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## FOREWORD

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This Arctic Cat Service Manual contains service, maintenance, and troubleshooting information for certain 2007 Arctic Cat ATV models (see cover). The complete manual is designed to aid service personnel in service-oriented applications.

Arctic Cat offers additional publications (when they become available) to aid in servicing other ATV models. To service models not included in this manual, please refer to the following publications:

- **2007 Y-12 Service Manual**
- **2007 DVX/Utility 250 Service Manual**
- **2007 DVX 400 Service Manual**
- **2007 Prowler Service Manual**
- **2007 700 Diesel Service Manual**

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

The service technician should become familiar with the operation and construction of each component or system by carefully studying the complete manual. This manual will assist the service technician in becoming more aware of and efficient with servicing procedures. Such efficiency not only helps build consumer confidence but also saves time and labor.

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

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

All materials and specifications are subject to change without notice.

Keep this manual accessible in the shop area for reference.

**Product Service and  
Warranty Department  
Arctic Cat Inc.**

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*ATV  
Service Manual*

# SECTION 1 - GENERAL INFORMATION

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# General Specifications\*

**(400/400 TRV - Automatic Transmission)**

CARBURETOR	
Type	Keihin CVK34
Main Jet	135
Slow Jet	38
Pilot Screw Setting (turns)	1 3/4
Jet Needle	NAZG
Idle RPM (engine warm)	1250-1350
Starter Jet	75
Float Arm Height	17 mm (0.7 in.)
Throttle Cable Free-Play (at lever)	3-6 mm (1/8-1/4 in.)
ELECTRICAL	
Ignition Timing	10° BTDC @ 1500 RPM
Spark Plug Type	NGK CR7E
Spark Plug Gap	0.7-0.8 mm (0.028-0.032 in.)
Spark Plug Cap	8000-12,000 ohms
Ignition Coil Resistance (primary)	Less than 1 ohm (terminal to ground)
(secondary)	5200-7800 ohms (high tension - plug cap removed - to ground)
Ignition Coil Peak Voltage (primary/ CDI)	250-375 DC volts (terminal to ground)
Magneto Coil Resistance (trigger)	160-240 ohms (green to blue)
(source)	Less than 1 ohm (yellow to white)
(charging)	Less than 1 ohm (black to black)
Magneto Coil Peak Voltage (trigger)	5.04-7.56 volts (green to blue)
(source)	0.7-1.05 volts (yellow to white)
Stator Coil Output (no load)	60 AC volts @ 5000 RPM (black to black #1) (black to black #2)
Magneto Output (approx)	220W @ 5000 RPM
CHASSIS	
Brake Type	Hydraulic w/Brake Lever Lock and Auxiliary Brake
Tire Size	Front - 25 x 8-12 Rear - 25 x 10-12
Tire Inflation Pressure	0.35 kg/cm <sup>2</sup> (5 psi)

MISCELLANY	
Gas Tank Capacity (rated)	24.6 L (6.5 U.S. gal.) 20.8 L (5.5 U.S. gal.) - TRV
Rear Drive Capacity	250 ml (8.5 fl oz)**
Differential Capacity (front - 4x4)	275 ml (9.3 fl oz)***
Engine Oil Capacity	3.08 L (3.25 U.S. qt)
Gasoline (recommended)	87 Octane Regular Unleaded
Engine Oil (recommended)	SAE 5W-30
Differential/Rear Drive Lubricant	SAE Approved 80W-90 Hypoid
Drive Belt Width	28.5 mm (1.12 in.)
Brake Fluid	DOT 4
Taillight/Brakelight	12V/8W/27W
Headlight	12V/37W (2)

\* Specifications subject to change without notice.

\*\* One inch below filler plug threads.

\*\*\* At the oil level plug threads.

# General Specifications\*

(400 - Manual Transmission)

1

CARBURETOR	
Type	Keihin CVK34
Main Jet	135
Slow Jet	38
Pilot Screw Setting (turns)	1 3/4
Jet Needle	NAZG
Idle RPM (engine warm)	1250-1350
Starter Jet	75
Float Arm Height	17 mm (0.7 in.)
Throttle Cable Free-Play (at lever)	3-6 mm (1/8-1/4 in.)
ELECTRICAL	
Ignition Timing	10° BTDC @ 1500 RPM
Spark Plug Type	NGK CR7E
Spark Plug Gap	0.7-0.8 mm (0.028-0.032 in.)
Spark Plug Cap	8000-12,000 ohms
Ignition Coil Resistance (primary) (secondary)	Less than 1 ohm (terminal to ground) 5200-7800 ohms (high tension - plug cap removed - to ground)
Ignition Coil Peak Voltage (primary/ CDI)	250-375 DC volts (terminal to ground)
Magneto Coil Resistance (trigger) (source) (charging)	160-240 ohms (green to blue) Less than 1 ohm (yellow to white) Less than 1 ohm (black to black)
Magneto Coil Peak Voltage (trigger) (source)	5.04-7.56 volts (green to blue) 0.7-1.05 volts (yellow to white)
Stator Coil Out- put (no load)	60 AC volts @ 5000 RPM (black to black #1) (black to black #2)
Magneto Output (approx)	220 W @ 5000 RPM
CHASSIS	
Brake Type	Hydraulic w/Brake Lever Lock and Auxiliary Brake
Tire Size	Front - 25 x 8-12 Rear - 25 x 10-12
Tire Inflation Pressure	0.35 kg/cm <sup>2</sup> (5 psi)

MISCELLANY	
Gas Tank Capacity (rated)	24.6 L (6.5 U.S. gal.)
Rear Drive Capacity	250 ml (8.5 fl oz)**
Differential Capacity (front - 4x4)	275 ml (9.3 fl oz)***
Engine Oil Capacity	3.08 L (3.25 U.S. qt)
Gasoline (recommended)	87 Octane Regular Unleaded
Engine Oil (recommended)	SAE 5W-30
Differential/Rear Drive Lubricant	SAE Approved 80W-90 Hypoid
Brake Fluid	DOT 4
Taillight/Brakelight	12V/8W/27W
Headlight	12V/37W (2)

\* Specifications subject to change without notice.

\*\* One inch below filler plug threads.

\*\*\* At the oil level plug threads.

# General Specifications\*

## (500 - Manual Transmission)

CARBURETOR	
Type	Keihin CVK36
Main Jet	138
Slow Jet	40
Pilot Screw Setting (turns)	1 3/4
Jet Needle	NFKG
Idle RPM (engine warm)	1250-1350
Starter Jet	85
Float Arm Height	17 mm (0.7 in.)
Throttle Cable Free-Play (at lever)	3-6 mm (1/8-1/4 in.)
ELECTRICAL	
Ignition Timing	10° BTDC @ 1500 RPM
Spark Plug Type	NGK CR6E
Spark Plug Gap	0.7-0.8 mm (0.028-0.032 in.)
Spark Plug Cap	8000-12,000 ohms
Ignition Coil Resistance (primary) (secondary)	Less than 1 ohm (terminal to ground) 5200-7800 ohms (high tension - plug cap removed - to ground)
Ignition Coil Peak Voltage (primary/ CDI)	140-215 DC volts (terminal to ground)
Magneto Coil Resistance (trigger) (source) (charging)	160-240 ohms (green to blue) Less than 1 ohm (yellow to white) Less than 1 ohm (black to black)
Magneto Coil Peak Voltage (trigger) (source)	4.2-6.3 volts (green to blue) 0.40-0.62 volt (yellow to white)
Stator Coil Out- put (no load)	60 AC volts @ 5000 RPM (black to black #1) (black to black #2)
Magneto Output (approx)	325W @ 5000 RPM
CHASSIS	
Brake Type	Hydraulic w/Brake Lever Lock and Auxiliary Brake
Tire Size	Front - 25 x 8-12 Rear - 25 x 10-12
Tire Inflation Pressure	0.35 kg/cm <sup>2</sup> (5 psi)

MISCELLANY	
Gas Tank Capacity (rated)	24.6 L (6.5 U.S. gal.)
Coolant Capacity	2.9 L (3.0 U.S. qt)
Differential Capacity	275 ml (9.3 fl oz)**
Rear Drive Capacity	250 ml (8.5 fl oz)***
Engine Oil Capacity	3.4 L (3.5 U.S. qt)
Gasoline (recommended)	87 Octane Regular Unleaded
Engine Oil (recommended)	SAE 5W-30
Differential/Rear Drive Lubricant	SAE Approved 80W-90 Hypoid
Brake Fluid	DOT 4
Taillight/Brakelight	12V/8W/27W
Headlight	12V/27W (2)

\* Specifications subject to change without notice.

\*\* At the oil level plug threads.

\*\*\* At the filler plug threads.

# General Specifications\*

## (500 - Automatic Transmission)

1

CARBURETOR	
Type	Keihin CVK36
Main Jet	138
Slow Jet	40
Pilot Screw Setting (turns)	1 3/4
Jet Needle	NFKG
Idle RPM (engine warm)	1250-1350
Starter Jet	85
Float Arm Height	17 mm (0.7 in.)
Throttle Cable Free-Play (at lever)	3-6 mm (1/8-1/4 in.)
ELECTRICAL	
Ignition Timing	10° BTDC @ 1500 RPM
Spark Plug Type	NGK CR6E
Spark Plug Gap	0.7-0.8 mm (0.028-0.032 in.)
Spark Plug Cap	8000-12,000 ohms
Ignition Coil Resistance (primary)	Less than 1 ohm (terminal to ground)
(secondary)	5200-7800 ohms (high tension - plug cap removed - to ground)
Ignition Coil Peak Voltage (primary/CDI)	140-215 DC volts (terminal to ground)
Magneto Coil Resistance (trigger)	160-240 ohms (green to blue)
(source)	Less than 1 ohm (yellow to white)
(charging)	Less than 1 ohm (black to black)
Magneto Coil Peak Voltage (trigger)	4.2-6.3 volts (green to blue)
(source)	0.40-0.62 volt (yellow to white)
Stator Coil Output (no load)	60 AC volts @ 5000 RPM (black to black #1) (black to black #2)
Magneto Output (approx)	325W @ 5000 RPM

CHASSIS	
Brake Type	Hydraulic w/Brake Lever Lock and Auxiliary Brake
Tire Size	Front - 25 x 8-12 Rear - 25 x 10-12
Tire Inflation Pressure	0.35 kg/cm <sup>2</sup> (5 psi)
MISCELLANY	
Gas Tank Capacity (rated)	24.6 L (6.5 U.S. gal.)
Coolant Capacity	2.9 L (3.0 U.S. qt)
Differential Capacity	275 ml (9.3 fl oz)**
Rear Drive Capacity	250 ml (8.5 fl oz)***
Engine Oil Capacity	2.5 L (2.6 U.S. qt)
Gasoline (recommended)	87 Octane Regular Unleaded
Engine Oil (recommended)	SAE 5W-30
Differential/Rear Drive Lubricant	SAE Approved 80W-90 Hypoid
Drive Belt Width (minimum)	38 mm (1.33 in.)
Brake Fluid	DOT 4
Taillight/Brakelight	12V/8W/27W
Headlight	12V/27W (2)

\* Specifications subject to change without notice.

\*\* At the oil level plug threads.

\*\*\* At the filler plug threads.

# General Specifications\*

(650 H1/650 H1 TBX/650 H1 TRV)

CARBURETOR	
Type	Keihin CVK36
Main Jet	132
Slow Jet	40
Pilot Screw Setting (turns)	1 1/4
Jet Needle	NFKS
Idle RPM (engine warm)	1250-1350
Starter Jet	85
Float Arm Height	17 mm (0.7 in.)
Throttle Cable Free-Play (at lever)	3-6 mm (1/8-1/4 in.)
ELECTRICAL	
Ignition Timing	10° BTDC @ 1500 RPM
Spark Plug Type	NGK CR6E
Spark Plug Gap	0.7-0.8 mm (0.028-0.032 in.)
Spark Plug Cap	4000 ohms
Ignition Coil Resistance (primary) (secondary)	Less than 1 ohm (terminal to ground) 5200-7800 ohms (high tension - plug cap removed - to ground)
Ignition Coil Peak Voltage (primary/CDI)	142.4-213.6 DC volts (terminal to ground)
Magneto Coil Resistance (trigger) (source) (charging)	160-240 ohms (green to blue) Less than 1 ohm (yellow to white) Less than 1 ohm (black to black)
Magneto Coil Peak Voltage (trigger) (source)	4.2-6.3 volts (green to blue) 0.40-0.62 volt (yellow to white)
Stator Coil Output (no load)	60 AC volts @ 5000 RPM (black to black #1) (black to black #2)
Magneto Output (approx)	325W @ 5000 RPM

CHASSIS	
Brake Type	Hydraulic w/Brake Lever Lock and Auxiliary Brake
Tire Size	Front - 25 x 8-12 Rear - 25 x 10-12
Tire Inflation Pressure	0.35 kg/cm <sup>2</sup> (5 psi)
MISCELLANY	
Gas Tank Capacity (rated)	24.6 L (6.5 U.S. gal.) 20.8 L (5.5 U.S. gal.) - TBX/TRV
Coolant Capacity	2.9 L (3.0 U.S. qt)
Differential Capacity	275 ml (9.3 fl oz)**
Rear Drive Capacity	250 ml (8.5 fl oz)***
Engine Oil Capacity	3.4 L (3.5 U.S. qt)
Gasoline (recommended)	87 Octane Regular Unleaded
Engine Oil (recommended)	SAE 5W-30
Differential/Rear Drive Lubricant	SAE Approved 80W-90 Hypoid
Belt Width	35.5 mm (1.40 in.)
Brake Fluid	DOT 4
Taillight/Brakelight	12V/8W/27W
Headlight	12V/27W (2)

\* Specifications subject to change without notice.

\*\* At the oil level plug threads.

\*\*\* At the filler plug threads.

## **General Specifications\*** **(700 EFI)**

1

FUEL INJECTION	
Type	Electronic Throttle Body
Idle RPM (engine warm)	1200-1400
Throttle Cable Free-Play (at lever)	3-6 mm (1/8-1/4 in.)
ELECTRICAL	
Spark Plug Type	NGK CR6E
Spark Plug Gap	0.7-0.8 mm (0.028-0.032 in.)
Spark Plug Cap	8000-12,000 ohms
Ignition Coil Resistance (primary) (secondary)	Less than 1 ohm (terminal (+) to terminal (-)) 12k-19k ohms (plug cap to terminal (+))
Ignition Coil Peak Voltage (ECU)	80 volts or more (wire (+) to wire (-))
Stator Coil Resistance (crankshaft position sensor) (charging)	150-250 ohms (blue to white) Less than 1 ohm (yellow to yellow)
Crankshaft Position Sensor Peak Voltage	5.0 volts or more (blue to white)
Stator Coil Output (no load)	75 AC volts @ 5000 RPM (yellow to yellow)

CHASSIS	
Brake Type	Hydraulic w/Brake Lever Lock and Auxiliary Brake
Tire Size	Front - 25 x 8-12 Rear - 25 x 10-12
Tire Inflation Pressure	0.35 kg/cm <sup>2</sup> (5 psi)
MISCELLANY	
Gas Tank Capacity (rated)	24.6 L (6.5 U.S. gal.)
Coolant Capacity	2.9 L (3.0 U.S. qt)
Differential Capacity	275 ml (9.3 fl oz)**
Rear Drive Capacity	250 ml (8.5 fl oz)***
Engine Oil Capacity	2.45 L (2.6 U.S. qt)
Gasoline (recommended)	87 Octane Regular Unleaded
Engine Oil (recommended)	SAE 5W-30
Differential/Rear Drive Lubricant	SAE Approved 80W-90 Hypoid
Drive Belt Width (minimum)	35.6 mm (1.40 in.)
Brake Fluid	DOT 4
Taillight/Brakelight	12V/8W/27W
Headlight	12V/27W (2)

\* Specifications subject to change without notice.

\*\* One inch below plug threads.

\*\*\* At the plug threads.

## Break-In Procedure

A new ATV and an overhauled ATV engine require a "break-in" period. The first 10 hours (or 200 miles) are most critical to the life of this ATV. Proper operation during this break-in period will help assure maximum life and performance from the ATV.

During the first 10 hours (or 200 miles) of operation, always use less than 1/2 throttle. Varying the engine RPM during the break-in period allows the components to "load" (aiding the mating process) and then "unload" (allowing components to cool). Although it is essential to place some stress on the engine components during break-in, care should be taken not to overload the engine too often. Do not pull a trailer or carry heavy loads during the 10-hour break-in period.

When the engine starts, allow it to warm up properly. Idle the engine several minutes until the engine has reached normal operating temperature. Do not idle the engine for excessively long periods of time.

During the break-in period, a maximum of 1/2 throttle is recommended; however, brief full-throttle accelerations and variations in driving speeds contribute to good engine break-in.

During the break-in period (or whenever the brake pads are replaced), the hydraulic brake pads must be burnished. Slow disc-speed hydraulic brakes must be properly burnished in order to achieve maximum stopping power.

### ⚠ CAUTION

**BRAKE PADS MUST BE BURNISHED TO ACHIEVE FULL BRAKING EFFECTIVENESS.** Braking distance will be extended until brake pads are properly burnished.

**TO PROPERLY BURNISH THE BRAKES, USE FOLLOWING PROCEDURE:**

- Choose an area sufficiently large to safely accelerate ATV to 30 mph and to brake to a stop.
- Accelerate to 30 mph; then compress brake lever to decelerate to 0-5 mph.
- Repeat procedure five times until brakes are burnished.
- This procedure burnishes the brake pads, stabilizes the pad material, and extends the life of the brake pads.

### ⚠ WARNING

**Do not attempt sudden stops or put the ATV into a situation where a sudden stop will be required until the brake pads are properly burnished.**

■ **NOTE: Do not be reluctant to heat up the brake pads during the burnishing procedure.**

After the completion of the break-in period, the engine oil and oil filter should be changed. Other maintenance after break-in should include checking of all prescribed adjustments and tightening of all fasteners.

## Gasoline - Oil - Lubricant

### RECOMMENDED GASOLINE

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

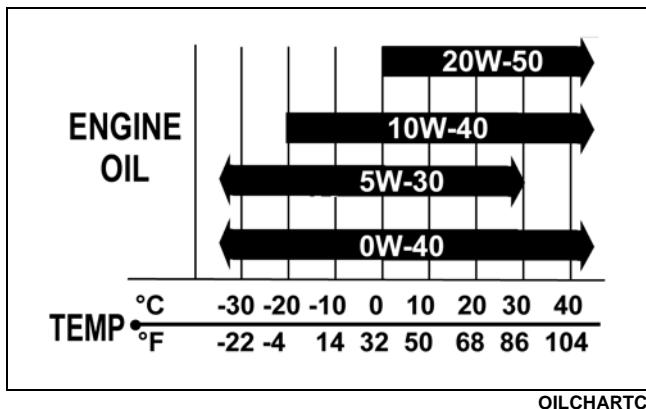
**Do not use white gas. Only Arctic Cat approved gasoline additives should be used.**

### 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 4-Cycle Engine Oil or an equivalent oil which is rated SE, SF, or SG under API service classification. These oils meet all of the lubrication requirements of the Arctic Cat ATV engine. The recommended engine oil viscosity is SAE 5W-30. Ambient temperature should determine the correct weight of oil. See the following viscosity chart for details.



## RECOMMENDED FRONT DIFFERENTIAL/REAR DRIVE LUBRICANT

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

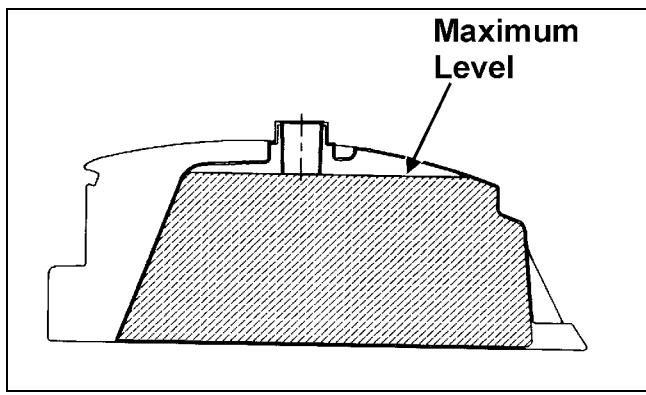
### ⚠ CAUTION

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

## FILLING GAS TANK

### ⚠ WARNING

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



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

### ⚠ 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.

1

### ⚠ WARNING

Do not over-fill the gas tank.

## Genuine Parts

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

## Preparation For Storage

### ⚠ CAUTION

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

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

1. Clean the seat cushion (cover and base) with a damp cloth and allow it to dry.
2. Clean the ATV thoroughly by washing dirt, oil, grass, and other foreign matter from the entire ATV. Allow the ATV to dry thoroughly. DO NOT get water into any part of the engine or air intake.

3. Either drain the gas tank or add Fuel Stabilizer to the gas in the gas tank. Remove the air filter housing cover and air filter. Start the engine and allow it to idle; then using Arctic Cat Engine Storage Preserver, rapidly inject the preserver into the air filter opening for a period of 10 to 20 seconds; then stop the engine. Install the air filter and housing cover.

**⚠ CAUTION**

If the interior of the air filter housing is dirty, clean the area before starting the engine.

4. On carbureted models, drain the carburetor float chamber.
5. Plug the exhaust hole in the exhaust system with a clean cloth.
6. Apply light oil to the upper steering post bushing and plungers of the shock absorbers.
7. Tighten all nuts, bolts, cap screws, and screws. 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 (see Section 10).
8. On liquid cooled models, fill the cooling system to the bottom of the stand pipe in the radiator neck with properly mixed coolant.
9. Disconnect the battery cables; then remove the battery, clean the battery posts and cables, and store in a clean, dry area.
10. Store the ATV indoors in a level position.

**⚠ CAUTION**

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

## **Preparation After Storage**

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

1. Clean the ATV thoroughly.
2. Clean the engine. Remove the cloth from the exhaust system.
3. Check all control wires and cables for signs of wear or fraying. Replace if necessary.
4. Change the engine/transmission oil and filter.
5. On liquid cooled models, check the coolant level and add properly mixed coolant as necessary.
6. Charge the battery; then install. Connect the battery cables.

**⚠ CAUTION**

The ignition switch must be in the OFF position prior to installing the battery or damage may occur to the ignition system.

**⚠ CAUTION**

Connect the positive battery cable first; then the negative.

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

# SECTION 2 -

# PERIODIC MAINTENANCE/TUNE-UP

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# Periodic Maintenance Chart

A = Adjust

C = Clean

D = Drain

I = Inspect

L = Lubricate

R = Replace

Item	Initial Service After Break-In (First Mo or 100 Mi)	Every Day	Every Month or Every 100 Miles	Every 3 Months or Every 300 Miles	Every 6 Months or Every 500 Miles	Every Year or Every 1500 Miles	As Needed
Battery	I		I				C
Fuses				I			R
Air Filter/Drain Tube	I	I	C*				R
Valve/Tappet Clearance	I				I		A
Engine Compression						I	
Spark Plug	I			I			R (4000 Mi or 18 Mo)
Muffler/Spark Arrestor					C		R
Gas/Vent Hoses	I	I					R (2 Yrs)
Throttle Cable	I	I			C-L		A-R
Carburetor Float Chamber (Carbureted Models)				D*			
Engine Idle RPM (Carbureted Models)	I				I		A
Engine-Transmission Oil Level		I					A
Engine-Transmission Oil/Filter	R			R*			R
Oil Strainer	I				I		C
Front Differential/Rear Drive Lubricant	I						R (4 Yrs)
Clutch (Manual)	I				I		A
Tires/Air Pressure	I			I			R
Steering Components	I	I		I			R
V-Belt (Automatic)	I				I		R
Suspension (Ball joint boots, drive axle boots front and rear, tie rods, differential and rear drive bellows)	I			I*			R
Nuts/Cap Screws/Screws	I			I	I		A
Ignition Timing						I	
Headlight/Taillight-Brakelight	I	I					R
Switches	I	I					R
Shift Lever					I		A-L
Recoil Starter (Except certain 650 H1 models)		I					C-R
Handlebar Grips		I					R
Handlebars	I	I					R
Gauges/Indicators	I	I					R
Frame/Welds/Racks	I		I		I		
Electrical Connections					I		C
Complete Brake System (Hydraulic & Auxiliary)	I	I		C			L-R
Brake Pads	I			I*			R
Brake Fluid	I			I			R (2 Yrs)
Brake Hoses	I			I			R (4 Yrs)
Coolant/Cooling System	I		I				R (2 Yrs)

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

## Lubrication Points

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

- A. Throttle Lever Pivot/Cable Ends
- B. Brake Lever Pivot/Cable Ends
- C. Auxiliary Brake Cable Ends
- D. Shift Lever Cable End
- E. Idle RPM Screw (Carburetor) (If Applicable)

## Battery

The level of the battery fluid must be kept between the upper and lower level lines at all times. If the level drops below the lower level line, add only **distilled water** until it reaches upper level line.

### ⚠ WARNING

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

If the battery is discharged, remove the battery from the ATV and charge the battery at 1.5 amps for 10 hours.

To remove and charge the battery, use the following procedure.

### ⚠ WARNING

**Anytime service is performed on a battery, the following must be observed: keep sparks, open flame, cigarettes, or any other flame away. Always wear safety glasses. Protect skin and clothing when handling a battery. When servicing battery in enclosed space, keep the area well-ventilated. Make sure battery venting is not obstructed.**

1. Remove the battery hold-down bracket.
2. Remove the negative battery cable; then remove the positive cable and the battery vent tube. Remove the battery from the ATV. Care should be taken not to damage the vent tube.

### ⚠ WARNING

**Avoid spillage and contact with skin, eyes, and clothing.**

### ⚠ CAUTION

**Do not charge the battery while it is in the ATV with the battery terminals connected.**

3. Remove the vent plugs; then (if necessary) fill the battery with **distilled water** to the upper level indicated on the battery.
4. Trickle charge the battery at 1.5 amps for 10 hours.

### ⚠ CAUTION

**Never exceed the standard charging rate.**

**2**

5. After charging, check fluid level and fill with distilled water as necessary; then install vent plugs.

### ⚠ CAUTION

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

6. Place the battery into position in the ATV and secure with the hold-down bracket.
7. Attach the vent tube and check the vent tube to make sure it is not crimped or obstructed in any way and that it is properly routed through and secured to the frame.
8. Connect cables to the proper terminals: positive cable to the positive terminal (+) and negative cable to the negative terminal (-). Connect the negative cable last.

### ⚠ CAUTION

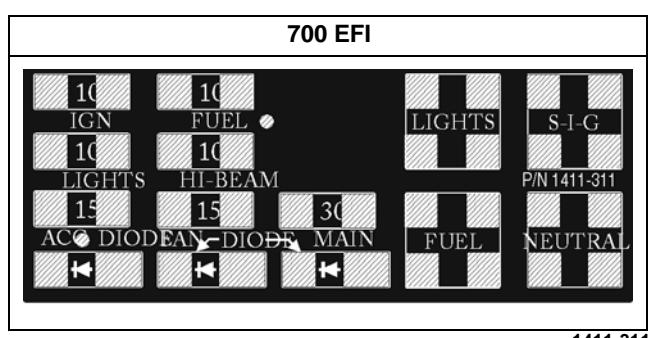
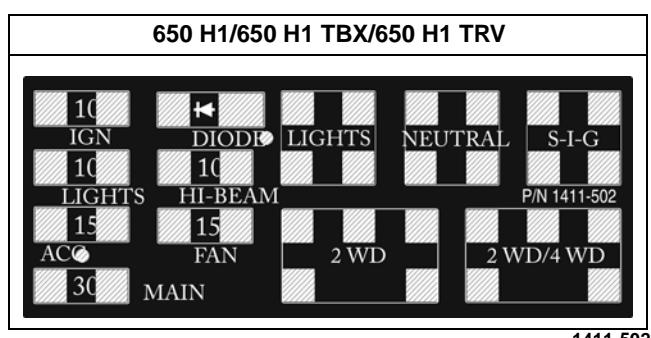
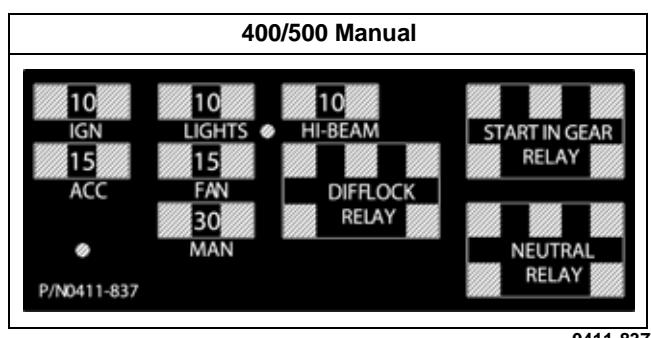
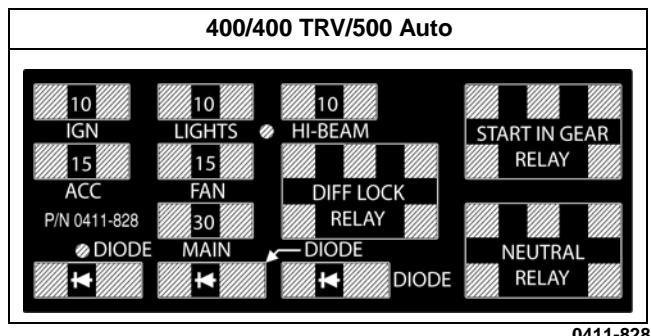
**Connecting cables in reverse (positive to negative and negative to positive) can cause serious damage to the electrical system.**

## Fuses

The fuses are located in a power distribution module under the seat.

If there is any type of electrical system failure, always check the fuses first.

**■ NOTE: To remove a fuse, compress the locking tabs on either side of the fuse case and lift out.**



## CAUTION

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

## Air Cleaner/Filter

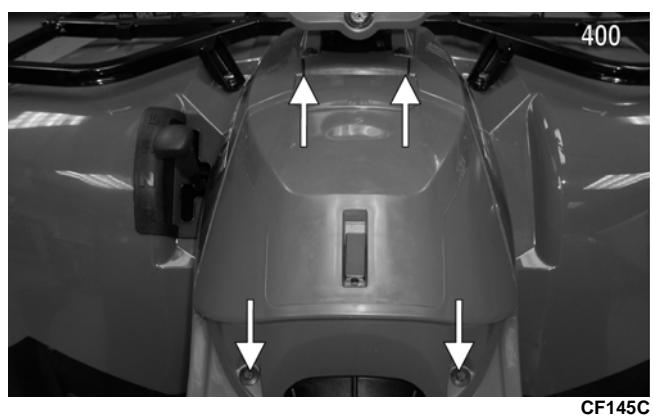
The air filter inside the air filter housing must be kept clean to provide good engine power and gas mileage. If the ATV is used under normal conditions, service the filter at the intervals specified. If operated in dusty, wet, or muddy conditions, inspect and service the filter more frequently. Use the following procedure to remove the filter and inspect and/or clean it.

### CLEANING AND INSPECTING 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 the seat; then remove the appropriate reinstallable rivets securing the storage compartment.



400

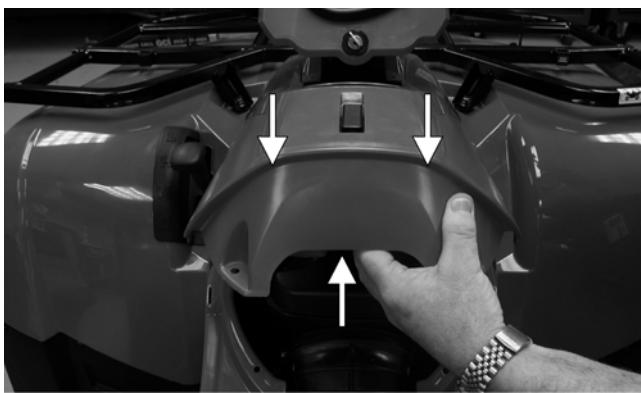
CF145C



500/650 H1/700 EFI

CD710C

2. On the 400, remove the storage compartment assembly by elevating the rear of the compartment, moving it rearward, and lifting it off.



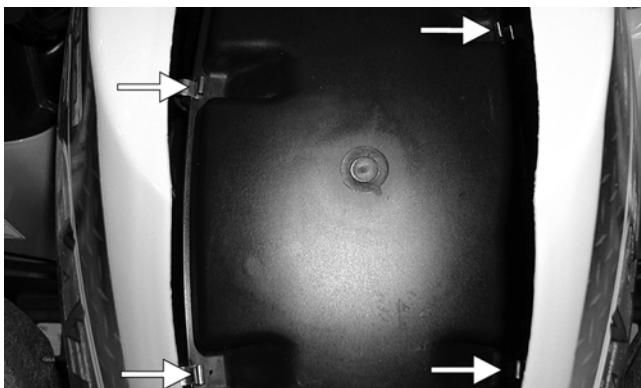
CF143A

3. On the 500/650 H1/700 EFI, raise the storage compartment cover; then slide the cover forward and off the compartment. Remove the storage compartment.



CD669

4. Unsnap the four spring-clip fasteners (400/500/650 H1) or remove two wing-nuts (700 EFI); then remove the air filter cover.



CD675A



FI033

5. Remove the air filter/filter screen assembly and separate the foam filter from the screen.
6. Fill a wash pan larger than the filter with a non-flammable cleaning solvent; then dip the filter in the solvent and wash it.

2

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

7. Dry the filter.
8. Put the filter in a plastic bag; then pour in air filter oil and work the filter. Reattach the filter to the filter screen.

### ⚠ CAUTION

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

9. Clean any dirt or debris from inside the air cleaner. Be sure no dirt enters the carburetor (if equipped).
10. Place the filter assembly in the air filter housing making sure it is properly positioned and properly seated with the filter screen down.

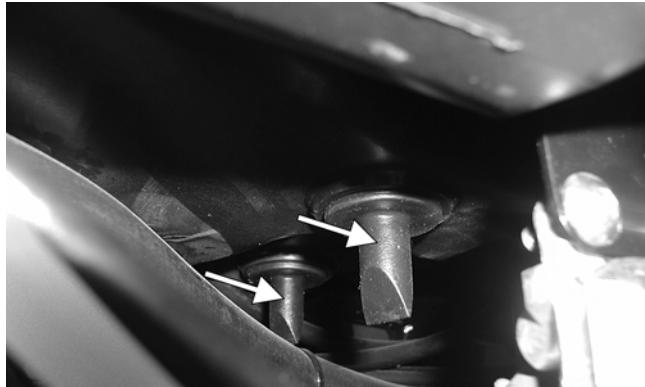


CD674

11. Install the air filter housing cover and secure with the retaining clips (400/500/650 H1) or wing-nuts (700 EFI).
12. Install the storage compartment; then secure with the reinstallable rivets.

## CHECKING AND CLEANING DRAINS

1. Inspect one-way drains beneath the main housing for debris and for proper sealing.



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

### ⚠ CAUTION

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

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

## Valve/Tappet Clearance (Feeler Gauge Procedure)

■ NOTE: For the 700 EFI, see Valve/Tappet Clearance (700 EFI) in this section.

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

1. Remove the timing inspection plug; then remove the tappet covers (for more detailed information, see Section 3 - Servicing Top-Side Components).
2. Rotate the crankshaft to the TDC position on the compression stroke.

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

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

### ⚠ CAUTION

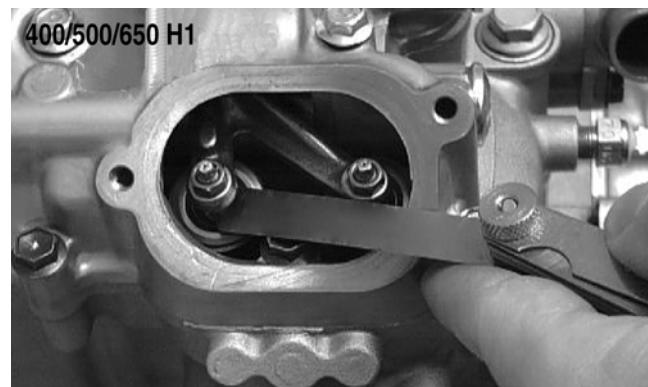
The feeler gauge must be positioned at the same angle as the valve and valve adjuster for an accurate measurement of clearance. Failure to measure the valve clearance accurately could cause valve component damage.

#### VALVE/TAPPET CLEARANCE (400/500)

Intake	0.05-0.10 mm (0.002-0.004 in.)
Exhaust (400)	0.22-0.27 mm (0.009-0.011 in.)
Exhaust (500)	0.17-0.22 mm (0.007-0.009 in.)

#### VALVE/TAPPET CLEARANCE (650 H1)

Intake	0.1016 mm (0.004 in.)
Exhaust	0.1524 mm (0.006 in.)



CC007DB

4. Install the timing inspection plug.

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

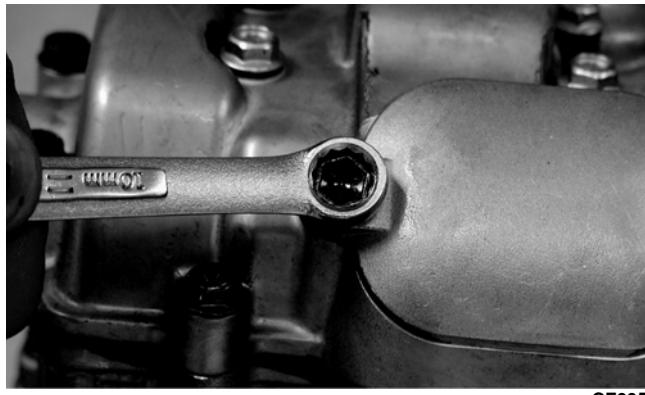
## Valve/Tappet Clearance (Valve Adjuster Procedure)

■ NOTE: For the 700 EFI, see Valve/Tappet Clearance (700 EFI) in this section.

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

■ **NOTE:** On the TBX/500/650 H1, the seat, storage compartment cover assembly, compartment box, air filter/filter housing, and left-side/right-side splash panels must be removed for this procedure.

1. Remove the timing inspection plug; then remove the tappet covers (for more detailed information, see Section 3 - 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.

■ **NOTE:** Use Valve Clearance Adjuster (p/n 0444-078) for this procedure.

3. Place the valve 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.
4. 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.

5. Align the valve adjuster handle with one of the marks on the valve adjuster dial.

6. While holding the valve adjuster handle in place, rotate the valve adjuster dial counter-clockwise until proper valve/tappet clearance is attained.

■ **NOTE:** Refer to the appropriate specifications in Feeler Gauge Procedure sub-section for the proper valve/tappet clearance.

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

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

8. Place the two tappet covers with O-rings into position; then tighten the covers securely.
9. Install the spark plug; then install the timing inspection plug.

## Valve/Tappet Clearance (700 EFI)

2

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

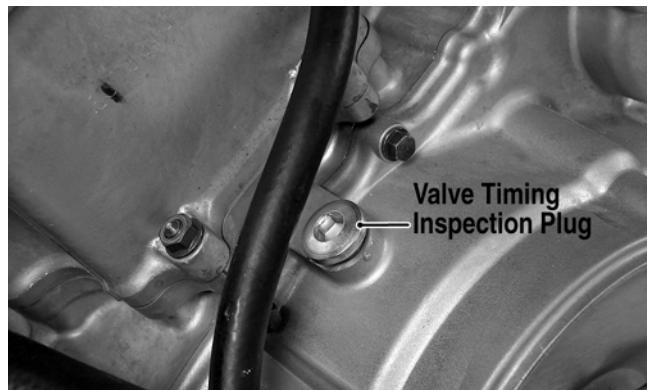
■ **NOTE:** The seat, heat shields, splash panels, front rack, and front fenders must be removed for this procedure (see Section 8).

1. Remove the spark plug cap/high tension lead; then using compressed air, blow any debris from around the spark plug.

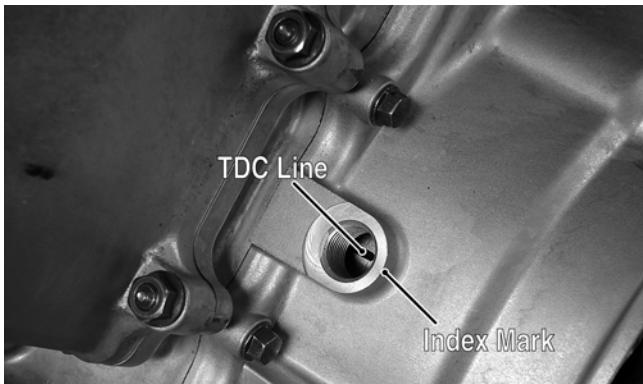
### ⚠ WARNING

Always wear safety glasses when using compressed air.

2. Remove the recoil starter assembly; then remove the valve timing inspection plug and the cylinder head cover.



3. Using an appropriate bar, rotate the engine through two full revolutions; then while on the compression stroke, align the TDC line on the starter clutch with the index mark on the crankcase.

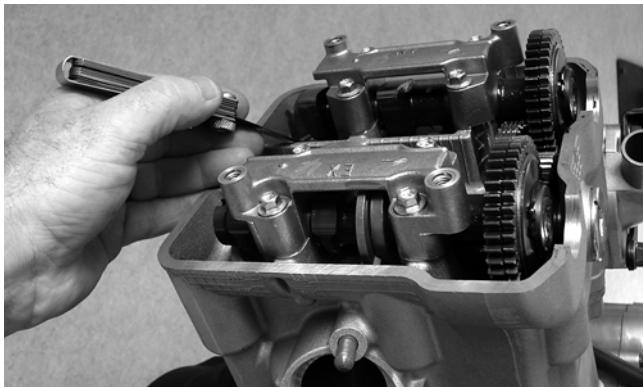


FI041A

■ **NOTE:** Rotating the engine ensures that any trapped oil is squeezed from the tappets and tappet shims. Oil trapped in these areas could result in a false valve clearance reading.

4. Using an appropriate thickness gauge, measure and record the clearance of both intake valves; then measure and record the clearance of both exhaust valves. Valve clearance must be within specifications.

VALVE/TAPPET CLEARANCE (700 EFI)	
Intake	0.10-0.20 mm (0.004-0.008 in.)
Exhaust	0.20-0.30 mm (0.008-0.012 in.)



FI046

### ☞ AT THIS POINT

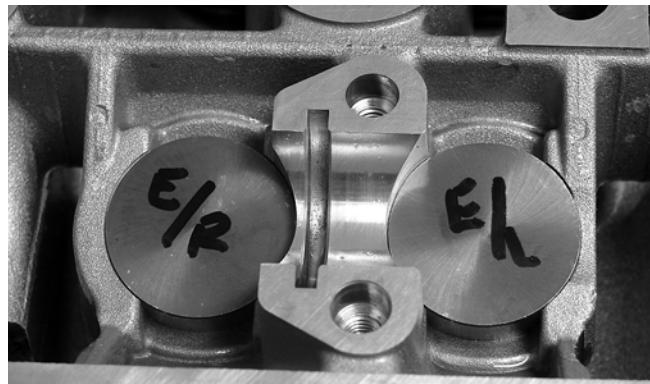
If valve clearance is within specifications, proceed to step 12.

5. Identify the valves that are not within specifications; then remove the corresponding camshaft (see Section 3 - Removing Top-Side Components).

### ⚠ CAUTION

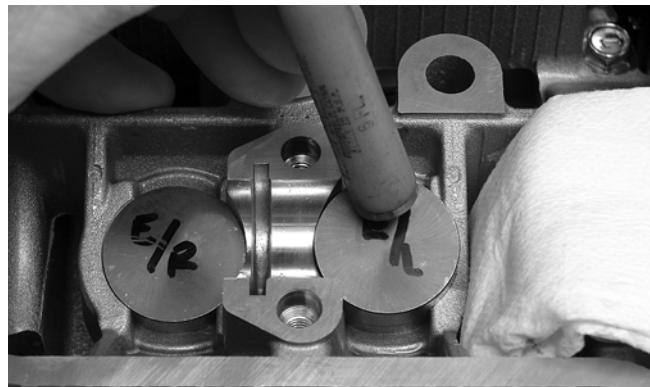
When removing camshaft holders, use extreme care not to drop alignment pins into the engine.

6. Mark the valve tappets in order to return them to the proper position during assembly.

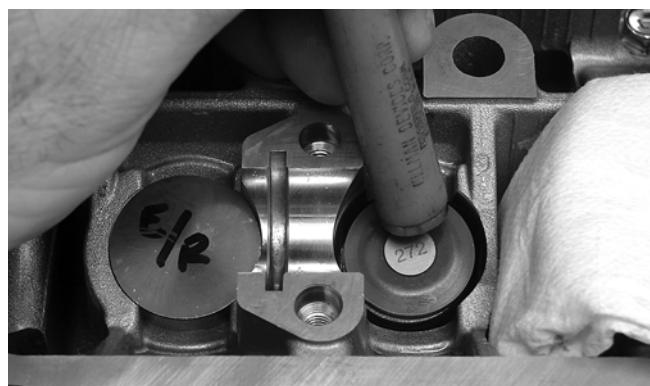


FI054

7. Fold a suitable towel and use it to plug the cam-shaft drive passageway; then using a magnet, remove the tappet and shim from the appropriate valve.



FI055



FI056

### ⚠ CAUTION

If the camshaft passageway is not plugged, tappet shims could fall into the engine crankcase.

8. Note the three digit number on the surface of the tappet shim; then refer to the appropriate tappet shim selection table at the end of this section for the correct replacement.



FI051

A. Measured tappet clearance from step 4 in vertical column on left.

B. Present shim size horizontal row at the top.

C. Match measured clearance in vertical column with current shim size in horizontal row to find recommended replacement size.

9. Apply engine oil to both surfaces of the tappet shim; then place the shim on the valve with the numbers toward the tappet.



FI053

10. Install the tappet on the appropriate valve; then install the camshaft.

11. Using an appropriate bar, rotate the engine through two full revolutions; then rotate to TDC on the compression stroke and check the valve tappet clearance.

**■ NOTE: Rotating the engine ensures that any excess oil is squeezed from the tappets and tappet shims. Oil trapped in these areas could result in a false valve clearance reading.**

12. Using a new gasket, apply Three Bond Sealant to the camshaft end caps of the cylinder head cover gasket; then install the cylinder head cover and tighten the four cap screws to specifications (see Section 10).

13. Install the valve timing inspection plug and tighten securely; then install the recoil starter assembly and secure with the four cap screws coated with blue Loctite #242. Tighten to specifications (see Section 10).

14. Install the spark plug cap/high tension lead, front fenders, front rack, and splash panels; then install the heat shields and seat making sure the seat locks securely.

## Testing Engine Compression

2

To test engine compression, use the following procedure.

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

### ⚠ WARNING

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

3. Remove the spark plug; then attach the high tension lead to the plug and ground the plug on the cylinder head well away from the spark plug hole.

### ⚠ CAUTION

**On the 700 EFI, do not ground the spark plug on the cylinder head cover. The cover is made of magnesium and any contact with spark or electrical arc will severely pit the surface.**

4. Attach the Compression Tester Kit (p/n 0444-213).

**■ NOTE: The engine must be warm and the battery must be fully charged for this test.**

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

**■ NOTE: For the 400, the compression should be within a range of 95-115 psi in the full-open throttle position. For the 500/650 H1, the compression should be within a range of 70-85 psi in the full-open throttle position. For the 700 EFI, the compression should be within a range of 130-155 psi in the full-open throttle position.**

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

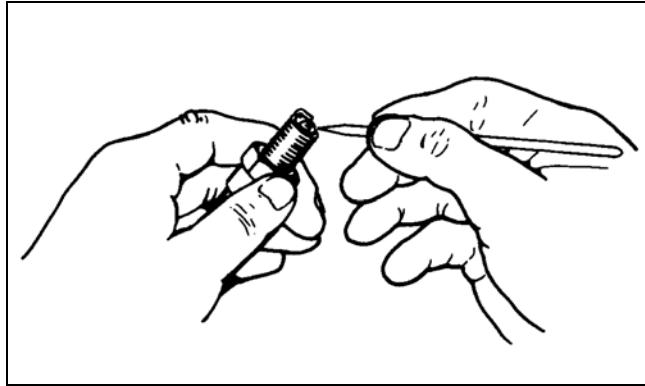
- A. Verify starter cranks engine over at normal speed (approximately 400 RPM).
- B. Gauge functioning properly.
- C. Throttle lever in the full-open position.
- D. Valve/tappet clearance correct.
- E. Valve not bent or burned.
- F. Valve seat not burned.

**■ NOTE: To service valves, see Section 3.**

7. Pour 29.5 ml (1 fl oz) of oil into the spark plug hole, reattach the gauge, and retest compression.
8. If compression is now evident, service the piston rings (see Section 3).

## Spark Plug

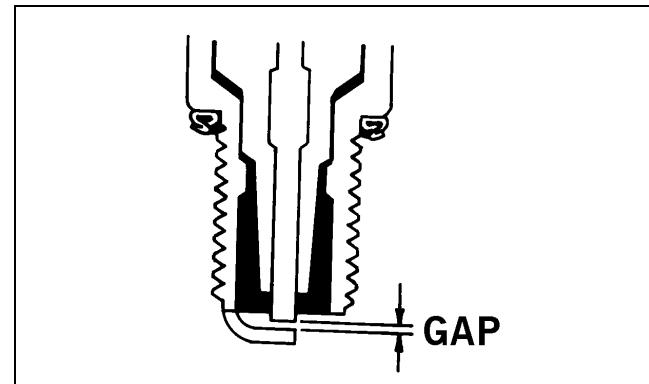
A light brown insulator indicates that a plug is correct. A white or dark insulator indicates that the engine may need to be serviced or the carburetor (if equipped) may need to be adjusted. To maintain a hot, strong spark, keep the plug free of carbon.



### ⚠ CAUTION

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

Adjust the gap to 0.7-0.8 mm (0.028-0.032 in.) for proper ignition. Use a feeler gauge to check the gap.



When installing the spark plug, be sure to tighten it securely. 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.

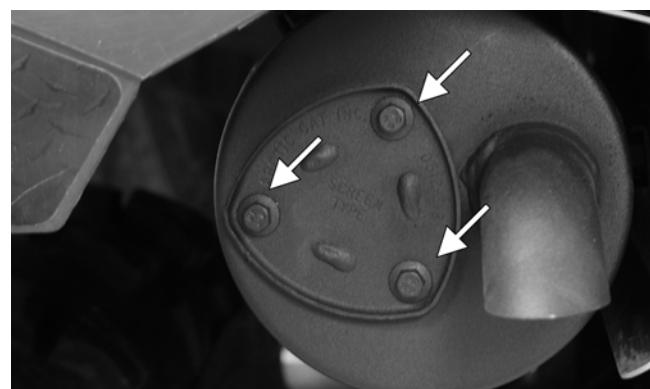
## Muffler/Spark Arrestor

The muffler has a spark arrester which must be periodically cleaned. At the intervals shown in the Periodic Maintenance Chart, clean the spark arrester using the following procedure.

### ⚠ WARNING

Wait until the muffler cools to avoid burns.

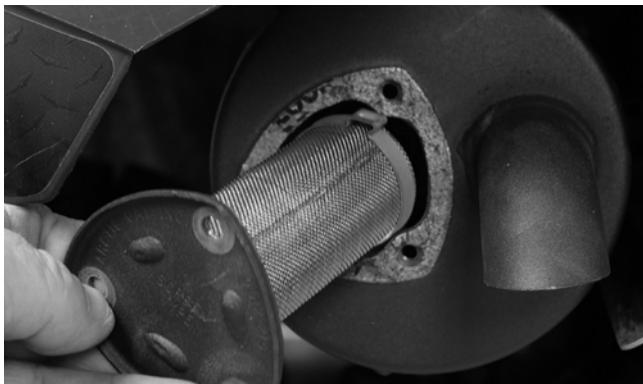
1. Remove the three cap screws securing the spark arrester assembly to the muffler; then loosen and remove the arrester.



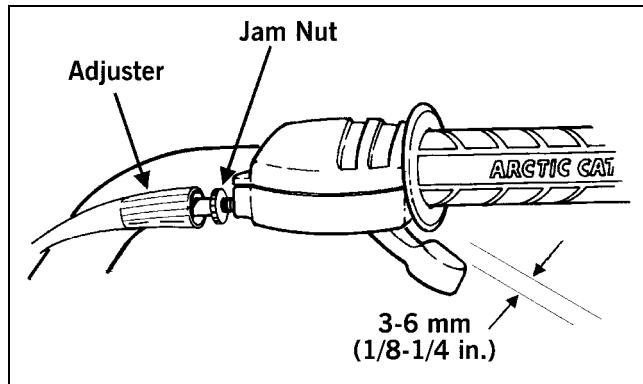
2. Using a suitable brush, clean the carbon deposits from the screen taking care not to damage the screen.

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

3. Install the spark arrester assembly with gasket; then secure with the three cap screws. Tighten to 0.6 kg-m (4.0 ft-lb).



CF104



ATV-0047

3. Tighten the jam nut against the throttle cable adjuster securely; then slide the rubber boot over the adjuster.

2

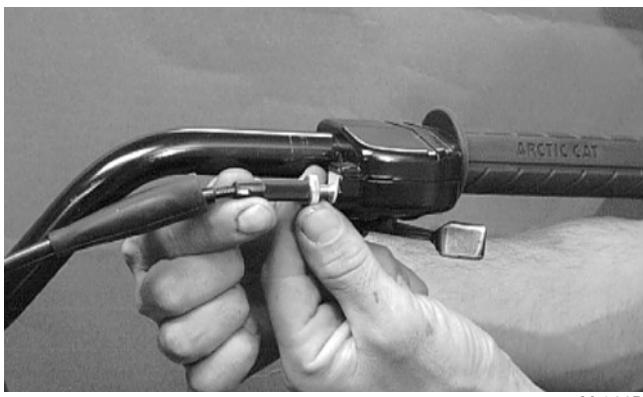
## Gas/Vent Hoses

Replace the gas hose every two years. Damage from aging may not always be visible. Do not bend or obstruct the routing of the carburetor/throttle body vent hose. Make certain that the vent hose is securely connected to the carburetor/throttle body and the opposite end is always open.

## Adjusting Throttle Cable

To adjust the throttle cable free-play, follow this procedure.

1. Slide the rubber boot away; then loosen the jam nut from the throttle cable adjuster.



AL611D

2. Turn the adjuster until the throttle cable has proper free-play of 3-6 mm (1/8-1/4 in.) at the lever.

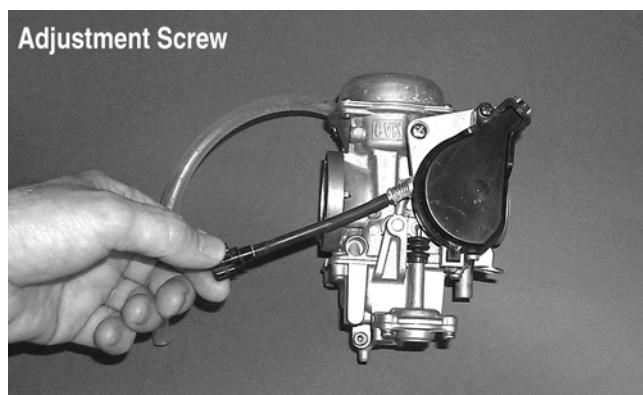
## Adjusting Engine RPM (Idle)

■ **NOTE:** The idle RPM is not adjustable on the 700 EFI.

To properly adjust the idle RPM, a tachometer is necessary. To adjust idle RPM, use the following procedure.

■ **NOTE:** The idle adjustment screw is located on the right-hand side of the carburetor.

1. With the transmission in neutral, start the engine and warm it up to normal operating temperature.
2. Turn the idle adjustment screw clockwise one turn past the recommended RPM setting; then turn it counterclockwise to 1250-1350 RPM.



AF920D

### ⚠ WARNING

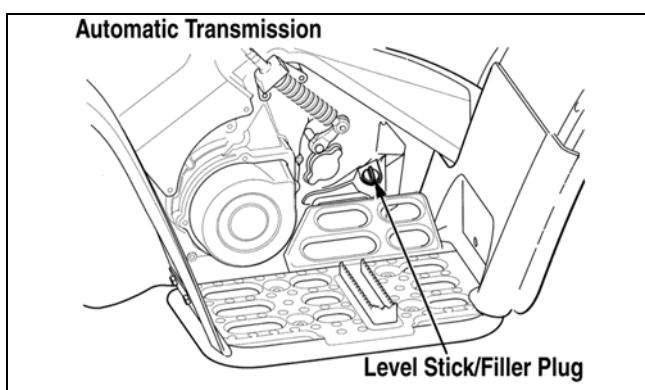
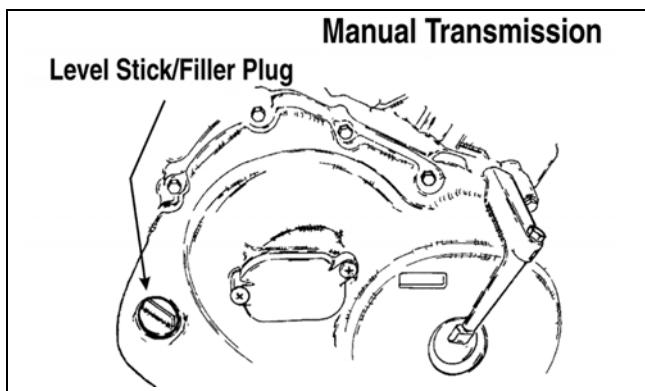
Adjust the idle to the correct RPM. Make sure the engine is at normal operating temperature before adjusting the idle RPM.

# Engine/Transmission Oil - Filter - Strainer

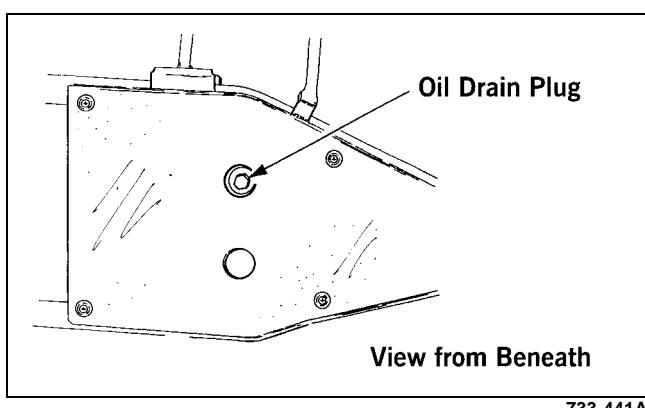
## OIL - FILTER

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



3. Remove the drain plug from the bottom of the engine and drain the oil into a drain pan.



4. On the 400/500, remove the oil filter plug from the filter mounting boss (located on the front side of the transmission case) and allow the filter to drain completely. Install the plug and tighten securely.

5. On the 700 EFI, remove the left-side engine cover and the left-front inner fender panel.
6. Using the adjustable Oil Filter Wrench (p/n 0644-389) and a suitable wrench, remove the old oil filter.

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

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

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

8. Install the engine drain plug and tighten to specifications. Pour the specified amount of the recommended oil in the filler hole. Install the oil level stick/filler plug.

### ⚠ CAUTION

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

9. Start the engine (while the ATV is outside on level ground) and allow it to idle for a few minutes.

10. Turn the engine off and wait approximately one minute.

11. Unscrew the oil level stick and wipe it with a clean cloth.

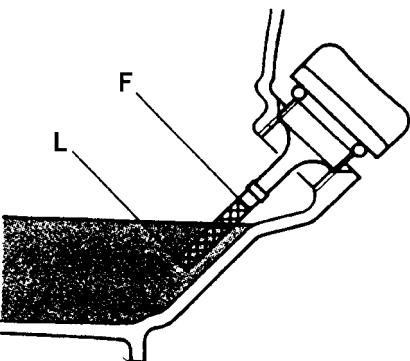
12. Install the oil level stick until the threads touch engine case.

■ **NOTE:** The oil level stick should not be threaded into the case for checking the oil level.

13. Remove the oil level stick; the engine oil level should be above the illustrated "L" mark but not higher than the illustrated "F" mark.

## ⚠ CAUTION

Do not over-fill the engine with oil. Always make sure that the oil level is above the "L" mark but not higher than the "F" mark.



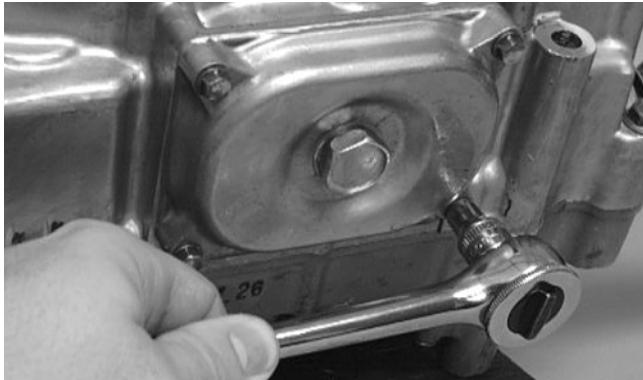
ATV-0100

14. Inspect the area around the drain plug and oil filter for leaks.
15. On the 700 EFI, install the left-side engine cover and the left-front inner fender panel.

## STRAINER

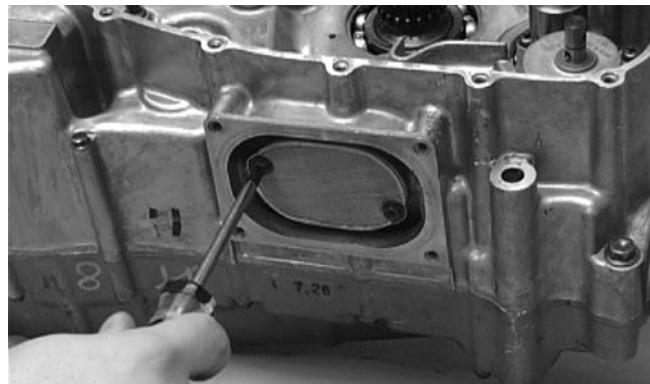
To check the oil strainer, use the following procedure.

1. Remove the belly panel.
2. Remove the cap screws securing the oil strainer cap; then remove the cap. Account for the O-ring.



CC091D

3. Remove the two Phillips-head cap screws securing the strainer.



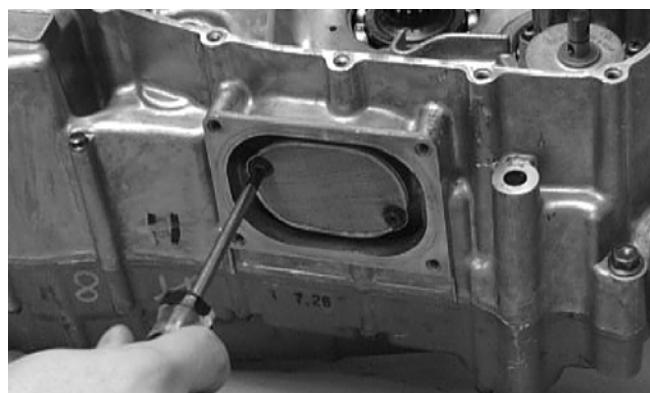
CC163D

## AT THIS POINT

To service oil strainer, see Section 3.

2

4. Place the oil strainer into position beneath the crankcase and secure with the Phillips-head cap screws. Tighten securely.



CC163D

5. Place the strainer cap into position on the strainer making sure the O-ring is properly installed; then secure with the cap screws. Tighten securely.



CC091D

6. Install the belly panel.

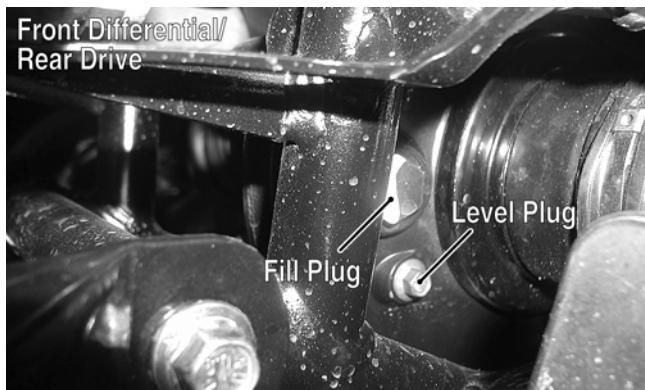
## Front Differential/Rear Drive Lubricant

Check and change the lubricant according to the Periodic Maintenance Chart. When changing the lubricant, use approved SAE 80W-90 hypoid gear lube.

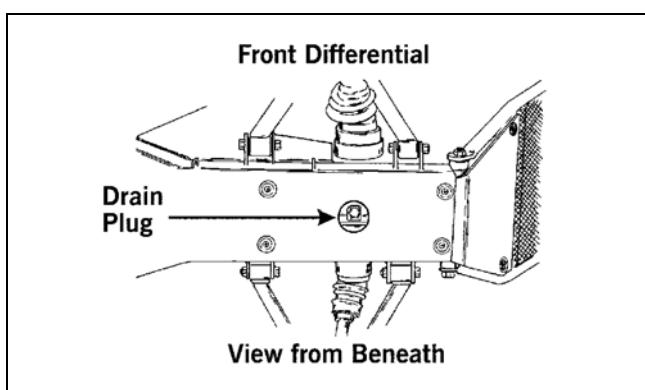
To check lubricant, remove the rear drive filler plug; the lubricant level should be 1 in. below the threads of the plug. If low, add SAE approved 80W-90 hypoid gear lube as necessary.

To change the lubricant, use the following procedure.

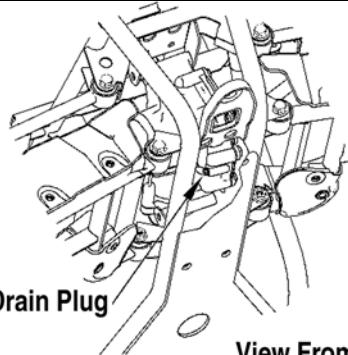
1. Place the ATV on level ground.
2. Remove each oil fill plug.



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



Rear Drive



View From Beneath

737-651B

4. After all the oil has been drained, install the drain plugs and tighten to specifications (see Section 10).
5. Pour the appropriate amount of recommended oil into the filler hole.
6. Install the fill plugs.

■ **NOTE:** If the differential/rear drive oil is contaminated with water, inspect the drain plug, filler plug, and/or bladder.

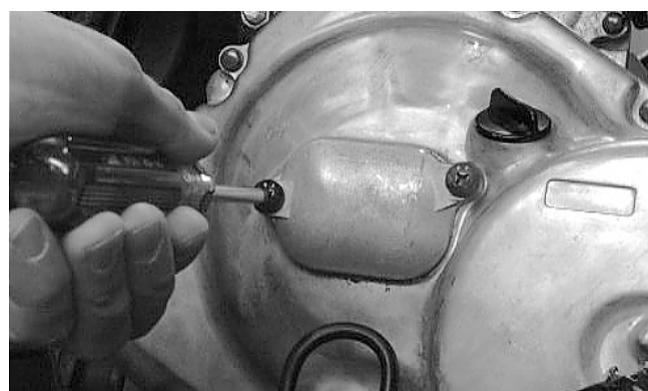
### CAUTION

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

## Adjusting Clutch (400/500 Manual Transmission)

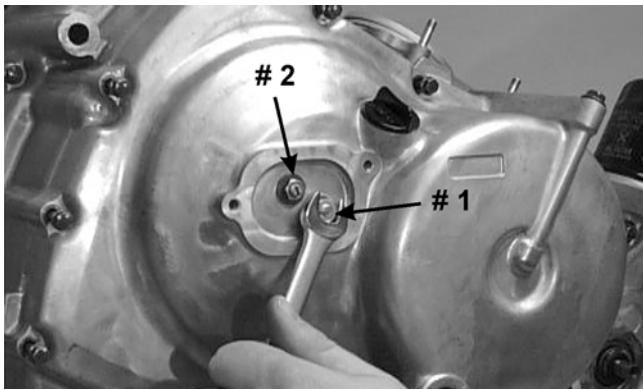
To adjust the clutch, use the following procedure.

1. Using an impact driver, remove the screws securing the cover and remove the cover. Account for the O-ring.



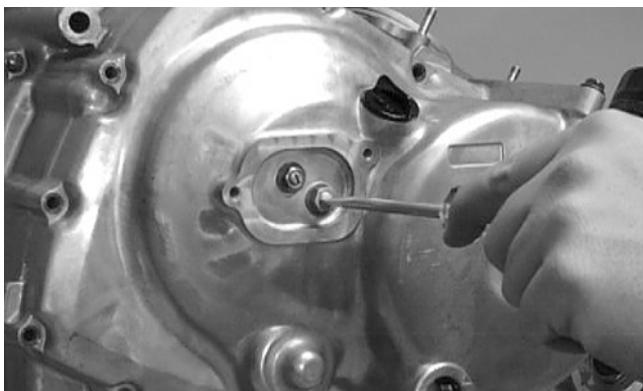
AM600D

2. Loosen the jam nuts securing adjustment screw #1 (forward) and adjustment screw #2 (rearward).



CC037D

3. Rotate adjustment screw #1 counterclockwise until it stops.



CC038D

4. Rotate adjustment screw #2 alternately clockwise and counterclockwise to ensure free movement without binding; then lock the jam nut securing adjustment screw #2.
5. Rotate adjustment screw #1 clockwise 1/8 turn; then lock the jam nut securing adjustment screw #1.

**■ NOTE: At this point the clutch should be adjusted correctly. Test to ensure accurate adjustment.**

6. Install the cover making sure the O-ring is properly positioned; then secure with the screws.

## Tires

### TIRE SIZES

The ATV is equipped with low-pressure tubeless tires of the size and type listed (see Section 1). 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.

## TIRE INFLATION PRESSURE

Front and rear tire inflation pressure should be 0.35 kg-cm<sup>2</sup> (5.0 psi).

A low-pressure gauge is provided in the tool kit to measure the air pressure in the tires. Check the air pressure in all tires before each use of the ATV.

---

## Steering Components

---

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

**2**

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

---

## Driveshaft/Coupling

---

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

- Spline lateral movement (slop).
- Coupling cracked, damaged, or worn.

---

## Suspension/Shock Absorbers/Bushings

---

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

- A. Shock absorber rods not bent, pitted, or damaged.
- B. Rubber damper not cracked, broken, or missing.
- C. Shock absorber body not damaged, punctured, or leaking.
- D. Shock absorber eyelets not broken, bent, or cracked.
- E. Shock absorber eyelet bushings not worn, deteriorated, cracked, or missing.
- F. Shock absorber spring not broken or sagging.

---

## Nuts/Bolts/Cap Screws

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Tighten all nuts, bolts, and cap screws. Make sure rivets holding components together are tight. Replace all loose rivets. Care must be taken that all calibrated nuts, bolts, and cap screws are tightened to specifications (see Section 10).

---

## Ignition Timing

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**■ NOTE: The 700 EFI rotor/flywheel does not have timing marks; therefore, timing cannot be verified.**

The ignition timing cannot be adjusted; however, verifying ignition timing can aid in troubleshooting other components. To verify ignition timing, use the following procedure.

1. Attach the Timing Light (p/n 0644-296) to the spark plug high tension lead; then remove the timing inspection plug from the left-side crankcase cover.
2. Using the Tachometer (p/n 0644-275), start the engine and 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/CKP sensor bracket may be bent or damaged, or the CDI unit/ECU may be faulty.

---

## Headlight/Taillight-Brakelight

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Each time the ATV is used, lights should be checked for proper function. Rotate the ignition switch to the lights position; the headlights and taillight should illuminate. Test the brakelight by compressing the brake lever. The brakelight should illuminate.

### 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.**

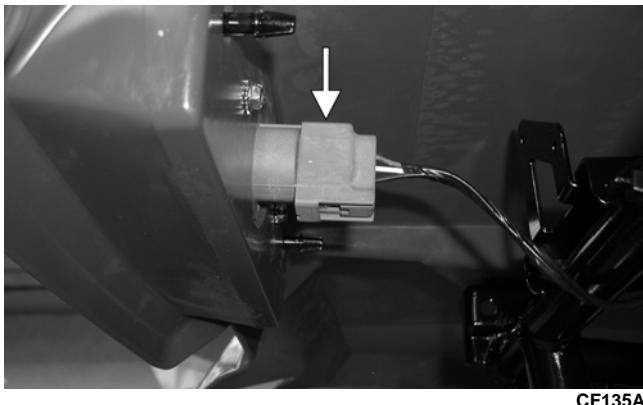
To replace the headlight bulb, use the following procedure.

1. Remove the wiring harness connector from the back of the headlight.
2. Grasp the bulb housing, turn it counterclockwise, and remove the bulb.
3. Install the new bulb into the housing and rotate it completely clockwise.
4. Install the wiring harness connector.

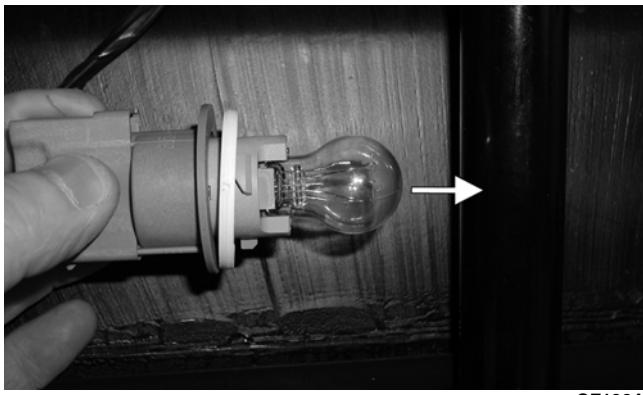
### TAILLIGHT-BRAKELIGHT

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

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



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



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

## CHECKING/ADJUSTING HEADLIGHT AIM

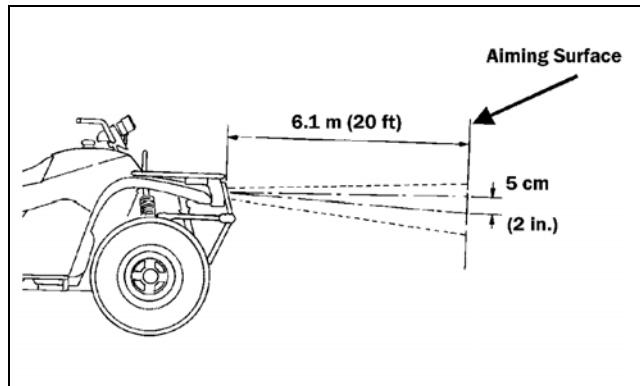
The headlights can be adjusted vertically and horizontally. The geometric center of the HIGH beam light zone is to be used for vertical and horizontal aiming.

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

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

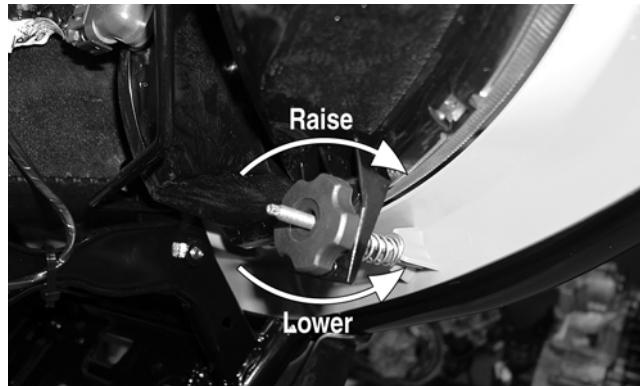
2. Measure the distance from the floor to the mid-point of each headlight.
3. Using the measurements obtained in step 2, make horizontal marks on the aiming surface.
4. Make vertical marks which intersect the horizontal marks on the aiming surface directly in front of the headlights.
5. Switch on the lights. Make sure the HIGH beam is on. DO NOT USE LOW BEAM.

6. Observe each headlight beam aim. Proper aim is when the most intense beam is centered on the vertical mark 5 cm (2 in.) below the horizontal mark on the aiming surface.



**2**

7. Adjust each headlight by turning the adjuster knob clockwise to raise the beam or counter-clockwise to lower the beam.



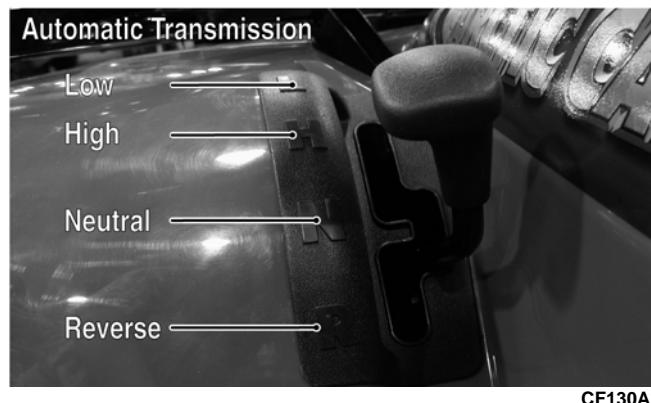
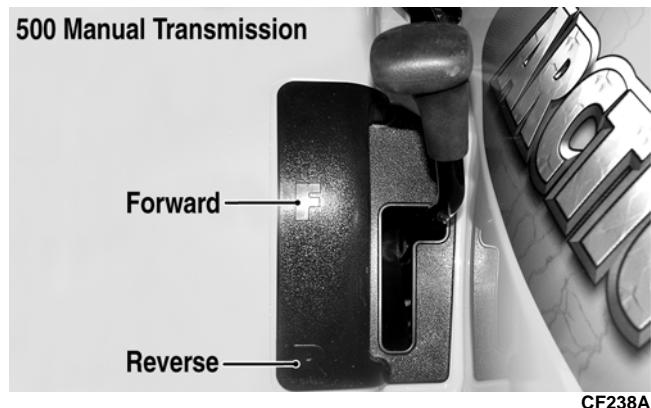
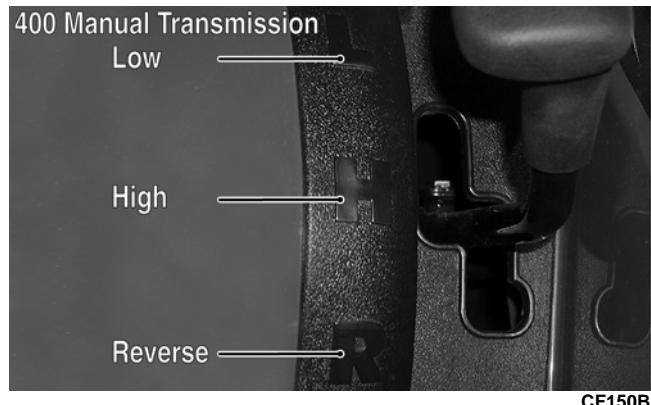
## Switches

Each time the ATV is used, switches should be checked for proper operation. Use the following list for reference.

- A. Ignition switch — engine will start.
- B. Emergency stop switch — engine will stop.
- C. Reverse switch — reverse indicator light will illuminate.
- D. Hi/Lo switch — headlight beam bright and dim.
- E. Brake switches — rear brakelight will illuminate.

# Shift Lever

## CHECKING ADJUSTMENT



Stop the ATV completely and shift the transmission into the R position. The reverse gear indicator light should be illuminated.

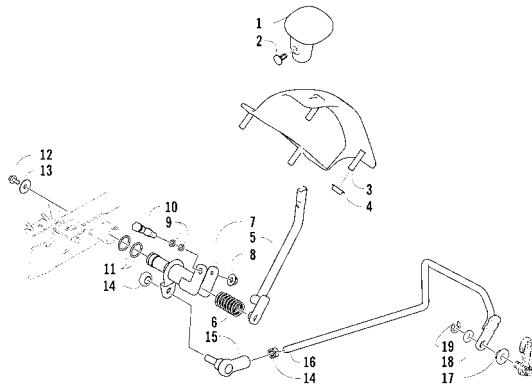
### **WARNING**

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

If the reverse light does not illuminate when shifted to the reverse position, the switch may be faulty, the fuse may be blown, the bulb may be faulty, a connection may be loose or corroded, or the lever may need adjusting. To adjust, proceed to Adjusting Shift Lever.

## ADJUSTING SHIFT LEVER

### 400/500 Manual Transmission

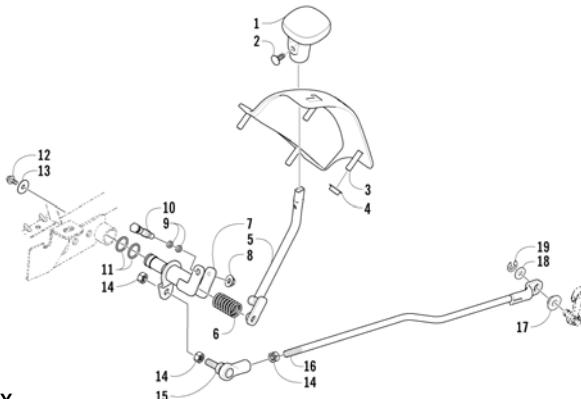


#### KEY

1. Handle	8. Nut	15. Rod End
2. Push Clip	9. O-Ring	16. Linkage
3. Shift Plate	10. Axle	17. Bushing
4. Stamped Nut	11. O-Ring	18. Washer
5. Lever	12. Cap Screw	19. E-Ring
6. Spring	13. Washer	
7. Axle	14. Nut	

0739-739

### 400/500 Automatic Transmission/650 H1/700 EFI



#### KEY

1. Handle	8. Nut	15. Rod End
2. Push Clip	9. O-Ring	16. Linkage
3. Shift Plate	10. Axle	17. Bushing
4. Stamped Nut	11. O-Ring	18. Washer
5. Lever	12. Cap Screw	19. E-Ring
6. Spring	13. Washer	
7. Axle	14. Nut	

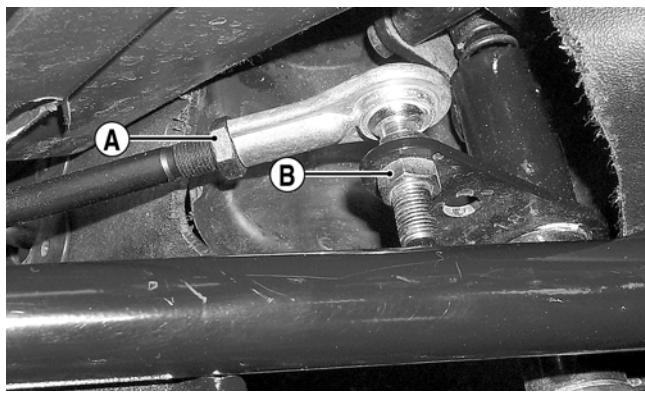
0739-701

1. Place the shift lever in the R position; then remove the seat.

■ NOTE: Steps 2-8 are for all models except the 700 EFI. For the 700 EFI, proceed to step 9.

2. Remove the left-side splash panel.

3. Loosen shift rod end jam nut (A).



AF941A

4. Using two open-end wrenches, remove lock nut (B) securing the shift rod to the upper shift axle. Discard the lock nut.

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

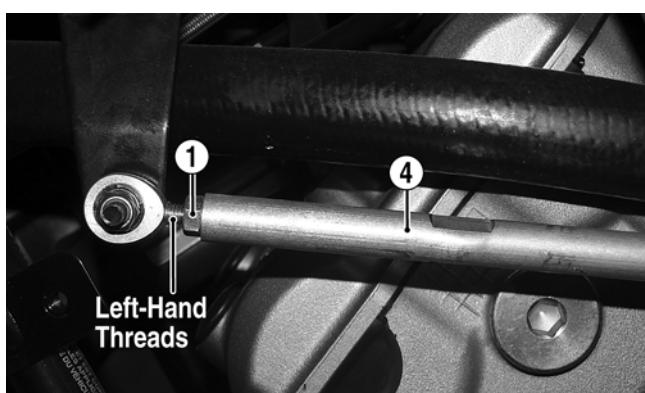
5. Push the upper shift axle down completely.

6. Rotate the shift rod end as necessary to align its threaded shaft with the hole in the upper shift axle. Secure with a new lock nut (B). Tighten securely.

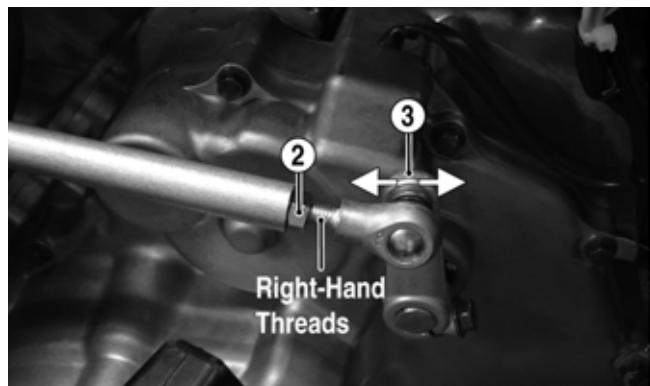
7. Tighten jam nut (A) to secure the adjustment.

8. Install the left-side splash panel; then install the seat.

9. Loosen the front shift rod jam nut (1) (left-hand threads); then loosen the rear shift rod jam nut (2) (right-hand threads).



FI059A



FI010A

2

10. Turn the ignition switch to the ON position; then move the shift arm (3) until the Neutral icon (N) appears on the LCD.

11. Rotate the shift rod (4) until the shifter is directly aligned with the Neutral position on the shift gate.

12. While holding the shift rod with an open-end wrench, tighten the shift rod jam nuts securely.

13. Shift the transmission into each of the remaining positions and verify that the appropriate icon is displayed for the selected gear shift position (H - High, L - Low, and R - Reverse).

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

## Frame/Welds/Racks

The frame, welds, and racks should be checked periodically for damage, bends, cracks, deterioration, broken components, and missing components. If replacement or repair constitutes removal, see Section 8.

## Electrical Connections

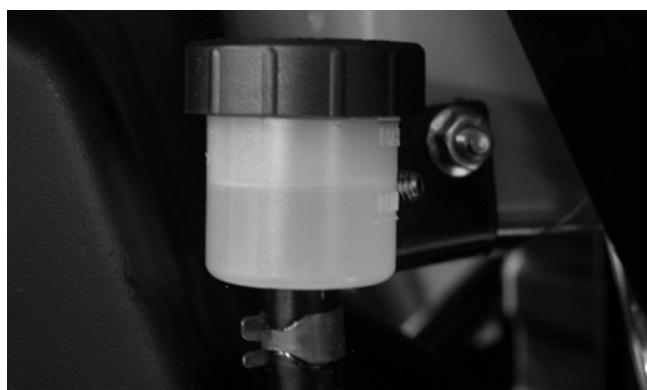
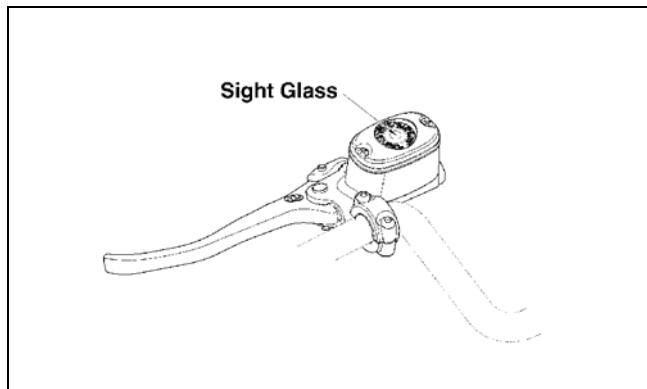
The electrical connections should be checked periodically for proper function. In case of an electrical failure, check fuses, connections (for tightness, corrosion, damage), and/or bulbs. If an electrical component needs to be tested for proper function, see Section 5.

# Hydraulic Brake Systems

## CHECKING/BLEEDING

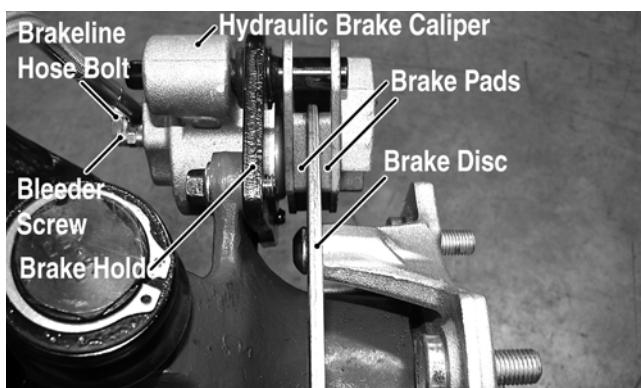
The hydraulic brake systems have been filled and bled at the factory. To check and/or bleed a hydraulic brake system, use the following procedure.

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



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

C. Remove the protective cap, install one end of a clear hose onto one FRONT bleeder screw, and direct the other end into a container; then while holding slight pressure on the brake lever, open the bleeder screw and watch for air bubbles. Close the bleeder screw before releasing the brake lever. Repeat this procedure until no air bubbles are present.



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

- D. Repeat step C until the brake lever is firm.
- E. At this point, perform step B, C, and D on the other FRONT bleeder screw; then move to the REAR bleeder screw and follow the same procedure.
4. Carefully check the entire hydraulic brake system that all hose connections are tight, the bleed screws are tight, the protective caps are installed, and no leakage is present.

## ⚠ CAUTION

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

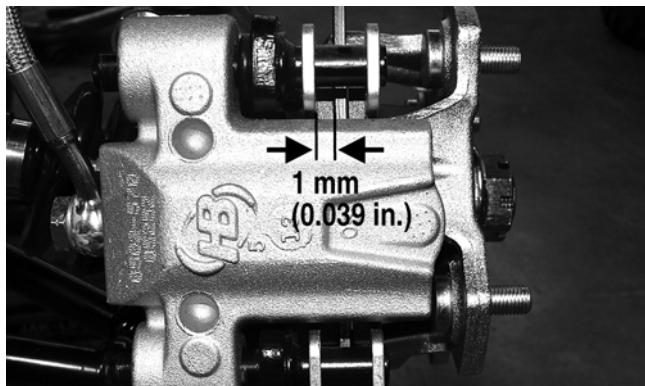
## INSPECTING HOSES

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

## CHECKING/REPLACING PADS

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

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



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

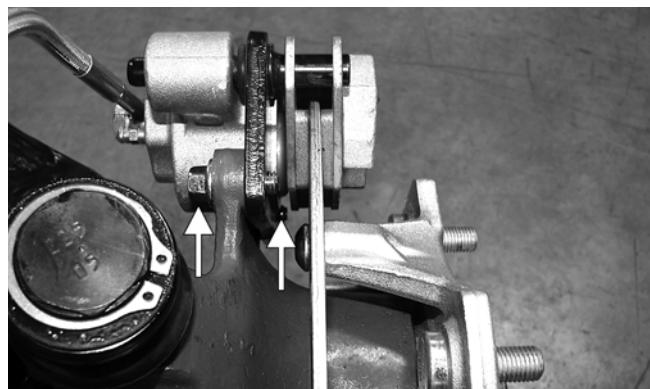
4. To replace the brake pads, use the following procedure.
  - A. Remove the wheel.
  - B. Remove the cap screws securing the caliper holder to the knuckle; then remove the pads.



C. Install the new brake pads.

D. Secure the caliper to the knuckle and/or axle housing with the cap screws. Tighten to specifications.

2



E. Install the wheel. Tighten to specifications.

5. Burnish the brake pads (see Burnishing Brake Pads in this section).

## Burnishing Brake Pads

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

## ⚠ 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.

1. Choose an area large enough to safely accelerate the ATV to 30 mph and to brake to a stop.
2. Accelerate to 30 mph; then compress brake lever or apply the auxiliary brake to decelerate to 0-5 mph.

3. Repeat procedure on each brake system five times until brake pads are burnished.
4. Adjust the auxiliary brake (if necessary).
5. Verify that the brakelight illuminates when the hand lever is compressed or the brake pedal is depressed.

---

## Coolant (500/650 H1/700 EFI)

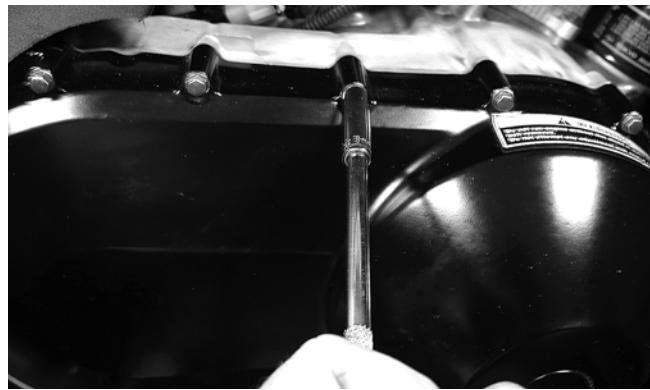
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The cooling system should be inspected daily for leakage and damage. Also, the coolant level should be checked periodically.

When filling the cooling system, use premixed Arctic Cat Antifreeze. While the cooling system is being filled, air pockets may develop; therefore, run the engine for five minutes after the initial fill, shut the engine off, and then fill the cooling system to the bottom of the stand pipe in the radiator neck.

**⚠ CAUTION**

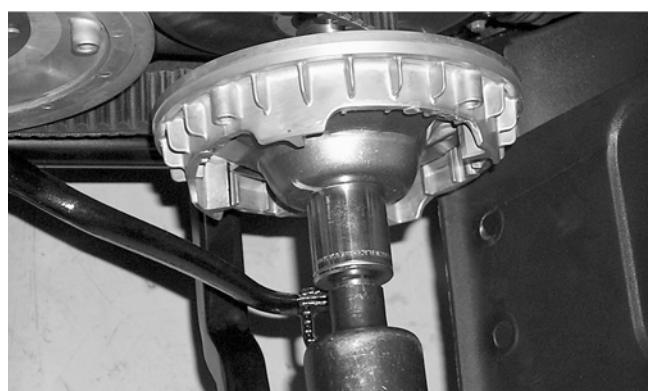
After operating the ATV for the initial 5-10 minutes, stop the engine, allow the engine to cool down, and check the coolant level. Add coolant as necessary.



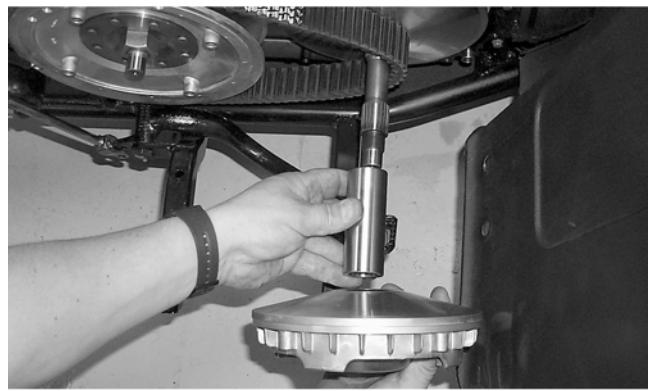
CD078

■ **NOTE: Note the location of the main engine ground wire for installing purposes.**

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



CC546



CC547

4. Remove the V-belt.

## REMOVING

1. Remove the right-side footrest (see Section 8).
2. 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. Remove the cover.



CC550



CC552

2

## INSTALLING

1. Spread the faces of the driven clutch by pushing the inner face toward the engine while turning it counterclockwise; then when the faces are separated, insert a wedge (approximately 3/8 in. thick) between the faces. Release the inner face.



CC549

2. Place the V-belt into position on the driven clutch and over the front shaft.



CC550

■ NOTE: The arrow on the V-belt should point forward.

3. Pinch the V-belt together near its center and slide the spacer and movable drive face onto the driveshaft. Secure the drive face with a nut. Tighten the nut to specifications (see Section 10).

■ NOTE: At this point, the wedge can be removed from between the driven clutch faces.

4. Rotate the V-belt and clutches until the V-belt is flush with the top of the driven clutch.
5. 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 specifications (see Section 10).



CD083

■ NOTE: Make sure the main engine ground wire is installed and secured in the proper location.

6. Secure the front fender to the footrest with the two cap screws. Tighten securely.
7. Install the right-side footrest (see Section 8).

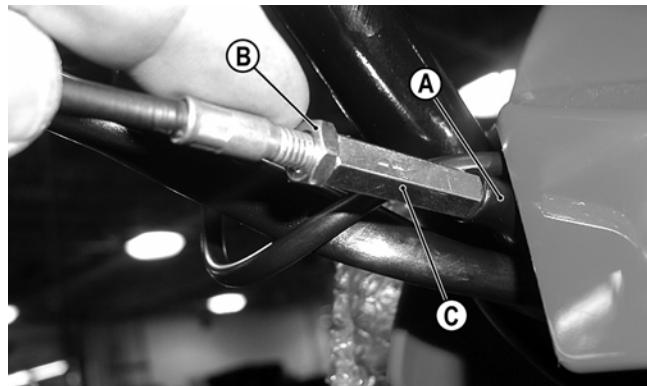
## Adjusting Differential Lock Cable

■ **NOTE:** The following procedure does not include the 400 TRV model.

If the differential or differential lock system has been serviced, the differential lock cable should be checked and/or adjusted for proper free-play.

To adjust the cable, use the following procedure.

1. With the differential lock selector in the UNLOCK position, slide the rubber boot (A) off the adjuster; then loosen the jam nut (B). Turn the adjuster (C) to achieve 6.35 mm (0.250 in.) of free-play measured at the end of the differential lock lever.



CD560A

2. Select the 2WD position on the front drive selector switch; then turn the ignition switch to the ON position and select the LOCK position on the differential lock selector. The front drive actuator should operate engaging four-wheel drive.
- **NOTE:** It may be necessary to turn the handlebar or rock the ATV forward and backward to align the differential lock splines and allow engagement.
3. Return the differential lock selector to the UNLOCK position and listen for the front drive actuator to operate.
4. Turn the ignition switch to the OFF position. Tighten the jam nut securely; then install the boot on the adjuster.

## Exhaust Chart

■ NOTE: Use this chart in conjunction with the procedure found in Valve/Tappet Clearance (700 EFI) in this section.

SUFFIX NO.	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	325	330	335	340	345	350
PRESENT SHIM SIZE (mm)	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50
MEASURED TAPPET CLEARANCE (mm)																									
0.00-0.04																									
0.05-0.09																									
0.10-0.14																									
0.15-0.19																									
0.20-0.30																									
0.31-0.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50		
0.36-0.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50		
0.41-0.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50		
0.46-0.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50		
0.51-0.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50		
0.56-0.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50		
0.61-0.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
0.66-0.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
0.71-0.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
0.76-0.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
0.81-0.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
0.86-0.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
0.91-0.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
0.96-1.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
1.01-1.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
1.06-1.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
1.11-1.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
1.16-1.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
1.21-1.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
1.26-1.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
1.31-1.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
1.36-1.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
1.41-1.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		
1.46-1.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50		

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## Intake Chart

■ NOTE: Use this chart in conjunction with the procedure found in Valve/Tappet Clearance (700 EFI) in this section.

SUFFIX NO.	PRESENT SHIM SIZE (mm)	SPECIFIED CLEARANCE/NO ADJUSTMENT REQUIRED																								
		230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	325	330	335	340	345	350
0.00-0.04	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	
0.05-0.09																										
0.10-0.20																										
0.21-0.25	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	
0.26-0.30	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	
0.31-0.35	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	
0.36-0.40	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	
0.41-0.45	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.46-0.50	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.51-0.55	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.56-0.60	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.61-0.65	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.66-0.70	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.71-0.75	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.76-0.80	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.81-0.85	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.86-0.90	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.91-0.95	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.96-1.00	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
1.01-1.05	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
1.06-1.10	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
1.11-1.15	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
1.16-1.20	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
1.21-1.25	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
1.26-1.30	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
1.31-1.35	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
1.36-1.40	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	



# SECTION 3 - ENGINE/TRANSMISSION

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## Engine/Transmission

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

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:** Some photographs and illustrations used in this section are used for clarity purposes only and are not designed to depict actual conditions.

**■ NOTE:** Critical torque specifications are located in Section 10.

# Specifications\*

## (400 - Automatic Transmission)

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VALVES AND GUIDES		
Valve Face Diameter	(intake) (exhaust)	30.6 mm (1.20 in.) 27.0 mm (1.06 in.)
Valve/Tappet Clearance (cold engine)	(intake) (exhaust)	0.05-0.10 mm (0.002-0.004 in.) 0.22-0.27 mm (0.009-0.011 in.)
Valve Guide/Stem Clearance	(intake) (exhaust)	0.010-0.037 mm (0.0004-0.0015 in.) 0.030-0.057 mm (0.0012-0.0022 in.)
Valve Guide/Valve Stem Deflection (wobble deflection)	(max)	0.35 mm (0.014 in.)
Valve Guide Inside Diameter		5.000-5.012 mm (0.1969-0.1973 in.)
Valve Stem Outside Diameter	(intake) (exhaust)	4.975-4.990 mm (0.1959-0.1965 in.) 4.955-4.970 mm (0.1951-0.1957 in.)
Valve Stem Runout	(max)	0.05 mm (0.002 in.)
Valve Head Thickness	(min)	0.5 mm (0.02 in.)
Valve Stem End Length	(min)	2.3 mm (0.09 in.)
Valve Face/Seat Width		0.9-1.1 mm (0.035-0.043 in.)
Valve Seat Angle	(intake) (exhaust)	45° 45°
Valve Face Radial Runout	(max)	0.03 mm (0.001 in.)
Valve Spring Free Length	(min)	38.8 mm (1.53 in.)
Valve Spring Tension @ 32.5 mm (1.28 in.)	(outer)	18.6-21.4 kg (41-47 lb)
CAMSHAFT AND CYLINDER HEAD		
Cam Lobe Height (min)	(intake) (exhaust)	32.830 mm (1.293 in.) 32.830 mm (1.293 in.)
Camshaft Journal Oil Clearance	(max)	0.15 mm (0.0059 in.)
Camshaft Journal Holder Inside	(right & center) (left)	22.012-22.025 mm (0.8666-0.8671 in.) 17.512-17.525 mm (0.6894-0.6900 in.)
Camshaft Journal Outside Diameter	(right & center) (left)	21.959-21.980 mm (0.8645-0.8654 in.) 17.466-17.484 mm (0.6876-0.6883 in.)
Camshaft Runout	(max)	0.10 mm (0.004 in.)
Rocker Arm Inside Diameter		12.000-12.018 mm (0.472-0.473 in.)
Rocker Arm Shaft Outside Diameter		11.973-11.984 mm (0.4714-0.4718 in.)
Cylinder Head Distortion	(max)	0.05 mm (0.002 in.)
Cylinder Head Cover Distortion	(max)	0.05 mm (0.002 in.)

CYLINDER, PISTON, AND RINGS		
Piston Skirt/Cylinder Clearance		0.060-0.073 mm (0.0024-0.0029 in.)
Cylinder Bore		82.000-82.015 mm (3.2283-3.2289 in.)
Piston Diameter 15 mm (0.6 in.) from Skirt End		81.930-81.945 mm (3.2256-3.2262 in.)
Piston Ring Free End Gap	(1st Ring) (min)	8.9 mm (0.3504 in.)
	(2nd Ring)	8.3 mm (0.3268 in.)
Bore x Stroke		82 x 71.2 mm (3.29 x 2.80 in.)
Cylinder Trueness	(max)	0.05 mm (0.002 in.)
Piston Ring End Gap - Installed		0.33-0.61 mm (0.013-0.024 in.)
Piston Ring to Groove Clearance (max)	(1st) (2nd)	0.180 mm (0.0071 in.) 0.150 mm (0.0059 in.)
Piston Ring Groove Width	(1st) (2nd) (oil)	1.01-1.03 mm (0.0398-0.0406 in.) 1.01-1.03 mm (0.0398-0.0406 in.) 2.01-2.03 mm (0.0791-0.0799 in.)
Piston Ring Thickness	(1st) (2nd)	0.97-0.99 mm (0.0381-0.0389 in.) 0.97-0.99 mm (0.0381-0.0389 in.)
Piston Pin Bore	(max)	20.03 mm (0.789 in.)
Piston Pin Outside Diameter	(min)	19.98 mm (0.787 in.)
CRANKSHAFT		
Connecting Rod (small end inside diameter)	(max)	20.04 mm (0.7889 in.)
Connecting Rod (big end side-to-side)		0.10-0.55 mm (0.004-0.022 in.)
Connecting Rod (big end width)		21.95-22.00 mm (0.8642-0.8661 in.)
Connecting Rod (small end deflection)	(max)	3 mm (0.12 in.)
Crankshaft (web-to-web)		59.9-60.1 mm (2.358-2.366 in.)
Crankshaft Runout	(max)	0.08 mm (0.003 in.)
Oil Pressure at 60°C (140°F) @ 3000 RPM	(above) (below)	1.1 kg/cm² (16 psi) 1.5 kg/cm² (21 psi)
Cooling Fan Thermo-Switch Operating Temperature	(off → on) (on → off)	120°C (248°F) 110°C (230°F)
Engine Oil Thermo-Switch Operating Temperature	(off → on) (on → off)	160°C (320°F) 140°C (284°F)

\* Specifications subject to change without notice.

# Specifications\*

## (400 - Manual Transmission)

VALVES AND GUIDES		
Valve Face Diameter	(intake)	30.6 mm (1.20 in.)
	(exhaust)	27.0 mm (1.06 in.)
Valve/Tappet Clearance	(intake)	0.05-0.10 mm (0.002-0.004 in.)
(cold engine)	(exhaust)	0.22-0.27 mm (0.009-0.011 in.)
Valve Guide/Stem Clearance	(intake)	0.010-0.037 mm (0.0004-0.0015 in.)
	(exhaust)	0.030-0.057 mm (0.0012-0.0022 in.)
Valve Guide/Valve Stem Deflection (wobble deflection)	(max)	0.35 mm (0.014 in.)
Valve Guide Inside Diameter		5.000-5.012 mm (0.1969-0.1973 in.)
Valve Stem Outside Diameter	(intake)	4.975-4.990 mm (0.1959-0.1965 in.)
	(exhaust)	4.955-4.970 mm (0.1951-0.1957 in.)
Valve Stem Runout	(max)	0.05 mm (0.002 in.)
Valve Head Thickness	(min)	0.5 mm (0.02 in.)
Valve Stem End Length	(min)	2.3 mm (0.09 in.)
Valve Face/Seat Width		0.9-1.1 mm (0.035-0.043 in.)
Valve Seat Angle	(intake)	45°
	(exhaust)	45°
Valve Face Radial Runout	(max)	0.03 mm (0.001 in.)
Valve Spring Free Length	(min)	38.8 mm (1.53 in.)
Valve Spring Tension @ 32.5 mm (1.28 in.)	(outer)	18.6-21.4 kg (41-47 lb)
CAMSHAFT AND CYLINDER HEAD		
Cam Lobe Height (min)	(intake)	32.830 mm (1.293 in.)
	(exhaust)	32.830 mm (1.293 in.)
Camshaft Journal Oil Clearance	(max)	0.15 mm (0.0059 in.)
Camshaft Journal Holder Inside	(right & center)	22.012-22.025 mm (0.8666-0.8671 in.)
	(left)	17.512-17.525 mm (0.6894-0.6900 in.)
Camshaft Journal Outside Diameter	(right & center)	21.959-21.980 mm (0.8645-0.8654 in.)
	(left)	17.466-17.484 mm (0.6876-0.6883 in.)
Camshaft Runout	(max)	0.10 mm (0.004 in.)
Rocker Arm Inside Diameter		12.000-12.018 mm (0.472-0.473 in.)
Rocker Arm Shaft Outside Diameter		11.973-11.984 mm (0.4714-0.4718 in.)
Cylinder Head Distortion	(max)	0.05 mm (0.002 in.)
Cylinder Head Cover Distortion	(max)	0.05 mm (0.002 in.)

CYLINDER, PISTON, AND RINGS		
Piston Skirt/Cylinder Clearance		0.060-0.073 mm (0.0024-0.0029 in.)
Cylinder Bore		82.000-82.015 mm (3.2283-3.2289 in.)
Piston Diameter 15 mm (0.6 in.) from Skirt End		81.930-81.945 mm (3.2256-3.2262 in.)
Piston Ring Free End Gap	(1st Ring)	8.9 mm (0.3504 in.)
	(2nd Ring)	8.3 mm (0.3268 in.)
Bore x Stroke		82 x 71.2 mm (3.29 x 2.80 in.)
Cylinder Trueness	(max)	0.05 mm (0.002 in.)
Piston Ring End Gap - Installed		0.33-0.61 mm (0.013-0.024 in.)
Piston Ring to Groove Clearance (max)	(1st)	0.180 mm (0.0071 in.)
	(2nd)	0.150 mm (0.0059 in.)
Piston Ring Groove Width	(1st)	1.01-1.03 mm (0.0398-0.0406 in.)
	(2nd)	1.01-1.03 mm (0.0398-0.0406 in.)
	(oil)	2.01-2.03 mm (0.0791-0.0799 in.)
Piston Ring Thickness	(1st)	0.97-0.99 mm (0.0381-0.0389 in.)
	(2nd)	0.97-0.99 mm (0.0381-0.0389 in.)
Piston Pin Bore	(max)	20.03 mm (0.789 in.)
Piston Pin Outside Diameter	(min)	19.98 mm (0.787 in.)
CRANKSHAFT		
Connecting Rod (small end inside diameter)	(max)	20.04 mm (0.7889 in.)
Connecting Rod (big end side-to-side)		0.10-0.55 mm (0.004-0.022 in.)
Connecting Rod (big end width)		21.95-22.00 mm (0.8642-0.8661 in.)
Connecting Rod (small end deflection)	(max)	3 mm (0.12 in.)
Crankshaft (web-to-web)		59.9-60.1 mm (2.358-2.366 in.)
Crankshaft Runout (max)		0.08 mm (0.003 in.)
Oil Pressure at 60°C (140°F) @ 3000 RPM	(above)	0.6 kg/cm² (9 psi)
	(below)	1.0 kg/cm² (14 psi)
Cooling Fan Thermo-Switch Operating Temperature	(off → on)	120°C (248°F)
	(on → off)	110°C (230°F)
Engine Oil Thermo-Switch Operating Temperature	(off → on)	160°C (320°F)
	(on → off)	140°C (284°F)

CLUTCH	
Clutch Release Screw	1/8 turn back
Drive Plate (fiber) Thickness (min)	2.62 mm (0.103 in.)
Drive Plate (fiber) Tab	13.25-13.95 mm (0.52-0.55 in.)
Driven Plate (warpage)	(max) 0.1 mm (0.004 in.)
Clutch Spring Length (min)	33.7 mm (1.33 in.)
Clutch Wheel Inside Diameter	140.0-140.2 mm (5.511-5.520 in.)
Starter Clutch Shoe	No groove at any part
Clutch Engagement RPM	1700 ± 200
Clutch Lock-Up RPM	3400 - 4000
Primary Reduction Ratio	2.392 (67/28)
Secondary Reduction Ratio	1.133 (17/15)
Final Reduction Ratio (front) (rear)	3.6 (36/10) 3.6 (36/10)
Secondary Transmission Reduction Ratio (low) (high)	2.435 (35/13 x 19/21) 1.296 (35/27)
Gear Ratios (1st) (2nd) (3rd) (4th) (5th) (reverse)	3.083 (37/12) 1.933 (29/15) 1.388 (25/18) 1.095 (23/21) 0.913 (21/23) 2.833 (34/12)
Engine Fork to Groove (side clearance)	0.1-0.3 mm (0.004-0.012 in.)
Secondary Transmission Fork to Groove (side clearance)	0.1-0.3 mm (0.004-0.012 in.)
Reverse Fork to Groove (side clearance)	0.1-0.3 mm (0.004-0.012 in.)
Shift Fork Groove Width (#1 and #2)  (secondary transmission)  (reverse)	4.5-4.6 mm (0.177-0.181 in.) 5.45-5.55 mm (0.215-0.219 in.) 4.0-4.1 mm (0.157-0.161 in.)
Shift Fork Thickness (#1 and #2)  (secondary transmission)  (reverse)	4.3-4.4 mm (0.169-0.173 in.) 5.3-5.4 mm (0.209-0.213 in.) 3.8-3.9 mm (0.150-0.154 in.)

\* Specifications subject to change without notice.

# Specifications\*

## (500 - Automatic Transmission)

VALVES AND GUIDES		
Valve Face Diameter	(intake) (exhaust)	30.6 mm (1.20 in.) 27.0 mm (1.06 in.)
Valve/Tappet Clearance (cold engine)	(intake) (exhaust)	0.05-0.10 mm (0.002-0.004 in.) 0.17-0.22 mm (0.007-0.009 in.)
Valve Guide/Stem Clearance	(intake) (exhaust)	0.010-0.037 mm (0.0004-0.0015 in.) 0.030-0.057 mm (0.0012-0.0022 in.)
Valve Guide/Valve Stem Deflection (wobble deflection)	(max)	0.35 mm (0.014 in.)
Valve Guide Inside Diameter		5.000-5.012 mm (0.1969-0.1973 in.)
Valve Stem Outside Diameter	(intake) (exhaust)	4.975-4.990 mm (0.1959-0.1965 in.) 4.955-4.970 mm (0.1951-0.1957 in.)
Valve Stem Runout	(max)	0.05 mm (0.002 in.)
Valve Head Thickness	(min)	0.5 mm (0.02 in.)
Valve Stem End Length	(min)	2.3 mm (0.09 in.)
Valve Face/Seat Width		0.9-1.1 mm (0.035-0.043 in.)
Valve Seat Angle	(intake) (exhaust)	45° 45°
Valve Face Radial Runout	(max)	0.03 mm (0.001 in.)
Valve Spring Free Length	(min)	38.8 mm (1.53 in.)
Valve Spring Tension @ 31.5 mm (1.24 in.)	(outer)	18.6-21.4 kg (41-47 lb)
CAMSHAFT AND CYLINDER HEAD		
Cam Lobe Height (min)	(intake) (exhaust)	33.13 mm (1.304 in.) 33.20 mm (1.307 in.)
Camshaft Journal Oil Clearance	(max)	0.15 mm (0.0059 in.)
Camshaft Journal Holder Inside	(right & center) (left)	22.012-22.025 mm (0.8666-0.8671 in.) 17.512-17.525 mm (0.6894-0.6900 in.)
Camshaft Journal Outside Diameter	(right & center) (left)	21.959-21.980 mm (0.8645-0.8654 in.) 17.466-17.484 mm (0.6876-0.6883 in.)
Camshaft Runout	(max)	0.10 mm (0.004 in.)
Rocker Arm Inside Diameter		12.000-12.018 mm (0.472-0.473 in.)
Rocker Arm Shaft Outside Diameter		11.973-11.984 mm (0.4714-0.4718 in.)
Cylinder Head Distortion	(max)	0.05 mm (0.002 in.)
Cylinder Head Cover Distortion	(max)	0.05 mm (0.002 in.)

CYLINDER, PISTON, AND RINGS		
Piston Skirt/Cylinder Clearance		0.030-0.040 mm (0.0011-0.0015 in.)
Cylinder Bore		87.500-87.515 mm (3.4448-3.4454 in.)
Piston Diameter 15 mm (0.6 in.) from Skirt End		87.465-87.480 mm (3.4435-3.4440 in.)
Piston Ring Free End Gap	(1st Ring) (2nd Ring)	9.0 mm (0.35 in.) 9.5 mm (0.37 in.)
Bore x Stroke		87.5 x 82 mm (3.40 x 3.22 in.)
Cylinder Trueness	(max)	0.05 mm (0.002 in.)
Piston Ring End Gap - Installed		0.35-0.63 mm (0.014-0.025 in.)
Piston Ring to Groove Clearance (max)	(1st) (2nd)	0.180 mm (0.0071 in.) 0.150 mm (0.0059 in.)
Piston Ring Groove Width	(1st) (2nd) (oil)	1.01-1.03 mm (0.0398-0.0406 in.) 1.21-1.23 mm (0.0476-0.0484 in.) 2.51-2.53 mm (0.0988-0.0996 in.)
Piston Ring Thickness	(1st) (2nd)	0.97-0.99 mm (0.0382-0.0389 in.) 1.17-1.19 mm (0.046-0.047 in.)
Piston Pin Bore	(max)	23.03 mm (0.907 in.)
Piston Pin Outside Diameter	(min)	22.98 mm (0.905 in.)
CRANKSHAFT		
Connecting Rod (small end inside diameter)	(max)	23.04 mm (0.9070 in.)
Connecting Rod (big end side-to-side)		0.10-0.65 mm (0.0039-0.0256 in.)
Connecting Rod (big end width)		24.95-25.00 mm (0.9822-0.9842 in.)
Connecting Rod (small end deflection)	(max)	3 mm (0.12 in.)
Crankshaft (web-to-web)		70.9-70.1 mm (2.796-2.804 in.)
Crankshaft Runout	(max)	0.08 mm (0.003 in.)
Oil Pressure at 60°C (140°F) @ 3000 RPM	(above) (below)	1.3 kg/cm² (18 psi) 1.7 kg/cm² (24 psi)
Cooling Fan Thermo-Switch Operating Temperature	(off → on) (on → off)	88°C (190°F) 82°C (180°F) (min)
Engine Coolant Thermo-Switch Operating Temperature	(off → on) (on → off) (approx)	115°C (239°F) 108°C (226°F)

\* Specifications subject to change without notice.

# Specifications\*

## (500 - Manual Transmission)

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VALVES AND GUIDES		
Valve Face Diameter	(intake)	30.6 mm (1.20 in.)
	(exhaust)	27.0 mm (1.06 in.)
Valve/Tappet Clearance	(intake)	0.05-0.10 mm (0.002-0.004 in.)
(cold engine)	(exhaust)	0.17-0.22 mm (0.007-0.009 in.)
Valve Guide/ Stem Clearance	(intake)	0.010-0.037 mm (0.0004-0.0015 in.)
	(exhaust)	0.030-0.057 mm (0.0012-0.0022 in.)
Valve Guide/Valve Stem Deflection (wobble deflection)	(max)	0.35 mm (0.014 in.)
Valve Guide Inside Diameter		5.000-5.012 mm (0.1969-0.1973 in.)
Valve Stem Outside Dia- meter	(intake)	4.975-4.990 mm (0.1959-0.1965 in.)
	(exhaust)	4.955-4.970 mm (0.1951-0.1957 in.)
Valve Stem Runout	(max)	0.05 mm (0.002 in.)
Valve Head Thickness	(min)	0.5 mm (0.02 in.)
Valve Stem End Length	(min)	1.7 mm (0.067 in.)
Valve Face/Seat Width		0.9-1.1 mm (0.035-0.043 in.)
Valve Seat Angle	(intake)	45°
	(exhaust)	45°
Valve Face Radial Runout	(max)	0.03 mm (0.001 in.)
Valve Spring Free Length	(min)	38.8 mm (1.53 in.)
Valve Spring Tension @ 31.5 mm (1.24 in.)	(outer)	18.2-21.0 kg (40.1-46.3 lb)

CYLINDER, PISTON, AND RINGS		
Piston Skirt/Cylinder Clearance		0.030-0.040 mm (0.0011-0.0015 in.)
Cylinder Bore		87.500-87.515 mm (3.4448-3.4454 in.)
Piston Diameter		87.465-87.480 mm 15 mm (0.6 in.) from Skirt End (3.4435-3.4440 in.)
Piston Ring	(1st Ring)	9.0 mm (0.35 in.)
	(2nd Ring)	9.5 mm (0.37 in.)
Bore x Stroke		87.5 x 82 mm (3.40 x 3.22 in.)
Cylinder Trueness	(max)	0.05 mm (0.002 in.)
Piston Ring End Gap - Installed		0.35-0.63 mm (0.014-0.025 in.)
Piston Ring to Groove Clearance (max)	(1st)	0.180 mm (0.0071 in.)
	(2nd)	0.150 mm (0.0059 in.)
Piston Ring Groove Width	(1st)	1.01-1.03 mm (0.0398-0.0406 in.)
	(2nd)	1.21-1.23 mm (0.0476-0.0484 in.)
	(oil)	2.51-2.53 mm (0.0988-0.0996 in.)
Piston Ring Thickness	(1st)	0.97-0.99 mm (0.0382-0.0389 in.)
	(2nd)	1.17-1.19 mm (0.046-0.047 in.)
Piston Pin Bore	(max)	23.03 mm (0.907 in.)
Piston Pin Outside Dia- meter	(min)	22.98 mm (0.905 in.)

CAMSHAFT AND CYLINDER HEAD		
Cam Lobe Height	(intake)	33.13 mm (1.304 in.)
(min)	(exhaust)	33.20 mm (1.307 in.)
Camshaft Journal Oil Clearance	(max)	0.15 mm (0.0059 in.)
Camshaft Journal Holder Inside	(right & center)	22.012-22.025 mm (0.8666-0.8671 in.)
	(left)	17.512-17.525 mm (0.6894-0.6900 in.)
Camshaft Journal Outside Diameter	(right & center)	21.959-21.980 mm (0.8645-0.8654 in.)
	(left)	17.466-17.484 mm (0.6876-0.6883 in.)
Camshaft Runout	(max)	0.10 mm (0.004 in.)
Rocker Arm Inside Diameter		12.000-12.018 mm (0.472-0.473 in.)
Rocker Arm Shaft Outside Diameter		11.973-11.984 mm (0.4714-0.4718 in.)
Cylinder Head Distor- tion	(max)	0.05 mm (0.002 in.)
Cylinder Head Cover Distortion	(max)	0.05 mm (0.002 in.)

CRANKSHAFT		
Connecting Rod	(max)	23.04 mm (0.9070 in.)
(small end inside diameter)		
Connecting Rod		0.10-0.65 mm (0.0039-0.0256 in.)
(big end side-to-side)		
Connecting Rod		24.95-25.00 mm (0.9822-0.9842 in.)
(big end width)		
Connecting Rod	(max)	3 mm (0.12 in.)
(small end deflection)		
Crankshaft (web-to-web)		70.9-70.1 mm (2.796-2.804 in.)
Crankshaft Runout (max)		0.08 mm (0.003 in.)
Oil Pressure at 60°C (140°F) @ 3000 RPM	(above)	1.2 kg/cm <sup>2</sup> (17 psi)
	(below)	1.6 kg/cm <sup>2</sup> (23 psi)

CLUTCH	
Clutch Release Screw	1/4-1/2 turn back
Drive Plate (fiber) Thickness	(min) 2.82 mm (0.1110 in.)
Drive Plate (fiber) Tab	(min) 2.9 mm (0.507 in.)
Driven Plate (warpage)	(max) 0.1 mm (0.004 in.)
Clutch Spring Length	(min) 35.6 mm (1.40 in.)
Clutch Wheel Inside Diameter	140.0-140.2 mm (5.511-5.520 in.)
Starter Clutch Shoe	No groove at any part
Clutch Engagement RPM	1700 ± 200
Clutch Lock-Up RPM	3700 ± 300
Primary Reduction Ratio	2.032 (63/31)
Secondary Reduction Ratio	1.133 (17/15)
Final Reduction Ratio	(front) 3.6 (36/10) (rear) 3.6 (36/10)
Secondary Transmission Reduction Ratio	(low) 2.419 (22/23 x 27/17 x 43/27) (high) 1.592 (43/27)
Gear Ratios	(1st) 3.09 (34/11) (2nd) 1.75 (28/16) (3rd) 1.2 (24/20) (4th) 0.875 (21/24) (5th) 0.724 (21/29) (reverse) 2.636 (24/11 x 29/24)
Engine Fork to Groove (side clearance)	0.1-0.3 mm (0.004-0.012 in.)
Secondary Transmission Fork to Groove (side clearance)	0.1-0.3 mm (0.004-0.012 in.)
Reverse Fork to Groove (side clearance)	0.1-0.3 mm (0.004-0.012 in.)
Shift Fork Groove Width	(#1 and #2) 5.5-5.6 mm (0.217-0.220 in.) (secondary transmission) 5.5-5.6 mm (0.217-0.220 in.) (reverse) 5.0-5.1 mm (0.197-0.201 in.)
Shift Fork Thickness	(#1 and #2) 5.3-5.4 mm (0.209-0.213 in.) (secondary transmission) 5.3-5.4 mm (0.209-0.213 in.) (reverse) 4.8-4.9 mm (0.189-0.193 in.)
Thermostat Valve Opening Temperature	73.5-76.5°C (164-170°F)
Thermostat Valve Lift	Over 3 mm (0.12 in.) @ 90°C (194°F)
Cooling Fan Thermo-Switch Operating Temperature	(off → on) 88°C (190°F) (on → off) 82°C (180°F) (min)
Engine Coolant Thermo-Switch Operating Temperature	(off → on) 115°C (239°F) (on → off) 108°C (226°F) (approx)

\* Specifications subject to change without notice.

# Specifications\*

## (650 H1)

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VALVES AND GUIDES		
Valve Face Diameter (intake) (exhaust)	31.6 mm (1.24 in.) 27.9 mm (1.10 in.)	
Valve/Tappet Clearance (cold engine) (intake) (exhaust)	0.1016 mm (0.004 in.) 0.1524 mm (0.006 in.)	
Valve Guide/Stem Clearance (intake) (exhaust)	0.013 mm (0.0005 in.) 0.013 mm (0.0005 in.)	
Valve Guide/Valve Stem Deflection (wobble method) (max)	0.35 mm (0.014 in.)	
Valve Guide Inside Diameter	5.000-5.012 mm (0.1969-0.1973 in.)	
Valve Stem Outside Diameter (intake) (exhaust)	4.972-4.987 mm (0.1957-0.1963 in.) 4.972-4.987 mm (0.1957-0.1963 in.)	
Valve Stem Runout (max)	0.1 mm (0.0039 in.)	
Valve Head Thickness (min)	2.3 mm (0.0906 in.)	
Valve Stem End Length (min)	3.97 mm (0.156 in.)	
Valve Face/Seat Width (intake) (exhaust)	2.25 mm (0.0886 in.) 2.60 mm (0.1024 in.)	
Valve Seat Angle (intake) (exhaust)	45° 15'-45° 30' 45° 15'-45° 30'	
Valve Face Radial Runout (max)	0.2 mm (0.0079 in.)	
Valve Spring Free Length (min)	38.7 mm (1.524 in.)	
Valve Spring Tension @ 31.5 mm (1.24 in.) (outer)	19.0 kg (42 lb)	
CAMSHAFT AND CYLINDER HEAD		
Cam Lobe Height (min) (intake) (exhaust)	13.97 mm (0.55 in.) 13.97 mm (0.55 in.)	
Camshaft Journal Oil Clearance (max)	0.04 mm (0.0016 in.)	
Camshaft Journal Holder Inside Diameter (right & center) (left)	21.98-22.04 mm (0.8654-0.8677 in.) 17.48-17.53 mm (0.6882-0.6902 in.)	
Camshaft Journal Outside Diameter (right & center) (left)	21.96-21.98 mm (0.8646-0.8654 in.) 17.47-17.48 mm (0.6878-0.6882 in.)	
Camshaft Runout (max)	0.05 mm (0.002 in.)	
Rocker Arm Inside Diameter	12.000-12.018 mm (0.4724-0.4731 in.)	
Rocker Arm Shaft Outside Diameter	11.97-11.98 mm (0.4713-0.4717 in.)	
Cylinder Head Distortion (max)	0.05 mm (0.002 in.)	
Cylinder Head Cover Distortion (max)	0.05 mm (0.002 in.)	

CYLINDER, PISTON, AND RINGS		
Piston Skirt/Cylinder Clearance	0.045 mm (0.0018 in.)	
Cylinder Bore	98 mm (3.858 in.)	
Piston Diameter 15 mm (0.6 in.) from Skirt End	97.948-97.962 mm (3.856-3.857 in.)	
Piston Ring Free End Gap (1st ring) (2nd ring)	12.5 mm (0.492 in.) 12.5 mm (0.492 in.)	
Bore x Stroke	97.9 x 85 mm (3.86 x 3.35 in.)	
Cylinder Trueness (max)	0.01 mm (0.004 in.)	
Piston Ring End Gap - Installed	0.36 mm (0.014 in.)	
Piston Ring to Groove Clearance (max) (1st) (2nd)	0.03 mm (0.0012 in.) 0.03 mm (0.0012 in.)	
Piston Ring Groove Width (1st) (2nd) (oil)	1.202-1.204 mm (0.0473-0.0474 in.) 1.202-1.204 mm (0.0473-0.0474 in.) 2.01-2.03 mm (0.0791-0.0799 in.)	
Piston Ring Thickness (1st) (2nd)	1.970-1.990 mm (0.0776-0.0783 in.) 1.970-1.990 mm (0.0776-0.0783 in.)	
Piston Pin Bore (max)	23.0 mm (0.9055 in.)	
Piston Pin Outside Diameter (min)	22.99 mm (0.9051 in.)	
CRANKSHAFT		
Connecting Rod (small end inside diameter) (max)	23.021 mm (0.9063 in.)	
Connecting Rod (big end side-to-side)	0.6 mm (0.024 in.)	
Connecting Rod (big end width)	25 mm (0.9843 in.)	
Connecting Rod @ 150 mm (5.9 in.) (small end deflection) (max)	0.3 mm (0.0118 in.)	
Crankshaft (web-to-web)	71 mm (2.79 in.)	
Crankshaft Runout (max)	0.03 mm (0.0012 in.)	
Oil Pressure at 60°C (140°F) @3000 RPM	1.40-2.46 kg/cm <sup>2</sup> (20-35 psi)	
Cooling Fan Thermo-Switch (off→on) (on→off) Operating Temperature	90°C (194°F) 75°C (167°F)	
Engine Coolant Thermo-Switch (off→on) (on→off) (approx) Operating Temperature	115°C (239°F) 108°C (226°F)	

\* Specifications subject to change without notice.

# Specifications\*

## (700 EFI)

VALVES AND GUIDES		
Valve Face Diameter (intake) (exhaust)	36.0 mm (1.42 in.) 33.0 mm (1.30 in.)	
Valve/Tappet Clearance (cold engine) (intake) (exhaust)	0.10-0.20 mm (0.004-0.008 in.) 0.20-0.30 mm (0.008-0.012 in.)	
Valve Guide/Stem Clearance (intake) (exhaust)	0.010-0.037 mm (0.0004-0.0015 in.) 0.030-0.057 mm (0.0012-0.0022 in.)	
Valve Stem Deflection (wobble method)	(max)	0.35 mm (0.014 in.)
Valve Guide Inside Diameter		5.500-5.512 mm (0.2165-0.2170 in.)
Valve Stem Outside Diameter (intake) (exhaust)	5.475-5.490 mm (0.2156-0.2161 in.) 5.455-5.470 mm (0.2148-0.2154 in.)	
Valve Stem Runout	(max)	0.05 mm (0.002 in.)
Valve Head Thickness	(min)	0.5 mm (0.02 in.)
Valve Face/ Seat Width (intake/exhaust)		0.9-1.1 mm (0.035-0.043 in.)
Valve Face Radial Runout	(max)	0.03 mm (0.001 in.)
Valve Spring Free Length	(min)	46.1 mm (1.81 in.)
Valve Spring Tension @ 36.35 mm (1.43 in.)		18.6-21.4 kg (41.0-47.2 lb)
CAMSHAFT AND CYLINDER HEAD		
Cam Lobe Height (min) (intake) (exhaust)	36.03 mm (1.4185 in.) 35.00 mm (1.3780 in.)	
Camshaft Journal Oil Clearance (max)	0.150 mm (0.0059 in.)	
Camshaft Journal Holder Inside Diameter		22.012-22.025 mm (0.8666-0.8671 in.)
Camshaft Journal Outside Diameter		21.972-21.993 mm (0.8650-0.8659 in.)
Camshaft Runout	(max)	0.10 mm (0.004 in.)
Cylinder Head Distortion	(max)	0.05 mm (0.002 in.)

CYLINDER, PISTON, AND RINGS		
Piston Skirt/Cylinder Clearance (max)		0.120 mm (0.0047 in.)
Cylinder Bore		98 mm (3.858 in.)
Piston Diameter 15 mm (0.6 in.) from Skirt End		102.000-102.015 mm (4.0157-4.0163 in.)
Piston Ring (1st ring) Free End Gap (min) (2nd ring)		8.3 mm (0.33 in.) 11.4 mm (0.45 in.)
Bore x Stroke		102 x 85 mm (4.016 x 3.350 in.)
Cylinder Trueness	(max)	0.05 mm (0.002 in.)
Piston Ring End Gap - Installed (min)		0.10 mm (0.004 in.)
Piston Ring to Groove Clearance (max)	(1st) (2nd)	0.180 mm (0.0071 in.) 0.150 mm (0.0059 in.)
Piston Ring Groove Width	(1st) (2nd) (oil)	0.83-0.85 mm (0.0327-0.0335 in.) 1.30-1.32 mm (0.0512-0.0520 in.) 1.010-1.030 mm (0.0398-0.0406 in.) 2.01-2.03 mm (0.0791-0.0799 in.)
Piston Ring Thickness	(1st) (2nd)	1.08-1.10 mm (0.0425-0.0433 in.) 0.970-0.990 mm (0.0382-0.0390 in.)
Piston Pin Bore	(max)	23.030 mm (0.9067 in.)
Piston Pin Outside Diameter	(min)	22.98 mm (0.9047 in.)
CRANKSHAFT		
Connecting Rod (small end inside diameter)	(max)	23.040 mm (0.9071 in.)
Connecting Rod (big end side-to-side)	(max)	1.0 mm (0.004 in.)
Connecting Rod (big end width)		25 mm (0.9843 in.)
Connecting Rod @ 150 mm (5.9 in.) (small end deflection)	(max)	0.3 mm (0.0118 in.)
Crankshaft (web-to-web)		72.9-73.1 mm (2.87-2.88 in.)
Crankshaft Runout	(max)	0.08 mm (0.003 in.)
Oil Pressure at 60°C (140°F) @3000 RPM		1.40-1.80 kg/cm <sup>2</sup> (20-26 psi)
Cooling Fan Thermo-Switch Operating Temperature	(off→on) (on→off)	93°C (199°F) 87°C (189°F)

\* Specifications subject to change without notice.

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## 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 left-side cover oil seals (3), front output joint oil seal (1), rear output joint oil seal (1), and/or the oil strainer (from beneath the engine/transmission), the engine/transmission does not have to be removed from the frame.

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

### WARNING

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

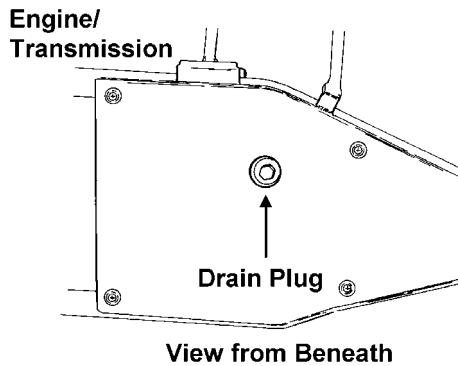
1. Remove the seat.

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

### CAUTION

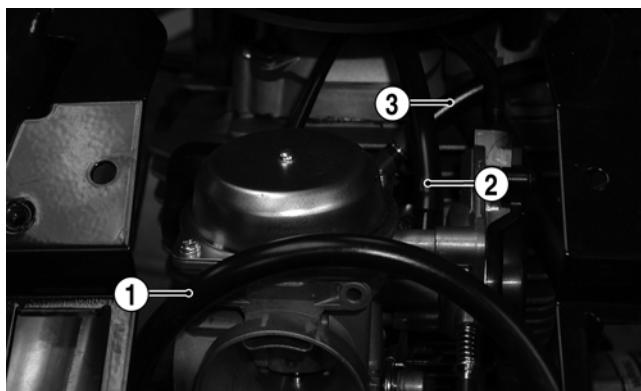
**Battery acid is harmful if it contacts eyes, skin, or clothing. Care must be taken whenever handling a battery.**

3. Remove the front and rear racks (see Section 8).
4. Remove the storage compartment and the steering post access panel (see Section 8).
5. Drain the oil from beneath the engine/transmission.



ATV-0109

6. Remove the front and rear fender panels (see Section 8).
7. Disconnect the fuel hose (1), carburetor vent hose (2), and the fuel pump vacuum hose (3) from the carburetor.

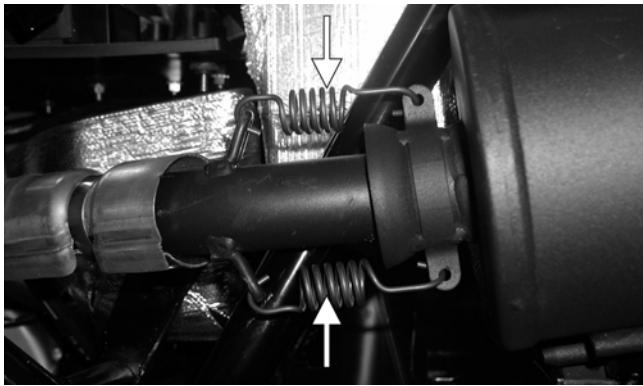


CF178A

8. Disconnect the crankcase vent hose from the air cleaner housing. Remove the clamp securing the air intake hose to the carburetor; then remove the housing.

■ **NOTE: The air cleaner intake duct must be removed prior to removing the air cleaner housing.**

9. Remove the exhaust springs at the juncture in front of the muffler; then slide the muffler rearward off the mounting lugs.

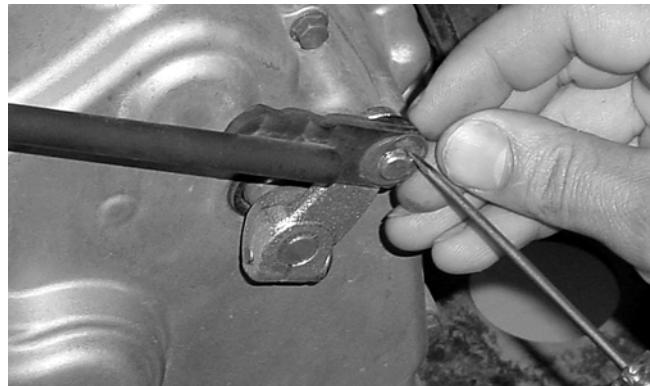


CF138A

10. Remove the exhaust pipe and account for the exhaust seal.
11. Remove the pinch screw and lock nut securing the gear shift lever; then remove the gear shift lever from the shaft on the engine.

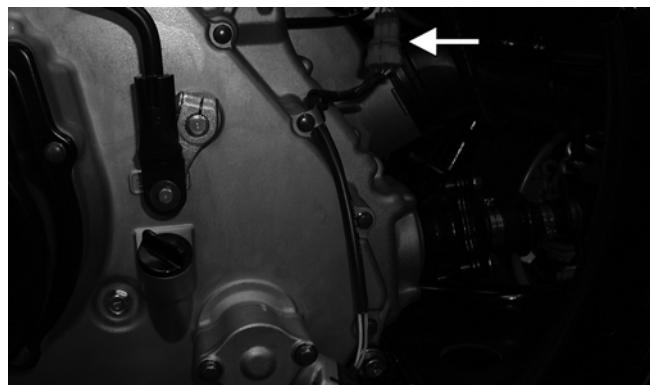


CD003



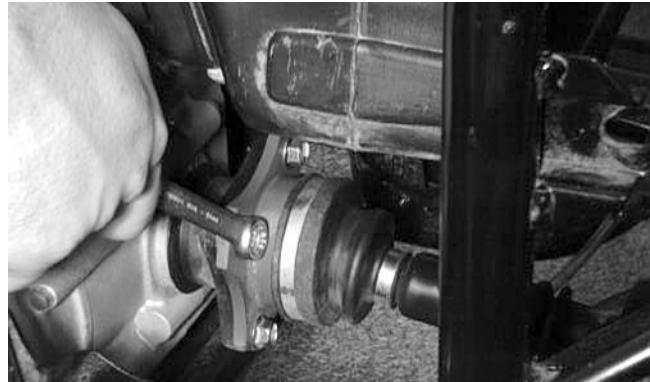
CC935

13. Disconnect the speed sensor lead from the wiring harness.



CF172A

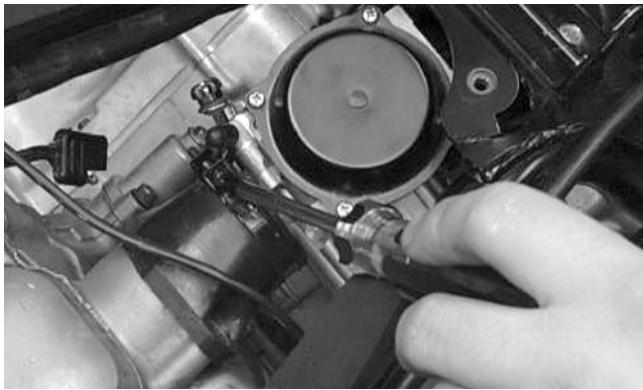
14. Remove the four cap screws securing the rear output joint to the transmission and push the shaft rearward as far as possible.



CC119D

12. Remove the E-clip securing the reverse/high/low shift linkage; then remove the linkage. Account for the bushing and washer.

15. Detach the carburetor from the intake boot; then secure the carburetor assembly away from the engine.



CC120D

■ **NOTE: Use cable ties or tape to secure the carburetor assembly above the handlebar to keep it from interfering with the removal procedure.**

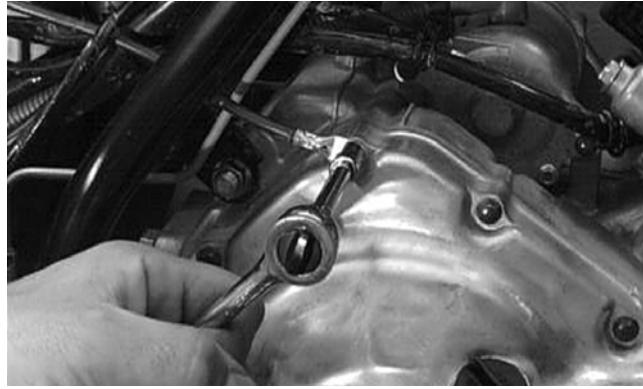
16. Remove the clamps securing the two oil cooler hoses to the engine; then disconnect the hoses.



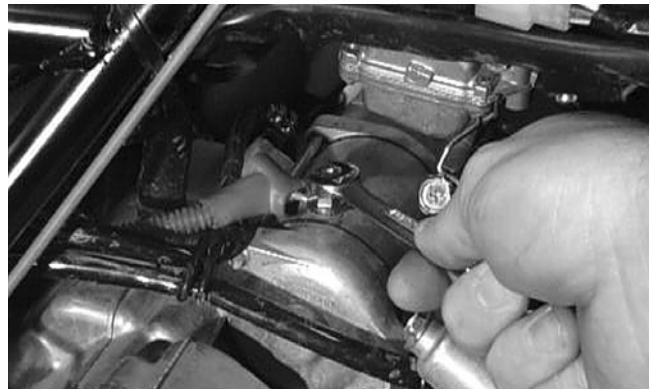
CC937

■ **NOTE: After disconnecting the oil cooler hoses, plug them to prevent leakage from the cooler.**

17. Disconnect the high tension lead from the spark plug. At the ignition coil, remove the cap screw, nut, and the two wire leads; then remove the coil.
18. Disconnect the battery ground (negative) cable from the crankcase cover; then disconnect the positive cable from the starter motor.



AR600D



AR604D

19. Disconnect the following electrical components: voltage regulator, CDI, indicator lights, and the two wire leads for the oil temperature sensors.



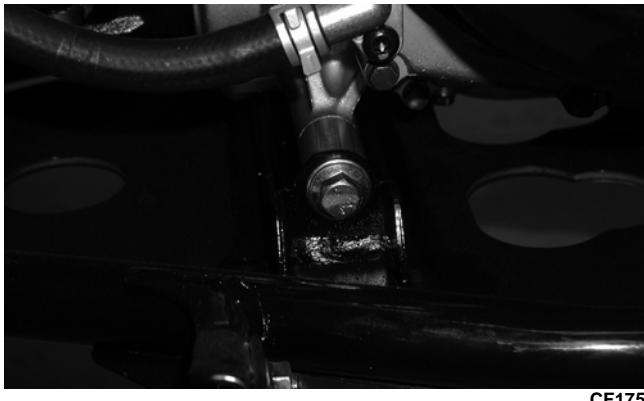
CF165

3



CF164A

20. Loosen the clamp on the crankcase breather vent hose; then disconnect the hose and remove it.
21. Remove the engine/transmission mounting fasteners in the following sequence:
  - A. Lower front: One cap screw, nut, spacer, and washer.



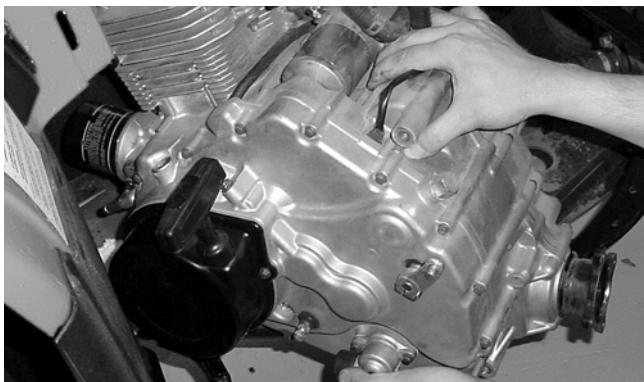
CF175

B. Lower rear: One cap screw and nut with flat washer.



CF176

22. By sliding the rear of the engine out first, remove the engine/transmission from the left side of the frame.



CC940

## 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

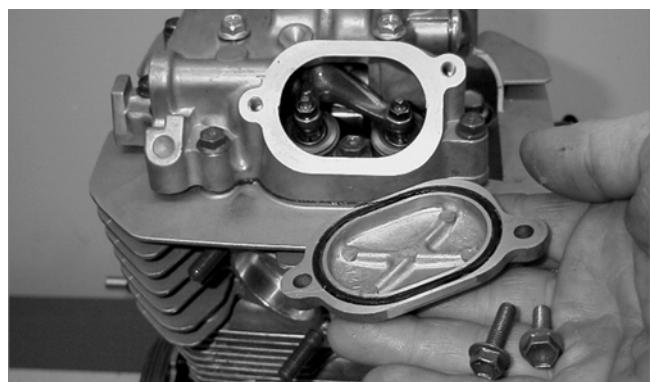
### A. Valve Cover

### B. Cylinder Head

■ NOTE: Remove the spark plug and timing inspection plug; then using the recoil starter, 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.



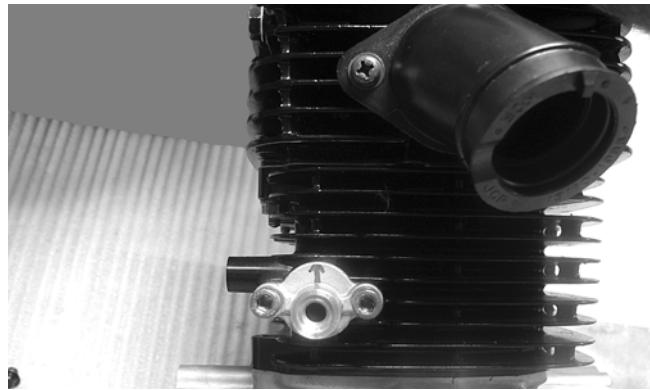
MD1264

■ 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 12 cap screws securing the valve cover to the head; account for the four rubber washers on the top side cap screws. Remove the valve cover. Account for and note the orientation of the cylinder head plug; then remove the plug. Note the location of two alignment pins.

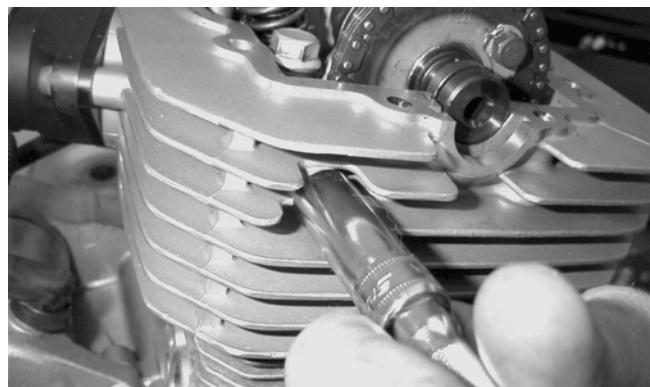


MD1261



CD382

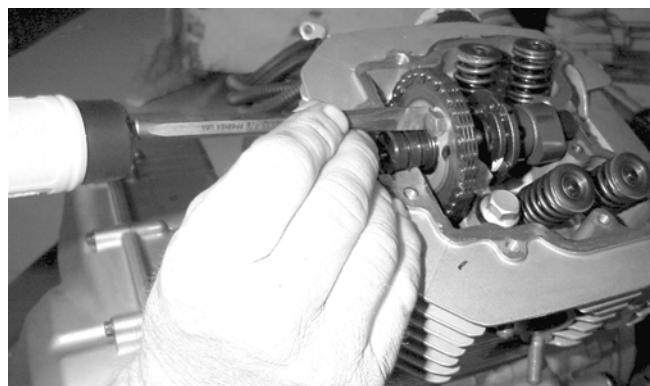
4. Remove the cam chain tensioner pivot cap screw and washer.



3

MD1251

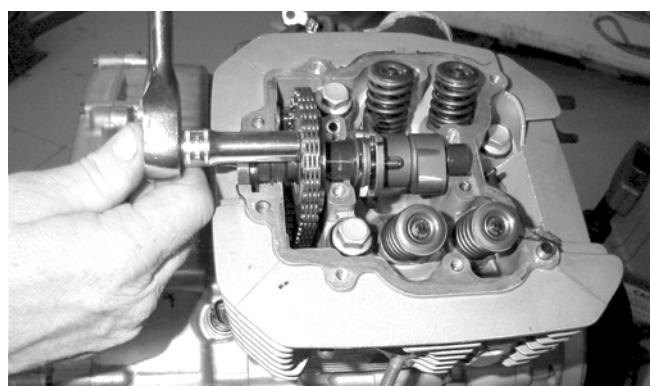
5. Bend the washer tabs and remove the two cap screw securing the sprocket to the camshaft.



MD1136



MD1245



MD1137

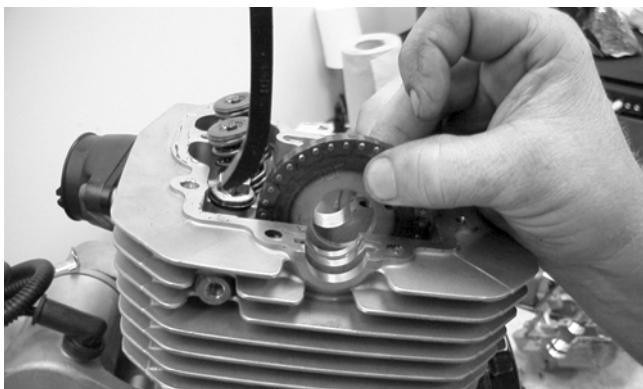
6. Using an awl, rotate the C-ring in its groove until it is out of the cylinder head; then remove the C-ring.

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



MD1131

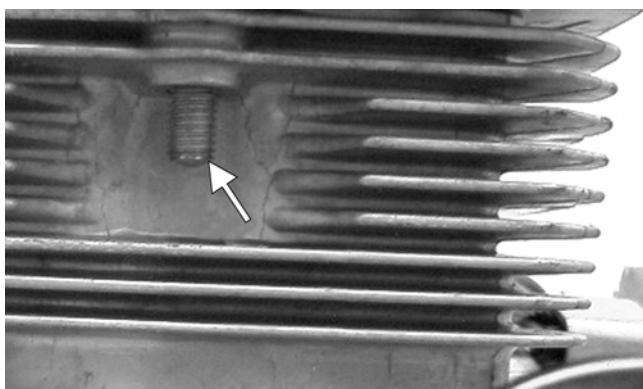
7. Note the timing marks for installing purposes; then drop the sprocket off the camshaft. While holding the chain, slide the sprocket and camshaft out of the cylinder head. Account for an alignment pin.



MD1132

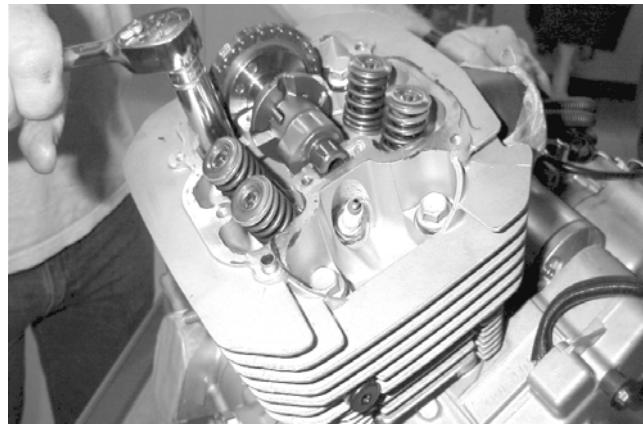
**■NOTE: Loop the chain over the cylinder and secure it with a wire to keep it from falling into the crankcase.**

8. Remove the cam chain tensioner by lifting it from the chain cavity; then remove the two lower nuts securing the cylinder head to the cylinder, one in front and one in rear.



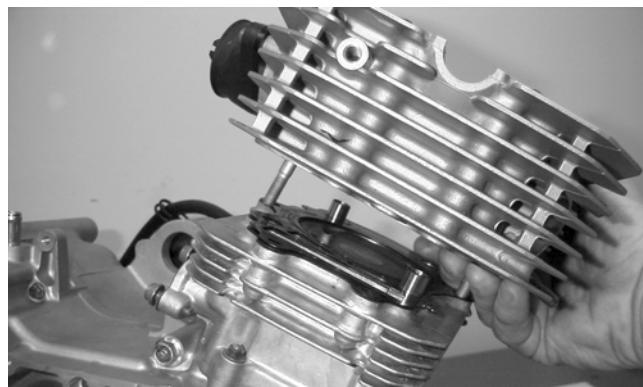
MC1192

9. 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.



MD1167

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



MD1163

#### **AT THIS POINT**

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

11. Remove the cam chain guide.

#### **AT THIS POINT**

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



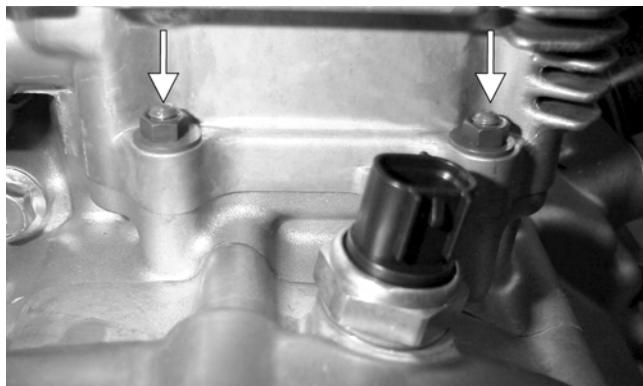
MD1173

### C. Cylinder

### D. Piston

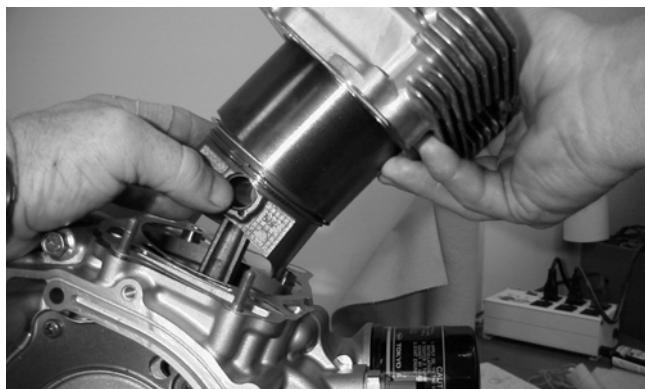
■ NOTE: Steps 1-11 in the preceding sub-section must precede this procedure.

12. Remove the two nuts securing the right side of the cylinder to the right-side crankcase half. Account for the washers.



MD1226A

13. 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.



MD1219

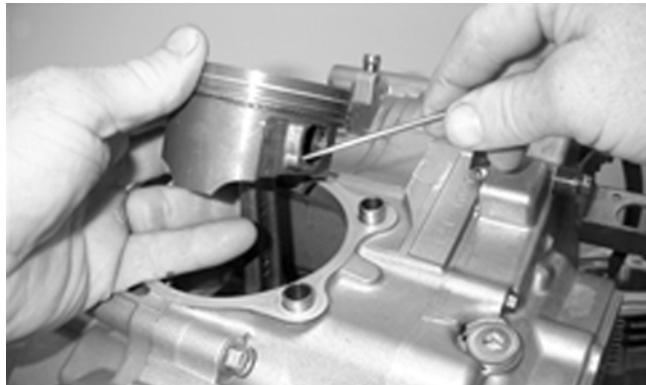
### AT THIS POINT

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.

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

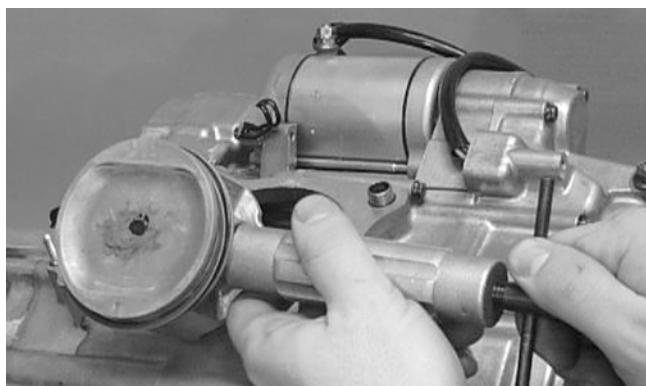


MD1213

3

15. Using the Piston Pin Puller (p/n 0644-328), 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 the Connecting Rod Holder (p/n 0444-006).

### 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.

■ NOTE: If the existing rings will not be replaced with new rings, note the location of each ring for proper installation. When replacing with new rings, replace as a complete set only. If the piston rings must be removed, remove them in this sequence.

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

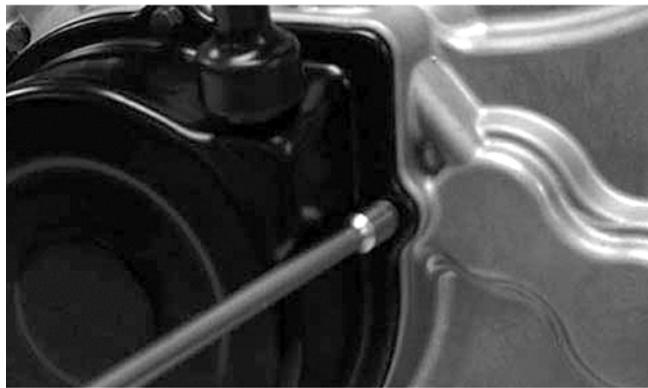
B. Remove each ring by working it toward the dome of the piston while rotating it out of the groove.

**☞ 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.



CC942

## 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. Cover/Stator Assembly

1. Remove the two cap screws securing the starter to the crankcase; then remove the starter.
2. Remove the four cap screws securing the recoil cover to the left-side cover; then remove recoil cover.



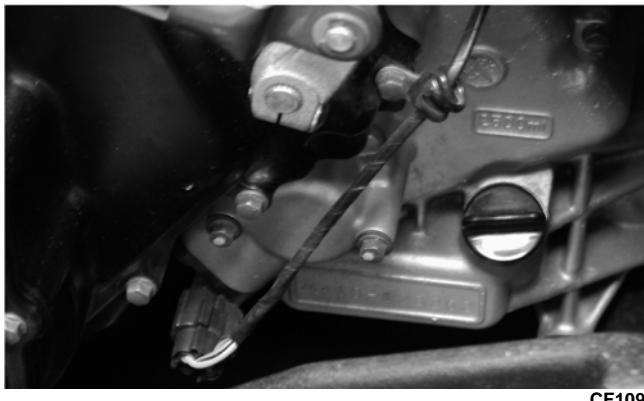
CC943

3. Remove the flange nut securing the starter cup to the crankshaft; then remove the starter cup. Account for the O-ring inside the cup.



CC944

■ **NOTE:** Remove the two cap screws securing the speed sensor housing; then remove the housing. Account for the gasket.

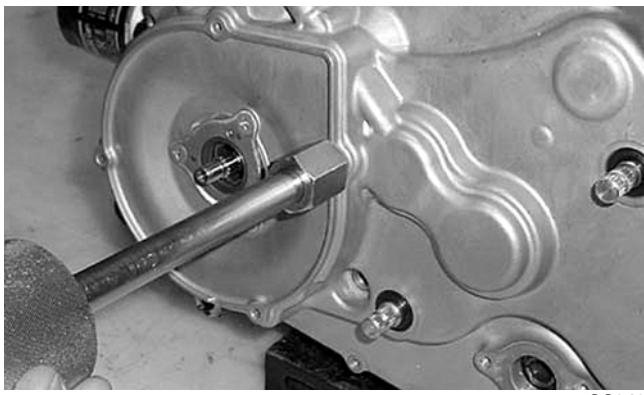


CF109

5. Remove the cap screws securing the left-side cover to the crankcase (fifteen 6 mm and one 8 mm); then using an appropriate slide hammer and Slide Hammer 6 mm Adapter (p/n 0644-310), remove the left-side cover.



CC945



CC946

■NOTE: Inspect the inside of the left-side cover for any shaft washers and spacers that may have come off with the cover. Make sure they are returned to their respective shafts. Also, make sure the alignment pins are in place.

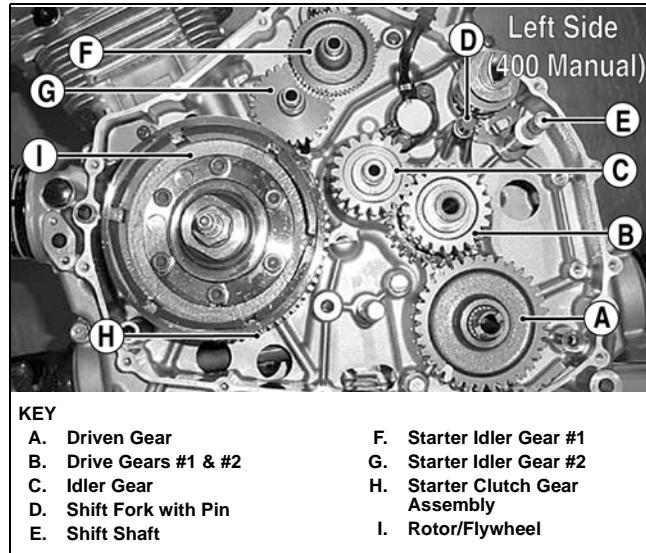
## B. Rotor/Flywheel

### C. Idle Gear Assembly

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

■NOTE: For steps 6-14, refer to illustration CC948B.

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



CC948B

3

6. Remove the nut securing the rotor/flywheel (I) to the crankshaft; then install the crankshaft protector.



CC514D

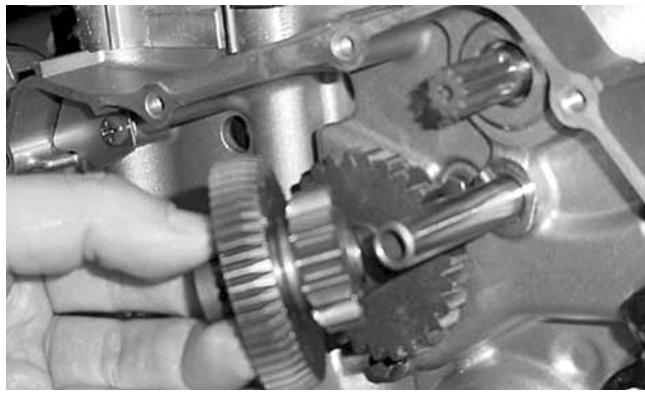
7. Using the Magneto Rotor Remover (p/n 0444-075), remove the rotor/flywheel assembly from the crankshaft. Account for the key; then remove the starter clutch gear assembly (H) w/washer.

■NOTE: Care must be taken that the remover is threaded all the way onto the rotor/flywheel.



CC949

8. Remove the starter idler gears (F & G) from the crankcase; then remove the pin.

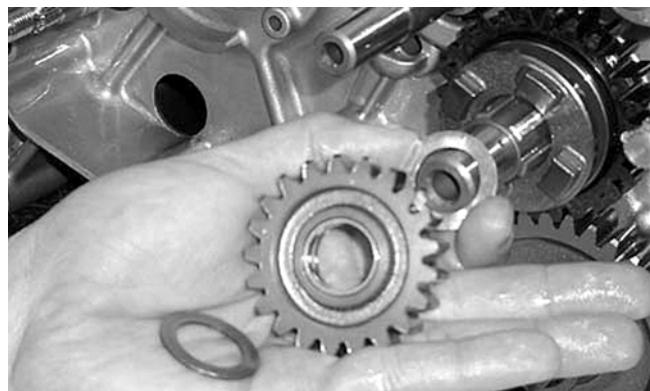


CC950



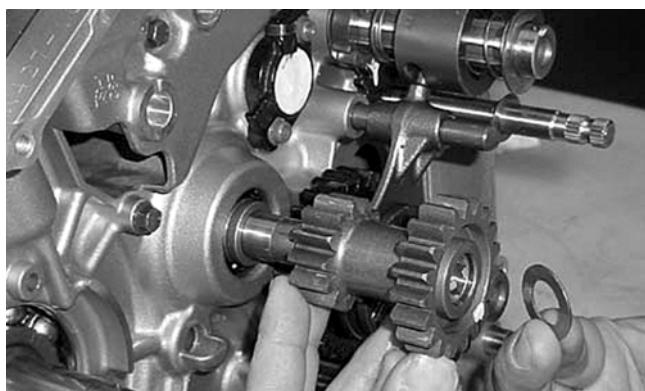
CC953

11. Remove drive gear #2 (B). Account for washers on both sides of the gear.



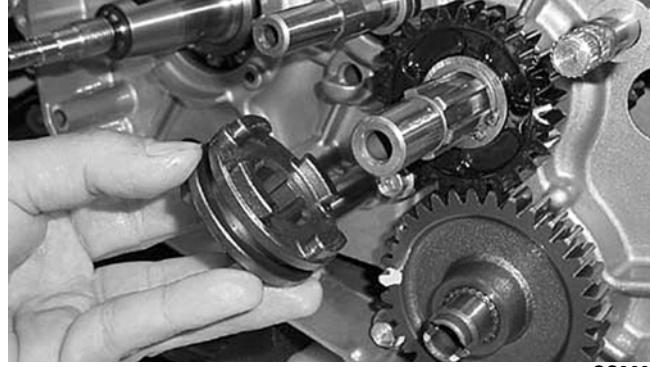
CC954

9. Remove the idler gear (C). Account for a washer and a spacer.



CC951

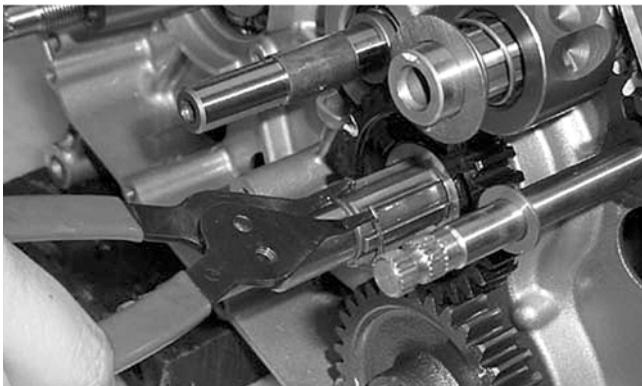
10. Remove the shift fork and pin (D).



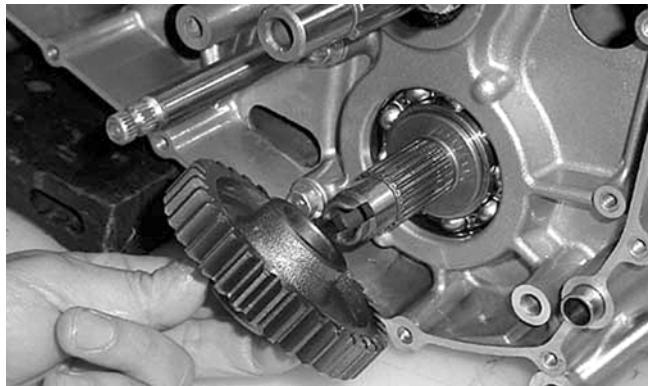
CC966

12. Remove the sliding dog from the driveshaft.

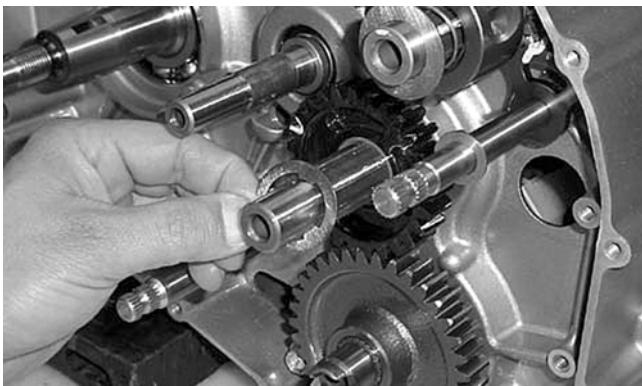
13. Remove the circlip, washer, and drive gear #1 (B) from the driveshaft; then account for the bushing and the spacer.



CC955



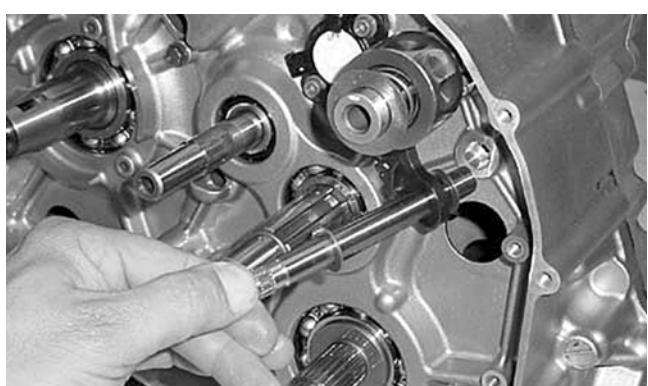
CC959



CC958

■ NOTE: Note the orientation of the oil holes on the driveshaft and bushing for installing purposes.

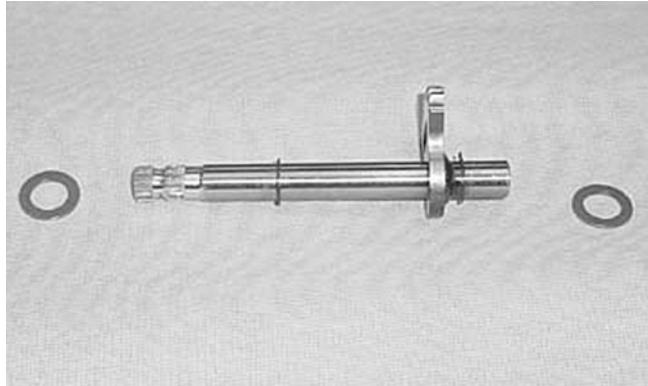
3



CC960



CD552

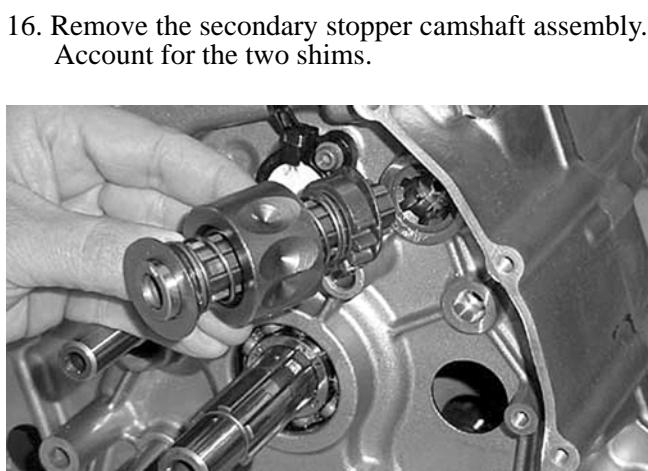


CC961



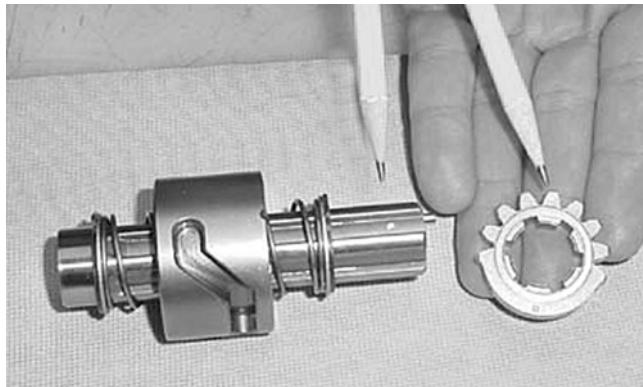
CC958

14. Remove driven gear (A) from the output shaft.



CC962

■ NOTE: Note the alignment dots on the cam plate and camshaft for installing purposes.

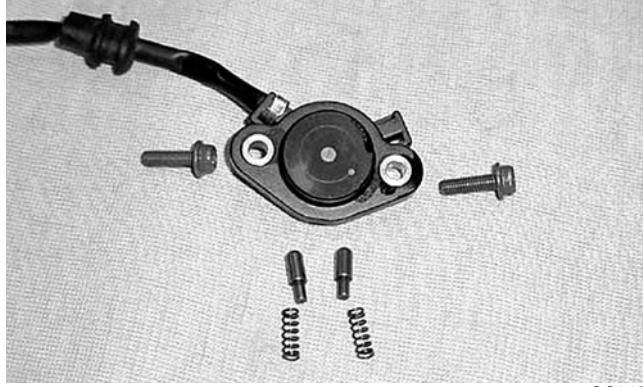


CC963

17. Remove the Allen-head cap screws from the neutral switch base; then remove the switch. Account for the two contacts and springs.



CC964



CC965

#### ☞ AT THIS POINT

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

## 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

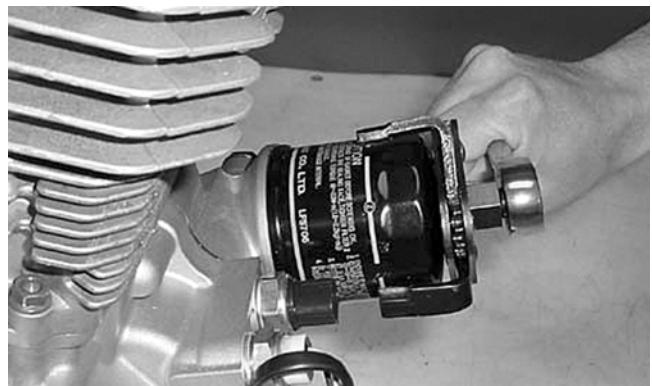
To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

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

## Removing Right-Side Components

### A. Oil Filter

1. Using an adjustable Oil Filter Wrench (p/n 0644-389), remove the oil filter.



CC967

2. If the engine has not been removed, lay the ATV on its left side; then remove the cap screws securing the right-side cover to the crankcase. Remove the cover. Account for the gasket and for two alignment pins.



CC968

■ **NOTE:** When removing the right-side cover, account for the release roller guide that it does not fall and cause damage.



CC070D

#### **B. Primary Clutch Shoe**

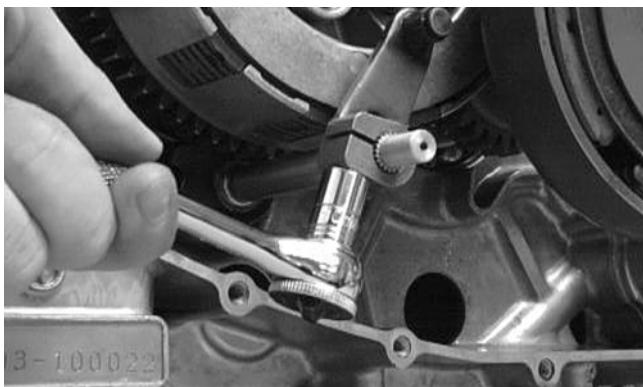
#### **C. Primary Clutch**

#### **D. Centrifugal Clutch Housing**

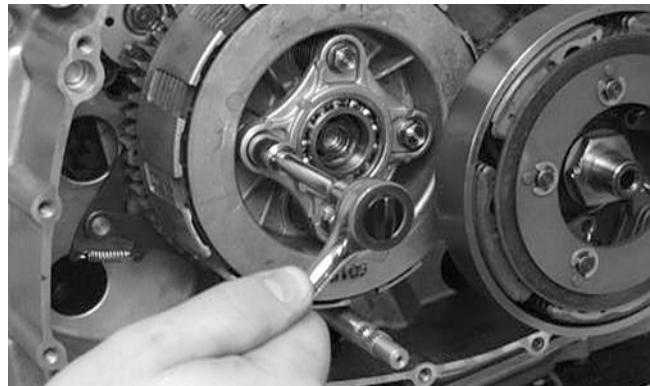
■ **NOTE:** Steps 1-2 in the preceding sub-section must precede this procedure.

3. Remove the cap screw securing the clutch release arm and remove the arm; then in a crisscross pattern, remove the four cap screws securing the clutch release roller assembly.

■ **NOTE:** Scribe a reference mark with a marker on the arm and shaft to aid in installing.



CC073D



CC074D

4. Remove the release roller assembly. Account for four springs.
5. Remove the centrifugal clutch-shoe nut (left-hand threads) and washer from the driveshaft; then using a primary clutch shoe remover, remove the clutch shoe.

#### **CAUTION**

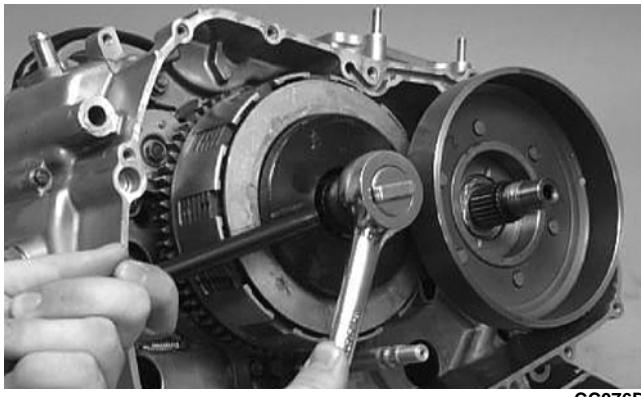
Care must be taken when removing the nut; it has "left-hand" threads.

6. Remove the primary drive one-way clutch from the centrifugal clutch housing. Note the word OUTSIDE stamped on the clutch for assembly purposes.



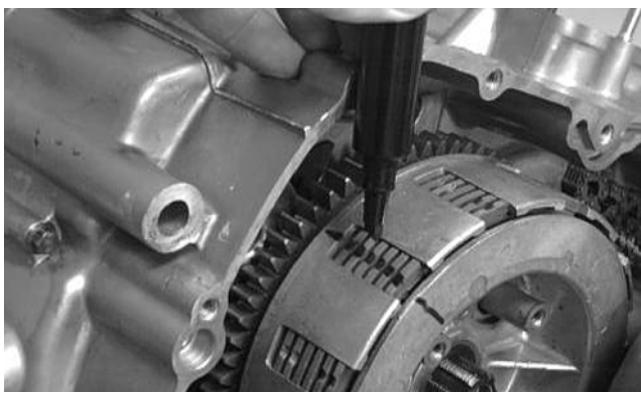
CF043

7. Using the Clutch Sleeve Hub Holder (p/n 0444-007) to hold the clutch sleeve hub, remove the nut and washer.



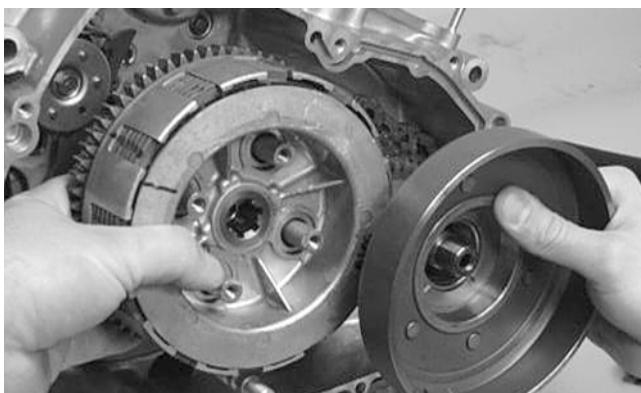
CC076D

8. Scribe a line across the primary clutch assembly to aid in installing.

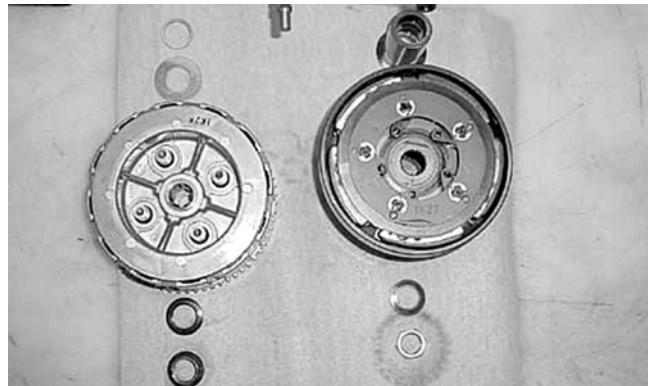


CC077D

9. Simultaneously, remove the primary clutch assembly and centrifugal clutch housing from their respective shafts. Account for the shims and washers.



CC078D



CC969

### **AT THIS POINT**

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

#### **E. Gear Shift Cam Plate/Guide F. Oil Pump/Oil Strainer**

■ NOTE: Steps 1-9 in the preceding sub-sections must precede this procedure.

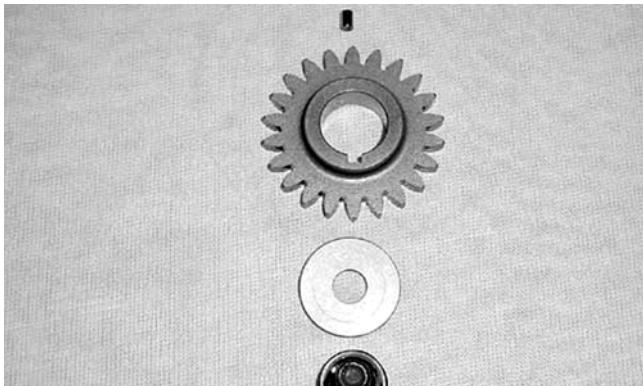
■ NOTE: Note that the bushings on the crankshaft are directional and that the oil holes align for installing purposes.

10. Remove the nut and washer securing the oil pump drive gear to the crank balancer shaft; then remove the gear and account for the pin, gear, washer, and nut.

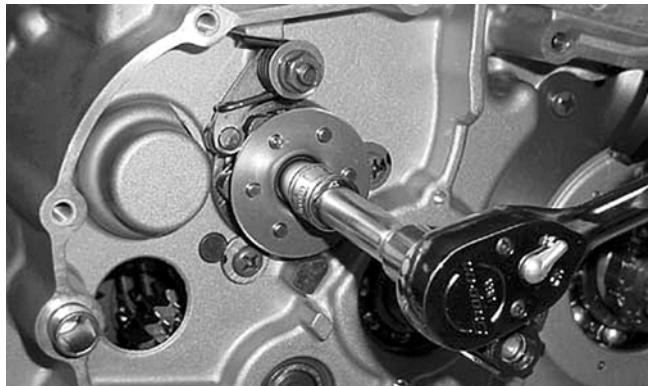
■ NOTE: Note that the raised hub of the gear is directed inward for installing purposes.



CC971

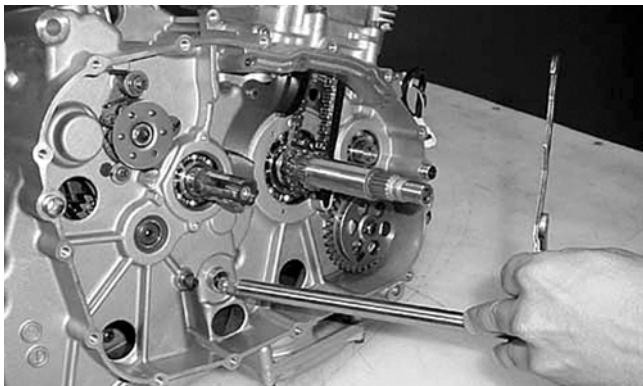


CC972



CC975

11. Remove the gear shift shaft from the crankcase.



CC973

12. Release the tension from the gear shift cam stopper arm spring.



CC974

13. Remove the cap screw securing the gear shift cam plate and guide to the gear shift cam; then remove the cam plate and guide. Account for the guide and five pins.



3

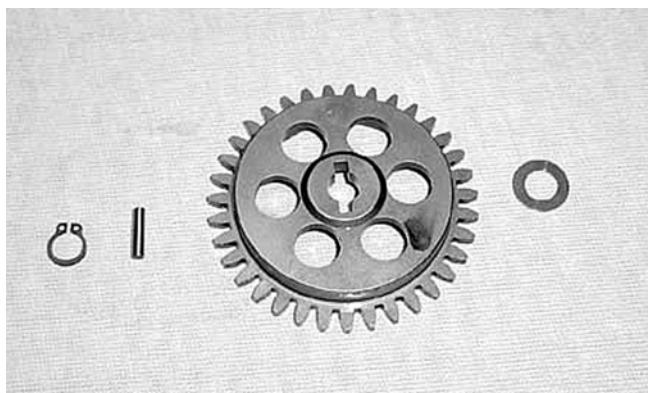
■ **NOTE:** For general servicing, it is advisable to disassemble, clean, and inspect the oil pump. If any wear or damage is suspected, replace the oil pump.

14. Remove the circlip securing the oil pump driven gear; then remove the gear. Account for the pin and the washer.

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

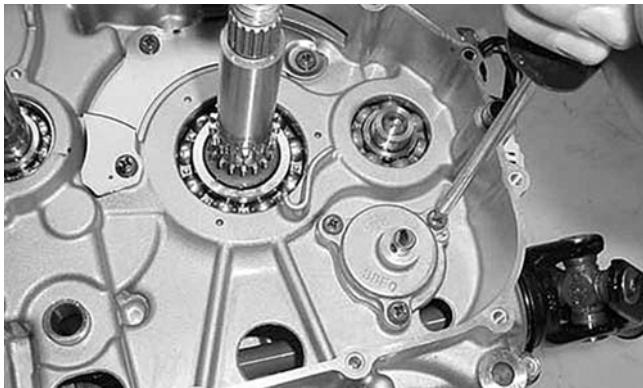


CC976



CC977

15. Remove the three Phillips-head screws securing the oil pump; then remove the oil pump.



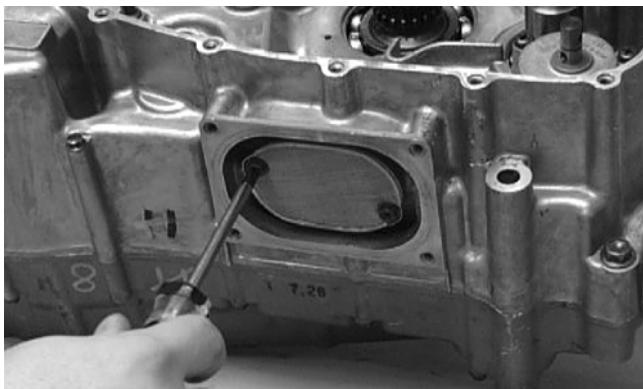
CC978

16. Remove the cap screws securing the oil strainer cap; then remove the cap. Account for the O-ring.



CC091D

17. Remove the two Phillips-head cap screws securing the strainer.



CC163D

#### **AT THIS POINT**

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

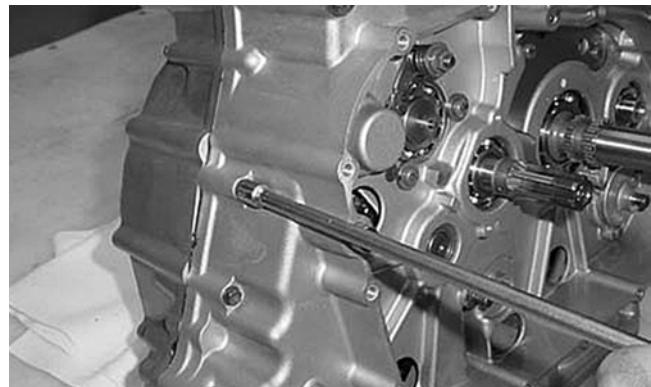
## **Center Crankcase Components**

■ **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 five right-side 6 mm cap screws (one from inside the case) securing the crankcase halves; then remove the seven left-side 6 mm cap screws. Note the location of the different-lengthed cap screws and a wiring form.

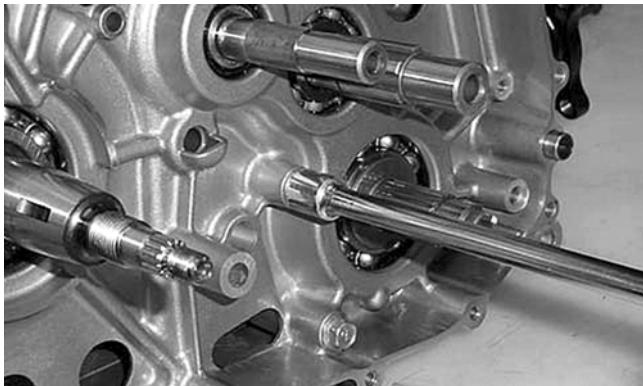


CC979



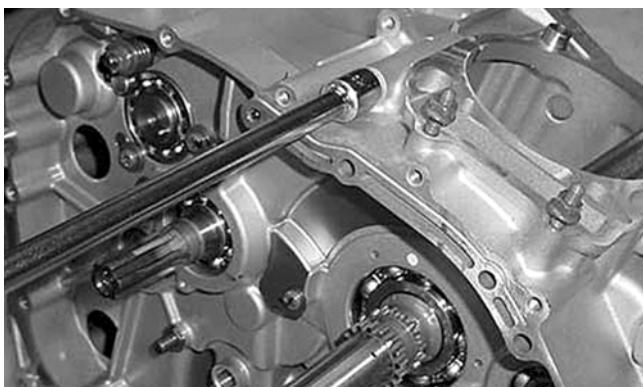
CC980

2. Remove the four left-side 8 mm cap screws (two from inside the case) securing the crankcase halves. Note the location of the different-lengthed cap screws.



CC981

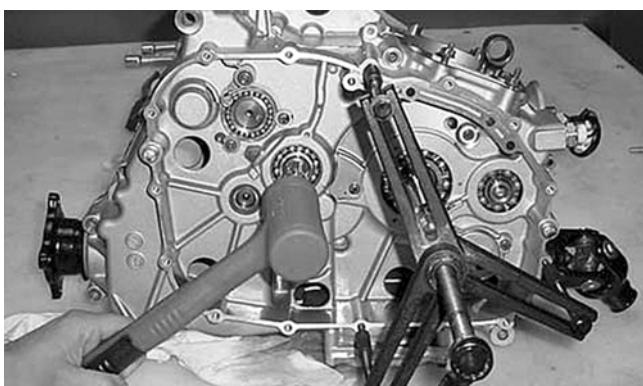
3. Remove the four right-side 8 mm cap screws securing the crankcase halves.



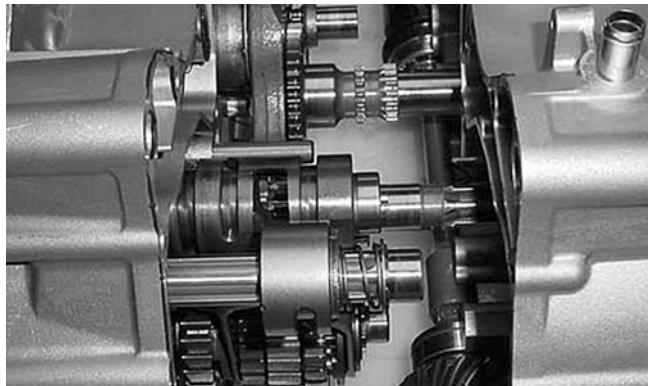
CC982

4. Using an appropriate crankcase separator and tapping lightly with a rubber mallet, separate the crankcase halves. Account for two alignment pins, a C-ring, and two washers.

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



CC983



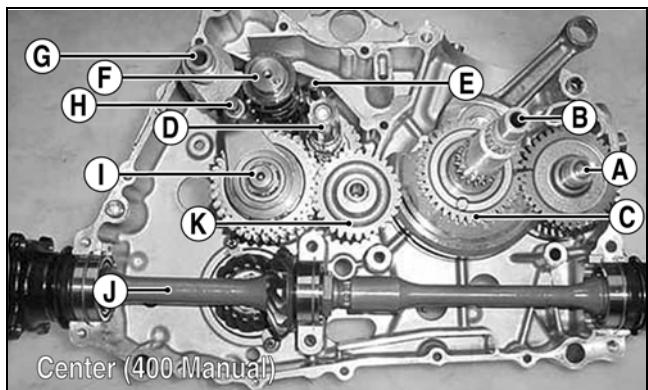
CC984

## Disassembling Crankcase Half

3

**■ NOTE: For steps 1-10, refer to illustration CC985B.**

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

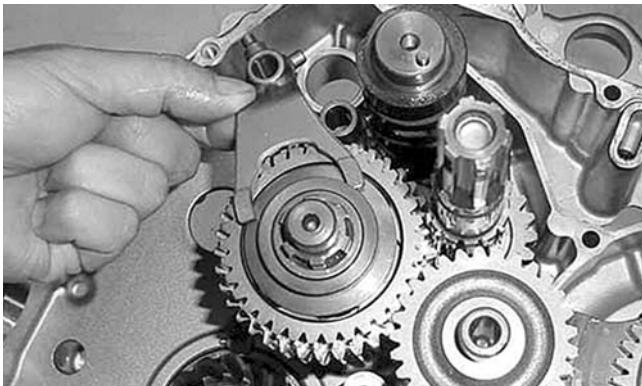


**KEY**

A. Crank Balancer Assembly	F. Gear Shift Cam
B. Crankshaft	G. Reverse Shift Cam
C. Balancer Drive Gear with Pin	H. Shift Shaft with 3 Forks
D. Countershaft Assembly	I. Driveshaft Assembly
E. Shift Shaft with Fork	J. Output Shaft Assembly
	K. Reverse Idle Gear

CC985B

1. Remove the output shaft assembly (J).
2. Remove the two shift shafts (E and H).
3. Remove the reverse shift cam (G) and spacer.
4. Disengage four forks from the gear shift cam (F); then remove the reverse shifter fork.



CC986

5. Remove the gear shift cam (F).



CC987

6. Remove the three remaining forks noting their positions for assembling purposes.

#### **AT THIS POINT**

To service gear shift forks, see Servicing Center Crankcase Components sub-section.

7. Remove the reverse idle gear (K) w/shaft. Account for the bushing, two washers, and the circlip.
8. Simultaneously, remove the driveshaft assembly (I) and countershaft assembly (D).

#### **AT THIS POINT**

To service the driveshaft and/or countershaft, see Servicing Center Crankcase Components sub-section.

■ **NOTE:** For efficiency, if the driveshaft and/or countershaft are not being serviced, it is preferable to leave them assembled. The technician should use discretion and sound judgment.

■ **NOTE:** Note the alignment marks on the crank balancer driven gear and balancer drive gear to aid in assembly.



CC166D

9. Remove the driven gear from the crank balancer assembly (A). Account for a key.



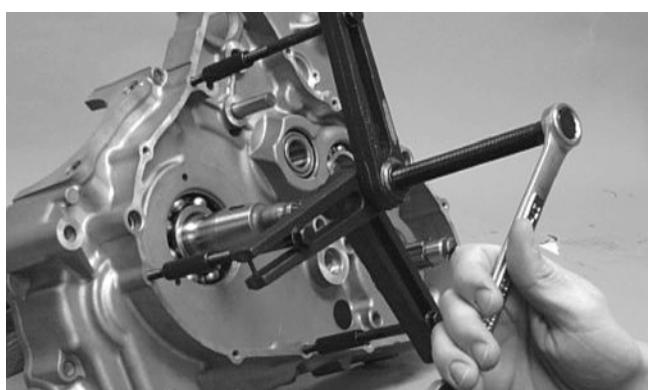
CD832A

■ **NOTE:** Note that the shoulder of the gear is directed to the outside for assembling purposes.

10. Remove the crank balancer assembly (A).

■ **NOTE:** When removing the crank balancer assembly, rotate the crankshaft counterweight away from the crank balancer assembly counterweight.

11. Using an appropriate crankshaft remover, push the crankshaft assembly out of the crankcase.



CC115D

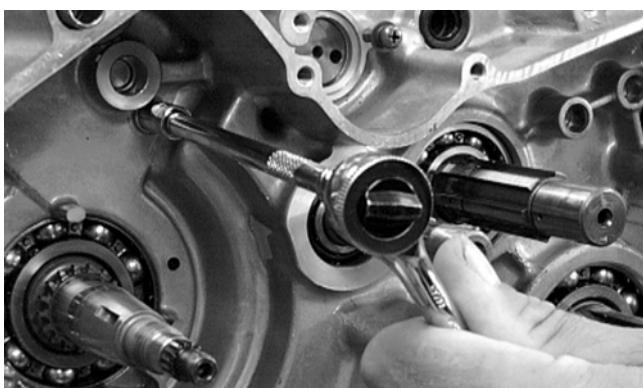
## ☞ AT THIS POINT

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

### ⚠ 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.

12. To remove the output shaft and gear, remove the nut, slide the gear off the shaft (account for a shim or shims), and drive the shaft out with a plastic mallet (account for a shim or shims).



CC482D

## Table of Contents (Servicing Components)

■ NOTE: Critical engine/transmission specifications are located at the beginning of this section.

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## Servicing Top-Side Components

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

### 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.

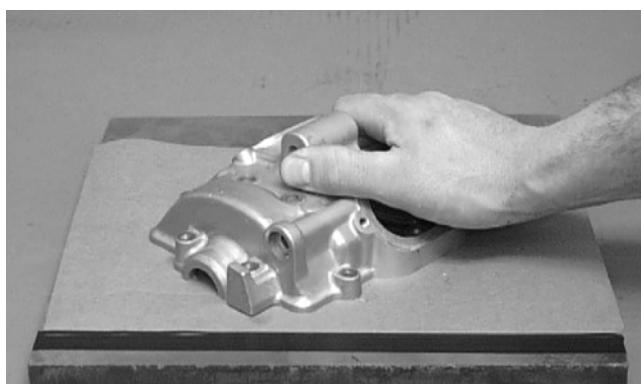
### Cleaning/Inspecting Valve Cover

■ 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 (p/n 0644-016) covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the valve cover in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the valve cover in a figure eight motion until a uniform bright metallic finish is attained.

### ⚠ CAUTION

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



CC130D

## ⚠ CAUTION

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

### Removing Valves

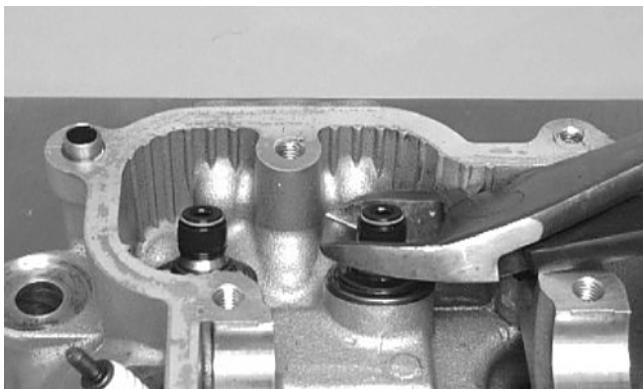
■ NOTE: Keep all valves and valve components as a set. Note the original location of each valve set for use during installation. Return each valve set to its original location during installation.

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

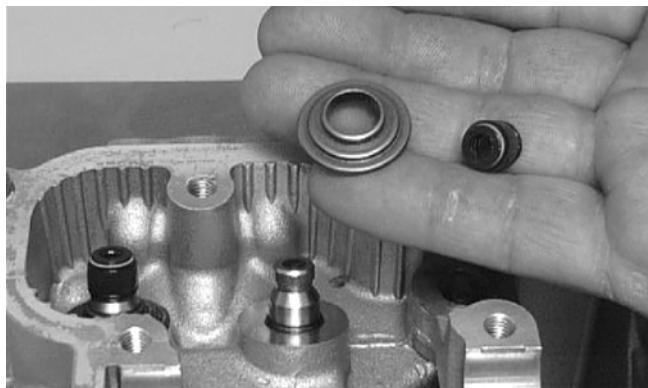


CC994

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



CC134D



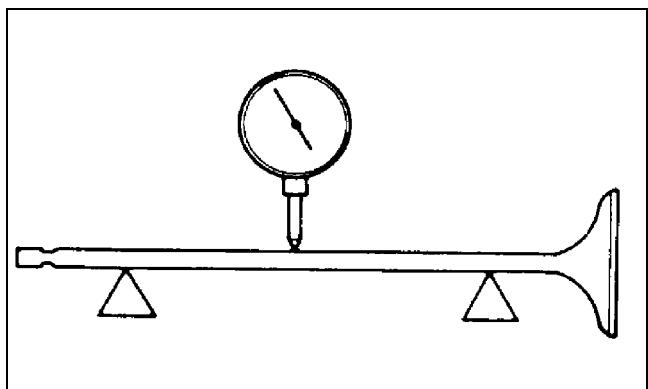
CC136D

■ NOTE: The valve seals must be replaced.

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

### Measuring Valve Stem Runout

1. Support each valve stem end with the V Blocks (p/n 0644-022); then check the valve stem runout using a dial indicator.



ATV-1082

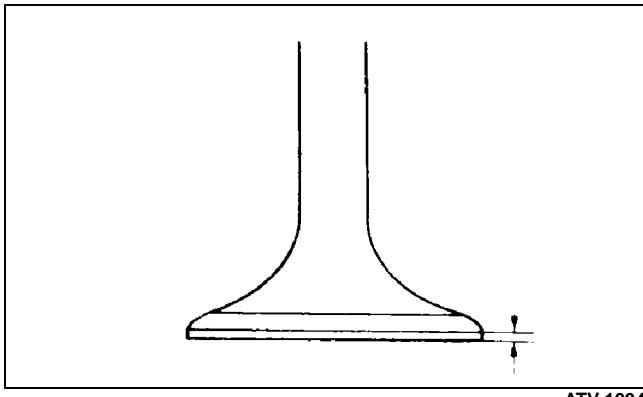
2. Maximum runout must not exceed specifications.

### Measuring Valve Stem Outside Diameter

1. Using a micrometer, measure the valve stem outside diameter.
2. Acceptable diameter range (intake valve) must be within specifications.
3. Acceptable diameter range (exhaust valve) must be within specifications.

### Measuring Valve Face/Seat Width

1. Using a micrometer, measure the width of the valve face.

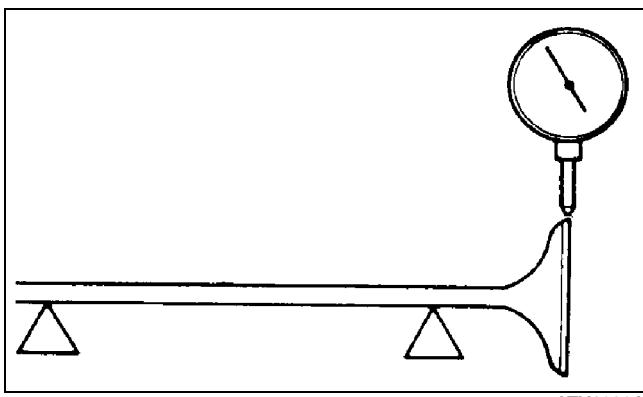


ATV-1004

- Acceptable width range must be within specifications.

### Measuring Valve Face Radial Runout

- Mount a dial indicator on the surface plate; then place the valve stem on a set of V blocks.
- Position the dial indicator contact point on the outside edge of the valve face; then zero the indicator.

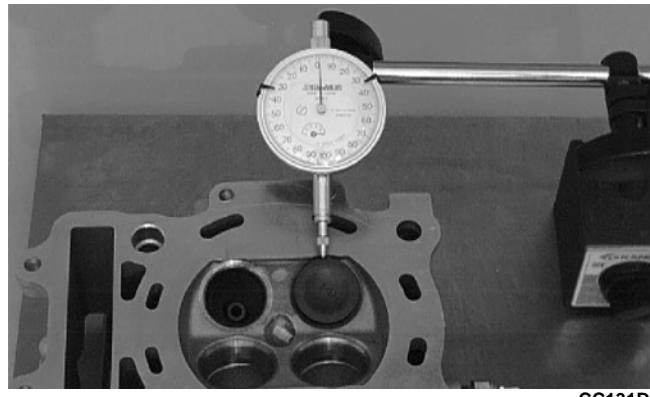


ATV1082A

- Rotate the valve in the V blocks.
- Maximum runout must not exceed specifications.

### Measuring Valve Guide/Valve Stem Deflection (Wobble Method)

- Mount a dial indicator and base on the surface plate; then place the cylinder head on the surface plate.
- Install the valve into the cylinder head; then position the dial indicator contact point against the outside edge of the valve face. Zero the indicator.



CC131D

- Push the valve from side to side; then from top to bottom.
- Maximum "wobble" deflection must not exceed specifications.

### Measuring Valve Guide (Inside Diameter)

3

- Insert a snap gauge 1/2 way down into each valve guide bore; then remove the gauge and measure it with a micrometer.
- Acceptable inside diameter range must be within specifications.
- 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 any valve is discolored or pitted or if the seating surface is worn, the valve must be replaced. Do not attempt to grind a valve or severe engine damage may occur.

### Measuring Rocker Arm (Inside Diameter)

- Using a dial calipers, measure the inside diameter of the rocker arm.
- Acceptable inside diameter range must be within specifications.

### Measuring Rocker Arm Shaft (Outside Diameter)

- Using a micrometer, measure the outside diameter of the rocker arm shaft.

- Acceptable outside diameter range must be within specifications.

## Installing Valves

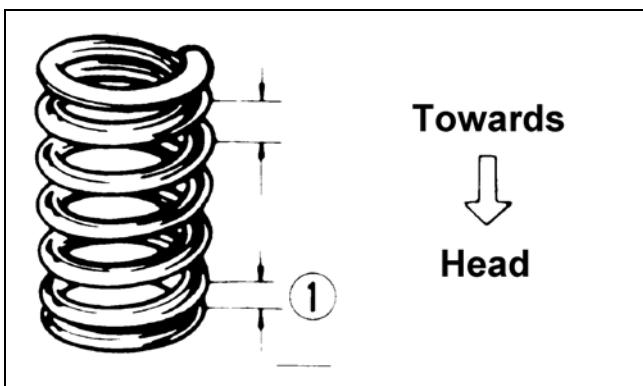
- Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



CC144D

- Insert each valve into its original valve location.
- 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

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



CC994

## PISTON ASSEMBLY

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

### Cleaning/Inspecting Piston

- Using a non-metallic carbon removal tool, remove any carbon buildup from the dome of the piston.
- Inspect the piston for cracks in the piston pin, dome, and skirt areas.
- 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.**

- 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

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



CC400D

- 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.

### Cleaning/Inspecting Piston Rings

1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

#### ⚠ CAUTION

Improper cleaning of the ring-grooves by the use of the wrong type of ring-groove cleaner will result in severe damage to the piston.

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

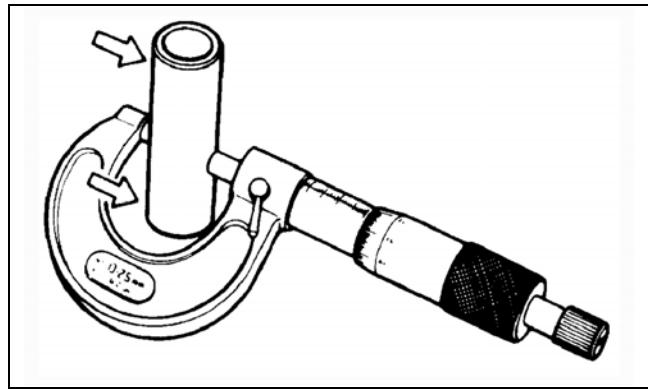
1. Place each piston ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must be within specifications.



CC995

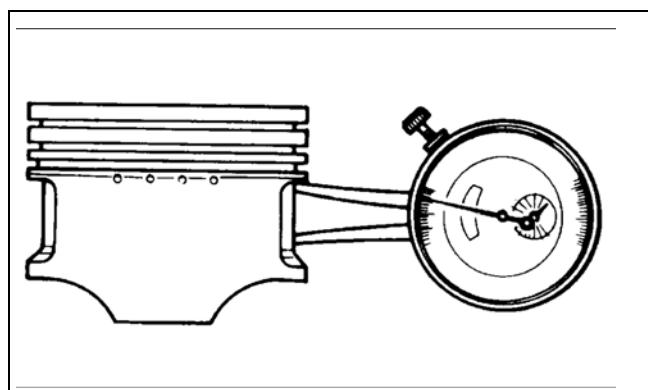
### Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

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



ATV-1070

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

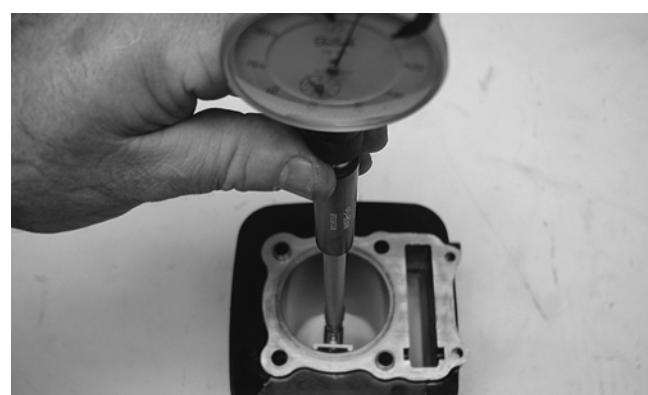


ATV-1069

3

### Measuring Piston Skirt/ Cylinder Clearance

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



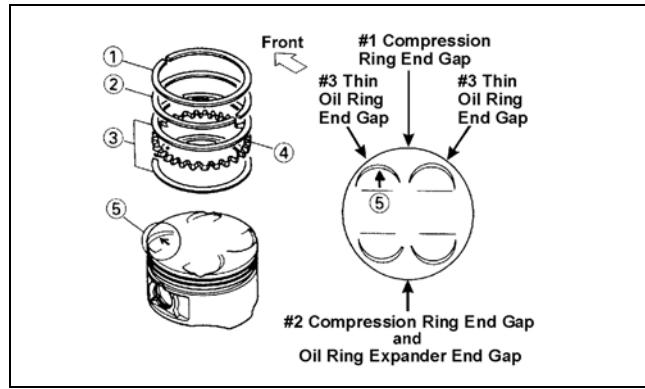
CD325

2. Measure the corresponding piston diameter at a point 15 mm (0.6 in.) above the piston skirt at a right angle to the piston-pin bore. Subtract this measurement from the measurement in step 1. The difference (clearance) must be within specifications.

## Installing Piston Rings

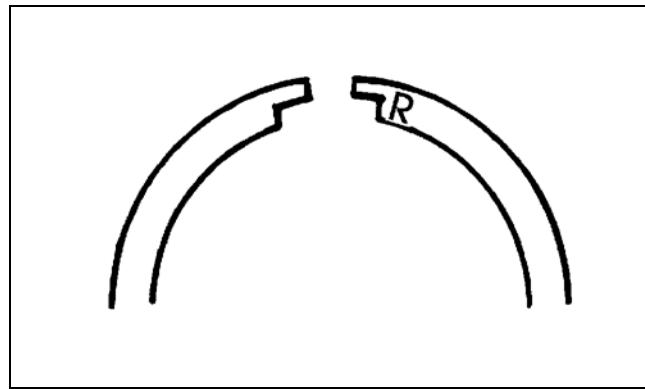
1. Install ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap. Stagger the end gaps of the upper and lower thin oil rings according to the illustration.

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



2. Install the compression rings (1 and 2) so the letter 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 (see illustration).

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



726-306A

### ⚠ 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

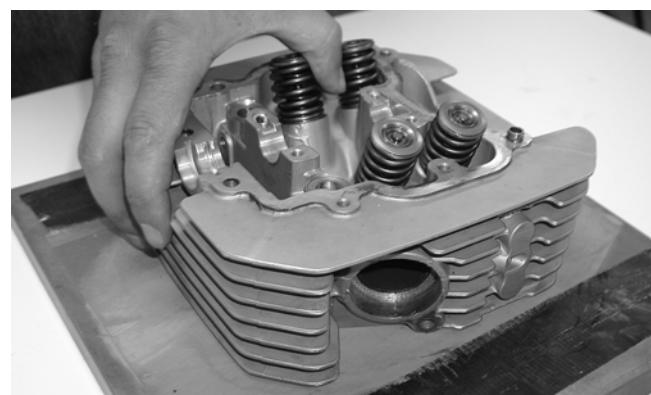
### ⚠ CAUTION

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.



CC996

## Measuring Cylinder Head Distortion

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



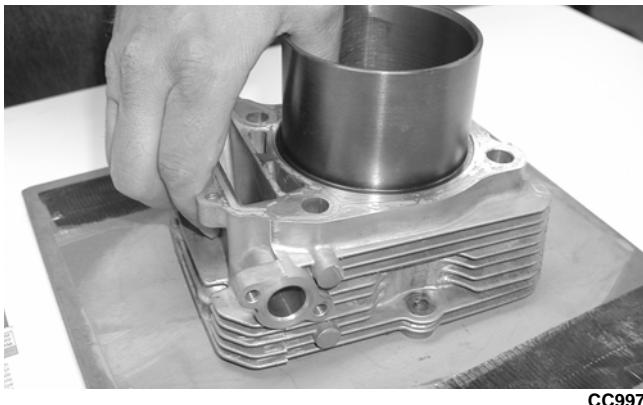
CC141D

## Cleaning/Inspecting Cylinder

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

### CAUTION

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



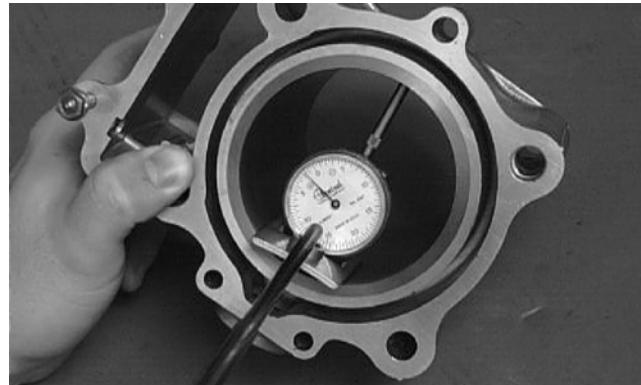
CC997

## Inspecting Cam Chain Guide

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

## Honing Cylinder

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

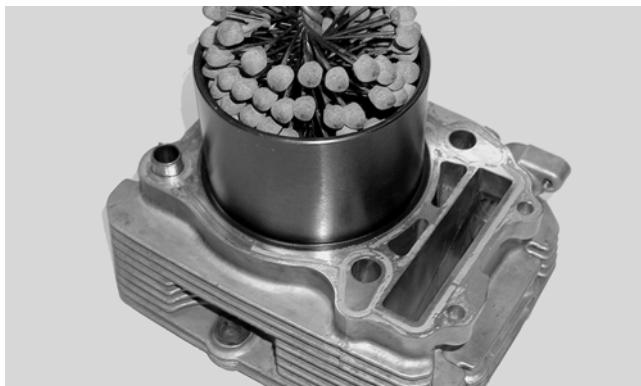


CC127D

3

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 ball hone.

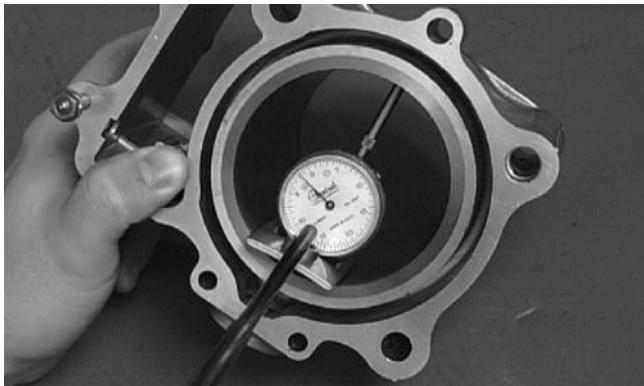
■ **NOTE:** To produce the proper 60° cross-hatch pattern, use a low RPM drill (600 RPM) at the rate of 30 strokes per minute. If honing oil is not available, use a lightweight petroleum-based oil. Thoroughly clean cylinder after honing using soap and hot water. Dry with compressed air; then immediately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



CC998

4. If any measurement exceeds the limit, bore the cylinder and install an oversized piston or replace the cylinder.

■ **NOTE:** Oversized piston and rings are available in 0.50 mm (0.020 in.) only.

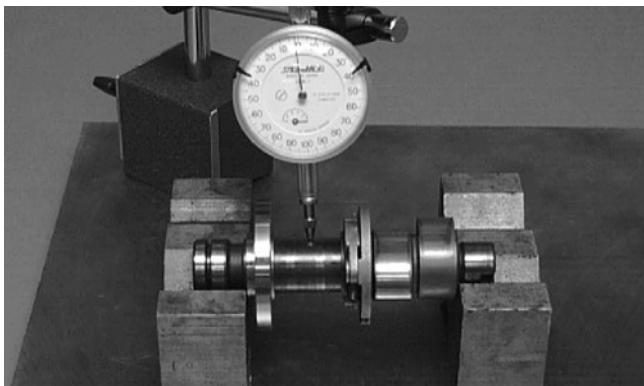


CC127D

### 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.

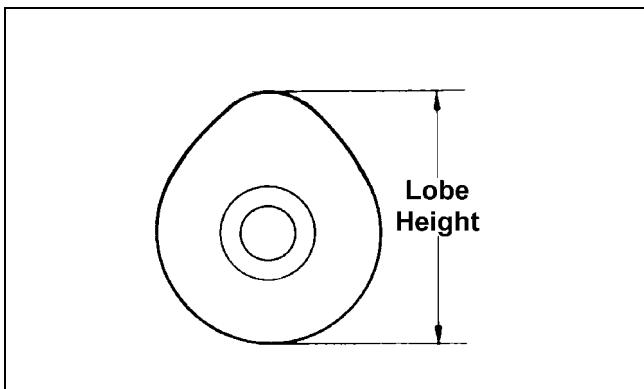


CC283D

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 not exceed 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.

### Measuring Camshaft to Cylinder Head Clearance

1. Remove the adjuster screws and jam nuts.



CC005D

2. Place a strip of plasti-gauge in each of the camshaft lands in the cylinder head.
3. Place the valve cover on the cylinder head and secure with the valve cover cap screws. Tighten securely.

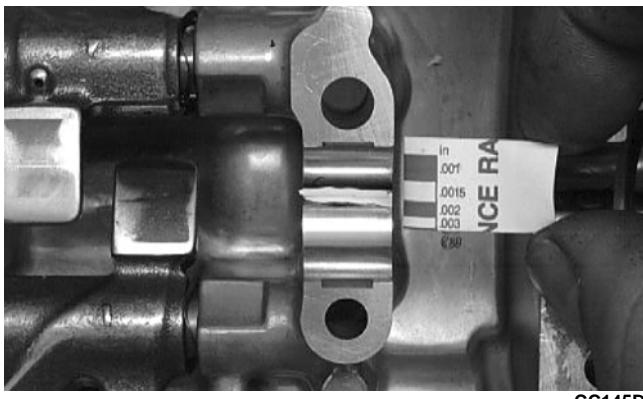
■ NOTE: Do not rotate the camshaft when measuring clearance.

4. Remove the cap screws securing the valve cover to the cylinder; then remove the valve cover and camshaft.



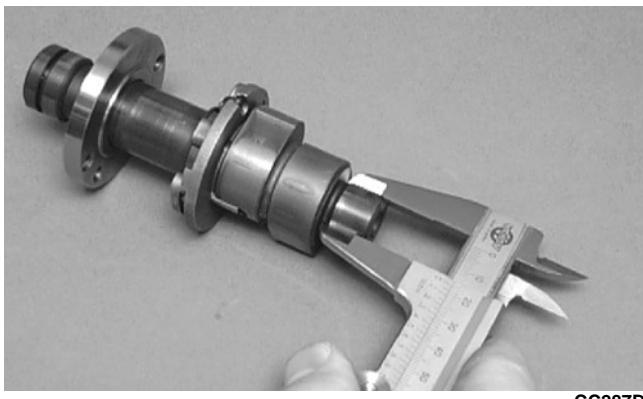
MD1261

5. Match the width of the plasti-gauge with the chart found on the plasti-gauge packaging to determine camshaft to cylinder head and valve cover clearance.



CC145D

6. If clearance is excessive, measure the journals of the camshaft.

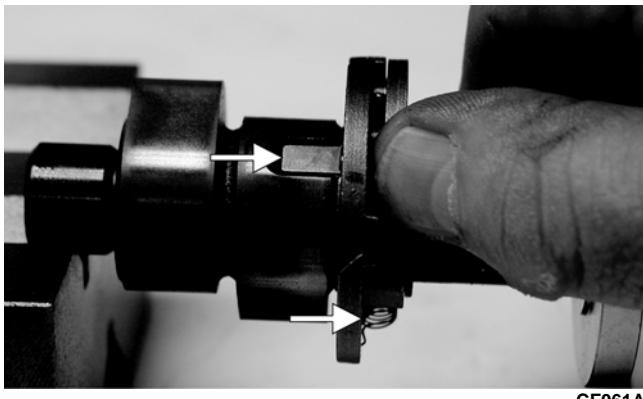


CC287D

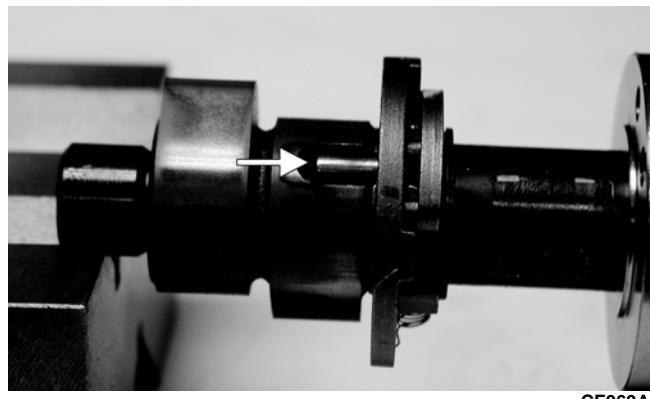
■ NOTE: If the journals are worn, replace the cam-shaft; then measure the clearance again. If it is still out of tolerance, replace the cylinder head.

### Inspecting Camshaft Spring/Drive Pin

1. Inspect the spring and drive pin for damage.



CF061A



CF060A

2. If damaged, the camshaft must be replaced.

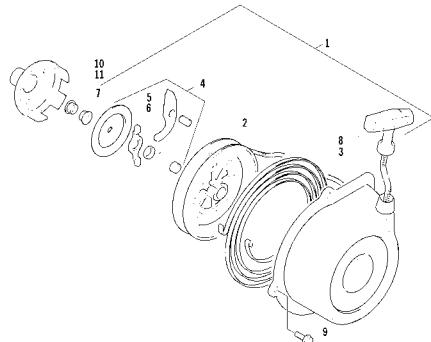
## Servicing Left-Side Components

3

### RECOIL STARTER

#### KEY

- 1. Recoil Starter Assy
- 2. Reel
- 3. Spiral Spring
- 4. Ratchet Assy
- 5. Ratchet
- 6. Ratchet Guide
- 7. Nut
- 8. Rope Assy
- 9. Cap Screw
- 10. Starter Cup
- 11. Nut



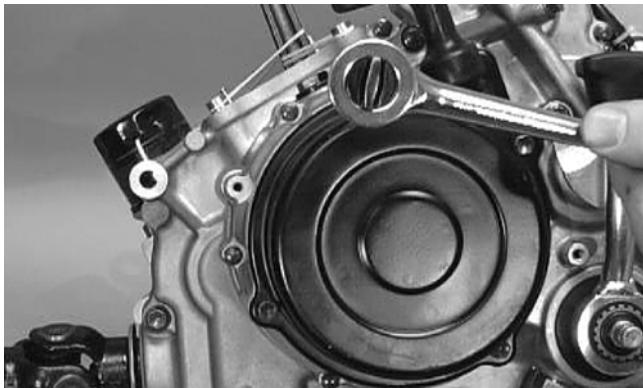
0737-034

#### ⚠ WARNING

Always wear safety glasses when servicing the recoil starter.

### Removing/Disassembling

1. Remove the cap screws securing the recoil starter assembly to the left-side cover; then remove the starter.

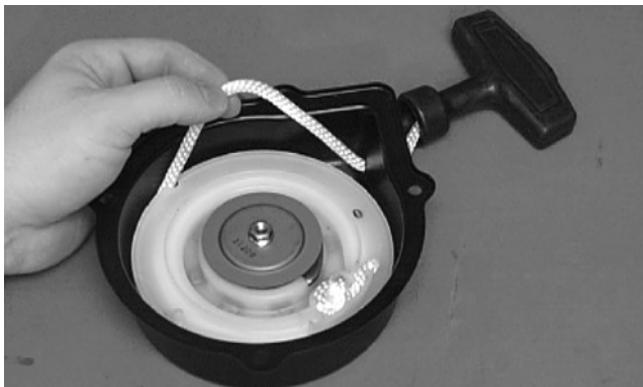


CC039D

### **WARNING**

During the disassembly procedure, continuous downward pressure must be exerted on the reel so it does not accidentally disengage and cause injury.

2. Rotate the reel counterclockwise until the notch of the reel is near the rope guide in the case. Guide the rope into the notch and slowly allow the reel to retract until all spiral spring tension is released.

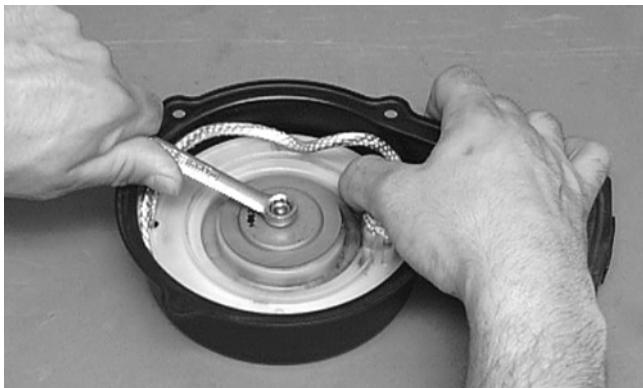


B600D

### **CAUTION**

During the disassembly procedure, make sure all spring tension is released before continuing.

3. Remove the nut.



B601D

4. Slowly release the friction plate and lift the plate with ratchet guide free of the recoil case; then remove the ratchet guide from the friction plate.



B602D

5. Remove the spring cover, spring, and shaft.



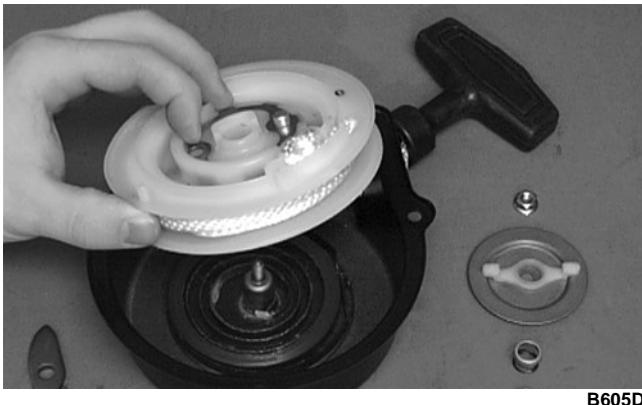
B603D

6. Remove the ratchet and account for the pin.



B604D

7. Carefully lift the reel free of the case making sure the spiral spring does not accidentally disengage from the case.



B605D

## ⚠️ WARNING

Care must be taken when lifting the reel free of the case. Wear safety glasses to avoid injury.

8. Remove the protective cover from the starter handle and pull the rope out of the handle; then untie the knot in the rope and remove the handle.

**■ NOTE: Do not remove the spiral spring unless replacement is necessary. It should be visually inspected in place to save time. If replacement is necessary, follow steps 9-10.**

9. Remove the spiral spring from the case by lifting the spring end up and out. Hold the remainder of the spring with thumbs and alternately release each thumb to allow the spring to gradually release from the case.
10. Unwind the rope from the reel and remove the rope.

## Cleaning and Inspecting

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

1. Clean all components.
2. Inspect the springs and ratchet for wear or damage.
3. Inspect the reel and case for cracks or damage.
4. Inspect the shaft for wear, cracks, or damage.
5. Inspect the rope for breaks or fraying.
6. Inspect the spiral spring for cracks, crystallization, or abnormal bends.
7. Inspect the handle for damage, cracks, or deterioration.

## Assembling/Installing

1. If removed, insert the spiral spring into the case with the outer end of the spring around the mounting lug in the case; then wind it in a counterclockwise direction until the complete spring is installed.

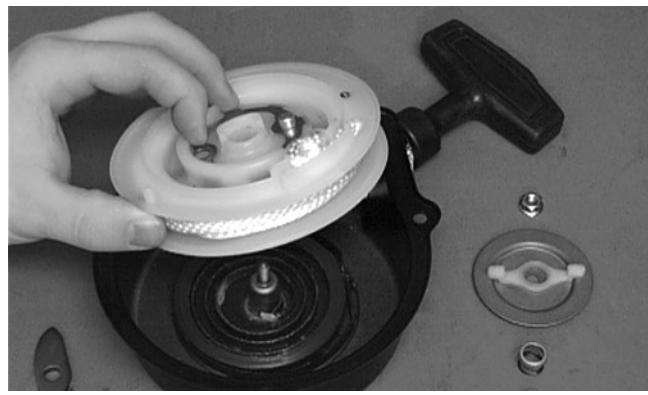
**■ NOTE: The spiral spring must seat evenly in the recoil case.**



3

B606D

2. Insert the rope through the hole in the reel and tie a knot in the end; then wrap the rope counterclockwise around the reel leaving approximately 50 cm (20 in.) of rope free of the reel.
3. Apply low-temperature grease to the spring and hub.
4. Thread the end of the rope through the guide hole of the case; then thread the rope through the handle and secure it with a double knot. Install the protective cover into the handle.
5. Align the inner hook of the spiral spring with the notch in the reel.



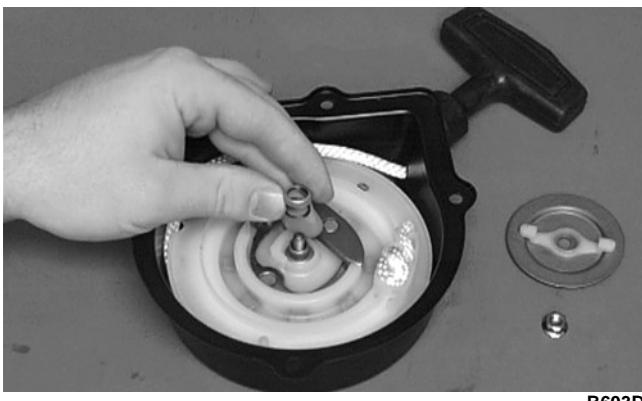
B605D

6. Install the ratchet onto its pin making sure the end is properly installed on the reel.



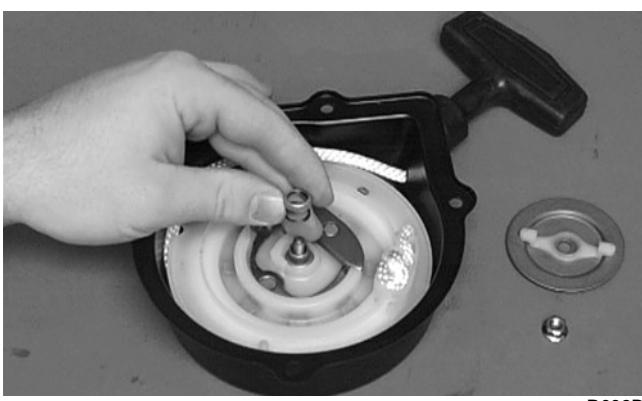
B604D

7. Install the shaft, spring, and the spring cover.



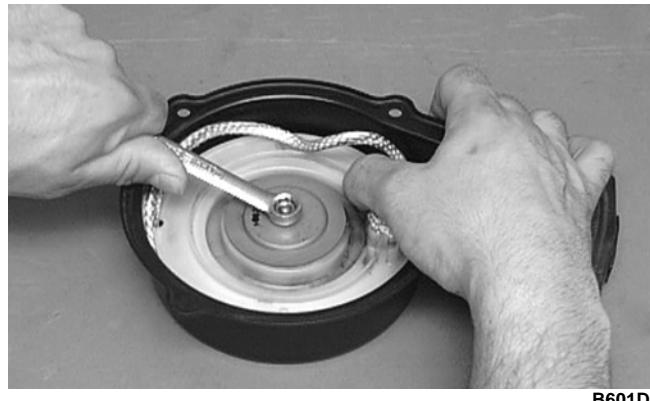
B603D

8. Install the friction plate with the ratchet guide fitting into the ratchet.



B602D

9. While pushing down on the reel, install the nut. Tighten securely.

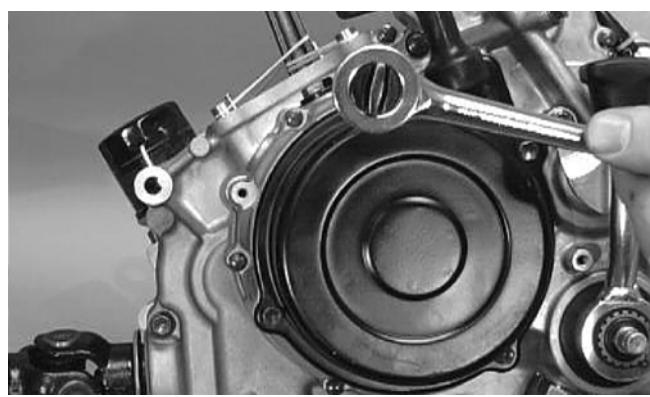


B601D

10. With the 50 cm (20 in.) of rope exposed, hook the rope in the notch of the reel.
11. Rotate the reel four turns counterclockwise; then release the rope from the notch and allow the rope to retract.
12. Pull the rope out two or three times to check for correct tension.

**■ NOTE: Increasing the rotations in step 11 will increase spring tension.**

13. Place the recoil starter assembly into position on the left-side cover; then tighten the cap screws to specifications.

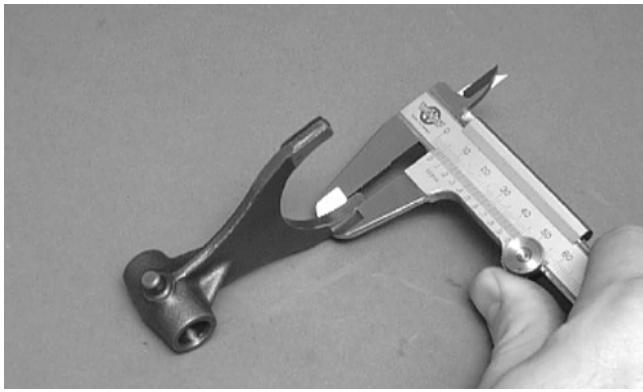


CC039D

## **MEASURING SHIFT FORK (Thickness)**

**■ NOTE: Whenever a shift fork is out of tolerance, replacement is necessary.**

1. Using a calipers, in turn measure the thickness of the machined tip of each shift fork.

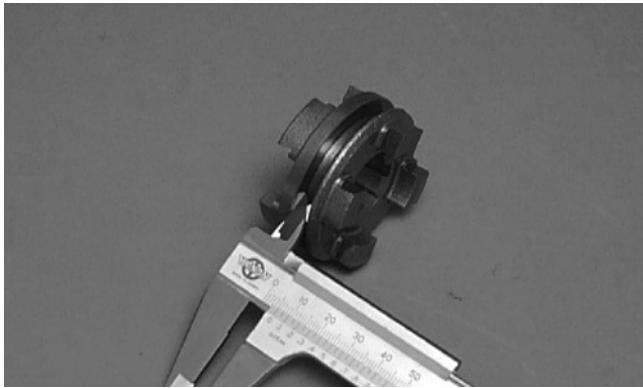


CC296D

2. Shift fork thickness must be within specifications.

### **MEASURING SHIFT FORK GROOVE (Width)**

1. Using a calipers, in turn measure the width of each shift fork groove.

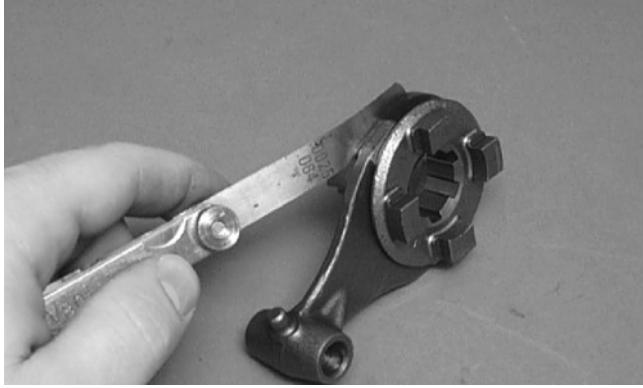


CC288D

2. Shift fork groove width must be within specifications.

### **MEASURING SHIFT FORK TO GROOVE (Side Clearance)**

1. In turn, insert each shift fork into its groove.
2. Using a feeler gauge, measure the clearance between the shift fork and the groove.



CC292D

3. Shift fork to groove side clearance must be within specifications.

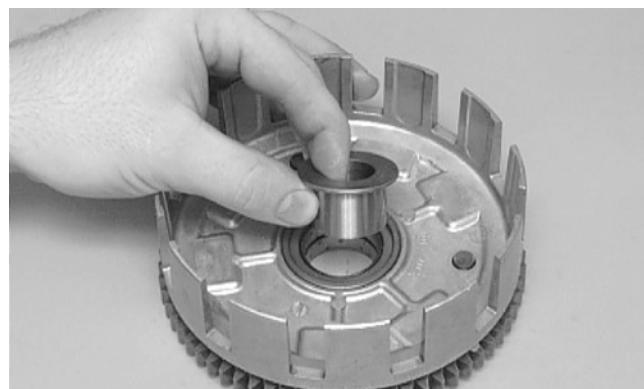
## **Servicing Right-Side Components**

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

### **PRIMARY CLUTCH ASSEMBLY (Inspecting/Measuring/Assembling)**

■ NOTE: Prior to inspecting and measuring components, it is recommended that all components be removed from the primary gear assembly and be cleaned.

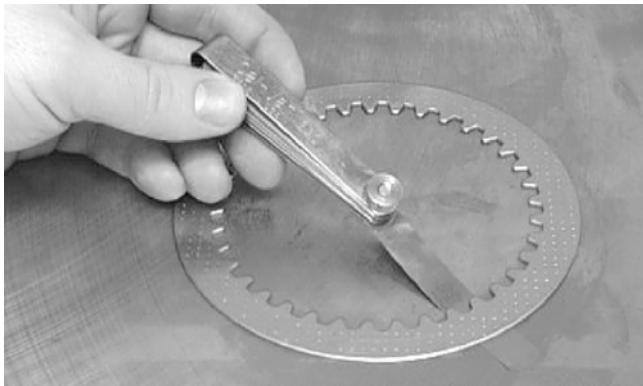
■ NOTE: When removing components from the primary gear assembly, account for the bushing that fits into the primary gear.



CC239D

### **Inspecting/Measuring Clutch Driven Plate Warpage**

1. Inspect each driven plate for warpage and burn marks.
2. In turn place each driven plate on the surface plate; then using a feeler gauge, measure warpage in several locations.

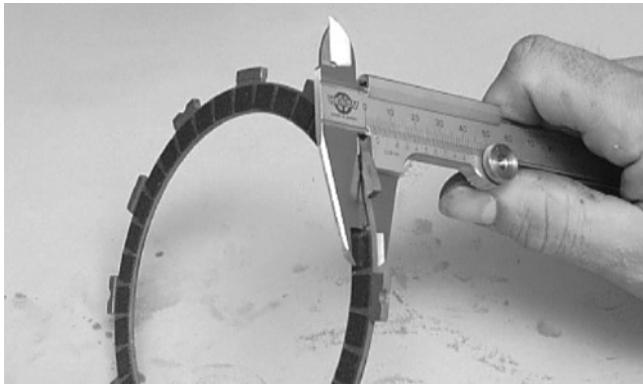


CC245D

3. Maximum driven plate warpage must not exceed specifications.

### Measuring Clutch Drive Plate (Fiber) Thickness

1. Using a calipers, in turn measure the thickness of each drive plate in several locations.



CC243D

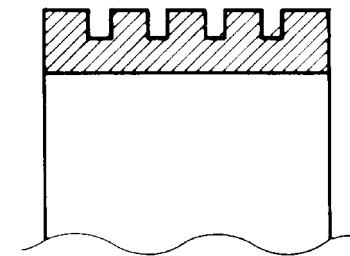
2. Drive plate thickness must not exceed minimum specifications.
3. If the fiber plate tabs are damaged, the plate must be replaced.
4. Inspect the clutch sleeve hub for grooves or notches. If grooves or notches are present, replace the hub.

### Inspecting Centrifugal Clutch Shoe

1. Inspect the clutch shoe for uneven wear, chips, cracks, or discoloration.
2. Inspect the depth of the grooves in the clutch shoes. If any shoe is worn to the bottom of the groove, replace the complete set.

#### ⚠ CAUTION

Always replace clutch shoes as a complete set or severe imbalance could occur.



Inspecting clutch shoe groove

ATV1014

### Inspecting Centrifugal Clutch Housing

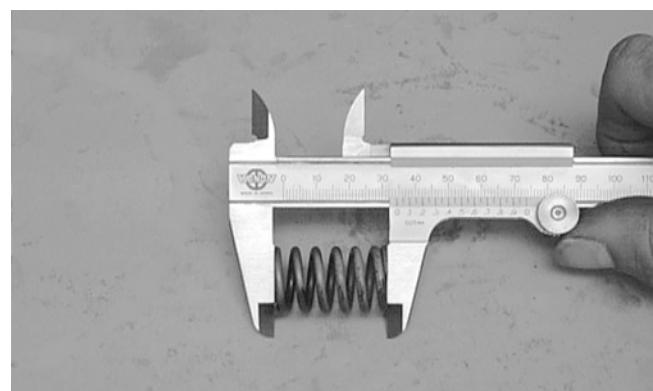
1. Inspect the clutch housing for burns, marks, scuffs, cracks, scratches, or uneven wear.
2. If the housing is damaged in any way, the housing must be replaced.

### Inspecting Primary One-Way Drive

1. 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.

### Measuring Clutch Spring Length

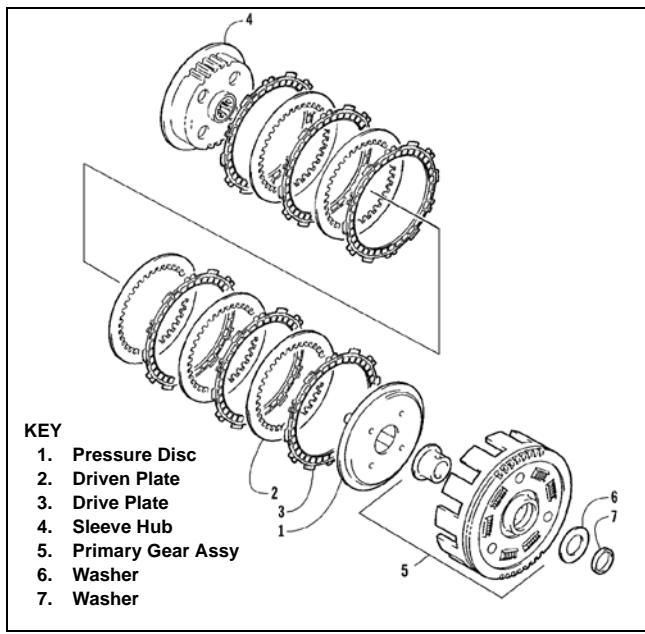
1. Using a calipers, measure the overall free length of the clutch spring.



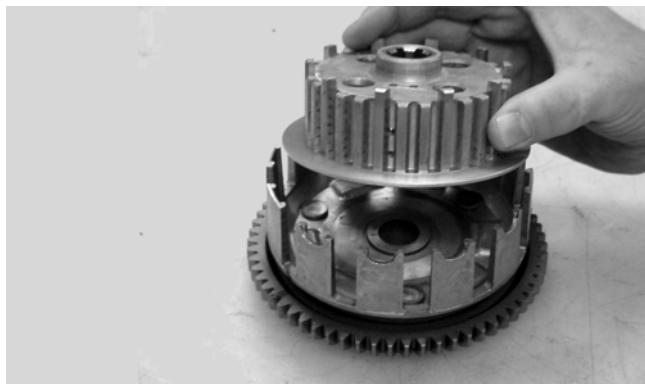
CC247D

2. Overall length must not exceed minimum specifications.

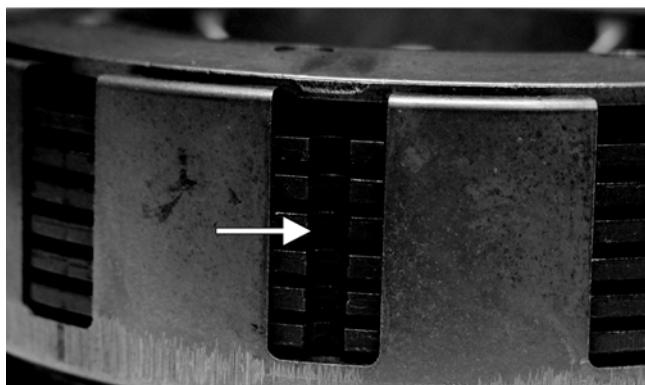
## Assembling Primary Clutch



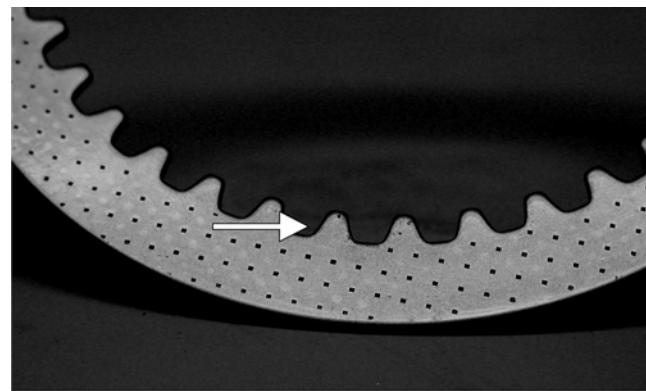
1. Place the clutch hub upside down into the primary gear assembly.



2. Alternately install the drive plates and driven plates onto the hub (starting and ending with a drive plate) making sure the tabs with the notches are all in line with each other.

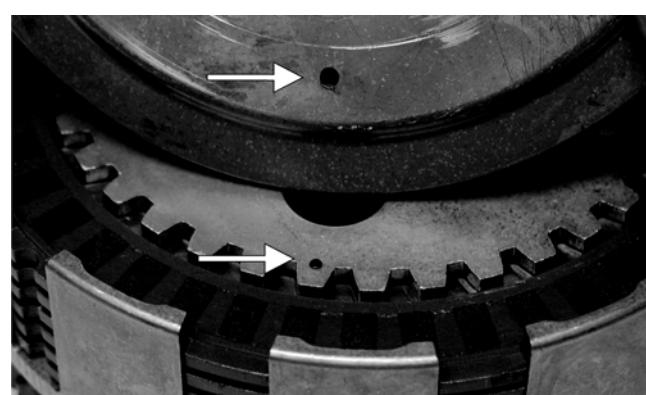


■ **NOTE:** When installing the driven plates for ease of installation, make sure they are placed onto the hub with the rounded side of the plates directed down.

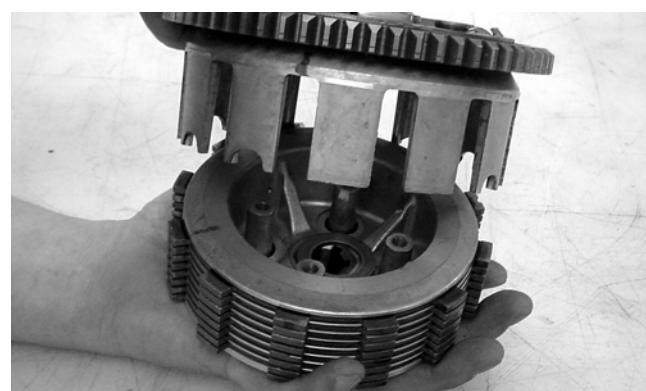


3. Install the pressure plate onto the hub making sure the alignment dots are correctly positioned.

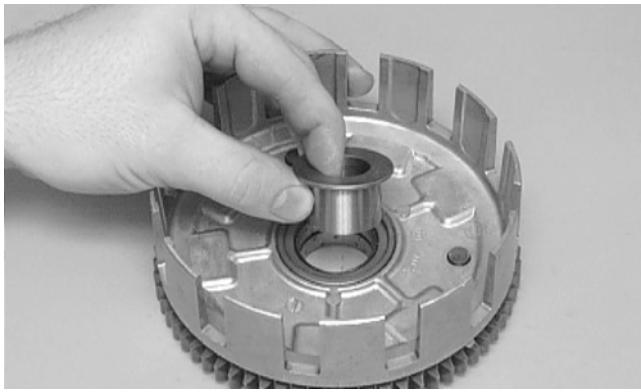
3



4. Place the primary gear assembly w/clutch hub assembly in one hand, place the other hand on top of the clutch hub assembly, and flip the assembly over; then lift the primary gear assembly off the clutch hub assembly being careful not to disturb the drive plate notched tab orientation.

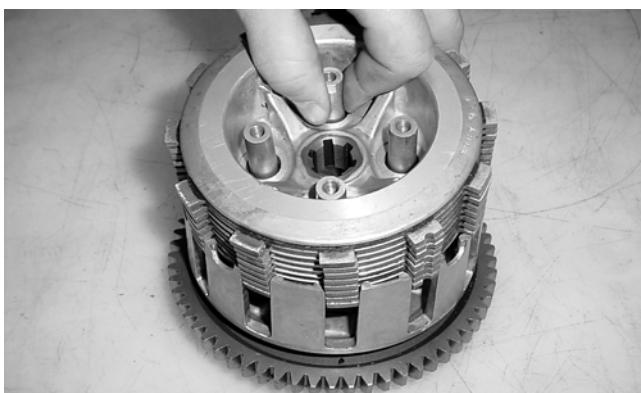


5. Place the primary gear assembly on a clean, flat surface; then install the primary washer into the assembly.



CC239D

6. Place the clutch hub assembly into the primary gear assembly.



CC926

### **CAUTION**

The clutch hub and the pressure plate must be seated in the proper position. If any of the incorrect positions are used, the hub and plate will have clearance between them and they will not operate properly.

■ NOTE: The primary clutch assembly is now completely assembled for installation.

### **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

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## **Servicing Center Crankcase Components**

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

### **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.
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.

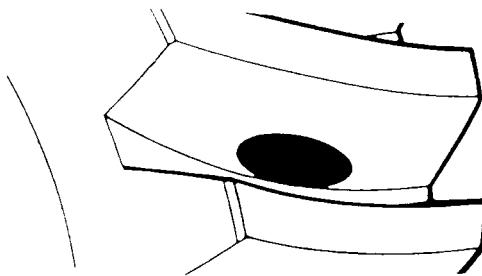
Backlash Measurement	Shim Correction
Under 0.05 mm (0.002 in.)	Decrease Shim Thickness
At 0.05-0.33 mm (0.002-0.013 in.)	No Correction Required
Over 0.33 mm (0.013 in.)	Increase Shim Thickness

### Checking Tooth Contact

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

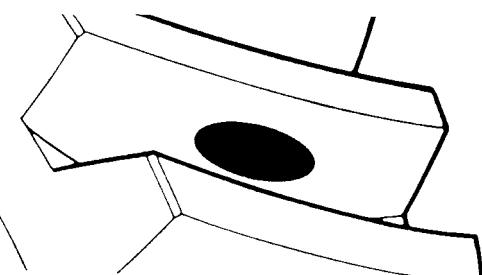
1. Remove the secondary driven output shaft assembly from the left-side crankcase half.
2. Clean the secondary driven bevel gear teeth of old oil and grease residue.
3. Apply a thin, even coat of a machinist-layout dye to several teeth of the gear.
4. Install the secondary driven output shaft assembly.
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 root)



ATV-0105

Correct



ATV-0104

3

### 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.

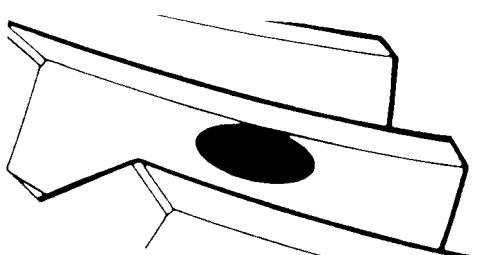
Tooth Contact	Shim Correction
Contacts at Top	Decrease Shim Thickness
Contacts at Root	Increase Shim Thickness

■ **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.

Incorrect (contact at tooth top)

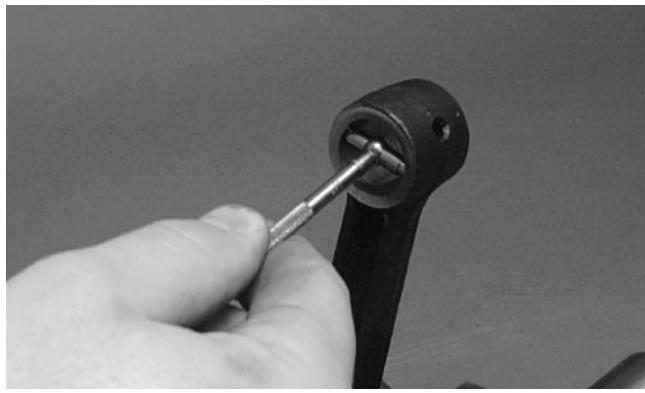


ATV-0103

## CRANKSHAFT ASSEMBLY

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

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



2. Maximum diameter must not exceed specifications.

### Measuring Connecting Rod (Small End Deflection)

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

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

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



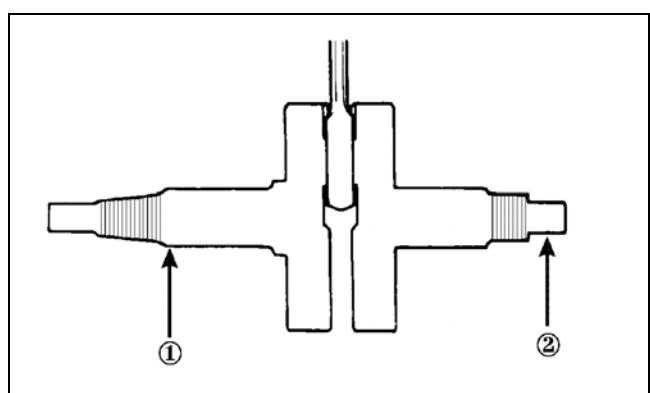
3. Acceptable gap range must be within specifications.

### Measuring Connecting Rod (Big End Width)

1. Using a calipers, measure the width of the connecting rod at the big-end bearing.
2. Acceptable width range must be within specifications.

### Measuring Crankshaft (Runout)

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



3. Zero the indicator and rotate the crankshaft slowly.

#### CAUTION

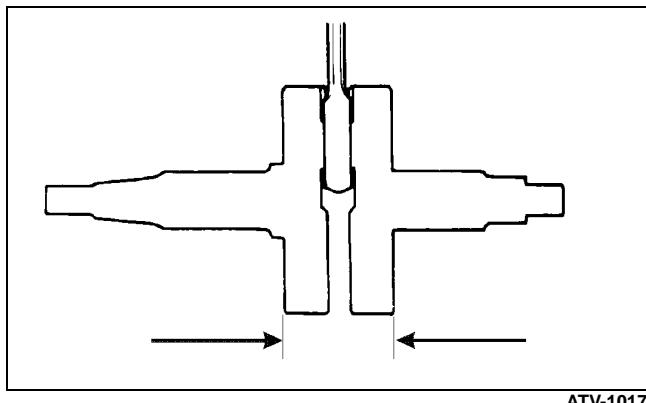
Care should be taken to support the connecting rod when rotating the crankshaft.

4. Maximum runout must not exceed specifications.

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

## 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.



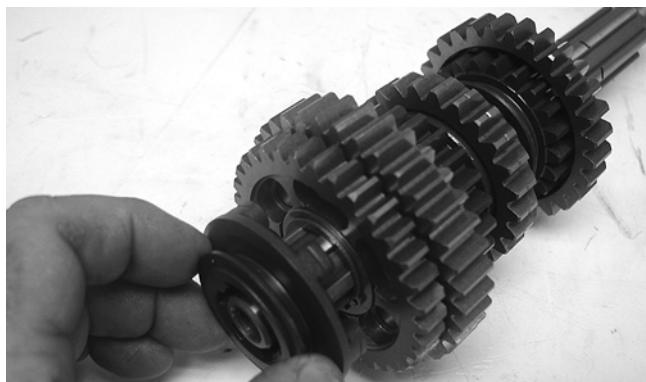
ATV-1017

2. Acceptable width range must be within specifications.

## DRIVESHAFT

### Disassembling

1. In order, remove the reverse dog, circlip, washer, reverse driven gear, and bushing from the driveshaft.



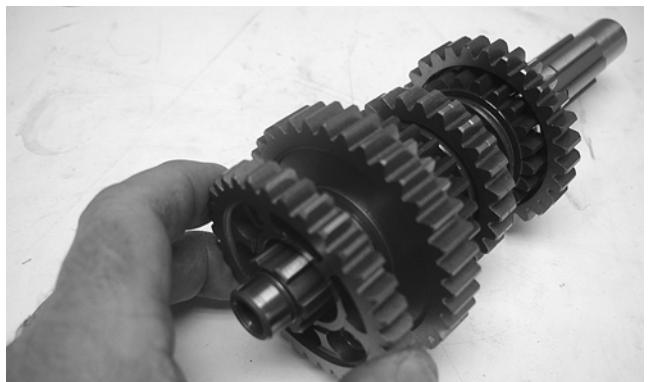
CD331



CD333



CD335



CD336



CD337

■ NOTE: The teeth on the bushing must face the 1st driven gear.

2. Remove the 1st driven washer (right side); then remove the 1st driven gear from the driveshaft.



CD339



CD341

3. Remove the 1st driven bushing; then remove the 1st driven washer (left side) from the shoulder of the splined shaft. Remove the 4th driven circlip.



CD342



CD343



CD344

4. Remove the 4th driven gear from the driveshaft. Note the four small dogs facing toward the 3rd driven gear for assembling purposes.



CD345

5. Remove the 3rd driven circlip; then remove the 3rd driven lock washer (right side) from the driveshaft.



CD346



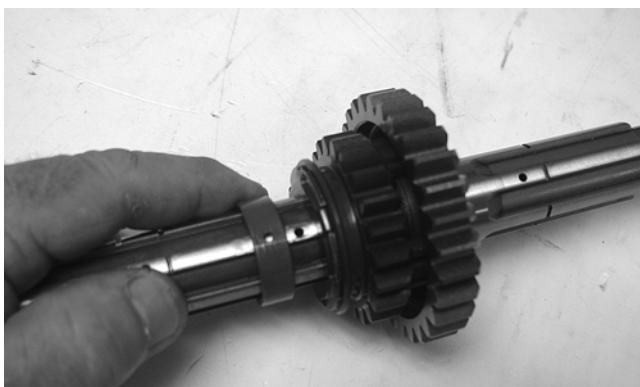
CD348

6. Remove the 3rd driven gear from the driveshaft.



CD349

7. Remove the 3rd driven bushing from the driveshaft. Note the location of the oil feed hole in the bushing and the matching oil supply hole in the driveshaft for assembling purposes.



CD351

8. Remove the 3rd driven lock washer (left side) from the driveshaft. Note the tabs facing toward the 5th driven gear for assembling purposes.



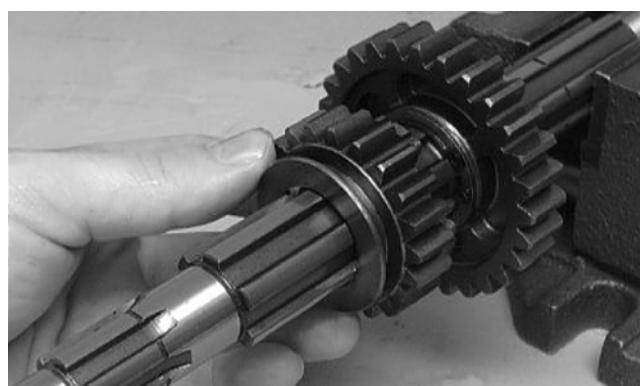
CD352

9. Remove the next 3rd driven lock washer (left side) by rotating it out of the groove. Note the groove closest to the 5th driven gear for assembling purposes.



CD354

10. Remove the 5th driven gear from the driveshaft.

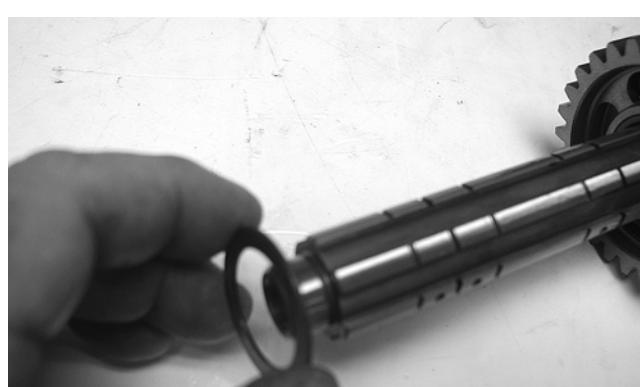


CC210D

11. In order, remove the 2nd driven circlip, washer, gear, and bushing from the driveshaft.



CD356



CD357

3



CD358



CD359

1. In order, install the 2nd driven bushing, gear, washer, and circlip onto the driveshaft.



CD359

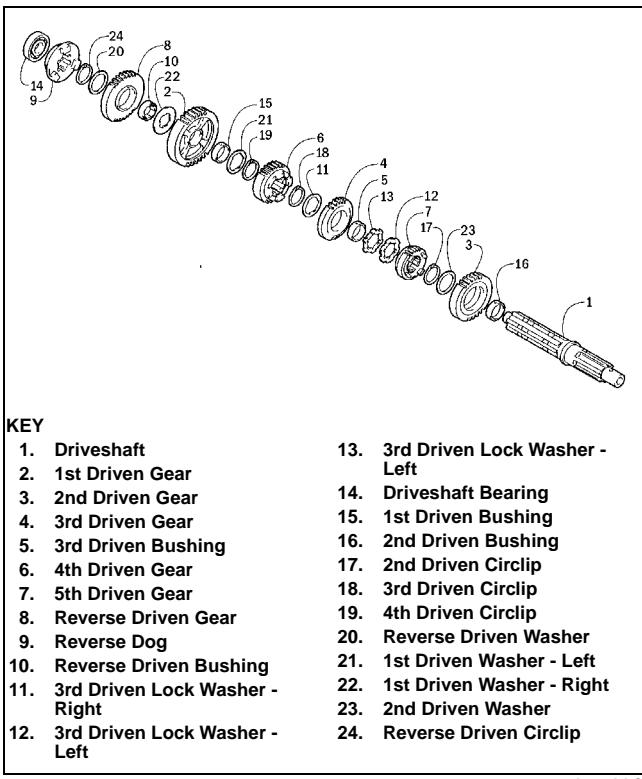


CD358

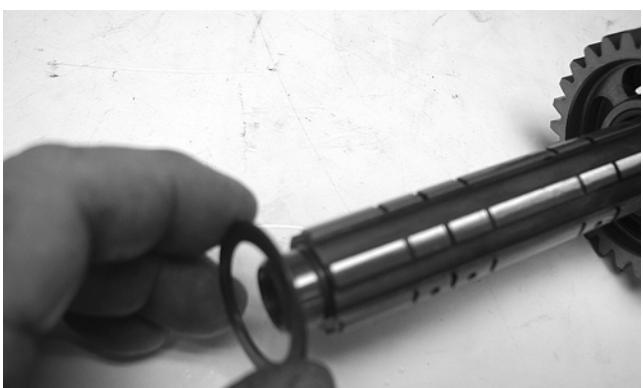
### **AT THIS POINT**

To service secondary gears, see Servicing Center Crankcase Components in this sub-section.

## Assembling



737-733A



CD357



CD356

2. Install the 5th driven gear onto the driveshaft.



CD355

3. Install the 3rd driven lock washer (left side). Lock it into the groove closest to the 5th driven gear (as noted in disassembling) by rotating it when it is in the groove.



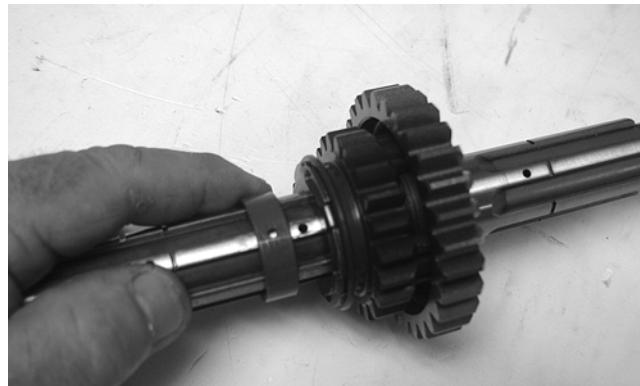
CD354

4. Install the next 3rd driven lock washer (left side) onto the driveshaft making sure the tabs are facing toward the 5th driven gear. Make sure the tabs intertwine with the first 3rd driven lock washer.



CD352

5. Install the 3rd driven bushing onto the driveshaft making sure the oil feed hole in the bushing aligns with the appropriate oil supply hole in the driveshaft (as noted in disassembling).



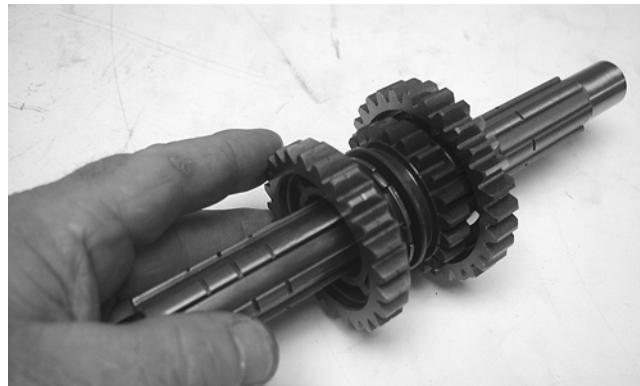
CD351

**⚠ CAUTION**

**It is very important to assure the oil feed hole in the bushing and oil supply hole in the driveshaft align. If not aligned, engine damage will result.**

6. In order, install the 3rd driven gear, lock washer (right side), and circlip onto the driveshaft.

3



CD349



CD348



CD346

7. Install the 4th driven gear onto the driveshaft making sure the four small dogs are facing toward the 3rd driven gear as noted in disassembling; then secure with the circlip.



CD345

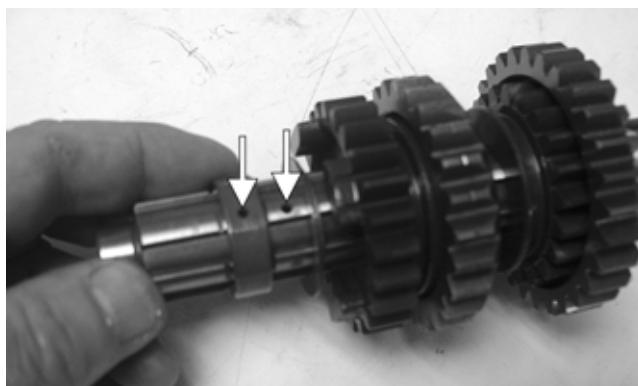


CD344

8. Install the 1st driven washer (left side) onto the shoulder of the splined shaft; then install the 1st driven bushing and gear.



CD343



CD342A



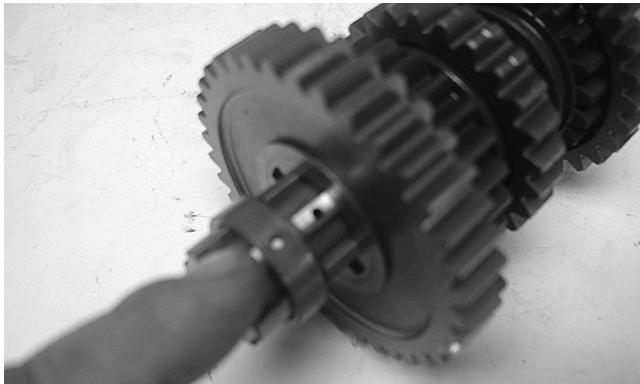
CD341

9. Install the 1st driven washer (right side) on the shaft making sure it lines up with the groove in the shaft; then turn the washer locking it on the shaft.



CD340

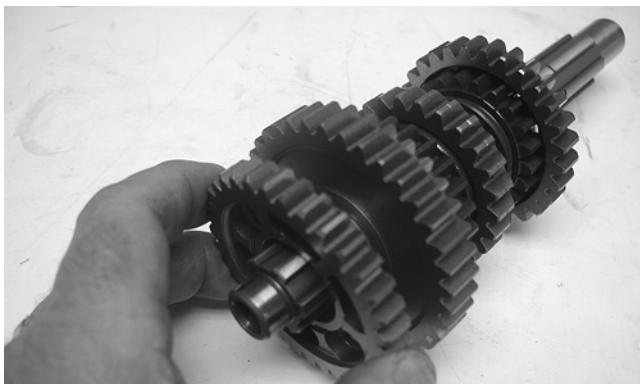
10. Slide the reverse driven bushing onto the shaft making sure the oil port in the bushing aligns with the oil port on the shaft.



CD337



11. In order, install the reverse driven gear, washer, circlip, and reverse dog onto the driveshaft.



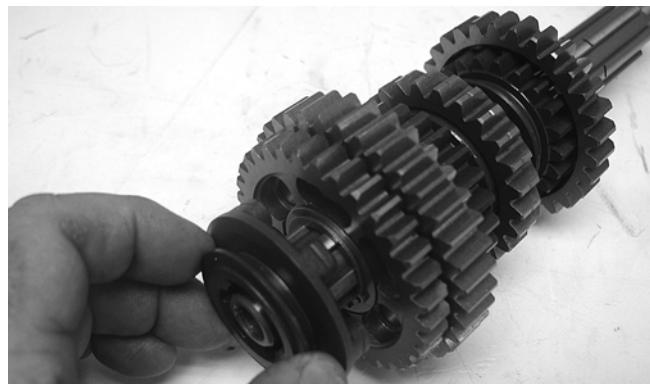
CD336



CD335



CD334



CD331

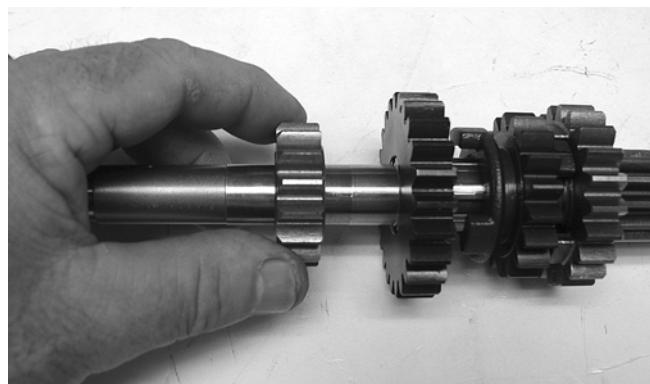
3

■ NOTE: The driveshaft is now completely assembled for installation.

## COUNTERSHAFT

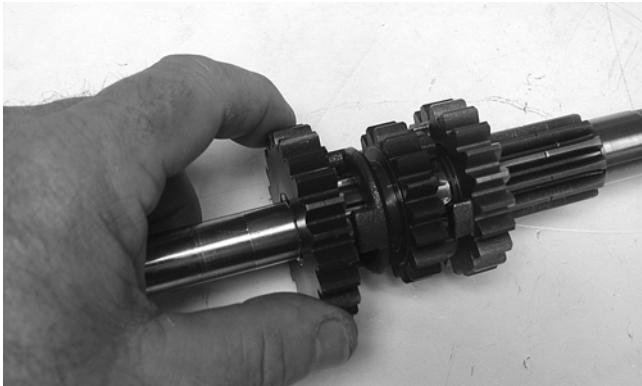
### Disassembling

1. Remove the 2nd drive gear from the countershaft.



CD395

2. Remove the 5th drive gear from the countershaft.



CD396

3. Remove the 5th drive washer and 5th drive circlip from the countershaft.



CD397



CD400

4. Remove the 3rd drive gear from the countershaft.

5. Remove the 4th drive circlip securing the 4th drive gear on the countershaft; then remove the first 4th drive washer and 4th drive gear. Account for the bushing.



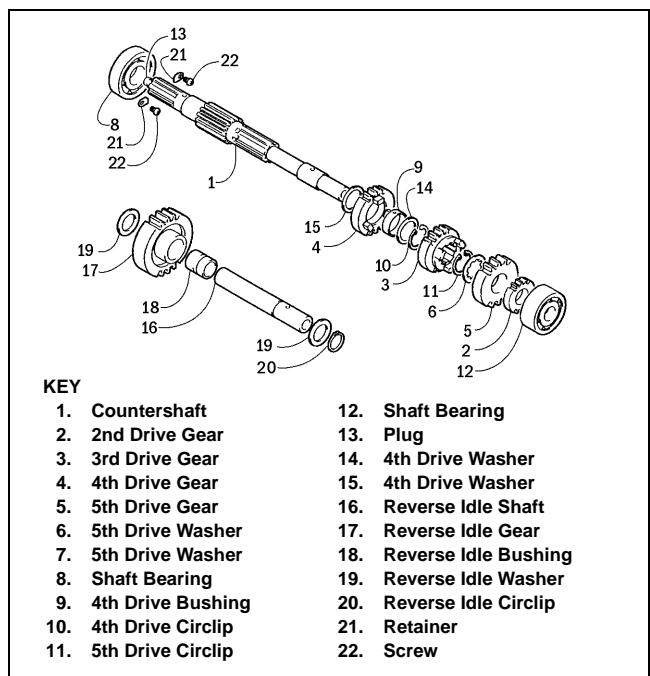
CD405

6. Remove the other 4th drive washer from the countershaft.



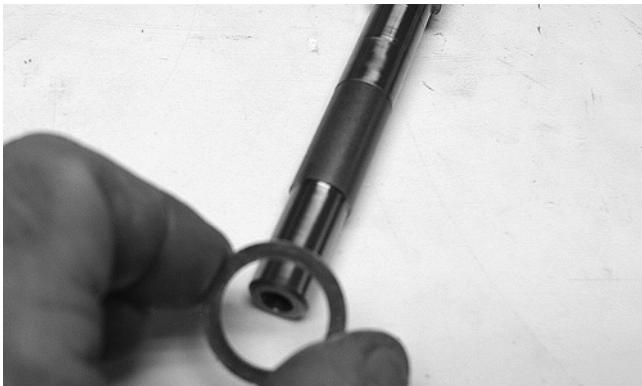
CD408

## Assembling



737-733B

1. Install the 4th drive washer onto the countershaft.



CD408

2. Install the 4th drive gear making sure the bushing is in position; then install the other 4th drive washer onto the countershaft. Secure with the circlip.

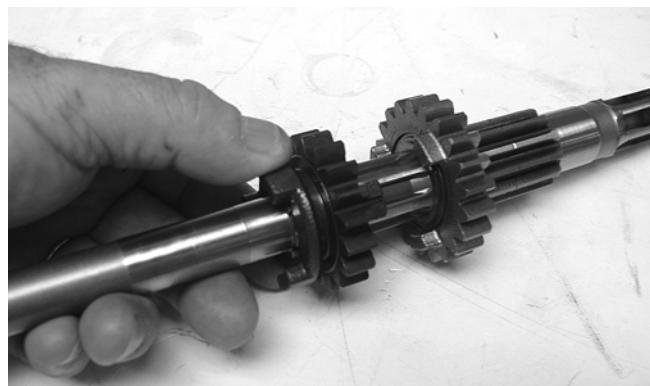


CD405

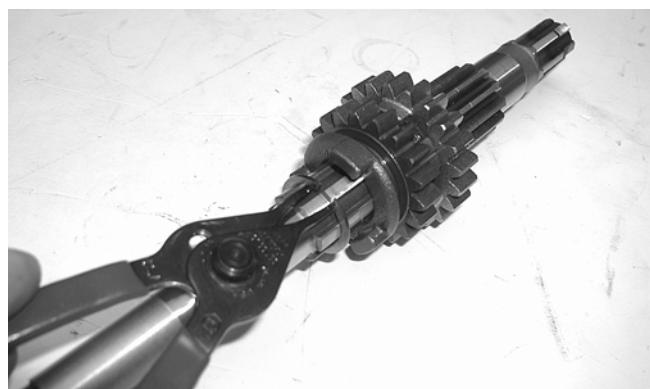


CD406

3. Install the 3rd drive gear; then install the 5th drive circlip onto the countershaft.



CD401



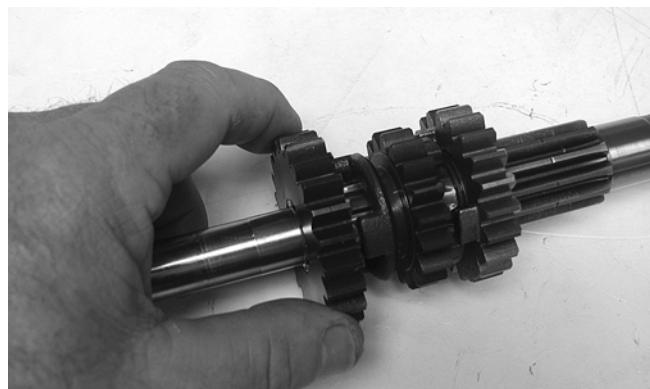
3

CD400

4. Install the 5th drive washer and 5th drive gear onto the countershaft.

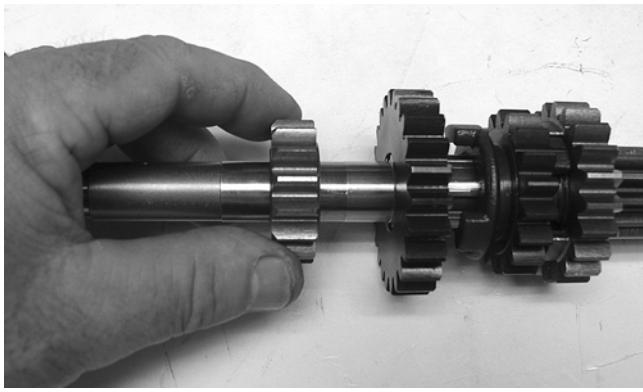


CD397



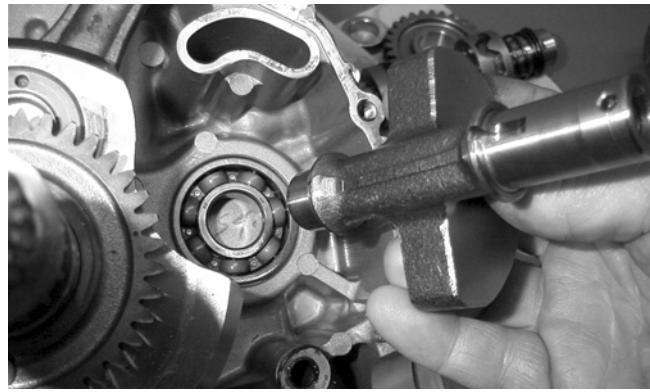
CD396

5. Install the 2nd drive gear onto the countershaft.



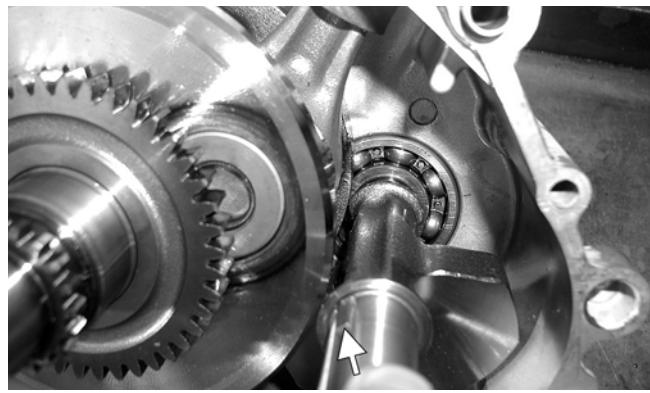
CD395

■ **NOTE:** The countershaft is now completely assembled for installation.



MD1024

3. With the key in position, slide the driven gear onto the crank balancer making sure the timing marks are aligned.



CD832A



CC167D



MD1334

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

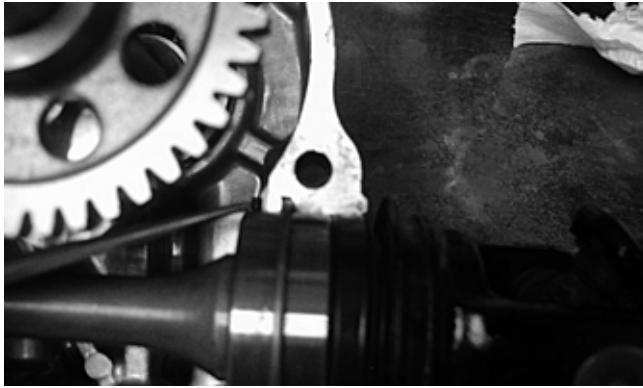


CC166D

4. Place the bearing C-ring into position in the crankcase; then install the front shaft and rear shaft assemblies.

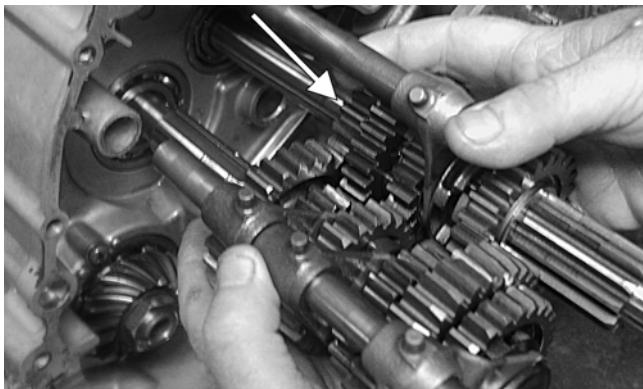
**CAUTION**

The bearing pins must be positioned into the crankcase.



CD267

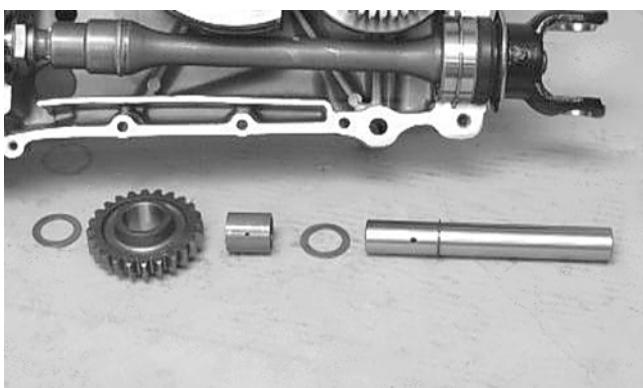
5. Simultaneously, install the driveshaft and countershaft assemblies making sure the washer is on the countershaft.



CD232A

6. Install the reverse idle shaft with circlip making sure the oil hole in the shaft is facing downward; then install a washer, bushing, reverse idle gear, and a washer.

■ NOTE: The reverse idle gear is directional. Care must be taken that it is installed correctly.



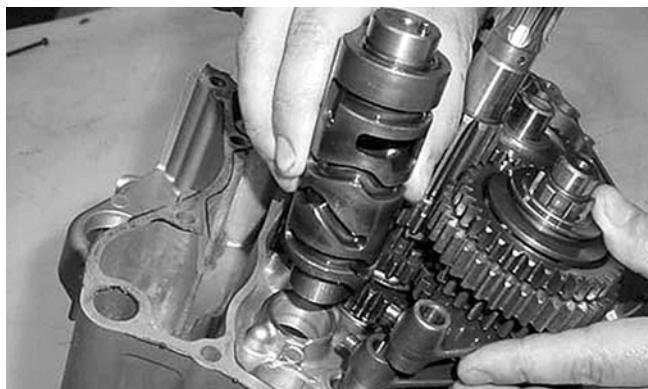
CC231D

7. Place each of the four shift forks into its respective gear or dog as noted during disassembling; then install the gear shift cam.



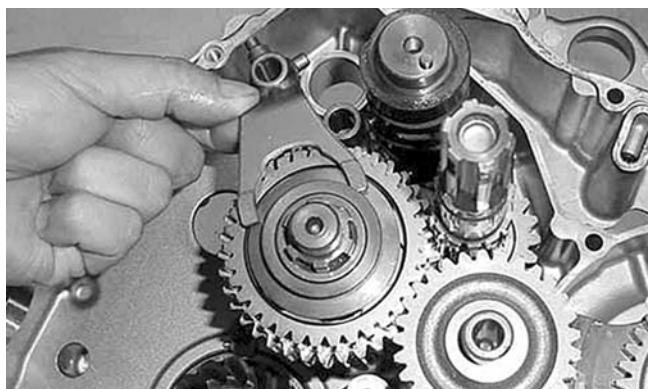
CD232

3



CC987

8. Engage the four forks to the gear shift cam; then install the reverse shift cam and spacer.



CC986

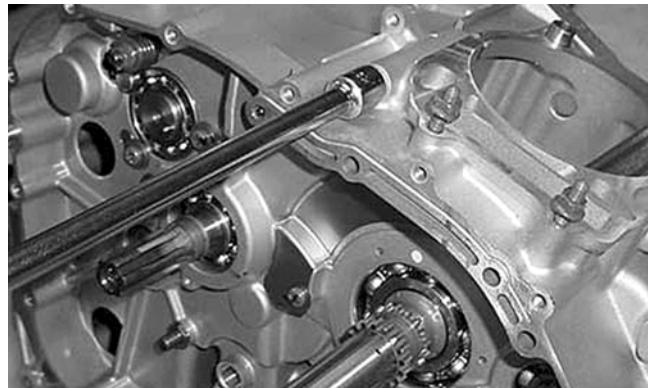
■ NOTE: For proper assembling, the cam lock plate must engage the shift cam cutaway.



CC988

9. Install the two gear shift fork shafts; then verify that the two crankcase half alignment pins are in place.

■ **NOTE: Prior to joining crankcase halves, turn the shift cam to ensure all gears shift properly.**



CC982

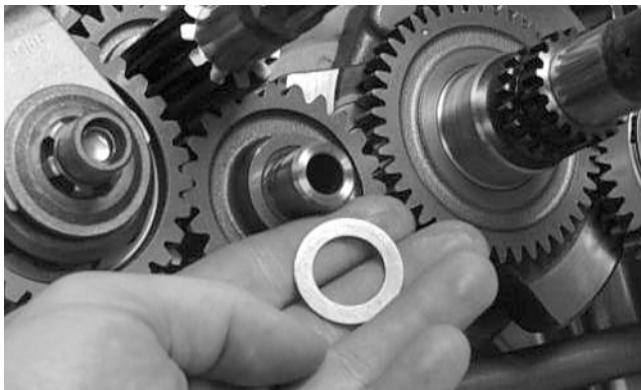
4. From the left side, install the three case half 8 mm cap screws (two inside the case); then tighten only until snug.

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



CC981

1. Verify that the shim washer is on the idler shaft; then apply Three Bond Sealant to the mating surfaces. Place the right-side half onto the left-side half.



CC102D

2. Using a plastic mallet, lightly tap the case halves together until cap screws can be installed.
3. From the right side, install the four case half 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 seven 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.**

6. From the right side, install the five case half 6 mm cap screws (one inside the case); then tighten only until snug.

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

7. In a crisscross/case-to-case pattern, tighten the 8 mm cap screws (from steps 3-4) until the halves are correctly joined; then tighten to specifications.

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

8. In a crisscross/case-to-case pattern, tighten the 6 mm cap screws (from steps 5-6) to specifications.

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

### ⚠ CAUTION

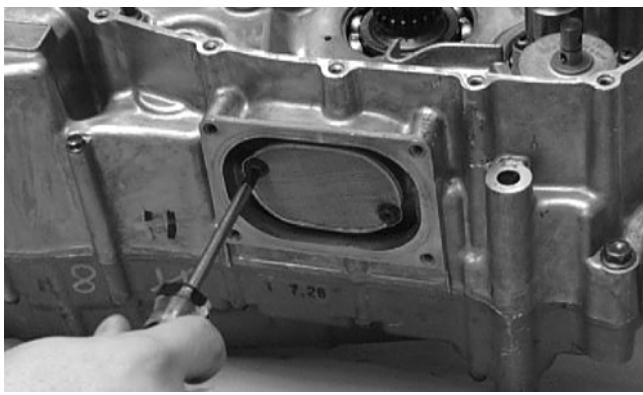
After completing center crankcase components, proceed to Installing Right-Side Components, to Installing Left-Side Components, and to Installing Top-Side Components.

## Installing Right-Side Components

### A. Oil Strainer/Oil Pump

#### B. Gear Shift Shaft

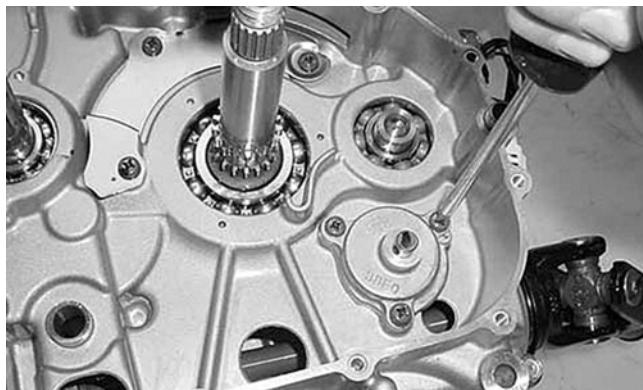
1. Place the oil strainer with a new O-ring into position beneath the crankcase and tighten securely with the Phillips-head cap screws.



2. Place the strainer cap into position on the strainer making sure the O-ring is properly installed and secure with the cap screws; then install and tighten the oil drain plug to specifications.



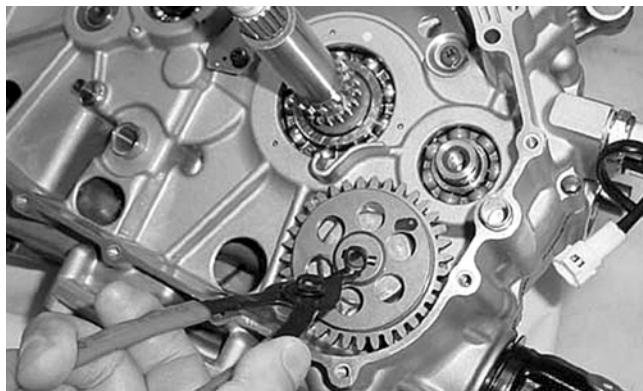
3. Place the oil pump into position in the crankcase and secure with the three Phillips-head screws coated with blue Loctite #243. Tighten to specifications.



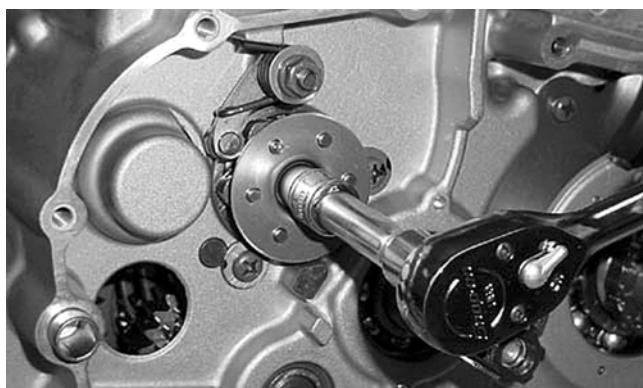
3

4. Place the washer and pin into position on the oil pump shaft, install the oil pump driven gear, and secure with the circlip.

■ NOTE: Always use a new circlip when installing the driven gear.



5. Place the gear shift cam plate and guide onto the gear shift cam making sure the alignment pin was installed. Secure assembly with the cap screw coated with blue Loctite #243. Tighten securely.

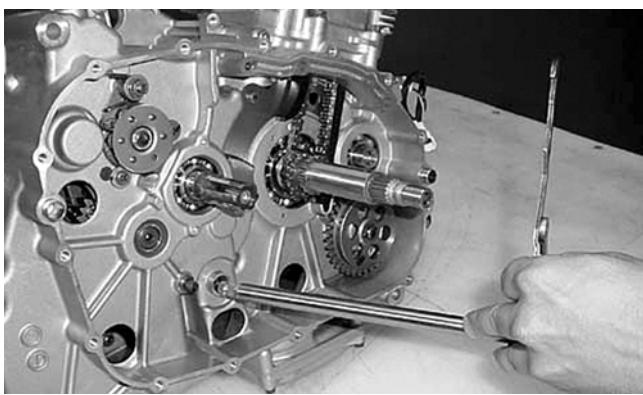


6. Attach the spring to the gear shift cam stopper arm.



CC974

7. Install the gear shift shaft.

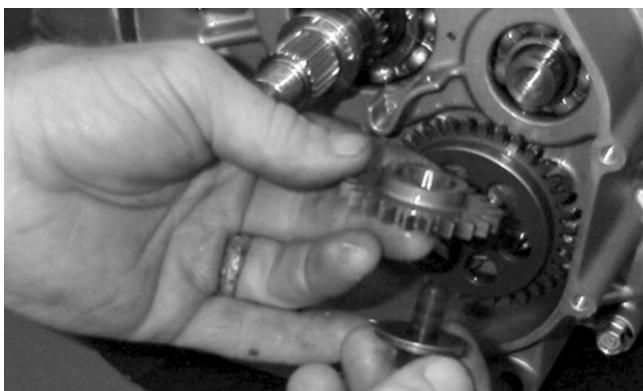


CC973

**C. Primary Driven Gear**  
**D. Primary Clutch**  
**E. Centrifugal Clutch Shoe**

**■ NOTE: Steps 1-7 in the preceding sub-section must precede this procedure.**

8. Install the spacer, pin, and oil pump drive gear onto the crank balancer shaft making sure the shoulder of the drive gear is facing inward toward the crankcase; then secure with the washer and nut (threads coated with red Loctite #271) tightened to specifications.

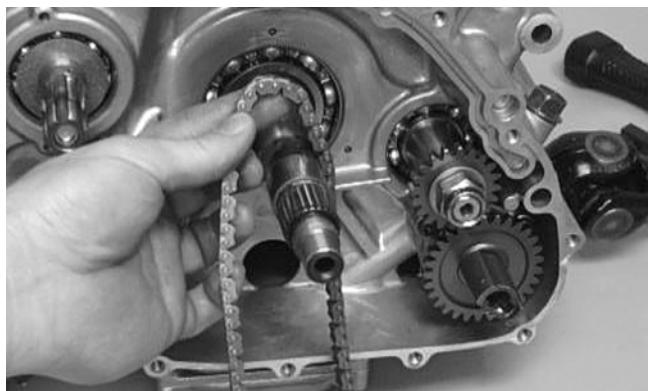


MD1017



CD447

9. Place the chain into the crankcase; then secure it from the top side with a wire for ease of installing.



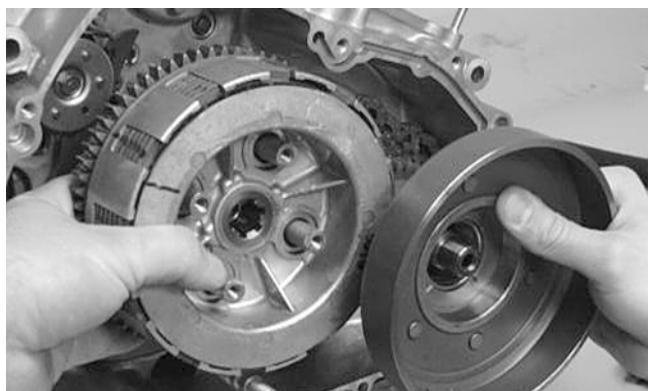
CC079D

10. Install the primary driven washers and shims onto the driveshaft and crankshaft.

**CAUTION**

The clutch sleeve hub and the clutch pressure plate must be seated in the proper position. If any of the incorrect positions are used, the hub and plate will have clearance between them and they will not operate properly.

11. Simultaneously, place the primary clutch assembly and the centrifugal clutch housing on their respective shafts making sure the sleeve is properly positioned in the primary assembly.

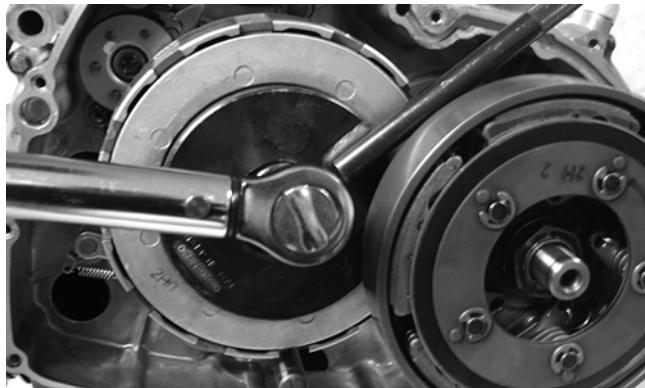


CC078D

■ **NOTE:** After placing the primary clutch assembly onto the shaft, pull out on the pressure plate tower to ensure the pressure plate has engaged the clutch hub properly and make sure the plates (drive and driven) are brought together tightly prior to tightening the nut securing the clutch assembly.

12. Using a clutch sleeve hub holder, install the nut and washer. Tighten to specifications.

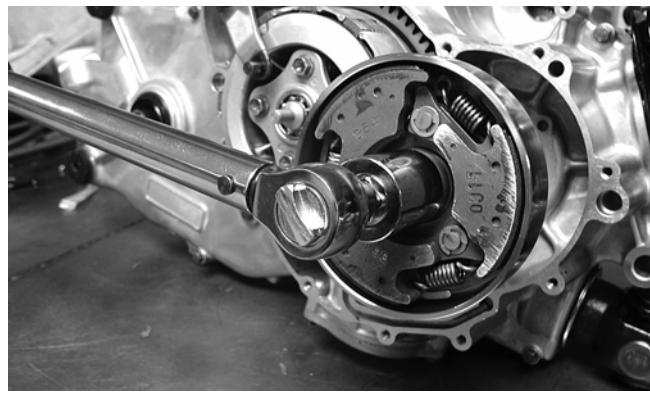
■ **NOTE:** The washer is directional. Care must be taken to install it correctly.



13. Place the primary drive one-way clutch into the centrifugal clutch housing noting the word OUTSIDE for proper placement.



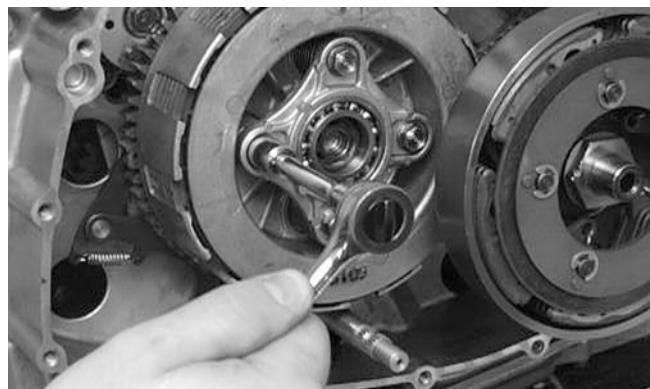
14. Install the centrifugal clutch shoe and washer; then secure with the centrifugal clutch-shoe nut (left-hand threads). Tighten to specifications; then using a center punch, stake the nut.



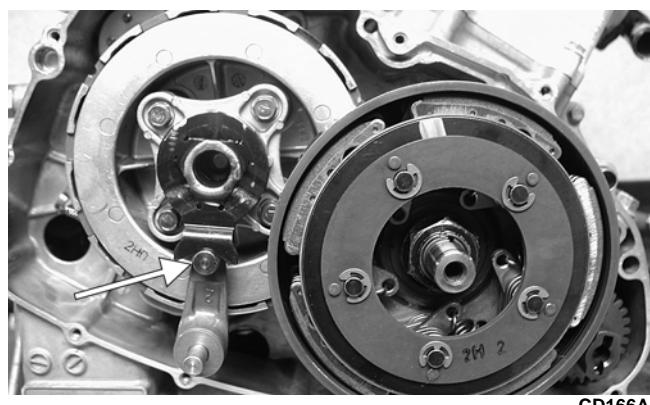
15. Install the release roller assembly making sure the four springs are in position; then using a crisscross pattern, tighten the four cap screws securely.

■ **NOTE:** Tighten the four roller assembly cap screws in a crisscross pattern making sure there is no clearance between the clutch plates when secured.

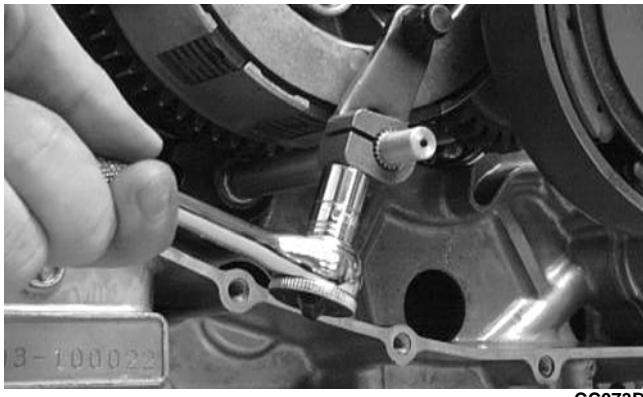
3



16. Install the clutch release arm and release roller guide making sure the release roller and guide are aligned.



17. Secure the clutch release arm with the cap screw coated with blue Loctite #243. Tighten securely.



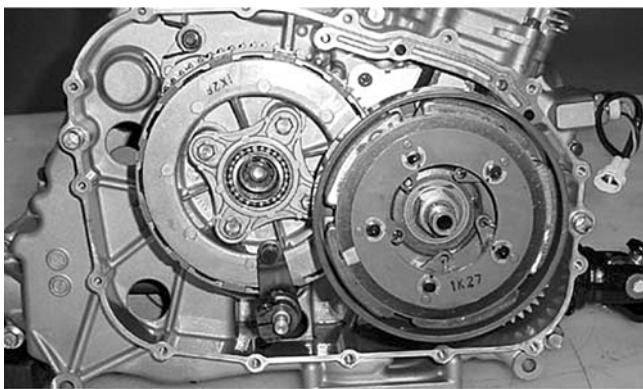
CC073D

## F. Oil Filter

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

■ **NOTE:** Lubricate all internal components with 5W-30 oil prior to installing the right-side cover.

■ **NOTE:** Care should be taken that the alignment pins are installed in the right-side cover.



CC989

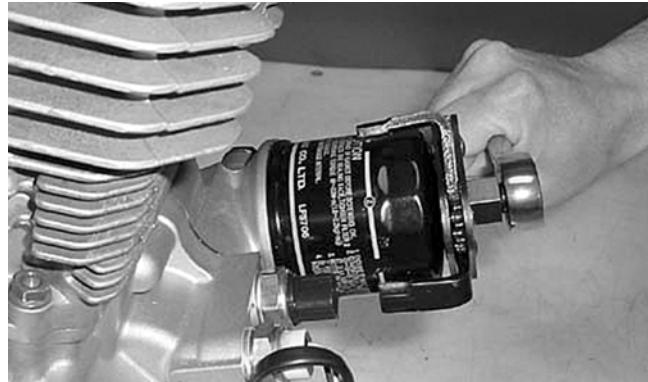
18. Place the gasket and right-side cover into position making sure the release roller guide remains correctly positioned; then install the fifteen cap screws.



CD441

19. Tighten the cap screws in a crisscross pattern to specifications.

20. Using the oil filter wrench, install a new oil filter.



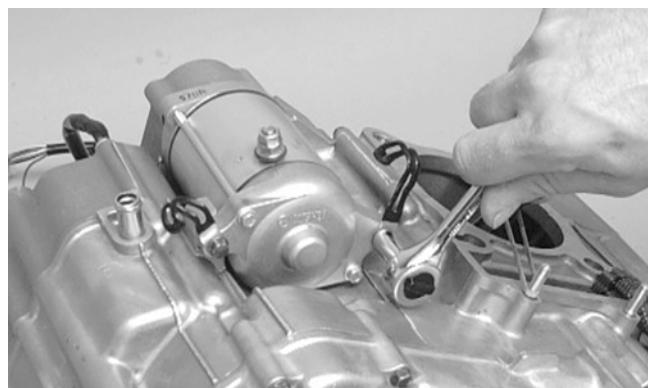
CC967

## Installing Left-Side Components

### A. Idle Gear Assembly

### B. Magneto Rotor

1. Place the starter into position on the crankcase and secure with the cap screws. Note the position of the wiring form.



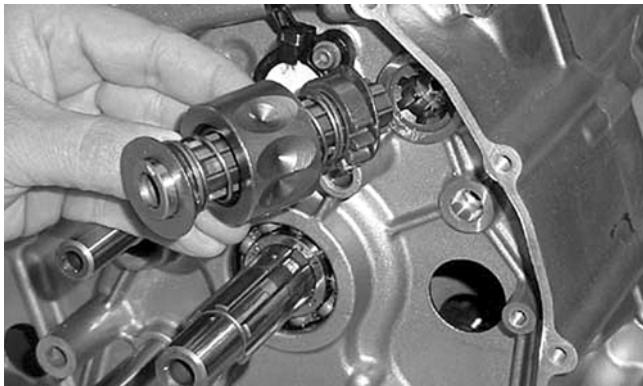
CC065D

2. Place the neutral switch base assembly into position making sure the two neutral contacts and springs are inside the case and properly positioned. Secure with Allen-head screws.



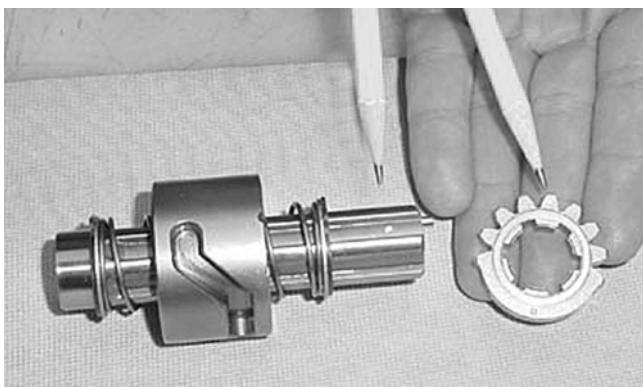
CC964

3. Install the secondary stopper camshaft w/one inner shim and one outer shim.



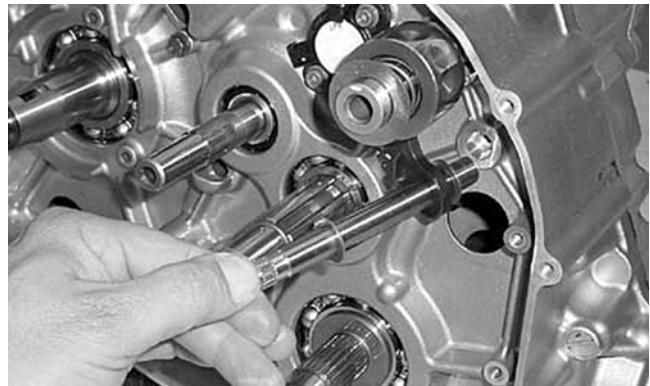
CC962

**■ NOTE:** Care must be taken that the alignment dots on the camshaft plate and the camshaft are properly aligned.



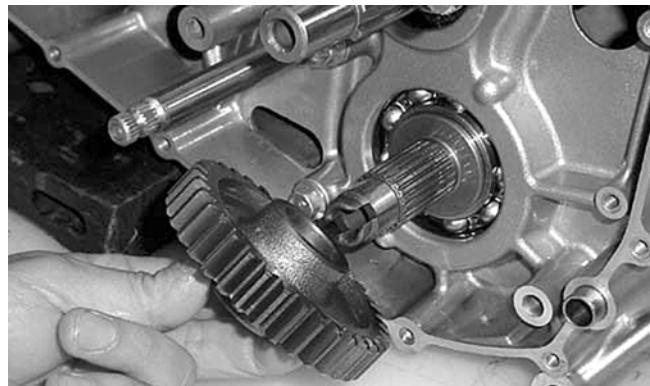
CC963

4. Install the gear shift shaft w/one inner washer and one outer washer.



CC960

5. Install the driven gear onto the output shaft.



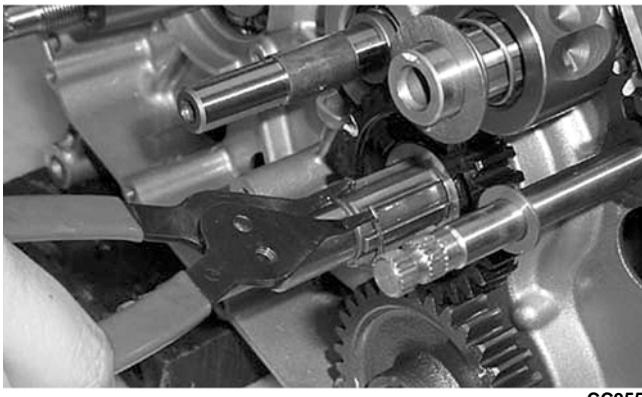
CC959

6. Place the bushing and washer onto the driveshaft making sure the oil hole of the bushing aligns with the oil hole of the driveshaft.



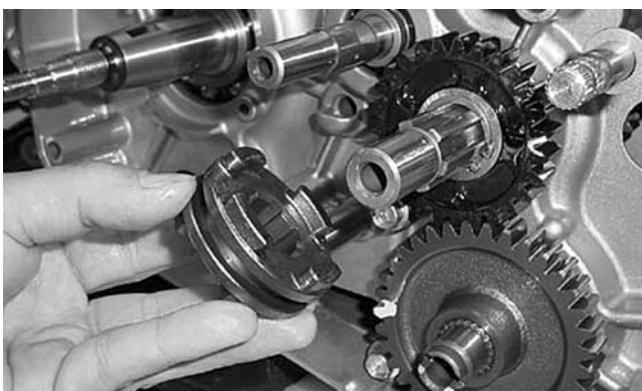
CD552

7. Turn on the driveshaft, install drive gear #1 and a washer; then secure with a circlip.

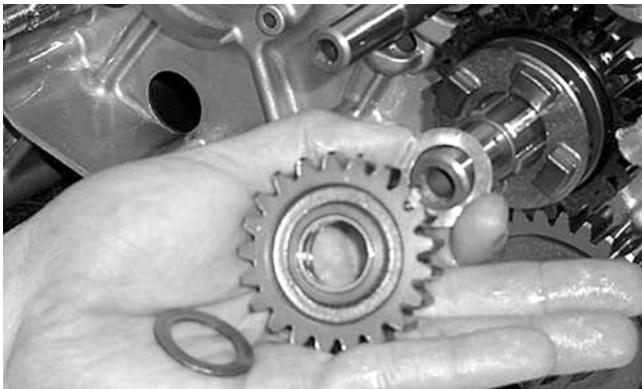


CC955

8. Place the select sliding dog gear onto the driveshaft; then place a washer, drive gear #2, and another washer onto the driveshaft.

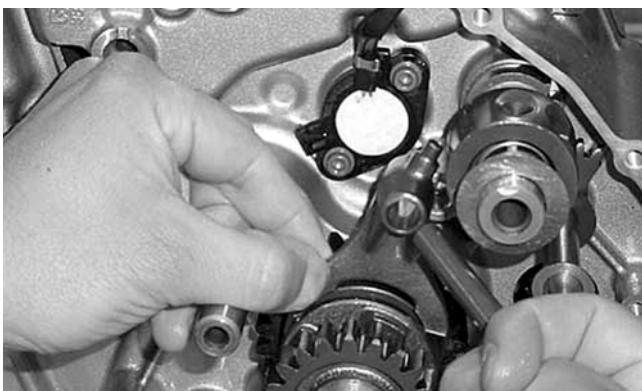


CC966



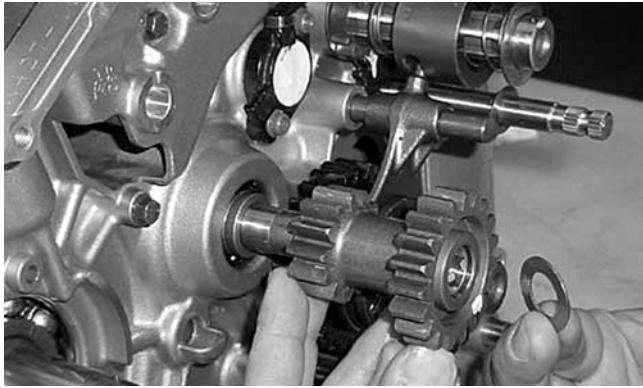
CC954

9. Place the gear shift fork into the sliding dog; then install the gear shift fork shaft.



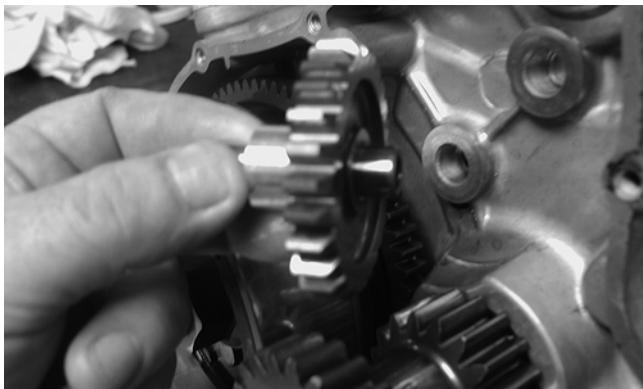
CC953

10. Install the drive idler gear with one spacer and one washer.



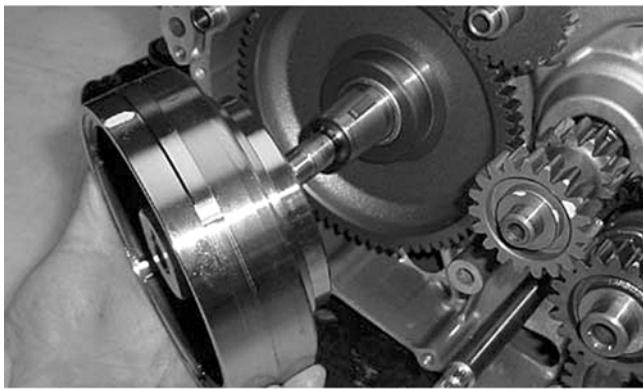
CC952

11. Install starter idler gear #2 and shaft with the chamfered side directed toward the crankcase.



CD140

12. Install the starter clutch gear assembly onto the crankshaft. Place the key into its notch. Place the magneto rotor into position on the crankshaft; then install the magneto rotor nut on the crankshaft and tighten until the rotor is properly seated. Tighten to specifications.



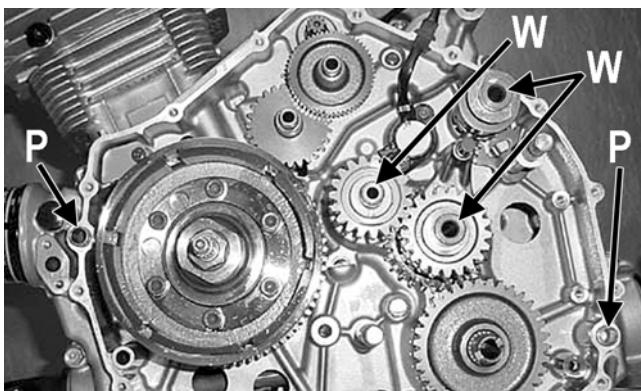
CC991



CC990

13. Install the two alignment pins into the left crankcase half.

**■ NOTE: Make sure that three washers and two alignment pins are in place.**

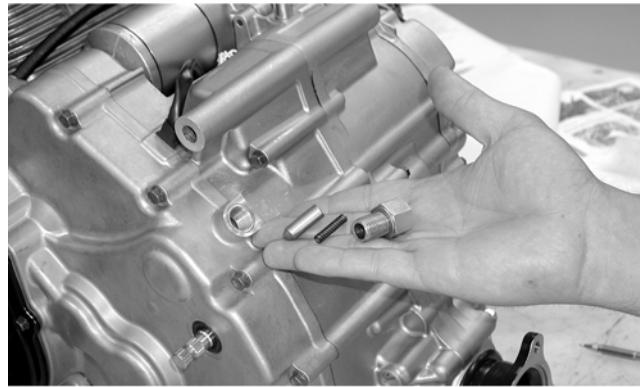


CC948A



CC945

16. Place the gear shift stopper w/spring and washer into position above the hi/low shift shaft making sure the spring and stopper are correctly positioned. Tighten to specifications.



CC93

3

**C. Cover**  
**D. Speedometer Drive**  
**E. Hi/Low Shifter Assembly**  
**F. Recoil Starter**

**■ NOTE: Steps 1-13 in the preceding sub-section must precede this procedure.**

14. Place the gasket and left-side cover into position on the crankcase.

**■ NOTE: It may be necessary to push or pull the splined Hi/Low range shift shaft to establish cover/crankcase mating.**

15. Install the fifteen 6 mm cap screws and one 8 mm cap screw to secure the left-side cover. Only finger-tighten at this time.

17. Place the speed sensor into position and secure with the two cap screws. Tighten securely.

#### **CAUTION**

**Make sure the speedometer gear and output shaft gear match up during assembly.**



CF109

18. Place the starter cup into position on the crank-shaft making sure a new, lubricated O-ring is inside the cup. Tighten the flange nut to specifications.



19. In a crisscross pattern, tighten the cap screws (from step 15) to specifications.



20. Place the recoil starter assembly into position on the left-side cover; then tighten four cap screws to specifications.

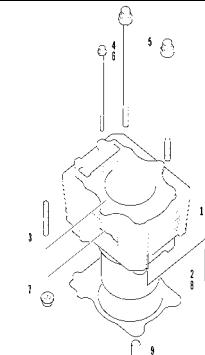


## Installing Top-Side Components

### A. Piston B. Cylinder

#### KEY

- 1. Cylinder
- 2. Stud Bolt
- 3. Stud Bolt
- 4. Bolt
- 5. Bolt
- 6. Bolt
- 7. Nut
- 8. Cylinder Gasket
- 9. Pin

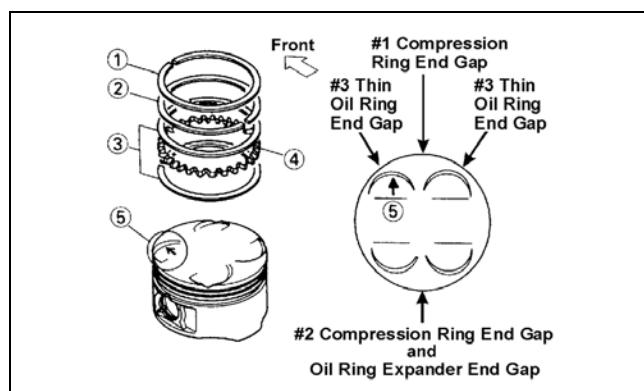


0737-039

■ NOTE: If the piston rings were removed, install them in this sequence.

A. 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.

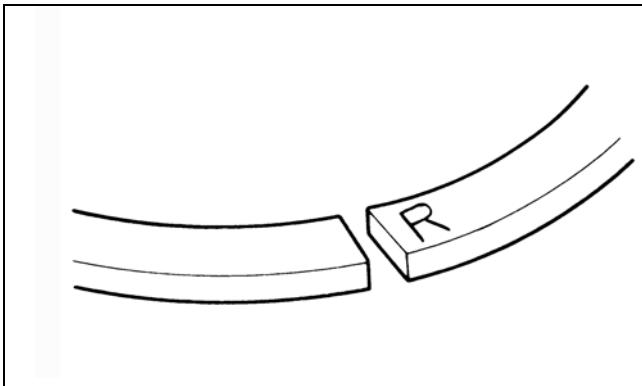
■ NOTE: Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.



ATV-1085B

B. Install the compression rings (1 and 2) so the letter 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 (see illustration).

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

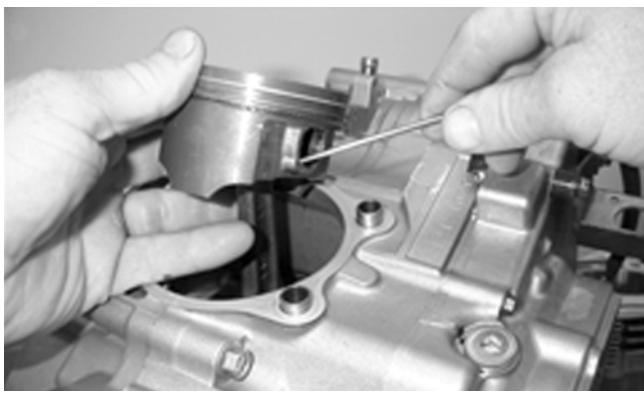


ATV-1024



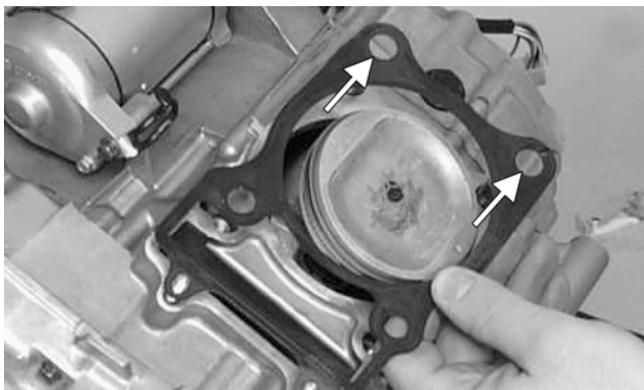
1. Install the piston on the connecting rod making sure there is a circlip on each side and the open end of the circlip is directed upwards or downwards.

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



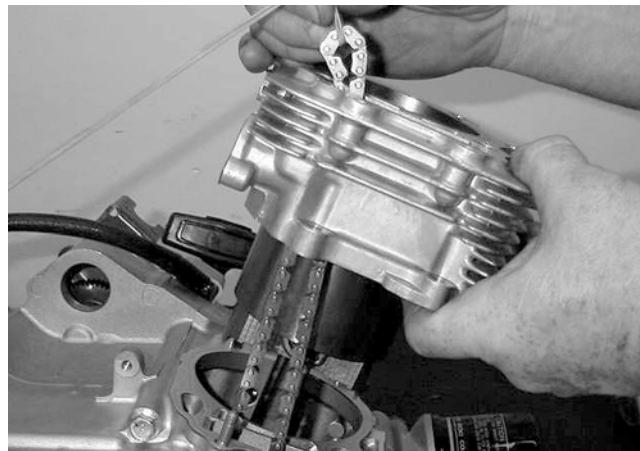
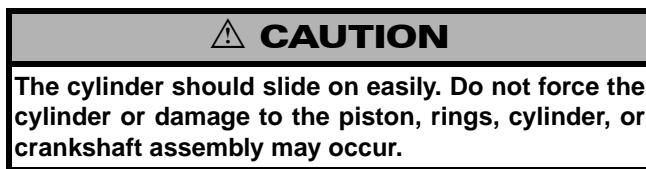
MD1213

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



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.

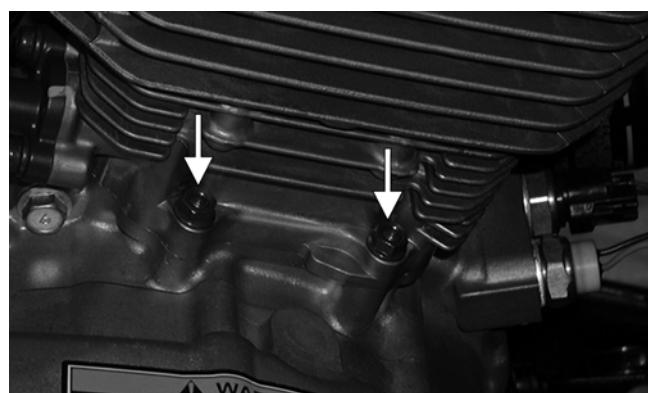


MD1345

3

4. Loosely install the two nuts with washers which secure the right-side of the cylinder to the right-side crankcase half.

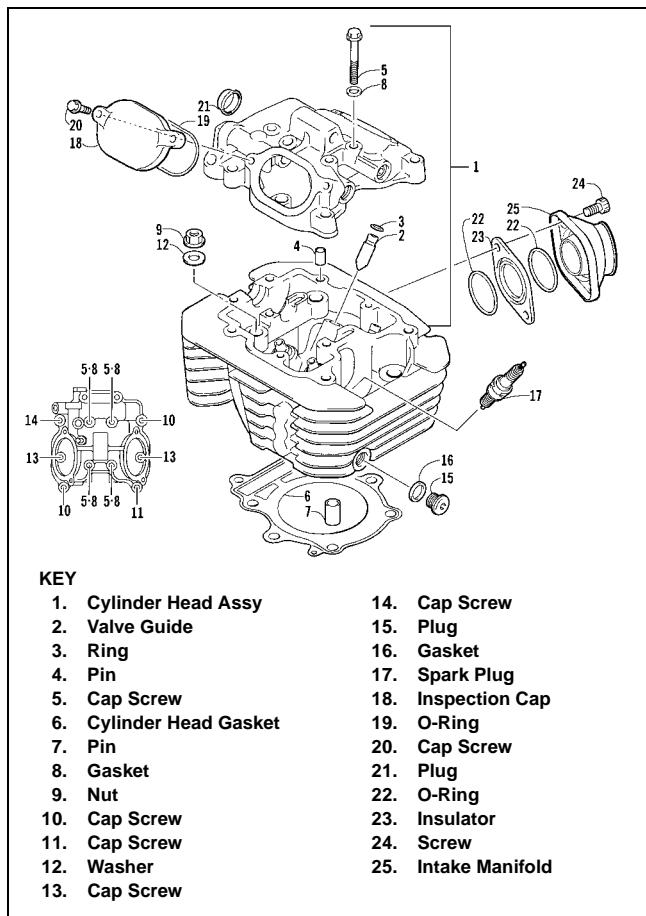
■ NOTE: The two cylinder-to-crankcase nuts will be tightened in step 9.



CF162A

## C. Cylinder Head

### D. Valve Cover



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

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

#### ⚠ CAUTION

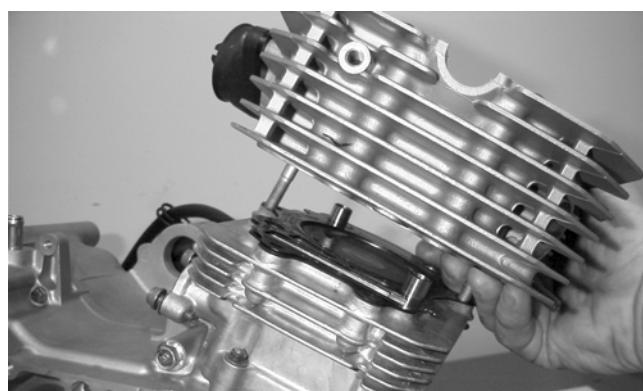
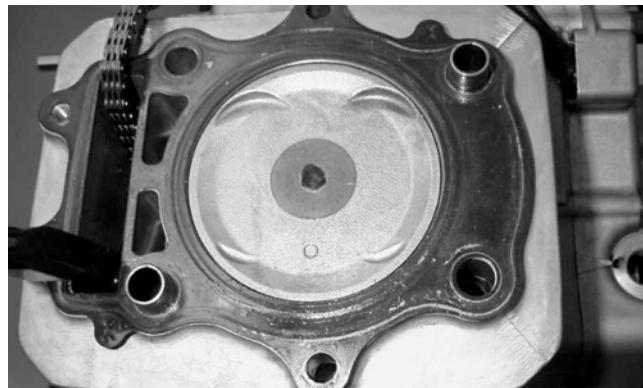
Care should be taken that the bottom of the chain guide is secured in the crankcase boss.



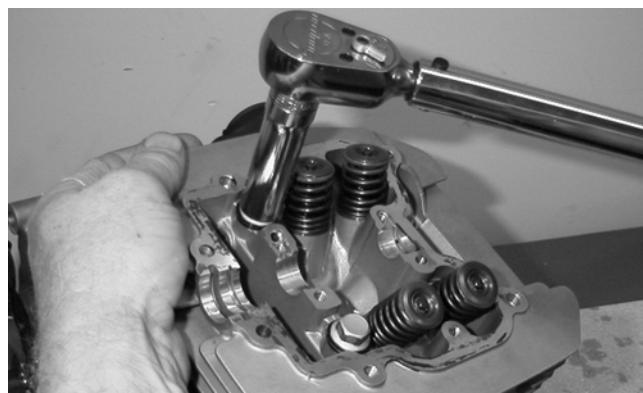
6. Place the head gasket into position on the cylinder. Place the alignment pins into position; then place the head assembly into position on the cylinder making sure the cam chain is routed through the chain cavity.

#### ⚠ CAUTION

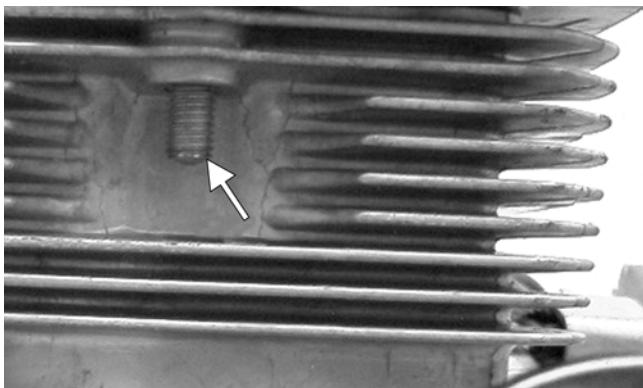
Keep tension on the cam chain to avoid damaging the crankcase boss.



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. Tighten only until snug.



MD1192

9. In a crisscross pattern, tighten the four cylinder head cap screws (from step 7) to specifications; then tighten the nuts (from step 8) to specifications. Tighten the cylinder-to-crankcase nuts (from step 4) to specifications.
10. With the timing inspection plug removed and the chain held tight, rotate the crankshaft until the piston is at top-dead-center.
11. Install the rear cam chain tensioner guide into the cylinder head. Install the pivot cap screw and washer.

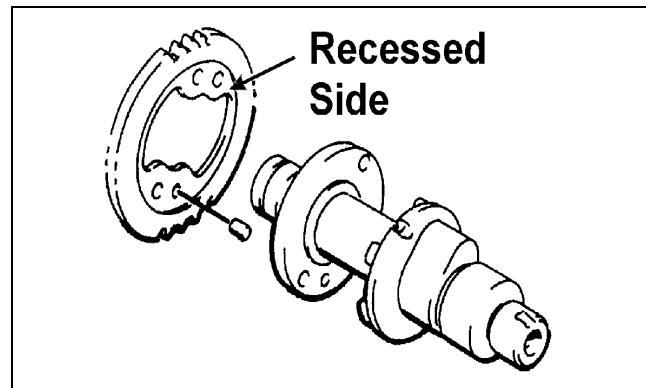


CD383

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.

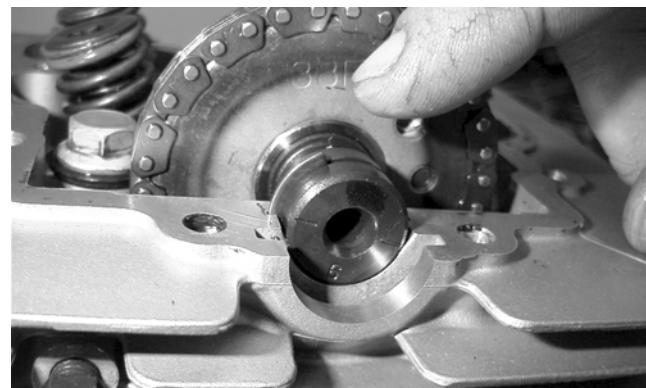
**■ NOTE: When the camshaft assembly is seated, make sure the alignment pin in the camshaft aligns with the smallest hole in the sprocket.**

13. 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.



732-307B

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



MD1131

3

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

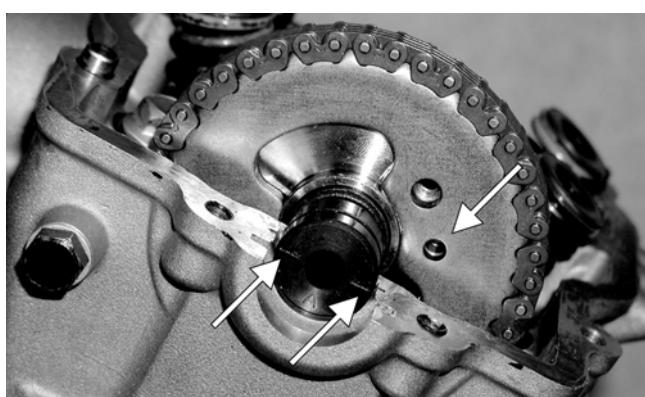
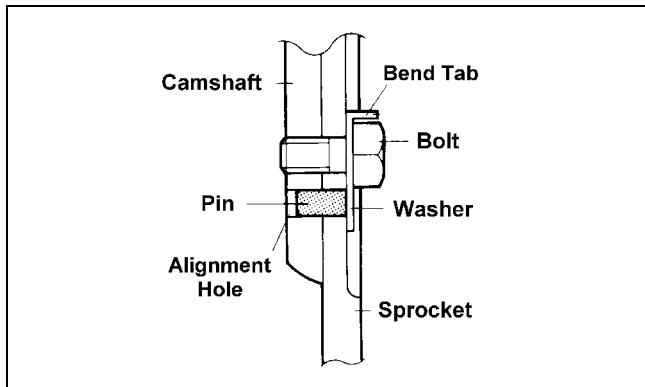
**■ NOTE: Note the position of the alignment marks on the end of the camshaft. They must be parallel with the valve cover mating surface. If rotating the camshaft is necessary for alignment, do not allow the chain and sprocket to rotate and be sure the cam lobes end up in the down position.**

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

### **CAUTION**

If any of the above factors are not as stated, go back to step 10 and carefully proceed.

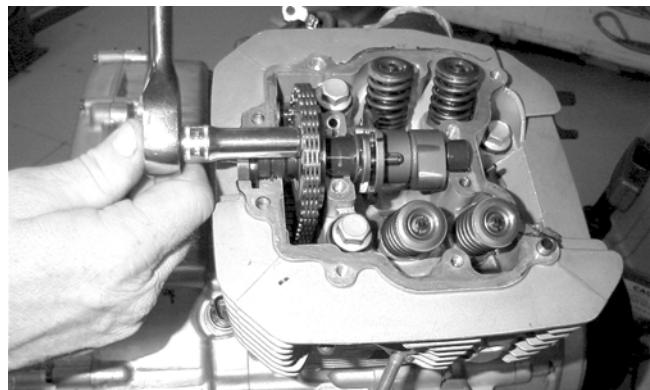
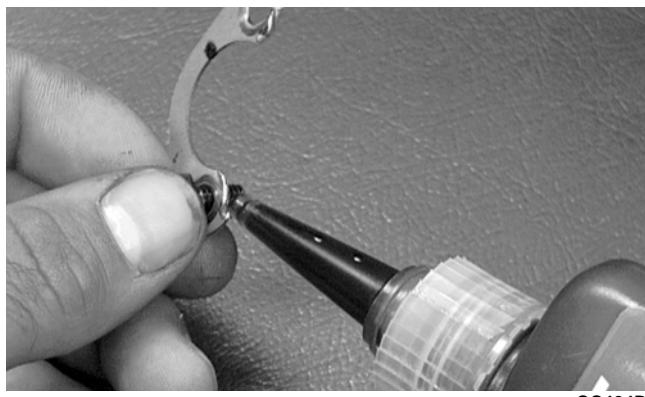
16. Place the tab washer onto the sprocket making sure it covers the pin in the alignment hole.



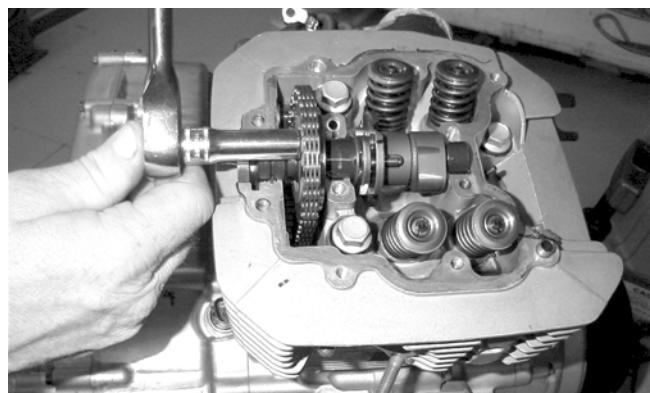
**CAUTION**

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 cam-shaft; then install the cap screw. Tighten cap screw only until snug.



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 specifications; then bend the tab to secure the cap screw.



19. Rotate the crankshaft until the first cap screw securing the sprocket to the camshaft (from step 17) can be addressed; then install the cap screw. Tighten to specifications; then bend the tab to secure the cap screw.

20. Install the cylinder head plug in the cylinder head with the open end facing the cylinder head.

21. Remove the cap screw from the end of the chain tensioner; then account for the plunger, spring, and O-ring.



22. Depress the spring-loaded lock and push the plunger into the tensioner.



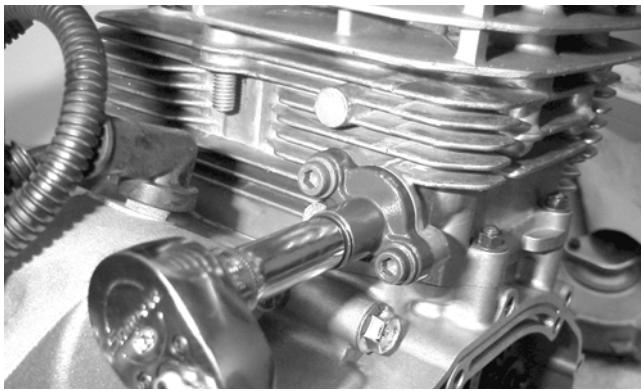
MD1146

23. Place the chain tensioner adjuster assembly and gasket into position on the cylinder making sure the ratchet side is facing toward the top of the cylinder and secure with the two Allen-head screws.



MD1254

24. Install the cap screw and spring into the end of the chain tensioner. Tighten securely.



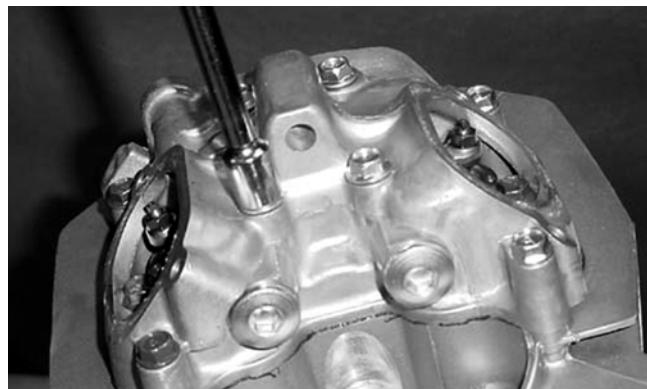
MD1245

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

26. Apply a thin coat of Three Bond Sealant to the mating surface of the valve cover. Place the valve cover into position making sure the two alignment pins are properly positioned.

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

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



CC999

3

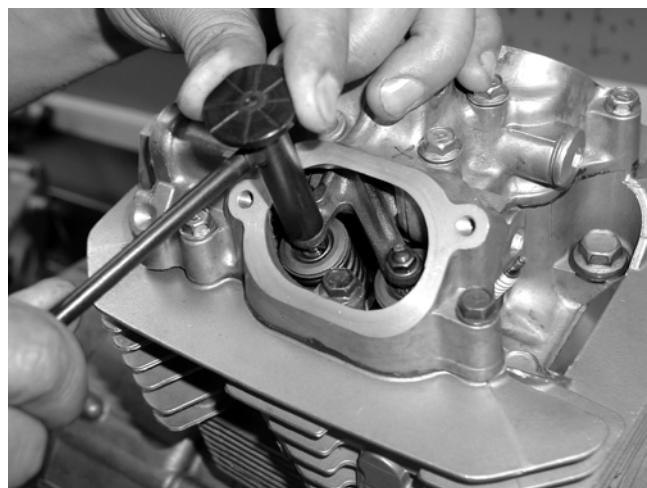
28. In a crisscross pattern starting from the center and working outward, tighten the cap screws (from step 27) to specifications.

29. Adjust valve/tappet clearance using the following procedure.

■ **NOTE:** Use Valve Clearance Adjuster (p/n 0444-078) for this procedure.

A. Turn the engine over until the piston reaches top dead center on the compression stroke.

B. Place the valve 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.



CD001

C. 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.

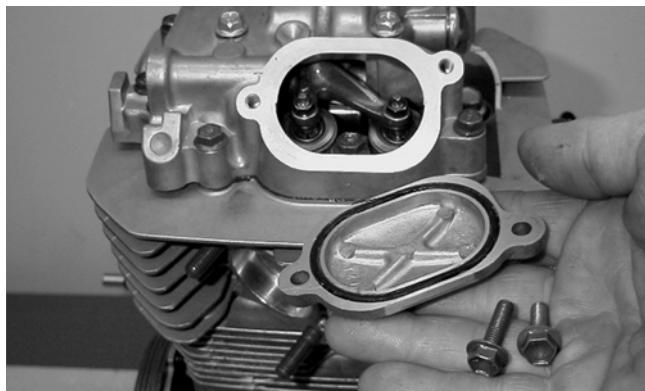
D. Align the valve adjuster handle with one of the marks on the valve adjuster dial.

E. While holding the valve adjuster handle in place, rotate the valve adjuster dial counterclockwise until specified valve/tappet clearance is attained.

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

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

30. Place the two tappet covers into position; then install and tighten the cap screws securely.



31. If removed, install the spark plug and tighten to specifications.



CD818

3. Raise the rear of the engine and place a block under it; then install the propeller shaft and output flange into the rear drive coupler.



CD821

4. Remove the block from beneath the engine; then align the rear drive flanges and secure with four cap screws. Tighten to specifications.



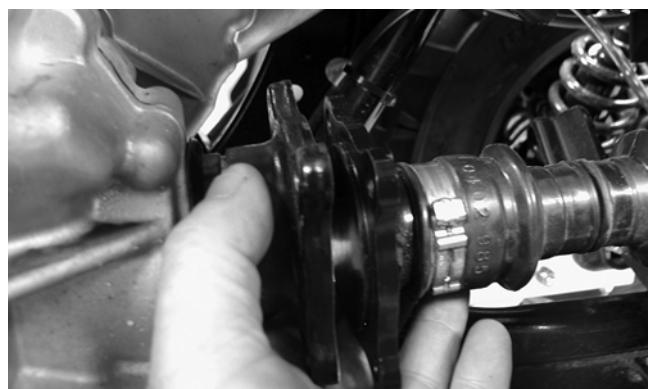
CD824

5. Install the lower rear engine mounting through-bolt, spacer, and washer; then install the lower front engine mounting through-bolt, spacer, and washer. Secure with the flange nuts. Tighten to specifications.

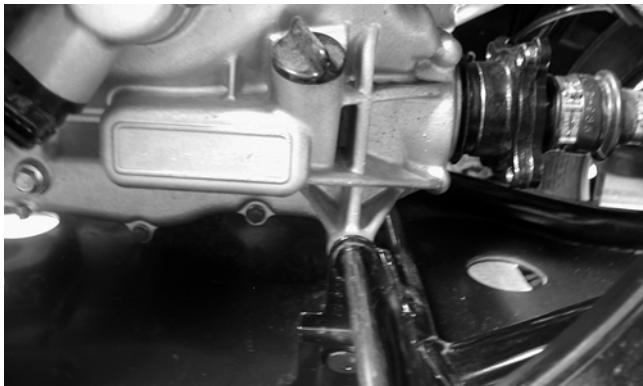
## Installing Engine/Transmission

**■ NOTE: Arctic Cat recommends that new gaskets and O-rings be installed whenever servicing the ATV.**

1. From the left side, place the engine/transmission into the frame; then move it rearward as far as possible.
2. Raise the rear of the engine enough to engage the front driveshaft into the splines of the front drive output yoke; then slide the engine forward as far as possible.



CD824



CD809



CC939

6. Connect the crankcase breather vent hose and secure with the clamp.



CC122D

7. Connect the oil cooler hoses to the engine and secure with the clamps.



CC937

8. Connect the following electrical components: two wire leads for the oil temperature and oil pressure sensors, indicator lights, CDI, and voltage regulator.



CC938

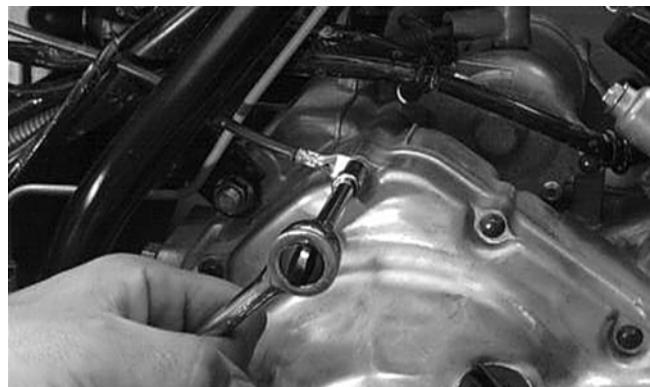
3

9. Connect the positive cable to the starter motor and install the protective boot.



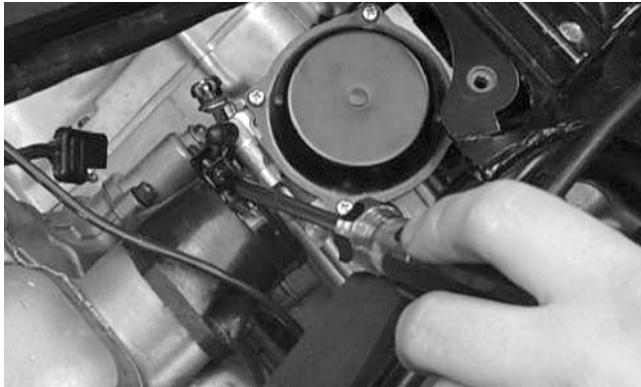
AR604D

10. Connect the battery ground (negative) cable to the crankcase cover.



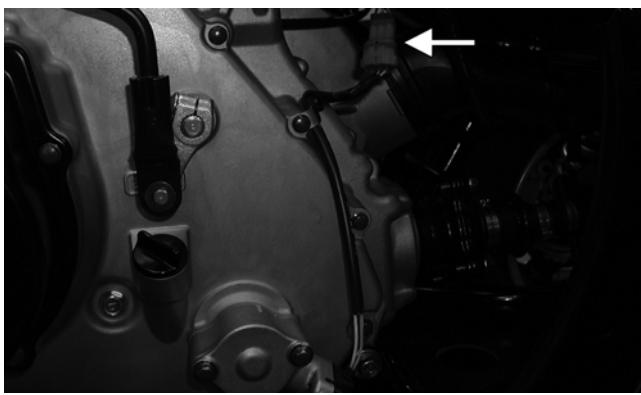
AR600D

11. Install the coil and connect the two wires; then install the high tension lead on the spark plug.
12. Install the carburetor assembly and secure the intake manifold and air inlet boot.



CC120D

13. Route the two vent hoses through the slots in the frame.
14. Connect the speed sensor lead to the wiring harness.



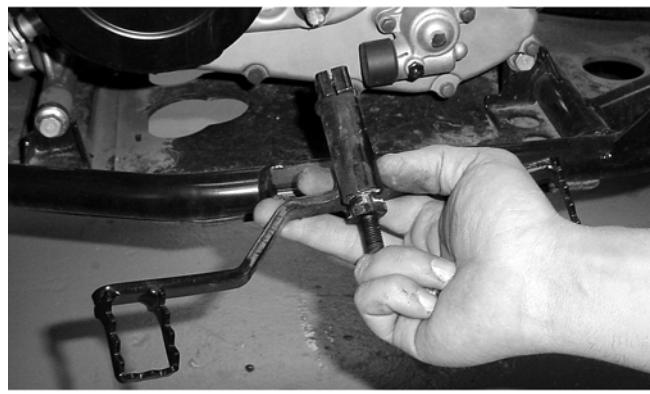
CF172A

15. Place the reverse/high/low shift linkage w/bushing and washer onto the engine shift shaft and secure with the E-clip.



CC935

16. Place the gear shift lever into position on the shaft on the engine; then secure with the pinch screw and lock nut.



CC934

17. Install the air filter housing; then connect the crankcase breather and the inlet air duct. Secure with the clamps.

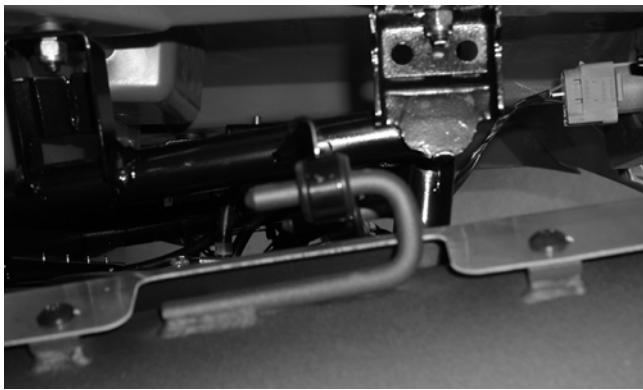


CD785

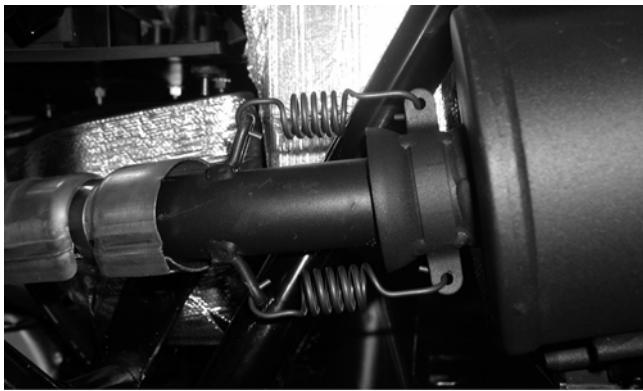


CD787

18. Install the exhaust pipe and secure with two cap screws; then install the muffler onto the frame brackets and secure with exhaust springs.

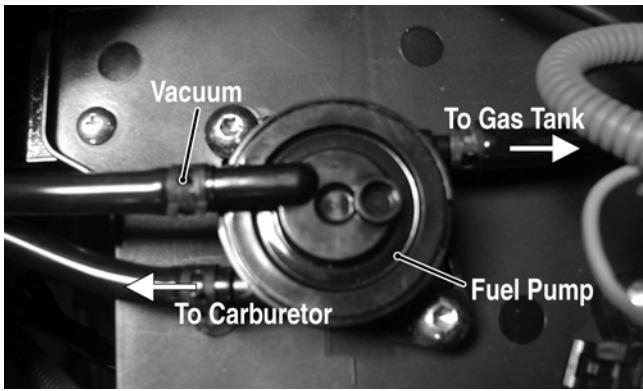


CF137



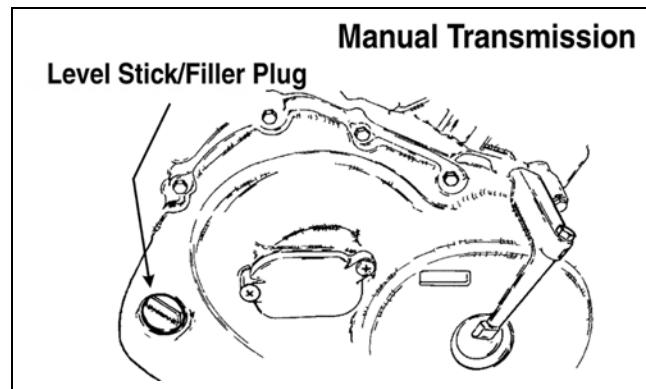
CF138

19. Connect the gas hose to the fuel pump; then connect the vacuum hose. Secure with hose clamps.



CD766A

20. Install the front and rear fender panels and the front and rear racks (see Section 8).
21. Install the storage compartment and steering post access panel; then secure with reinstallable rivets.
22. Install the battery in the tray, install the vent hose. Connect the positive battery cable; then connect the negative cable. Install the battery cover/tool tray.
23. Install the seat.
24. Pour the correct amount of recommended oil into the engine/transmission filler hole; install the filler plug.

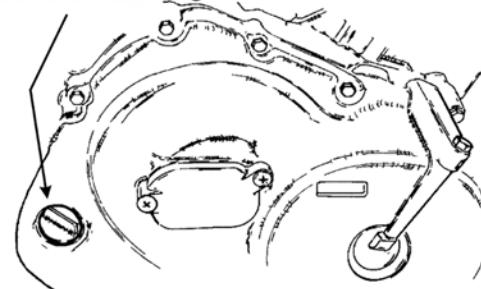


ATV-0075

3

### Manual Transmission

#### Level Stick/Filler Plug



### CAUTION

If the engine had a major overhaul or if any major part was replaced, proper engine break-in procedures must be followed (see Section 1). If the proper engine break-in procedures are not followed, severe engine damage may result.

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## 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 left-side cover oil seals (3), front output joint oil seal (1), rear output joint oil seal (1), and/or the oil strainer (from beneath the engine/ transmission), the engine/transmission does not have to be removed from the frame.

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

### ⚠ WARNING

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

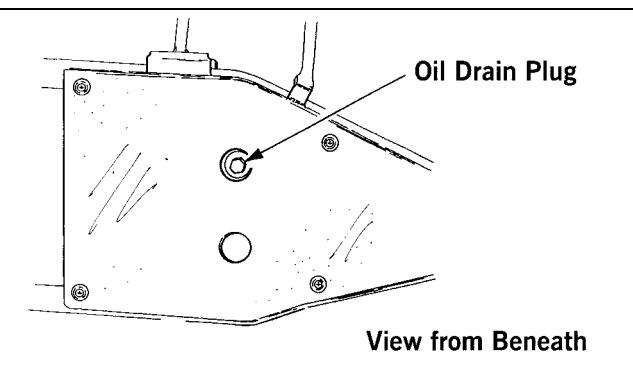
1. Remove the seat; then remove the battery cover/tool tray.

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

### ⚠ CAUTION

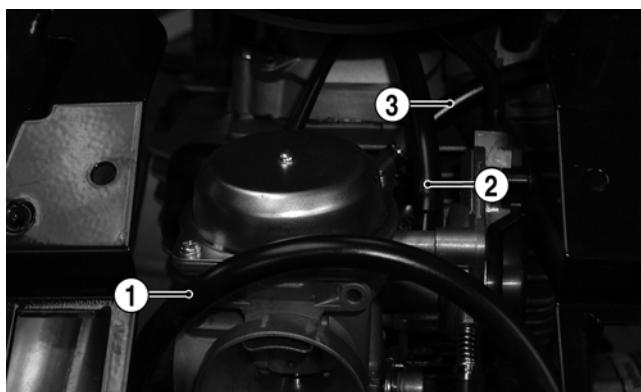
**Battery acid is harmful if it contacts eyes, skin, or clothing. Care must be taken whenever handling a battery.**

3. Remove the front and rear racks (see Section 8).
4. Remove the storage compartment and the steering post access panel (see Section 8).
5. Drain the oil from beneath the engine/transmission.



733-441A

6. Remove the front and rear fender panels (see Section 8).
7. Disconnect the fuel hose (1), carburetor vent hose (2), and the fuel pump vacuum hose (3) from the carburetor.



8. Disconnect the crankcase vent hose from the air cleaner housing. Remove the clamp securing the air intake hose to the carburetor; then remove the air cleaner housing.

■ **NOTE: The air cleaner intake duct must be removed prior to removing the air cleaner housing.**



CF181

9. Remove the clamps securing the cooling ducts to the V-belt housing.
10. Remove the cooling ducts from the V-belt cover.



CD793

11. Remove the cap screws securing the left-side foot peg to the footrest.



CD781

12. Loosen the clamp securing the carburetor to the intake; then route the carburetor assembly up and away from the engine.
13. Remove the E-clip securing the shift rod to the engine shift arm; then allow the shift rod to hang by the pivot axle bolt.



AF962

14. Remove the cap screws securing the two oil fittings to the crankcase; then route the hoses away from the engine. Account for two O-rings.



CF174

3

■ **NOTE: There will be a substantial amount of oil draining from the oil hoses when removing. Place a drain pan beneath the hoses prior to removing the cap screws.**

15. Remove the two cap screws securing the exhaust pipe to the engine; then remove the exhaust springs from the muffler at the juncture in front of the muffler.



CF138

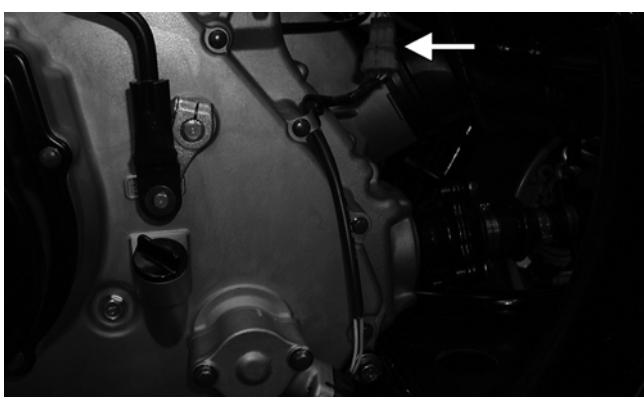
16. Remove the four cap screws securing the rear output shaft to the transmission; then push the shaft to the rear as far as possible.



CD085

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

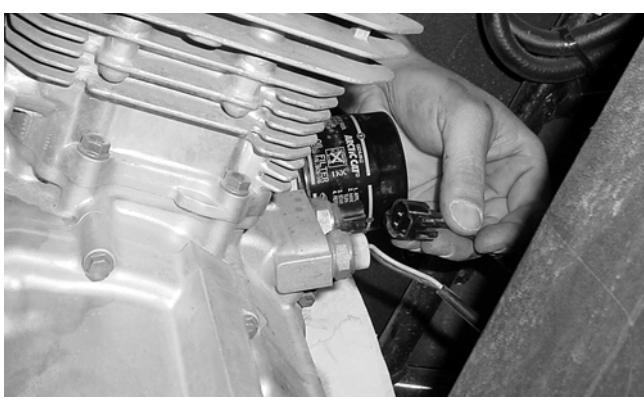
17. Remove the positive cable from the starter motor and route it out of the way.
18. Disconnect the speed sensor lead from the wiring harness.



CF172A

19. Disconnect the stator-to-rectifier/regulator connector.
20. Remove the temperature sensor wires from the engine.

■ **NOTE:** There are two temperature sensors.



CC939

21. Remove the spark plug wire from the spark plug.
22. Remove the shift indicator connector from the main wiring harness.
23. Remove the cap screw securing the engine ground wire to the engine.
24. Remove the two engine mounting through-bolts. Account for a spacer on the lower front bolt.



CF193



CF194

25. Slightly raise the front of the engine to disengage the front driveshaft from the front output yoke.



CD096

26. Remove the engine from the left side by moving the engine forward while raising the engine in the rear and rotating the engine clockwise. The engine will come out the left side of the frame.

## 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.

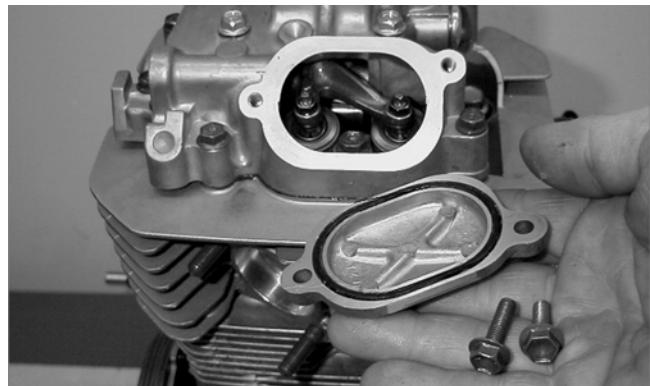
## Removing Top-Side Components

### A. Valve Cover B. Cylinder Head

■ NOTE: Remove the spark plug and timing inspection plug; then using the recoil starter, 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.



MD1264

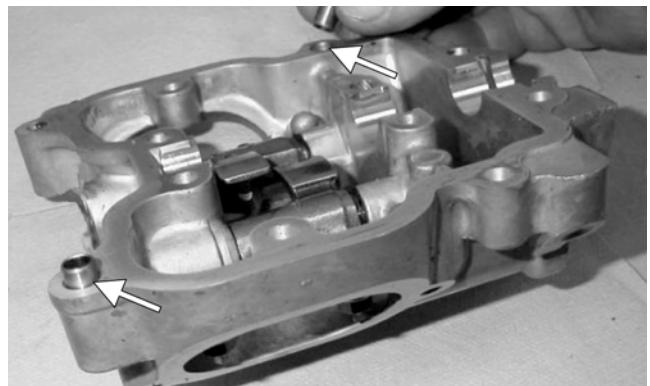
■ NOTE: Keep the mounting hardware with the covers for assembly purposes.

2. Remove the 12 valve cover cap screws. Note the rubber washers on the four top-side cap screws; remove the valve cover. Note the orientation of the cylinder head plug and remove it. Note the location of the two alignment pins.

3



MD1261



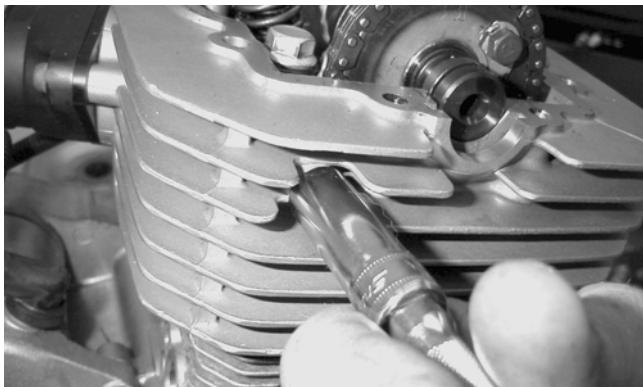
MD1354A

3. Loosen the cap screw on the end of the cam chain tensioner; then remove the two Allen-head screws securing the cam chain tensioner assembly. Remove the tensioner assembly and gasket.



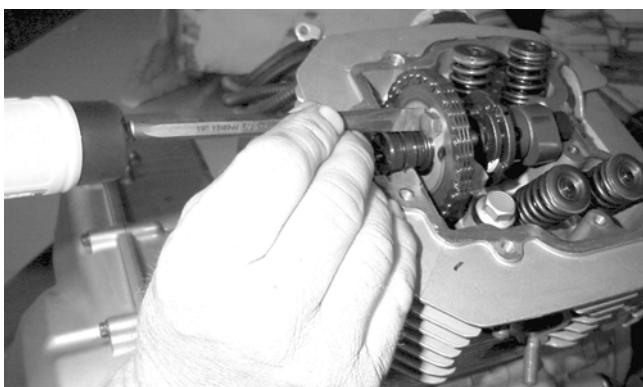
MD1245

4. Remove the cam chain tensioner pivot cap screw and washer.

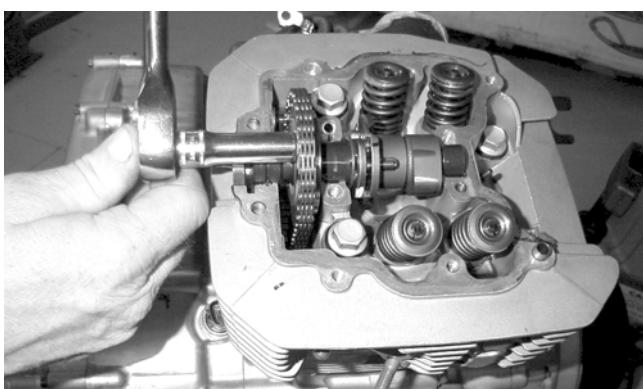


MD1251

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



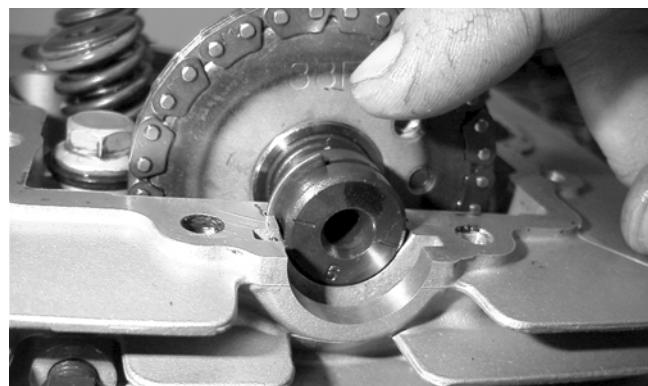
MD1136



MD1137

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.



MD1131

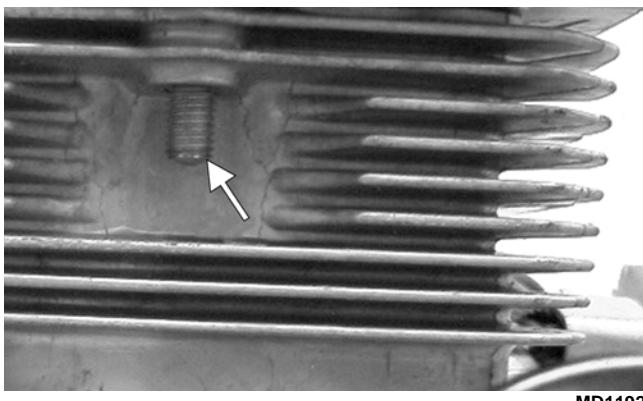
7. Noting the timing marks for installing purposes, drop the sprocket off the camshaft. While holding the cam chain, slide the sprocket and cam-shaft out of the cylinder head. Account for an alignment pin.

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



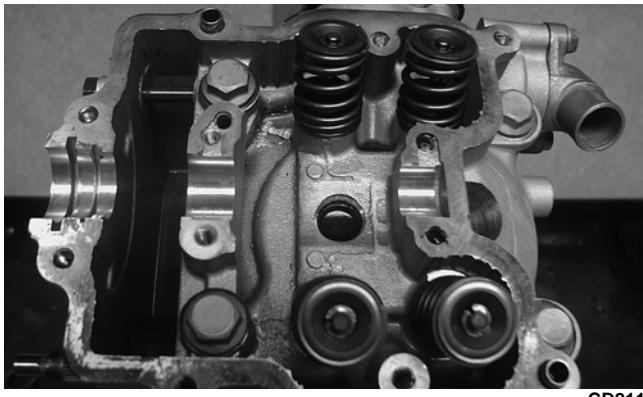
MD1132

8. Remove the cam chain tensioner by lifting it from the chain cavity; then remove the two lower nuts securing the cylinder head to the cylinder, one in front and one in rear.



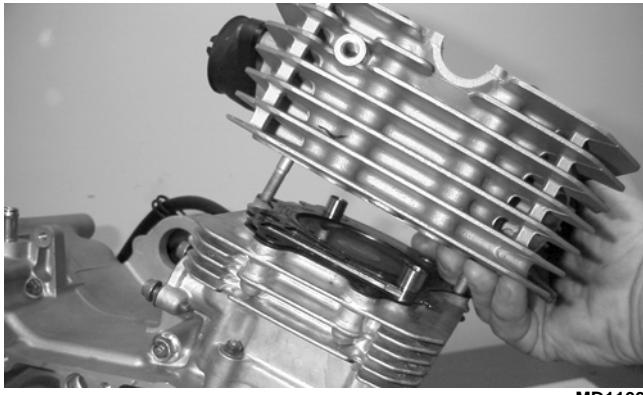
MD1192

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



CD211

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



MD1163

11. Remove the cam chain guide.

 **AT THIS POINT**

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



MD1173

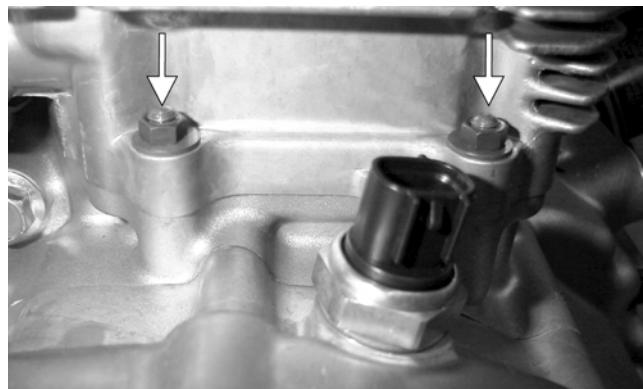
3

**C. Cylinder**

**D. Piston**

■ NOTE: Steps 1-11 in the preceding sub-section must precede this procedure.

12. Remove the two nuts securing the right side of the cylinder to the right-side crankcase half. Account for the washers.

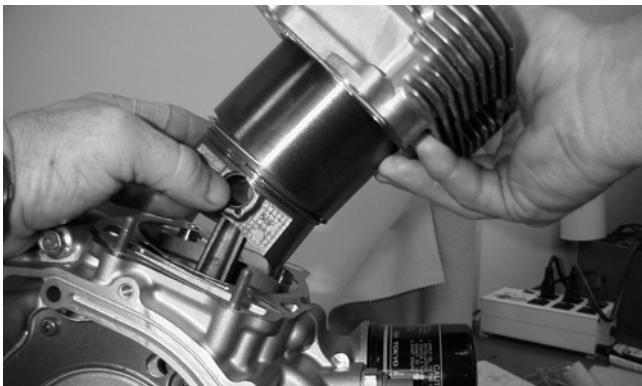


MD1226A

13. 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.

 **AT THIS POINT**

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



MD1214

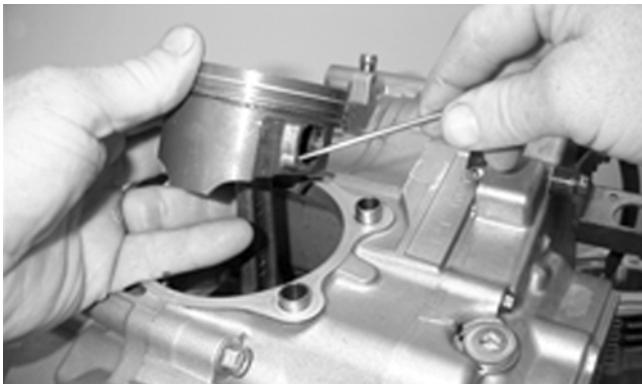
### **AT THIS POINT**

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.

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



MD1213

15. Using Piston Pin Puller (p/n 0644-328), 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 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.

■ NOTE: If the existing rings will not be replaced with new rings, note the location of each ring for proper installation. When replacing with new rings, replace as a complete set only. If the piston rings must be removed, remove them in this sequence.



MD1211

- A. Starting with the top ring, slide one end of the ring out of the ring-groove.
- B. Remove each ring by working it toward the dome of the piston while rotating it out of the groove.

### **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.



MD1219

## 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. Recoil Starter

### B. Starter Cup

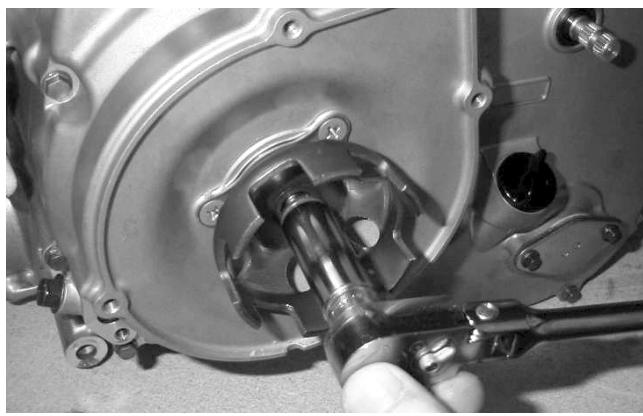
### C. Cover/Stator Assembly

1. Remove the four recoil starter cover cap screws. Remove the recoil starter assembly noting the location of the single washer. Note the condition of the recoil cover gasket. Replace if damaged.

### AT THIS POINT

To service the recoil starter, see Servicing Left-Side Components sub-section.

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

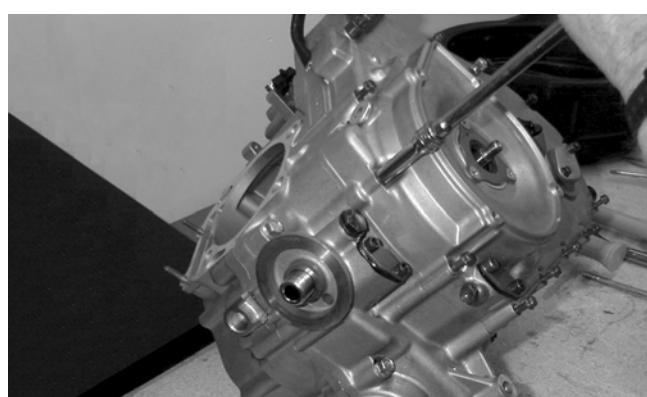


MD1303



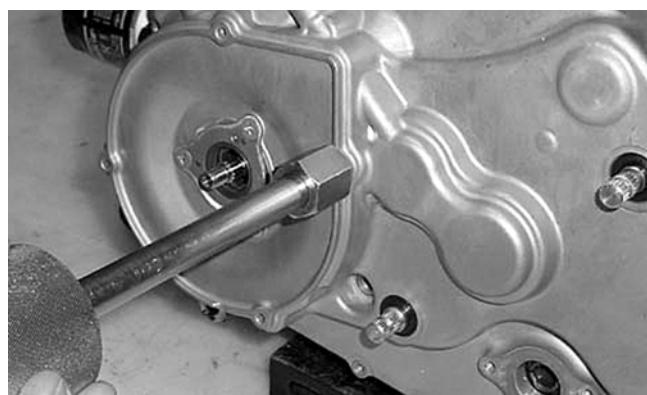
MD1304

3. Lay the engine/transmission on its right side. Remove the 15 left-side cover-to-crankcase mounting cap screws noting the location of the 8 mm cap screw with the washer near the middle of the left-side cover. Keep the different-lengthed 6 mm cap screws in order for installing purposes.

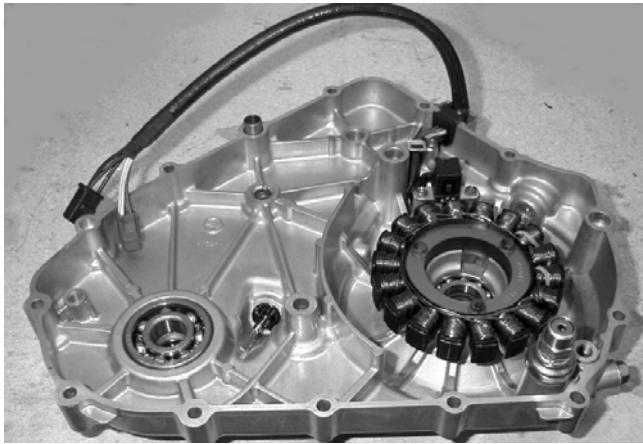


MD1186

4. Using Side Case Puller (p/n 0644-262) and the 6 mm adapter, remove the left-side cover w/stator assembly. Note the condition of the gasket. Replace if necessary. Account for the two alignment pins and the position of the shifter bracket for installing purposes.



CC946



MD1188

■ NOTE: Inspect the inside of the left-side cover for any shaft washers that may have come off with the cover. Make sure they are returned to their respective shafts and that the starter idler gear spacer is on the shaft or in the cover.

#### D. Rotor/Flywheel

#### E. Starter Motor

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

5. Remove the rotor/flywheel nut.



MD1194

6. Install the crankshaft protector.



MD1365

#### CAUTION

Care must be taken that the remover is fully threaded onto the rotor/flywheel or damage may occur.

7. Using Magneto Rotor Remover (p/n 0444-075), break the rotor/flywheel assembly loose from the crankshaft. Remove the remover, the crankshaft protector, the rotor/flywheel, and the starter clutch gear. Account for the key.



MD1368

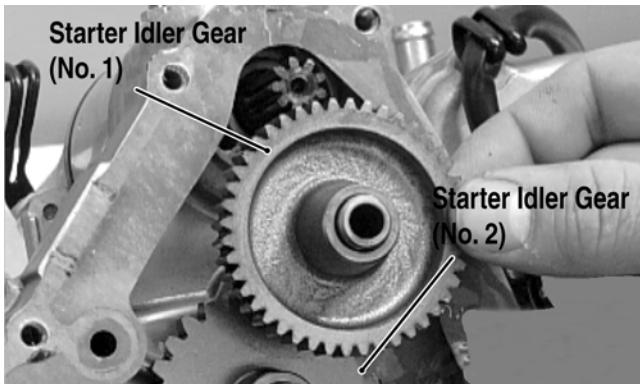


MD1369



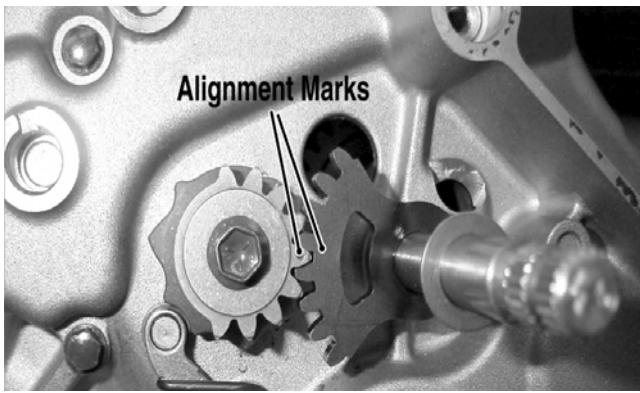
MD1370

8. Remove the starter idler gear (No. 1) and starter idler gear (No. 2).



MD1305

9. Remove the gear shift shaft assembly and washer from the left-side crankcase. Note the positions of the alignment marks and washer for installing purposes; then release the cam stopper spring tension.



MD1239

10. Remove the shift detent cam. Note position of spacer for installing purposes.

11. Remove the cam stopper assembly.

12. Remove the spacer from the driveshaft noting the direction of the stepped side for installing purposes.



MD1224

13. Remove two starter motor cap screws.



MD1078

14. Remove starter motor by tapping lightly with a mallet.

15. Using an impact screwdriver, remove the three Phillips-head screws holding the crankshaft bearing retainer. Remove the crankshaft bearing retainer.



MD1122

3

## 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.

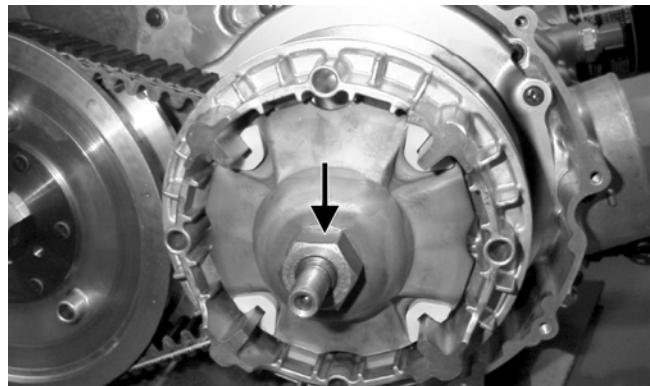
## Removing Right-Side Components

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

1. If the engine is still in the frame, turn the gas tank valve to the OFF position. Remove the cap screws securing the right-side V-belt cover to the clutch cover. Remove the cover. Note the locations of the long cap screws and the two wire forms. Account for the gasket and for two alignment pins.

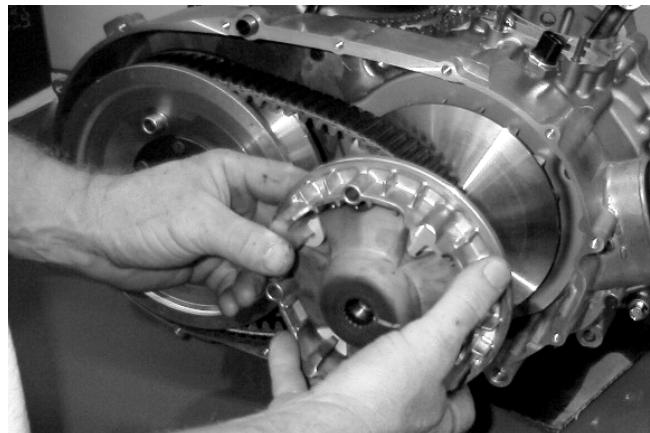


MD1306

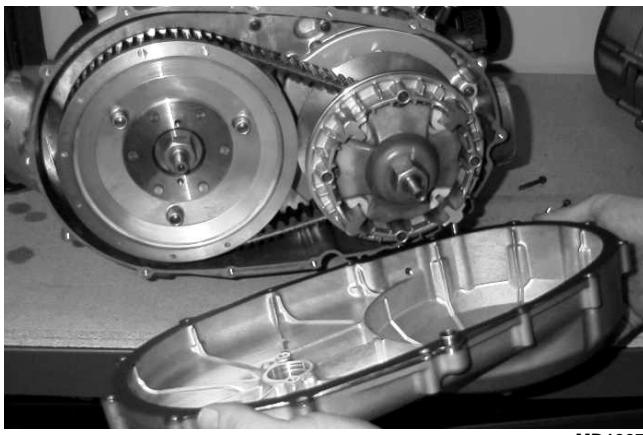


MD1033

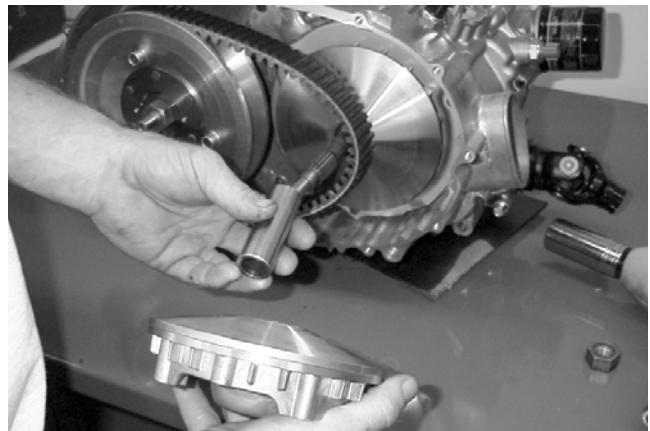
3. Remove the movable drive face and spacer. Account for the eight movable drive face rollers and outer drive face cover.



MD1035

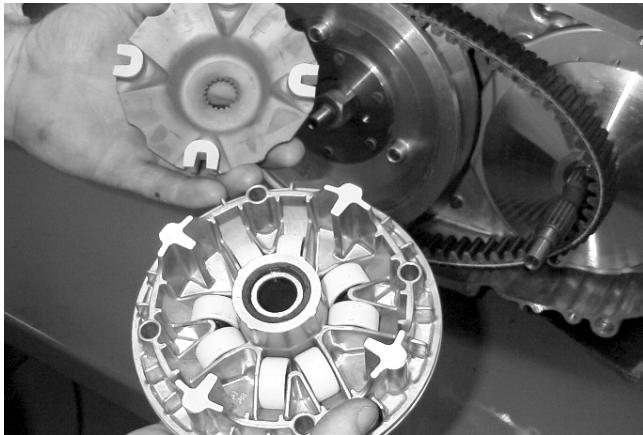


MD1307



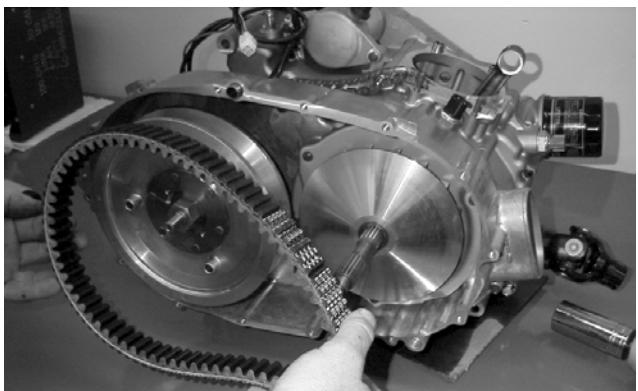
MD1034

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 crank-shaft.



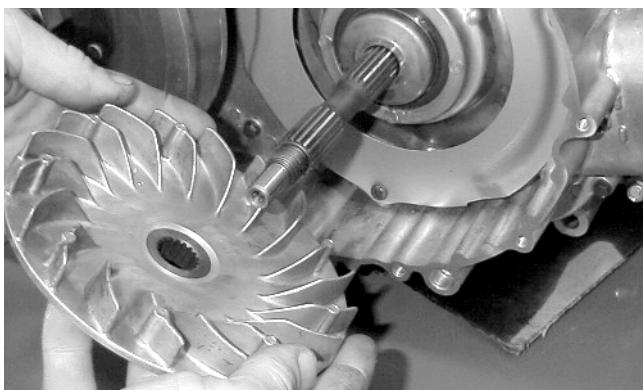
MD1036

4. Remove the V-belt.



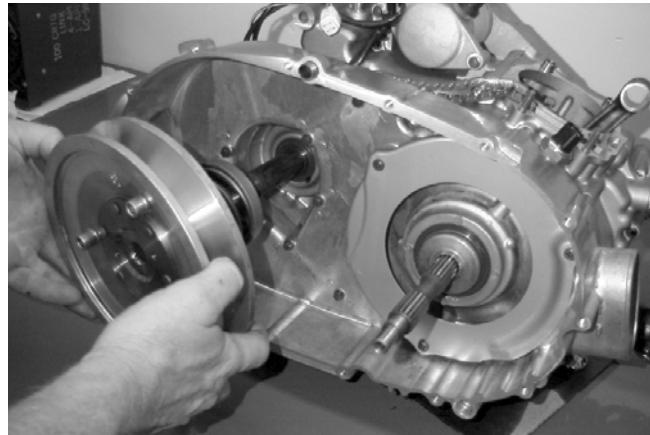
MD1118

5. Remove the fixed drive face.



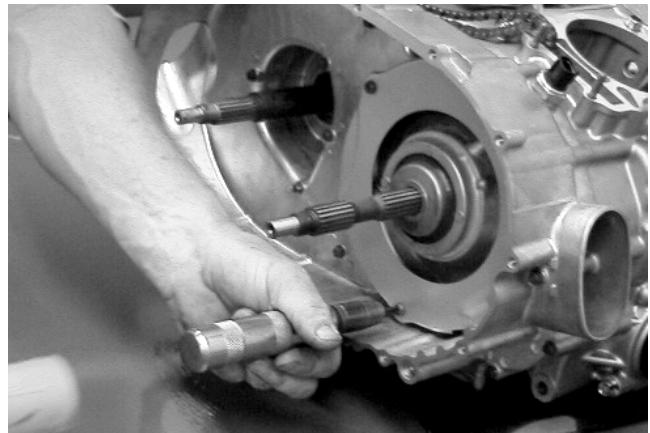
MD1094

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



MD1068

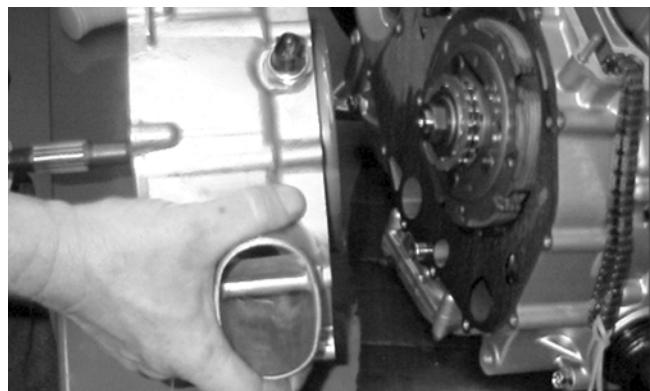
7. Using an impact screwdriver, remove the three Phillips-head cap screws holding the air intake plate. Remove the air intake plate.



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.

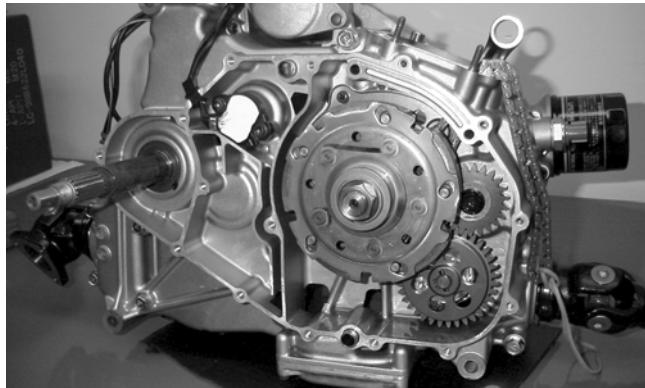


MD1115

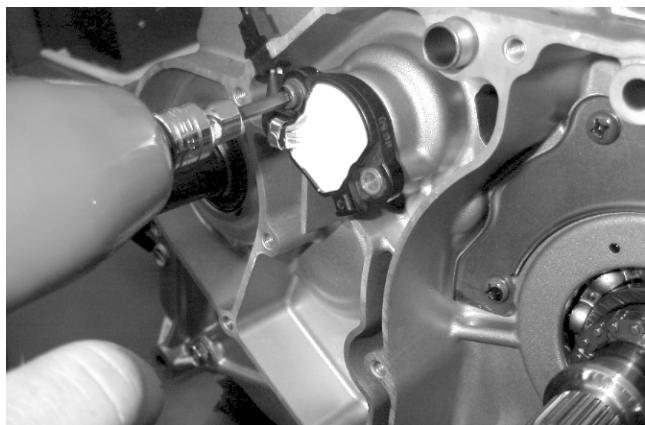
3

**D. Gear Position Switch**  
**E. Centrifugal Clutch Assembly**  
**F. Oil Pump Drive Gear**  
**G. Oil Pump Driven Gear**

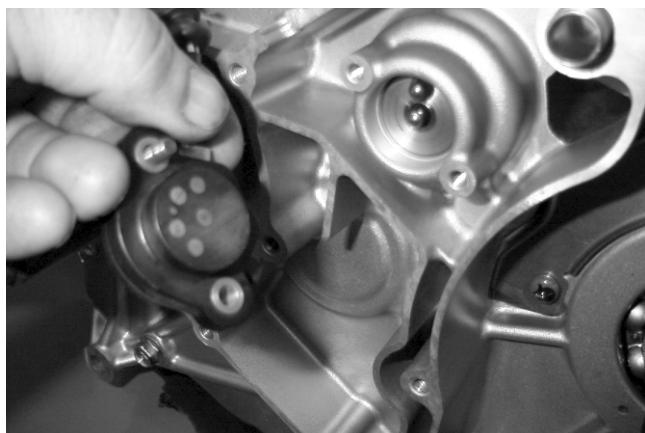
■ NOTE: Steps 1-9 in the preceding sub-section must precede this procedure.



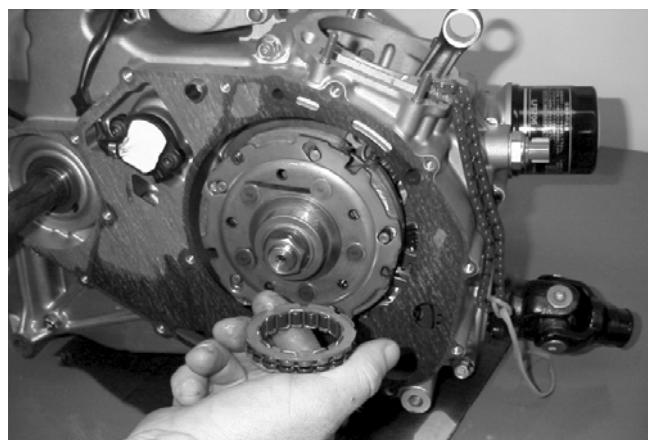
10. Remove the cap screws holding the gear position indicator switch onto the right-side crank-case half.



11. Remove the gear position indicator switch. Account for two contact pins and two springs.



12. Remove the one-way sprag clutch noting the direction of the green dot or the stamp tag OUT-SIDE for installing purposes.



13. 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.





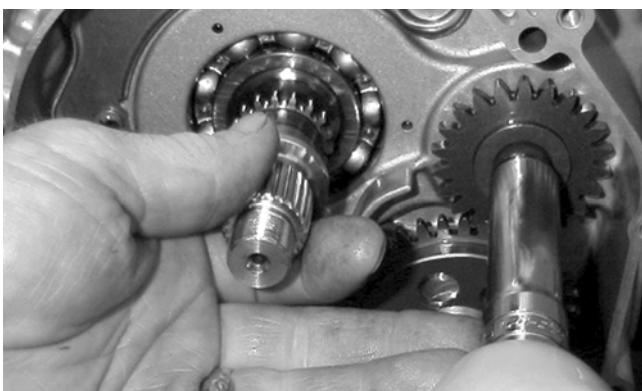
MD1016

14. Remove the cam chain.



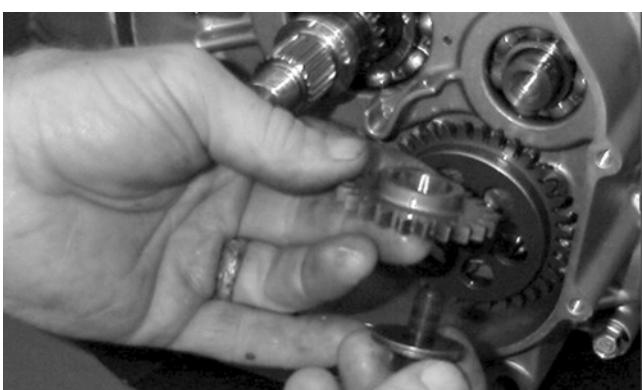
MD1335

15. Remove the oil pump drive gear cap screw.



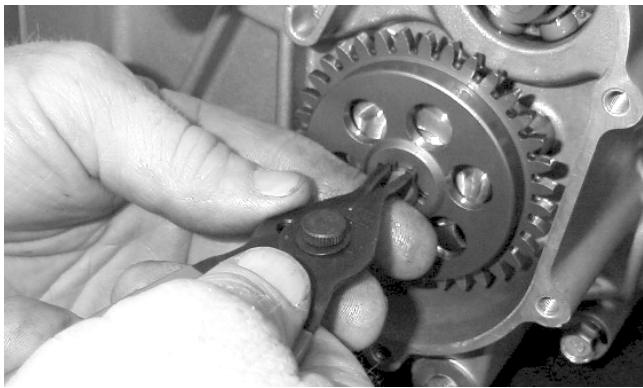
MD1018

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



MD1017

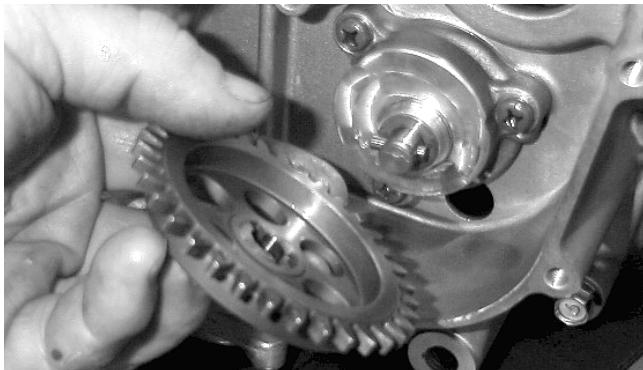
17. Remove the snap ring holding the oil pump driven gear.



MD1019

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

18. Remove oil pump driven gear. Account for the pin.



MD1020

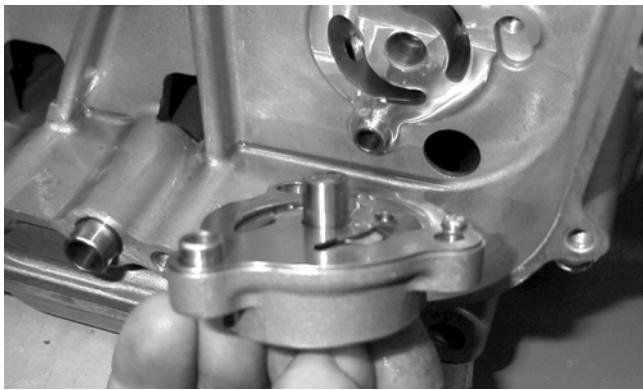
#### **AT THIS POINT**

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

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

■ **NOTE:** Steps 1-18 in the preceding sub-sections must precede this procedure.

19. Remove three Phillips-head screws holding the oil pump and remove the oil pump. Account for two alignment pins.



MD1060

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

■ NOTE: Note the directional arrow for installing purposes.



MD1207

#### **AT THIS POINT**

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

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

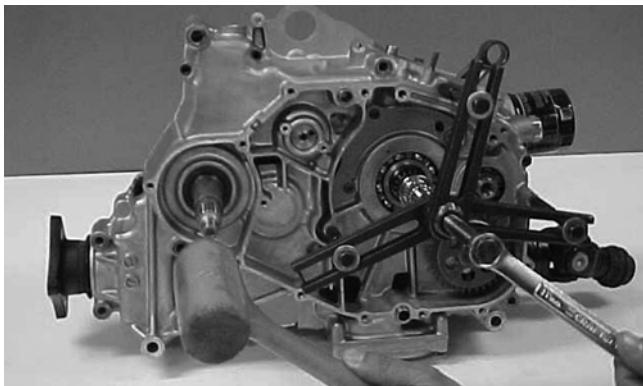


MD1006



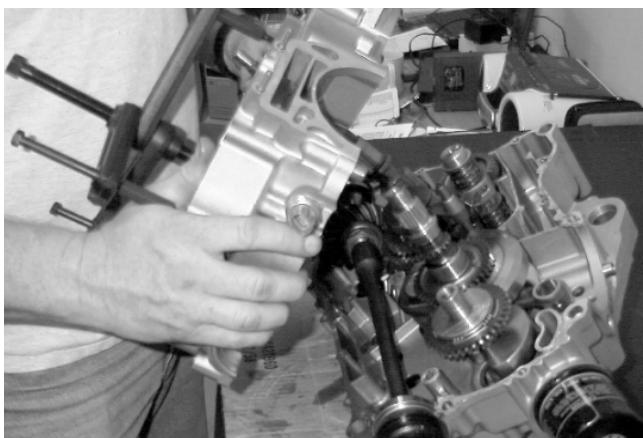
MD1012

2. Using Crankcase Separator/Crankshaft Remover (p/n 0444-009) and tapping lightly with a rubber mallet, separate the crankcase halves. Account for two alignment pins.



CC869

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



MD1313

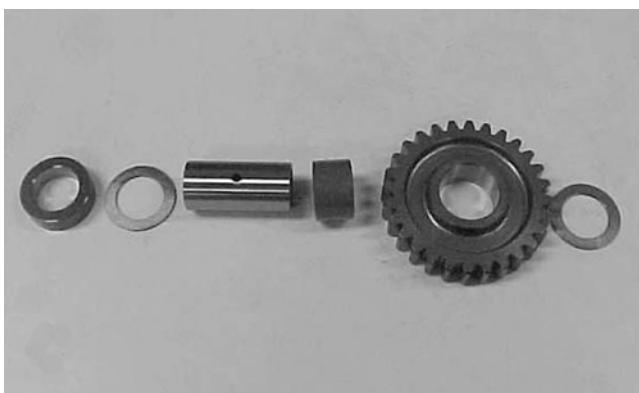
■ **NOTE:** Note the location of the bearing alignment pin on the secondary output shaft.

2. Remove the reverse idler gear, spacer, and sleeve. Account for the washers.



MD1325

3



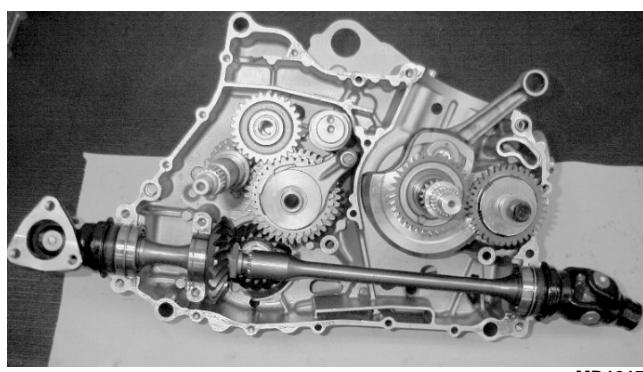
CC870

3. Remove the driveshaft.



MD1326

4. Remove the shift fork shaft and the outer shift fork.



MD1317

## Disassembling Crankcase Half

1. Remove the secondary and primary driveshaft assemblies. Account for the bearing alignment C-ring on the bearing boss next to the pinion gear.



MD1327

5. Remove snap ring and gear from the output side of the gear cluster. Remove the gear cluster and the inner shift fork together. Account for snap ring, gear, and washer.



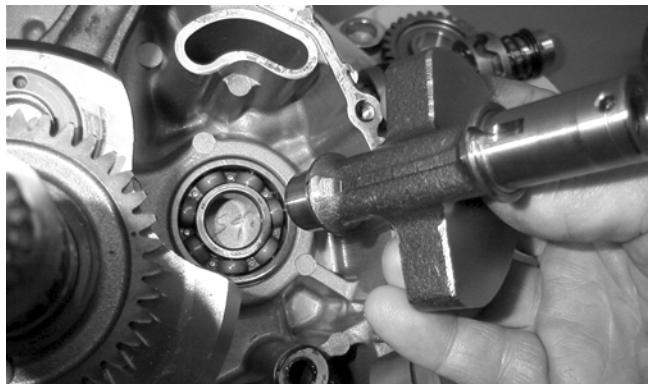
MD1328

6. Noting the position of the two holes on the end, remove the shift cam assembly. Account for inner and outer washers.



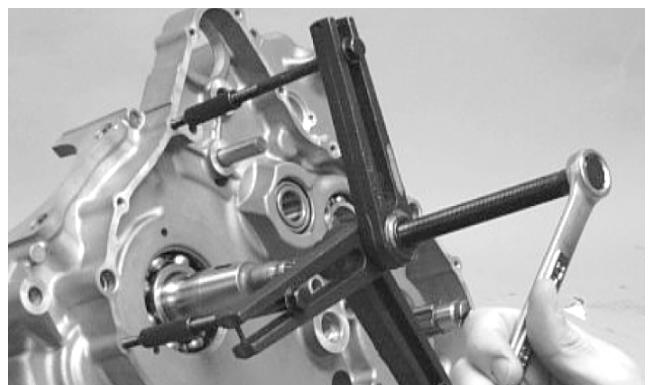
MD1329

7. Remove the counterbalance gear. Account for the key.
8. Remove the counterbalance shaft.



MD1024

9. Using Crankcase Separator/Crankshaft Remover (p/n 0444-009), remove the crankshaft.



MD1330

#### **CAUTION**

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

10. 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.**

## Table of Contents (Servicing Components)

■ NOTE: Critical engine/transmission specifications are located at the beginning of this section.

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## Servicing Top-Side Components

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

### 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

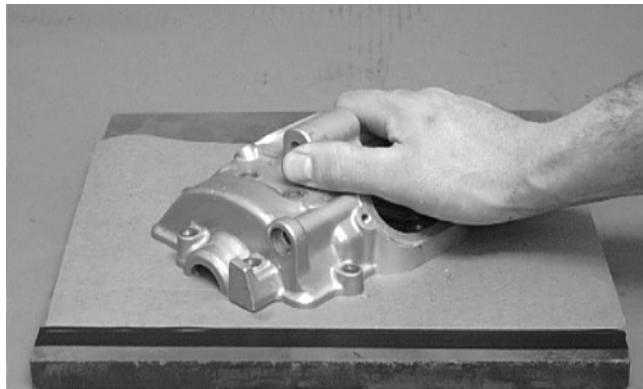
■ NOTE: If the valve cover cannot be trued, the cylinder head assembly must be replaced.

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

2. Place the valve cover on the Surface Plate (p/n 0644-016) covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the valve cover in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the valve cover in a figure eight motion until a uniform bright metallic finish is attained.

### CAUTION

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



CC130D

3

### 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

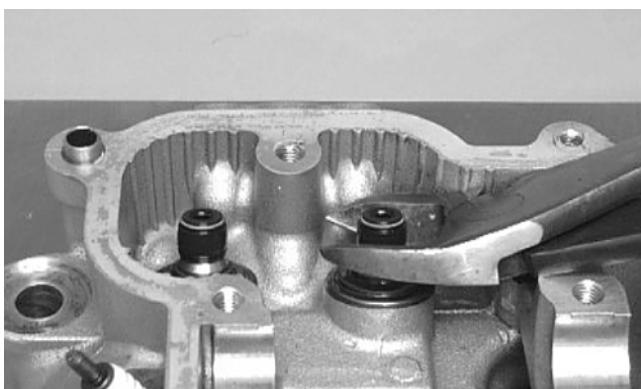
■ NOTE: Keep all valves and valve components as a set. Note the original location of each valve set for use during installation. Return each valve set to its original location during installation.

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

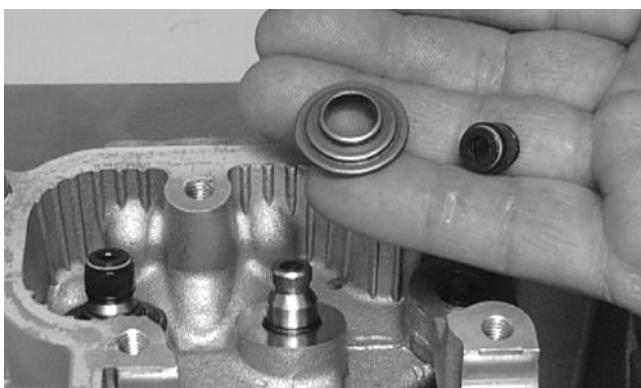


CC994

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



CC134D



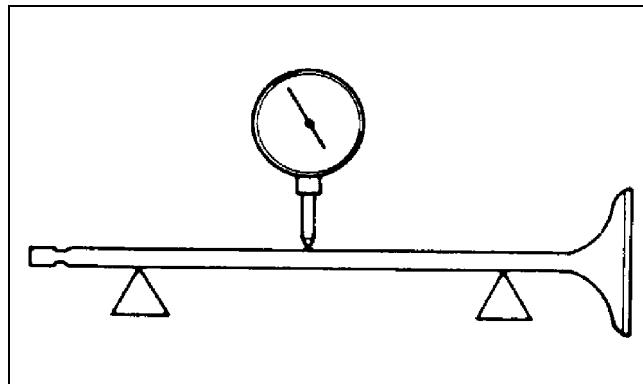
CC136D

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

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

### **Measuring Valve Stem Runout**

1. Support each valve stem end with the V Blocks (p/n 0644-022); then check the valve stem runout using a dial indicator.



ATV-1082

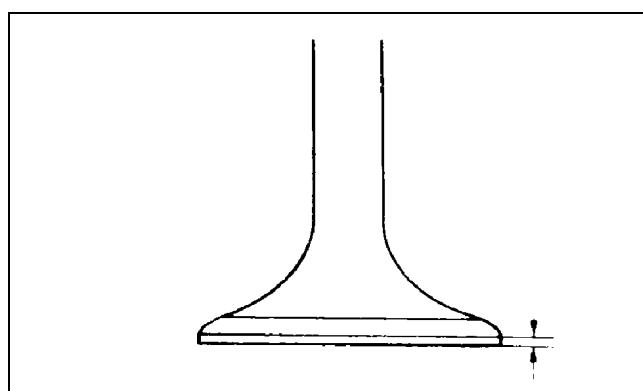
2. Maximum runout must not exceed specifications.

### **Measuring Valve Stem Outside Diameter**

1. Using a micrometer, measure the valve stem outside diameter.
2. Acceptable diameter range (intake valve) must be within specifications.
3. Acceptable diameter range (exhaust valve) must be within specifications.

### **Measuring Valve Face/Seat Width**

1. Using a micrometer, measure the width of the valve face.

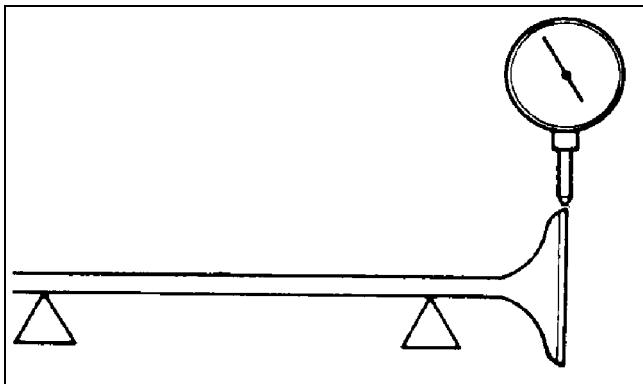


ATV-1004

2. Acceptable width range must be within specifications.

### **Measuring Valve Face Radial Runout**

1. Mount a dial indicator on the surface plate; then place the valve stem on a set of V blocks.
2. Position the dial indicator contact point on the outside edge of the valve face; then zero the indicator.

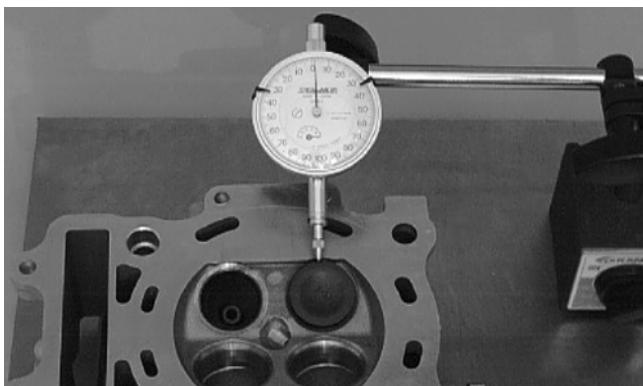


ATV1082A

3. Rotate the valve in the V blocks.
4. Maximum runout must not exceed specifications.

### **Measuring Valve Guide/Valve Stem Deflection (Wobble Method)**

1. Mount a dial indicator and base on the surface plate; then place the cylinder head on the surface plate.
2. Install the valve into the cylinder head; then position the dial indicator contact point against the outside edge of the valve face. Zero the indicator.



CC131D

3. Push the valve from side to side; then from top to bottom.
4. Maximum "wobble" deflection must not exceed specifications.

### **Measuring Valve Guide (Inside Diameter)**

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.

**3**

### **Measuring Rocker Arm (Inside Diameter)**

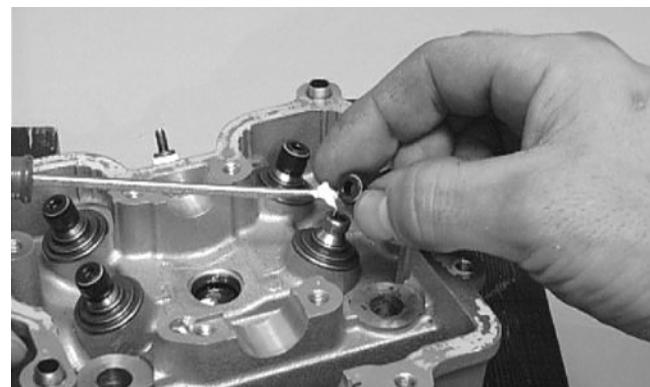
1. Using a dial calipers, measure the inside diameter of the rocker arm.
2. Acceptable inside diameter range must be within specifications.

### **Measuring Rocker Arm Shaft (Outside Diameter)**

1. Using a micrometer, measure the outside diameter of the rocker arm shaft.
2. Acceptable outside diameter range must be within specifications.

### **Installing Valves**

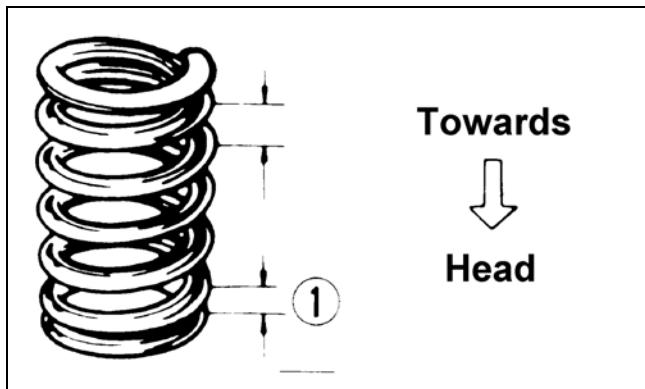
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



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.**



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



## PISTON ASSEMBLY

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

### Cleaning/Inspecting Piston

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the dome of the piston.
2. Inspect the piston for cracks in the piston pin, dome, and skirt areas.
3. 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.**

4. 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.**

### Cleaning/Inspecting Piston Rings

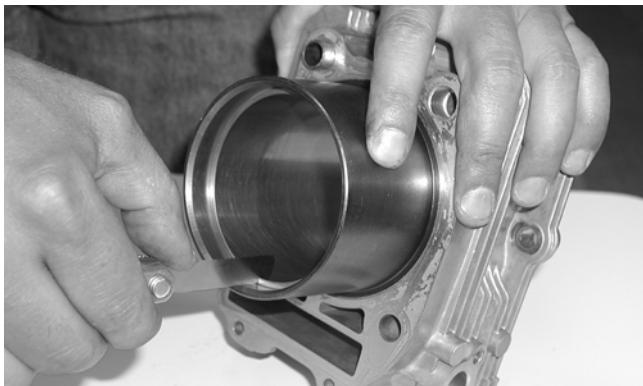
1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

#### **CAUTION**

Improper cleaning of the ring-grooves by the use of the wrong type of ring-groove cleaner will result in severe damage to the piston.

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

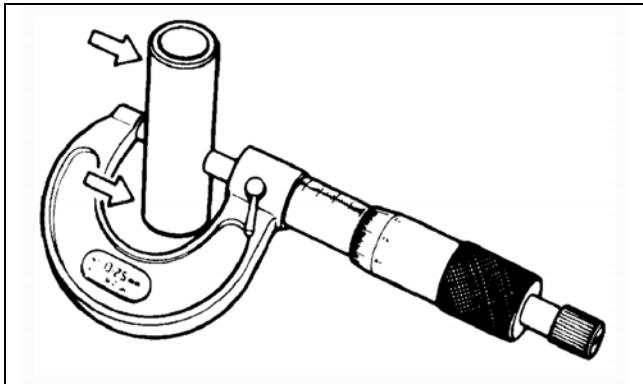
1. Place each piston ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must not exceed specifications.



CC995

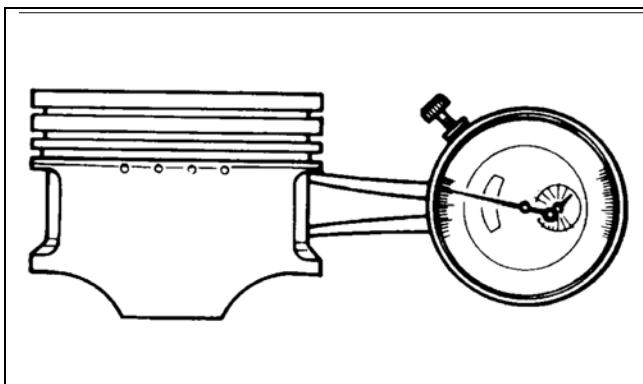
### Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

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



ATV-1070

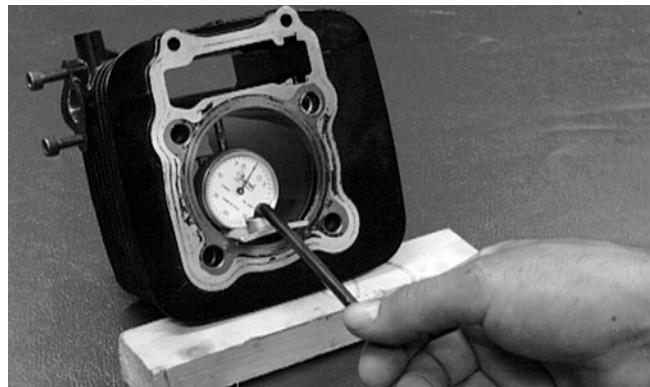
2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



ATV-1069

### Measuring Piston Skirt/Cylinder Clearance

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



CC397D

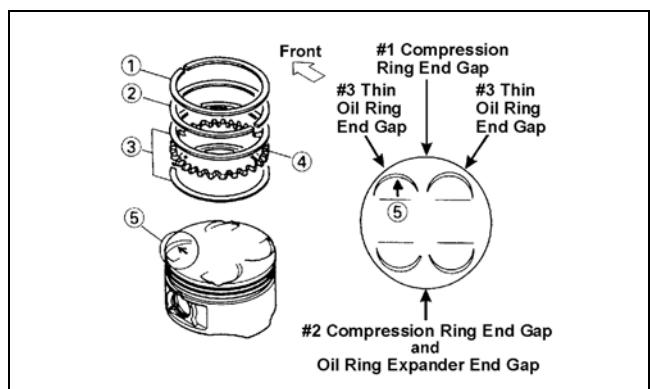
3

2. Measure the corresponding piston diameter at a point 15 mm (0.6 in.) above the piston skirt at a right angle to the piston-pin bore. Subtract this measurement from the 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.

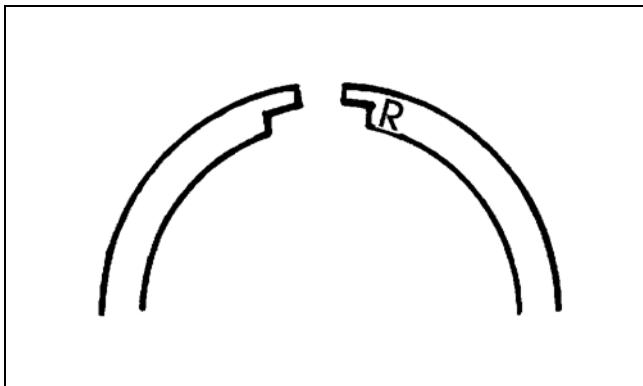
■ **NOTE: Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.**



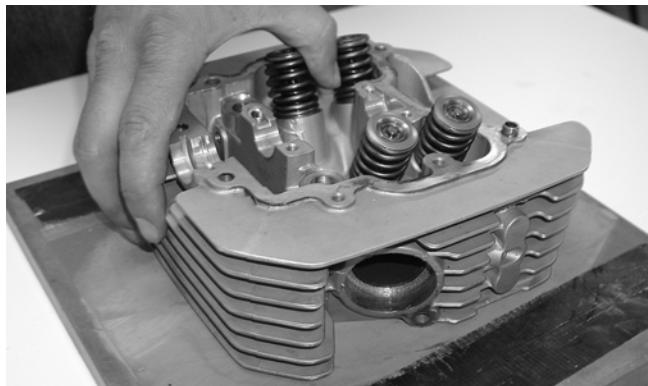
ATV-1085B

2. Install the compression rings (1 and 2) so the letter 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.**



726-306A



CC996

### **⚠ CAUTION**

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

## **CYLINDER/CYLINDER HEAD ASSEMBLY**

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

### **Cleaning/Inspecting Cylinder Head**

### **⚠ CAUTION**

The cylinder head studs must be removed for this procedure.

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

### **⚠ CAUTION**

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

## **Measuring Cylinder Head Distortion**

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



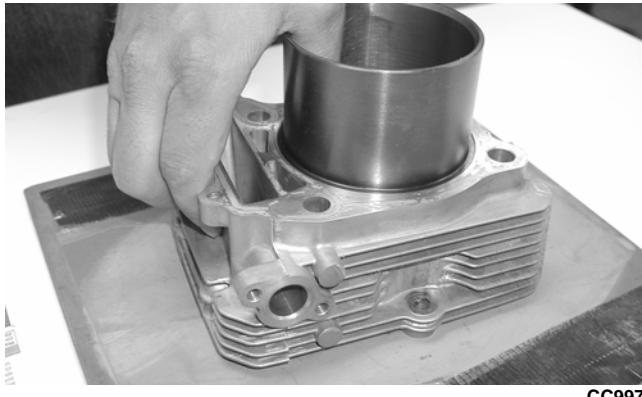
CC141D

### **Cleaning/Inspecting Cylinder**

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

## ⚠ CAUTION

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



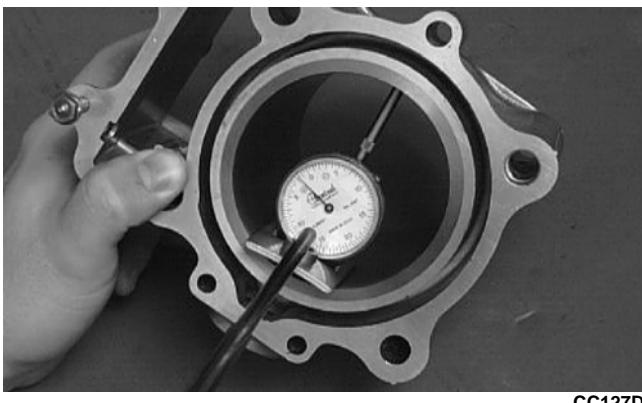
CC997

## 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  $90^\circ$  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 ball hone.

■ NOTE: To produce the proper  $60^\circ$  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.

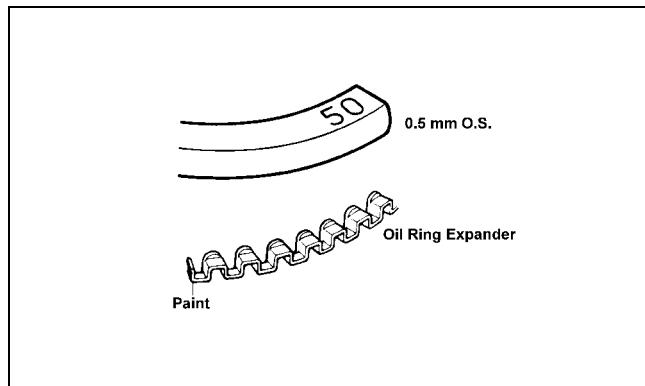


CC390D

3

4. If any measurement exceeds the limit, bore the cylinder and install an oversized piston or replace the cylinder.

■ NOTE: Oversized piston and rings are available. The oversized piston and rings are marked for identification.

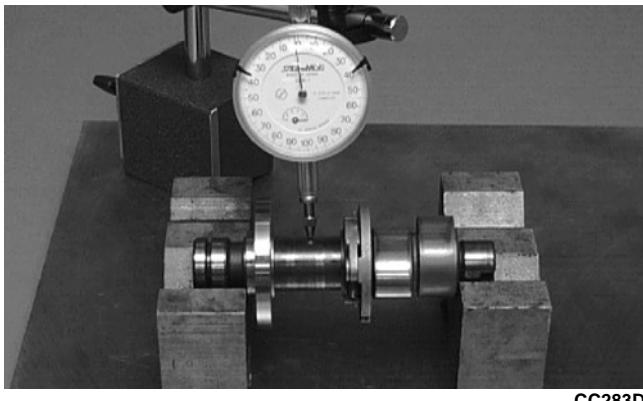


ATV-1068A

## Measuring Camshaft Runout

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

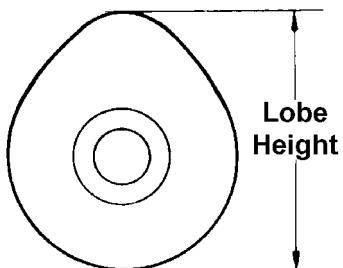
1. Place the camshaft on a set of V blocks; then position the dial indicator contact point against the shaft and zero the indicator.



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

### Measuring Camshaft Lobe Height

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



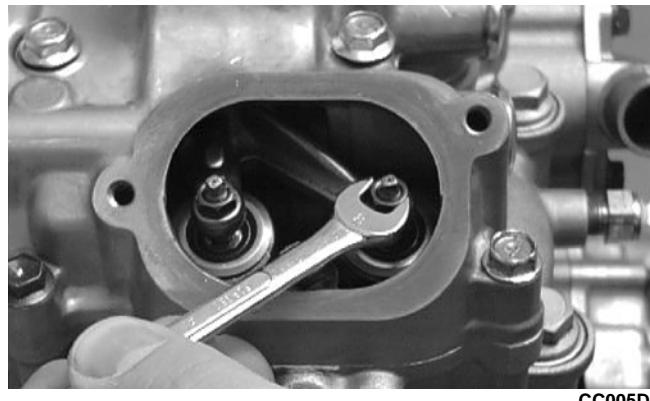
2. The lobe heights must not exceed minimum specifications.

### 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.

### Measuring Camshaft to Cylinder Head Clearance

1. Remove the adjuster screws and jam nuts.



2. Place a strip of plasti-gauge in each of the camshaft lands in the cylinder head.

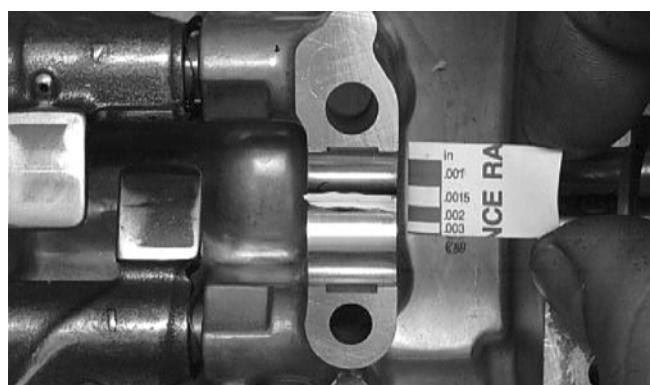
3. Place the valve cover on the cylinder head and secure with the valve cover cap screws. Tighten securely.

**■ NOTE: Do not rotate the camshaft when measuring clearance.**

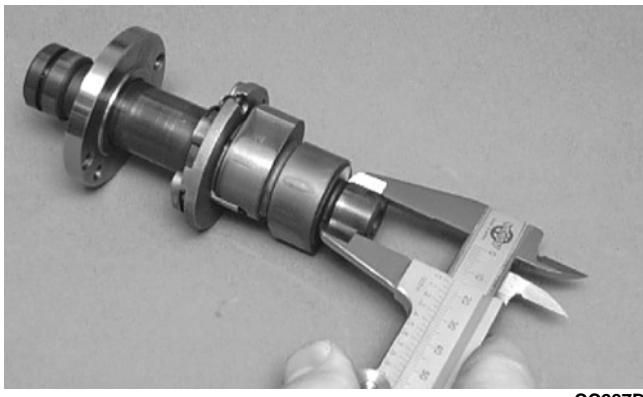
4. Remove the cap screws securing the valve cover to the cylinder; then remove the valve cover and camshaft.



5. Match the width of the plasti-gauge with the chart found on the plasti-gauge packaging to determine camshaft to cylinder head and valve cover clearance.



6. If clearance is excessive, measure the journals of the camshaft.

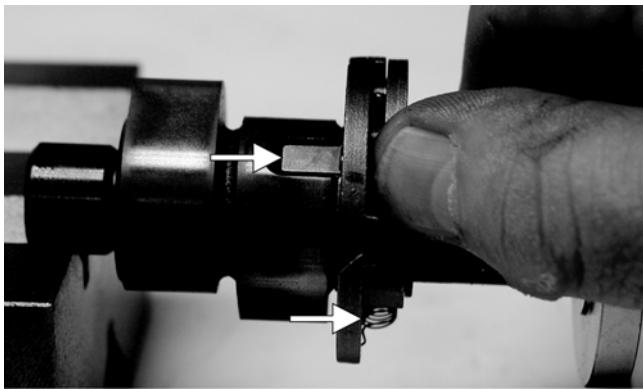


CC287D

■ **NOTE:** If the journals are worn, replace the cam-shaft; then measure the clearance again. If it is still out of tolerance, replace the cylinder head.

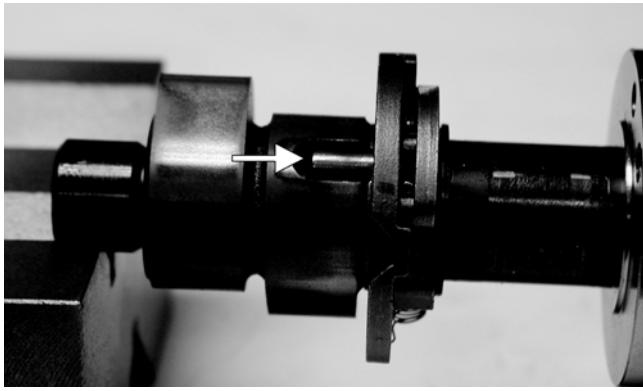
### Inspecting Camshaft Spring/Drive Pin

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

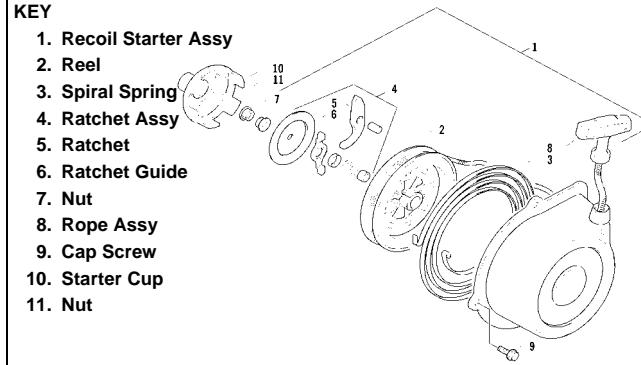
2. If damaged, the camshaft must be replaced.

## Servicing Left-Side Components

### RECOIL STARTER

#### KEY

1. Recoil Starter Assy
2. Reel
3. Spiral Spring
4. Ratchet Assy
5. Ratchet
6. Ratchet Guide
7. Nut
8. Rope Assy
9. Cap Screw
10. Starter Cup
11. Nut



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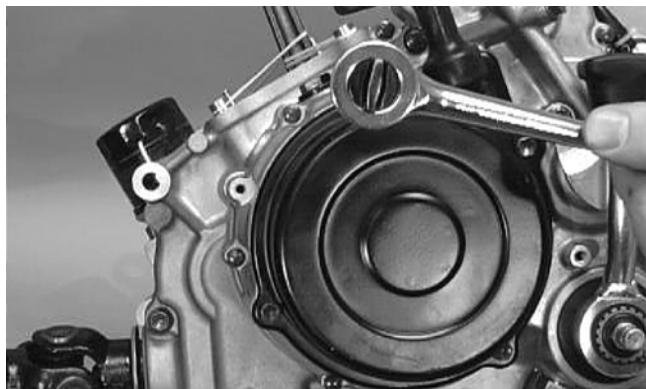
3

#### ⚠ WARNING

Always wear safety glasses when servicing the recoil starter.

### Removing/Disassembling

1. Remove the cap screws securing the recoil starter assembly to the left-side cover; then remove the starter.



CC039D

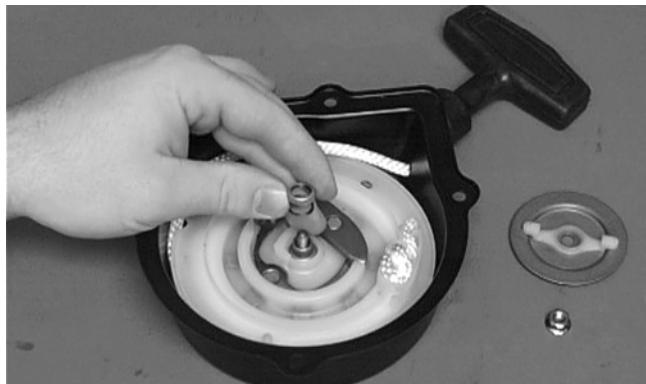
#### ⚠ WARNING

During the disassembly procedure, continuous downward pressure must be exerted on the reel so it does not accidentally disengage and cause injury.

2. Rotate the reel counterclockwise until the notch of the reel is near the rope guide in the case. Guide the rope into the notch and slowly allow the reel to retract until all spiral spring tension is released.



B600D



B603D

### **⚠ CAUTION**

**During the disassembly procedure, make sure all spring tension is released before continuing.**

3. Remove the nut.



B601D

4. Slowly release the friction plate and lift the plate with ratchet guide free of the recoil case; then remove the ratchet guide from the friction plate.



B602D

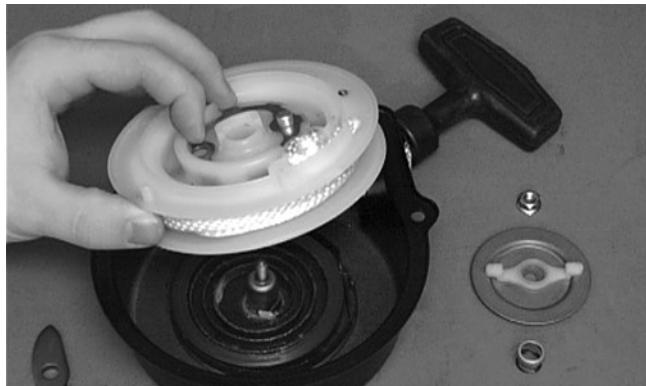
5. Remove the spring cover, spring, and shaft.



B604D

6. Remove the ratchet and account for the pin.

7. Carefully lift the reel free of the case making sure the spiral spring does not accidentally disengage from the case.



B605D

### **⚠ WARNING**

**Care must be taken when lifting the reel free of the case. Wear safety glasses to avoid injury.**

8. Remove the protective cover from the starter handle and pull the rope out of the handle; then untie the knot in the rope and remove the handle.

■ **NOTE: Do not remove the spiral spring unless replacement is necessary. It should be visually inspected in place to save time. If replacement is necessary, follow steps 9-10.**

9. Remove the spiral spring from the case by lifting the spring end up and out. Hold the remainder of the spring with thumbs and alternately release each thumb to allow the spring to gradually release from the case.
10. Unwind the rope from the reel and remove the rope.

## Cleaning and Inspecting

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

1. Clean all components.
2. Inspect the springs and ratchet for wear or damage.
3. Inspect the reel and case for cracks or damage.
4. Inspect the shaft for wear, cracks, or damage.
5. Inspect the rope for breaks or fraying.
6. Inspect the spiral spring for cracks, crystallization, or abnormal bends.
7. Inspect the handle for damage, cracks, or deterioration.

## Assembling/Installing

1. If removed, insert the spiral spring into the case with the outer end of the spring around the mounting lug in the case; then wind it in a counterclockwise direction until the complete spring is installed.

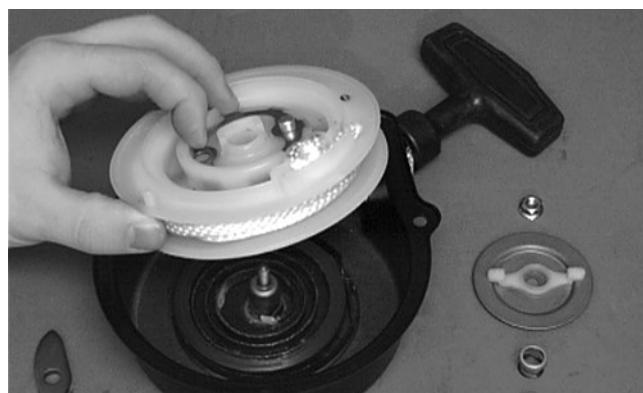
**■ NOTE:** The spiral spring must seat evenly in the recoil case.



B606D

2. Insert the rope through the hole in the reel and tie a knot in the end; then wrap the rope counterclockwise around the reel leaving approximately 50 cm (20 in.) of rope free of the reel.

3. Apply low-temperature grease to the spring and hub.
4. Thread the end of the rope through the guide hole of the case; then thread the rope through the handle and secure it with a double knot. Install the protective cover into the handle.
5. Align the inner hook of the spiral spring with the notch in the reel.



B605D

6. Install the ratchet onto its pin making sure the end is properly installed on the reel.



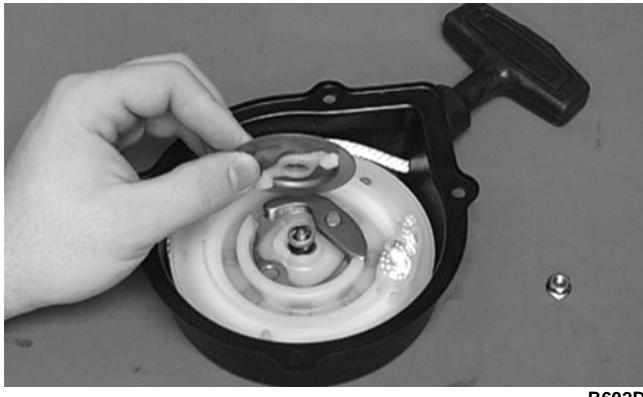
B604D

7. Install the shaft, spring, and the spring cover.



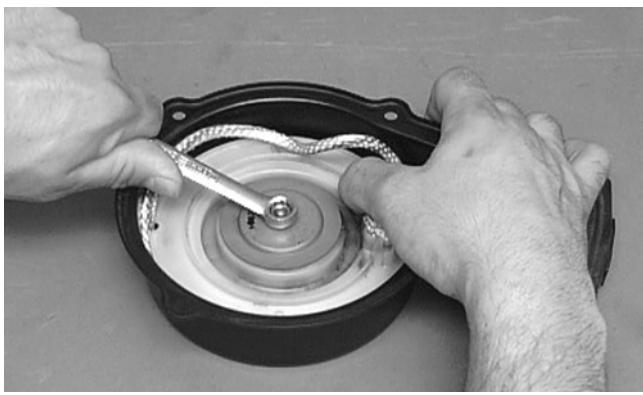
B603D

8. Install the friction plate with the ratchet guide fitting into the ratchet.



B602D

9. While pushing down on the reel, install the nut. Tighten securely.



B601D

10. With the 50 cm (20 in.) of rope exposed, hook the rope in the notch of the reel.
11. Rotate the reel four turns counterclockwise; then release the rope from the notch and allow the rope to retract.
12. Pull the rope out two or three times to check for correct tension.

**■ NOTE: Increasing the rotations in step 11 will increase spring tension.**

13. Place the recoil starter assembly into position on the left-side cover; then tighten the cap screws to specifications.

## Servicing Right-Side Components

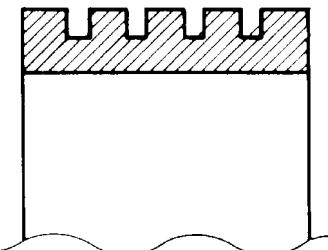
**■ NOTE:** Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.

### INSPECTING CENTRIFUGAL CLUTCH SHOE

1. Inspect the clutch shoe for uneven wear, chips, cracks, or discoloration.
2. Inspect the depth of the grooves in the clutch shoes. If any shoe is worn to the bottom of the groove, replace the complete set.

#### CAUTION

Always replace clutch shoes as a complete set or severe imbalance could occur.



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. 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

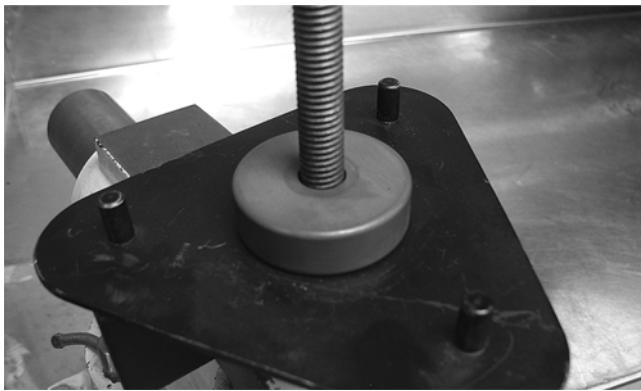
## DRIVEN PULLEY ASSEMBLY

### Disassembling

#### **WARNING**

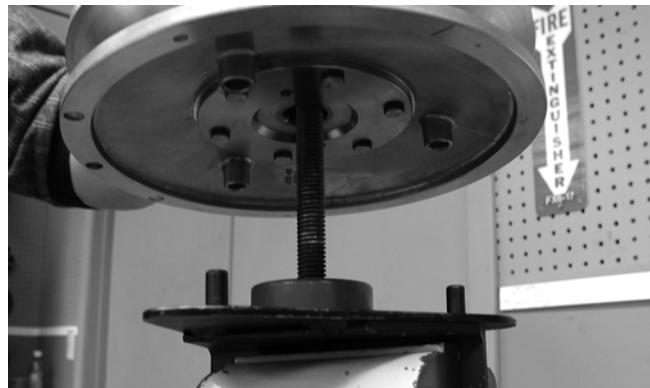
This procedure involves relaxing a compressed spring assembly. DO NOT attempt disassembling without the proper tools.

1. Secure Driven Pulley Compressor (p/n 0444-140) in a suitable holding fixture such as a bench vise; then remove the wing nut, holding handle, flat washer, and pilot bushing leaving the large spacer on the compressor tool base.



CD047

2. Place the driven pulley assembly onto the compressor tool base engaging the dowel pins into appropriate holes in the fixed face of the assembly.



CD048

3. Install the pilot bushing with the machined end directed down; then fit the bushing into the pulley hub.



CD067

4. Using a suitable marking pen, make alignment marks on the fixed face spring holder and both pulley faces.



CD049

5. Place the holding handle on the spring holder fitting the two dowel pins into the spring holder face; then install a flat washer and the wing nut. Turn the wing nut down until resistance is felt.

■ **NOTE: Do not use the wing nut to compress the spring further.**



CD050

### ⚠ WARNING

The spring assembly is under pressure. Extreme care must be taken when relaxing the spring. Always wear safety glasses. Use proper tools only.

6. Using a spanner and suitable breaker bar, loosen the notched-ring nut; then spin the nut free of the hub.



CD051

7. Firmly hold the handle and slowly turn the wing nut counterclockwise to relax the spring.

■ NOTE: There will be a tendency for the handle to rotate clockwise approximately  $\frac{1}{4}$  turn as the spring holder clears the flats or hub. This is due to a slight counterclockwise preload on the spring.



CD052

8. Release the preload slowly; then continue to relax the spring until the wing nut is flush with the end of the threads.

9. Firmly holding the spring and spring holder, remove the wing nut; then remove the spring.



CD053

10. Using a thin pry-bar or screwdriver, work the movable face sleeve upward and free of the O-rings; then remove the sleeve.

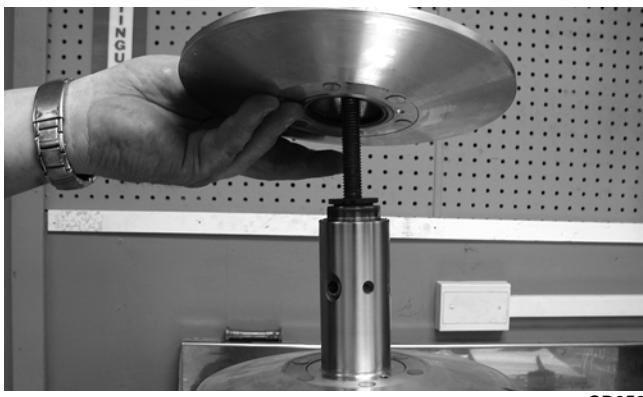


CD054

11. Remove the three pins and spacers from the cam slots in the movable face; then remove the movable face.



CF091



CD056

## Inspecting

1. Inspect the pulley faces for wear, galling, or grooving.
2. Inspect the O-rings on the movable face for nicks, tears, or swelling.



CF092A

3. Inspect two grease seals in the movable face for nicks, cuts, or damage.



CF095A

4. Inspect the pins and bushings for wear, flat spots, looseness, or cracking.

## Assembling

1. Place the fixed face of the driven pulley on the pulley compressor base making sure the dowel pins are engaged in the appropriate holes in the pulley face.

■ **NOTE: Make sure the spacer is on the base or damage to the fixed face will occur when the spring is compressed.**



CD048

3

2. Apply multi-purpose grease to the O-rings and grease seals on the movable face; then install on the fixed face making sure the alignment marks are properly aligned.



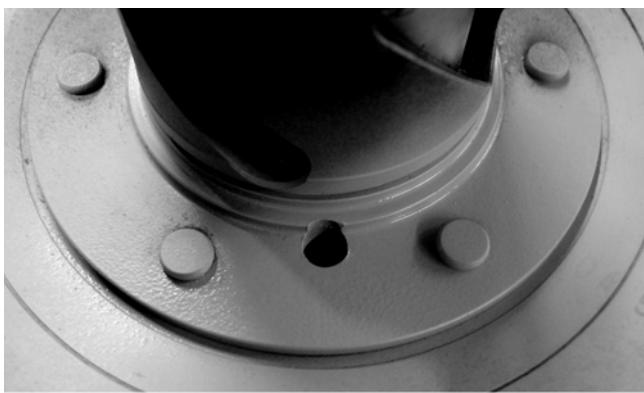
CD060

3. Install the three pins and spacers into the fixed face hub; then pack the cam slots in the movable face with multi-purpose grease.

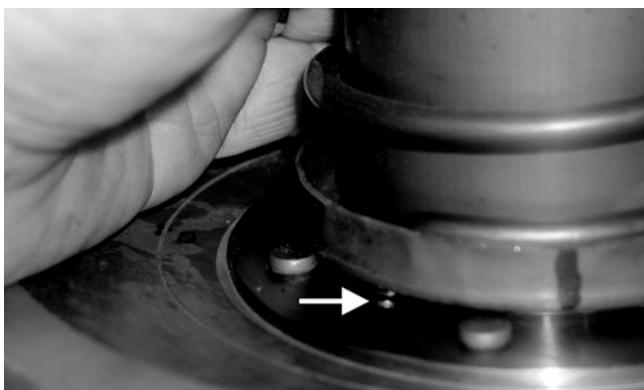


CD061

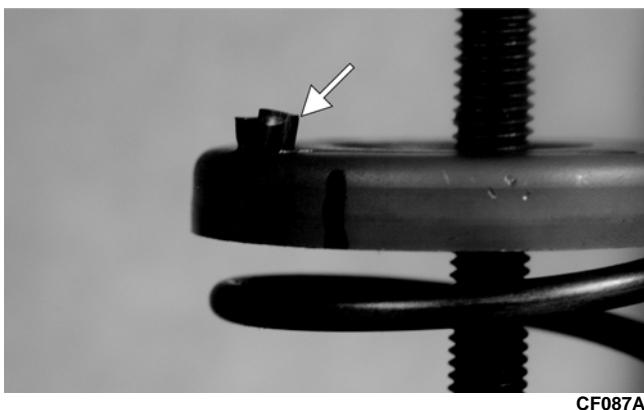
4. Install the movable face sleeve aligning the hole in the spring seat with the spring anchor hole in the movable face.



5. Install the spring over the hub and movable face sleeve; then insert the end of the spring through the sleeve and into the spring anchor hole in the movable face.



6. Place the spring holder on the spring engaging the spring end with the appropriate anchor hole.



7. Assemble the notched-ring nut, spring holding handle, one flat washer, and the wing nut in order on the pulley compressor bolt; then thread the wing nut onto the bolt.



8. Compress the spring until the spring holder nears the threads on the fixed face hub; then using the handle, wind the spring holder counterclockwise to align the flats of the spring holder and hub.



9. Continue compressing the spring while guiding the spring holder onto the hub. When a slight resistance is felt, stop turning the wing nut.

10. Install the nut (threads coated with red Loctite #271); then tighten the nut to specification using the spanner and a torque wrench.



11. Remove the wing nut, washer, and holding handle; then remove the driven pulley from the pulley compressor.

# Servicing Center Crankcase Components

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

## 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.
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

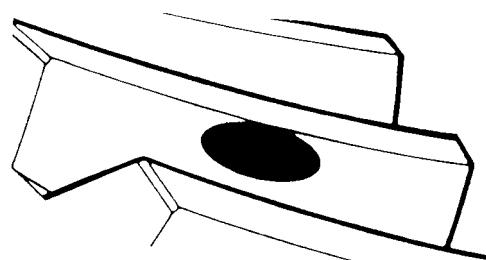
### Checking Tooth Contact

■ **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.

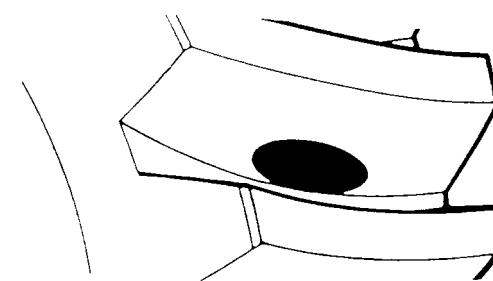
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Incorrect (contact at tooth top)

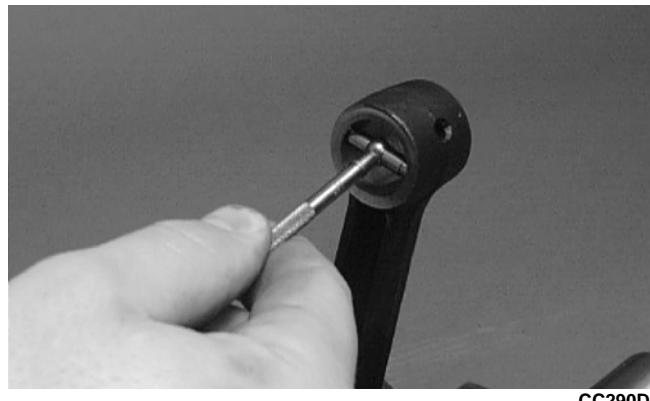
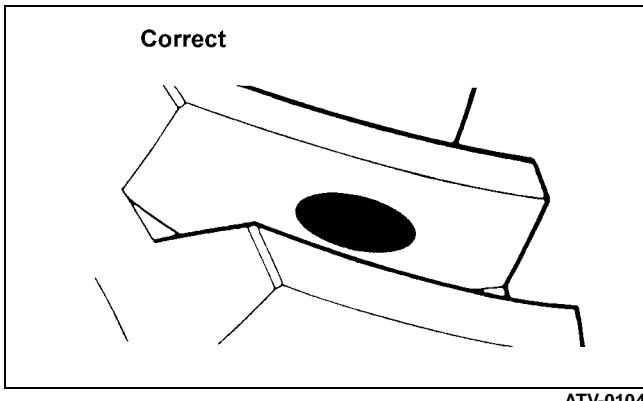


ATV-0103

Incorrect (contact at tooth root)



ATV-0105



CC290D

## 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

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

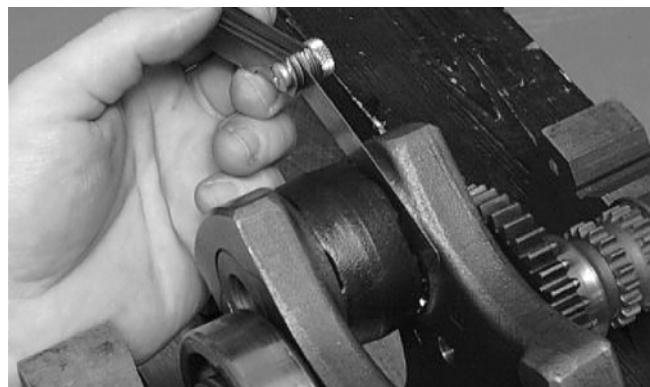
1. Insert a snap gauge into the upper connecting rod small end bore; then remove the gauge and measure it with micrometer.

### 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

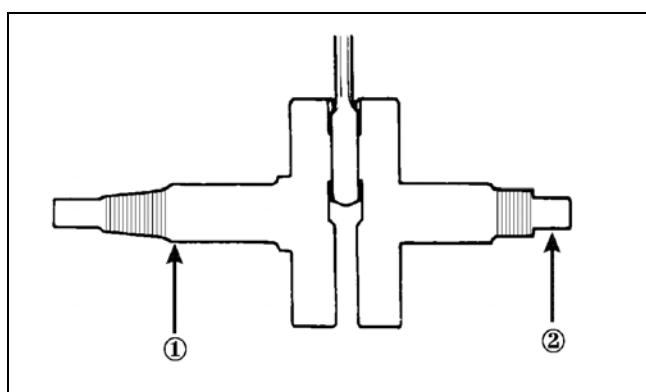
3. Acceptable gap range must be within specifications.

## Measuring Connecting Rod (Big End Width)

1. Using a calipers, measure the width of the connecting rod at the big-end bearing.
2. Acceptable width range must be within specifications.

## Measuring Crankshaft (Runout)

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



3. Zero the indicator and rotate the crankshaft slowly.

### ⚠ CAUTION

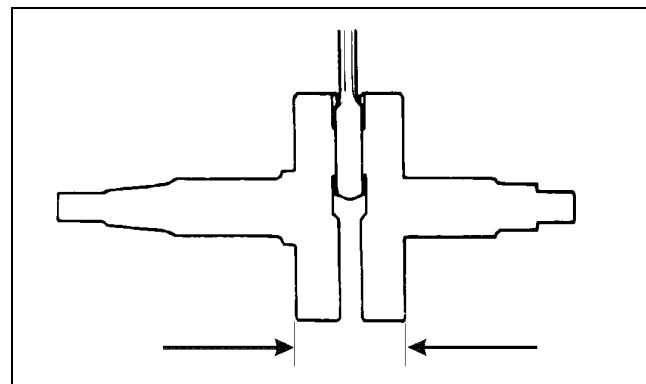
Care should be taken to support the connecting rod when rotating the crankshaft.

4. Maximum runout must not exceed specifications.

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

## 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.



ATV-1077

2. Acceptable width range must be within specifications.

## COUNTERSHAFT

### ⚠ CAUTION

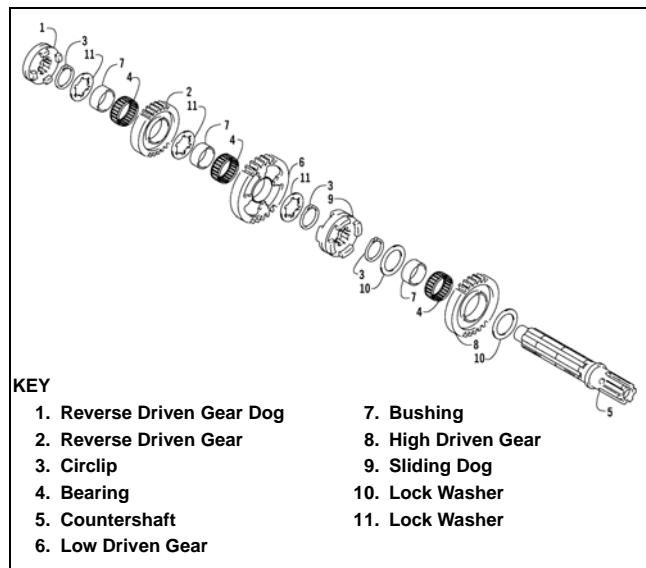
When disassembling the countershaft, care must be taken to note the direction each major component (dog, gear) faces. If a major component is installed facing the wrong direction, transmission damage may occur and/or the transmission will malfunction. In either case, complete disassembly and assembly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

3

## Disassembling

1. Remove the reverse driven gear dog; then remove the circlip securing the reverse driven gear.
2. Remove the reverse driven gear and account for the washer, bushing, and bearing.
3. Remove the low driven gear washer; then remove the low driven gear. Account for the bushing and bearing.
4. Remove the washer; then remove the circlip securing the sliding dog. Remove the sliding dog.
5. Remove the high driven gear circlip; then remove the high driven gear. Account for the washer, bushing, and bearing.

## Assembling

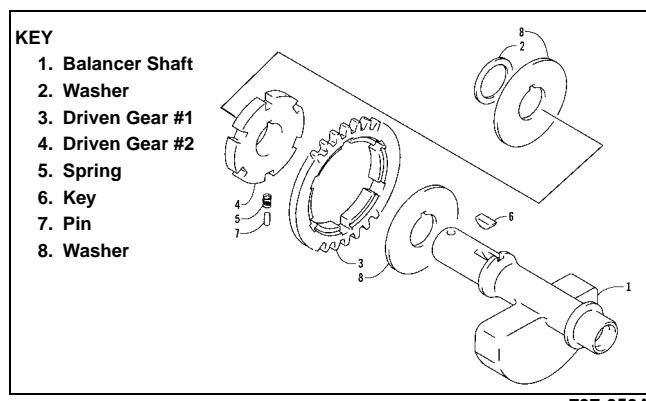


737-053A

1. Place the high driven gear onto the countershaft making sure the bearing, bushing, and washer are properly positioned. Secure with the circlip.
2. Place the sliding dog onto the countershaft; then secure with the circlip. Place the washer next to the circlip.
3. Place the low driven gear onto the countershaft making sure the bearing and bushing are properly positioned; then place the washer onto the shaft.
4. Place the reverse driven gear onto the counter-shaft making sure the bearing, bushing, and washer are properly positioned; then secure with the circlip.
5. Place the reverse driven gear dog onto the countershaft; then secure with the circlip.

**■ NOTE: The countershaft is now completely assembled for installation.**

## CRANK BALANCER DRIVEN GEAR



737-050A

## Disassembling

1. Remove the small and large washers from the balancer shaft.
2. Note the position of the alignment marks for assembling purposes; then remove driven gear #1 with driven gear #2. Account for pins and springs.
3. Remove driven gear #2 from gear #1; then account for a large washer and a key.

## Inspecting

1. Inspect the gear, pins, and keyway for wear.
2. Inspect the springs for damage or fatigue.

## Assembling

1. Place driven gear #2 into driven gear #1; then align the alignment marks of driven gear #1 and driven gear #2.
2. Using a pair of needle-nose pliers, insert each spring part way into the slot; then install a pin and push the spring/pin assembly into the slot.
3. Place the key and the large washer into position on the balancer shaft.
4. Place the driven gear #1 assembly onto the balancer shaft; then place the large and small washers onto the shaft.

**■ NOTE: The crank balancer/driven gear assembly is now completely assembled for installation.**

## 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



MD1334



MD1079

2. Apply red Loctite #271 to the threads of the output shaft. Install and tighten the nut specifications. 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.



MD1024

4. Keeping the counterbalance gear timing mark aligned with the one on the crankshaft gear, install the key and the counterbalance gear.



CC166D

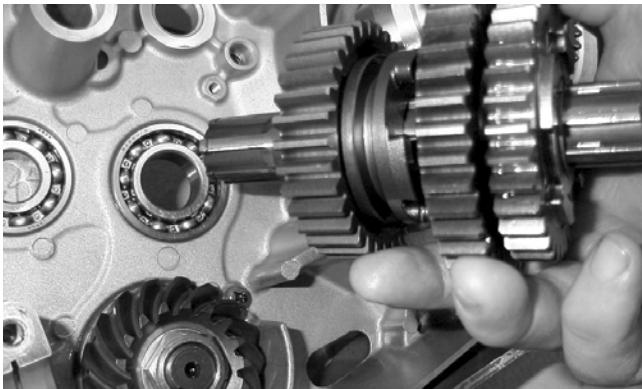
5. Keeping the two holes facing up, install the shift cam and inner and outer washers.

3

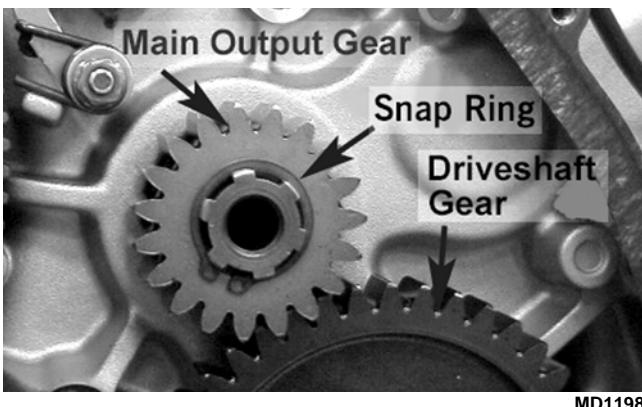


MD1329

7. Align the inner shift fork with the gear cluster and with the inner washer in place, install the gear cluster and inner shift fork. While holding the gear cluster in place, install the washer, gear, and snap ring.



MD1032



MD1198

8. Install the outer shift fork and the shift fork shaft.

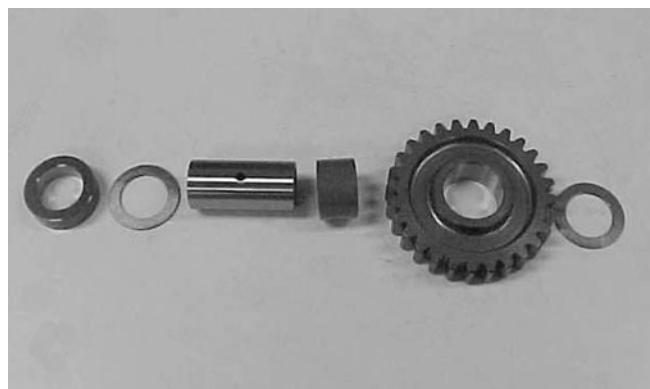


MD1327

9. Install the input driveshaft.



MD1326



CC870

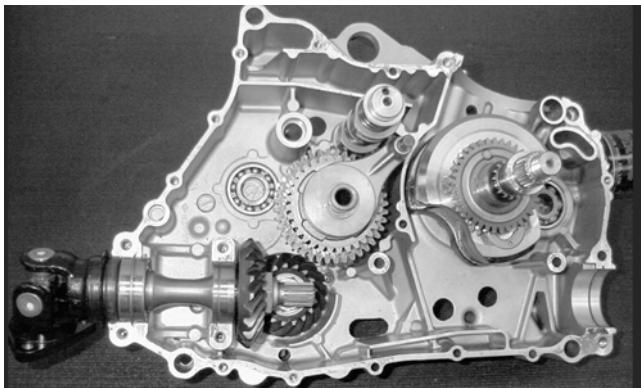
10. Install the washer, spacer, sleeve, reverse idler gear, and washer.



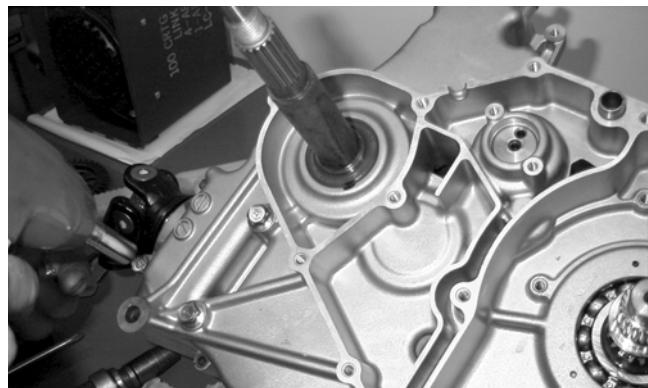
MD1357

11. Install the secondary and primary driveshaft assemblies. Account for the bearing alignment C-ring on the bearing boss next to the pinion gear.

■ **NOTE:** Align the bearing alignment pin on the secondary output shaft.



MD1316



MD1008

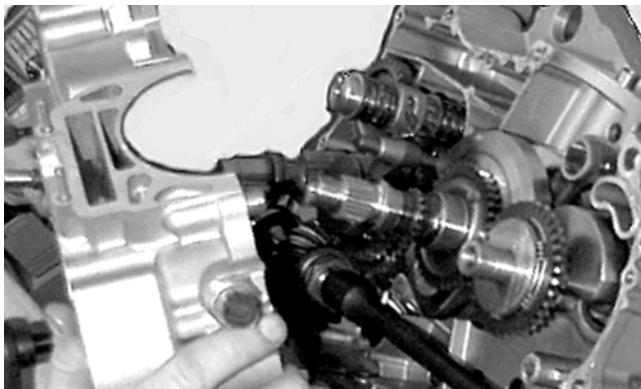
4. From the left side, install the remaining crankcase cap screws; then tighten only until snug.

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

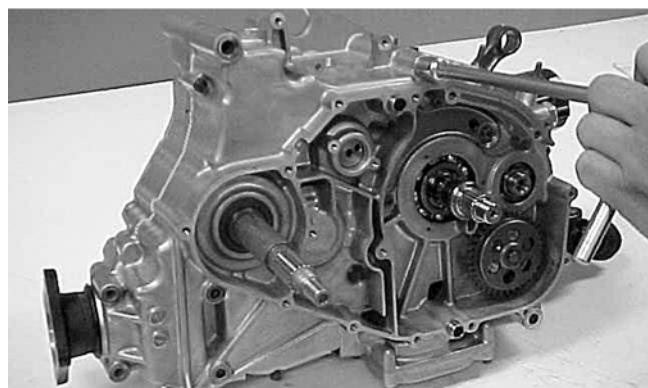
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## Joining Crankcase Halves

1. Verify that the two alignment pins are in place and that both case halves are clean and grease free. Apply Three Bond Sealant to the mating surfaces. Place the right-side half onto the left-side half.



MD1336



CC871

5. In a crisscross/case-to-case pattern, tighten the 8 mm cap screws until the halves are correctly joined; then tighten to specifications.

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

6. In a crisscross/case-to-case pattern, tighten the 6 mm cap screws to specifications.

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

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.

### ☞ 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**.

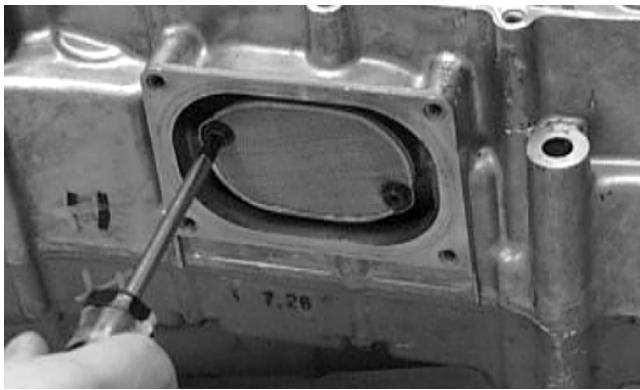
# Installing Right-Side Components

## A. Oil Strainer/Oil Pump

1. Place the oil strainer and new O-ring into position beneath the crankcase. Tighten the Phillips-head screws (coated with red Loctite #271) securely.

### ⚠ CAUTION

The legs of the strainer must be directed out.



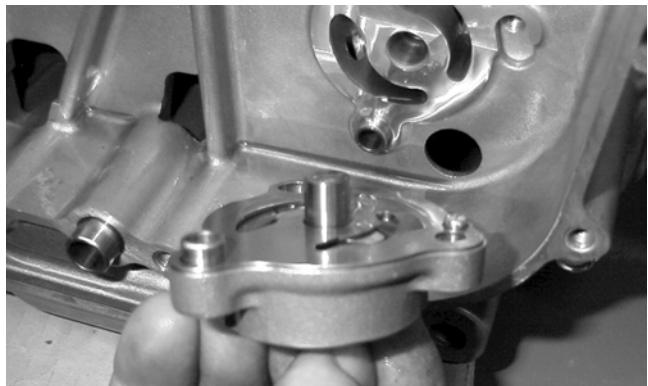
MD1337

2. Noting the directional arrow from removing, place the strainer cover into position on the crankcase making sure the O-ring is properly installed and secure with the four cap screws; then tighten the oil drain plug to specifications.



MD1208

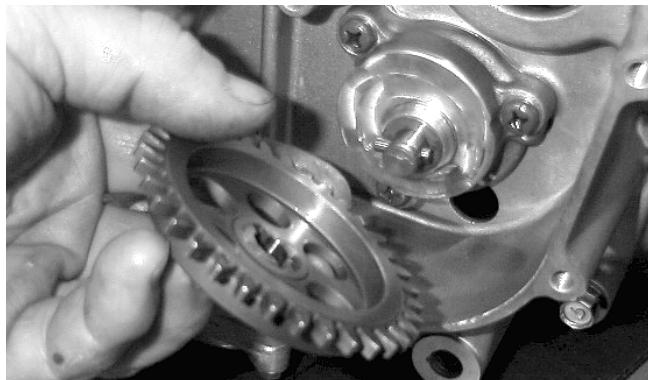
3. Place two alignment pins and the oil pump into position on the crankcase and secure with the Phillips-head screws coated with blue Loctite #243. Tighten to specifications.



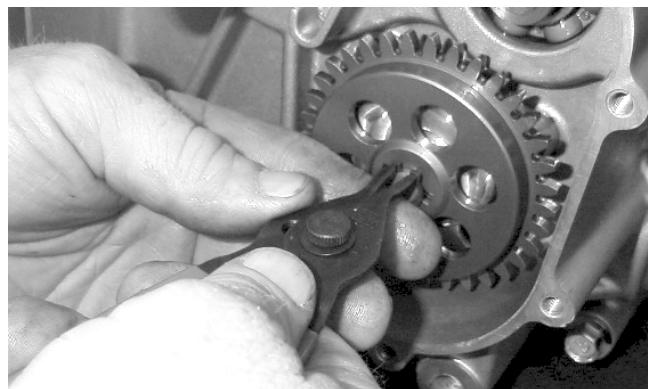
MD1060

4. Place the 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

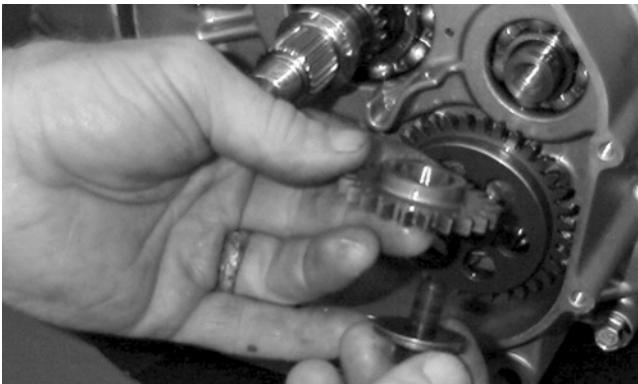


MD1019

5. Install the cam chain.

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

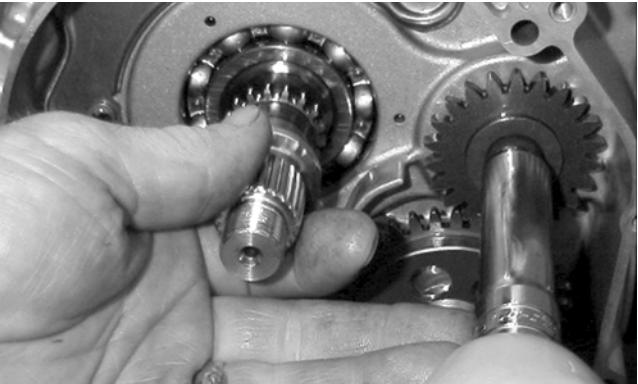
6. Place the pin into position, install the oil pump drive gear, and tighten the cap screw (coated with red Loctite #271) securely.



MD1017



MD1043



MD1018

7. Install the clutch shoe assembly on the crank-shaft; then install the flange nut (left-hand thread). Tighten to specifications.

■ **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 sprag clutch making sure that the green dot or the stamp tag OUTSIDE is directed away from the crankcase.



MD1286

9. Install gear position indicator switch contact pins and springs into the end of the shift shaft.

10. Install gear position indicator switch making sure the O-ring is well-oiled and properly positioned. Tighten cap screws securely.



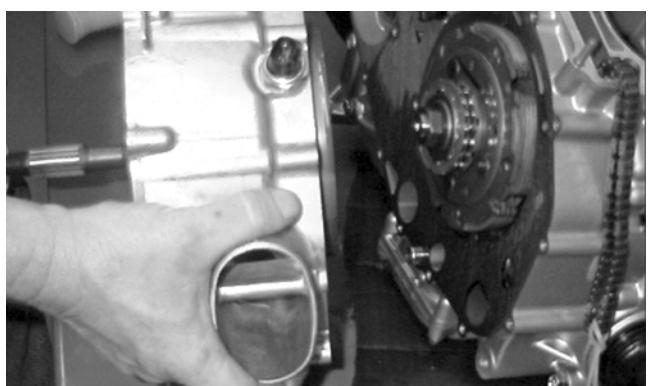
MD1040

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

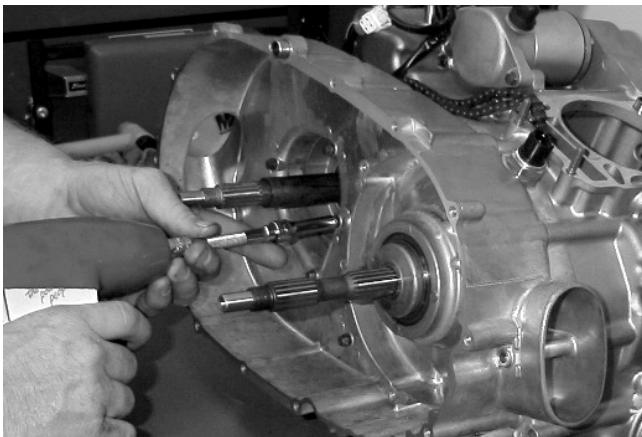
■ **NOTE:** Steps 1-10 in the preceding sub-section must precede this procedure.

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



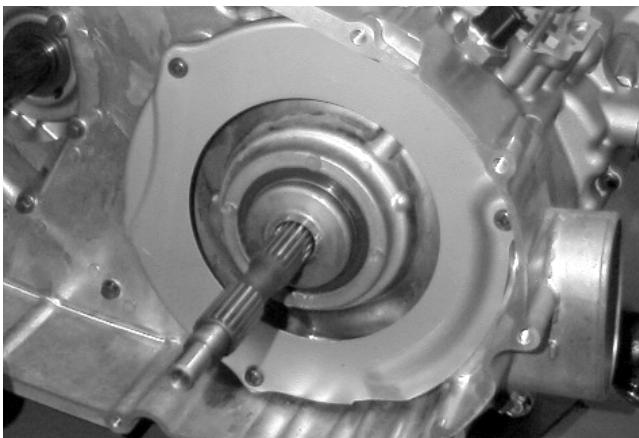
MD1115

12. Tighten the clutch cover cap screws to specifications.



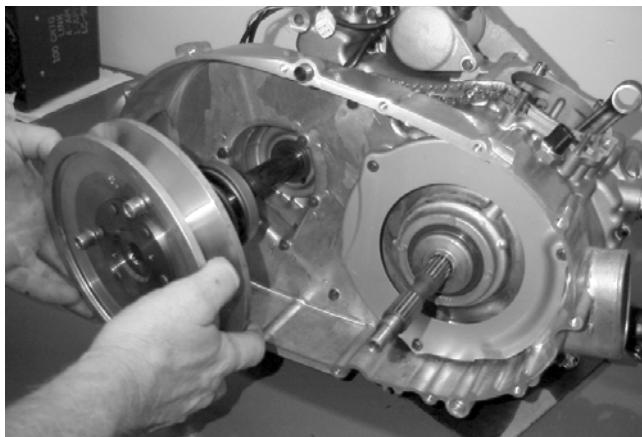
MD1117

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

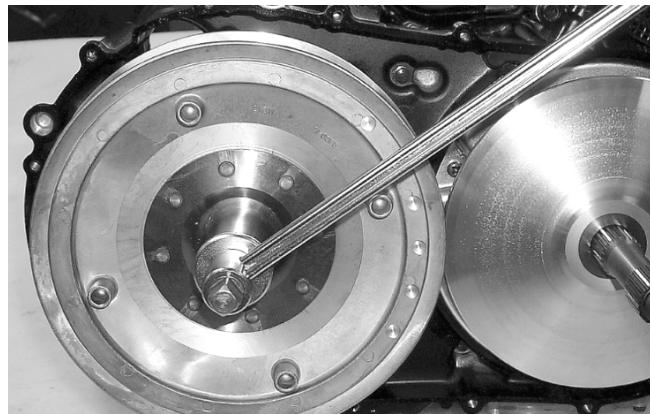


MD1342

14. Place the driven pulley assembly into position and secure with the nut (threads coated with red Loctite #271). Tighten to specifications.



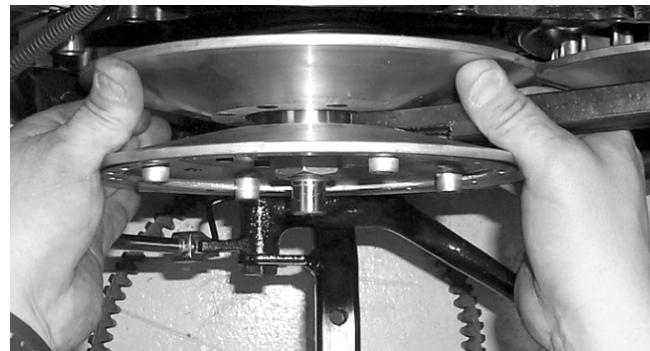
MD1068



MD1339

15. Slide the fixed drive face assembly onto the front shaft.

16. Spread the faces of the driven pulley by pushing the inner face toward the engine while turning it counterclockwise; then when the faces are separated, insert a wedge (approximately 3/8 in. thick) between the faces. Release the inner face.



MD1340

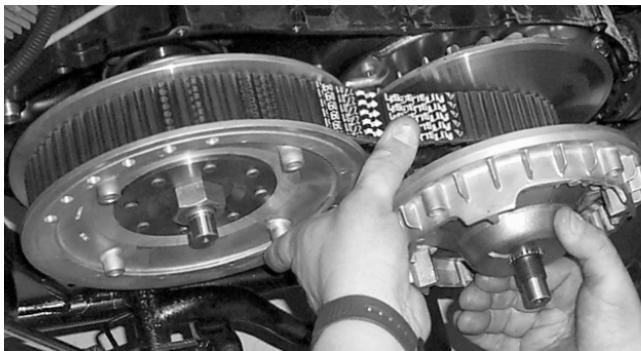
17. Place the V-belt into position on the driven pulley and over the front shaft.



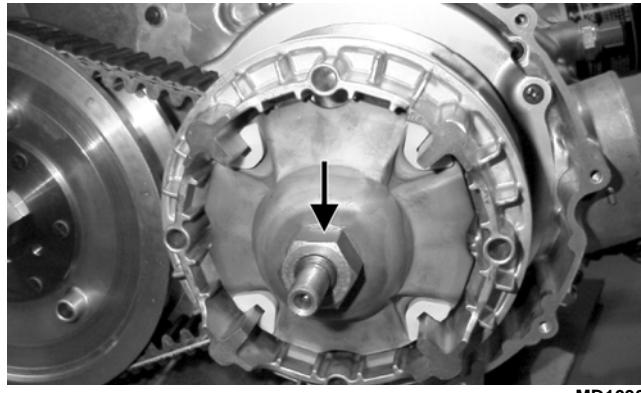
MD1341

■ **NOTE: The arrows on the V-belt should point forward.**

18. Making sure the eight 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. Coat the threads of the nut with red Loctite #271 and secure the movable drive face. Tighten the nut to specifications.



MD1338



MD1033

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

19. Rotate the V-belt and drive/driven assemblies until the V-belt is flush with the top of the driven pulley.

20. Install two alignment pins and place the V-belt cover gasket into position on the clutch cover. Install the V-belt cover noting the position of the long cap screws and rubber washer and two wire forms. In a crisscross pattern, tighten cap screws to specifications.



MD1306

## Installing Left-Side Components

### A. Starter Idler Gears B. Rotor/Flywheel

1. Place the crankshaft bearing retainer into position. Apply red Loctite #271 to the three Phillips-head screws. Install and tighten the three Phillips-head screws securely.



MD1122

2. Install the starter motor and tighten the two cap screws securely.
3. Install the driveshaft spacer making sure the stepped side is to the inside.



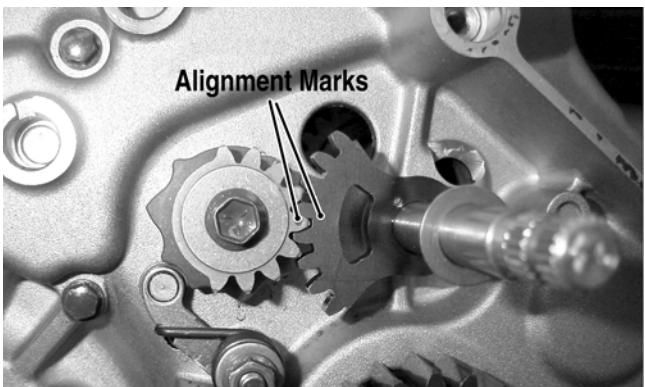
MD1224

4. Install the shift detent cam making sure the spacer is properly positioned.



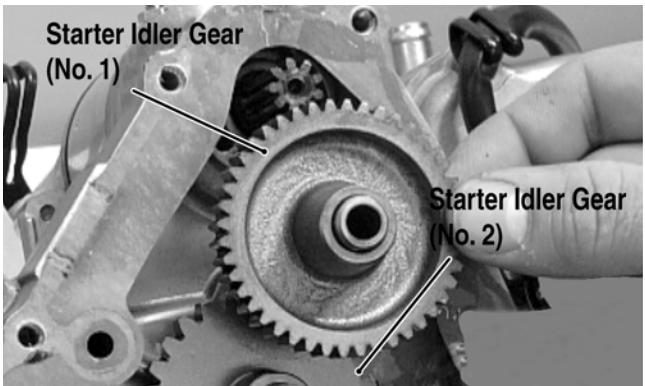
MD1086

5. Install the cam stopper assembly.
6. Install the gear shift shaft assembly and washer making sure to align the alignment marks.



MD1239

7. Install starter idler gear (No. 1) and starter idler gear (No. 2).



MD1305

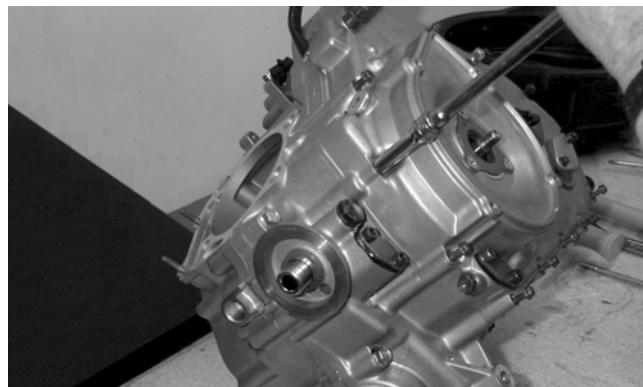
8. Place the key into its notch; then slide the rotor/flywheel (with the ring gear in place) over the crankshaft. Tighten the nut to specifications.

## C. Cover

### D. Recoil Starter

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

9. Install two alignment pins and place the left-side cover gasket into position. Install the left-side cover. Noting the different-lengthed 6 mm cap screws, the position of the shifter bracket, and the location of the long cap screw with the washer, tighten cap screws only until snug.



MD1186

10. Install the starter cup making sure that the O-ring is in place inside the starter cup. Tighten the nut w/lock washer to specifications.



MD1304



MD1303

11. Tighten the cap screws (from step 9) in a criss-cross pattern to specifications.

12. Place the gasket, recoil starter assembly, and cover into position on the left-side cover making sure the single washer is properly positioned; then install and tighten the four cap screws to specifications.

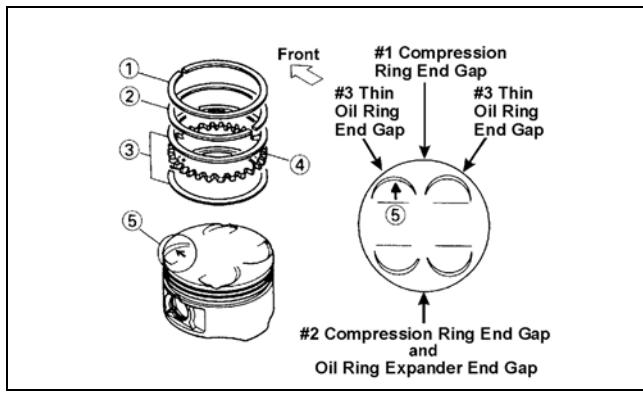
## Installing Top-Side Components

### A. Piston

### B. Cylinder

■ NOTE: If the piston rings were removed, install them in this sequence.

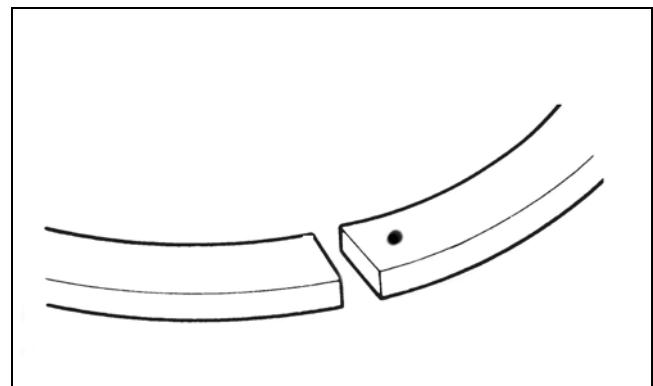
A. Install ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap. Stagger the end gaps of the upper and lower thin oil rings according to the illustration.



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

B. Install the compression rings (1 and 2) so the letter 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.



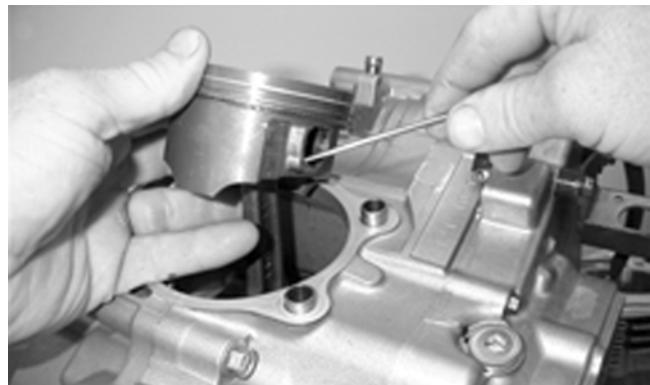
MD1343

### CAUTION

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

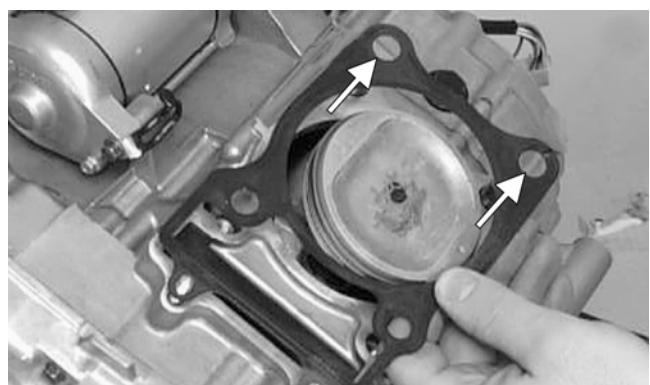
1. Install the piston on the connecting rod making sure there is a circlip on each side and the open end of the circlip is directed upwards or downwards.

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



MD1213

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

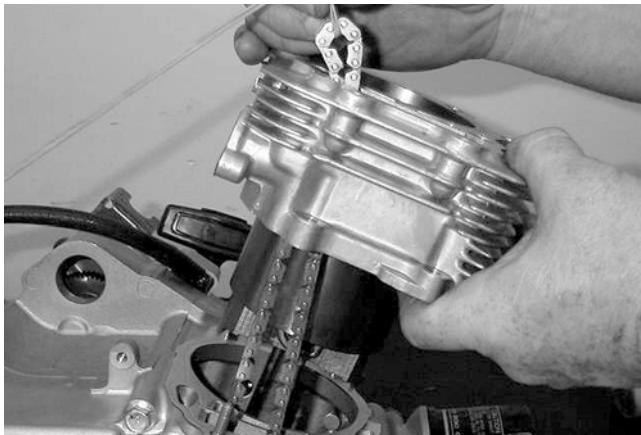


MD1344

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**

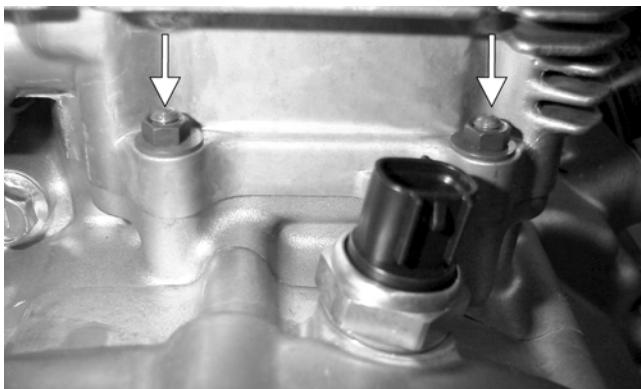
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



MD1345

4. Loosely install the two nuts with washers which secure the cylinder to the right-side crankcase half.

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



MD1226A

## C. Cylinder Head D. Valve Cover

■ 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.

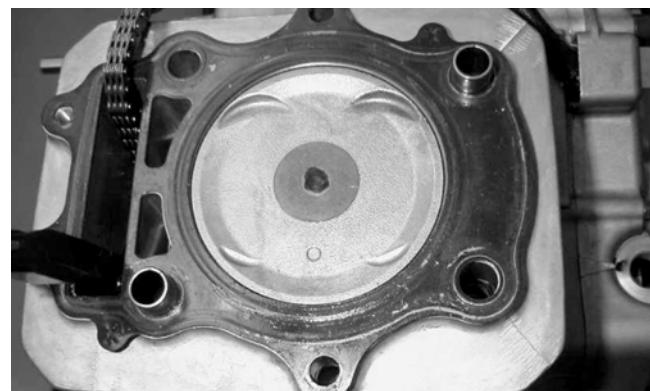


MD1349

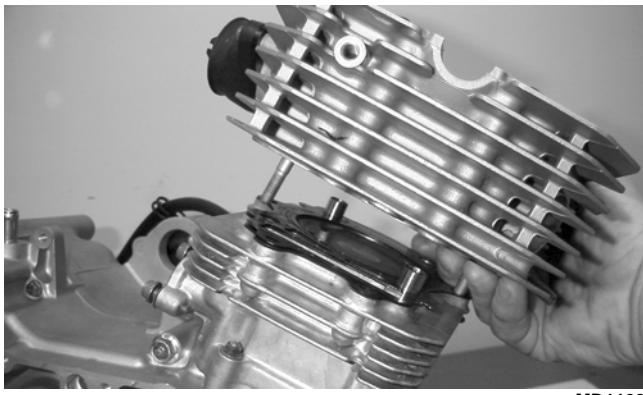
6. Place the head gasket into position on the cylinder. Place the alignment pins into position; then place the head assembly into position on the cylinder making sure the cam chain is routed through the chain cavity.

**⚠ CAUTION**

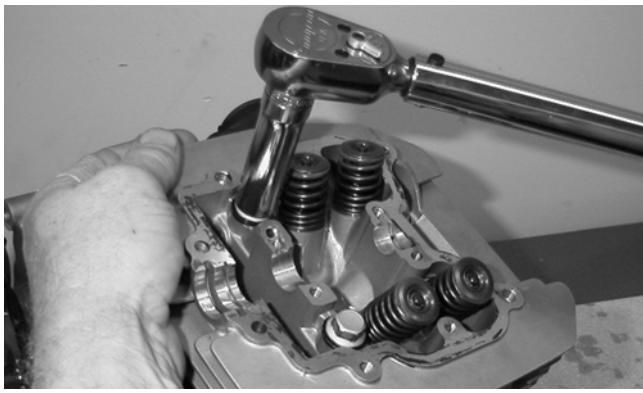
Keep tension on the cam chain to avoid damaging the crankcase boss.



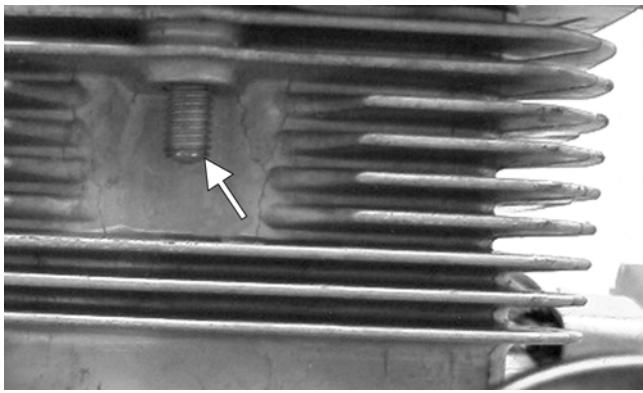
MD1347



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 specifications. Tighten the two lower cylinder head nuts (from step 8) to specifications and the cylinder-to-crankcase nuts (from step 4) to specifications.

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 sprocket to the side, install the rear cam chain tensioner guide into the cylinder head. Install the pivot cap screw and washer.



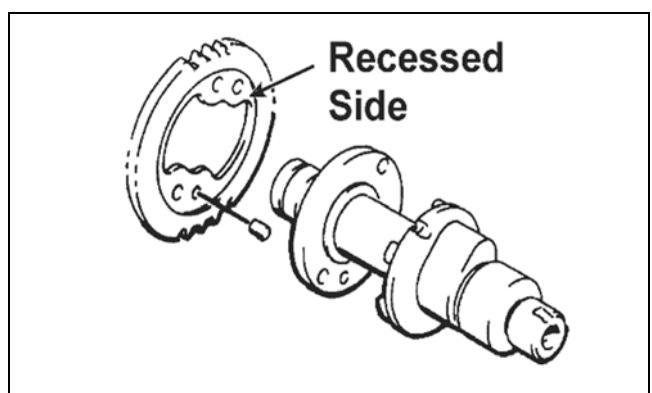
CD383

3

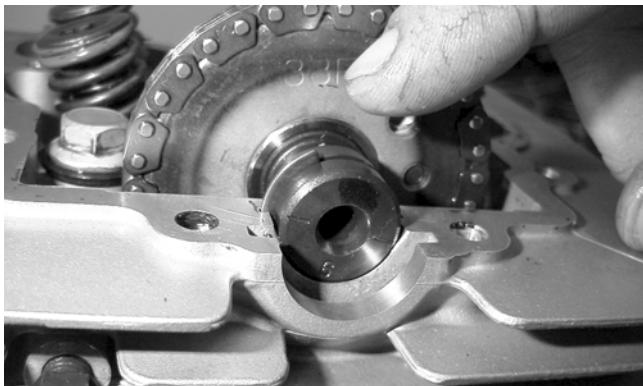
12. With the alignment pin installed in the camshaft and the cam lobes directed down (toward the piston), place the camshaft in position and verify that the timing mark on the magneto is visible through the inspection plug and that the timing marks on the camshaft sprocket are parallel with the valve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

■ **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.



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



MD1131

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

■ **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 is necessary for alignment, do not allow the chain and sprocket to rotate and be sure the cam lobes end up in the down position.

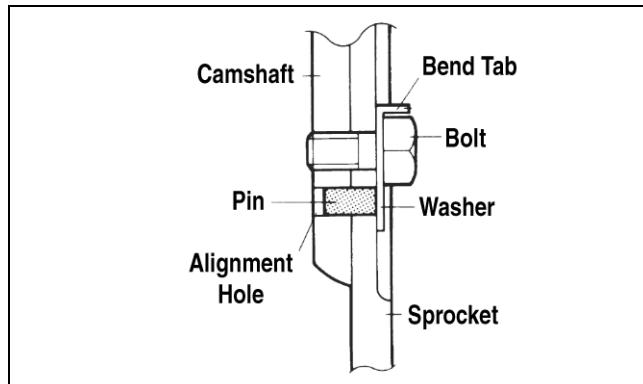
15. When the camshaft assembly is seated, ensure the following.

- 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

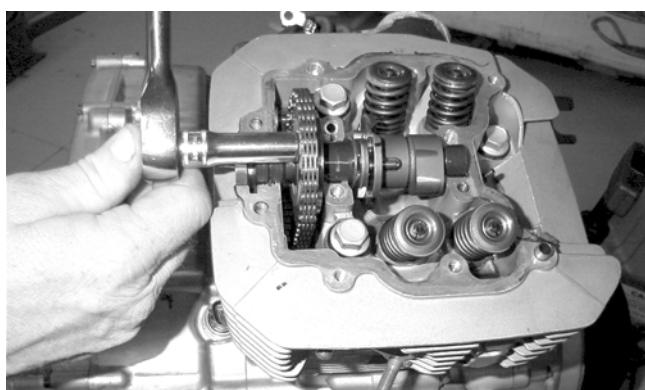
**⚠ CAUTION**

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.

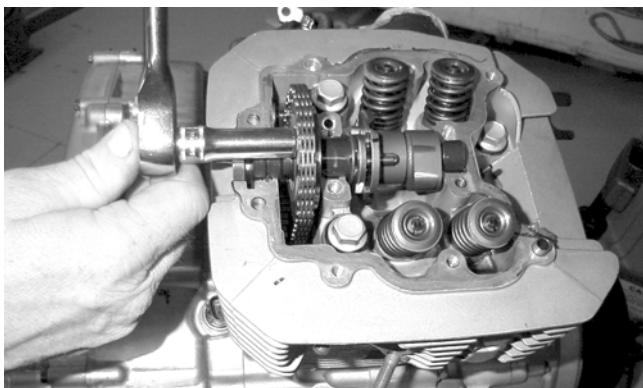


CC404D



MD1137

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 specifications; then bend the tab to secure the cap screw.



MD1137

19. Rotate the crankshaft until the first cap screw (from step 17) securing the sprocket to the cam-shaft can be addressed; then tighten to specifications. 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. Remove the cap screw from the end of the chain tensioner. Account for the plunger, spring, and O-ring.



MD1248

22. Depress the spring-loaded lock and push the plunger into the tensioner.



MD1144

23. Place the cam chain tensioner assembly and gasket into the cylinder making sure the ratchet side is facing toward the top of the cylinder and secure with the two Allen-head screws.



MD1254

24. Install the cap screw and spring into the end of the cam chain tensioner. Tighten securely.



MD1245

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

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



MD1261

28. In a crisscross pattern starting from the center and working outward, tighten the cap screws (from step 27) to specifications.
29. Adjust valve/tappet clearance using the following procedure.

**■ NOTE: Use Valve Clearance Adjuster (p/n 0444-078) for this procedure.**

- A. Turn the engine over until the piston reaches top-dead-center on the compression stroke.
- B. Place the valve 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.
- C. 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.

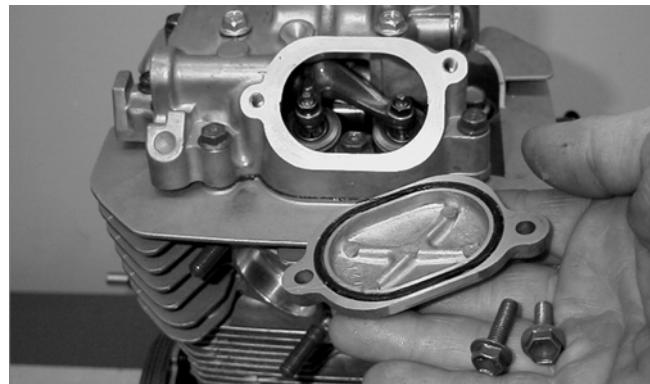


CD001

- D. Align the valve adjuster handle with one of the marks on the valve adjuster dial.
- E. While holding the valve adjuster handle in place, rotate the valve adjuster dial counter-clockwise until specified valve/tappet clearance is attained.

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

- F. While holding the adjuster dial at the proper clearance setting, tighten the jam nut securely with the valve adjuster handle.
30. Place the two tappet covers with O-rings into position; then install and tighten the cap screws securely.



MD1264

31. Install the spark plug and tighten to specifications; then install the timing inspection plug.

---

## Installing Engine/Transmission

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**■ NOTE: Arctic Cat recommends that new gaskets and O-rings be installed whenever servicing the ATV.**

1. From the left side, place the engine/transmission into the frame; then slide the engine rearward as far as possible.
2. Slightly raise the rear of the engine and engage the front drive coupler into the splines of the front drive output yoke; then slide the engine forward as far as possible.



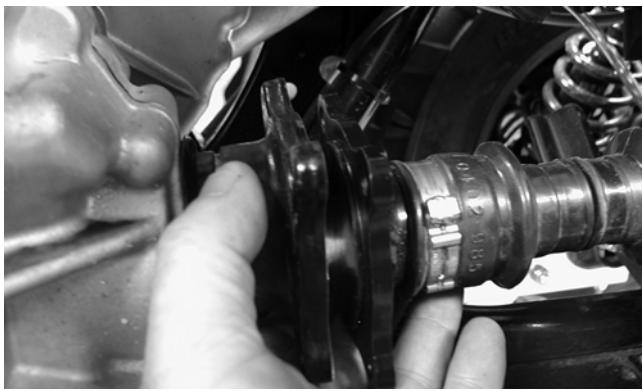
CD818

3. Raise the rear of the engine and place a block beneath it; then install the propeller shaft and output flange into the rear drive coupler.



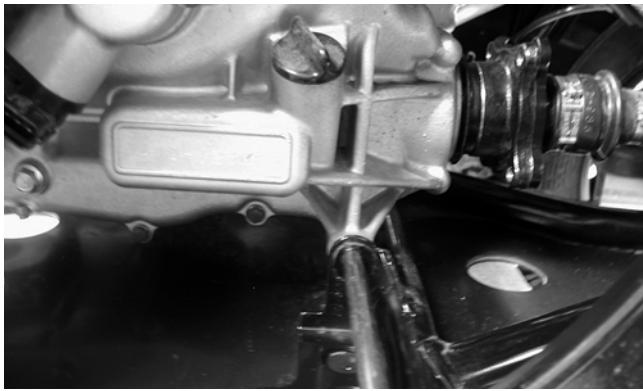
CD821

4. Remove the block from beneath the engine; then align the rear drive flanges and secure with four cap screws. Tighten to specifications.



CD824

5. Install two engine mounting through-bolts, two bushings, and two washers; then tighten the through-bolt flange nuts to specifications.

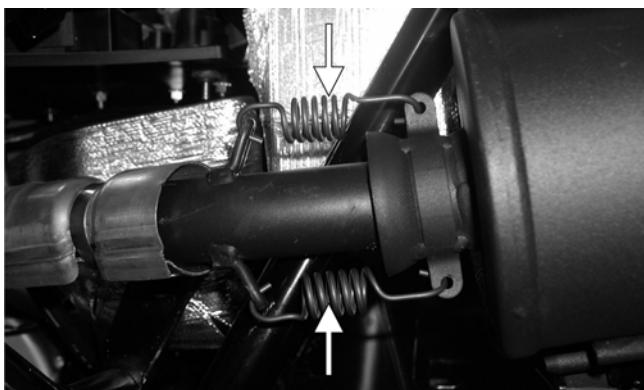


CD809

6. Secure the exhaust pipe to the engine with two cap screws; then install the muffler and the exhaust springs.



CC941



CF138A

3

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



CD515



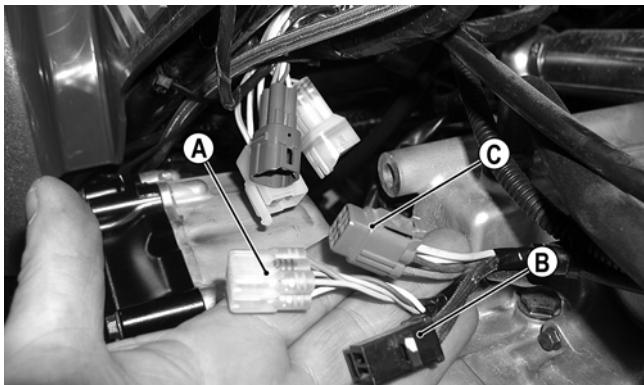
CD793

8. Secure the engine ground wire to the engine with a cap screw. Tighten to specifications.



CD810

9. Connect the gear position indicator connector (A), stator connector (B), and the CDI connector (C) to the main wiring harness.



CD797A

10. Connect the temperature sensor leads to the main wiring harness.

11. Secure the wires to the frame with nylon ties.

12. Connect the speed sensor lead to the wiring harness.

13. Secure the positive cable to the starter motor.

14. Secure all wiring to the frame and upper engine bracket with cable ties.

15. Secure the two oil hoses to the engine.

16. Secure the crankcase vent hose to the air cleaner housing; then secure the inlet boot and carburetor to the air cleaner housing.



CD787



CD785



CD793

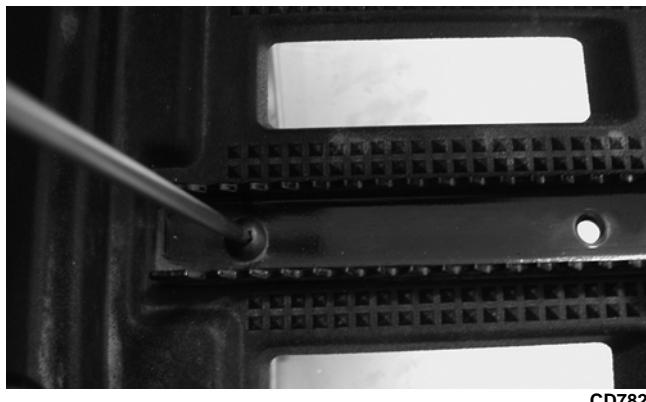
17. Secure the shift rod to the engine with a new E-clip.



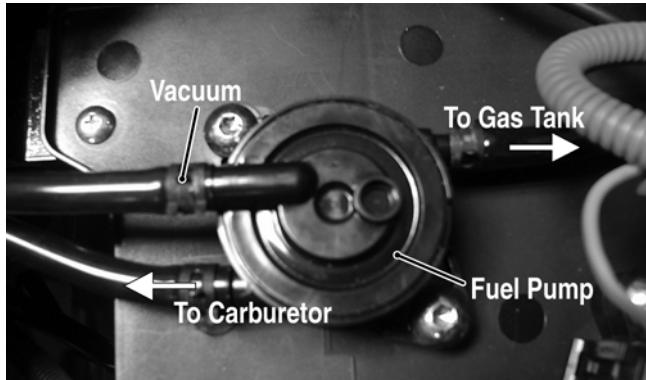
CD774

18. Install the front and rear body panels; then install the front and rear racks (see Section 8).

19. Install the left-side foot peg to the footrest. Tighten securely.



20. Connect the hose to the fuel pump; then connect the vacuum hose and secure with hose clamps.



21. Place the storage compartment into position; then install the reinstallable rivets.

22. Place the battery into position in the battery compartment; then install the battery cables and vent hose. Secure with the battery cover.

**⚠ CAUTION**

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

23. Add proper amounts of engine/transmission oil.

24. Install the seat.

**3**

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## 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 left-side cover oil seals (3), front output joint oil seal (1), rear output joint oil seal (1), and/or the oil strainer (from beneath the engine/transmission), the engine/transmission does not have to be removed from the frame.

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

### ⚠ WARNING

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

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

### ⚠ CAUTION

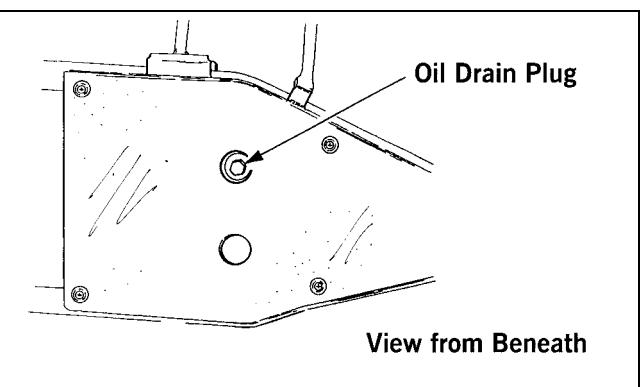
Battery acid is harmful if it contacts eyes, skin, or clothing. Care must be taken whenever handling a battery.

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

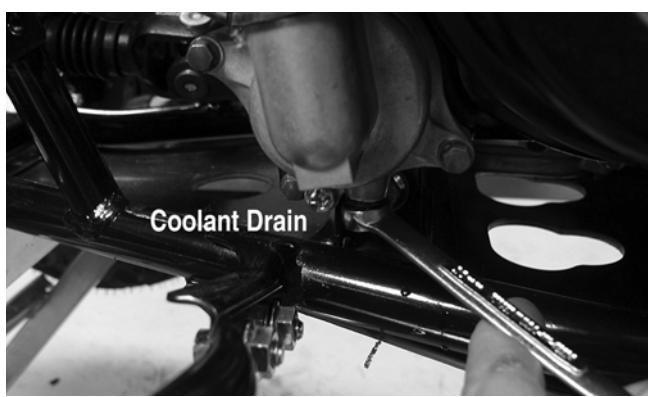


CD683A

5. Remove the instrument pod; then remove the front rack and front body panel (see Section 8).
6. Drain the oil from beneath the engine/transmission; then drain the coolant.



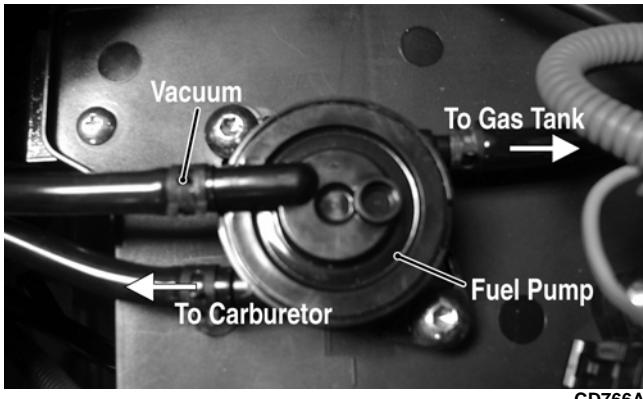
733-441A



CD799A

7. Remove the air filter (see Section 2).

8. Remove the vacuum hose and the fuel-pump-to-carburetor hose.



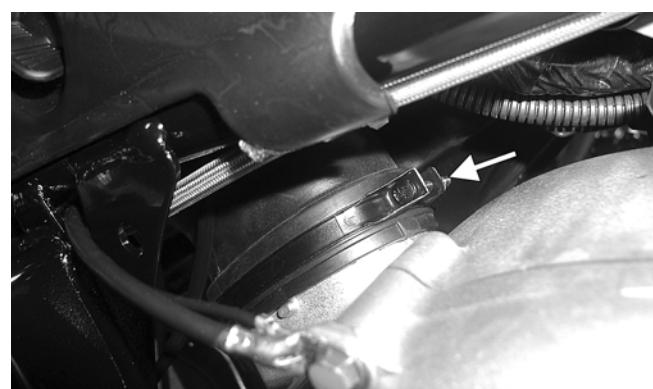
9. Loosen the clamp securing the air intake duct to the air filter housing.



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



3



12. Remove the left-side foot peg and footwell (see Section 8).

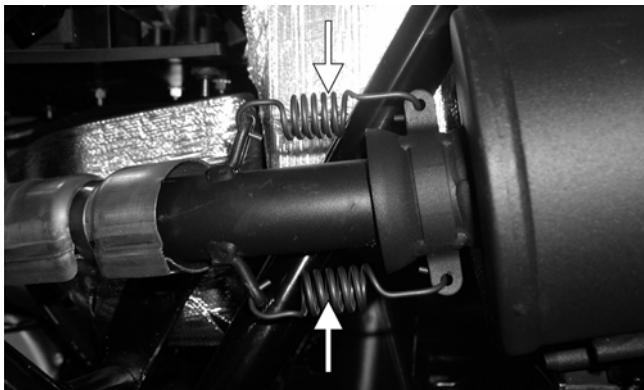


13. Secure the carburetor assembly up and away from the engine.
14. Remove the E-clip securing the shift rod to the engine shift arm; then allow the shift rod to swing forward and hang straight down from the shift lever.



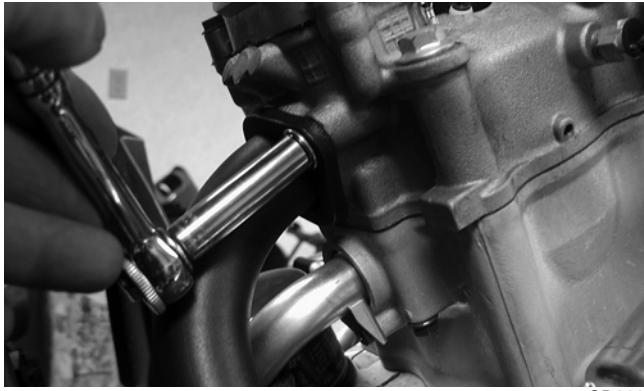
CD774

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



CF138A

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



CD803

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

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



CD805

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

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



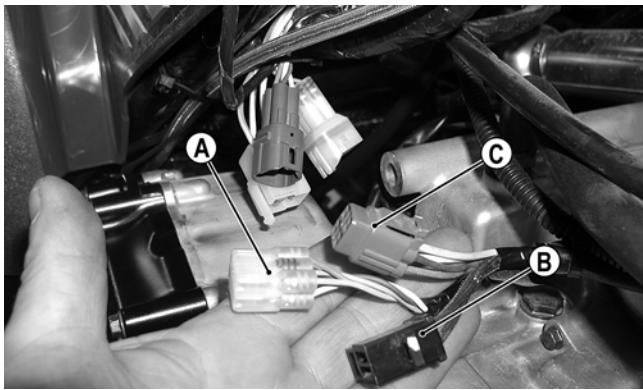
CD796

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



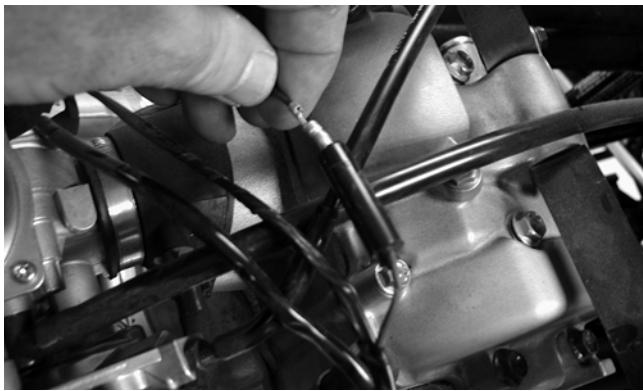
CD794

21. On the right-side, disconnect the gear position indicator connector (A), stator connector (B), and the CDI connector (C).



CD797A

22. Disconnect the temperature sensor lead from the wiring harness.



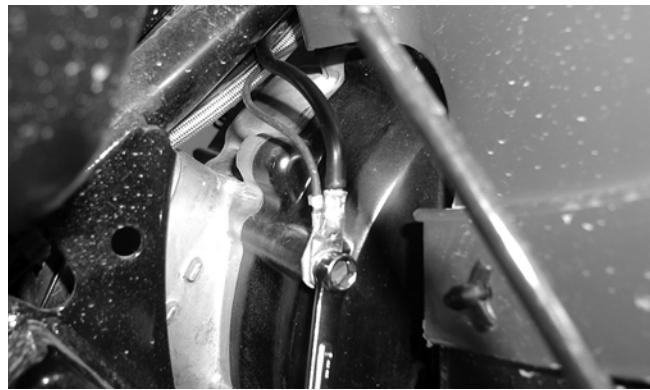
CD788

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



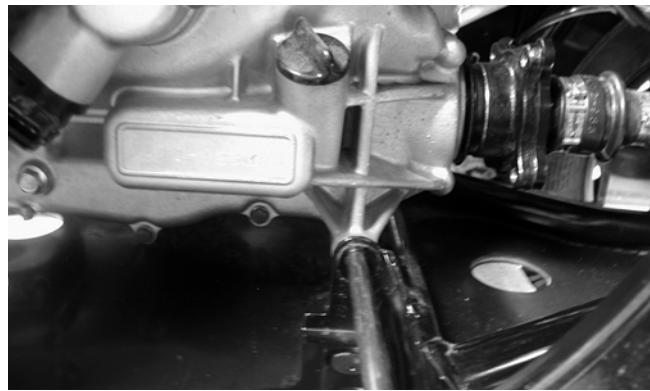
CD814

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



CD810

25. Remove the two engine mounting through-bolts. Account for a washer and a spacer on the bolts.



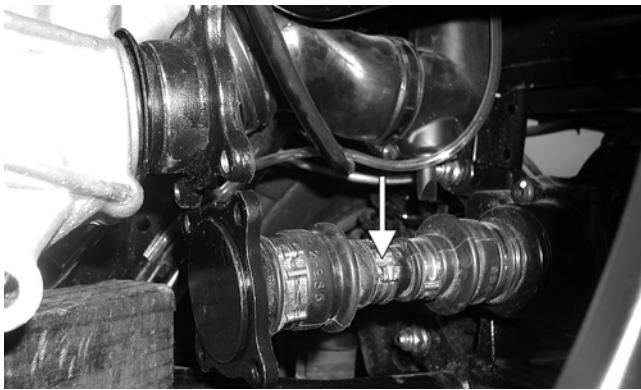
CD809

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

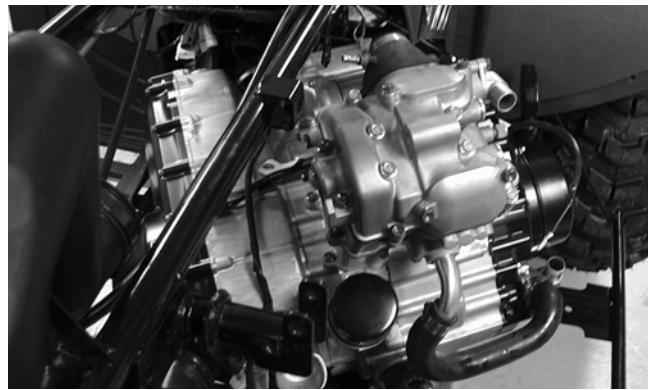


CD811

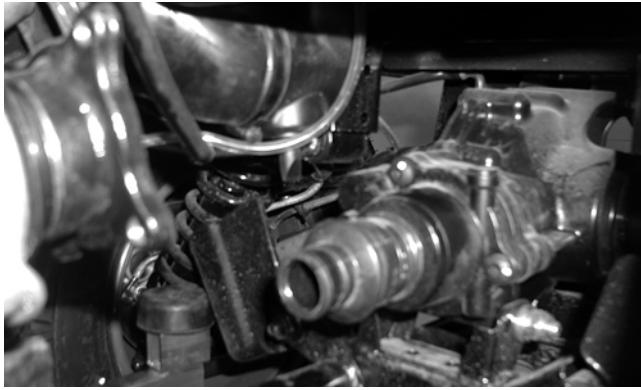
27. Remove the first small boot clamp; then remove the output flange and driveshaft from the rear drive coupler.



CD812A



CD773



CD813

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



CD818

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

## 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

### B. Cylinder Head

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

1. Remove the two tappet covers.



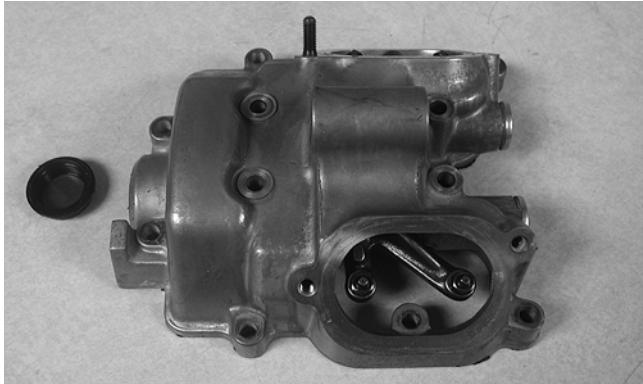
CC001D

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

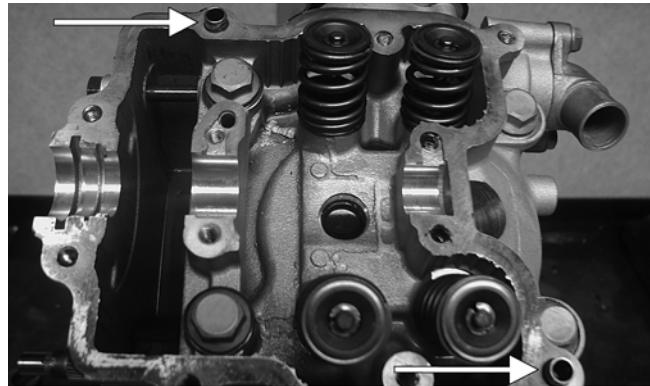
2. Remove the 12 cap screws securing the valve cover to the head; account for the four rubber washers on the top side cap screws. Remove the valve cover. Account for and note the orientation of the cylinder head plug. Note the location of two alignment pins.



CD205



CD206



CD211A

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



CC009D

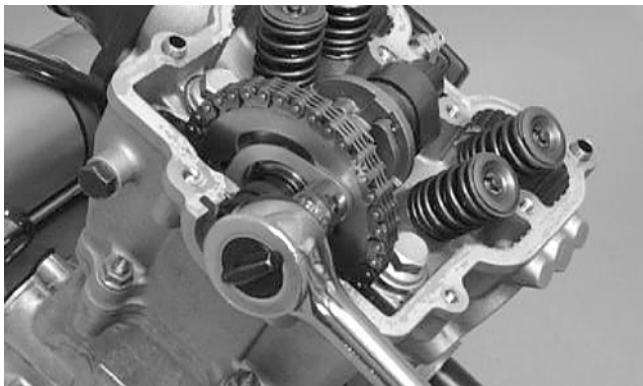
4. Using an awl, rotate the C-ring in its groove until it is out of the cylinder head; then remove the C-ring.

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



CC012D

5. Bend the washer tabs down and remove the two cap screws securing the sprocket to the cam-shaft; then drop the sprocket off the cam-shaft.



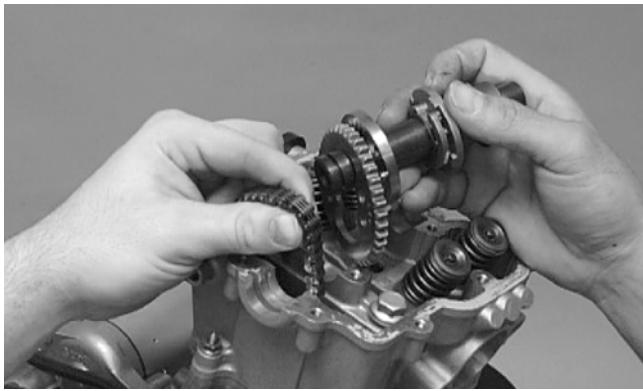
CC013D

6. Remove the cap screw securing the chain tensioner (account for a washer); then remove the tensioner.



CC014D

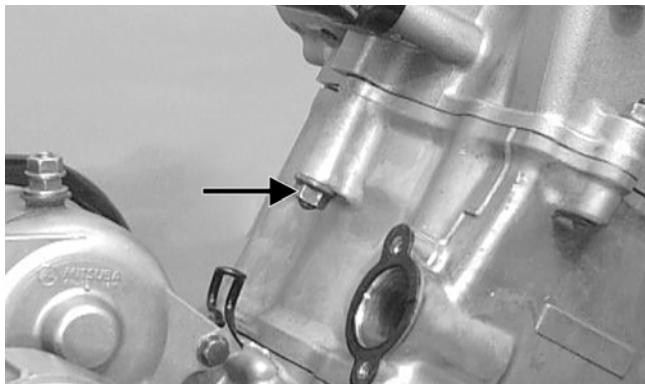
7. While holding the chain, slide the sprocket and camshaft out of the cylinder head.



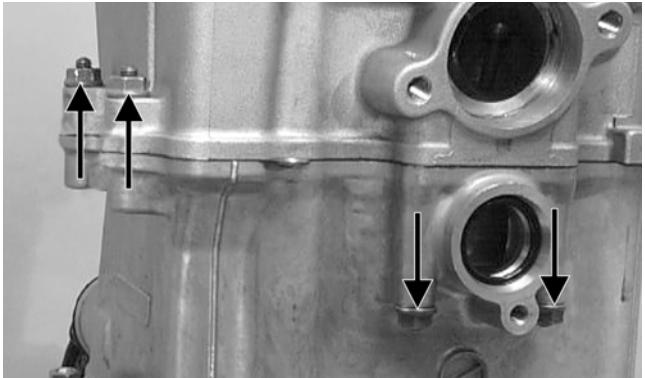
CC266D

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

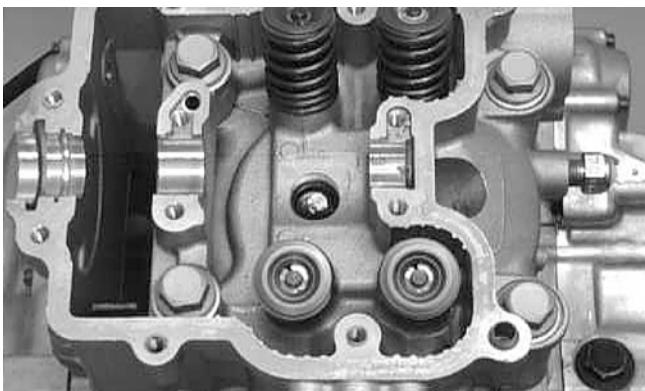
8. Remove the five nuts securing the cylinder head to the cylinder; then remove the four cylinder head cap screws with copper washers (note location of the different-sized cap screws and nuts).



CC017D

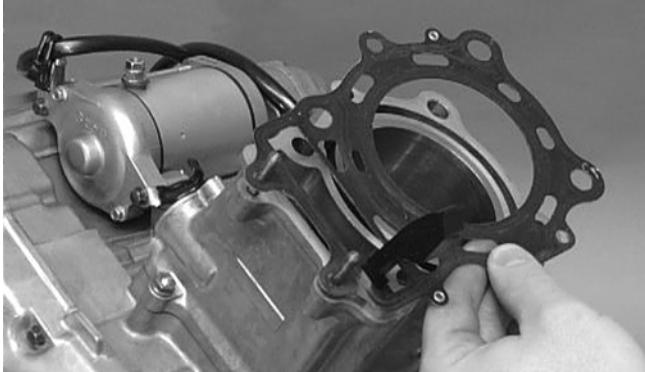


CC018D



CC016D

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



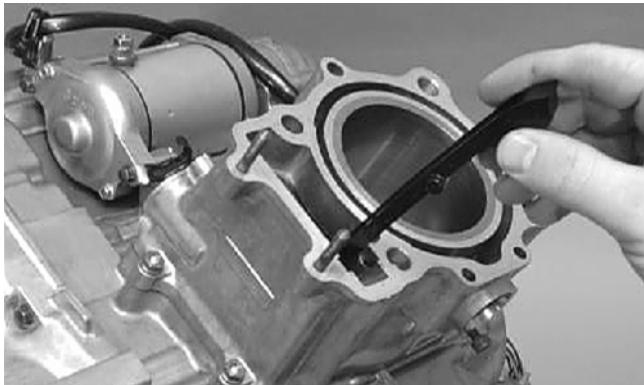
CC020D

### ☞ 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.

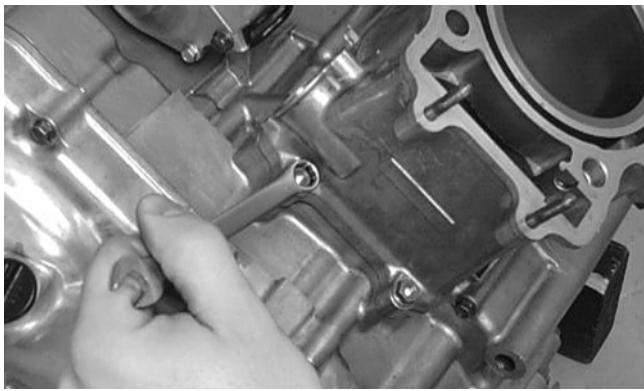


CC022D

## C. Cylinder D. Piston

■ NOTE: Steps 1-9 in the preceding sub-section must precede this procedure.

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

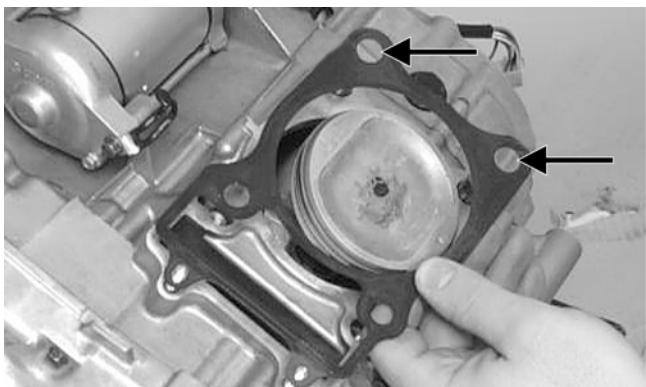


CC023D

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.

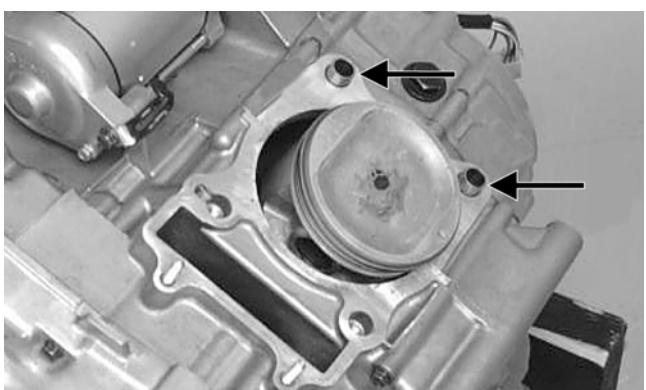


CC024D



3

CC025D



CC026D



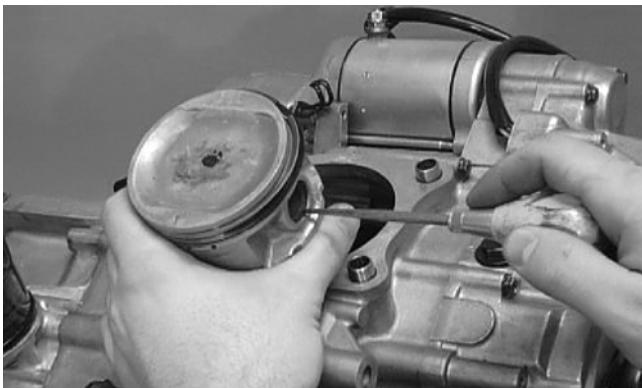
### ☞ AT THIS POINT

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.

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



CC032D

14. Using the Piston Pin Puller (p/n 0644-328), remove the piston pin. Account for the opposite-side circlip. Remove the piston.

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



CC033D

■ **NOTE:** Support the connecting rod with rubber bands to avoid damaging the rod or install the Connecting Rod Holder (p/n 0444-006).

#### **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.

■ **NOTE:** If the existing rings will not be replaced with new rings, note the location of each ring for proper installation. When replacing with new rings, replace as a complete set only. If the piston rings must be removed, remove them in this sequence.

- A. Starting with the top ring, slide one end of the ring out of the ring-groove.
- B. Remove each ring by working it toward the dome of the piston while rotating it out of the groove.

#### **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.

## **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. Recoil Starter/Outer Magneto Cover**
- B. Water Pump**
- C. Cover**
- D. Rotor/Flywheel**

■ **NOTE:** The 500 and certain 650 H1 models are equipped with a recoil starter.

1. Remove the four cap screws securing the recoil starter/outer magneto cover to the left-side cover; then remove the recoil starter/outer magneto cover. Account for the gasket.

#### **AT THIS POINT**

To service the recoil starter, see Servicing Left-Side Components sub-section.

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



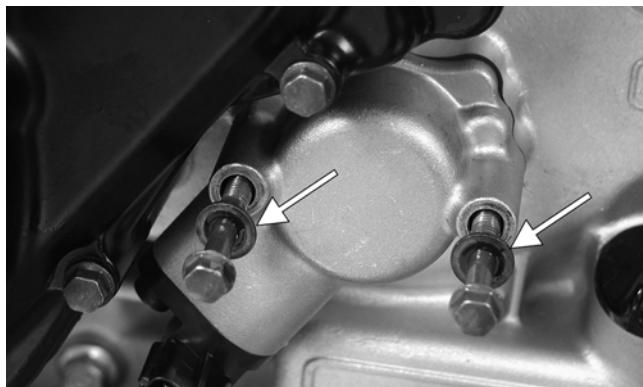
CD925A

3. Using a cold chisel, scribe a mark showing the relative position of the shift arm to the shift arm shaft to aid in installing; then remove the shift arm.



FI085A

4. Remove the two cap screws securing the speed sensor housing; then remove the housing. Account for the gasket and two seal washers.



CD920A

5. Loosen the clamps securing the coolant hose to the water pump; then remove the crossover tube from the cylinder head. Account for an O-ring.



CD214

6. Remove the two cap screws securing the water pump to the engine; then remove the water pump.

### **AT THIS POINT**

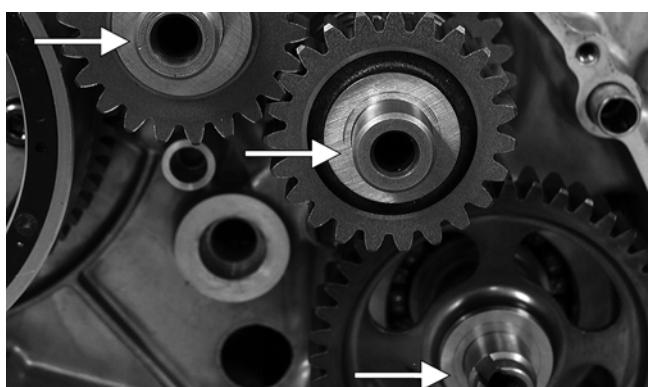
**To service the water pump, see Section 4.**

**3**

7. Remove the cap screws securing the left-side cover to the crankcase noting the location of the different-sized cap screws for installing purposes.

8. Using Side Case Puller (p/n 0644-262), remove the side cover. Account for a gasket and two alignment pins.

**■ NOTE: Inspect the inside of the left-side cover for any shaft washers that may have come off with the cover. Make sure they are returned to their respective shafts and that the starter idler gear spacer is on the shaft or in the cover.**

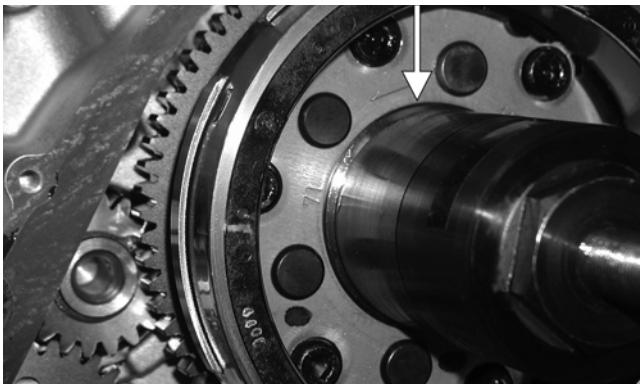


CF075A

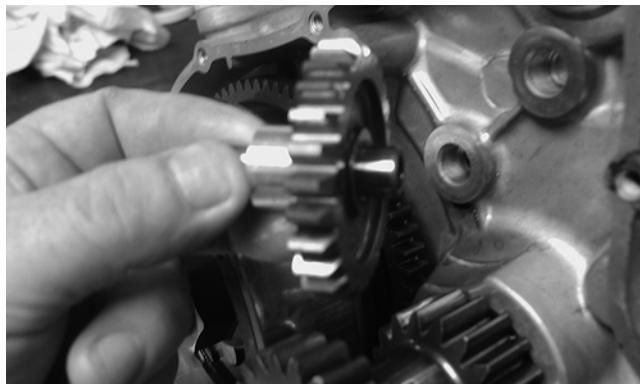
9. Remove the nut securing the magneto rotor to the crankshaft; then install the magneto rotor puller adapter.

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

10. Using Magneto Rotor Remover Set (p/n 0444-075), remove the rotor/flywheel assembly from the crankshaft. Account for the key; then remove the starter clutch gear assembly and washer.



CD939A



CD140

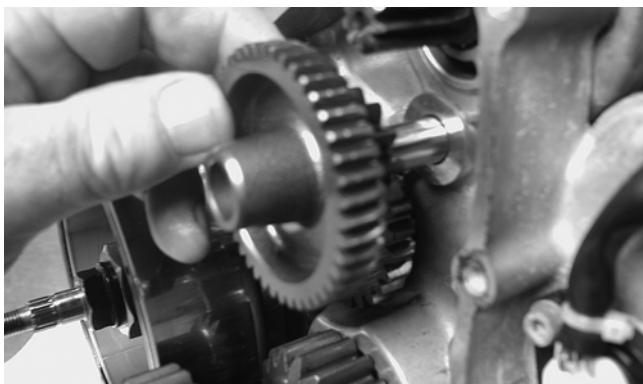


CD940A

### **AT THIS POINT**

**To service the magneto assembly, see Section 5.**

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



CD136

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



CD944

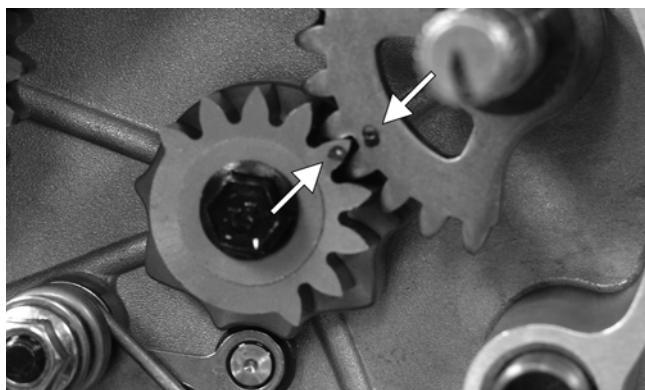
13. Remove the snap ring securing the water pump driven gear; then remove the gear noting the direction of the sides of the gear for installing purposes. Account for the driven gear alignment pin.



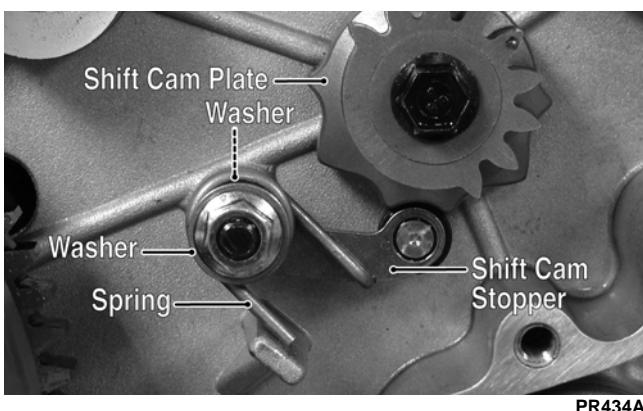
CD952A

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

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



15. Remove the gear shift cam plate; then remove the cam stopper and cam stopper spring. Account for two washers.



## 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.

3

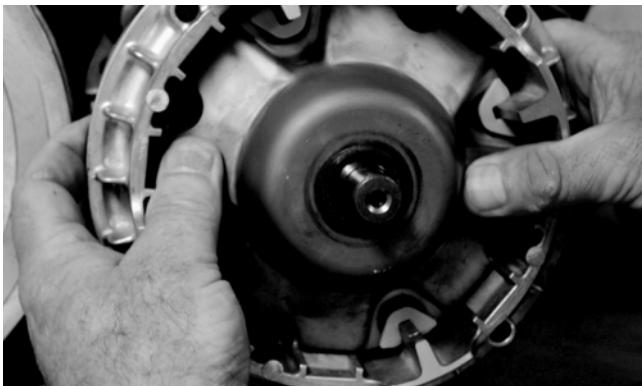
## Removing Right-Side Components

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

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.



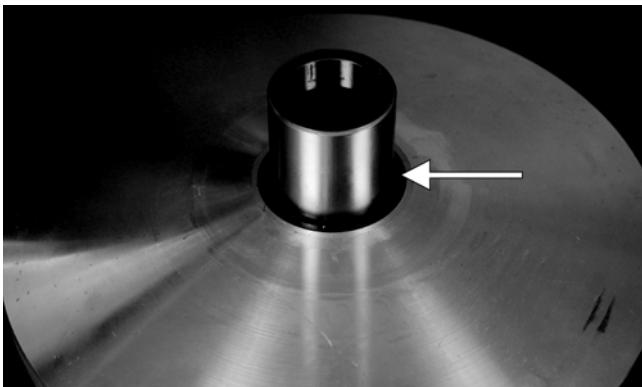
2. Remove the nut securing the movable drive face; then remove the face. Account for a spacer.



CD963



PR393



CD966A

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



PR388

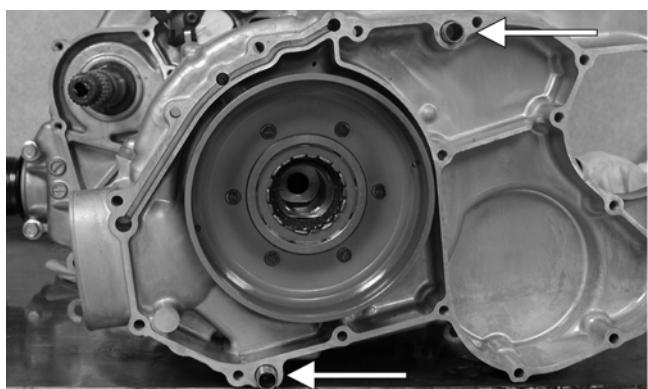
5. Remove the fixed drive face.
6. Using an impact driver, remove the cap screws securing the air intake plate; then remove the plate cushion.



CD973A

### CAUTION

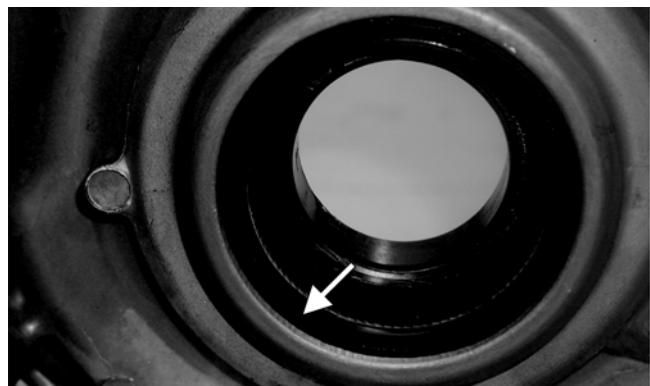
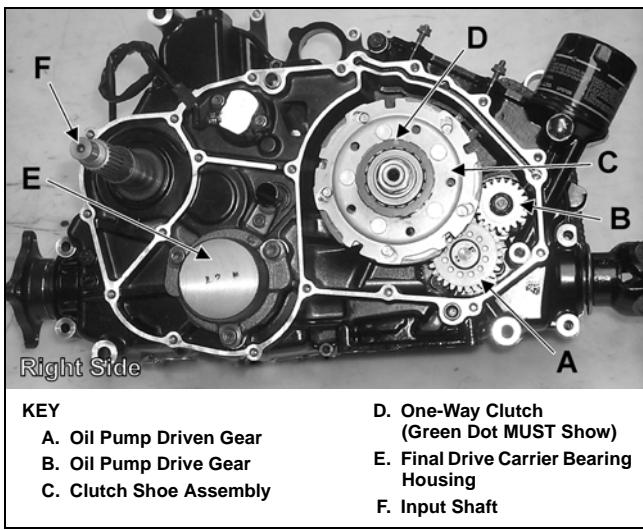
Care must be taken when removing the cover so the cover gasket is not damaged.



CD974A

■ NOTE: For steps 8-14, refer to illustration CC829B.

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

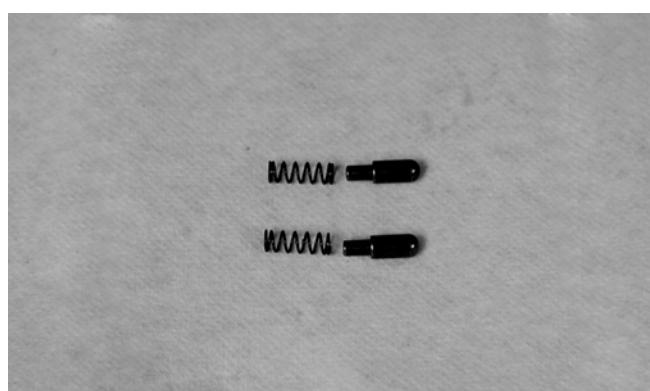


8. Remove the one-way clutch (D) from the clutch housing. Note the location of the green alignment dot (or the word OUTSIDE) for installing purposes.
9. Using a hydraulic press, remove the clutch housing assembly from the clutch cover. Account for the left fixed drive spacer and an O-ring inside the fixed drive spacer.



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

10. Remove the two Allen-head screws securing the shift indicator sensor; then remove the sensor. Account for two neutral contact pins and two springs.

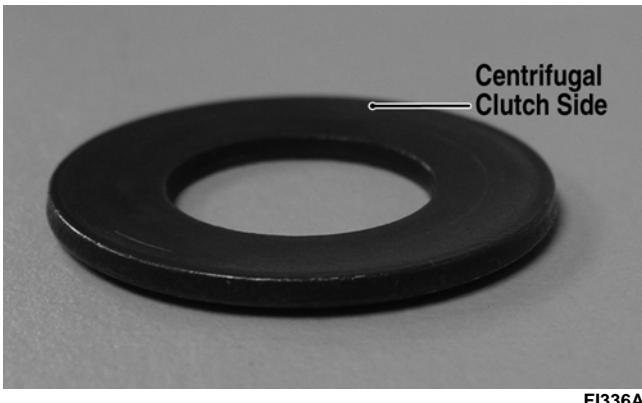


3

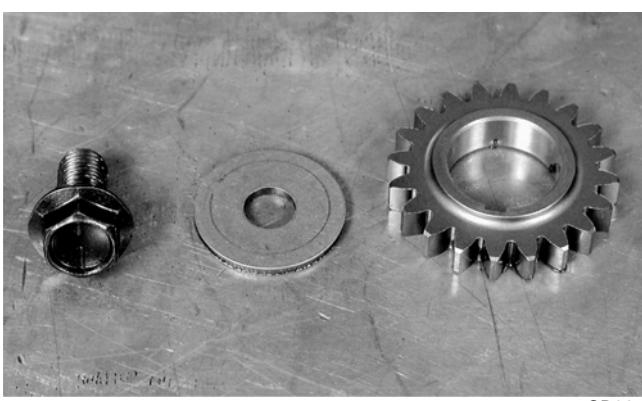
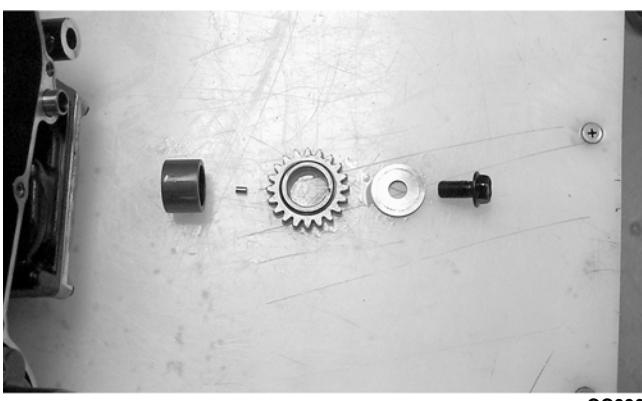
11. Remove the nut (left-hand threads) securing the clutch shoe assembly (C). Account for a washer.



■ NOTE: The washer is also directional. The flat side of the washer must face toward the centrifugal clutch assembly when installing.



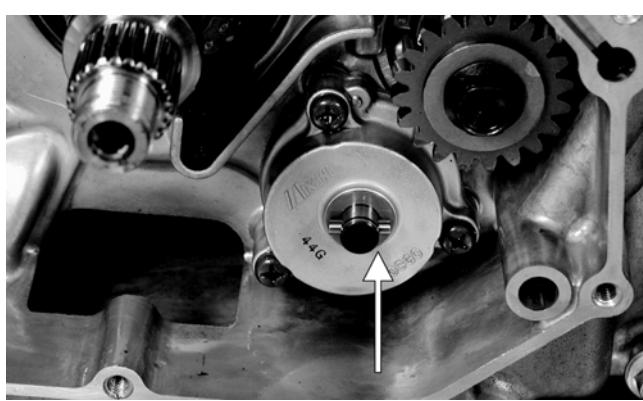
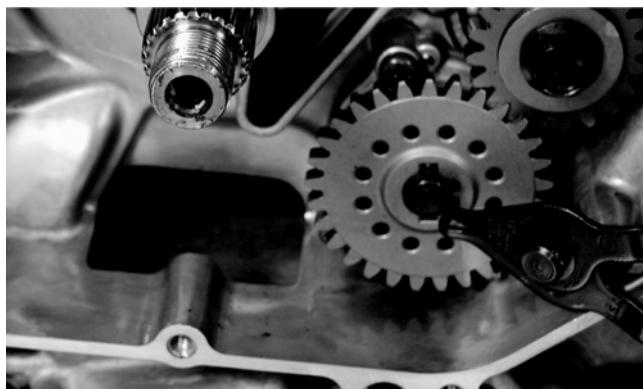
12. Remove the cap screw securing the oil pump drive gear (B). Account for a cap screw, washer, pin, and spacer.



13. Using an impact driver, remove the Allen-head screws securing the final drive carrier bearing housing (E); then remove the housing and account for two alignment pins.



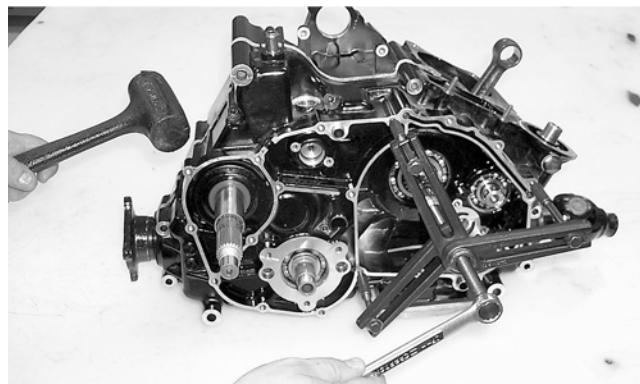
14. Remove the snap ring securing the oil pump driven gear (A); then remove the gear noting the direction of the sides of the gear for installing purposes. Account for a pin and a washer.



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



CD988



CC665

## 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

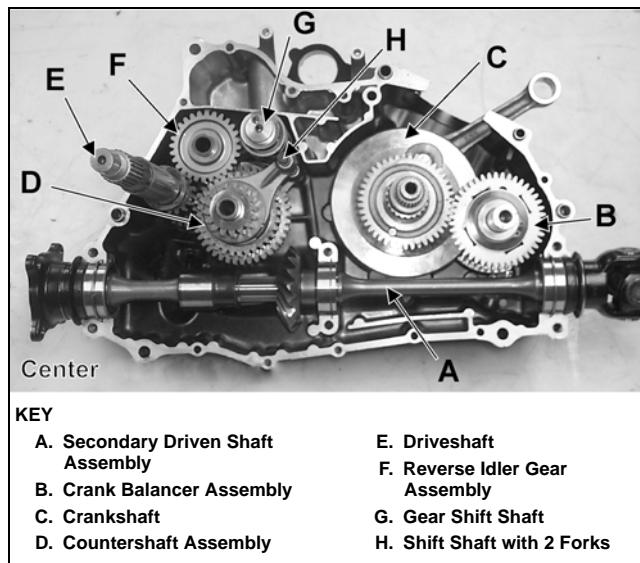
1. Remove the right-side cap screws securing the crankcase halves. Note the location of the different-lengthed cap screws.
2. Remove the left-side cap screws securing the crankcase halves. Note the location of the different-lengthed cap screws.
3. Using the Crankcase Separator/Crankshaft Remover (p/n 0444-009) 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: For steps 1-7, refer to illustration CC821B.

3



CC821B

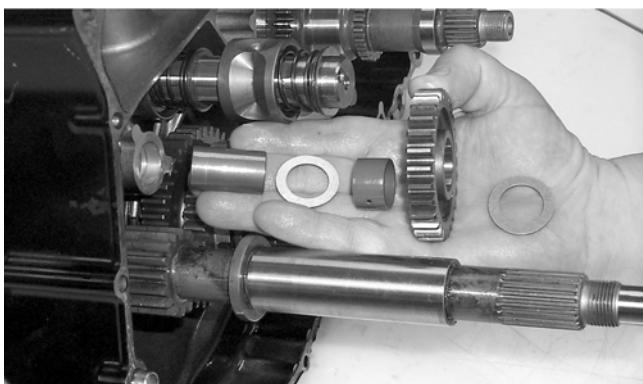
■ NOTE: To aid in installing, it is recommended that the assemblies are kept together and IN ORDER.

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



CD267

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



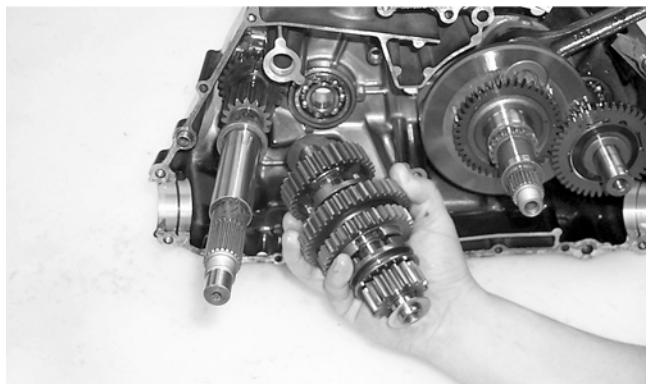
CC668

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 two washers.



PR380A

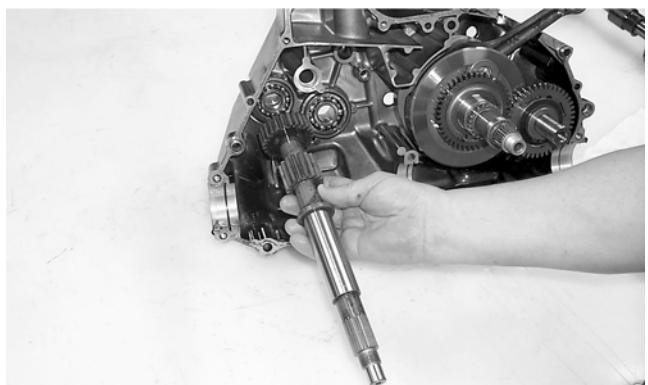
5. Remove the countershaft assembly (D). Account for a washer on each end of the countershaft.



CC674

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

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



CC675

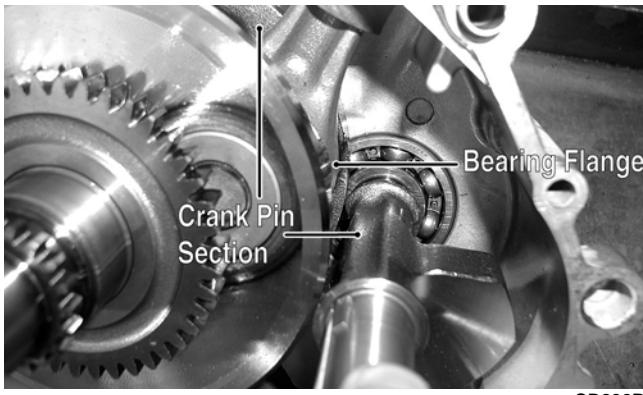
7. Note the timing marks on the crank balancer assembly (B) gear and crankshaft (C) gear for assembling purposes; then slide the crank balancer gear off the crank balancer. Account for the key in the keyway.



CD826

8. Remove the crank balancer.

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



CD832B

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

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

11. Remove the cap screws securing the oil strainer cap; then remove the cap. Account for the cap O-ring.



PR407

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



PR406

## 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.**

13. To remove the assembly, remove the nut securing the secondary drive gear and secondary driven gear; then from the inside of the crankcase using a rubber mallet, remove the output shaft assembly. Account for the output shaft, two gears, a shim, a washer, and the nut.



CC686

3

## Table of Contents (Servicing Components)

**■ NOTE: Critical engine/transmission specifications are located at the beginning of this section.**

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# Servicing Top-Side Components

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

## 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.

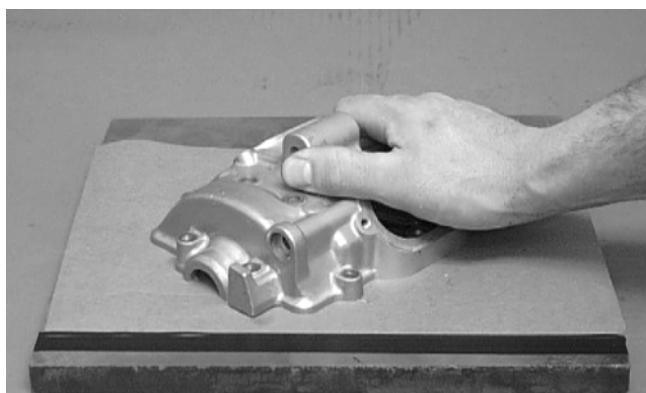
### Cleaning/Inspecting Valve Cover

■ 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 (p/n 0644-016) 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.



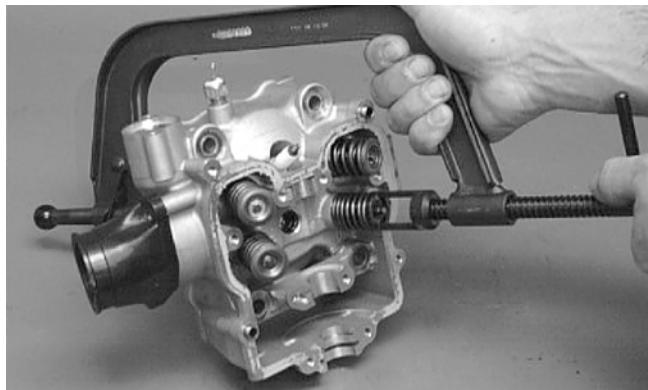
### CAUTION

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

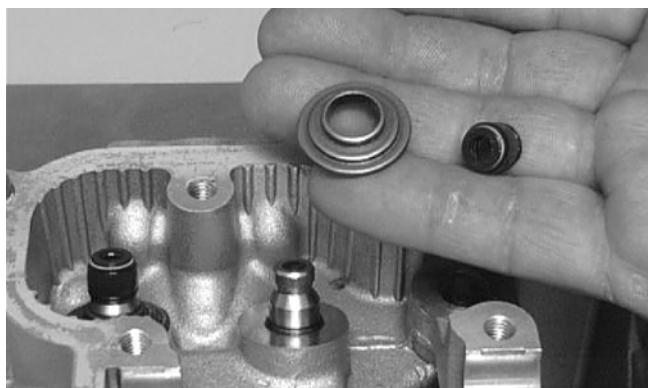
■ NOTE: Keep all valves and valve components as a set. Note the original location of each valve set for use during installation. Return each valve set to its original location during installation.

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.



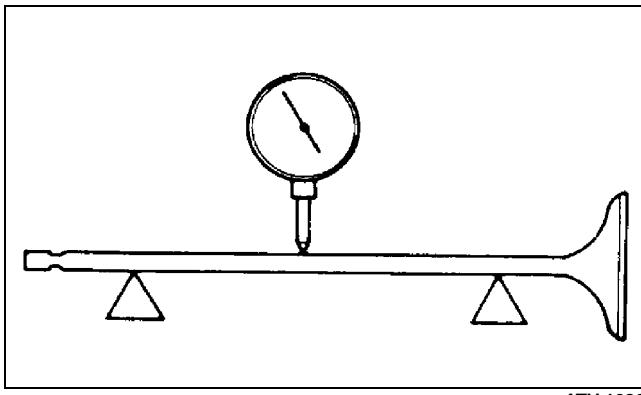
CC136D

■ NOTE: The valve seals must be replaced.

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

## Measuring Valve Stem Runout

1. Support each valve stem end with the V Blocks (p/n 0644-022); then check the valve stem runout using a dial indicator.



ATV-1082

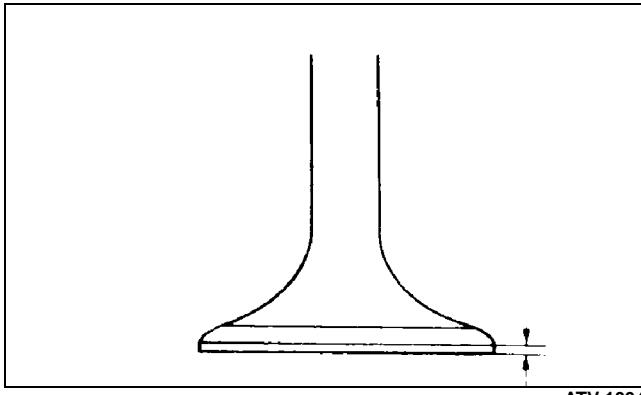
2. Maximum runout must not exceed specifications.

### **Measuring Valve Stem Outside Diameter**

1. Using a micrometer, measure the valve stem outside diameter.
2. Acceptable diameter range (intake valve) must be within specifications.
3. Acceptable diameter range (exhaust valve) must be within specifications.

### **Measuring Valve Face/Seat Width**

1. Using a micrometer, measure the width of the valve face.

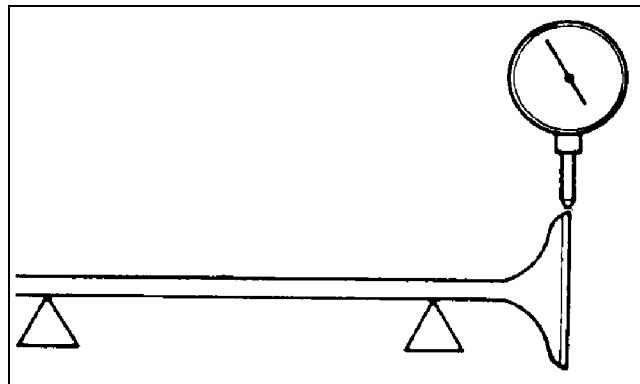


ATV-1004

2. Acceptable width range must be within specifications.

### **Measuring Valve Face Radial Runout**

1. Mount a dial indicator on the surface plate; then place the valve stem on a set of V blocks.
2. Position the dial indicator contact point on the outside edge of the valve face; then zero the indicator.



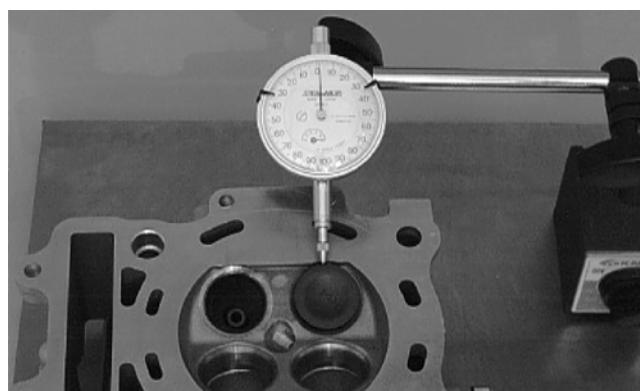
ATV1082A

3. Rotate the valve in the V blocks.
4. Maximum runout must not exceed specifications.

### **Measuring Valve Guide/Valve Stem Deflection (Wobble Method)**

3

1. Mount a dial indicator and base on the surface plate; then place the cylinder head on the surface plate.
2. Install the valve into the cylinder head; then position the dial indicator contact point against the outside edge of the valve face. Zero the indicator.



CC131D

3. Push the valve from side to side; then from top to bottom.
4. Maximum "wobble" deflection must not exceed specifications.

### **Measuring Valve Guide (Inside Diameter)**

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.

## Measuring Rocker Arm (Inside Diameter)

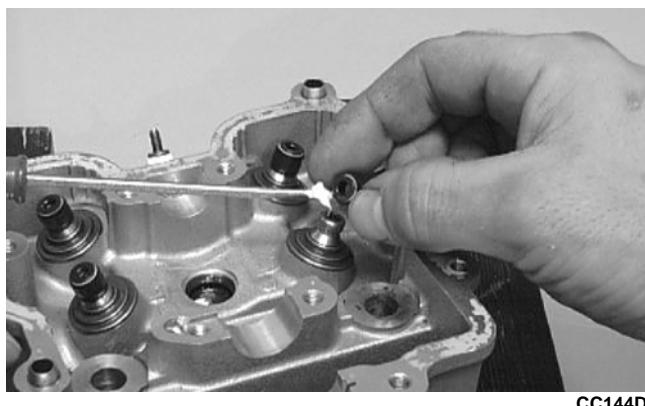
1. Using a dial calipers, measure the inside diameter of the rocker arm.
2. Acceptable inside diameter range must be within specifications.

## Measuring Rocker Arm Shaft (Outside Diameter)

1. Using a micrometer, measure the outside diameter of the rocker arm shaft.
2. Acceptable outside diameter range must be within specifications.

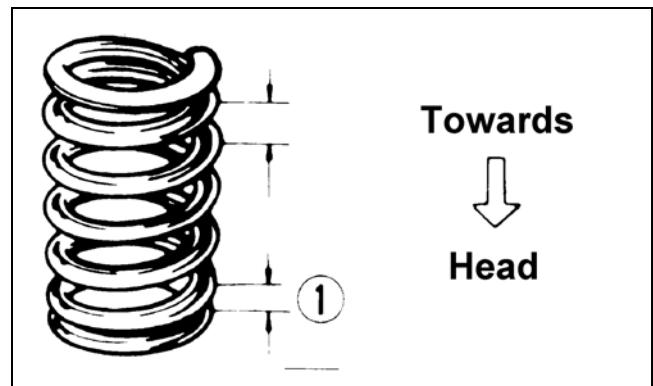
## Installing Valves

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.



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

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



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



## PISTON ASSEMBLY

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

## Cleaning/Inspecting Piston

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the dome of the piston.
2. Inspect the piston for cracks in the piston pin, dome, and skirt areas.
3. 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.**

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

## Removing Piston Rings

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



CC400D

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

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

## Cleaning/Inspecting Piston Rings

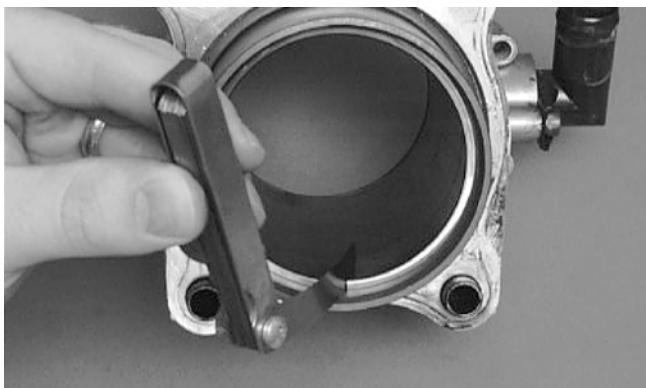
1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

### CAUTION

Improper cleaning of the ring-grooves by the use of the wrong type of ring-groove cleaner will result in severe damage to the piston.

## 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 be within specifications.

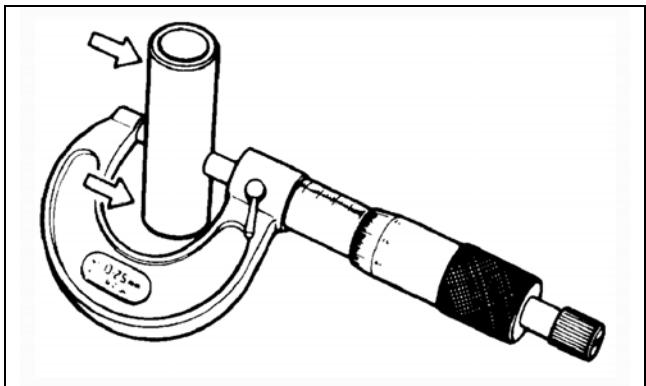


CC280D

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

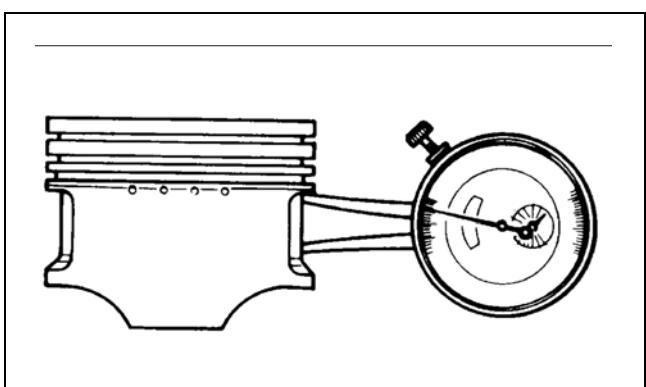
1. Measure the piston pin outside diameter at each end and in the center. If measurement is not within specifications, the piston pin must be replaced.

3



ATV-1070

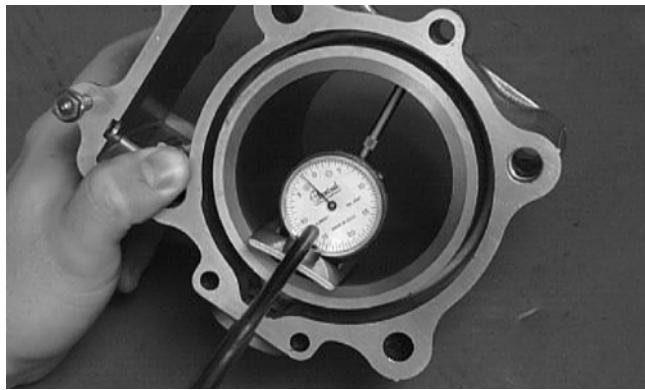
2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



ATV-1069

## Measuring Piston Skirt/ Cylinder Clearance

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

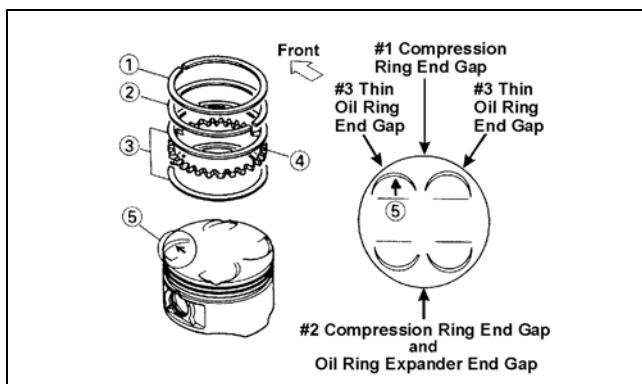


CC127D

- Measure the corresponding piston diameter at a point 15 mm (0.6 in.) above the piston skirt at a right angle to the piston-pin bore. Subtract this measurement from the measurement in step 1. The difference (clearance) must be within specifications.

## Installing Piston Rings

- 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.

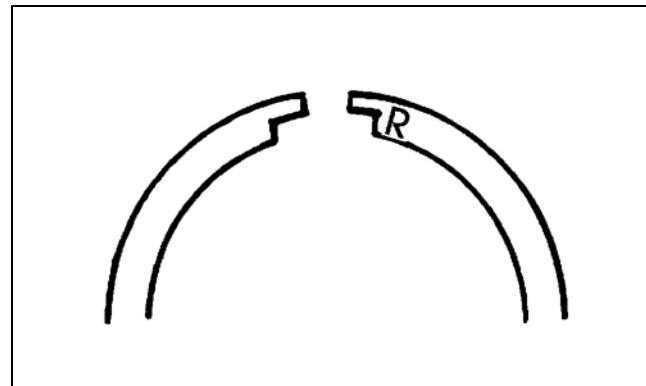


ATV-1085B

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

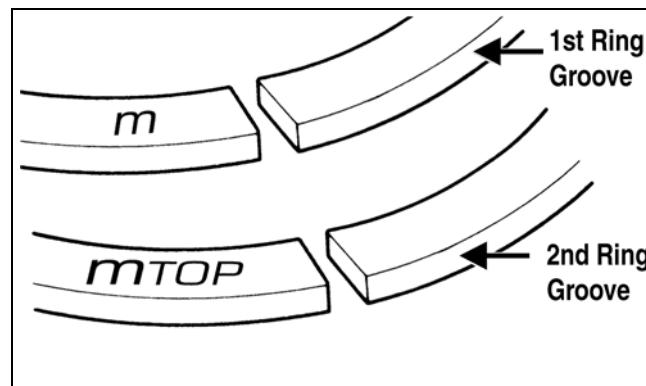
- On the 500, install the compression rings (1 and 2) so the letter on the top surface of each ring faces the dome of the piston. Rotate the rings until the ring end gaps are on directly opposite sides of the piston (see illustration).

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



726-306A

- On the 650 H1, the ring with the orientation mark (MTOP) should be installed in the second (middle) groove and the ring with the orientation mark (M) should be installed in the first (top) groove.



ATV-1024A

## 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.

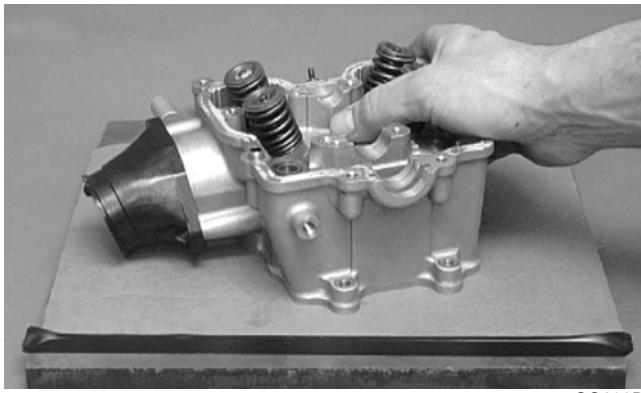
- Using a non-metallic carbon removal tool, remove any carbon buildup from the combustion chamber being careful not to nick, scrape, or damage the combustion chamber or the sealing surface.

- 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

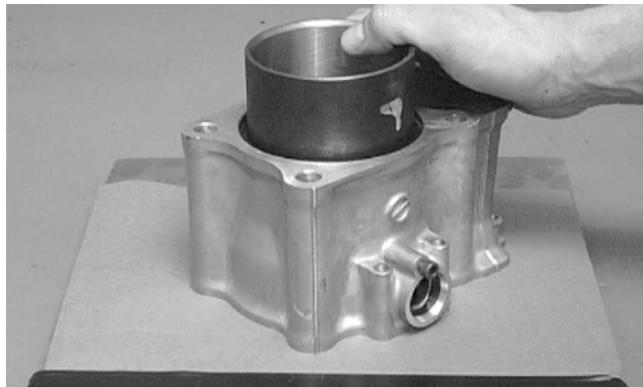
1. Wash the cylinder in parts-cleaning solvent.

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.



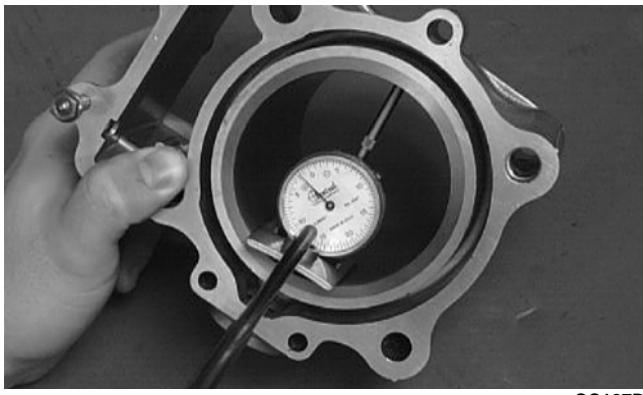
3

### Inspecting Cam Chain Guide

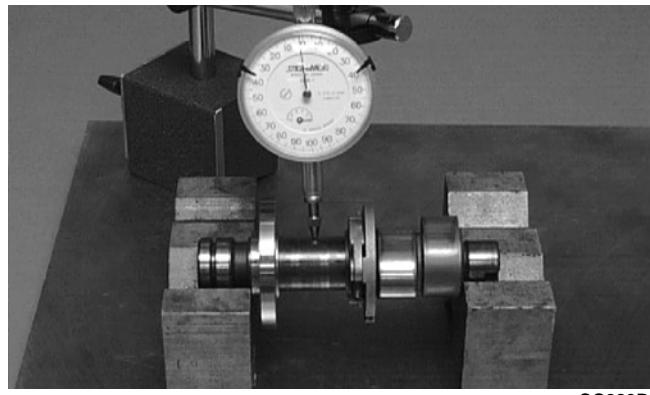
1. Inspect cam chain guide for cuts, tears, breaks, or chips.
2. If the chain guide is damaged, it must be replaced.

### Honing Cylinder

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



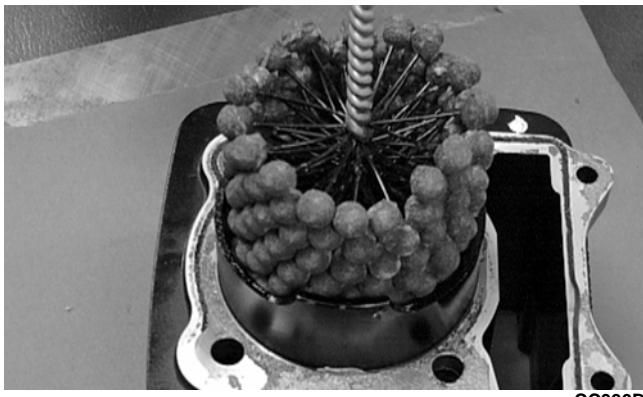
CC127D



CC283D

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 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

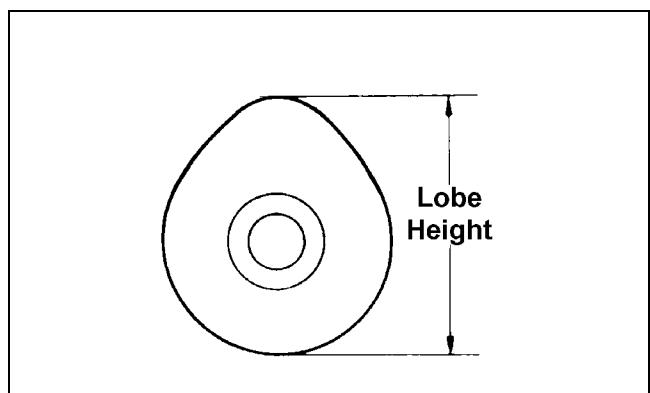
**■ NOTE:** If the camshaft is out of tolerance, it must be replaced.

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

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

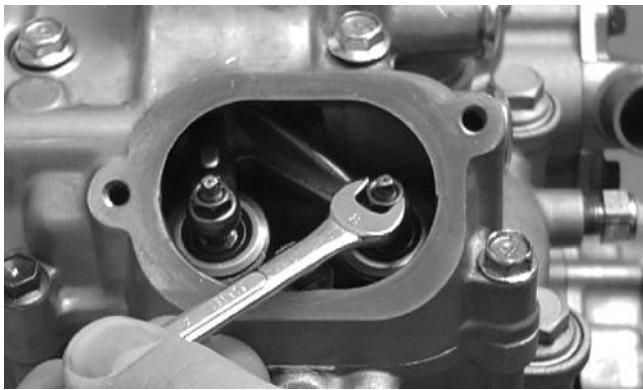
2. The lobe heights must not exceed minimum specifications.

### 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.

### Measuring Camshaft to Cylinder Head Clearance

1. Remove the adjuster screws and jam nuts.

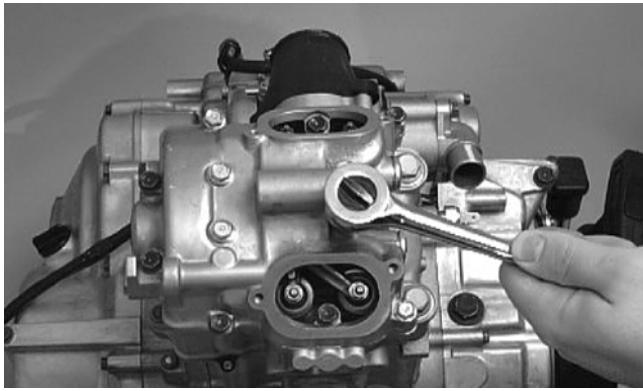


CC005D

2. Place a strip of plasti-gauge in each of the cam-shaft lands in the cylinder head.
3. Place the valve cover on the cylinder head and secure with the valve cover cap screws. Tighten securely.

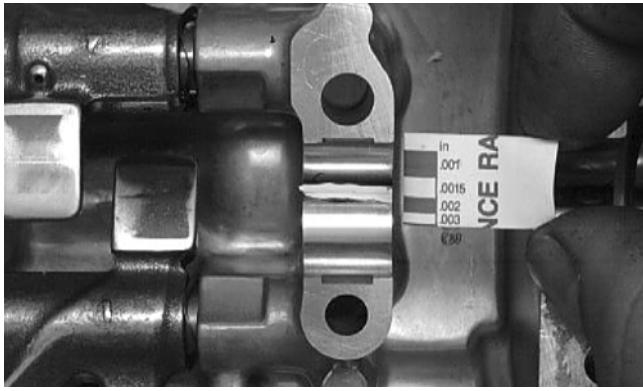
**■ NOTE: Do not rotate the camshaft when measuring clearance.**

4. Remove the cap screws securing the valve cover to the cylinder; then remove the valve cover and camshaft.



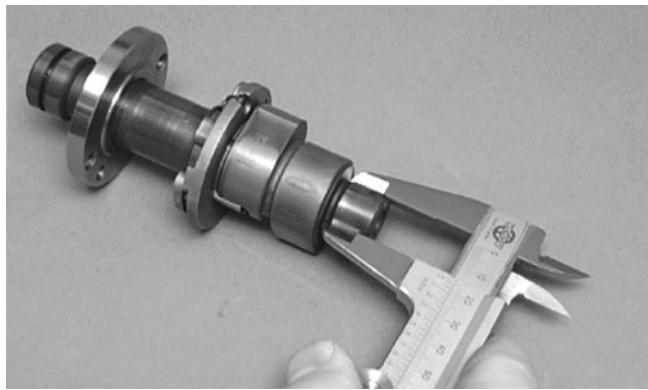
CC003D

5. Match the width of the plasti-gauge with the chart found on the plasti-gauge packaging to determine camshaft to cylinder head and valve cover clearance.



CC145D

6. If clearance is excessive, measure the journals of the camshaft.



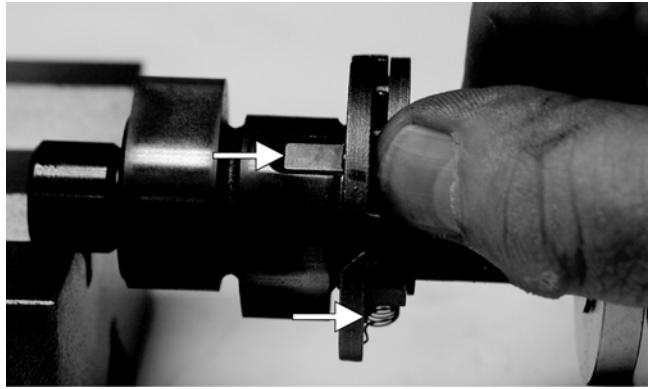
CC287D

**■ NOTE: If the journals are worn, replace the cam-shaft; then measure the clearance again. If it is still out of tolerance, replace the cylinder head.**

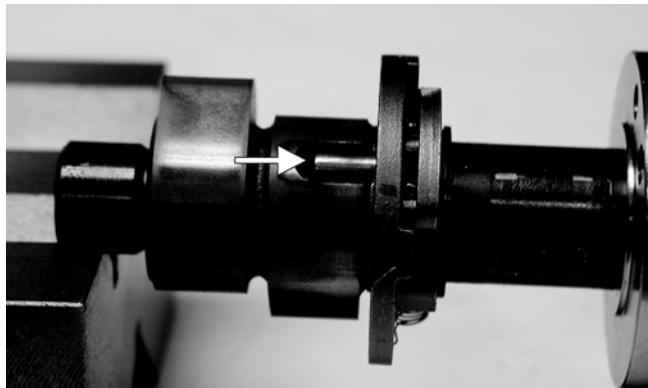
### Inspecting Camshaft Spring/Drive Pin

3

1. Inspect the spring and drive pin for damage.



CF061A

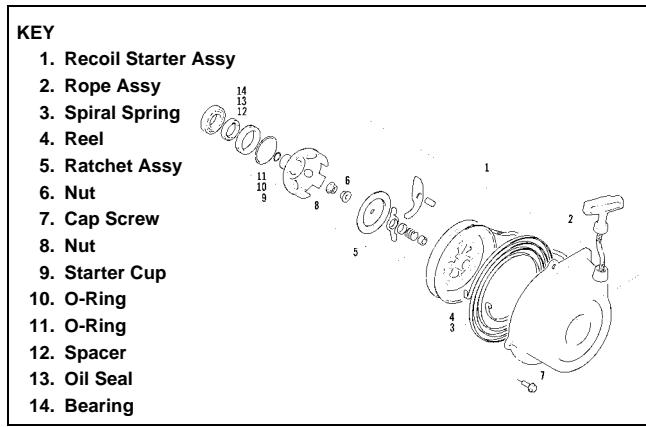


CF060A

2. If damaged, the camshaft must be replaced.

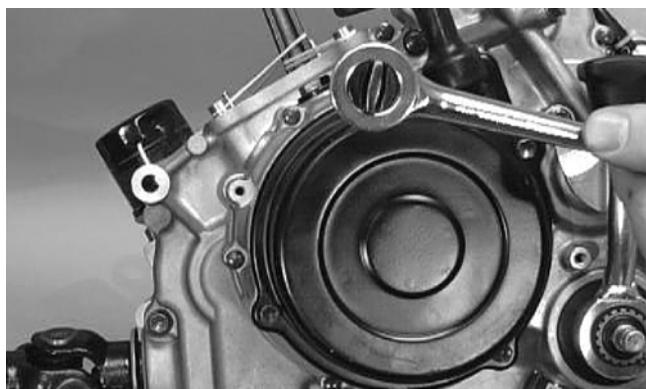
# Servicing Left-Side Components

## RECOIL STARTER



### Removing/Disassembling

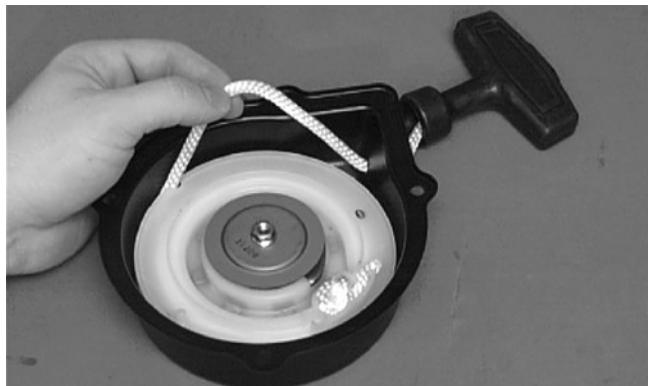
1. Remove the cap screws securing the recoil starter assembly to the left-side cover; then remove the starter.



#### **⚠ WARNING**

During the disassembly procedure, continuous downward pressure must be exerted on the reel so it does not accidentally disengage and cause injury.

2. Rotate the reel counterclockwise until the notch of the reel is near the rope guide in the case. Guide the rope into the notch and slowly allow the reel to retract until all spiral spring tension is released.



#### **⚠ CAUTION**

During the disassembly procedure, make sure all spring tension is released before continuing.

3. Remove the nut.



4. Slowly release the friction plate and lift the plate with ratchet guide free of the recoil case; then remove the ratchet guide from the friction plate.



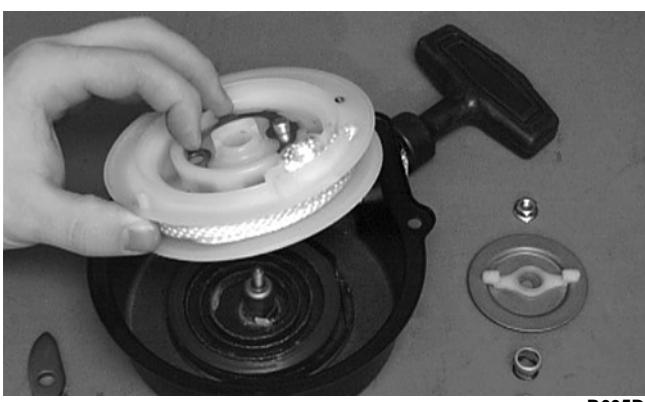
5. Remove the spring, collar, and friction spring.



6. Remove the ratchet and account for the pin.



7. Carefully lift the reel from the case making sure the spiral spring does not accidentally disengage from the case.



### ⚠ WARNING

Care must be taken when lifting the reel free of the case. Wear safety glasses to avoid injury.

8. Remove the protective cover from the starter handle and pull the rope out of the handle; then untie the knot in the rope and remove the handle.

■ NOTE: Do not remove the spiral spring unless replacement is necessary. It should be visually inspected in place to save time. If replacement is necessary, follow steps 9-10.

9. Remove the spring from the case by lifting the spring end up and out. Hold the remainder of the spring with thumbs and alternately release each thumb to allow the spring to gradually release from the case.

10. Unwind the rope from the reel and remove the rope.

## Cleaning and Inspecting

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

1. Clean all components.
2. Inspect the springs and ratchet for wear or damage.
3. Inspect the reel and case for cracks or damage.
4. Inspect the shaft for wear, cracks, or damage.
5. Inspect the rope for breaks or fraying.
6. Inspect the spiral spring for cracks, crystallization, or abnormal bends.
7. Inspect the handle for damage, cracks, or deterioration.

3

## Assembling/Installing

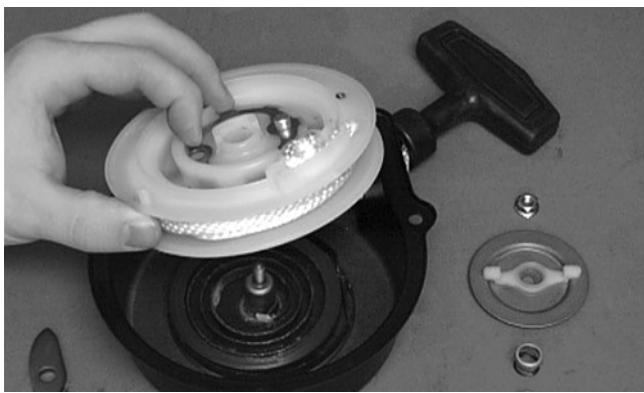
1. If removed, insert the spiral spring into the case with the outer end of the spring around the mounting lug in the case; then wind it in a counterclockwise direction until the complete spring is installed.

■ NOTE: The spiral spring must seat evenly in the recoil case.



2. Insert the rope through the hole in the reel and tie a knot in the end; then wrap the rope counterclockwise around the reel leaving approximately 50 cm (20 in.) of rope free of the reel.

3. Apply low-temperature grease to the spring and hub.
4. Thread the end of the rope through the guide hole of the case; then thread the rope through the handle and secure it with a double knot. Install the protective cover into the handle.
5. Align the inner hook of the spiral spring with the notch in the reel.



B602D

6. Install the ratchet making sure the end is properly installed on the reel.



B603D

7. Install the friction spring and the spring cover.



B604D

8. Install the friction plate with the ratchet guide fitting into the ratchet.



B601D

9. While pushing down on the reel, install the nut. Tighten securely.

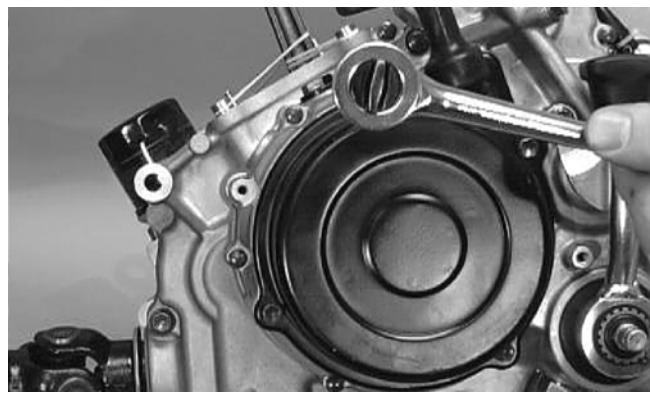


B602D

10. With the 50 cm (20 in.) of rope exposed, hook the rope in the notch of the reel.
11. Rotate the reel four turns counterclockwise; then release the rope from the notch and allow the rope to retract.
12. Pull the rope out two or three times to check for correct tension.

**■ NOTE: Increasing the rotations in step 11 will increase spring tension.**

13. Place the recoil starter assembly into position on the left-side cover; then tighten the cap screws to specifications.



CC039D

## Servicing Right-Side Components

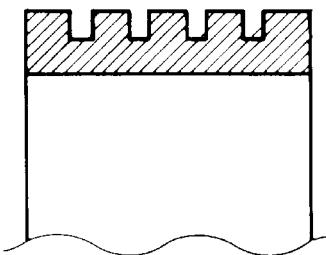
**■ NOTE:** Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.

### 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 complete set.

#### ⚠ CAUTION

Always replace the clutch shoes as a complete set or severe imbalance could occur.



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

3

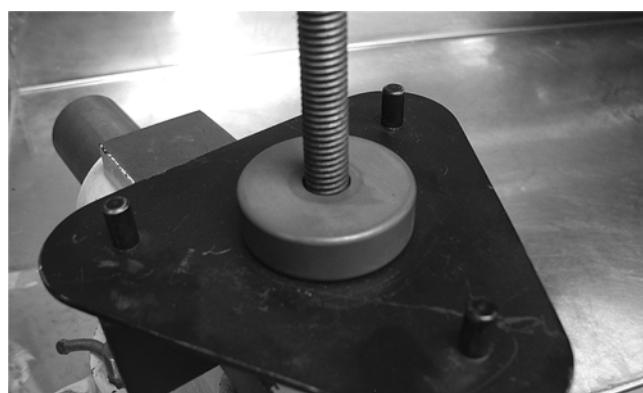
### DRIVEN PULLEY ASSEMBLY

#### Disassembling

#### ⚠ WARNING

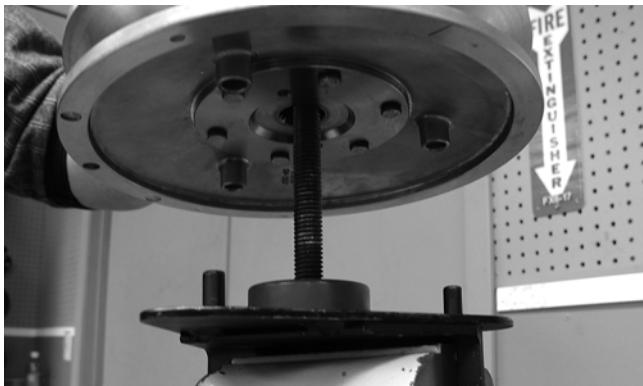
This procedure involves relaxing a compressed spring assembly. DO NOT attempt disassembling without the proper tools.

1. Secure Driven Pulley Compressor (p/n 0444-121) in a suitable holding fixture such as a bench vise; then remove the wing nut, holding handle, flat washer, and pilot bushing leaving the large spacer on the compressor tool base.



CD047

2. Place the driven pulley assembly onto the compressor tool base engaging the dowel pins into appropriate holes in the fixed face of the assembly.



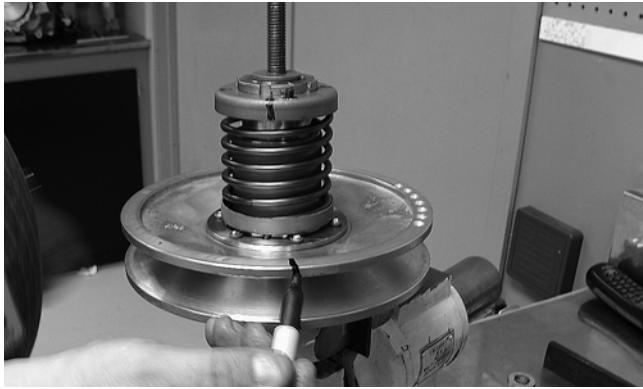
CD048

3. Install the pilot bushing with the machined end directed down; then fit the bushing into the pulley hub.



CD067

4. Using a suitable marking pen, make alignment marks on the fixed face spring holder and both pulley faces.



CD049

5. Place the holding handle on the spring holder fitting the two dowel pins into the spring holder face; then install a flat washer and the wing nut. Turn the wing nut down until resistance is felt.

■ **NOTE: Do not use the wing nut to compress the spring further.**



CD050

## ⚠ WARNING

The spring assembly is under pressure. Extreme care must be taken when relaxing the spring. Always wear safety glasses. Use proper tools only.

6. Using a spanner and suitable breaker bar, loosen the notched-ring nut; then spin the nut free of the hub.



CD051

7. Firmly hold the handle and slowly turn the wing nut counterclockwise to relax the spring.

■ **NOTE: There will be a tendency for the handle to rotate clockwise approximately  $\frac{1}{4}$  turn as the spring holder clears the flats or hub. This is due to a slight counterclockwise preload on the spring.**



CD052

8. Release the preload slowly; then continue to relax the spring until the wing nut is flush with the end of the threads.
9. Firmly holding the spring and spring holder, remove the wing nut; then remove the spring.



CD053

10. Using a thin pry-bar or screwdriver, work the movable face sleeve upward and free of the O-rings; then remove the sleeve.



CD054

11. Remove the four pins and spacers from the cam slots in the movable face; then remove the movable face.



CF091



CD056

## Inspecting

1. Inspect the pulley faces for wear, galling, or grooving.
2. Inspect the O-rings on the movable face for nicks, tears, or swelling.

3



CF092A

3. Inspect two grease seals in the movable face for nicks, cuts, or damage.



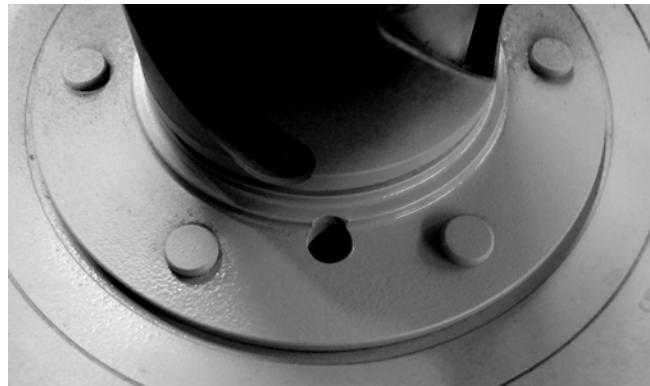
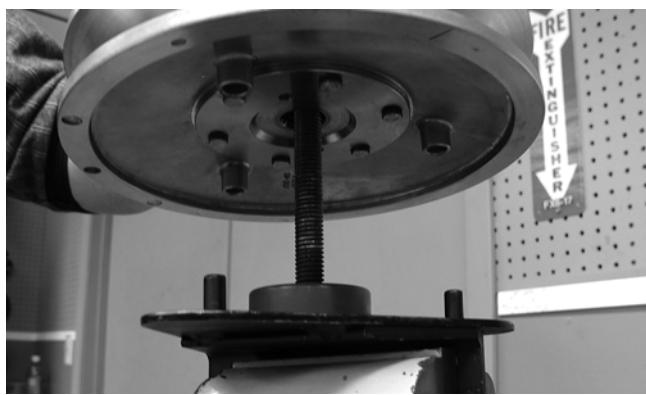
CF095A

4. Inspect the pins and bushings for wear, flat spots, looseness, or cracking.

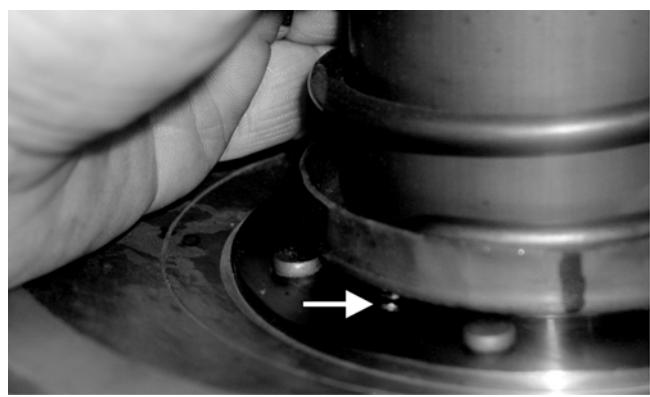
## Assembling

1. Place the fixed face of the driven pulley on the pulley compressor base making sure the dowel pins are engaged in the appropriate holes in the pulley face.

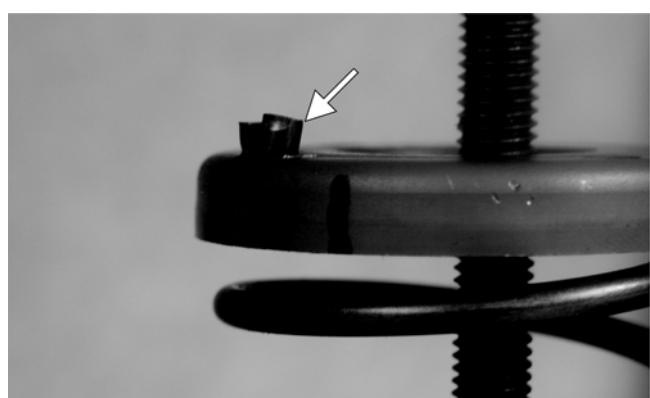
■ **NOTE:** Make sure the spacer is on the base or damage to the fixed face will occur when the spring is compressed.



2. Apply multi-purpose grease to the O-rings and grease seals on the movable face; then install on the fixed face making sure the alignment marks are properly aligned.



3. Install the four pins and spacers into the fixed face hub; then pack the cam slots in the movable face with multi-purpose grease.



4. Install the movable face sleeve aligning the hole in the spring seat with the spring anchor hole in the movable face.

7. Assemble the notched-ring nut, spring holding handle, one flat washer, and the wing nut in order on the pulley compressor bolt; then thread the wing nut onto the bolt.



CD052

8. Compress the spring until the spring holder nears the threads on the fixed face hub; then using the handle, wind the spring holder counterclockwise to align the flats of the spring holder and hub.



CD052A

9. Continue compressing the spring while guiding the spring holder onto the hub. When a slight resistance is felt, stop turning the wing nut.
10. Install the nut (threads coated with red Loctite #271); then tighten the nut to specification using the spanner and a torque wrench.



CD066

11. Remove the wing nut, washer, and holding handle; then remove the driven pulley from the pulley compressor.

## Servicing Center Crankcase Components

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

### 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.

3

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 dial indicator so the tip is contacting a tooth on the secondary driven bevel gear.
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.

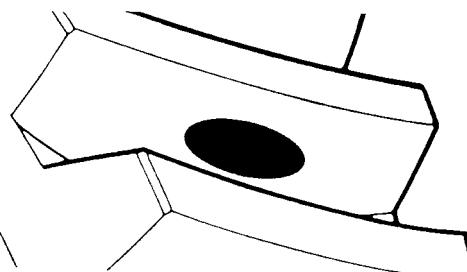
Backlash Measurement	Shim Correction
Under 0.05 mm (0.002 in.)	Decrease Shim Thickness
At 0.05-0.33 mm (0.002-0.013 in.)	No Correction Required
Over 0.33 mm (0.013 in.)	Increase Shim Thickness

## 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.

Correct



ATV-0104

## Correcting Tooth Contact

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

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

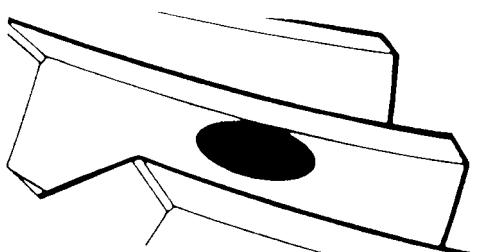
Tooth Contact	Shim Correction
Contacts at Top	Decrease Shim Thickness
Contacts at Root	Increase Shim Thickness

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

### CAUTION

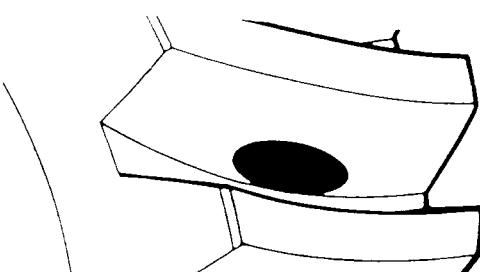
After correcting tooth contact, backlash must again be checked and corrected (if necessary). Continue the correcting backlash/correcting tooth contact procedures until they are both within tolerance values.

Incorrect (contact at tooth top)



ATV-0103

Incorrect (contact at tooth root)

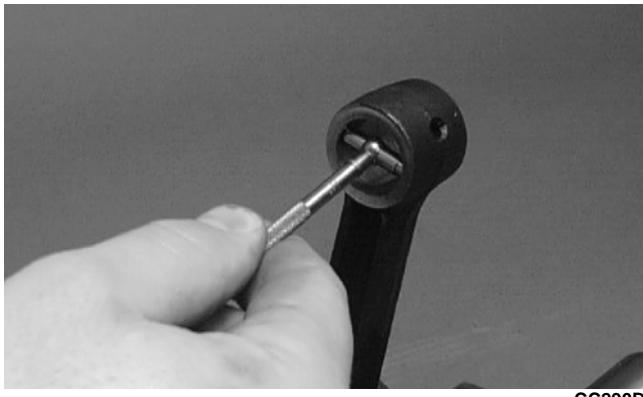


ATV-0105

## CRANKSHAFT ASSEMBLY

### 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

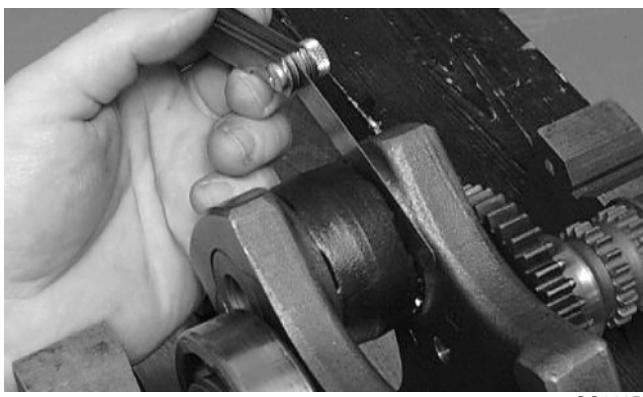
2. Maximum diameter must not exceed specifications.

### 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.

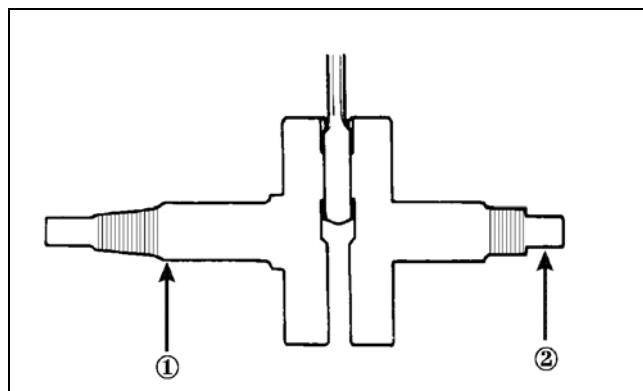
### Measuring Connecting Rod (Big End Width)

1. Using a calipers, measure the width of the connecting rod at the big-end bearing.

2. Acceptable width 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.



ATV-1074

3. Zero the indicator and rotate the crankshaft slowly.

#### CAUTION

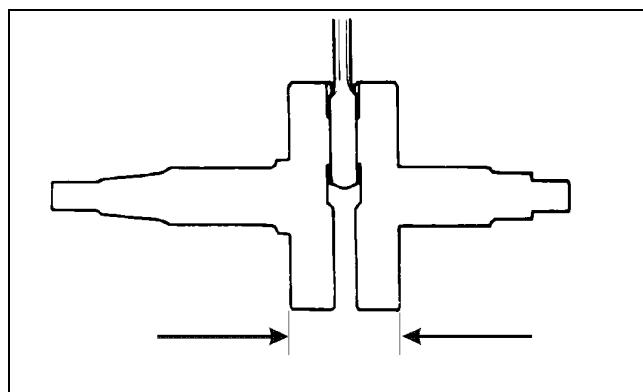
Care should be taken to support the connecting rod when rotating the crankshaft.

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 2-4.

### 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.



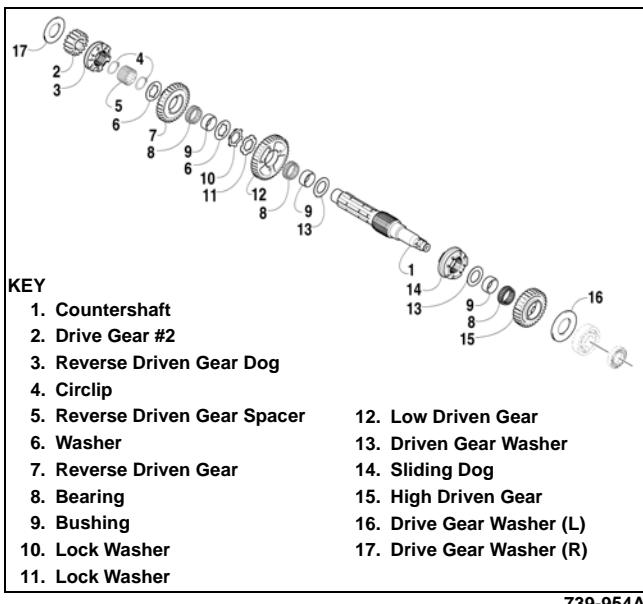
ATV-1074

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

From the right side:

1. Remove the right drive gear washer (17); then remove drive gear #2 (2).
2. Remove the reverse driven gear dog (3); then remove the circlip (4).
3. Remove the reverse driven gear spacer (5); then remove the circlip (4).
4. In order, remove washer (6), reverse driven gear (7), bearing (8), and bushing (9).
5. In order, remove washer (6), lock washer (10), lock washer (11), and low driven gear (12).
6. In order, remove bearing (8), bushing (9), and driven gear washer (13).

From the left side:

1. Remove the left drive gear washer (16); then remove the high driven gear (15) and bearing (8).
2. In order, remove bushing (9), driven gear washer (13), and sliding dog (14).

## Assembling

From the left side:

1. Install the sliding dog (14), driven gear washer (13), and bushing (9).
2. Install bearing (8) and high driven gear (15); then install the left drive gear washer (16).

From the right side:

1. Install driven gear washer (13), bushing (9), bearing (8), and low driven gear (12).
2. Install lock washer (11), lock washer (10), washer (6), and bushing (9).
3. Install bearing (8), reverse driven gear (7), washer (6), and the circlip (4).
4. Install reverse driven gear spacer (5), circlip (4), reverse driven gear dog (3), and drive gear #2 (2); then install the right drive gear washer (17).

■ NOTE: When installing the countershaft assembly, account for the washer on each end of the shaft.

## Assembling Crankcase Half

1. Install the output shaft assembly into the crankcase making sure the two gears, shim, washer, and nut are properly sequenced.



CC686

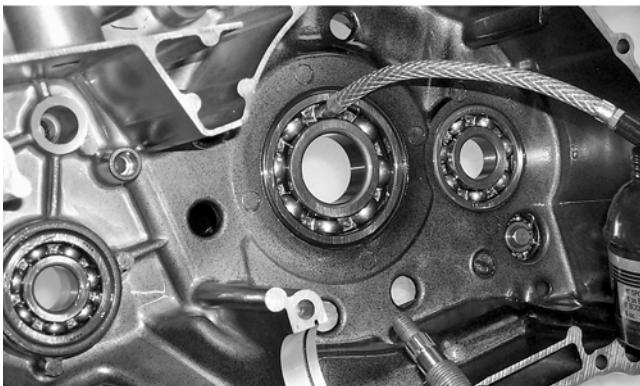
■ NOTE: The beveled side of the secondary drive gear must face upward.

2. Apply red Loctite #271 to the threads of the output shaft; then secure with the nut. Tighten nut to specifications; then using a punch, peen the nut.



CC687

3. 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.



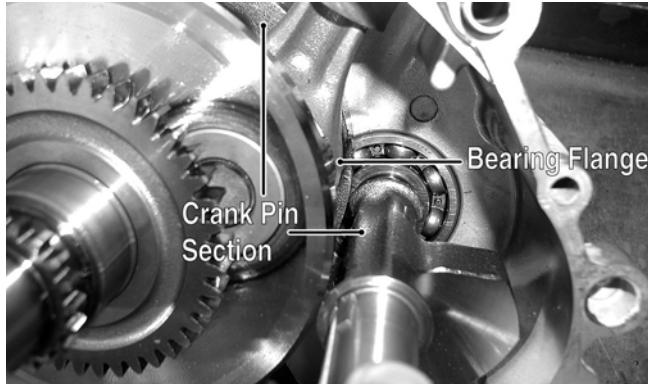
CC688



CC689

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

4. Install the crank balancer.

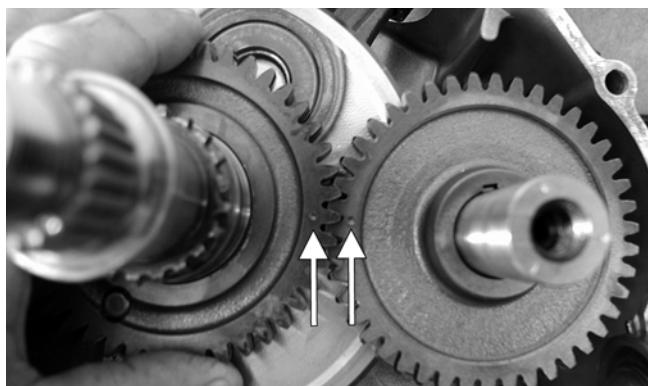


CD832B

■ 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.

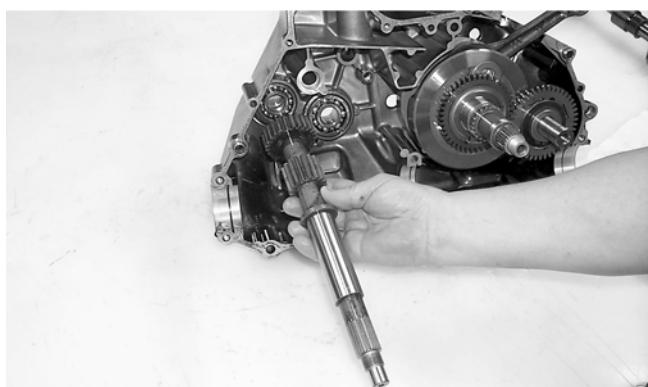
5. Place the key into the crank balancer keyway; then install the crank balancer gear making sure the alignment dots on the crank balancer gear and the crankshaft gear align.

3



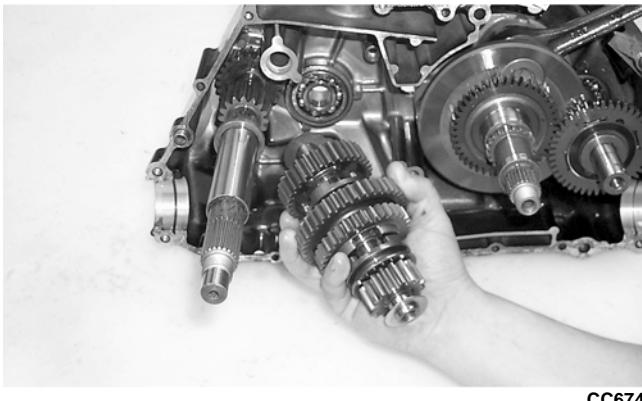
CD826A

6. Install the driveshaft.



CC675

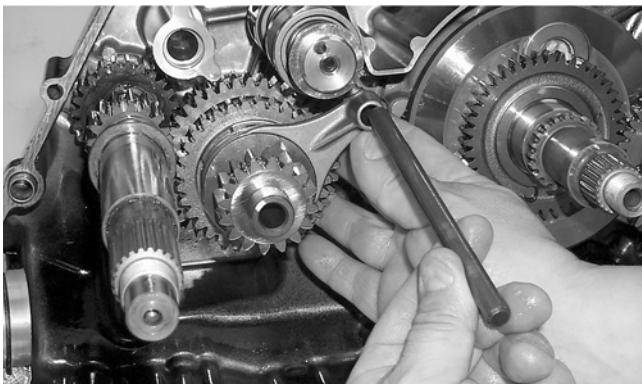
7. Place a washer on each end of the countershaft assembly; then install the assembly.



CC674

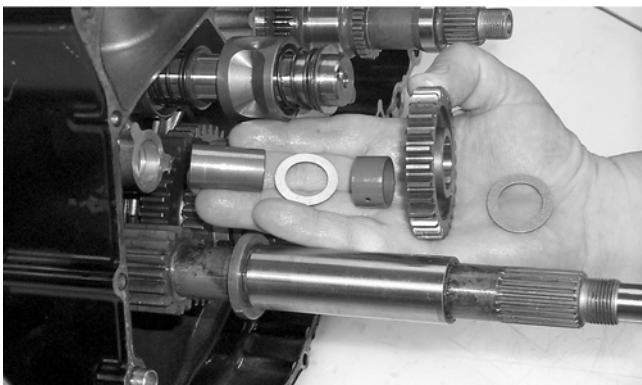
8. Place a washer on each end of the gear shift shaft; then install the shaft assembly making sure the two holes on the end of the shaft are positioned vertically.
9. Insert the two shift forks into the sliding dogs noting the direction of the tabs from disassembling; then install the shift fork shaft.

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



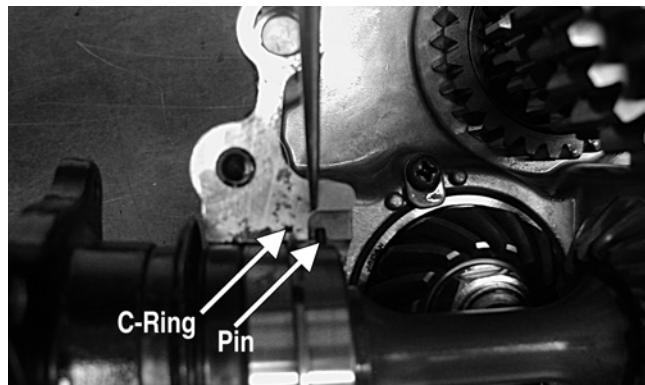
CC669

10. Install the reverse idler gear assembly noting the positioning of the two washers, gear, bushing, and shaft.



CC668

11. Install the front and rear secondary driven shaft assemblies into the left side of the crankcase making sure the bearing locating pins are facing upward and the bearing C-ring is fully seated in the crankcase.



CD268A

12. Place the oil strainer into position; then secure with the two screws.
13. Place the oil strainer cap into position making sure the O-ring is in position; then secure the cap with cap screws. Tighten securely.

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## Joining Crankcase Halves

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1. Apply High-Temp Sealant to the left-side mating surface.
2. Lightly oil all bearings and grease all shafts in the right-side crankcase.
3. Using a propane torch, heat the right-side crankshaft bearing until the oil begins to smoke; then join the two crankcase halves.



CC695

4. Using a plastic mallet, lightly tap the case halves together until cap screws can be installed.
5. 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.

6. 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.

7. 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.

8. 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.

9. In a crisscross/case-to-case pattern, tighten the 8 mm cap screws (from steps 5-6) until the halves are correctly joined; then tighten to specifications.

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

10. In a crisscross/case-to-case pattern, tighten the 6 mm cap screws (from steps 7-8) to specifications.

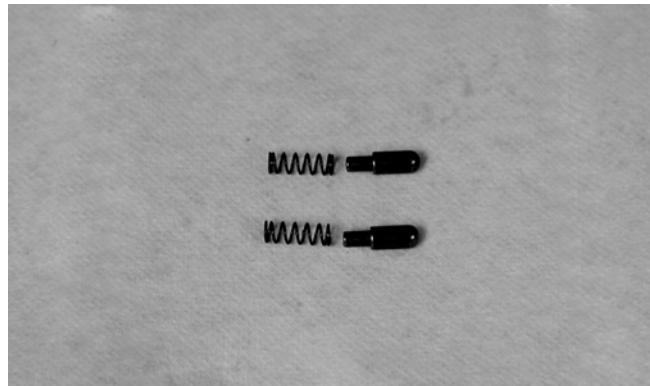
■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

#### **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 Right-Side Components**

1. Install the shift indicator sending unit making sure the two neutral contact pins and the two springs are properly positioned. Tighten the Allen-head screws securely.



CD997



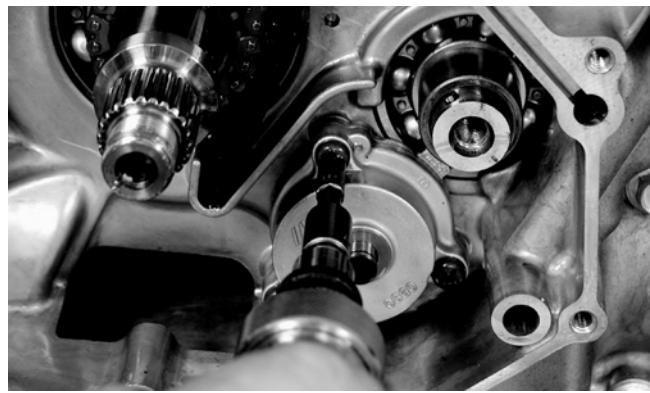
3

2. Install the secondary shaft bearing housing making sure the two alignment pins are properly positioned. Tighten the Allen-head screws securely.



CD999

3. Install the oil pump onto the engine; then tighten the Phillips-head screws securely.



CD988

4. 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 specifications.



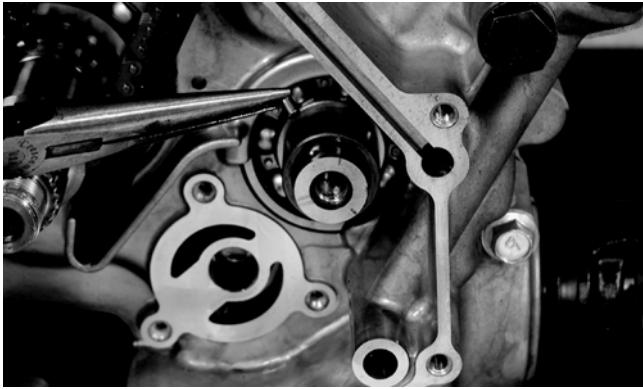
CD992



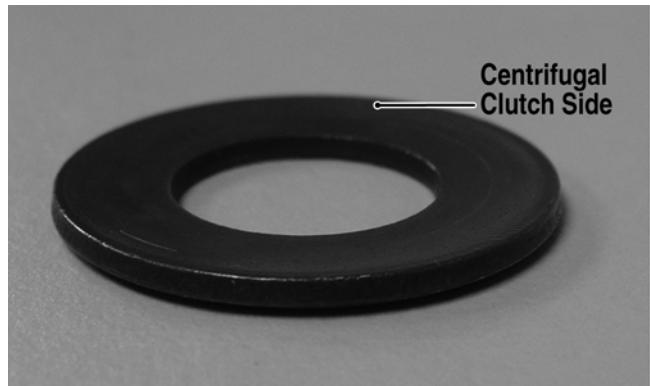
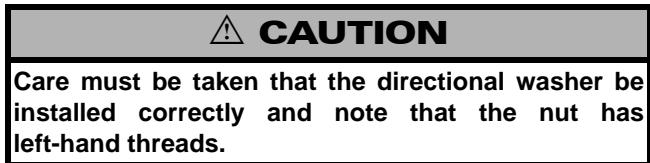
CD984

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

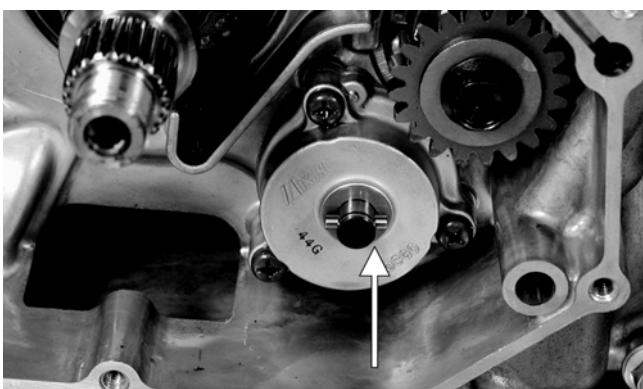
6. Install the clutch shoe assembly and secure with the washer (with the flat side facing the assembly as noted in removing) and the nut (threads coated with red Loctite #271). Tighten to specifications.



CD991



FI336A

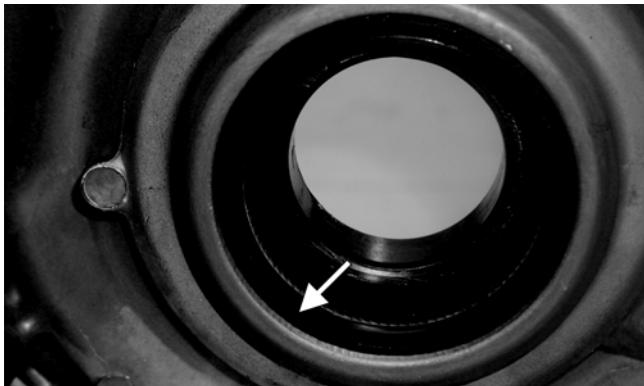


CD985A



FI279A

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

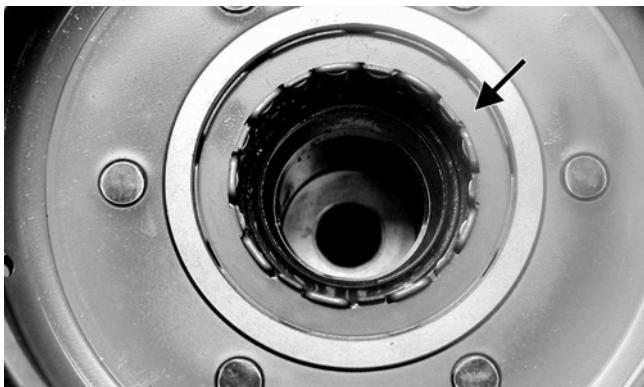


CF088A



CF086

8. Install the clutch cover alignment pins into the crankcase, apply oil to the cover gasket, and install the gasket onto the crankcase.
9. Apply grease to the outer edges of the clutch housing; then from inside the clutch cover, install the clutch housing into the cover using a rubber mallet.
10. Install the one-way clutch onto the clutch shoe assembly.



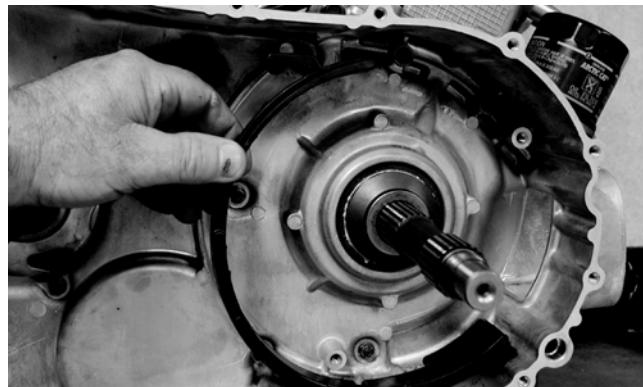
CF084A

### **CAUTION**

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

11. Place the clutch cover/clutch 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 specifications.

12. Place the air intake plate cushion into position; then install the air intake plate. Tighten the cap screws (threads treated with a small amount of red Loctite #271) securely.



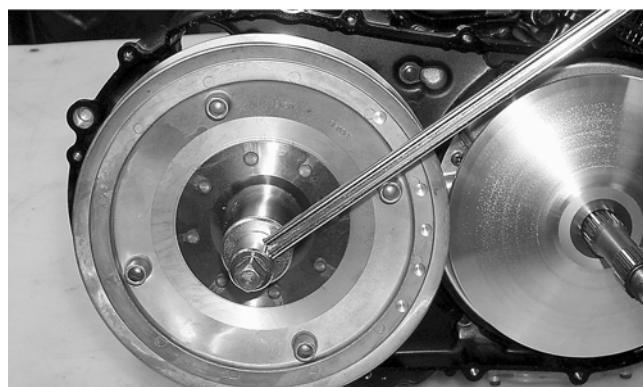
CD971

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CD970

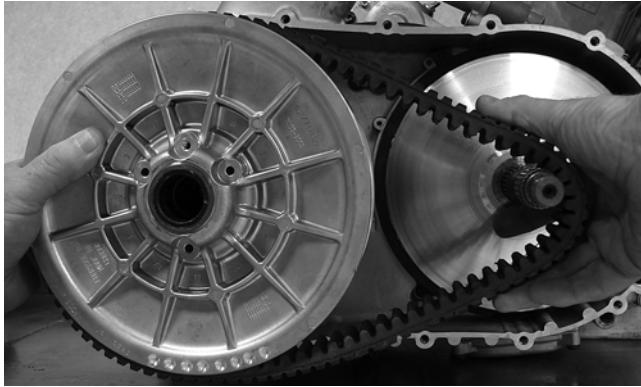
13. Place the driven pulley assembly into position and secure with the nut. Tighten to specifications.



CC726

14. Slide the fixed drive face onto the shaft.

15. Spread the faces of the driven pulley by pushing the inner face toward the engine while turning it counterclockwise; then when the faces are separated, insert a wedge (approximately 3/8 in. thick) between the faces. Release the inner face.
16. 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 forward.

17. Pinch the V-belt together near its center and slide the spacer and movable drive face onto the shaft. Secure the drive face with a nut (threads coated with red Loctite #271). Tighten the nut to specifications.

**CAUTION**

Make sure the splines extend beyond the drive face or a false torque reading and spline damage may occur.

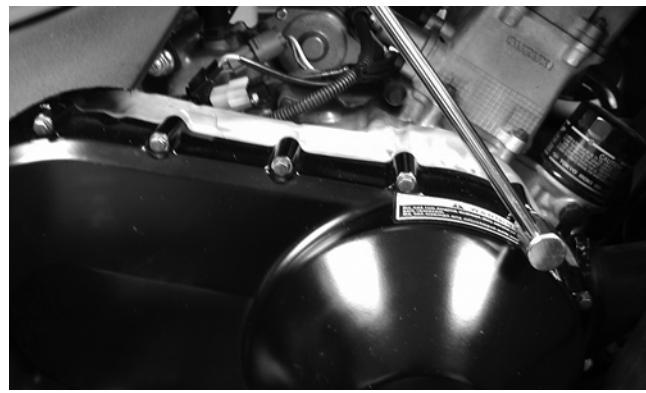


FI428A

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

18. Rotate the V-belt and drive/driven assemblies until the V-belt is flush with the top of the driven pulley.

19. 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 specifications.

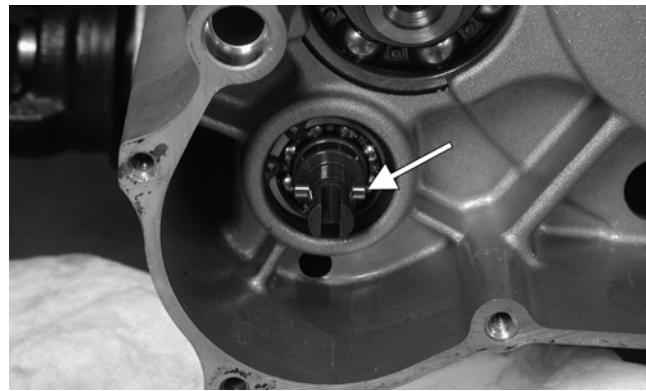


CD083

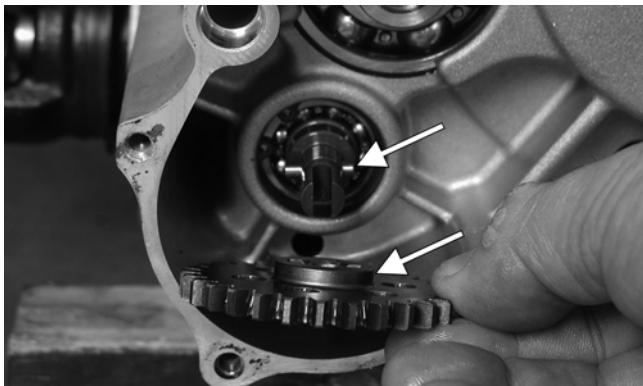
## Installing Left-Side Components

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

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



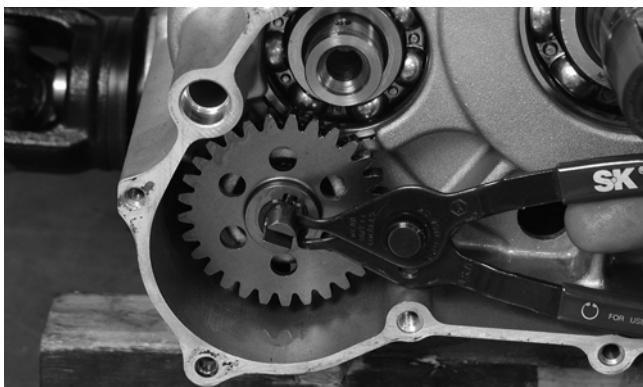
CD950A



CD952A



CD944



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

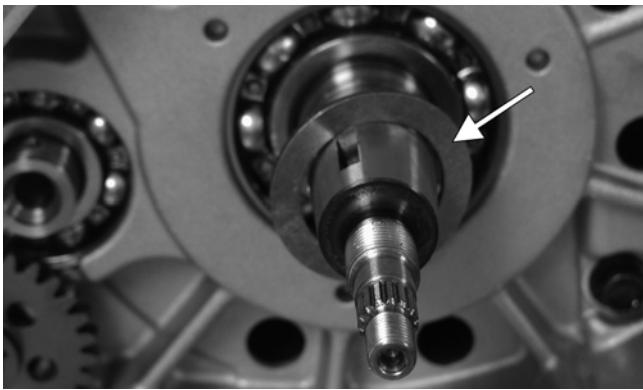


CD139

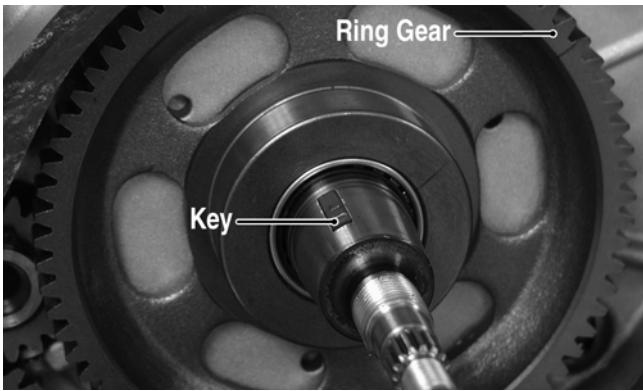


CD145

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



CD948A



CD940B

5. Install the shift cam plate onto the shift cam shaft; then coat the cap screw threads with red Loctite #271 and tighten securely.

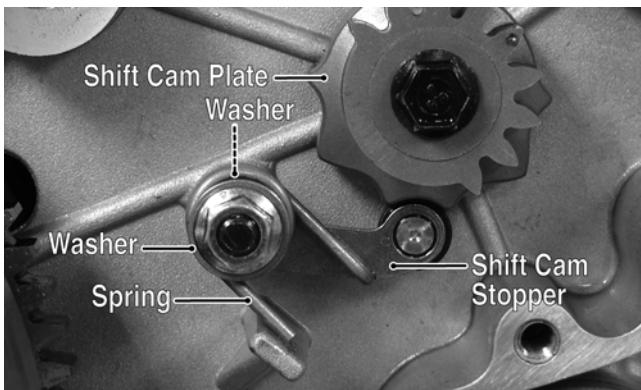


CD935A



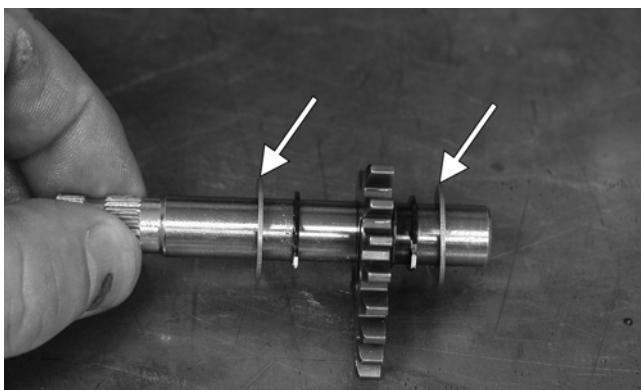
CD934

6. Install the shift cam stopper, spring, and two washers; then coat the threads on the mounting stud with red Loctite #271 and install the nut. Tighten securely.

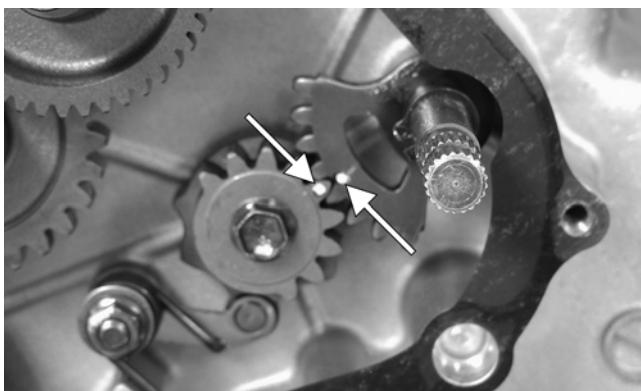


PR434A

7. Install the shift shaft with two washers making sure to align the timing mark on the shift shaft with the mark on the shift cam plate.

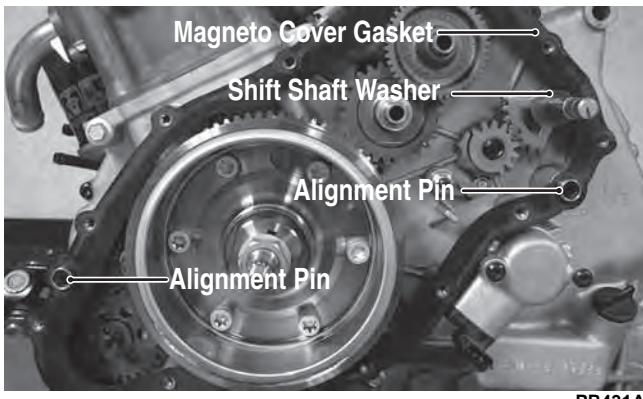


CD954A



CD927A

8. Lubricate the magneto cover gasket with fresh engine oil; then place it into position on the two alignment pins. Make sure the outer shift shaft washer is in place.



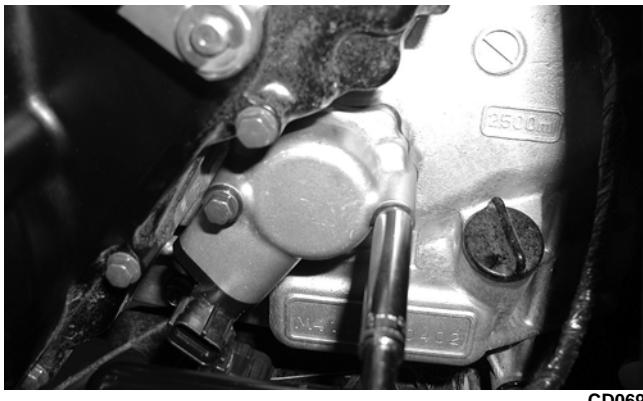
PR431A

9. Install the magneto cover and secure with the cap screws. Tighten only until snug.
10. Place the starter cup/spacer into position on the crankshaft making sure a new, lubricated O-ring is inside the cup/spacer. Tighten the flange nut to specifications.



CD925A

11. Tighten the cap screws (from step 9) to specifications.
12. Place the speed sensor housing and gasket into position and secure with the two cap screws. Tighten securely.



CD069

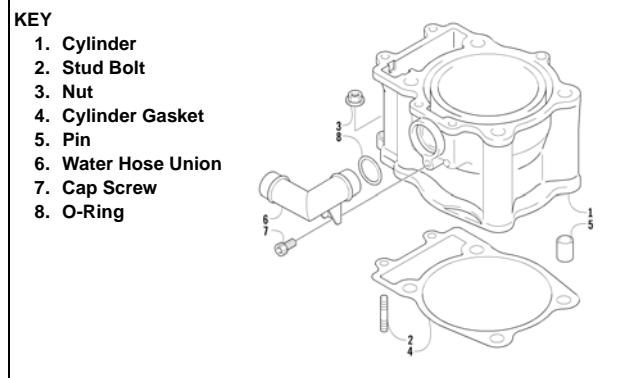
13. Place the water pump into position and secure with two cap screws. Tighten securely.

14. Install the crossover tube on the water pump and cylinder head making sure the O-ring is properly positioned.
15. Install the shift arm on the shift arm shaft making sure the scribed marks (from removing) are aligned. Tighten securely.
16. Place the gasket and recoil starter/outer magneto cover into position on the left-side cover; then tighten four cap screws to specifications.

## Installing Top-Side Components

**A. Piston**  
**B. Cylinder**

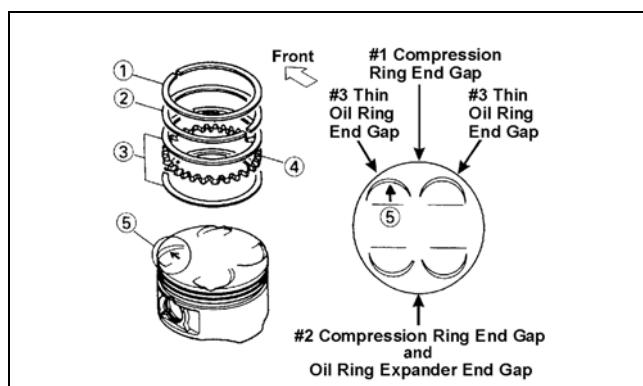
3



0732-301

■ **NOTE: If the piston rings were removed, install them in this sequence.**

A. 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.

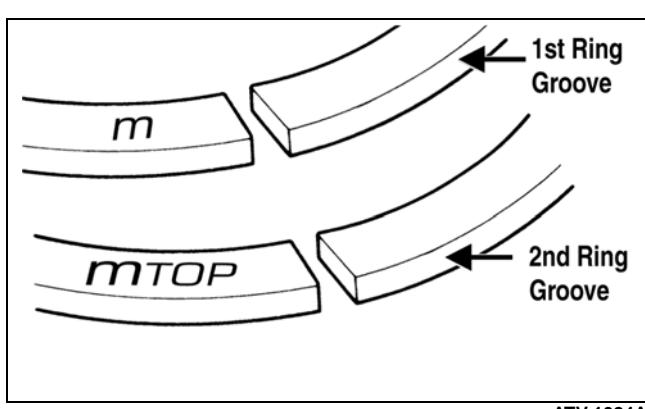
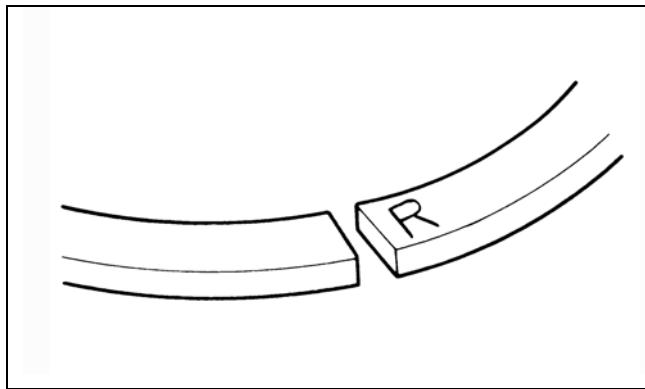


ATV-1085B

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

B. Install the compression rings (1 and 2) so the letter 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 (see illustration).

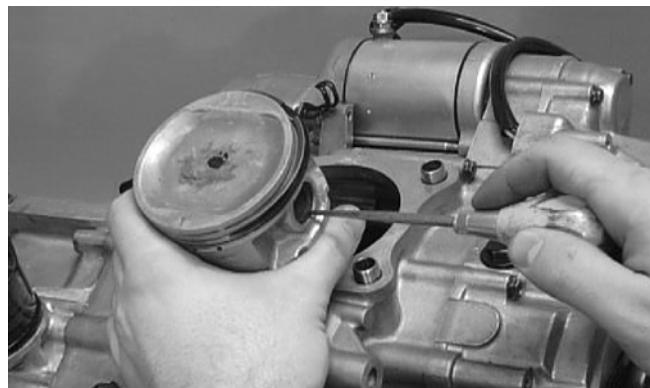
■ **NOTE:** On the 500, the chrome (silver) ring should be installed in the top position. On the 650 H1, the ring with the orientation mark (MTOP) should be installed in the second (middle) groove and the ring with the orientation mark (M) should be installed in the first (top) groove.



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

1. Install the piston on the connecting rod making sure there is a circlip on each side and the open end of the circlip faces upwards.

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



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



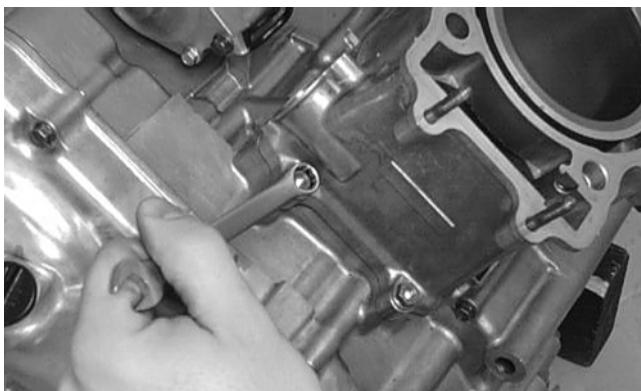
3. Lubricate the inside wall of the cylinder; then using a ring compressor or the fingers, compress the rings and slide the cylinder over the piston. Route the cam chain up through the cylinder cam chain housing; then remove the piston holder and seat the cylinder firmly on the crankcase.

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



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 10.**

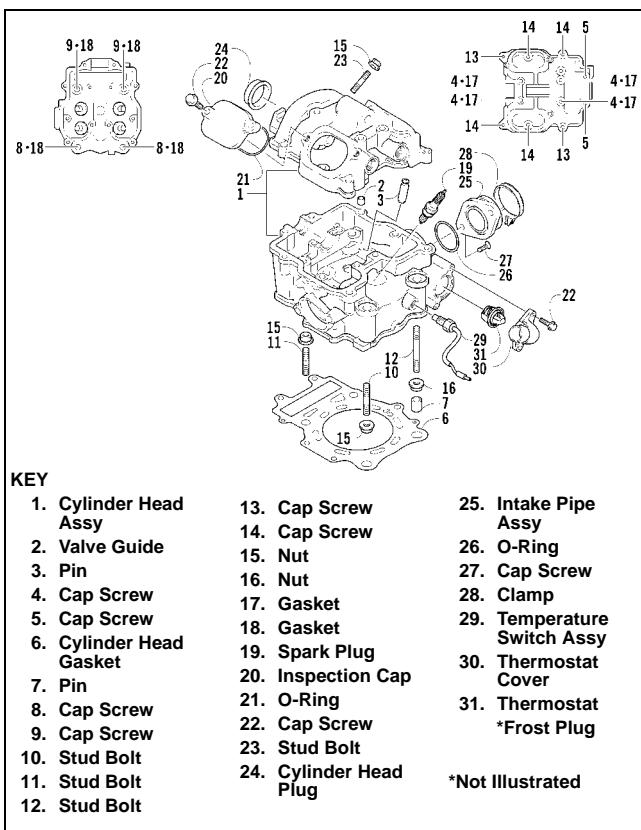


CC023D

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

## C. Cylinder Head

## D. Valve Cover



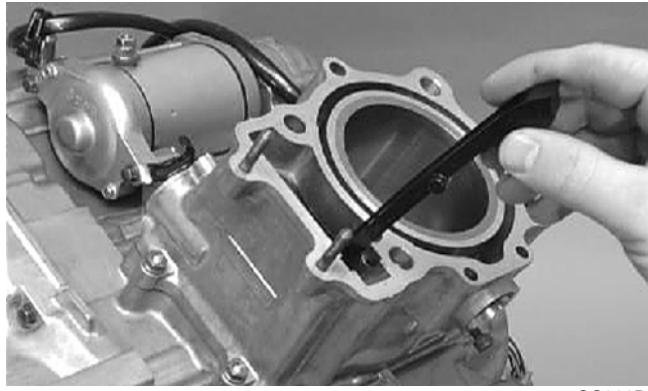
0737-755

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

6. Place the chain guide into the cylinder.

## CAUTION

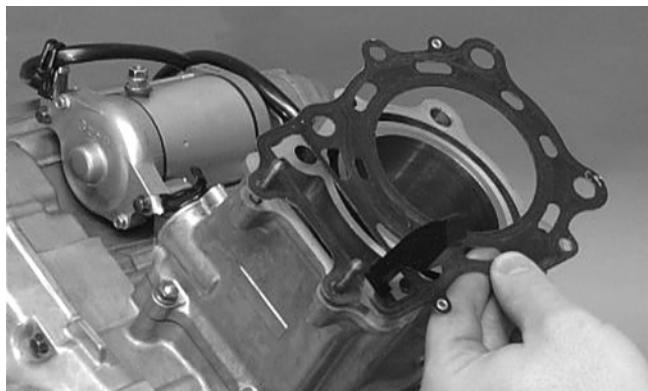
Care should be taken that the bottom of the chain guide is secured in the crankcase boss.



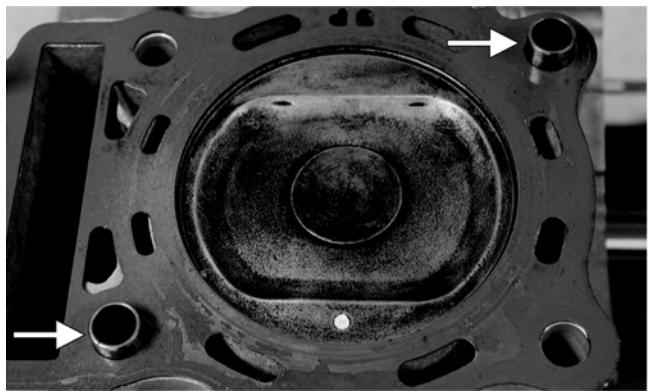
CC022D

3

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

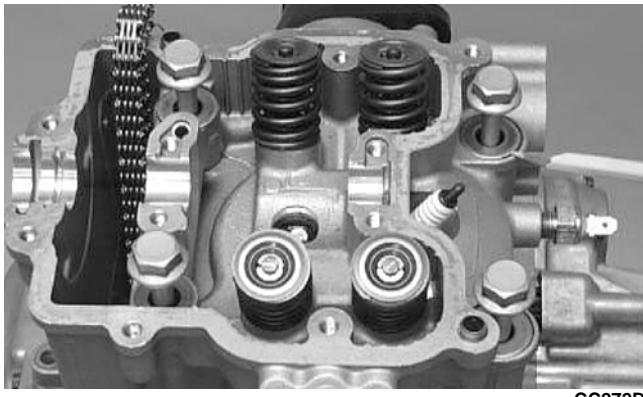


CC020D

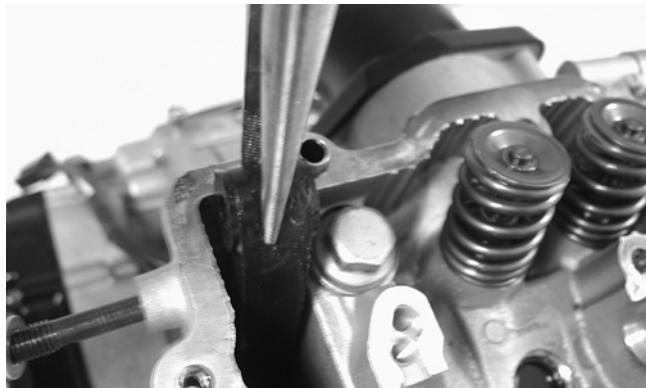


CF057A

8. Install the four cylinder head cap screws with copper washers (note the locations of the different-lengthed cap screws). Tighten only until snug.

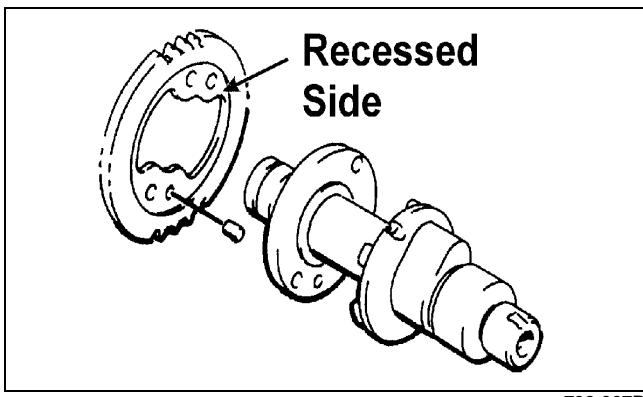


CC272D



CD461

9. Loosely install the five cylinder head nuts.
10. In a crisscross pattern, tighten the four cylinder head cap screws (from step 8) to 3.8 kg-m (27.5 ft-lb) 500 models, 5.5 kg-m (40 ft-lb) 650 H1; then tighten the 8 mm nut (from step 9) to 2.5 kg-m (18 ft-lb). Using a crisscross pattern, tighten the 6 mm nuts (from step 9) to 1.1 kg-m (8 ft-lb). Tighten the two cylinder-to- crankcase nuts (from step 4) securely.
11. With the timing inspection plug removed and the chain held tight, rotate the crankshaft until the piston is at top-dead-center.
12. 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.



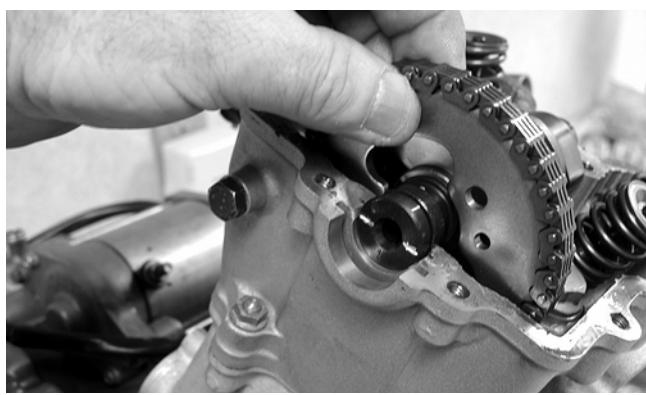
732-307B

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

13. While holding the cam chain sprocket to the side, install the rear cam chain tensioner guide into the cylinder head. Install the pivot cap screw and washer.

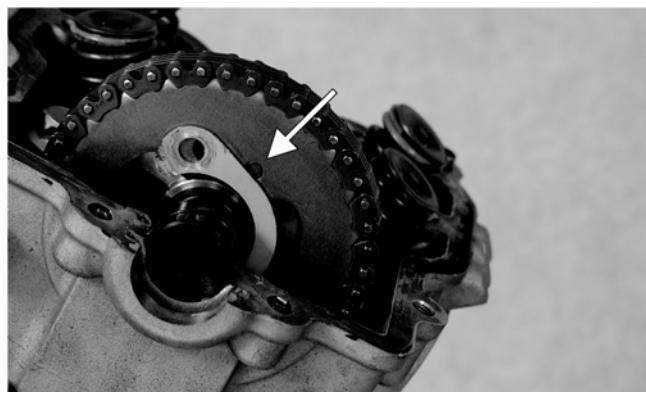
14. With the cam lobes directed down (toward the piston), maneuver the camshaft/sprocket assembly through the chain and towards its seating position; then loop the chain over the sprocket.

■ 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 camshaft is necessary for alignment, do not allow the chain and sprocket to rotate and be sure the cam lobes end up in the down position.



CD463

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



CF013A

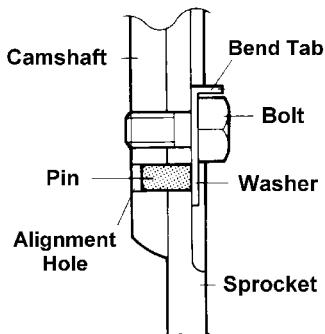
A. Piston still at top-dead-center.

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

**⚠ CAUTION**

If any of the above factors are not as stated, go back to step 11 and carefully proceed.

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



ATV1027

**⚠ CAUTION**

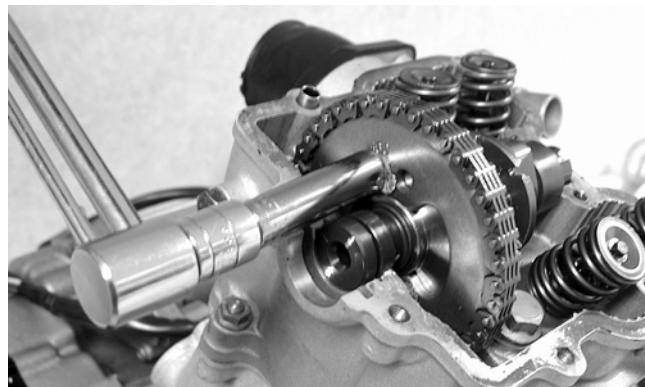
Care must be taken that the tab-washer is installed correctly to cover the alignment hole on the sprocket. If the alignment pin falls out, severe engine damage will result.

17. 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

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) and tighten to specifications. Bend the tab to secure the cap screw.



CD465

3

19. Rotate the crankshaft until the first cap screw (from step 17) can be addressed; then tighten to specifications. Bend the tab to secure the cap screw.



CD466

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



CC012D

21. 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

22. 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

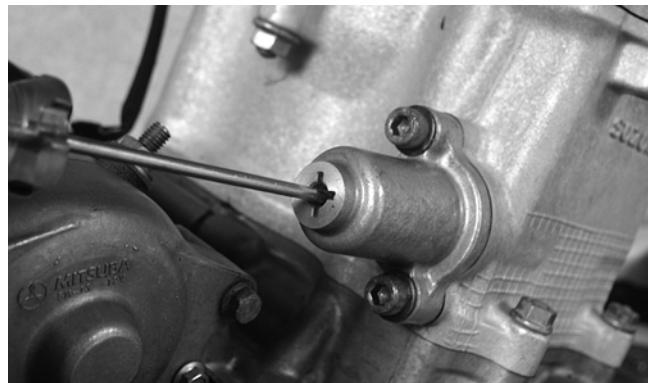
**■ NOTE:** The adjuster shaft will be drawn into the tensioner as the adjuster screw is rotated clockwise. The adjuster shaft tension will be released in step 24.

23. Place the chain tensioner adjuster assembly and gasket into position on the cylinder and secure with the two Allen-head cap screws.



CD469

24. Using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner counter-clockwise until all tension is released; then install the cap screw into the end of the chain tensioner.

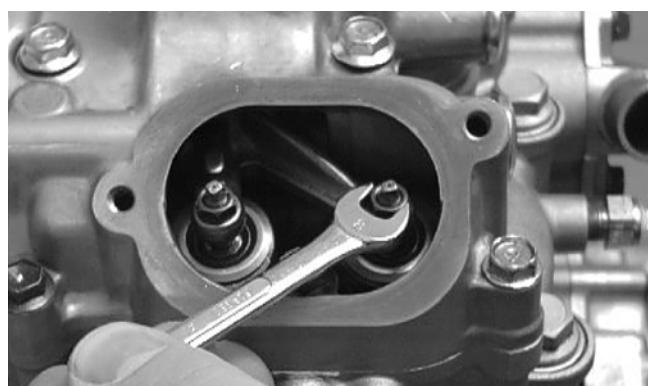


CD470



CD471

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



CC005D

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

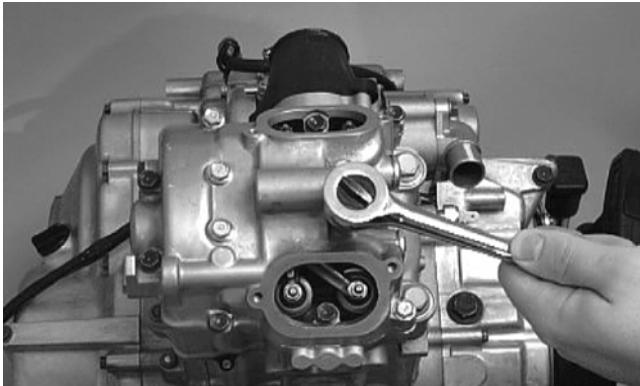


CC275D

27. Place the valve cover into position.

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

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



CC003D

29. In a crisscross pattern starting from the center and working outward, tighten the cap screws securely.

30. Adjust valve/tappet clearance using the following procedure.

**■ NOTE: Use Valve Clearance Adjuster (p/n 0444-078) for this procedure.**

A. Turn the engine over until the piston reaches top dead center on the compression stroke.

B. Place the valve 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.

C. 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.

D. Align the valve adjuster handle with one of the marks on the valve adjuster dial.

E. While holding the valve adjuster handle in place, rotate the valve adjuster dial counter-clockwise until specified valve/tappet clearance is attained.

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

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

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



CC001D

32. If removed, install the spark plug. Tighten to specifications.

3

## Installing Engine/Transmission

**■ NOTE: Arctic Cat recommends that new gaskets and O-rings be installed whenever servicing the ATV.**

1. From the left side, place the engine/transmission into the frame; then slide the engine rearward as far as possible.

2. Slightly raise the rear of the engine and engage the front drive coupler into the splines of the front drive output yoke; then slide the engine forward as far as possible.



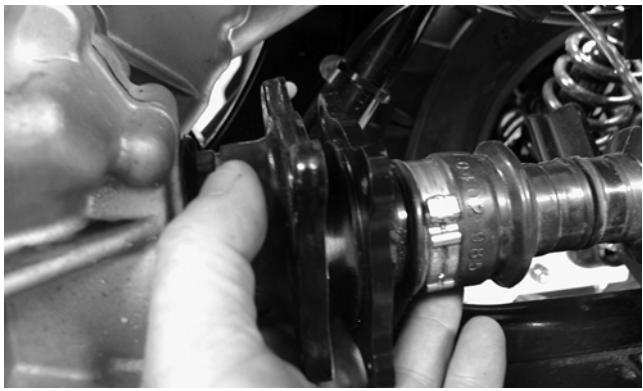
CD821

3. Raise the rear of the engine and place a block beneath it; then install the propeller shaft and output flange into the rear drive coupler.



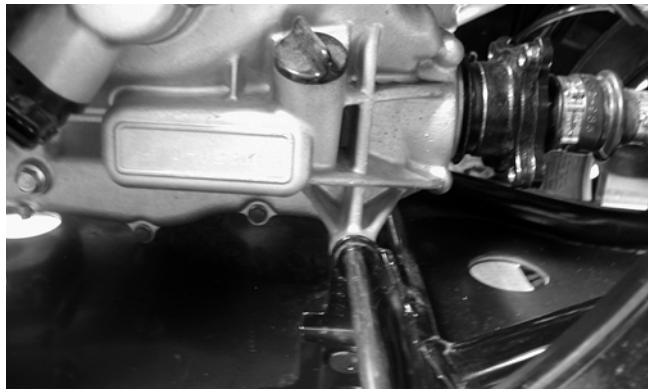
CD821

4. Remove the block from beneath the engine; then align the rear drive flanges and secure with four cap screws. Tighten to specifications.



CD824

5. Install two engine mounting through-bolts, two bushings, and two washers; then tighten the through-bolt flange nuts to specifications.

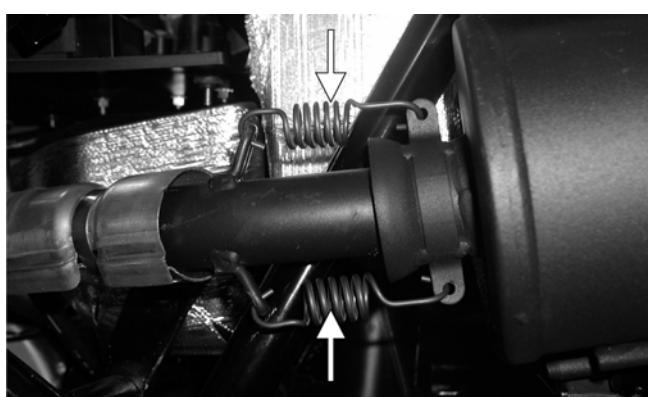


CD809

6. Secure the exhaust pipe to the engine with two cap screws making sure the mounting brackets engage the frame grommets; then install the muffler and tighten all mounting hardware to specifications.



CD803

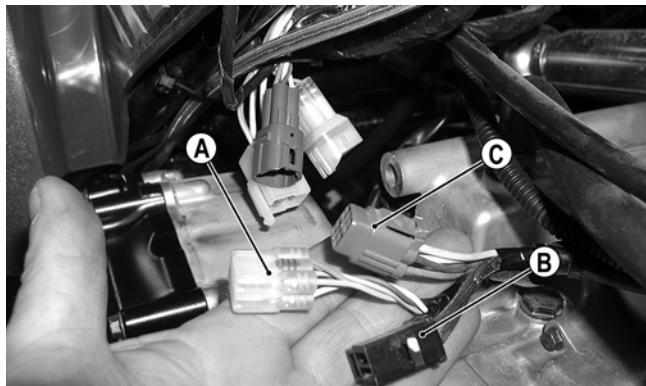


CF138A

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



CD515



CD797A



CD793

8. Secure the engine ground wire to the engine with a cap screw. Tighten to specifications.



CD810

9. Connect the gear position indicator connector (A), stator connector (B), and the CDI connector (C) to the main wiring harness.

10. Connect the temperature sensor wire to the main wiring harness.  
11. Secure the wires to the frame with nylon ties.  
12. Connect the speed sensor connector to the housing.  
13. Secure the positive cable to the starter motor.  
14. Secure all wiring to the frame and upper engine bracket with cable ties.  
15. Secure the two coolant/oil hoses to the engine.  
16. Secure the crankcase vent hose to the air cleaner housing; then secure the inlet boot and carburetor to the air cleaner housing.

3



CD787



CD785

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

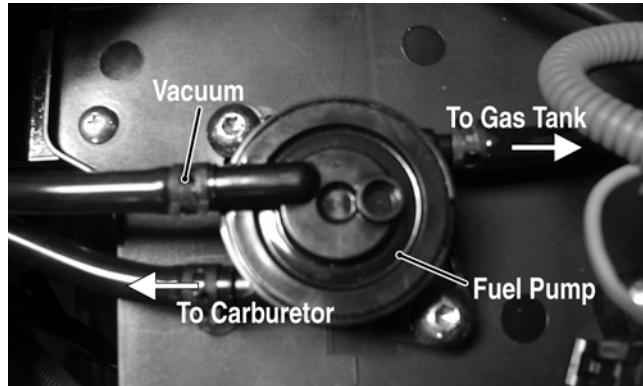


18. Place the left-side footwell and foot peg in position on the frame; then secure with existing hardware. Tighten to specifications.



19. Install the front body panel with existing hardware (see Section 8).

20. Connect the hose to the fuel pump; then connect the vacuum hose and secure with hose clamps.



21. Place the side panels into position; then install the reinstallable rivets.

22. Place the battery into position in the battery compartment; then install the battery cables and vent hose. Secure with the battery cover.

**CAUTION**

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

23. Add proper amounts of engine/transmission oil and coolant.

24. Install the seat.

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## 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 left-side cover oil seals (3), front output joint oil seal (1), rear output joint oil seal (1), and/or the oil strainer (from beneath the engine/transmission), the engine/transmission does not have to be removed from the frame.

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

### ⚠ WARNING

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

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

### ⚠ CAUTION

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

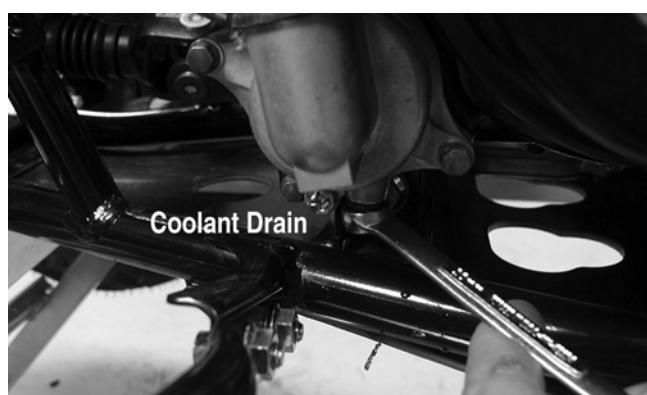
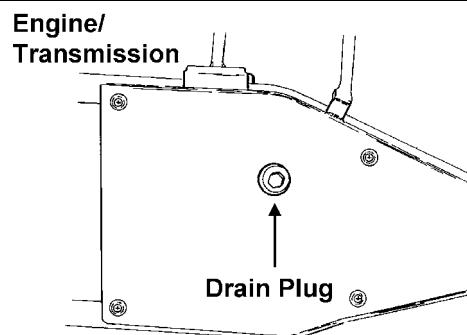
3. Remove the radiator access cover, steering post cover, and storage compartment cover assembly; then remove the storage compartment box.
4. Remove the reinstallable rivets securing the side panels; then remove the panels.



CD683A

3

5. Remove the instrument pod; then remove the front rack and front body panel (see Section 8).
6. Drain the oil from beneath the engine/transmission; then drain the cooling system.

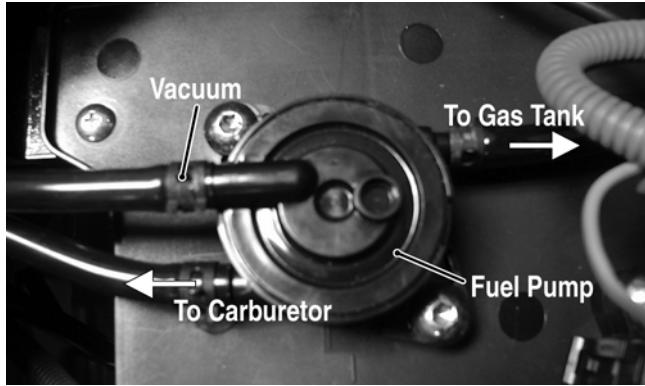


ATV-0109

CD799A

7. Remove the air filter (see Section 2).

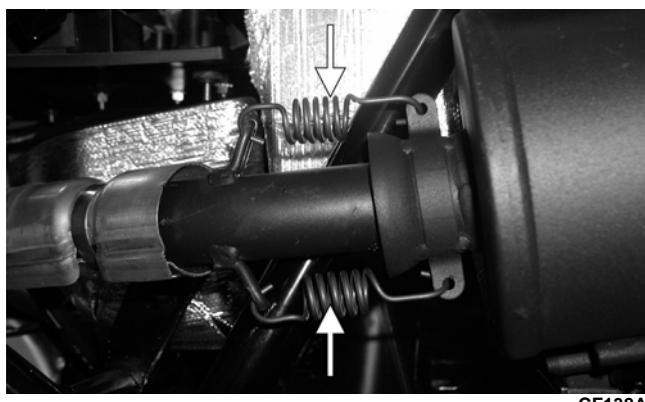
8. Remove the vacuum hose and the fuel-pump-to-carburetor hose.



9. Remove the cap screws securing the left-side foot peg and footwell to the footrest; then remove the footwell.



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



11. Remove the cap screws securing the exhaust pipe to the head; then remove the exhaust pipe.



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

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

14. Remove the four cap screws securing the rear output joint to the transmission and push the shaft away from the transmission.



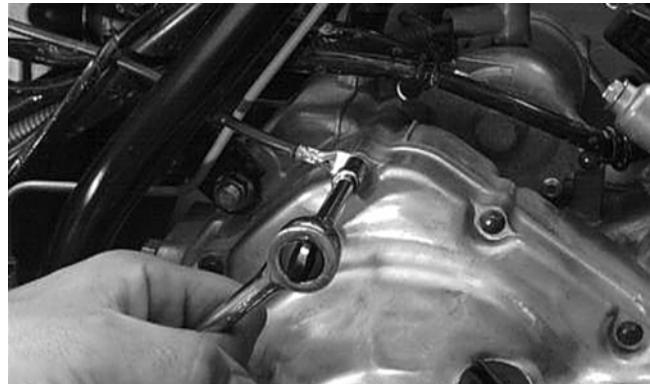
15. Loosen the clamp securing the air intake duct to the air filter housing.



16. Disconnect the crankcase vent hose from the air filter housing. Loosen the clamp securing the carburetor intake duct to the air filter housing; then remove the housing.



CD787



AR600D



CD786

3

17. Remove the clamp securing the upper coolant hose to the thermostat housing; then disconnect the hose.



AR604D

20. Remove the clamp securing the lower coolant hose to the water pump housing; then disconnect the hose.



CC335D

18. Disconnect the high tension lead from the spark plug; then remove the coil.



CC334D

19. Disconnect the battery ground (negative) cable from the crankcase cover; then disconnect the positive cable from the starter motor.

21. Loosen the clamp on the crankcase breather vent hose; then remove the hose.



CC122D

22. Remove the engine/transmission mounting fasteners in the following sequence:

A. Lower front: One cap screw, nut, spacer, and washer.



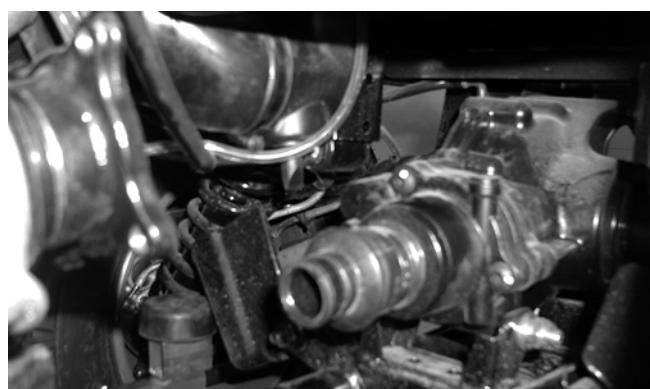
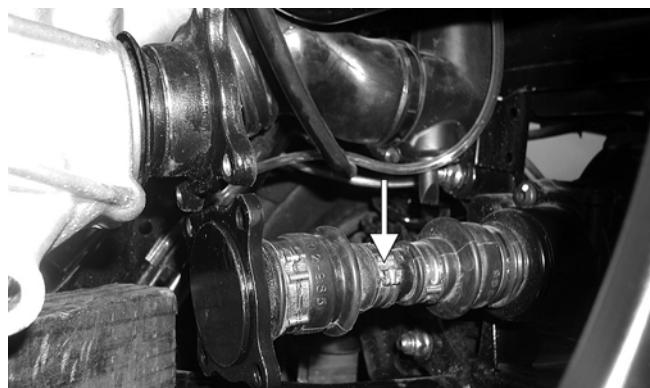
B. Lower rear: One cap screw, nut, spacer, and washer.



23. Raise the rear of the engine enough to allow the rear output flange to clear the output flange joint. Place a block beneath the engine in this position.



24. Remove the first small boot clamp; then slide the output flange and driveshaft out of the rear coupler.



25. Remove the block and lower the rear of the engine; then remove the boot clamp on the front output drive yoke.



26. Move the engine to the rear enough to allow the front drive coupler to clear the front output yoke; then move the engine forward and to the left. Remove the engine from the left-side of the frame.



CD773



CC001D

3

## 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

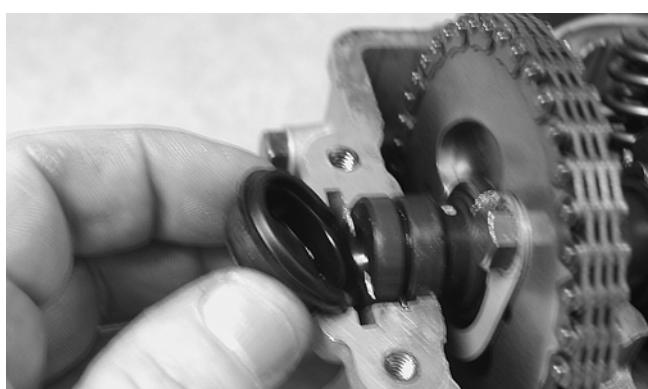
### A. Valve Cover B. Cylinder Head

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

1. Remove the two tappet covers.



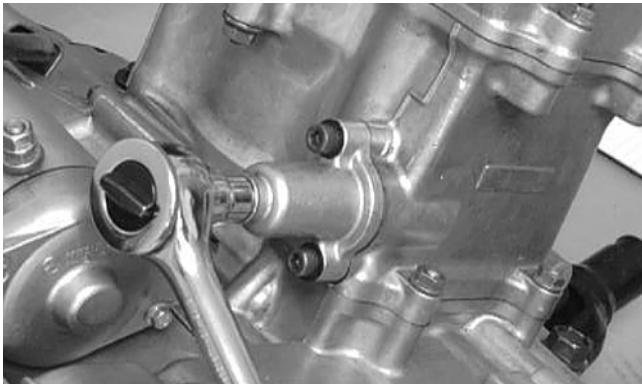
CD205



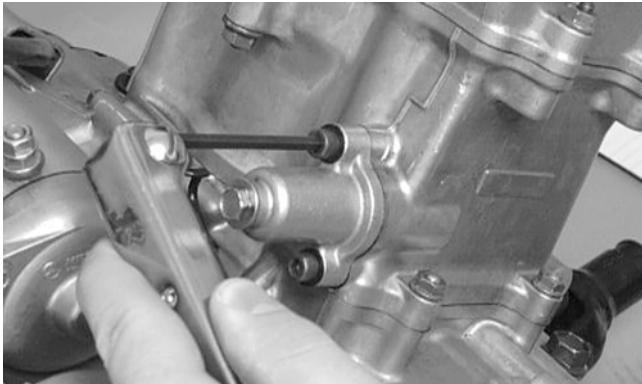
CD468

■ NOTE: Note that the opening of the head plug must be directed to the 6 o'clock position.

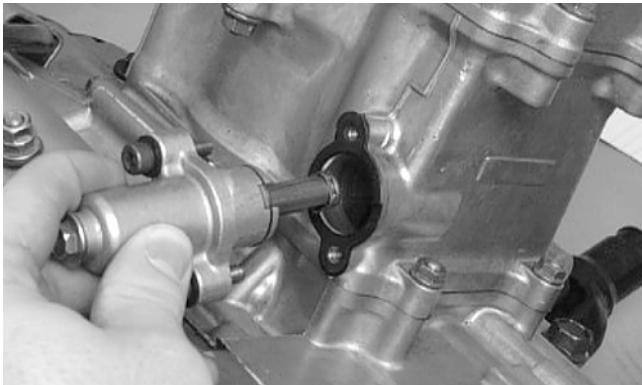
3. Loosen the cap screw on the end of the tensioner; then remove the two Allen-head cap screws securing the tensioner adjuster assembly and remove the assembly. Account for a gasket.



CC009D



CC010D



CC011D

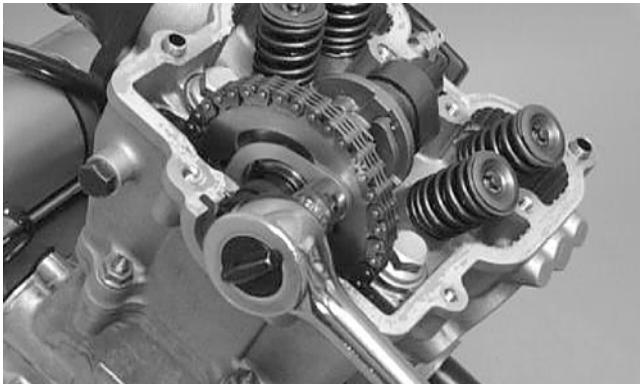
4. Using an awl, rotate the C-ring in its groove until it is out of the cylinder head; then remove the C-ring.

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

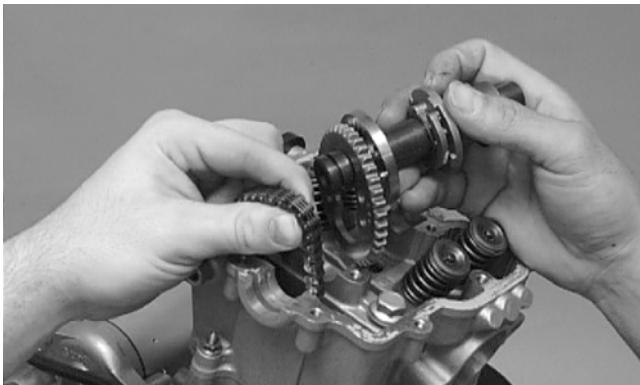


CC012D

5. Bend the washer tabs and remove the two cap screws securing the sprocket to the camshaft; then drop the sprocket off the camshaft. While holding the chain, slide the sprocket and cam-shaft out of the cylinder head.



CC013D



CC266D

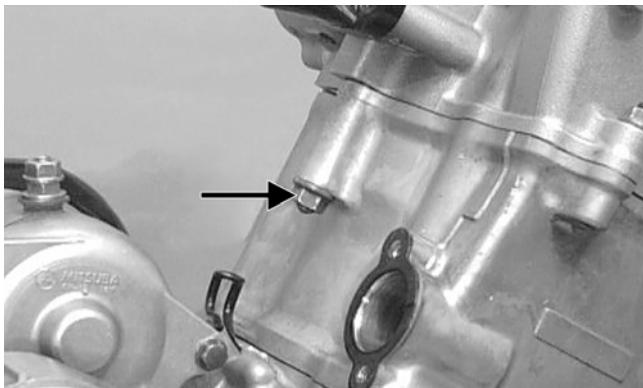
**■ NOTE:** Loop the chain over the cylinder and secure it to keep it from falling into the crankcase.

6. Remove the cap screw securing the chain tensioner (account for a washer); then remove the tensioner.

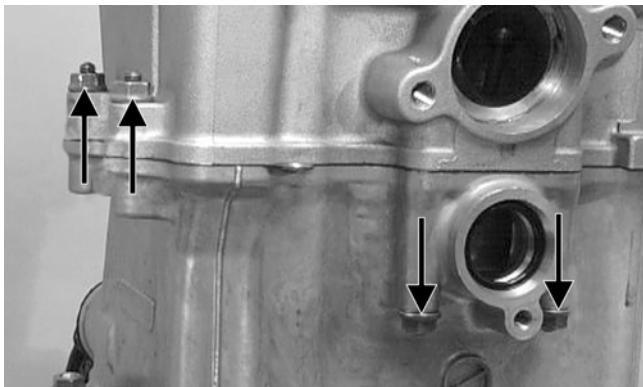


CC014D

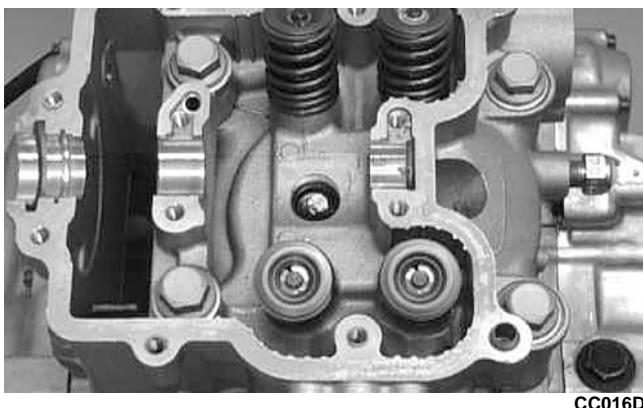
7. Remove the five nuts securing the cylinder head to the cylinder; then remove the four cylinder head cap screws with copper washers (note location of the different-sized cap screws and nuts).



CC017D

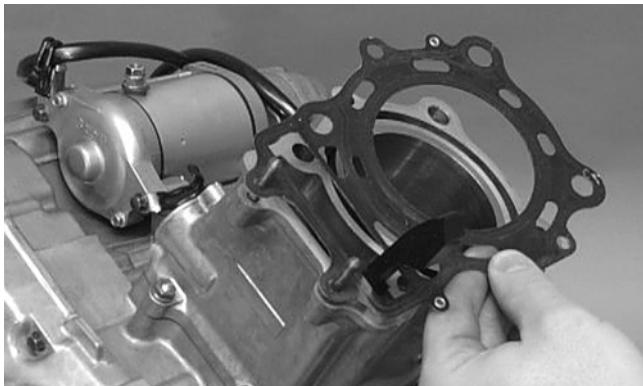


CC018D



CC016D

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



CC020D

**AT THIS POINT**

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

9. Remove the cam chain guide.

**AT THIS POINT**

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



CC022D

**3**

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

■ NOTE: Steps 1-9 in the preceding sub-section must precede this procedure.

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

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

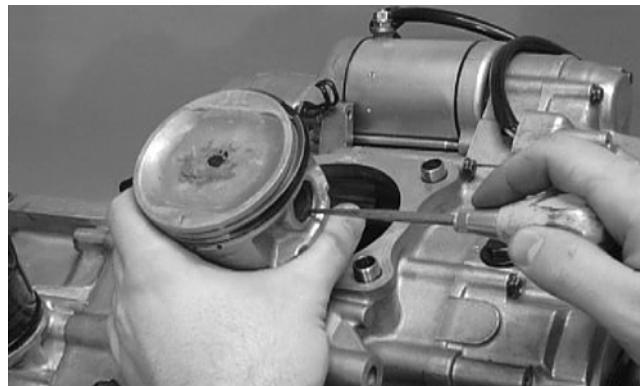


CC023D

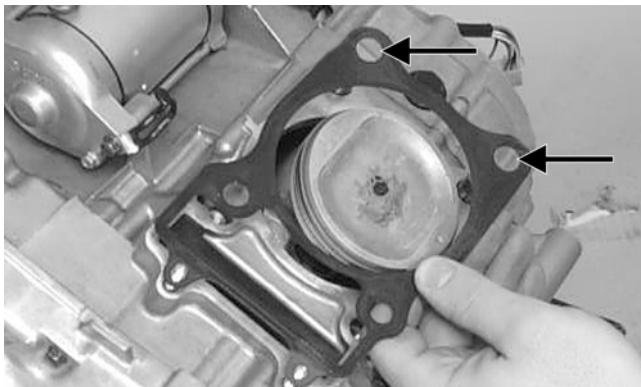
12. Lift the cylinder off the crankcase taking care not to allow the piston to drop against the crankcase. Account for the gasket and two alignment pins.



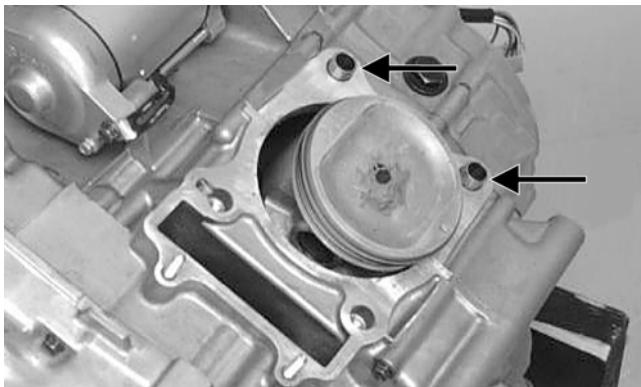
CC024D



CC032D



CC025D



CC026D

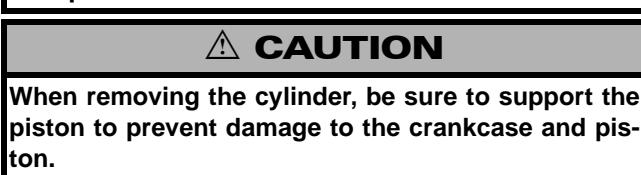


### ☞ AT THIS POINT

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

### ⚠ 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.



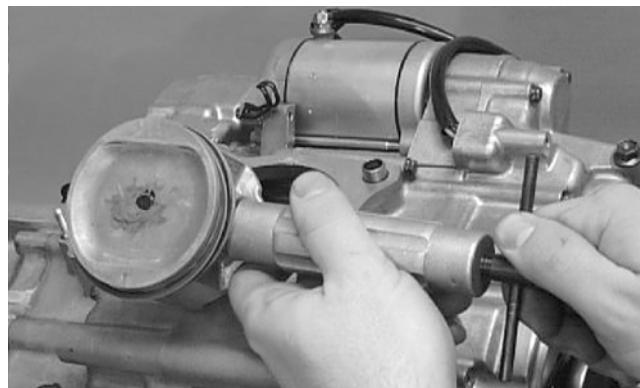
### ⚠ CAUTION

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.

14. Using the Piston Pin Puller (p/n 0644-328), remove the piston pin. Account for the opposite-side circlip. Remove the piston.

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



CC033D

■ NOTE: Support the connecting rod with rubber bands to avoid damaging the rod or install the Connecting Rod Holder (p/n 0444-006).

### ⚠ 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.

■ NOTE: If the existing rings will not be replaced with new rings, note the location of each ring for proper installation. When replacing with new rings, replace as a complete set only. If the piston rings must be removed, remove them in this sequence.

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

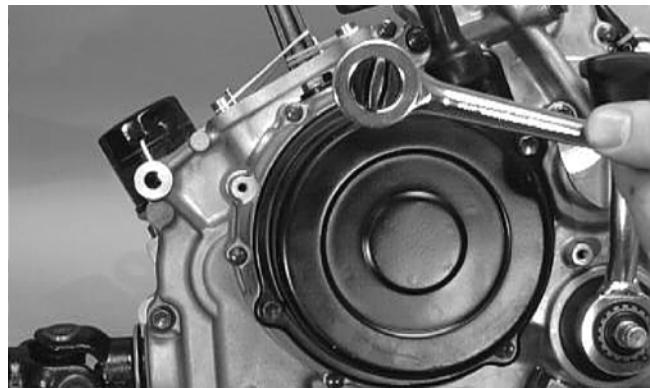
B. Remove each ring by working it toward the dome of the piston while rotating it out of the groove.

**☞ AT THIS POINT**

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

**☞ AT THIS POINT**

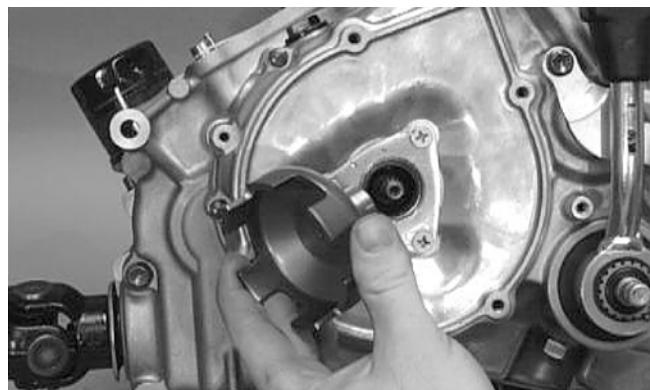
To service center crankcase components only, proceed to Removing Left-Side Components.



CC039D

3

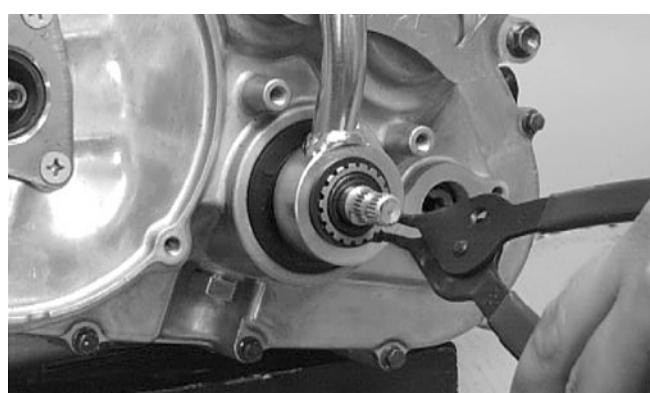
2. Remove the flange nut securing the starter cup to the crankshaft; then remove the starter cup. Account for the O-ring inside the cup.



CC041D

3. Put the shift lever into the hi-range position and remove the circlip from the hi/low range shift shaft; then remove the shift lever.

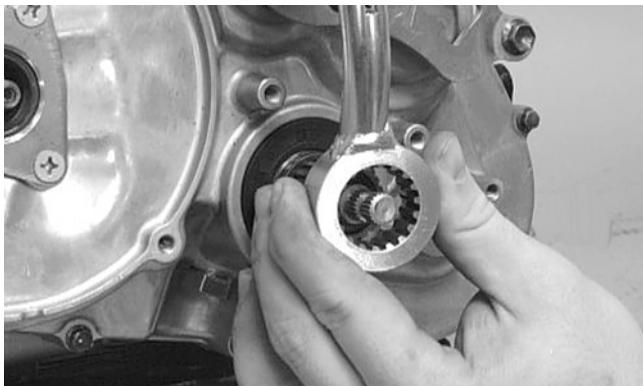
■ NOTE: It will be necessary to lift slightly on the shift lever to remove it from the shaft and plate.



CC044D

**☞ AT THIS POINT**

To service the recoil starter, see Servicing Left-Side Components sub-section.



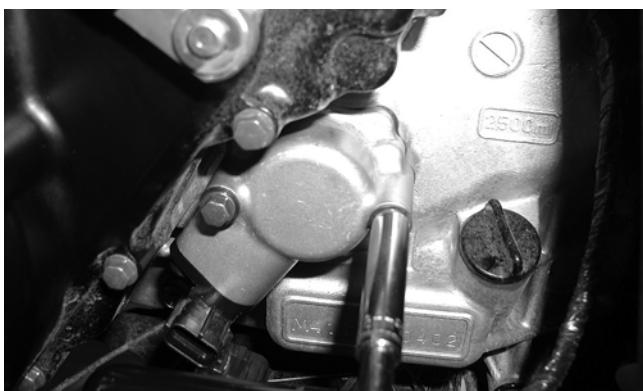
CC045D

4. Remove the inside circlip.



CC046D

5. Remove the two cap screws securing the speed sensor housing; then remove the housing. Account for the gasket.



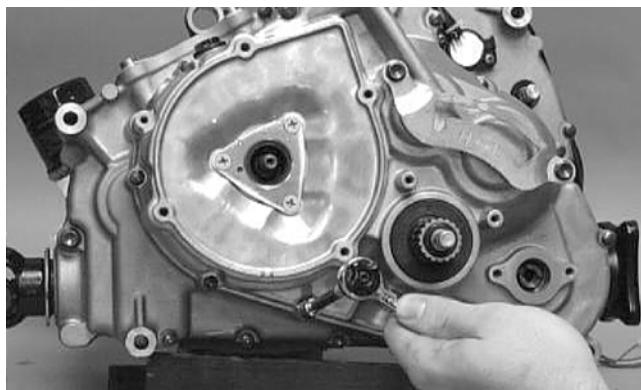
CD069

6. Remove the shift stop housing assembly from beneath the shift shaft housing. Account for the stopper and spring.



CC054D

7. Remove the cap screws securing the left-side cover to the crankcase and note the location of the long cap screw with rubber washer.



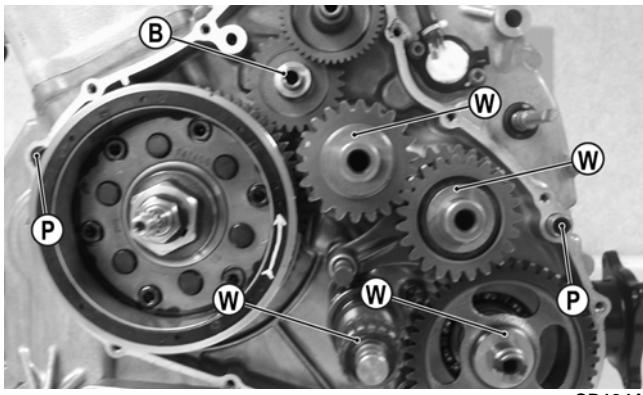
CC047D



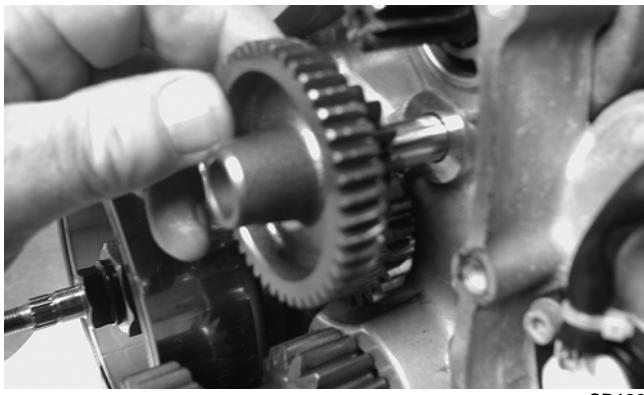
CF037A

8. Using Side Case Puller (p/n 0644-262), remove the side cover. Account for a gasket, two alignment pins, and an idle gear limiter bushing.

**■ NOTE: Inspect the inside of the left-side cover for the four shaft washers that may have come off with the cover. The three gear shaft washers are identical and interchangeable. The shift shaft washer is a larger diameter. Keep the washers with their respective shafts for installing purposes.**



CD134A

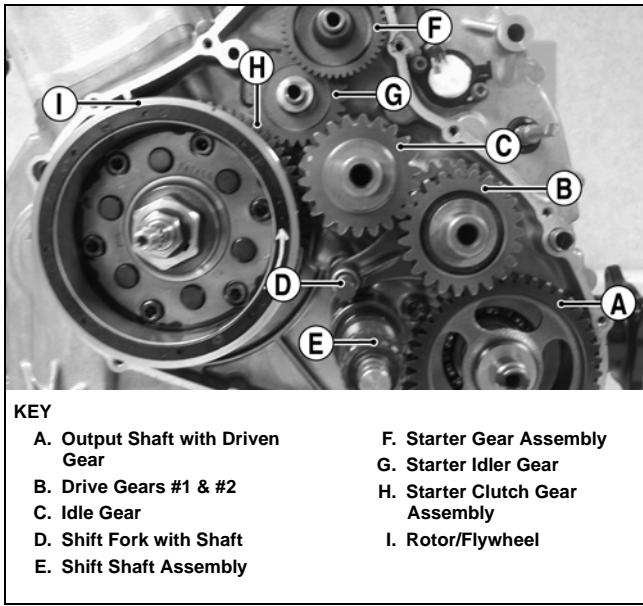


CD136

## E. Rotor/Flywheel F. Idle Gear Assembly

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

■ NOTE: For steps 9-18, refer to illustration CD134B.



CD134B

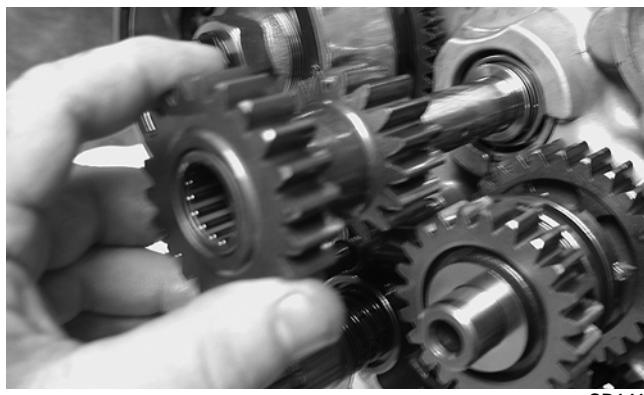
■ NOTE: To aid in installing, it is recommended that the assemblies are kept together and IN ORDER.

9. Remove the starter gear assembly (F) from the crankcase; then remove the starter idler gear (G) and spacer.



CD138

10. Remove the idle gear (C), washer, and spacer from the countershaft.



CD141

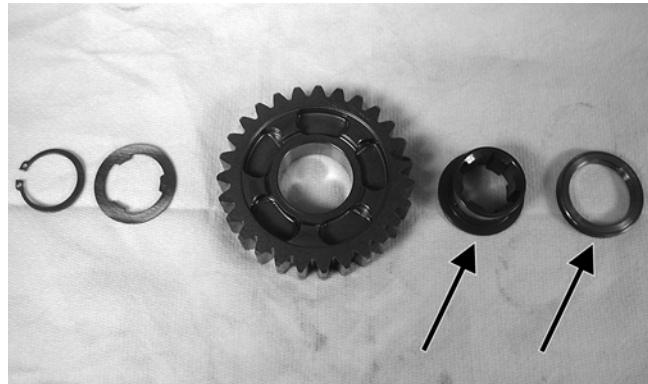
11. Remove the #2 drive gear (B), washer, and the select sliding dog gear from the driveshaft. Account for a bushing and a washer.

**☞ AT THIS POINT**  
To service shift fork, see Servicing Left-Side Components sub-section.

12. Remove the shift fork shaft (D) from the crankcase boss; then remove the shift fork from the shaft. Remove the shift shaft assembly (E) from the fixed shaft. Account for the left shaft washer.



CD146



CD154A

14. Remove the washer and driven gear (A) from the output shaft; then account for the bushing.



CD147



CD149



CD152

13. Remove the circlip and washer from the drive-shaft; then remove the #1 drive gear (B). Account for a splined bushing and a spacer.

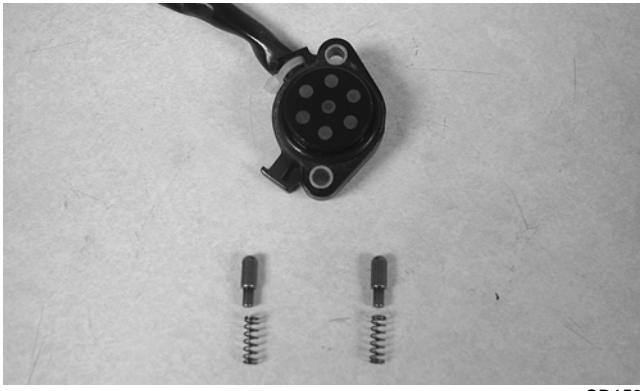


CD150

15. Remove the Allen-head screws securing the shift-indicator sending unit; then remove the sending unit. Account for an O-ring, two contacts, and two springs.

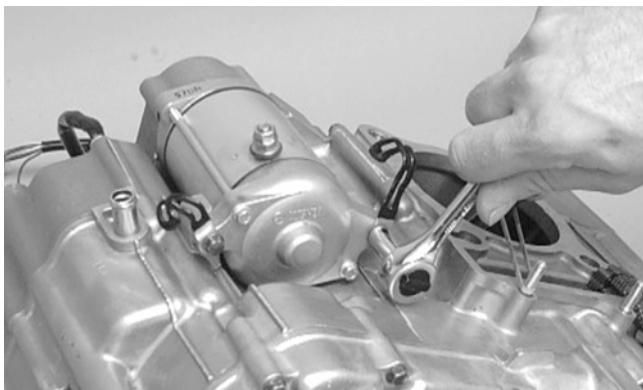


CC059D



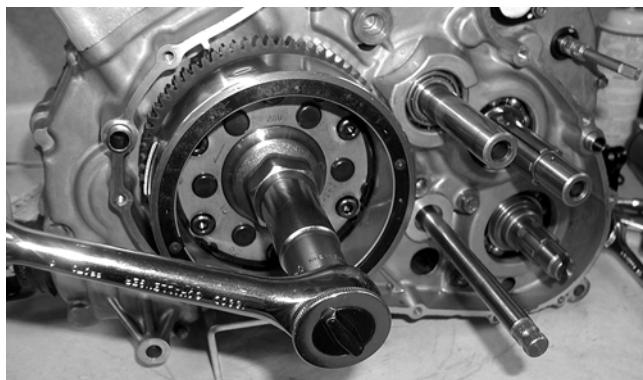
CD159

16. Remove the two cap screws securing the starter to the crankcase; then remove the starter. Account for the wiring forms.



CC065D

17. Remove the nut securing the rotor/flywheel (I) to the crankshaft; then install the magneto rotor remover adapter.

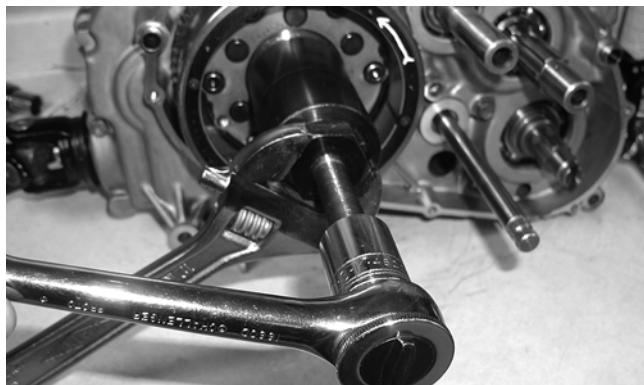


CD562



CD549

18. Using Magneto Rotor Remover (p/n 0444-075), remove the rotor/flywheel assembly from the crankshaft. Account for the key; then remove the starter clutch gear assembly (H) and thrust washer.



CD550



CD155

 **AT THIS POINT**

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

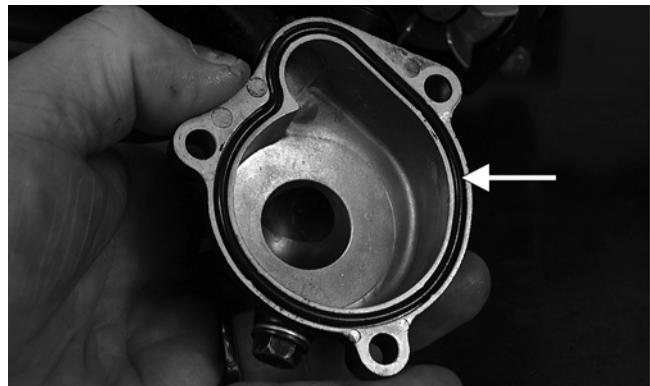
## Right-Side Components

■ 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

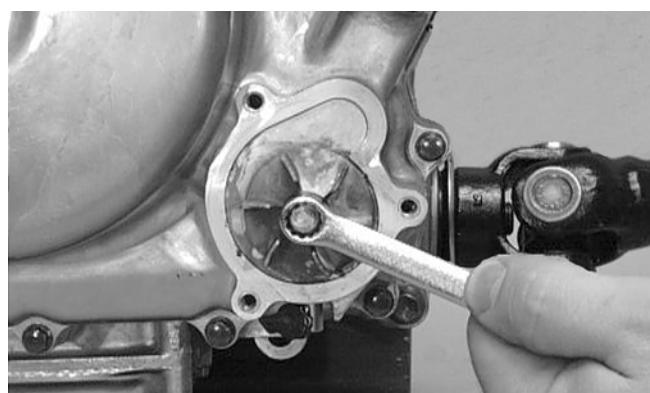
To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

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



CF066A

4. Remove the cap screw securing the impeller to the impeller shaft; then remove the impeller. Account for the rubber retainer and porcelain seal.

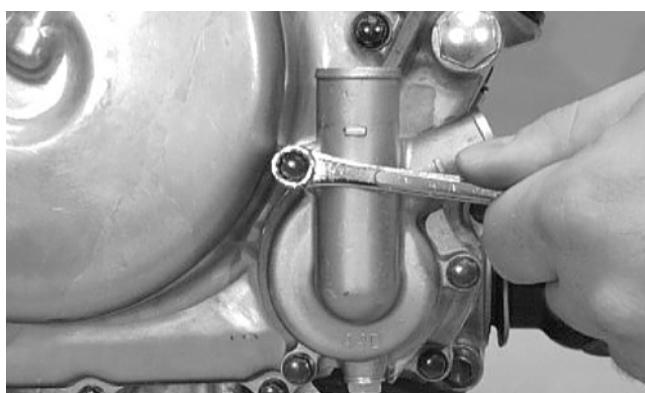


CC029D

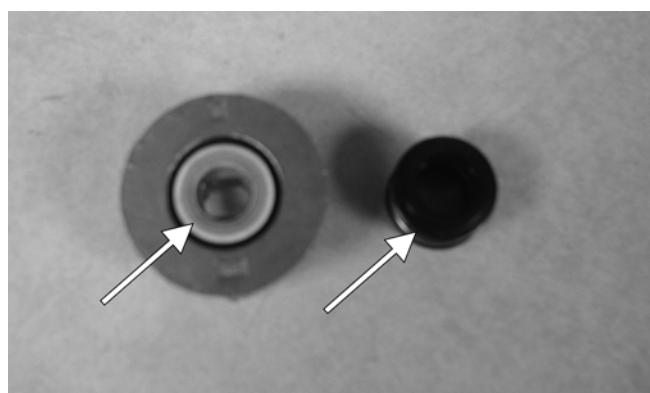
## Removing Right-Side Components

### A. Oil Filter B. Water Pump

1. Remove the clamp securing the coolant hose to the water pump; then remove the hose.
2. Using the adjustable Oil Filter Wrench (p/n 0644-389), remove the oil filter.
3. Remove the three cap screws securing the water pump cover to the right-side cover; then remove the water pump cover. Account for the O-ring.



CC027D



CD163A

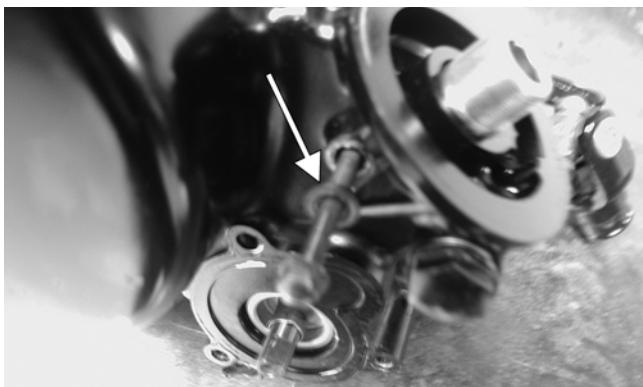
5. Remove the fifteen cap screws securing the right-side cover to the crankcase. Remove the cover. Note the location of the long cap screw and rubber washer. Account for the gasket and for two alignment pins.





CC034D

■ NOTE: The water pump housing does not have to be removed when removing the right-side cover.



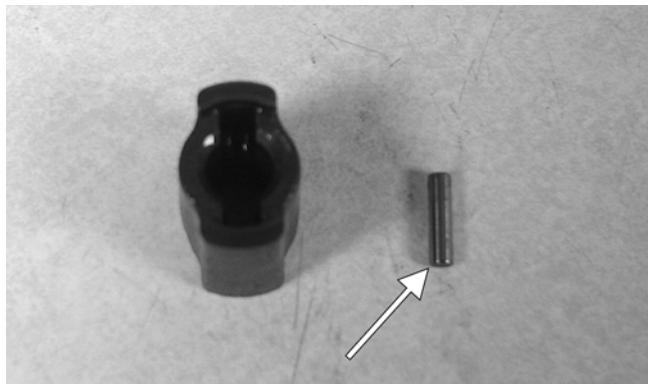
CD164A

■ NOTE: When removing the right-side cover, account for the release roller guide that it does not fall and cause damage.



CC070D

6. Remove the water pump drive joint from the water pump shaft. Account for the pin.



CD168A

### **C. Primary Drive Clutch Shoe D. Primary Driven Clutch E. Primary Drive Clutch Housing**

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

3

7. Remove the reverse cam stopper housing and gasket and account for a stopper and spring.

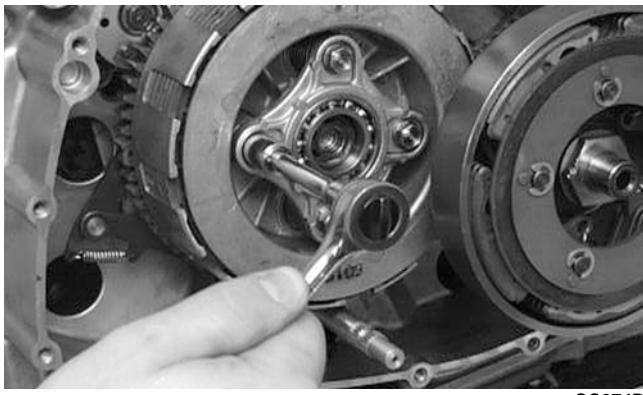


CC069D

8. Remove the clutch release arm and washer; then in a crisscross pattern, remove the four cap screws securing the clutch release roller assembly.



CD171

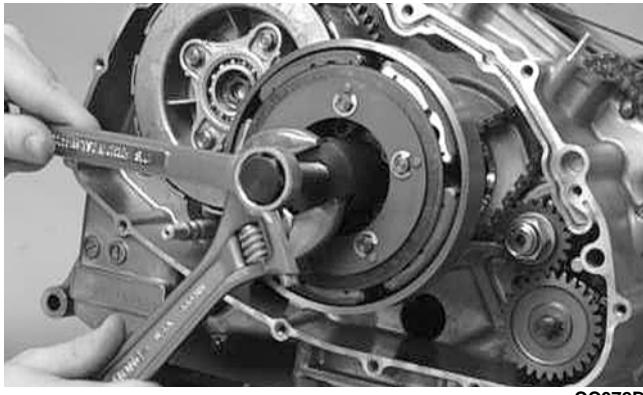


CC074D

9. Remove the release plate. Account for four springs.
10. Remove the primary drive clutch-shoe nut (left-hand threads) and washer from the drive-shaft; then using a primary clutch shoe remover, remove the clutch shoe.

**⚠ CAUTION**

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



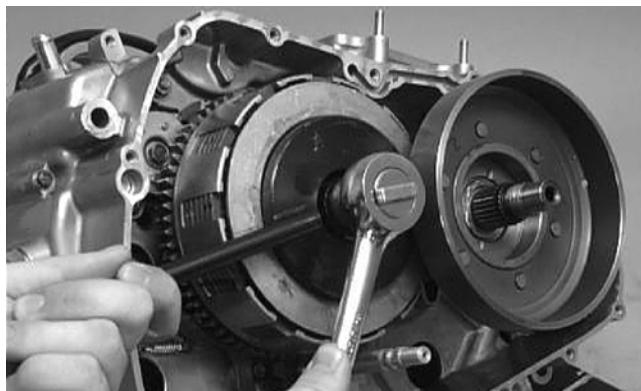
CC072D

11. Remove the primary drive one-way clutch from the primary drive clutch housing. Note the word OUTSIDE stamped on the clutch for installing purposes.



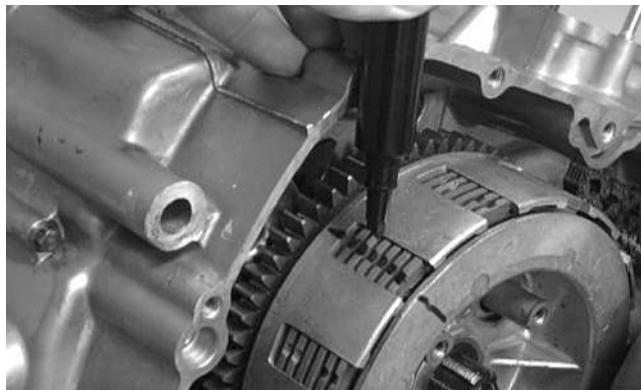
CF043

12. Using the Clutch Sleeve Hub Holder (p/n 0444-007) to hold the clutch sleeve hub, remove the nut and washer.



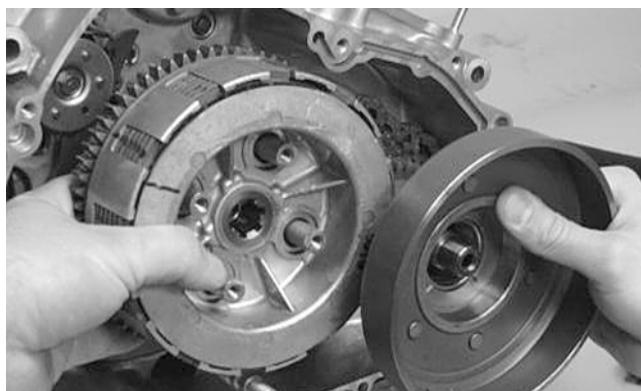
CC076D

13. Scribe a line across the primary driven clutch assembly to aid in assembling.



CC077D

14. Simultaneously, remove the primary driven clutch assembly and primary drive clutch housing from their respective shafts. Account for the sleeve and washers.



CC078D

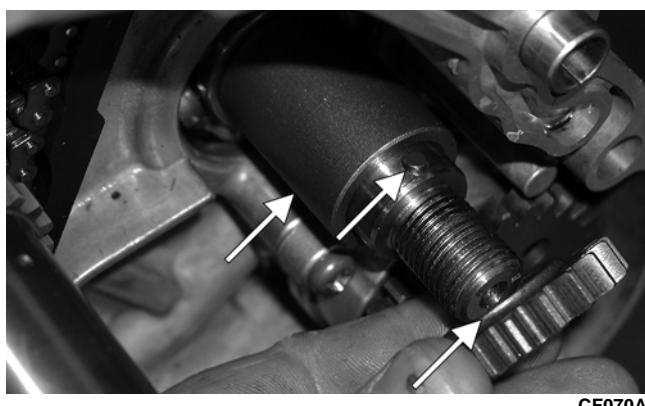
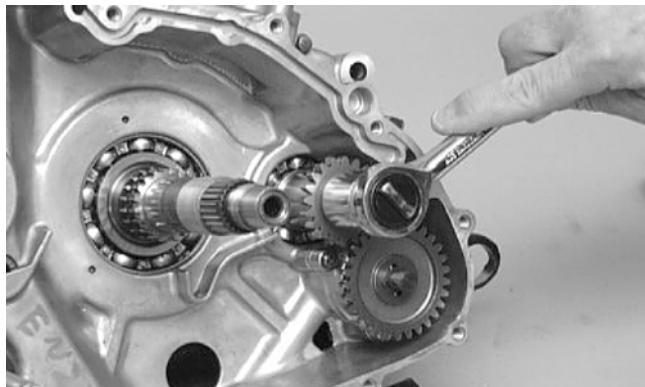
**☞ AT THIS POINT**

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

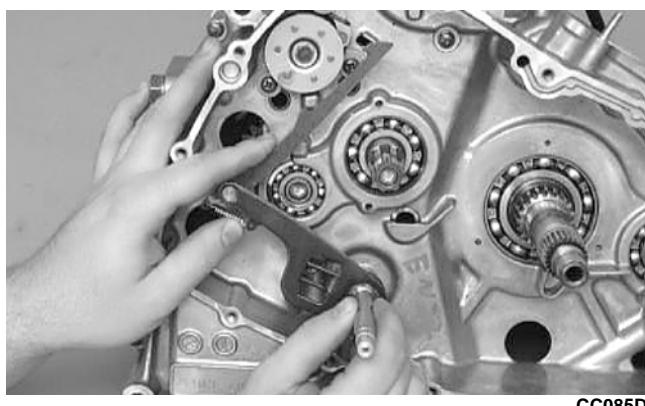
## F. Gear Shift Cam Plate/Guide G. Oil Pump/Oil Strainer

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

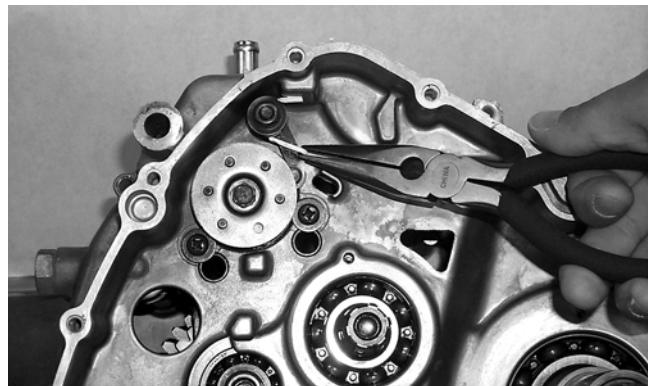
15. Remove the cam chain from the crankcase.
16. Remove the nut and washer securing the oil pump drive gear to the crank balancer shaft; then remove the gear and account for the pin and the spacer.



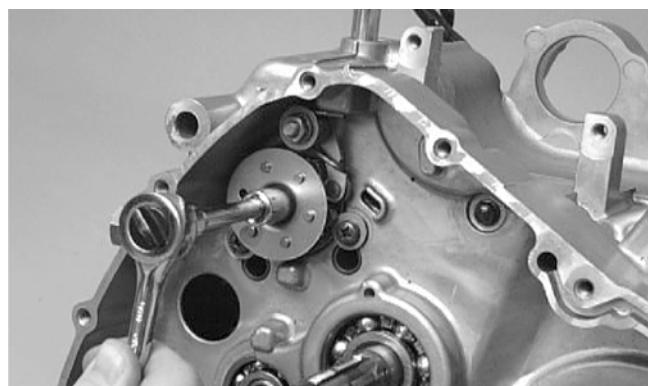
17. Remove the gear shift shaft from the crankcase.



18. Release the tension from the gear shift cam stopper arm spring.



19. Remove the cap screw securing the gear shift cam plate and guide to the gear shift cam; then remove the cam plate and guide.



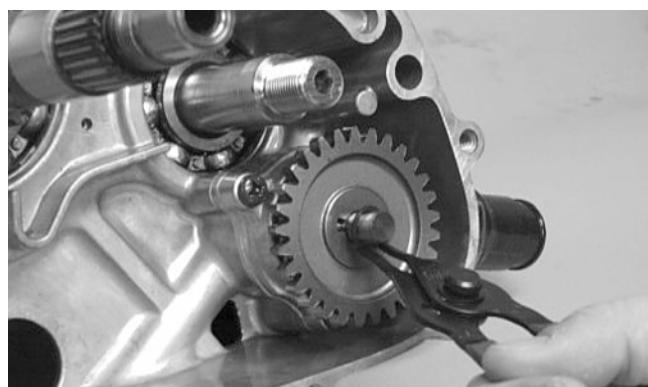
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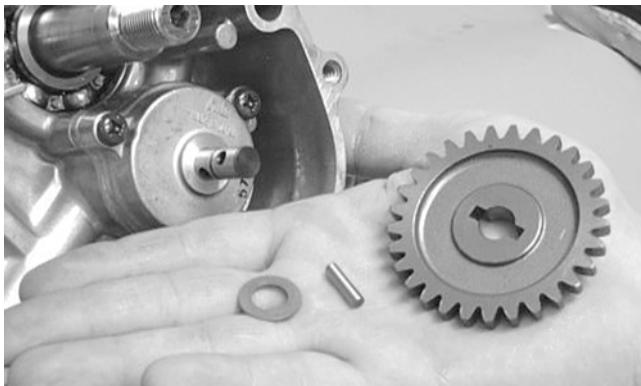
### ⚠ CAUTION

If servicing of the engine/transmission is due to a lubrication-related problem, replace the oil pump.

■ NOTE: For general servicing, it is advisable to disassemble, clean, and inspect the oil pump. If any wear or damage is suspected, replace the oil pump.

20. Remove the circlip securing the oil pump driven gear; then remove the gear. Account for the pin and the washer.

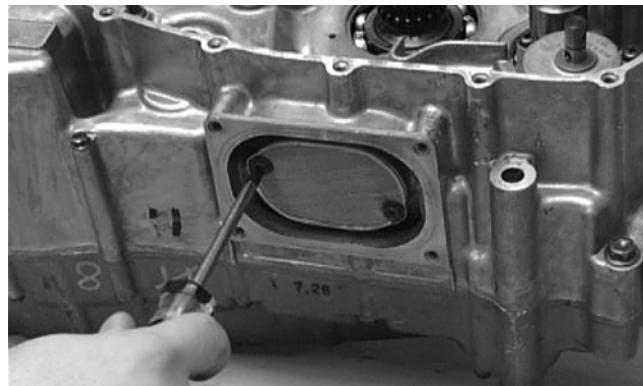




CC089D

21. Remove the three Phillips-head screws securing the oil pump; then remove the oil pump.

■ **NOTE:** It may be necessary to use an impact driver to loosen the screws.



CC163D

#### **AT THIS POINT**

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



CD190

22. Remove the cap screws securing the oil strainer cap; then remove the cap. Account for the O-ring.



CC091D

23. Remove the two Phillips-head cap screws securing the strainer.

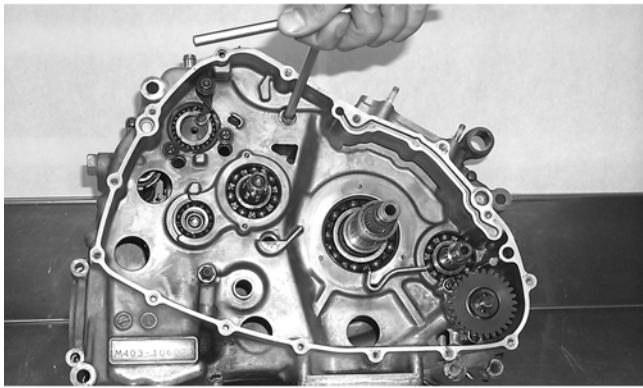
## **Center Crankcase Components**

■ **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.

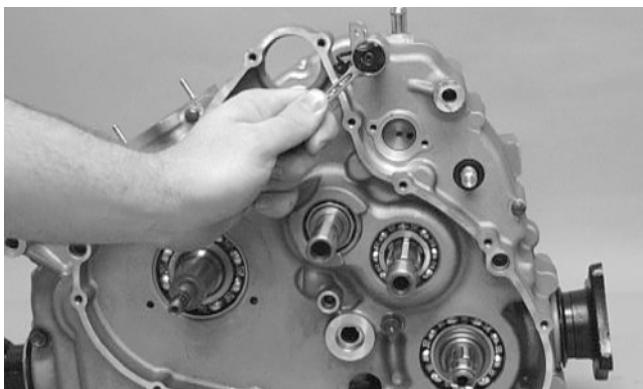
## **Separating Crankcase Halves**

1. Remove the five right-side 6 mm cap screws (one from inside the case) securing the crankcase halves. Note the location of the different-lengthed cap screws.



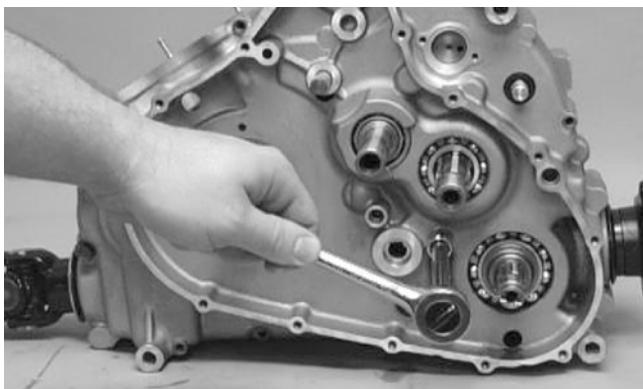
CC530D

2. Remove the seven left-side 6 mm cap screws securing the crankcase halves. Note the location of the wiring form. Note the location of the different-lengthed cap screws.



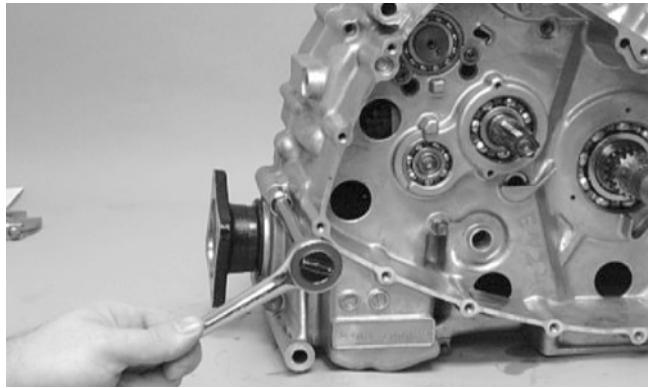
CC096D

3. Remove the three left-side 8 mm cap screws (two from inside the case) securing the crankcase halves. Note the location of the different-lengthed cap screws.



CC097D

4. Remove the three right-side 8 mm cap screws securing the crankcase halves.

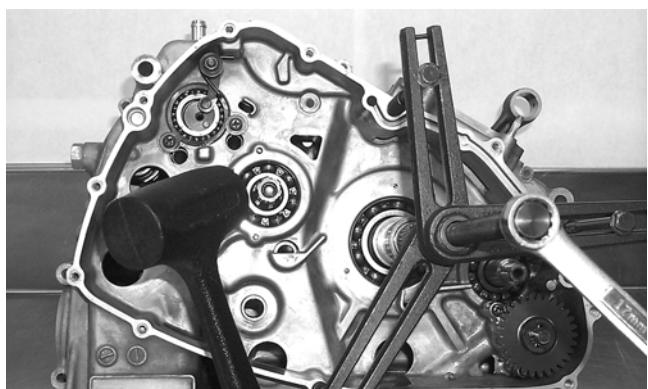


CC098D

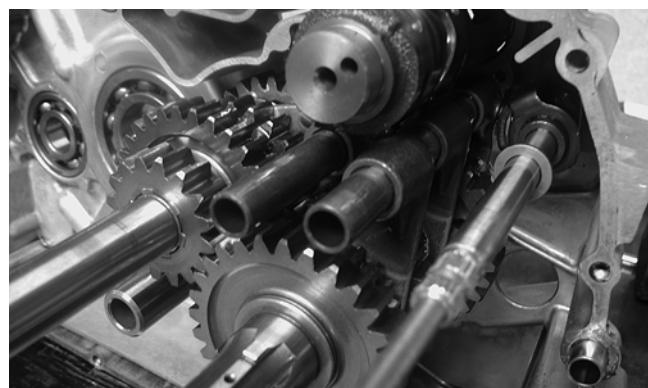
5. Using the Crankcase Separator/Crankshaft Remover (p/n 0444-009) and tapping lightly with a rubber mallet, separate the crankcase halves. Account for two alignment pins, an O-ring, and a washer.

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

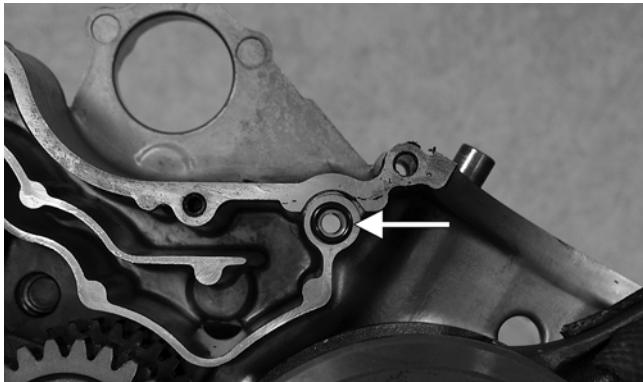
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CC099D



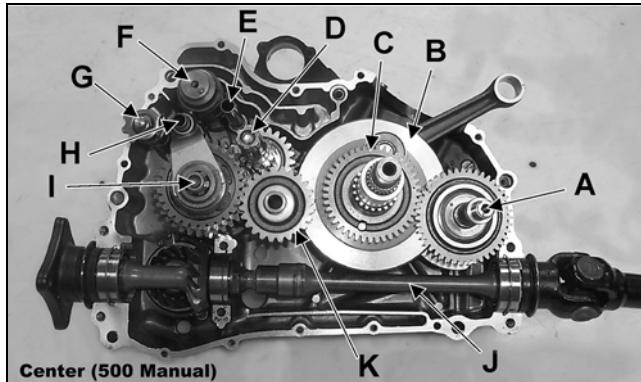
CD227



CF078A



CC102D



## KEY

A. Crank Balancer Assembly	G. Reverse Shift Cam
B. Crankshaft	H. Shift Shaft with Three Forks
C. Balancer Drive Gear with Pin	I. Driveshaft Assembly
D. Countershaft Assembly	J. Output Shaft
E. Shift Shaft with Fork	K. Reverse Idle Gear
F. Gear Shift Cam	

CC803C

1. Remove the two shift shafts (E and H).
2. Remove the reverse shift cam (G) and spacer.
3. Disengage four forks from the gear shift cam (F); then remove the reverse shifter fork.



CC105D

4. Remove the gear shift cam (F).



CC106D

5. Remove the three remaining forks noting their positions for assembling purposes.

### **AT THIS POINT**

To service gear shift forks, see Servicing Center Crankcase Components sub-section.

6. Remove the reverse idle gear (K) w/shaft. Account for the bushing, two washers, and the circlip.
7. Simultaneously, remove the driveshaft assembly (I) and countershaft assembly (D). Account for the washer on the countershaft.

### **AT THIS POINT**

To service the driveshaft and/or countershaft, see Servicing Center Crankcase Components sub-section.

■ **NOTE:** For efficiency, if the driveshaft and/or countershaft are not being serviced, it is preferable to leave them assembled. The technician should use discretion and sound judgment.

8. Remove the front output shaft (J) and rear shaft assemblies. Account for the bearing C-ring.

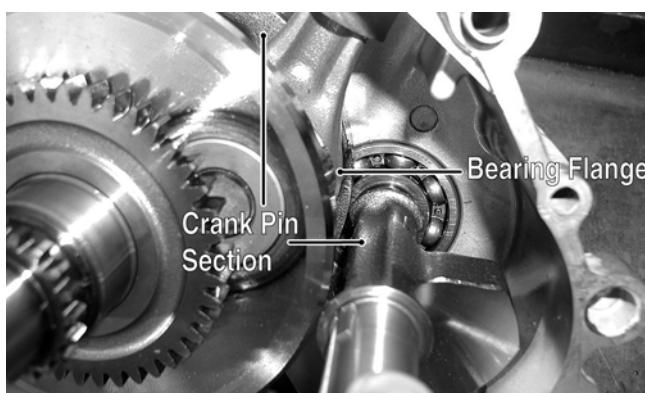
■ **NOTE:** Note the alignment marks on the crank balancer driven gear and balancer drive gear to aid in assembly.



9. Remove the driven gear from the crank balancer assembly (A). Account for a key.



10. Remove the crank balancer assembly (A).



3

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

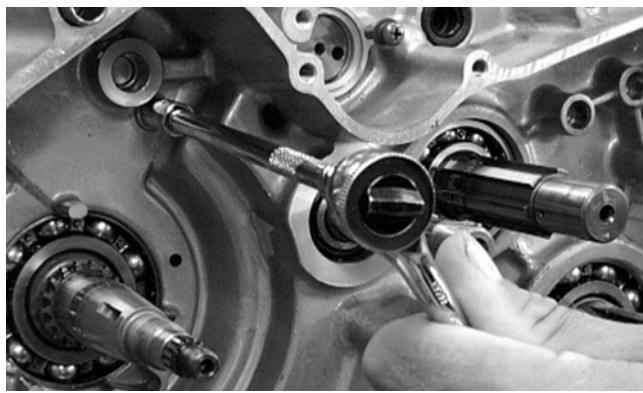
11. Using the Crankcase Separator/Crankshaft Remover (p/n 0444-009), push the crankshaft assembly out of the crankcase.



### **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.

12. To remove the output shaft and gear, remove the nut, slide the gear off the shaft (account for a shim or shims), and drive the shaft out with a plastic mallet (account for a shim or shims).



CC482D

## Servicing Top-Side Components

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

### 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.

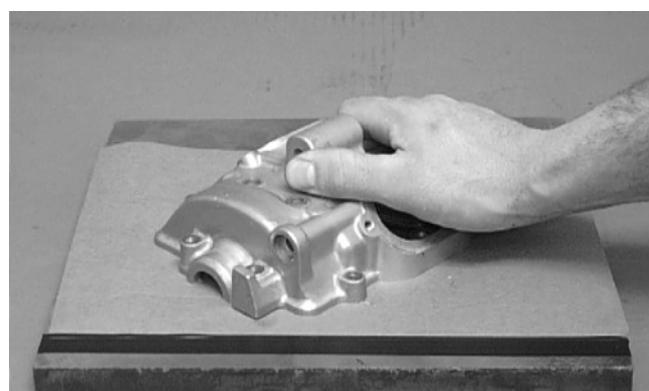
### Cleaning/Inspecting Valve Cover

■ **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 (p/n 0644-016) covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the valve cover in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the valve cover in a figure eight motion until a uniform bright metallic finish is attained.

#### ⚠ CAUTION

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



CC130D

## Table of Contents (Servicing Components)

■ **NOTE:** Critical engine/transmission specifications are located at the beginning of this section.

Servicing Top-Side Components.....	3-206
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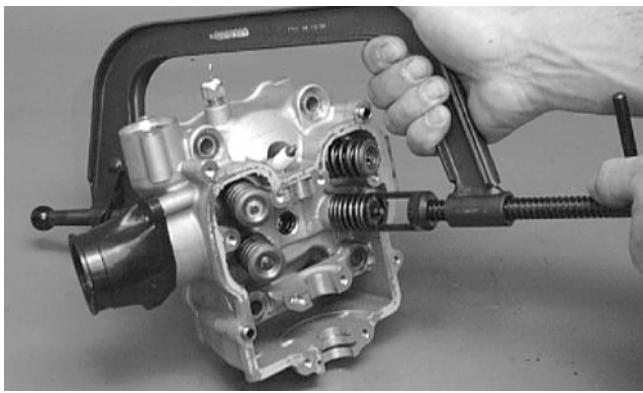
## ⚠ CAUTION

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

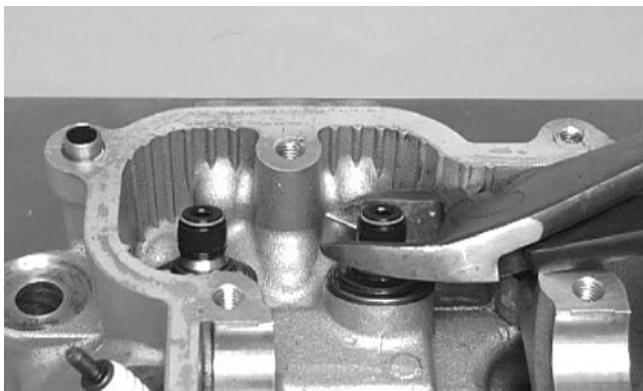
■ NOTE: Keep all valves and valve components as a set. Note the original location of each valve set for use during installation. Return each valve set to its original location during installation.

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

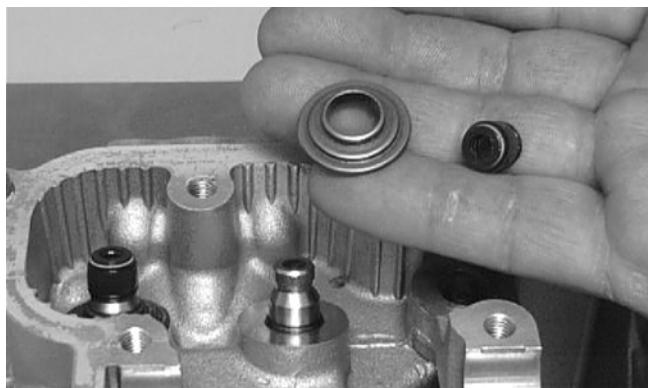


CC132D

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



CC134D



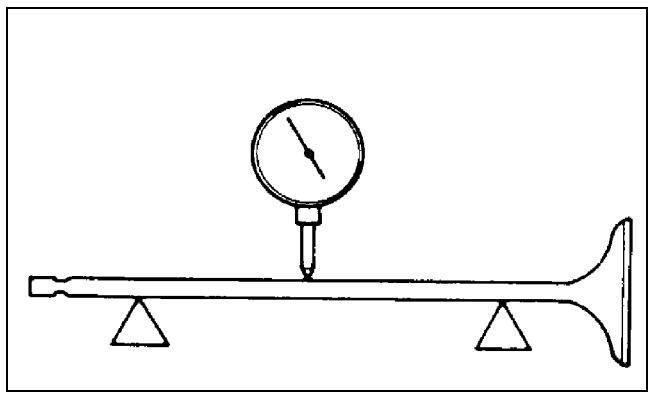
CC136D

■ NOTE: The valve seals must be replaced.

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

### Measuring Valve Stem Runout

1. Support each valve stem end with the V Blocks (p/n 0644-022); then check the valve stem runout using a dial indicator.



ATV-1082

2. Maximum runout must not exceed specifications.

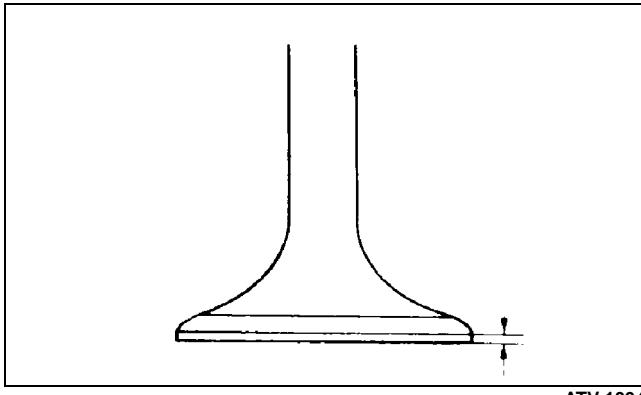
### Measuring Valve Stem Outside Diameter

1. Using a micrometer, measure the valve stem outside diameter.
2. Acceptable diameter range (intake valve) must be within specifications.
3. Acceptable diameter range (exhaust valve) must be within specifications.

### Measuring Valve Face/Seat Width

1. Using a micrometer, measure the width of the valve face.

3

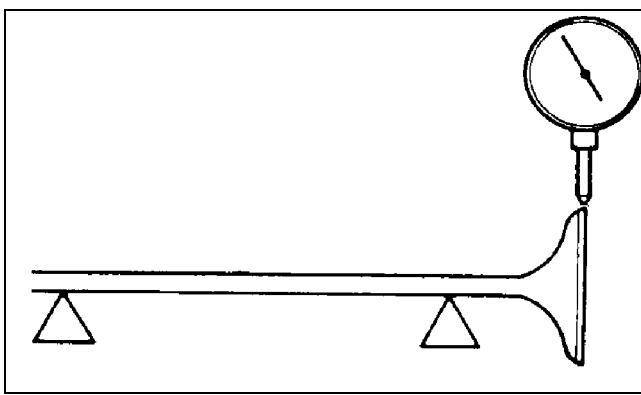


ATV-1004

2. Acceptable width range must be within specifications.

### **Measuring Valve Face Radial Runout**

1. Mount a dial indicator on the surface plate; then place the valve stem on a set of V blocks.
2. Position the dial indicator contact point on the outside edge of the valve face; then zero the indicator.

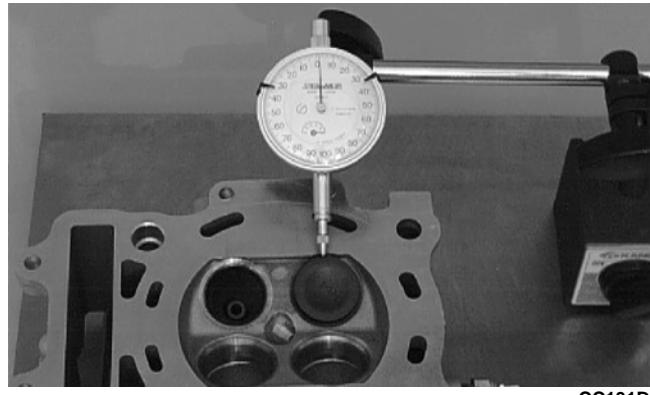


ATV1082A

3. Rotate the valve in the V blocks.
4. Maximum runout must not exceed specifications.

### **Measuring Valve Guide/Valve Stem Deflection (Wobble Method)**

1. Mount a dial indicator and base on the surface plate; then place the cylinder head on the surface plate.
2. Install the valve into the cylinder head; then position the dial indicator contact point against the outside edge of the valve face. Zero the indicator.



CC131D

3. Push the valve from side to side; then from top to bottom.
4. Maximum "wobble" deflection must not exceed specifications.

### **Measuring Valve Guide (Inside Diameter)**

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.

### **Measuring Rocker Arm (Inside Diameter)**

1. Using a dial calipers, measure the inside diameter of the rocker arm.
2. Acceptable inside diameter range must be within specifications.

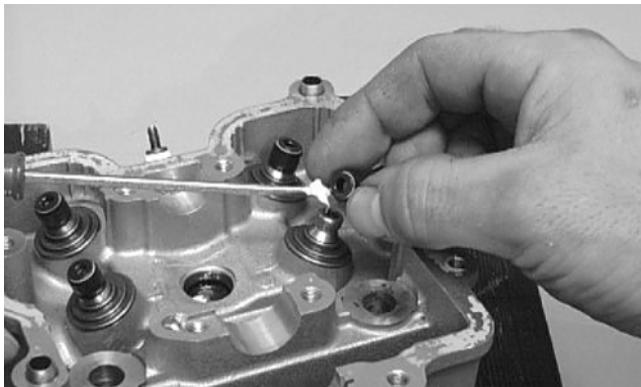
### **Measuring Rocker Arm Shaft (Outside Diameter)**

1. Using a micrometer, measure the outside diameter of the rocker arm shaft.

- Acceptable outside diameter range must be within specifications.

## Installing Valves

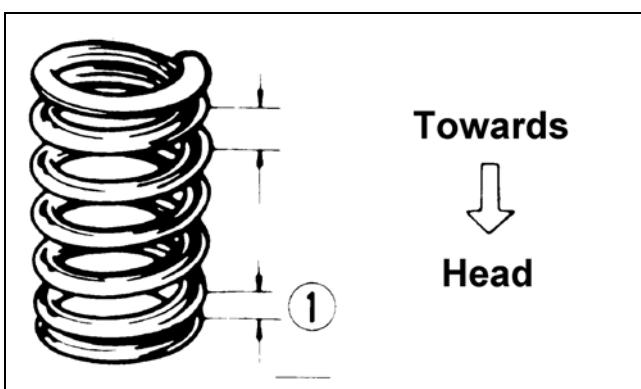
- Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



CC144D

- Insert each valve into its original valve location.
- 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

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



CC132D

## PISTON ASSEMBLY

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

### Cleaning/Inspecting Piston

3

- Using a non-metallic carbon removal tool, remove any carbon buildup from the dome of the piston.
- Inspect the piston for cracks in the piston pin, dome, and skirt areas.
- 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.**

- 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

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



CC400D

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

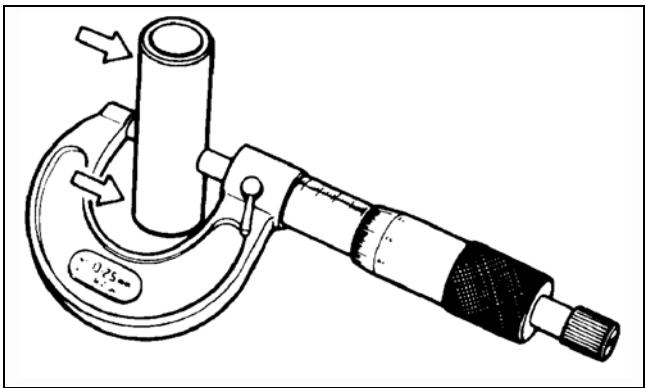
■ NOTE: If the existing rings will not be replaced with new ones, note the location of each ring for proper installation. When installing new rings, install as a complete set only.

## Cleaning/Inspecting Piston Rings

1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

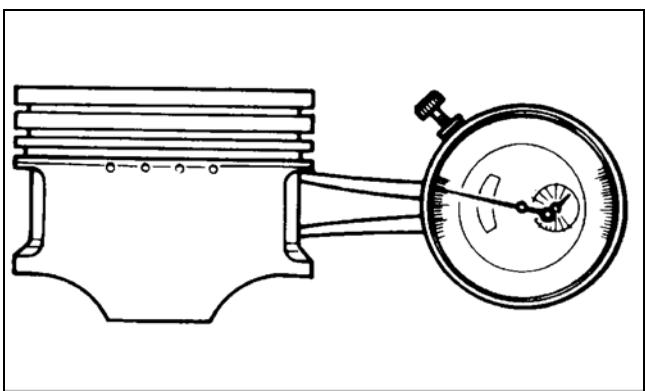
### ⚠ CAUTION

Improper cleaning of the ring-grooves by the use of the wrong type of ring-groove cleaner will result in severe damage to the piston.



ATV-1070

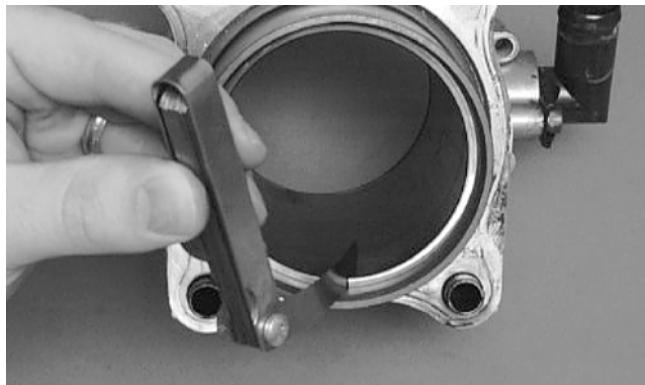
2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



ATV-1069

## Measuring Piston-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 be within specifications.



CC280D

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

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

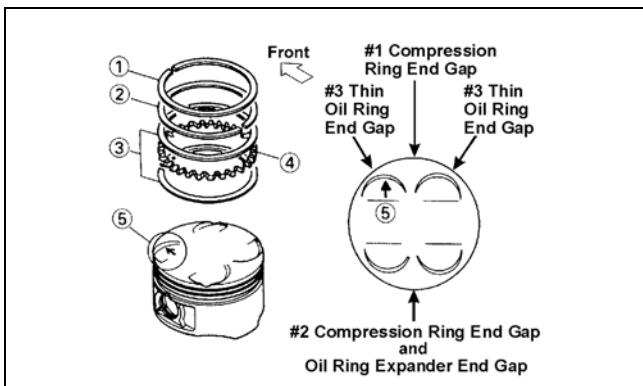
## Measuring Piston Skirt/ Cylinder Clearance

1. Measure the cylinder front to back in six places.
2. Measure the corresponding piston diameter at a point 15 mm (0.6 in.) above the piston skirt at a right angle to the piston-pin bore. Subtract this measurement from the 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.

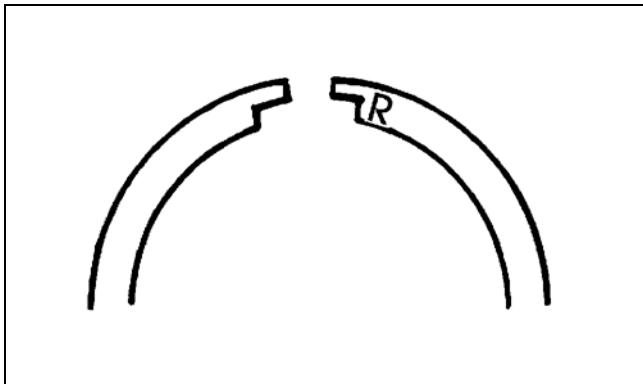
■ NOTE: Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.



ATV-1085B

2. Install the compression rings (1 and 2) so the letter 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 (see illustration).

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



726-306A

#### ⚠ 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.

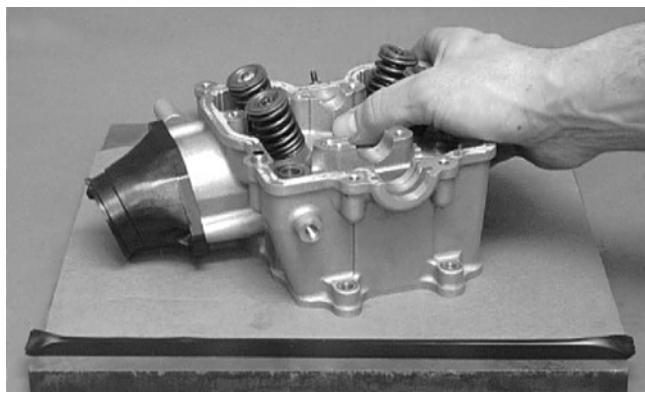
1. Using a non-metallic carbon removal tool, remove any carbon buildup from the combustion chamber being careful not to nick, scrape, or damage the combustion chamber or the sealing surface.

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.

3



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.



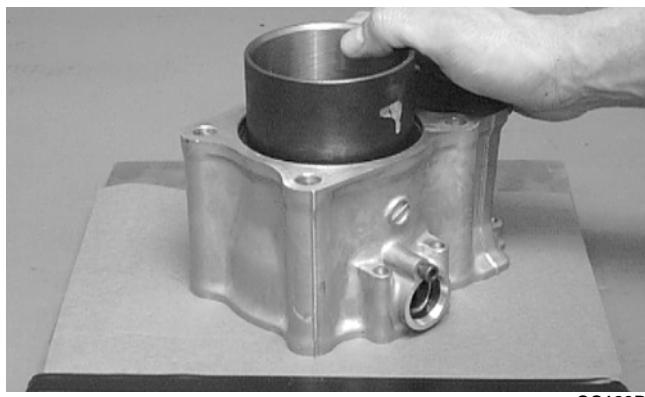
CC141D

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

### **CAUTION**

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



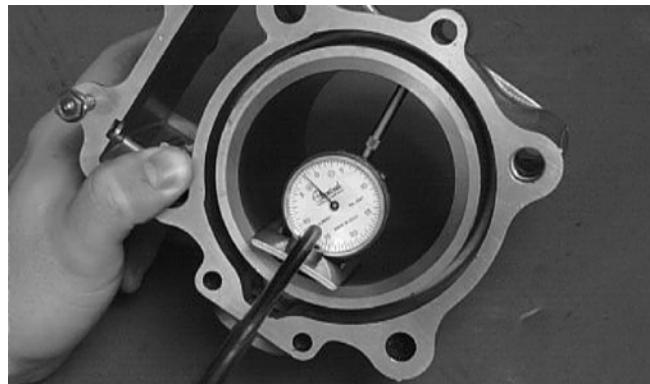
CC129D

## Inspecting Cam Chain Guide

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

## Honing Cylinder

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



CC127D

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



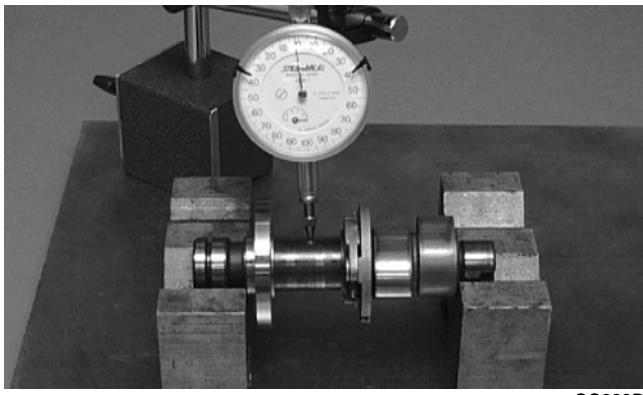
CC390D

4. If any measurement exceeds specifications, replace the cylinder.

## 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.

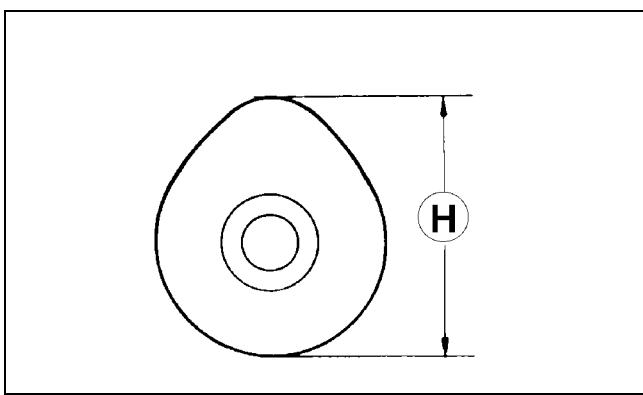


CC283D

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

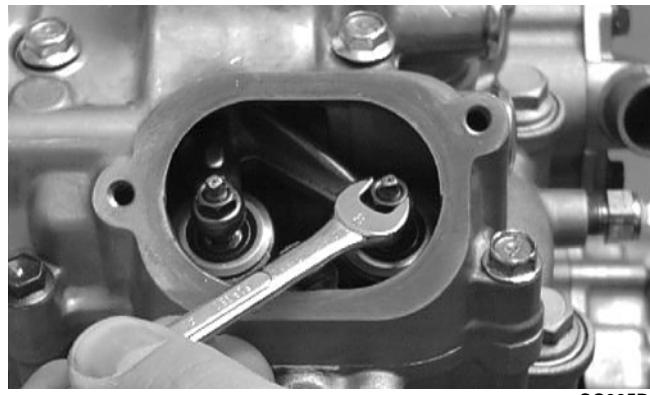
2. The lobe heights must not exceed minimum specifications.

### 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.

### Measuring Camshaft to Cylinder Head Clearance

1. Remove the adjuster screws and jam nuts.



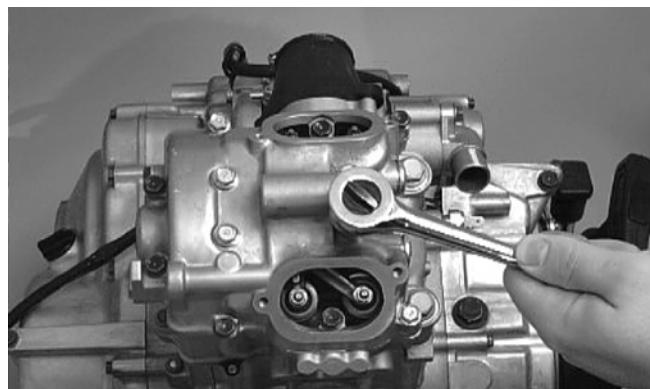
CC005D

2. Place a strip of plasti-gauge in each of the cam shaft lands in the cylinder head.
3. Place the valve cover on the cylinder head and secure with the valve cover cap screws. Tighten securely.

■ **NOTE: Do not rotate the camshaft when measuring clearance.**

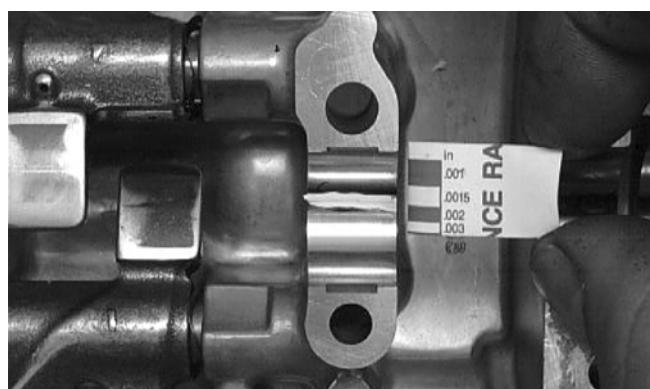
3

4. Remove the cap screws securing the valve cover to the cylinder; then remove the valve cover and camshaft.



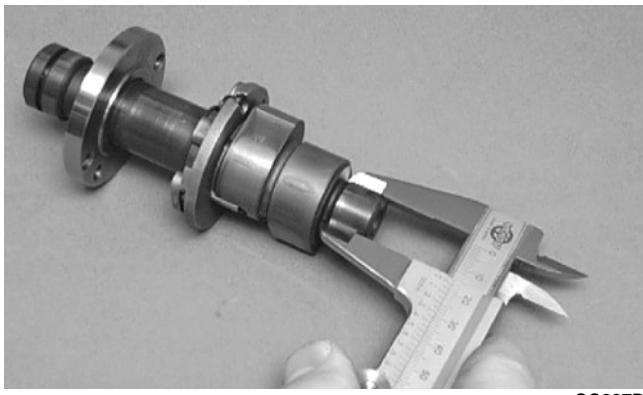
CC003D

5. Match the width of the plasti-gauge with the chart found on the plasti-gauge packaging to determine camshaft to cylinder head and valve cover clearance.



CC145D

6. If clearance is excessive, measure the journals of the camshaft.

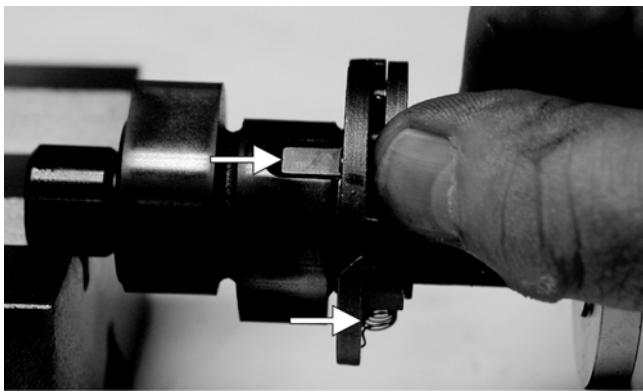


CC287D

■ **NOTE:** If the journals are worn, replace the camshaft; then measure the clearance again. If it is still out of tolerance, replace the cylinder head.

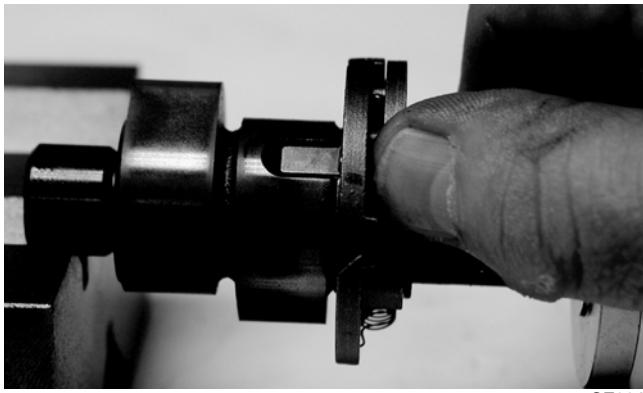
### Inspecting Camshaft Automatic Decompression Spring/Unloader Assembly

1. Inspect the spring, weights, and unloader for damage and freedom of movement.



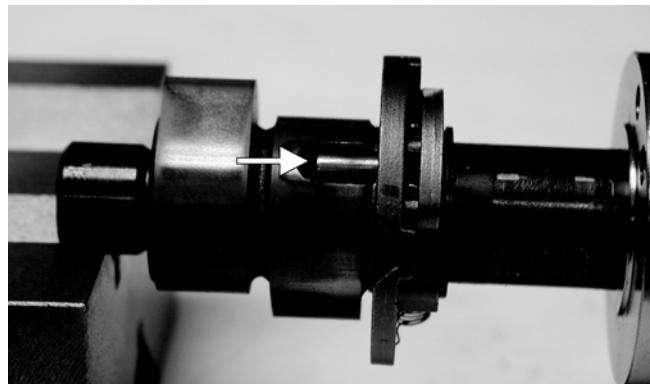
CF061A

■ **NOTE:** With the weight extended, the unloader flat should be even with the camshaft journal.



CF061

■ **NOTE:** When the weight is released, the spring should return the assembly to the "unload" position with the unloader extending above the camshaft journal.



CF060A

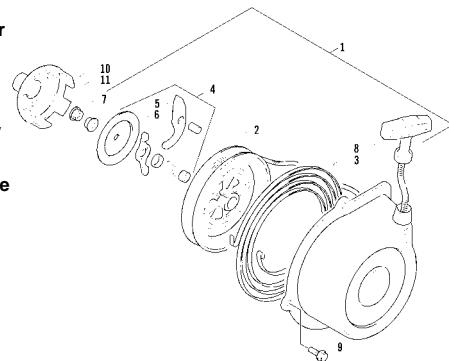
2. If damaged, the camshaft must be replaced.

## Servicing Left-Side Components

### RECOIL STARTER

#### KEY

- 1. Recoil Starter Assy
- 2. Reel
- 3. Spiral Spring
- 4. Ratchet Assy
- 5. Ratchet
- 6. Ratchet Guide
- 7. Nut
- 8. Rope Assy
- 9. Cap Screw
- 10. Starter Cup
- 11. Nut



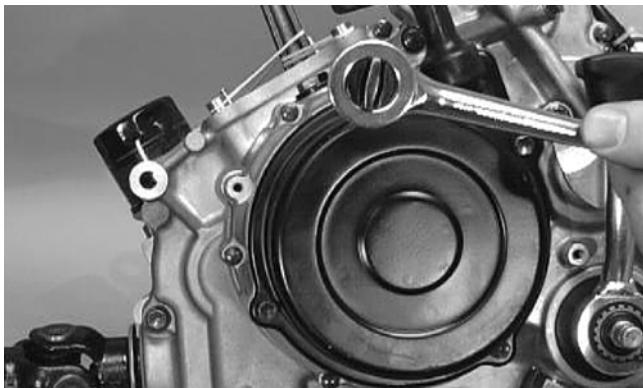
0737-034

### ⚠ WARNING

Always wear safety glasses when servicing the recoil starter.

### Removing/Disassembling

1. Remove the cap screws securing the recoil starter assembly to the left-side cover; then remove the starter.

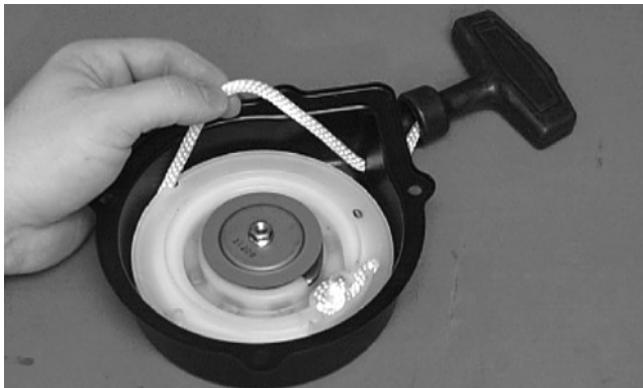


CC039D

### ⚠️ **WARNING**

**During the disassembly procedure, continuous downward pressure must be exerted on the reel so it does not accidentally disengage and cause injury.**

2. Rotate the reel counterclockwise until the notch of the reel is near the rope guide in the case. Guide the rope into the notch and slowly allow the reel to retract until all spiral spring tension is released.

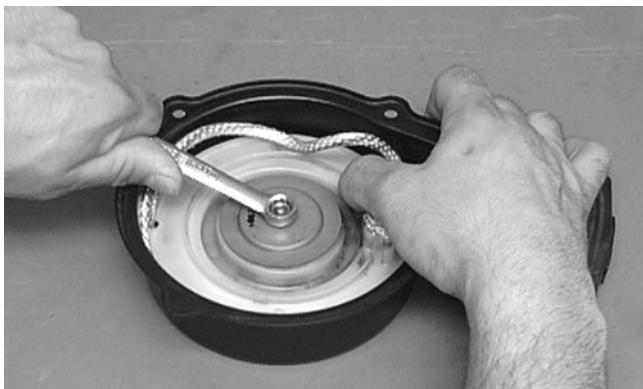


B600D

### ⚠️ **CAUTION**

**During the disassembly procedure, make sure all spring tension is released before continuing.**

3. Remove the nut.



B601D

4. Slowly release the friction plate and lift the plate with ratchet guide free of the recoil case; then remove the ratchet guide from the friction plate.



B602D

5. Remove the spring cover, spring, and shaft.



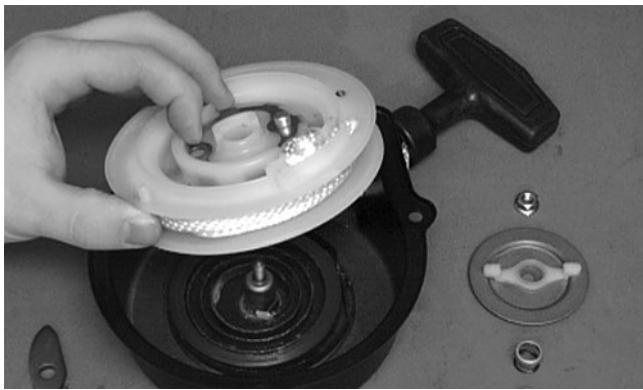
B603D

6. Remove the ratchet and account for the pin.



B604D

7. Carefully lift the reel from the case making sure the spring does not accidentally disengage from the case.



B605D

### **WARNING**

**Care must be taken when lifting the recoil free of the case. Wear safety glasses to avoid injury.**

8. Remove the protective cover from the starter handle and pull the rope out of the handle; then untie the knot in the rope and remove the handle.

**■ NOTE: Do not remove the spiral spring unless replacement is necessary. It should be visually inspected in place to save time. If replacement is necessary, follow steps 9-10.**

9. Remove the spiral spring from the case by lifting the spring end up and out. Hold the remainder of the spring with thumbs and alternately release each thumb to allow the spring to gradually release from the case.
10. Unwind the rope from the reel and remove the rope.

### **Cleaning and Inspecting**

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

1. Clean all components.
2. Inspect the springs and ratchet for wear or damage.
3. Inspect the reel and case for cracks or damage.
4. Inspect the shaft for wear, cracks, or damage.
5. Inspect the rope for breaks or fraying.
6. Inspect the spiral spring for cracks, crystallization, or abnormal bends.
7. Inspect the handle for damage, cracks, or deterioration.

### **Assembling/Installing**

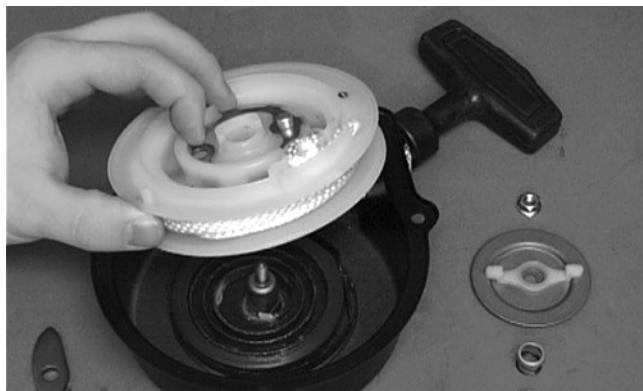
1. If removed, insert the spiral spring into the case with the outer end of the spring around the mounting lug in the case; then wind it in a counterclockwise direction until the complete spring is installed.

**■ NOTE: The spiral spring must seat evenly in the recoil case.**



B606D

2. Insert the rope through the hole in the reel and tie a knot in the end; then wrap the rope counterclockwise around the reel leaving approximately 50 cm (20 in.) of rope free of the reel.
3. Apply low-temperature grease to the spring and hub.
4. Thread the end of the rope through the guide hole of the case; then thread the rope through the handle and secure it with a double knot. Install the protective cover into the handle.
5. Align the inner hook of the spiral spring with the notch in the reel.



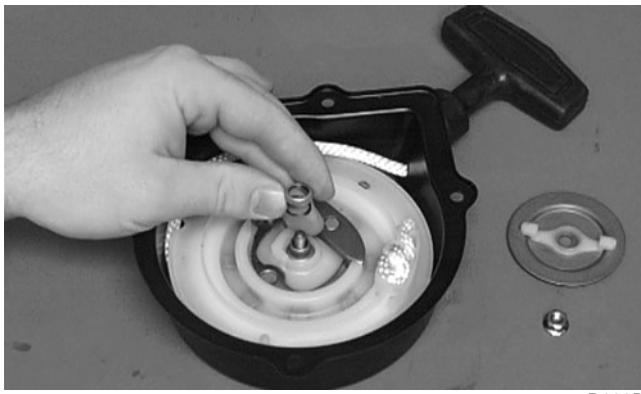
B605D

6. Install the ratchet onto its spring making sure the end is properly installed on the reel.



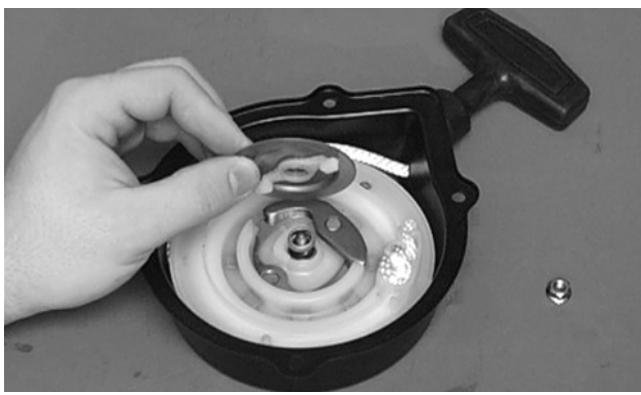
B604D

7. Install the shaft, spring, and the spring cover.



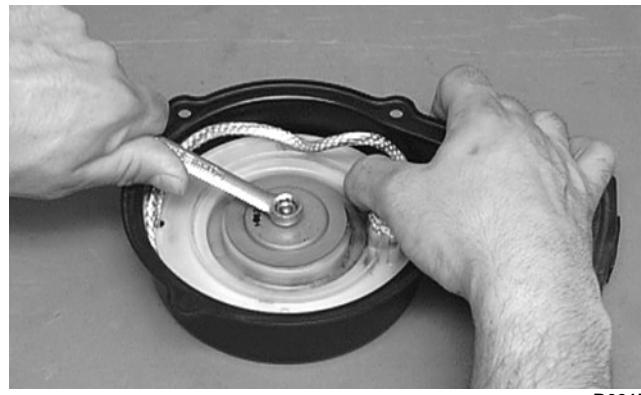
B603D

8. Install the friction plate with the ratchet guide fitting into the ratchet.



B602D

9. While pushing down on the reel, install the nut. Tighten securely.



B601D

10. With the 50 cm (20 in.) of rope exposed, hook the rope in the notch of the reel.

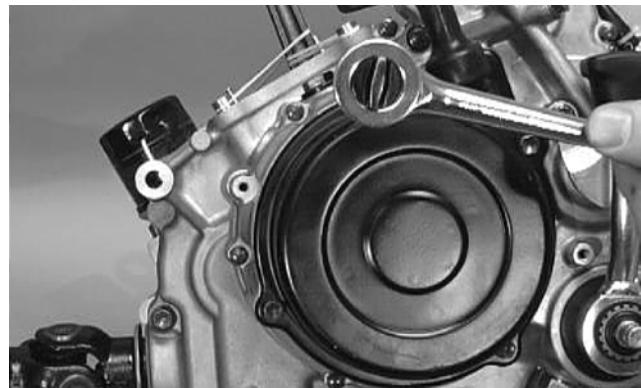
11. Rotate the reel four turns counterclockwise; then release the rope from the notch and allow the rope to retract.

12. Pull the rope out two or three times to check for correct tension.

3

**■ NOTE: Increasing the rotations in step 11 will increase spring tension.**

13. Place the recoil starter assembly into position on the left-side cover; then tighten the cap screws to specifications.



CC039D

## **MEASURING SHIFT FORK (Thickness)**

**■ NOTE: Whenever a shift fork is out of tolerance, replacement is necessary.**

1. Using a calipers, in turn measure the thickness of the machined tip of each shift fork.

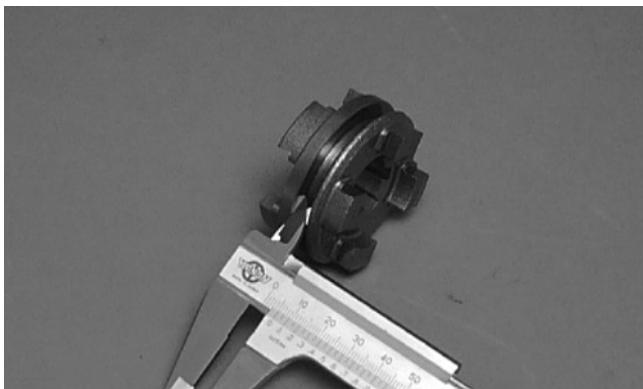


CC296D

2. Shift fork thickness must be within specifications.

### **MEASURING SHIFT FORK GROOVE (Width)**

1. Using a calipers, in turn measure the width of each shift fork groove.



CC288D

2. Shift fork groove width must be within specifications.

### **MEASURING SHIFT FORK TO GROOVE (Side Clearance)**

1. In turn, insert each shift fork into its groove.
2. Using a feeler gauge, measure the clearance between the shift fork and the groove.



CC292D

3. Shift fork to groove side clearance must be within specifications.

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## **Servicing Right-Side Components**

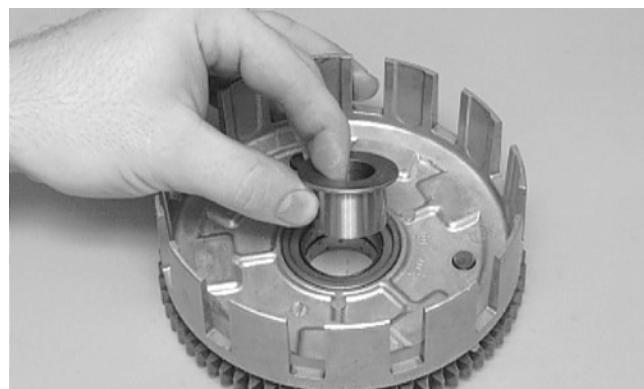
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■ **NOTE:** Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.

### **PRIMARY CLUTCH ASSEMBLY (Inspecting/Measuring/Assembling)**

■ **NOTE:** Prior to inspecting and measuring components, it is recommended that all components be removed from the primary gear assembly and be cleaned.

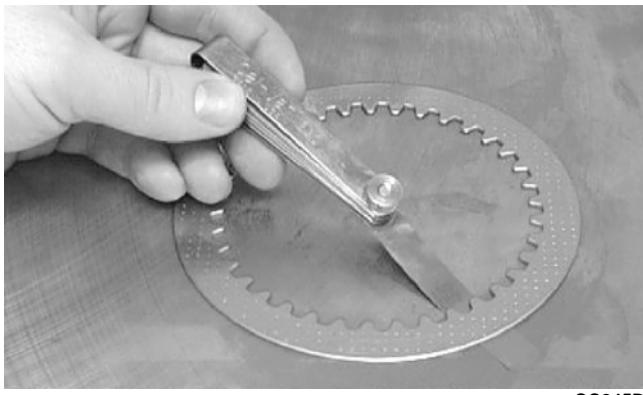
■ **NOTE:** When removing components from the primary gear assembly, account for the bushing that fits into the primary gear.



CC239D

### **Inspecting/Measuring Clutch Driven Plate Warpage**

1. Inspect each driven plate for warpage and burn marks.
2. In turn place each driven plate on the surface plate; then using a feeler gauge, measure warpage in several locations.

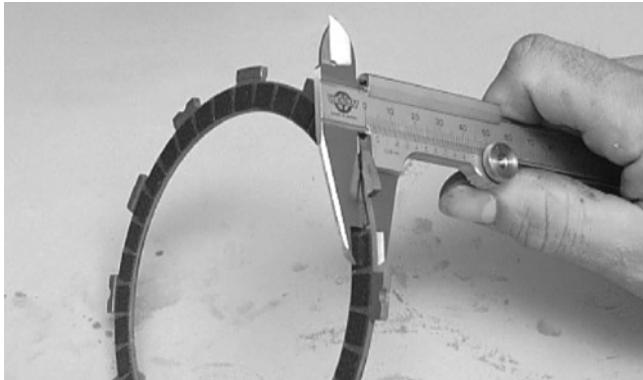


CC243D

3. Maximum driven plate warpage must not exceed specifications.

### Measuring Clutch Drive Plate (Fiber) Thickness

1. Using a calipers, in turn measure the thickness of each drive plate in several locations.



CC243D

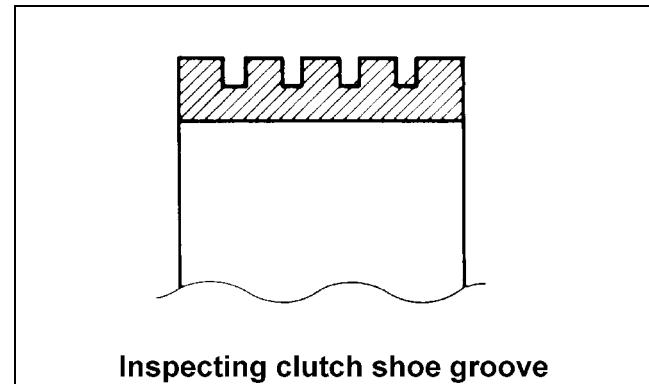
2. Drive plate thickness must be within minimum specifications.
3. If the fiber plate tabs are damaged, the plate must be replaced.
4. Inspect the clutch sleeve hub for grooves or notches. If grooves or notches are present, replace the hub.

### Inspecting Centrifugal Clutch Shoe

1. Inspect the clutch shoe for uneven wear, chips, cracks, or discoloration.
2. Inspect the depth of the grooves in the clutch shoes. If any shoe is worn to the bottom of the groove, replace the complete set.

#### ⚠ CAUTION

Always replace clutch shoes as a complete set or severe imbalance could occur.



Inspecting clutch shoe groove

ATV1014

3

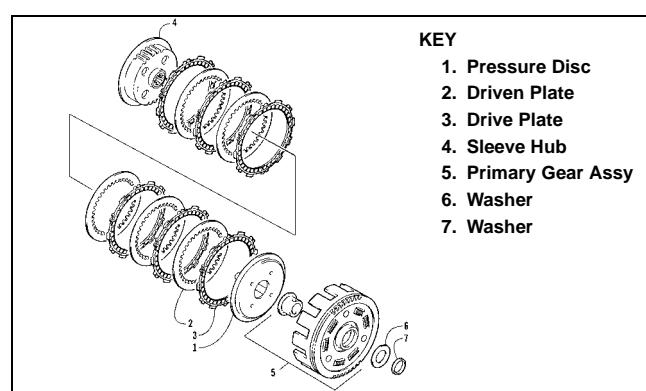
### Inspecting Centrifugal Clutch Housing

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

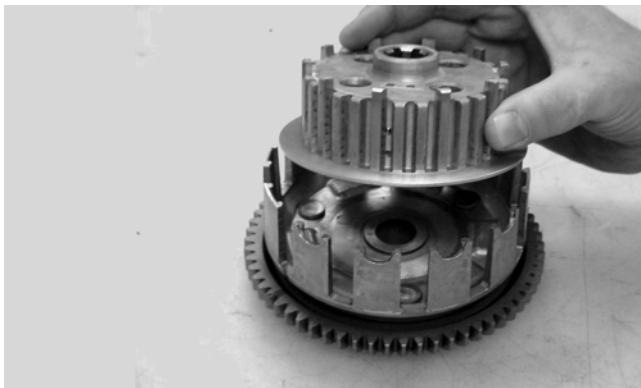
1. Insert the drive into the centrifugal clutch housing.
2. Rotate the inner race by hand and verify the inner race rotates only one direction.
3. If the inner race is locked in place or rotates both directions, the drive assembly must be replaced.

### Assembling Primary Clutch



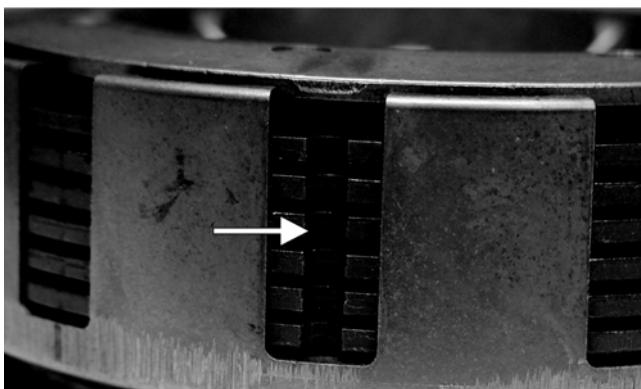
737-731A

1. Place the clutch hub upside down into the primary gear assembly.



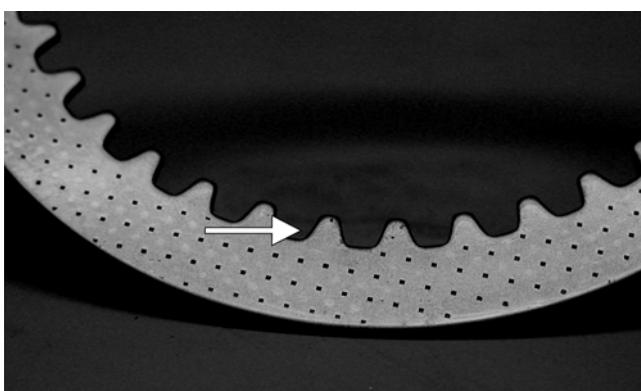
CC920

2. Alternately install the drive plates and driven plates onto the hub (starting with and ending with a drive plate) making sure the tabs with the notches are all in line with each other.



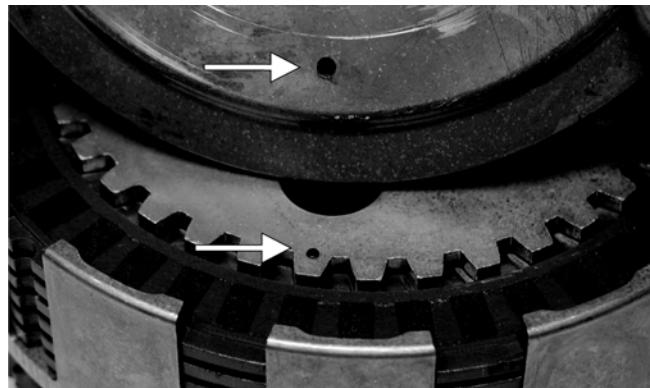
CF044A

**■ NOTE: When installing the driven plates for ease of installation, make sure they are placed onto the hub with the rounded side of the plates directed down.**



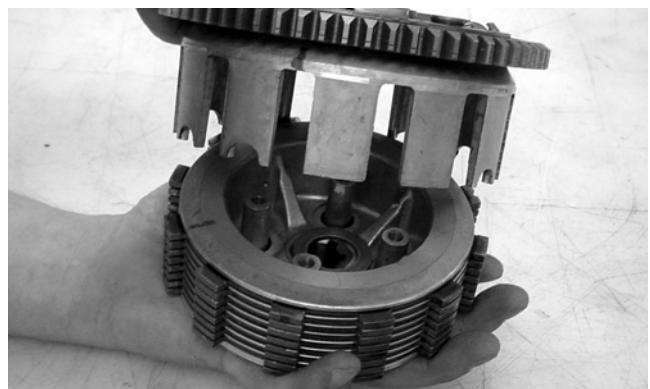
CF045A

3. Install the pressure plate onto the hub making sure the alignment dots are correctly positioned.



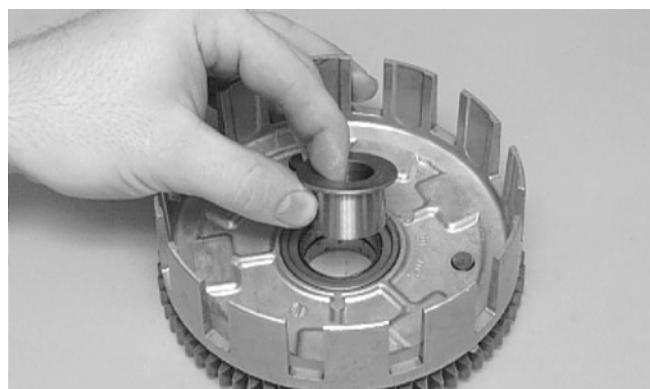
CF047A

4. Place the primary gear assembly w/clutch hub assembly in one hand, place the other hand on top of the clutch hub assembly, and flip the assembly over; then lift the primary gear assembly off the clutch hub assembly being careful not to disturb the drive plate notched tab orientation.



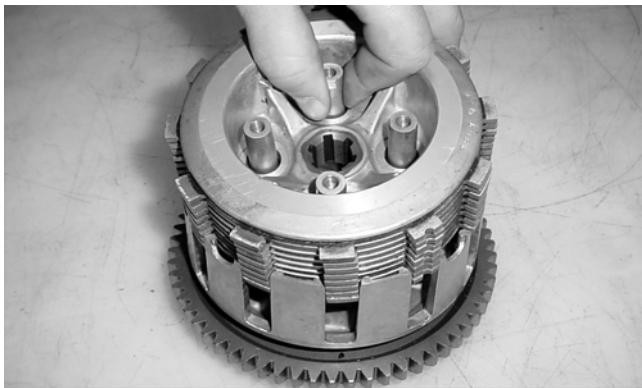
CC924

5. Place the primary gear assembly on a clean, flat surface; then install the primary washer into the assembly.



CC239D

6. Place the clutch hub assembly into the primary gear assembly.



CC926

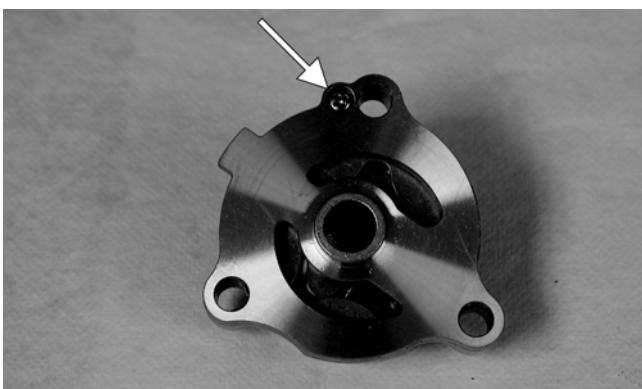
### ⚠ CAUTION

The clutch hub and the pressure plate must be seated in the proper position. If any of the incorrect positions are used, the hub and plate will have clearance between them and they will not operate properly.

■ NOTE: The primary clutch assembly is now completely assembled for installation.

### 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.



CD989A

## Servicing Center Crankcase Components

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

### 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.
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.

3

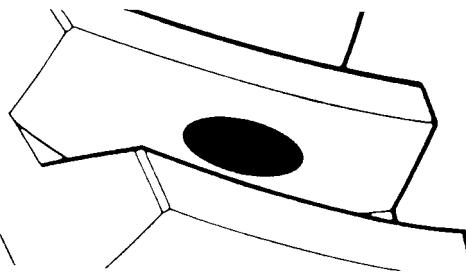
Backlash Measurement	Shim Correction
Under 0.05 mm (0.002 in.)	Decrease Shim Thickness
At 0.05-0.33 mm (0.002-0.013 in.)	No Correction Required
Over 0.33 mm (0.013 in.)	Increase Shim Thickness

## 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.

Correct



ATV-0104

## Correcting Tooth Contact

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

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

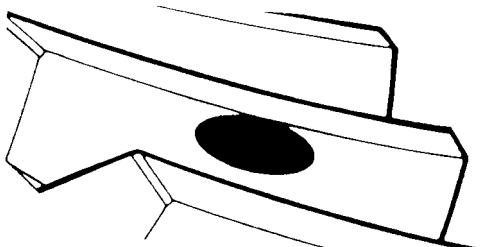
Tooth Contact	Shim Correction
Contacts at Top	Decrease Shim Thickness
Contacts at Root	Increase Shim Thickness

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

### CAUTION

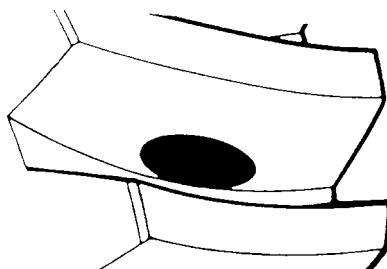
After correcting tooth contact, backlash must again be checked and corrected (if necessary). Continue the correcting backlash/correcting tooth contact procedures until they are both within tolerance values.

Incorrect (contact at tooth top)



ATV-0103

Incorrect (contact at tooth root)

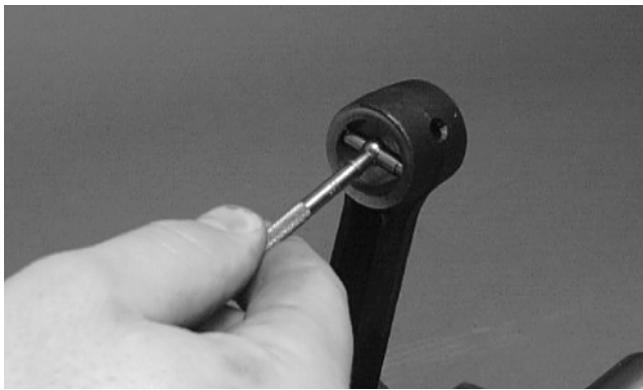


ATV-0105

## CRANKSHAFT ASSEMBLY

### 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

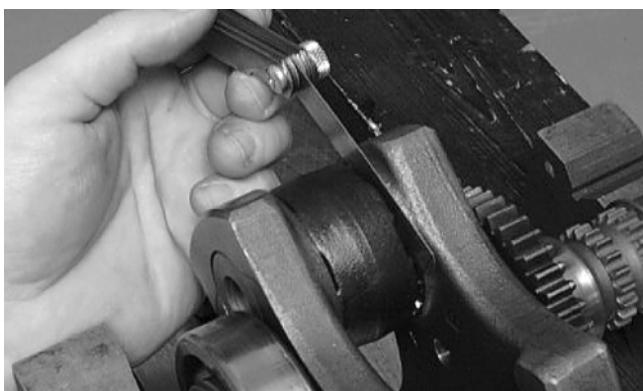
2. Maximum diameter must not exceed specifications.

### 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

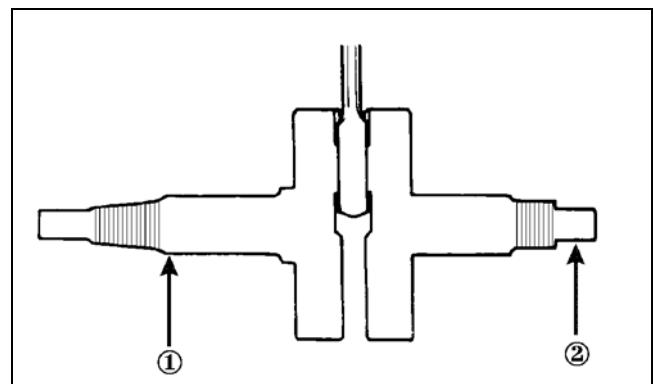
3. Acceptable gap range must be within specifications.

## Measuring Connecting Rod (Big End Width)

1. Using a calipers, measure the width of the connecting rod at the big-end bearing.
2. Acceptable width 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.



ATV-1074

3. Zero the indicator and rotate the crankshaft slowly.

### CAUTION

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

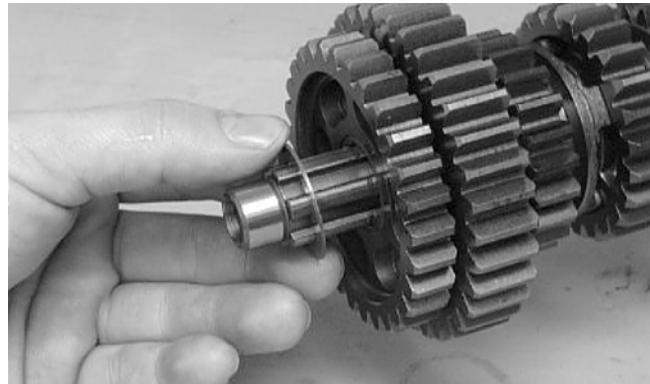
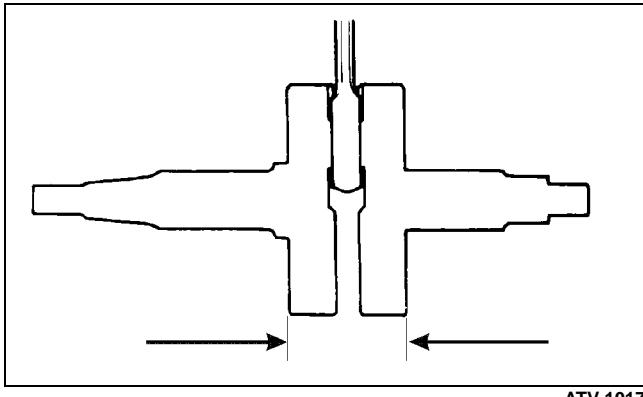
4. Maximum runout must not exceed specifications.

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

### 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.

3

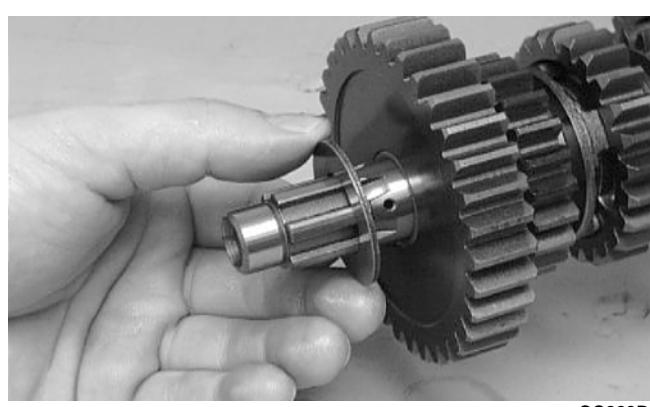
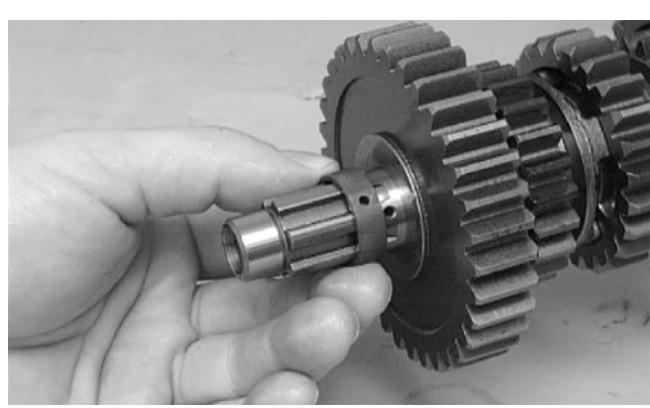


2. Acceptable width range must be within specifications.

## DRIVESHAFT

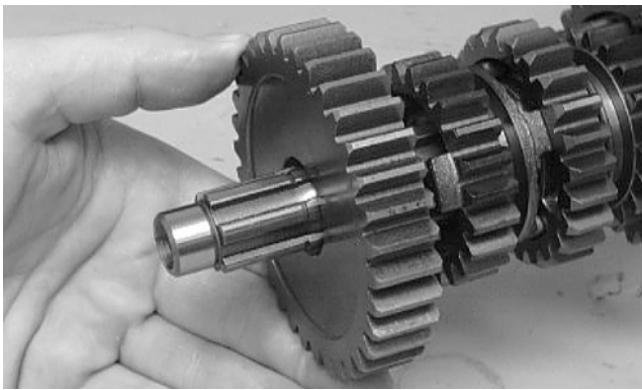
### Disassembling

1. In order, remove the reverse dog, circlip, washer, reverse driven gear, and bushing from the driveshaft.



■ **NOTE:** The teeth on the bushing must face the 1st driven gear.

2. Remove the 1st driven washer (right side); then remove the 1st driven gear from the driveshaft.



CC222D

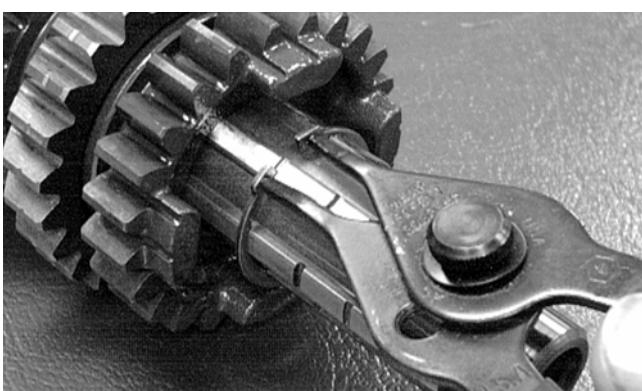
3. Remove the 1st driven bushing; then remove the 1st driven washer (left side) from the shoulder of the splined shaft. Remove the 4th driven circlip.



CC221D

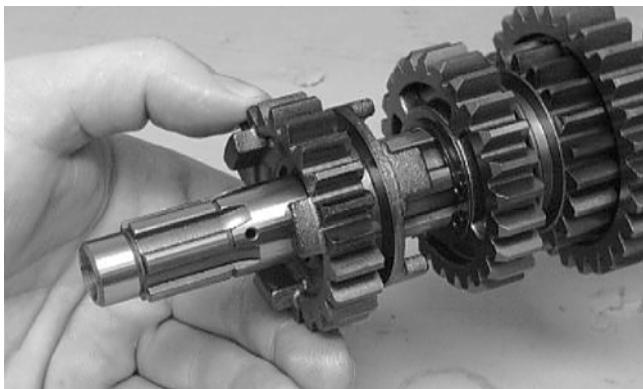


CC220D



CC508D

4. Remove the 4th driven gear from the driveshaft. Note the four small dogs facing toward the 3rd driven gear for assembling purposes.



CC219D

5. Remove the 3rd driven circlip; then remove the 3rd driven lock washer (right side) from the driveshaft.



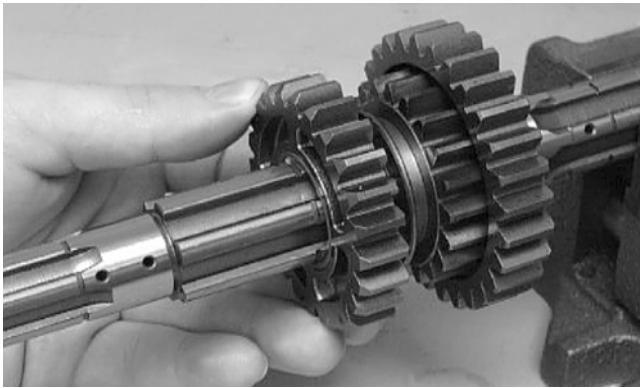
CC216D



CC215D

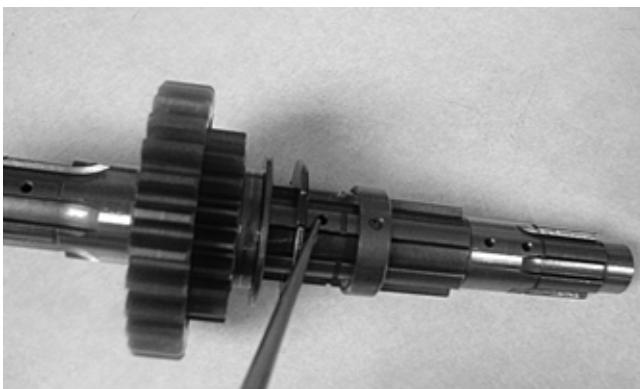
6. Remove the 3rd driven gear from the driveshaft.

3



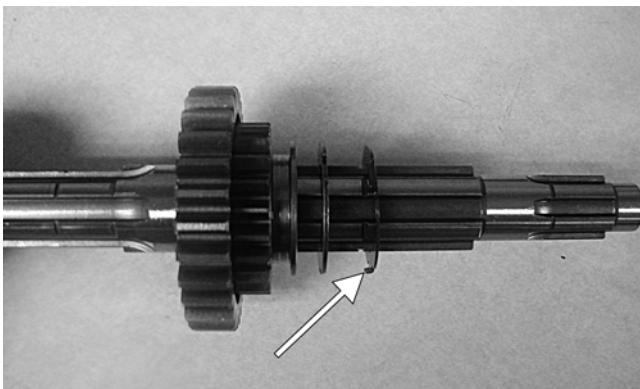
CC214D

7. Remove the 3rd driven bushing from the driveshaft. Note the location of the oil feed hole in the bushing and the matching oil supply hole in the driveshaft for assembling purposes.



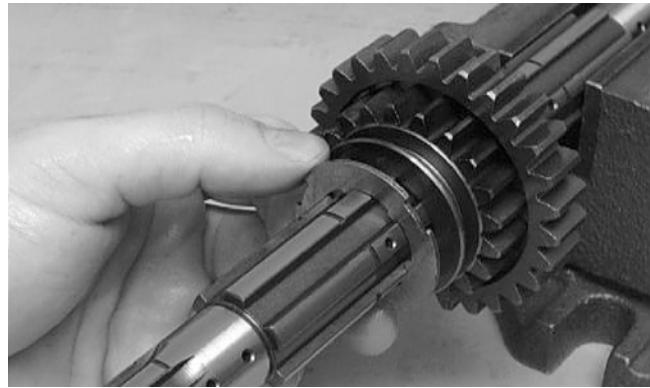
CD248

8. Remove the 3rd driven lock washer (left side) from the driveshaft. Note the tabs facing toward the 5th driven gear for assembling purposes.



CD247A

9. Remove the next 3rd driven lock washer (left side) by rotating it out of the groove. Note the groove closest to the 5th driven gear for assembling purposes.



CC211D

10. Remove the 5th driven gear from the driveshaft.



CC210D

11. In order, remove the 2nd driven circlip, washer, gear, and bushing from the driveshaft.



CC209D



CC208D



CC207D



CC206D

1. In order, install the 2nd driven bushing, gear, washer, and circlip onto the driveshaft.



CC206D



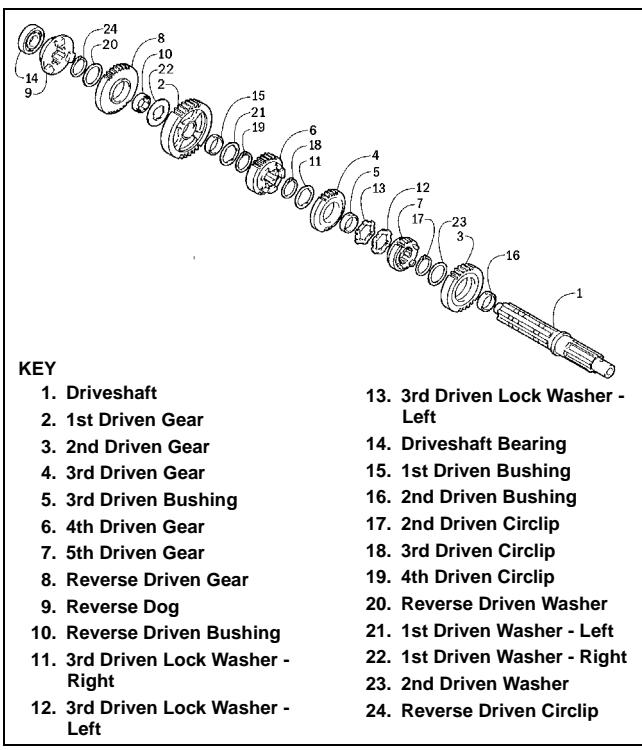
CC207D

### ☞ AT THIS POINT

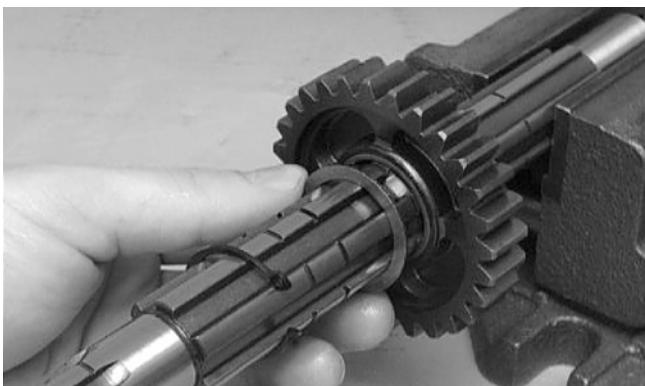
To service secondary gears, see Servicing Center Crankcase Components in this sub-section.

3

## Assembling



737-733A

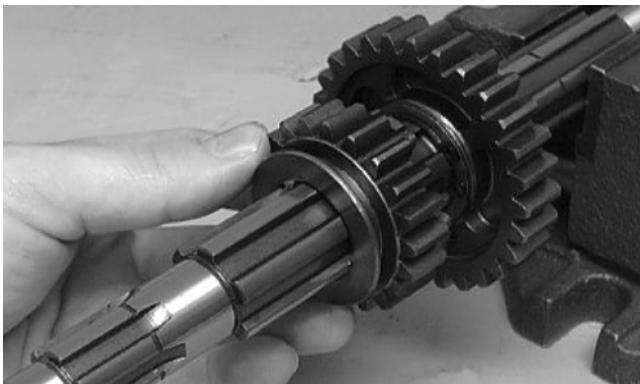


CC208D



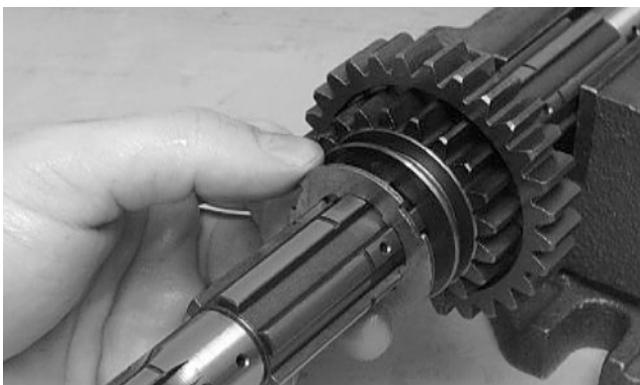
CC209D

2. Install the 5th driven gear onto the driveshaft.



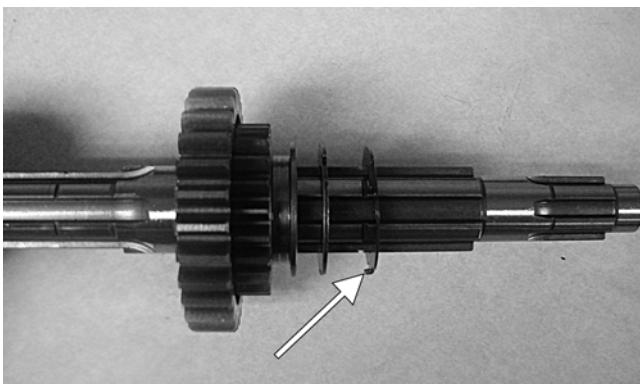
CC210D

3. Install the 3rd driven lock washer (left side). Lock it into the groove closest to the 5th driven gear (as noted in disassembling) by rotating it when it is in the groove.



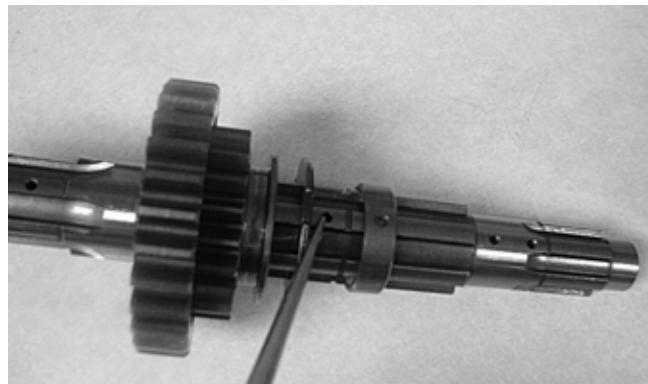
CC211D

4. Install the next 3rd driven lock washer (left side) onto the driveshaft making sure the tabs are facing toward the 5th driven gear. Make sure the tabs intertwine with the 3rd driven lock washer.



CD247A

5. Install the 3rd driven bushing onto the driveshaft making sure the oil feed hole in the bushing aligns with the appropriate oil supply hole in the driveshaft (as noted in disassembling).

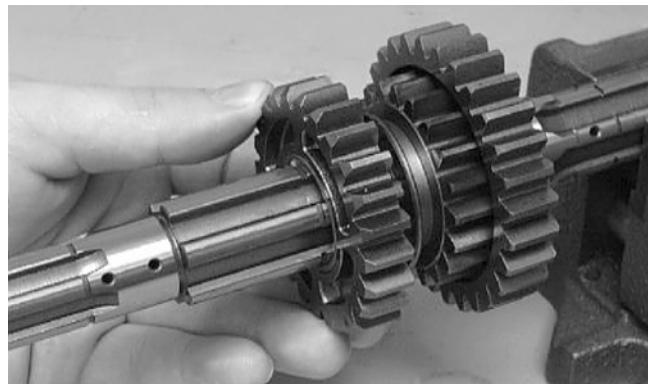


CD248

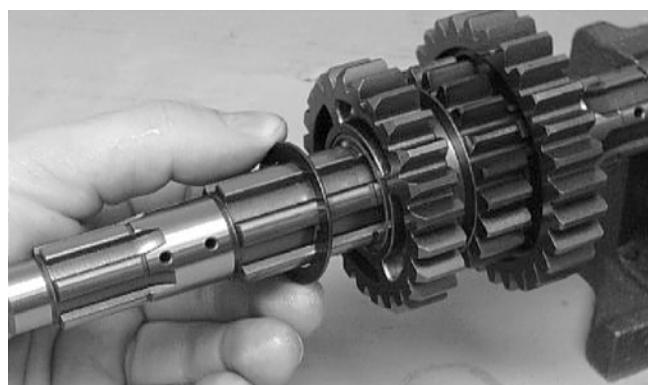
**⚠ CAUTION**

**It is very important to assure the oil feed hole in the bushing and oil supply hole in the driveshaft align. If not aligned, engine damage will result.**

6. In order, install the 3rd driven gear, lock washer (right side), and circlip onto the driveshaft.



CC214D

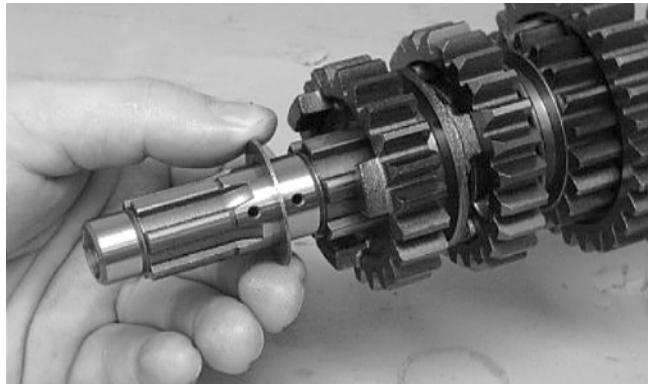


CC215D

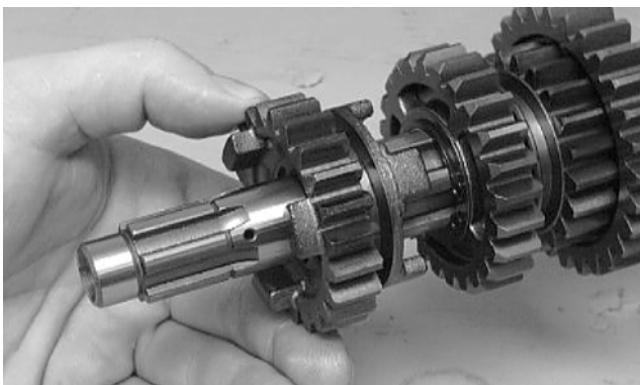


CC216D

7. Install the 4th driven gear onto the driveshaft making sure the four small dogs are facing toward the 3rd driven gear as noted in disassembling; then secure with the circlip.



CC220D

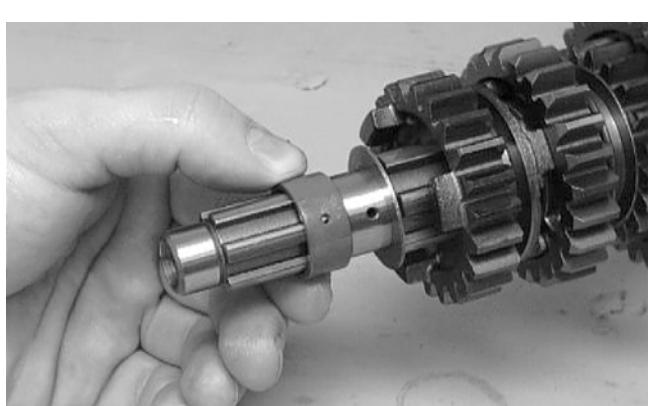


CC219D



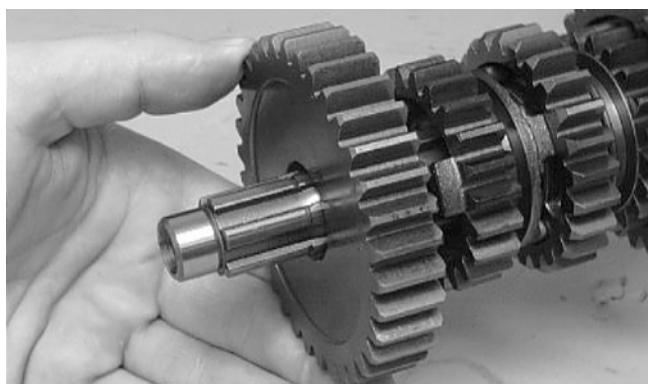
CC508D

8. Install the 1st driven washer (left side) onto the shoulder of the splined shaft; then install the 1st driven bushing and gear.



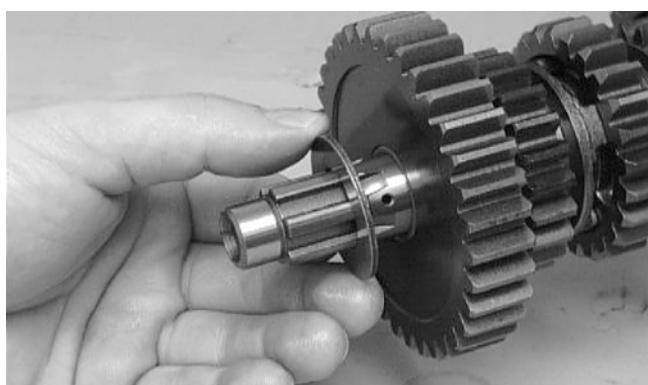
3

CC221D



CC222D

9. Install the 1st driven washer (right side) on the shaft making sure it lines up with the groove in the shaft; then turn the washer locking it on the shaft.

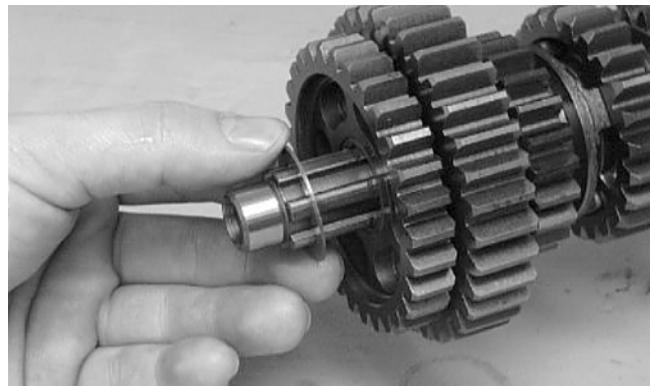


CC223D

10. Slide the reverse driven gear bushing onto the shaft making sure the oil port in the bushing aligns with the oil port on the shaft.



CC842



CC226D

**CAUTION**  
Failure to align the oil ports will result in serious engine damage.

11. Move the washer in the shaft groove until the notches in the washer align with the tabs on the bushing; then slide the bushing up tight against the washer.



CC843

12. In order, install the reverse driven gear, washer, circlip, and reverse dog onto the driveshaft.



CC227D



CC228D

■ NOTE: The driveshaft is now completely assembled for installation.

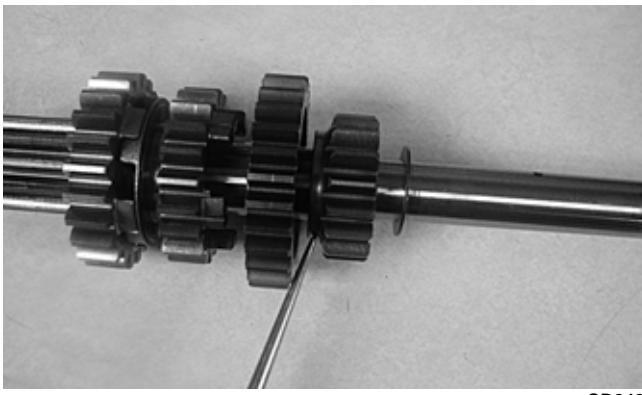
## COUNTERSHAFT

### Disassembling

1. Remove the 2nd drive gear and washer from the countershaft.

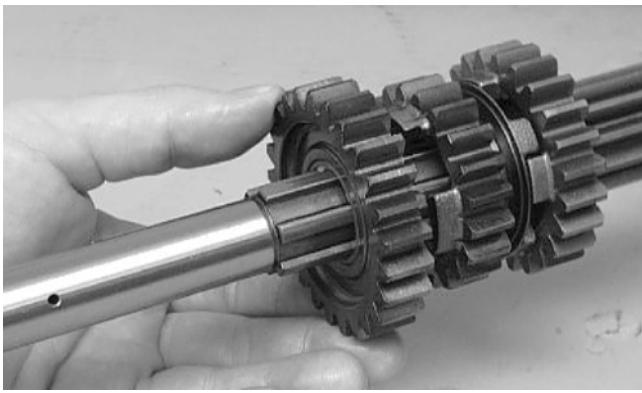


CC225D



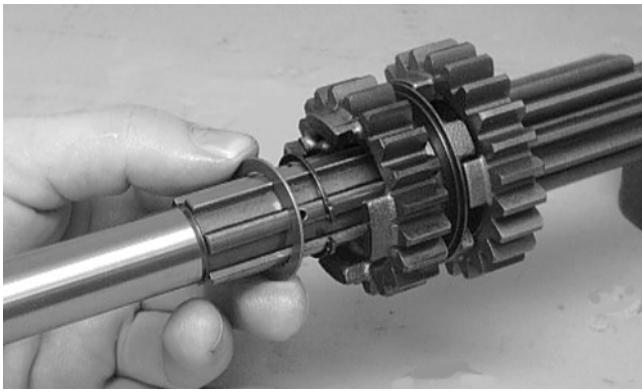
CD242

2. Remove the 5th drive gear from the countershaft.

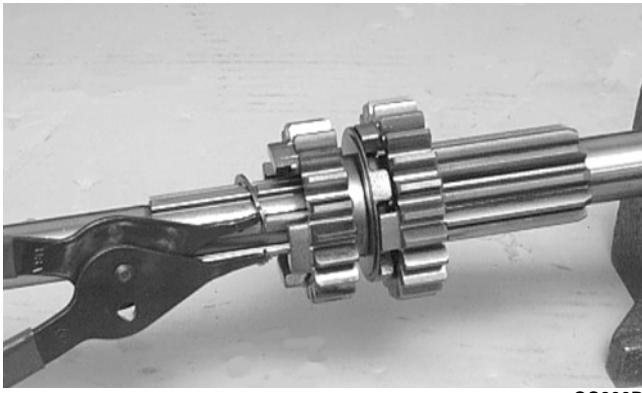


CC203D

3. Remove the 5th drive washer and 5th drive circlip from the countershaft.



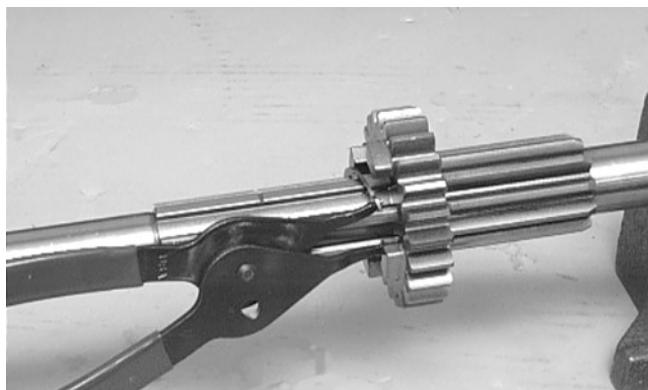
CC201D



CC200D

4. Remove the 3rd drive gear from the countershaft.

5. Remove the 4th drive circlip securing the 4th drive gear on the countershaft; then remove the first 4th drive washer and 4th drive gear. Account for the bushing.

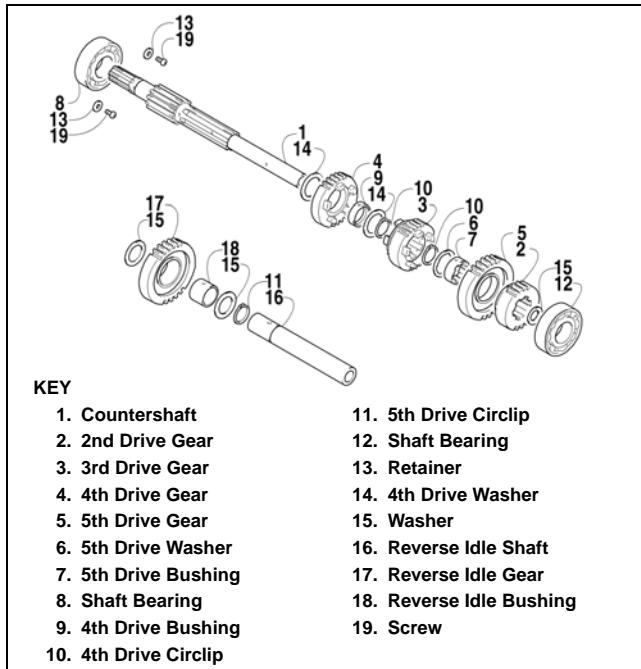


CC199D

6. Remove the other 4th drive washer from the countershaft.

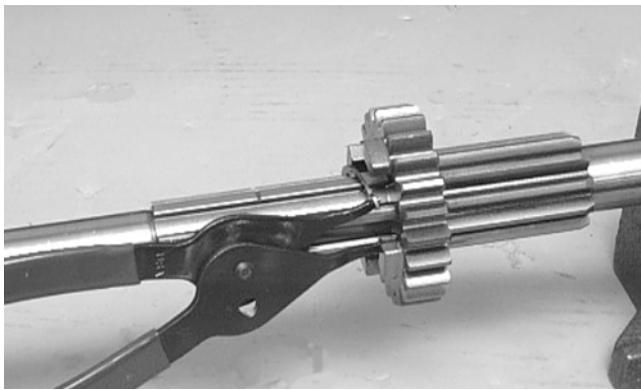
## Assembling

3



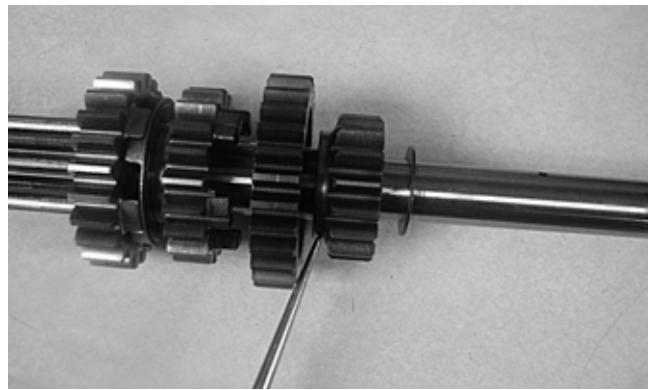
738-294A

1. Install the 4th drive washer onto the countershaft.
2. Install the 4th drive gear making sure the bushing is in position; then install the other 4th drive washer onto the countershaft. Secure with the circlip.



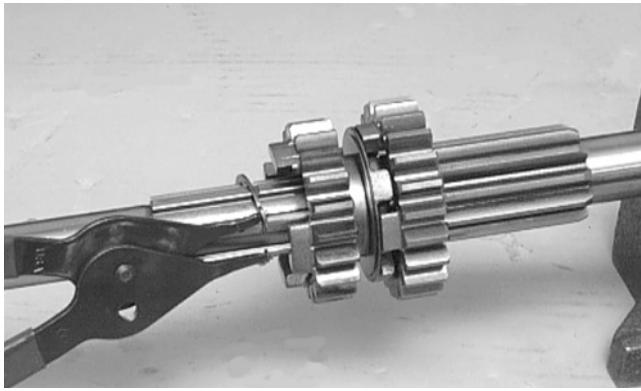
CC199D

3. Install the 3rd drive gear; then install the 5th drive circlip onto the countershaft.



CD242

■ **NOTE:** The countershaft is now completely assembled for installation.



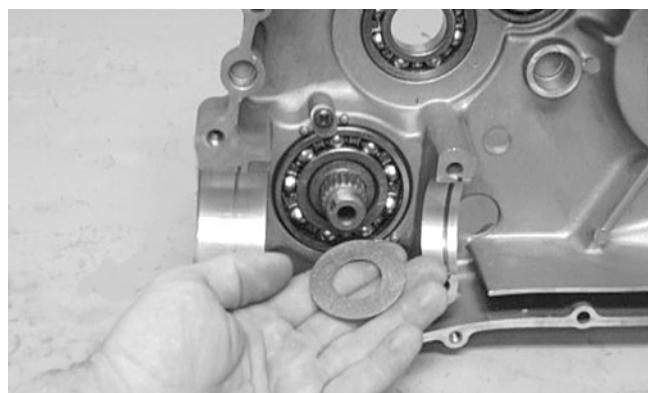
CC200D

4. Install the 5th drive washer and 5th drive gear onto the countershaft.



CC201D

5. Install the 2nd drive gear and washer onto the countershaft.



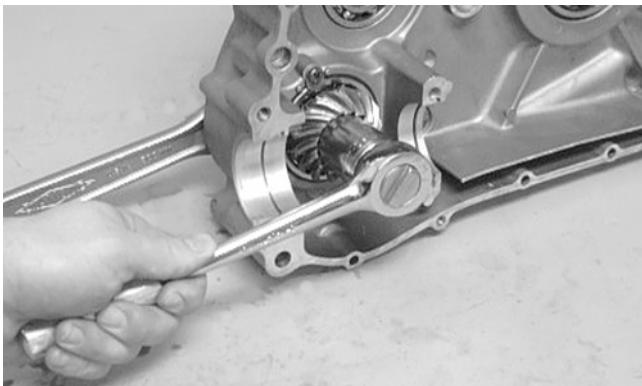
CC117D

## Assembling Crankcase Half

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

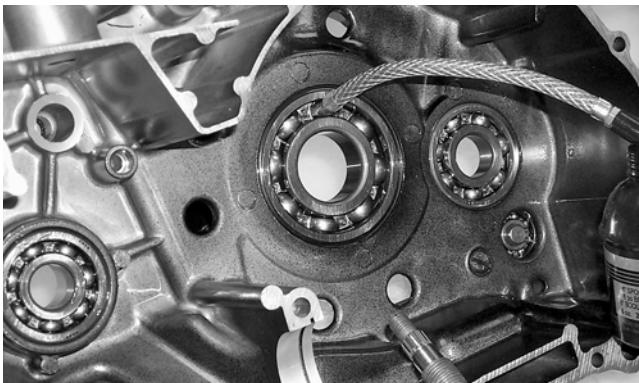
■ **NOTE:** If the output shaft and gear were removed, make sure that the proper shim is installed.

1. To install the output shaft and gear, place the shaft into position with proper shims, slide the gear onto the shaft, and secure with a new nut tightened to specifications.



CC116D

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.

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



CD832A

4. With the key in position, slide the driven gear onto the crank balancer making sure the timing marks are aligned.

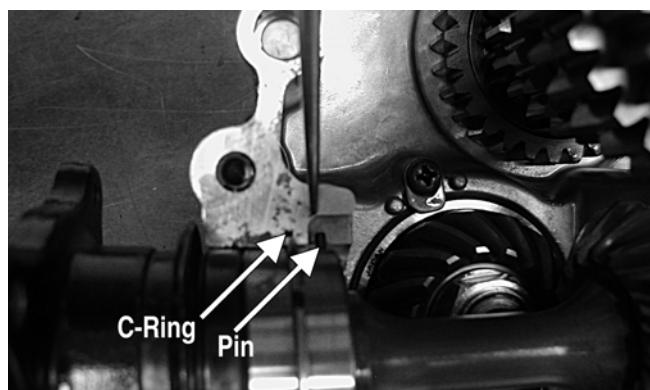


CD826

5. Place the bearing C-ring into position in the crankcase; then install the front output shaft and rear shaft assemblies.

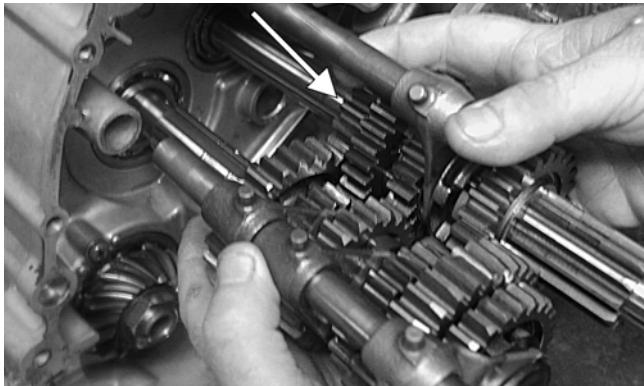
### ⚠ CAUTION

The bearing pins must be positioned into the crankcase correctly or damage to the crankcase may occur.



CD268A

6. Simultaneously, install the driveshaft and countershaft assemblies making sure the washer is on the countershaft.

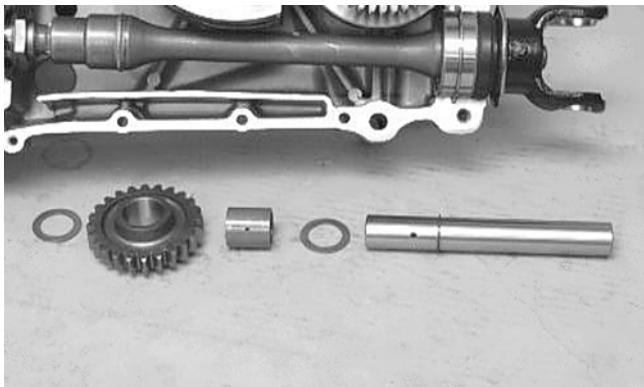


CD232A

7. Install the reverse idle shaft with circlip making sure the oil hole in the shaft is facing downward; then install a washer, bushing, reverse idle gear, and a washer.



CF055



CC231D

8. Place each of the four shift forks into its respective gear or dog as noted during disassembling; then install the gear shift cam.



CC107D

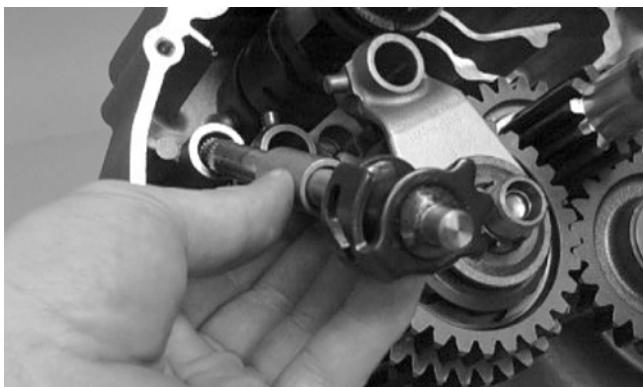


CC106D

9. Engage the four forks to the gear shift cam; then install the reverse shift cam and spacer.

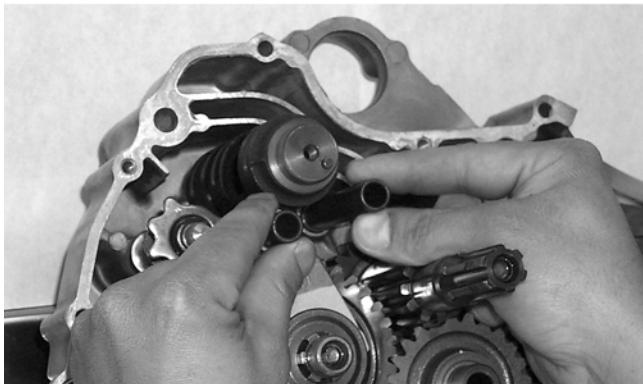


CC105D



CC103D

10. Install the two gear shift shafts; then verify that the two crankcase half alignment pins are in place.

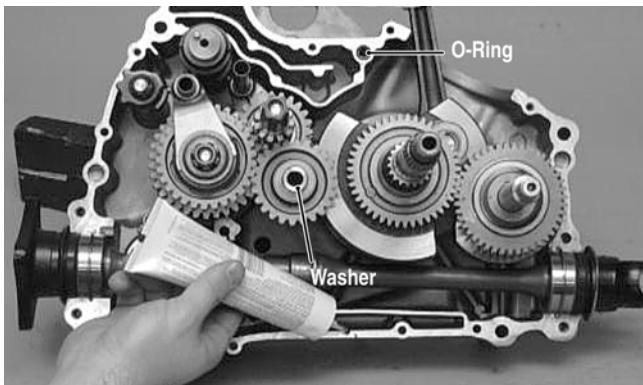


CC104D

■ **NOTE:** Prior to joining crankcase halves, turn the shift cam to ensure all gears shift properly.

## Joining Crankcase Halves

1. Place the O-ring in the left-side crankcase half and verify that the washer is on the idler shaft; then apply Three Bond Sealant to the mating surfaces. Place the right-side half onto the left-side half.



CC234DA

2. Using a plastic mallet, lightly tap the case halves together until cap screws can be installed.
3. From the left side, install the three case half 8 mm cap screws (two inside the case); then tighten only until snug.

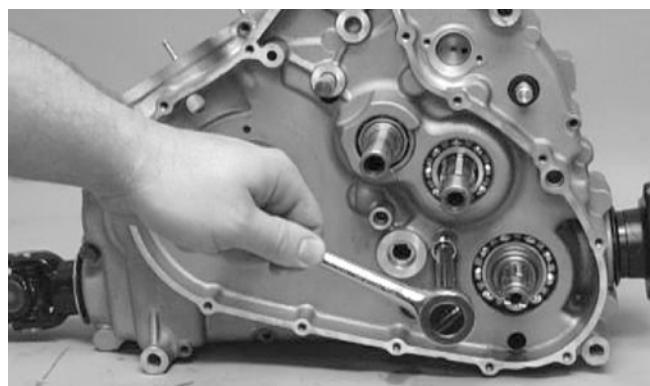
■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.



CC098D

4. From the right side, install the three case half 8 mm cap screws; then tighten only until snug.

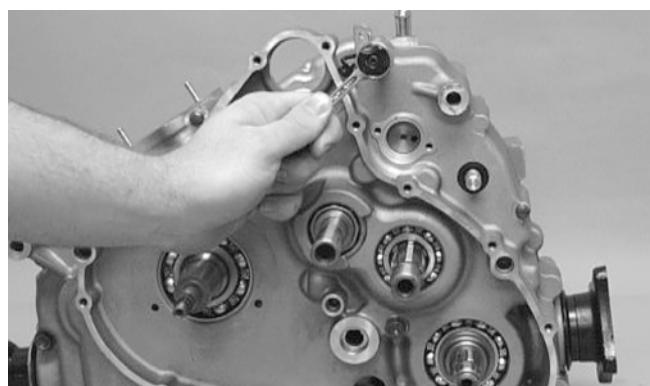
■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.



CC097D

5. From the left side, install the seven case half 6 mm cap screws noting the location of the wiring form; then tighten only until snug.

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

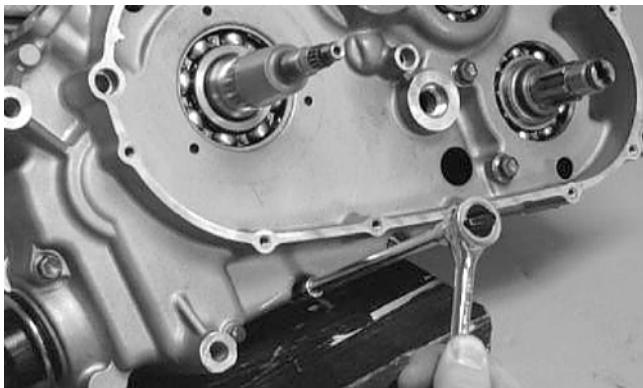


CC096D

6. From the right side, install the five case half 6 mm cap screws (one inside the case); then tighten only until snug.

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

3



CC095D

7. In a crisscross/case-to-case pattern, tighten the 8 mm cap screws (from steps 3-4) until the halves are correctly joined; then tighten to specifications.

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

8. In a crisscross/case-to-case pattern, tighten the 6 mm cap screws (from steps 5-6) to specifications.

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

#### **⚠ CAUTION**

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

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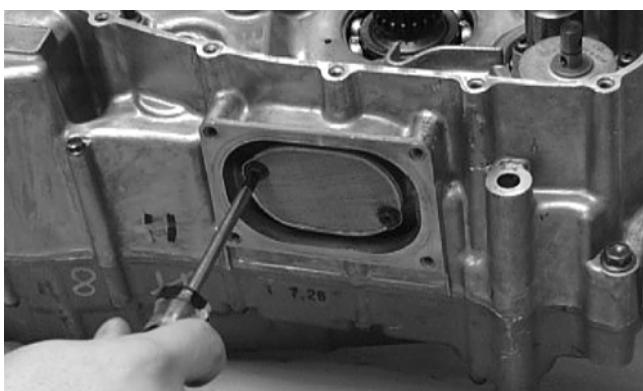
## **Installing Right-Side Components**

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### **A. Oil Strainer/Oil Pump**

### **B. Gear Shift Shaft**

1. Place the oil strainer into position beneath the crankcase and tighten securely with the Phillips-head cap screws.



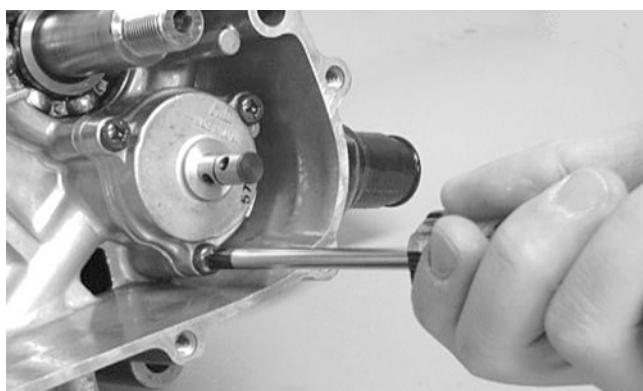
CC163D

2. Place the strainer cap into position on the strainer making sure a new O-ring is properly installed and secure with the cap screws; then install and tighten the oil drain plug to specifications.



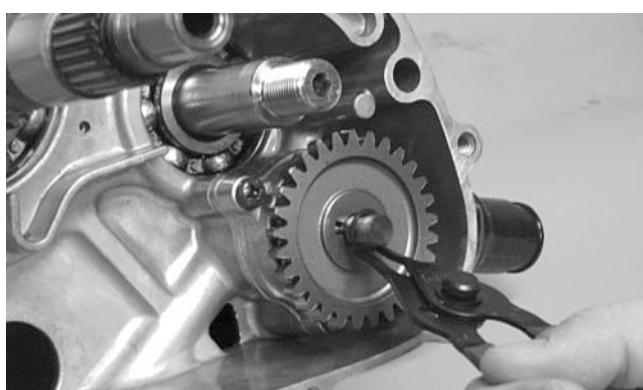
CC091D

3. Place the oil pump into position in the crankcase and secure with the three Phillips-head screws coated with blue Loctite #243. Tighten to specifications.



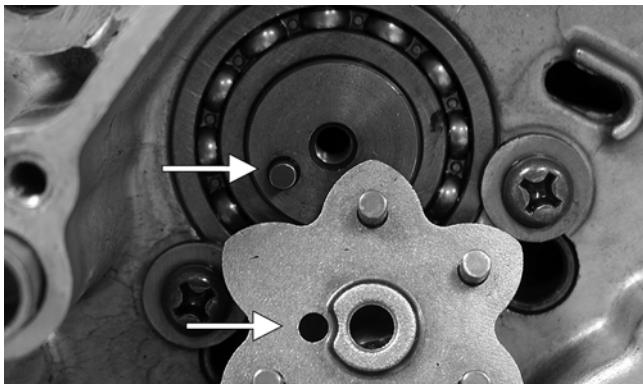
CC090D

4. Place the pin and washer into position on the oil pump shaft, install the oil pump driven gear, and secure with the circlip.



CC088D

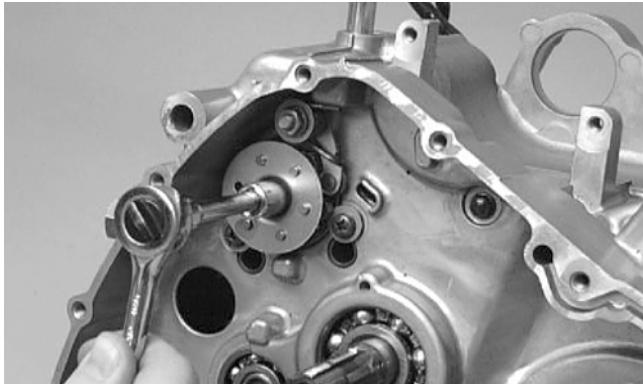
5. Place the gear shift cam plate and guide onto the gear shift cam making sure the alignment pin was installed. Secure assembly with the cap screw coated with blue Loctite #243. Tighten securely.



CF073A

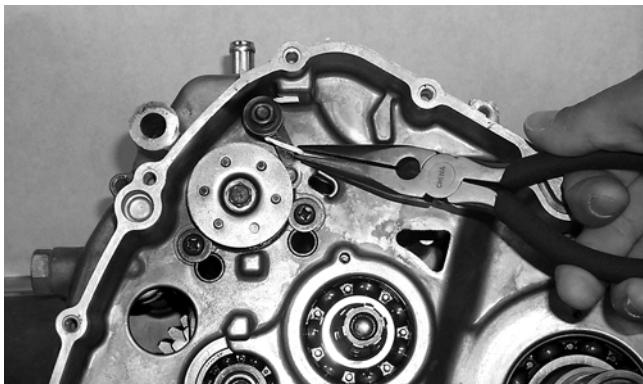


CC085D

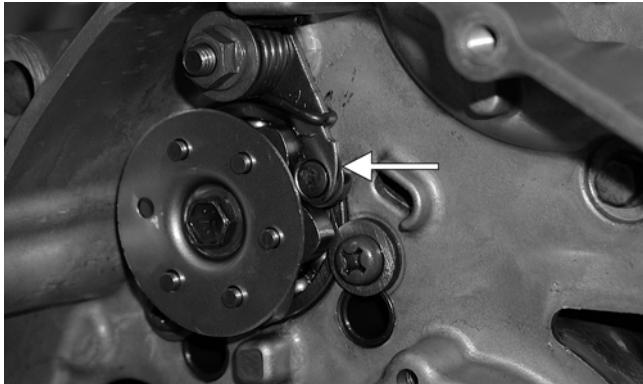


CC164D

6. Attach the spring to the gear shift cam stopper arm.



CC086D



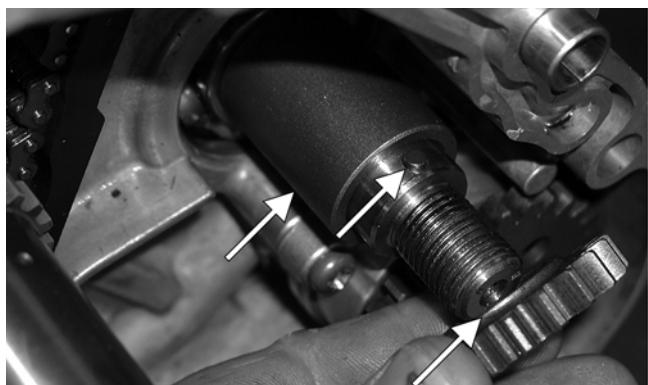
CF072A

7. Install the gear shift shaft.

### **C. Primary Driven Gear D. Primary Driven Clutch E. Primary Drive Clutch Shoe**

■ NOTE: Steps 1-7 in the preceding sub-section must precede this procedure.

8. Install the spacer, pin, and oil pump drive gear onto the crank balancer shaft making sure the shoulder of the drive gear is facing inward toward the crankcase; then secure with the washer and nut tightened to specifications.

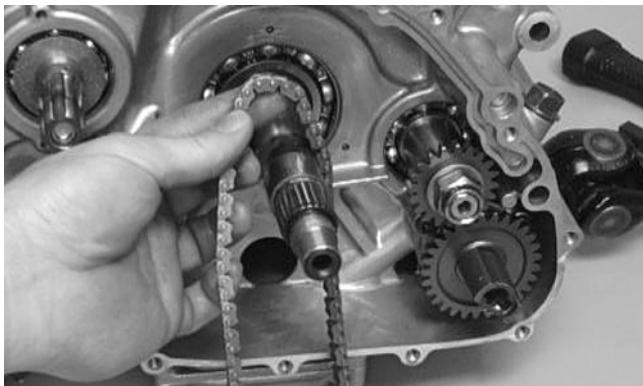


CF070A



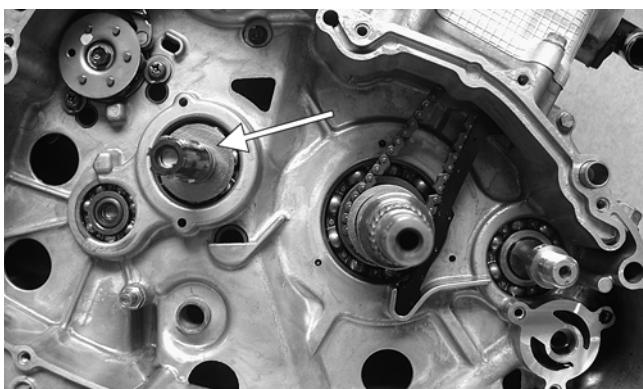
CD481

9. Place the chain into the crankcase; then secure it from the top side with a wire for ease of assembling.



CC079D

10. Install the primary driven washers onto the driveshaft and crankshaft.



CD198B

### CAUTION

The clutch sleeve hub and the pressure plate must be seated in the proper position. If any of the incorrect positions are used, the hub and plate will have clearance between them and they will not operate properly.

11. Simultaneously, place the primary clutch assembly and the starter clutch housing on their respective shafts making sure the sleeve is properly positioned in the primary assembly.



CC078D

■ NOTE: Note the alignment mark scribed on the primary driven gear assembly during disassembly.

12. Using the Clutch Sleeve Hub Holder (p/n 0444-007), install the nut and washer. Tighten to specifications.



CD479

13. Place the primary drive one-way clutch into the starter clutch housing noting the word OUT-SIDE for proper placement.

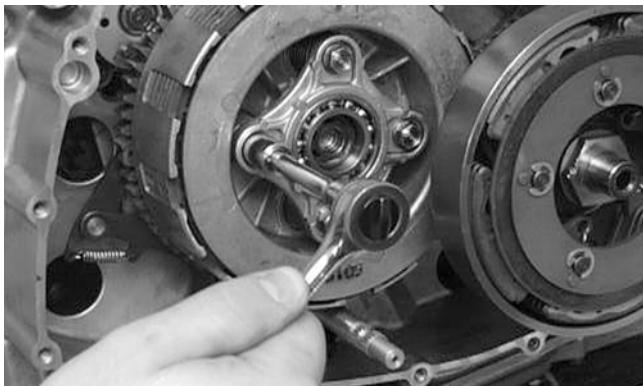


CD482

14. Install the clutch shoe and washer; then secure with the starter clutch shoe nut (left-hand threads). Tighten to specifications; then using a center punch, stake the nut.

15. Install the release roller assembly making sure the four springs are in position; then using a crisscross pattern, tighten the four cap screws securely.

■ NOTE: Tighten the four roller assembly cap screws in a crisscross pattern making sure there is no clearance between the clutch plates when secured.



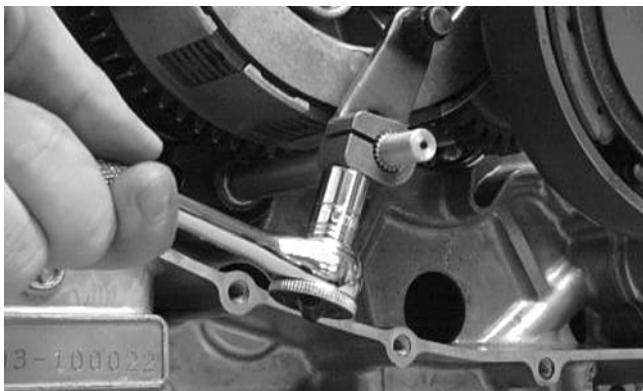
CC074D

16. Install the clutch release arm and release roller guide making sure the release roller and guide are aligned.



CD166A

17. Secure the clutch release arm with the cap screw coated with blue Loctite #243. Tighten securely.



CC073D

18. Install the reverse cam stopper housing and gasket making sure the stopper and spring are correctly positioned. Tighten to specifications.



CD494

## F. Water Pump G. Oil Filter

■ NOTE: Steps 1-18 of the preceding sub-sections must precede this procedure.

■ NOTE: Lubricate all internal components with 5W-30 oil prior to installing the right-side cover.

3

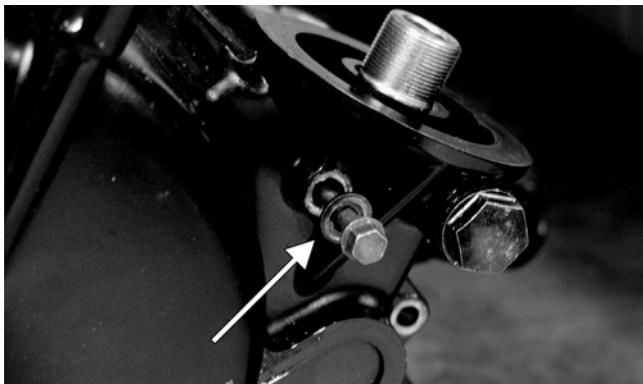
19. Place the water pump drive joint into position on the water pump shaft making sure the pin is properly positioned.



CF067

■ NOTE: Care should be taken that the alignment pins are installed in the right-side cover.

20. Place the gasket and right-side cover into position making sure the release roller guide remains correctly positioned and that the water pump drive adapter aligns; then install the fifteen cap screws. Note the proper location of the long cap screw with rubber washer.



CF039A

21. Tighten the cap screws in a crisscross pattern to specifications.
22. Place the water pump cover onto the right-side cover making sure the new O-ring is properly positioned. Tighten securely with the three cap screws.

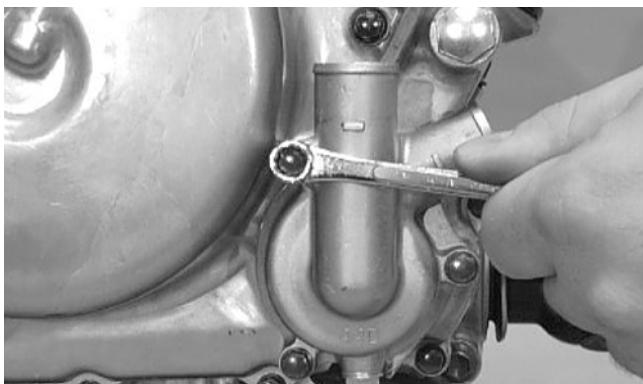


CC067D

24. Install the coolant hose on the water pump and secure with the clamp.



CD910A



CC027D

23. Using the oil filter wrench, install a new oil filter.

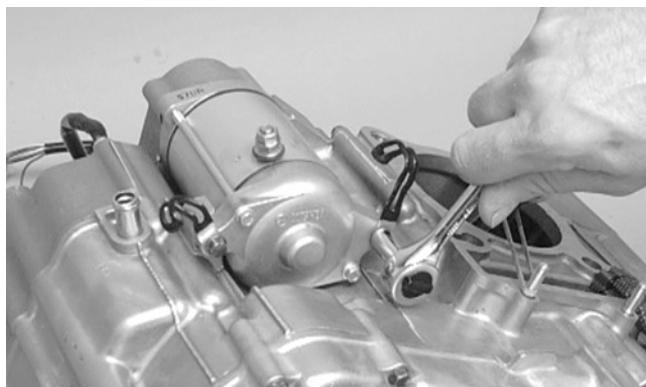
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## Installing Left-Side Components

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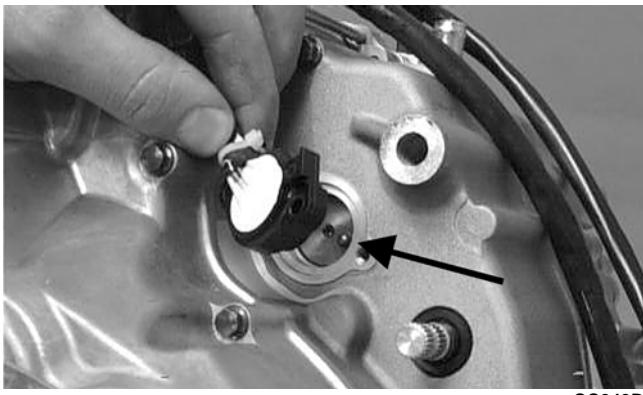
### A. Idle Gear Assembly B. Magneto Rotor

1. Place the starter into position on the crankcase and secure with the cap screws. Note the position of the wiring form.

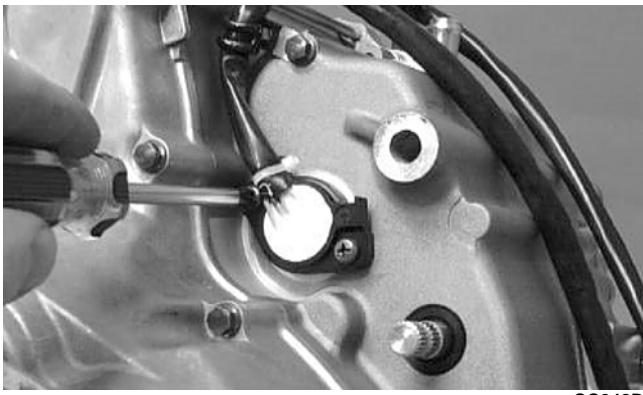


CC065D

2. Place the shift-indicator sending unit into position making sure the contacts and springs are inside the case and a well-oiled O-ring is properly positioned. Secure with Phillips-head screws.

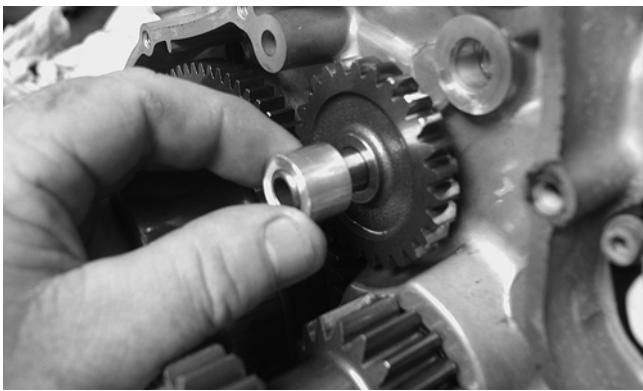


CC049D



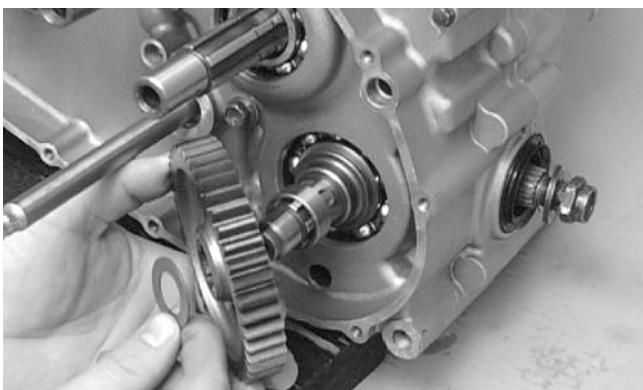
CC048D

3. Install the starter idle gear pin into the crankcase; then with the beveled side of the idle gear facing the crankcase, install the idle gear and spacer.



CD138

4. Place the bushing onto the output shaft; then install the driven gear and washer.



CC063D

5. Install the spacer onto the driveshaft.



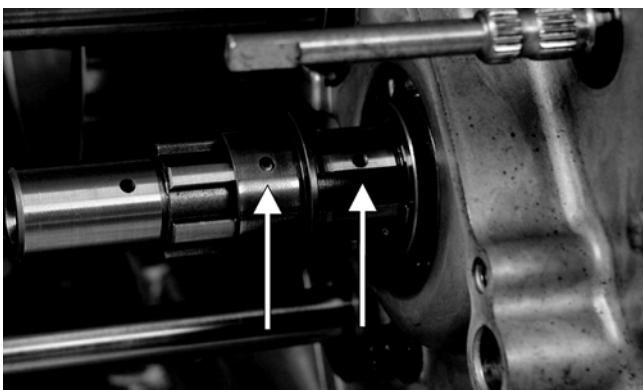
CC258D

6. Place the splined bushing onto the driveshaft making sure the oil hole of the splined bushing aligns with the oil hole of the driveshaft.

**CAUTION**

**It is important that the oil holes in the splined bushing and driveshaft align. If they are not aligned, major damage will occur from lack of lubrication.**

**3**



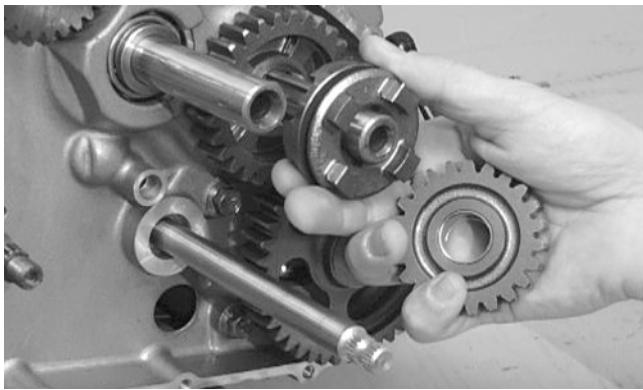
CF038A

7. In turn on the driveshaft, install the #1 drive gear and washer; then secure with the circlip.



CC059D

8. Place the select sliding dog gear and washer onto the driveshaft; then place the #2 drive gear onto the driveshaft making sure the bushing and washer follow on the driveshaft.

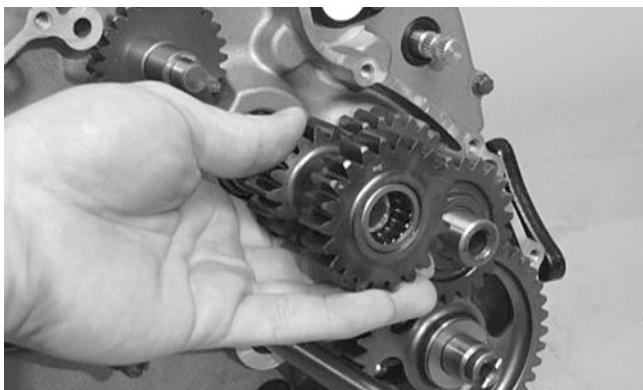


CC061D

9. Place the idle gear spacer and idle gear onto the countershaft.

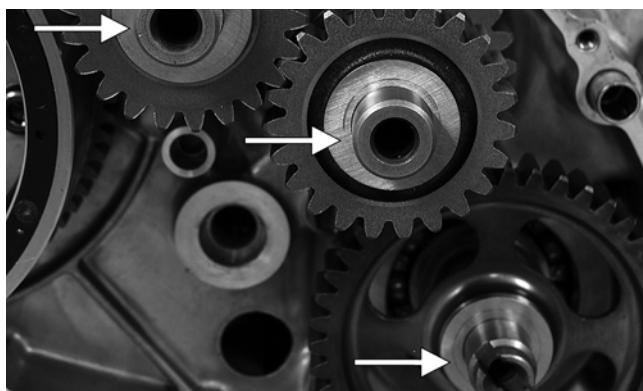


CC262D



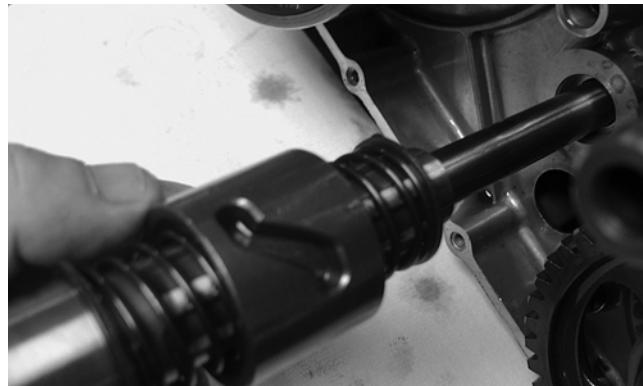
CC060D

10. Place a washer on the driveshaft, the countershaft, and the driven shaft.



CF075A

11. With the slot in the shift shaft assembly facing upward, place the assembly on the fixed shaft.



CD147

12. Place the left shaft washer on the shift shaft.



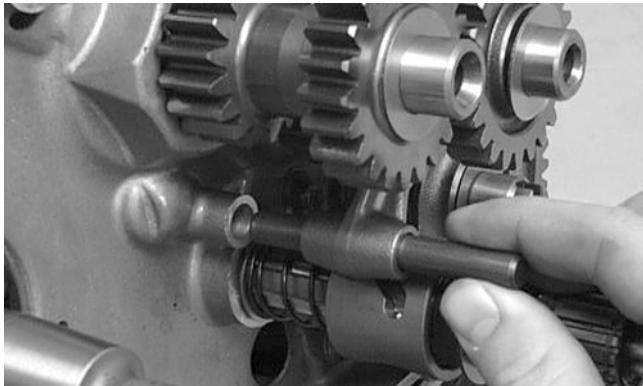
CC333D

13. With the shift fork peg positioned in the shift shaft assembly slot, install the shift fork in the select sliding dog gear.



CC329D

14. Slide the shift fork shaft through the shift fork and into the crankcase boss.



CC330D

15. Insert the pin into the starter gear assembly boss in the crankcase; then install starter idler gear #1.



CD136

16. Place a washer on each end of the starter gear assembly and install in the crankcase.

17. Place a thrust washer onto the crankshaft; then install the starter clutch gear assembly onto the crankshaft. Place the key into its notch.



CD155

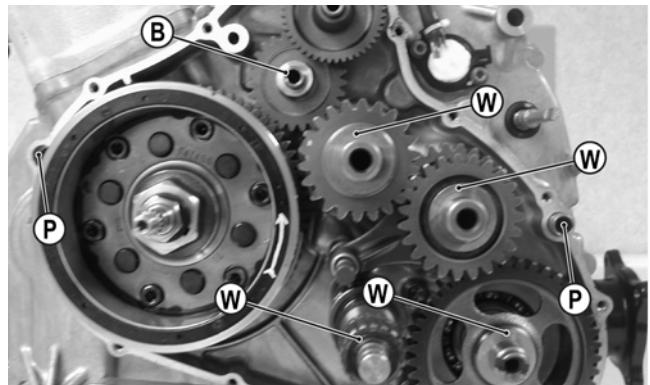
18. Place the rotor/flywheel into position on the crankshaft; then install the nut on the crankshaft and tighten until the rotor/flywheel is properly seated. Tighten to specifications.



CD44

19. Install the two alignment pins into the left crankcase half.

■ **NOTE:** Make sure that four washers, one bushing, and two alignment pins are in place.



CD134A

3

### C. Cover

### D. Speed Sensor Housing

### E. Hi/Low Shifter Assembly

### F. Recoil Starter

■ **NOTE:** Steps 1-19 in the preceding sub-section must precede this procedure.

20. Place the gasket and left-side cover into position on the crankcase.

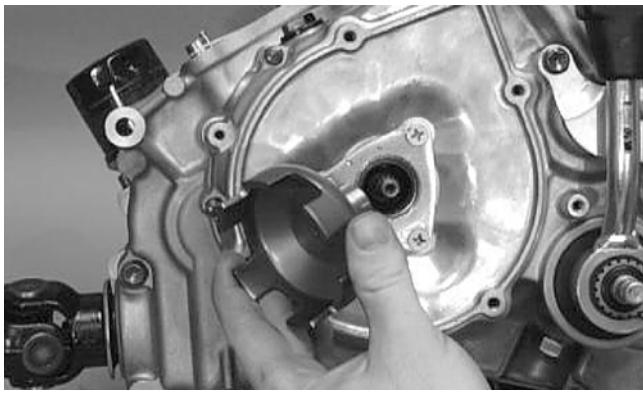
■ **NOTE:** It may be necessary to push or pull the splined Hi/Low range shift shaft to establish cover/crankcase mating.

21. Install the fourteen cap screws to secure the left-side cover. Do not tighten at this time. Note the location of the long cap screw with rubber washer.



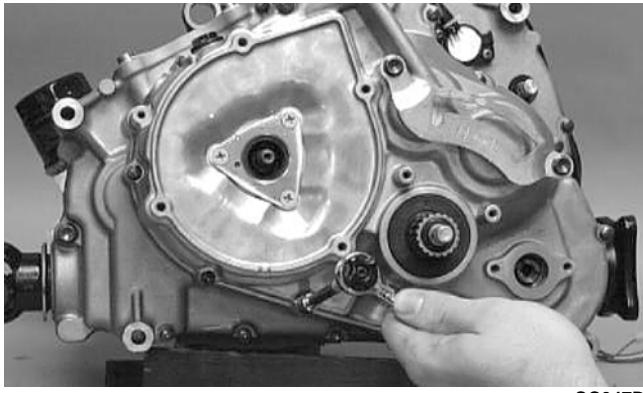
CF037A

22. Place the starter cup into position on the crank-shaft making sure a new, lubricated O-ring is inside the cup. Tighten the flange nut to specifications.



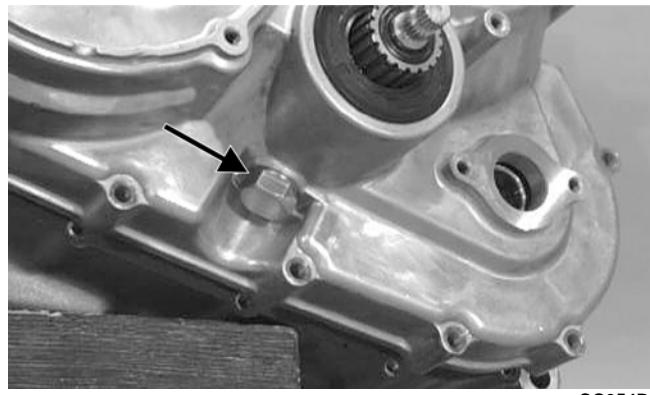
CC041D

23. In a crisscross pattern, tighten the cap screws (from step 21) to specifications.



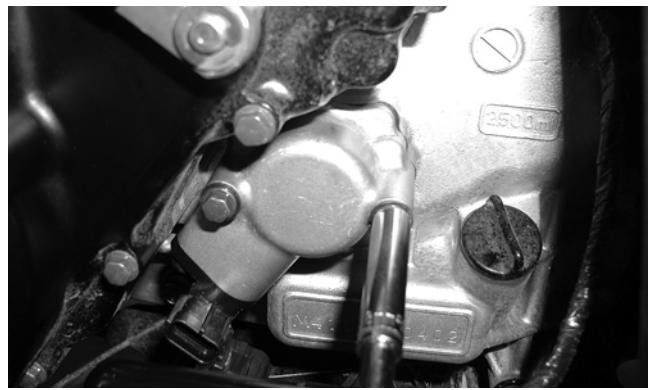
CC047D

24. Place the shift stop housing assembly into position beneath the shift shaft housing making sure the spring and stopper are correctly positioned. Tighten to specifications.



CC054D

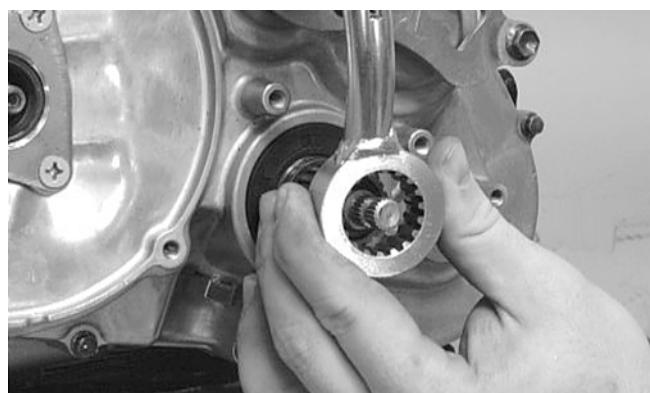
25. Place the speed sensor housing and gasket into position and secure with the two cap screws. Tighten securely.



CD069

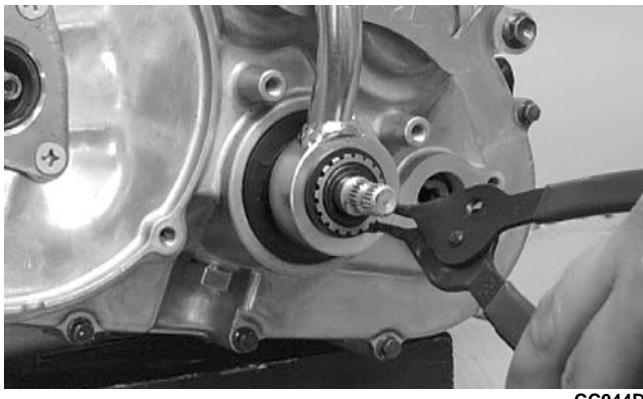
26. Install the inside circlip onto the hi/low range shift shaft with the sharp side of the circlip facing the engine; then place the shift lever assembly part way onto the shaft.

**■ NOTE: Position the shift lever part way onto the splines and verify the subtransmission is in hi range. If not, shift into hi range.**



CC045D

27. Pull up on the hi/low shift T-handle and guide the T-handle stop pin into the hi range lever stop plate slot; then slide the shift lever assembly the rest of the way onto the shift shaft. Secure with the outer circlip making sure the sharp side of the circlip faces away from the hi/low-range lever.



CC044D

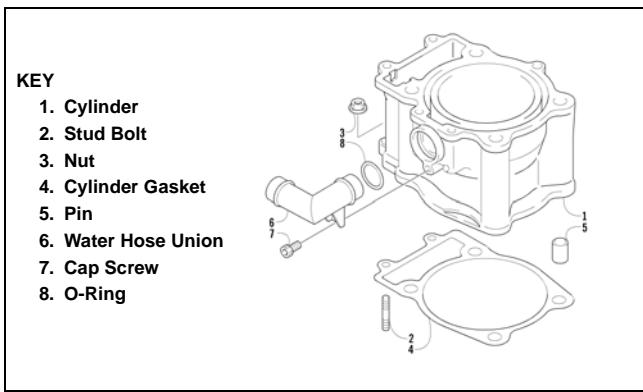
28. Place the recoil starter assembly into position on the left-side cover; then tighten four cap screws to specifications.



CC039D

## Installing Top-Side Components

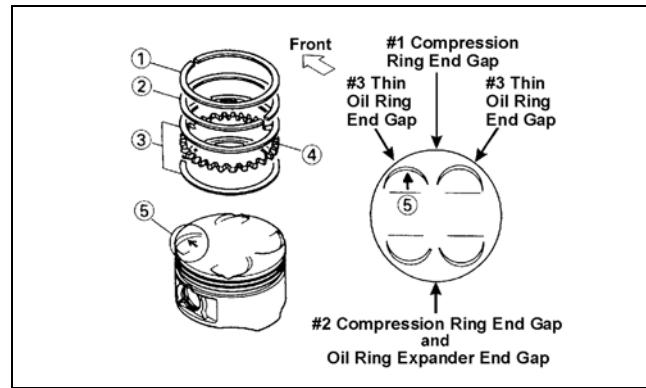
### A. Piston B. Cylinder



0732-301

■ NOTE: If the piston rings were removed, install them in this sequence.

A. 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.

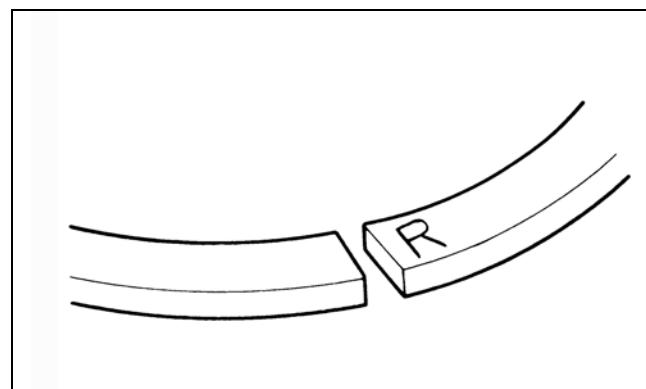


ATV-1085B

B. 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.

3



ATV-1024

C. Install the compression rings (1 and 2) so the letter 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 (see illustration).

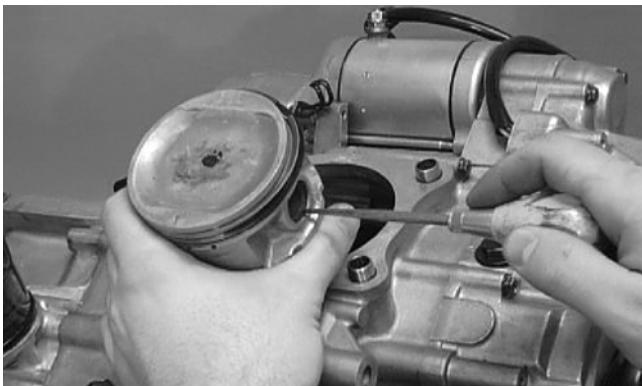
■ NOTE: The chrome (silver) ring should be installed in the top position.

### CAUTION

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

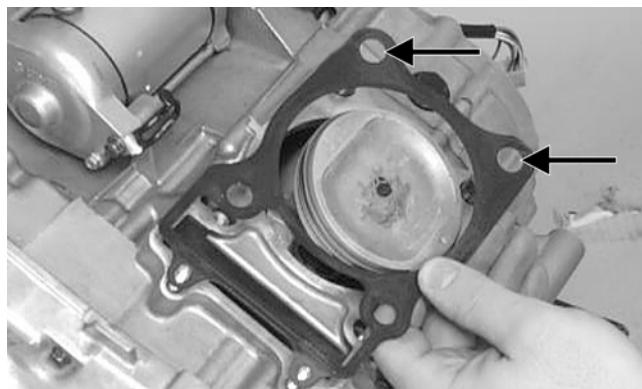
1. Install the piston on the connecting rod making sure there is a circlip on each side and the open end of the circlip faces upwards.

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



CC032D

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



CC025D

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

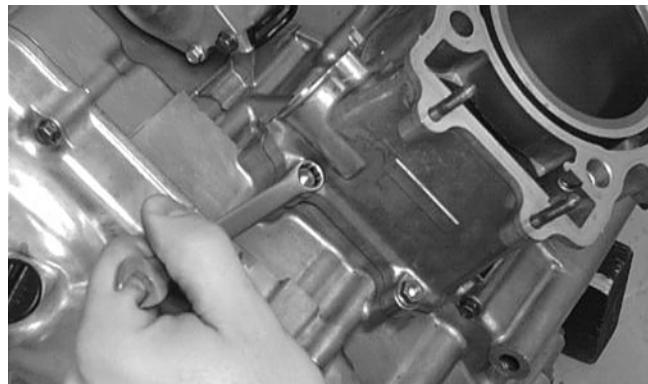
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



CC024D

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

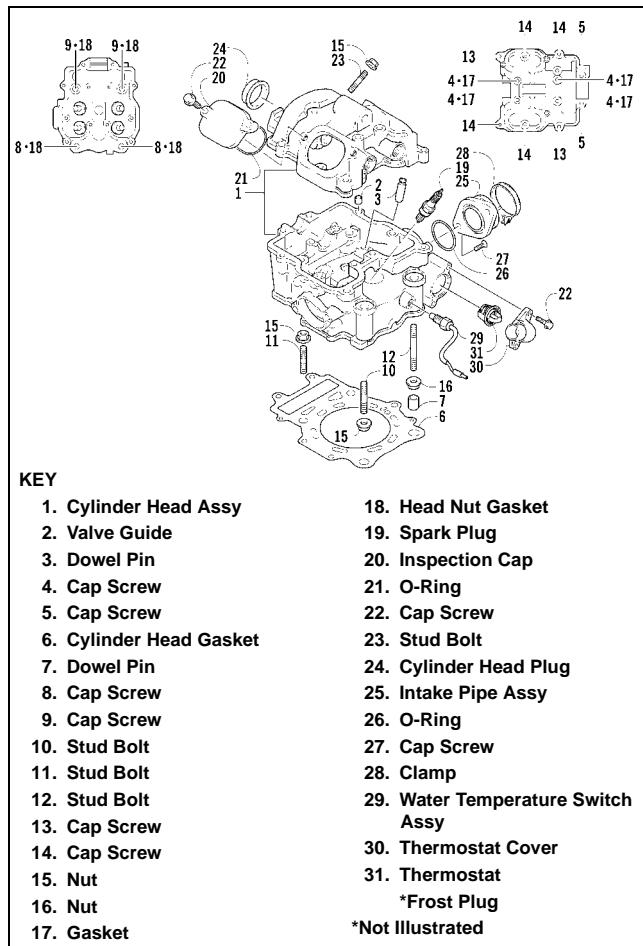
■ **NOTE:** The two cylinder-to-crankcase nuts will be tightened in step 10.



CC023D

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

## C. Cylinder Head D. Valve Cover



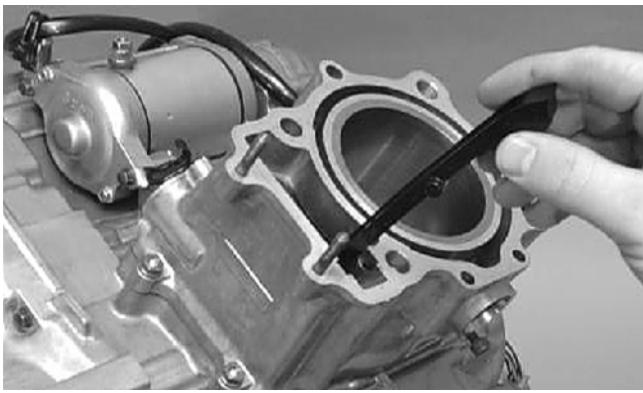
0737-755

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

6. Place the chain guide into the cylinder.

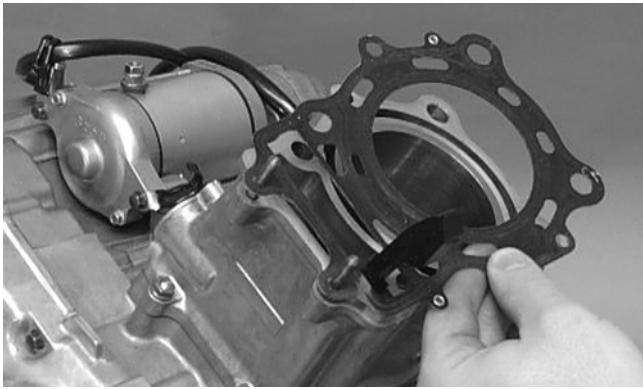
**CAUTION**

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

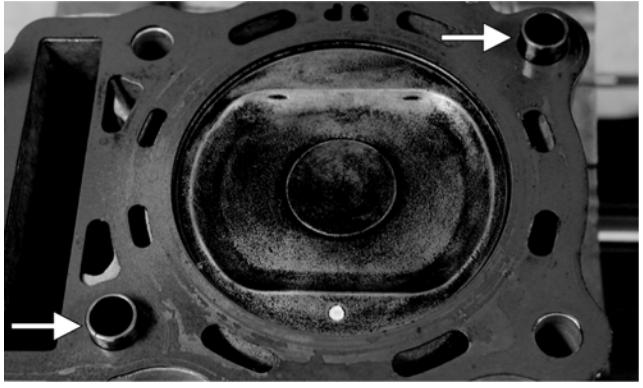


CC022D

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

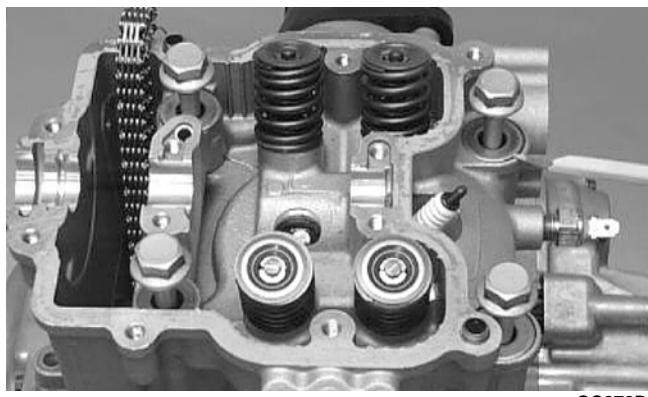


CC020D



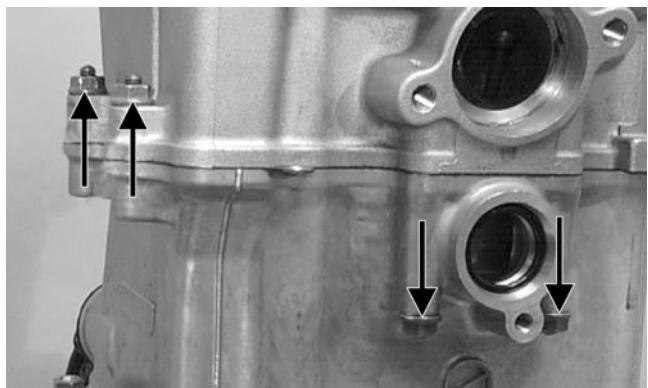
CF057A

8. Install the four cylinder head cap screws with copper washers (note the locations of the different-lengthed cap screws). Tighten only until snug.



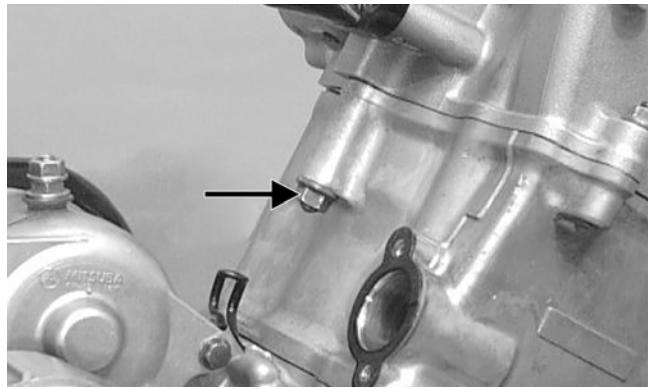
CC272D

9. Loosely install the five cylinder head nuts.



CC018D

3

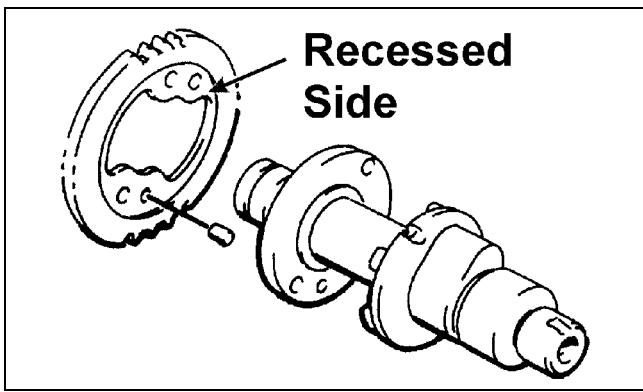


CC017D

10. In a crisscross pattern, tighten the four cylinder head cap screws (from step 8) to 3.8 kg-m (27.5 ft-lb); then tighten the 8 mm nut (from step 9) to 2.5 kg-m (18 ft-lb). Using a crisscross pattern, tighten the four 6 mm nuts (from step 9) to 1.1 kg-m (8 ft-lb). Tighten the two cylinder-to-crankcase nuts (from step 4) securely.

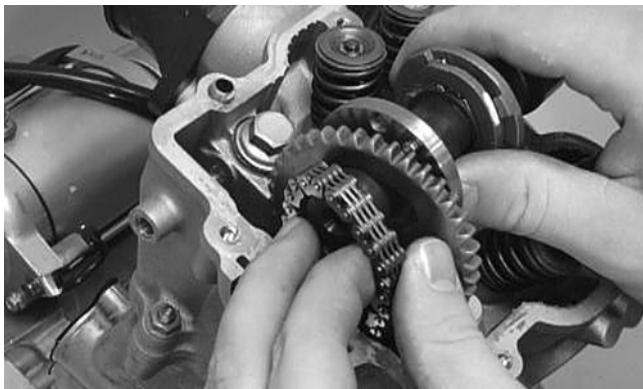
11. With the timing inspection plug removed and the chain held tight, rotate the crankshaft until the piston is at top-dead-center.

12. 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.



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

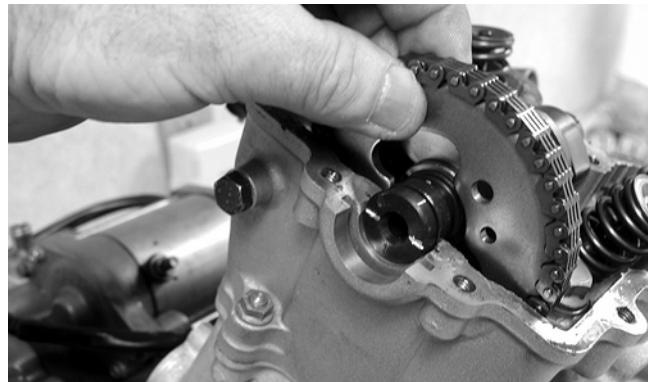
13. With the cam lobes directed down (toward the piston), maneuver the camshaft/sprocket assembly through the chain and towards its seating position; then loop the chain over the sprocket.



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



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

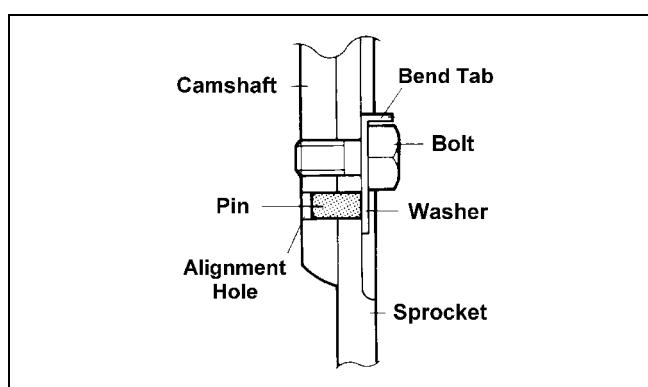


- A. Piston still at top-dead-center.
- B. Camshaft lobes directed down (toward the piston).
- C. Camshaft alignment marks parallel to the valve cover mating surface.
- D. Recessed side of the sprocket directed toward the cam lobes.
- E. Camshaft alignment pin and sprocket alignment hole (smallest) are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

#### ⚠ CAUTION

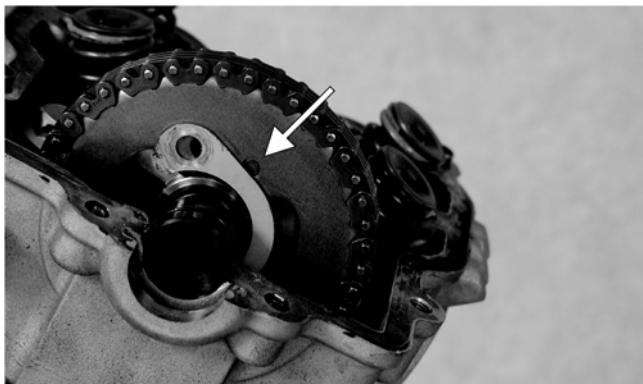
If any of the above factors are not as stated, go back to step 11 and carefully proceed.

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



#### ⚠ 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.



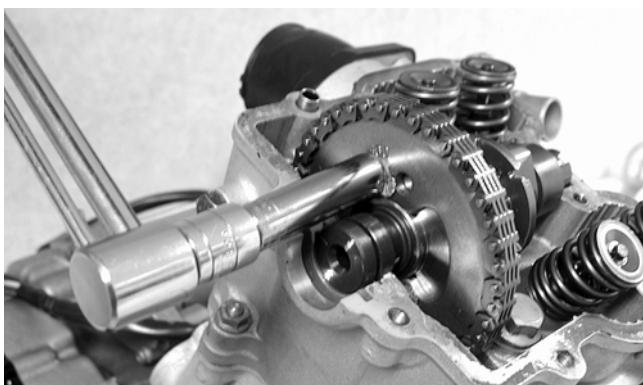
CF013A

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



CD464

17. 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 specifications. Bend the tab to secure the cap screw.



CD465

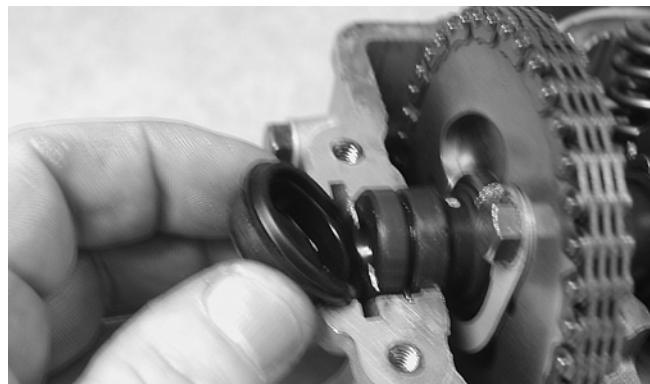
18. Rotate the crankshaft until the first cap screw (from step 16) securing the sprocket to the cam-shaft can be addressed; then tighten to specifications. Bend the tab to secure the cap screw.

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



CC012D

20. Install the cylinder head plug in the cylinder head with the opening of the plug directed downward and toward the inside.



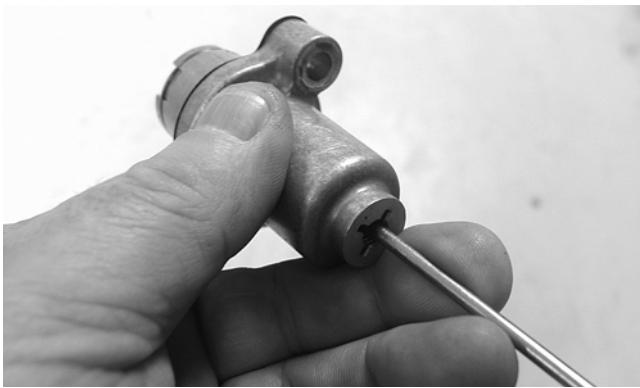
CD468

21. Place the cam chain tensioner guide into position and secure with the cap screw and washer.



CC014D

22. 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.



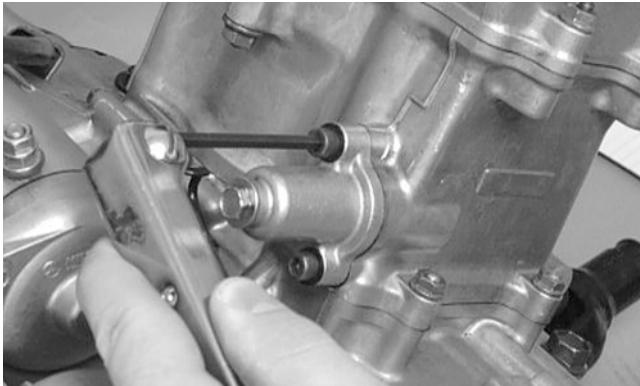
CD501

■ **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 24.

23. Place the chain tensioner adjuster assembly and gasket into position on the cylinder and secure with the two Allen-head cap screws.

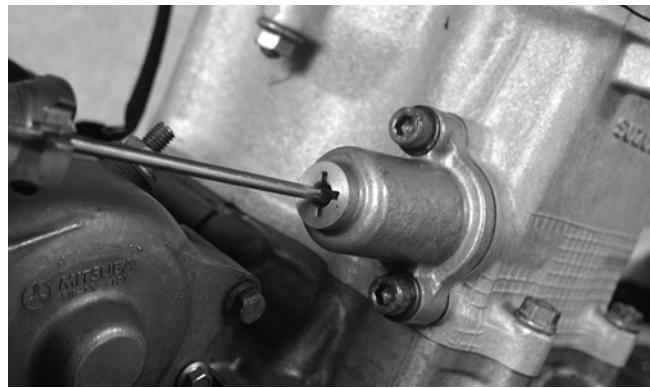


CD469



CC010D

24. Using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner counter-clockwise until all tension is released; then install the cap screw into the end of the chain tensioner.



CD470



CD471

25. Loosen the four adjuster screw jam nuts; then loosen the four adjuster screws on the rocker arms in the valve cover.
26. Apply a thin coat of Three Bond Sealant (p/n 0636-070) to the mating surfaces of the cylinder head and valve cover.

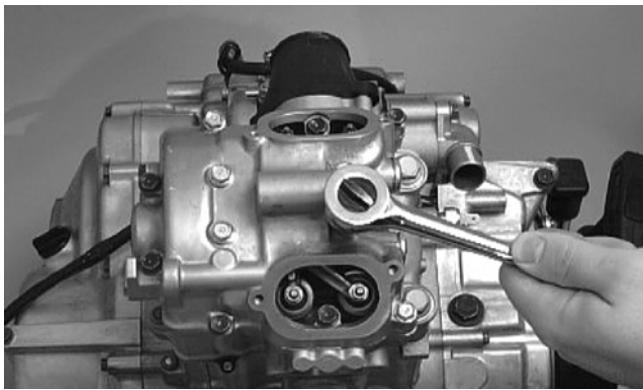


CC275D

27. Place the valve cover into position.

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

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

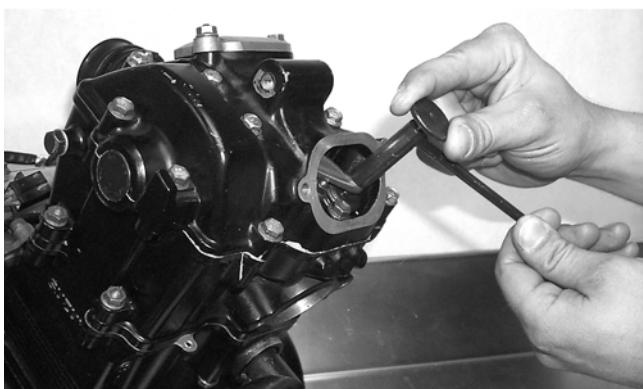


CC003D

29. In a crisscross pattern starting from the center and working outward, tighten the cap screws (from step 28) securely.
30. Adjust valve/tappet clearance using the following procedure.

■ **NOTE: Use Valve Clearance Adjuster (p/n 0444-078) for this procedure.**

- A. Turn the engine over until the piston reaches top dead center on the compression stroke.
- B. Place the valve 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.



CC528D

- C. 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.
- D. Align the valve adjuster handle with one of the marks on the valve adjuster dial.
- E. While holding the valve adjuster handle in place, rotate the valve adjuster dial counter-clockwise until specified valve/tappet clearance is attained.

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

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

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



CC001D

3

32. If removed, install the spark plug and tighten to specifications.

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## Installing Engine/Transmission

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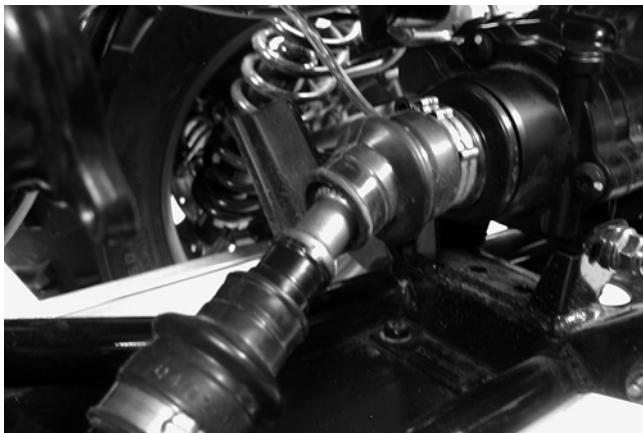
■ **NOTE: Arctic Cat recommends that new gaskets and O-rings be installed whenever servicing the ATV.**

1. From the left side, place the engine/transmission into the frame; then move it rearward as far as possible.
2. Raise the rear of the engine enough to engage the front driveshaft into the splines of the front drive output yoke; then slide the engine forward as far as possible.



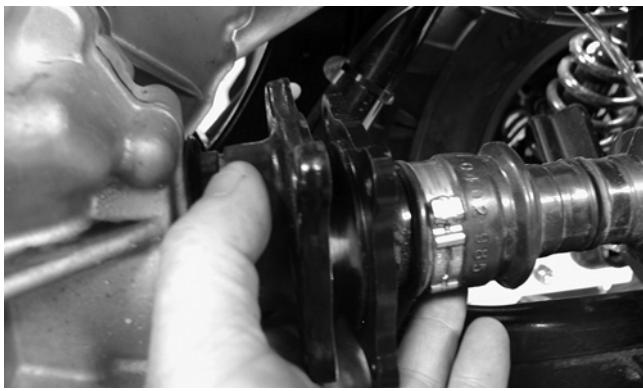
CD818

3. Raise the rear of the engine and place a block under it; then install the propeller shaft and output flange into the rear drive coupler.



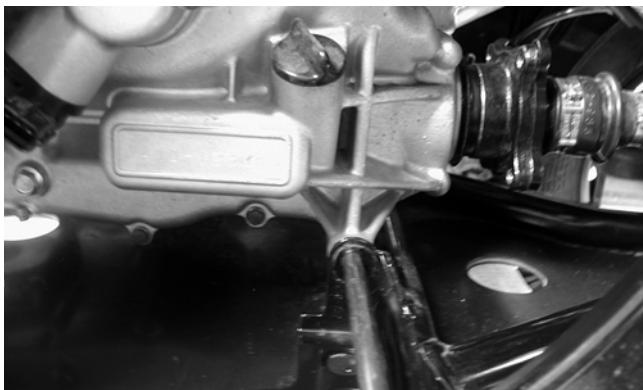
CD821

4. Remove the block from beneath the engine; then align the rear drive flanges and secure with four cap screws. Tighten to specifications.



CD824

5. Install the lower rear engine mounting through-bolt, spacer, and washer; then install the lower front engine mounting through-bolt, spacer, and washer. Secure with the flange nuts. Tighten to specifications.



CD809

6. Connect the crankcase breather vent hose and secure with the clamp.
7. Connect the lower coolant hose to the water pump housing and secure with the clamp.



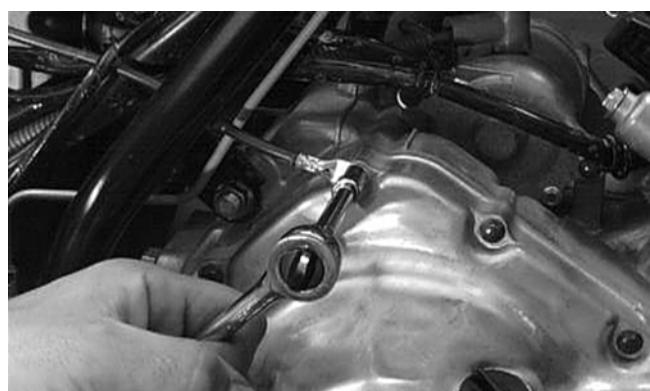
CC124D

8. Connect the positive cable to the starter motor and install the protective boot.



AR604D

9. Connect the battery ground (negative) cable to the crankcase cover.



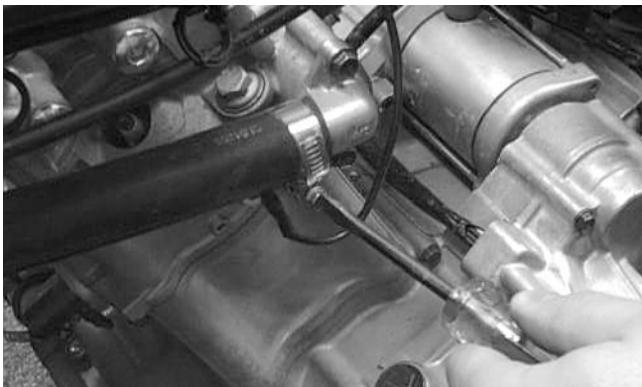
AR600D

10. Install the coil and secure with two cap screws; then install the high tension lead on the spark plug.



CD814

11. Connect the upper coolant hose to the thermostat housing and secure with the clamp.



CC121D

12. Install the air filter housing; then connect the crankcase breather and the inlet air duct. Secure with the clamps.



CD785



CD787

13. Position the carburetor into the intake pipe and secure with the clamp; then connect the carburetor boot to the air filter housing. Secure with the clamp.



CD790



CD786

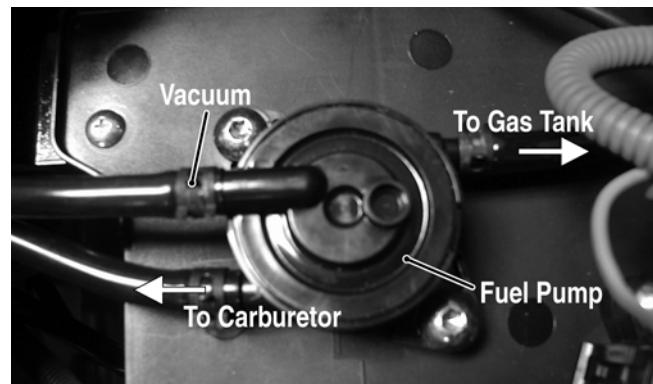
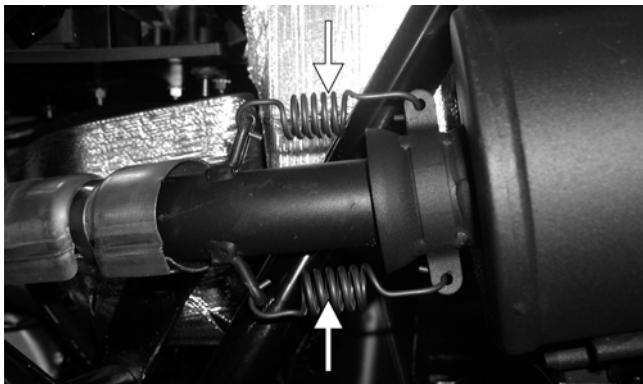
14. Connect the speed sensor connector to the sensor housing.



CD794

15. Install the exhaust pipe and secure with two cap screws making sure the mounting brackets engage the frame grommets; then install the muffler with the springs. Tighten all hardware to specifications.

3



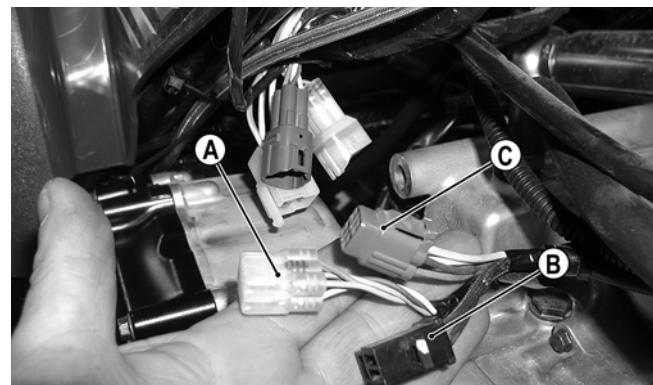
16. Swing the shift rod back into position on the engine shift arm; then secure with the E-clip.
17. Place the left-side footwell and foot peg into position on the footrest. Secure with two cap screws. Tighten to specifications.



18. Connect the gas hose to the fuel pump; then connect the vacuum hose. Secure with hose clamps.



19. Connect the temperature sensor wire to the main harness.
20. Connect the gear position indicator connector (A), stator connector (B), and the CDI connector (C) to the main harness.



21. Install the front body panel and the front rack (see Section 8).
22. Place the side panels into position; then install the reinstallable rivets.



CD683A

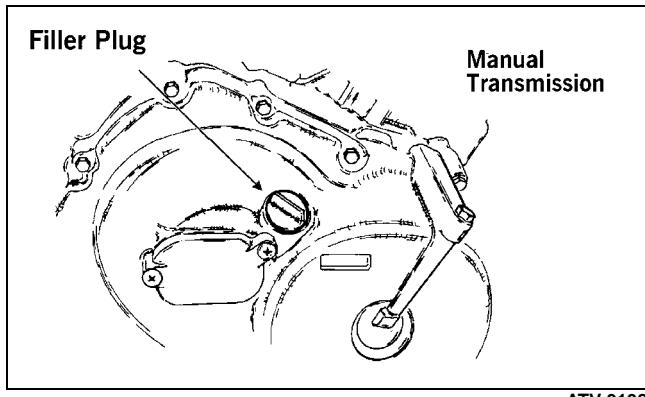
23. Install the battery connecting the positive cable first; then the negative cable.
24. Pour the correct amount of recommended oil into the engine/transmission filler hole; install the filler plug.

25. Pour 2.9 L (3 U.S. qt) of premixed Arctic Cat Antifreeze into the cooling system. Allow coolant to settle and then fill to the bottom of the stand pipe in the radiator neck.

26. Install the seat making sure it locks into position.

**CAUTION**

If the engine had a major overhaul or if any major part was replaced, proper engine break-in procedures must be followed (see Section 1). If the proper engine break-in procedures are not followed, severe engine damage may result.



ATV-0108

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## Removing Engine/ Transmission

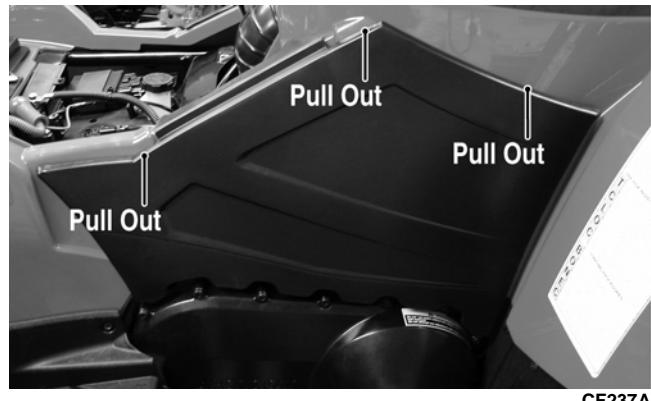
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Many service procedures can be performed without removing the engine/transmission from the frame. Closely observe the note introducing each sub-section for this important information.

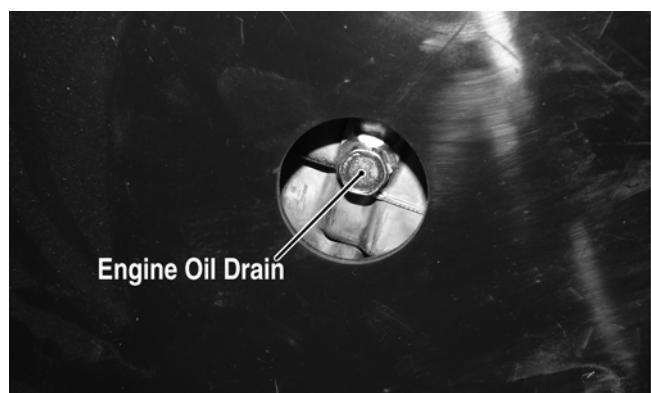
### AT THIS POINT

If the technician's objective is to service/replace left-side components, right-side components, and/or top-side components, the engine/transmission does not have to be removed from the frame.

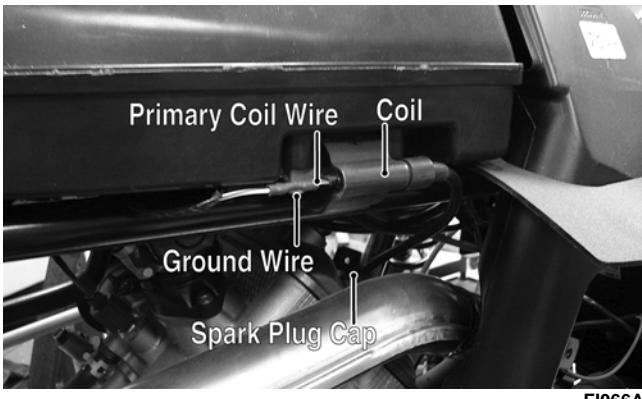
1. Remove the seat.
2. Remove the negative cable from the battery; then remove the positive cable.
3. Remove the radiator access cover, steering post cover, and storage compartment cover assembly; then remove the storage compartment box.
4. Remove the side panels.



5. Remove the front rack and front body panel (see Section 8).
6. Drain the oil from beneath the engine/transmission; then drain the coolant.

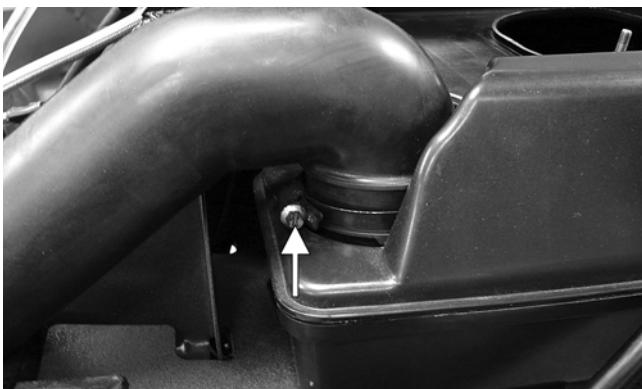


7. Remove the air filter (see Section 2).
8. Disconnect the primary coil wire; then disconnect the ground wire and remove the high tension wire/spark plug cap from the spark plug.



FI066A

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

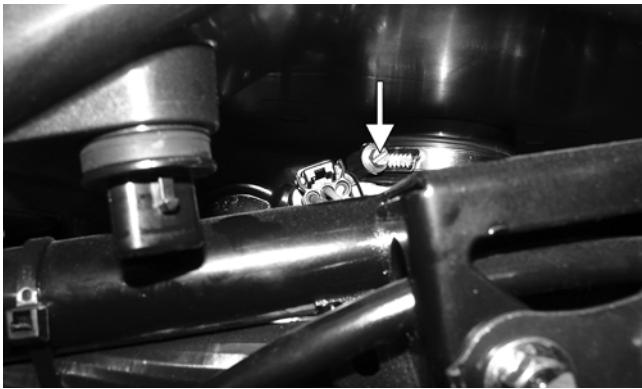


FI098A

10. Disconnect the crankcase vent hose from the air filter housing; then loosen the clamp securing the air filter housing to the throttle body.



FI081A



FI099A

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



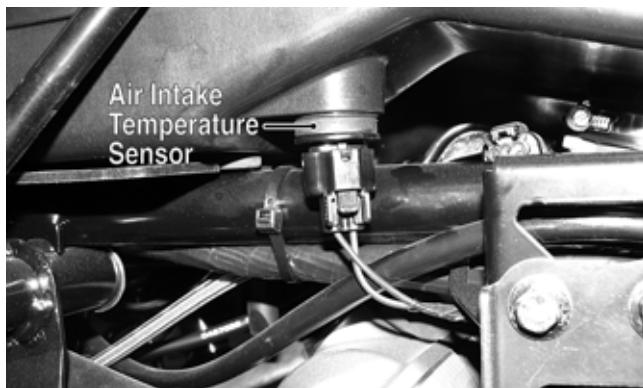
FI075



FI076

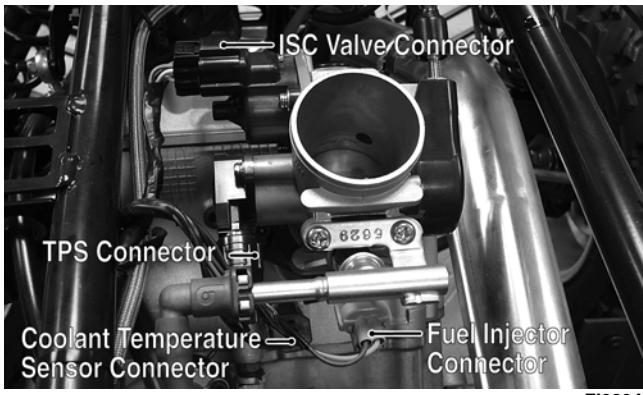
12. Remove the left-side foot peg and footwell (see Section 8).

13. Disconnect the air intake temperature sensor connector; then lift the air filter housing off the frame and slip the air pressure sensor off the mount. Remove the air filter housing.



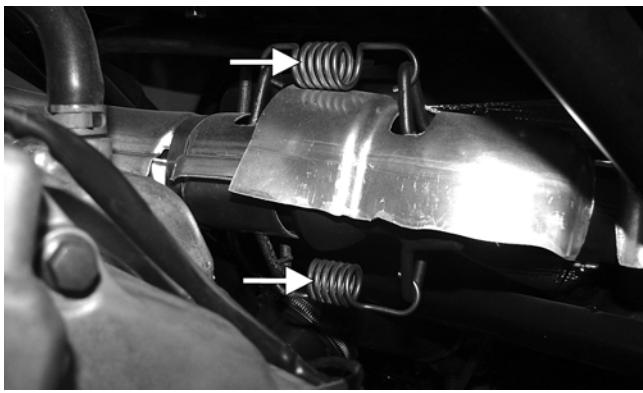
FI082A

14. Remove the ISC valve connector, the TPS connector, the coolant temperature sensor connector, and the fuel injector connector.



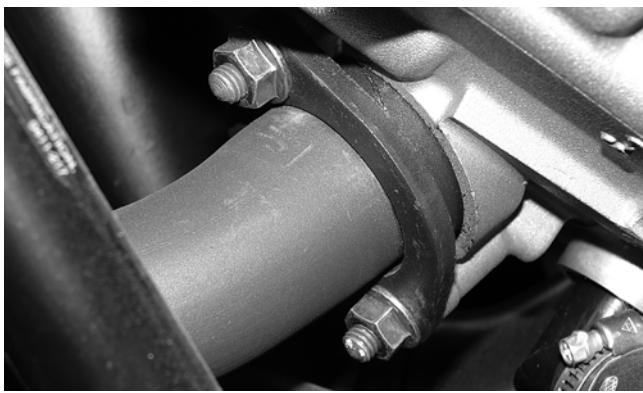
FI089A

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



FI097A

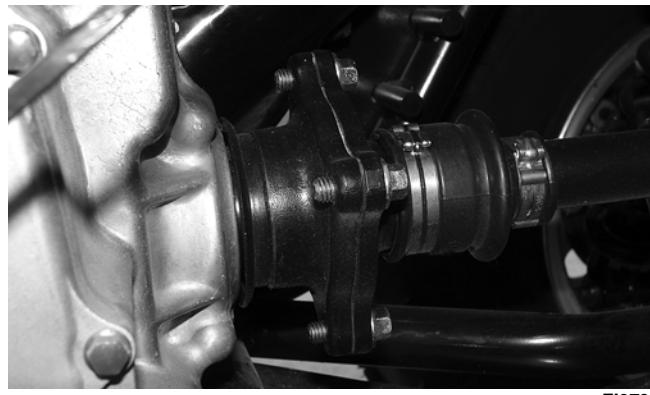
16. Remove the two flange nuts securing the exhaust pipe to the cylinder head; then remove the pipe.



FI073

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

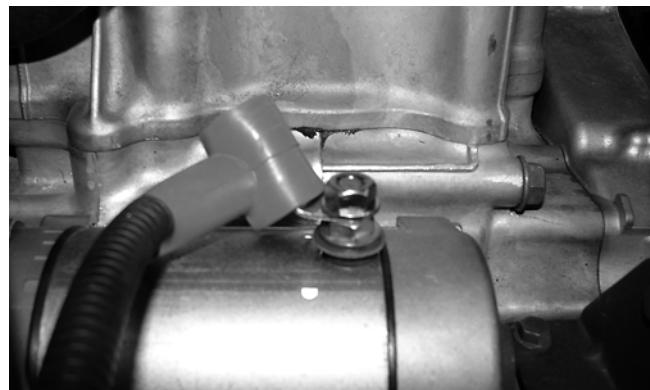
18. Remove the cap screws securing the rear drive-shaft/output flange to the rear output joint flange.



FI079

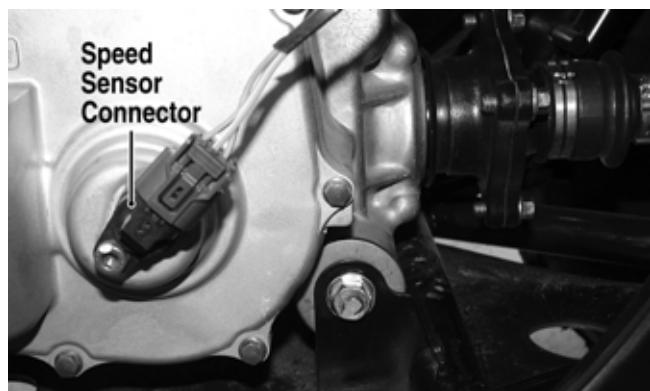
■ **NOTE:** It is advisable to lock the brake when loosening the cap screws securing the rear drive-shaft.

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



FI094

20. Disconnect the speed sensor connector from the sensor housing; then mark the shift arm/shift shaft for installing purposes and remove the shift arm.

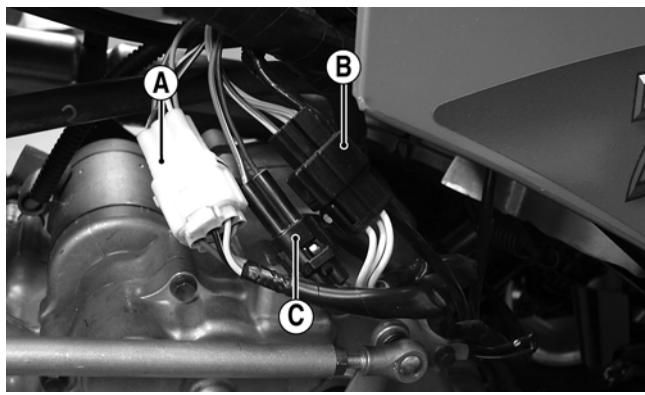


FI078A



FI085A

21. On the left side, disconnect the gear position indicator connector (A), stator connector (B), and the crankshaft position sensor connector (C).

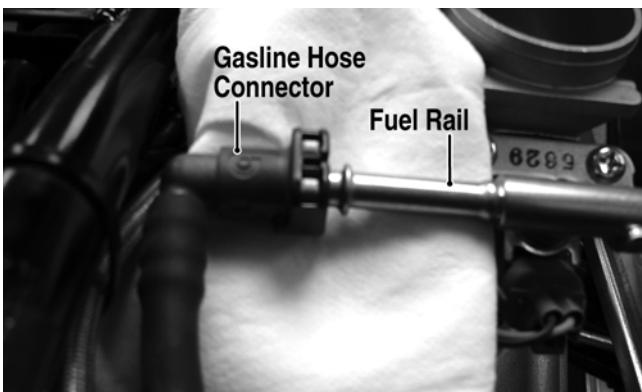


FI083A

22. Using an absorbent towel to catch any spilled gas, press the locking tab release on the gasline hose connector; then slide the gasline hose connector off the fuel rail.

### ⚠ WARNING

Whenever working on the fuel system if a gasline hose is removed from any component, slowly bleed the pressure from the hose into an absorbent towel before removing the hose from the component.



FI092A

### ⚠ WARNING

Make sure the ignition switch is in the OFF position and the FUEL fuse is removed from the PDM to prevent inadvertent discharge of gas from the gasline hose.



FI109A

3

23. Loosen the clamp securing the throttle body to the intake pipe; then remove the throttle body and secure it out of the way.

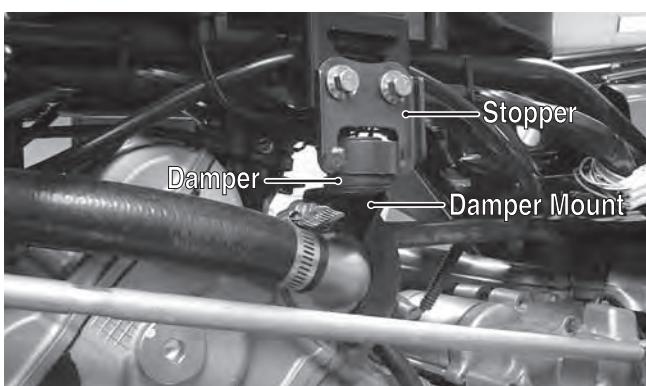
24. Remove the two cap screws securing the intake pipe to the cylinder head and remove the intake pipe. Account for an O-ring.

### ⚠ CAUTION

Cover the intake opening to prevent hardware or dirt from entering the intake or severe engine damage could occur.

25. Remove the engine damper stopper from the frame; then remove the engine damper mount and damper from the engine.

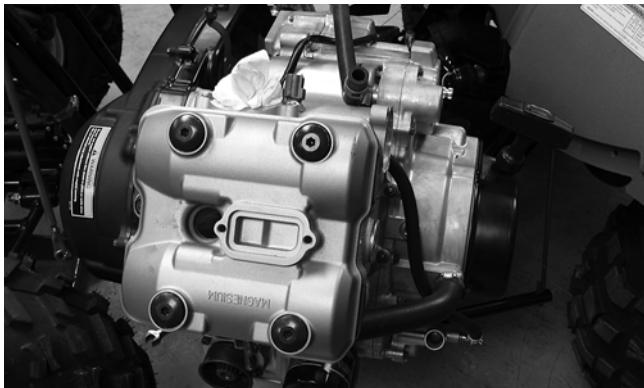
■ NOTE: The engine damper mount is secured to the engine with the thermostat housing cap screws. Note the position of the bleed valve in the thermostat for assembling purposes.



FI067A

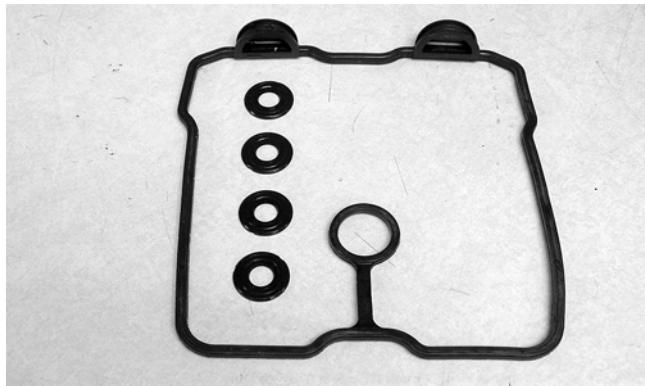
26. Support the engine/transmission; then remove the lower front through-bolt.

27. Remove the lower rear through-bolt; then free the engine from the engine mounting brackets.
28. Lift the front of the engine/transmission far enough to disengage the front drive spline from the engine; then remove the engine from the left-side of the ATV.



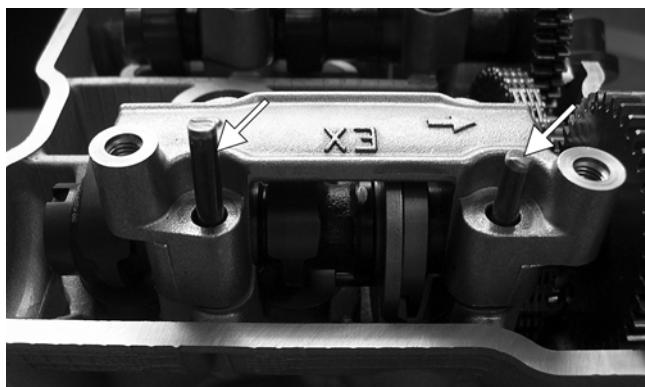
FI102

1. Remove the cylinder head cover. Account for a gasket and four seal washers.

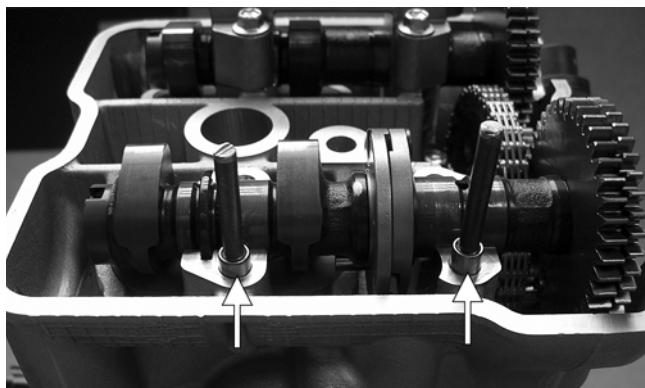


FI122

2. Check and record valve tappet clearance for reference when assembling (see Section 2).
3. Remove the eight cap screws securing the cam-shaft holders to the cylinder head.
4. Install two alignment studs in the exhaust cam-shaft holder; then carefully remove the cam-shaft holder. Account for two alignment pins.



FI125A



FI123A

## Top-Side Components

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

### ☞ AT THIS POINT

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

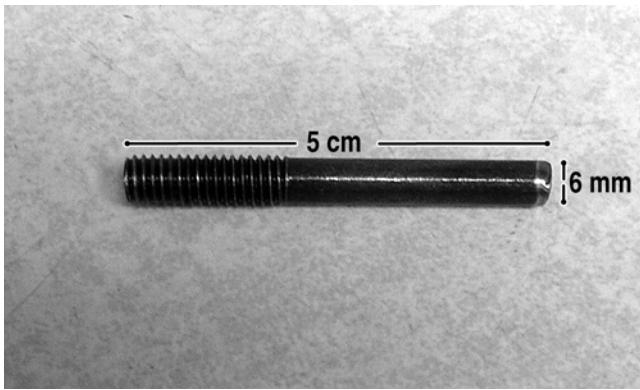
■ NOTE: The engine/transmission does not have to be removed from the frame for this procedure.

## Removing Top-Side Components

### A. Cylinder Head Cover B. Cylinder Head

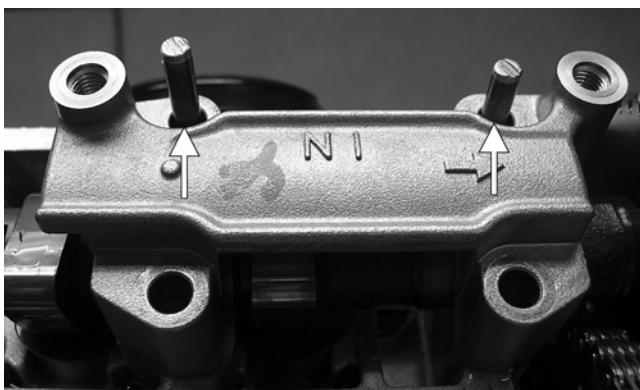
■ NOTE: Remove the spark plug and timing inspection plug; then using the recoil starter, rotate the crankshaft to top-dead-center of the compression stroke. Account for a copper washer on the timing inspection plug.

■ NOTE: Alignment studs can be made by cutting the heads off two 6 mm x 5 cm cap screws and will aid in preventing loss of the alignment pins into the crankcase.



FI155A

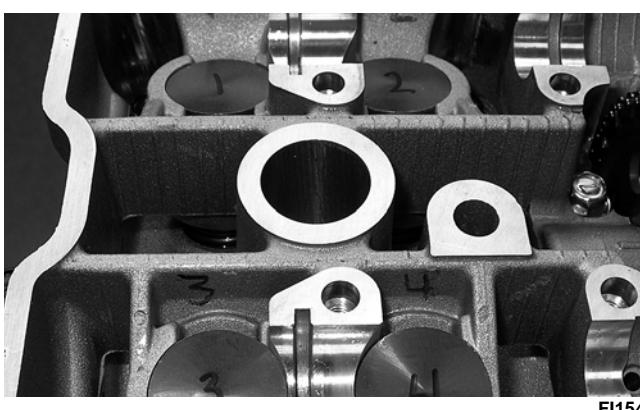
5. Remove the exhaust camshaft; then repeat step 4 for the intake camshaft. Account for two alignment pins.



FI124A

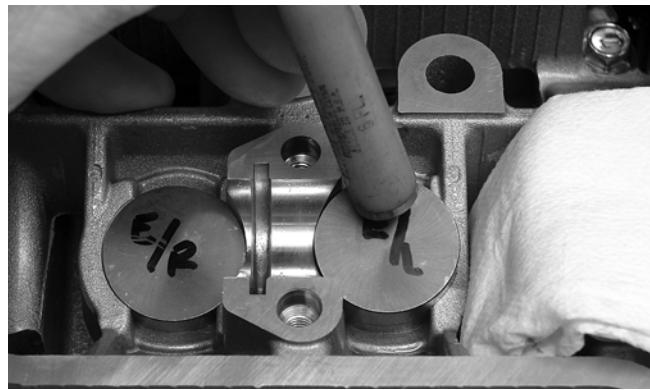
6. Remove the intake camshaft; then wipe the four valve tappets clean and using a suitable marker, number the tappets and mark the corresponding position on the cylinder head.

**■ NOTE: This will greatly simplify valve clearance adjustment during assembling.**

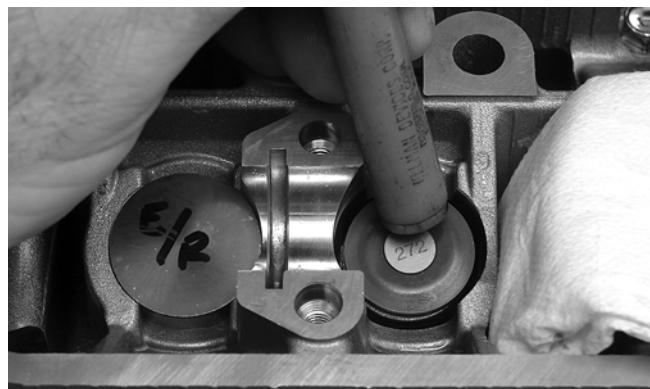


FI154

7. Using a magnet, withdraw the valve tappets from the cylinder head taking care to prevent loose adjusting shims from falling into the engine.



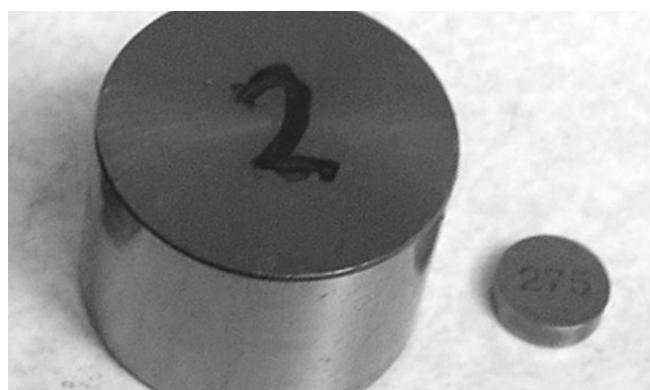
FI105



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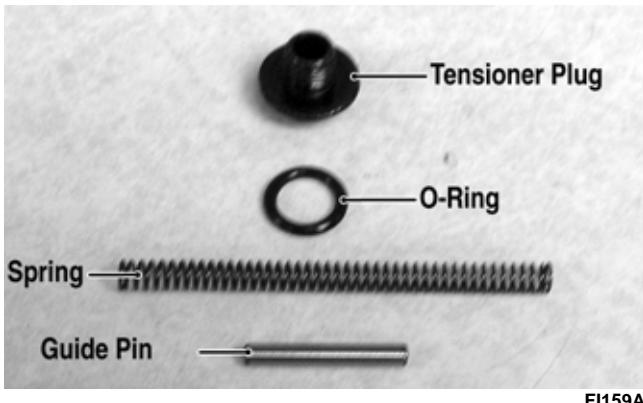
FI106

**■ NOTE: The adjustment shims are of different thickness. Whenever the shims are removed, they must remain with the corresponding valve tappets or complete valve adjustment will be required when assembling.**



FI157

8. Remove the cam chain tensioner plug, spring, guide pin, and O-ring; then remove the cam chain tensioner body.

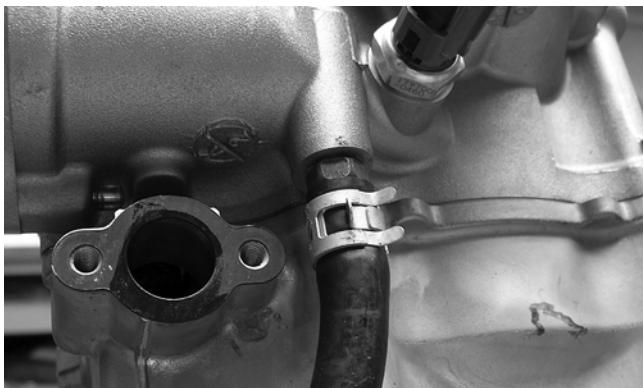


FI159A

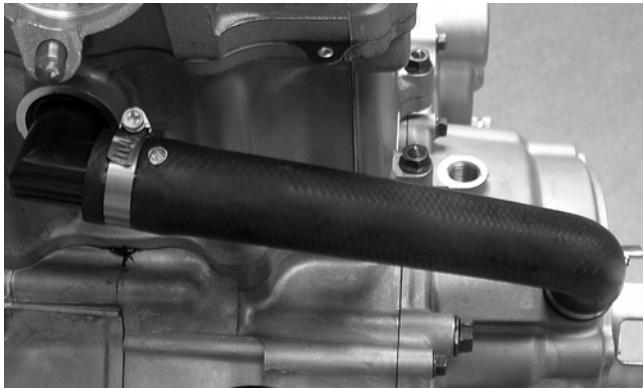


FI162A

9. Remove the coolant bypass hose from the cylinder head fitting; then remove the coolant cross-over hose.

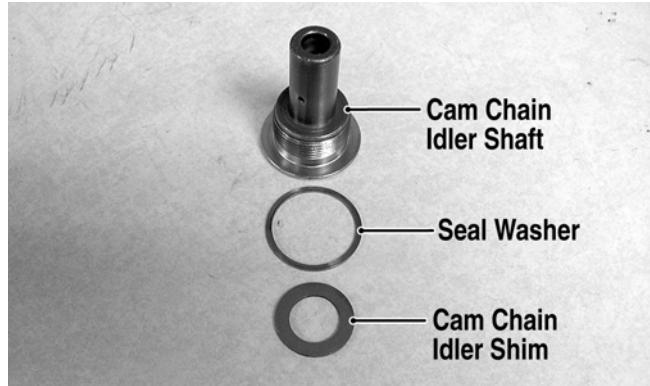


FI160



FI161

10. Loosen but do not remove the cam chain idler shaft; then using a suitable flat-blade screwdriver, hold the cam chain idler shaft shim against the shoulder of the cam chain idler shaft and remove the shaft. Account for a copper seal washer and the cam chain idler shim.

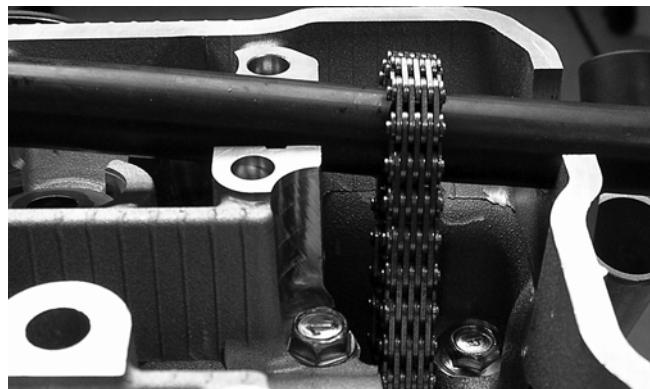


FI131A

**CAUTION**

Failure to hold the cam chain idler shim against the cam chain idler shaft may result in the shim falling into the engine resulting in severe engine damage.

11. Remove the cam chain idler from the cam chain; then support the cam chain to prevent it from dropping into the crankcase.

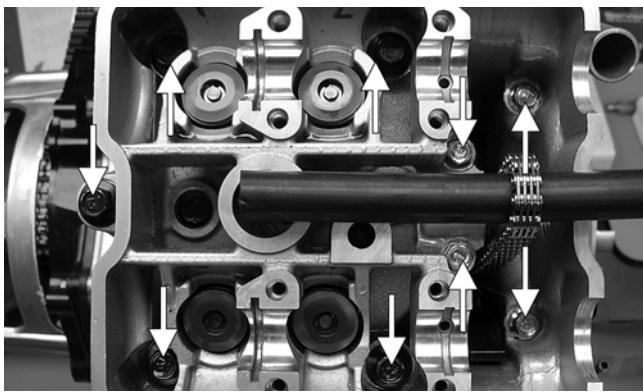


FI163

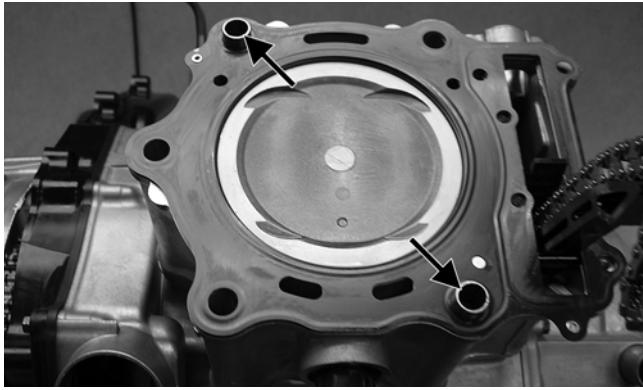
**CAUTION**

Do not rotate the engine with the cam chain loose or severe engine damage could occur.

12. Remove the cylinder head cap screws (four 6 mm and five 12 mm) noting the location of the longer and shorter 6 mm cap screws; then remove the cylinder head. Account for two alignment pins and one head gasket.



FI133A



FI134A

#### ☞ AT THIS POINT

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

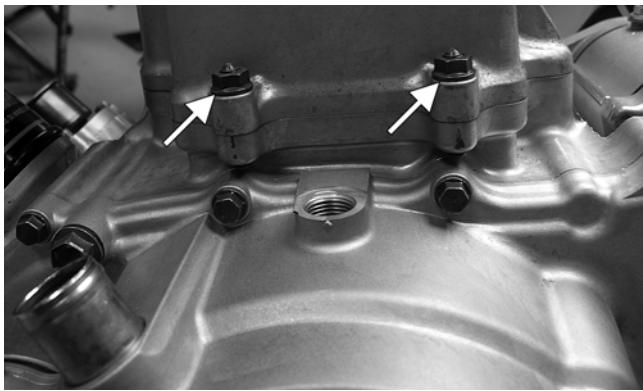
#### ☞ AT THIS POINT

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

### C. Cylinder D. Piston

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

13. Remove the cam chain guide; then remove the two nuts from the cylinder base mounting studs.



FI135A

14. 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.



FI136A

#### ☞ AT THIS POINT

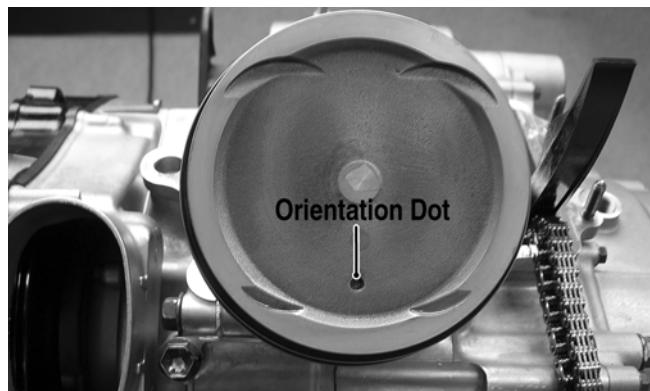
To service cylinder, see Servicing Top-Side Components sub-section.

#### ⚠ CAUTION

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

3

15. Note the position of the orientation dot on the piston; then remove the piston pin circlips using care not to drop the circlip into the crankcase.



FI138A



FI139

16. Remove the piston pin and the piston.

■ NOTE: The piston pin is a full-floating type and should slide out by hand. If the piston pin is stuck, use Piston Pin Puller (p/n 0644-328) to remove the piston pin.



CC033D

■ NOTE: Support the connecting rod with rubber bands to avoid damaging the rod or install the Connecting Rod Holder (p/n 0444-006).

#### **⚠ 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.

■ NOTE: If the existing rings will not be replaced with new rings, note the location of each ring for proper installation. When replacing with new rings, replace as a complete set only. If the piston rings must be removed, remove them in this sequence.

- A. Starting with the top ring, slide one end of the ring out of the ring-groove.
- B. Remove each ring by working it toward the dome of the piston while rotating it out of the groove.

#### **👉 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.

## **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. Recoil Starter**
- B. Water Pump**
- C. Cover**
- D. Rotor/Flywheel**
- E. Oil Pump**

1. Remove the four cap screws securing the recoil starter assembly to the left-side cover; then remove the recoil starter. Account for the gasket.

#### **👉 AT THIS POINT**

To service the recoil starter, see Servicing Left-Side Components sub-section.

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

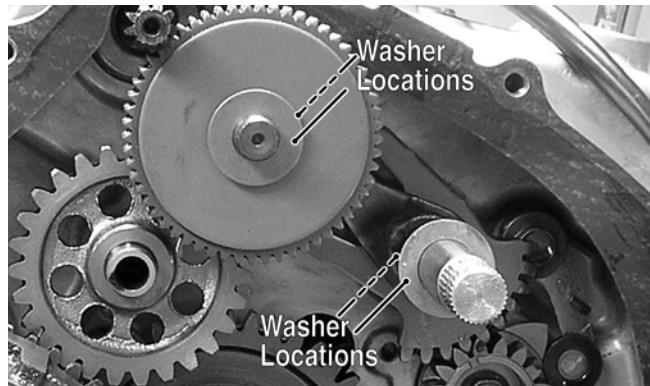


CD925A

3. Remove the three cap screws securing the water pump to the engine; then remove the water pump.



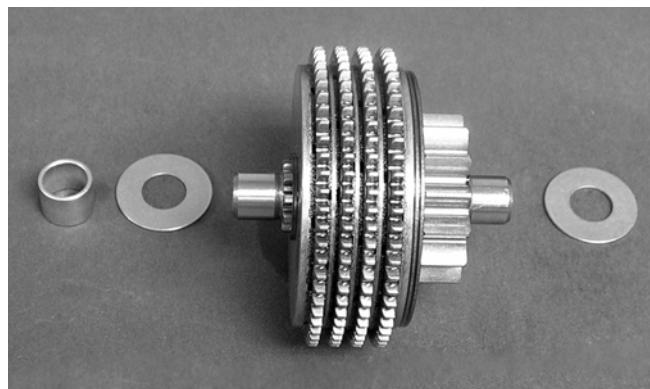
FI141A



FI185A

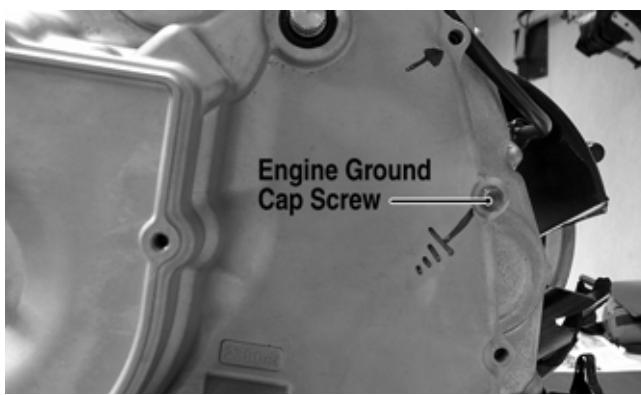
5. Remove the starter torque limiter. Account for two washers, one bushing, and the shaft.

3

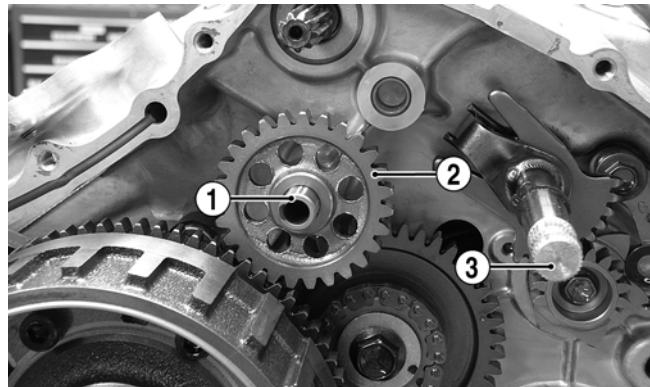


FI189

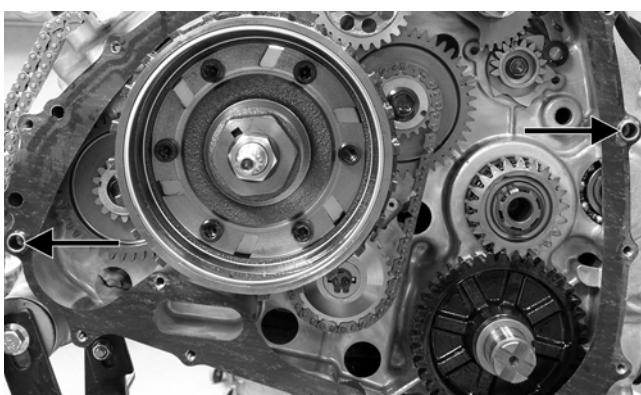
6. Remove the starter idler shaft (1) and the starter idler gear (2); then remove the shift shaft (3). Account for two washers on the shift shaft.



FI147A



FI148A



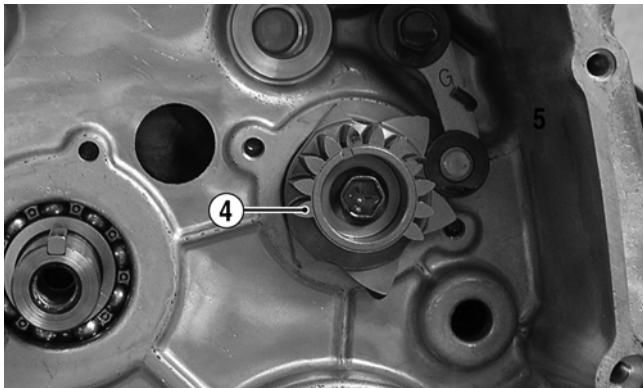
FI184A

■ **NOTE: Inspect the inside of the left-side cover for any shaft washers that may have come off with the cover. Make sure they are returned to their respective shafts.**

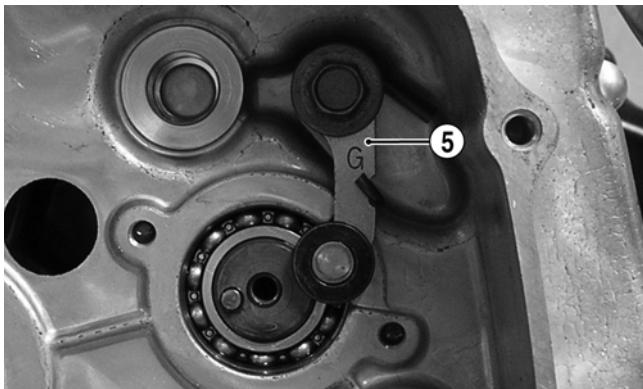


FI1302

7. Remove the shift cam driven gear (4); then remove the cam stopper (5). Account for a spring.



FI311A

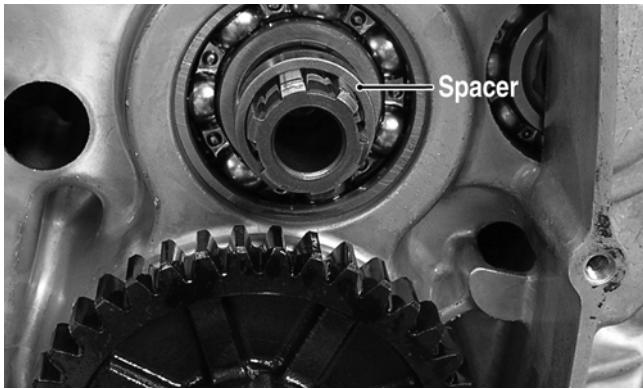


FI307A

8. Remove the circlip securing the drive gear on the countershaft; then remove the drive gear. Account for a spacer.

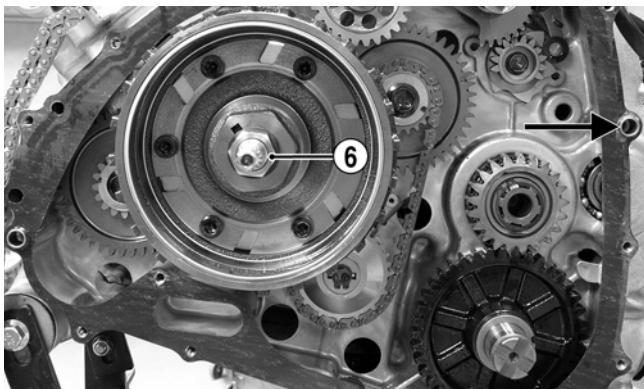


FI310

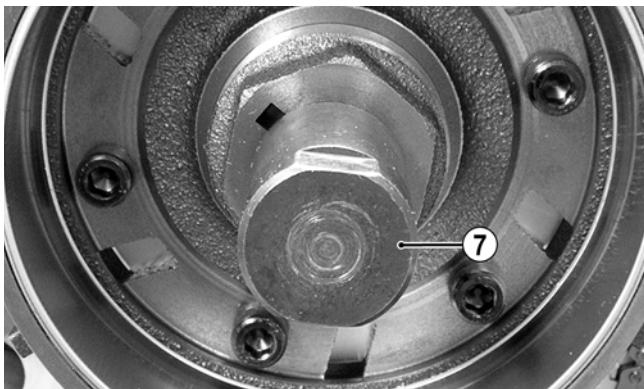


FI309A

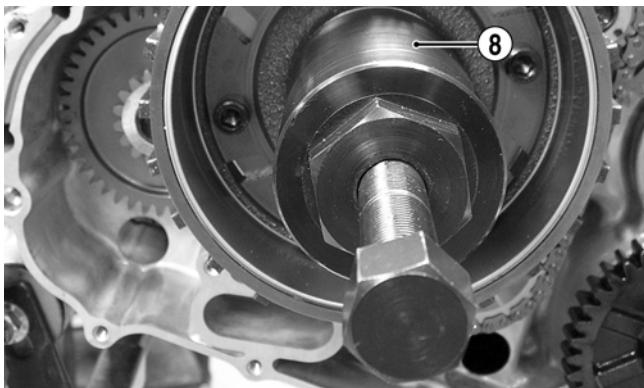
9. Remove the rotor/flywheel nut (6); then install the flywheel protector (7) and Magneto Rotor Remover (p/n 0444-206) (8) and remove the rotor/flywheel. Note the orientation of the one-way bearing.



FI181B



FI191A



FI192A

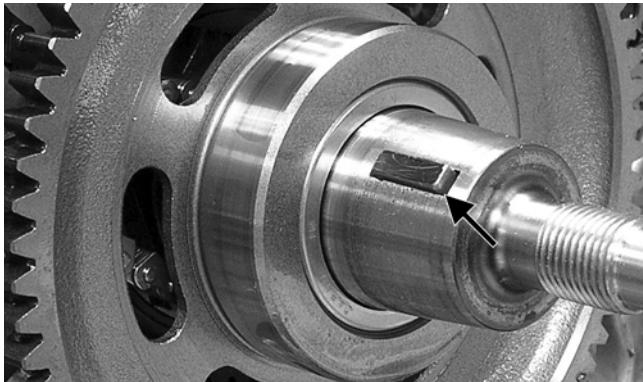


FI195A

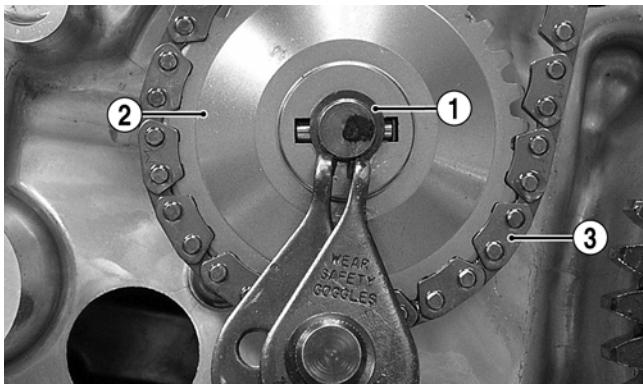
## ⚠ CAUTION

Make sure the crankshaft protector is fully installed on the crankshaft and the rotor/flywheel puller is turned all the way onto the rotor/flywheel or severe damage to the crankshaft, rotor/flywheel, or puller will occur.

10. Remove the rotor/flywheel key; then remove the starter driven gear.

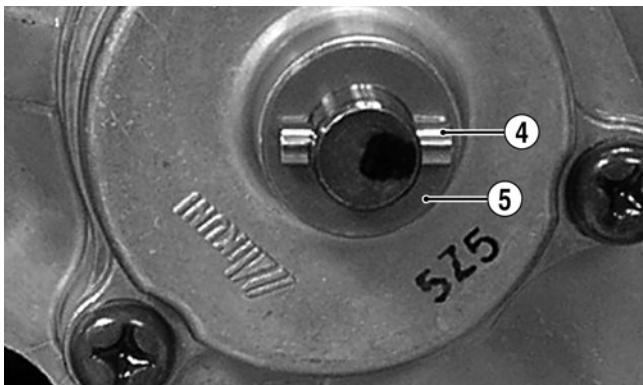


FI193A



FI200A

3



FI201A

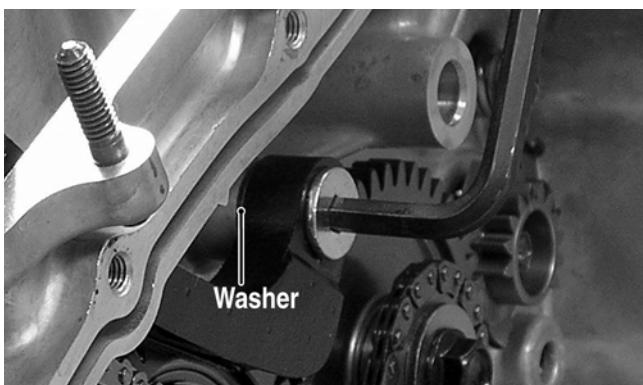
13. Using an impact driver and appropriate Phillips-head bit, remove the three cap screws securing the oil pump and remove the oil pump.



FI308

■ NOTE: The oil pump is not a serviceable component. Do not disassemble the oil pump. It is available only as a complete assembly.

11. Remove the pivot bolt from the cam chain tensioner; then remove the cam chain tensioner and cam chain. Account for a washer.



FI197A

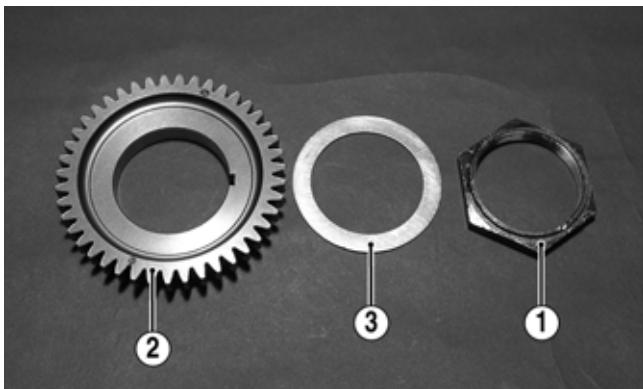
12. Remove the snap ring (1) from the oil pump shaft; then remove the oil pump driven gear (2) and drive chain (3). Account for the oil pump drive pin (4) and washer (5).

14. Remove the cap screws from the crankshaft balancers; then remove the crankshaft balancer driven gears. Account for two washers and two keys.

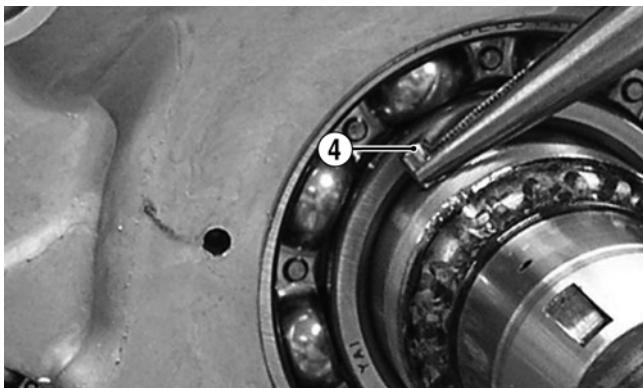


FI303A

15. Using a 52 mm deep-well socket and a suitable holding tool, remove the crankshaft balancer drive gear nut (1) from the crankshaft; then remove the drive gear (2). Account for a washer (3) and drive pin (4).



FI305A



FI318A

## 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

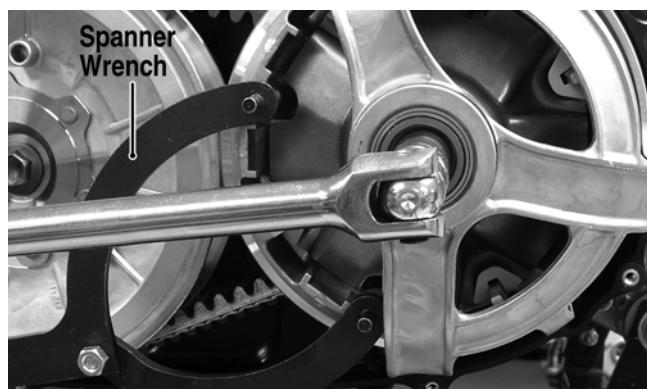
To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■ 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; then using a rubber mallet, gently tap on the cover tabs to loosen the cover. Account for a gasket.
2. Remove the bearing cap; then using Spanner Wrench (p/n 0444-153) to hold the drive pulley, remove the cap screw from the clutch shaft.



FI316A

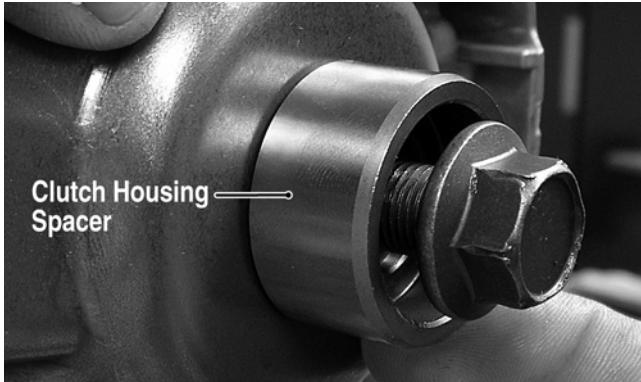
3. Remove the three cap screws securing the V-belt bearing housing to the inner V-belt cover; then remove the housing. Account for two dowel pins and a spacer.



FI315

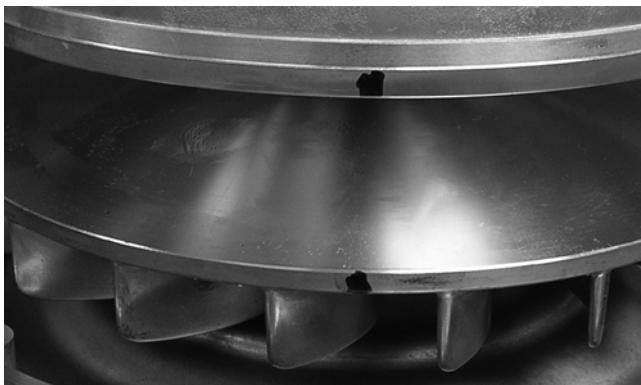


FI131



FI429A

4. Make match marks on the fixed drive face and the movable drive face; then remove the movable drive face.



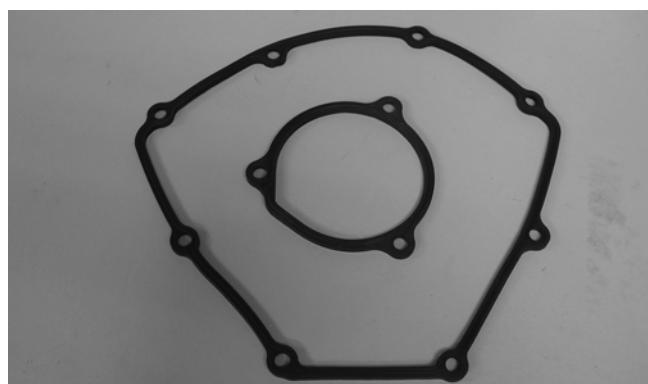
FI334

5. Using Spanner Wrench (p/n 0444-153) to hold the driven pulley, remove the cap screw from the driveshaft; then remove the driven pulley assembly and the V-belt.



3

FI225A



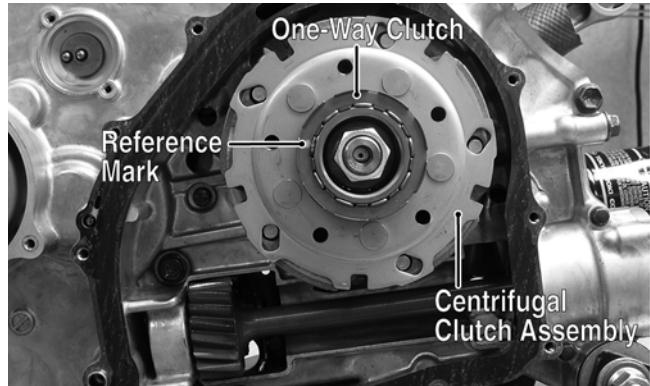
FI226

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

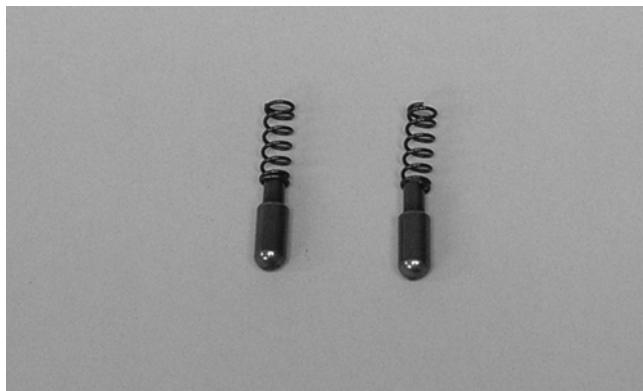
8. Remove the gear shift switch. Account for two springs and two gear shift switch contacts.



FI319

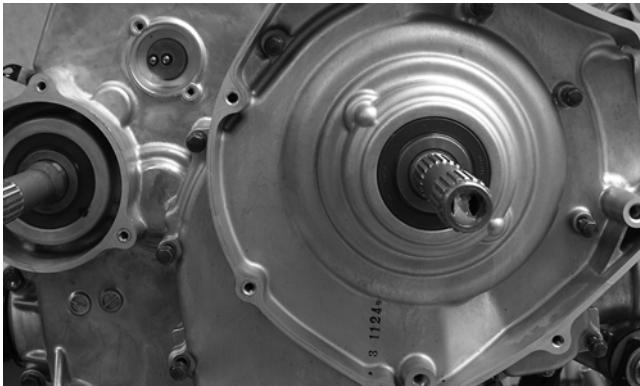


FI271A



FI280

9. Remove the twelve cap screws securing the clutch cover to the engine case noting the positions of the two longer cap screws; then remove the clutch cover. Account for two alignment pins and a gasket.



FI272

10. Note the reference mark and the word OUT-SIDE stamped on the cage of the one-way clutch; then remove the one-way clutch.

11. Using a hydraulic press or rubber mallet, remove the centrifugal clutch housing from the clutch cover. Account for the primary shaft spacer with O-ring.

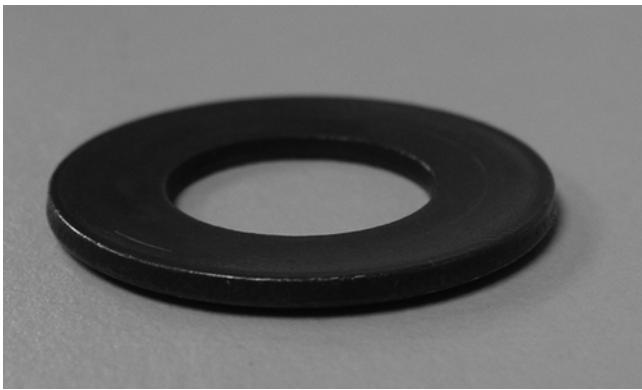


FI344

12. Using Spanner Wrench (p/n 0444-153) to hold the centrifugal clutch assembly, remove the clutch retainer nut (left-hand threads); then remove the centrifugal clutch assembly from the crankshaft. Account for a concave washer and note that the concave side is directed toward the clutch assembly.



FI279A



FI336

13. Remove the oil jet from the crankcase. Account for an O-ring.



FI337



FI274

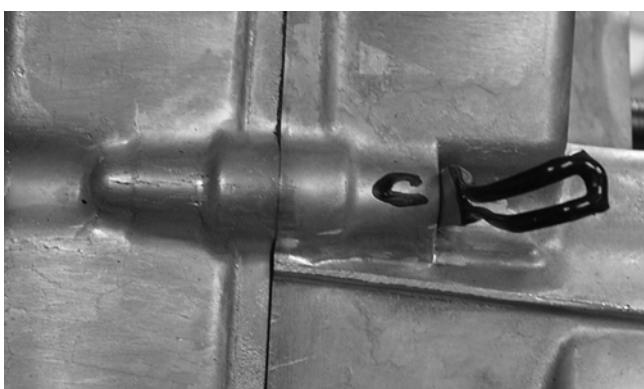
3



FI275



FI276



FI277

## 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.

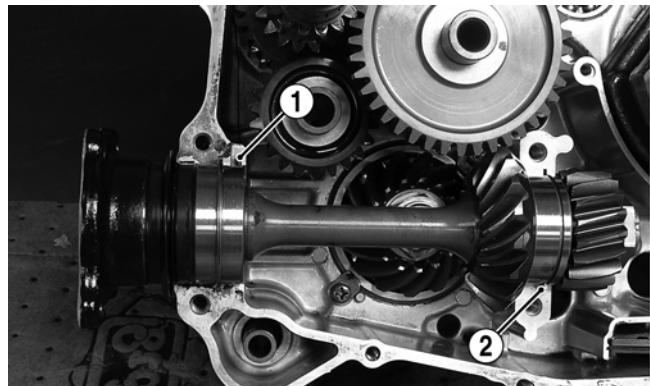
■ NOTE: For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

## Separating Crankcase Halves

1. Remove the thirteen right-side 6 mm cap screws using a crisscross pattern; then remove the six right-side 8 mm cap screws. Note the location of the different-lengthed cap screws and the wire clip location.

2. Using the Crankcase Separator/Crankshaft Remover (p/n 0444-009) 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.



FI288A

2. Remove the reverse idler gear assembly (F). Account for two washers, shaft, needle bearing, and the gear.



FI291

3. Remove the shift fork shaft (H); then remove the two forks taking note of the direction of the tabs on the forks for assembling purposes.

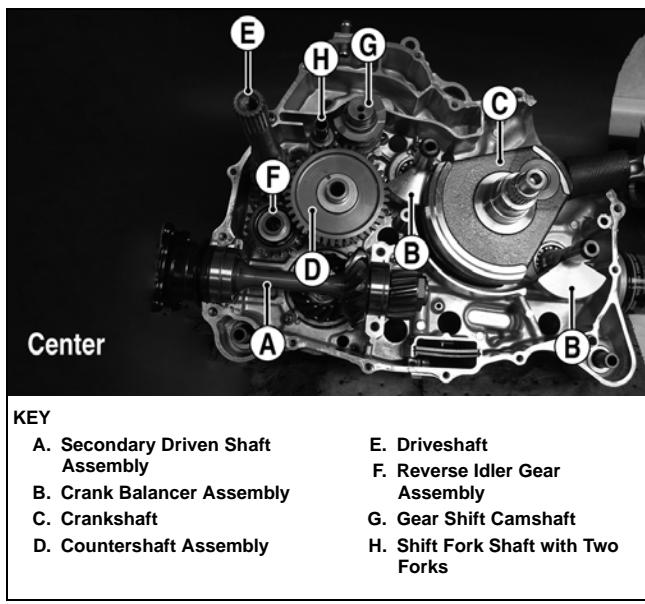


FI282A

4. Remove the gear shift camshaft (G) noting the location of the two holes on the end of the shaft.

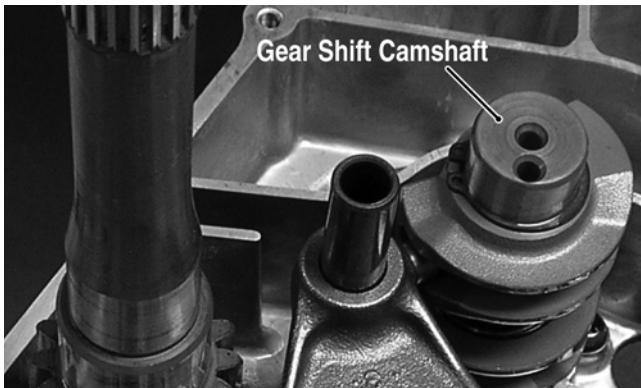
## Disassembling Crankcase Half

■ NOTE: For steps 1-7, refer to illustration FI235A.



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

1. Remove the secondary driven shaft assembly (A) noting the location of the bearing locating pin (1). Account for the bearing C-ring (2).



FI282B

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



FI343

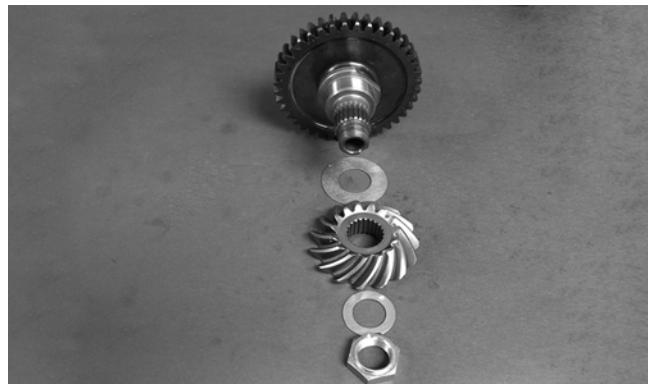
**■ NOTE: Do not disassemble the countershaft assembly unless necessary. If necessary, see Servicing Center Crankcase Components sub-section.**

6. Using a small chisel or screwdriver, unlock the drive bevel gear nut; then hold the output driven gear with a suitable holding tool and remove the drive bevel gear nut.



FI349

7. Using a rubber mallet, tap the output driveshaft from the bearing. Account for a shim, driven bevel gear, washer, and nut.



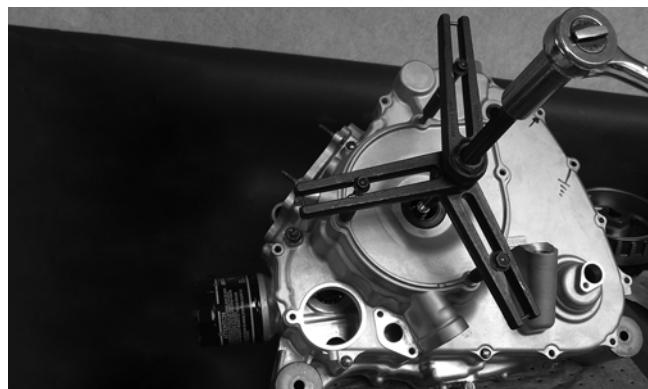
FI407

### **⚠ CAUTION**

**Do not attempt to separate the output driven gear from the output driveshaft. They are serviced as an assembly only.**

8. Remove the front and rear crankshaft balancers; then install the magneto cover on the left crankcase half.
9. Using Crankcase Separator/Crankshaft Remover (p/n 0444-009), remove the crankshaft assembly from the bearing; then remove the magneto cover.

**3**



FI252

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### (Servicing Components)

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## Servicing Top-Side Components

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

### CYLINDER HEAD/ 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

#### ⚠ CAUTION

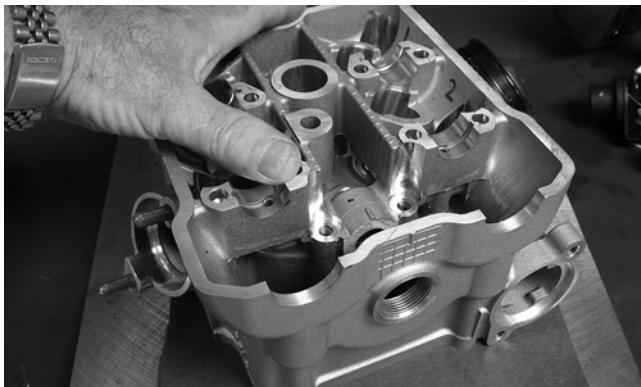
The cylinder head studs must be removed for this procedure.

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.



FI358

### 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.



FI357

## Removing Valves

■ **NOTE:** Keep all valves and valve components as a set. Note the original location of each valve set for use during installation. Return each valve set to its original location during installation.

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



FI331

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



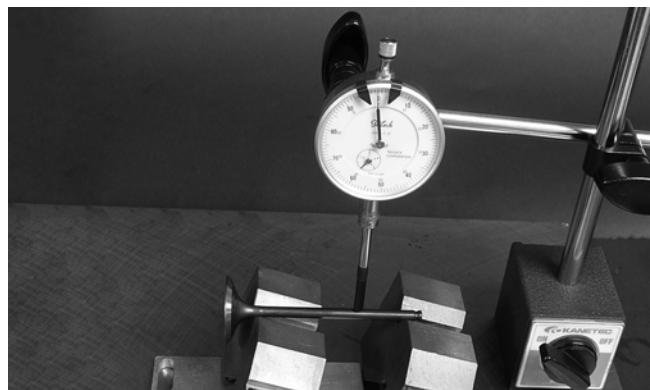
FI351

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

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

## Measuring Valve Stem Runout

1. Support each valve stem end with the V Blocks (p/n 0644-022); then check the valve stem runout using a dial indicator.



FI330

2. Maximum runout must not exceed specifications.

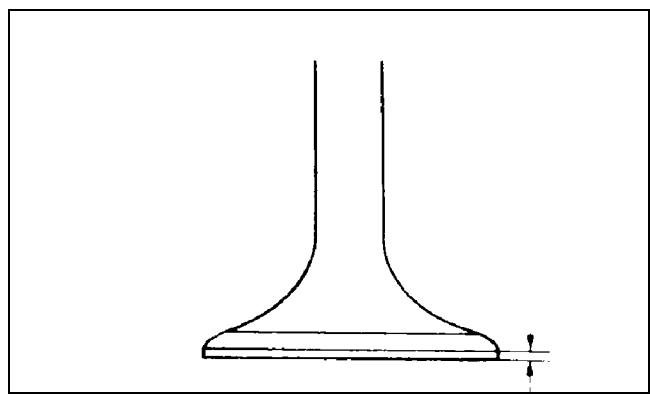
## Measuring Valve Stem Outside Diameter

3

1. Using a micrometer, measure the valve stem outside diameter.
2. Acceptable diameter range (intake valve) must be within specifications.
3. Acceptable diameter range (exhaust valve) must be within specifications.

## Measuring Valve Face/Seat Width

1. Using a calipers, measure the width of the valve face.

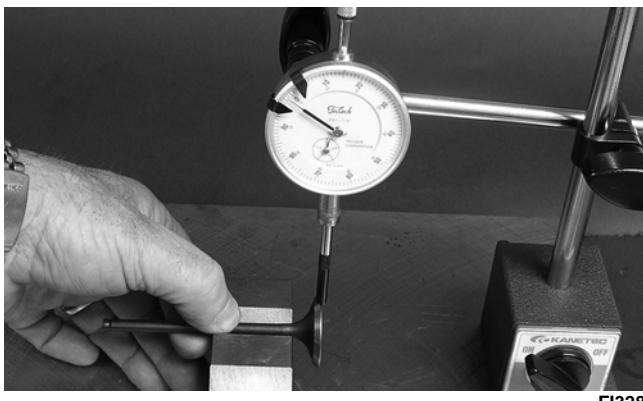


ATV-1004

2. Acceptable width range must be within specifications.

## Measuring Valve Face Radial Runout

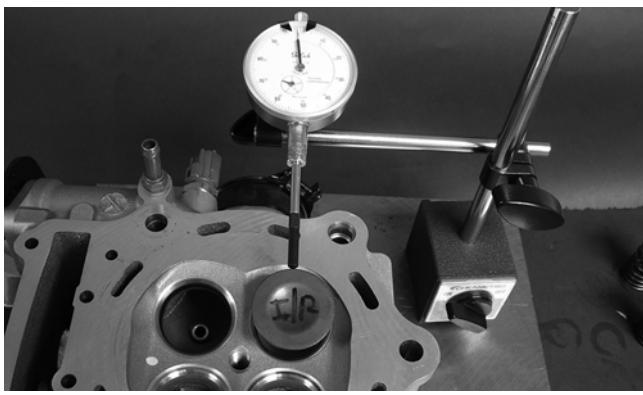
1. Mount a dial indicator on the surface plate; then place the valve stem on a set of V blocks.
2. Position the dial indicator contact point on the outside edge of the valve face; then zero the indicator.



3. Rotate the valve in the V blocks.
4. Maximum runout must not exceed specifications.

### **Measuring Valve Stem Deflection (Wobble Method)**

1. Mount a dial indicator and base on the surface plate; then place the cylinder head on the surface plate.
2. Install the valve into the cylinder head; then position the dial indicator contact point against the outside edge of the valve face. Zero the indicator.



3. Push the valve from side to side; then from top to bottom.
4. Maximum "wobble" deflection must not exceed specifications.

### **Measuring Valve Guide (Inside Diameter)**

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

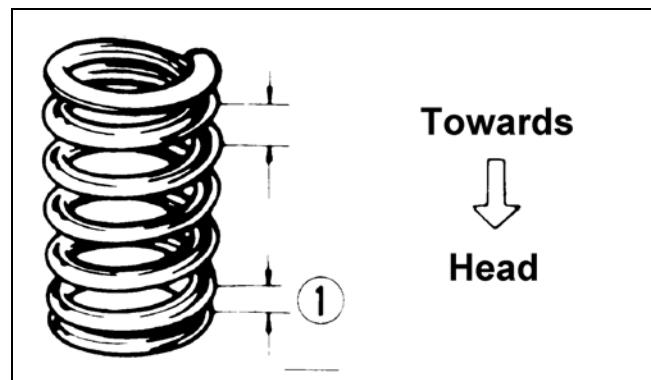
### **Installing Valves**

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.



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.**



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



FI331

## PISTON ASSEMBLY

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

### Cleaning/Inspecting Piston

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the dome of the piston.
2. Inspect the piston for cracks in the piston pin, dome, and skirt areas.
3. 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.

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

### Removing Piston Rings

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



CC400D

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

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

### Cleaning/Inspecting Piston

1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

#### **CAUTION**

Improper cleaning of the ring-grooves by the use of the wrong type of ring-groove cleaner will result in severe damage to the piston.

### Measuring Piston-Ring End Gap (Installed) 3

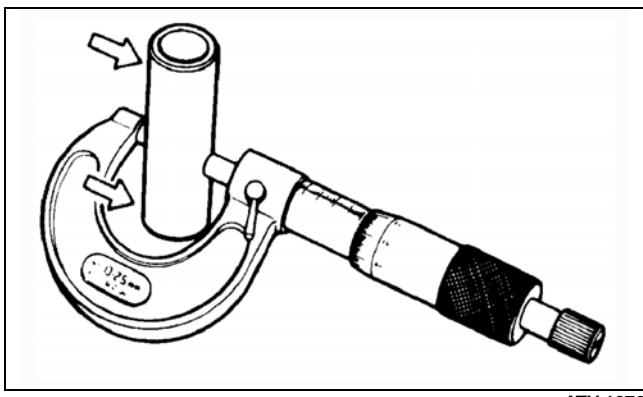
1. Place each compression ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must be within specifications.



FI327

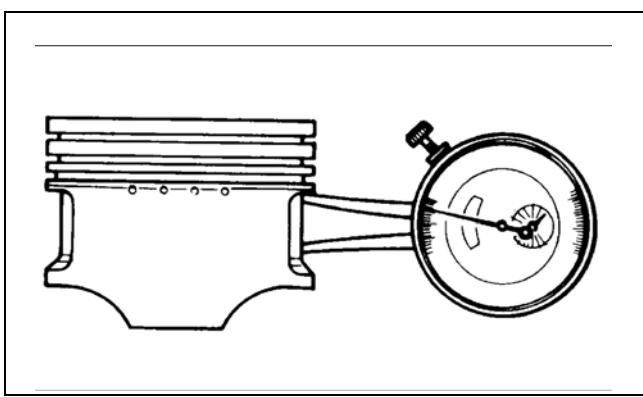
### Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

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



ATV-1070

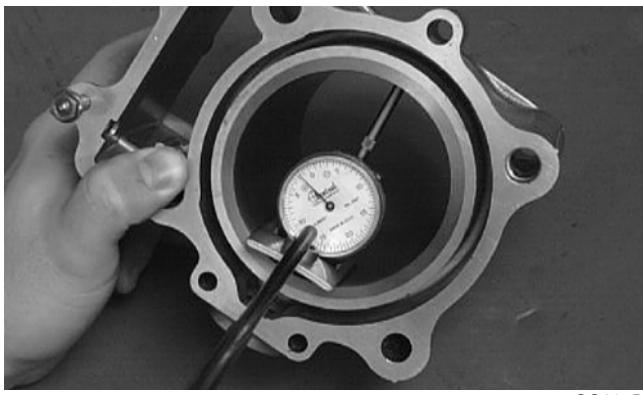
2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



ATV-1069

### Measuring Piston Skirt/ Cylinder Clearance

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

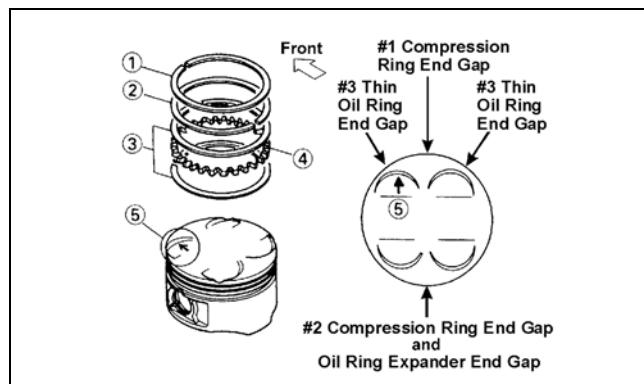


CC127D

2. Measure the corresponding piston diameter at a point 15 mm (0.6 in.) above the piston skirt at a right angle to the piston-pin bore. Subtract this measurement from the measurement in step 1. The difference (clearance) must be within specifications.

### Installing Piston Rings

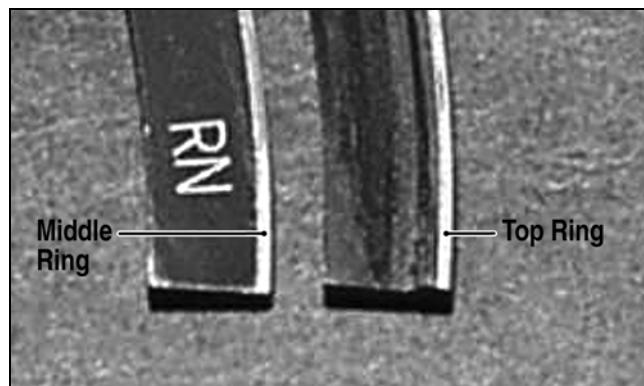
Install ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap. Stagger the end gaps of the upper and lower thin oil rings according to the illustration.



ATV-1085B

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

■ NOTE: The chrome (L-shaped) ring must be installed in the top position. The ring marked RN must be installed in the middle position.



FI168A

### CAUTION

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

### CYLINDER ASSEMBLY

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

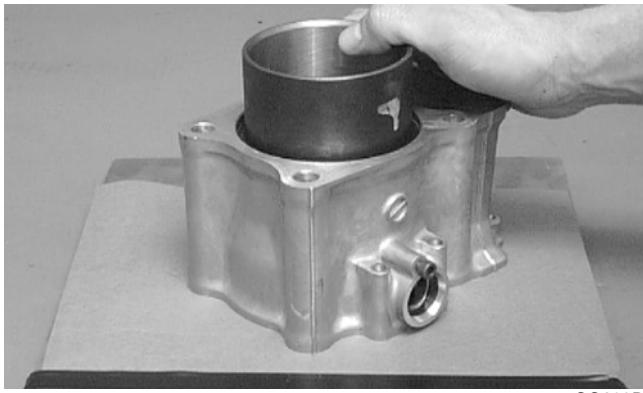
### Cleaning/Inspecting Cylinder

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

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

### **⚠ CAUTION**

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



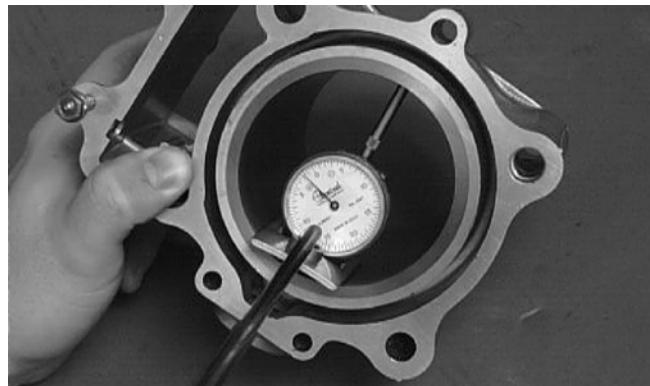
CC129D

### **Inspecting Cam Chain Guide**

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

### **Honing Cylinder**

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



CC127D

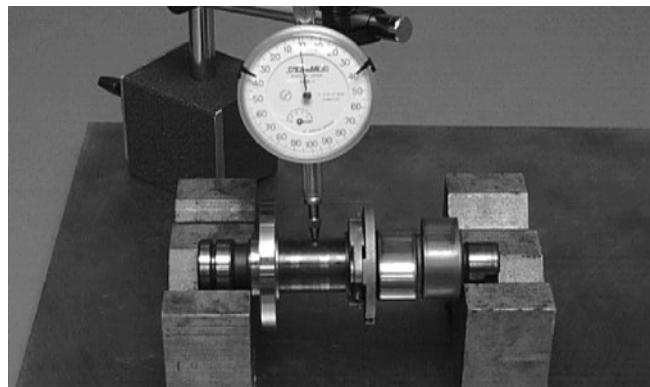
2. Wash the cylinder in parts-cleaning solvent.
3. Inspect the cylinder for pitting, scoring, scuffing, and corrosion. If marks are found, replace the cylinder.
4. If any measurement exceeds the limit, replace the cylinder and piston.

**3**

### **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.

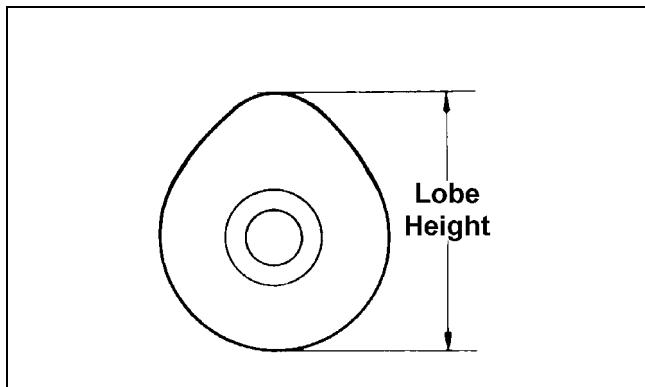


CC283D

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 not exceed minimum specifications.

## Inspecting Camshaft Bearing Journal

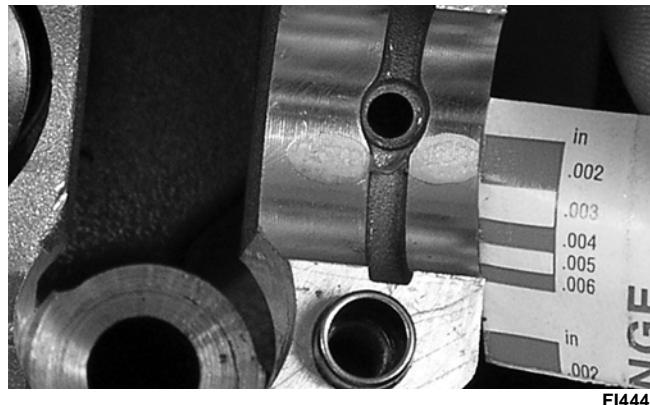
1. Inspect the bearing journal for scoring, seizure marks, or pitting.
2. If excessive scoring, seizure marks, or pitting is found, the cylinder head assembly must be replaced.

## Measuring Camshaft to Cylinder Head Clearance

1. Place a strip of plasti-gauge in each of the camshaft lands in the cylinder head.
2. Place the camshafts in the cylinder head; then install the camshaft journal caps and tighten.

■ **NOTE: Do not rotate the camshaft when measuring clearance.**

3. Remove the camshaft journal caps; then remove the camshafts.
4. Match the width of the plasti-gauge with the chart found on the plasti-gauge packaging to determine camshaft to cylinder head clearance.



FI444

5. If clearance is excessive, measure the journals of the camshaft.

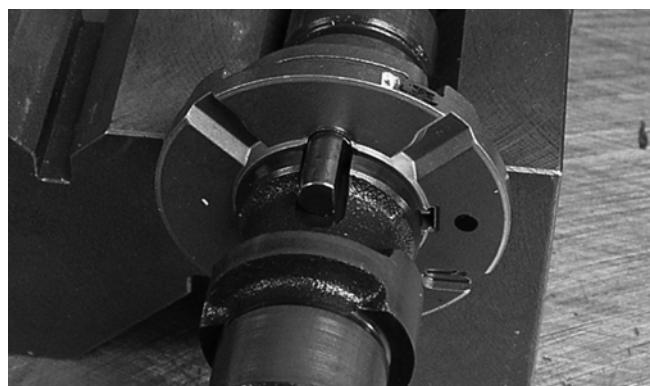


FI377

■ **NOTE: If the journals are worn, replace the camshaft; then measure the clearance again. If it is still out of tolerance, replace the cylinder head.**

## Inspecting Exhaust Camshaft Compression Release Assembly

1. Inspect the spring and decompression pin for damage.



FI411

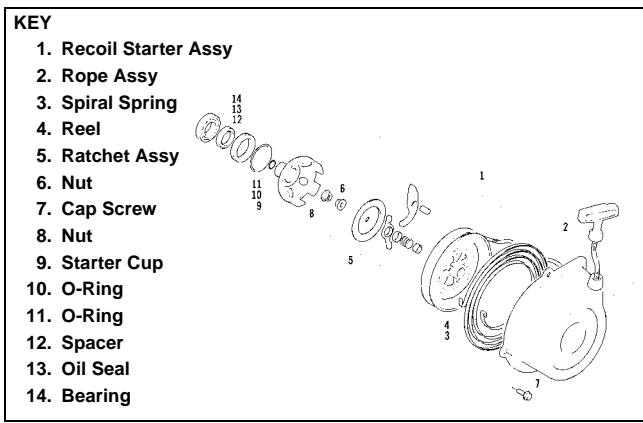


FI412

2. If damaged, the camshaft must be replaced.

## Servicing Left-Side Components

### RECOIL STARTER



#### Removing/Disassembling

1. Remove the cap screws securing the recoil starter assembly to the left-side cover; then remove the starter.



CC039D

### WARNING

During the disassembly procedure, continuous downward pressure must be exerted on the reel so it does not accidentally disengage and cause injury.

2. Rotate the reel counterclockwise until the notch of the reel is near the rope guide in the case. Guide the rope into the notch and slowly allow the reel to retract until all spiral spring tension is released.



B600D

### CAUTION

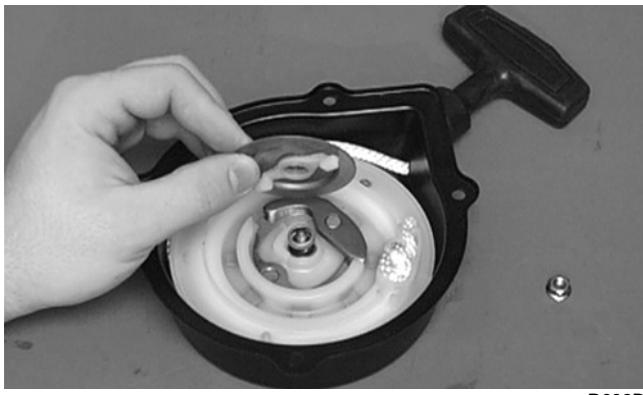
During the disassembly procedure, make sure all spring tension is released before continuing.

3. Remove the nut.



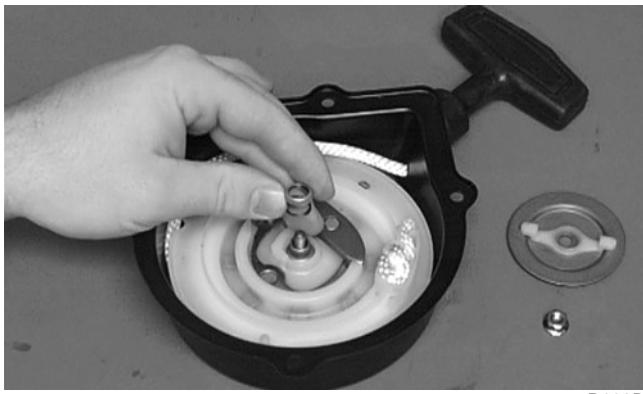
B601D

4. Slowly release the friction plate and lift the plate with ratchet guide free of the recoil case; then remove the ratchet guide from the friction plate.



B602D

5. Remove the spring, collar, and friction spring.



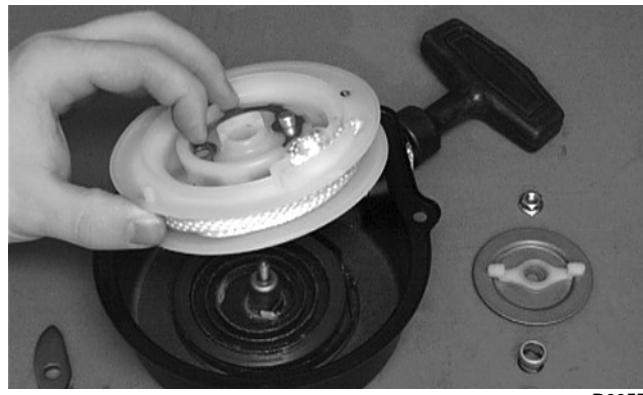
B603D

6. Remove the ratchet and account for the pin.



B604D

7. Carefully lift the reel from the case making sure the spiral spring does not accidentally disengage from the case.



B605D

## **⚠ WARNING**

**Care must be taken when lifting the reel free of the case. Wear safety glasses to avoid injury.**

8. Remove the protective cover from the starter handle and pull the rope out of the handle; then untie the knot in the rope and remove the handle.

■ **NOTE: Do not remove the spiral spring unless replacement is necessary. It should be visually inspected in place to save time. If replacement is necessary, follow steps 9-10.**

9. Remove the spring from the case by lifting the spring end up and out. Hold the remainder of the spring with thumbs and alternately release each thumb to allow the spring to gradually release from the case.

10. Unwind the rope from the reel and remove the rope.

## **Cleaning and Inspecting**

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

1. Clean all components.
2. Inspect the springs and ratchet for wear or damage.
3. Inspect the reel and case for cracks or damage.
4. Inspect the shaft for wear, cracks, or damage.
5. Inspect the rope for breaks or fraying.
6. Inspect the spiral spring for cracks, crystallization, or abnormal bends.
7. Inspect the handle for damage, cracks, or deterioration.

## Assembling/Installing

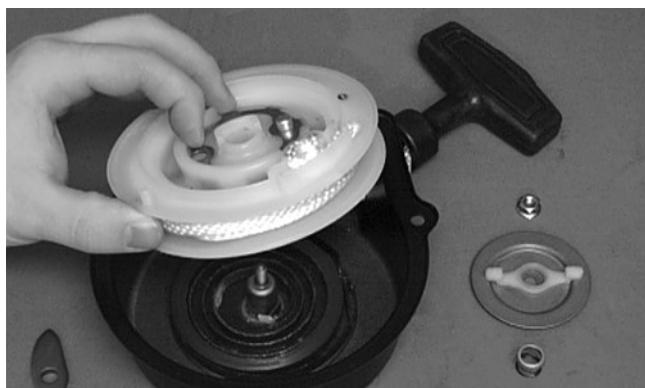
1. If removed, insert the spiral spring into the case with the outer end of the spring around the mounting lug in the case; then wind it in a counterclockwise direction until the complete spring is installed.

■ **NOTE:** The spiral spring must seat evenly in the recoil case.



B606D

2. Insert the rope through the hole in the reel and tie a knot in the end; then wrap the rope counter-clockwise around the reel leaving approximately 50 cm (20 in.) of rope free of the reel.
3. Apply low-temperature grease to the spring and hub.
4. Thread the end of the rope through the guide hole of the case; then thread the rope through the handle and secure it with a double knot. Install the protective cover into the handle.
5. Align the inner hook of the spiral spring with the notch in the reel.



B605D

6. Install the ratchet making sure the end is properly installed on the reel.



B604D

7. Install the friction spring and the spring cover.



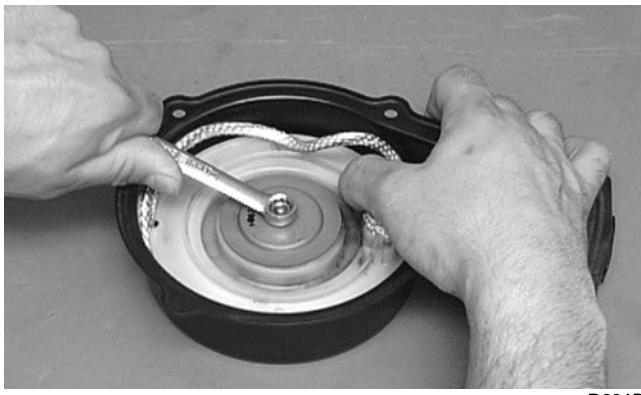
B603D

8. Install the friction plate with the ratchet guide fitting into the ratchet.



B602D

9. While pushing down on the reel, install the nut. Tighten securely.



B601D

10. With the 50 cm (20 in.) of rope exposed, hook the rope in the notch of the reel.
11. Rotate the reel four turns counterclockwise; then release the rope from the notch and allow the rope to retract.
12. Pull the rope out two or three times to check for correct tension.

**■ NOTE: Increasing the rotations in step 11 will increase spring tension.**

13. Place the recoil starter assembly into position on the left-side cover; then tighten the cap screws to specifications.



CC039D

## 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

## Servicing Right-Side Components

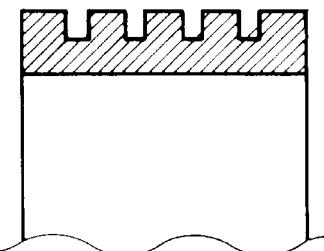
**■ NOTE: Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.**

### 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 complete set.

#### CAUTION

Always replace the clutch shoes as a complete set or severe imbalance could occur.



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.

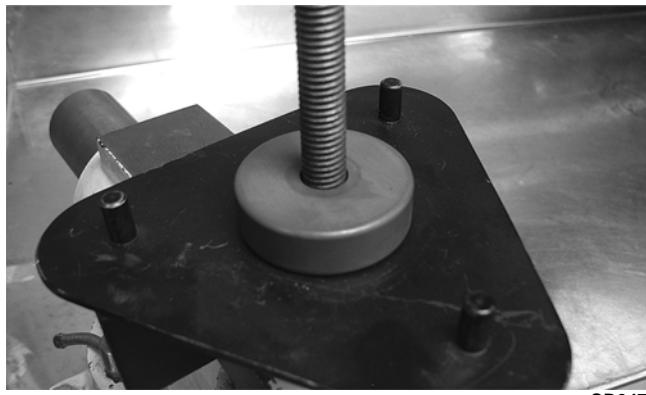
## DRIVEN PULLEY ASSEMBLY

### Disassembling

#### ⚠ WARNING

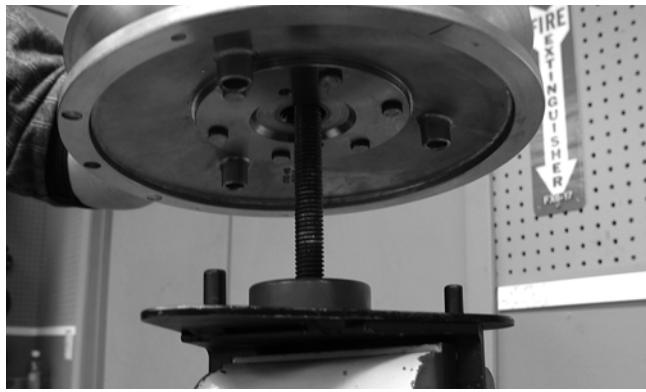
This procedure involves relaxing a compressed spring assembly. DO NOT attempt disassembling without the proper tools.

1. Secure Driven Pulley Compressor (p/n 0444-121) in a suitable holding fixture such as a bench vise; then remove the wing nut, holding handle, flat washer, and pilot bushing leaving the large spacer on the compressor tool base.



CD047

2. Place the driven pulley assembly onto the compressor tool base engaging the dowel pins into appropriate holes in the fixed face of the assembly.



CD048

3. Install the pilot bushing with the machined end directed down; then fit the bushing into the pulley hub.



CD067

4. Using a suitable marking pen, make alignment marks on the fixed face spring holder and both pulley faces.



CD049

5. Place the holding handle on the spring holder fitting the two dowel pins into the spring holder face; then install a flat washer and the wing nut. Turn the wing nut down until resistance is felt.

■ NOTE: Do not use the wing nut to compress the spring further.



CD050

3

## ⚠️ WARNING

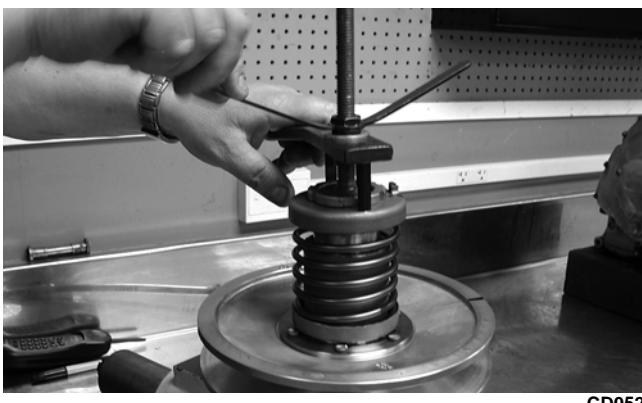
The spring assembly is under pressure. Extreme care must be taken when relaxing the spring. Always wear safety glasses. Use proper tools only.

6. Using a spanner and suitable breaker bar, loosen the notched-ring nut; then spin the nut free of the hub.



7. Firmly hold the handle and slowly turn the wing nut counterclockwise to relax the spring.

■ NOTE: There will be a tendency for the handle to rotate clockwise approximately  $\frac{1}{4}$  turn as the spring holder clears the flats or hub. This is due to a slight counterclockwise preload on the spring.



8. Release the preload slowly; then continue to relax the spring until the wing nut is flush with the end of the threads.
9. Firmly holding the spring and spring holder, remove the wing nut; then remove the spring.



10. Using a thin pry-bar or screwdriver, work the movable face sleeve upward and free of the O-rings; then remove the sleeve.



11. Remove the four pins and spacers from the cam slots in the movable face; then remove the movable face.





CD056

## Inspecting

1. Inspect the pulley faces for wear, galling, or grooving.
2. Inspect the O-rings on the movable face for nicks, tears, or swelling.



CF092A

3. Inspect two grease seals in the movable face for nicks, cuts, or damage.



CF095A

4. Inspect the pins and bushings for wear, flat spots, looseness, or cracking.

## Assembling

1. Place the fixed face of the driven pulley on the pulley compressor base making sure the dowel pins are engaged in the appropriate holes in the pulley face.

■ NOTE: Make sure the spacer is on the base or damage to the fixed face will occur when the spring is compressed.



CD048

2. Apply multi-purpose grease to the O-rings and grease seals on the movable face; then install on the fixed face making sure the alignment marks are properly aligned.



CD060

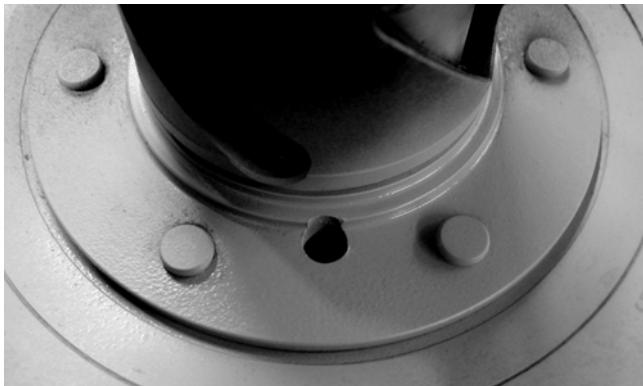
3. Install the four pins and spacers into the fixed face hub; then pack the cam slots in the movable face with multi-purpose grease.



CF095A

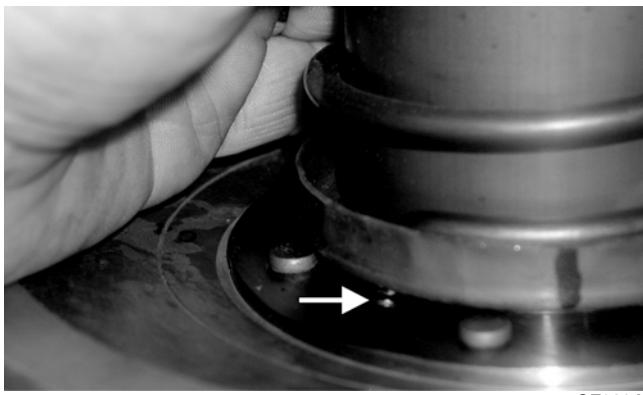
4. Install the movable face sleeve aligning the hole in the spring seat with the spring anchor hole in the movable face.





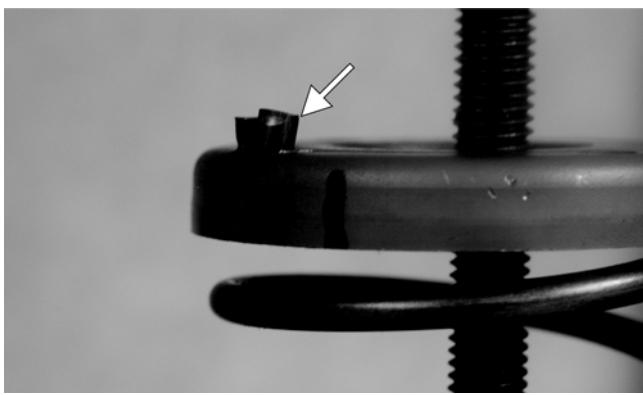
CF097

5. Install the spring over the hub and movable face sleeve; then insert the end of the spring through the sleeve and into the spring anchor hole in the movable face.



CF089A

6. Place the spring holder on the spring engaging the spring end with the appropriate anchor hole.



CF087A

7. Assemble the notched-ring nut, spring holding handle, one flat washer, and the wing nut in order on the pulley compressor bolt; then thread the wing nut onto the bolt.



CD052

8. Compress the spring until the spring holder nears the threads on the fixed face hub; then using the handle, wind the spring holder counterclockwise to align the flats of the spring holder and hub.



CD052A

9. Continue compressing the spring while guiding the spring holder onto the hub. When a slight resistance is felt, stop turning the wing nut.

10. Install the nut (threads coated with red Loctite #271); then tighten the nut to specification using the spanner and a torque wrench.



CD066

11. Remove the wing nut, washer, and holding handle; then remove the driven pulley from the pulley compressor.

# Servicing Center Crankcase Components

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

## 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 dial indicator so the tip is contacting a tooth on the secondary driven bevel gear.
4. While rocking the driven bevel gear back and forth, note the maximum backlash reading on the gauge.
5. Acceptable backlash range is 0.03-0.15 mm (0.001-0.006 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 thicker shim.
2. If backlash measurement is more than specified, remove an existing shim, measure it, and install a thinner shim.

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

Backlash Measurement	Shim Correction
Under 0.03 mm (0.001 in.)	Increase Shim Thickness
At 0.03-0.15 mm (0.001-0.006 in.)	No Correction Required
Over 0.15 mm (0.006 in.)	Decrease Shim Thickness

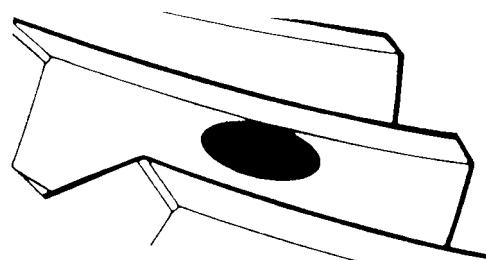
### Checking Tooth Contact

■ 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.

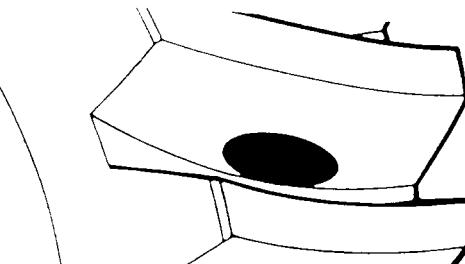
3

Incorrect (contact at tooth top)

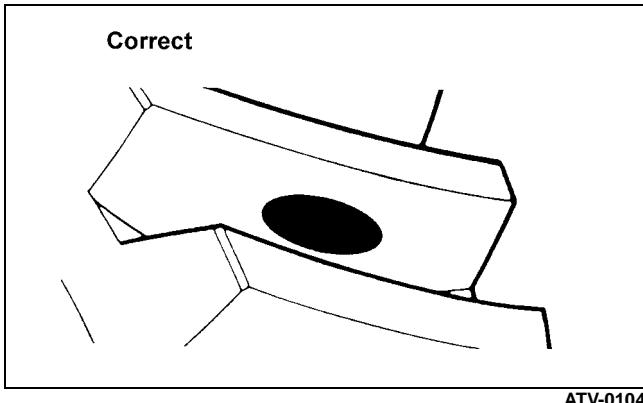


ATV-0103

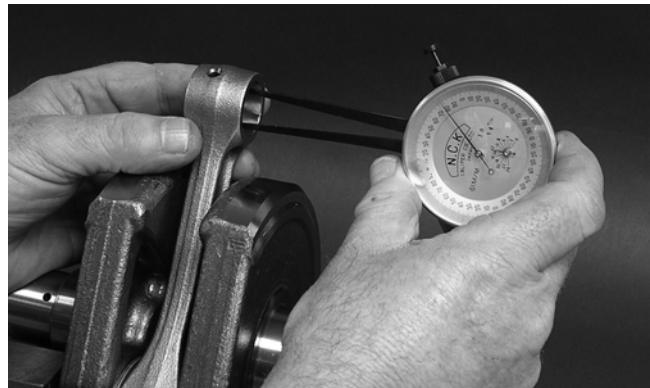
Incorrect (contact at tooth root)



ATV-0105



ATV-0104



FI267

## 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	Increase Shim Thickness
Contacts at Root	Decrease 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

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

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

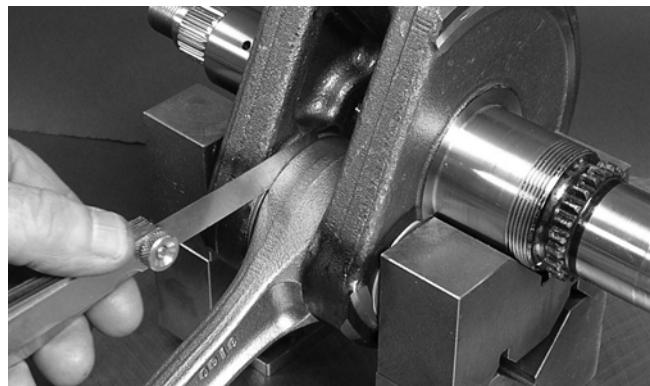
2. Maximum diameter must not exceed specifications.

### Measuring Connecting Rod (Small End Deflection)

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

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

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



FI266

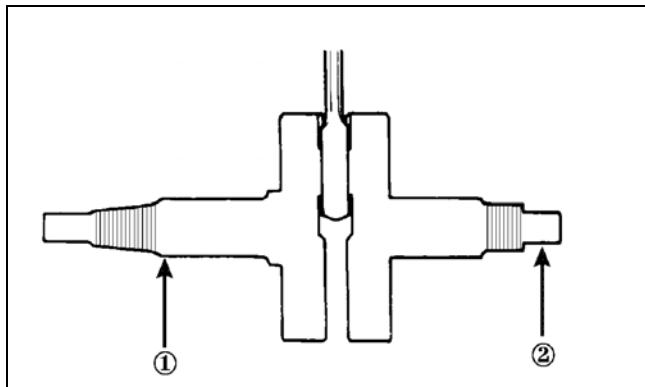
3. Maximum gap range must not exceed specifications.

## Measuring Connecting Rod (Big End Width)

1. Using a calipers, measure the width of the connecting rod at the big-end bearing.
2. Acceptable width 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.



ATV-1074

3. Zero the indicator and rotate the crankshaft slowly.

### ⚠ CAUTION

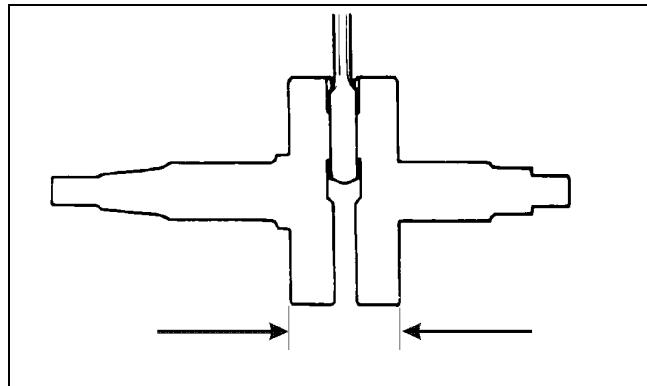
Care should be taken to support the connecting rod when rotating the crankshaft.

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 2-4.

## 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.



ATV-1074

2. Acceptable width range must be within specifications.

## COUNTERSHAFT

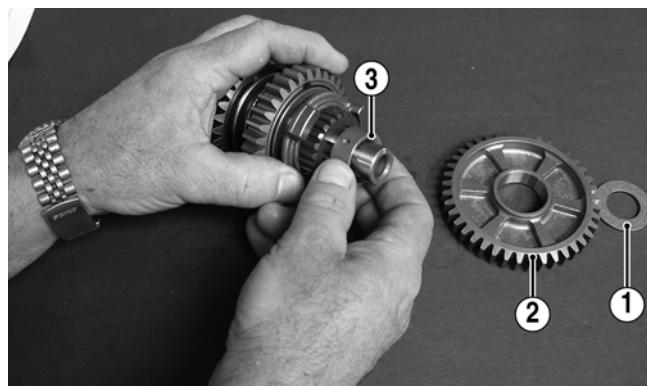
### ⚠ CAUTION

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.

3

## Disassembling

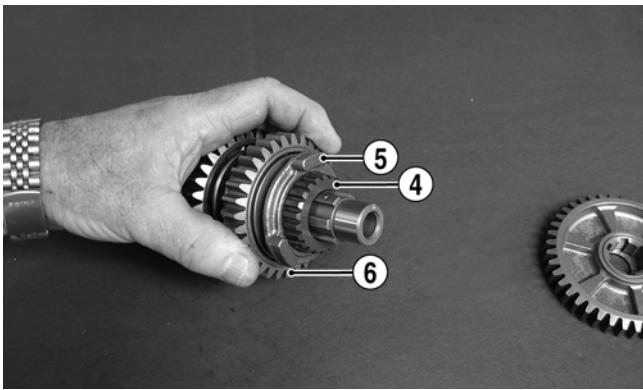
1. Remove the thrust washer (1); then remove the low driven gear (2) and the bushing (3) noting the orientation of the oil hole.



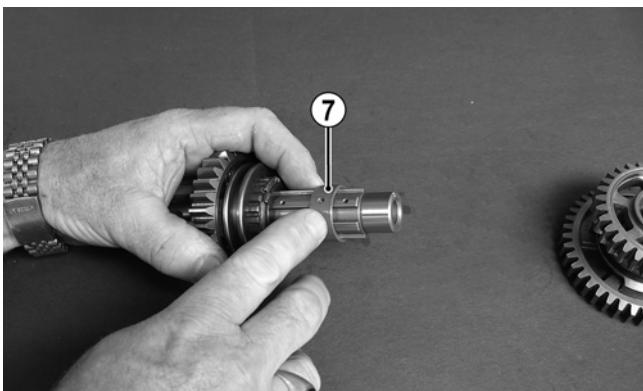
FI391A

2. Remove the low/reverse spacer (4), low/reverse clutch dog (5), and reverse driven gear (6); then noting the orientation of the oil hole, remove the reverse driven gear bushing (7).



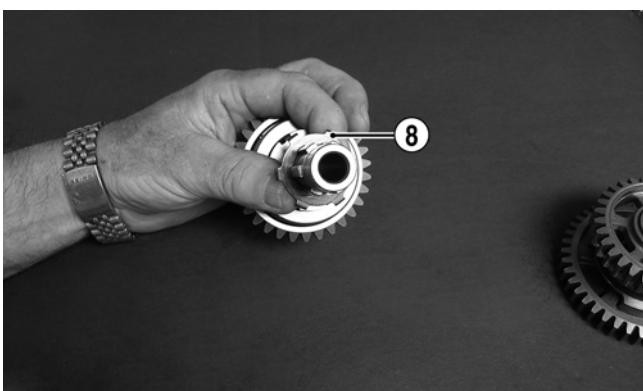


FI392A



FI393A

3. Remove the locking tab washer (8); then rotate the thrust washer (9) and remove from the countershaft.

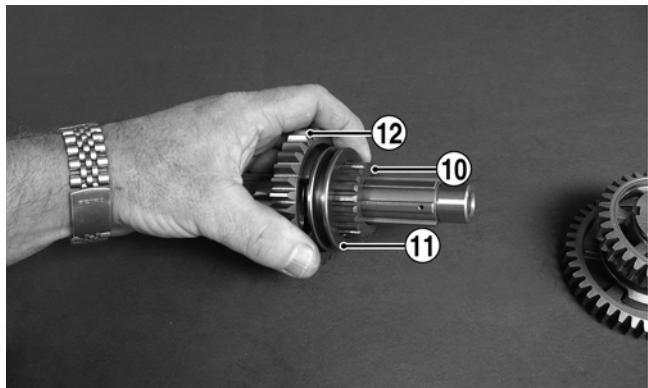


FI395A

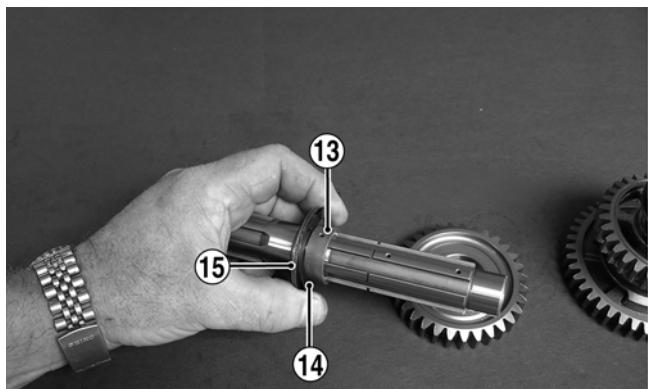


FI396A

4. Remove the high driven gear spacer (10), high driven clutch dog (11), and the high driven gear (12). Account for the bushing (13), wave washer (14), and thrust washer (15).



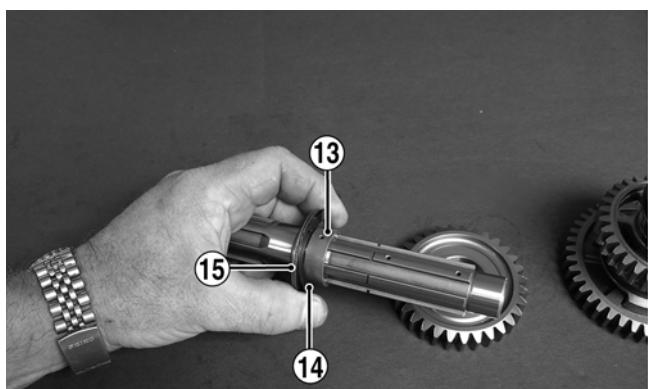
FI397A



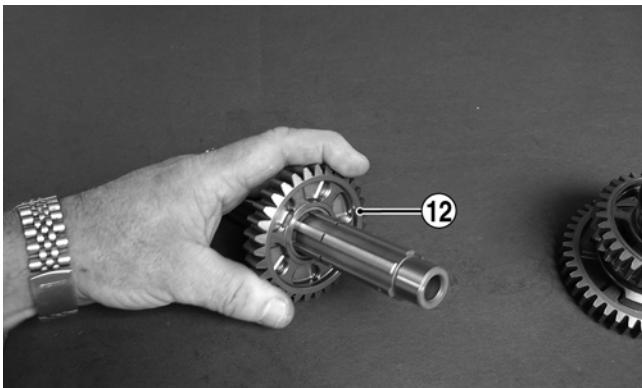
FI399A

## Assembling

1. Install the thrust washer (15), wave washer (14), and bushing (13) on the countershaft; then install the high driven gear (12) making sure the wave washer (14) is aligned under the thrust washer (15).

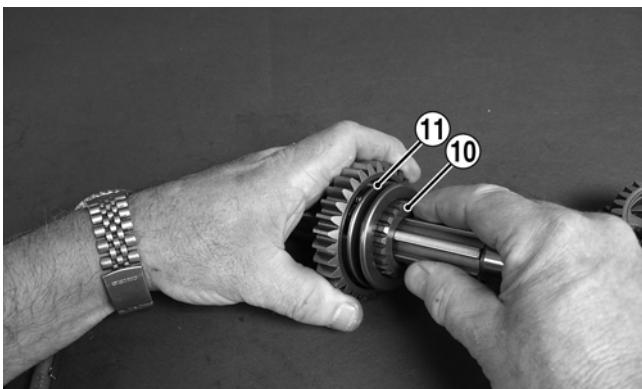


FI398A



FI398A

2. Install the high driven gear spacer (10) and high driven clutch dog (11).

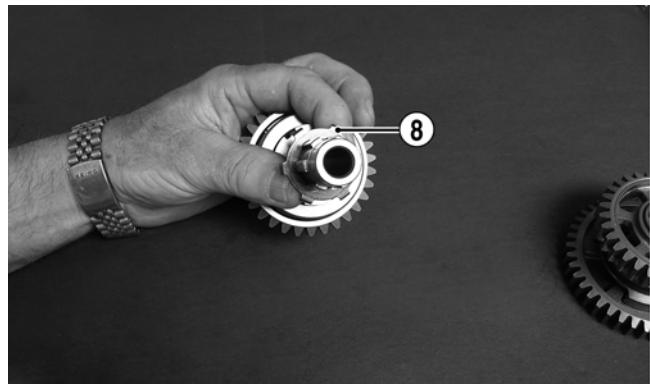


FI402A

3. Position the thrust washer (9) onto the countershaft; then while pressing toward the driven gear, rotate the thrust washer to engage the splines and install the locking tab washer (8) making sure the tabs engage the splines.

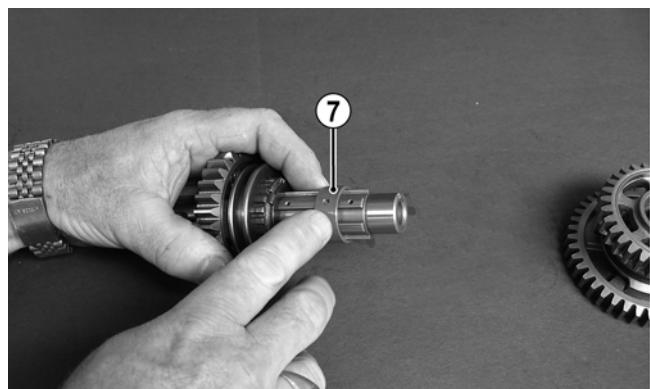


FI396A



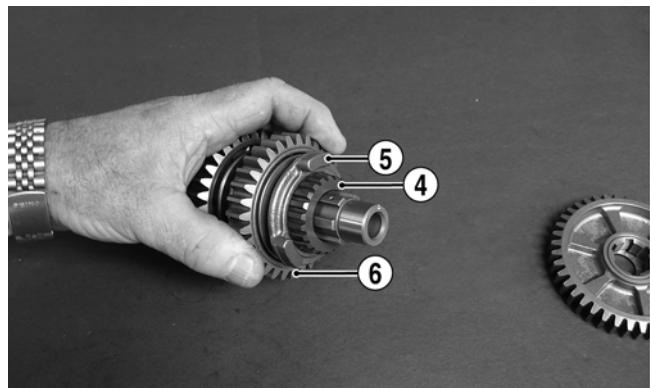
FI395A

4. Install the reverse driven gear bushing (7) making sure to align the oil hole in the bushing with the oil hole in the countershaft; then install the reverse driven gear (6), low/reverse clutch dog (5), and low/reverse spacer (4).



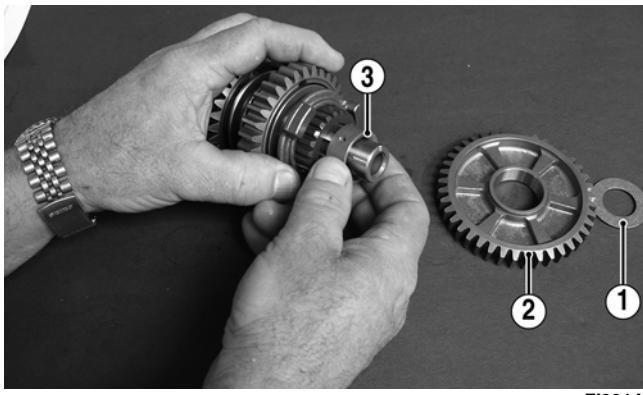
FI393A

3



FI392A

5. Install the low driven bushing (3) making sure the oil hole in the bushing aligns with the hole in the countershaft; then install the low driven gear (2) and the thrust washer (1).



FI391A

■ **NOTE:** The countershaft is now completely assembled and ready for installation.



FI406

■ **NOTE:** When installing the countershaft assembly, account for the washer on each end of the shaft.

2. Apply red Loctite #271 to the threads of the output shaft; then secure with the nut. Tighten nut to specifications; then using a punch, peen the nut as shown.



FI346A

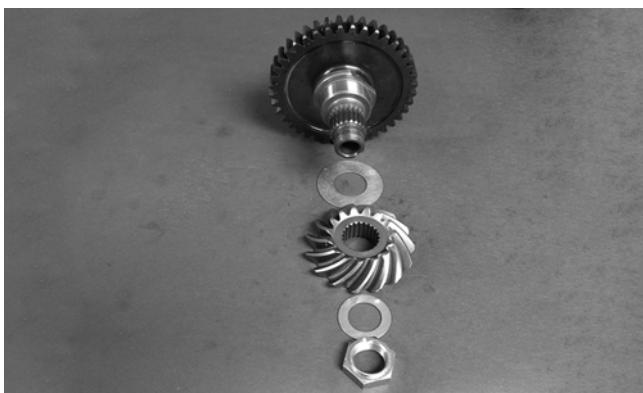
3. Apply a liberal amount of engine oil to the crankshaft bearing. Using a propane torch, heat the bearing until the oil begins to smoke; then slide the crankshaft assembly into place.



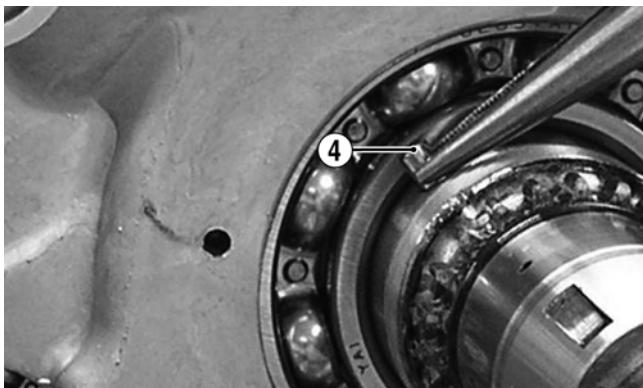
FI409

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

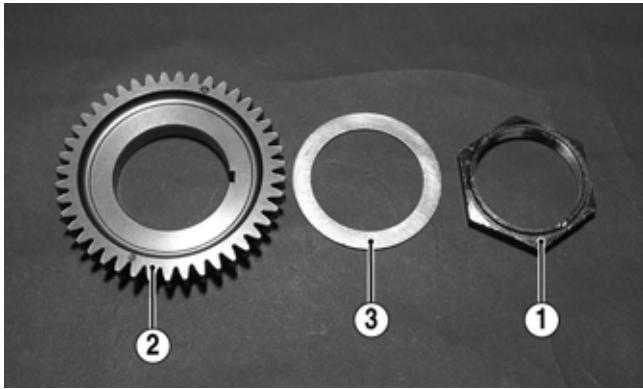
4. Install the drive pin (4) in the crankshaft; then apply red Loctite #271 to the threads of the crankshaft and install the crankshaft balancer drive gear (2), washer (3), and nut (1). Tighten to specifications; then using a punch, stake the nut to the crankshaft.



FI407

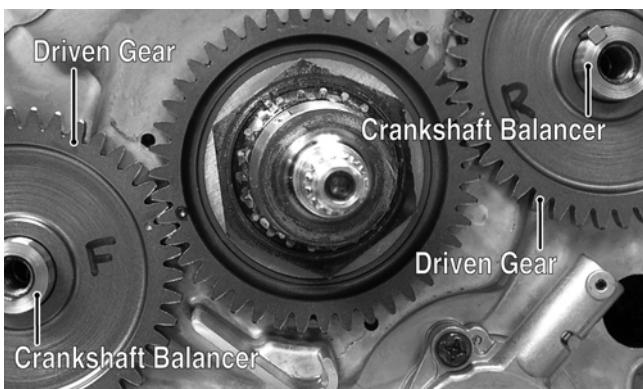


FI318A

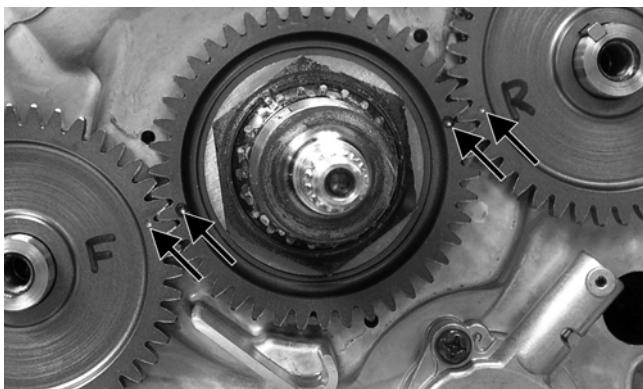


FI305A

5. Install the front and rear crankshaft balancers; then install the drive keys and driven gears making sure the timing marks are properly aligned to the drive gear timing marks.



FI303A



FI303B

6. Install the water pump drive gear on the front crankshaft balancer and the oil pump drive sprocket on the rear crankshaft balancer; then thread in but do not tighten the cap screws at this time.



FI441A

3

7. Install the assembled countershaft; then install the driveshaft.



FI343

8. Install the shift cam assembly making sure the two holes on the end of the shaft are positioned vertically.

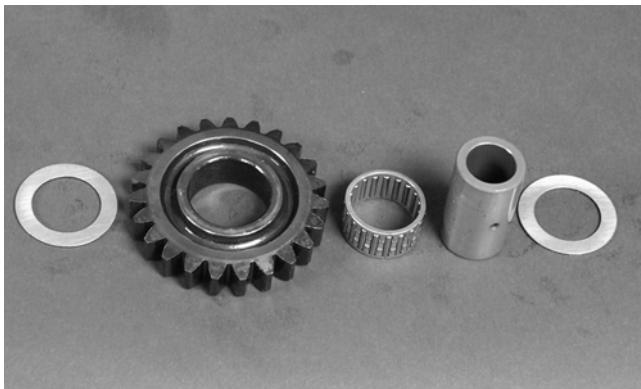
9. Insert the two shift forks into the sliding dogs noting the direction of the tabs from disassembling; then install the gear shift fork shaft.

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



FI282A

10. Install the reverse idler gear assembly noting the positioning of the two washers, gear, bushing, and shaft.



FI291

11. Install the rear secondary driven shaft assembly into the left side of the crankcase making sure the bearing locating pin (1) is facing upward and the bearing C-ring (2) is fully seated in the crankcase.



FI288A

12. Place the oil strainer into position in the left crankcase half.



FI299

13. Install the two alignment pins in the left crankcase half.

## Joining Crankcase Halves

1. Apply High-Temp Sealant to the left-side mating surface.
2. Lightly oil all bearings and grease all shafts in the right-side crankcase.
3. Making sure to align the shafts and alignment pins, join the two crankcase halves.

### CAUTION

**Do not heat the bearing in the right-side crankcase half. Damage to the oil seal will occur.**

4. Using a plastic mallet, lightly tap the case halves together until cap screws can be installed.
5. From the right side, install the 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 right side, install the 6 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.**

7. In a crisscross pattern, tighten the 8 mm cap screws (from step 5) until the halves are correctly joined; then tighten to specifications.

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

8. In a crisscross pattern, tighten the 6 mm cap screws (from step 6) to specifications.

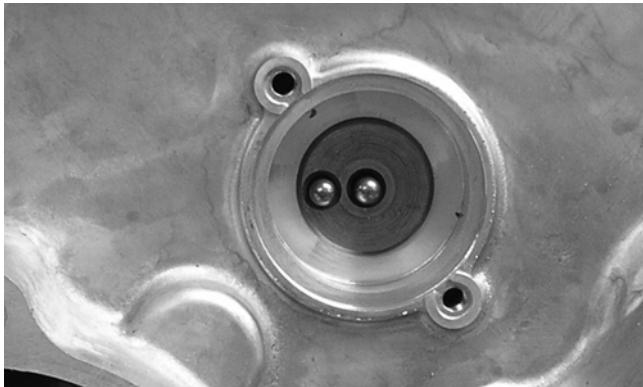
■ **NOTE: Rotate the shafts back and forth to ensure no binding or sticking occurs.**

### AT THIS POINT

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

## Installing Right-Side Components

1. Install the shift indicator sending unit making sure the two neutral contact pins and the two springs are properly positioned. Tighten the Allen-head screws securely.



2. Using a new O-ring, install the oil jet in the right side of the crankcase.



3. Install the clutch shoe assembly and secure with the washer (with the flat side facing the assembly as noted in removing) and the nut (threads coated with red Loctite #271). Tighten to specifications.

### ⚠ CAUTION

Care must be taken that the directional washer be installed correctly and note that the nut has left-hand threads.



4. Lightly grease the clutch housing seal; then insert the primary drive spacer.



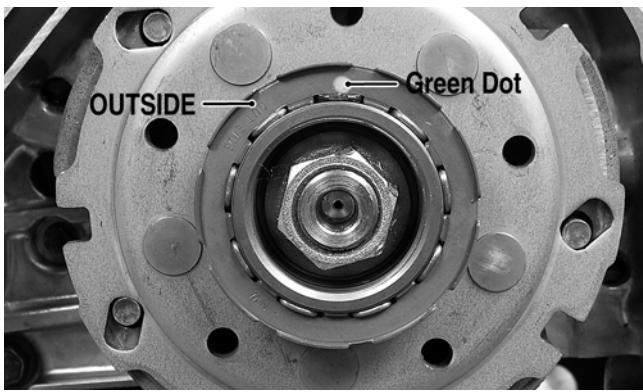
3



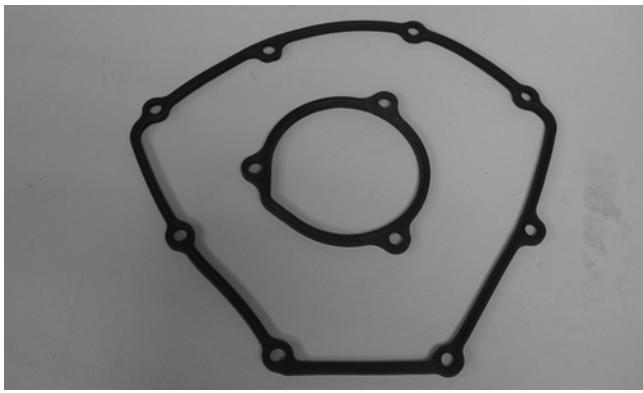
5. Install the clutch cover alignment pins into the crankcase, apply oil to the cover gasket, and install the gasket onto the crankcase.
6. Apply grease to the outer edges of the clutch housing; then from inside the clutch cover, install the clutch housing into the cover using a rubber mallet.
7. Install the one-way clutch onto the clutch shoe assembly.

### ⚠ CAUTION

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



8. Place the clutch cover/clutch 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 specifications.
9. Position the two gaskets in place on the crankcase; then install the inner V-belt housing.



FI226



10. Place the driven pulley assembly into position and secure with the nut. Tighten to specifications.
11. Slide the fixed drive face onto the shaft.
12. Spread the faces of the driven pulley by pushing the inner face toward the engine while turning it counterclockwise; then when the faces are separated, press the V-belt down between the pulley faces.

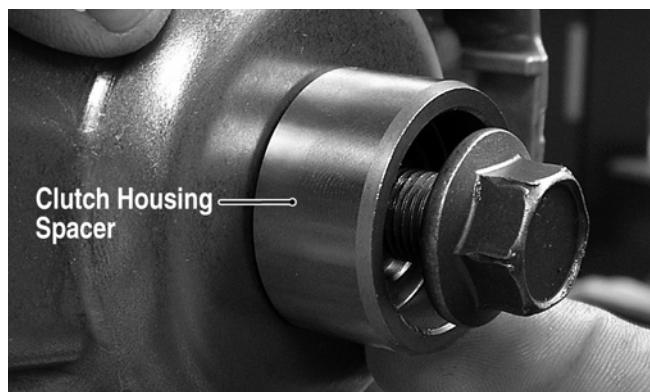
13. Place the V-belt into position over the front shaft.



FI221

■ **NOTE: The arrows on the V-belt should point forward.**

14. Pinch the V-belt together near its center and slide the movable drive face and clutch housing spacer onto the shaft. Secure the drive face with a cap screw (threads coated with red Loctite #271). Tighten the cap screw to specifications.



FI429A

### **CAUTION**

Make sure the splines extend beyond the movable drive face plate or the clutch housing spacer may become jammed when the cap screw is tightened. This could result in a false torque reading.



FI428A

15. Rotate the V-belt and drive/driven assemblies until the V-belt is flush with the top of the driven pulley.
16. Install the V-belt housing assembly and tighten the three cap screws securely.



FI220

17. 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 specifications.



FI219

2. Install the drive pin in the oil pump shaft; then with the drive chain around both the drive sprocket and the driven sprocket, install the driven sprocket onto the oil pump engaging the drive pin. Secure with the circlip.

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

3

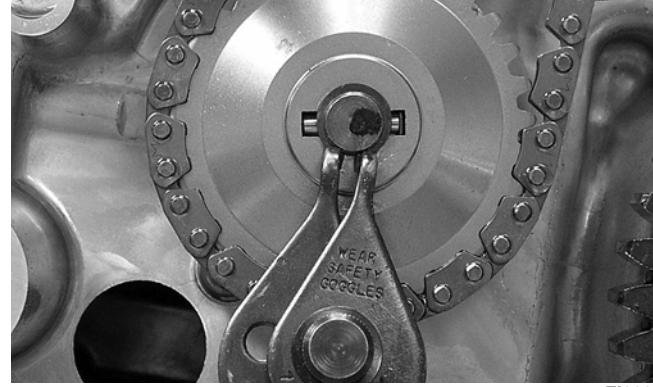


FI221

1. Install the oil pump securing it to the crankcase with three Phillips-head cap screws (threads coated with red Loctite #271). Tighten securely.



FI426



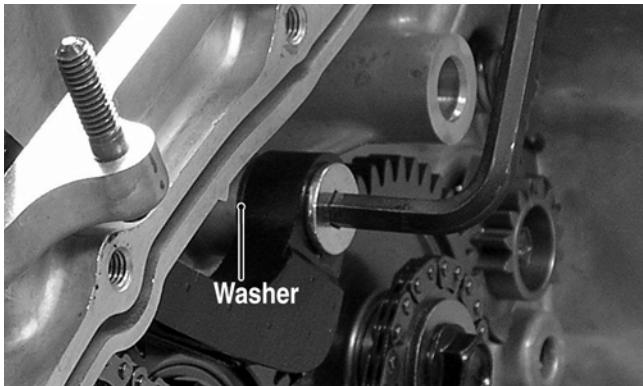
FI200

3. Apply red Loctite #271 to the two crankshaft balancer cap screws and tighten to specifications.



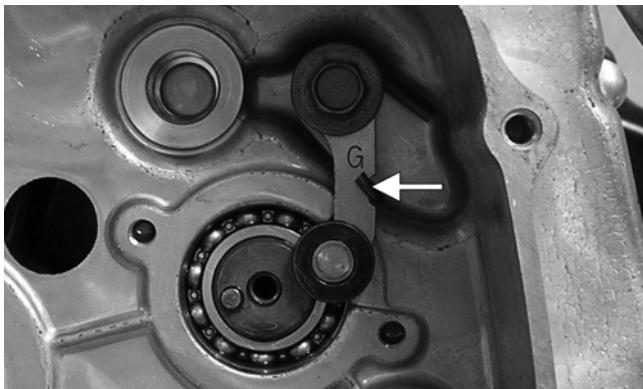
FI432A

4. Install the cam chain tensioner making sure the washer is in place. Tighten the shoulder-bolt to specifications.



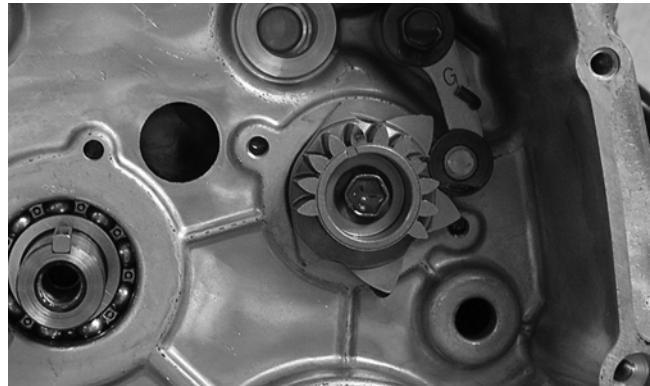
FI197A

5. Install the shift cam stopper, spring, and washer. Tighten the cap screw securely making sure the stopper arm moves freely.



FI307B

6. Install the shift cam stopper plate. Tighten securely.



FI311

7. Install the gear shift shaft with the index mark aligned with the index mark on the shift cam stopper plate. Make sure there is a washer on both ends of the gear shift shaft.

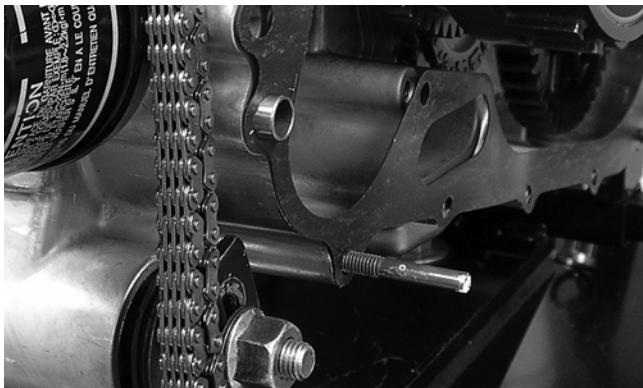


FI127



FI302

8. Install the cam chain over the cam drive sprocket; then secure the chain out of the way to prevent it from falling into the crankcase.



FI435



FI422

### **⚠ CAUTION**

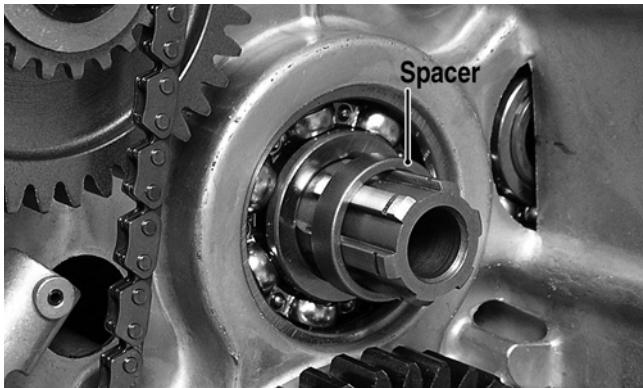
**Do not turn the engine with the cam chain loose or severe engine damage will occur.**

9. Install the starter driven gear; then install the key in the crankshaft.



FI193A

10. Install the spacer on the driveshaft; then install the output drive gear and secure with the circlip. Make sure the flat side of the circlip is directed away from the gear.



FI430A

11. Clean any oil or grease from the crankshaft and rotor/flywheel and secure with the flange nut. Tighten to specifications.



FI425



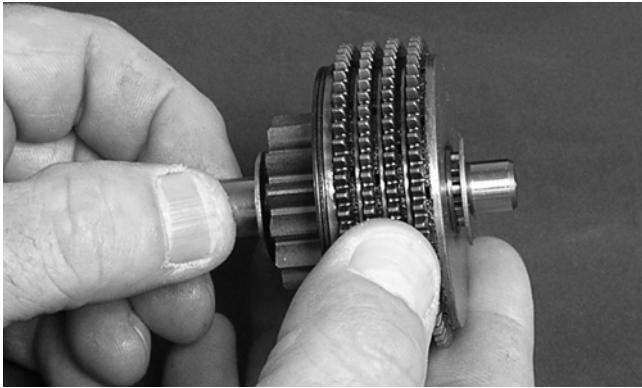
FI436

12. Install the starter idler gear and shaft; then with a washer on each side, install the starter torque limiter and bushings.

**3**



FI148



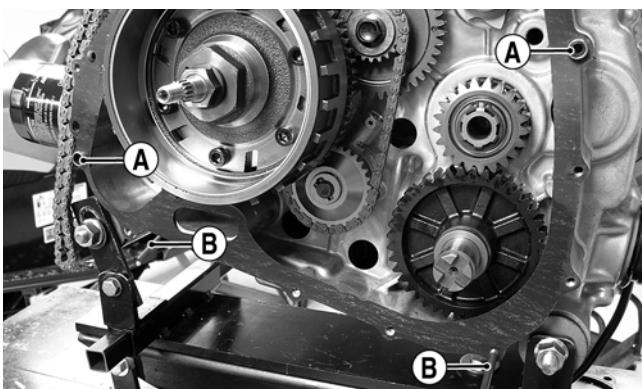
FI301

13. Install the two alignment pins (A) in the crankcase; then place the gasket in position.



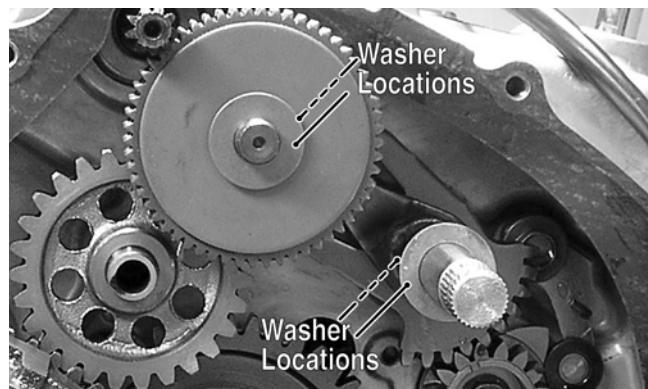
FI176A

■ NOTE: The use of alignment studs (B) will aid in the installation of the magneto cover.



FI438A

14. Verify that the washers are properly located; then install the magneto cover and secure with the cap screws. Tighten only until snug.



FI185A

15. Place the starter cup into position on the crankshaft making sure a new, lubricated O-ring is inside the cup. Tighten the flange nut to specifications.



CD925A

16. Tighten the cap screws (from step 14) to specifications.

17. Place the speed sensor housing and new O-ring into position and secure with the cap screw. Tighten securely.

18. Place the water pump into position and secure with three cap screws. Tighten securely.

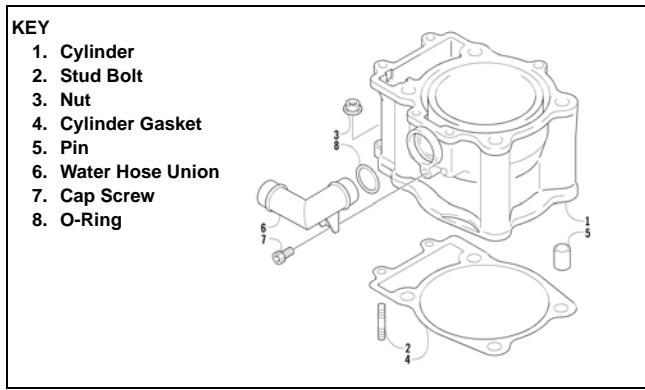


FI141A

19. Place the gasket and recoil starter assembly into position on the left-side cover; then tighten four cap screws to specifications.

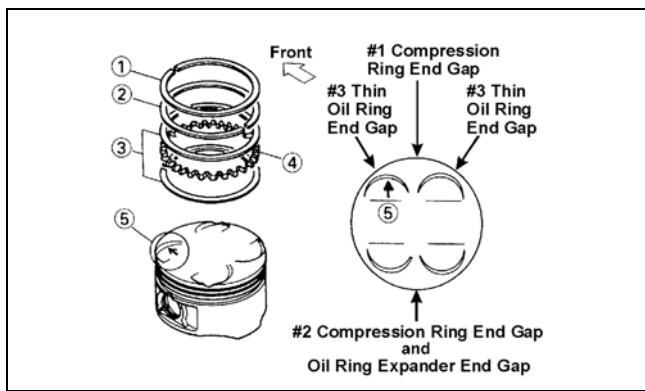
## Installing Top-Side Components

### A. Piston B. Cylinder



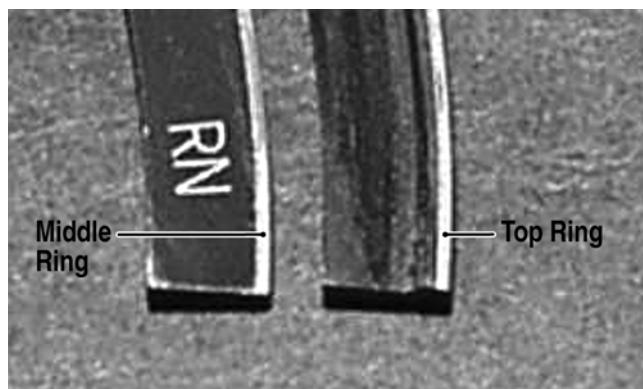
■ **NOTE:** If the piston rings were removed, install them in this sequence.

A. 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.

B. Install the middle ring (2) so the letters RN are directed toward the top of the piston; then install the top ring (1) with the lip directed toward the top of the piston.



FI168A

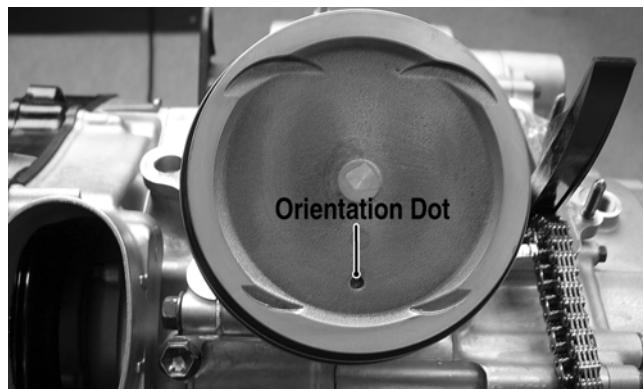
### CAUTION

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

1. Install the piston on the connecting rod making sure there is a circlip on each side and the open end of the circlip faces upwards.

3

■ **NOTE:** The piston should be installed so the orientation dot is directed toward the exhaust.



FI138A

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

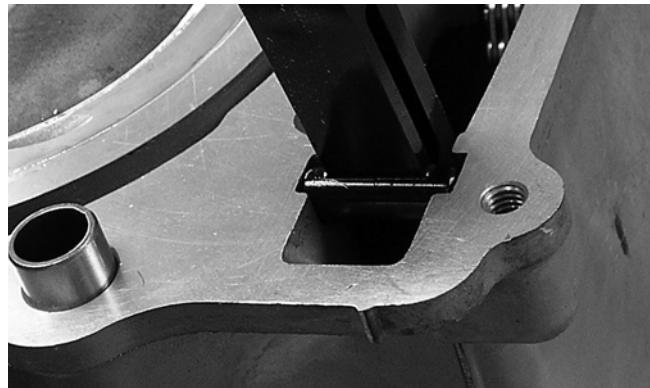


FI136A

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.

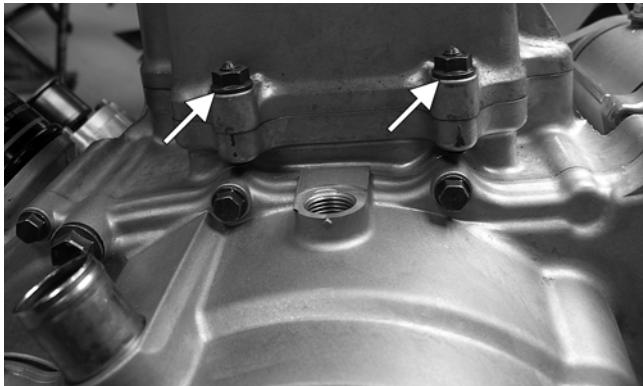
**⚠ CAUTION**

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



FI1443

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



FI135A

**■ NOTE: The two cylinder-to-crankcase nuts will be tightened in step 10.**

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

## C. Cylinder Head

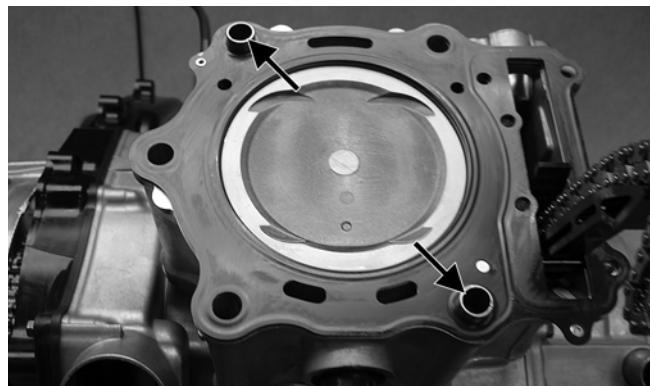
**■ NOTE: Steps 1-5 in the preceding sub-section must precede this procedure.**

6. Place the chain guide into the cylinder.

**⚠ CAUTION**

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

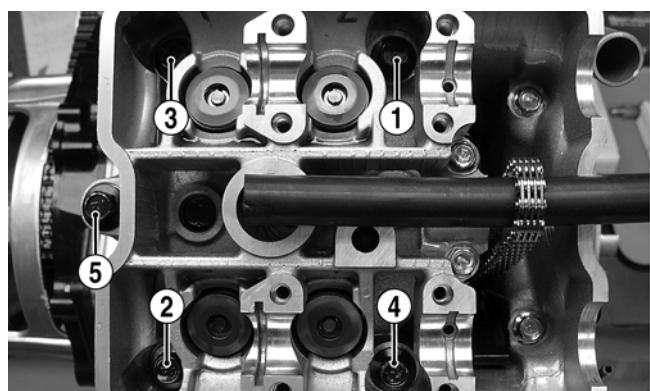
7. Place the head gasket into position on the cylinder. Place the alignment pins into position; then place the head assembly into position on the cylinder.



FI134A

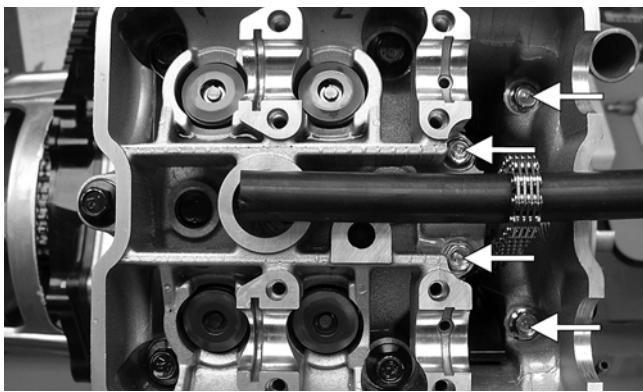
8. Install the five 10 mm cylinder head cap screws and tighten in the sequence shown to an initial torque of 2.5 kg-m (18 ft-lb); then using the same sequence, tighten to a final torque of 3.7 kg-m (27 ft-lb).

**■ NOTE: Apply engine oil to the threads and both sides of the washers before installing the cylinder head cap screws.**



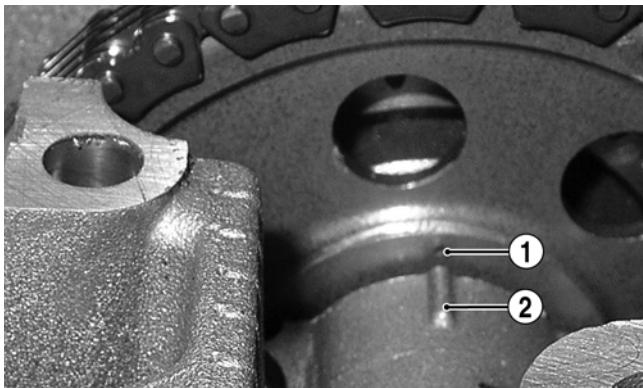
FI133B

9. Install the four 6 mm flange-head cap screws and tighten to specifications. Tighten the cylinder-to-crankcase nuts (from step 4) securely.



FI133C

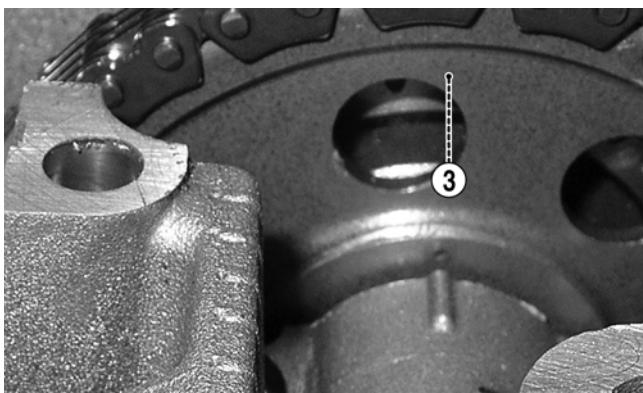
10. Align the TDC line on the rotor/flywheel with the index mark on the magneto cover; then install the camshaft idler into the cam chain and align the punch mark (1) with the index rib (2). Adjust the idler in the chain as necessary to align the marks.



FI447A

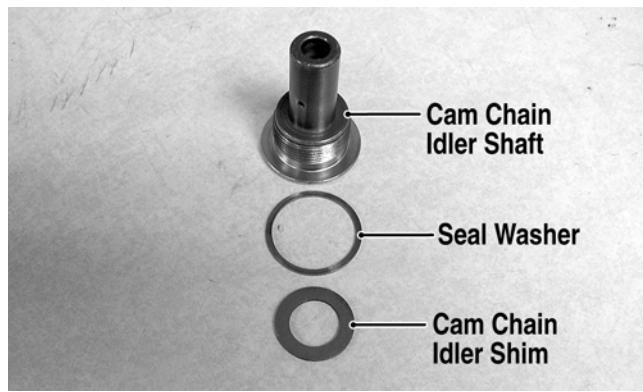
### ⚠ CAUTION

When checking the alignment, place tension on the front of the chain by pulling up on the idler and rotating to the rear. The punch mark (1), index rib (2), and gear tooth root (3) must align or engine damage will occur. If all three cannot be aligned, remove the idler and rotate the crankshaft one turn (360°) and repeat step 10.



FI447B

11. When the idler gear is properly timed, place the seal washer and cam chain idler shim on the cam chain idler shaft; then install the shaft and tighten to specifications.

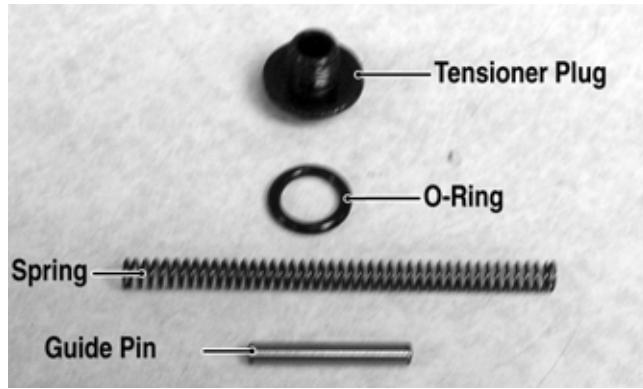


FI131A

12. Install the cam chain tensioner with a new gasket; then tighten the Allen-head cap screws to specifications.

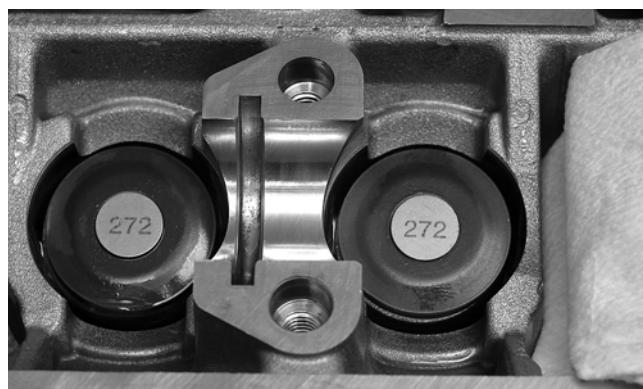
13. Install the spring and spring guide pin into the cam chain tensioner; then with a new O-ring installed on the tensioner plug, install the plug and tighten to specifications.

3

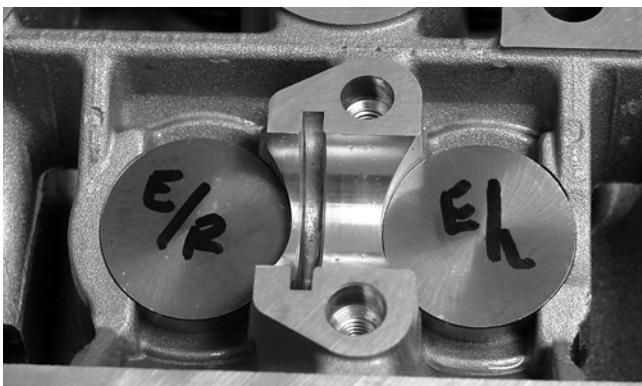


FI159A

14. Install the proper tappet shims on the corresponding valves as noted during removing; then install the tappets as noted during removing.



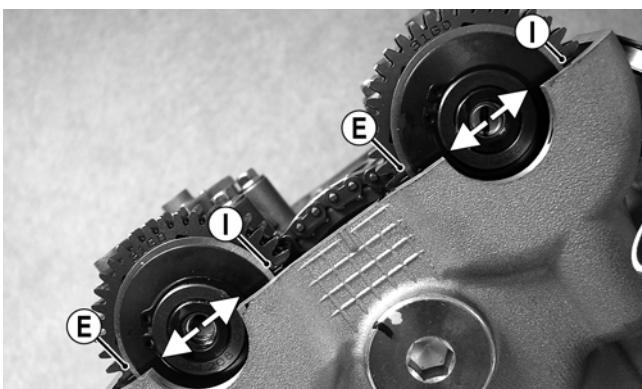
FI103



FI054

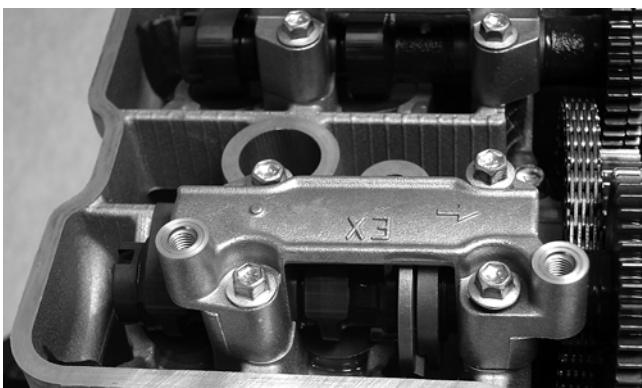
■ **NOTE:** The tappet shims must be installed with the numbers facing the tappet.

15. Oil the tappets, camshaft journals, and cylinder head journals with clean engine oil; then install the four camshaft holder alignment pins.
16. With the TDC line aligned with the index mark on the magneto cover, install the camshafts with the engraved marks parallel with the top of the cylinder head and the I and E directed toward the intake or exhaust side of the head.



FI044A

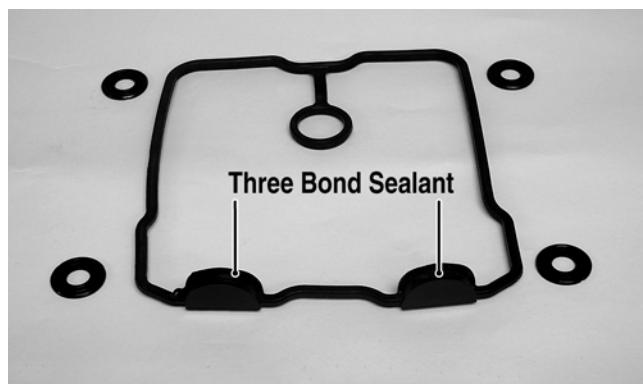
17. Install the camshaft holders on the respective camshaft with the arrows directed toward the cam gears; then secure with the eight cap screws and tighten to specifications.



FI047

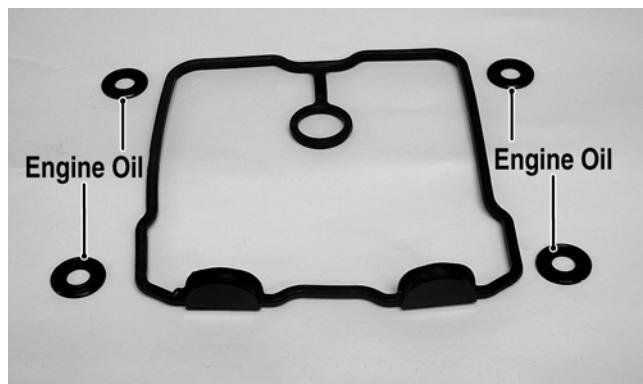
18. Rotate the engine through three or four revolutions; then rotate to top-dead-center (TDC) on the compression stroke and check valve adjustment (see Section 2).

19. With a new gasket installed on the cylinder head cover, apply Three Bond Sealant (p/n 0636-070) to the camshaft end caps; then place the head cover into position on the cylinder head.



FI040A

20. Apply engine oil to the cylinder head cover seal washers; then install the cylinder head cover cap screws and seal washers. Tighten in a crisscross pattern to 1.0 kg-m (7 ft-lb). Repeat in the same pattern to a final torque of 1.4 kg-m (10 ft-lb).



FI040B

21. Install the coolant crossover hose on the water pump and cylinder. Tighten the clamps securely.



FI161A

22. Install the timing inspection plug on the magneto cover and tighten to specifications.

23. Place a new O-ring on the drive end of the starter; then place a light coat of grease on the O-ring and install the starter. Secure with the two cap screws and tighten securely.

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## Installing Engine/Transmission

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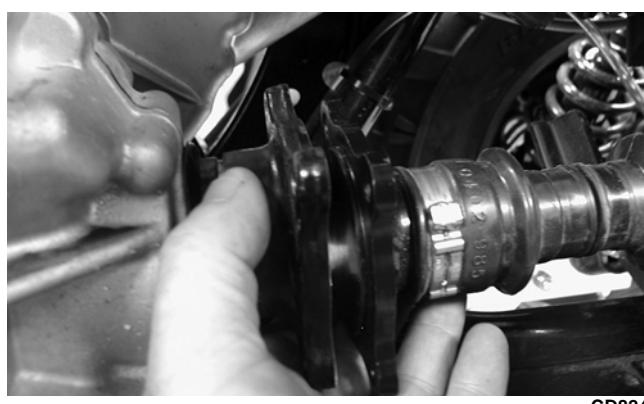
**■ NOTE:** Arctic Cat recommends that new gaskets and O-rings be installed whenever servicing the ATV.

1. From the left side, place the engine/transmission into the frame; then slide the engine rearward as far as possible.
2. Raise the front of the engine and engage the front drive output yoke onto the splined output shaft; then lower the engine into the mounting brackets.

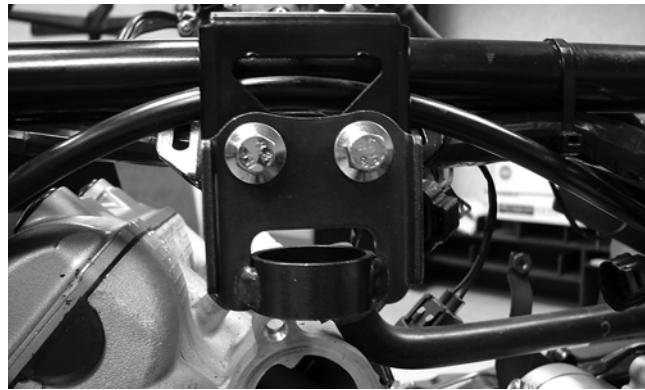


3. Install the front through-bolt; then install the rear through-bolt. Secure with new self-locking nuts and tighten to specifications.
4. Align the rear drive flanges and secure with four cap screws. Tighten to specifications.

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

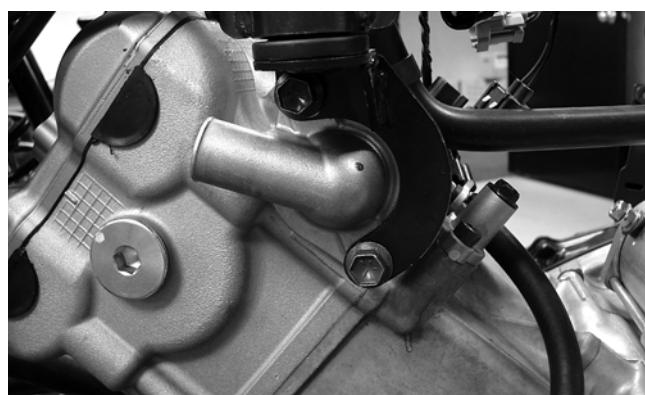
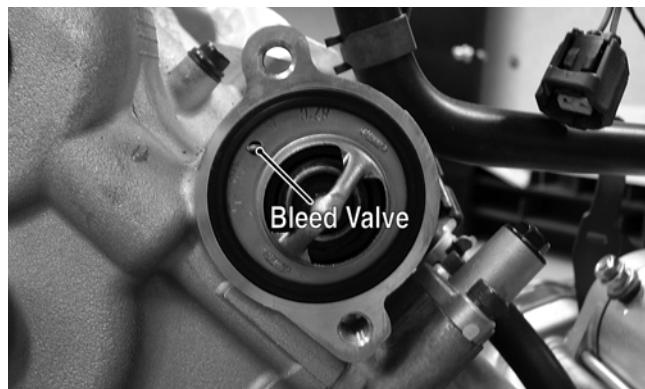


5. Secure the engine damper stopper to the frame with the cap screws. Tighten only until snug.



6. Making sure the thermostat bleed valve is correctly oriented, install the thermostat housing and engine damper mount; then secure with the two cap screws and tighten to specifications. Tighten the engine damper stopper cap screws (from step 5) to specifications.

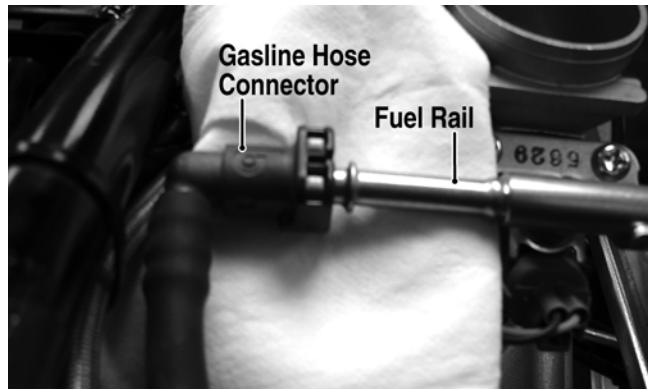
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7. Using a new O-ring, install the intake pipe on the cylinder head making sure the UP mark is directed toward the top of the engine; then secure with the two cap screws and tighten securely.



FI104A

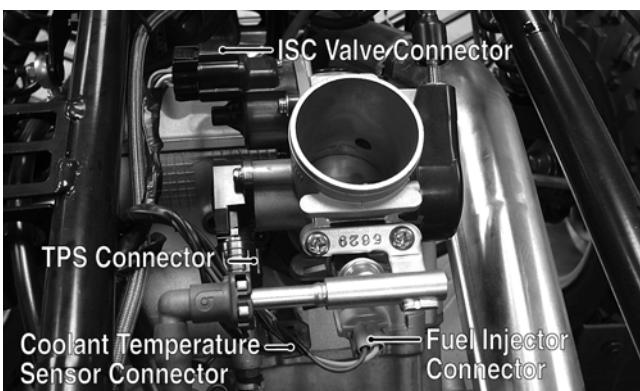


FI092A



FI103

8. Install the throttle body into the intake pipe and tighten the clamp securely.
9. Connect the ISC valve connector, TPS connector, coolant temperature sensor connector, and fuel injector connector to the appropriate sensor; then connect the gasoline hose connector to the fuel rail.



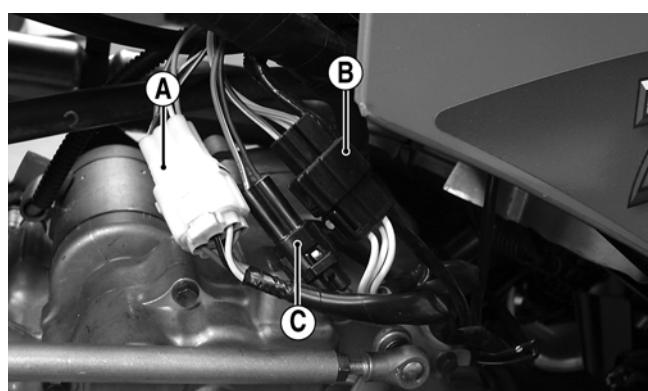
FI089A

10. Secure the engine ground wire and main harness ground to the engine at the appropriate position on the left-side cover and tighten the cap screw to specifications.



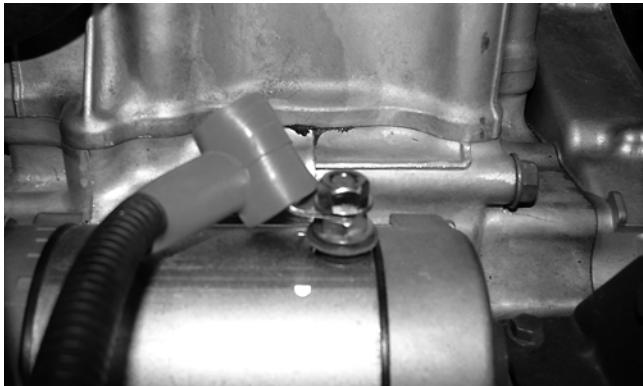
FI084

11. Connect the gear position indicator connector (A), stator connector (B), and the crankshaft position sensor connector (C) to the main wiring harness.



FI083A

12. Connect the starter positive cable to the starter and tighten the nut securely.



FI094

13. Place the shifter arm on the shift shaft aligning the match marks; then install the cap screw and tighten to specifications.



FI085A

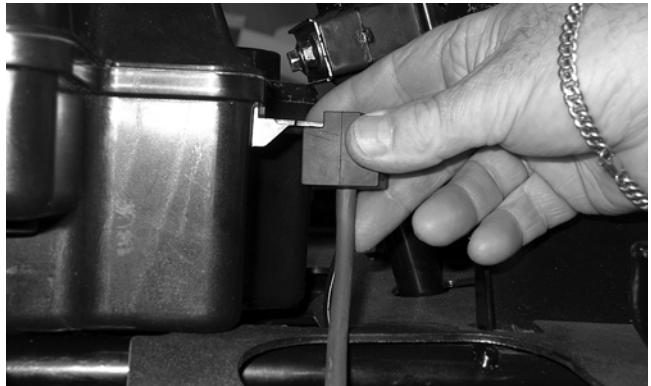
14. Connect the speed sensor connector to the housing.

15. Install the exhaust pipe to the cylinder head using a new grafoil seal; then secure with two nuts and finger-tighten only. Connect the exhaust pipe to the muffler and secure with the two exhaust springs. Tighten the two exhaust pipe nuts securely.

16. Secure all wiring to the frame and upper engine bracket with cable ties.

17. Secure the two coolant hoses to the engine.

18. Place the air filter housing into position on the frame and mount the intake air pressure sensor on the mount; then install the air diverter assembly and connect and secure the inlet air duct to the air filter housing.



FI114



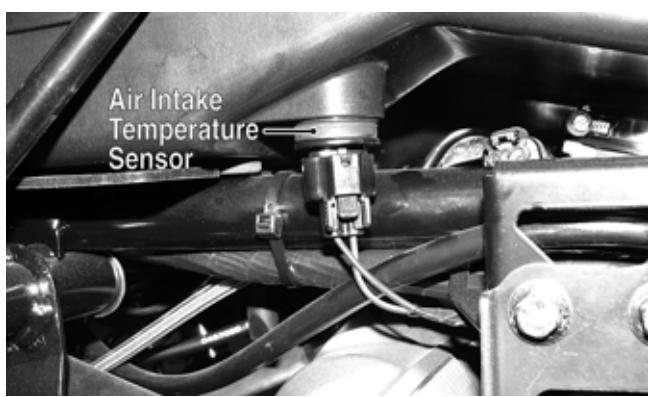
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FI098A

19. Secure the air filter to the throttle body and tighten the clamp securely; then connect the air intake temperature sensor to the harness connector.

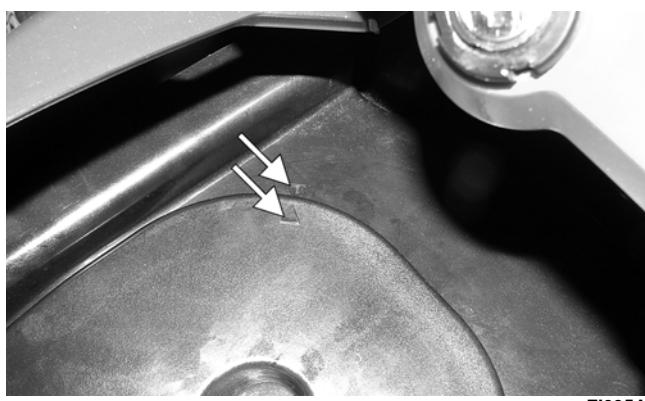


FI099A



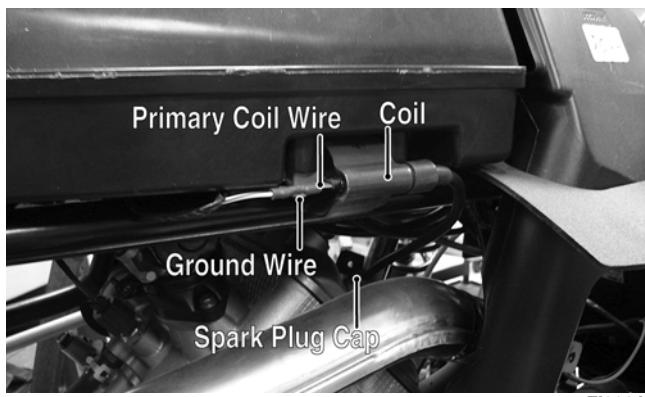
FI082A

20. Secure the crankcase vent hose to the air filter housing; then install the air filter and secure with the air filter housing cover noting the alignment marks.



21. Connect the V-belt cooling inlet duct and outlet boot and secure with the hose clamps. Tighten securely.

22. Connect the spark plug cap/high tension lead to the spark plug; then connect the primary coil wire and ground wire to the coil. Tighten the ground wire cap screw securely.



23. Place the left-side footwell and foot peg in position on the frame; then secure with existing hardware. Tighten securely.



24. Install the front body panel with existing hardware (see Section 8).

25. Place the side panels into position.

26. Place the battery into position in the battery compartment; then install the battery cables and vent hose. Secure with the battery cover.

**CAUTION**

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

27. Add proper amounts of engine/transmission oil and coolant.

28. Install the seat.