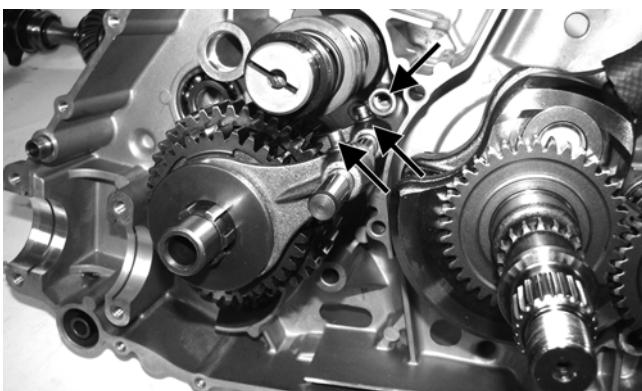


MD1024

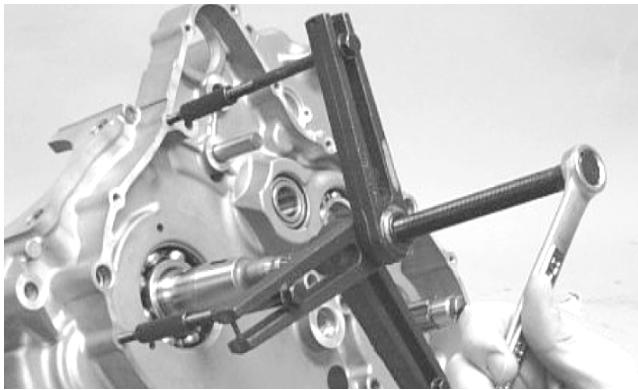
7. Using Crankcase Separator/Crankshaft Remover with the appropriate crankshaft protector, remove the crankshaft.



FI646



FI653A



MD1330

### CAUTION

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

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

### ☞ AT THIS POINT

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

## Servicing Center Crankcase Components

### SECONDARY GEARS

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

#### Checking Backlash

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

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

#### Correcting Backlash

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

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

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

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

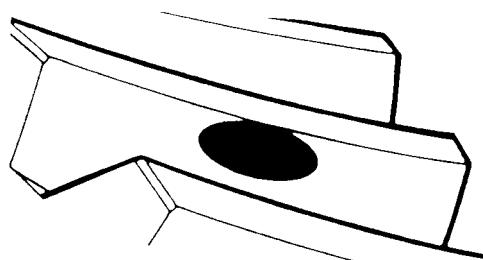
Backlash Measurement	Shim Correction
Under 0.05 mm (0.002 in.)	Decrease Shim Thickness
At 0.05-0.33 mm (0.002-0.013 in.)	No Correction Required
Over 0.33 mm (0.013 in.)	Increase Shim Thickness

#### Checking Tooth Contact

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

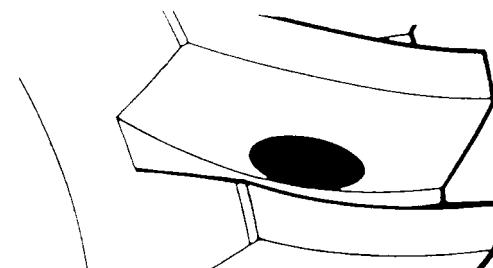
1. Remove the secondary driven output shaft assembly from the left-side crankcase half.
2. Clean the secondary driven bevel gear teeth of old oil and grease residue.
3. Apply a thin, even coat of a machinist-layout dye to several teeth of the gear.
4. Install the secondary driven output shaft assembly.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

#### Incorrect (contact at tooth top)

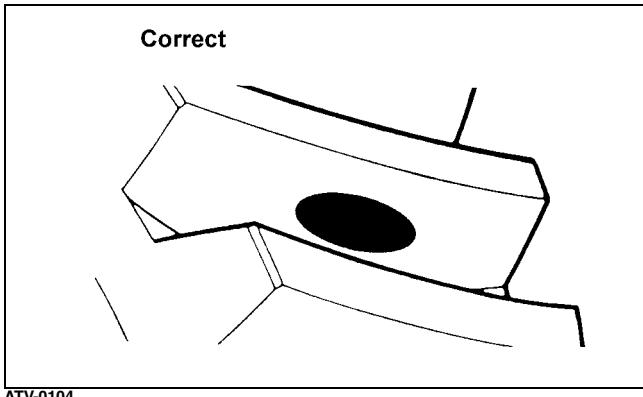


ATV-0103

#### Incorrect (contact at tooth root)



ATV-0105



### Correcting Tooth Contact

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

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

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

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

### CAUTION

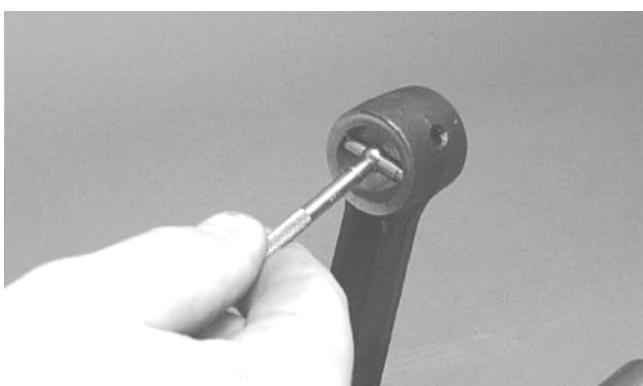
After correcting tooth contact, backlash must again be checked and corrected (if necessary). Continue the correcting backlash/correcting tooth contact procedures until they are both within tolerance values.

### CRANKSHAFT ASSEMBLY

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

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

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



CC290D

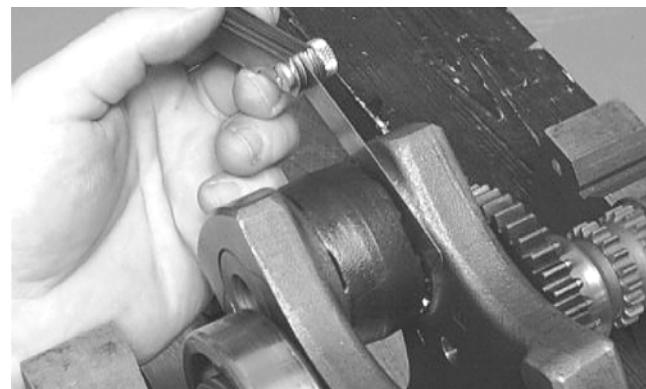
2. Maximum diameter must not exceed specifications.

### Measuring Connecting Rod (Small End Deflection)

1. Place the crankshaft on a set of V-blocks and mount a dial indicator and base on the surface plate. Position the indicator contact point against the center of the connecting rod small end journal.
2. Zero the indicator and push the small end of the connecting rod away from the dial indicator.
3. Maximum deflection must not exceed specifications.

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

1. Push the lower end of the connecting rod to one side of the crankshaft journal.
2. Using a feeler gauge, measure the gap between the connecting rod and crankshaft journal.

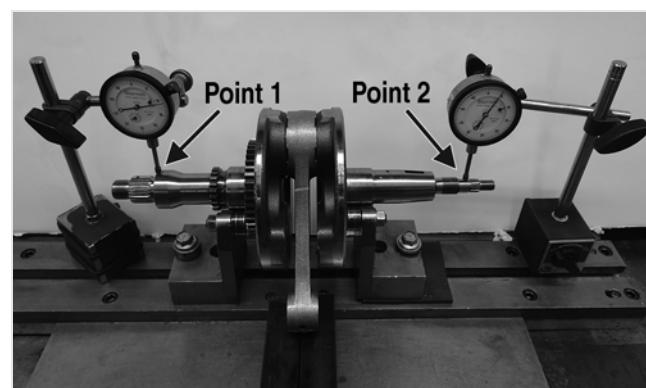


CC289D

3. Acceptable gap range must be within specifications.

### Measuring Crankshaft (Runout)

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



H1-003A

3. Zero the indicator and rotate the crankshaft slowly.

### CAUTION

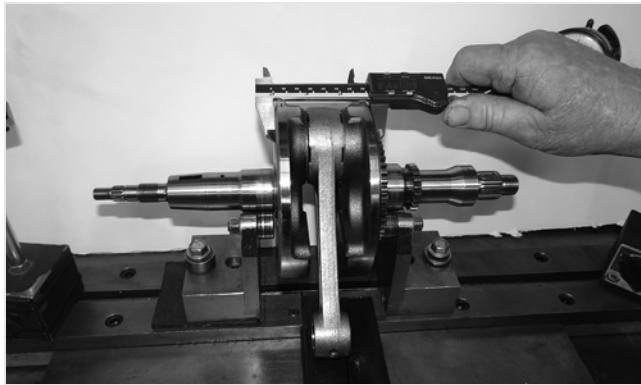
Care should be taken to support the connecting rod when rotating the crankshaft.

4. Maximum runout must not exceed specifications.

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

## Measuring Crankshaft (Web-to-Web)

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



2. Acceptable width range must be within specifications.

## COUNTERSHAFT

### CAUTION

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

### Disassembling

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

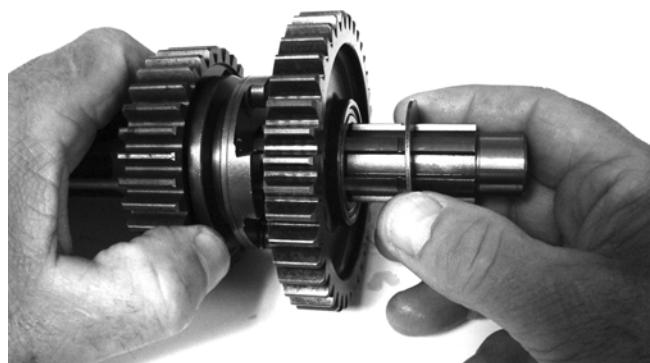


2. Remove the splined washer; then remove the reverse driven gear along with the bearing and bushing.



FI665

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



FI667

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





FI669

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



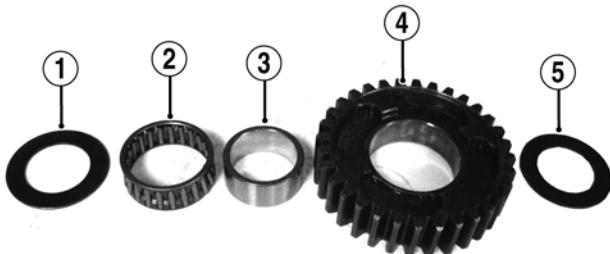
FI670



FI671

## ASSEMBLING

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

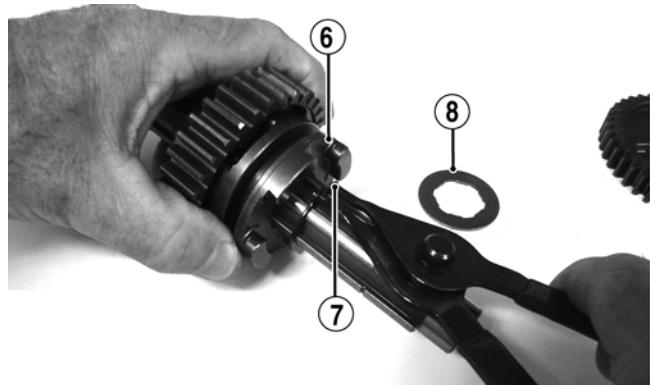


FI671A



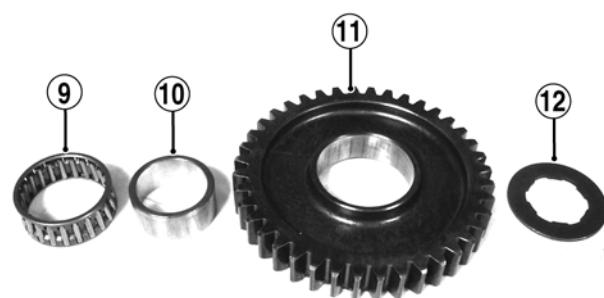
FI670

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

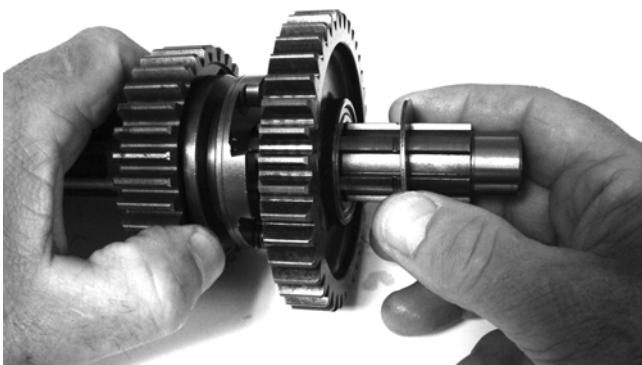


FI668A

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

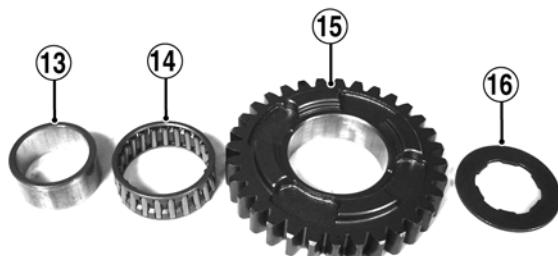


FI667A



FI666

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



FI665A

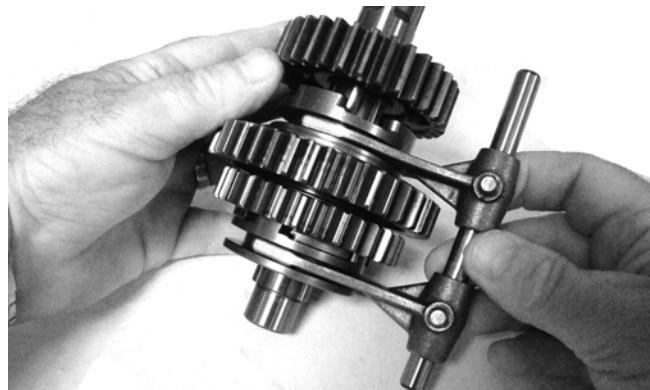


FI664

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



FI663



FI662

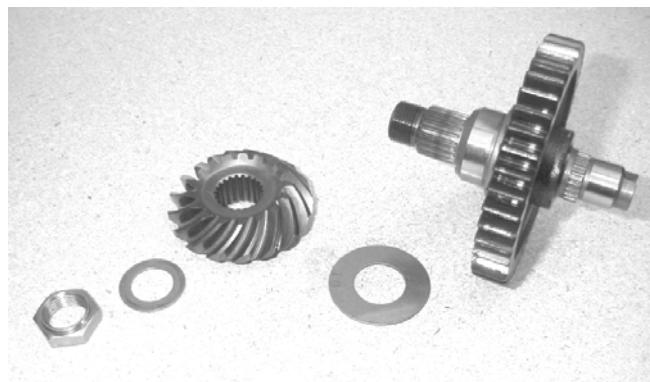
■**NOTE:** The countershaft assembly is now ready to be installed.

## Assembling Crankcase Half

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

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

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

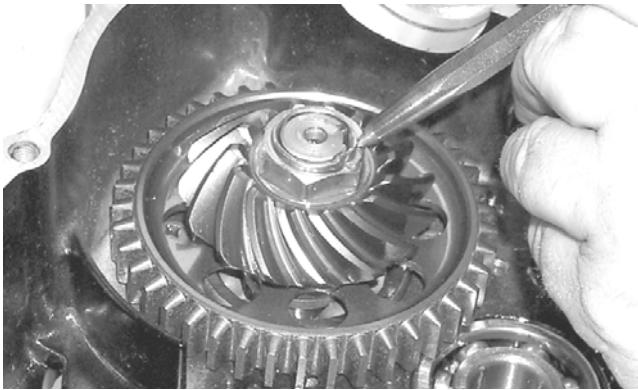


MD1199



MD1079

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



MD1333

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



MD1334

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

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



MD1024

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



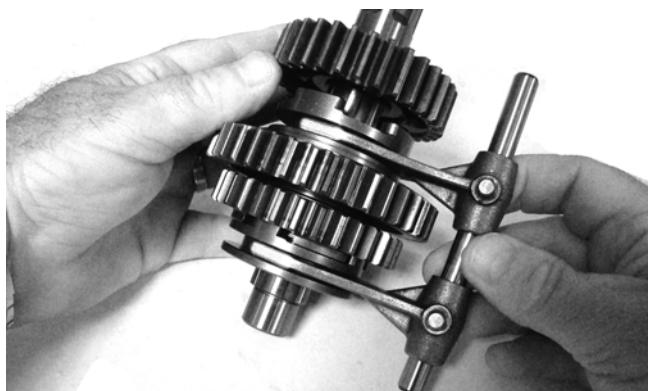
FI658

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

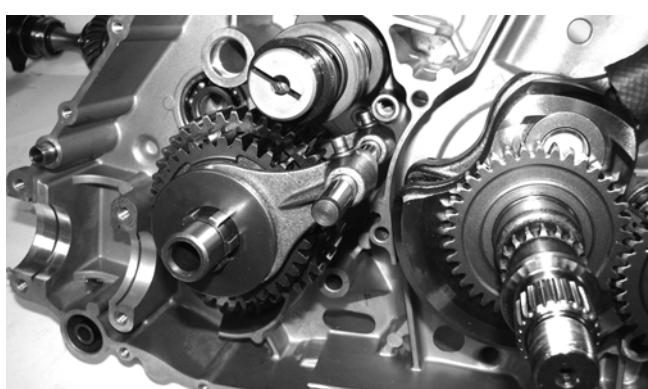


FI652A

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

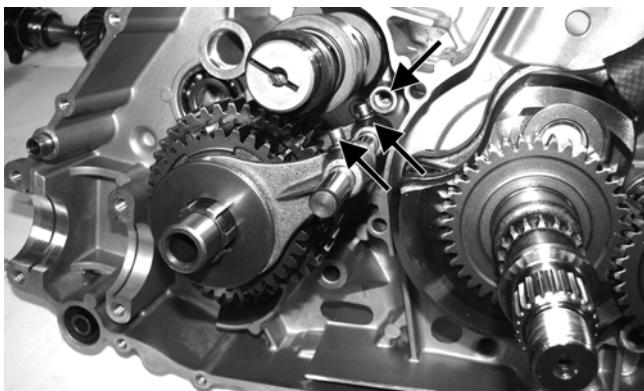


FI662



FI653

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

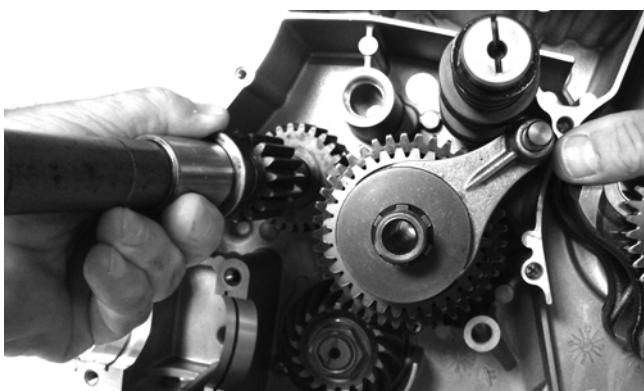


FI653A



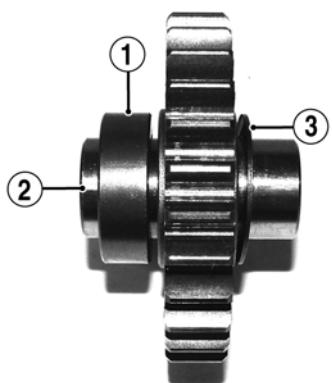
FI655A

9. Install the input driveshaft.

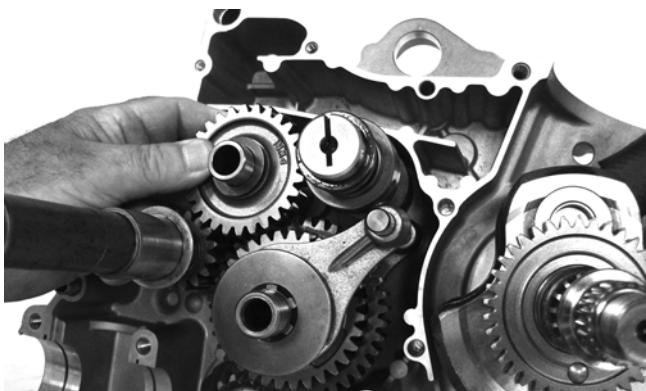


FI646

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

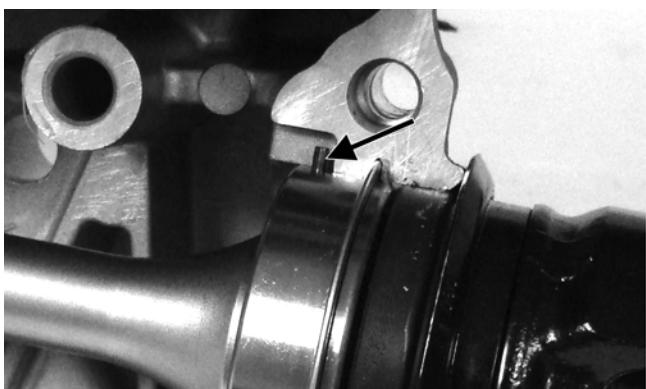


FI641A

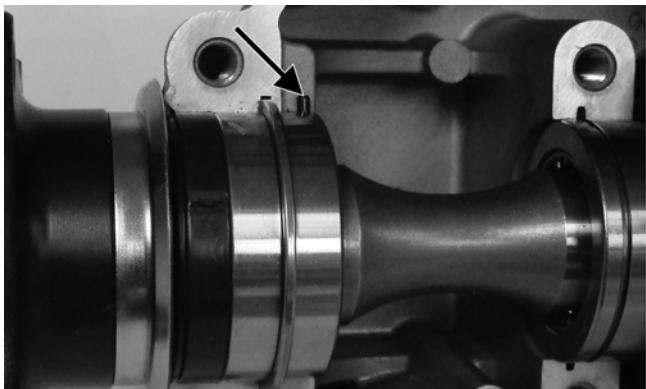


FI645

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



FI660A



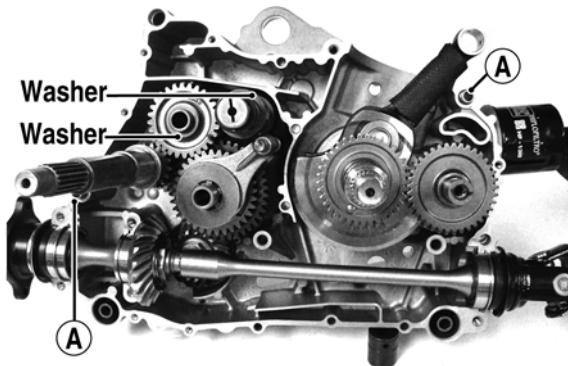
FI659A



FI661A

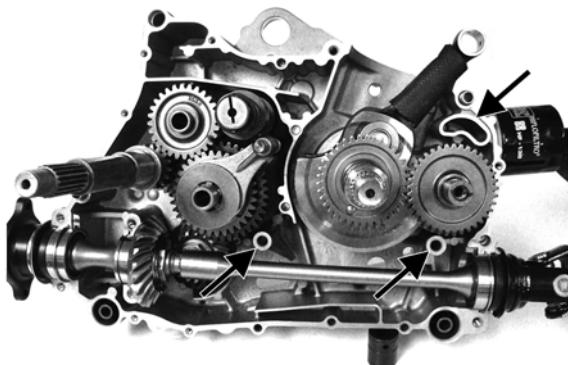
## Joining Crankcase Halves

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



FI639B

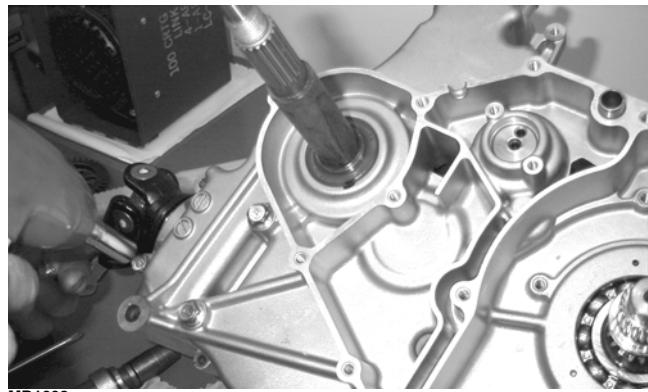
■**NOTE:** Be sure to apply silicone to the inside radius of all cap screw locations and the entire surface of the internal cap screw bosses.



FI639D

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

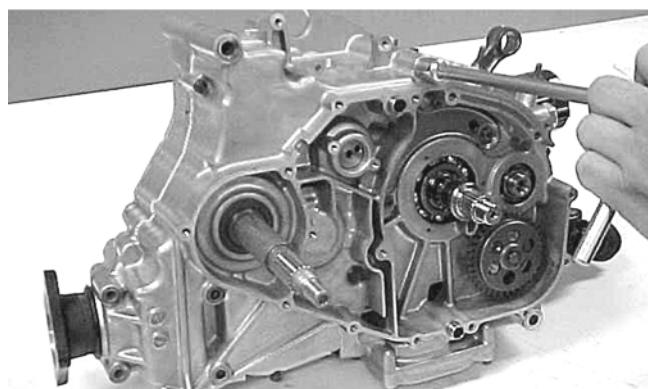
■**NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs while tightening the cap screws.



MD1008

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

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



CC871

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

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

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

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

### ☞ AT THIS POINT

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

# Servicing Engine (700)

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## Top-Side Components

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

### ☞ AT THIS POINT

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

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

## Removing Top-Side Components

### A. Valve Cover/Rocker Arms

### B. Cylinder Head/Camshaft

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

1. Remove the two tappet covers.



CC001D

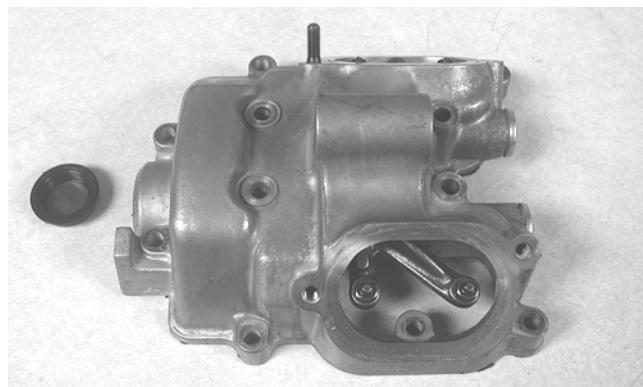
■NOTE: Keep the mounting hardware with the covers for assembly purposes or thread them back into the head to keep them separated.

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.

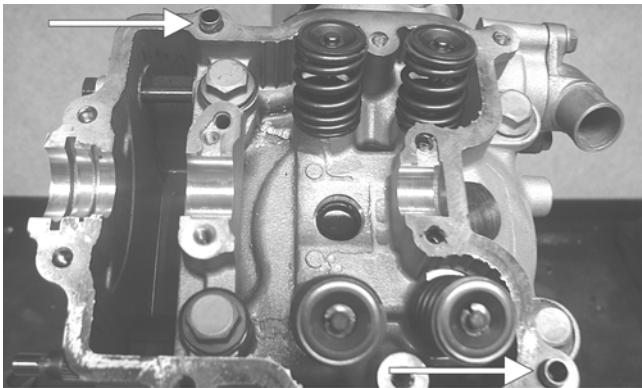


H1-013A

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



CC211A

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



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.



FI620

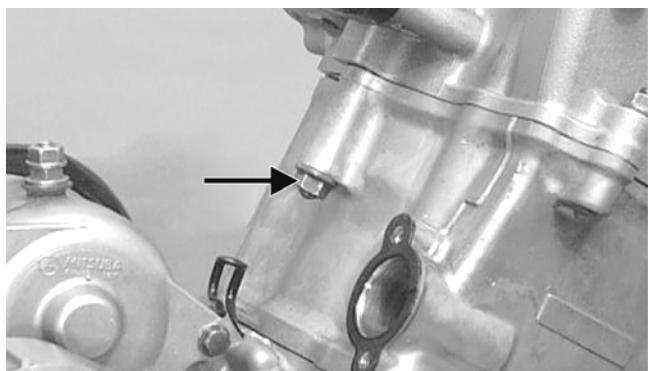
**■NOTE: Loop the chain over the cylinder head and secure it to keep it from falling into the crankcase.**

9. Remove the cam chain guide.

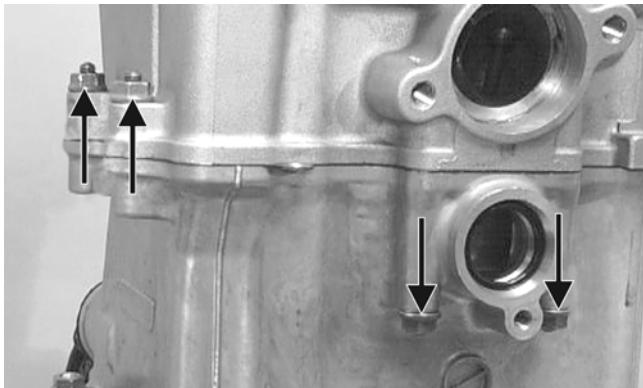


FI617A

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

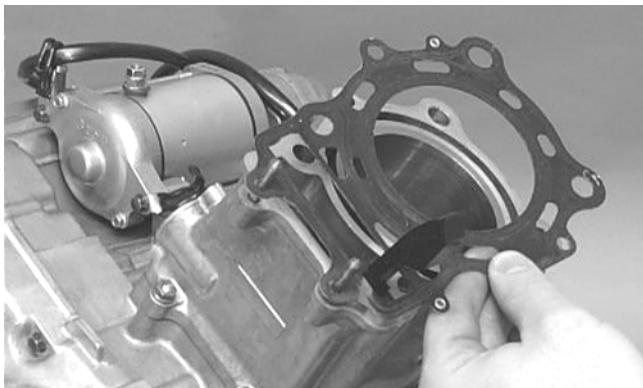


CC017D



CC018D

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



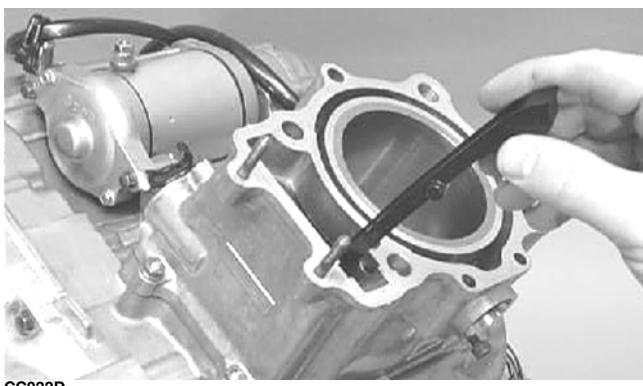
CC020D

#### **AT THIS POINT**

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

#### **AT THIS POINT**

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

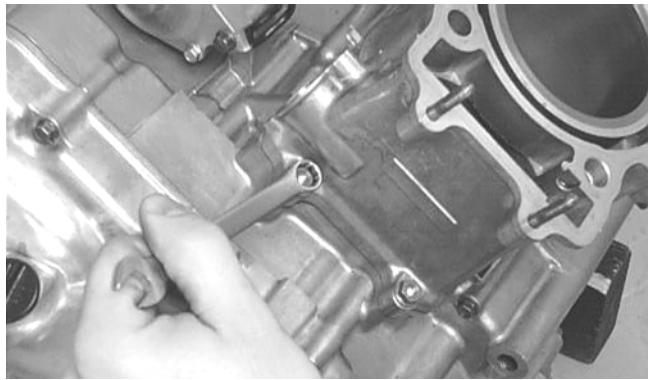


CC022D

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

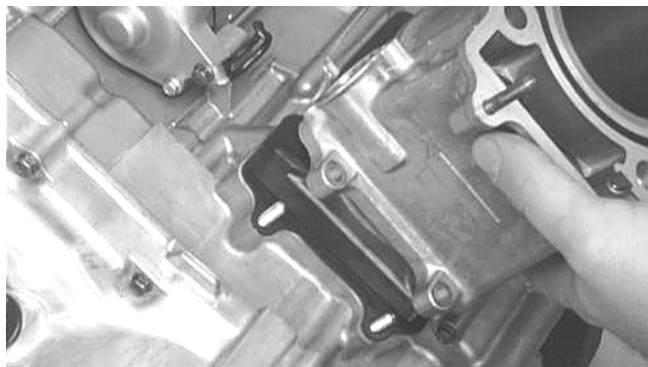
**■NOTE: Steps 1-12 in the preceding sub-section must precede this procedure.**

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.

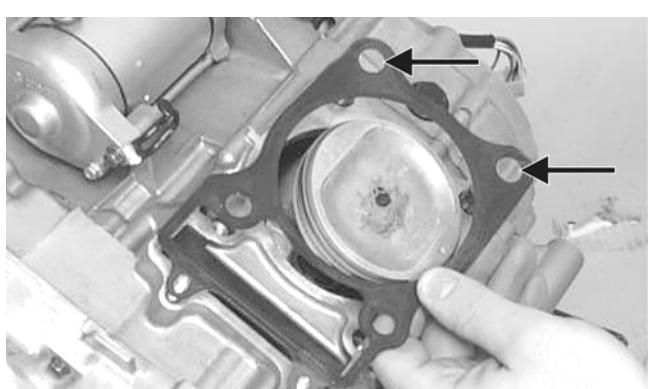


CC023D

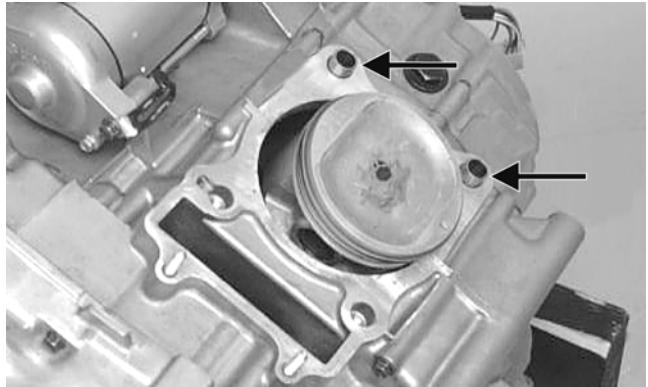
15. Lift the cylinder off the crankcase taking care not to allow the piston to drop against the crankcase. Account for the gasket and two alignment pins.



CC024D



CC025D



CC026D

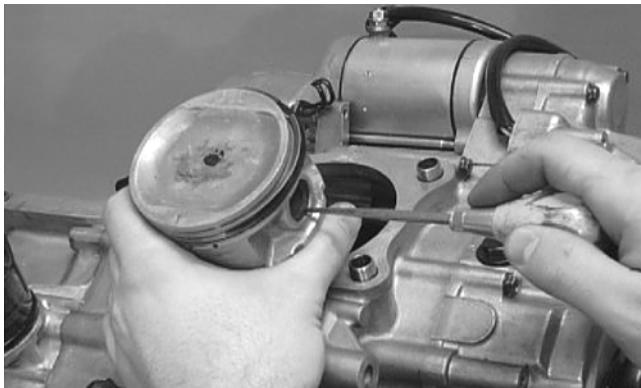
#### **AT THIS POINT**

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

## CAUTION

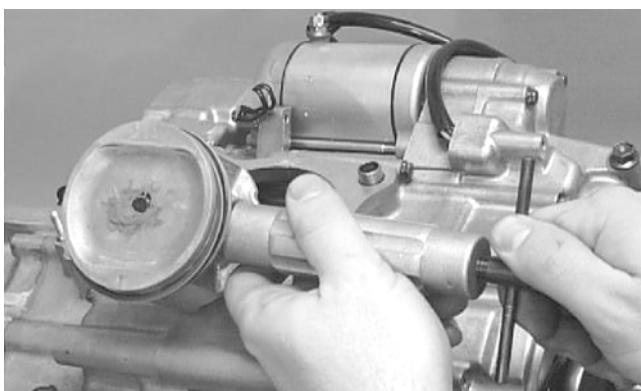
When removing the cylinder, be sure to support the piston to prevent damage to the crankcase and piston.

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



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

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



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

## CAUTION

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

### AT THIS POINT

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

### AT THIS POINT

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

## Servicing Top-Side Components

### VALVE ASSEMBLY

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

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

#### Cleaning/Inspecting Valve Cover

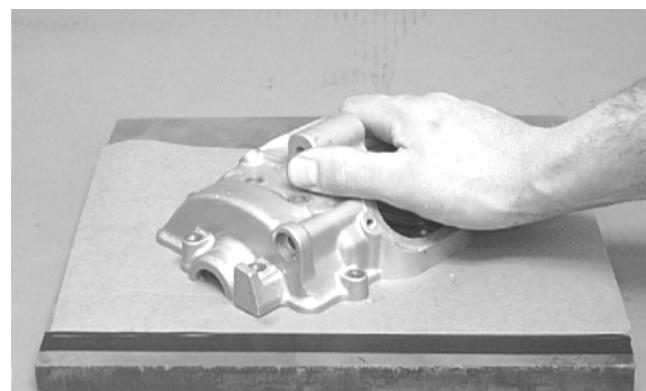
■**NOTE:** If the valve cover cannot be trued, the cylinder head assembly must be replaced.

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

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

## CAUTION

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



## CAUTION

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

### Removing Valves

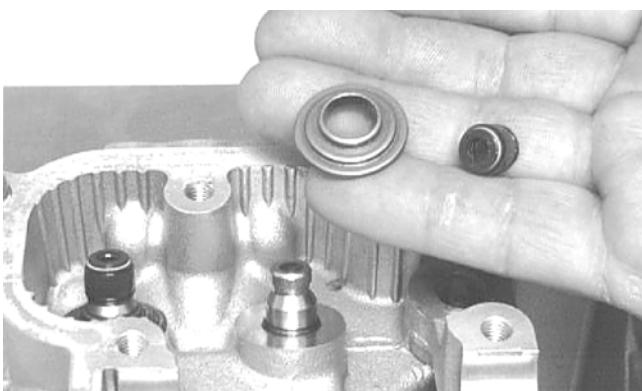
■**NOTE:** Index all valves, springs, and cotters to their original position when removing. When installing, all valve components should be installed in their original position.

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



CC132D

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



CC136D

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

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

**Measuring Valve Guide (Bore)**

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

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

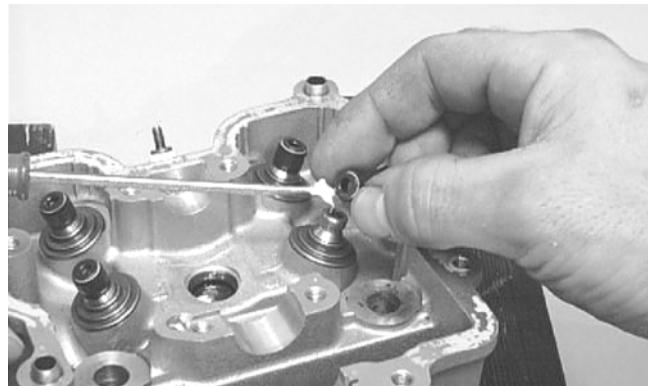
If valves, valve guides, or valve seats require servicing or replacement, Arctic Cat recommends that the components be taken to a qualified machine shop for servicing.

**CAUTION**

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

**Installing Valves**

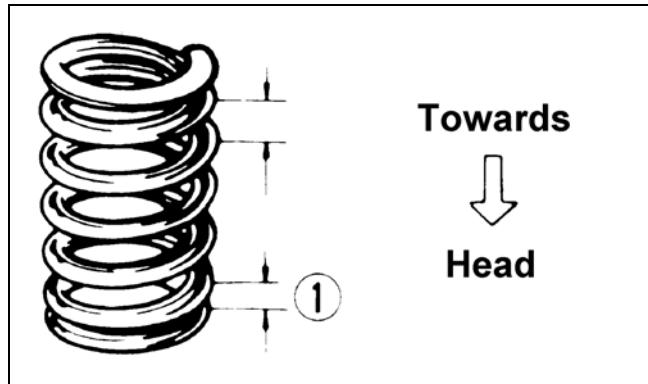
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



CC144D

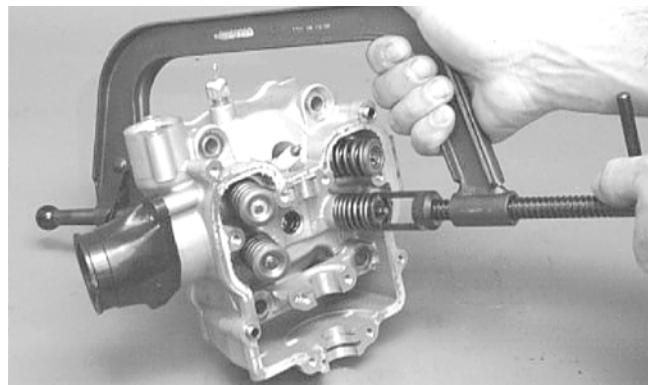
2. Insert each valve into its original location.
3. Install the valve springs with the painted end of the spring facing away from the cylinder head.

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



ATV-1011A

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



CC132D

**PISTON ASSEMBLY**

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

**Inspecting Piston**

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

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

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

### Removing Piston Rings

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

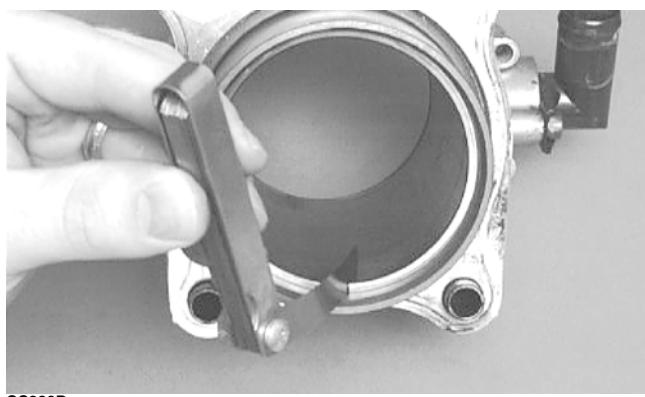


2. Remove each ring by working it toward the dome of the piston while rotating it out of the groove.

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

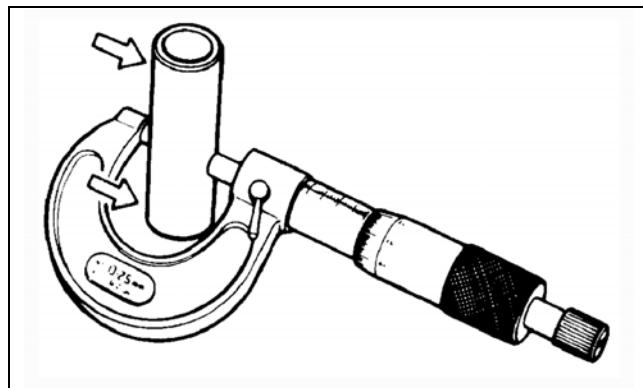
### Measuring Piston-Ring End Gap (Installed)

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

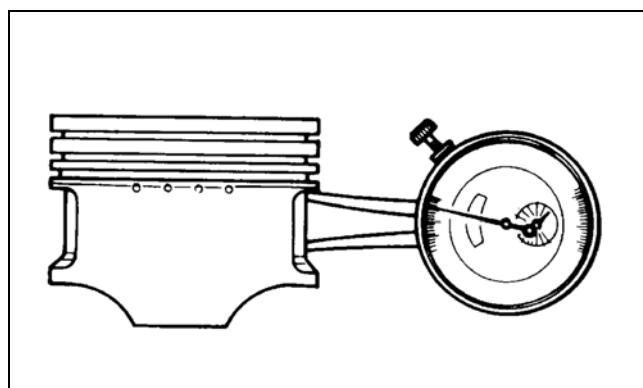


### Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

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

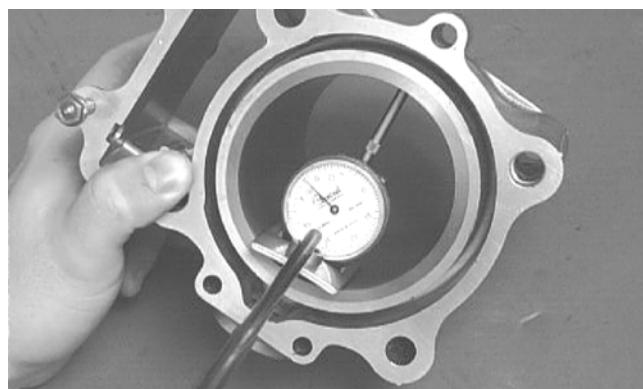


2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



### Measuring Piston Skirt/Cylinder Clearance

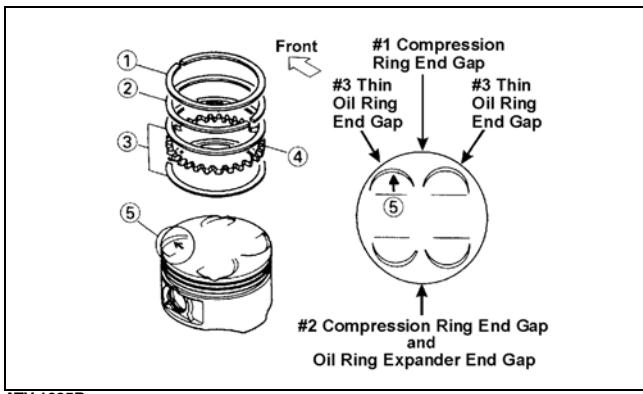
1. Measure the cylinder front to back in six places.



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

### Installing Piston Rings

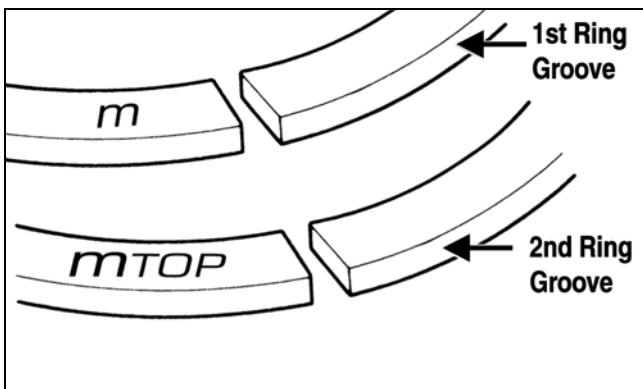
1. Install ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap. Stagger the end gaps of the upper and lower thin oil rings according to the illustration.



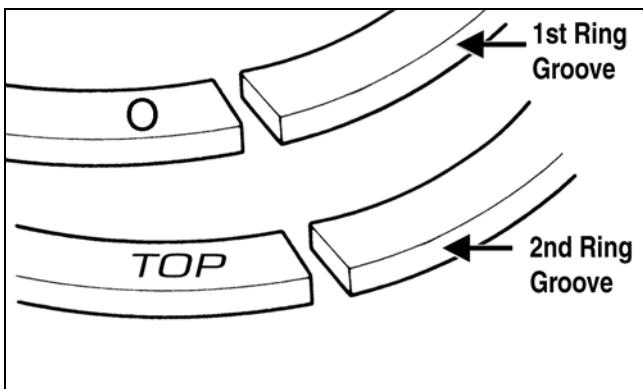
ATV-1085B

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

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



ATV-1024A



ATV-1024B

### 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

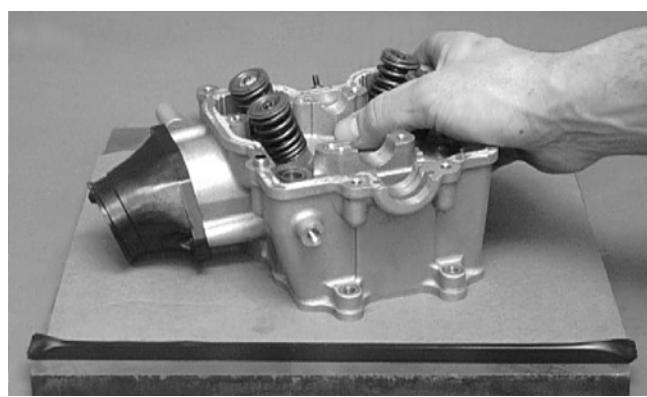
### CAUTION

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

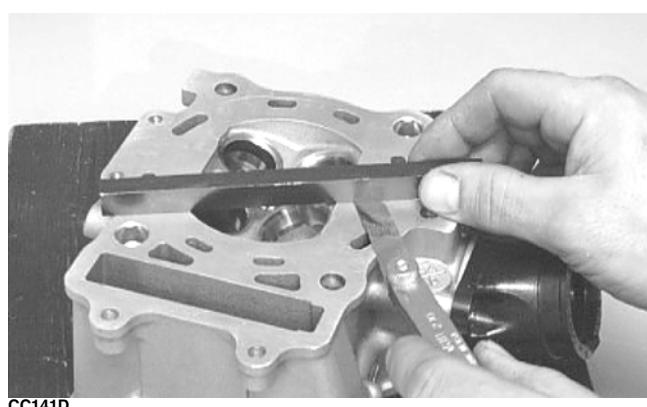
Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.



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.



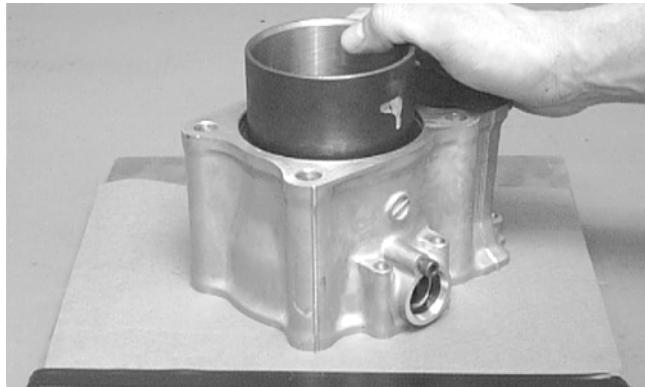
CC141D

## 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.



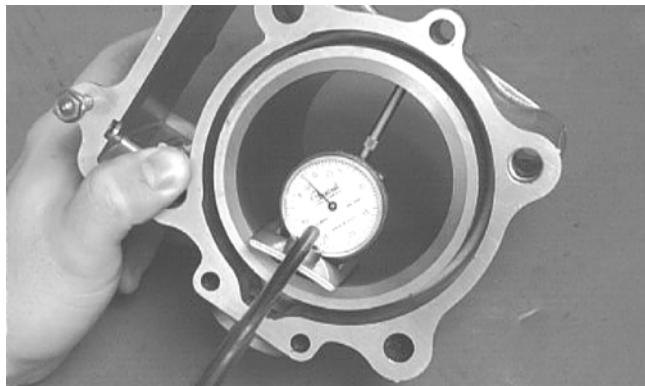
CC129D

## Inspecting Cam Chain Guide

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

## Inspecting Cylinder

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

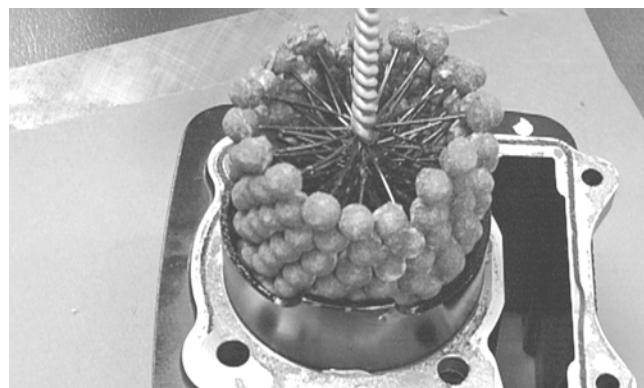


CC127D

2. Wash the cylinder in parts-cleaning solvent.

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

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



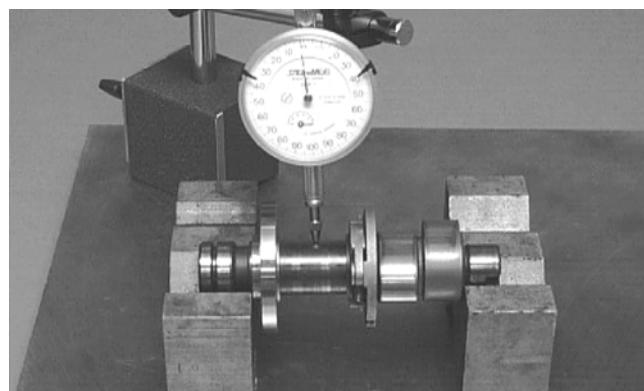
CC390D

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

## Measuring Camshaft Runout

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

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

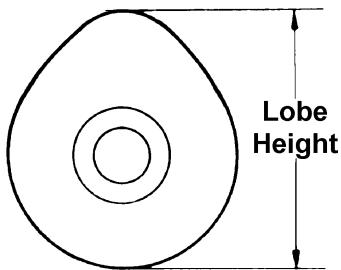


CC283D

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

## Measuring Camshaft Lobe Height

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



ATV1013A

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

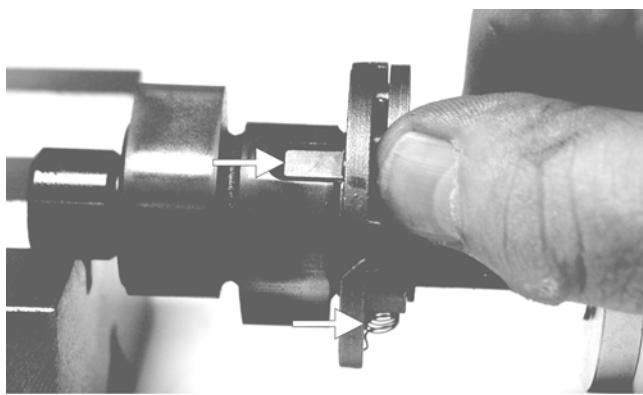
### Inspecting Camshaft Bearing Journal

1. Inspect the bearing journal for scoring, seizure marks, or pitting.
2. If excessive scoring, seizure marks, or pitting is

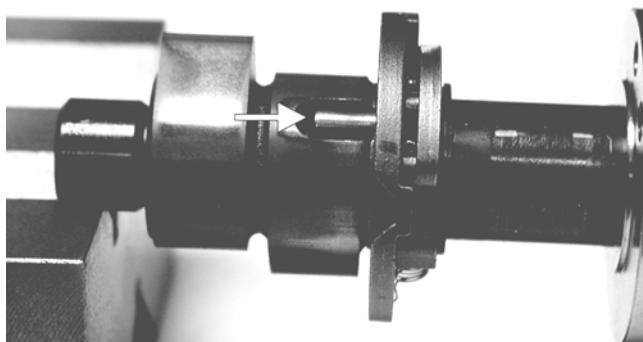
**■NOTE: If the journals are worn, replace the camshaft.**

### Inspecting Camshaft Spring/Drive Pin

1. Inspect the spring and drive pin for damage.



CF061A



CF060A

2. If damaged, the camshaft must be replaced.

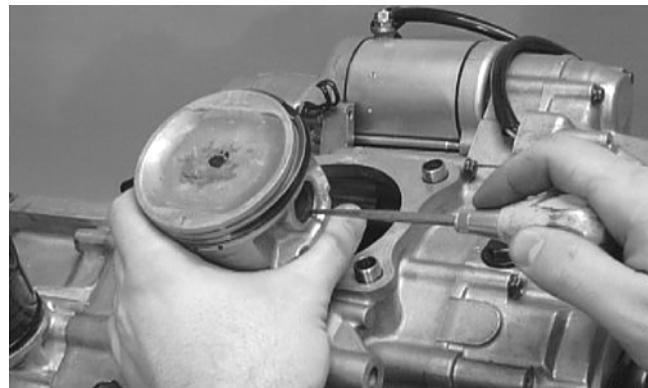
## Installing Top-Side Components

### A. Piston

#### B. Cylinder

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

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



CC032D

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



CC026D

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

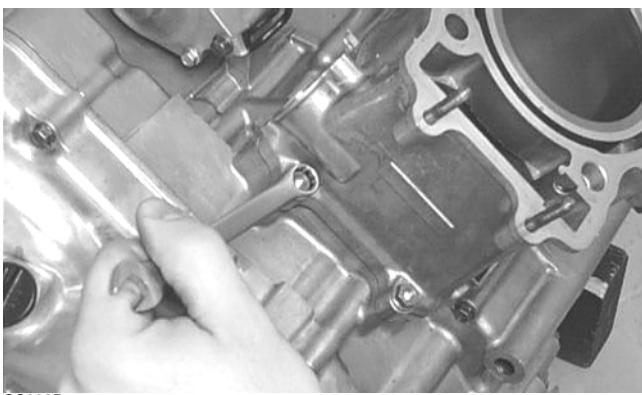
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



CC024D

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

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



CC023D

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

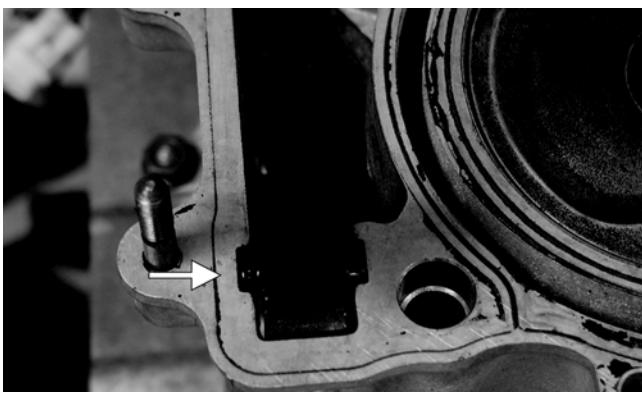
### **C. Cylinder Head D. Valve Cover**

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

6. Place the chain guide into the cylinder.

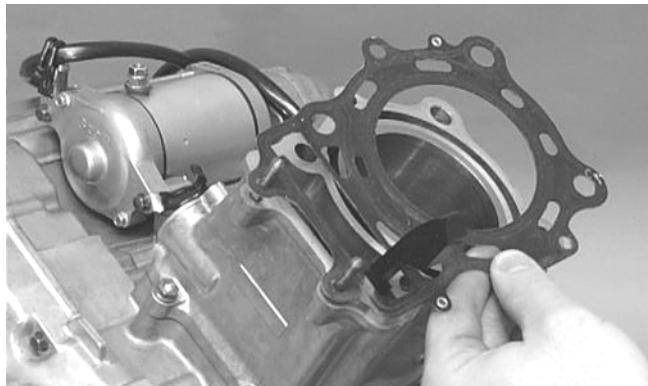
#### **CAUTION**

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

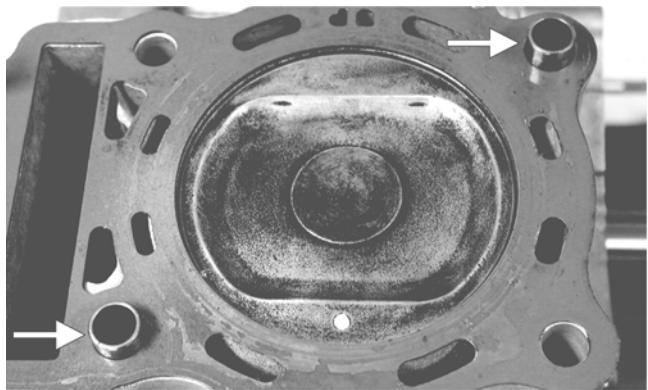


CF058A

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

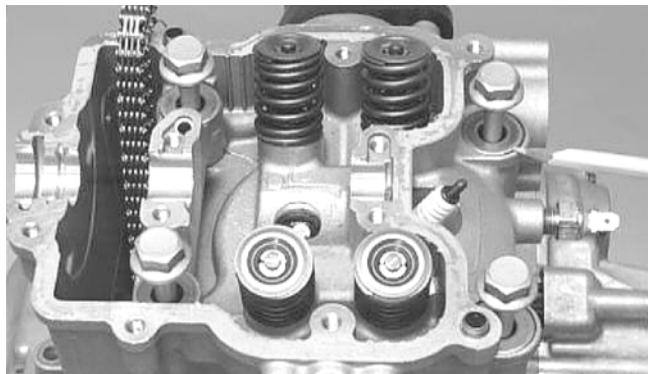


CC020D



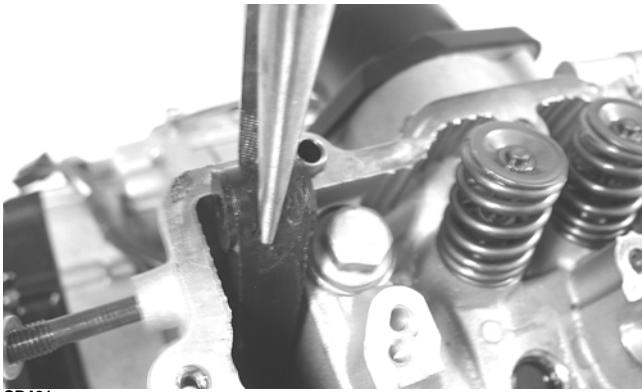
CF057A

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



CC272D

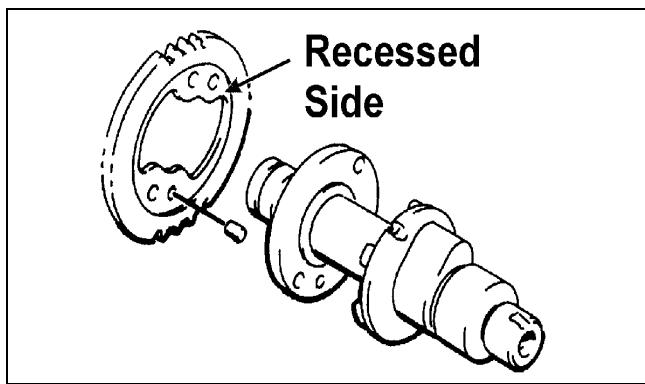
9. Loosely install the five cylinder head nuts.
10. Using a crisscross pattern, tighten the four cap screws (from step 8) initially to 20 ft-lb; then in 10 ft-lb increments, tighten to a final torque of 40 ft-lb.
11. Tighten the 8 mm nuts from step 9 to 18 ft-lb and the 6 mm nuts to 8 ft-lb; then tighten the two cylinder-to-crankcase nuts (from step 4) securely.
12. With the timing inspection plug removed and the chain held tight, rotate the crankshaft until the piston is at top-dead-center.
13. Install the rear cam chain tensioner guide into the cylinder head. Install the pivot cap screw and washer.



CD461

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

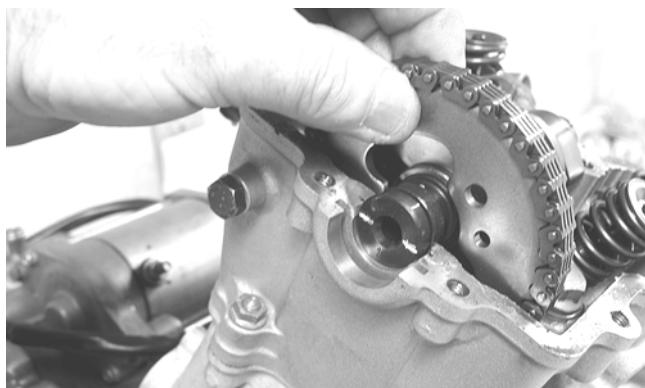
14. With the alignment pin installed in the camshaft, loosely place the cam sprocket (with the recessed side facing the cam shaft lobes) onto the camshaft. At this point, do not “seat” the sprocket onto the shaft.



732-307B

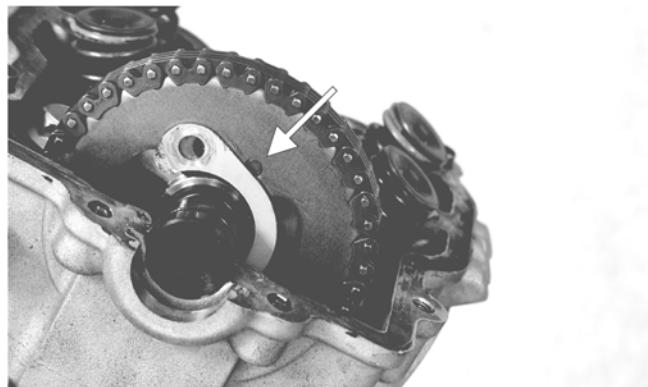
15. With the cam lobes directed down (toward the piston), maneuver the camshaft/sprocket assembly through the chain and towards its seating position; then loop the chain over the sprocket.

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



CD463

16. Seat the cam sprocket onto the camshaft making sure the alignment pin in the camshaft aligns with the smallest hole in the sprocket; then place the cam-shaft/sprocket assembly onto the cylinder ensuring the following.



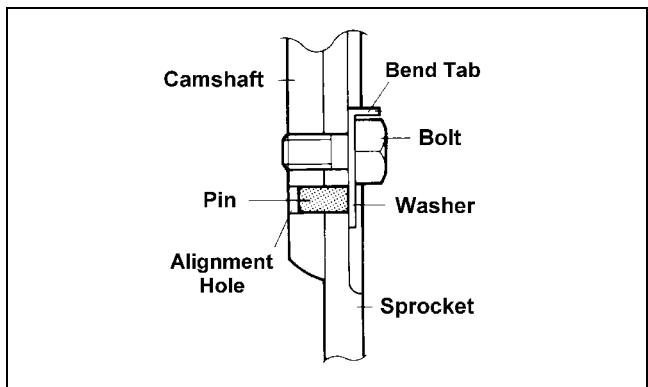
CF013A

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

#### CAUTION

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

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

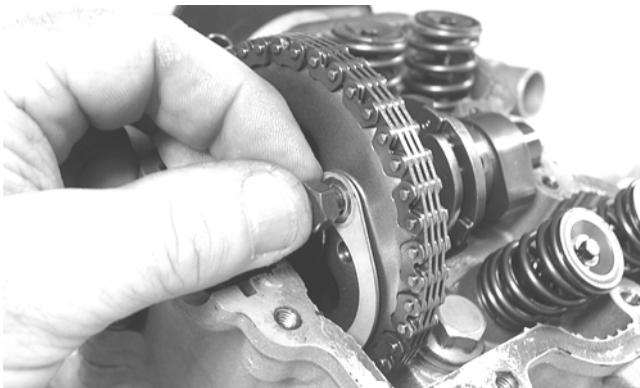


ATV1027

#### CAUTION

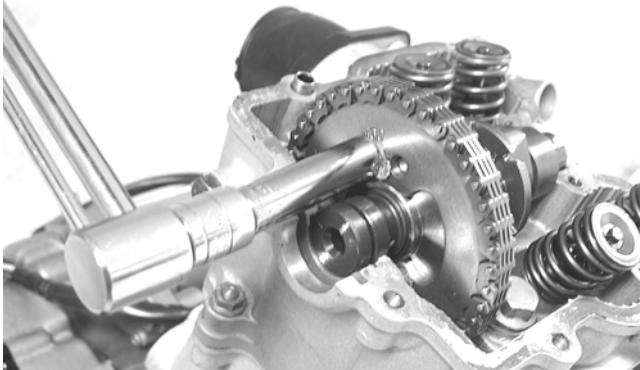
Care must be taken that the tab-washer is installed correctly to cover the alignment hole on the sprocket. If the alignment pin falls out, severe engine damage will result.

18. Install the first cap screw (threads coated with red Loctite #271) securing the sprocket and tab-washer to the camshaft. Tighten only until snug.



CD464

19. Rotate the crankshaft until the second cap screw securing the sprocket to the camshaft can be installed; then install the cap screw (threads coated with red Loctite #271) and tighten to 11 ft-lb. Bend the tab to secure the cap screw.



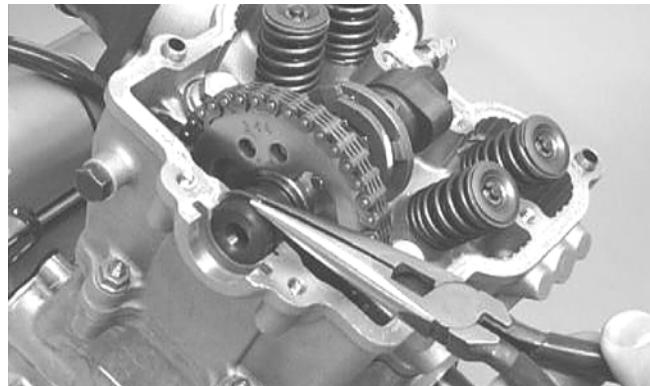
CD465

20. Rotate the crankshaft until the first cap screw (from step 18) can be accessed; then tighten to 11 ft-lb. Bend the tab to secure the cap screw.



CD466

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

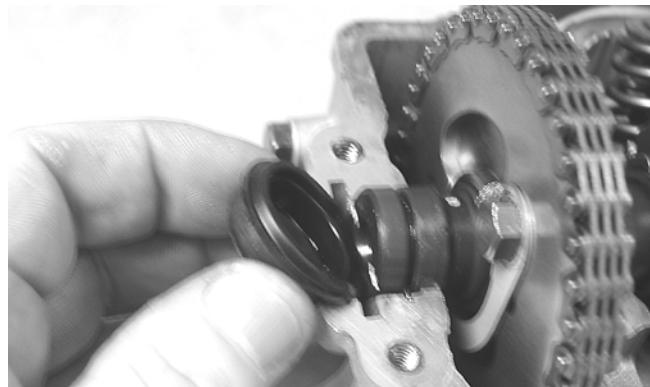


CC012D

22. Install the cylinder head plug in the cylinder head with the open end facing downward and toward the inside.

### CAUTION

The open end of the plug must be positioned downward.



CD468

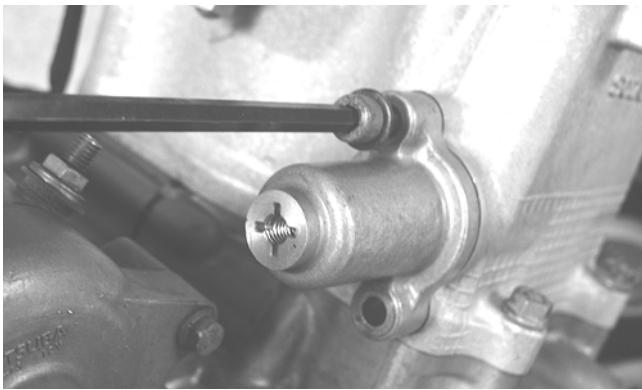
23. Remove the cap screw from the end of the chain tensioner; then using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner clockwise until the screw bottoms.



CD501

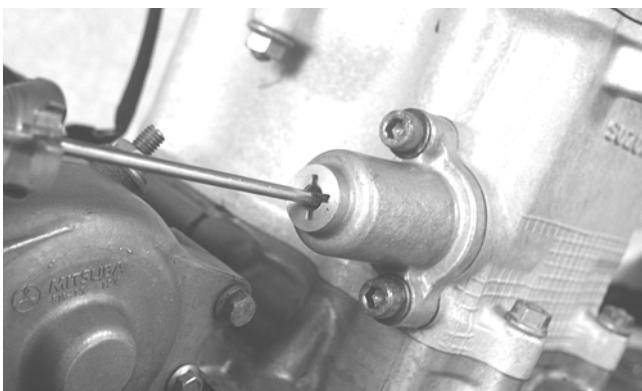
■**NOTE: The adjuster shaft will be drawn into the tensioner as the adjuster screw is rotated clockwise. The adjuster shaft tension will be released in step 25.**

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

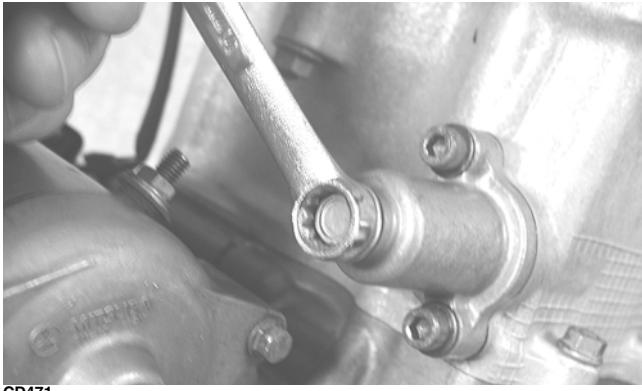


CD469

25. Using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner counterclockwise until the tension spring bears tension; then remove the screwdriver to automatically apply tension to the cam chain.

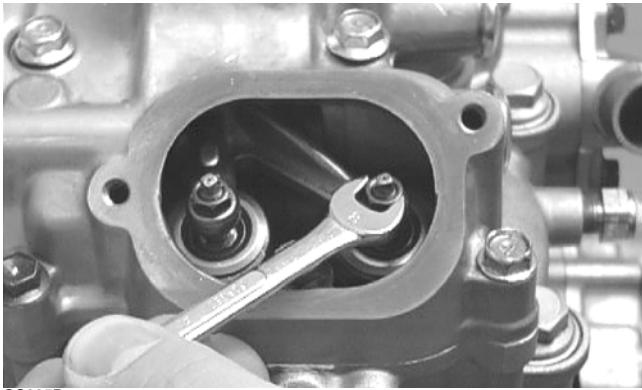


CD470



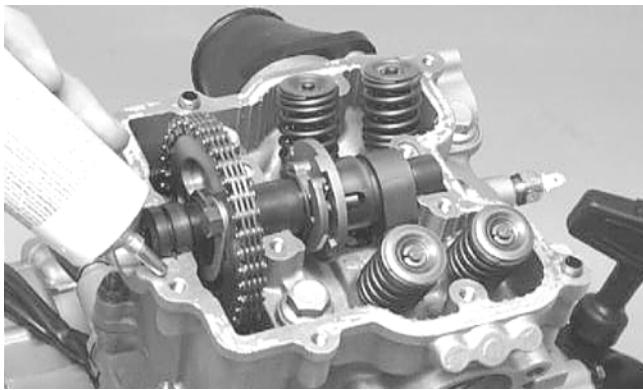
CD471

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



CC005D

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

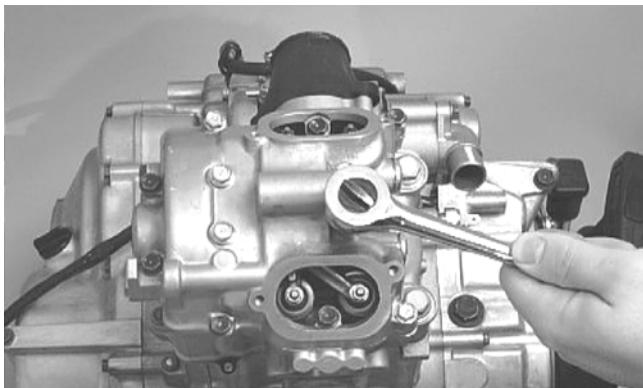


CC275D

28. Place the valve cover into position.

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

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



CC003D

30. In a crisscross pattern starting from the center and working outward, tighten the cap screws (from step 29) to 8.5 ft-lb.

31. Adjust valve/tappet clearance (see Periodic Maintenance/Tune-Up).

32. Place the two tappet covers into position making sure the proper cap screws are with the proper cover. Tighten to 9 ft lb.



CC001D

33. If removed, install the spark plug. Tighten securely.

## Left-Side Components

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

### ☞ AT THIS POINT

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

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

## Removing Left-Side Components

### A. Outer Magneto Cover

#### B. Water Pump

#### C. Cover

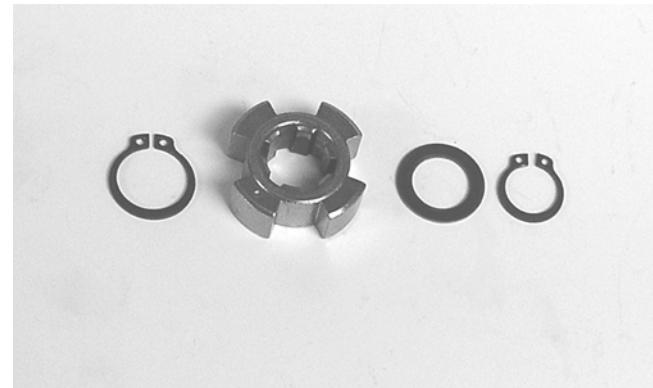
#### D. Rotor/Flywheel

1. Remove the four cap screws securing the outer magneto cover to the left-side cover; then remove the outer magneto cover.
2. Remove the flange nut securing the bushing to the crankshaft; then remove the bushing. Account for the O-ring inside the spacer.
3. Remove the cap screws securing the speed sensor housing to the crankcase and remove the housing assembly; then remove the snap ring securing the speed sensor trigger and thrust washer to the shaft and remove the trigger. Account for the gasket, spring, and dowel pins.

■NOTE: It may be necessary to use a small two-jaw puller to remove the trigger.



H1-030



GZ254

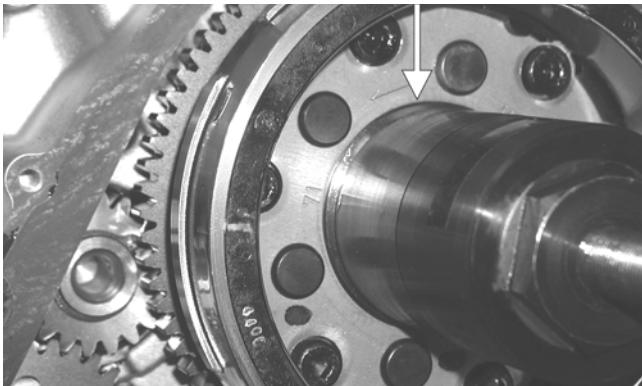
4. Loosen the clamps securing the coolant hose to the water pump; then remove the crossover tube from the cylinder head. Account for an O-ring.
5. Remove the two cap screws securing the water pump to the engine; then remove the water pump.
6. Remove the cap screws securing the left-side cover to the crankcase noting the location of the different-sized cap screws for installing purposes.
7. Using an appropriate side case puller, remove the side cover. Account for a gasket and two alignment pins.
8. Remove the nut securing the magneto rotor to the crankshaft; then install the magneto rotor puller adapter.

■NOTE: The puller has left-hand threads.

9. 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

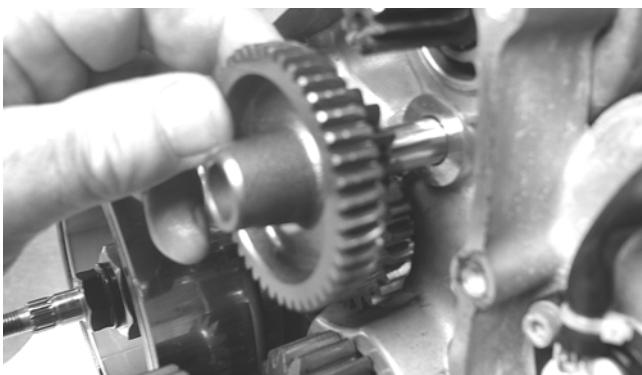


CD939A



CD940A

10. Remove the two starter gears from the crankcase noting the direction of the beveled side of the starter idler gear #2 for installing purposes; then remove the two starter gear shafts.



CD136



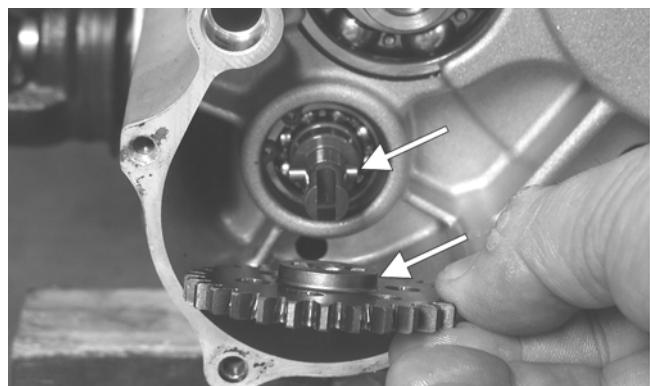
CD140

11. 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

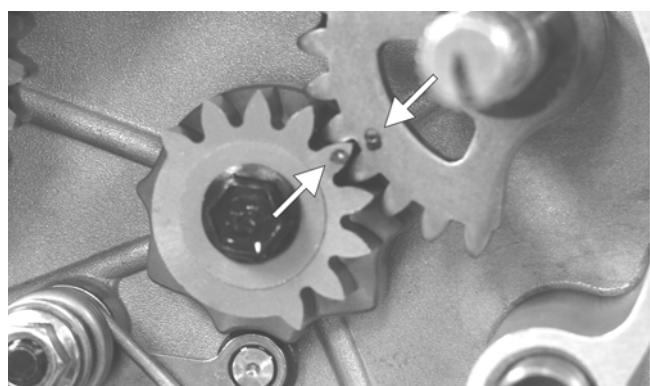
12. Remove the snap ring securing the water pump driven gear; then remove the gear noting the direction of the sides of the gear for installing purposes. Account for the driven gear alignment pin.



CD952A

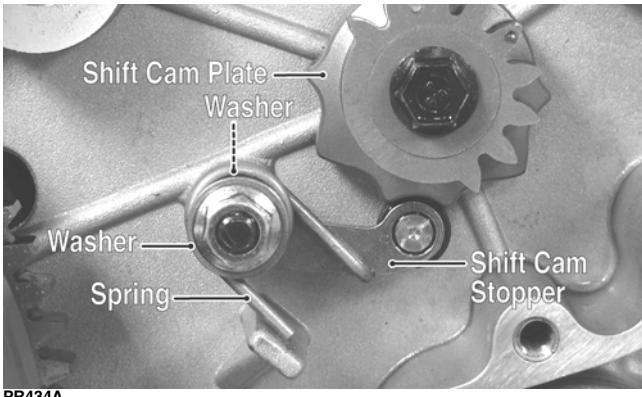
■**NOTE:** There is an oil passage beneath the driven gear/drive gear assembly. This passage should be plugged prior to removing the driven gear and drive gear. Failure to do so could result in the loss of an alignment pin into the crankcase.

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



PR430A

14. Remove the gear shift cam plate and account for a washer; then remove the cam stopper and cam stopper spring. Account for two washers.



PR434A

## REPLACING STARTER CLUTCH ASSEMBLY

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



FI570

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



FI569



FI572

## 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.



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.



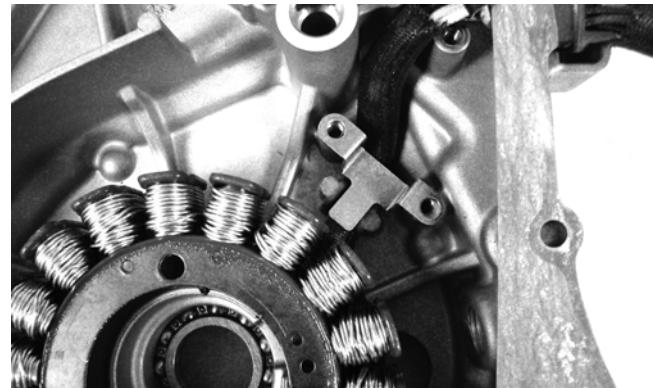
FI580

#### **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.

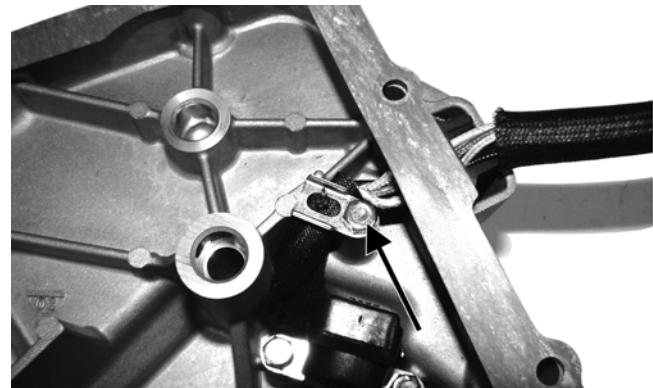
#### **REPLACING STATOR COIL/CRANKSHAFT POSITION SENSOR**

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 new "patch-lock" cap screws. Tighten to 13 ft-lb.
4. Place the stator wire harness hold-down into position; then install the crankshaft position sensor and secure with two cap screws. Tighten securely.
5. Install the upper cable hold-down and secure with a cap screw. Tighten securely.

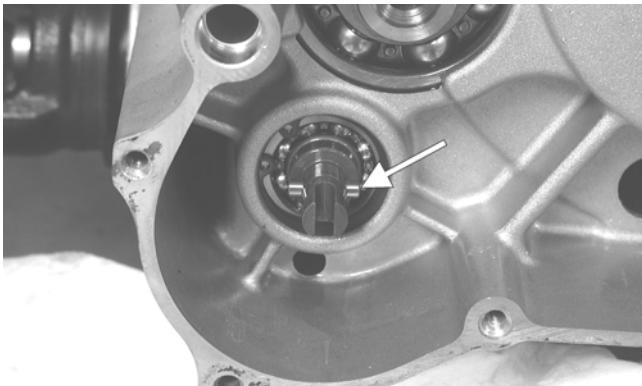


FI595A

#### **Installing Left-Side Components**

**■NOTE: Plug the oil passage in the crankcase housing prior to installing the drive gear/driven gear assembly to prevent loss of an alignment pin.**

1. Install the water pump driven gear alignment pin and the driven gear (with the beveled side of the gear facing outward as noted in removing); then secure with the snap ring.



CD950A



CD944

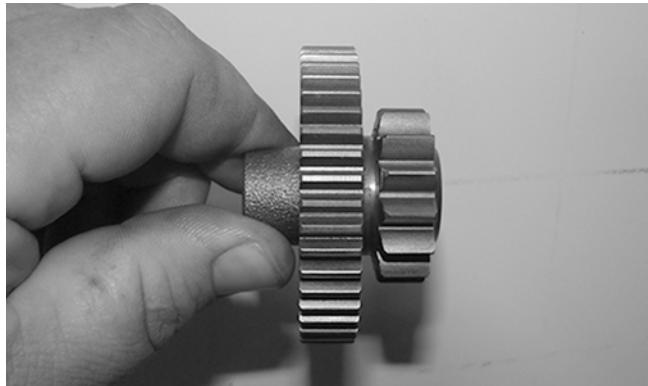
■**NOTE:** The sharp side of the snap ring should be facing outward.

■**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.

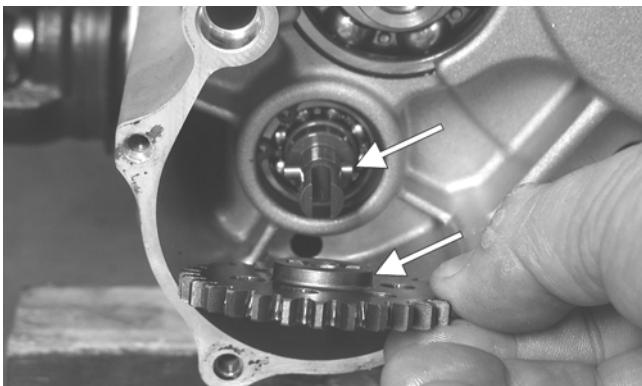


CD139

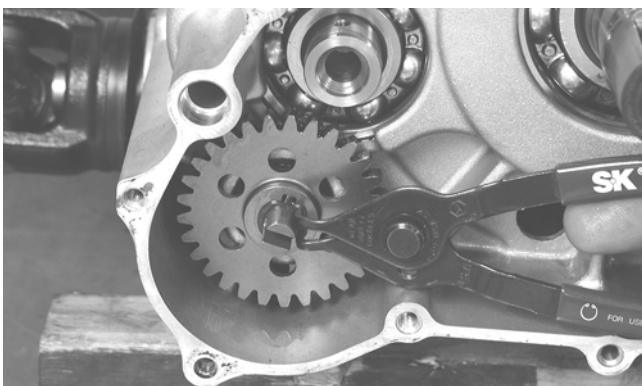


H2-045

4. In order on the crankshaft, install a washer, ring gear, key, and the magneto rotor. Secure with the nut (coated with red Loctite #271). Tighten to 105 ft-lb.



CD952A



CD949

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

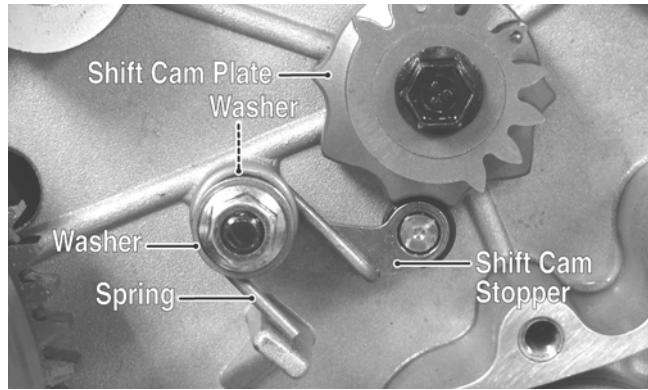
2. Install the water pump drive gear drive pin and the drive gear (with the flat side of the gear facing outward as noted in removing); then secure with the snap ring.



CD946A



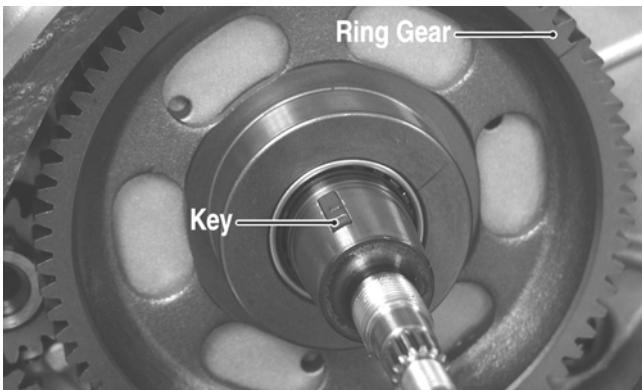
CD948A



PR434A

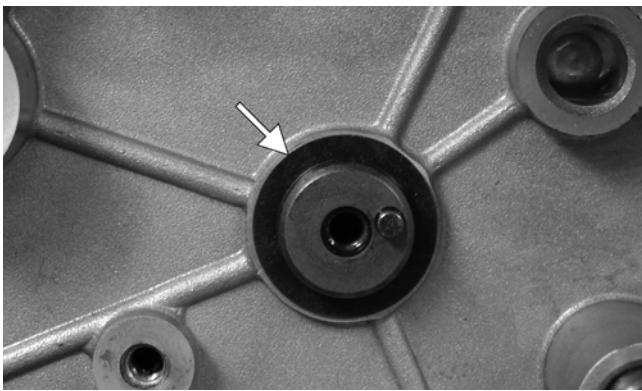
■**NOTE: Rotate the shift cam plate to ensure it ratchets with no binding.**

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.

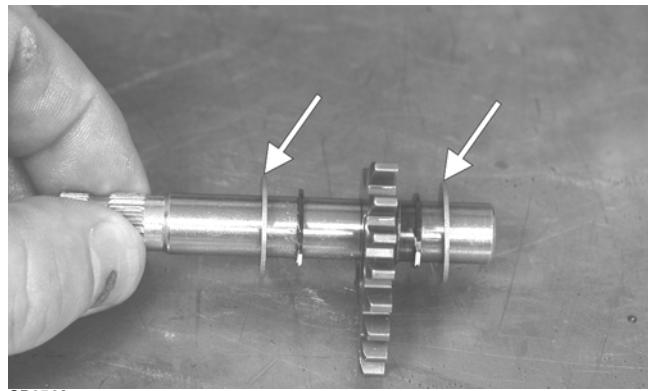


CD940B

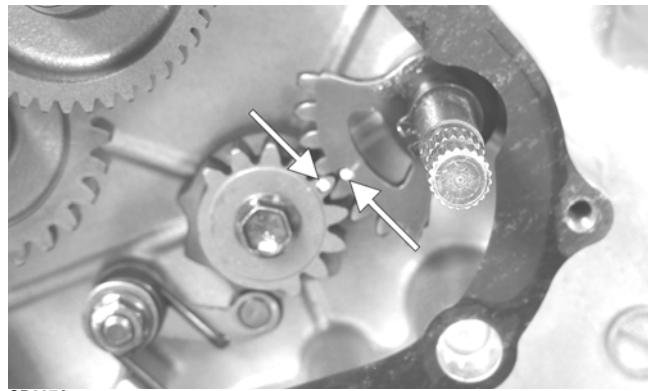
5. Install the thrust washer and shift cam plate onto the shift cam shaft; then coat the cap screw threads with red Loctite #271 and tighten to 8 ft-lb.



PR433A

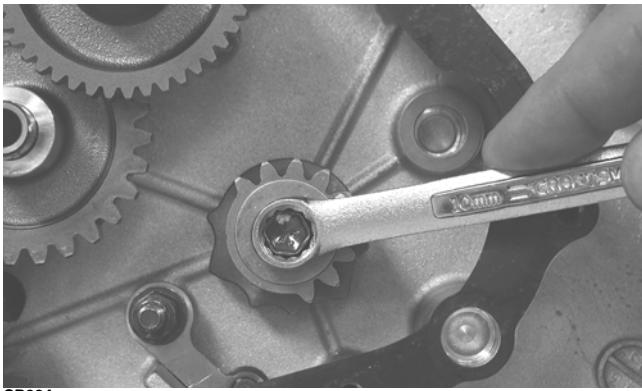


CD954A



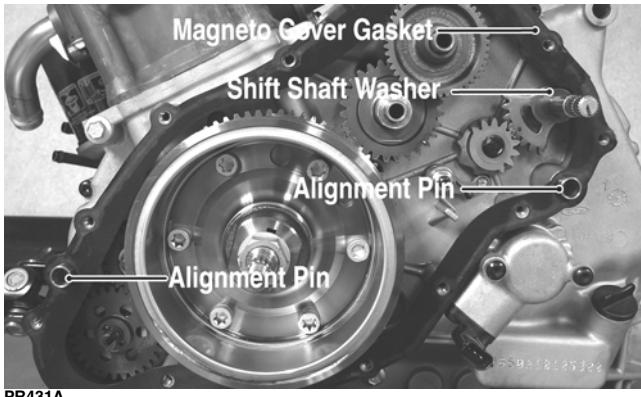
CD927A

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.

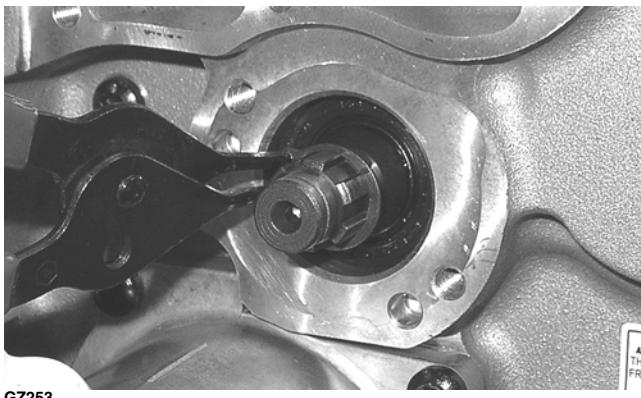


CD934

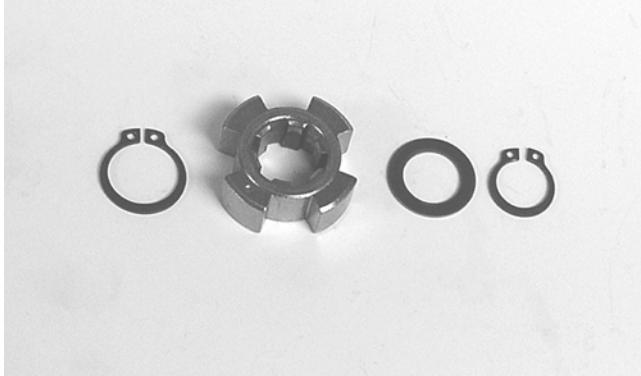
6. Install the shift cam stopper, spring, and two washers (thick washer closest to the nut); then coat the threads on the mounting stud with red Loctite #271 and install the nut. Tighten to 8 ft-lb.



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 8 ft-lb.
12. Clean the countershaft and trigger splines thoroughly and install the inner snap ring onto the shaft; then apply green Loctite #620 to the trigger and counter-shaft splines and install the trigger. Secure with a flat washer and outer snap ring.



GZ253



13. Using a new gasket, install the dowel pins and speed sensor housing onto the crankcase and secure with two cap screws. Tighten to 8 ft-lb.



14. Place the water pump into position and secure with two cap screws. Tighten to 8 ft-lb.

**■NOTE: Ensure the slotted water pump shaft is aligned with the groove in the counter balancer shaft.**

15. Install the crossover tube on the water pump and cylinder head making sure the O-ring is properly positioned.
16. Place the outer magneto cover into position on the left-side cover; then tighten four cap screws to 6 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

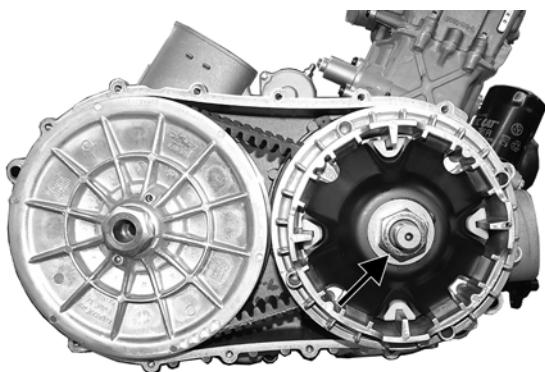
- V-Belt Cover**
- Driven Pulley**
- Clutch Cover**
- Oil Pump**

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

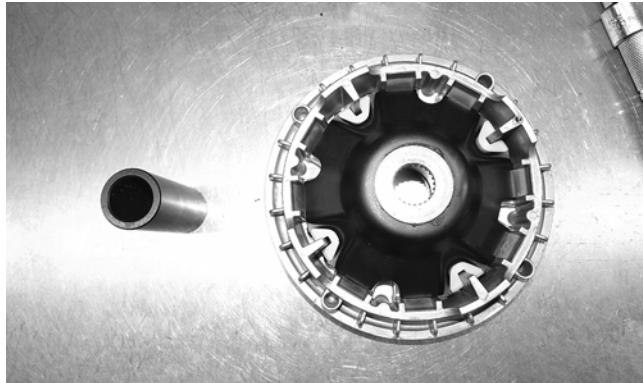


H1-017

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



CF373A



CF378

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



PR388

5. Remove the fixed drive face.

6. Remove the cap screws securing the clutch cover. Note the location of the different-lengthed cap screws for installing purposes. Using a rubber mallet, carefully remove the cover. Account for two alignment pins.



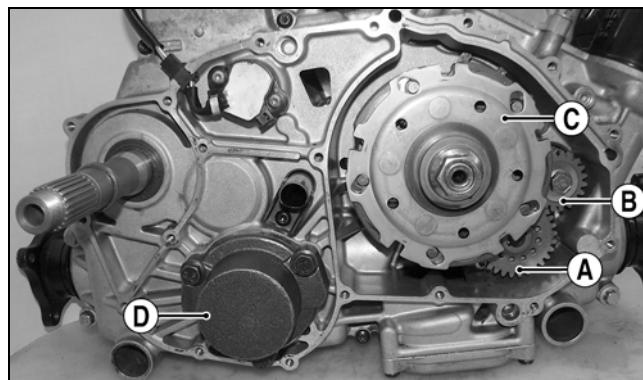
CD973A

**CAUTION**

Care must be taken when removing the cover so the cover gasket is not damaged.

■NOTE: For steps 7-13, refer to illustration H1-029A.

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



KEY

A. Oil Pump Driven Gear  
B. Oil Pump Drive Gear

C. Clutch Shoe Assembly  
D. Final Drive Carrier Bearing Housing

H1-029A

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



CF085



CC596

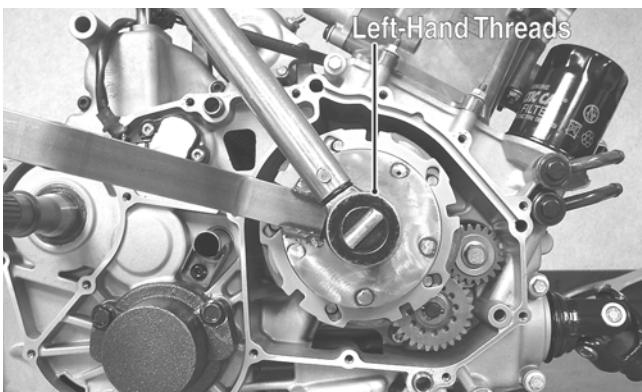
**■NOTE: Account for and inspect the clutch housing seal.**



CF088A

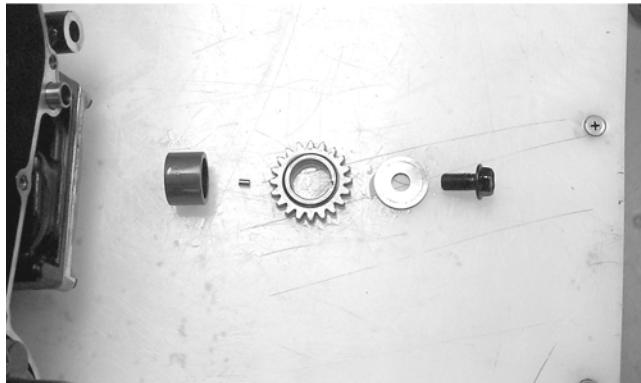
8. Remove the two cap screws securing the gear position switch; then remove the switch.

9. Remove the nut (left-hand threads) securing the clutch shoe assembly (C).



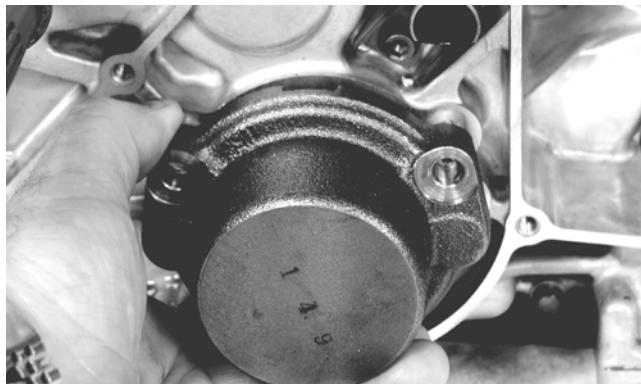
PR410A

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



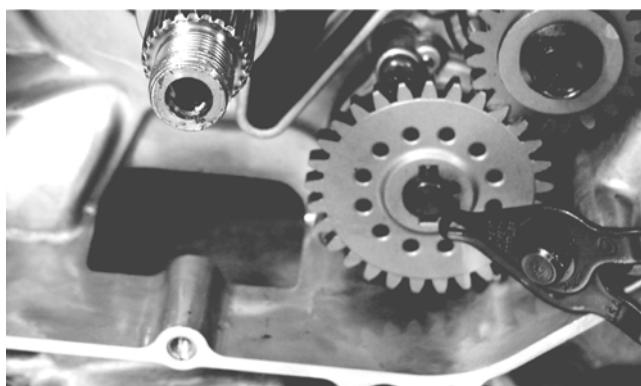
CC606

11. 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.

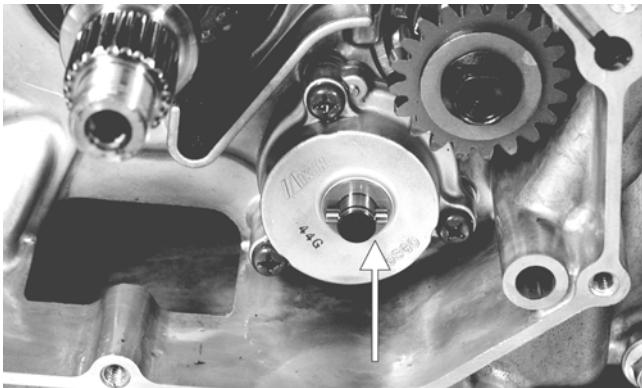


CD999

12. Remove the snap ring securing the oil pump driven gear (A); then remove the gear noting the direction of the sides of the gear for installing purposes. Account for a pin and a washer.



CD984



CD895A

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

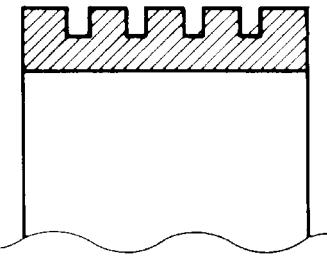


CD988

## Servicing Right-Side Components

### 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.

### INSPECTING PRIMARY ONE-WAY DRIVE

1. Insert the drive into the clutch housing.
2. Rotate the inner race by hand and verify the inner race rotates only one direction.
3. If the inner race is locked in place or rotates both directions, the drive assembly must be replaced.

### INSPECTING OIL PUMP

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

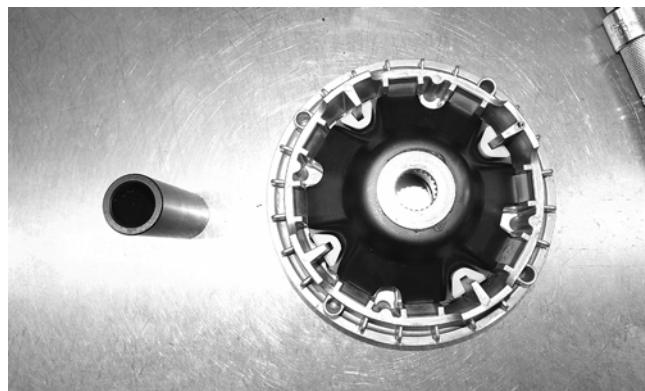


CC446D

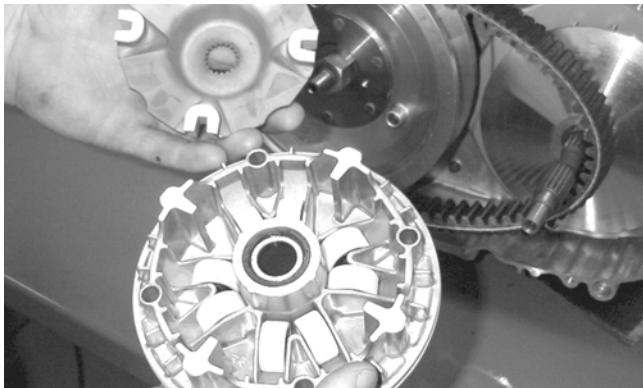
### DRIVE CLUTCH ASSEMBLY

#### 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

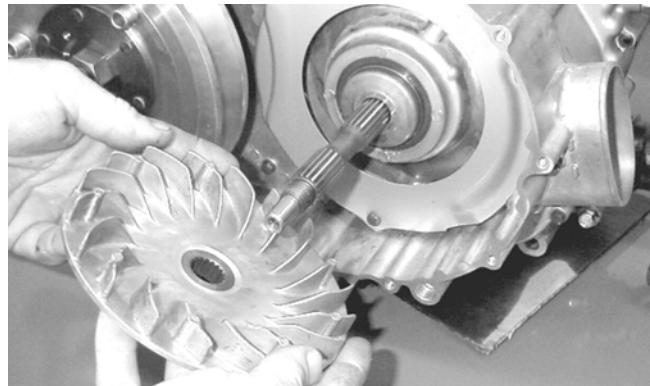
3. Check the internal bushing of the movable drive sheave and surface of the spacer. Replace as necessary. Check the fixed drive sheave internal splines for excessive wear. Check for any broken cooling fins and replace as necessary.



MD1094

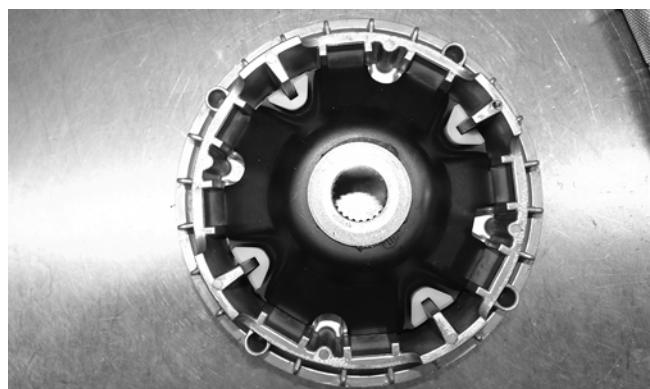
## Assembling

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

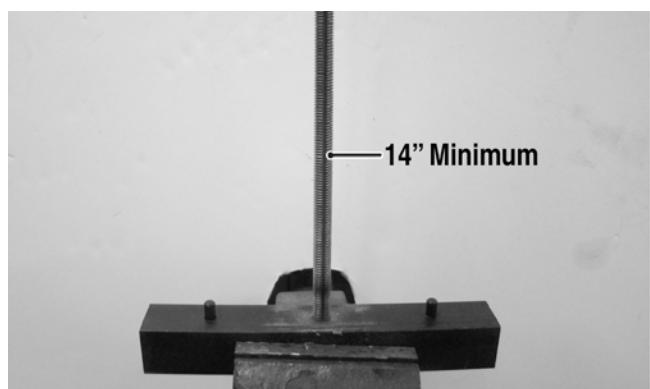
## DRIVEN CLUTCH ASSEMBLY

### Disassembling

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

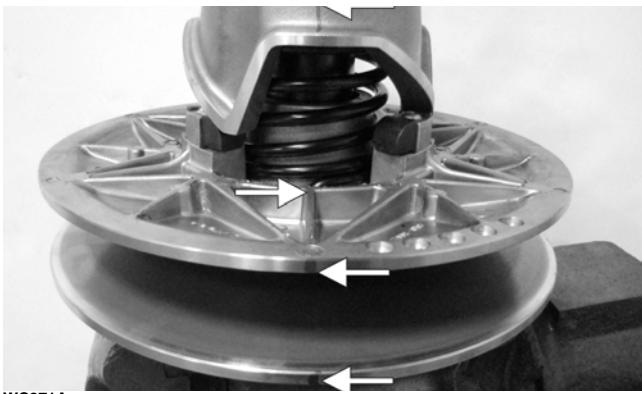
#### ⚠️ WARNING

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



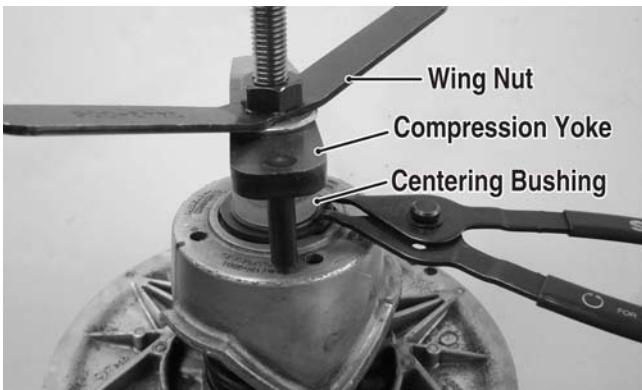
WC422A

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.

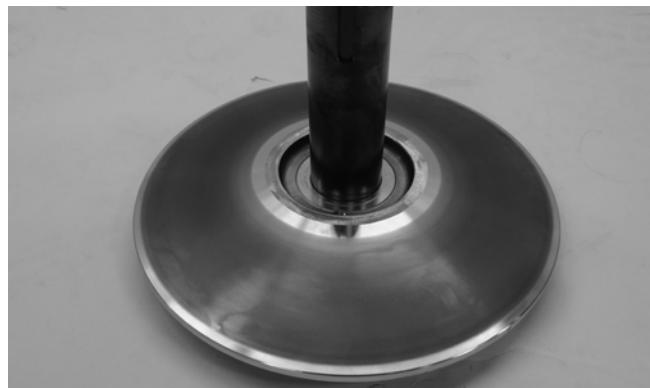
#### **WARNING**

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.

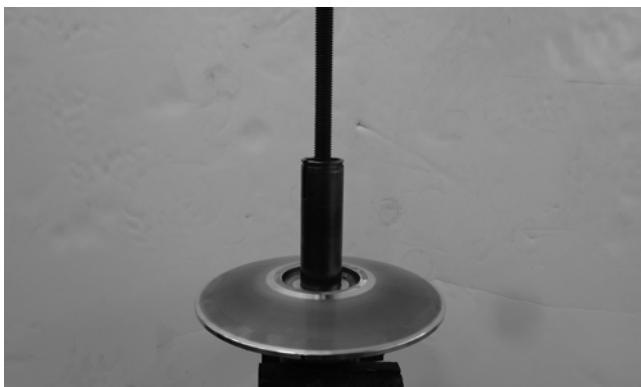
**■NOTE: If any of the components fail the above inspection, the driven pulley must be replaced.**

## 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.



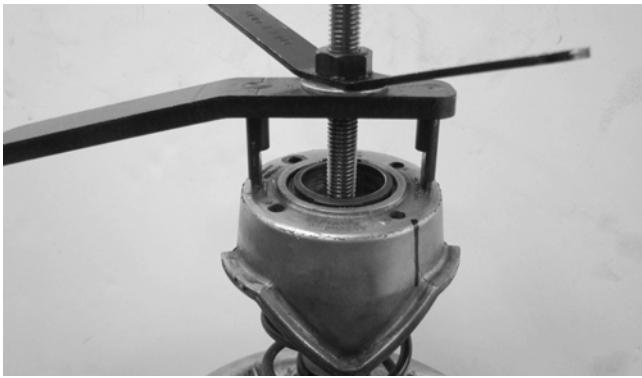
WC391A

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



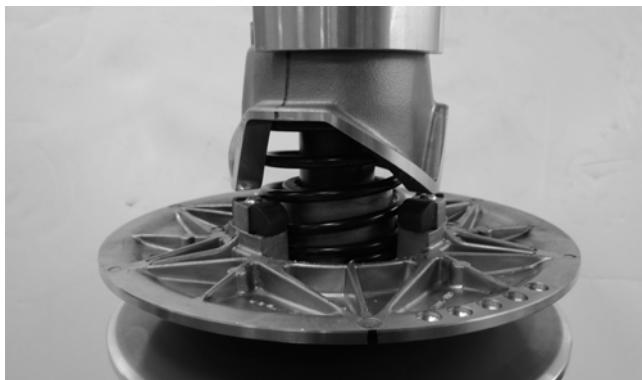
WC753

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.



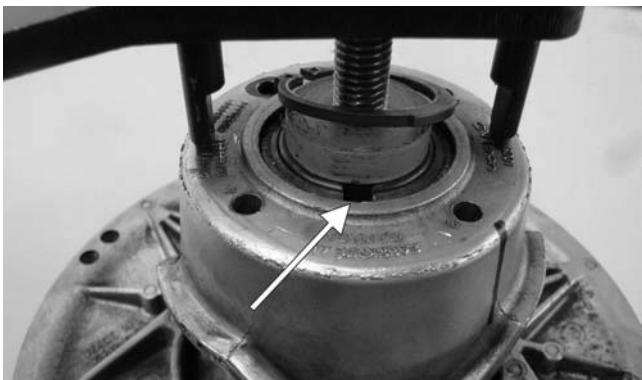
WC414

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 28 ft-lb.



CD999

2. Install the oil pump; then tighten the screws (coated with red Loctite #271) to 8 ft-lb.

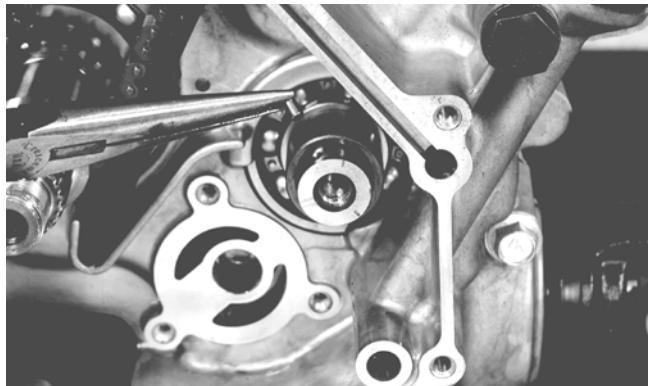


CD988

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 62 ft-lb.

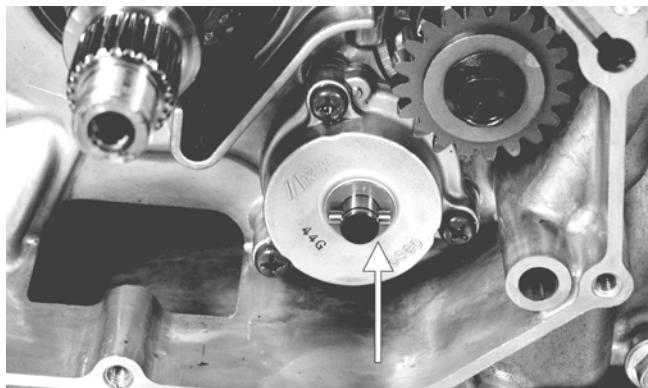


CD992

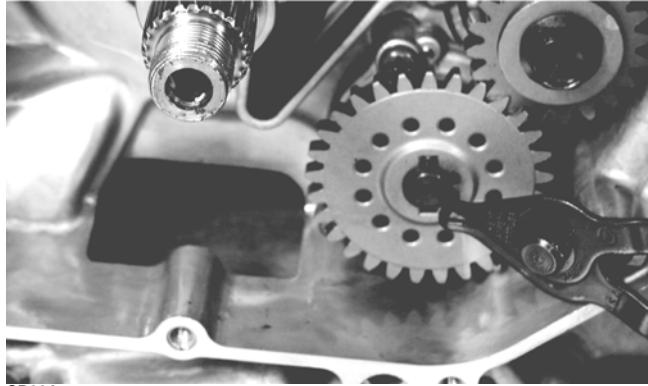


CD991

4. Grease the driven gear pin and insert it into the shaft. Install the washer; then install the driven gear noting the direction on the sides of the gear from removing). Secure with a snap ring.



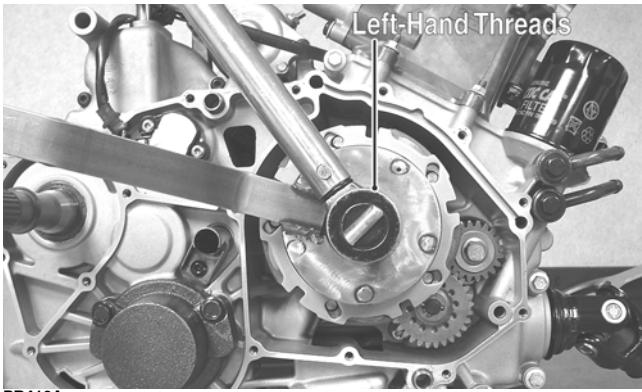
CD985A



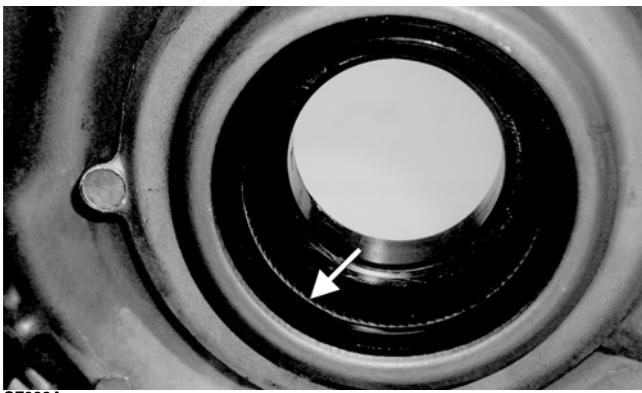
CD984

**■NOTE: When installed correctly, the sides of the drive and driven gears will be flush with each other.**

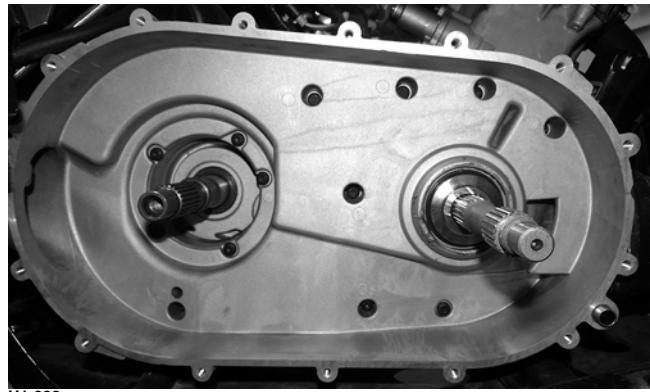
5. Install the clutch shoe assembly and secure with the flange nut (threads coated with red Loctite #271). Tighten to 221 ft-lb.



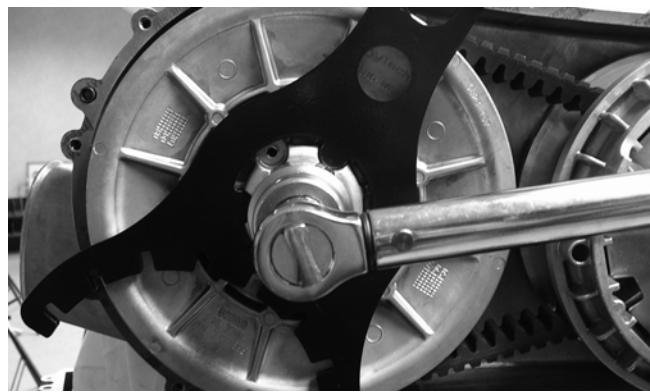
6. Install the clutch cover alignment pins into the crankcase, apply oil to the cover gasket, and install the gasket onto the crankcase.
7. Lightly grease the clutch housing seal; then insert the left fixed-drive spacer.



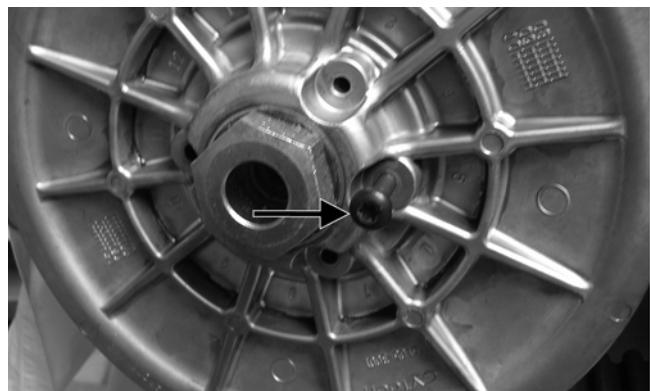
8. Apply grease to the outer edges of the clutch housing; then from inside the clutch cover, install the clutch housing into the cover using a rubber mallet.
9. Place the clutch cover/housing assembly into position on the crankcase; then secure with the cap screws making sure the different-lengthed cap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



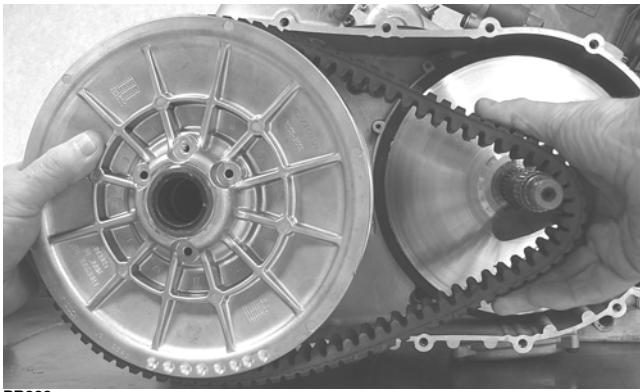
10. Place the driven pulley assembly into position and secure with the nut. Tighten to 162 ft-lb.



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



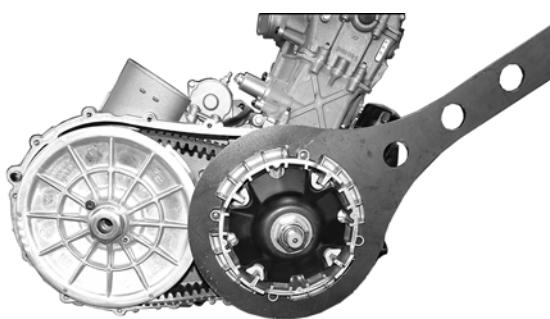
13. Place the V-belt into position on the driven pulley and over the front shaft.



PR389

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

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 (threads coated with red Loctite #271) and 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 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 into position; then install the cover and secure with the cap screws making sure the different-lengthed cap screws are in their proper location. Tighten the cap screws to 48 in.-lb.



H1-017

## Center Crankcase Components

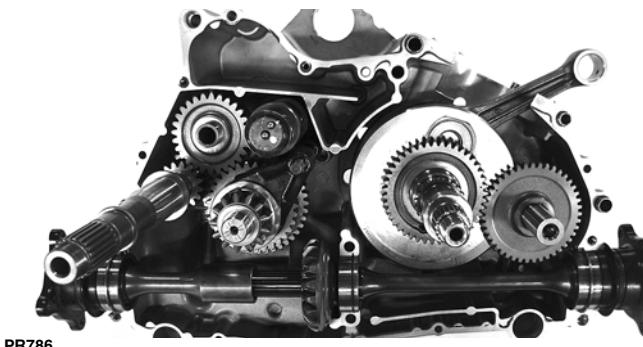
■**NOTE:** This procedure cannot be done with the engine/transmission in the frame. Complete Removing procedures for Top-Side, Left-Side, and Right-Side must precede this procedure.

■**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.

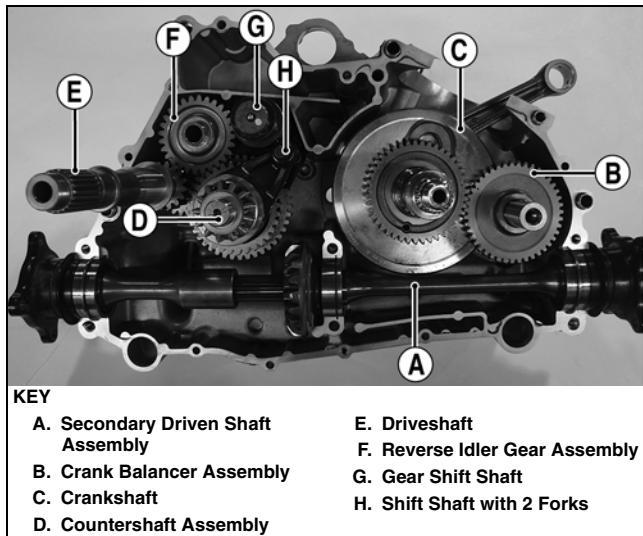


PR786

## Disassembling Crankcase Half

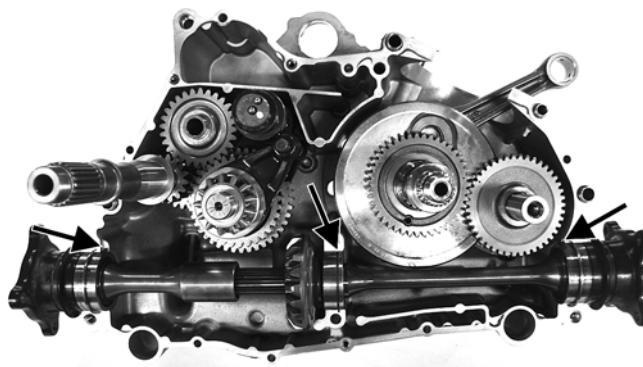
■**NOTE:** For steps 1-7, refer to illustration PR787A.

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



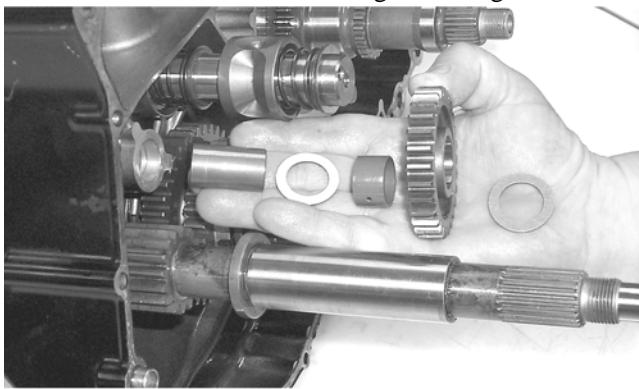
PR787A

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



PR787B

2. Remove the reverse idler gear assembly (F). Account for all washers, shaft, bushing, and the gear.



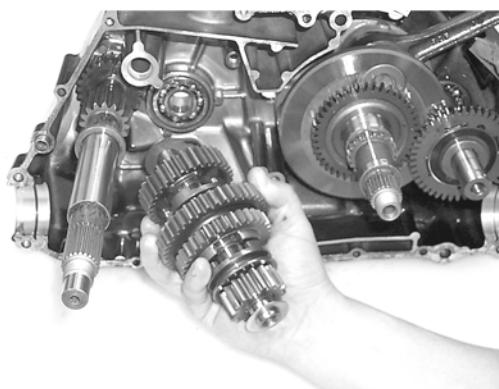
CC668

3. Remove the shift shaft (H); then remove the two forks taking note of the direction of the tabs on the forks for assembling purposes.
4. Remove the gear shift shaft (G) noting the location of the two holes on the end of the shaft. Account for a spacer and a washer.



DE677A

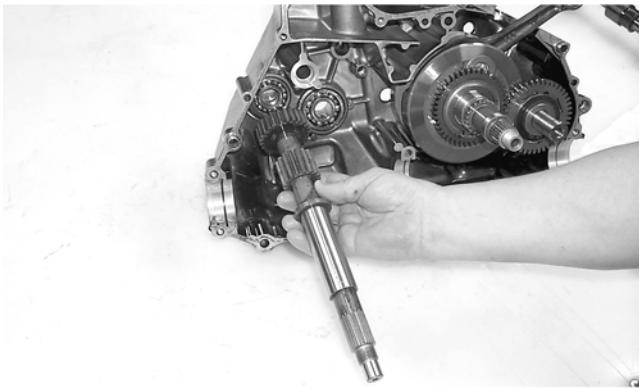
5. Remove the countershaft assembly (D). Account for a washer on each end of the countershaft.



DE677A

■**NOTE:** Do not disassemble the countershaft assembly unless necessary. If necessary, see Servicing Center Crankcase Components sub-section.

6. Using a rubber mallet, tap on the crankcase to remove the driveshaft.



CC675

7. Note the timing marks on the crank balancer assembly (B) gear and crankshaft (C) gear for assembling purposes; then slide the crank balancer gear off the crank balancer. Account for the key in the keyway.



CD826

8. Remove the crank balancer.

■NOTE: There is a flat spot on the crank balancer bearing flange to allow clearance past the crankshaft.



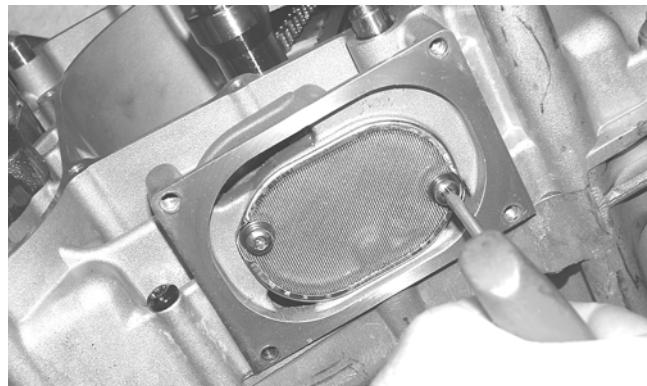
CD832B

9. Remove the snap ring securing the water pump driven gear shaft.
10. Using a hydraulic press, remove the crankshaft assembly.

■NOTE: Use a protective end cap to prevent damage to the crankshaft threads.

11. Remove the cap screws securing the oil strainer cap; then remove the cap.
12. Remove the two cap screws securing the oil strainer; then remove the strainer.

■NOTE: Thoroughly clean any sealant from the oil strainer cap.



PR406

### CAUTION

Unless the secondary drive gear, bevel gear, or bearings require service, do not remove the secondary drive assembly from the case. If removed, bevel gear backlash will have to be adjusted requiring re-shimming of the drive bevel gear shaft.

13. To remove the secondary drive/bevel gear, remove the secondary drive bearing housing; then remove the nut securing the drive/bevel gear shaft in the bearing and using a plastic mallet, drive the shaft out of the bearing. Account for shim/shims.

■NOTE: Shims should be measured and kept for a starting point in adjusting backlash.

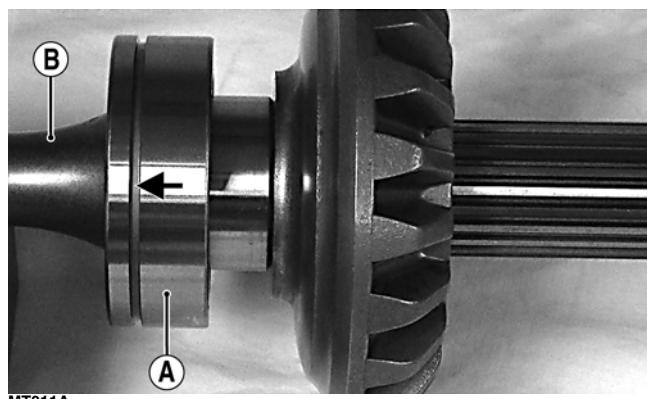
## Servicing Center Crankcase Components

### SECONDARY OUTPUT DRIVE GEARS

#### Initial Set-Up

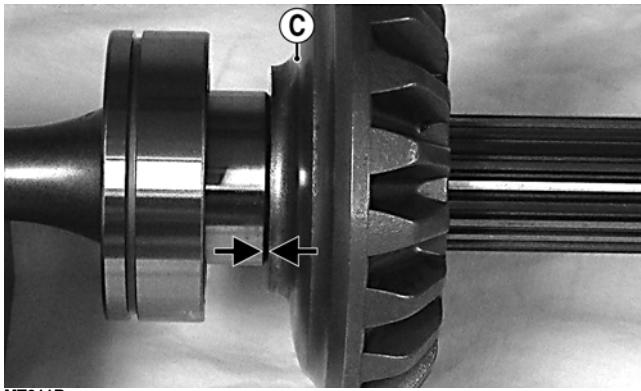
■NOTE: If the secondary output driven shaft is replaced or disassembled, the initial set-up must be performed to establish correct gear tooth contact. If only the secondary output drive shaft or secondary output driven gear is replaced, proceed to **Correcting Backlash** in this sub-section.

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



MT011A

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

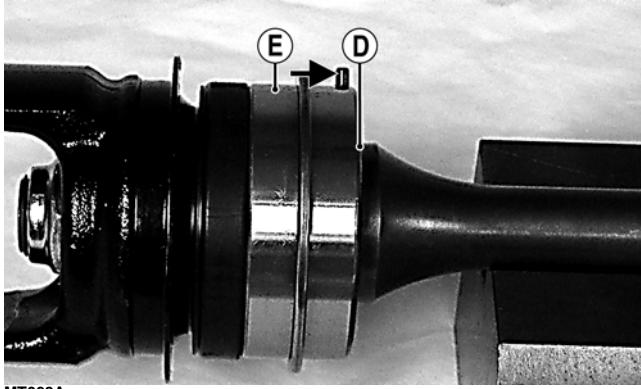


MT011B

3. If installing the existing shaft, start with the shims removed during disassembly or if installing a new shaft, start with approximately 1.0 mm shims at point (D); then install the output drive shaft bearing (E) making sure the locating pin is directed toward the center of the shaft.

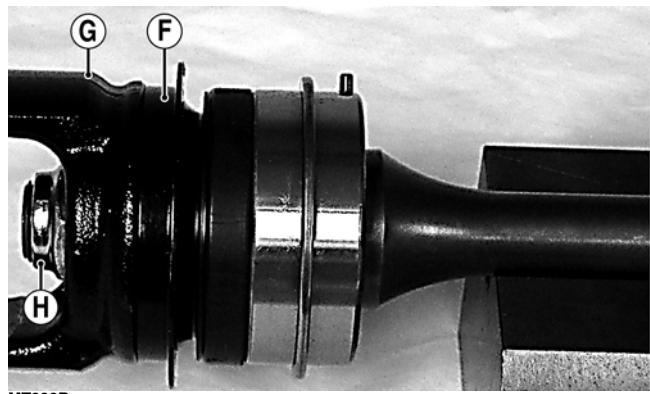


MT012



MT008A

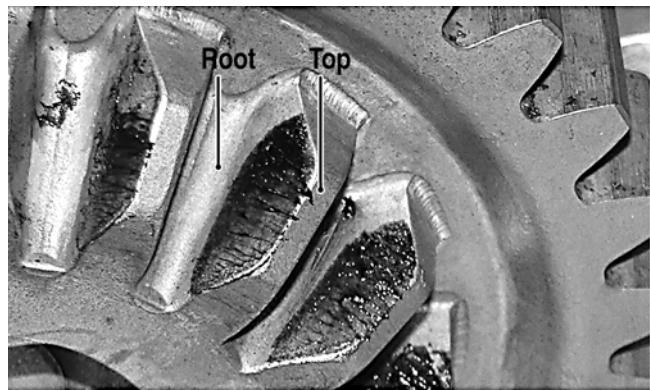
4. Install a new seal (F), output yoke (G), and nut (H) and tighten to 74 ft-lb.



MT008B

■**NOTE: Do not use a new lock nut at this time as this procedure may have to be repeated.**

5. Place the assembled shaft into the left crankshaft case; then lightly coat the gear teeth with machinist's lay-out dye. Rotate the shafts through several rotations in both directions. Gear contact should extend from the root to the top of the gear teeth.



MT016A

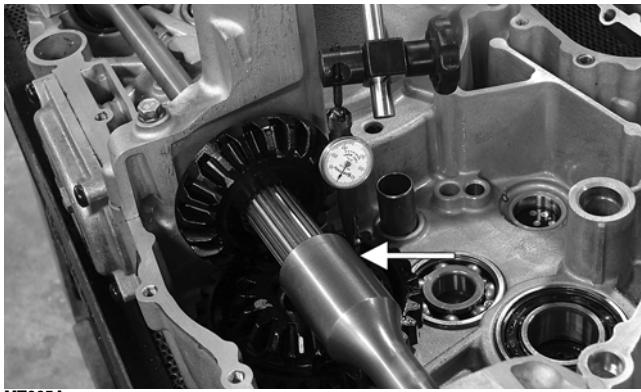
6. To adjust tooth contact, use the following chart to correctly shim the driven shaft.

Tooth Contact	Shim Correction
Contact at Top	Increase Shim Thickness
Contact at Root	Decrease Shim Thickness

7. After correct tooth contact is established, proceed to Checking Backlash in this sub-section.

### Checking Backlash

- If removed, install the secondary drive/bevel gear shaft into the crankcase; then tighten the nut to 59 ft-lb.
- Install the secondary drive bearing support; then install the secondary driven output shaft into the crankcase.
- Mount the dial indicator so the tip is contacting a tooth on the secondary drive bevel gear.
- While rocking the drive bevel gear back and forth, note the maximum backlash reading on the gauge.



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

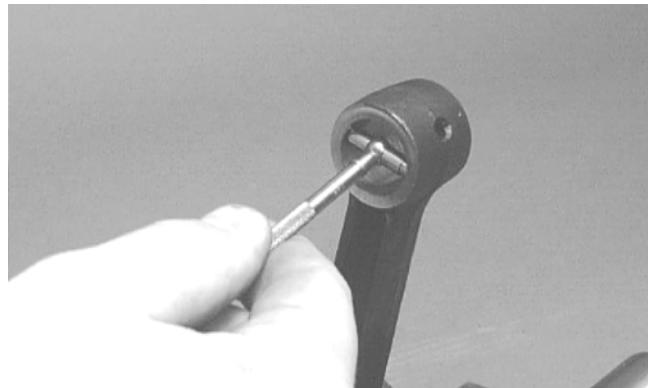
After backlash and tooth contact are within specifications, apply red Loctite #271 to the driveshaft threads and driven output shaft threads; then using new nuts, tighten the output shaft nut to 59 ft-lb and the output yoke nut to 74 ft-lb.

### 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

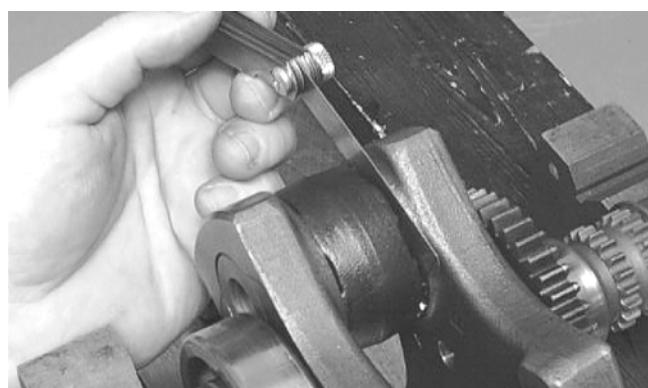
2. Maximum diameter must not exceed specifications.

### 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.

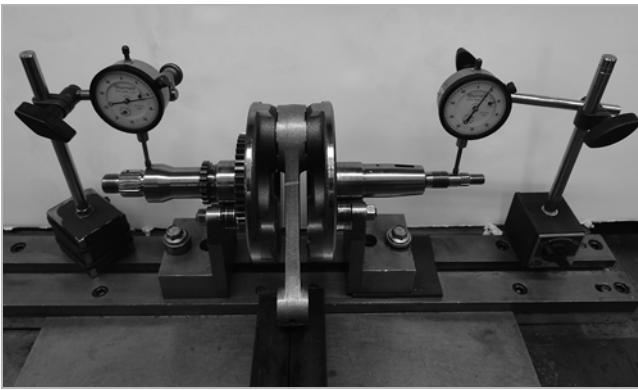


CC289D

3. Acceptable gap range must not exceed specifications.

### Measuring Crankshaft (Runout)

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



H1-003

3. Zero the indicator and rotate the crankshaft slowly.

### CAUTION

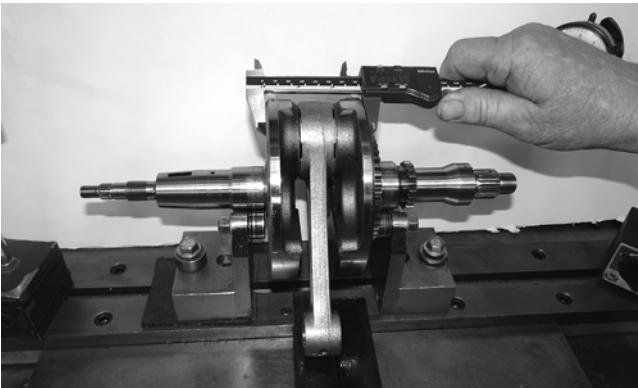
Care should be taken to support the connecting rod when rotating the crankshaft.

4. Maximum runout must not exceed specifications.

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

### Measuring Crankshaft (Web-to-Web)

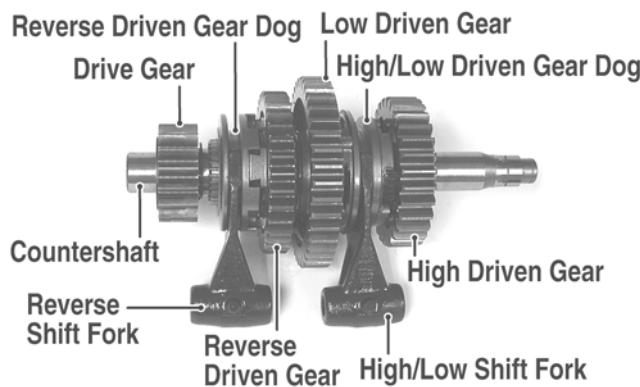
1. Using a calipers, measure the distance from the outside edge of one web to the outside edge of the other web.



H1-005

2. Acceptable width range must not exceed specifications.

### COUNTERSHAFT



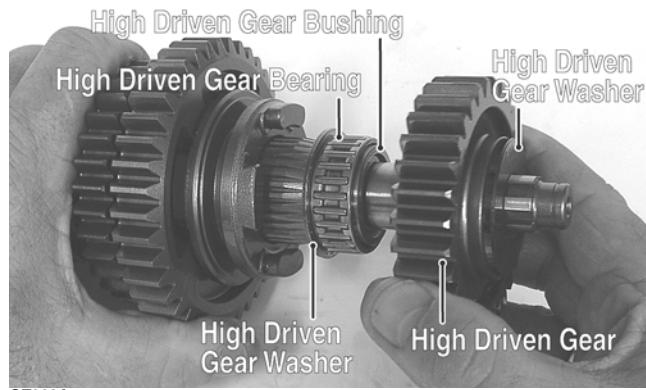
GZ281A

### 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

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

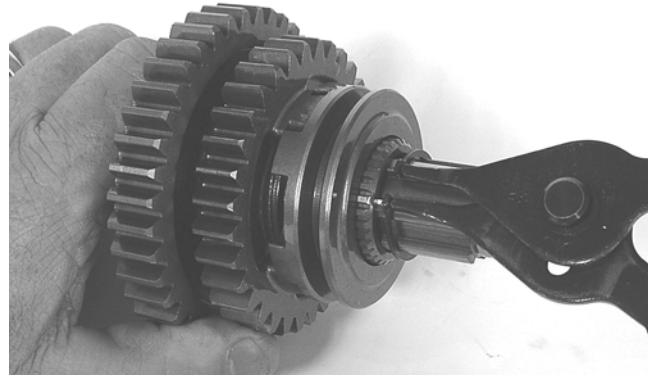


GZ283A

2. Remove the drive gear; then remove the snap ring securing the reverse driven gear dog and bushing to the countershaft.



GZ296



GZ312

3. Remove the reverse driven gear dog.



GZ313A

4. Remove the snap ring securing the reverse driven gear and washer; then remove the washer and gear.



GZ314

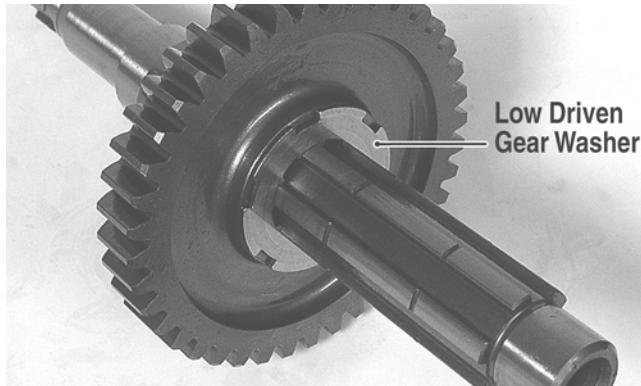
5. Remove the reverse driven washer; then remove the low driven gear locking washer.



GZ319

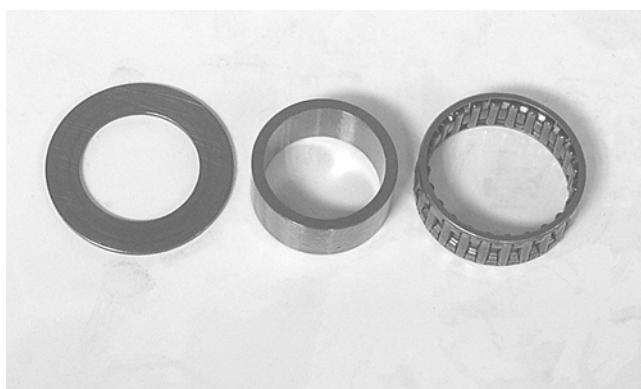


GZ319



GZ318A

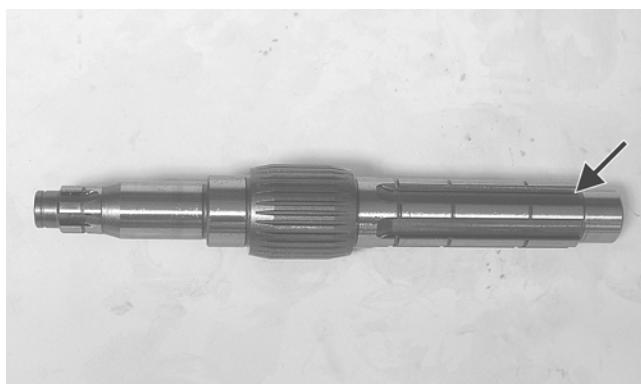
6. Remove the low driven gear. Account for a bearing, bushing, and thrust washer.



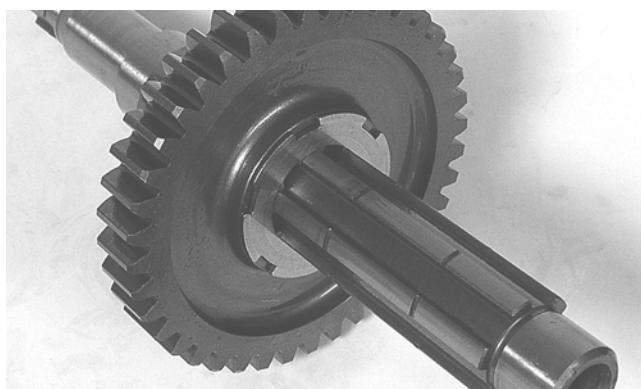
GZ316

## Assembling

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

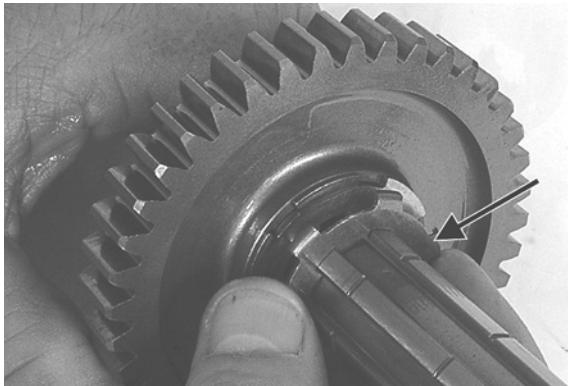


GZ317A

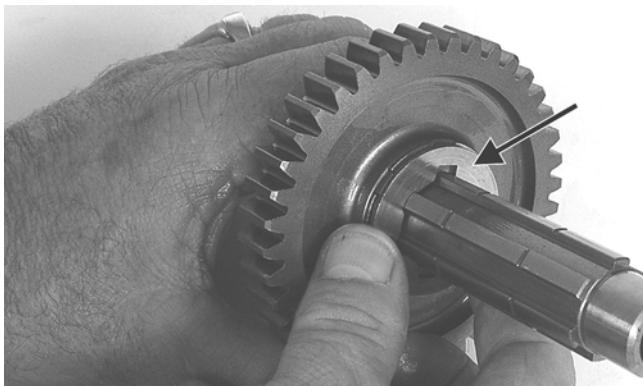


GZ318

2. Install the low driven gear locking washer; then install the inner reverse driven gear washer.

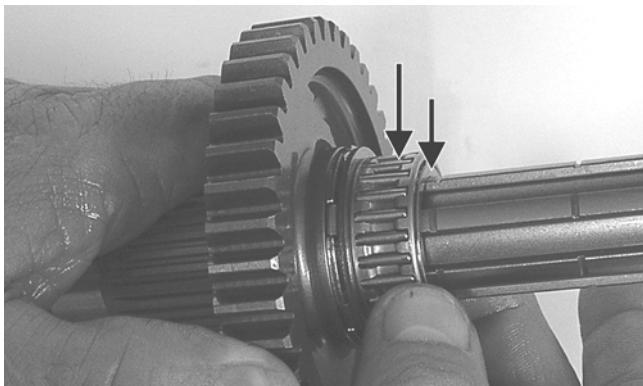


GZ319B



GZ320B

3. Install the reverse driven bushing and bearing; then install the reverse driven gear.

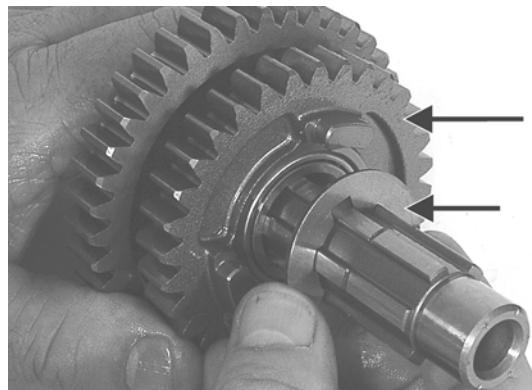


GZ286A



GZ287

4. Install the outer reverse driven washer; then secure the reverse driven gear assembly with a snap ring.



GZ288A

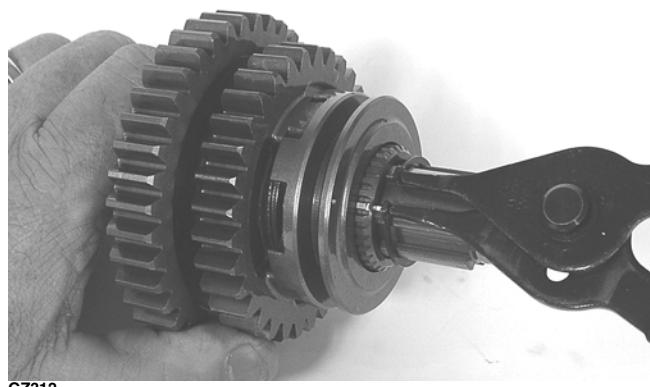


GZ314

5. Install the reverse driven gear dog onto the countershaft and secure with a snap ring.

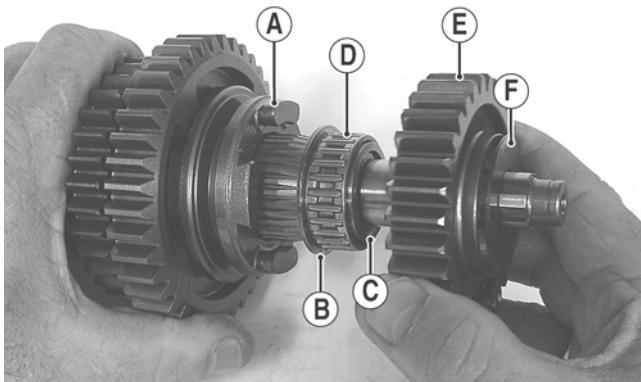


GZ313A



GZ312

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



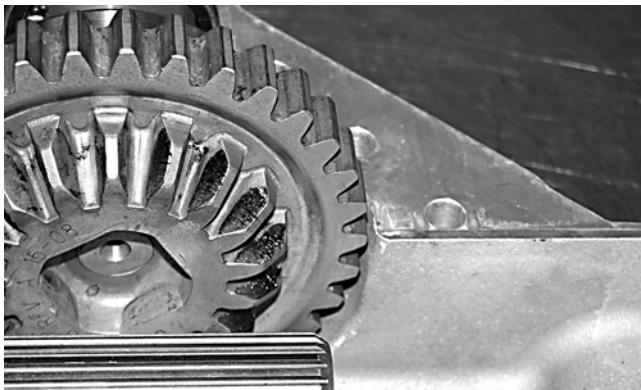
CC283B

7. Install the two drive gear washers and the shift forks. The countershaft is now ready for installation.

**■NOTE:** When installing the countershaft assembly, account for the washer on each end of the shaft.

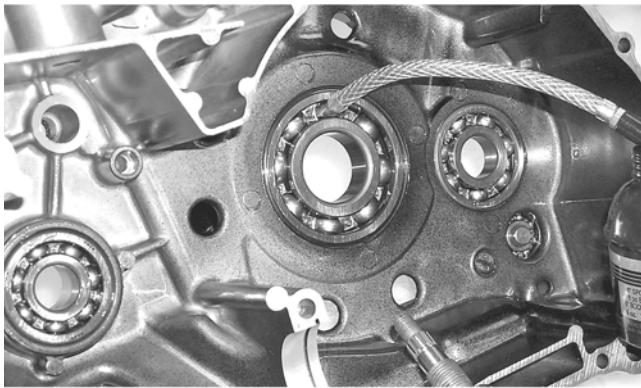
## Assembling Crankcase Half

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

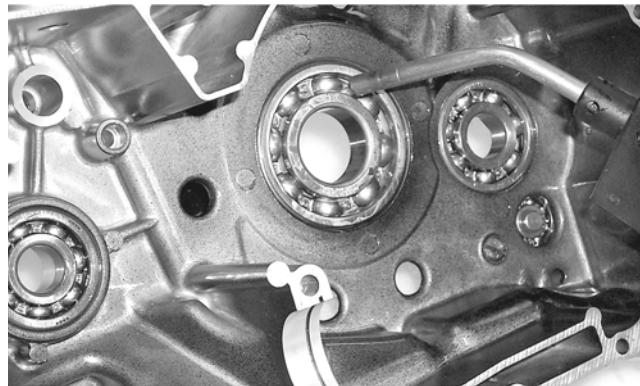


MT014

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.

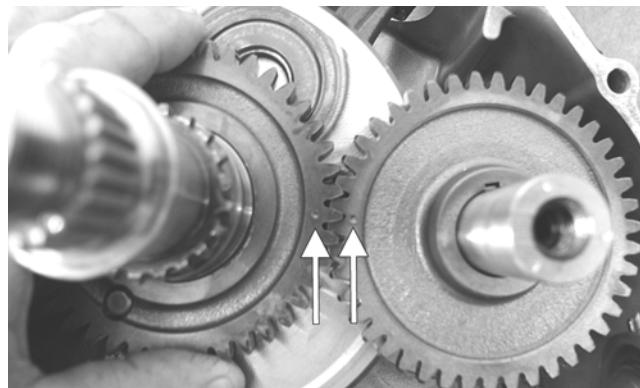
3. Install the crank balancer.



CD832B

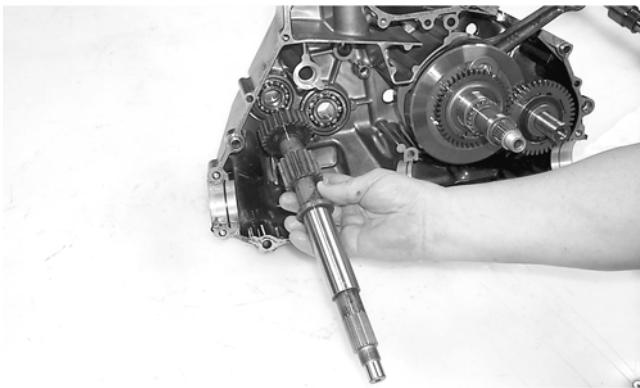
**■NOTE:** It will be necessary to rotate the crank balancer until the counterweight is facing away from the crankshaft; then rotate the crankshaft clockwise into the journal area to allow the crank balancer to be fully seated.

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.



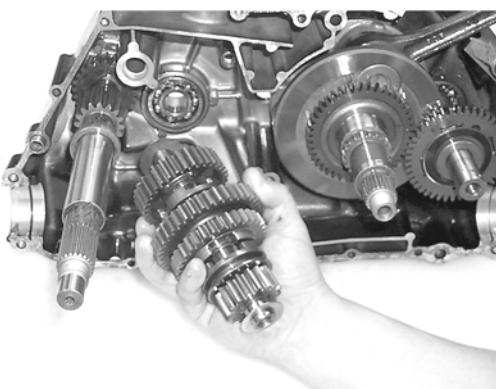
CD826A

5. Install the driveshaft.



CC675

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



CC674

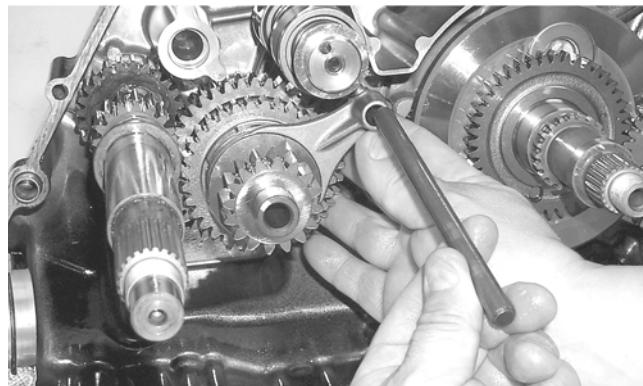
7. Place a washer on the end of the gear shift shaft; then install the shaft assembly making sure the two holes on the end of the shaft are positioned vertically. Install the spacer on the shift shaft.



DE677A

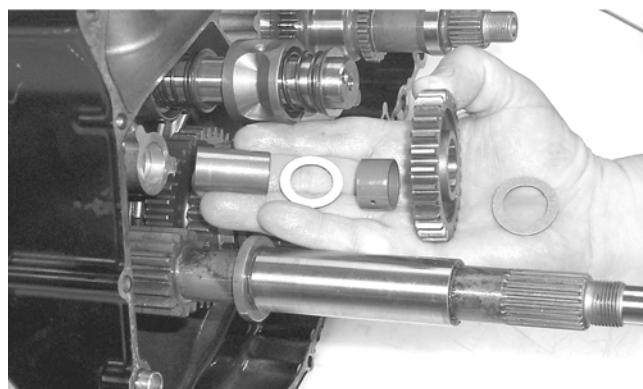
8. Insert the two shift forks into the sliding dogs noting the direction of the tabs from disassembling; then install the shift fork shaft.

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



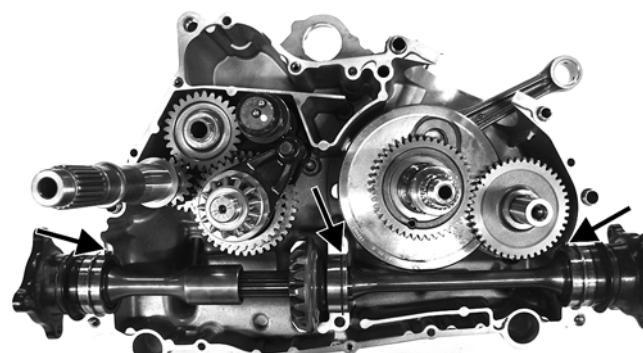
CC669

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 10 ft-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 20 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**

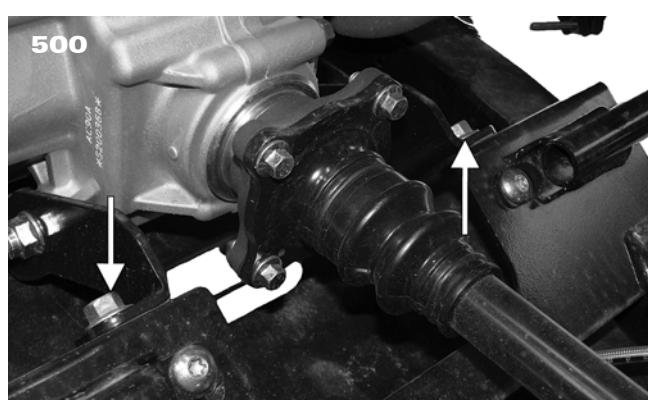
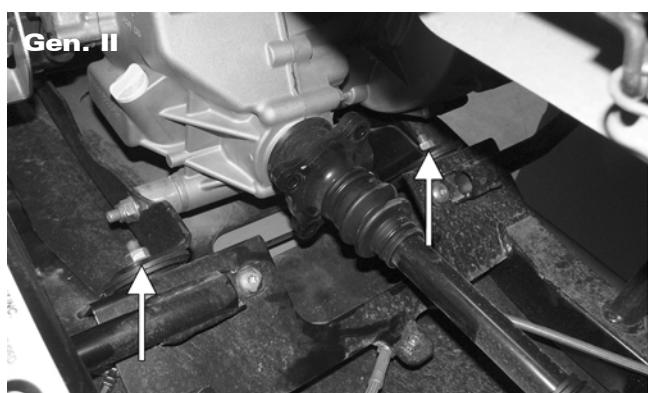
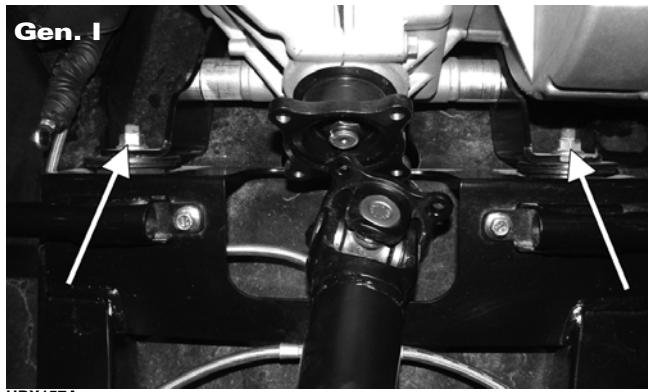
After completing center crankcase components, proceed to **Installing Right-Side Components**, to **Installing Left-Side Components**, and to **Installing Top-Side Components**.

## **Installing Engine/ Transmission**

**■NOTE: Arctic Cat recommends new gaskets and O-rings be installed whenever servicing the vehicle.**

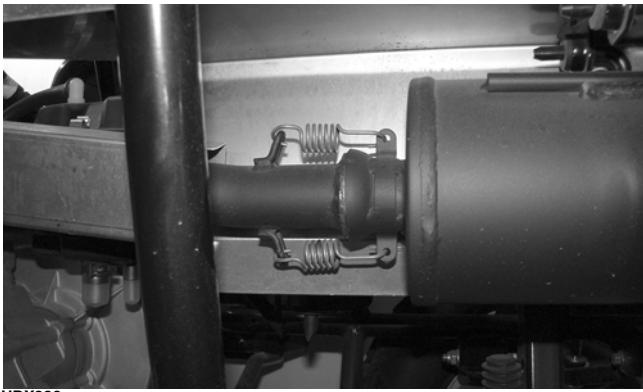
1. On the 700, place the engine spacers in position; then using new lock nuts, install the two cap screws securing the engine brackets to the engine. Tighten to 43 ft-lb.
2. On the 500, using new lock nuts, install the two cap screws securing both engine brackets to the engine. Tighten to 43 ft-lb.
3. Using a suitable lifting sling and engine hoist, lower the engine into the vehicle engaging the slotted front and rear engine mount brackets with the engine mounts.

4. Tighten the flange nuts (700) or bolts (500) on the front and rear cradle to 25 ft-lb.



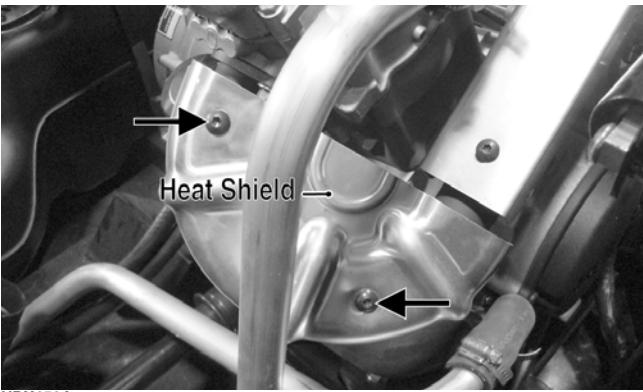
5. Secure the front and rear driveshafts to the engine flanges with the cap screws and tighten to 20 ft-lb; then connect the upper and lower coolant hoses and tighten the clamps securely.

6. Place a new grafoil seal in the cylinder head and a new grafoil seal on the muffler end of the exhaust pipe and install the exhaust pipe. Secure with two exhaust springs and two cap screws tightened to 20 ft-lb.

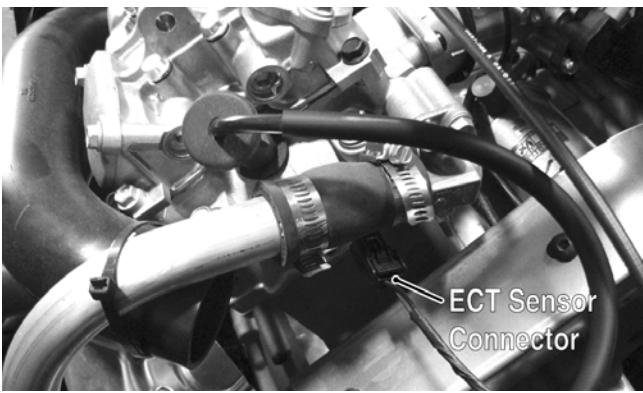


7. Install the O2 sensor and tighten the sensor to 19 ft-lb. Connect the harness to the sensor.

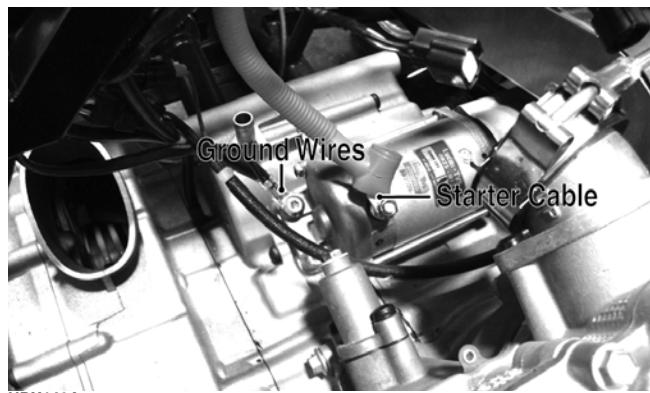
8. Install the forward exhaust pipe heat shield and secure with the machine screws. Tighten securely.



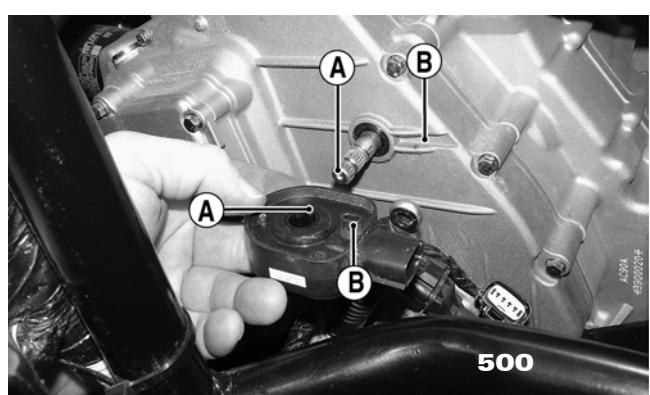
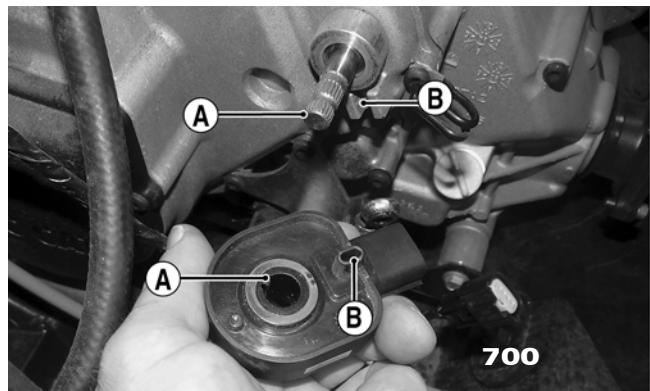
9. Install the CVT cooling ducts on the V-bolt housing and secure with clamps. Tighten securely. Install an appropriate nylon tie to secure the exhaust duct.



10. Install the starter cable to the starter motor, secure with the nut, and tighten securely; then secure the engine/harness ground wires to the engine with a cap screw and tighten to 8 ft-lb.



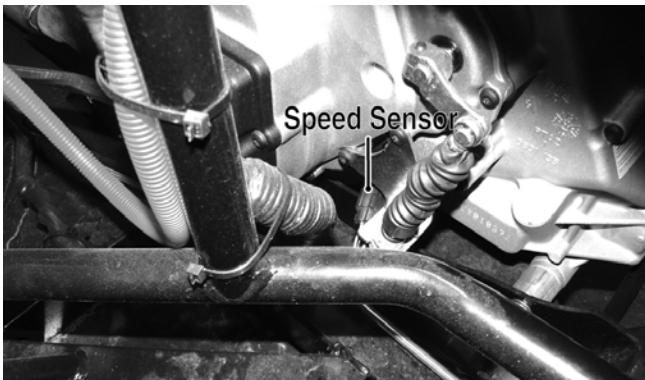
11. Properly position the gear position switch on the engine (A to A and B to B); then secure the shift cable bracket to the engine case and tighten the engine case screws to 8 ft-lb. Connect the gear position switch connector.



12. On the left side, connect the ECT sensor connector, speed sensor connector, and spark plug cap.

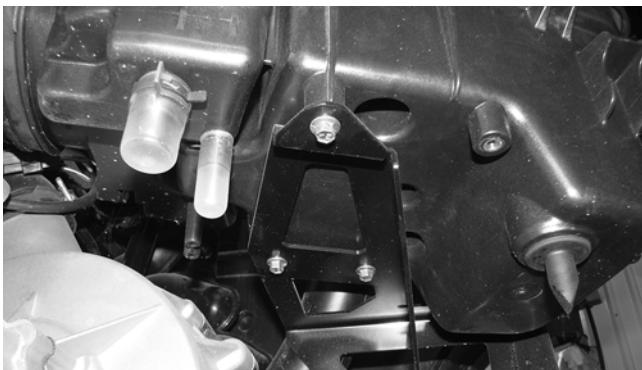


HDX135A



HDX137A

13. Install the throttle body into the intake manifold boot and secure with the clamp. Tighten to 30 in.-lb.
14. Install the air filter assembly and secure to the frame with the cap screws; then secure the intake boot with the clamp and tighten securely.



HDX287

15. Connect the IAT sensor connector to the IAT sensor and the crankcase breather tube to the crankcase; then install the air filter intake tube and secure with a clamp and sheet metal screw.



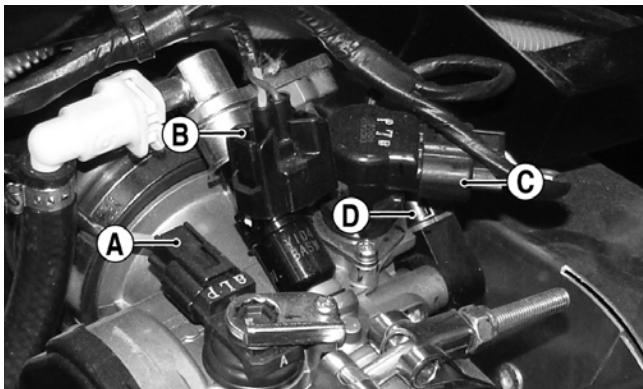
HDX031A

16. Connect the gasline hose to the throttle body making sure the gasline hose connector fully engages and locks onto the fuel rail.



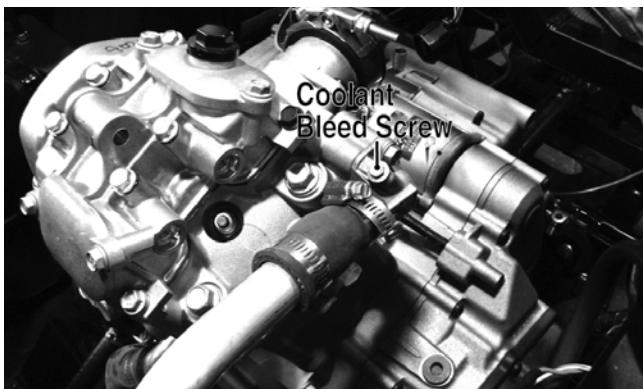
HDX138B

17. Connect the MAP sensor connector (A), fuel injector connector (B), ISC connector (C), and TPS connector (D); then install new nylon ties as noted during removing.



HDX136A

18. Pour the recommended amount of oil and coolant into the engine and radiator; then loosen the coolant bleed screw to allow trapped air to escape. When clear coolant flows, tighten the bleed screw.



HDX158B

19. Connect the negative battery cable to the battery.
20. Install the center skid plate, center floorboard, and seat base; then install the seat back and seat.
21. Start the engine and check for leaks allowing to warm up for several minutes; then shut the engine off and check engine oil and coolant levels.

# Fuel/Lubrication/ Cooling

## 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 EFI Sensors/Components in Electrical System.
2. Check for a flashing EFI icon on the LCD. If EFI is flashing, see EFI Diagnostic System in Electrical System.
3. Make sure there is sufficient, clean gas in the gas tank.

## 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
Tachometer	0644-275

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

## Throttle Body

### ⚠ WARNING

Whenever the gasoline hoses are removed (other than for pressure testing), the battery must be disconnected to prevent inadvertent activation of the electronic fuel pump.

### ⚠ 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

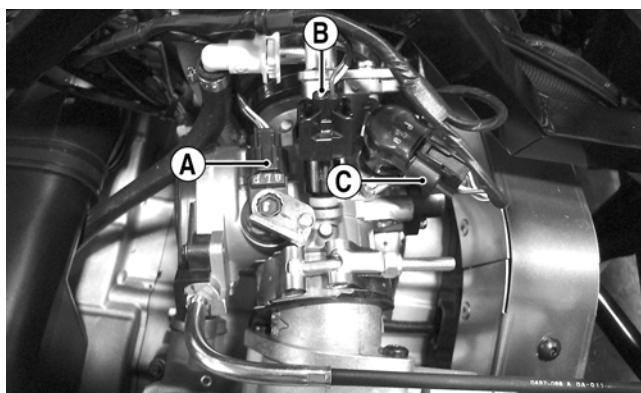
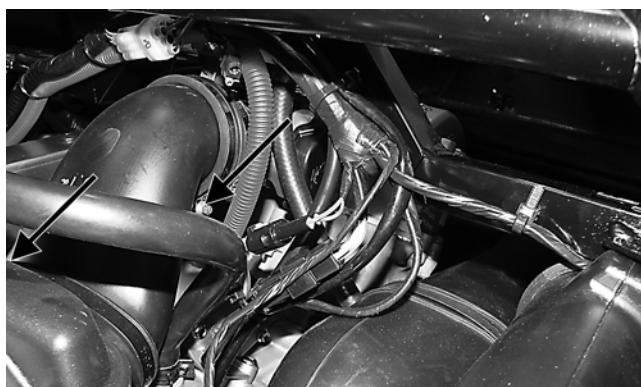
1. Turn the ignition switch to the OFF position; then remove the ignition switch key.

### ⚠ WARNING

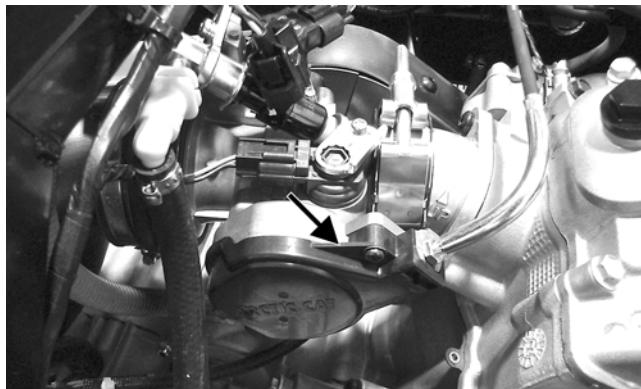
Do not turn the ignition switch to the ON position with the hoses removed. Gasoline will be pumped by the electric fuel pump causing a safety hazard.

2. Remove the seat, seat back, and seat base; then disconnect the battery.

3. Remove the air inlet boot between the air filter and throttle body; then disconnect the MAP sensor connector (A), fuel injector connector (B), and ISC connector (C).



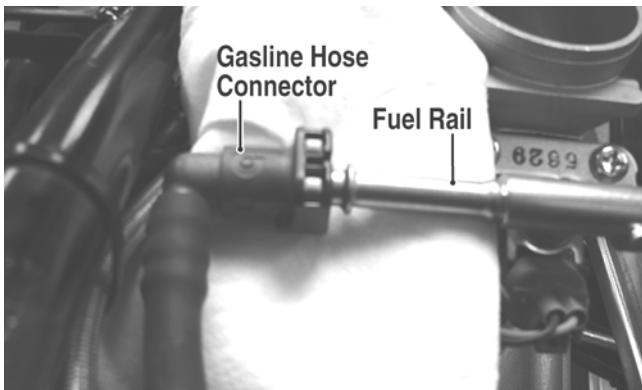
4. Remove the screw from the throttle arm cover and remove the cover; then loosen the jam nut and disconnect the throttle cable.



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

### ⚠ WARNING

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



FI092A

6. Loosen the clamp securing the throttle body to the intake manifold boot and remove the throttle body assembly.
7. 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. Install the throttle body into the intake manifold boot and secure with the clamp. Tighten to 30 in.-lb.
2. Connect the throttle cable to the throttle body; then connect the gasoline hose.
3. Connect the electrical connectors to the throttle body components.
4. Install the air filter boot and secure with the existing hardware.
5. Install the seat base, seat back, and seat.

**■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 accelerator pedal to Wide Open Throttle (WOT).
2. Place the ignition key in the ON position and wait for 10 seconds.
3. Release the accelerator pedal and wait an additional 10 seconds.
4. Turn the key to the OFF position and allow the gauge to shut off.

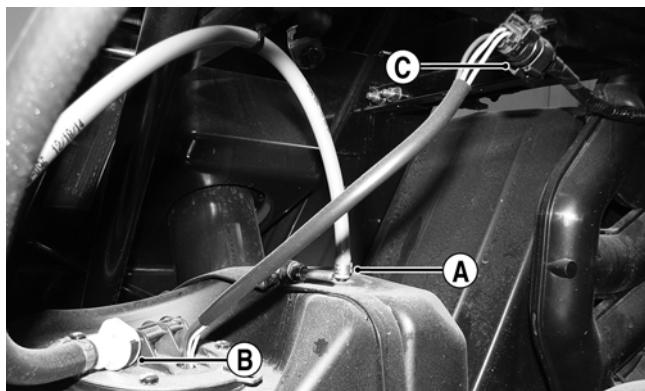
## Gas Tank

### 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.

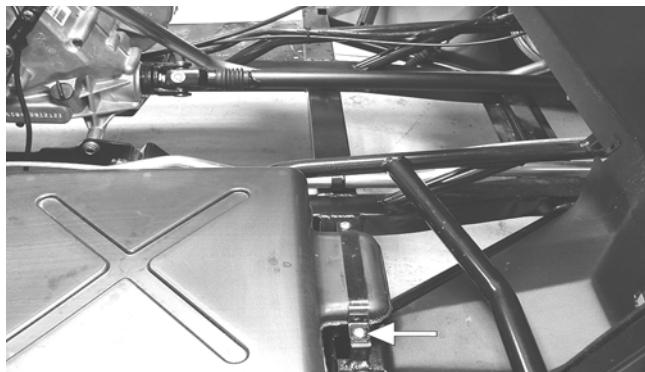
### REMOVING

1. Remove the seat, seat back, seat base, and side panels; then remove the floorboard.
2. Disconnect the vent hose (A), gasoline hose (B), and fuel pump/fuel level sensor connector (C); then cap the vent fitting and gas hose fitting.

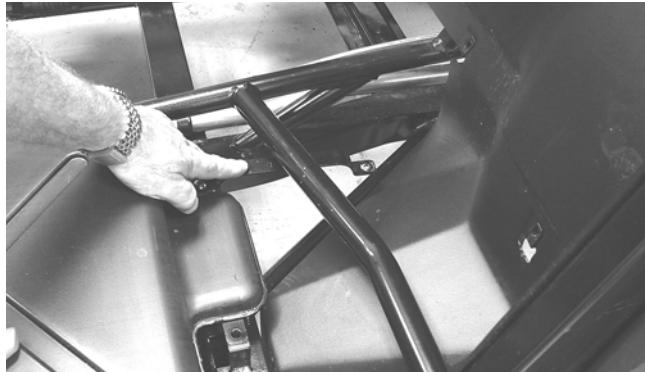


HDX259A

3. Remove the outer cap screw securing the front tank hold-down; then swing the hold-down to the left.

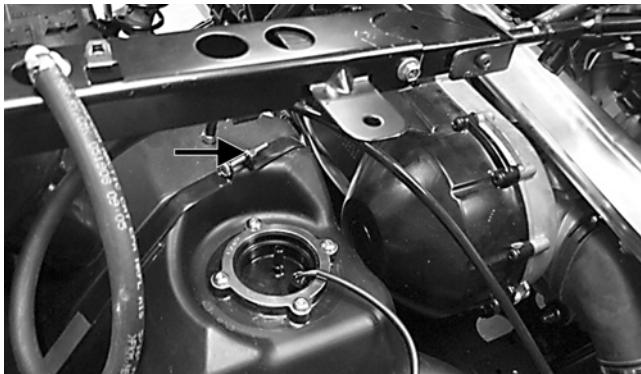


PR167A



PR170

4. Remove the joining cap screw and nut from the rear gas tank hold-down strap; then remove the inside hold-down strap.



PR699A

5. Lift and slide the tank forward raising the front of the tank first; then turn the tank and lift out the right side.

## CLEANING AND INSPECTING

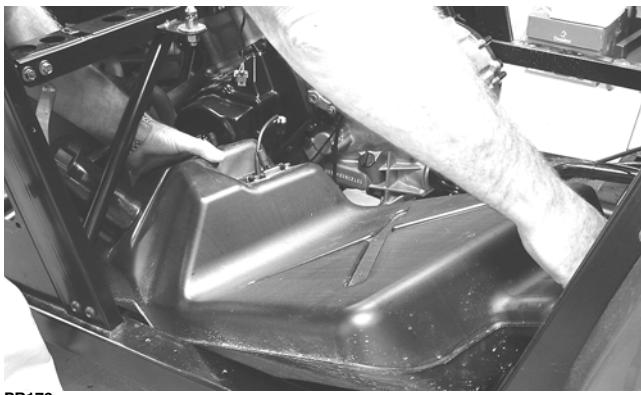
1. Clean all gas tank components with parts-cleaning solvent.
2. Inspect all hoses for cracks or leaks.
3. Inspect gas tank cap and tank for leaks, holes, and damaged threads.
4. Inspect the fuel level sensor for proper operation (see EFI Sensors/Components in Electrical System).

## INSTALLING

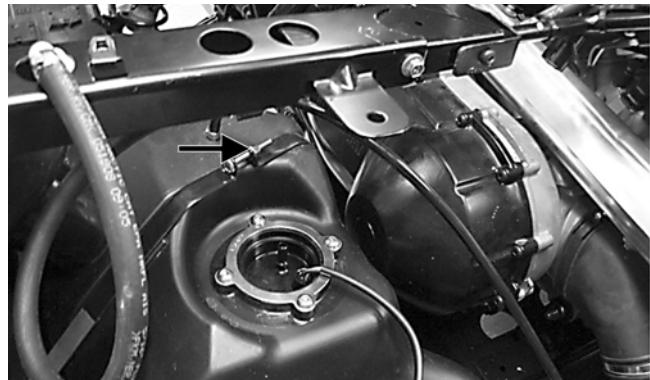
### ⚠️ WARNING

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.

1. Place the gas tank into position in the vehicle; then install the inside rear hold-down strap.



PR173



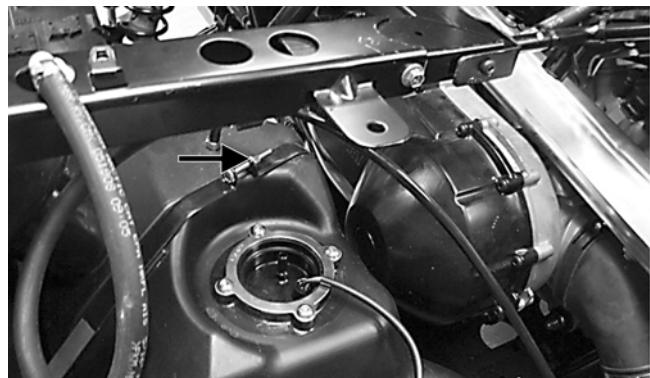
PR699A

2. Swing the front hold-down to the right into position and install the cap screw and nut. Do not tighten at this time.



PR171

3. Install the rear hold-down strap joining cap screw and nut. Do not tighten at this time.



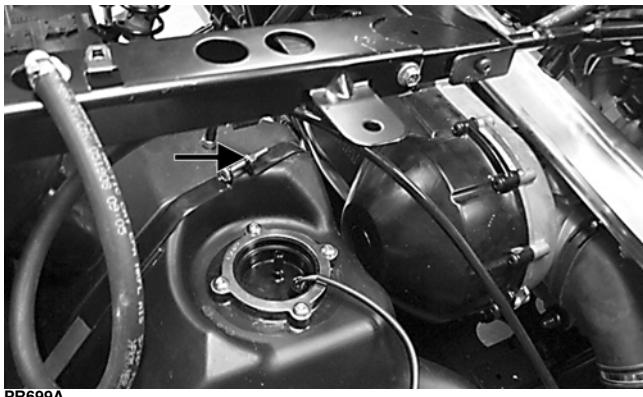
PR699A

4. Place the gas cap filler panel into position; then if necessary, position the gas tank so the filler panel and filler neck are not binding or rubbing.

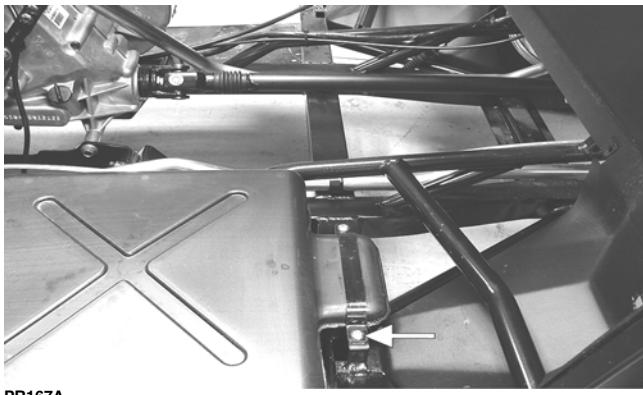


PR946

5. Tighten the hardware securing the hold-down straps (from steps 2-3) securely.

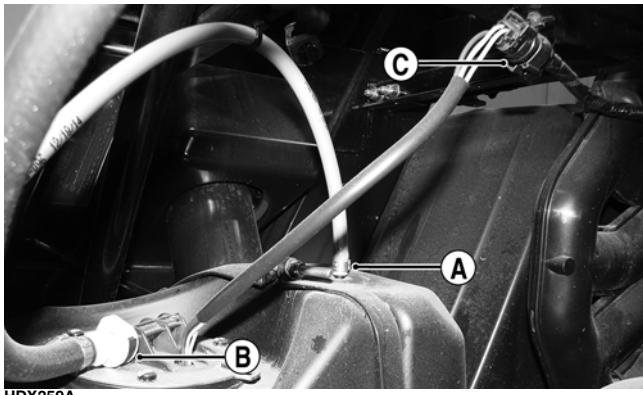


PR699A



PR167A

6. Connect the vent hose (A) and gasline hose (B) to the proper fittings; then connect the fuel pump/fuel level sensor connector (C) to the main harness.



HDX259A

7. Position the floorboard into the vehicle and secure with the appropriate hardware; then install the seat base, seat back, and seat.

## Oil Pump

**■NOTE:** Whenever internal engine components wear excessively or break and whenever oil is contaminated, the oil pump should be replaced.

### TESTING OIL PUMP PRESSURE

**■NOTE:** The engine must be warmed up to operating temperature (cooling fan cycling) for this test.

1. Remove the seat, seat back, and seat base.

2. Using a suitable "T" fitting, connect Oil Pressure Test Kit to the oil fitting and hose. Tighten all clamps securely.

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

3. Block the wheels, place the transmission in neutral, and start the engine. Allow the engine to warm up to operating temperature (with cooling fan cycling).
4. Connect a suitable tachometer. With the engine running at 3000 RPM, the pressure gauge must show 0.7-1.4 kg/cm<sup>2</sup> (10-20 psi).
5. Remove the test kit and tachometer from the vehicle and install the oil hose. Tighten the clamps securely.
6. Install the seat base, seat back, and seat.

**■NOTE:** If the oil pressure is lower than specified, check for an oil leak, damaged oil seal, or defective oil pump.

**■NOTE:** If the oil pressure is higher than specified, check for too heavy engine oil weight (see General Information/Foreword - Gasoline - Oil - Lubricant), clogged oil passage, clogged oil filter, or improper installation of the oil filter.

### REMOVING/DISASSEMBLING

1. Remove the oil pump from the engine (see Right-Side Components in the Engine/Transmission section).
2. Remove the Phillips-head screw on the back side of the pump and separate the pump housing and cover. Note the position of the inner and outer rotors and alignment pin for assembly.
3. Remove oil pump components.

### CLEANING AND INSPECTING

1. Clean all oil-pump components.
2. Inspect the rotors for scoring and gouges.
3. Inspect the alignment pin, driveshaft, and driven sprocket for damage.
4. Inspect the pump housing and cover for cracks or damage.

### ASSEMBLING/INSTALLING

1. Place the rotors into the pump housing making sure the alignment pin is in the groove of the rotor.
2. Place the cover onto the pump housing.
3. Secure the pump cover with the Phillips-head screw coated with red Loctite #271. Tighten to 8 ft-lb.
4. Install the oil pump into the engine (see Right-Side Components in the Engine/Transmission section).

## Liquid Cooling System

When filling the cooling system, use premixed Arctic Cat Antifreeze. While the cooling system is being filled, air pockets may develop; therefore, open the bleed screw on the thermostat housing to allow air to bleed from the cooling system. When clear coolant (no bubbles) is present, tighten the bleed screw securely; then fill the cooling system to the bottom of the stand pipe in the radiator neck. Run the engine for five minutes after the initial fill, shut the engine off, and then "top-off" the cooling system to the bottom of the stand pipe in the radiator neck.

**■NOTE: Use a good quality, biodegradable glycol-based, automotive-type antifreeze. 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.**

### **WARNING**

**Never check the coolant level when the engine is hot or the cooling system is under pressure.**

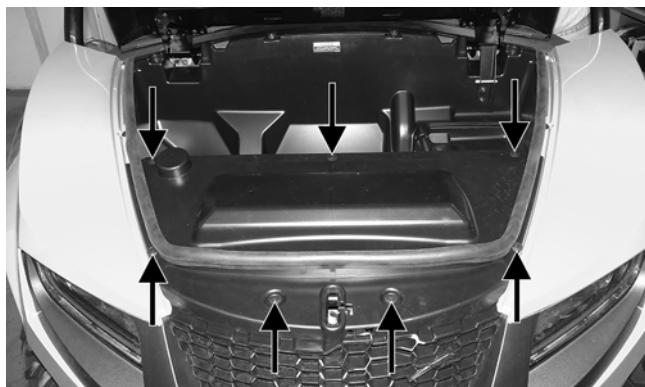
### **CAUTION**

**After operating the vehicle for the initial 5-10 minutes, stop the engine, allow the engine to cool down, and check the coolant level. Add coolant as necessary.**

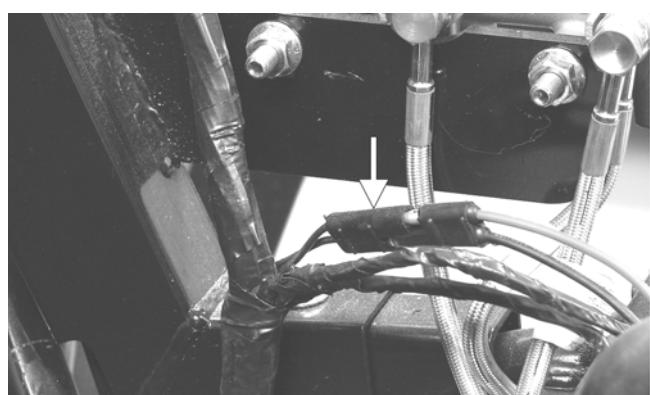
## RADIATOR

### Removing

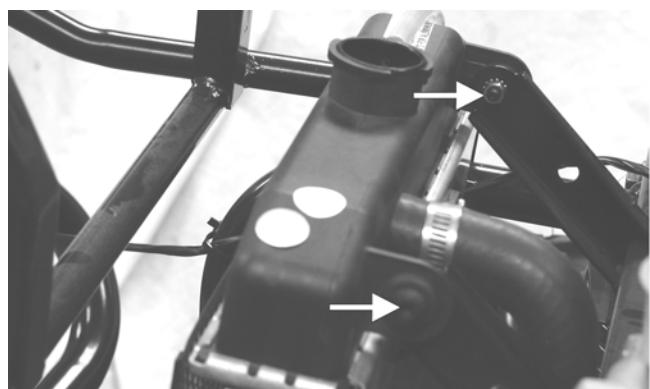
1. Open the hood and remove the weather strip; then remove the front access panel, front fenders, and front storage box.



2. Drain the coolant into a suitable container; then disconnect the cooling fan wire connector from the main harness.



3. Remove the two shoulder bolts and nuts securing the radiator to the frame; then disconnect the upper and lower coolant hoses.



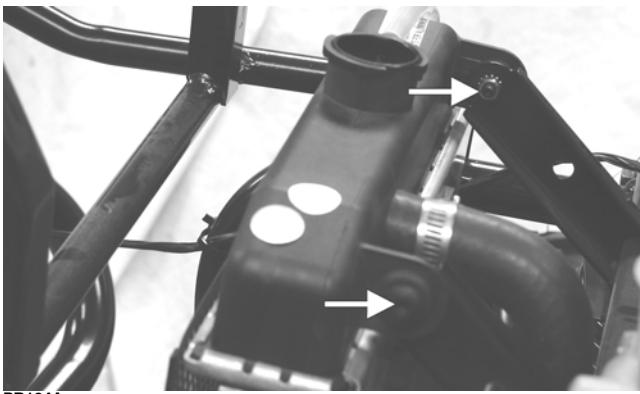
4. Lift the radiator assembly from the vehicle. Account for two upper and two lower rubber mounting grommets.

### 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.

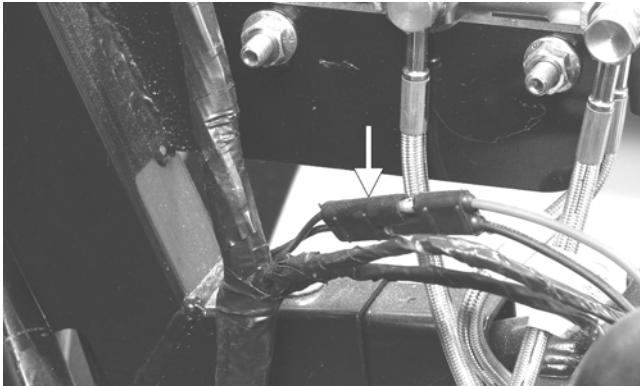
### Installing

1. Place the radiator into position making sure the grommets are correctly installed; then secure to the mounts with the two shoulder bolts and nuts. Tighten to 8 ft-lb.



PR184A

2. Connect the upper and lower coolant hoses to the radiator and secure with the appropriate hose clamps; then connect the cooling fan wire connector to the main harness.



PR183A

3. Open the high-point bleed screw on the top of the thermostat cover (700) or coolant outlet pipe (500) (located under the seat base) to allow trapped air to escape. Tighten securely after filling.
4. Pour the recommended coolant into the radiator and secure the radiator cap.
5. Install the front storage box, front fenders, and front access panel. Close the hood.
6. Start the engine and warm up to operating temperature; then verify the coolant level is at the bottom of the stand pipe in the radiator neck. Add coolant as necessary.
7. Install the front access panel and the weather strip.

## **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 a thermostat with seal.

### **Inspecting**

1. Inspect the thermostat for corrosion, wear, or spring damage.
2. Using the following procedure, inspect the thermostat for proper operation.

A. Suspend the thermostat in a container filled with water.

B. Heat the water and monitor the temperature with a thermometer.

C. The thermostat should start to open at 71.0-86.0° C (160-187° F).

D. If the thermostat does not open, it must be replaced.

3. Inspect all coolant hoses, connections, and clamps for deterioration, cracks, and wear.

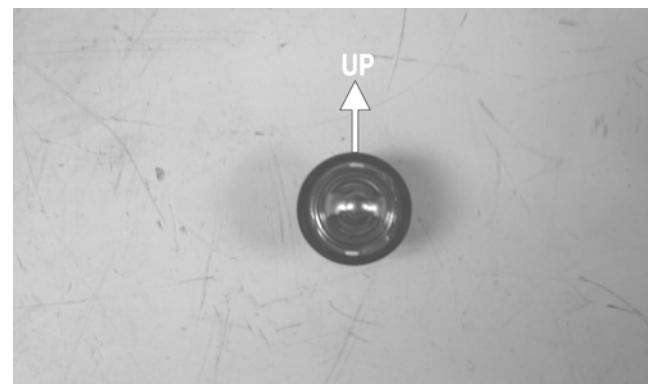
■**NOTE:** All coolant hoses and clamps should be replaced every four years or 4000 miles.

### **Installing**

1. Place the thermostat with seal into the thermostat housing; then secure the thermostat housing to the cylinder head with the two cap screws.

### **CAUTION**

When installing the thermostat, make sure the bleed holes are straight up and down or air will remain trapped causing engine damage due to overheating.



PR281A

2. Fill the cooling system with the recommended amount of antifreeze. Check for leakage.

## **COOLING FAN**

### **Removing**

1. Remove the radiator.
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:** On the 700, the water pump is a non-serviceable component. It must be replaced as an assembly (see Left-Side Components). On the 500 to service the water pump, see Servicing Left-Side Components.

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## Troubleshooting

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**Problem: Starting impaired**

Condition	Remedy
1. Gas contaminated	1. Drain gas tank and fill with clean gas

**Problem: Idling or low speed impaired**

Condition	Remedy
1. TPS out of adjustment	1. Adjust TPS

**Problem: Medium or high speed impaired**

Condition	Remedy
1. High RPM "cut out" against RPM limiter	1. Decrease RPM speed

# Electrical System

The electrical connections should be checked periodically for proper function.

## TESTING ELECTRICAL COMPONENTS

All electrical tests should be made using the CATT II or the Fluke Model 77 Multimeter. The CATT II can return data for certain components which are identified at the beginning of their respective sub-section. If any other type of meter is used, readings may vary due to internal circuitry. When troubleshooting a specific component, always verify first that the fuse(s) are good, that the LED(s) are good, that the connections are clean and tight, that the battery is fully charged, and that all appropriate switches are activated.

**■NOTE: For absolute accuracy, all tests should be made at room temperature of 68° F.**

**■NOTE: Certain components and sensors can be checked by using the EFI diagnostic system (see EFI Diagnostic System in this section for more information).**

## SPECIAL TOOLS

A number of special tools must be available to the technician when performing service procedures in this section. Refer to the current Special 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
Fluke Model 77 Multimeter	0644-559
CATT II	0544-029
MaxiClips	0744-041
Test Plug/Code List	0486-219

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

## Battery



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

**■NOTE: Preliminary checks may be performed on this component using the diagnostic mode on the LCD gauge (see EFI Diagnostic System in this section)**

The battery is located under the seat.

After being in service, batteries require regular cleaning and recharging in order to deliver peak performance and maximum service life. The following procedures are recommended for cleaning and maintaining lead-acid batteries. Always read and follow instructions provided with battery chargers and battery products.

**■NOTE: Refer to all warnings and cautions provided with the battery or battery maintainer/charger.**

Loss of battery charge may be caused by ambient temperature, ignition OFF current draw, corroded terminals, self discharge, frequent start/stops, and short engine run times. Frequent winch usage, snowplowing, extended low RPM operation, short trips, and high amperage accessory usage are also reasons for battery discharge.

## Maintenance Charging

**■NOTE: Arctic Cat recommends the use of the CTEK Multi US 800 or the CTEK Multi US 3300 for battery maintenance charging. Maintenance charging is required on all batteries not used for more than two weeks or as required by battery drain.**

1. When charging a battery in the vehicle, be sure the ignition switch is in the OFF position.

**■NOTE: Be sure to maintain the fluid of the battery at the UPPER LEVEL. Use only distilled water when adding fluid to these batteries.**

2. Clean the battery terminals with a solution of baking soda and water.

3. Be sure the charger and battery are in a well-ventilated area and ensure the battery charger cables will not contact any battery acid. Be sure the charger is unplugged from the 110-volt electrical outlet.

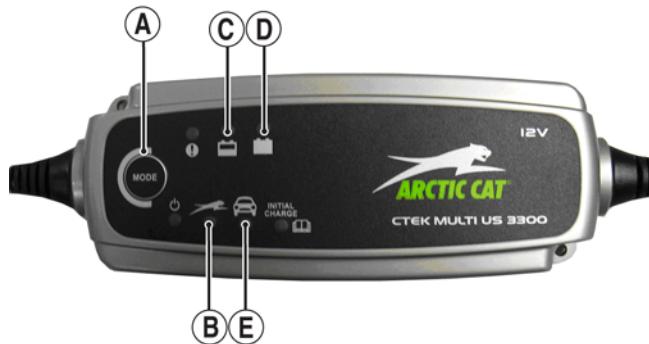
4. Connect the red terminal lead from the charger to the positive terminal of the battery; then connect the black terminal lead of the charger to the negative terminal of the battery.

5. Plug the battery charger into a 110-volt electrical outlet.

6. If using the CTEK Multi US 800, there are no further buttons to push. If using the CTEK Multi US 3300, press the Mode button (A) at the left of the charger until the Maintenance Charge Icon (B) at the bottom illuminates. The Normal Charge Indicator (C) should illuminate on the upper portion of the battery charger.



■**NOTE:** The maintainer/charger will charge the battery to 95% capacity at which time the Maintenance Charge Indicator (D) will illuminate and the maintainer/charger will change to pulse/float maintenance. If the battery falls below 12.9 DC volts, the charger will automatically start again at the first step of the charge sequence.



3300A

■**NOTE:** Not using a battery charger with the proper float maintenance will damage the battery if connected over extended periods.

### Charging

■**NOTE:** Arctic Cat recommends the use of the CTEK Multi US 800 or the CTEK Multi US 3300 for battery maintenance charging.

1. Be sure the battery and terminals have been cleaned with a baking soda and water solution.
2. Be sure the charger and battery are in a well-ventilated area and ensure the battery charger cables will not contact any battery acid. Be sure the charger is unplugged from the 110-volt electrical outlet.
3. Connect the red terminal lead from the charger to the positive terminal of the battery; then connect the black terminal lead of the charger to the negative terminal of the battery.
4. Plug the charger into a 110-volt electrical outlet.
5. By pushing the Mode button (A) on the left side of the charger, select the Normal Charge Icon (E). The Normal Charge Indicator (C) should illuminate on the upper left portion of the charger.
6. The battery will charge to 95% of its capacity at which time the Maintenance Charge Indicator (D) will illuminate.

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

7. Once the battery has reached full charge, unplug the charger from the 110-volt electrical outlet.

■**NOTE:** If, after charging, the battery does not perform to operator expectations, bring the battery to an authorized Arctic Cat dealer for further troubleshooting.

## Electronic Power Steering (EPS)



Component data and system updates can be retrieved/ performed using the CATT II. Navigate the screens as required.

The EPS system is an electro-mechanical device that utilizes 12 volt DC power to drive a motor linked to the steering shaft to assist the driver when rotating the steering wheel. Driver steering inputs are detected by a torque-sensing transducer assembly within the EPS housing. These inputs are converted to electronic signals by the transducer and control circuitry to tell the motor which way to drive the steering shaft. When no steering input (pressure on the steering wheel) is detected, no torque signal is generated, and no steering assist is provided by the motor.

If an electrical-related EPS system malfunction occurs, a diagnostic trouble code (DTC) will be displayed on the LCD gauge. Check for updates and verify any active DTCs using the most up-to-date CATT II software. The following is a list of DTCs, possible conditions, and causes.

■**NOTE:** If no active codes are present on the LCD or verified through CATT II and the vehicle is experiencing steering-related issues, there may be a mechanical steering-related issue. In this case, the EPS is not the cause of the issue. Components that may contribute to this type of issue could be abnormal tire wear, bad wheel bearings, ball joints, tie rod ends, tie rods, or bushings. Check the complete steering system for any sign of wear or misalignment.

■**NOTE:** If any code C1306-C1315 or C1317-C1325 are active and verified with CATT II, EPS replacement is not necessary. Follow the instructions listed in the chart to correct the malfunction.

Code	Fault Description	Fault Condition	Possible Cause	EPS Fault Recovery Method
C1301	Over Current	EPS internal over-current condition has been detected	Internal EPS Condition	Correct EPS condition*
C1302	Excessive Current Error	EPS internal current measurement error has been detected	Internal EPS Condition	Correct EPS condition*
C1303	Torque Sensor Range Fault	EPS internal torque sensor range condition has been detected	Internal EPS Condition	Correct EPS condition*
C1304	Torque Sensor Linearity Fault	EPS internal torque sensor linearity condition has been detected	Internal EPS Condition	Correct EPS condition*

Code	Fault Description	Fault Condition	Possible Cause	EPS Fault Recovery Method
C1305	Rotor Position Encoder	EPS internal rotor position encoder condition has been detected	Internal EPS Condition	Correct EPS condition*
C1306	System Voltage Low	EPS battery power low-voltage condition has been detected	System voltage low (less than 11 VDC at the EPS). Wire harness issue, faulty voltage regulator, weak battery or loose battery terminals.	EPS will auto-recover when the battery supply returns to normal
C1307	System Voltage High	EPS battery power over-voltage condition has been detected	System voltage high (more than 16 VDC at the EPS). Wire harness issue, faulty voltage regulator or loose battery terminals.	EPS will auto-recover when the battery supply returns to normal
C1308	Temperature Above 110° C	EPS internal 110o C over-temp condition has been detected	Clean the EPS housing and cooling fins.	EPS will auto-recover when internal temperature drops below 105° C
C1309	Temperature Above 120° C	EPS internal 120o C over-temp condition has been detected	Clean the EPS housing and cooling fins.	EPS will auto-recover when internal temperature drops below 115° C
C1310	Vehicle Speed High	Vehicle speed signal received by the EPS exceeds the maximum speed specification	Intermittent main harness wires, defective speed-sensor, or intermittent speed sensor wires.	EPS will auto-recover when the vehicle speed signal drops below the maximum speed specification
C1311	Vehicle Speed Low	Vehicle speed signal received by the EPS is zero or missing	Broken main harness wires, defective speed sensor, or broken speed sensor wires.	EPS will auto-recover when the vehicle speed signal returns to normal
C1312	Vehicle Speed Faulty	Vehicle speed CAN signal received by the EPS incorrect or missing	Broken main harness CAN wires, defective speed-sensor, or broken speed sensor wires.	EPS will auto-recover when the vehicle speed signal returns to normal
C1313	Engine RPM High	Engine RPM signal received by the EPS exceeds the maximum RPM specification	Intermittent main harness RPM wires, intermittent voltage regulator, intermittent ACG stator wires.	EPS will auto-recover when engine RPM signal drops below the maximum RPM specification
C1314	Engine RPM Low	Engine RPM signal received by the EPS suddenly dropped below 500 RPM	Handlebar switch in the "OFF" position, broken main harness RPM wires, defect voltage regulator, broken ACG stator wires.	EPS will auto-recover when engine RPM signal returns to normal
C1315	Engine RPM Faulty	Engine RPM CAN signal received by the EPS incorrect or missing	Broken main harness CAN wires or defective ECM.	EPS will auto-recover when engine RPM signal returns to normal
C1316	EEPROM Error	EPS internal memory error has been detected	Internal EPS condition	Correct EPS condition*
C1317	CAN Bus Error	The EPS has lost CAN communication with the EFI ECM	Broken CAN wires in the main harness. EFI ECM connector has been disconnected.	Correct EPS condition*
C1318	Internal CRC Error	EPS internal CRC calculation condition has been detected	EPS reflash has failed. Battery power was lost, or the key switch was turned off, during EPS reflash programming.	EPS must be reprogrammed
C1319	Boot Counter Exceeded	EPS internal application code condition has been detected	Intermittent power has prevented a successful application code launch.	Correct EPS power condition*
C1320	Incorrect Vehicle Speed-to-RPM Ratio	Vehicle speed signal received by the EPS exceeds 10 MPH, but the engine RPM signal less than 500 RPM	Intermittent or broken main harness RPM wires, intermittent voltage regulator, intermittent or broken ACG stator wires.	Correct EPS condition*
C1321	Vehicle Speed Erratic	Vehicle speed signal received by the EPS changing at an unrealistic rate	Intermittent main harness, intermittent speed sensor, dirty speed sensor or trigger wheel.	Correct EPS vehicle speed signal condition*
C1322	Engine RPM Lost	Engine RPM signal received by the EPS exceeds 500 RPM and then is zero or missing	Handlebar switch in the "OFF" position, broken main harness RPM wires, defect voltage regulator, broken ACG stator wires.	EPS will auto-recover when engine RPM signal returns to normal
C1323	"EPS OFF" Gauge Display	Battery power has been applied to the EPS for more than 5-minutes, but no engine RPM signal has been detected	The EPS has been automatically disabled, after 5-minutes of inactivity, to conserve battery power.	EPS will auto-recover when engine is started or the keyswitch is cycled On-Off-On
C1324	Loss of CAN communication with EPS unit	The gauge has lost CAN communication with the EPS	Broken CAN wires in the main harness or disconnected EPS. This is not an EPS generated DTC; gauge DTC display only.	Gauge DTC display will clear when the EPS-to-gauge CAN communication is restored.
C1325	Dual Loss	EPS loss of both the vehicle speed and the engine RPM signals has been detected	Handlebar switch in the "OFF" position, the engine stalled (key switch "ON"), broken harness wires, loss of CAN data signal.	EPS will auto-recover when either the vehicle speed or engine RPM signal is restored.
C1326	Rotor Position Encoder	EPS internal rotor position encoder variance condition has been detected	Internal EPS Condition	Correct EPS condition*
C1327	Voltage Converter Error (Low)	EPS internal voltage converter low-voltage condition has been detected	Internal EPS Condition	Correct EPS condition*
C1328	Voltage Converter Error (High)	EPS internal voltage converter over-voltage condition has been detected	Internal EPS Condition	Correct EPS condition*
C1329	Internal Data Error	EPS internal preloaded data condition has been detected	Internal EPS Condition	EPS must be reprogrammed

\* After correcting the condition, cycle the key switch On-Off-On

## TROUBLESHOOTING

**■NOTE: The EPS assembly is not serviceable and must not be disassembled or EPS warranty will be voided.**

1. Check 30-amp EPS fuse and EPS relay (primary coil: 150 ohms  $\pm$  10%, secondary resistance  $< 1$  ohm with primary energized).

2. With the ignition off, disconnect 2-pin connector on the EPS assembly and connect a volt meter set to DC voltage to the harness (black meter lead to BLK and red meter lead to ORG/BRN). With the ignition switch in the ON position, the meter should read battery voltage (if correct voltage is not present, check connections and wiring harness).

## CAUTION

Do not attempt to check resistance of the EPS motor (2-pin input receptacle). There are internal capacitors holding a charge that can cause internal damage to an ohmmeter.

3. With ignition switch off, disconnect the 8-pin connector on the EPS assembly and connect a volt meter set to DC voltage to the harness (red meter lead to the ORG wire and black meter lead to battery ground.) With the ignition switch in the on position, the meter should read battery voltage (if correct voltage is not present, check for loose fittings or connections in the wiring harness).

## CAUTION

If CATT II has confirmed an active DTC relating to the CAN communication wires, use extreme caution when testing the wires. Do not probe the ECM connector with meter leads; instead use a small T-pin or other suitable testing component to make light and proper contact.

## CAUTION

Never disconnect the ECM connector with the battery cables installed onto the battery.

■NOTE: If after completing the preceding tests and possible solutions with normal results an EPS issue persists with active DTCs C1301-C1305, 1316, or C1326-C1329 confirmed by CATT II, the EPS assembly must be replaced (see Steering/Body/Controls).

## Ignition Switch

The ignition switch, dash switches, front accessory connectors, and front switched accessory connector can be accessed from under the dash.

### 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 the 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 30 amp fuse, the battery, or the main wiring harness.

4. Connect the red meter lead to the red/black wire; then with the black lead grounded, turn the ignition switch to the ON position. The meter must show battery voltage.
5. Connect the red meter lead to the yellow/green wire; then with the black lead grounded, turn the ignition switch to the START position. The starter should engage and the meter must show battery voltage.

■NOTE: When the starter is engaged, battery voltage will be approximately 10.5 DC volts.

## Ignition Coil

The ignition coil is mounted under the seat base below the driver's seat.

### VOLTAGE

#### Primary Coil

1. Set the meter selector to the DC Voltage position; then disconnect the two wires from the coil.
2. Connect the red tester lead to the orange wire and the black tester lead to 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. Connect the red tester lead to one terminal; then connect the black tester lead to the other terminal.



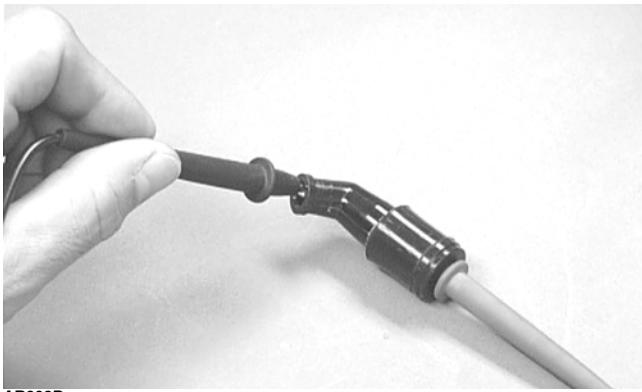
HDX290

2. The meter reading must be less than 1 ohm.

■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 show as specified, replace the spark plug cap.**

## Ignition Timing

The ignition timing cannot be adjusted; however, verifying ignition timing can aid in troubleshooting other components. To verify ignition timing, use the following procedure.

**■NOTE: To check ignition timing, the seat, seat back, and seat base must be removed.**

1. Attach the Timing Light to the spark plug high tension lead; then remove the timing inspection plug from the left-side crankcase cover.
2. Start the engine and using the RPM function on the speedometer/tachometer, run at 1500 RPM; ignition timing should be 10° BTDC.
3. Install the timing inspection plug.

If ignition timing cannot be verified, the rotor may be damaged, the key may be sheared, the trigger coil bracket may be bent or damaged, or the ECM may be faulty.

## Accessory Receptacle/Connector

**■NOTE: This test procedure is for either the receptacles or the connectors.**

### 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 orange/black wire; then connect the black tester lead to 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

### VOLTAGE (Brakelight)



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

Remove the front storage tray to access the front wires and switch.

**■NOTE: The ignition switch must be in the ON position.**

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the orange wire; then connect the black tester lead to battery ground.



HDX272

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)

#### CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

**■NOTE: The brake pedal must be depressed for this test.**

1. Set the meter selector to the OHMS position. Remove both wires from the switch.
2. Connect the red tester lead to one terminal spade; then connect the black tester lead to the other terminal spade.



HDX272

- When the 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.**

### VOLTAGE (Headlight)

- Connect the red meter lead to the gray wire; then connect the black meter lead to the black wire.
- Turn the ignition switch to the ON position. The meter must show battery voltage.

**■NOTE: If the meter does not show battery voltage, troubleshoot the LIGHTS fuse on the power distribution module, the ignition switch, or the main harness.**

- Connect the red meter lead to the yellow wire; then select the high beam position on the headlight switch. The meter must show battery voltage.
- Connect the red meter lead to either of the two white wires; then select the low beam position on the headlight switch. The meter must show battery voltage.

**■NOTE: The battery voltage will show lower in steps 3 and 4 due to electrical loading of the headlights.**

### RESISTANCE (Drive Select)

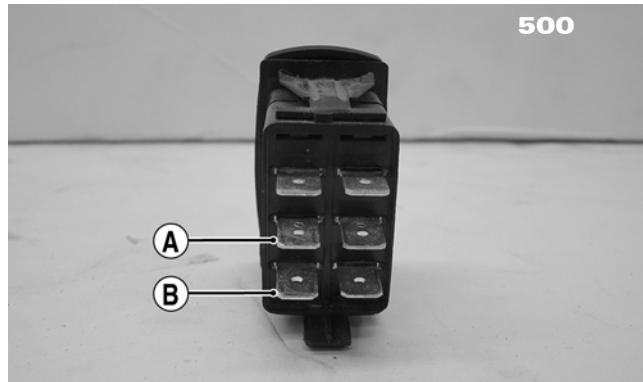


Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

- Remove the switch assembly from the dash; then disconnect the harness from the switch.

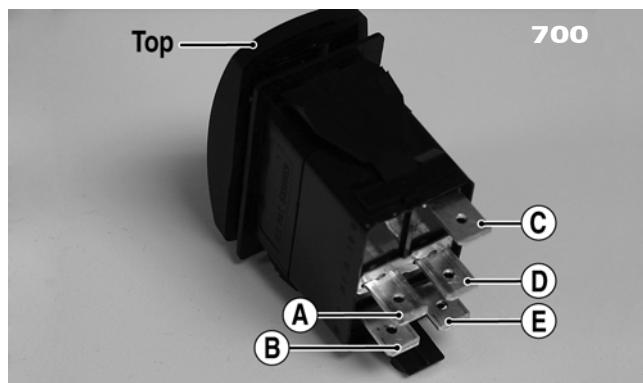
**■NOTE: The switch can be removed from the dash using a thin, flat pry bar or suitable putty knife. It is not necessary to remove the dash to remove the switch.**

- Using an ohmmeter, the following readings must be observed.



HDX273A

500



PR566A

700

500		
2WD	4WD	
A to B Open	A to B <1 Ohm	
700		
2WD	4WD	DIFFERENTIAL LOCK
A to D <1 ohm	A to D <1 ohm	A to D <1 ohm
C to E 48 ohms	C to E 48 ohms	C to E 48 ohms
A to B Open	A to B <1 ohm	A to B <1 ohm
A to C Open	A to C Open	A to C 48 ohms
A to E Open	A to E Open	A to C <1 ohm

### VOLTAGE (Drive Select)

**■NOTE: Voltage tests must be made with the switch and the actuator connected. The meter can be connected at the actuator connector using a break-out harness or MaxiClips. The front drive actuator must be connected.**

- Connect the black tester lead to the black wire; then turn the ignition switch to the ON position.
- Select the DC Volts position on the tester and observe the meter readings for each of the three switch positions.

WIRE COLOR	2WD	4WD	DIFFERENTIAL LOCK
Red to Orange	12.0 DC Volts	12.0 DC Volts	12.0 DC Volts
Red to White/ Green	11.5 DC Volts	0 DC Volts	0 DC Volts
Red to White/ Red	11.5 DC Volts	11.5 DC Volts	0 DC Volts

**■NOTE: If the meter does not show voltages according to the chart, make sure the front drive actuator is plugged in; then troubleshoot the switch, ignition fuses, battery connections, or wiring harness.**

## VOLTAGE (Reverse Override)

■NOTE: To perform the following tests, the ignition switch must be in the ON position and the transmission shifted into reverse gear.

1. Connect the red meter lead to the red/green wire and the black meter lead to a suitable ground; then select 2WD on the drive select switch. The meter must show battery voltage.
2. Depress the reverse override switch. The meter must show near zero volts.
3. Select 4WD on the drive select switch. The meter must show battery voltage.
4. Depress the reverse override switch. The meter must show near zero volts.
5. If equipped, select "LOCK" on the drive select switch. The meter must show battery voltage.
6. Depress the reverse override switch. The meter will typically read <0.1 DC volt.

■NOTE: If the voltage readings are correct and a momentary "whirring" sound is not heard from the front drive actuator, check voltage at the actuator connector. If voltage readings are correct and the connector and the actuator doesn't operate, the actuator must be replaced.

## Fan Motor



This component can be tested using the CATT II. Utilize the Test screen.

■NOTE: Preliminary checks may be performed on this component using the diagnostic mode on the LCD gauge (see EFI Diagnostic System in this section).

■NOTE: 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.



PR912A



### 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 (Headlights)

Each headlight has one HI/LO three-pin connector and one two-pin connector for the LED lights.

■NOTE: The HI/LO bulb-connector is located toward the inside of the headlight assembly. It uses a three-pin connector with the corresponding color codes: white, yellow/black, and black. The LED light and connector are located toward the outside of the headlight assembly and use the color codes white/red and black.

1. Set the meter selector to the DC Voltage position.
2. Set the light switch to the correct position for the affected light; then connect the black tester lead to the black wire using a MaxiClip.
3. Connect the red tester lead to the yellow/black wire (high beam) or white wire (low beam) using a Maxi-Clip. The meter must show battery voltage.

■NOTE: If battery voltage is not shown in any test, inspect the LIGHTS fuse on the power distribution module, headlight switch, ignition switch, switch connectors, or wiring harness.

4. To test LED voltage, disconnect the two-pin connector from the back of the headlight; then connect the black tester lead to the black wire using a MaxiClip. Connect the red tester lead to the white/red wire (LED). The meter must show battery voltage.

### VOLTAGE (Taillight)

■NOTE: Perform this test at the socket end of the taillight-brakelight harness (pigtail). The ignition switch must be in the ON position and either high beam or low beam selected on the light switch.

1. Set the meter selector to the DC Voltage position.
2. Connect the black tester lead to the black wire; then connect the red tester lead to the white/red wire. The meter should show battery voltage.
3. With the ignition key in the LIGHTS position, the meter must show battery voltage.

■NOTE: If battery voltage is not shown and the headlights are illuminated, inspect the three-wire connector in the left-rear canopy tube at the juncture of the canopy tube and lower frame. If battery voltage is shown on the meter, replace the bulb.

### VOLTAGE (Brakelight)

■NOTE: Perform this test at the socket end of the taillight-brakelight harness (pigtail). The ignition switch must be in the ON position.

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 the brake applied, the meter must show battery voltage.

**■NOTE: If the meter shows no voltage, inspect the 10 amp ignition (IGN) fuse, brakelight switch, wiring harness, or connectors.**

## Power Distribution Module (PDM)

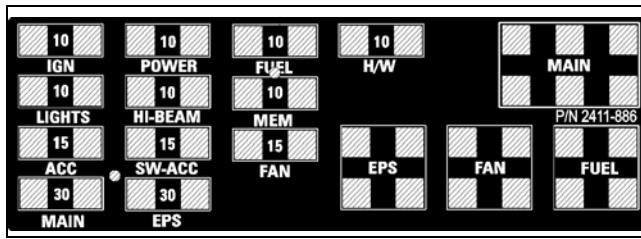
**■NOTE: The module and wiring harness are not a serviceable component and must be replaced as an assembly.**

If there is any type of electrical system failure, always check the fuses first.

**■NOTE: The fuses are located in a power distribution module under the left side of the dash.**

1. Remove all fuses from the power distribution module.

**■NOTE: To remove a fuse, compress the locking tabs on either side of the fuse case and lift out.**



2411-886

### CAUTION

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

**■NOTE: Make sure the fuses are returned to their proper position according to amperage. Refer to the amperage listed under each fuse on the power 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 fuse holder, the headlight OFF/HI/LO switch must be in the HI position; when testing the LIGHTS fuse holder, the headlight dimmer switch can be in either the HI or the LO position.**

**■NOTE: If the meter shows no battery voltage, troubleshoot the battery, switches, power distribution module, or the main wiring harness.**

## RELAYS

The 4-pin relays are identical plug-in type located on the power distribution module. Relay function can be checked by switching relay positions. The 4-pin relays are interchangeable.

## 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 9.78-10.82 ohms (700) or 12 ohms (500).

**■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

#### Resistance

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to the brown wire; then connect the black tester lead to the white wire. The meter reading must be 104-156 ohms.

#### AC Voltage

**■NOTE: The battery must be at full charge for these tests.**

1. Set the meter selector to the AC Voltage position.
2. Connect the red tester lead to the brown wire; then connect the black tester lead to the white wire.
3. Crank the engine over using the electric starter.
4. The meter reading must be 2.0 volts or more.

## OXYGEN (O<sub>2</sub>) SENSOR

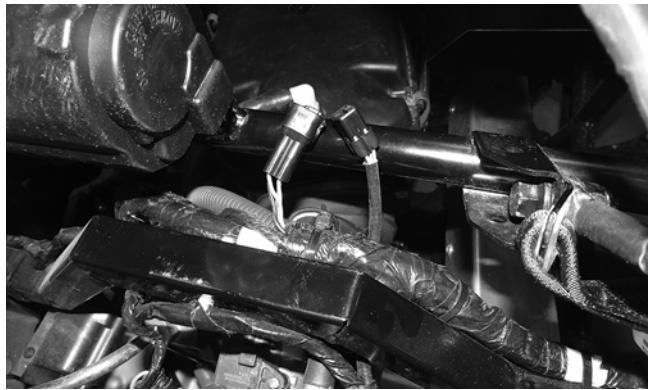


Component data can be retrieved using the CATT II. Utilize the Sensor Data screen.

The Oxygen Sensor (O<sub>2</sub> Sensor) is located in the exhaust pipe.

■**NOTE:** When testing the resistance of the sensor's heater, the engine/exhaust pipe must be at room temperature (65-75° F) or inaccurate readings will occur.

1. Open the cargo box; then remove the seat, air filter cover, and air filter.
2. Remove the backrest and seat base.
3. Disconnect the sensor.



HDX 247

■**NOTE:** For this test, the meter must be in OHMS position.

4. 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. Readings should be between 6.7 and 10.1 ohms.

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

## TEMPERATURE/MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR (500)



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

■**NOTE:** Preliminary checks may be performed on this component using the diagnostic mode on the LCD gauge (see EFI Diagnostic System in this section).

1. Disconnect the connector from the sensor located on top of the throttle body.
2. Select DC Voltage on the tester and turn the ignition switch to the ON position.
3. Connect the black tester lead to the pink/black wire and the red tester lead to the orange/blue wire. The meter should read 4.5-5.5 DC volts. If the meter does not read as specified, check the ECM connector or wiring.

4. Connect the sensor to the harness; then using Maxi-Clips, connect the red tester lead to the brown/white wire and the black tester lead to the pink/black wire. With the engine running at idle speed, the meter should read approximately 2.5 DC volts (MAP sensor signal).

5. Connect the red tester lead to the green/red wire. The meter should read approximately 2.9 DC volts.

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

## MANIFOLD ABSOLUTE PRESSURE/INLET AIR TEMPERATURE (MAP/IAT) SENSOR (700)



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

■**NOTE:** Preliminary checks may be performed on this component using the diagnostic mode on the LCD gauge (see EFI Diagnostic System in this section).

1. Disconnect the appropriate sensor (MAP sensor is located on top of the throttle body; IAT sensor is located on the right side of the air filter housing).
2. Select DC Voltage on the tester and turn the ignition switch to the ON position.
3. Connect the leads as shown. If the meter does not read 4.5-5.5 DC volts, check the ECM connector or wiring.

Sensor	Wire Color
MAP	Black to Pink/Black
	Red to Orange/Blue
IAT	Black to Pink/Black
	Red to Green/Red

4. Connect the appropriate sensor to the harness; then using MaxiClips, connect the leads as shown. With the engine running at idle speed, the meter should read approximately 2.0 DC volts (MAP sensor) or 2.9 DC volts (IAT sensor).

Sensor	Wire Color
MAP	Black to Pink/Black
	Red to Brown/White
IAT	Black to Pink/Black
	Red to Green/Red

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

## ENGINE COOLANT TEMPERATURE (ECT) SENSOR



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

■**NOTE:** Preliminary checks may be performed on this component using the diagnostic mode on the LCD gauge (see EFI Diagnostic System in this section).

1. Connect the meter leads (selector in OHMS position) to the sensor terminals.
2. Suspend the sensor and a thermometer in a container of cooking oil; then heat the oil.

**■NOTE:** Neither the sensor nor the thermometer should be allowed to touch the bottom of the container or inaccurate readings will occur. Use wire holders to suspend the sensor and thermometer.

### **⚠ WARNING**

Wear insulated gloves and safety glasses. Heated oil can cause severe burns.

3. If the readings are not as indicated, the sensor must be replaced.

MODEL	OIL TEMPERATURE	OHMS
500	60 °C (140 °F)	704k
	90 °C (194 °F)	261
	120 °C (248 °F)	111
700	-20 °C (-4 °F)	19k
	40 °C (105 °F)	1.13k
	100 °C (212 °F)	0.15

4. Install the sensor and tighten securely; then connect the leads.

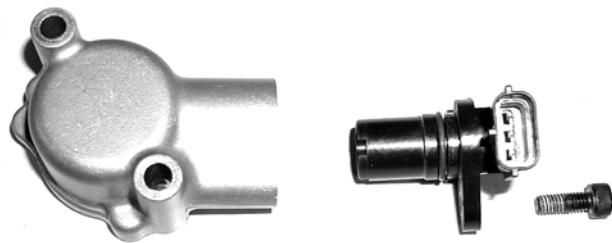
### **SPEED SENSOR**

**■NOTE:** Prior to testing the speed sensor, inspect the three-wire connector on the speed sensor for contamination, broken pins, and/or corrosion.

1. Set the meter selector to the DC Voltage position.
2. With appropriate needle adapters on the meter leads, connect the red tester lead to the orange wire; then connect the black tester lead to the black wire.
3. Turn the ignition switch to the ON position.
4. The meter will typically show battery voltage.
5. Leave the black tester lead connected; then connect the red tester lead to the pink/white wire.
6. Slowly move the vehicle forward or backward; the meter must show 0 and battery voltage alternately.

To replace a speed sensor, use the following procedure.

1. Disconnect the three-wire connector from the speed sensor; then remove the cap screw securing the sensor to the sensor housing.
2. Remove the sensor from the sensor housing accounting for an O-ring.
3. Install the new speed sensor into the housing with new O-ring lightly coated with multi-purpose grease; then secure the sensor with the cap screw (threads coated with blue Loctite #242). Tighten securely.



CD071

### **FUEL PUMP/FUEL LEVEL SENSOR**

The fuel pump and fuel level sensor are not serviceable components. If either component fails, it must be replaced.

### **Testing**

### **⚠ WARNING**

Whenever any maintenance or inspection is made on the fuel system during which there may be fuel leakage, there should be no welding, smoking, open flames, etc., in the area.

### **☞ AT THIS POINT**

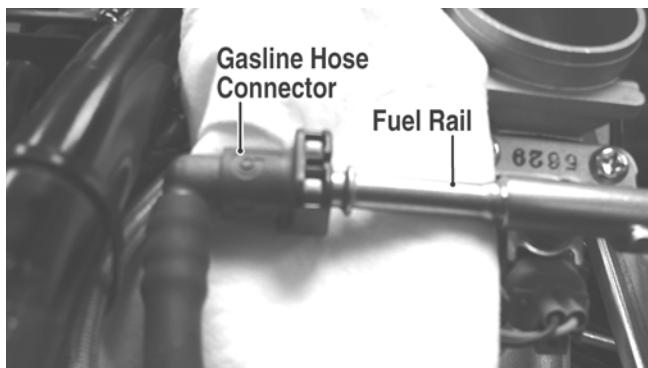
Prior to removing the electric fuel pump, the following check should be performed to determine that removal is necessary.

1. Turn the ignition switch ON and listen for a momentary “whirring” sound of the pump building pressure. If the sound is heard (several seconds), no electrical checks are necessary. Turn the ignition switch OFF.

### **⚠ WARNING**

Gasoline may be under pressure. Depressurize the fuel system by disconnecting the fuel pump electrical connector and running the engine until it stalls. Place an absorbent towel around the connector to absorb any gasoline when disconnecting.

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



FI092A

3. Reconnect the fuel pump electrical connector; then turn the ignition switch to the ON position. The fuel pressure should build until the pump shuts off. Pressure should read 3.0 kg-cm<sup>2</sup> (43 psi).

- 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 key from the ignition switch.

### WARNING

**Always ensure that power cannot be inadvertently applied to the ignition/ECM when working on the fuel system. If the ignition switch is turned on, the electric fuel pump will start and gas could be rapidly pumped and spilled resulting in fire and severe injury.**

- Remove the seat, seat back, and seat base; then disconnect the negative battery cable.
- Disconnect the electrical plug from the main harness; then disconnect the gasoline hose from the fuel pump.
- Mark the fuel pump mounting and gas tank for installing purposes; then remove the screws securing the fuel pump to the gas tank and remove the fuel pump.

### CAUTION

**Take care not to damage the float or float arm or replacement of the entire assembly will be necessary.**

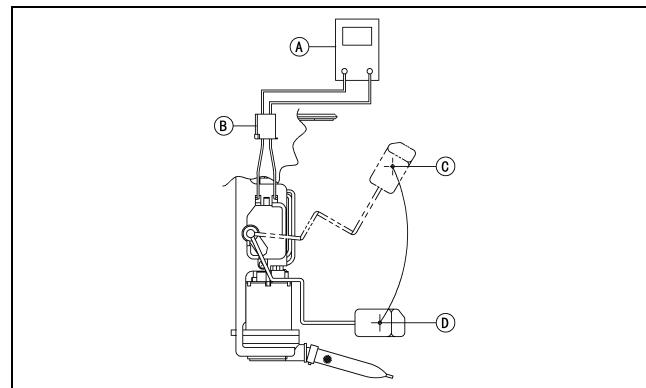
- Using duct tape or other suitable means, cover the fuel pump opening.

## 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.
- Test the fuel level sensor by connecting a multimeter (A) to the fuel level sensor leads (B); then select OHMS. The multimeter should show 5 ohms at full fuel position (C) and 95 ohms at empty fuel position (D).



ATV2116

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

## Installing

- Place the fuel pump assembly into the gas tank with a new gasket aligning the match marks; then secure with the four screws. Tighten securely.

**NOTE: It is important to install the fuel pump with the correct orientation to ensure adequate float lever clearance.**

- Connect the gasoline hose to the fuel pump pipe and secure with the hose clamp; then connect the electrical plug to the main harness.
- Connect the negative battery cable; then turn the ignition switch to the ON position and verify that no gas leaks are present, the pump runs for several seconds, and the gas gauge reading is normal.
- Start the engine to verify proper engine operation; then shut off the engine and install the seat base, seat back, and seat.

## TIlt Sensor

### WARNING

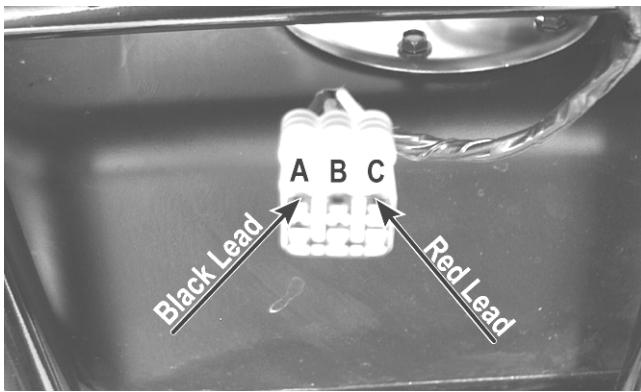
**Incorrect installation of the tilt sensor could cause sudden loss of engine power which could result in loss of vehicle control resulting in injury or death.**

### CAUTION

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

## Supply Voltage

- 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 pink/black wire (A).



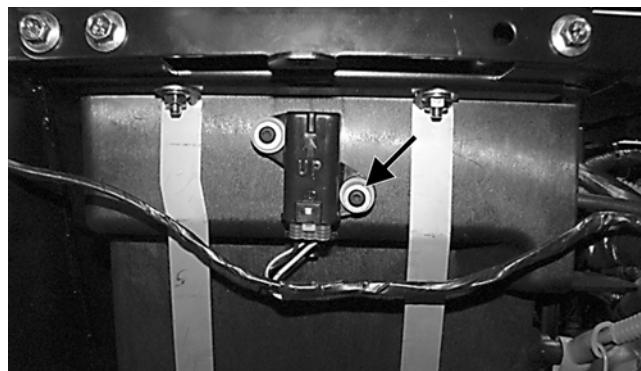
CD706A

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 fuse in the PDM or the 10-amp power fuse, wiring harness, or the ignition switch.
3. Remove the red tester lead and connect to the blue/brown wire. The multimeter should read less than 0.2 DC volts. If the specified voltage is not indicated, check wire connections at the ECM or substitute another ECM to verify the test.

### Output Voltage

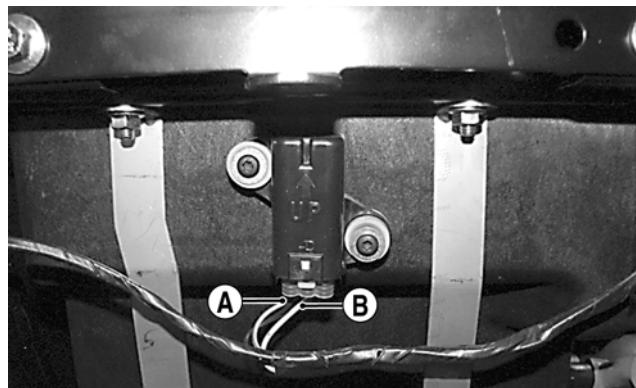
■**NOTE:** Needle adapters will be required on the multimeter leads as the following tests are made with the sensor connected.

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



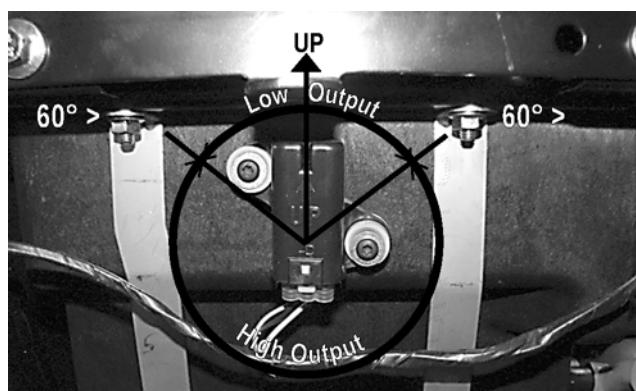
PR702A

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 pink/black wire (A); then turn the ignition switch ON and observe the meter. The meter should read 0.3-2.9 DC volts.



PR703B

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.



PR703A

■**NOTE:** When replacing the sensor after testing, make sure the arrow marking is directed up.

### THROTTLE POSITION SENSOR (TPS)



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

■**NOTE:** Preliminary checks may be performed on this component using the diagnostic mode on the LCD gauge (see EFI Diagnostic System in this section).

### Verifying TPS Adjustment Tool

Before using the TPS adjustment tool, verify its battery condition. The battery used in the tool is a 9-volt battery. To check battery condition, use a digital volt/ohmmeter set on DC volt scale. Test between the adjustment tool black and red jacks. Insert the red lead of the digital voltmeter into the red jack of the adjustment tool and the black lead of the digital voltmeter into the black jack of the adjustment tool. The green power light of the analyzer should now be illuminated. If voltage is found below 4.9 volts, replace the battery.

■**NOTE:** The Test Harness must be plugged into the analyzer for testing voltage. Always verify battery voltage is at least 4.9 DC volts before testing TPS.

## Testing

1. Remove the left-side engine cover; then disconnect the three-wire 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.

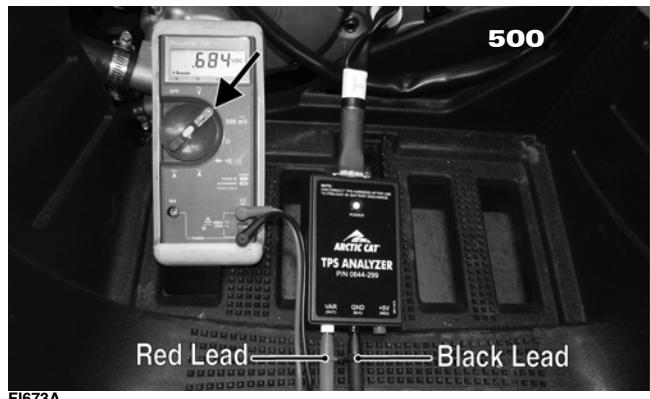
2. Connect the TPS Multi-Analyzer Harness connector #8 to the TPS; then connect the harness to the TPS Analyzer Tool.



FI672

3. Using a multimeter, connect the tester to the analyzer as shown in the table below; then select the DC Voltage position. With the vehicle off and throttle at idle, the gauge should read as shown and at Wide-Open Throttle it should read up to as shown.

Model	Tester Lead	Analyzer Socket	Idle (DC Volts)	WOT (DC Volts)
500	Black	GND	0.66-0.70	3.88
	Red	VAR		
700	Black	VAR	0.58-0.62	3.70
	Red	+5V		



FI676A

■**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 accelerator pedal to Wide Open Throttle (WOT).
2. Place the ignition key in the ON position and wait for 10 seconds.
3. Release the accelerator pedal 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.

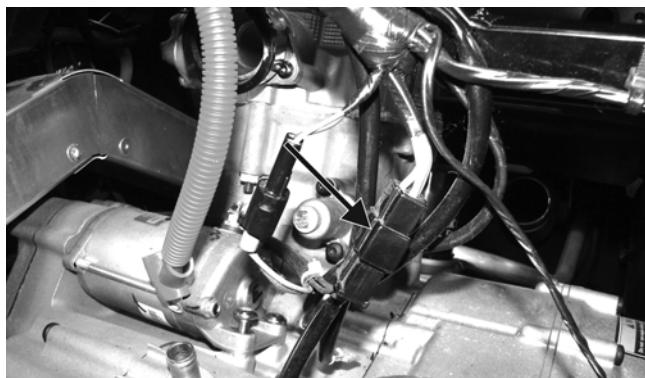
■NOTE: The ROV is equipped with an ECM that cuts fuel spray and spark when maximum RPM is approached. When the RPM limiter is activated, it could be misinterpreted as a high-speed misfire.

Gear	Park	Neutral	Reverse	High/Low	Fail-Safe Mode	Incorrect ECU/Gauge (P0630)	Warranty Registration (U1001)
2WD	2250	6500	4500 (500) 4000 (700)	7650 (500) 7250 (700)	4500 (500) 4000 (700)	6650	4500
4WD			5500 (500) 5000 (700)				
4WD Lock			7000				
2WD Override							
4WD Override							
Differential-Lock Override							

## Stator Coil

### VOLTAGE (AC Generator - No Load)

The connector is the black three-pin one on the right side below the ignition coil.



HDX150A

■NOTE: Test the connector coming 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 3000 RPM (500) or 5000 RPM (700), all wire tests must be within specification

### CAUTION

Do not run the engine at high RPM for more than 10 seconds.

### CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

1. Set the meter selector to OHMS position.
2. Test between the three black wires for a total of three tests.
3. The meter reading must be within specification.

## Regulator/Rectifier

The regulator/rectifier is located under the seat next to the battery. Try to verify all other charging system components before the regulator/rectifier is replaced.

### TESTING VOLTAGE

1. Start engine and warm up to normal operating temperatures; then connect a multimeter (set at the DC Voltage position) to the battery as follows.
2. Connect the red tester lead to the positive battery post and the black tester lead to the negative battery post.
3. 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, replace the regulator/rectifier.

## Starter Motor

■NOTE: The starter motor is not a serviceable component. If the starter is defective, it must be replaced.

### 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; then remove the cable from the starter.
3. Remove the two cap screws securing the starter with ground wires to the crankcase; then remove the starter. 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; then install the starter into the crankcase. Secure with two machine screws and wiring forms.
2. Secure the positive cable to the starter with the nut.
3. Connect the battery.

### TESTING VOLTAGE

Perform this test on the starter positive terminal. To access the terminal, slide the boot away.

■NOTE: The ignition switch must be in the ON 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 terminal; then connect the black tester lead to ground.
3. With the starter button depressed, the meter must show battery voltage and the starter should operate.

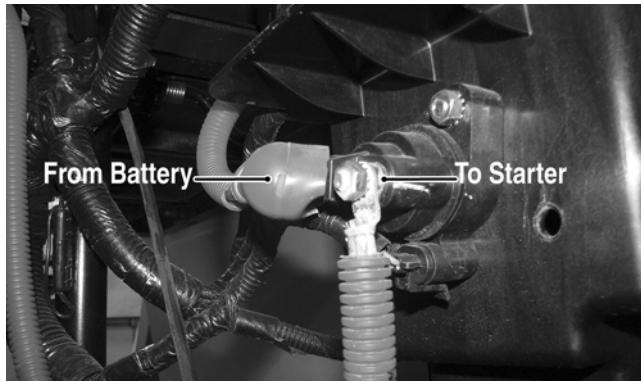


■NOTE: If the meter showed correct voltage but the starter motor did not operate or operated slowly, troubleshoot all starting system components before replacing the starter motor.

■NOTE: If the meter showed no battery voltage, inspect the main fuse, ground connections, starter lead, battery voltage (at the battery), starter relay, or the neutral start relay.

## Starter Relay

1. Remove the seat, seat back, and seat base; 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.

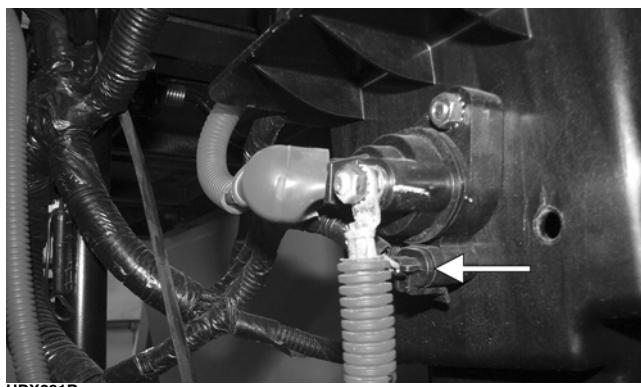


■NOTE: Make sure the ignition switch is in the ON position and the transmission in neutral.

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 one 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 green wire and the black tester lead to the black wire.



5. Depress the starter button and observe the multimeter.

■NOTE: If battery voltage is indicated, replace the starter relay.

## Electronic Control Module (ECM)

The 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 to verify the suspected one is defective.

This EFI system has a built-in feature that will only allow an ECM of the same part number to be used in this model. Do not attempt to substitute an ECM from a different model as the system will not allow it to start.

Error codes can be cleared by following the procedures located in the EFI Diagnostic System sub-section 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 accelerator pedal to Wide Open Throttle (WOT).
2. Place the ignition key in the ON position and wait for 10 seconds.
3. Release the accelerator pedal, and wait an additional 10 seconds.
4. Turn the key to the OFF position and allow the gauge to shut off.

## EFI Diagnostic System

### DIGITAL GAUGE

The digital gauge can be used as a diagnostic tool for many of the DTC's displayed. To place the gauge into the diagnostic mode, use the following procedure.

1. Turn the ignition switch ON.
2. Depress and hold both left and right buttons together for approximately three seconds until "DIAGNOSTIC" appears on the LCD.



WT541

3. Press the center button (SELECT) to enter diagnostic mode; cycle the display by pressing either the left or right button to step to the desired function.

**■NOTE: The gauge can be utilized dynamically (engine running/vehicle moving) or statically (engine/vehicle stopped).**

### DIAGNOSTIC MODES

#### Battery (BATTERY)



WT540

Display: System DC voltage.

DTC: P0562, P0563, P2531, P2532

Usage: Verify system voltage under following conditions.

1. Battery voltage with engine and accessories off (>12.2 VDC for fully charged).
2. Battery voltage with engine idling (charging = 13.8 VDC or greater).
3. Battery voltage with electrical accessories operating, engine idling (13.5 VDC or greater).
4. Battery voltage starter cranking (10.5-11.5 VDC).

#### Coolant (COOLANT)



WT591

Display: Engine coolant temperature as measured by the ECT sensor.

DTC: P0116, P0117, P0118, P0119

Usage: Monitor coolant temperature to verify the following.

1. ECT sensor signal.
2. High Temperature indicator (on @ 230° F.).

3. Thermostat opening @ approximately 180° F, indicated by a momentary drop or pause in the rising temperature reading.
4. Fan ON @ 185° F, OFF @ 176° F (700) or ON @ 194° F, OFF @ 185° F (1000):

  - A. fan motor
  - B. fan relay
  - C. fan fuse
  - D. wiring connections

5. High Temperature Rev Limiter 5000 RPM @ 230° F.

### **Inlet Air Temperature (INTAKE)**



Display: Inlet air temperature in Fahrenheit or Celsius.

DTC: P0112, P0113, P0114

Usage: Verify correct output of IAT sensor.

**■NOTE: After engine has been running, IAT readings will be higher than outside air temperature due to engine and engine compartment heat as well as intake manifold heating.**

### **MAP (AIR PRESS)**



Display: MAP in millibars and in./Hg.

DTC: P0107, P0108

Usage: Verify barometric pressure signal correct.

**■NOTE: Local barometric pressure is given in in./Hg (inches of mercury) and millibars. The gauge should display approximately 965 millibars at 970 ft. above sea level. This number will not change when the engine is started. However, the value is being observed internally in the ECM.**

### **Idle Step Control (ISC)**



Display: ISC position

DTC: P0508, P0509

Usage: Verify correct ISC position.

### **TPS (TPS)**



Display: TPS position (0% closed, 95-100% WOT).

DTC: P0121, P0122, P0123

Usage: Verify TPS signal and adjust throttle cable.

### **Fuel Sensor (FUEL)**



Display: Fuel level signal from the fuel level sensor.

DTC: C1400, C1401, C1402

Usage: Check output of the fuel level sensor.\*

1. Full fuel is indicated by a reading of 0-5 ohms.
2. Empty is indicated by a reading of 95-105 ohms.

\* 110-500 ohms, suspect the fuel level sensor or wiring. 0-100 ohms but no gauge indication, suspect the gauge.

## Tachometer (RPM)



WT544

Display: Engine RPM

DTC: P0336, P0337, P0339

Usage: Verify engine speed signal from the following.

1. CKP (crankshaft position) sensor to ECM
2. ECM (CAN) signal to gauge (tachometer)
3. ECM (CAN) signal to EPS

## Speedometer (SPEED)



WT543

Display: Vehicle speed signal.

DTC: P0500

Usage: Verify speedometer sensor signal from the following.

1. Speed sensor to ECM.
2. ECM (CAN) signal to gauge (speedometer/odometer).
3. ECM (CAN) signal to EPS

## DIAGNOSTIC TROUBLE CODES (DTC)

If an EFI or related chassis component fails or an out-of-tolerance signal is detected by the ECM, a diagnostic trouble code (DTC) will be generated in the ECM and displayed on the LCD. The DTC will be displayed alternately with a wrench icon or malfunction indicator light (MIL). The DTC will continue to flash, until the malfunction is corrected and the code cleared.

### Code List

■**NOTE:** Each of the following numerical codes will have a one-letter prefix of C, P, or U. A “C” prefix denotes a chassis malfunction, a “P” prefix denotes a power train malfunction, and a “U” prefix denotes a loss of communication with the gauge.

■**NOTE:** Normal malfunction codes are cleared from the LCD when the component is replaced or the malfunction is corrected; however, intermittent codes must be cleared as noted in the code chart.

Code	Fault Description	Possible Cause	Fault Recovery Method
C0063	Tilt Sensor Circuit High	Sensor or interconnect harness shorted to battery power	Correct condition*
C0064	Tilt Sensor Circuit Low/SG/Open	Sensor or interconnect harness open or shorted to chassis ground	Correct condition*
P0030	O2 Heater Intermittent/Open	Heater or interconnect harness intermittent or open	Correct condition*
P0031	O2 Heater Low/SG	Heater or interconnect harness shorted to chassis ground	Correct condition*
P0032	O2 Heater High/SP	Heater or interconnect harness shorted to battery power	Correct condition*
P0107	MAP Sensor Circuit Low/SG/Open	Sensor or interconnect harness shorted to chassis ground	Correct condition*
P0108	MAP Sensor Circuit High/SP	Sensor or interconnect harness shorted to battery power	Correct condition*
P0112	IAT Sensor Circuit Low/SG	Sensor or interconnect harness shorted to chassis ground	Correct condition*
P0113	IAT Sensor Circuit High/Open	Sensor or interconnect harness open or shorted to battery power	Correct condition*
P0114	IAT Sensor Circuit Intermittent	Sensor or interconnect harness intermittent	Correct condition*
P0116	ECT Sensor Circuit Range/Performance	Sensor producing an out-of-range voltage	Correct condition*
P0117	ECT Sensor Circuit Low/SG	Sensor or interconnect harness shorted to chassis ground	Correct condition*
P0118	ECT Sensor Circuit High/Open/SP	Sensor or interconnect harness open or shorted to battery power	Correct condition*
P0119	ECT Sensor Circuit Intermittent	Sensor or interconnect harness intermittent	Correct condition*
P0121	TPS Range/Performance	Sensor producing an out-of-range voltage	Correct condition*
P0122	TPS Circuit Low/SG	Sensor or interconnect harness shorted to chassis ground	Correct condition*
P0123	TPS Circuit High	Sensor or interconnect harness open or shorted to battery power	Correct condition*
P0130	O2 Sensor Intermittent/Open	Sensor or interconnect harness intermittent or open	Correct condition*
P0131	O2 Sensor Low/SG or Air-Leak	Sensor or interconnect harness shorted to chassis ground or an air-leak exists	Correct condition*
P0132	O2 Sensor High/SP	Sensor or interconnect harness shorted to battery power	Correct condition*
P0171	O2 Feedback Below Minimum Correction	Low fuel rail pressure, dirty fuel filter, or dirty injectors	Correct condition*
P0172	O2 Feedback Exceeds Maximum Correction	Excessive fuel rail pressure, MAP or temp sensors out-of-spec	Correct condition*

Code	Fault Description	Possible Cause	Fault Recovery Method
P0219	Engine Over-Speed Condition	Engine speed (RPM) has exceeded the ECM over-speed setpoint/limit	Reduce engine speed
P0231	Fuel Pump Relay Circuit Low/SG/Open	Relay has been removed or interconnect harness shorted to chassis ground	Correct condition*
P0232	Fuel Pump Relay Circuit High	Relay or interconnect harness shorted to battery power	Correct condition*
P0233	Fuel Pump Relay Circuit	Relay circuit erratic or intermittent	Correct condition*
P0261	Rear Cylinder Fuel injector Circuit Low/SG	Injector or interconnect harness shorted to chassis ground	Correct condition**
P0262	Rear Cylinder Fuel injector Circuit High	Injector or interconnect harness shorted to battery power	Correct condition**
P0263	Rear Cylinder Fuel injector Balance/Open	Injector has been disconnected or interconnect harness open	Correct condition**
P0264	Front Cylinder Fuel injector Circuit Low/SG	Injector or interconnect harness shorted to chassis ground	Correct condition**
P0265	Front Cylinder Fuel injector Circuit High	Injector or interconnect harness shorted to battery power	Correct condition**
P0266	Front Cylinder Fuel injector Balance/Open	Injector has been disconnected or interconnect harness open	Correct condition**
P0336	Crankshaft Angle Sensor Synchronization	Sensor or interconnect harness intermittent	Correct condition**
P0337	Crankshaft Angle Sensor Circuit/SG	Sensor or interconnect harness shorted to chassis ground	Correct condition**
P0339	Crankshaft Angle Sensor Intermittent/Erratic	Sensor or interconnect harness intermittent	Correct condition**
P0340	Camshaft Angle Sensor Synchronization	Sensor or interconnect harness intermittent	Correct condition**
P0341	Camshaft Angle Sensor Circuit/SG	Sensor or interconnect harness shorted to chassis ground	Correct condition**
P0342	Camshaft Angle Sensor Intermittent/Erratic	Sensor or interconnect harness intermittent	Correct condition**
P0480	Fan-Primary/Right Relay Control Circuit	Relay erratic or intermittent	Correct condition*
P0481	Fan-Secondary/Left Relay Control Circuit 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*
P0485	Fan-Primary/Right Relay Control Circuit Low/SG/Open	Primary fan fuse has blown, the primary fan relay has been removed or interconnect harness shorted to chassis ground	Correct condition*
P0500	Vehicle Speed-Sensor	Sensor circuit signal intermittent or missing	Correct condition*, start and drive the vehicle*
P0508	IAC System Circuit Low/SG	IAC interconnect harness shorted to chassis ground	Correct condition*
P0509	IAC System Circuit High/Open	IAC disconnected or the interconnect harness shorted to battery power	Correct condition*
P0520	Engine Oil Sensor/Switch	Sensor or interconnect harness erratic or intermittent	Correct condition*
P0562	System Voltage Low	Battery charge condition low or the regulator/rectifier output low	Correct condition*
P0563	System Voltage High	Battery cable connections are loose or the regulator/rectifier output high	Correct condition*
P0601	ECM CAN Communication Shutdown	Intermittent CAN connections or unstable CAN conditions have caused the ECM to temporarily shutdown CAN communication	Correct CAN communication issue*
P0615	Starter Relay Circuit	Start switch/button, starter relay, gearswitch 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 LCD gauge and ECM part numbers are correct for the vehicle model number and VIN	Correct gauge and ECM VIN compatibility issue*
P0642	Sensor Power Circuit Low	One or more of the sensors defective or shorted to chassis ground	Correct condition*
P0643	Sensor Power Circuit High	One or more of the sensors defective or shorted to battery power	Correct condition*
P2300	Rear Ignition Coil Primary Circuit Low/SG/Open	Coil or interconnect harness open or shorted to chassis ground	Correct condition**
P2301	Rear Ignition Coil Primary Circuit High	Coil or interconnect harness shorted to battery power	Correct condition**
P2303	Front Ignition Coil Primary Circuit Low/Open	Coil or interconnect harness open or shorted to chassis ground	Correct condition**
P2304	Front Ignition Coil Primary Circuit High	Coil or interconnect harness shorted to battery power	Correct condition**
P2531	Ignition Switch Circuit Low	Battery charge condition low or the regulator/rectifier output low	Correct condition*
P2532	Ignition Switch Circuit High	Battery cable connections are loose or the regulator/rectifier output high	Correct condition*
U0155	LCD Gauge to EFI ECM CAN Communication Lost	Gauge CAN circuit or interconnect harness intermittent or has failed	Correct condition*
U1000	Vehicle Not Registered or Invalid PIN Entered	An invalid registration PIN has been entered	Enter the correct registration PIN*
U1001	Vehicle Not Registered and Vehicle Limits Enabled	An invalid registration PIN has been entered	Enter the correct registration PIN*
FUEL OFF	Tilt Sensor Activation Code	Sensor has been activated	Restore the vehicle chassis to an upright position*

High: A high voltage condition has been detected

Low: A low voltage condition has been detected

Intermittent: An intermittent circuit condition has been detected

Open: An open circuit condition has been detected

\* After correcting the condition, cycle the key switch On-Off-On

\*\*After correcting the condition, cycle the key switch On-Off-On, start the engine, then cycle the key switch On-Off-On.

# Troubleshooting

<b>Problem: Spark absent or weak</b>	
<b>Condition</b>	<b>Remedy</b>
1. Ignition coil defective 2. Spark plug(s) defective 3. CKP sensor defective 4. ECM defective	1. Replace ignition coil 2. Replace plug(s) 3. Replace CKP sensor 4. Replace ECM
<b>Problem: Spark plug fouled with carbon</b>	
<b>Condition</b>	<b>Remedy</b>
1. Gasoline incorrect 2. Air cleaner element dirty 3. Spark plug(s) incorrect (too cold) 4. Valve seals cracked - missing 5. Oil rings worn - broken	1. Change to correct gasoline 2. Clean element 3. Replace plug(s) 4. Replace seals 5. Replace rings
<b>Problem: Spark plug electrodes overheat or burn</b>	
<b>Condition</b>	<b>Remedy</b>
1. Spark plug(s) incorrect (too hot) 2. Engine overheats 3. Spark plug(s) loose	1. Replace plug(s) 2. Service cooling system 3. Tighten plug(s)
<b>Problem: Battery does not charge</b>	
<b>Condition</b>	<b>Remedy</b>
1. Lead wires/connections shorted - loose - open 2. Stator coils shorted - grounded - open 3. Regulator/rectifier shorted	1. Repair - replace - tighten lead wires 2. Replace stator coils 3. Replace regulator/rectifier
<b>Problem: Battery charges, but charging rate is below the specification</b>	
<b>Condition</b>	<b>Remedy</b>
1. Lead wires shorted - open - loose (at terminals) 2. Stator coils grounded - open 3. Regulator/rectifier defective 4. Cell plates (battery) defective	1. Repair - tighten lead wires 2. Replace stator coils 3. Replace regulator/rectifier 4. Replace battery
<b>Problem: Magneto overcharges</b>	
<b>Condition</b>	<b>Remedy</b>
1. Battery short circuited 2. Regulator/rectifier defective 3. Regulator/rectifier poorly grounded	1. Replace battery 2. Replace regulator/rectifier 3. Clean - tighten ground connection
<b>Problem: Charging unstable</b>	
<b>Condition</b>	<b>Remedy</b>
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
<b>Problem: Starter does not engage</b>	
<b>Condition</b>	<b>Remedy</b>
1. Battery charge low 2. Switch contacts defective 3. Starter motor brushes not seating 4. Starter relay defective 5. Wiring connections loose - disconnected 6. Start-in-gear/neutral relay defective	1. Recharge - replace battery 2. Replace switch 3. Replace starter 4. Replace relay 5. Connect - tighten - repair connections 6. Replace relay
<b>Problem: Battery "sulfation" (Acidic white powdery substance or spots on surfaces of cell plates)</b>	
<b>Condition</b>	<b>Remedy</b>
1. Charging rate too low - too high 2. Battery discharged	1. Replace battery 2. Charge battery
<b>Problem: Battery discharges too rapidly</b>	
<b>Condition</b>	<b>Remedy</b>
1. Charging system (charging operation) not set properly 2. Cell plates overcharged - damaged 3. Battery short-circuited 4. Electrical load too high	1. Check AC generator - regulator/rectifier - circuit connections 2. Replace battery - correct charging system 3. Replace battery 4. Reduce load
<b>Problem: Battery polarity reversed</b>	
<b>Condition</b>	<b>Remedy</b>
1. Battery incorrectly connected	1. Reverse connections - replace battery

# Drive System

## GENERAL INFORMATION

Gear cases are 4.0:1 ratio (500 or 3.6:1 ratio (700).

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)	9 ft-lb	8 ft-lb
M8 (Torx T-40 Recess)	28 ft-lb	23 ft-lb

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

## 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
Backlash Measuring Tool (24-Spline Axle)	0544-010
Backlash Measuring Tool (27-Spline Axle)	0544-011
CV Boot Clamp Tool	0444-120
Internal Hex Socket	0444-104
Pinion Gear/Shaft Removal Tool	0444-127
Gear Case Seal Installer Tool	0444-273
Hub Retaining Wrench	0444-270
U-Joint Separator Tool	0444-128

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

## Front Drive Actuator

**■NOTE:** The actuator is not a serviceable component. If it is defective, it must be replaced.

**■NOTE:** The actuator will operate only when the ignition switch is in the ON position.

The front drive actuator is located on the left side of the front differential input housing. With the engine stopped and the ignition switch in the ON position, a momentary "whirring" sound can be heard each time the drive select switch is shifted. If no sound is heard, see Electrical System. If the actuator runs constantly or makes squealing or grinding sounds, the actuator must be replaced.

### REMOVING

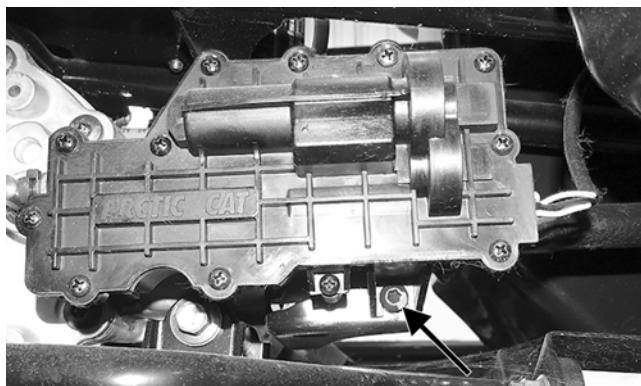
1. Select LOCK on the drive select switch; then disconnect the connector on the actuator harness. Remove the front six cap screws securing the skid plate to the frame.

2. Using a T-30 torx wrench, remove the mounting cap screw from the driveshaft side of the actuator.



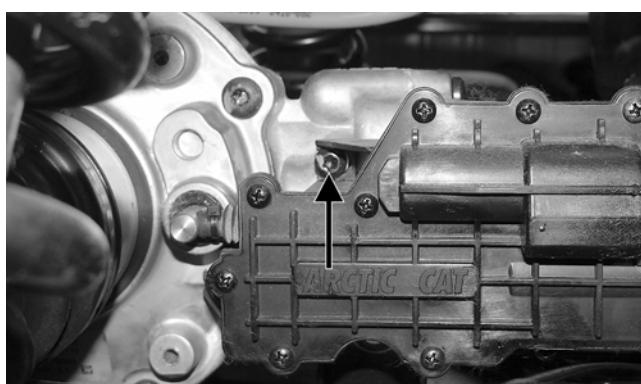
WC938A

3. Remove the mounting cap screw from below the actuator on the suspension side.



WC940A

4. Loosen but do not remove the mounting cap screw at the front of the actuator; then slide the actuator to the rear enough to clear the slotted mounting tab and the selector shaft. Remove through the bottom of the frame.

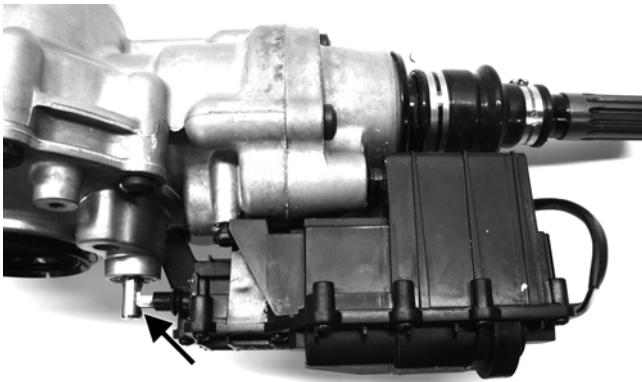


WC939A

### INSTALLING

1. Lubricate the O-rings on the actuator; then ensure all mounting surfaces are clean and free of debris.
2. Align the actuator with the selector shaft and slide it forward onto the shaft taking care to engage the cap screw in the slot of the front mounting tab.

**■NOTE:** Make sure to properly align the differential lock actuator lever with the hole in the differential lock plunger.



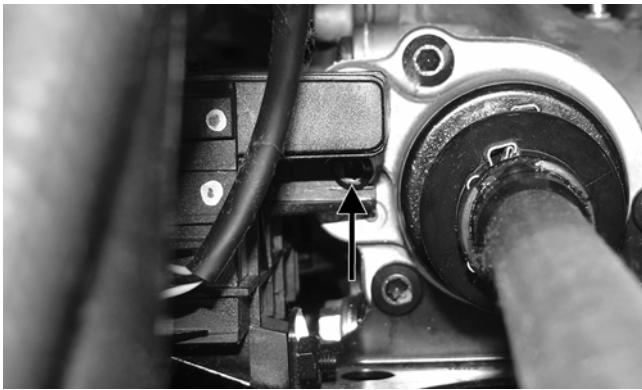
GC002A

3. While holding the actuator firmly forward, tighten the front cap screw to hold the actuator in place; then install but do not tighten the two remaining cap screws.



GC001

4. Loosen the front cap screw; then tighten the cap screw on the driveshaft side.



WC938A

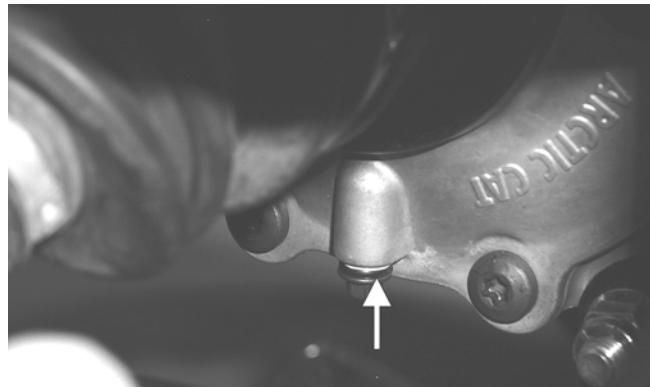
**■NOTE: It is important to tighten this cap screw while the others are loose to ensure proper seating of the actuator.**

5. Tighten the remaining cap screws; then connect the electrical plug to the main harness.
6. Turn the ignition switch to the ON position and check the operation by shifting the drive select switch several times.
7. Secure the wiring harness to the frame with a nylon cable tie; then install the inner fender panel.
8. Install the cap screws to secure the skid plate to the frame.

## Front Differential

### REMOVING

1. Remove the hubs (see Hub in this section).
2. Remove the belly panel.
3. Remove the drain plug and drain the gear lubricant into a drain pan; then install the plug and tighten to 45 in.-lb.



PR022A

4. Disconnect the front drive actuator connector from the main harness.



HDX291

5. Remove the lower and 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.



PR193

6. Pull the steering knuckle away from the axle.



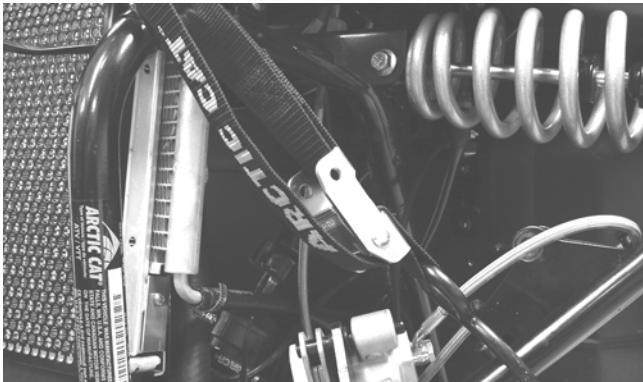
PR222

7. Support the axle to prevent it from dropping or hanging.

### CAUTION

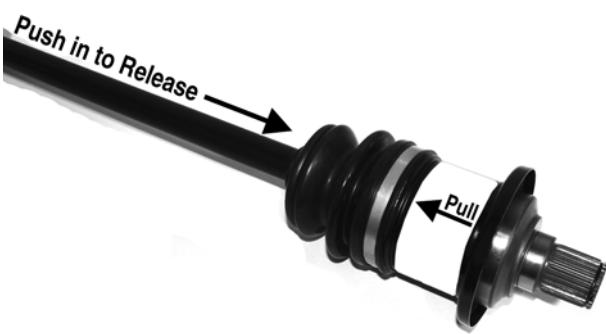
**The axle must be supported. If the axle is allowed to drop or hang, damage to the inner CV joint may occur.**

8. Remove the lower shock cap screws. Account for the lock nuts; then move the shocks and upper A-arm up and secure them with a strap.



PR200

9. Push the axle shaft toward the differential to release the "plunge" coupler; then remove the axle from the differential. Repeat for the opposite side.



PR729C

10. Remove the lower differential mounting cap screw. Account for a lock nut and washers.



HDX292

11. Remove the upper differential mounting cap screw. Account for a lock nut and two washers.



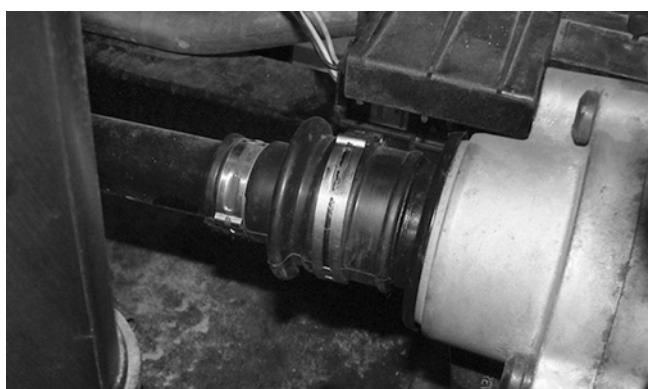
CD016

12. Match mark the front engine flange to the front differential flange. Remove the four cap screws.



HDX275

13. Remove the clamps from the front propeller shaft and gear case input shaft boot.



HDX276

14. Free the differential assembly from the frame mountings and separate from the front driveshaft; then lower the differential through the frame.

### Disassembling Input Shaft

■**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.

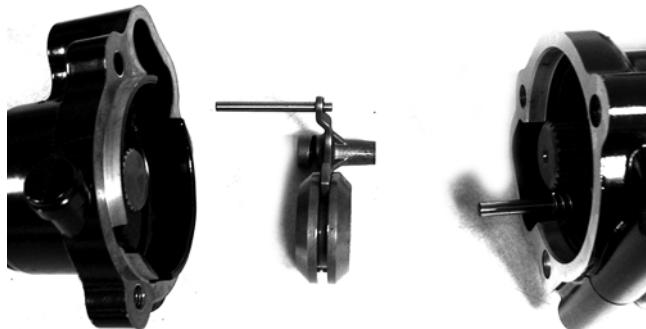


GC004A

2. Using a rubber mallet, remove the housing. Account for a gasket. Remove the fork, collar, and spring. Note the location of all the components for assembling purposes.



GC015



CD106

3. Remove the snap rings from the input shaft; then remove the input shaft from the pinion housing.



GC009A

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

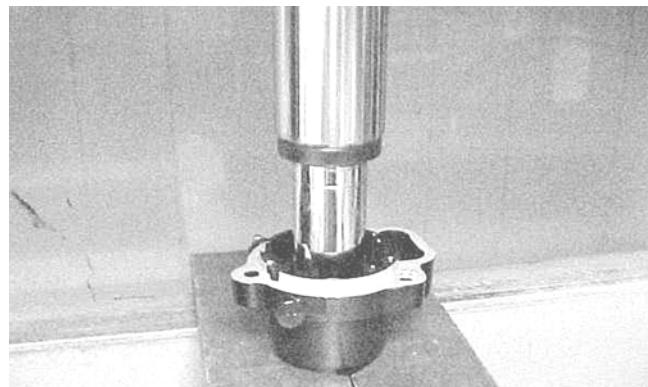


GC010

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



GC011



AF984



KX219

### Assembling Input Shaft

1. Place the pinion housing in a press and install the input shaft bearing. Secure the bearing with the existing snap ring making sure the sharp edge of the snap ring faces to the outside.



GC012



GC011



GC014

3. Lubricate the input shaft with High-Performance #2 Molybdenum Disulphide Grease packing the boot ribs and splines; then assemble allowing excess grease to freely escape. Slight pressure on the boot will be present during assembly. Secure with new clamps.

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

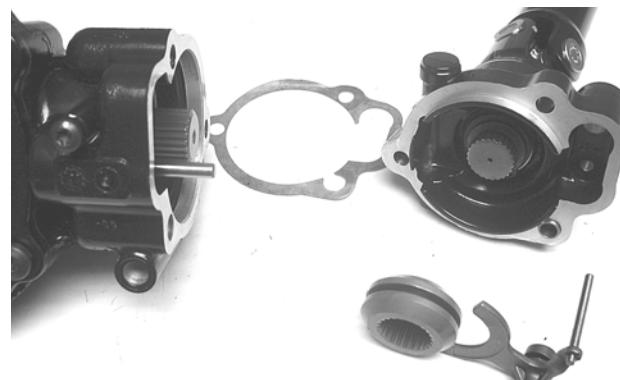
4. Install the input shaft into the pinion housing; then secure the bearing with a circlip.



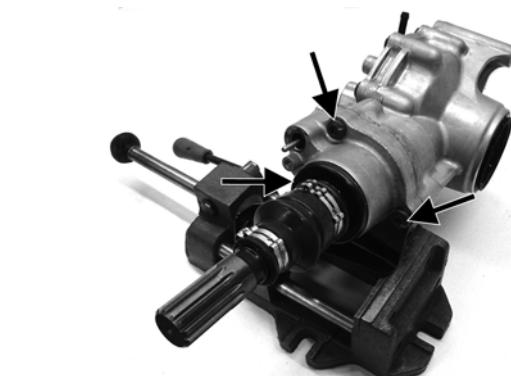
GC009A

5. Place the pinion housing with new gasket onto the differential housing; then secure with existing cap screws. Tighten to 23 ft-lb.

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



KX209



GZ004A

## Disassembling Differential Assembly

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

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



GC015

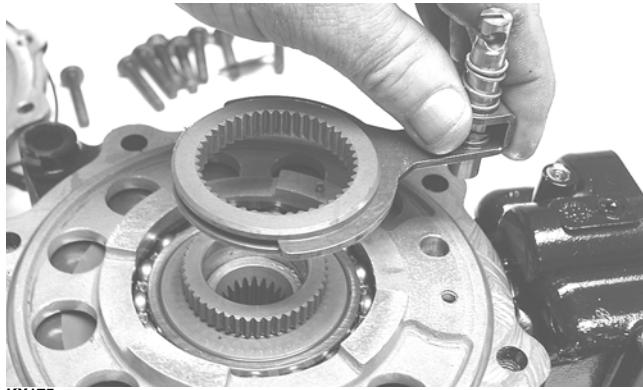
2. Using a T-40 torx wrench, remove the cap screws securing the differential cover.
3. Using a plastic mallet, tap lightly to remove the differential cover. Account for an O-ring.



KX174

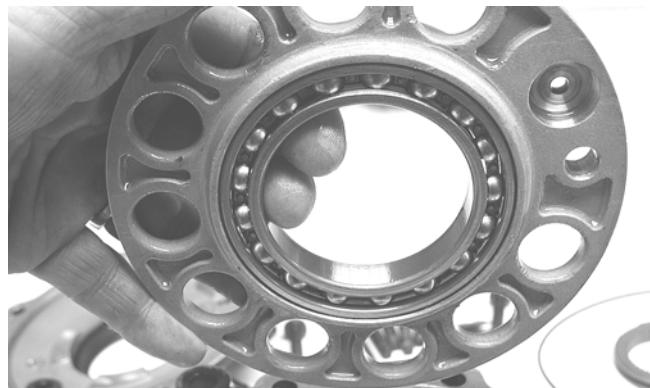
■**NOTE:** If the cover is difficult to remove, pry on the cover in more than one recessed location.

4. Remove the splined coupler, shifter fork, pin, and spring of the differential lock assembly and set aside. Note position of parts for assembling purposes.



KX175

5. Remove the left differential bearing flange assembly and account for a shim. Mark the shim as left-side.



KX177

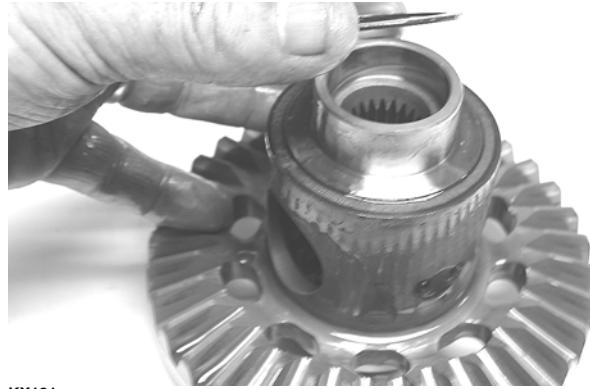


KX178

6. Place the differential with the open side down; then lift the housing off the spider assembly. Account for shim(s) and mark as right-side.



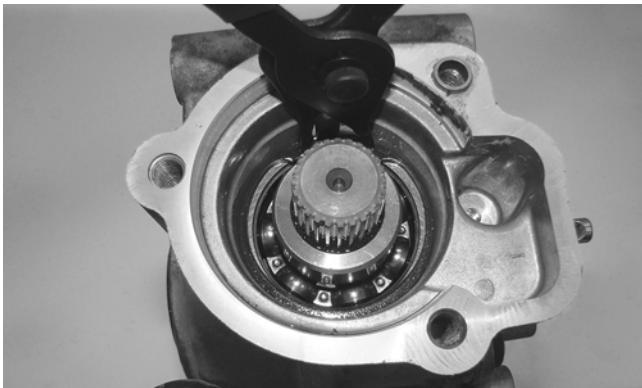
KX179



KX181

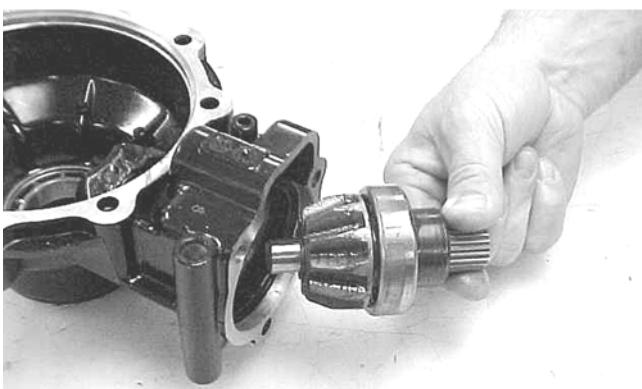
## Disassembling Pinion Gear

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



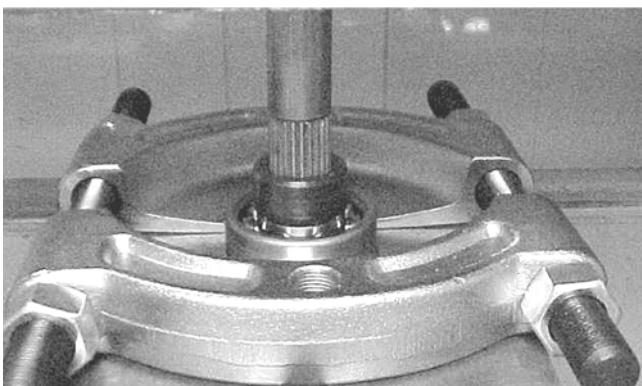
WC430

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



CC878

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

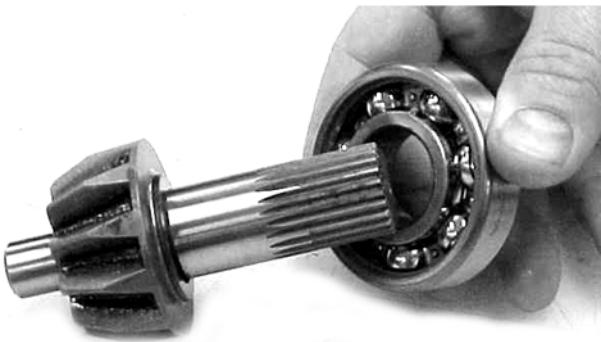


CC879

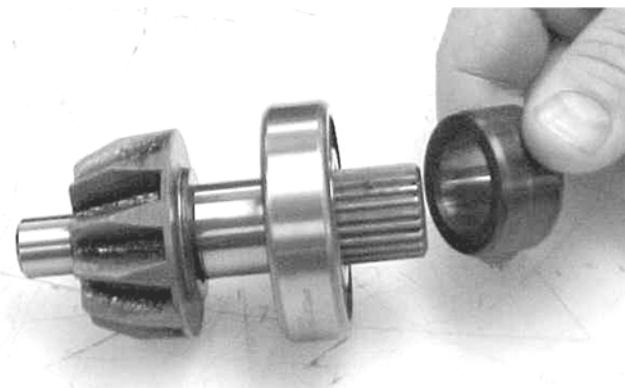
4. Remove any reusable parts from the gear case housing; then discard the housing and lock collar.

### **Assembling Pinion Gear**

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

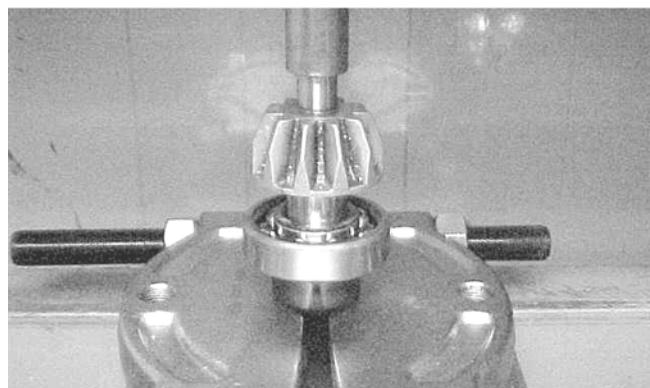


CC882



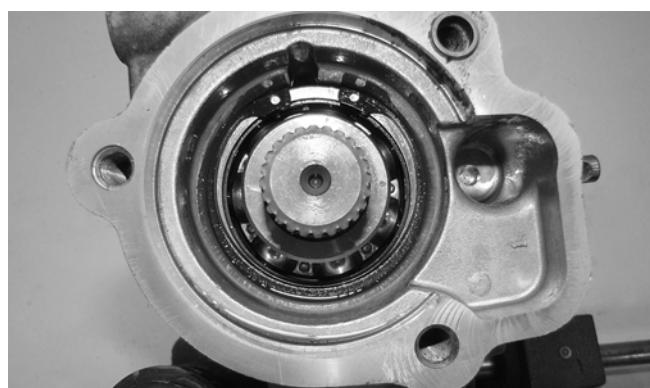
CC883

2. Place the pinion assembly in a bearing puller; then install the bearing using a press.



CC884

3. Using a propane torch, heat the gear case housing to approximately 200° F; then install the pinion assembly.
4. Install the internal snap ring with the sharp side directed away from the bearing.



WC429

## Shimming Procedure/Shim Selection

Case-Side Shims (Backlash)		
p/n	mm	in.
0402-405	1.3	0.051
0402-406	1.4	0.055
0402-407	1.5	0.059
0402-408	1.6	0.063
0402-409	1.7	0.067

Cover-Side Shims (Ring Gear End-Play)		
p/n	mm	in.
1402-074	1.3	0.051
1402-075	1.4	0.055
1402-076	1.5	0.059
1402-077	1.6	0.063
1402-078	1.7	0.067

It is very important to adjust bevel gears for the proper running tolerances. Gear life and gear noise are greatly affected by these tolerances; therefore, it is very important to properly adjust any gear set prior to final assembly.

The following procedure can be used on both front differential or rear drive gear case.

**■NOTE: All bearings must be installed in the gear case and the pinion properly installed before proceeding.**

### Backlash

**■NOTE: Always set backlash prior to any other shimming.**

1. Install the existing shim or a 0.051-0.055-in. shim on the gear case side of the ring gear assembly.



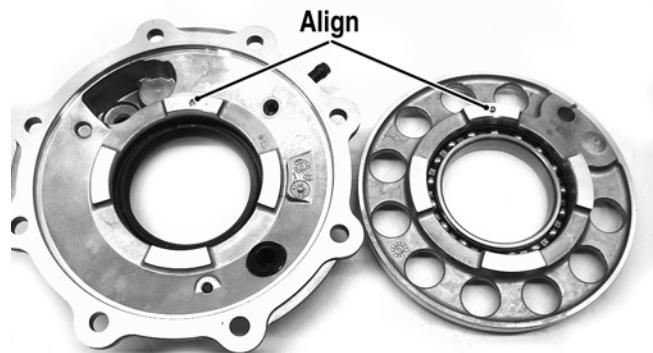
GC031A

2. Install the ring gear with shim in the gear case; then while holding the pinion stationary, rock the ring gear forward and back to determine if any backlash exists. If no backlash exists, install a thicker shim and recheck.



GC036A

3. Install the bearing flange onto the gear case cover making sure the alignment/locating pin engages the locating hole in the cover; then make sure the bearing flange is completely seated in the cover.



GC032A



GC033A

4. Install the existing shim or a 0.063 in. shim on the cover side of the ring gear; then place the assembled gear case cover onto the gear case and secure with three cap screws. Tighten evenly using a crisscross pattern.

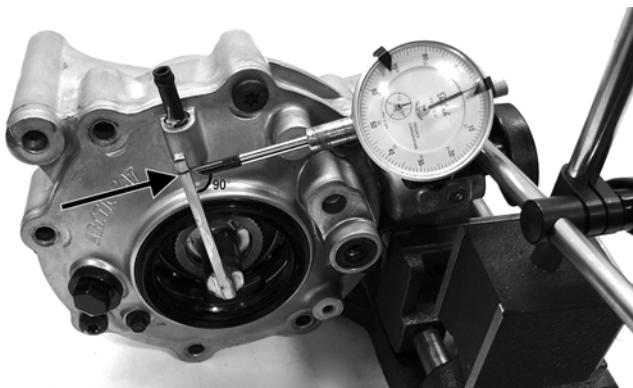


GC036B

5. Place the appropriate Backlash Measuring Tool into the splines of the ring gear and install a dial indicator making sure it contacts the gauge at a 90° angle and on the index mark.



GC040



GC039A

6. 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.

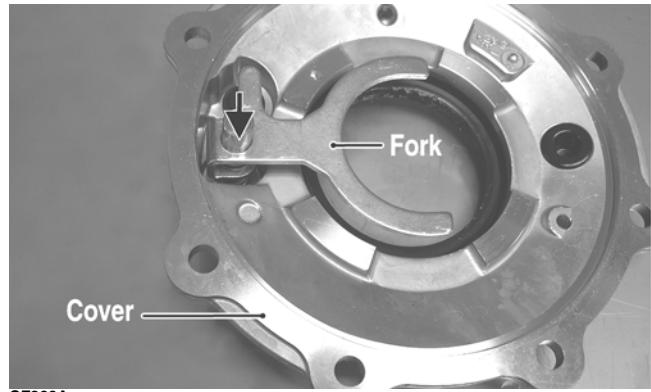
■**NOTE:** Once proper backlash and end play are established, the gear case can be assembled.

### 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



CF266A



GC020

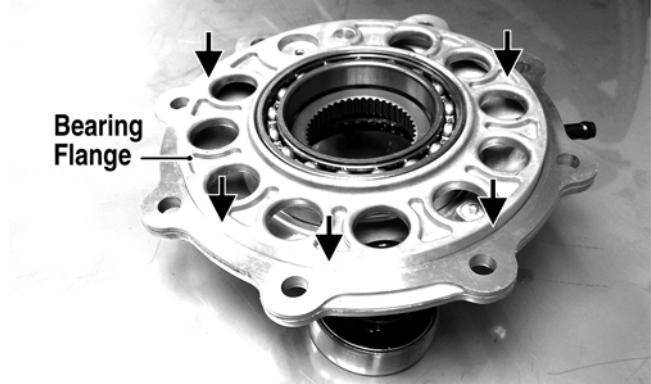
2. Place the selected (end-play) shim, chamfered side toward the gear, onto the cover side of the ring gear.



GC036B

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

3. Assemble the fork and sliding collar into the cover assembly; then install the left bearing flange/bearing assembly and seat firmly into the cover.



CF267A

4. Apply a liberal coat of grease to the O-ring; then install it on the assembled cover assembly making sure to seat the O-ring completely down around the circumference of the bearing flange.



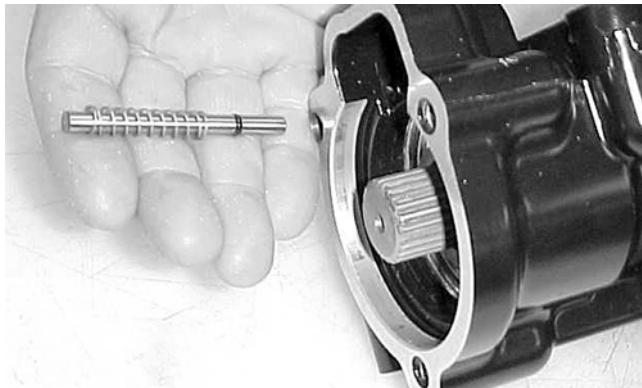
CF275A

5. Making sure the O-ring is properly positioned on the differential housing cover assembly, install the cover with existing cap screws (coated with green Loctite #270). Tighten the cap screws evenly to 23 ft-lb.

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

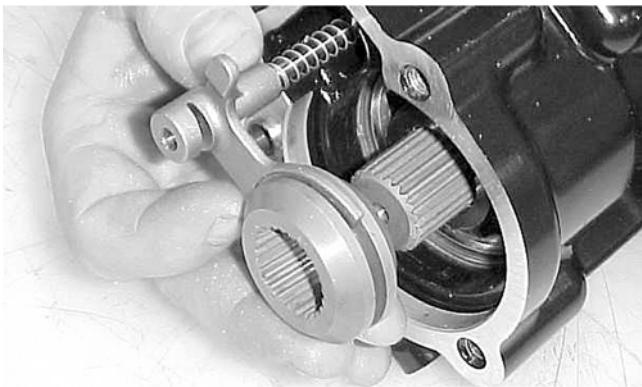
**■NOTE: If a new housing is being installed, tighten the cap screws to 28 ft-lb.**

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



CC892

7. Install the shift fork assembly making sure the fork leg is facing upward. Apply a small amount of oil to the gasket; then install the gasket.



CC893

8. Place the input shaft assembly onto the gear case housing; then secure with the existing cap screws. Tighten to 23 ft-lb.

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



CD103

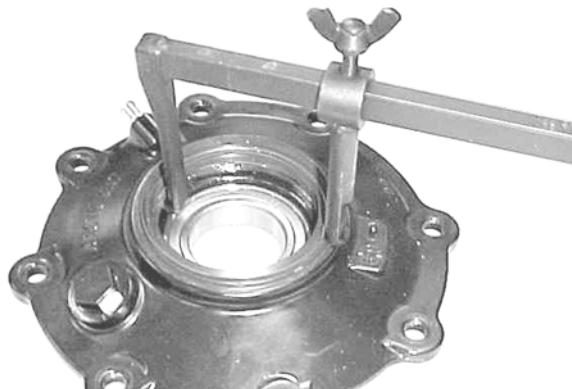


CD110

### **Removing/Installing Axle Seal**

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

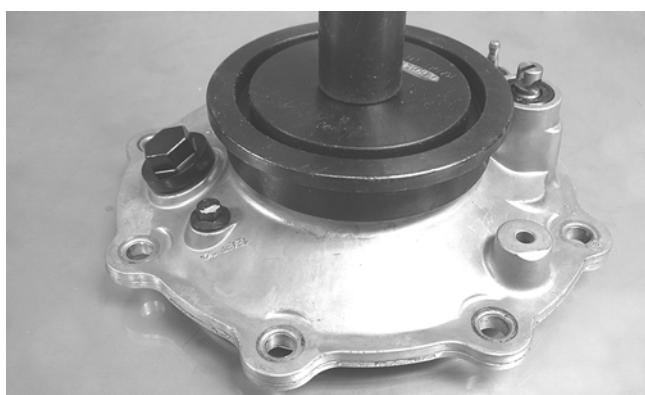
1. Remove the seal using a seal removal tool.



CC899

**■NOTE: Prior to installing the seal, apply High-Performance #2 Molybdenum Disulphide grease to the seal outside diameter.**

2. Using Gear Case Seal Installer Tool, evenly press the seal into the cover bore until properly seated.



CF278

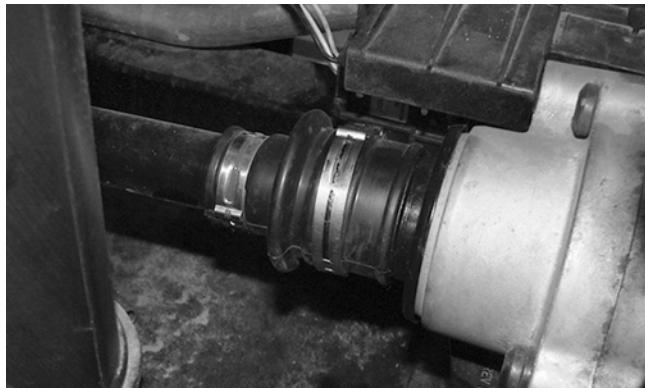
### **CAUTION**

**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 differential assembly into position in the frame engaging the front propeller shaft; then install the top mounting cap screw, two washers, and lock nut. Do not tighten at this time.



HDX276

2. Install the lower differential mounting cap screw, washers, and lock nut. Note the correct location for the washers. Tighten to 38 ft-lb.



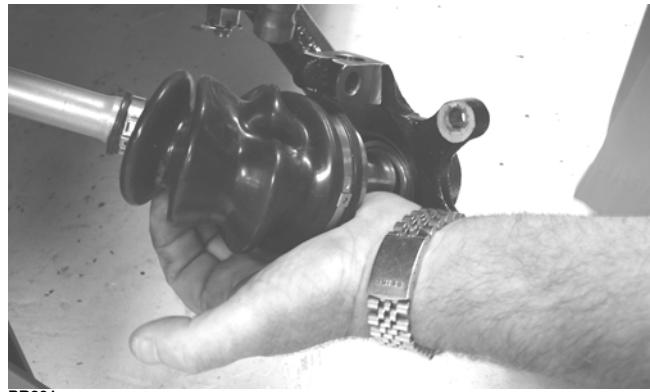
HDX292

3. Pour 275 ml (9.3 fl oz) of SAE 80W-90 hypoid lubricant into the differential and install the fill plug. Tighten to 16 ft-lb.
4. Align the scribed match marks on the front input drive flange and the front engine flange; then secure with the cap screws tightened to 20 ft-lb.



HDX275

5. Install the front axles.
6. Install the knuckle assemblies onto the axles and ball joints; then secure with four cap screws taking care not to damage the threads when installing. Tighten to 35 ft-lb.



PR201



PR193

7. Secure the lower shock eyelets with cap screws and lock nuts. Tighten to 35 ft-lb.



HDX293

8. Connect the front drive actuator connector to the main harness; then secure the wires to the frame with nylon ties.
9. Apply a light coat of multi-purpose grease to the hub splines; then install the hubs (see Hub in this section).
10. Install the wheels and 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).
11. Remove the vehicle from the support stand.
12. Install the belly panel.

## Drive Axles

### REMOVING REAR DRIVE AXLE

1. Remove the hubs (see Hub in this section).
2. Remove the cap screw and lock nut securing the knuckle to the upper A-arm. Discard the lock nut.



PR962

3. While holding the drive axle stationary, pull the top of the knuckle out and down until it is free of the drive axle.



PR963

4. Place a drain pan under the vehicle to contain any oil leakage; then pushing the axle shaft in, pull the axle assembly from the gear case.



PR729C

### REMOVING FRONT DRIVE AXLE

■**NOTE:** For removing a front drive axle, see Front Differential in this section.

### CLEANING AND INSPECTING AXLES

■**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.



CD019

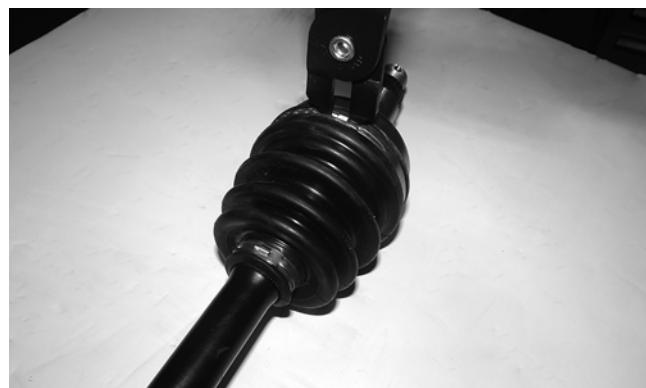
2. Inspect boots for any tears, cracks, or deterioration.

■**NOTE:** If a boot is damaged in any way, it must be replaced with a boot kit.

### 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.



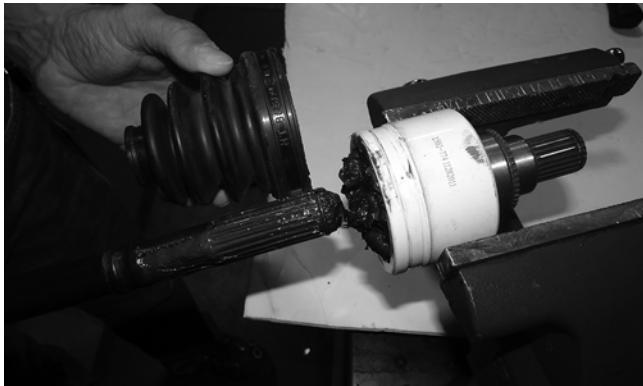
CF337

2. Place the white-striped end of the CV joint into a vise.



CF335

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



CF334

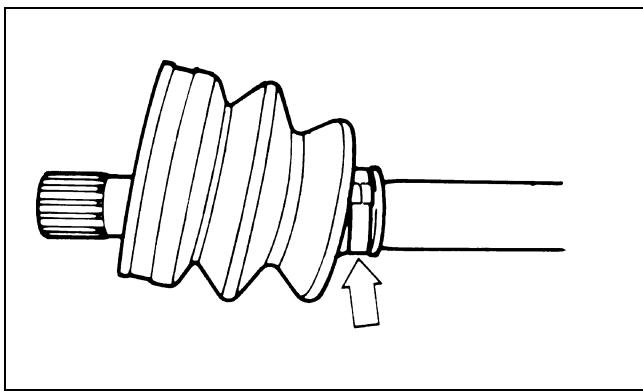
■**NOTE:** Steps 1-3 can be used to replace the outboard boot.

### ASSEMBLING AXLES

- Install the inner boot with the small clamp making sure the ends of the clamp are positioned correctly.

■**NOTE:** The boot is positioned correctly when the small end of the boot seats down into the recessed groove.

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



ATV-1048

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

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

■**NOTE:** In the outboard boot, use the final 40 grams (1/3 of contents) of grease from the pack in the bearing housing.

### INSTALLING REAR DRIVE AXLE

- Push the axle shaft into the CV coupler to release the lock ring; then slide the drive axle into place in the gear case.



PR729C

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

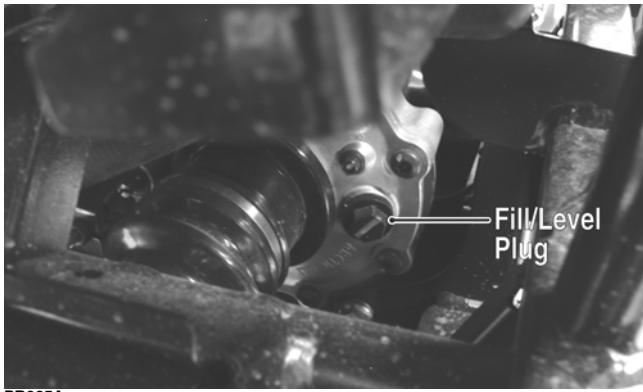
- Swing the knuckle up and onto the drive axle; then place the knuckle into place in the upper A-arm. Secure the knuckle to the A-arm with a cap screw and a new lock nut. Tighten to 35 ft-lb.
- Install the hubs (see Hub in this section).
- Install the wheels and using a crisscross pattern, tighten the 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).
- Remove the vehicle from the support stand and release the parking brake.

### INSTALLING FRONT DRIVE AXLE

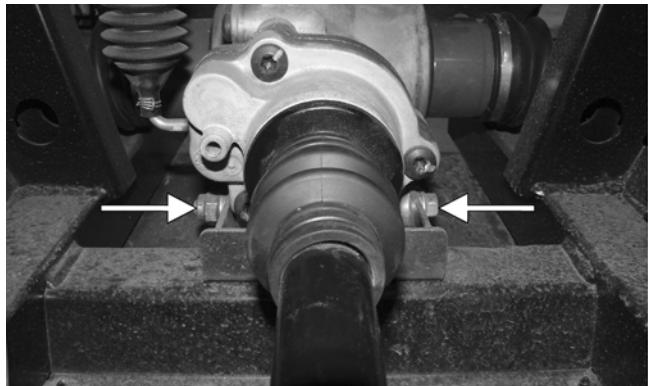
- Push the axle shaft into the CV coupler to release the lock ring; then position the drive axle in the gear case and steering knuckle; then insert the ball joints into the steering knuckles. Secure with cap screws tightened to 35 ft-lb.

- Secure the lower shock eyelet to the A-arm with a cap screw and a new lock nut. Tighten to 35 ft-lb.

- Install the hubs (see Hub in this section).
- Install the wheels and 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).
- Remove the vehicle from the support stand.
- Check the front differential lubricant level and add lubricant as necessary.



PR065A

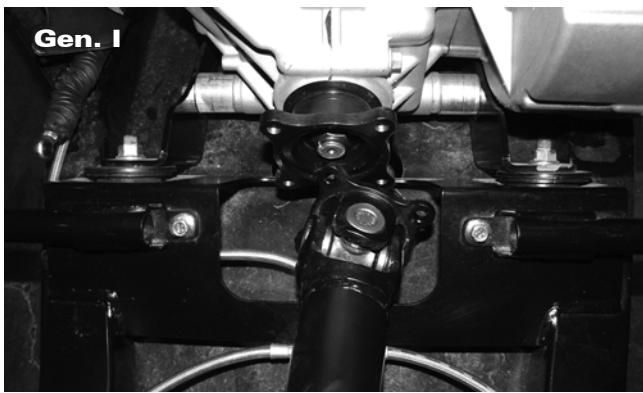


HDX278A

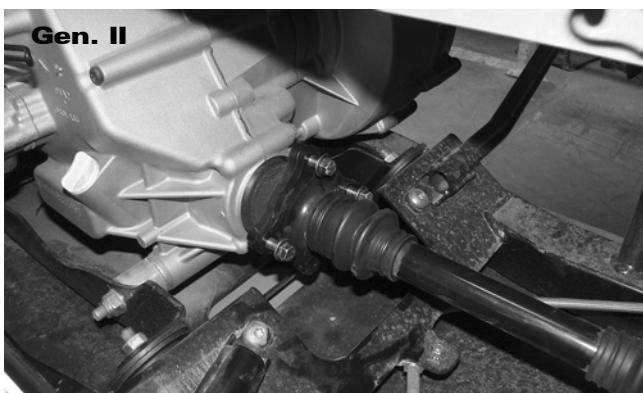
## Rear Gear Case

### REMOVING

1. Release the cargo box latch and allow the cargo box to tilt back; then remove the left side storage box.
2. Drain the lubricant from the rear gear case; then remove both rear drive axles.
3. Remove the four cap screws securing the driveline flange to the engine flange.

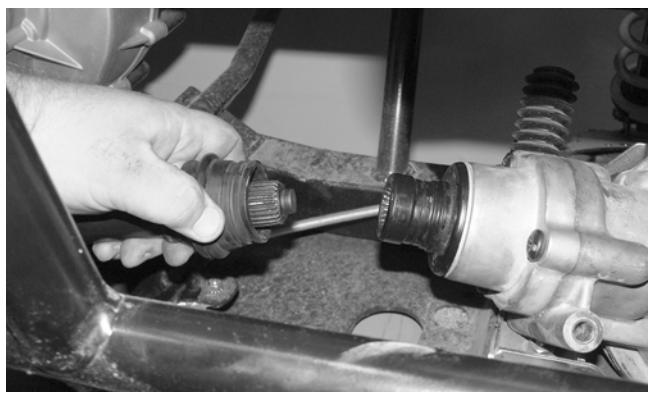


HDX157



HDX277

4. Remove the front and rear cap screws and lock nuts securing the rear gear case to the frame (Gen. I) or bracket (Gen. II). Account for the washers and their locations. Discard the lock nuts.



HDX279

5. Remove the driveshaft (Gen. I) or propeller shaft (Gen. II) from the rear gear case. Account for the driveshaft bumper (Gen. II).



HDX280

### AT THIS POINT

For servicing the input shaft, pinion gear, needle bearing, ring gear, and axle seals, 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.

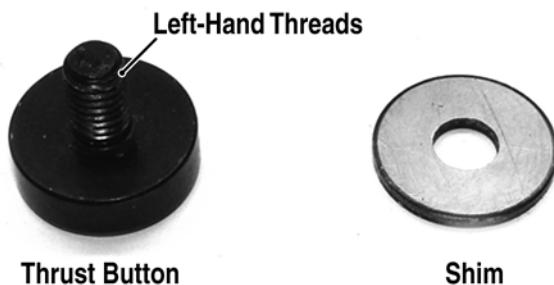
## Inspecting

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.

## Installing/Shimming

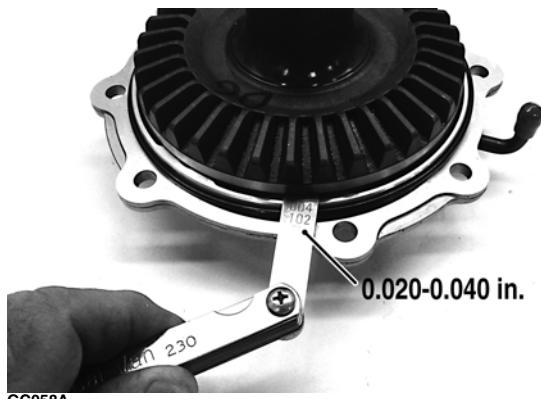
**■NOTE:** Ring gear clearance must be adjusted prior to selecting shim for the thrust button.

1. Install the thrust button with shim into the gear case cover and tighten securely (left-hand threads).



GC057A

2. Place the ring gear with selected shim into the cover and measure the ring gear to thrust button clearance with a thickness gauge. Clearance should be 0.020-0.040 in.



GC058A

3. If clearance is as specified, remove the ring gear and thrust button; then place a drop of red Loctite #271 on the threads and tighten to 8 ft-lb (left-hand threads).
4. If clearance is not as specified, repeat steps 1 and 2 using thicker shim (clearance too great) or thinner shim (clearance too small) until correct specification is reached.

## REAR DRIVE INPUT SHAFT/HOUSING

### Removing/Disassembling

1. Remove the cap screws securing the rear drive input shaft/housing to the rear gear case; then remove the input housing assembly.



GZ183

2. Remove the input shaft from the input housing; then remove the oil seal.



GZ180



GZ182A

3. Remove the snap ring retaining the input bearing and using an appropriate bearing driver, press the bearing from the housing.



GZ184A

## Cleaning and Inspecting

1. Wash all parts in parts cleaning solvent and dry with compressed air.

### ⚠️ WARNING

Always wear safety glasses when working with compressed air.

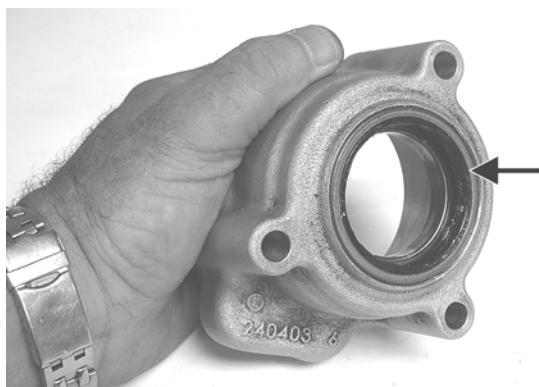
2. Clean all gasket material and sealant from mating surfaces.
3. Inspect bearings, shafts, and housing for excessive wear, cracks, or discoloration.

## Assembling/Installing

1. Install a new bearing into the input housing and secure with the snap ring (flat side directed away from bearing).



2. Using a suitable seal driver, install a new oil seal into the front of the input housing until the seal is flush with the housing.



3. Apply grease to the lips of the oil seal; then install the input shaft into the input bearing and housing.



4. Using a new gasket, install the assembled rear drive input shaft/housing onto the rear drive gear case and secure with the three cap screws. Tighten to 23 ft-lb.

### ⚠️ AT THIS POINT

For servicing the input shaft, pinion gear, needle bearing, and axle seal, see Front Differential in this section.

## INSTALLING

1. Slide the gear case into position down through the upper-right side of the frame; then align the driveline splines to the gear case input coupler and engage the driveshaft and gear case.
2. Lubricate the splines of the driveshaft with the appropriate grease; then align and engage the driveline flange to the engine flange. Tighten to 20 ft-lb.
3. Secure the differential to the frame/frame bracket with two through-bolts and secure with lock nuts and flat washers. Tighten to 38 ft-lb.
4. Install the rear drive axles; then install the brake calipers and tighten the new “patch-lock” cap screws to 20 ft-lb.
5. Fill the gear case with the appropriate lubricant; then install the left side storage box.

## Hub

## REMOVING

1. Secure the vehicle on a support stand to elevate the wheel; then remove the wheel(s).

■**NOTE: The jack stands should be placed under the main frame to avoid contact with front suspension components.**

■**NOTE: Removing or tightening of the hub nuts requires the axles be locked. To lock the rear axle, place the transmission in park. To lock the front axle, turn the ignition switch to ON and select LOCK on the drive select switch; then place the transmission in park and turn the ignition switch to OFF.**

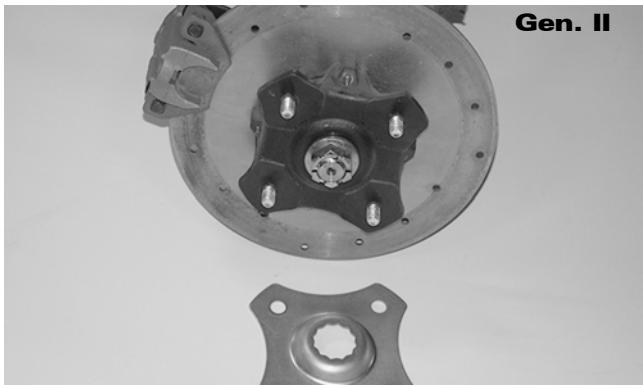
### ⚠️ WARNING

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

2. Remove the cotter pin from the axle (Gen. I) or hub retaining plate (Gen. II). Discard the cotter pins.



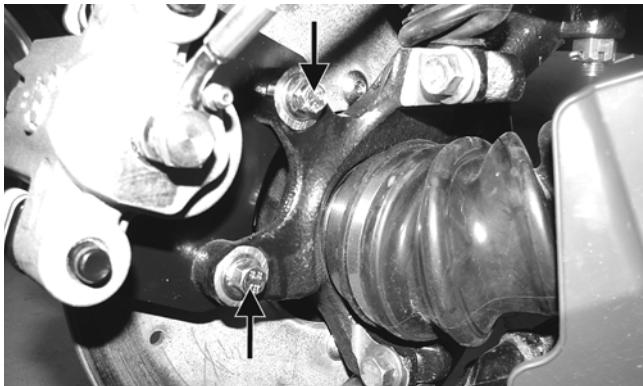
PR257



PR960

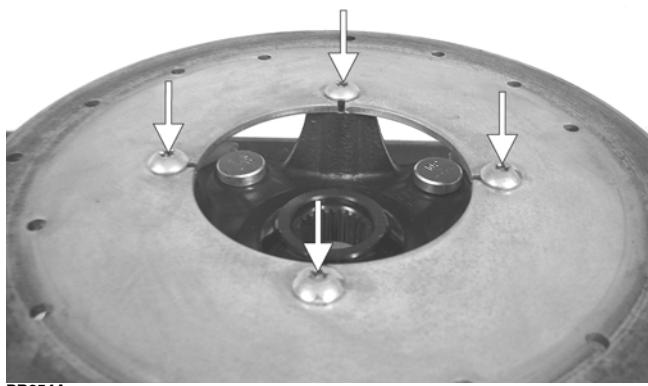
3. Remove the hub nut securing the hub.
4. Remove the brake caliper(s).

**■NOTE: It is not necessary to remove the brake hoses from the calipers for this procedure.**



PR264A

5. Remove the hub assembly.
6. Remove the four cap screws securing the brake disc.



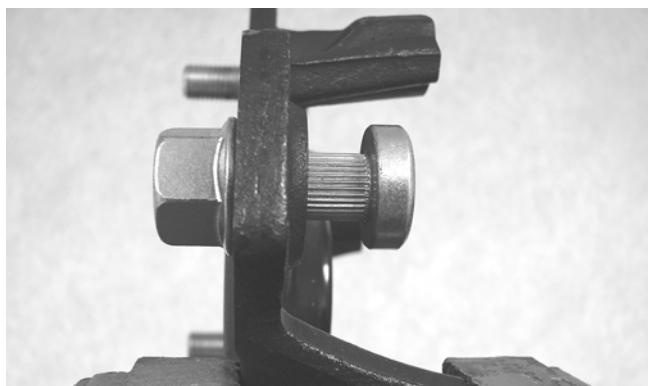
PR254A

## CLEANING AND INSPECTING

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

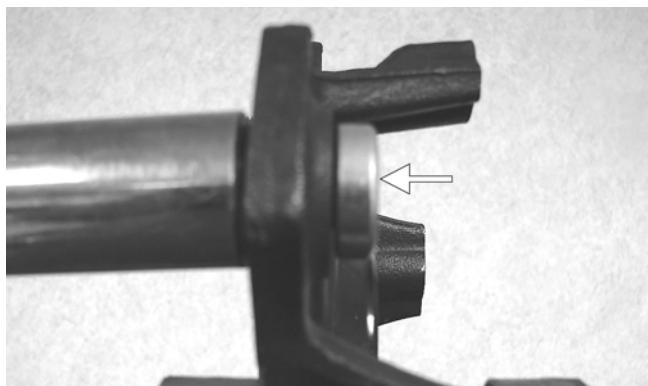
## REPLACING WHEEL STUDS

1. Secure the hub in a suitable holding fixture and remove the brake disc (if applicable).
2. Drive the damaged stud out of the hub; then place the new stud into the hub and thread on an appropriate flange nut.



PR250

3. Using a socket and ratchet handle, tighten the nut until the stud is fully drawn into the hub.



PR252A

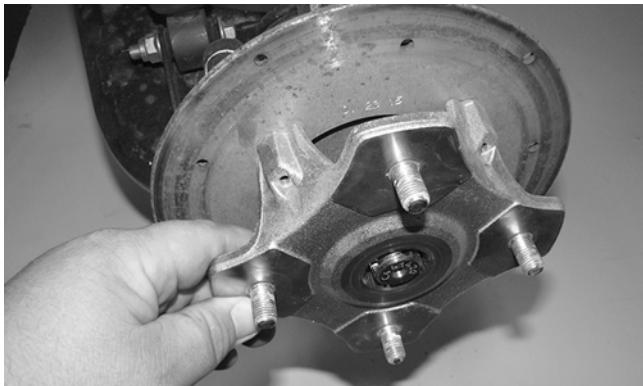
## INSTALLING

1. Secure the brake disc (if applicable) to the hub with the four cap screws coated with red Loctite #271. Tighten to 15 ft-lb.
2. Apply grease to the splines in the hub.



PR254B

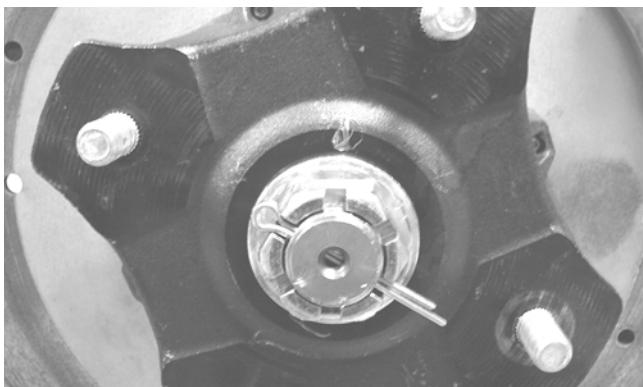
3. Install the hub assembly onto the axle; then place the transmission in park.



PR961

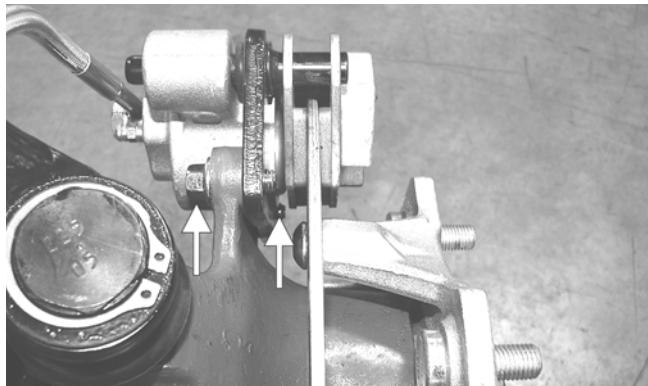
4. Secure the hub assembly with the nut. Tighten to 200 ft-lb; then secure with a new cotter pin (Gen. I) or install the hub retaining plate (Gen. II).

**■NOTE: If the cotter pin or hub retaining plate cannot be inserted due to misalignment of the hole in the axle and the slots in the nut, tighten the nut until properly aligned.**



PR258

5. Secure the brake calipers to the knuckle with two new "patch-lock" cap screws tightened to 20 ft-lb.



PR377B

6. Install the wheels and 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).
7. Remove the vehicle from the support stand.

## Hydraulic Brake Caliper

### ⚠ WARNING

Arctic Cat recommends only authorized Arctic Cat ROV dealers perform hydraulic brake service. Failure to properly repair brake systems can result in loss of control causing severe injury or death.

### REMOVING/DISASSEMBLING

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

### ⚠ WARNING

Make sure the vehicle 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 pedal.



PR235

## CAUTION

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

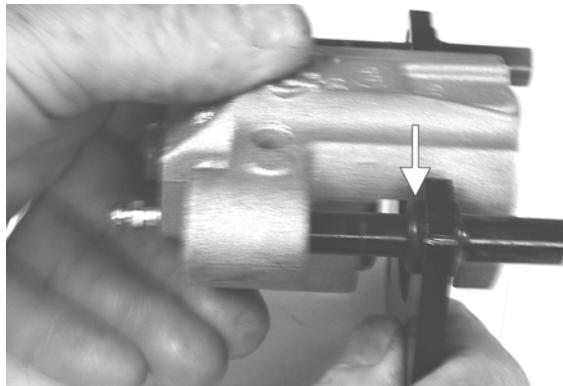


PR237A



PR238

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 - Hydraulic Brake System.**

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

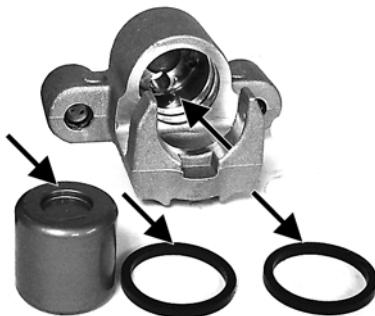
1. Install new seals into the brake caliper housing and apply a liberal amount of DOT 4 brake fluid to the cylinder bore of the housing, seals, and brake piston.

### 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.

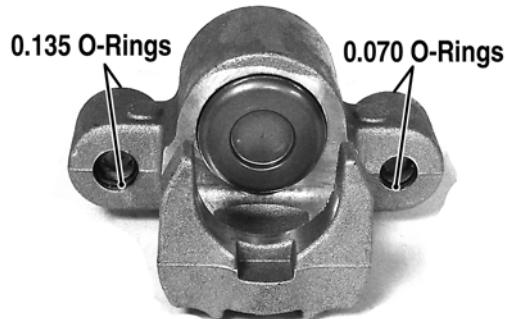


PR711A



PR712

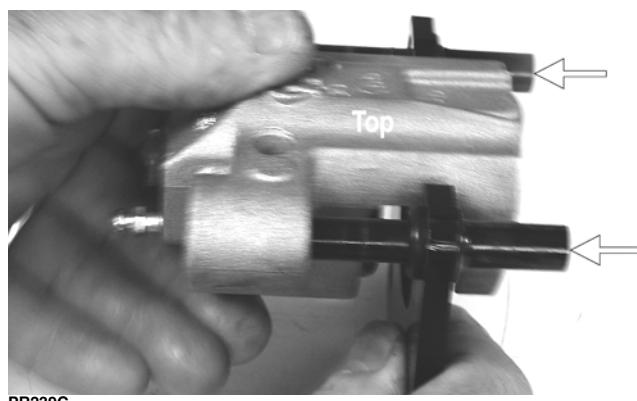
3. Apply high-temperature silicone grease (supplied with the O-ring kit) to the inside of the caliper holder bores and O-rings; then install the four O-rings into the caliper.



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

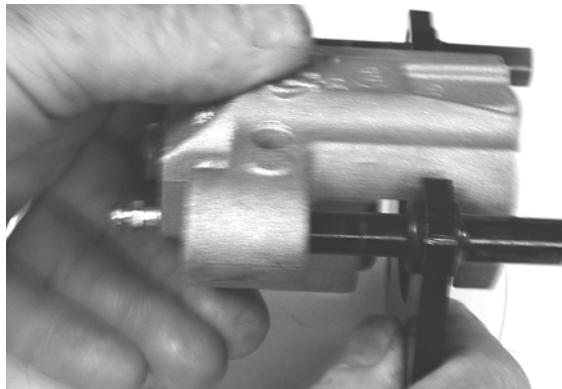
- Making sure brake fluid does not contact the brake pads, compress the caliper holder toward the caliper and install the inner brake pad; then install the outer pad.

### 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

- Place the brake caliper assembly into position and secure with new "patch-lock" cap screws. Tighten the caliper to 20 ft-lb.
- Place a new crush washer on each side of the brake hose fitting and install it on the caliper. Tighten to 20 ft-lb.
- Fill the reservoir; then bleed the brake system (see Periodic Maintenance/Tune-Up - Hydraulic Brake System).

### 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.

- Install the wheels and 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).
- Remove the vehicle from the support stand and verify brake operation.

## MASTER CYLINDER ASSEMBLY

■**NOTE:** The master cylinder is a non-serviceable component; it must be replaced as an assembly.

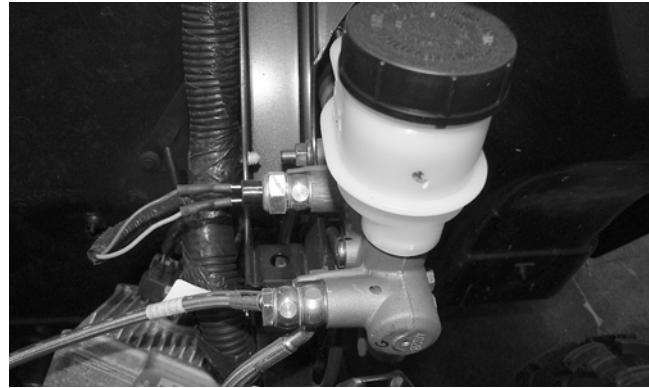
### Removing

- 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 until the reservoir is empty.



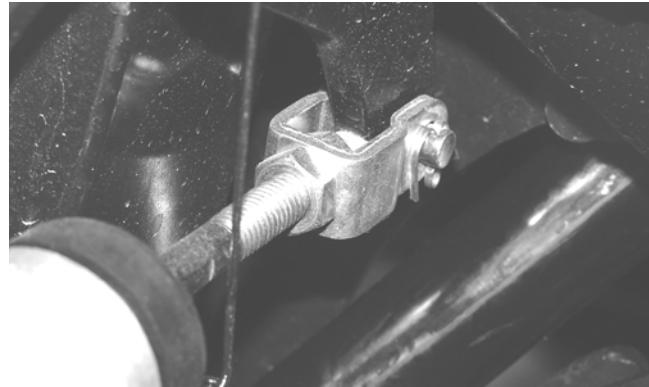
AF637D

- Remove the banjo bolt and brake switch securing the banjo-fittings to the master cylinder.



PR947

- Remove the cotter pin and pivot pin from the yoke; then remove two cap screws and flange nuts securing the master cylinder assembly to the frame.



PR338



PR336

4. Remove the master cylinder. Discard the three crush washers.

### CAUTION

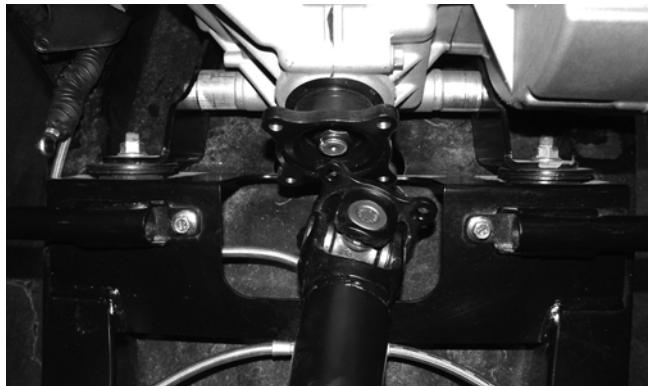
**Brake fluid is highly corrosive. Do not spill brake fluid on any surface of the vehicle.**

### Inspecting

1. Inspect the master cylinder push rod and clevis for wear, bending, or elongation of clevis holes.
2. Inspect the push rod boot for tears or deterioration.
3. Inspect the reservoir for cracks and leakage.
4. Inspect the brake hose for cracks and deterioration and the condition of the banjo-fittings.

### Installing

1. Secure the master cylinder assembly to the frame with two cap screws and two flange nuts. Tighten to 25 ft-lb.
2. Using new crush washers, secure the banjo-fittings to the master cylinder with a new banjo bolt and the existing brake switch. Tighten to 20 ft-lb.
3. Install the pivot pin and secure with a new cotter pin.
4. Fill the master cylinder and bleed the brake system (see Hydraulic Brake System in the Periodic Maintenance/Tune-Up section).



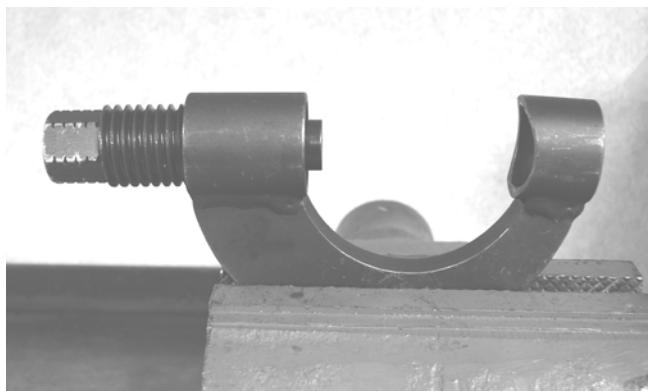
HDX157

4. Install U-Joint Separator Tool on the universal joint fixed yoke; then remove the bearing cup retainers.
5. Using a suitable socket and ratchet handle, rotate the jackscrew to push the bearing cup out of the yoke; then remove the tool and the bearing cup.



PR359

6. Install the separator tool on the opposite side of the yoke to push the second bearing cup from the yoke; then remove the tool and separate the universal joint.
7. Secure the separator tool in a vise and repeat steps 4-6 to remove the bearing cups from the movable yoke.



PR375

### INSPECTING

1. Inspect the yoke bores for damage or signs of bearing cup looseness. If bearing cups are loose, the yoke must be replaced.

## Universal Joints (Gen. I)

### REMOVING

**■NOTE: The universal joints can be accessed by removing the belly panel (see Steering/Body/Controls).**

1. Support the vehicle on suitable jack stands elevated high enough to allow working from the underside of the vehicle.
2. To aid in installing, match mark drive-line components prior to removing.
3. Remove the cap screws securing the driveshaft flange to the output flange; then remove the driveshaft.



PR367B

2. Check that yoke legs are parallel.



PR367A

3. Check splines and flanges for excessive wear, thread damage, or warpage.



PR367C

## INSTALLING

1. Remove the bearing cups from the universal joint; then insert the joint into the yoke and install one bearing cup on the joint.

### CAUTION

Care must be taken when installing bearing cups that the needle bearings stay in place or severe damage to the universal joint will occur.



PR368

2. Secure U-Joint Separator Tool in a vise; then place the yoke, joint, and bearing cup into position and press the cup into the yoke.

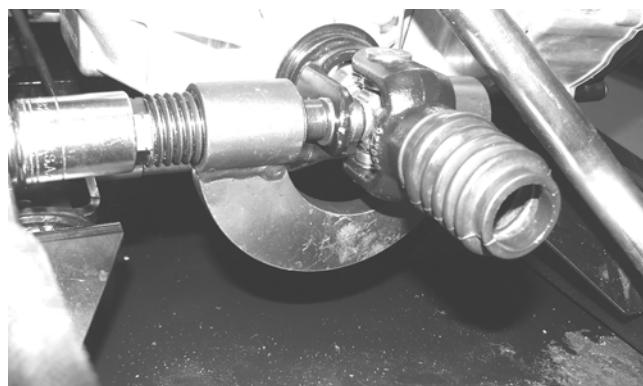


PR374

3. Install the retainer in the bearing cup; then remove the yoke from the separator tool.

■**NOTE: Repeat steps 2-3 for the opposite-side bearing cup.**

4. Remove the separator tool from the vise and install the universal joint, bearing cups, and movable yoke into the fixed yoke using the same procedure as steps 2-3 except the vise cannot be used.



PR355

5. Check that the universal joint can be flexed freely without binding; then apply multi-purpose grease to the splines and install the driveshaft noting the match marks made prior to removing.

## Troubleshooting Drive System

### Problem: Power not transmitted from engine to wheels

Condition	Remedy
1. Rear axle shaft serration worn - broken	1. Replace shaft

### Problem: Power not transmitted from engine to either front wheel

Condition	Remedy
1. Secondary drive - driven gear teeth broken 2. Propeller shaft serration worn - broken 3. Coupling damaged 4. Coupling joint serration worn - damaged 5. Front drive - driven bevel gears broken - damaged 6. Front differential gears/pinions broken - damaged 7. Front drive actuator not operating	1. Replace gear(s) 2. Replace shaft 3. Replace coupling 4. Replace joint 5. Replace gear(s) 6. Replace gears - pinions 7. Replace fuse - drive select switch - front drive actuator

## Troubleshooting Brake System

### Problem: Braking poor

Condition	Remedy
1. Pad worn 2. Brake fluid leaking 3. Master cylinder/brake cylinder seal worn	1. Replace pads 2. Repair - replace hydraulic system 3. Replace seal(s)

### Problem: Brake pedal travel excessive

Condition	Remedy
1. Brake fluid low 2. Piston seal - cup worn	1. Add fluid to proper level 2. Replace seal - cup

### Problem: Brake fluid leaking

Condition	Remedy
1. Connection fittings loose 2. Hose cracked 3. Piston seal worn	1. Tighten fittings 2. Replace hose 3. Replace seal

### Problem: Brake pedal spongy

Condition	Remedy
1. Air trapped in hydraulic system 2. Brake fluid low	1. Bleed hydraulic system 2. Add brake fluid and bleed hydraulic brake system

# Suspension

The following suspension system components should be inspected periodically to ensure proper operation.

- A. Shock absorber rods bent, pitted, or damaged.
- B. Rubber damper cracked, broken, or missing.
- C. Shock absorber body damaged, punctured, or leaking.
- D. Shock absorber eyelets broken, bent, or cracked.
- E. Shock absorber eyelet bushings worn, deteriorated, cracked, or missing.
- F. Shock absorber spring broken or sagging.
- G. Sway bar mountings tight and bushings secure.

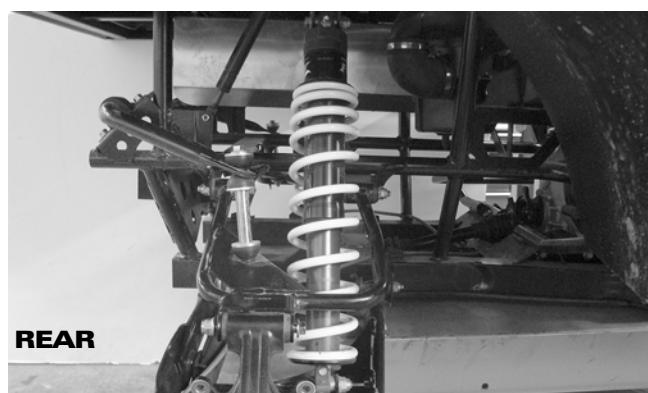
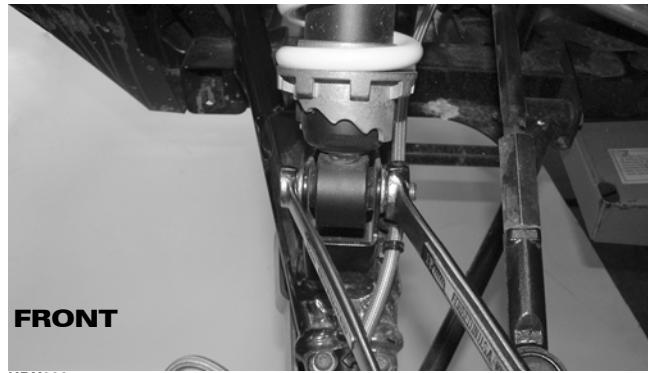
## SPECIAL TOOL

A special tool 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
Fox Shock Air Pump	2603-614
Spring Removal Tool	0644-057

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



3. Using a suitable spring compressor, compress the spring and retainer ring from the lower shock body.
4. Carefully release the spring pressure and remove the spring. Account for the spring retainer.

## WARNING

**Shock absorber springs are under high compression loads. Do not attempt to remove springs without an adequate spring compressor. Severe injury could result.**



## CLEANING AND INSPECTING

1. Clean all shock absorber components in parts-cleaning solvent.
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.

absorber, compress the spring, and install the retainer.

## INSTALLING

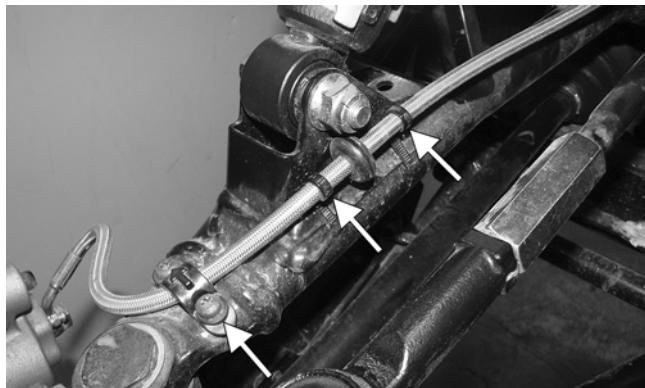
1. Place the shock absorber spring over the shock

2. Place bushings and O-rings (where appropriate) into the shock eyelet; then install the shock absorbers with two cap screws and new nuts. Tighten to 35 ft-lb.
3. Remove the vehicle from the support stand.

## Front A-Arms

### REMOVING

1. Remove the hubs (see Drive System).
2. Remove the brake hose clamp from the upper A-arm; then release the anchors from the A-arm.



HDX295A

3. Remove the cotter pin and slotted nut securing the tie rod end to the knuckle; then remove the tie rod end from the knuckle.
4. 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.



PR193

5. Tap the ball joints out of the knuckle; then remove the knuckle.
6. Remove the lower shock absorber eyelet from the upper A-arm.



HDX293

7. Remove the cap screws securing the A-arms to the frame.



HDX296

8. Remove the snap ring from the ball joint; then remove the ball joint from the A-arm.



HDX297

### CLEANING AND INSPECTING

1. Clean all A-arm components in parts-cleaning solvent.
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 A-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.



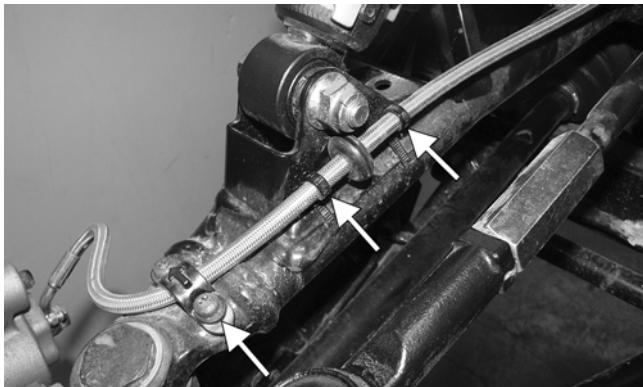
HDX297

2. Install the A-arm assemblies into the frame mounts and secure with the cap screws. Only finger-tighten at this time.



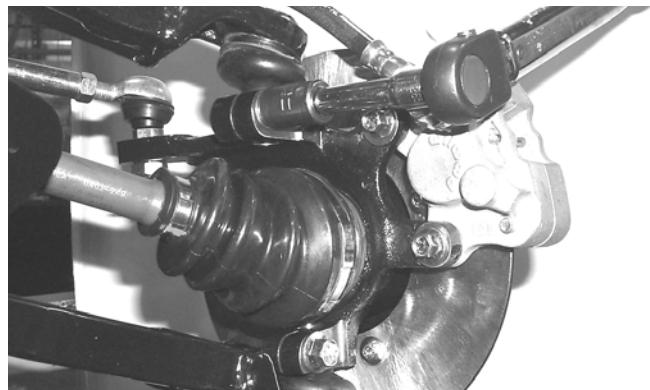
HDX296

3. Route the brake hose along the upper A-arm. Secure with hose anchors and the clamp.



HDX295A

4. Secure the lower eyelet of the shock absorber to the lower A-arm. Tighten nut to 20 ft-lb.
5. Secure the A-arm assemblies to the frame mounts (from step 2). Tighten the cap screws to 35 ft-lb.
6. Install the knuckle assembly onto the ball joints and secure with cap screws. Tighten to 35 ft-lb.



AF628D

7. Install the tie rod end and secure with the nut (coated with red Loctite #271). Tighten to 30 ft-lb; then install a new cotter pin and spread the pin to secure the nut.

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



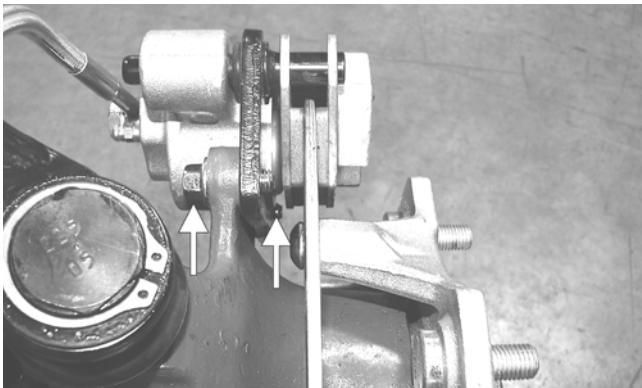
AF618D

8. Apply grease to the hub and drive axle splines; then install the hub (see Drive System).



PR290A

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



PR377B

10. Install the wheels and 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).
11. Remove the vehicle from the support stand.

## Rear A-Arms

### REMOVING

1. With the vehicle in park, secure the vehicle on a support stand to elevate the wheels.

#### **WARNING**

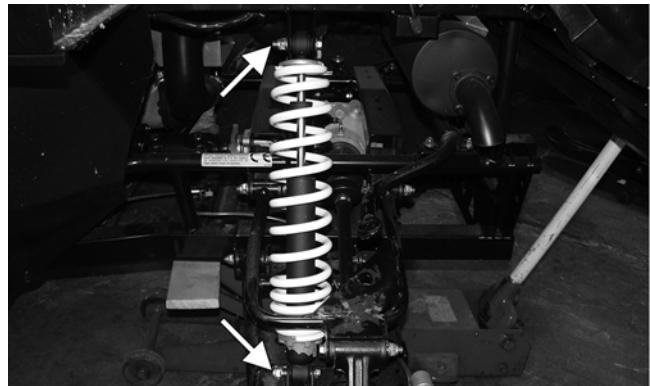
**Make sure the vehicle is solidly supported on the support stand to avoid injury.**

2. Remove the wheel.
3. Secure a strap to the top of the rear knuckle and frame. This will support the knuckle and axle while the A-arms are being removed.
4. Remove the cap screws securing the boot guard to the lower A-arm.
5. Loosen and remove the sway bar link lock nut and cap screw. Account for bushings, washers, and spacer.



PR922

6. Remove the cap screws and lock nuts securing the shock absorber to the frame and lower A-arm; then remove the shock absorber. Discard the lock nuts.



PR923A

7. Remove the cap screws and lock nuts securing the lower A-arm to the frame and knuckle; then remove the lower A-arm. Follow the same procedure to remove the upper A-arm.

### CLEANING AND INSPECTING

1. Clean all A-arm components in parts-cleaning solvent.
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 mounts and secure with the cap screws and new lock nuts. Finger-tighten only 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 mounts (from step 1) to 35 ft-lb.
4. Secure the shock absorber to the frame with a cap screw and new lock nut. Tighten to 35 ft-lb.
5. Secure the shock absorber to the lower A-arm with a cap screw and new lock nut. Tighten to 35 ft-lb.
6. Install the sway bar link and tighten to show three full threads.
7. Secure the boot guard to the lower A-arm with the two cap screws. Tighten securely.
8. Install the wheels and 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).
9. Remove the vehicle from the support stand.

## Wheels and Tires

### TIRE SIZE

#### ⚠ WARNING

Use only Arctic Cat approved tires when replacing tires. Failure to do so could result in unstable vehicle operation.

This vehicle is equipped with low-pressure tubeless tires of the size and type listed in the General Information section. Do not under any circumstances substitute tires of a different type or size.

#### ⚠ WARNING

Always use the size and type of tires specified. Always maintain proper tire inflation pressure.

#### ⚠ 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 vehicle and could cause excessive drive train damage not covered by warranty.

### TIRE INFLATION PRESSURE

Front and rear tire inflation pressure should be 82.7 kPa (12 psi).

### REMOVING

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

#### ⚠ WARNING

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

2. Remove the nuts securing the wheels; then remove the wheels.

### 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

1. Install each wheel on its hub and secure with the existing hardware.
2. 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).

### 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 vehicle if tire damage exists.

■NOTE: If repair is needed, follow the instructions found on the tire repair kit or remove the wheel and have it repaired professionally.

■NOTE: Be sure all tires are the specified size and have identical tread pattern.

## Troubleshooting

<b>Problem: Suspension too soft</b>	
<b>Condition</b>	<b>Remedy</b>
1. <b>Spring preload</b> incorrect 2. <b>Spring(s)</b> weak 3. <b>Shock absorber</b> damaged 4. <b>Rear shock absorbers</b> too soft	1. Adjust preload 2. Replace spring(s) 3. Replace shock absorber 4. Check and adjust air pressure in shocks
<b>Problem: Suspension too stiff</b>	
<b>Condition</b>	<b>Remedy</b>
1. <b>Spring preload</b> incorrect 2. <b>A-arm-related bushings</b> worn	1. Adjust preload 2. Replace bushing
<b>Problem: Suspension noisy</b>	
<b>Condition</b>	<b>Remedy</b>
1. <b>Cap screws (suspension system)</b> loose 2. <b>A-arm-related bushings</b> worn	1. Tighten cap screws 2. Replace bushings
<b>Problem: Vehicle pulling or steering erratic</b>	
<b>Condition</b>	<b>Remedy</b>
1. <b>Vehicle steering</b> is erratic on dry, level surface 2. <b>Vehicle</b> pulls left or right on dry, level surface	1. Check front wheel alignment and adjust if necessary (see Steering/Body/Controls - Front Wheel Alignment) 2. Check air pressure in tires and adjust to specifications

## **NOTES**



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