
FOREWORD

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.**

TABLE OF CONTENTS

Foreword

Click on the red text to go.

Section

1. General Information

1

2. Periodic Maintenance/Tune-Up

2

3. Engine/Transmission

3

4. Fuel/Lubrication/Cooling

4

5. Electrical System

5

6. Drive System

6

7. Suspension

7

8. Steering/Frame

8

9. Controls/Indicators

9

10. Aids for Maintenance

10

11. Troubleshooting

11

400 Automatic

400 Manual

500 Automatic

500 Manual

650 H1

700 EFI

2007

ATV

Service Manual

SECTION 1 - GENERAL INFORMATION

1

TABLE OF CONTENTS

General Specifications (400/400 TRV - Automatic Transmission).....	1-2
General Specifications (400 - Manual Transmission).....	1-3
General Specifications (500 - Manual Transmission).....	1-4
General Specifications (500 - Automatic Transmission).....	1-5
General Specifications (650 H1/650 H1 TBX/650 H1 TRV).....	1-6
General Specifications (700 EFI).....	1-7
Break-In Procedure	1-8
Gasoline - Oil - Lubricant	1-8
Genuine Parts	1-9
Preparation For Storage	1-9
Preparation After Storage.....	1-10

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) (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 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 ² (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)

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)	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 ² (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)	Less than 1 ohm (terminal to ground) 5200-7800 ohms (high tension - plug cap removed - to ground)
(secondary)	
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 ² (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)

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 ² (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)	Less than 1 ohm (terminal to ground) 5200-7800 ohms (high tension - plug cap removed - to ground)
(secondary)	
Ignition Coil Peak Voltage (primary/ CDI)	142.4-213.6 DC volts (terminal to ground)
Magneto Coil Resistance (trigger)	160-240 ohms (green to blue) Less than 1 ohm (yellow to white) Less than 1 ohm (black to black)
(source)	
(charging)	
Magneto Coil Peak Voltage (trigger)	4.2-6.3 volts (green to blue) 0.40-0.62 volt (yellow to white)
(source)	
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 ² (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)

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 ² (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.

1

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

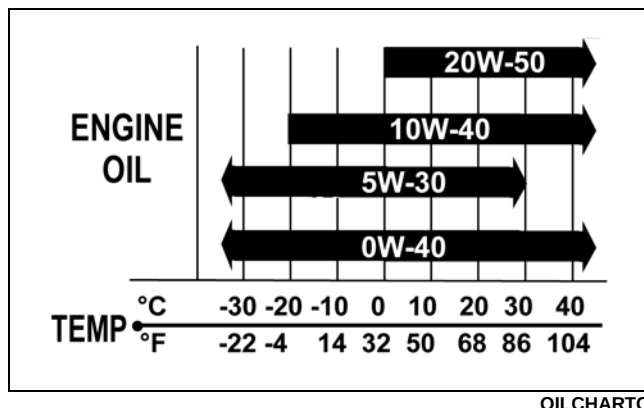
Do not use white gas. Only Arctic Cat approved gasoline additives should be used.

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.

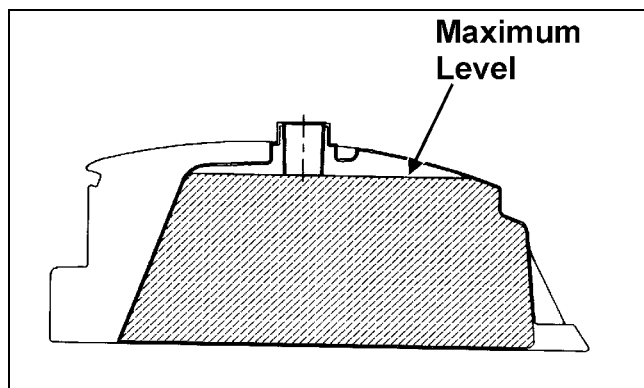
⚠ CAUTION

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.



ATV0049B

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.

⚠ WARNING

Do not over-fill the gas tank.

1

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

TABLE OF CONTENTS

2

Periodic Maintenance Chart.....	2-2
Lubrication Points.....	2-3
Battery.....	2-3
Fuses.....	2-4
Air Cleaner/Filter.....	2-4
Valve/Tappet Clearance (Feeler Gauge Procedure).....	2-6
Valve/Tappet Clearance (Valve Adjuster Procedure).....	2-6
Valve/Tappet Clearance (700 EFI).....	2-7
Testing Engine Compression.....	2-9
Spark Plug.....	2-10
Muffler/Spark Arrester.....	2-10
Gas/Vent Hoses.....	2-11
Adjusting Throttle Cable.....	2-11
Adjusting Engine RPM (Idle).....	2-11
Engine/Transmission Oil - Filter - Strainer.....	2-12
Front Differential/Rear Drive Lubricant.....	2-14
Adjusting Clutch (400/500 Manual Transmission).....	2-14
Tires.....	2-15
Steering Components.....	2-15
Driveshaft/Coupling.....	2-15
Suspension/Shock Absorbers/Bushings.....	2-16
Nuts/Bolts/Cap Screws.....	2-16
Ignition Timing.....	2-16
Headlight/Taillight-Brakelight.....	2-16
Switches.....	2-17
Shift Lever.....	2-18
Frame/Welds/Racks.....	2-19
Electrical Connections.....	2-19
Hydraulic Brake Systems.....	2-20
Burnishing Brake Pads.....	2-21
Coolant (500/650 H1/700 EFI).....	2-22
Checking/Replacing V-Belt.....	2-22
Adjusting Differential Lock Cable.....	2-24
Exhaust Chart.....	2-25
Intake Chart.....	2-26

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 Arrester					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.

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.

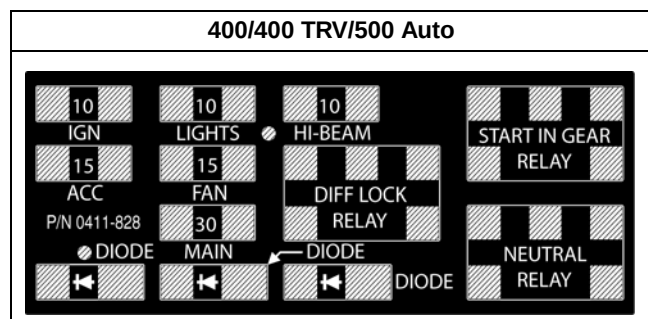
2

Fuses

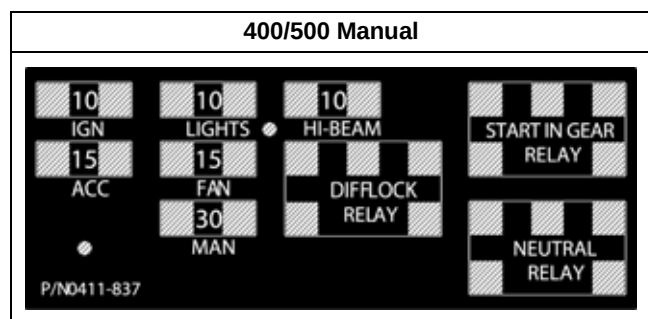
The fuses are located in a power distribution module under the seat.

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

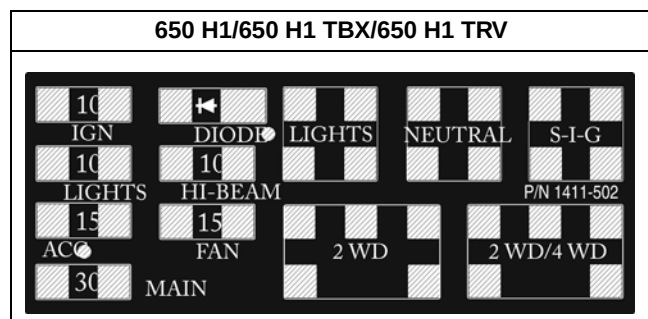
■ **NOTE:** To remove a fuse, compress the locking tabs on either side of the fuse case and lift out.



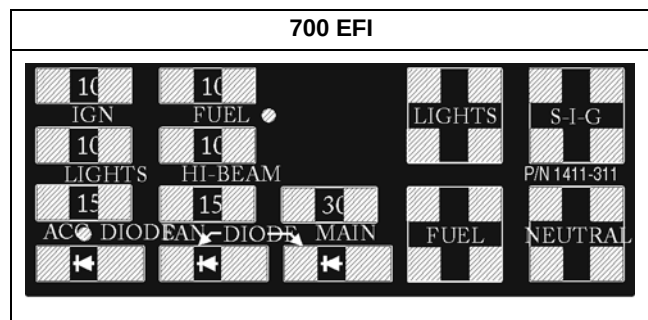
0411-828



0411-837



1411-502



1411-311

CAUTION

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

Air Cleaner/Filter

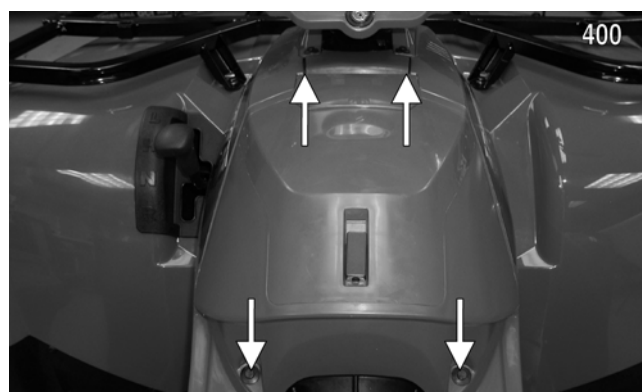
The air filter inside the air filter housing must be kept clean to provide good engine power and gas mileage. If the ATV is used under normal conditions, service the filter at the intervals specified. If operated in dusty, wet, or muddy conditions, inspect and service the filter more frequently. Use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

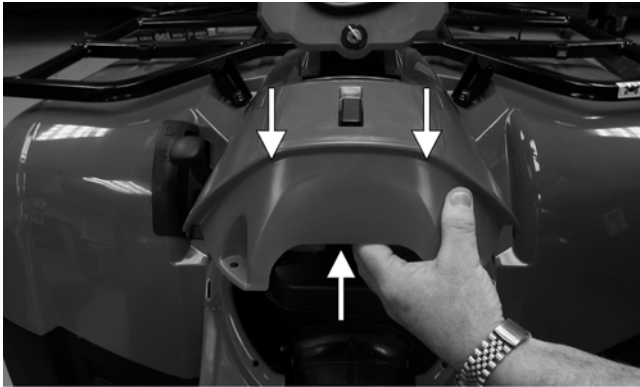


CF145C



CD710C

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



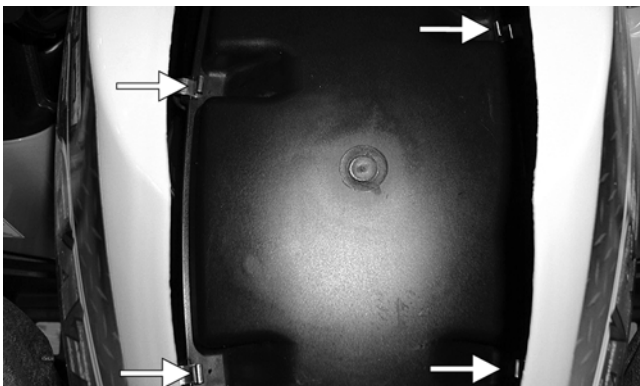
CF143A

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.

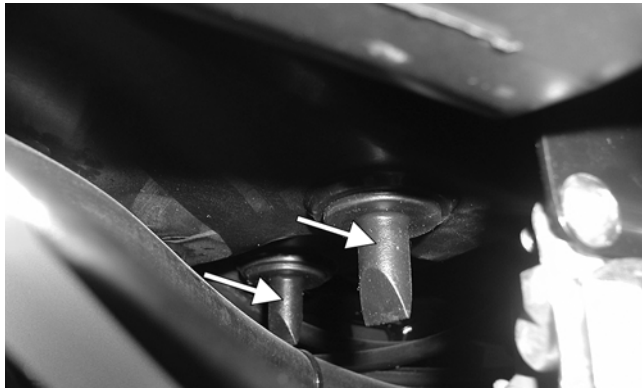


CD674

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.



KX045A

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

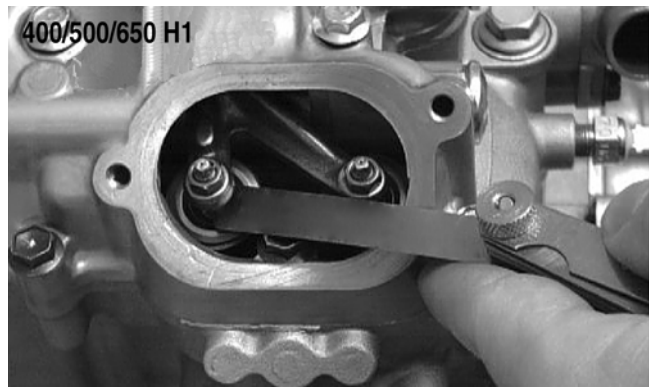
The feeler gauge must be positioned at the same angle as the valve and valve adjuster for an accurate measurement of clearance. Failure to measure the valve clearance accurately could cause valve component damage.

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.

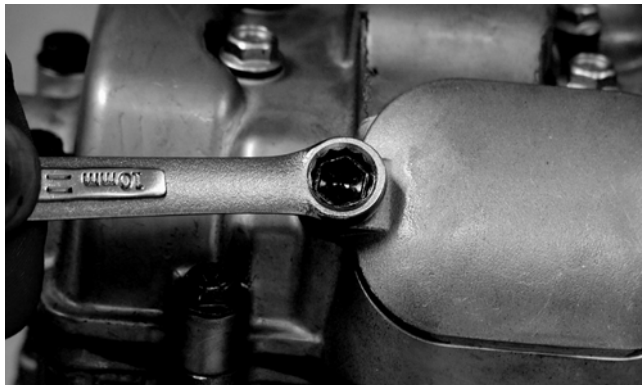
Valve/Tappet Clearance (Valve Adjuster Procedure)

■ **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).



CF005

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)

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).

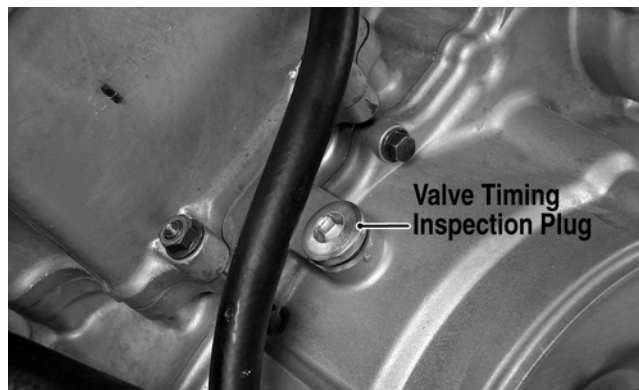
2

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

WARNING

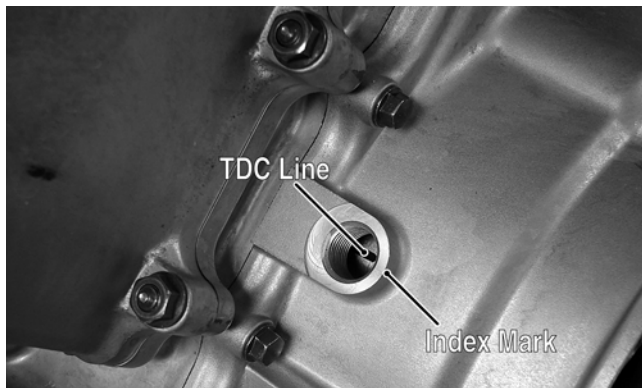
Always wear safety glasses when using compressed air.

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



FI039A

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.

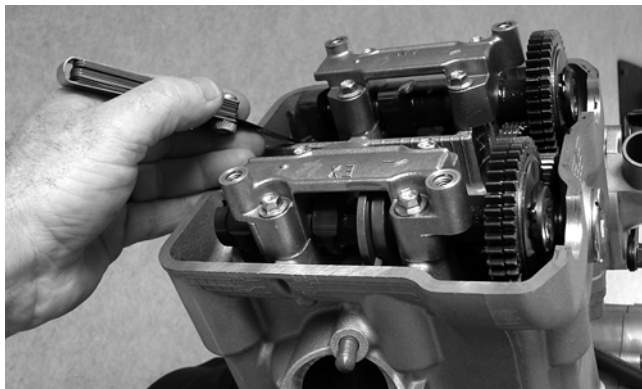


FI041A

■ **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

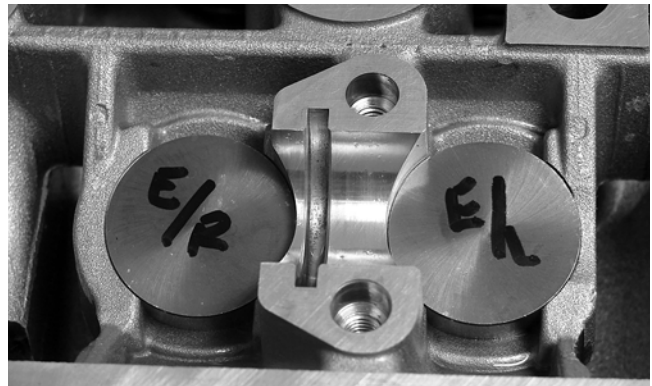
If valve clearance is within specifications, proceed to step 12.

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.

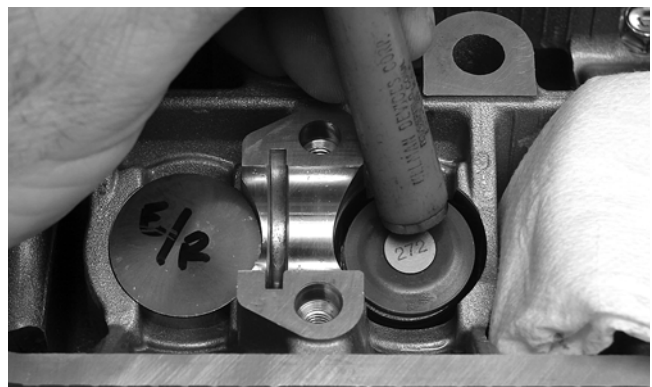


FI054

7. Fold a suitable towel and use it to plug the camshaft 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.



F1051

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.



F1053

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

To test engine compression, use the following procedure.

2

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.

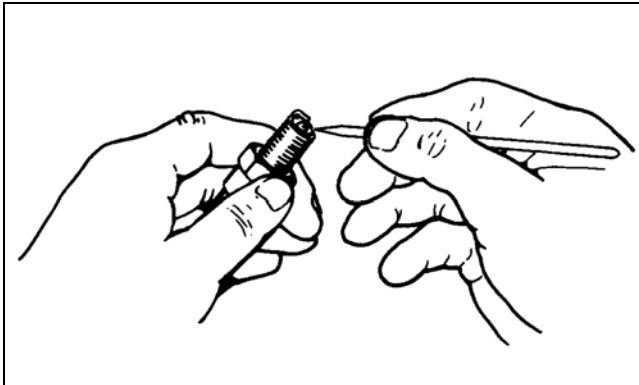
6. If compression is abnormally low, inspect the following items.
 - A. Verify starter cranks engine over at normal speed (approximately 400 RPM).
 - B. Gauge functioning properly.
 - C. Throttle lever in the full-open position.
 - D. Valve/tappet clearance correct.
 - E. Valve not bent or burned.
 - 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.

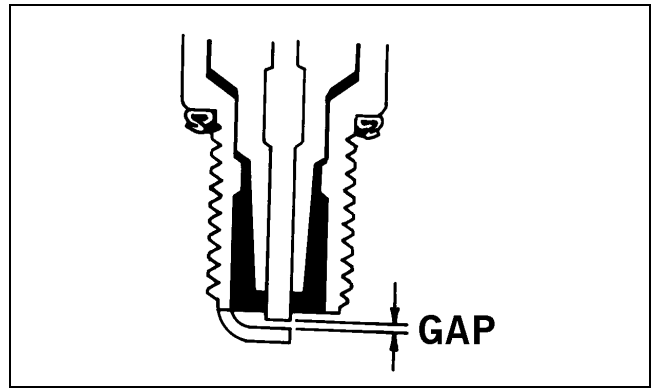


ATV-0051

CAUTION

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

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



ATV0052B

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.

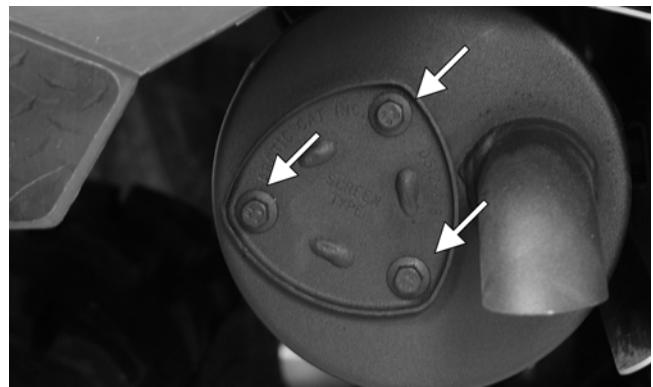
Muffler/Spark Arrester

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.

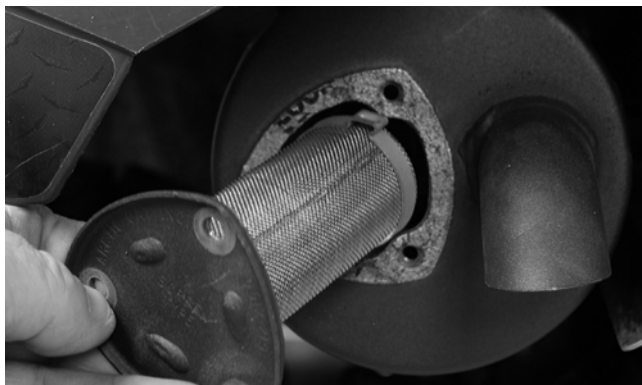


CF105A

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

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

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



CF104

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

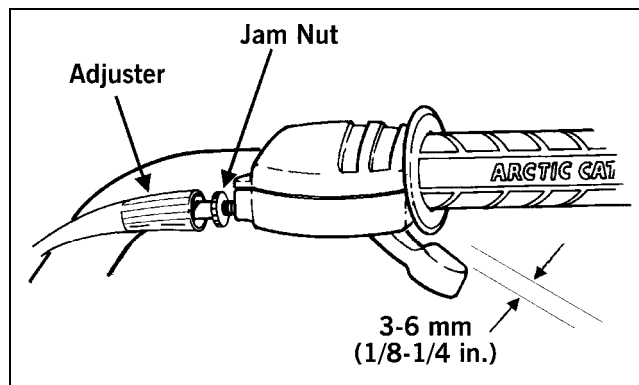
To adjust the throttle cable free-play, follow this procedure.

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.



ATV-0047

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

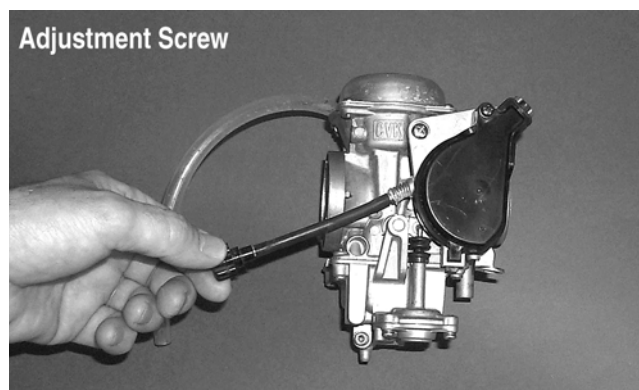
Adjusting Engine RPM (Idle)

■ **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

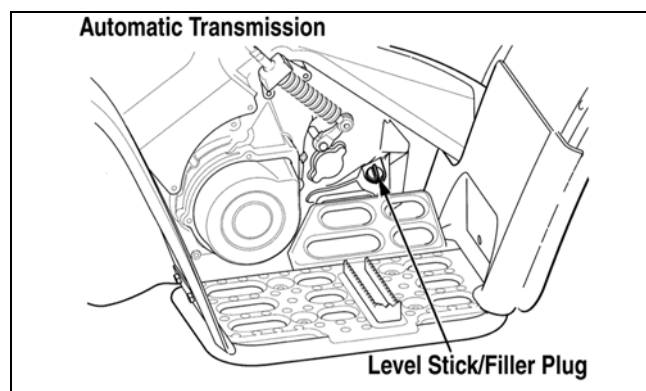
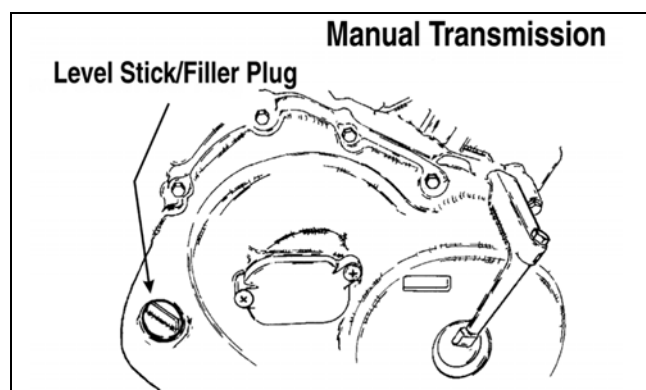
Adjust the idle to the correct RPM. Make sure the engine is at normal operating temperature before adjusting the idle RPM.

Engine/Transmission Oil - Filter - Strainer

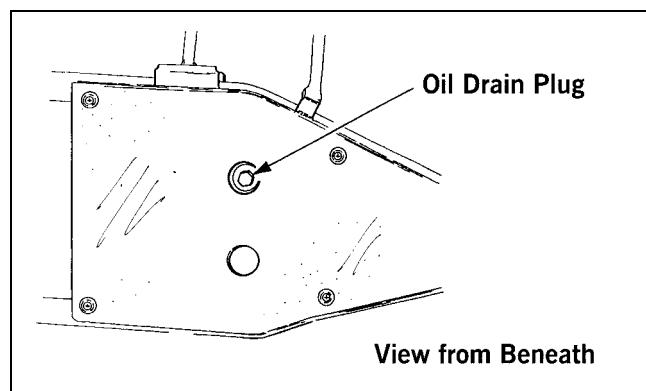
OIL - FILTER

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.

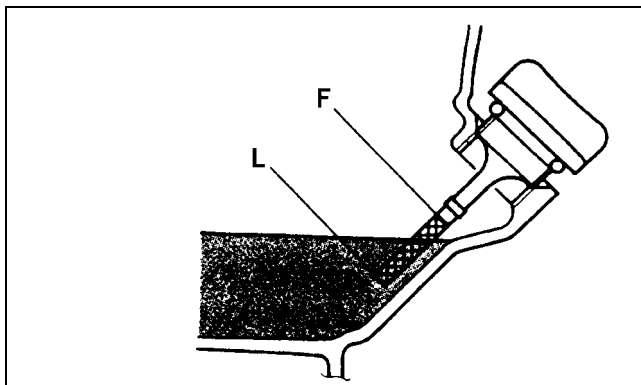
⚠ CAUTION

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

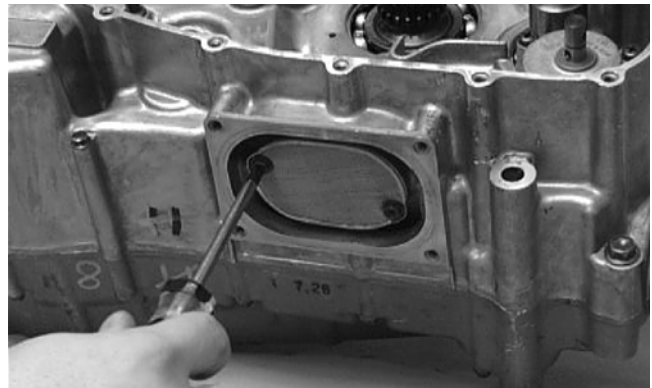
To check the oil strainer, use the following procedure.

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.

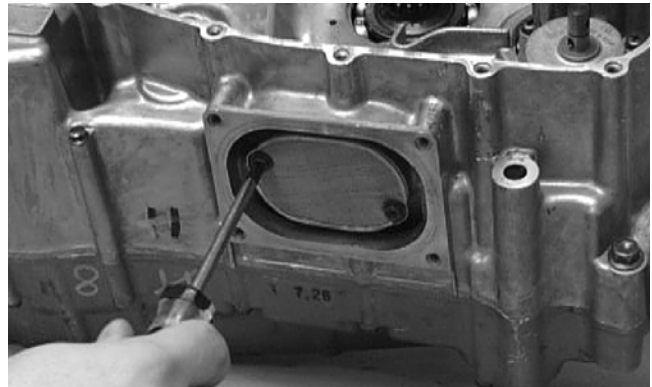


CC163D

👉 AT THIS POINT

To service oil strainer, see Section 3.

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.

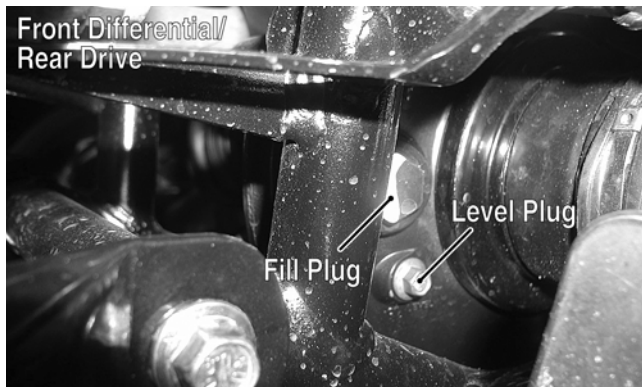
Front Differential/Rear Drive Lubricant

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.

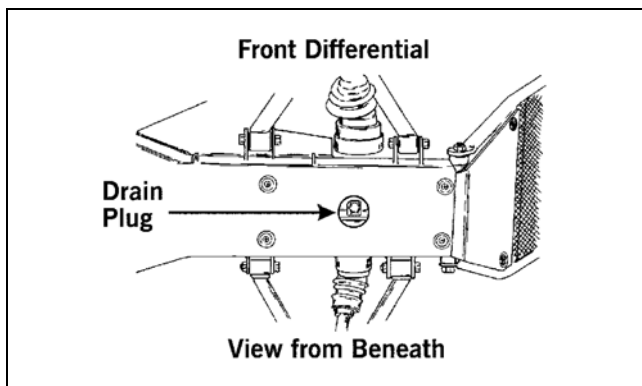
To change the lubricant, use the following procedure.

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

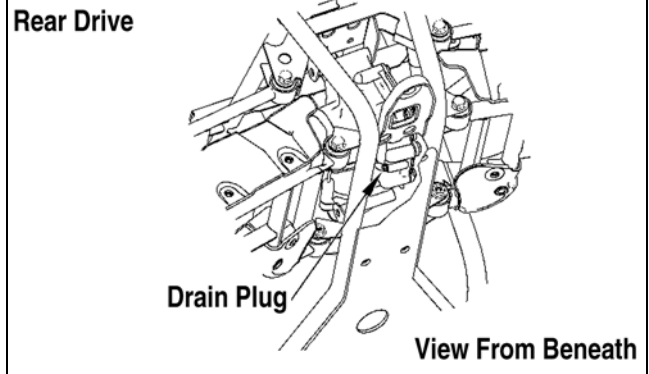


AL677C

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



ATV0082A



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.

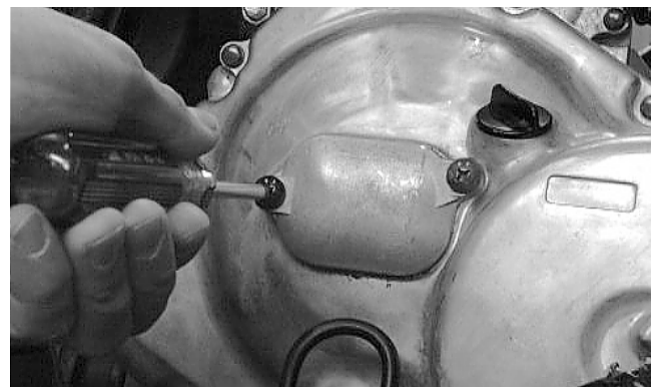
CAUTION

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)

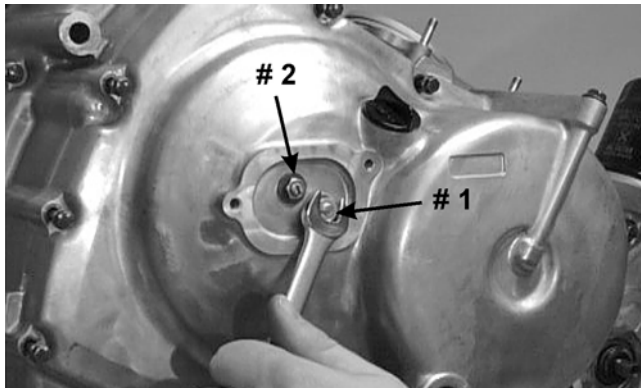
To adjust the clutch, use the following procedure.

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



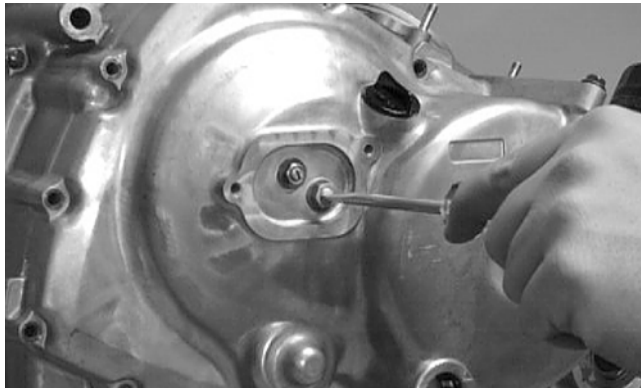
AM600D

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-cm² (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.

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

2

Driveshaft/Coupling

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

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

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

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

■ **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

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.

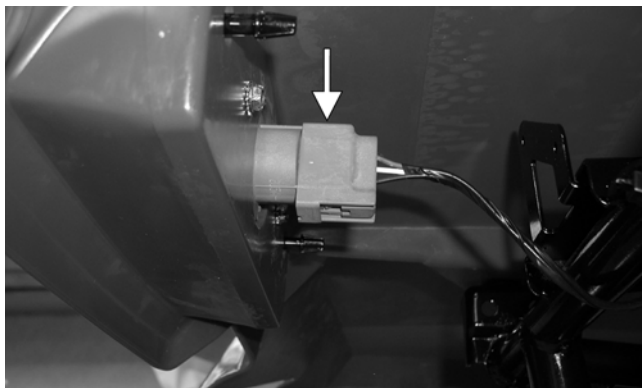
To replace the headlight bulb, use the following procedure.

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

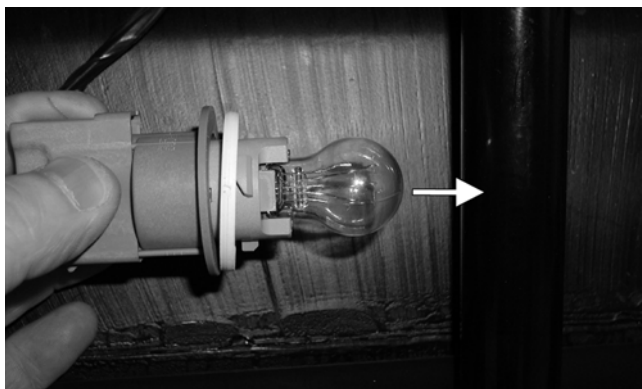
To replace the taillight-brakelight bulb, use the following procedure.

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



CF135A

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



CF132A

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

CHECKING/ADJUSTING HEADLIGHT AIM

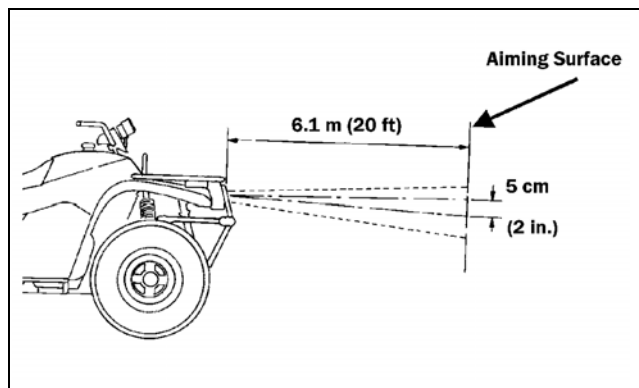
The headlights can be adjusted vertically and horizontally. The geometric center of the HIGH beam light zone is to be used for vertical and horizontal aiming.

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

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

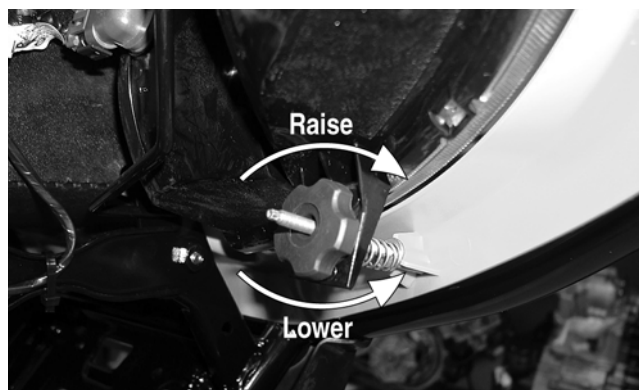
2. Measure the distance from the floor to the mid-point of each headlight.
3. Using the measurements obtained in step 2, make horizontal marks on the aiming surface.
4. Make vertical marks which intersect the horizontal marks on the aiming surface directly in front of the headlights.
5. Switch on the 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.



ATV-0070C

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



CD714A

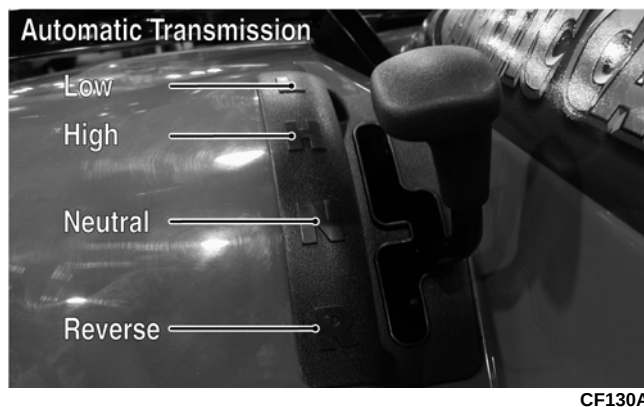
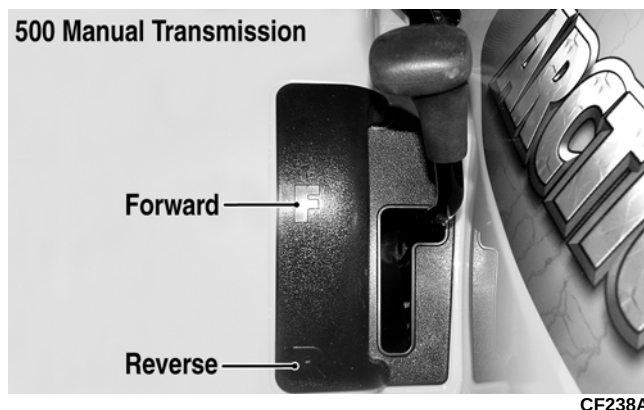
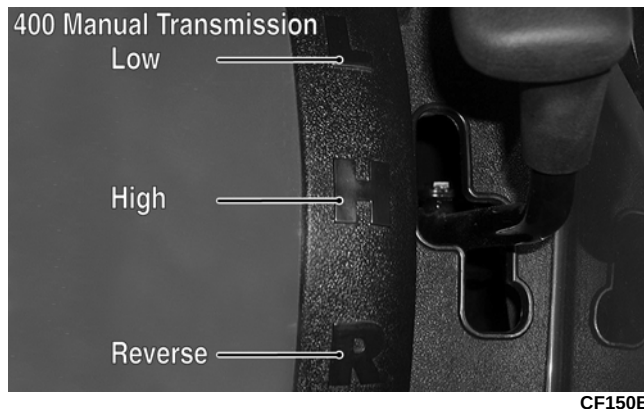
Switches

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.

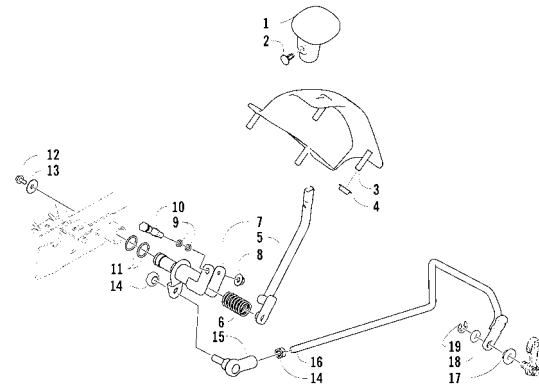
WARNING

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

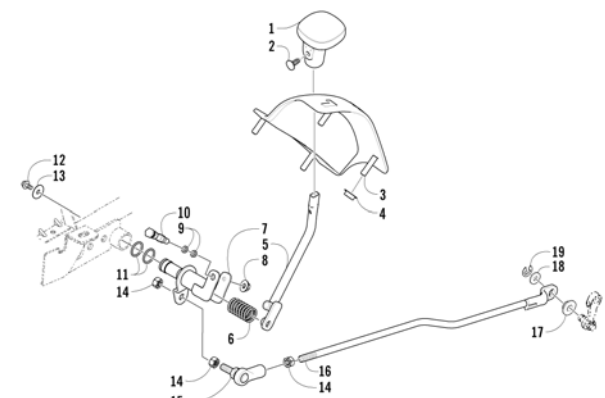


KEY

- | | | |
|----------------|---------------|-------------|
| 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

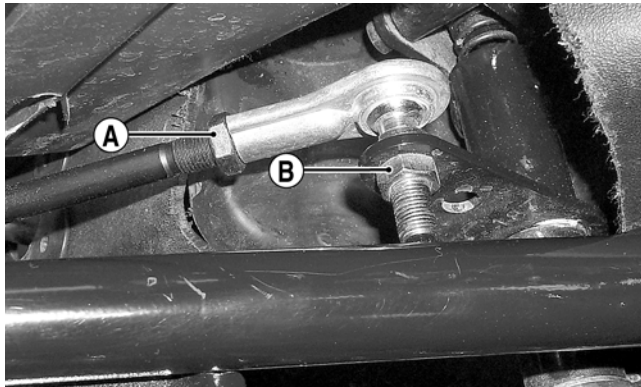
- | | | |
|----------------|---------------|-------------|
| 1. Handle | 8. Nut | 15. Rod End |
| 2. Push Clip | 9. O-Ring | 16. Linkage |
| 3. Shift Plate | 10. Axle | 17. Bushing |
| 4. Stamped Nut | 11. O-Ring | 18. Washer |
| 5. Lever | 12. Cap Screw | 19. E-Ring |
| 6. Spring | 13. Washer | |
|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

0739-701

- 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).

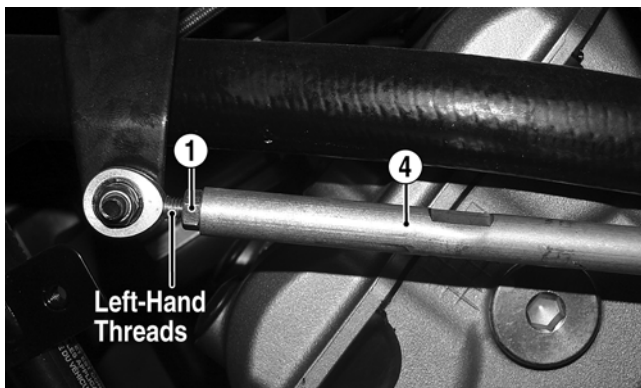


AF941A

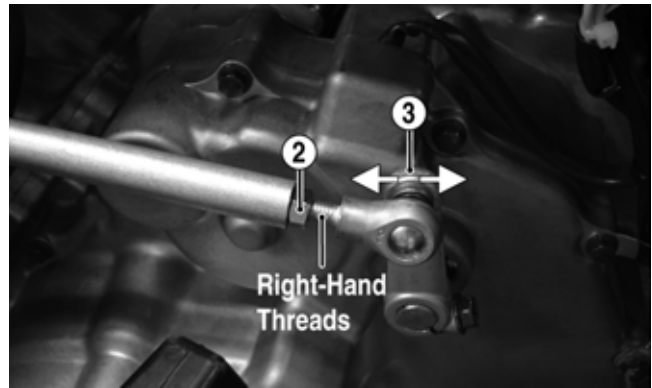
4. Using two open-end wrenches, remove lock nut (B) securing the shift rod to the upper shift axle. Discard the lock nut.

■ **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

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

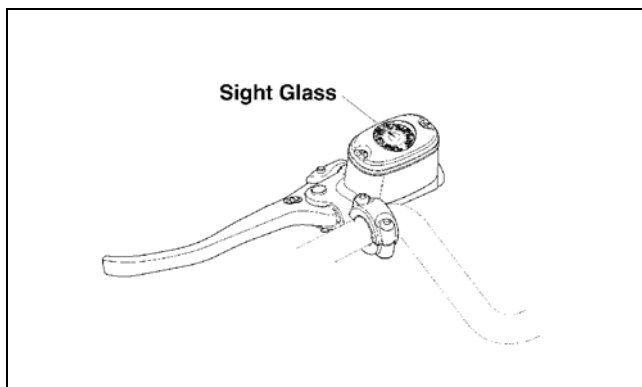
The electrical connections should be checked periodically for proper function. In case of an electrical failure, check fuses, connections (for tightness, corrosion, damage), and/or bulbs. If an electrical component needs to be tested for proper function, see Section 5.

Hydraulic Brake Systems

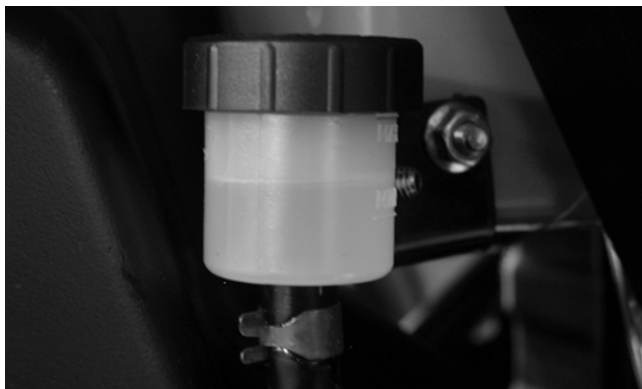
CHECKING/BLEEDING

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.



738-420A



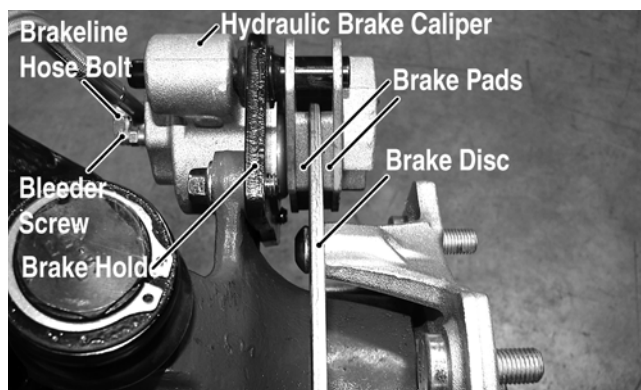
AL681

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.



AF637D



PR377A

■ **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.

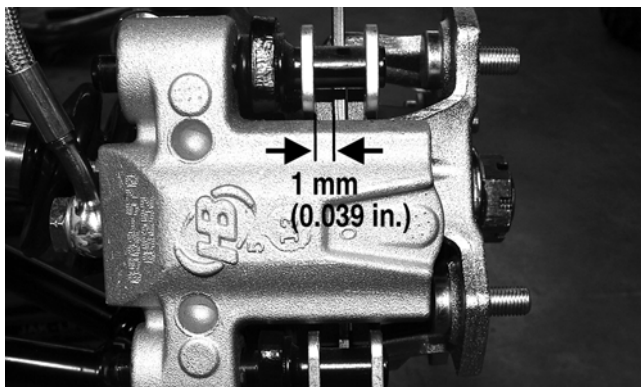
INSPECTING HOSES

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.



PR376B

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

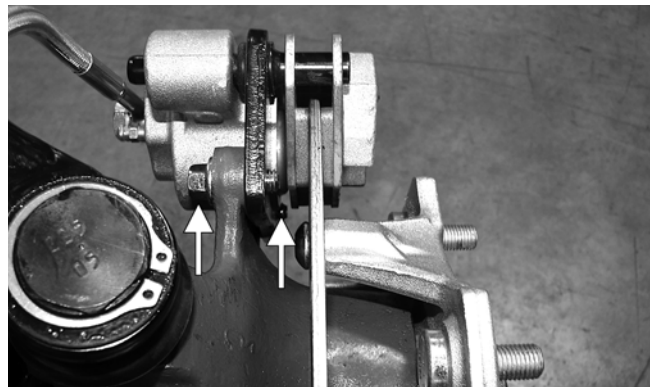
4. To replace the brake pads, use the following procedure.
 - A. Remove the wheel.
 - B. Remove the cap screws securing the caliper holder to the knuckle; then remove the pads.



PR237

C. Install the new brake pads.

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



PR377B

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)

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.

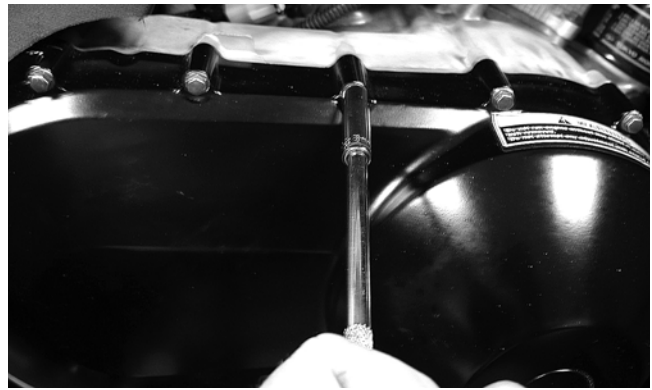
⚠ CAUTION

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.

Checking/Replacing V-Belt

REMOVING

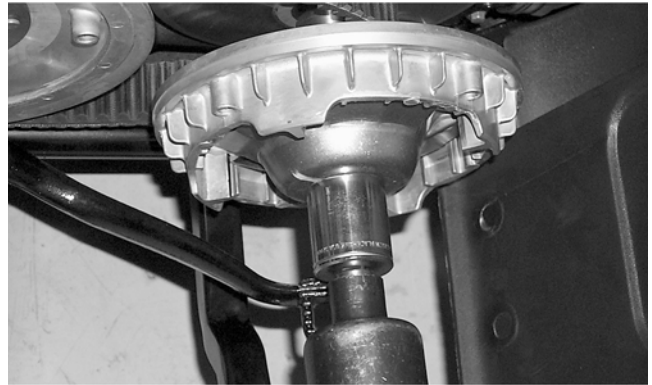
1. Remove the right-side footrest (see Section 8).
2. Remove the cap screws securing the V-belt cover noting the location of the different-lengthed cap screws for installing purposes; then using a rubber mallet, gently tap on the cover tabs to loosen the cover. Remove the cover.



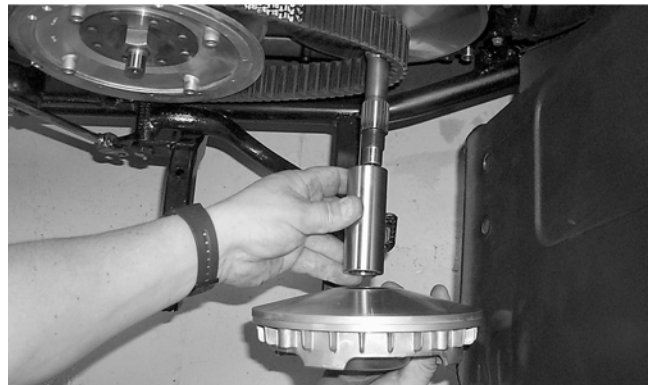
CD078

■ **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.



CC550

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

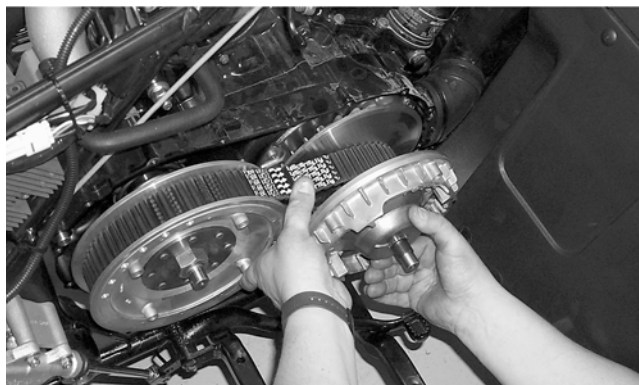
2. Place the V-belt into position on the driven clutch and over the front shaft.



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).

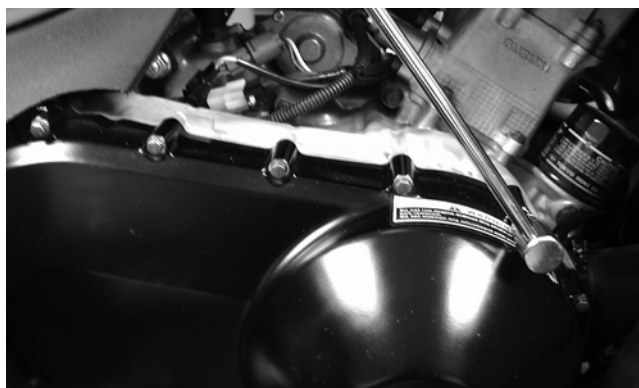


CC552

■ **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).

2



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).

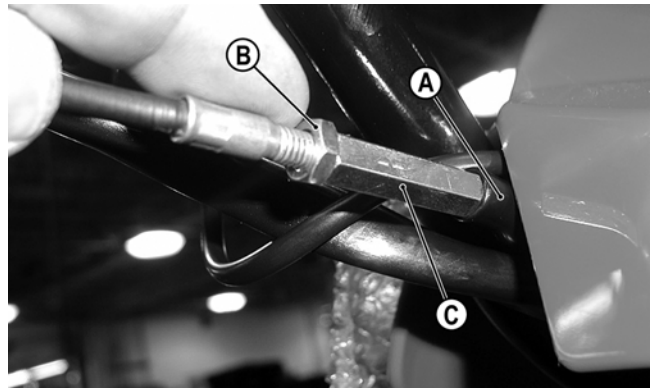
Adjusting Differential Lock Cable

■ **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.

MEASURED TAPPET CLEARANCE (mm)	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)																								
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	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			
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				
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					
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						
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							
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								
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									
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										
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											
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												
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													
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														
1.01-1.05		3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	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																
1.11-1.15		3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50																	
1.16-1.20		3.25	3.30	3.35	3.40	3.45	3.50	3.50																		
1.21-1.25		3.30	3.35	3.40	3.45	3.50	3.50																			
1.26-1.30		3.35	3.40	3.45	3.50	3.50																				
1.31-1.35		3.40	3.45	3.50	3.50																					
1.36-1.40		3.45	3.50	3.50																						
1.41-1.45		3.50	3.50																							
1.46-1.50		3.50																								

ATV2152A


[Back to TOC](#)
[Back to Section TOC](#)


Intake Chart

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

MEASURED TAPPET CLEARANCE (mm)	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)																								
SPECIFIED CLEARANCE/NO ADJUSTMENT REQUIRED	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
	0.05-0.09			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
	0.10-0.20			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
	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
	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	
	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	
	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		
	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			
	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				
	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					
	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						
	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							
	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								
	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									
	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										
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												
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													
0.91-0.95			3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	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															
1.01-1.05			3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50																
1.06-1.10			3.25	3.30	3.35	3.40	3.45	3.50	3.50																	
1.11-1.15			3.30	3.35	3.40	3.45	3.50	3.50																		
1.16-1.20			3.35	3.40	3.45	3.50	3.50																			
1.21-1.25			3.40	3.45	3.50	3.50																				
1.26-1.30			3.45	3.50	3.50																					
1.31-1.35			3.50	3.50																						
1.36-1.40			3.50																							

[Back to TOC](#)
[Back to Section TOC](#)
[Back](#)

SECTION 3 - ENGINE/TRANSMISSION

3

TABLE OF CONTENTS

Engine/Transmission	3-2
Specifications (400 - Automatic Transmission).....	3-3
Specifications (400 - Manual Transmission).....	3-4
Specifications (500 - Automatic Transmission).....	3-6
Specifications (500 - Manual Transmission).....	3-7
Specifications (650 H1)	3-9
Specifications (700 EFI)	3-10
400 (Manual Transmission) Table of Contents	3-11
400 (Automatic Transmission) Table of Contents	3-76
500 (Automatic Transmission)/650 H1 Table of Contents	3-130
500 (Manual Transmission) Table of Contents	3-185
700 EFI Table of Contents.....	3-256

Engine/Transmission

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

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)

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 (min)	(1st Ring) (2nd Ring)	8.9 mm (0.3504 in.) 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) (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 (min)	(1st Ring) (2nd Ring)	8.9 mm (0.3504 in.) 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)	0.6 kg/cm ² (9 psi) 1.0 kg/cm ² (14 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)

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 (min)	(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)

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 Diame- ter	(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)	1.7 mm (0.067 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)	18.2-21.0 kg (40.1-46.3 lb)

CAMSHAFT AND CYLINDER HEAD		
Cam Lobe Height	(intake) (min) (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 Distor- tion	(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 (min)	(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 Diame- ter	(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)	1.2 kg/cm² (17 psi) 1.6 kg/cm² (23 psi)

3

CLUTCH		
Clutch Release Screw		1/4-1/2 turn back
Drive Plate (fiber) Thick- ness	(min)	2.82 mm (0.1110 in.)
Drive Plate (fiber) Tab	(min)	2.9 mm (0.507 in.)
Driven Plate (warp)age	(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) (rear)	3.6 (36/10) 3.6 (36/10)
Secondary Transmission Reduction Ratio	(low) (high)	2.419 (22/23 x 27/17 x 43/27) 1.592 (43/27)
Gear Ratios	(1st) (2nd) (3rd) (4th) (5th) (reverse)	3.09 (34/11) 1.75 (28/16) 1.2 (24/20) 0.875 (21/24) 0.724 (21/29) 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) (secondary transmission) (reverse)	5.5-5.6 mm (0.217-0.220 in.) 5.5-5.6 mm (0.217-0.220 in.) 5.0-5.1 mm (0.197-0.201 in.)
Shift Fork Thickness	(#1 and #2) (secondary transmission) (reverse)	5.3-5.4 mm (0.209-0.213 in.) 5.3-5.4 mm (0.209-0.213 in.) 4.8-4.9 mm (0.189-0.193 in.)
Thermostat Valve Open- ing 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) (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*

(650 H1)

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/cm² (20-35 psi)
Cooling Fan Thermo-Switch Operating Temperature	(off→on) (on→off)	90°C (194°F) 75°C (167°F)
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*

(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 Free End Gap (min)	(1st ring) (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/cm² (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.

Table of Contents (400 - Manual Transmission)

Removing Engine/Transmission	3-11
Top-Side Components.....	3-14
Removing Top-Side Components	3-14
Left-Side Components	3-18
Removing Left-Side Components	3-18
Right-Side Components.....	3-22
Removing Right-Side Components.....	3-22
Center Crankcase Components.....	3-26
Separating Crankcase Halves.....	3-26
Disassembling Crankcase Half	3-27
Servicing Components.....	3-29
Assembling Crankcase Half.....	3-56
Joining Crankcase Halves.....	3-58
Installing Right-Side Components.....	3-59
Installing Left-Side Components	3-62
Installing Top-Side Components	3-66
Installing Engine/Transmission.....	3-72

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.

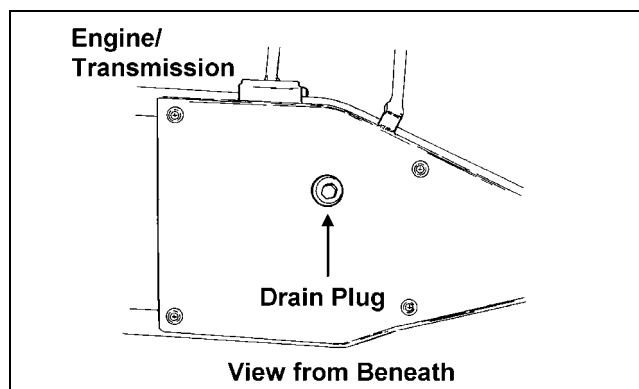
1. Remove the seat.

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.

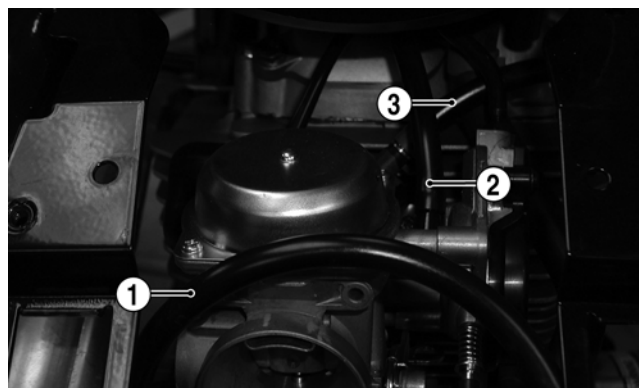
3. Remove the front and rear racks (see Section 8).
4. Remove the storage compartment and the steering post access panel (see Section 8).
5. Drain the oil from beneath the engine/transmission.



ATV-0109

3

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.

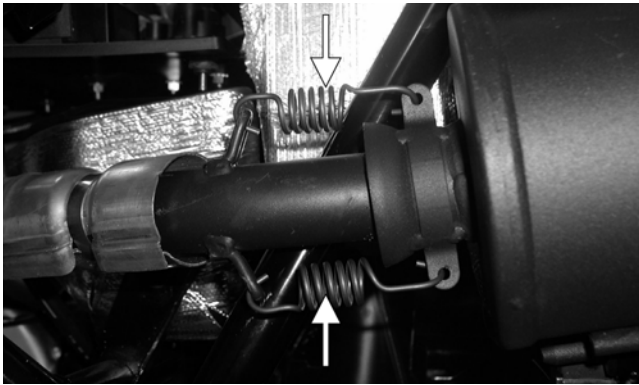


CF178A

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.

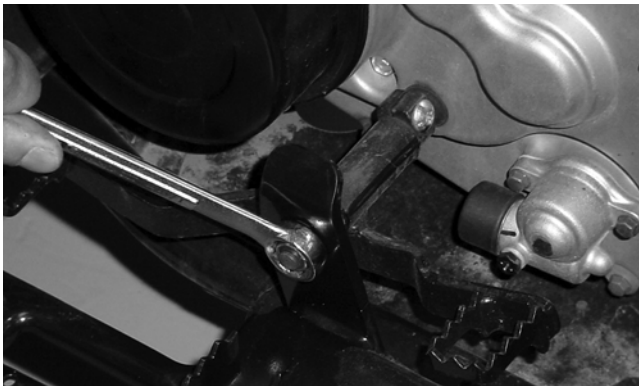
9. Remove the exhaust springs at the juncture in front of the muffler; then slide the muffler rearward off the mounting lugs.



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.

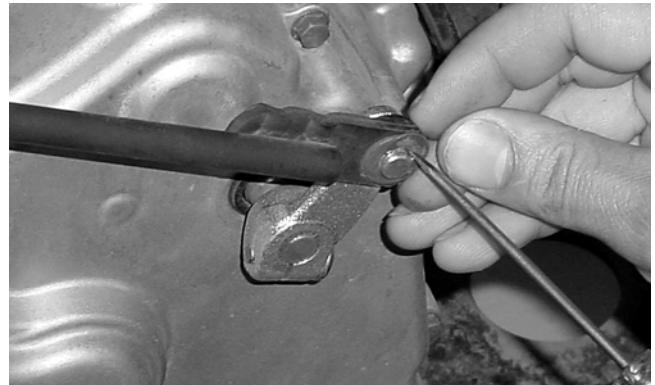


CD003



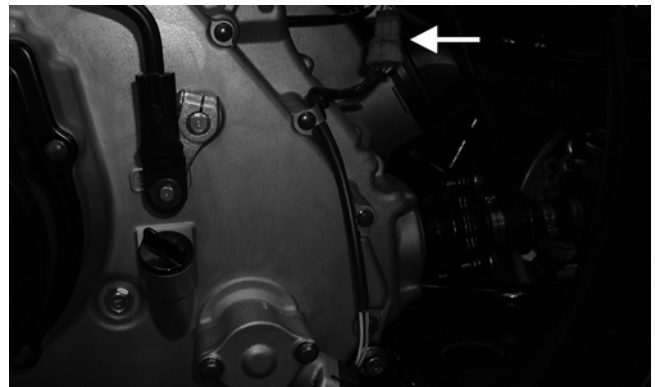
CC934

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



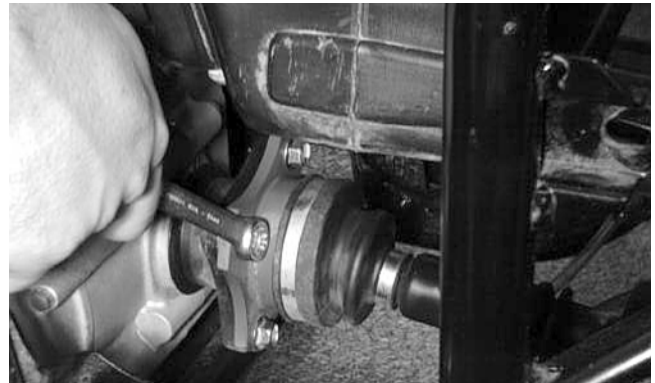
CC935

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



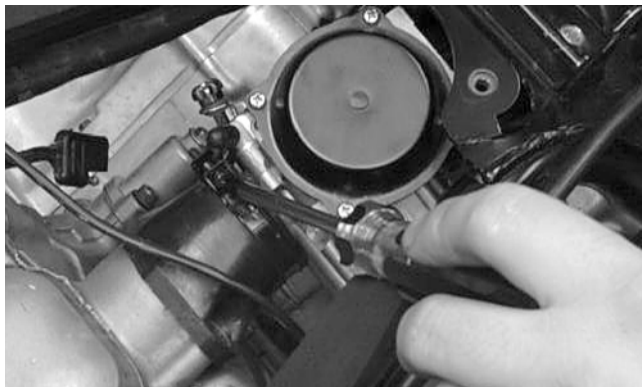
CF172A

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



CC119D

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.

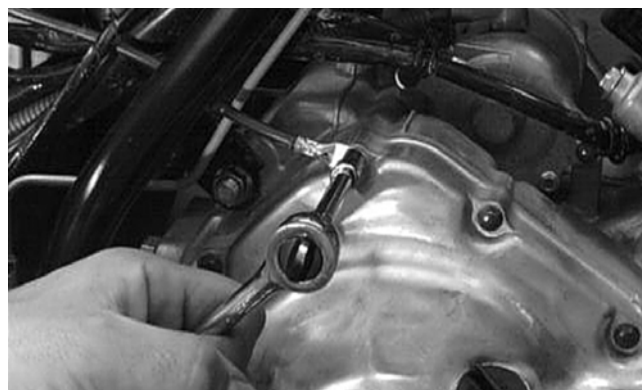
16. Remove the clamps securing the two oil cooler hoses to the engine; then disconnect the hoses.



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.



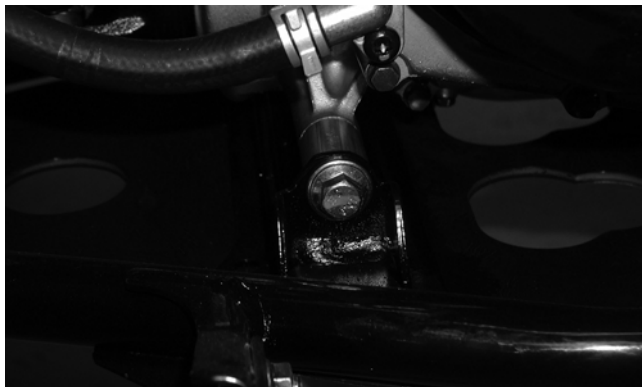
CF165



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.

3



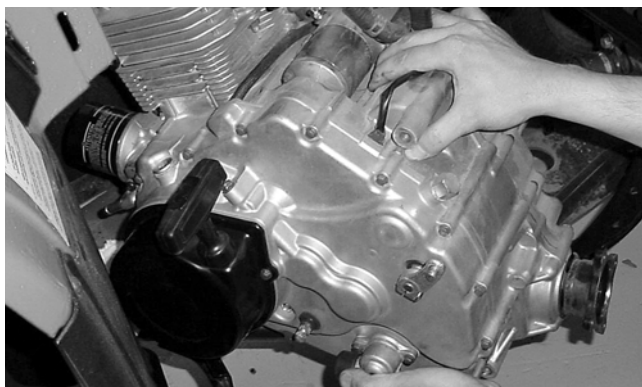
CF175

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.

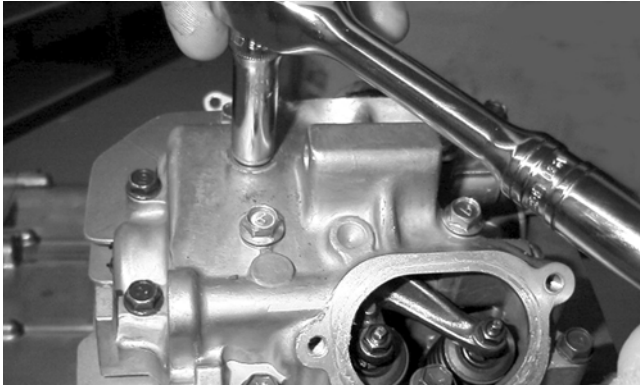
1. Remove the cap screws securing the two tappet covers. Remove the two tappet covers. Account for the O-rings.



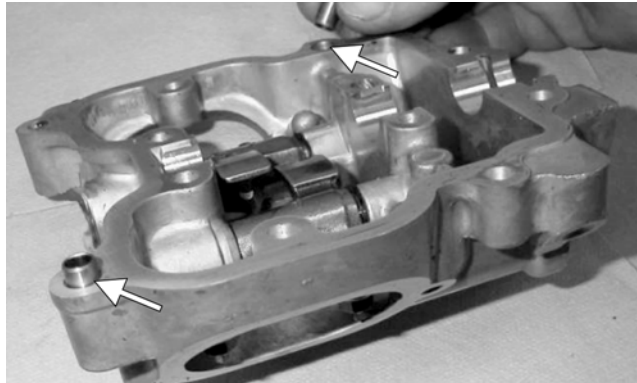
MD1264

■ **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

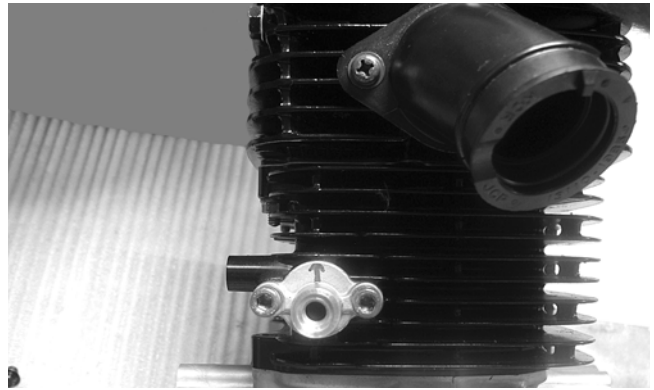


MD1354A

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

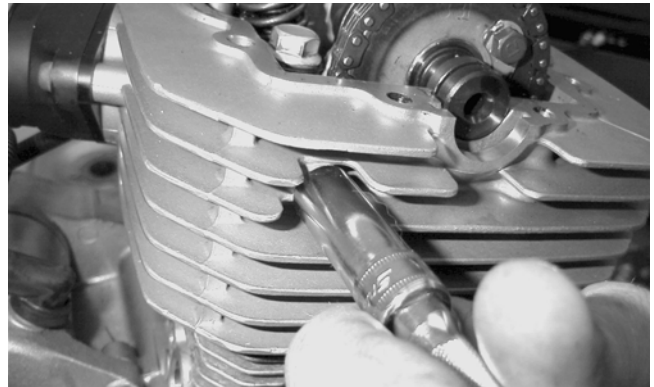


MD1245



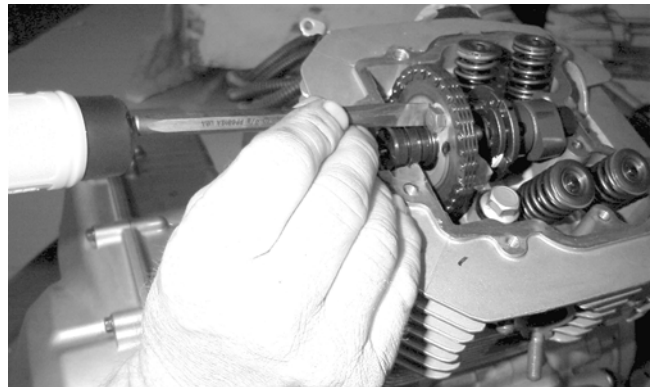
CD382

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

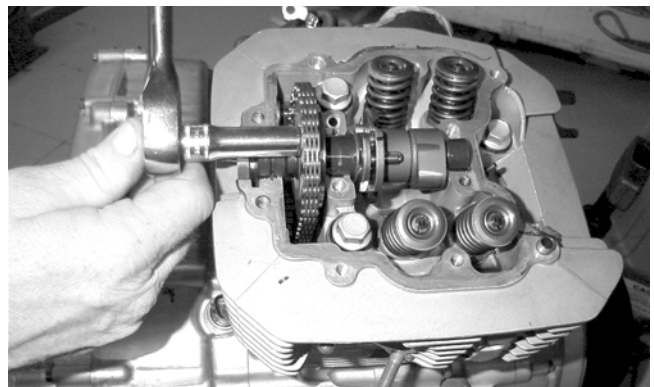


MD1251

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



MD1136



MD1137

3

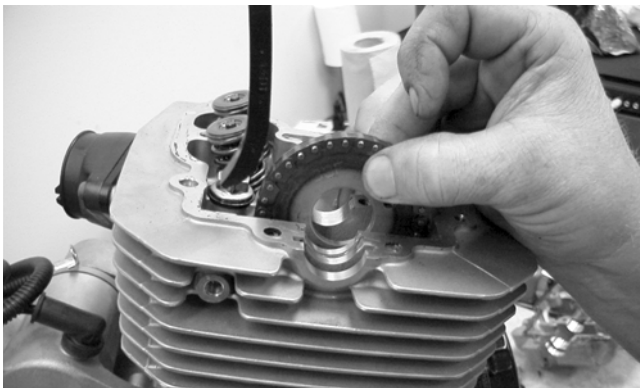
6. Using an awl, rotate the C-ring in its groove until it is out of the cylinder head; then remove the C-ring.

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



MD1131

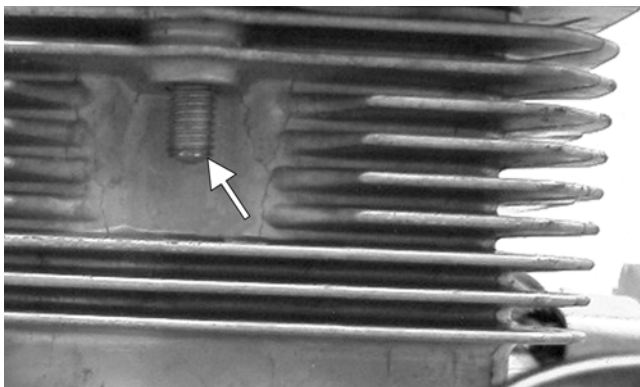
7. Note the timing marks for installing purposes; then drop the sprocket off the camshaft. While holding the chain, slide the sprocket and camshaft out of the cylinder head. Account for an alignment pin.



MD1132

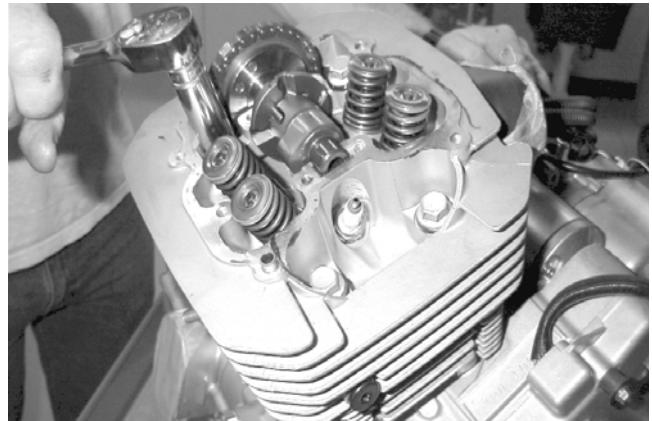
■ **NOTE:** Loop the chain over the cylinder and secure it with a wire to keep it from falling into the crankcase.

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.



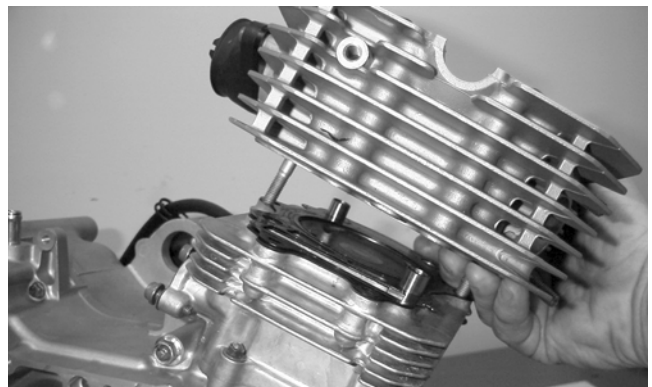
MC1192

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.



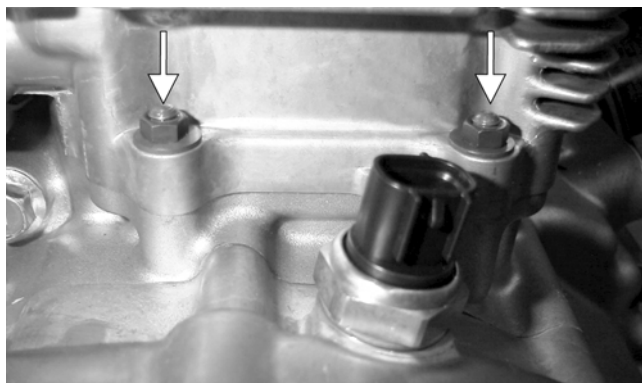
MD1173

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.



MD1214

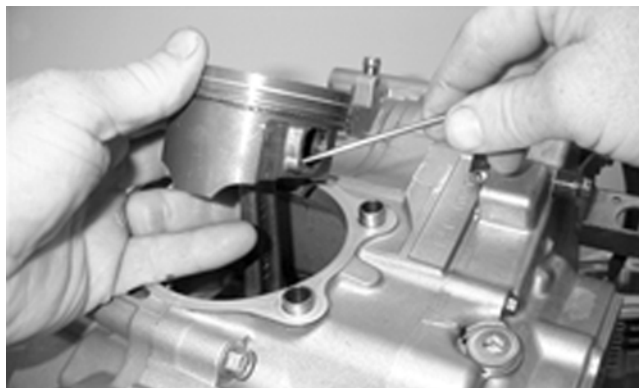
👉 AT THIS POINT

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.

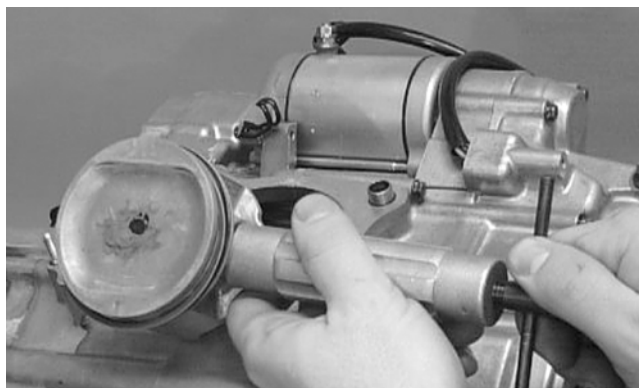
14. Using an awl, remove one piston-pin circlip. Take care not to drop it into the crankcase.



MD1213

15. Using 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.

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.



CC942

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.



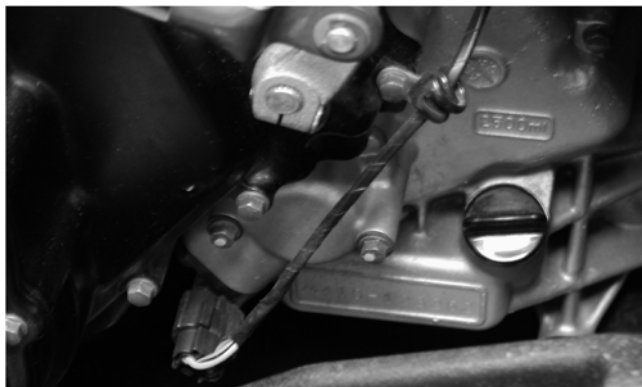
CC943

4. Remove the gear shift stopper (located above the hi/low shift shaft). Account for the washer, spring, and stopper.



CC944

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

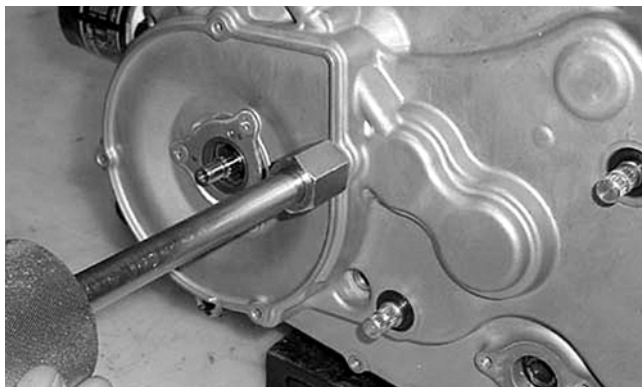


CF109

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.

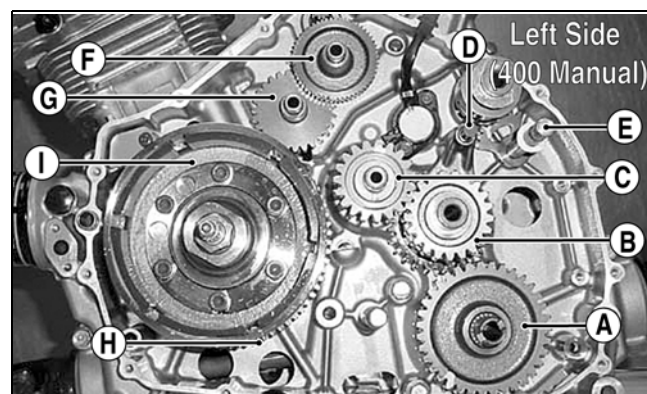
B. Rotor/Flywheel

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.



KEY

- | | |
|------------------------|---------------------------------|
| A. Driven Gear | F. Starter Idler Gear #1 |
| B. Drive Gears #1 & #2 | G. Starter Idler Gear #2 |
| C. Idler Gear | H. Starter Clutch Gear Assembly |
| D. Shift Fork with Pin | I. Rotor/Flywheel |
| E. Shift Shaft | |

CC948B

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



CC514D

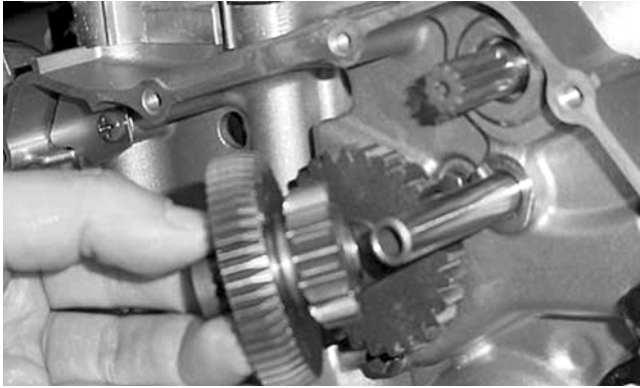
7. Using the Magneto Rotor Remover (p/n 0444-075), remove the rotor/flywheel assembly from the crankshaft. Account for the key; then remove the starter clutch gear assembly (H) w/washer.

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

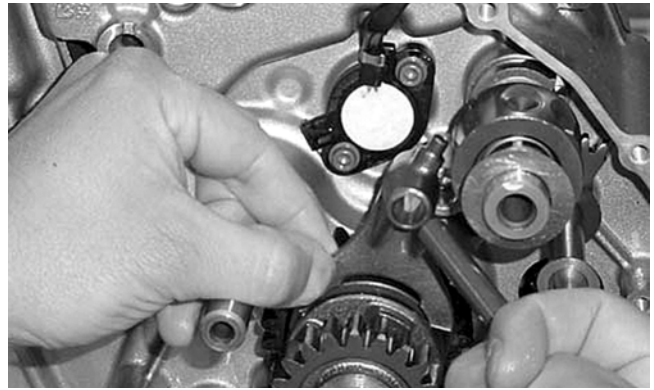


CC949

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

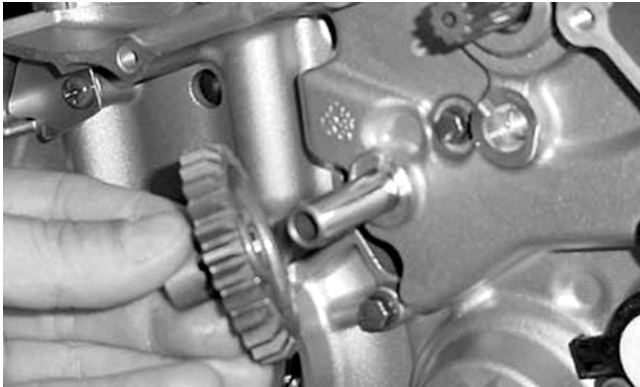


CC950

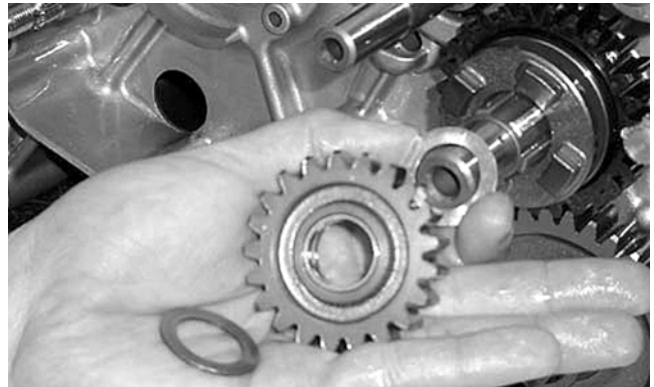


CC953

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

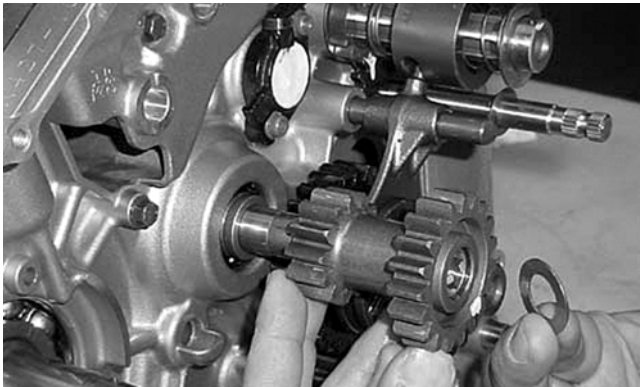


CC951



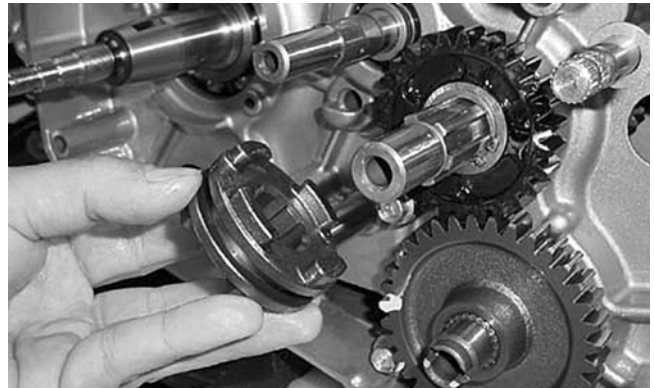
CC954

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



CC952

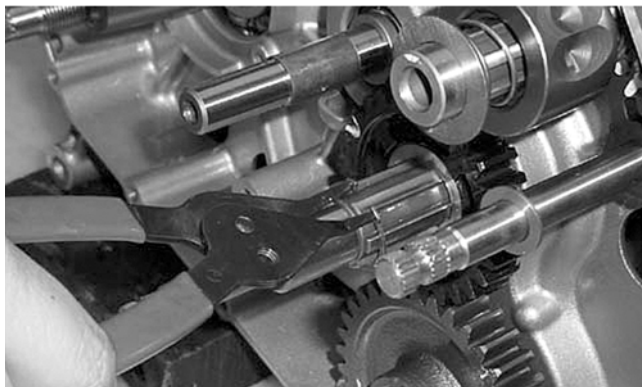
12. Remove the sliding dog from the driveshaft.



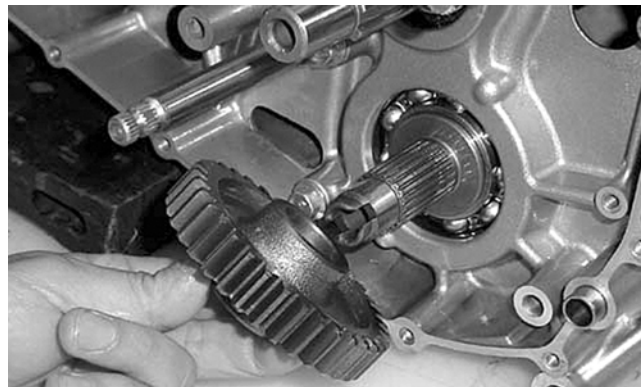
CC966

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

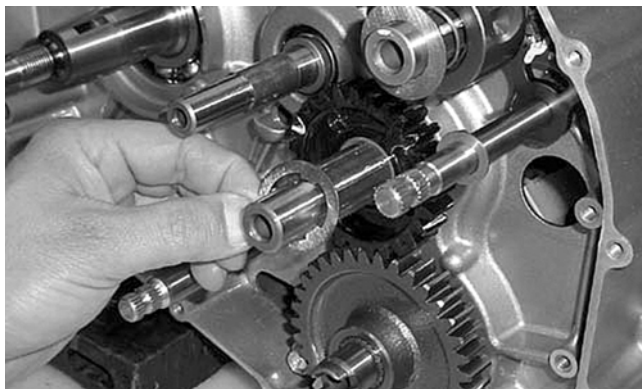
13. Remove the circlip, washer, and drive gear #1 (B) from the driveshaft; then account for the bushing and the spacer.



CC955



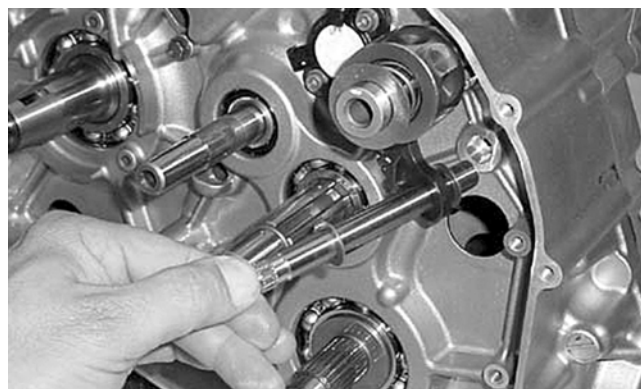
CC959



CC956

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

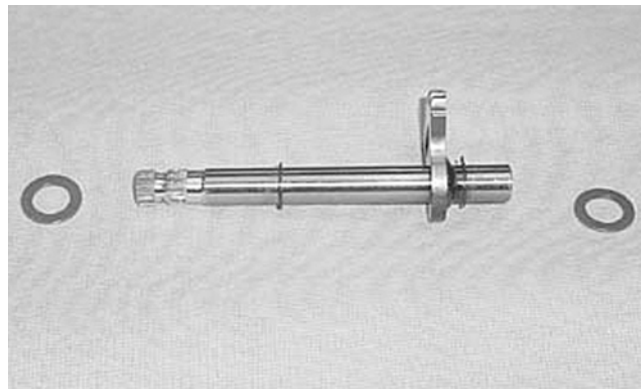
15. Remove the gear shift shaft. Account for two shims.



CC960



CD552



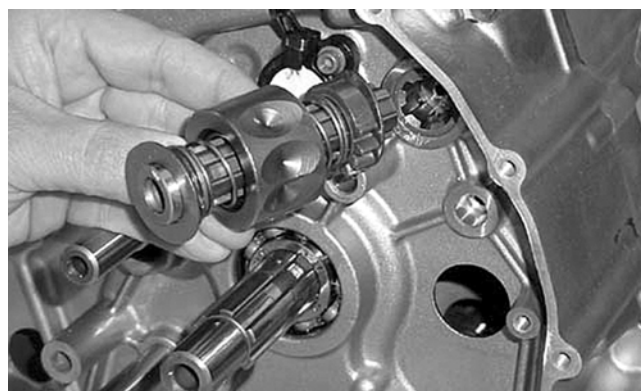
CC961



CC958

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

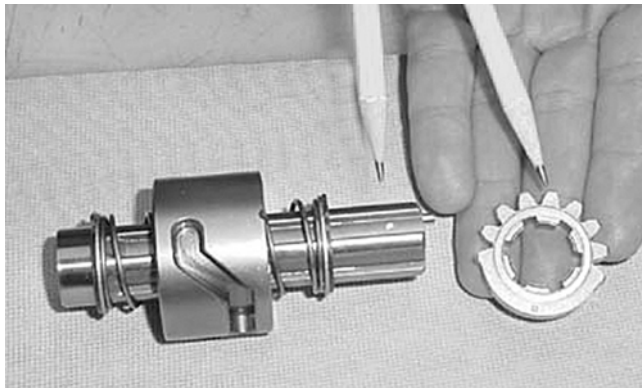
16. Remove the secondary stopper camshaft assembly. Account for the two shims.



CC962

3

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

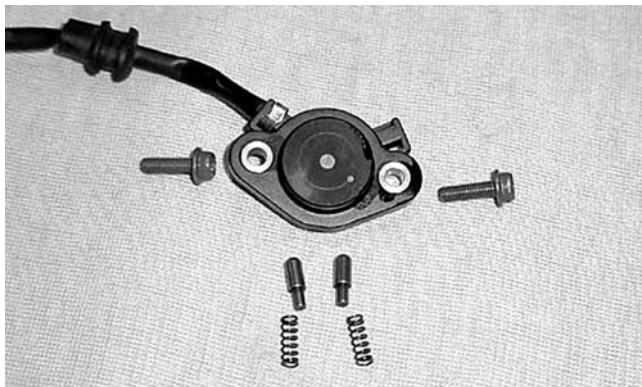


CC963

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

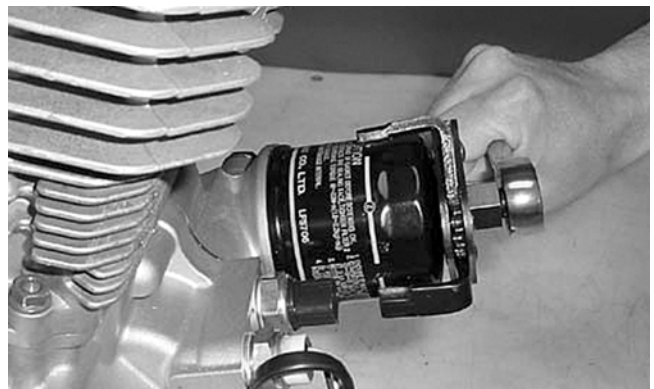
To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■ **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.



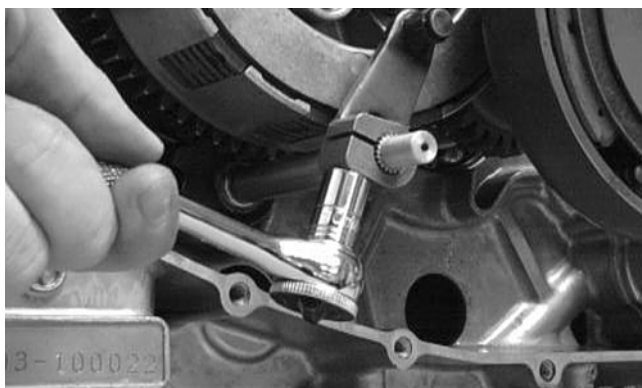
CC070D

B. Primary Clutch Shoe
C. Primary Clutch
D. Centrifugal Clutch Housing

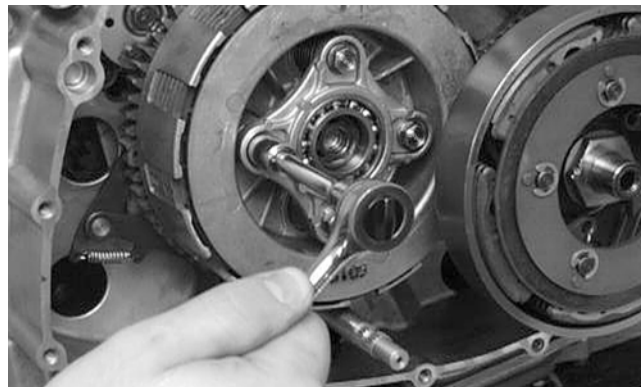
■ **NOTE:** Steps 1-2 in the preceding sub-section must precede this procedure.

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.

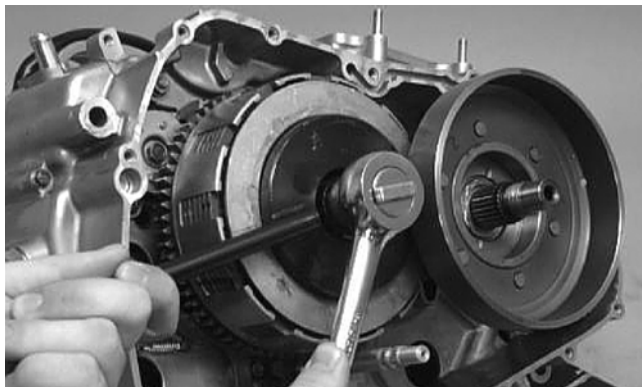
6. Remove the primary drive one-way clutch from the centrifugal clutch housing. Note the word OUTSIDE stamped on the clutch for assembly purposes.



CF043

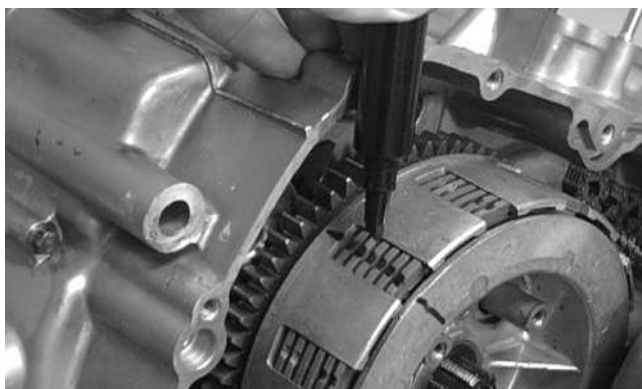
7. Using the Clutch Sleeve Hub Holder (p/n 0444-007) to hold the clutch sleeve hub, remove the nut and washer.

3



CC076D

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

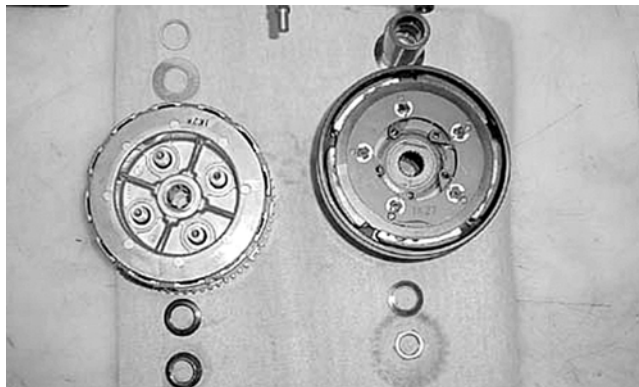


CC077D

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.

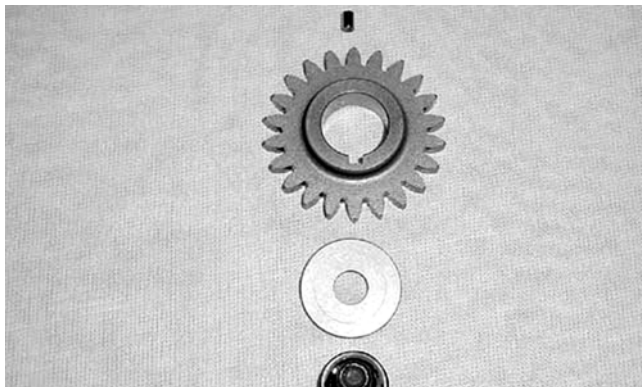
■ **NOTE:** Note that the bushings on the crankshaft are directional and that the oil holes align for installing purposes.

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.

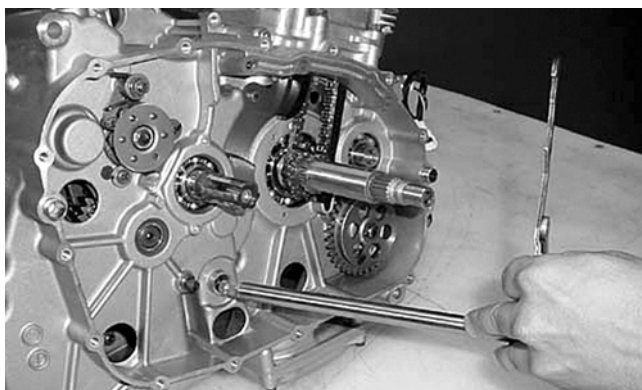


CC971



CC972

11. Remove the gear shift shaft from the crankcase.



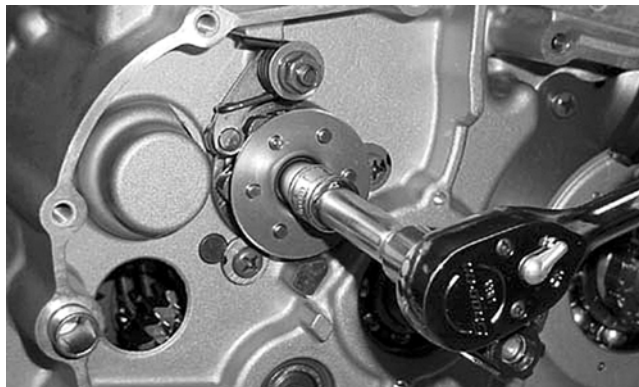
CC973

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.



CC975

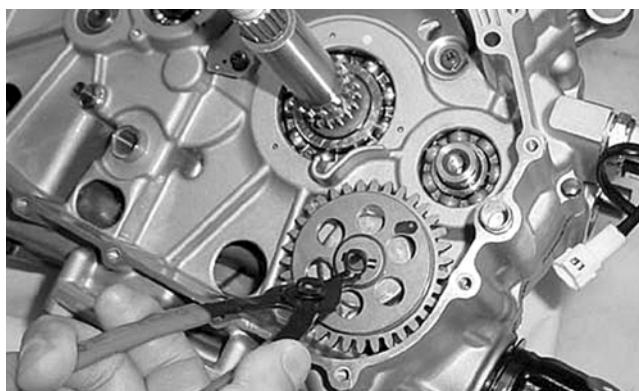
⚠ CAUTION

If servicing of the engine/transmission is due to a lubrication-related problem, replace the oil pump.

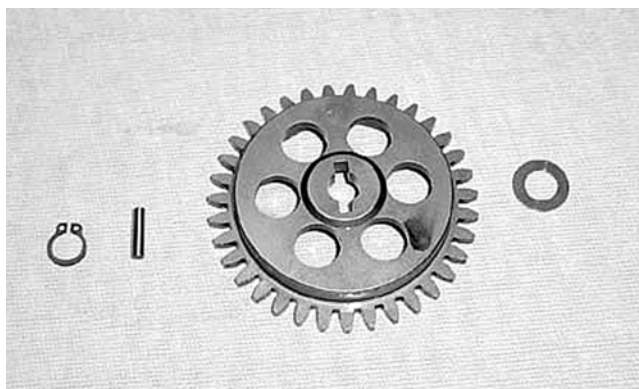
■ **NOTE:** For general servicing, it is advisable to disassemble, clean, and inspect the oil pump. If any wear or damage is suspected, replace the oil pump.

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.

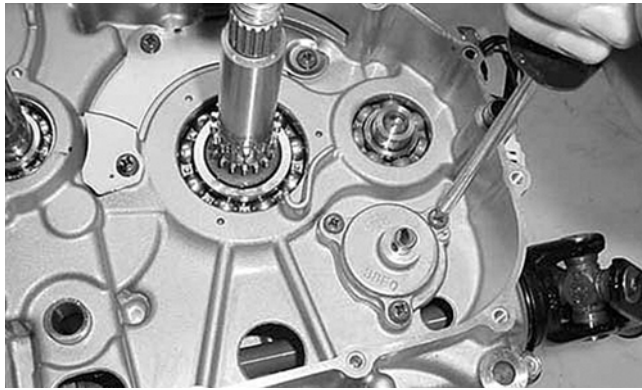


CC976



CC977

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



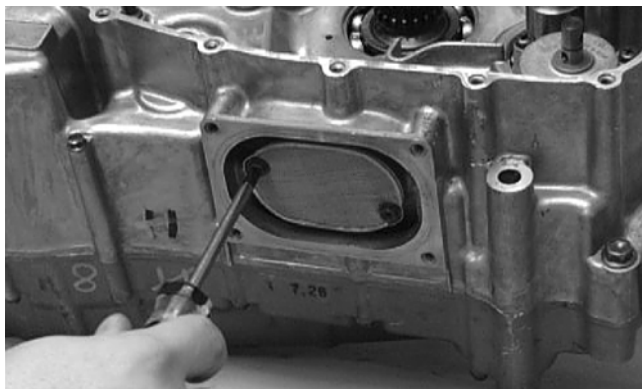
CC978

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.

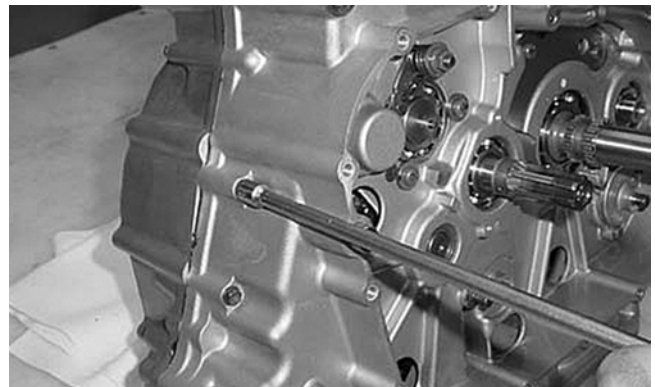
Center Crankcase Components

■ **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.

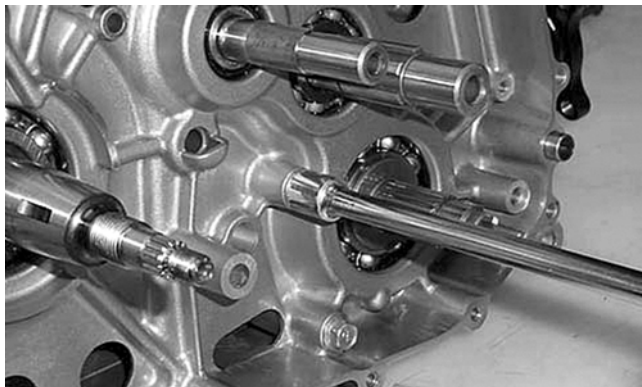


CC979



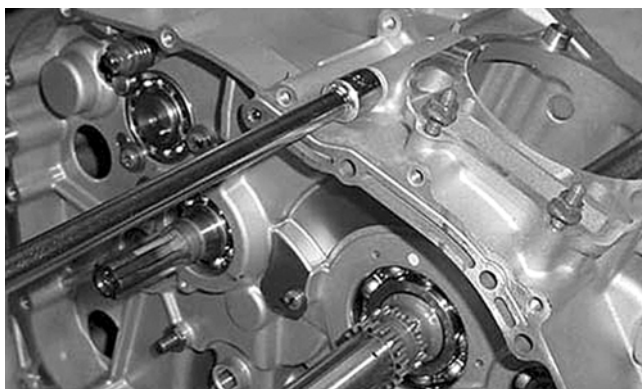
CC980

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

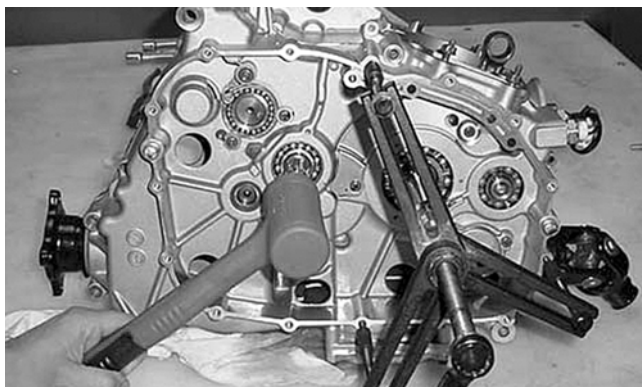
3. Remove the four right-side 8 mm cap screws securing the crankcase halves.



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

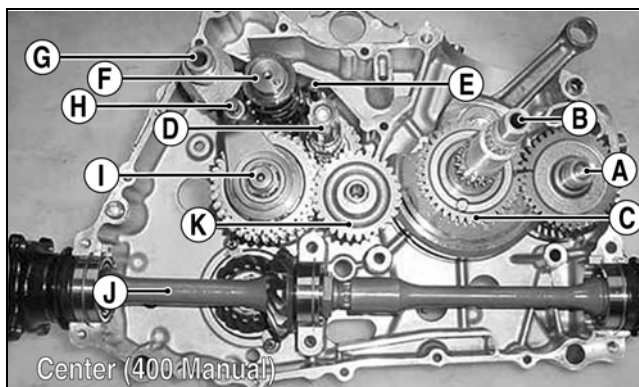


CC984

Disassembling Crankcase Half

■ **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**.

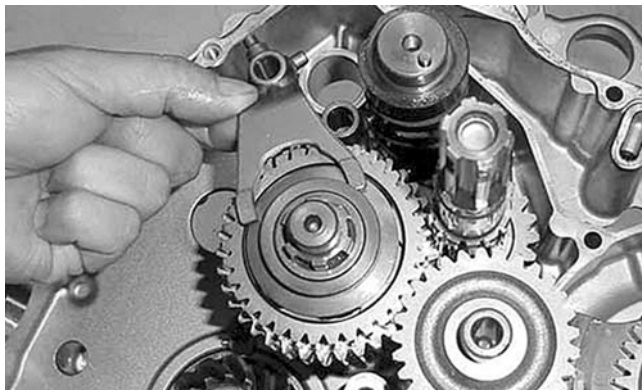
3


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

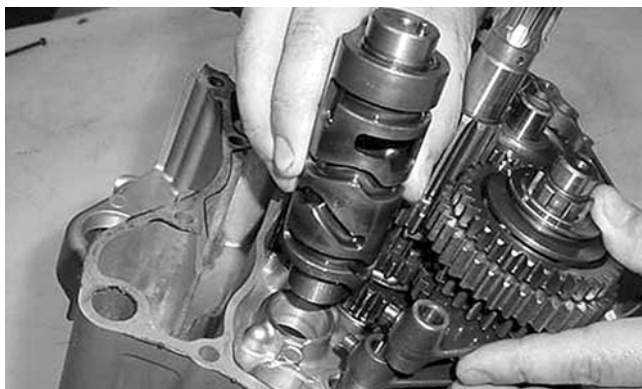
CC985B

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.



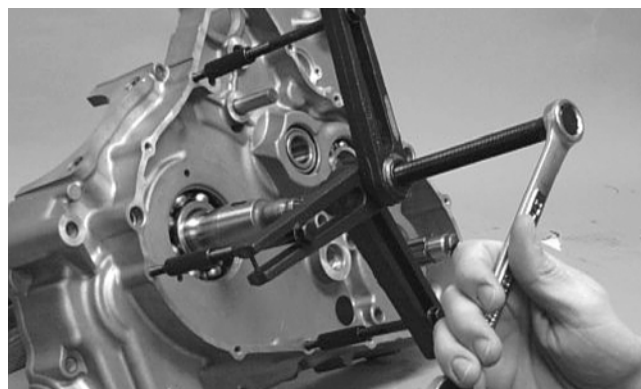
CD832A

■ **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

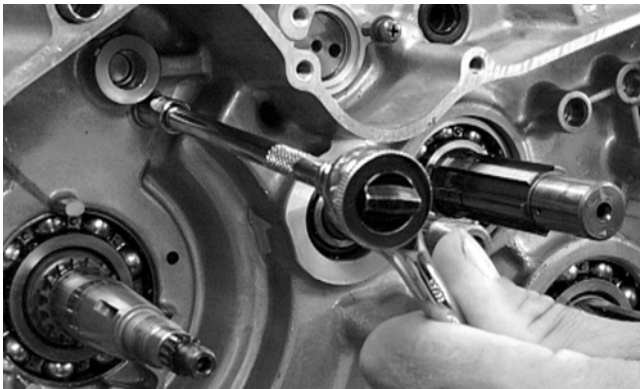
👉 AT THIS POINT

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.

Servicing Top-Side Components	3-29
Valve Assembly	3-29
Piston Assembly	3-32
Cylinder/Cylinder Head Assembly	3-34
Servicing Left-Side Components	3-37
Recoil Starter	3-37
Measuring Shift Fork (Thickness)	3-40
Measuring Shift Fork Groove (Width)	3-41
Measuring Shift Fork To Groove (Side Clearance)	3-41
Servicing Right-Side Components	3-41
Primary Clutch Assembly	3-41
Inspecting Oil Pump	3-44
Servicing Center Crankcase Components	3-44
Secondary Gears	3-44
Crankshaft Assembly	3-46
Driveshaft	3-47
Countershaft	3-53

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.

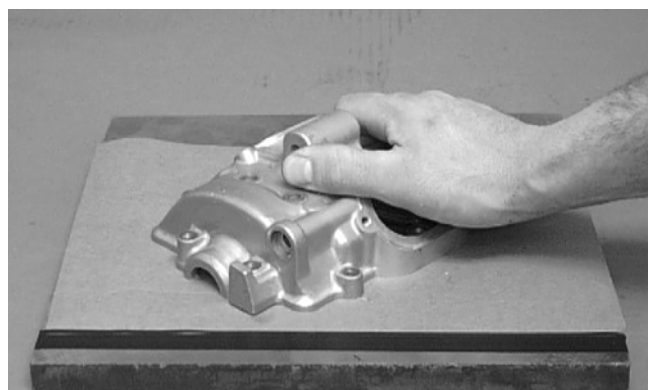
Cleaning/Inspecting Valve Cover

■ **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

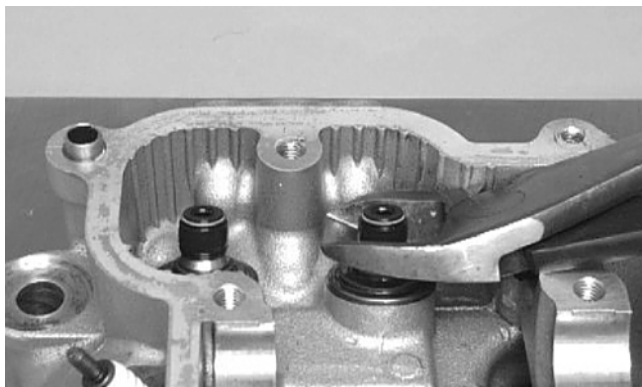
■ **NOTE:** Keep all valves and valve components as a set. Note the original location of each valve set for use during installation. Return each valve set to its original location during installation.

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

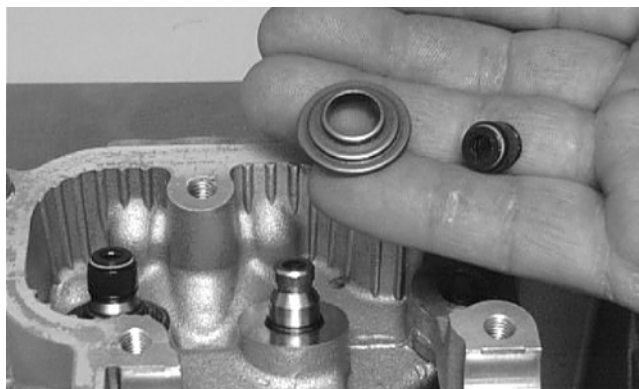


CC994

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



CC134D



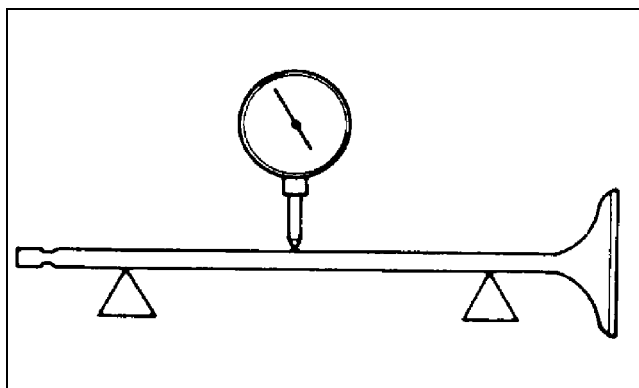
CC136D

■ **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

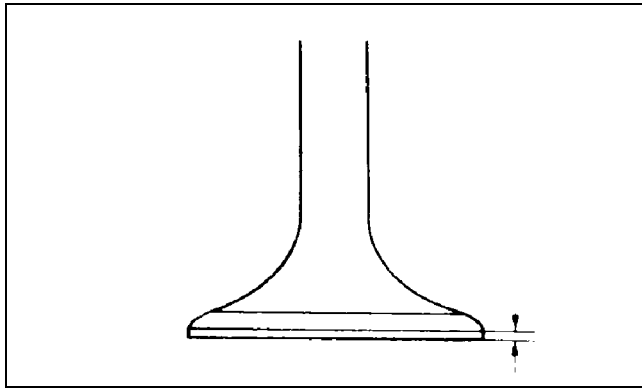
2. Maximum runout must not exceed specifications.

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.

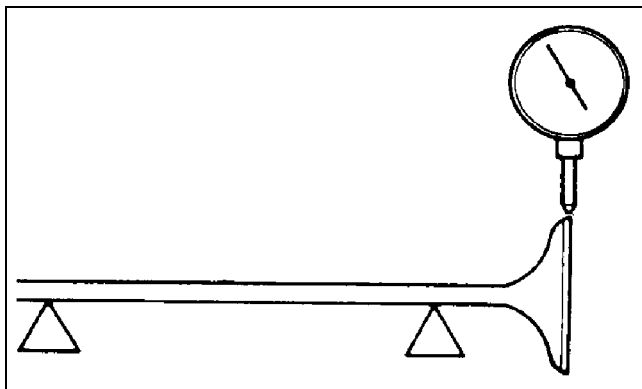


ATV-1004

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.

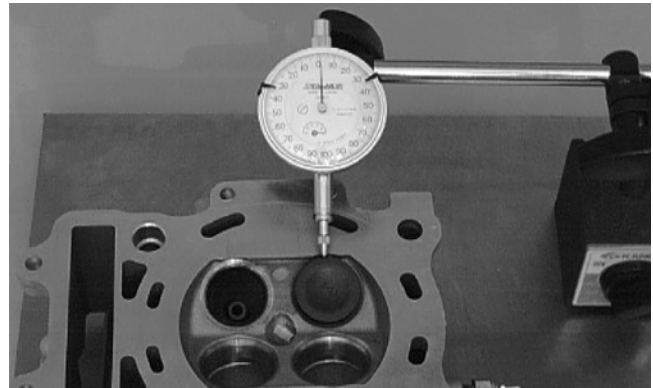


ATV1082A

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 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)

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

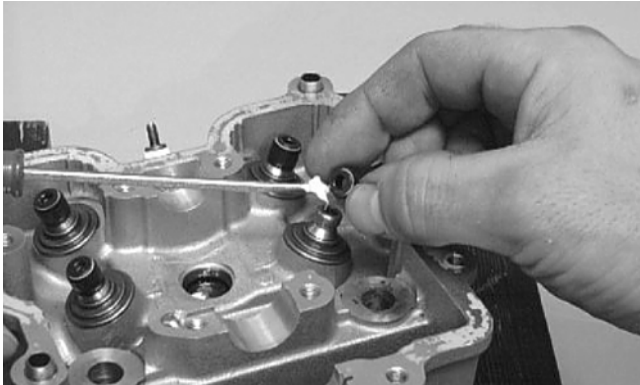
Measuring Rocker Arm Shaft (Outside Diameter)

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

2. Acceptable outside diameter range must be within specifications.

Installing Valves

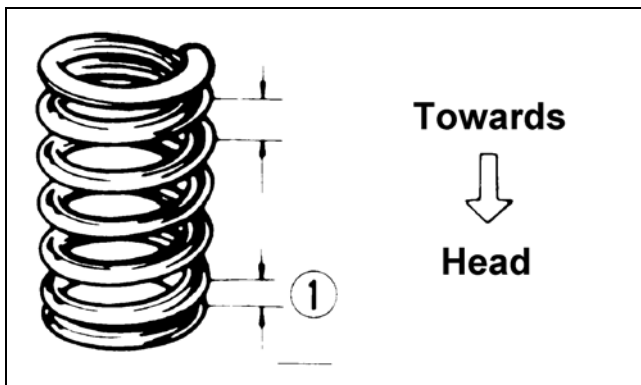
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



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.



ATV-1011A

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



CC994

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

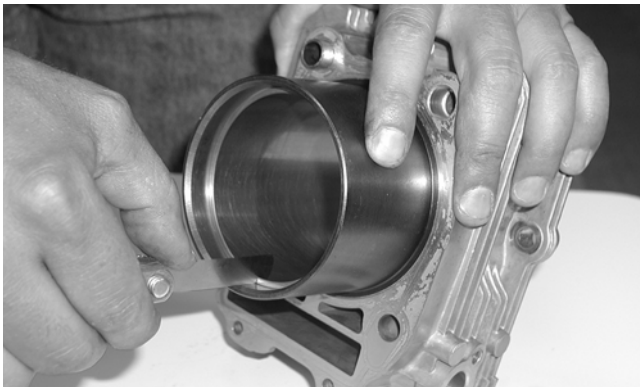
1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

⚠ 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)

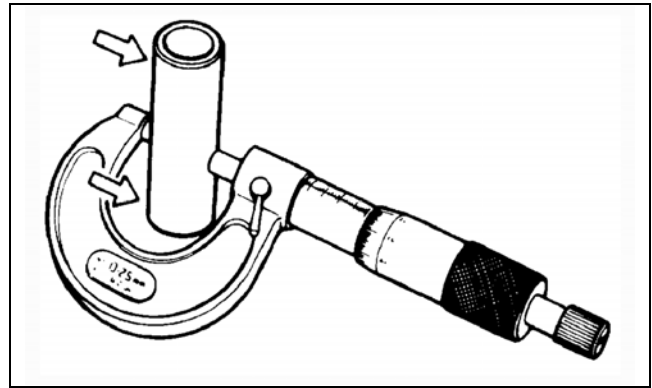
1. Place each piston ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must be within specifications.



CC995

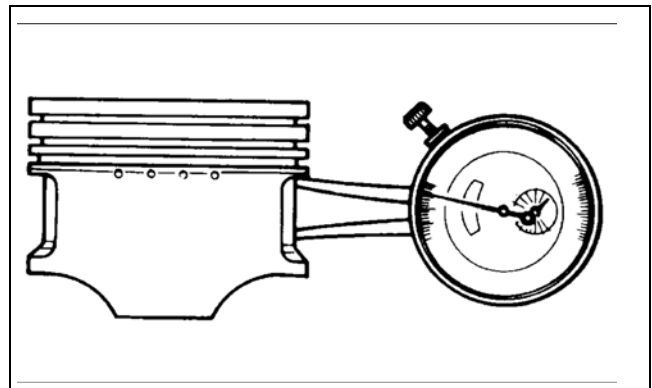
Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

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

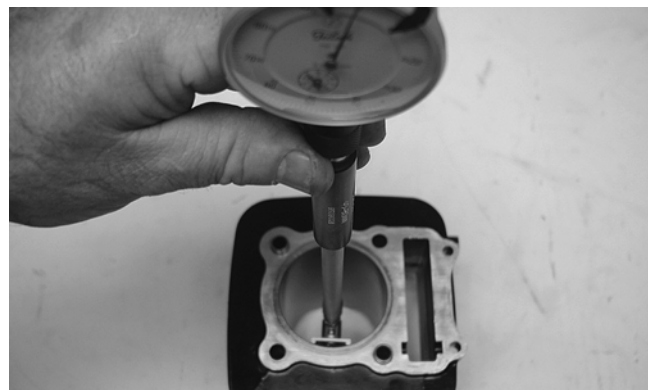
2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



ATV-1069

Measuring Piston Skirt/ Cylinder Clearance

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



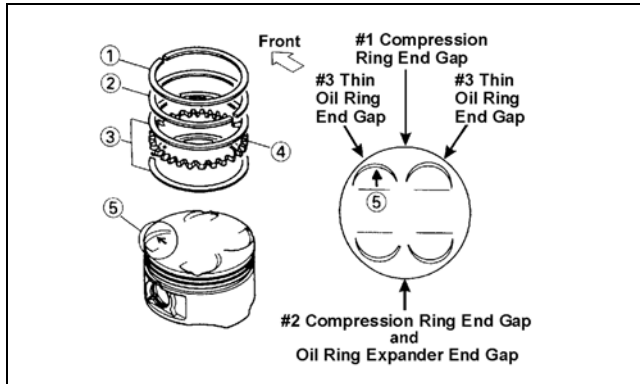
CD325

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.

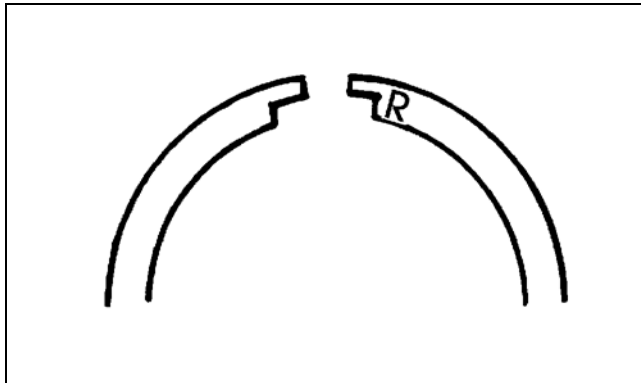
■ **NOTE:** Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.



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

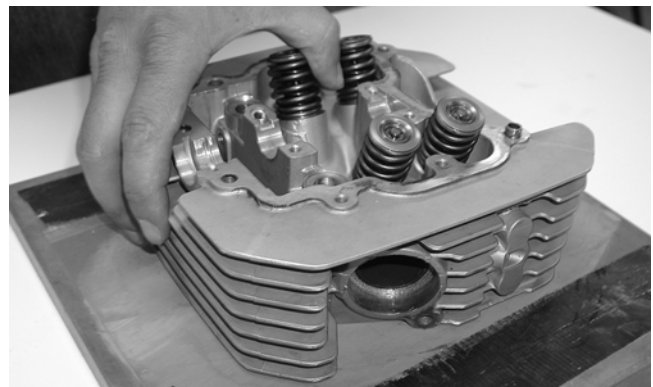
⚠ CAUTION

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

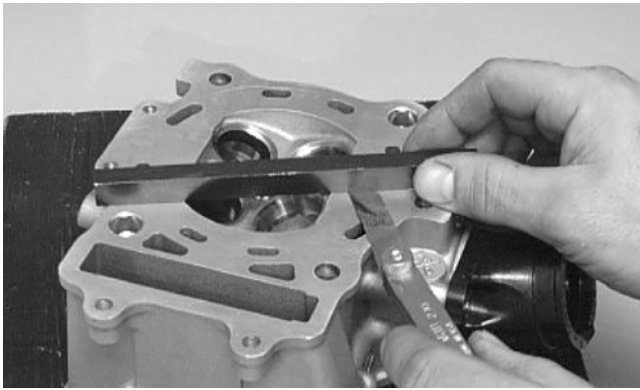
Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.



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.



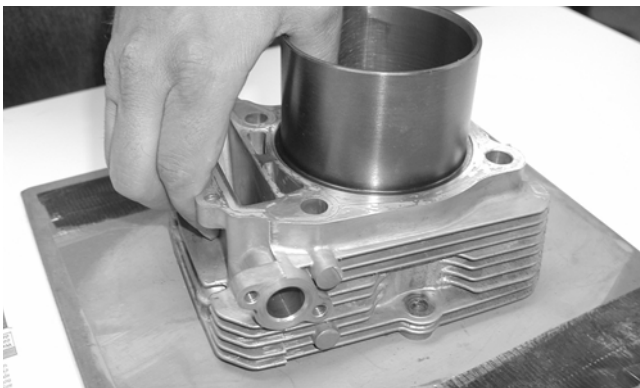
CC141D

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.



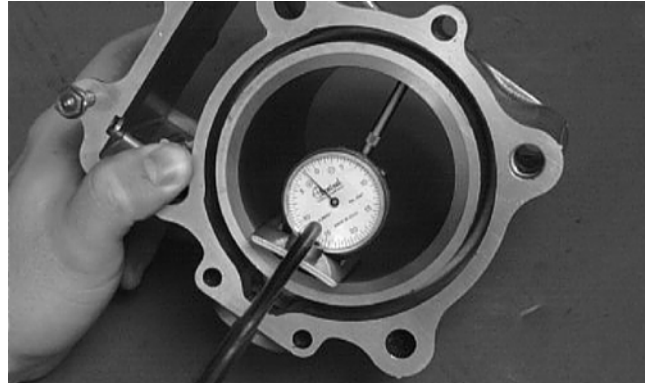
CC997

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

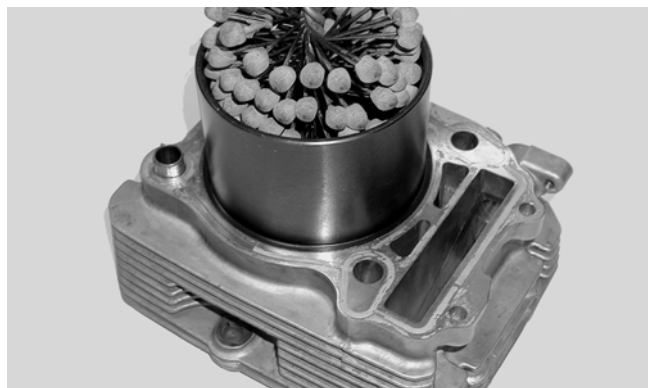
1. Using a slide gauge and a dial indicator or a snap gauge, measure the cylinder bore diameter in three locations from top to bottom and again from top to bottom at 90° from the first measurements for a total of six measurements. The trueness (out-of-roundness) is the difference between the highest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



CC127D

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.

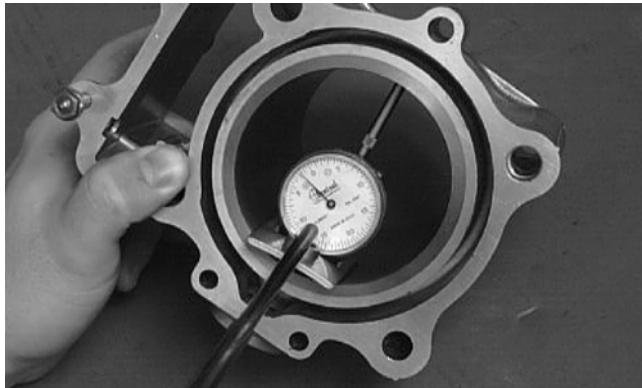
■ **NOTE:** To produce the proper 60° cross-hatch pattern, use a low RPM drill (600 RPM) at the rate of 30 strokes per minute. If honing oil is not available, use a lightweight petroleum-based oil. Thoroughly clean cylinder after honing using soap and hot water. Dry with compressed air; then immediately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

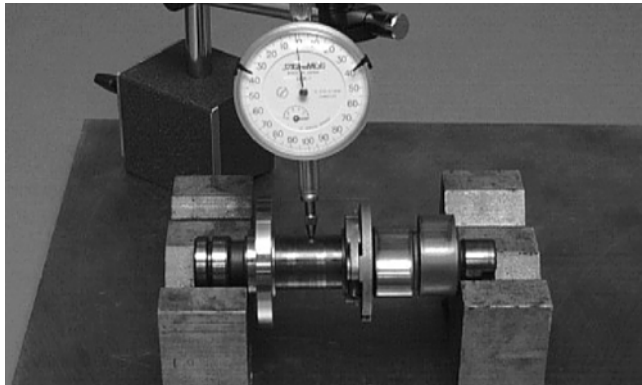


CC127D

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.

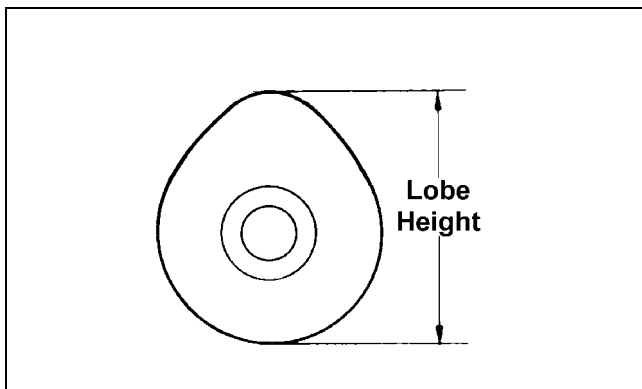


CC283D

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

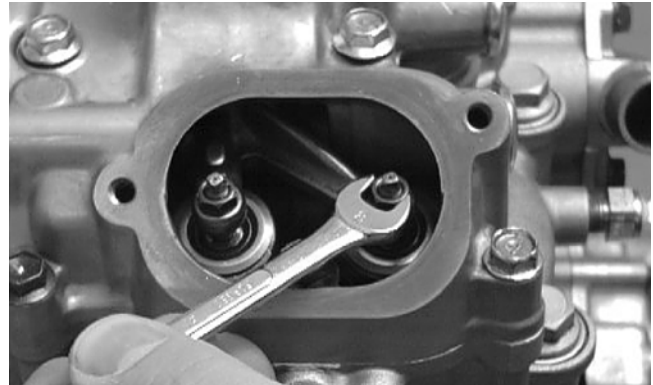
2. The lobe heights must not exceed minimum specifications.

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.

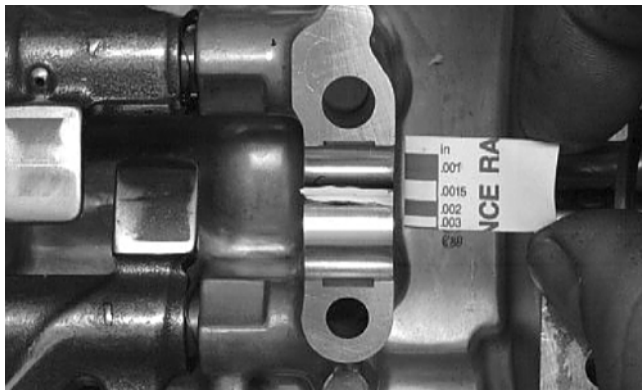
■ **NOTE:** Do not rotate the camshaft when measuring clearance.

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



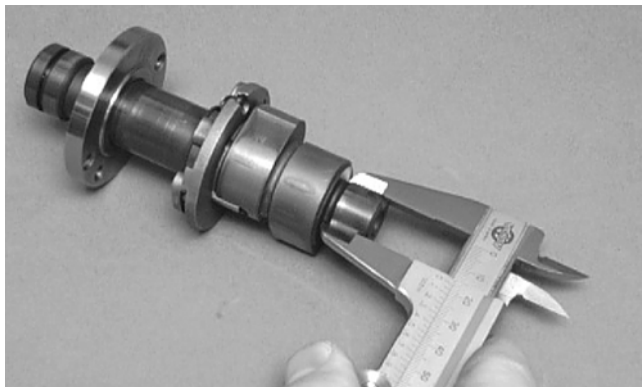
MD1261

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.

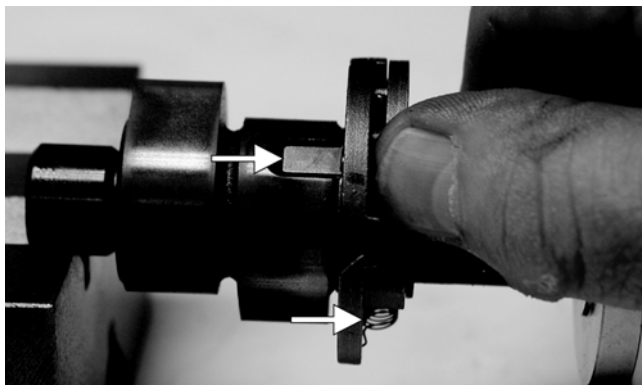


CC287D

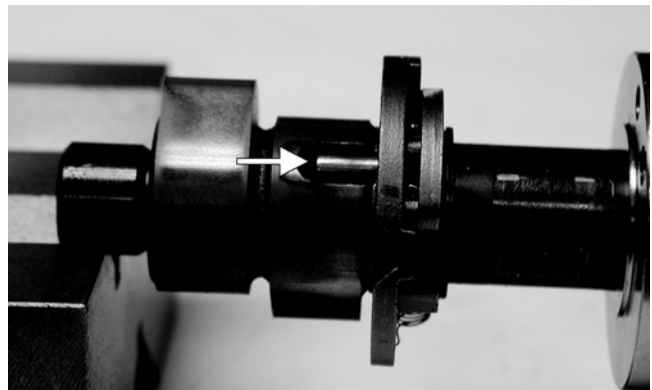
■ **NOTE:** If the journals are worn, replace the camshaft; then measure the clearance again. If it is still out of tolerance, replace the cylinder head.

Inspecting Camshaft Spring/Drive Pin

1. Inspect the spring and drive pin for damage.



CF061A



CF060A

2. If damaged, the camshaft must be replaced.

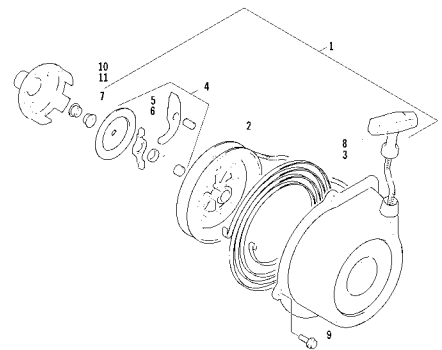
Servicing Left-Side Components

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

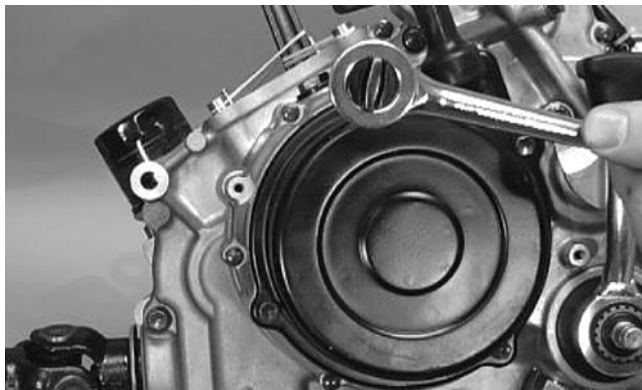


WARNING

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

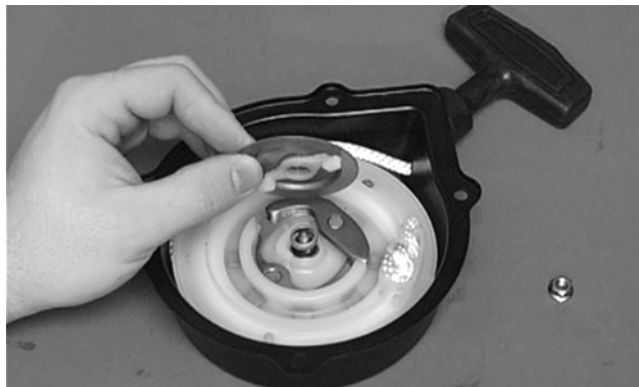
During the disassembly procedure, make sure all spring tension is released before continuing.

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.



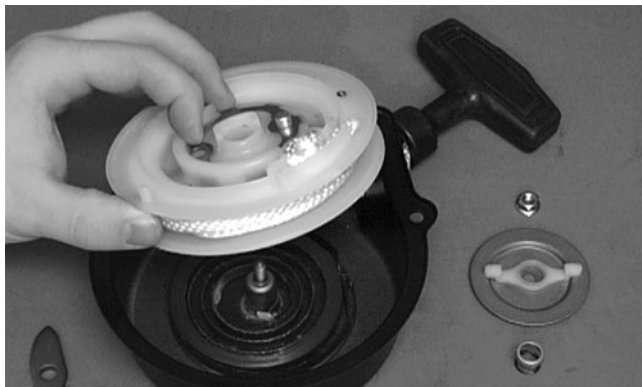
B603D

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.

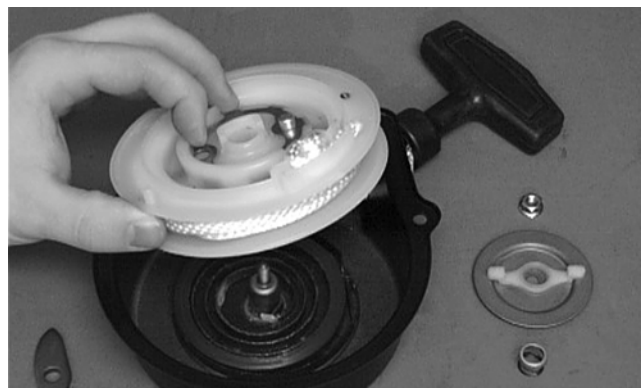
■ **NOTE:** The spiral spring must seat evenly in the recoil case.



B606D

3

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.



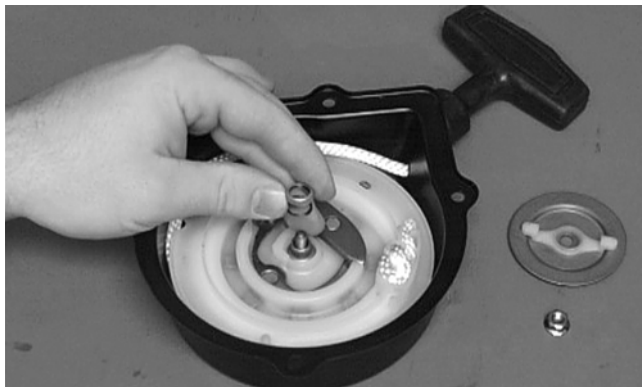
B605D

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



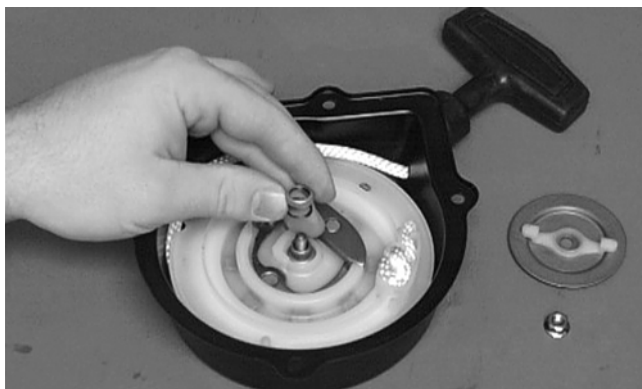
B604D

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.

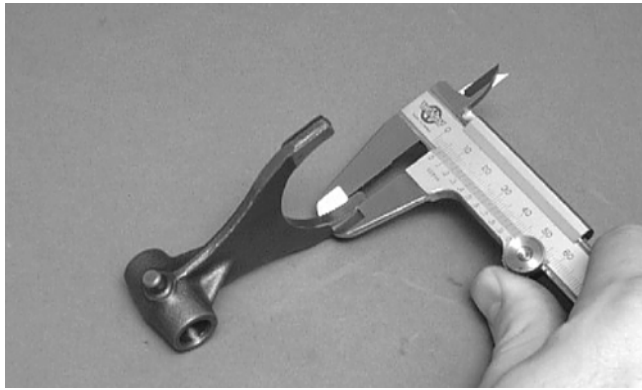


CC039D

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.

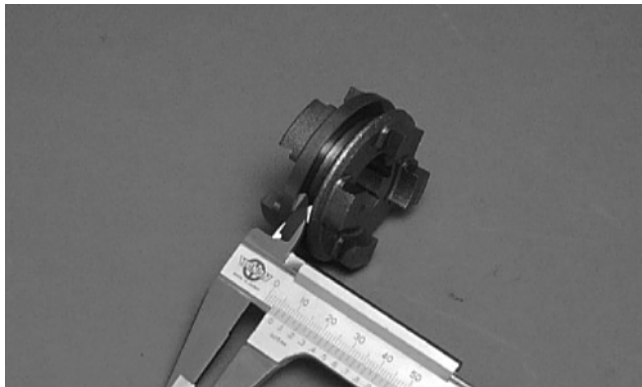


CC296D

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

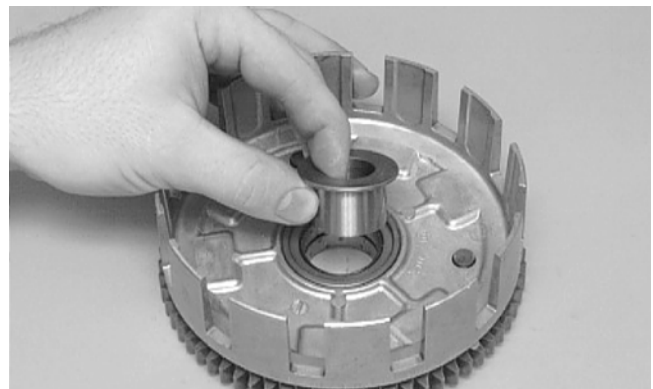
■ **NOTE:** Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.

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.

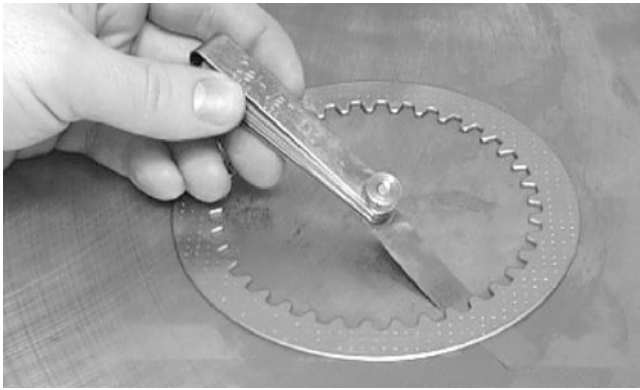
3



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.

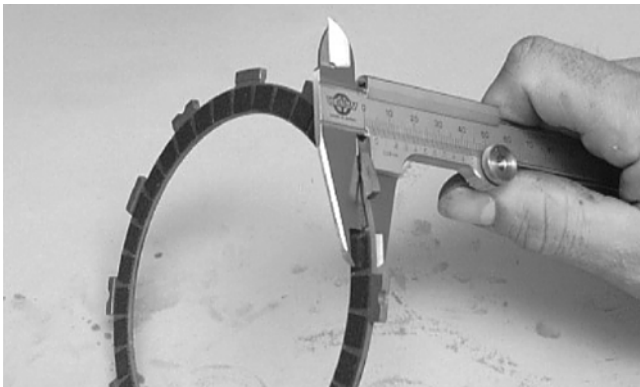


CC245D

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.

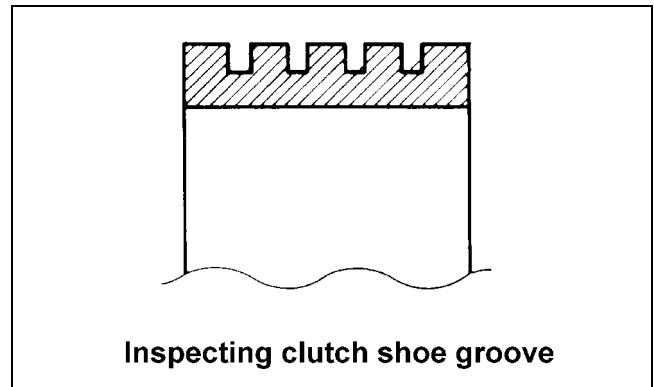
Inspecting Centrifugal Clutch Shoe

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.



ATV1014

Inspecting Centrifugal Clutch Housing

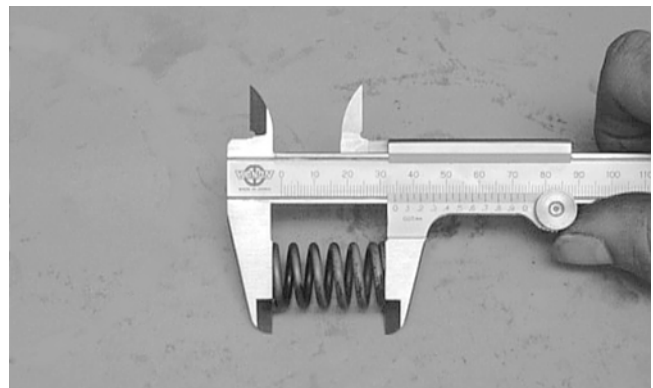
1. Inspect the clutch housing for burns, marks, scuffs, cracks, scratches, or uneven wear.
2. If the housing is damaged in any way, the housing must be replaced.

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

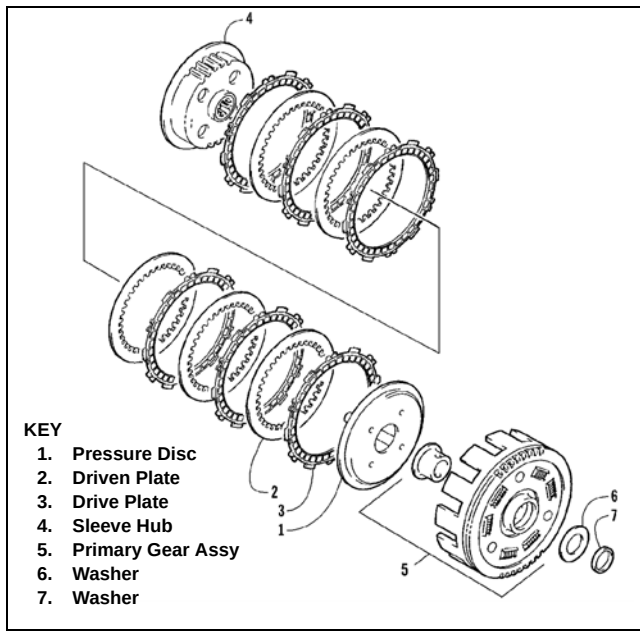
1. Using a calipers, measure the overall free length of the clutch spring.



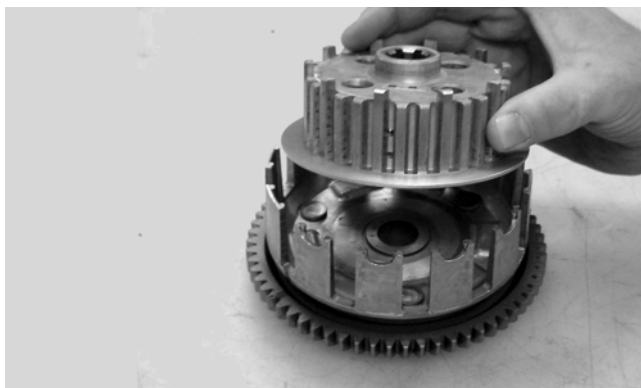
CC247D

2. Overall length must not exceed minimum specifications.

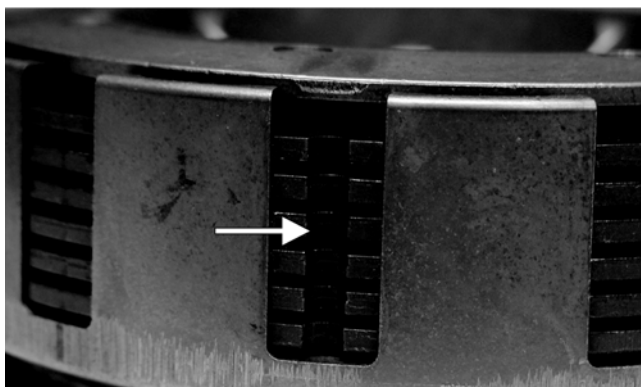
Assembling Primary Clutch



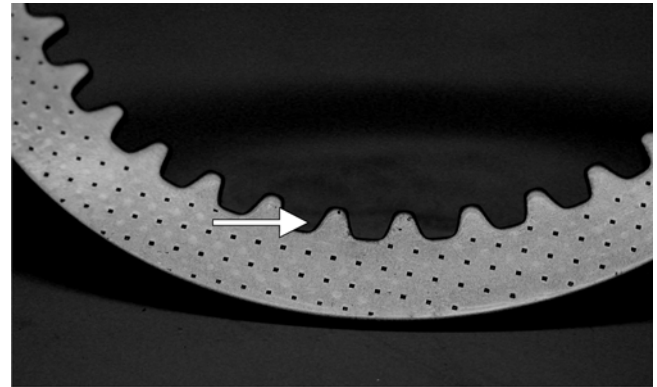
1. Place the clutch hub upside down into the primary gear assembly.



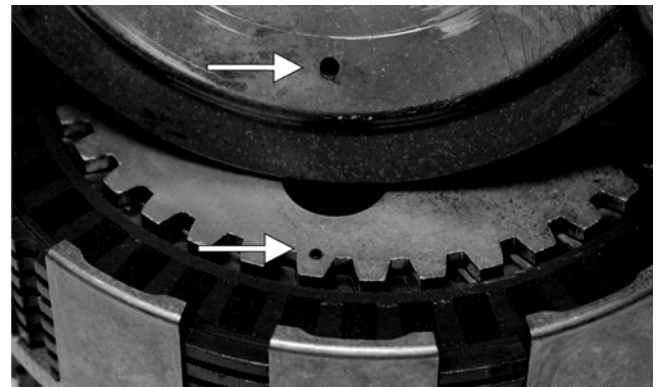
2. Alternately install the drive plates and driven plates onto the hub (starting and ending with a drive plate) making sure the tabs with the notches are all in line with each other.



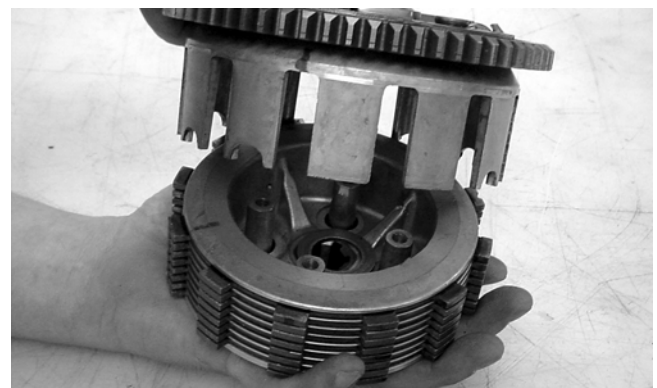
■ **NOTE:** When installing the driven plates for ease of installation, make sure they are placed onto the hub with the rounded side of the plates directed down.



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

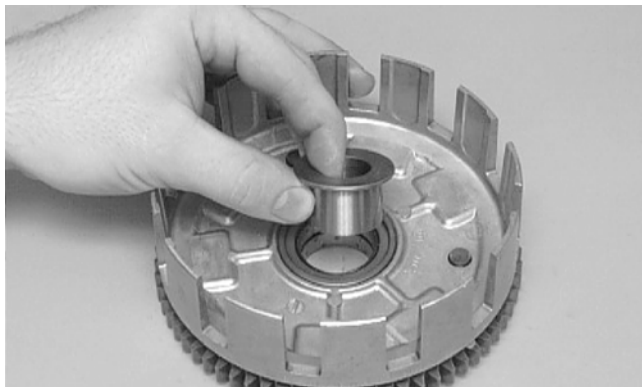


4. Place the primary gear assembly w/clutch hub assembly in one hand, place the other hand on top of the clutch hub assembly, and flip the assembly over; then lift the primary gear assembly off the clutch hub assembly being careful not to disturb the drive plate notched tab orientation.



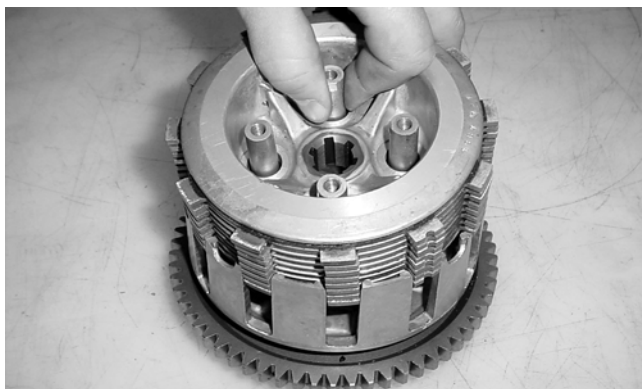
5. Place the primary gear assembly on a clean, flat surface; then install the primary washer into the assembly.

3



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

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.

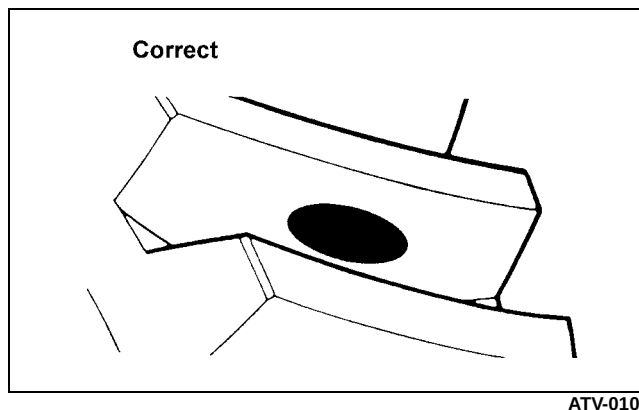
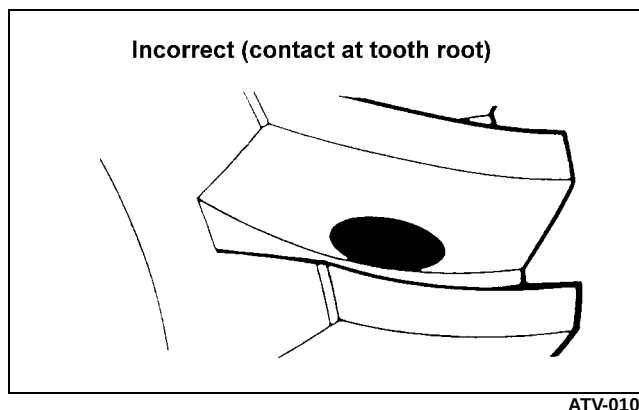
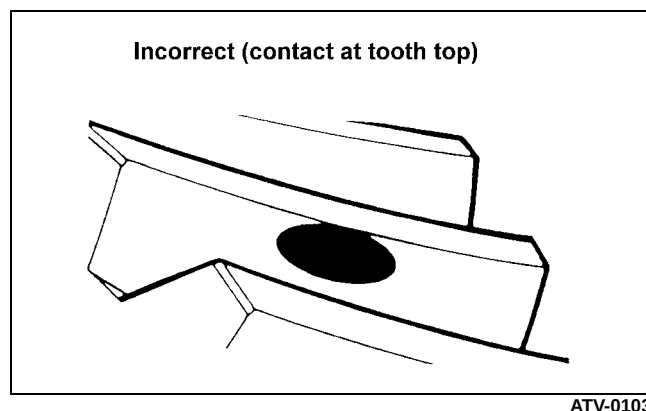
■ **NOTE:** Continue to remove, measure, and install until backlash measurement is within tolerance. Note the following chart.

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.



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.

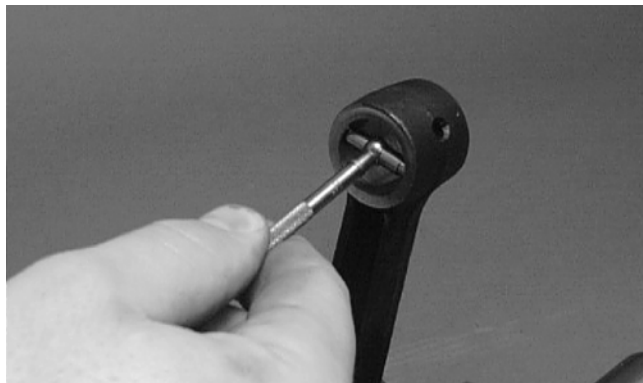
⚠ CAUTION

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.

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

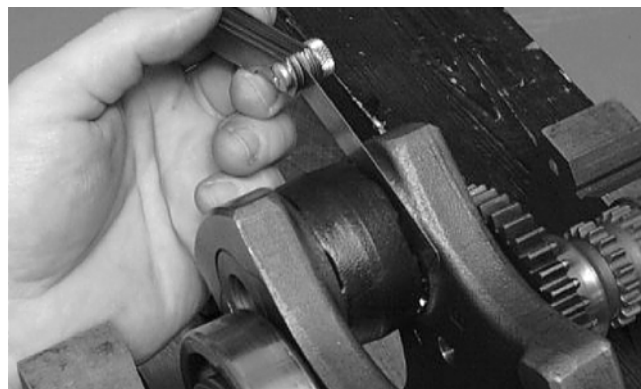
2. Maximum diameter must not exceed specifications.

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

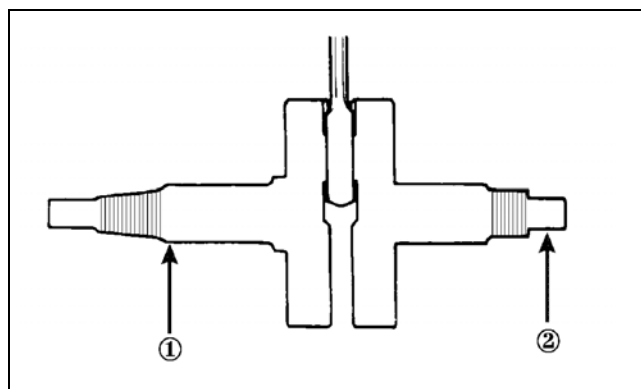
3. Acceptable gap range must be within specifications.

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

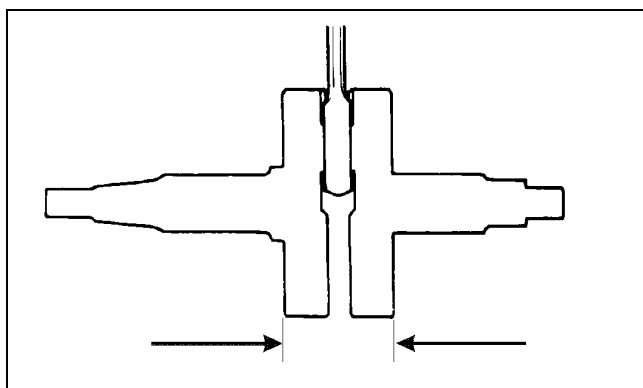
Care should be taken to support the connecting rod when rotating the crankshaft.

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.



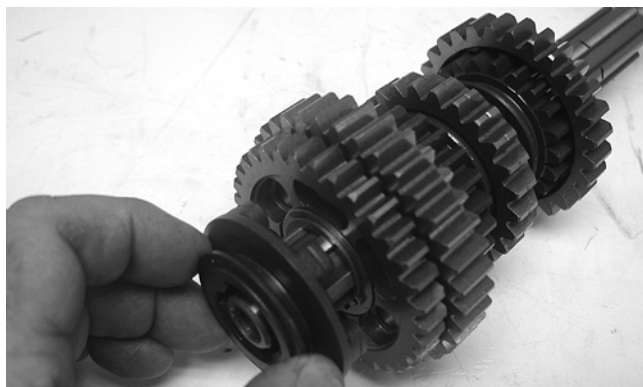
ATV-1017

2. Acceptable width range must be within specifications.

DRIVESHAFT

Disassembling

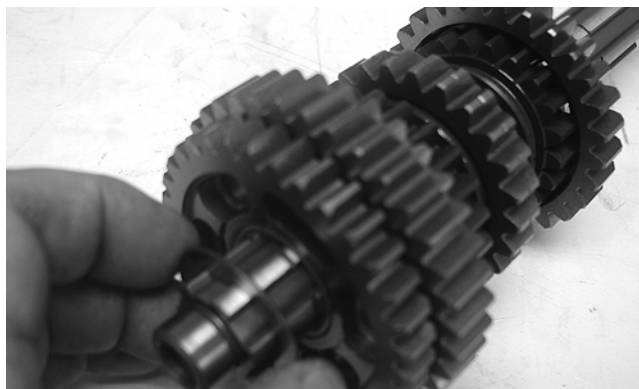
1. In order, remove the reverse dog, circlip, washer, reverse driven gear, and bushing from the driveshaft.



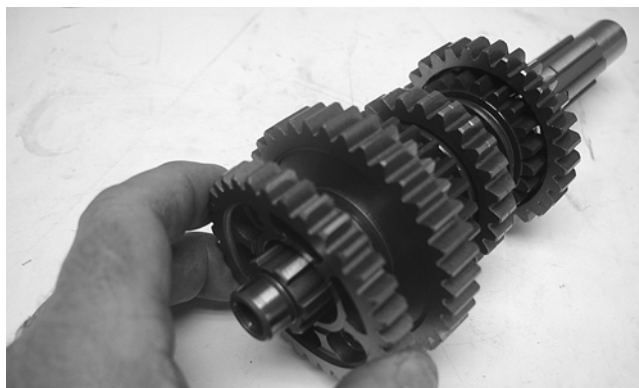
CD331



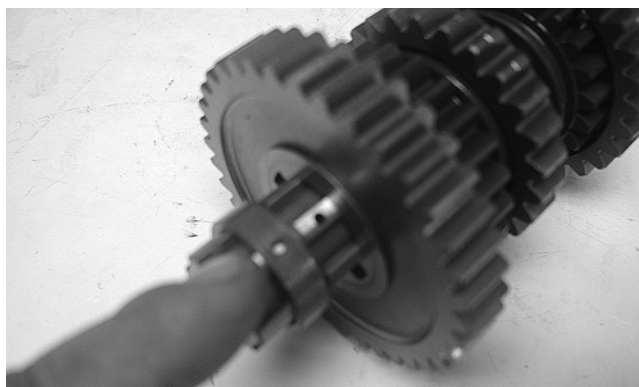
CD333



CD335



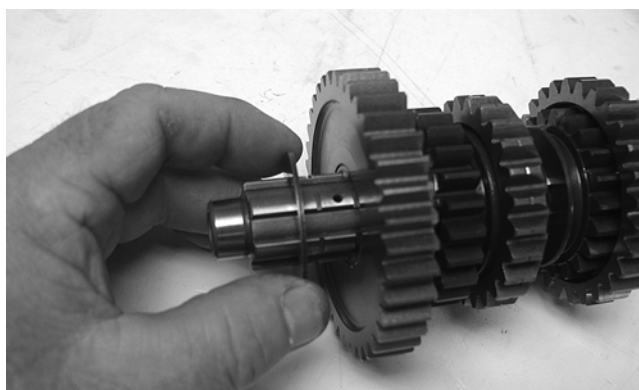
CD336



CD337

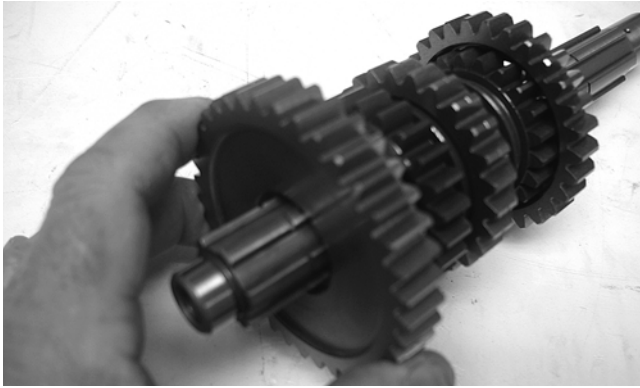
■ **NOTE:** The teeth on the bushing must face the 1st driven gear.

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



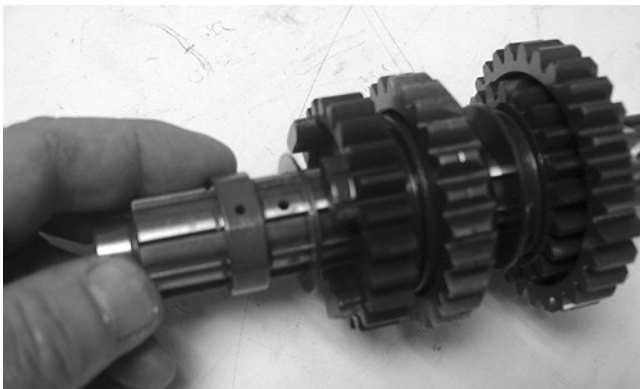
CD339

3



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

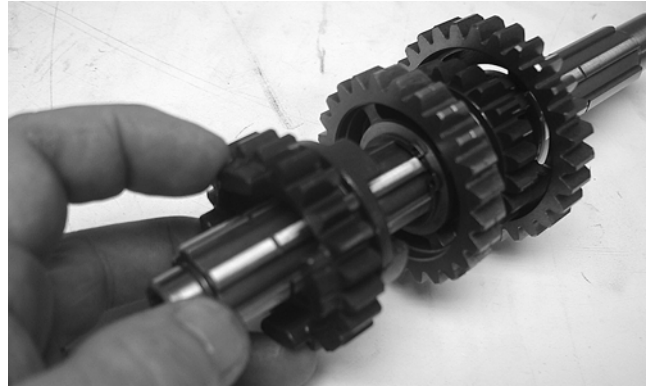


CD343



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.

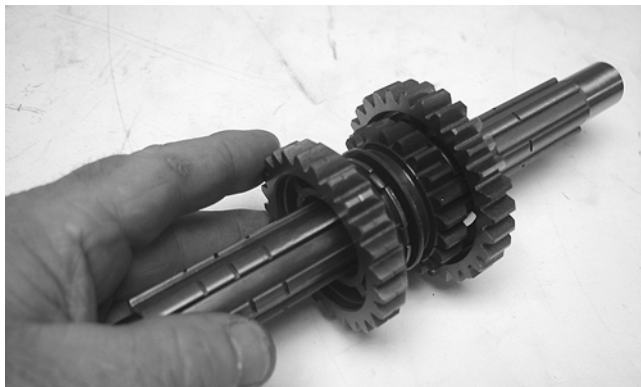


CD346



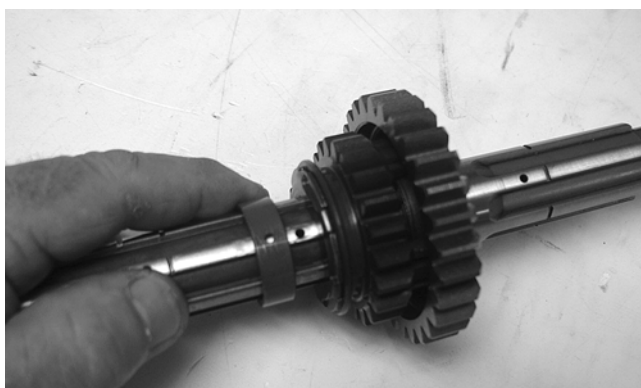
CD348

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.



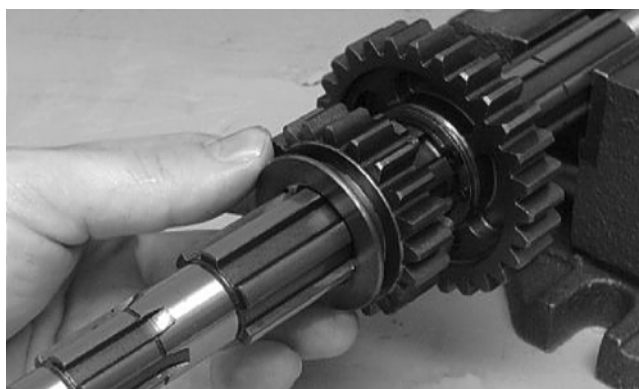
CD352

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.

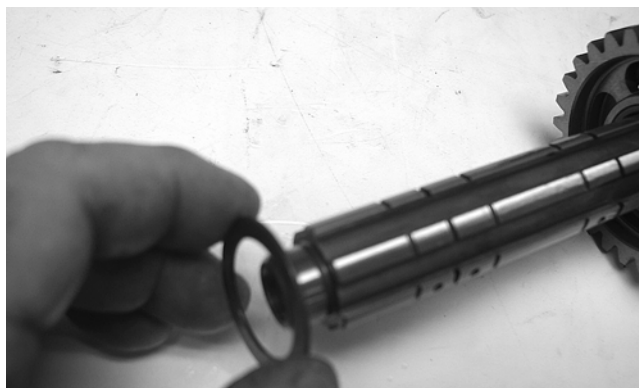


CC210D

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



CD356



CD357

3



CD358

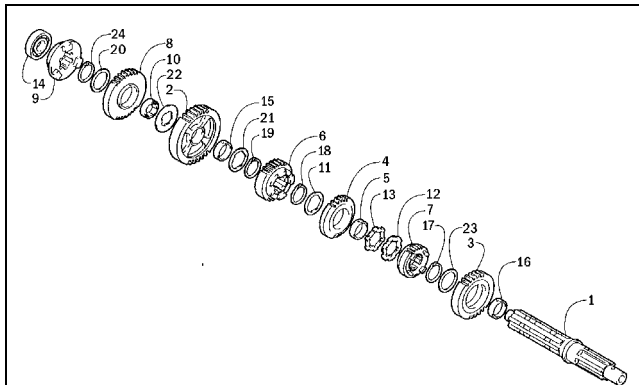


CD359

AT THIS POINT

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

Assembling



KEY

- | | |
|------------------------------------|-----------------------------------|
| 1. Driveshaft | 13. 3rd Driven Lock Washer - Left |
| 2. 1st Driven Gear | 14. Driveshaft Bearing |
| 3. 2nd Driven Gear | 15. 1st Driven Bushing |
| 4. 3rd Driven Gear | 16. 2nd Driven Bushing |
| 5. 3rd Driven Bushing | 17. 2nd Driven Circlip |
| 6. 4th Driven Gear | 18. 3rd Driven Circlip |
| 7. 5th Driven Gear | 19. 4th Driven Circlip |
| 8. Reverse Driven Gear | 20. Reverse Driven Washer |
| 9. Reverse Dog | 21. 1st Driven Washer - Left |
| 10. Reverse Driven Bushing | 22. 1st Driven Washer - Right |
| 11. 3rd Driven Lock Washer - Right | 23. 2nd Driven Washer |
| 12. 3rd Driven Lock Washer - Left | 24. Reverse Driven Circlip |

737-733A

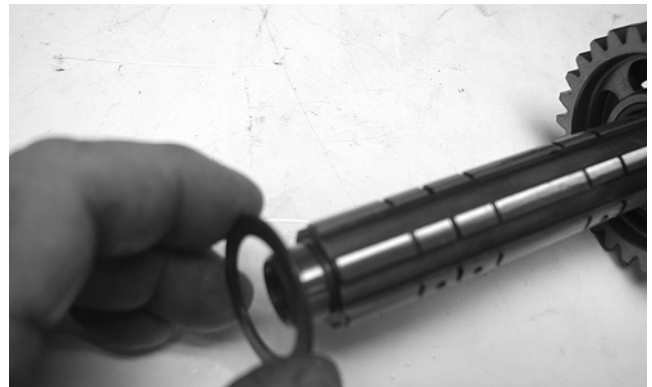
1. In order, install the 2nd driven bushing, gear, washer, and circlip onto the driveshaft.



CD359



CD358



CD357



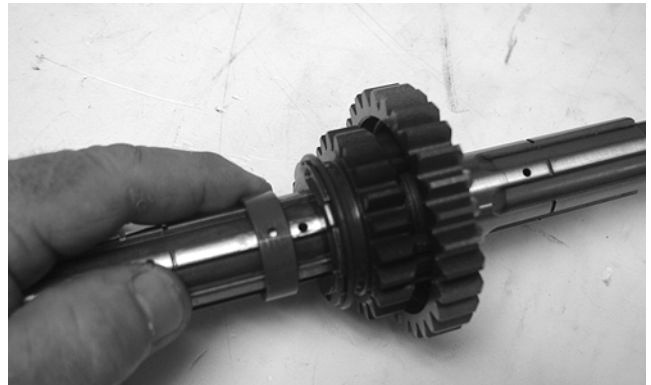
CD356

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.



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



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.



CD349



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).

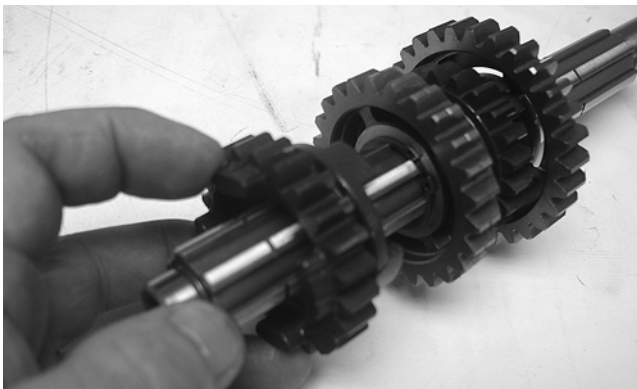


CD348



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

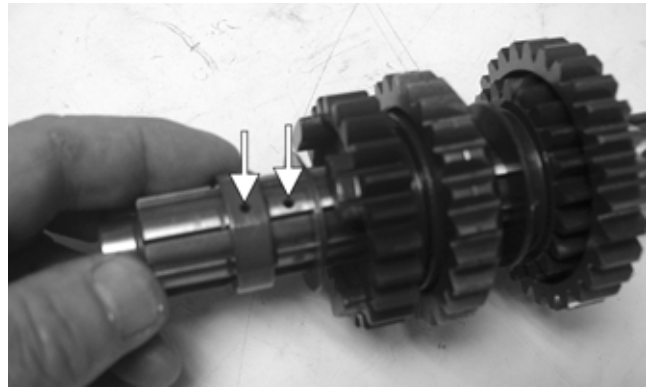


CD344

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.

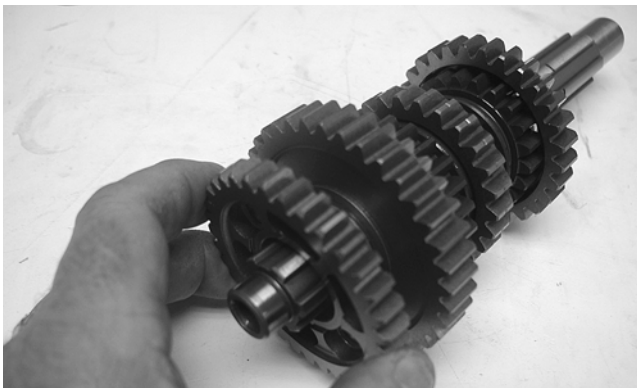


CD337

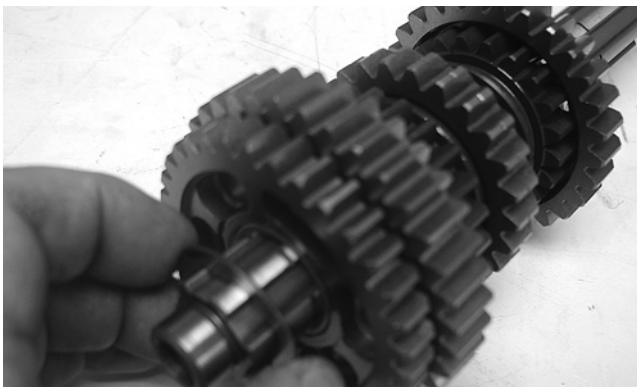
⚠ CAUTION

Failure to align the oil ports will result in serious engine damage.

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



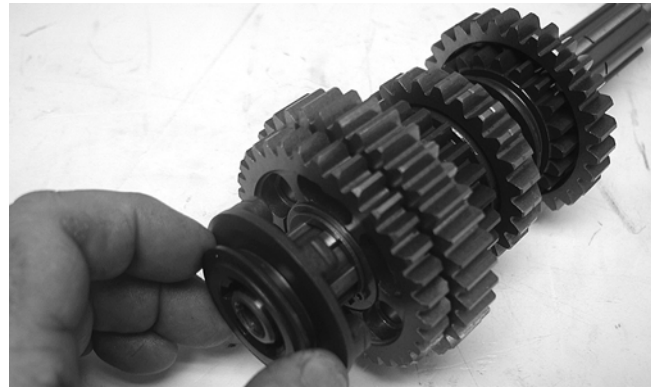
CD336



CD335



CD334



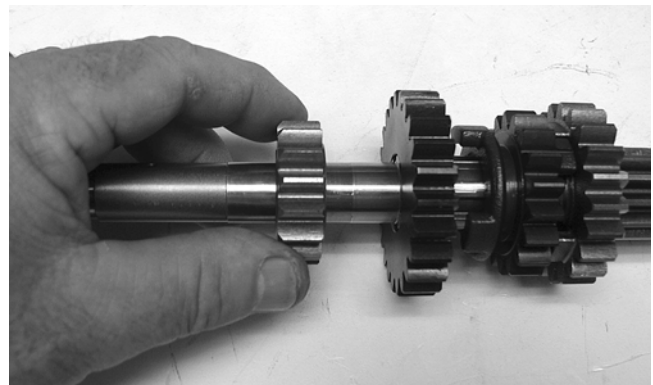
CD331

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

COUNTERSHAFT

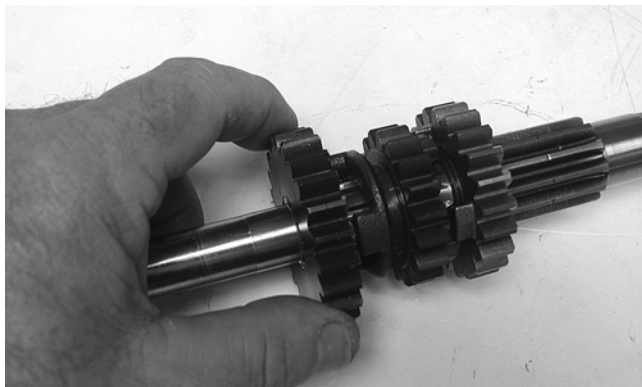
Disassembling

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.

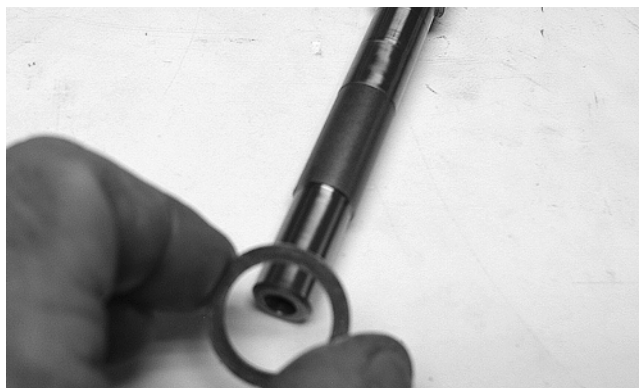


CD405

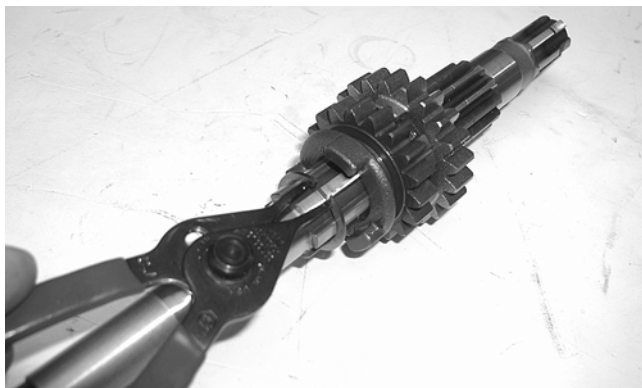
6. Remove the other 4th drive washer from the countershaft.



CD397



CD408

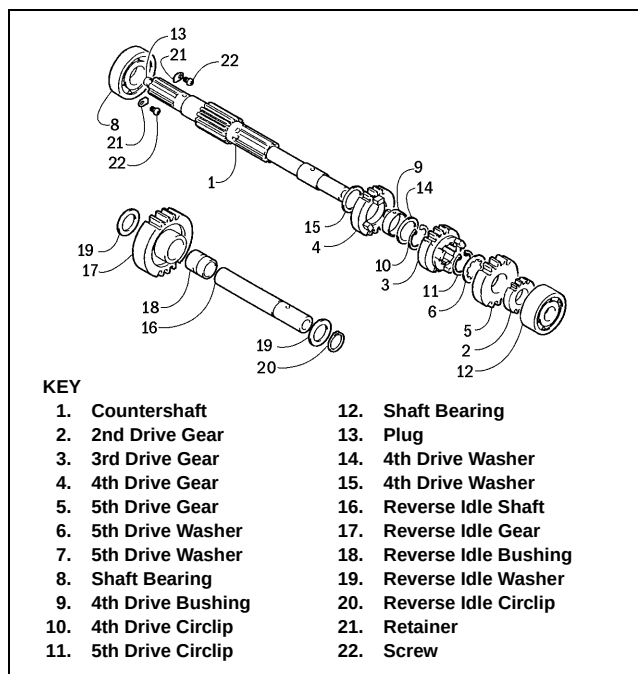


CD400

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

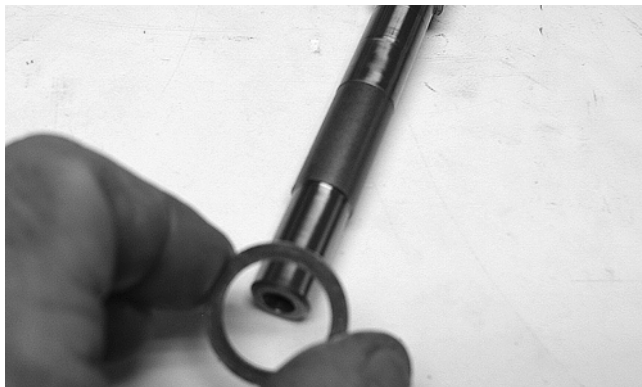
5. Remove the 4th drive circlip securing the 4th drive gear on the countershaft; then remove the first 4th drive washer and 4th drive gear. Account for the bushing.

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.

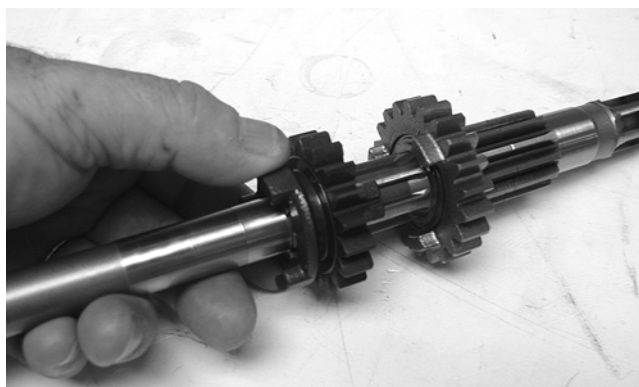


CD405

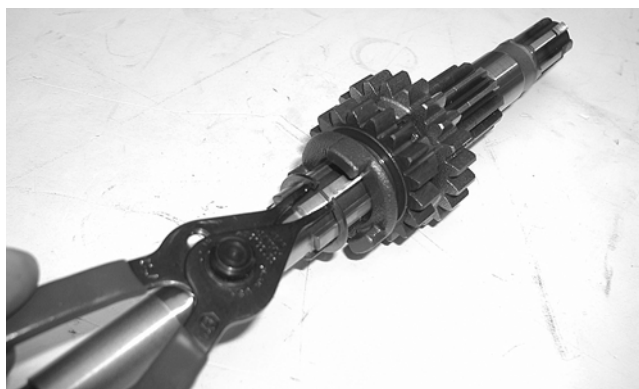


CD406

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



CD401

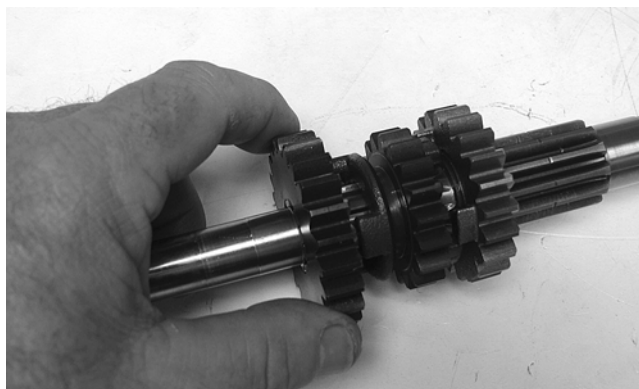


CD400

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

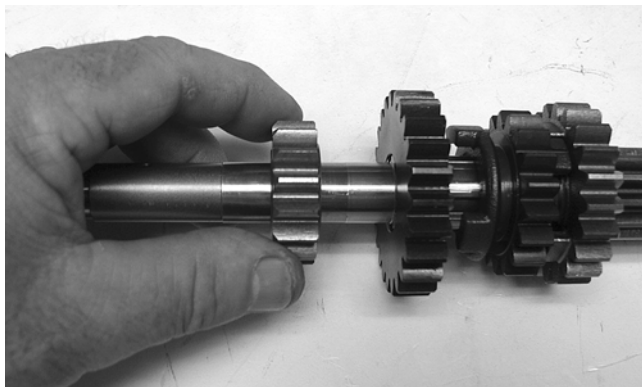


CD397



CD396

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



CD395

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

Assembling Crankcase Half

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

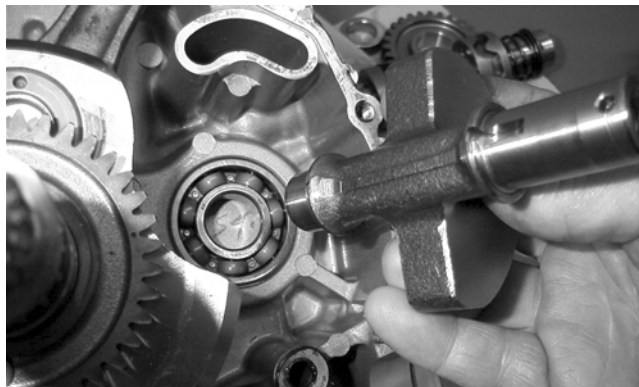
■ **NOTE:** If the output shaft and gear were removed, make sure that the proper shim is installed.

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.
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. Install the crank balancer.



MD1334

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



MD1024

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



CD832A



CC167D



CC166D

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

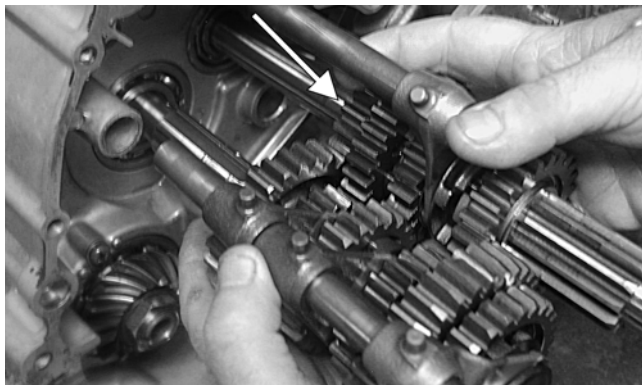
⚠ CAUTION

The bearing pins must be positioned into the crankcase.



CD267

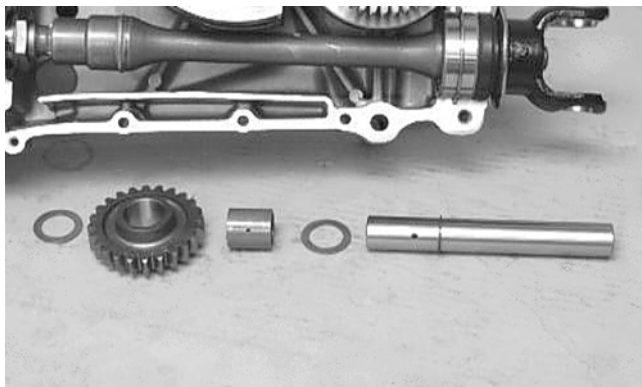
5. Simultaneously, install the driveshaft and countershaft assemblies making sure the washer is on the countershaft.



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.

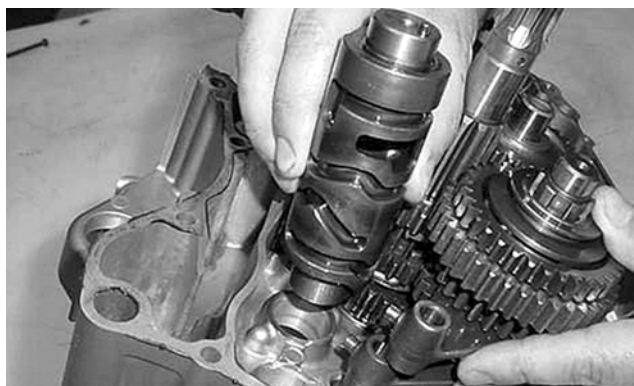


CC231D

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

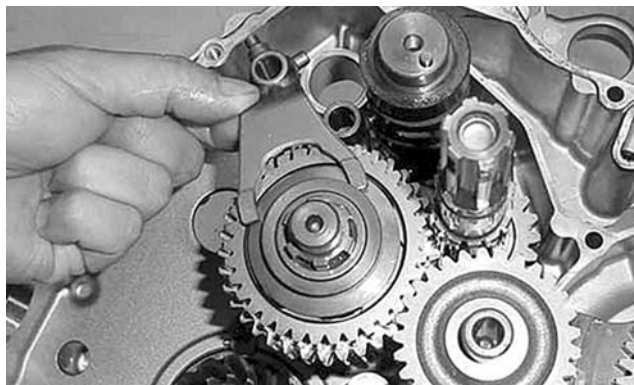


CD232



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.

3



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.

Joining Crankcase Halves

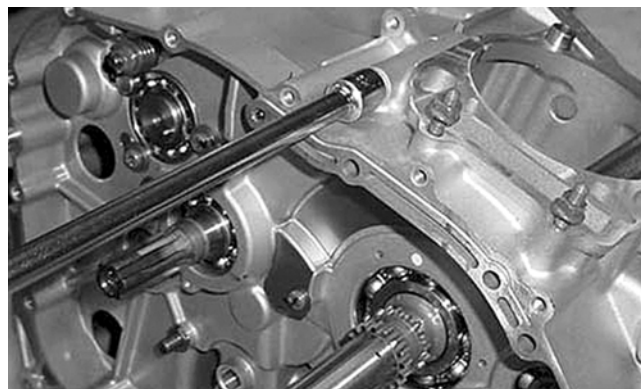
1. Verify that the shim washer is on the idler shaft; then apply Three Bond Sealant to the mating surfaces. Place the right-side half onto the left-side half.



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.



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

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.

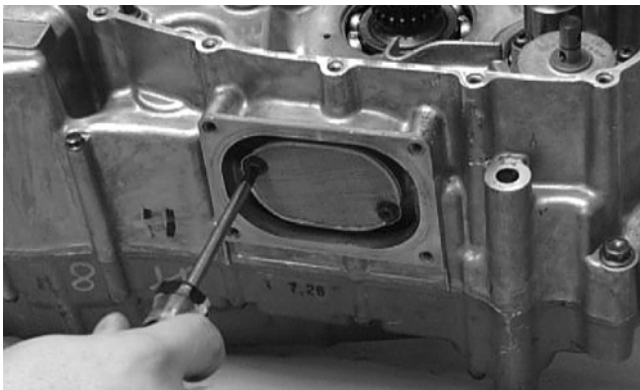
⚠ **CAUTION**

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.



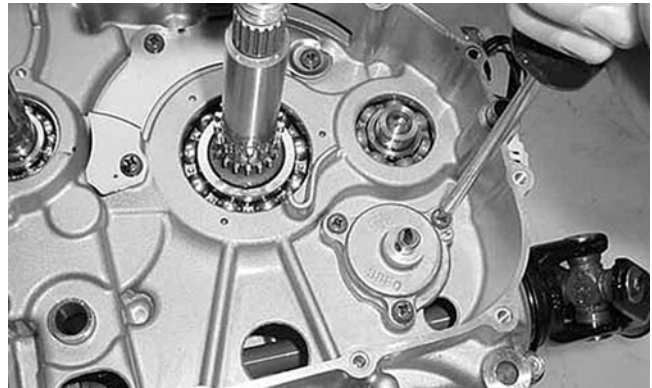
CC163D

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.



CC091D

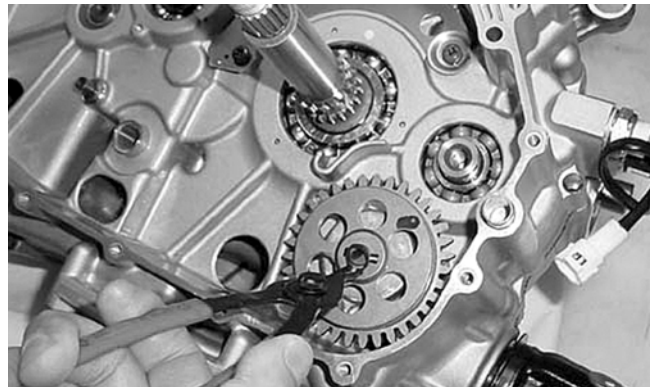
3. Place the oil pump into position in the crankcase and secure with the three Phillips-head screws coated with blue Loctite #243. Tighten to specifications.



CC978

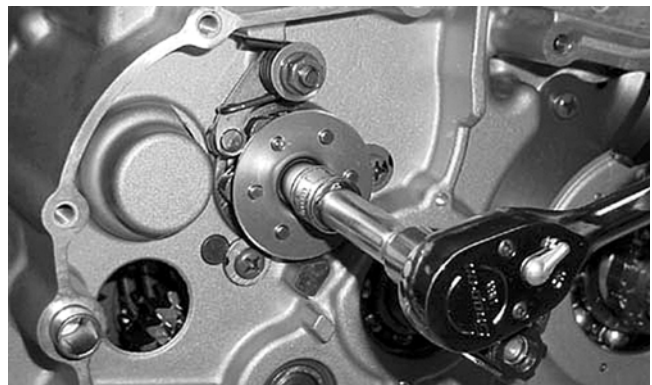
4. Place the washer and pin into position on the oil pump shaft, install the oil pump driven gear, and secure with the circlip.

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



CC976

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.



CC975

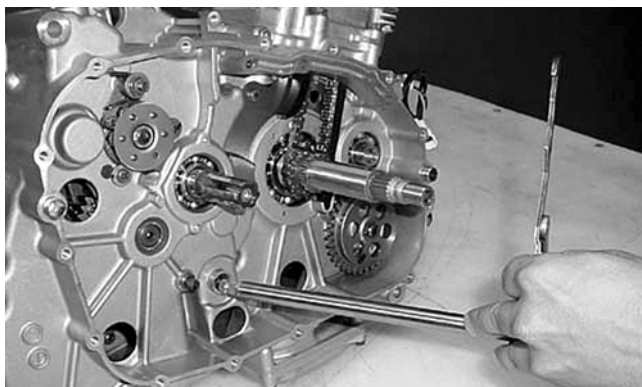
6. Attach the spring to the gear shift cam stopper arm.

3



CC974

7. Install the gear shift shaft.



CC973

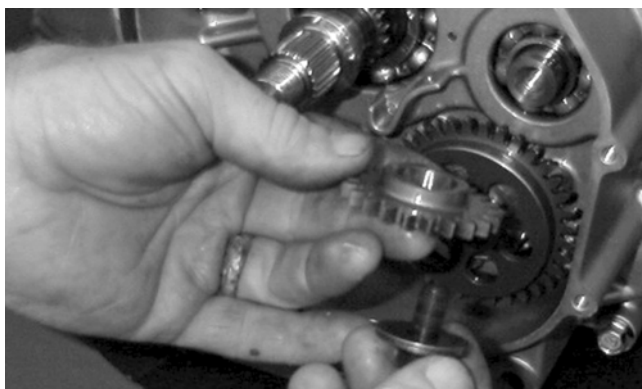
C. Primary Driven Gear

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.

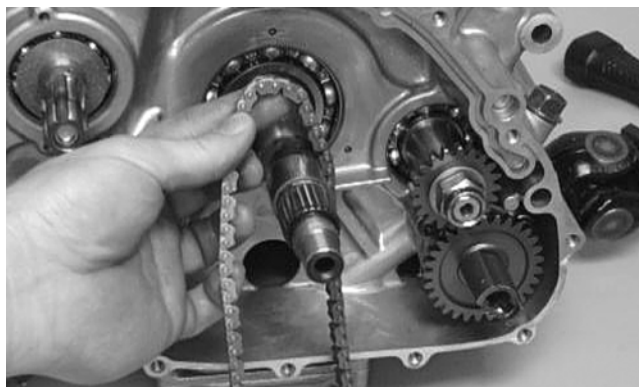


MD1017



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.

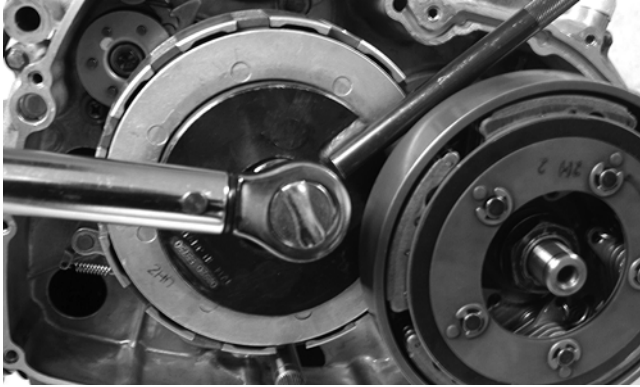


CC078D

■ **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.



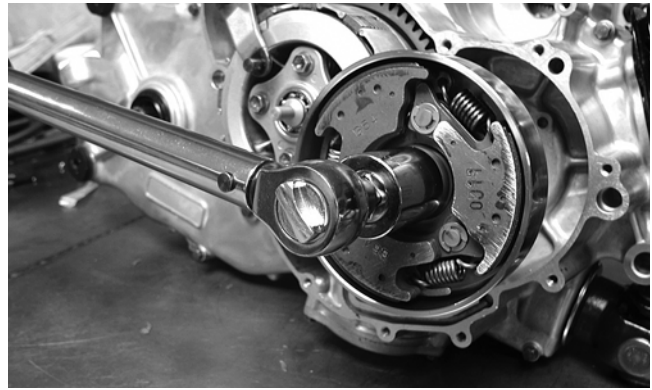
CD448

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



CF043

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.

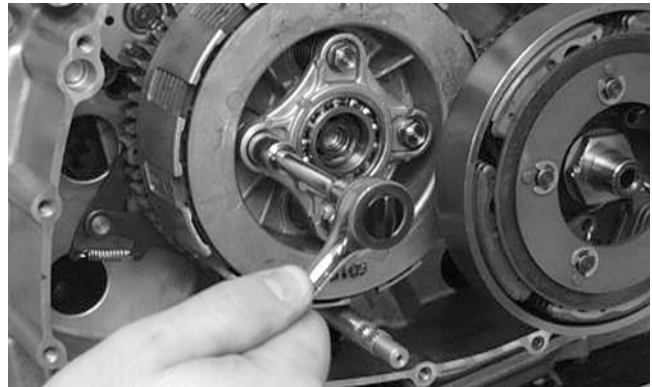


CD440

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



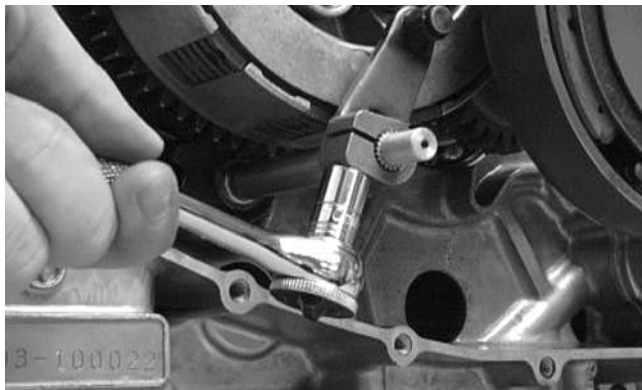
CC074D

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.



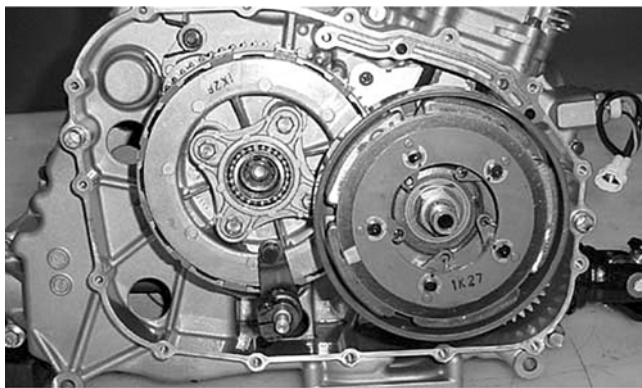
CC073D

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

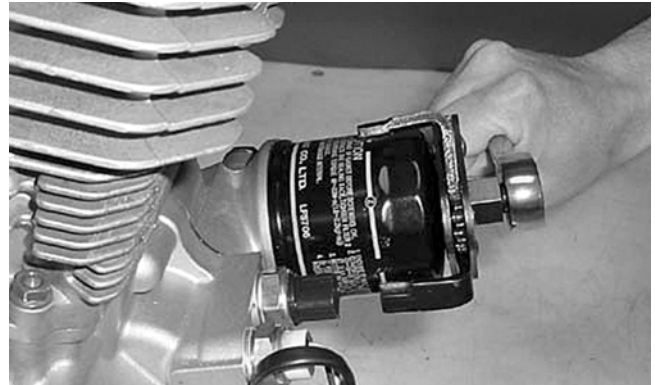
18. Place the gasket and right-side cover into position making sure the release roller guide remains correctly positioned; then install the fifteen cap screws.



CD441

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

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



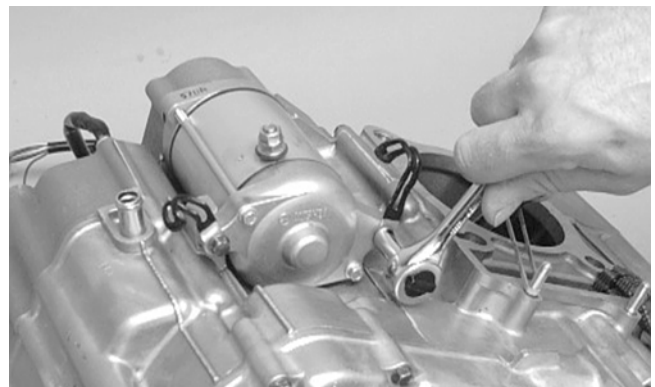
CC967

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.



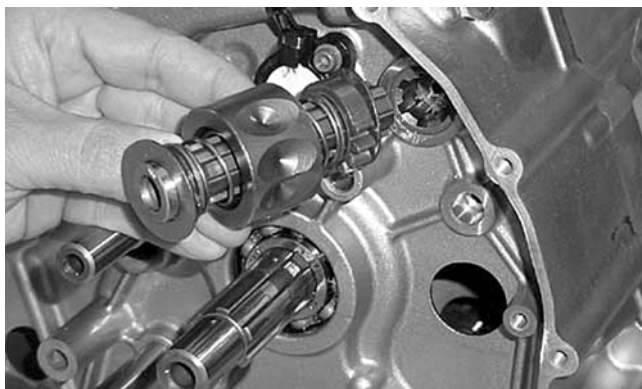
CC065D

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.



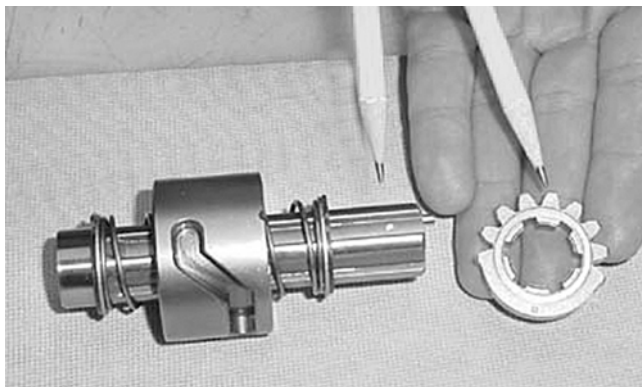
CC964

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



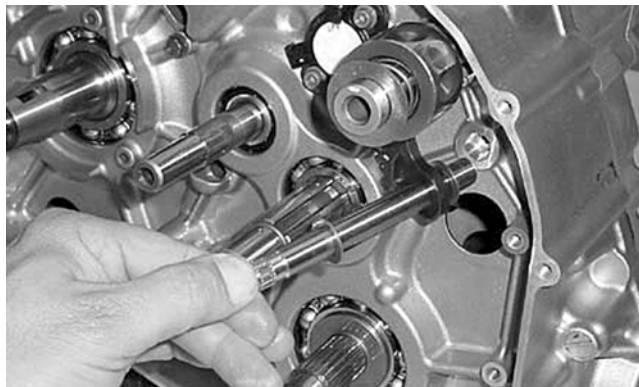
CC962

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



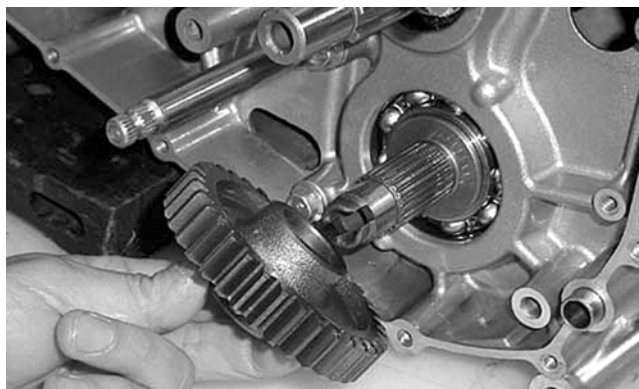
CC963

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

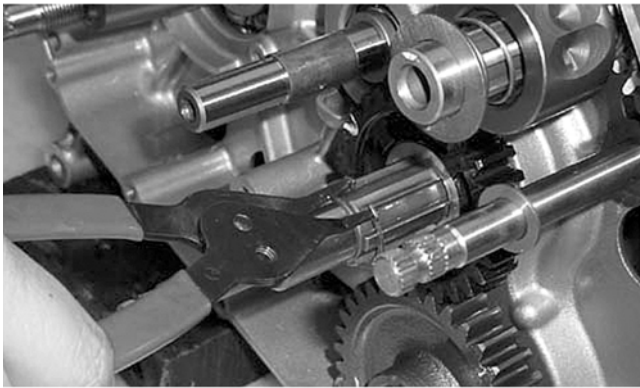
6. Place the bushing and washer onto the drive-shaft making sure the oil hole of the bushing aligns with the oil hole of the driveshaft.



CD552

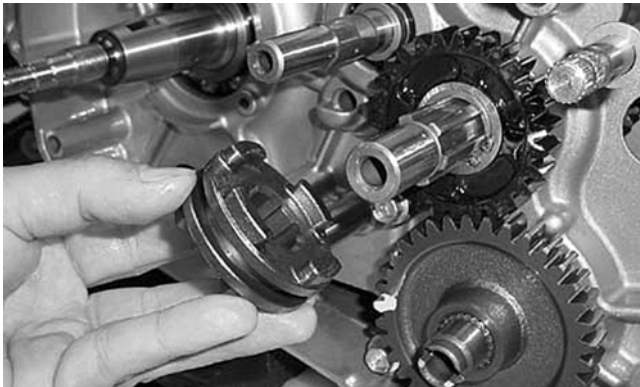
7. In turn on the driveshaft, install drive gear #1 and a washer; then secure with the circlip.

3

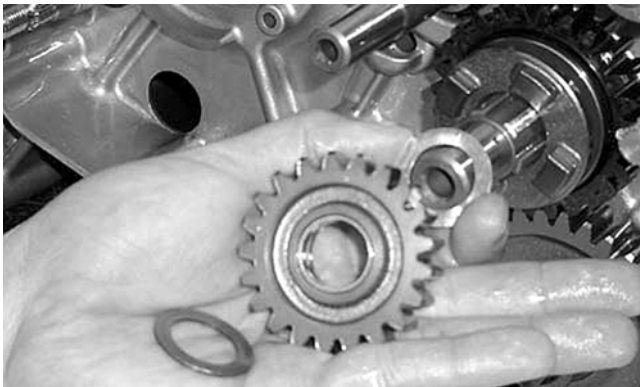


CC955

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



CC966



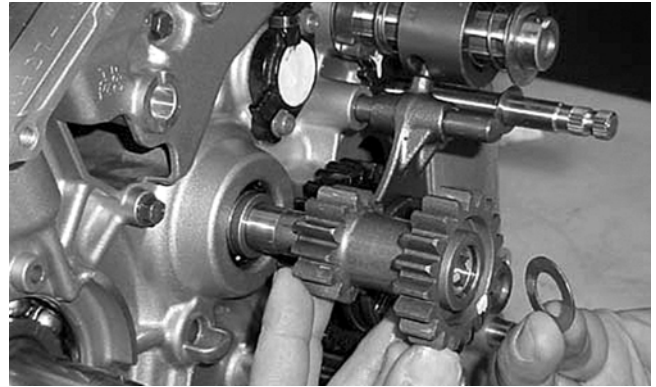
CC954

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



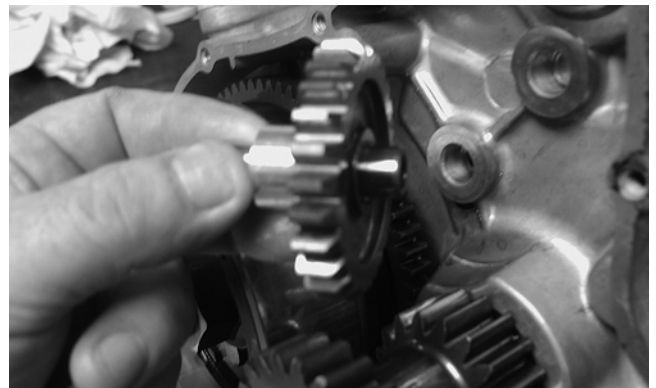
CC953

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



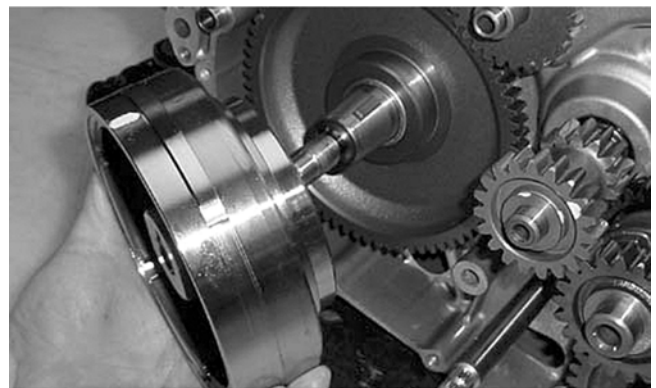
CC952

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.



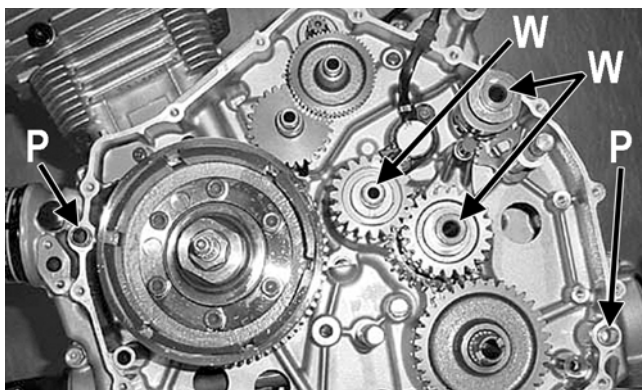
CC991



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

C. Cover

D. Speedometer Drive

E. Hi/Low Shifter Assembly

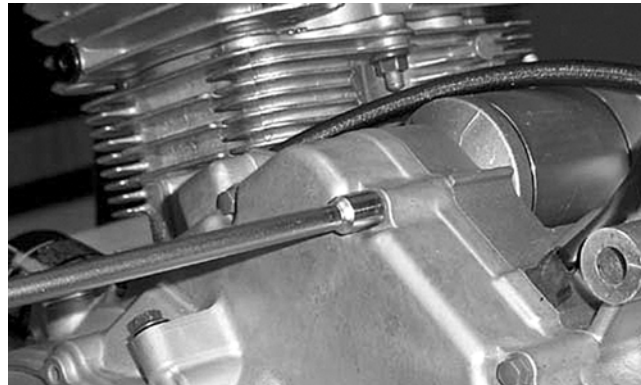
F. Recoil Starter

■ **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.



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.



CC993

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 crankshaft making sure a new, lubricated O-ring is inside the cup. Tighten the flange nut to specifications.



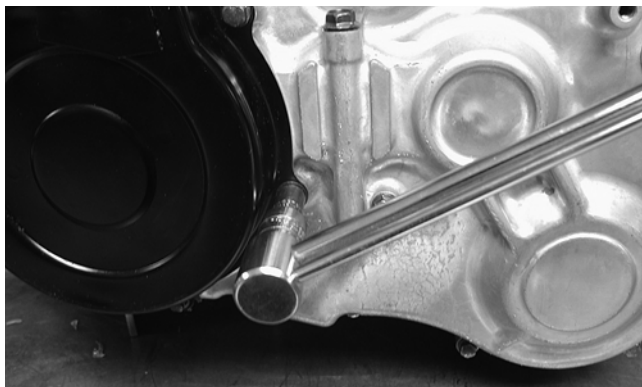
CC943

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



CD429

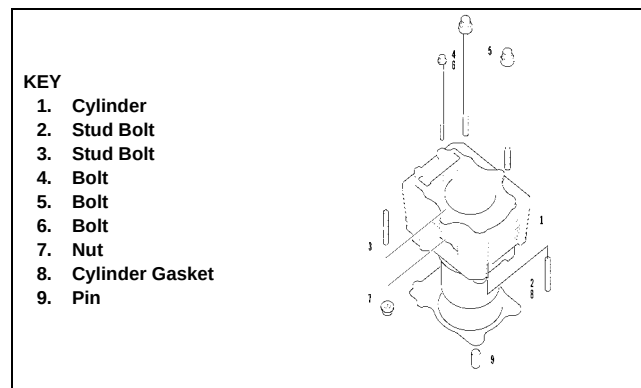
20. Place the recoil starter assembly into position on the left-side cover; then tighten four cap screws to specifications.



CD431

Installing Top-Side Components

A. Piston B. Cylinder

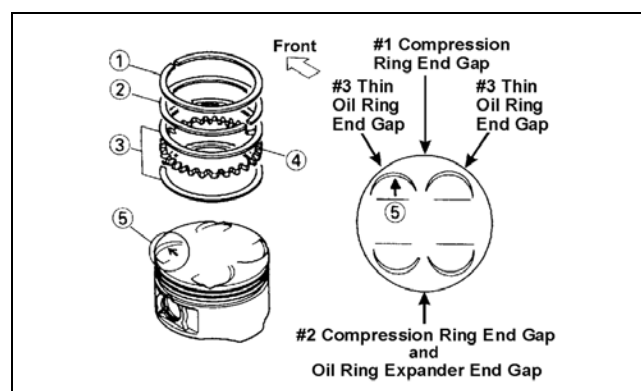


0737-039

■ **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.

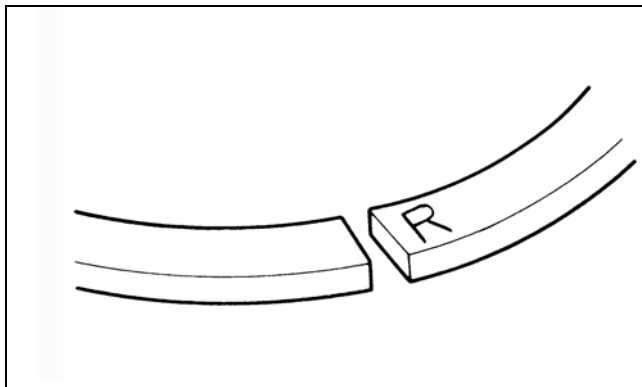
■ **NOTE:** Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.



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.



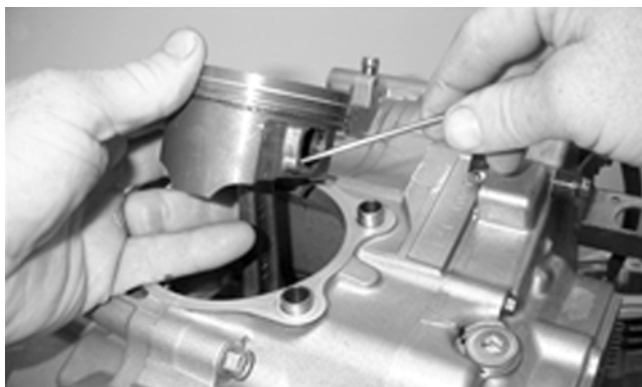
ATV-1024

⚠ CAUTION

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

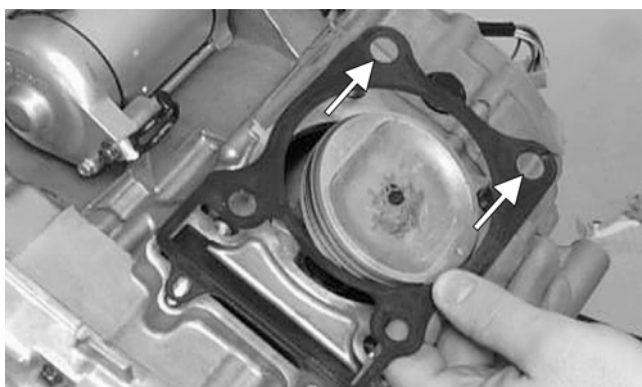
1. Install the piston on the connecting rod making sure there is a circlip on each side and the open end of the circlip is directed upwards or downwards.

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

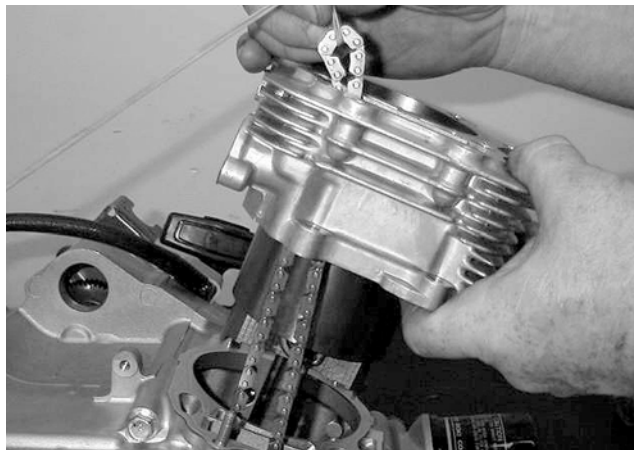


MD1344

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.

⚠ CAUTION

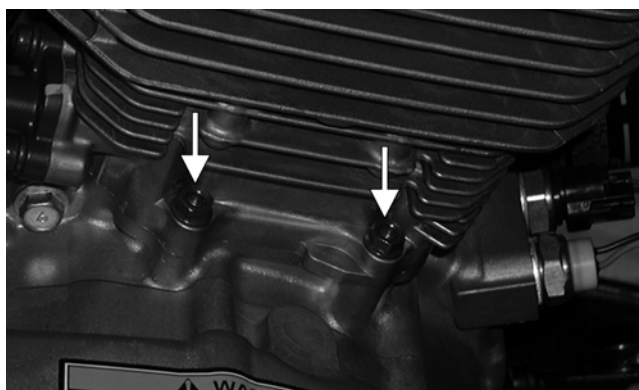
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



MD1345

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

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

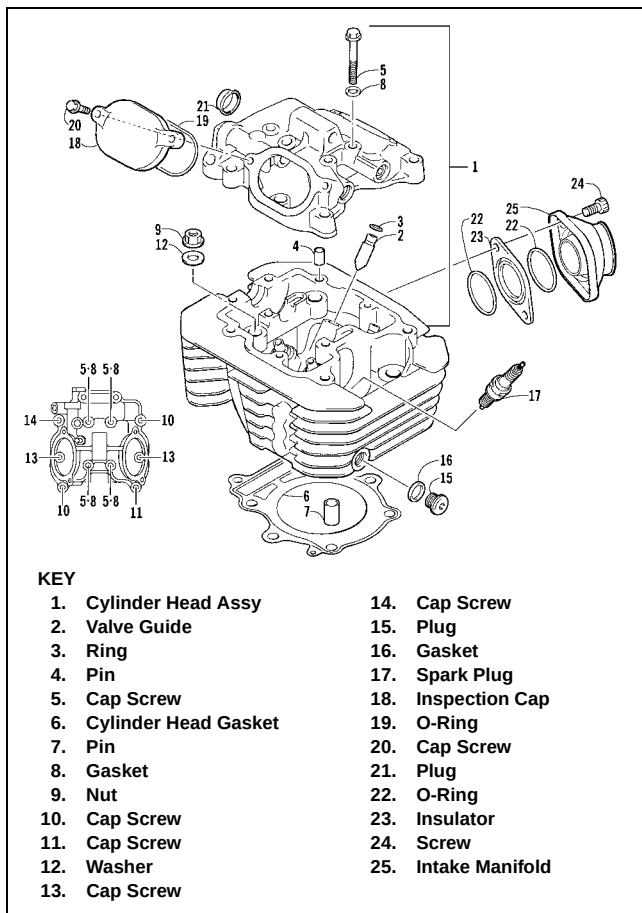


CF162A

3

C. Cylinder Head

D. Valve Cover



0737-038

■ **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.

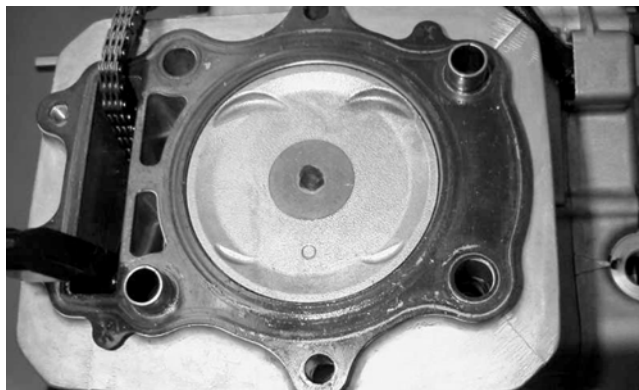


MD1349

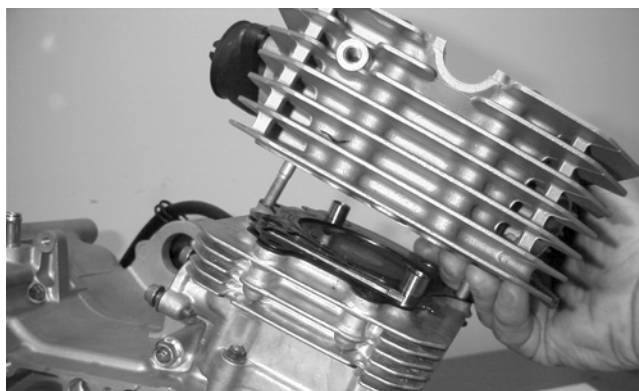
6. Place the head gasket into position on the cylinder. Place the alignment pins into position; then place the head assembly into position on the cylinder making sure the cam chain is routed through the chain cavity.

⚠ CAUTION

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

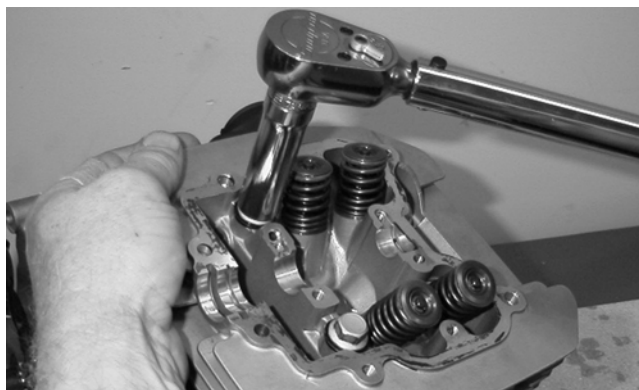


MD1347



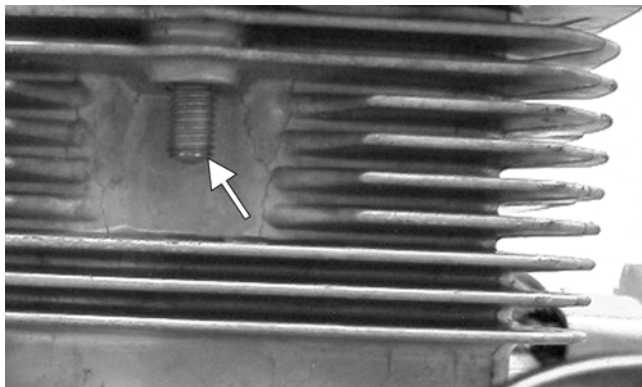
MD1163

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.



MD1270

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.

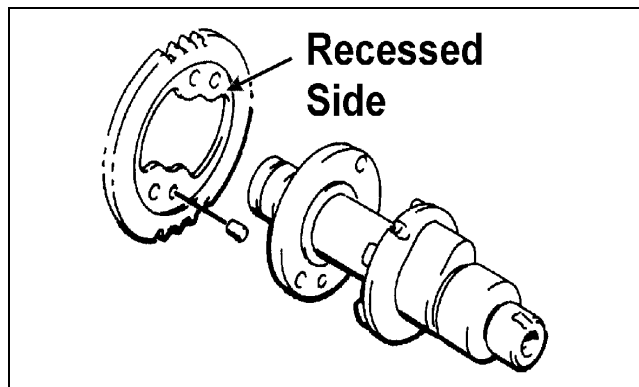


CD383

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.

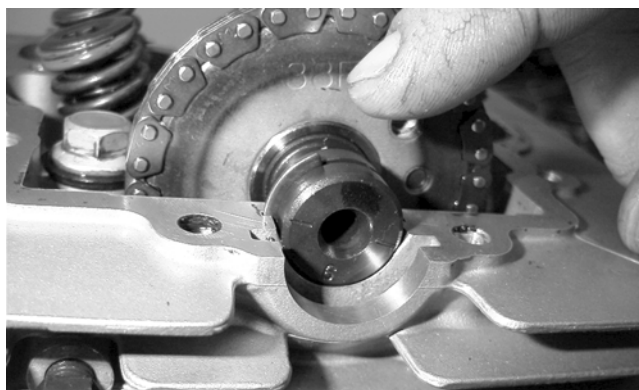
■ **NOTE:** When the camshaft assembly is seated, make sure the alignment pin in the camshaft aligns with the smallest hole in the sprocket.

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

■ **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.

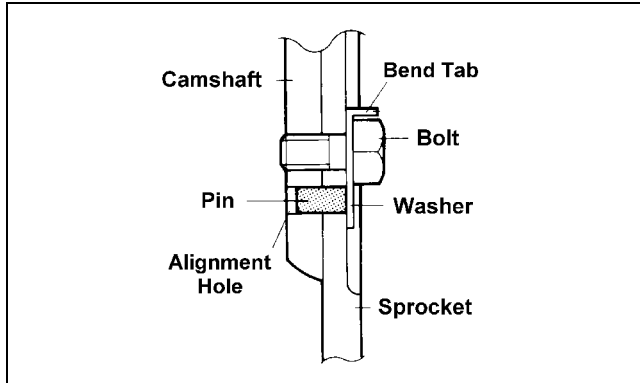
15. When the camshaft assembly is seated, ensure the following.

- 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.

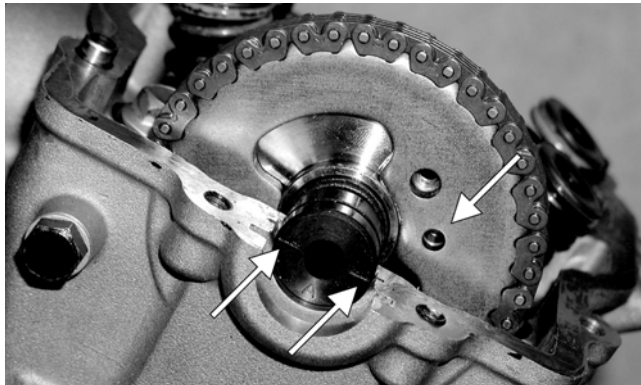
⚠ CAUTION

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.



ATV-1027



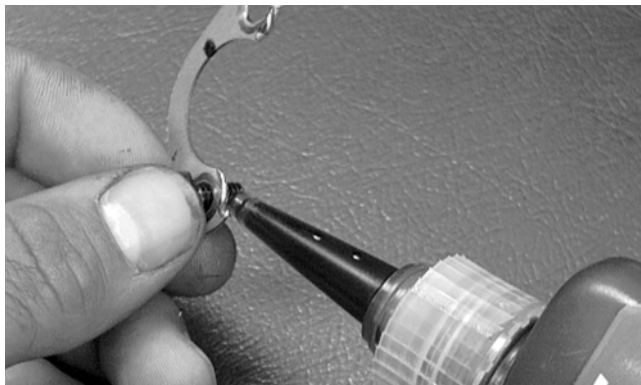
CF030B



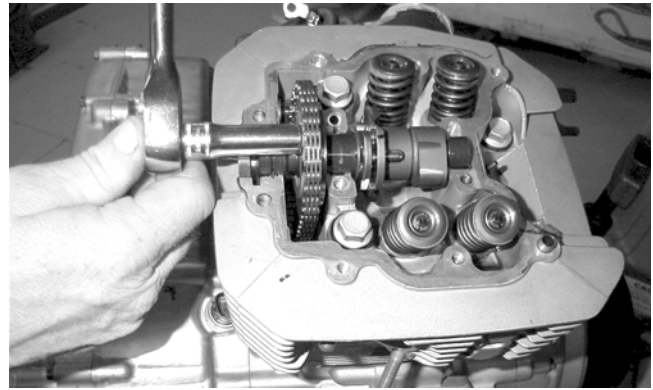
CAUTION

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. Tighten cap screw only until snug.

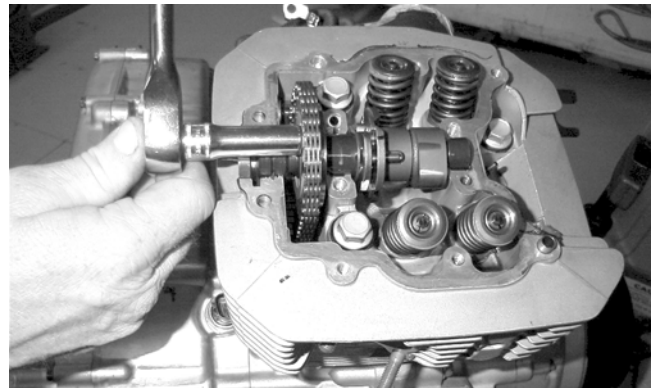


CC404D



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 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.



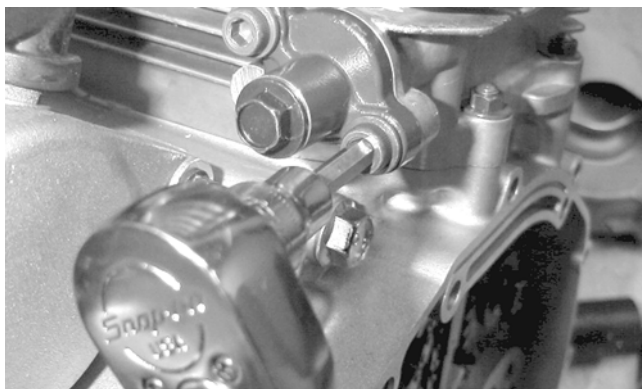
MD1248

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.

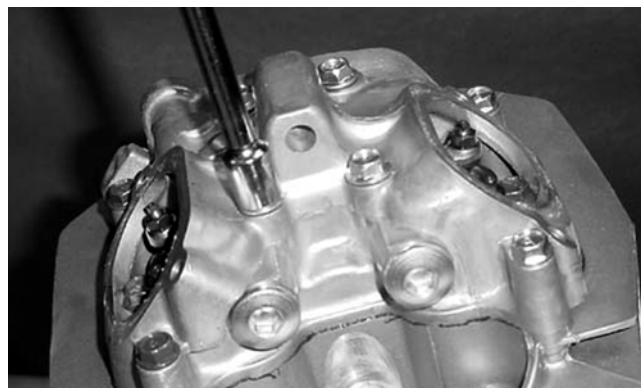


MD1245

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

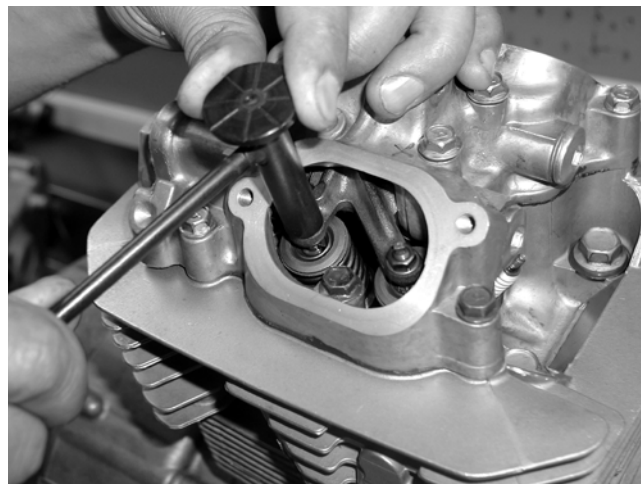
28. In a crisscross pattern starting from the center and working outward, tighten the cap screws (from step 27) to specifications.

3

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

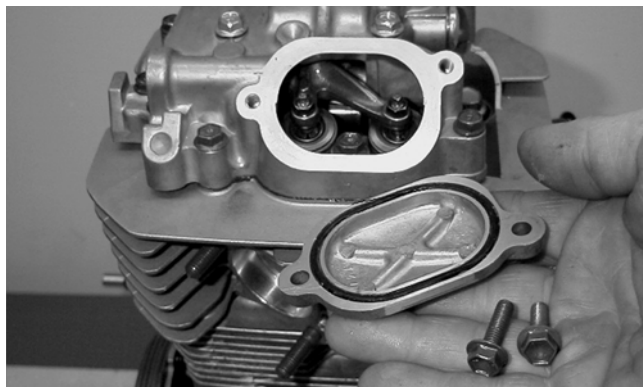
- C. While holding the valve adjuster dial in place, use the valve adjuster handle and loosen the jam nut; then rotate the tappet adjuster screw clockwise until friction is felt.
- D. Align the valve adjuster handle with one of the marks on the valve adjuster dial.

- 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.



MD1264

31. If removed, install the spark plug and 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.



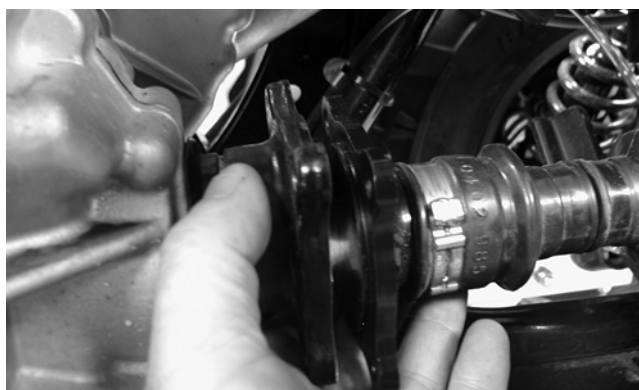
CD818

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.



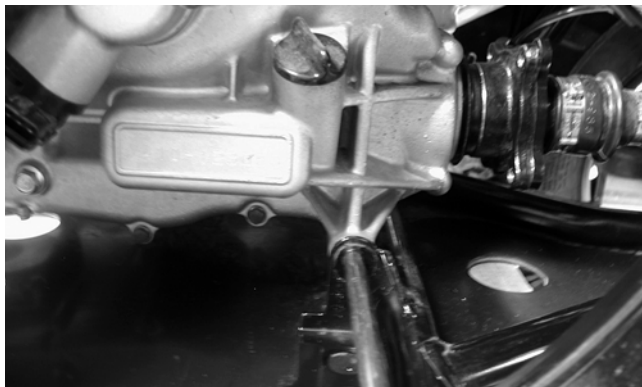
CD821

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.



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.



CC939



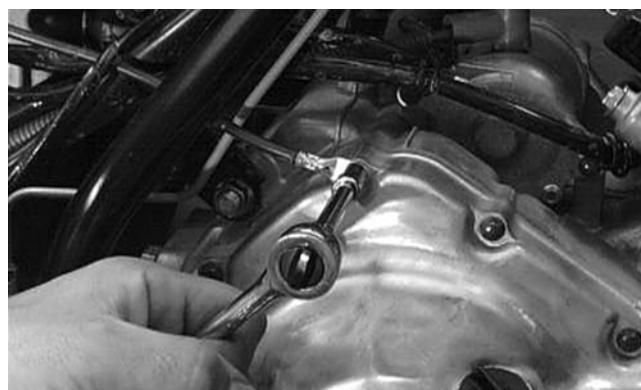
CC938

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



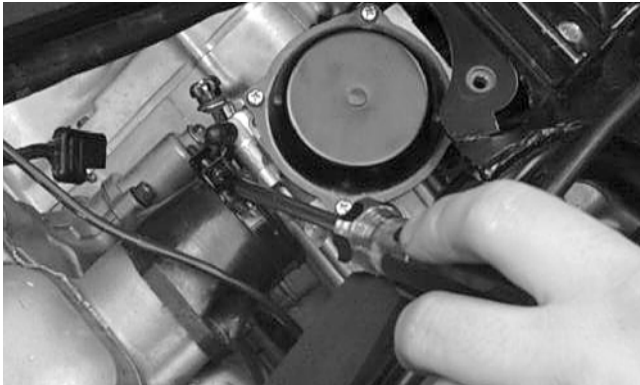
AR604D

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



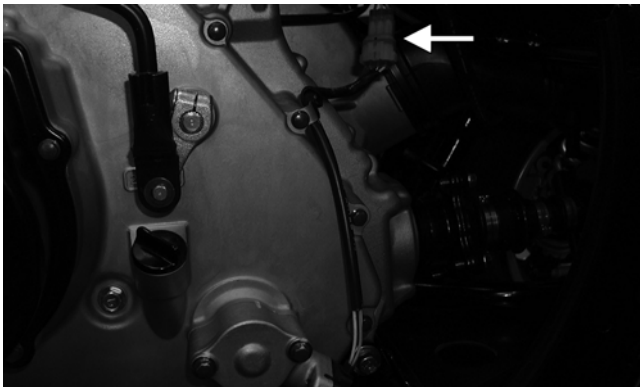
AR600D

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.



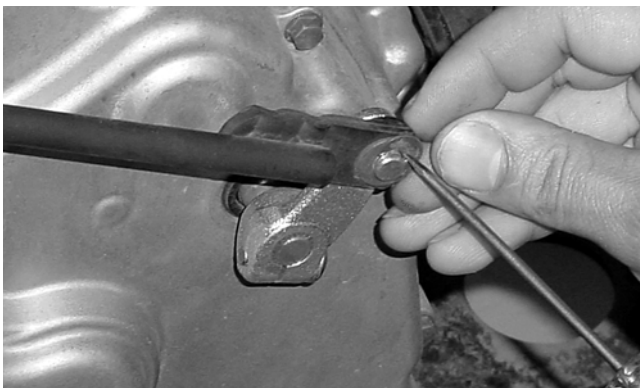
CC120D

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



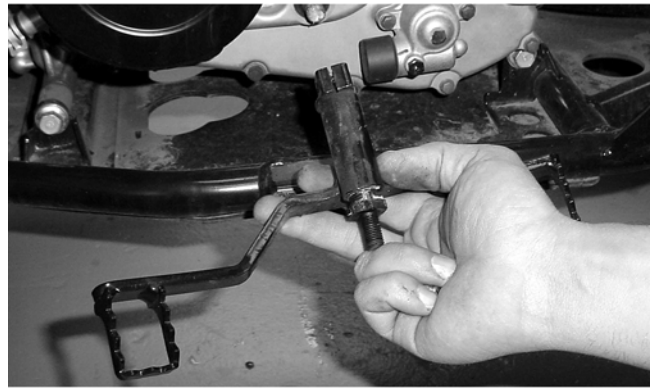
CF172A

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

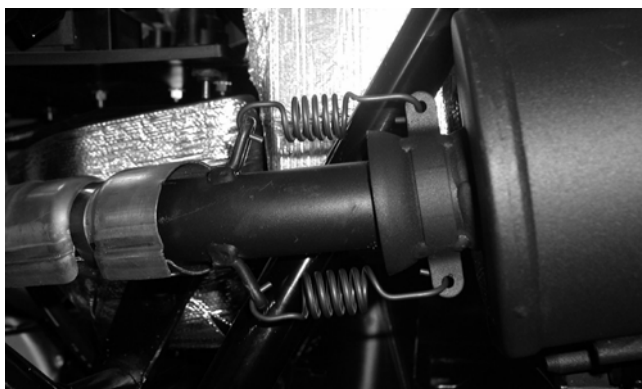


CD787

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

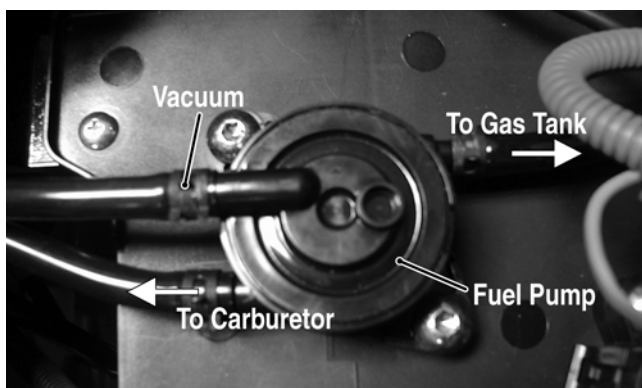


CF137



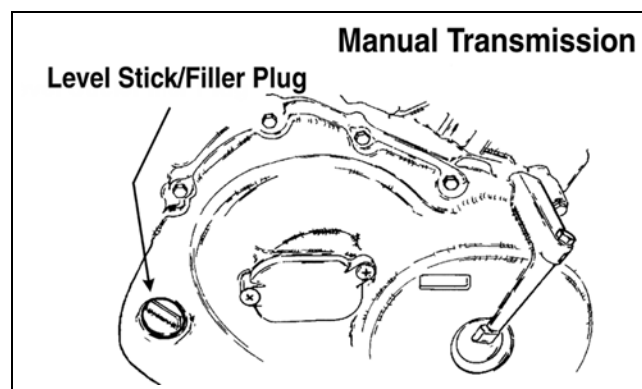
CF138

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

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.

Table of Contents (400 - Automatic Transmission)

Removing Engine/Transmission	3-76
Top-Side Components.....	3-79
Removing Top-Side Components	3-79
Left-Side Components	3-83
Removing Left-Side Components	3-83
Right-Side Components.....	3-85
Removing Right-Side Components.....	3-86
Center Crankcase Components.....	3-90
Separating Crankcase Halves.....	3-90
Disassembling Crankcase Half	3-91
Servicing Components.....	3-93
Assembling Crankcase Half.....	3-112
Joining Crankcase Halves.....	3-115
Installing Right-Side Components.....	3-116
Installing Left-Side Components	3-119
Installing Top-Side Components	3-121
Installing Engine/Transmission	3-126

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.

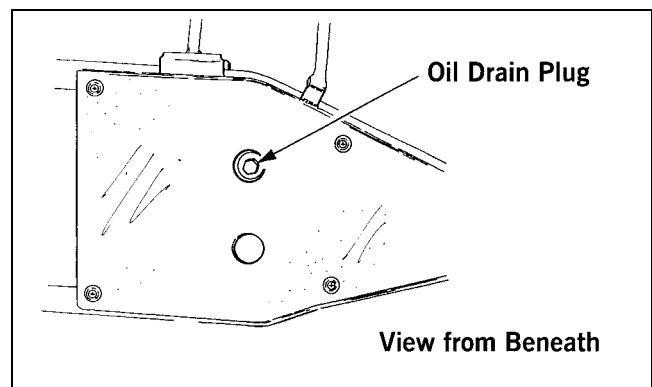
1. Remove the seat; then remove the battery cover/tool tray.

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

CAUTION

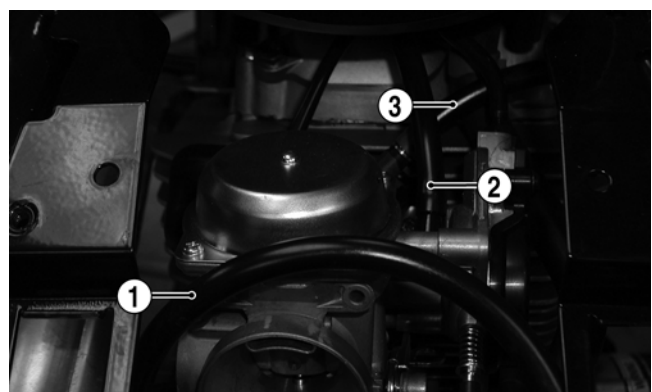
Battery acid is harmful if it contacts eyes, skin, or clothing. Care must be taken whenever handling a battery.

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

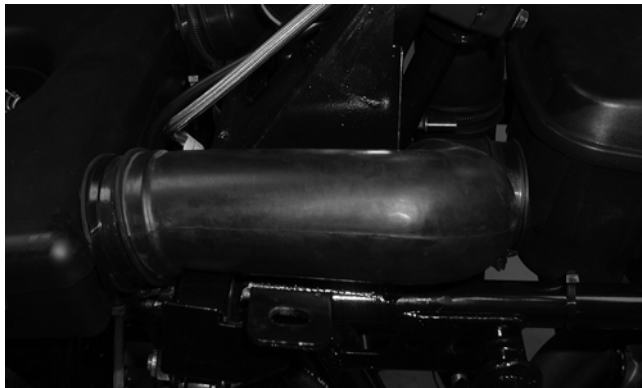
6. Remove the front and rear fender panels (see Section 8).
7. Disconnect the fuel hose (1), carburetor vent hose (2), and the fuel pump vacuum hose (3) from the carburetor.



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 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

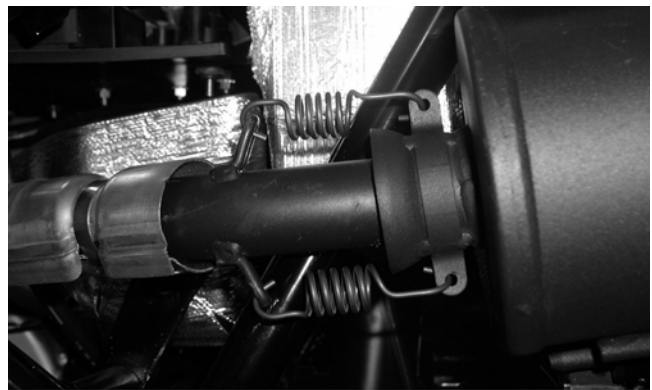
14. Remove the cap screws securing the two oil fittings to the crankcase; then route the hoses away from the engine. Account for two O-rings.



CF174

■ **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.

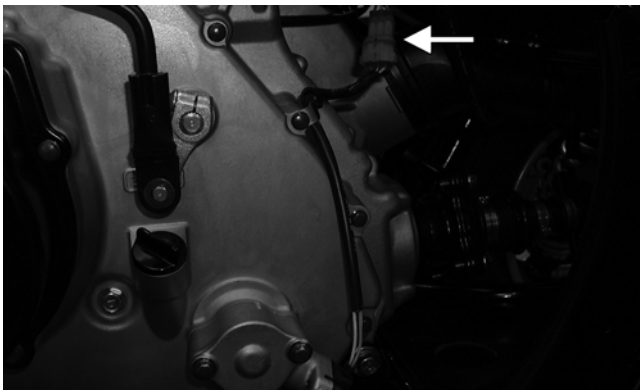


CD085

■ **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.

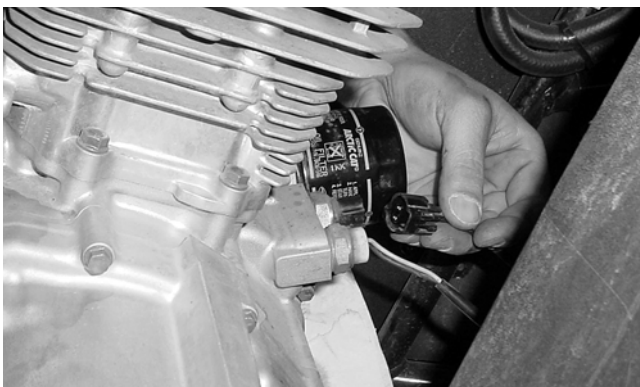


CF172A

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

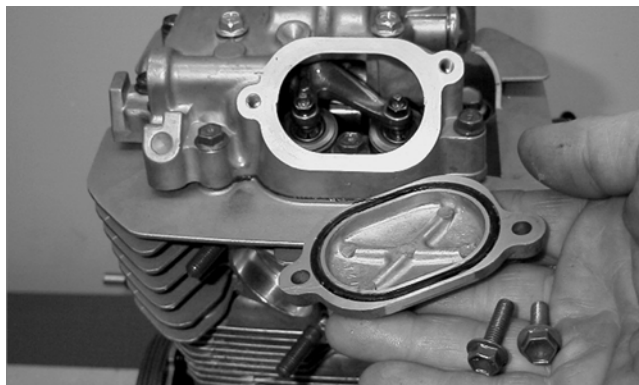
A. Valve Cover

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.



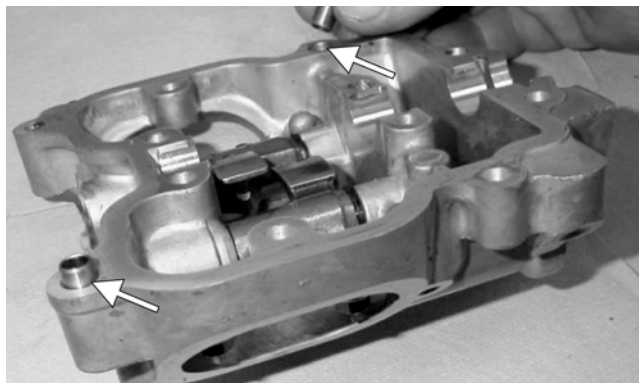
MD1264

■ **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



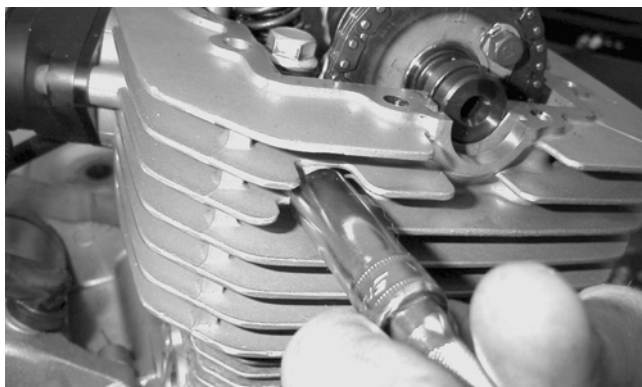
MD1354A

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.



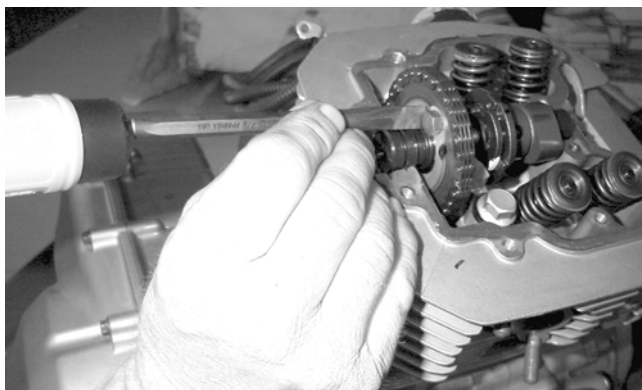
MD1245

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

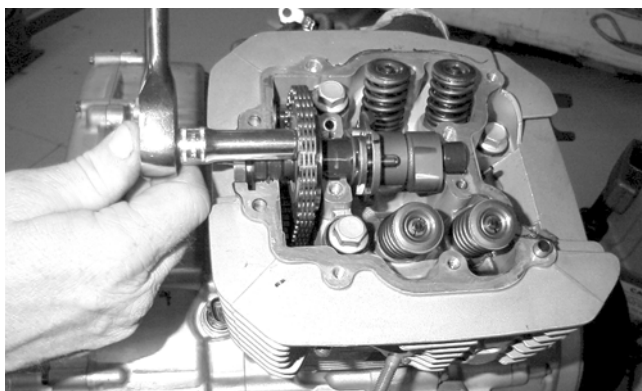


MD1251

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



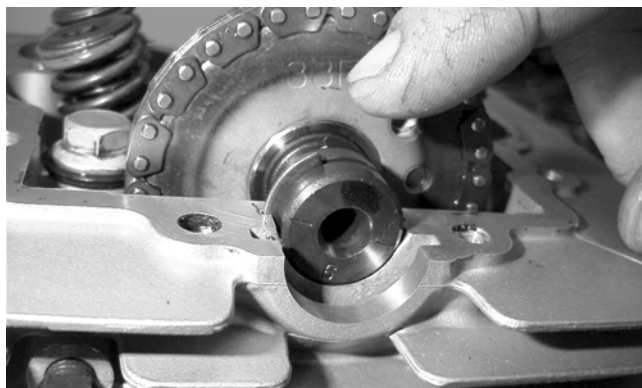
MD1136



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.

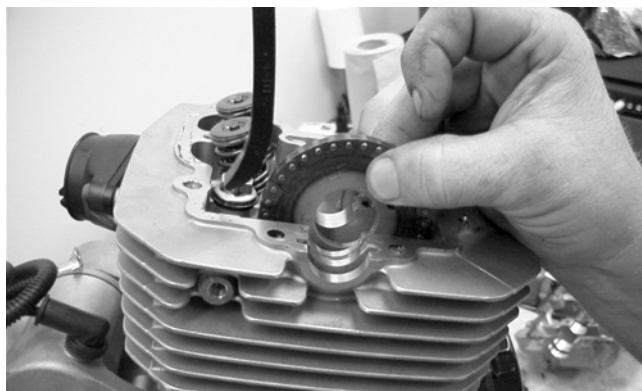
■ **NOTE:** Care should be taken not to drop the C-ring down into the crankcase.



MD1131

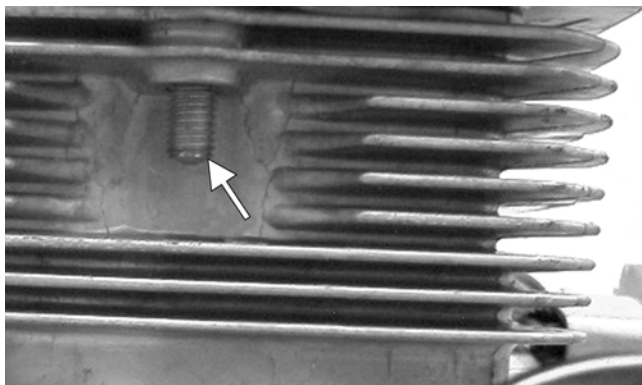
7. Noting the timing marks for installing purposes, drop the sprocket off the camshaft. While holding the cam chain, slide the sprocket and camshaft out of the cylinder head. Account for an alignment pin.

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



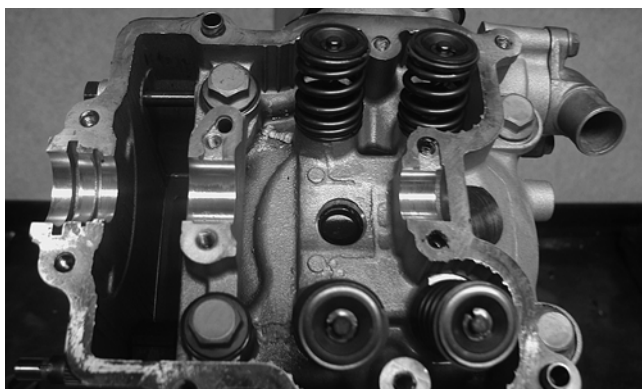
MD1132

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.



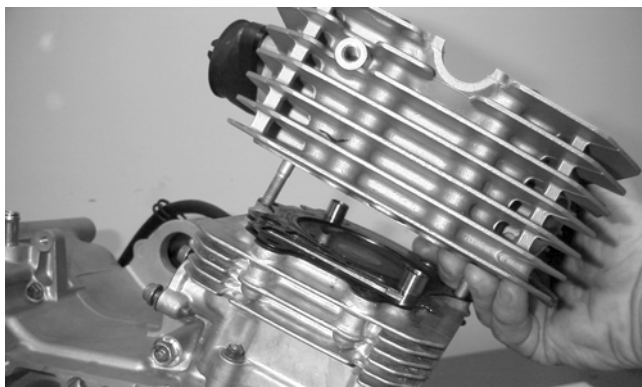
MD1192

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

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.

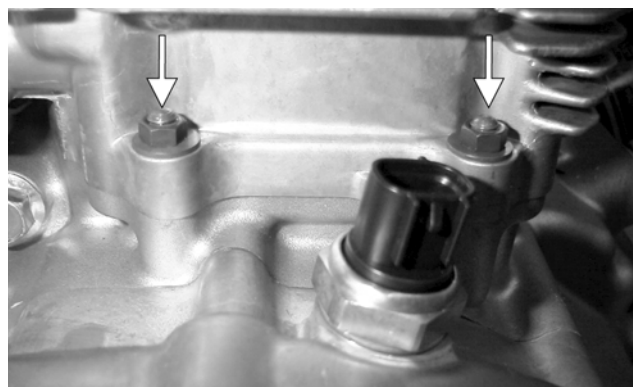


MD1173

C. Cylinder **D. Piston**

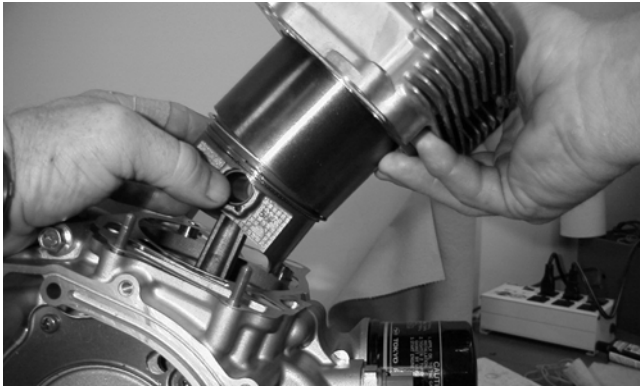
■ **NOTE:** Steps 1-11 in the preceding sub-section must precede this procedure.

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.



MD1214

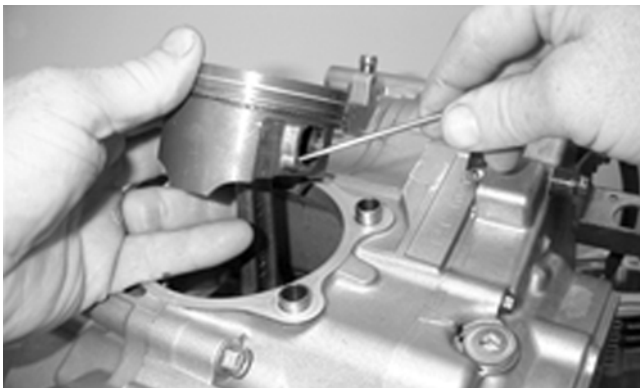
AT THIS POINT

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.

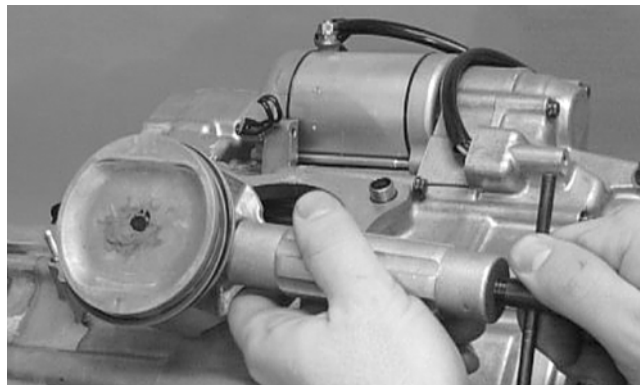
14. Using an awl, remove one piston-pin circlip. Take care not to drop it into the crankcase.



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.



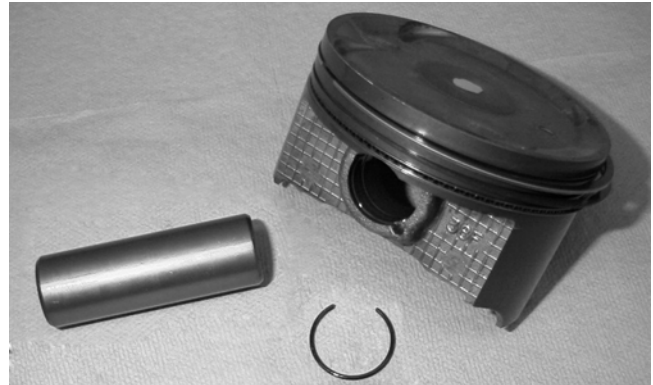
MD1219

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

CAUTION

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

■ **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.

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.

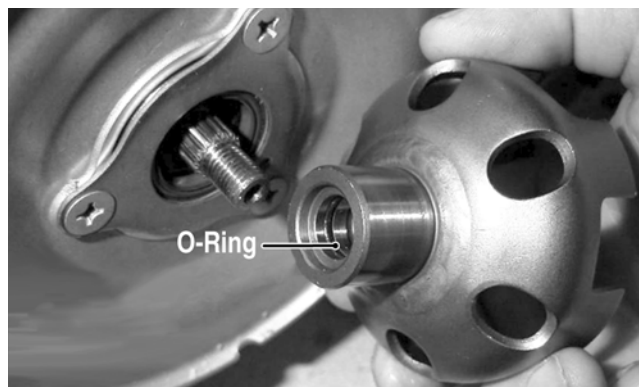
AT THIS POINT

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.

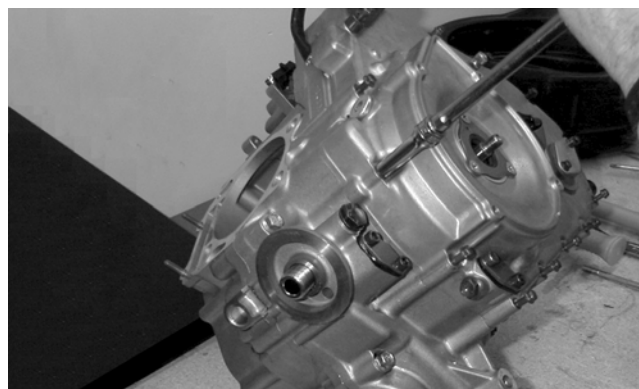


MD1303



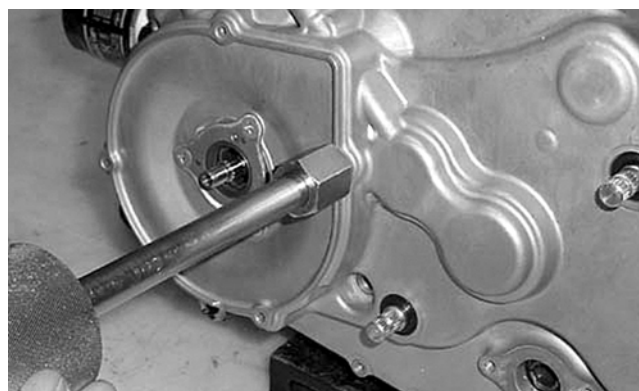
MD1304

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.



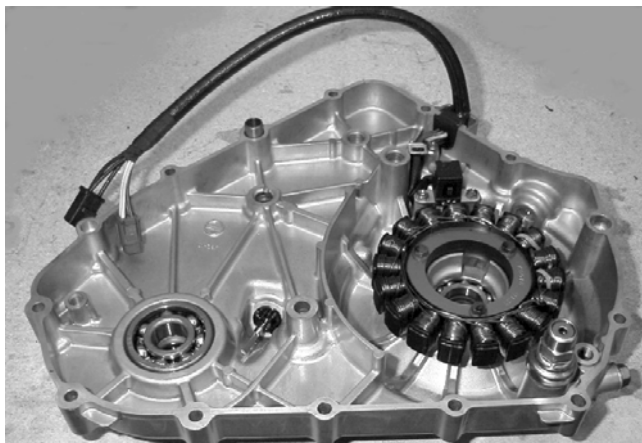
MD1186

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

3



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

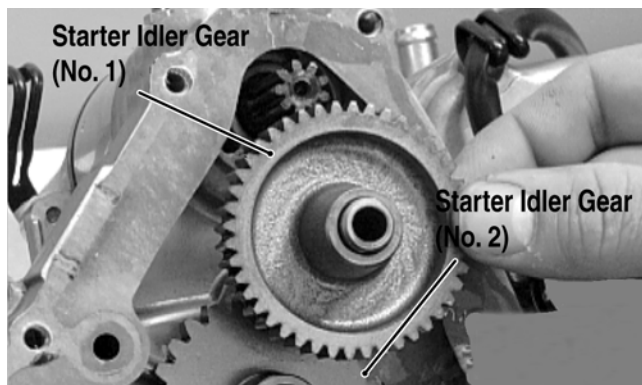


MD1369



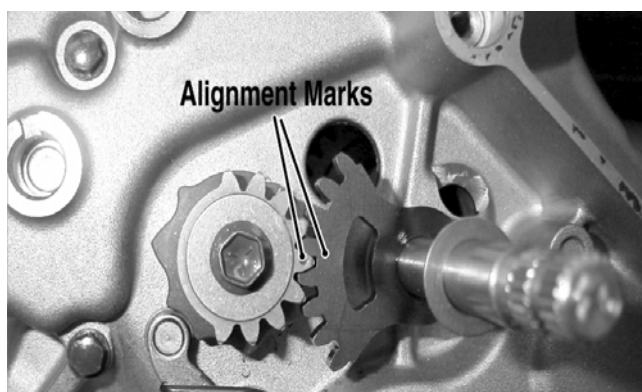
MD1370

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.

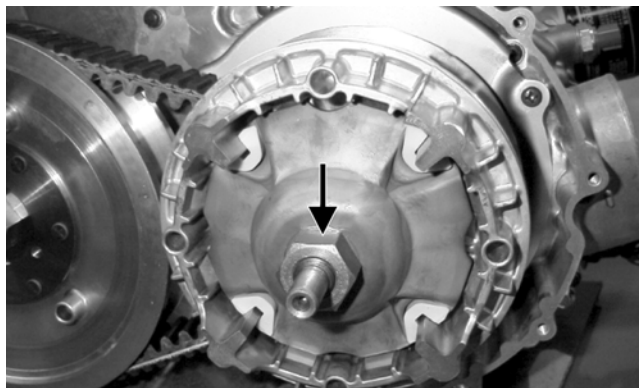


MD1306



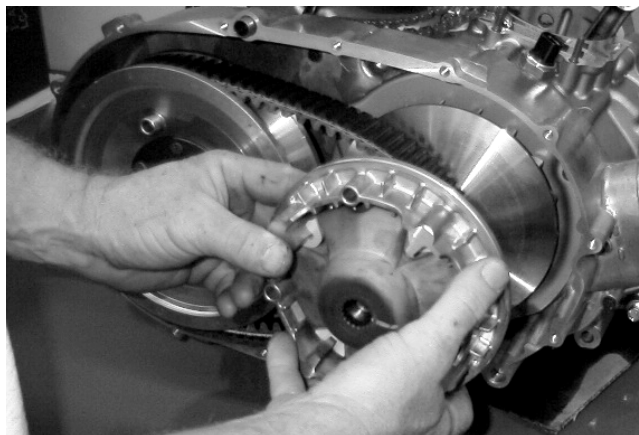
MD1307

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

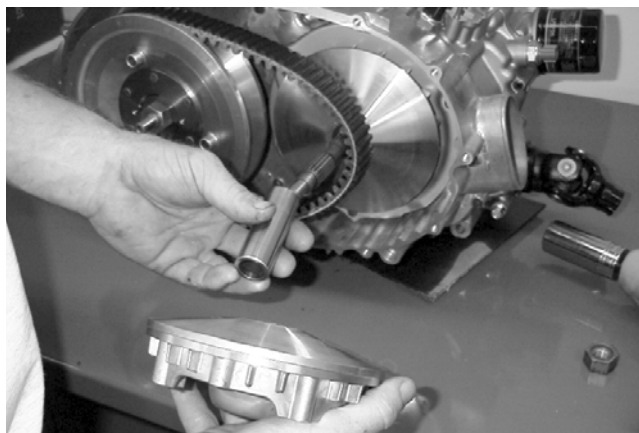


MD1033

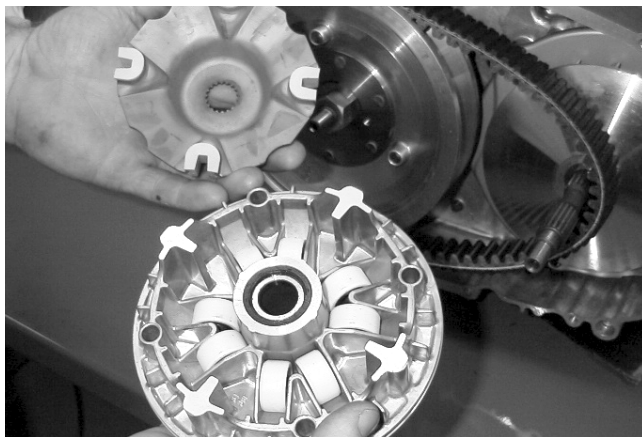
3. Remove the movable drive face and spacer. Account for the eight movable drive face rollers and outer drive face cover.



MD1035

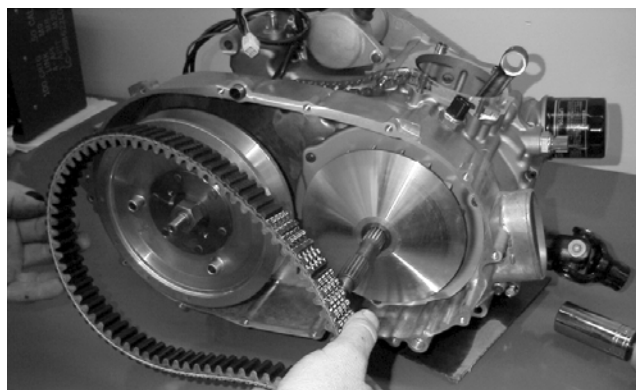


MD1034



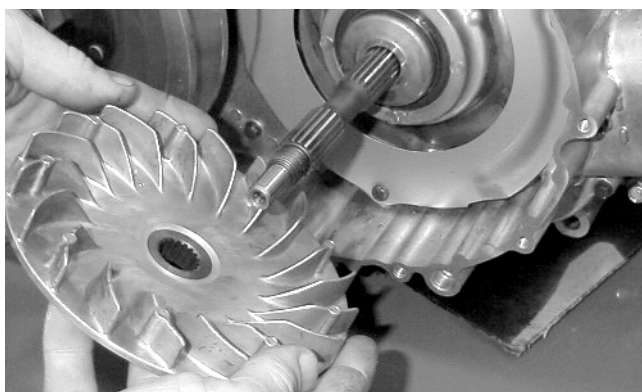
MD1036

4. Remove the V-belt.



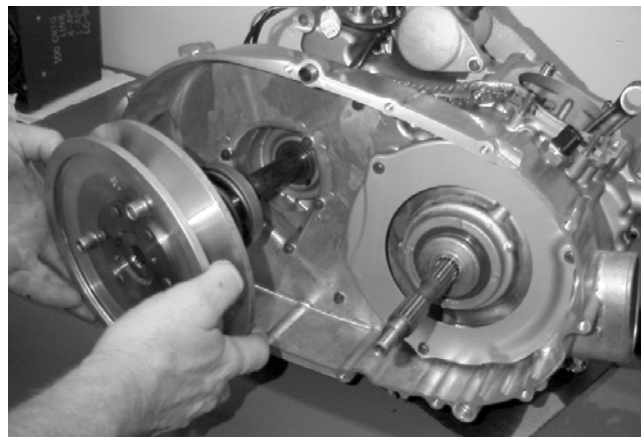
MD1118

5. Remove the fixed drive face.



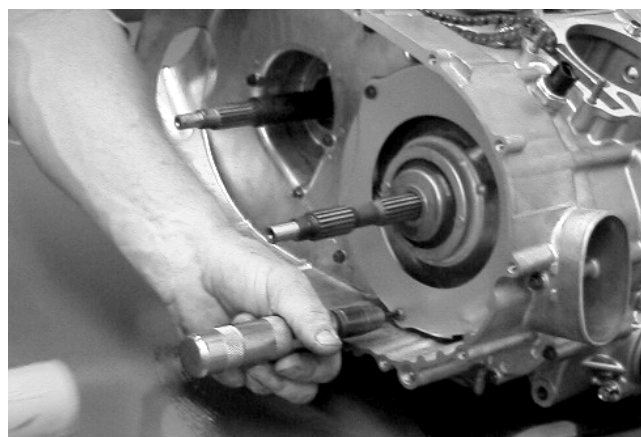
MD1094

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



MD1068

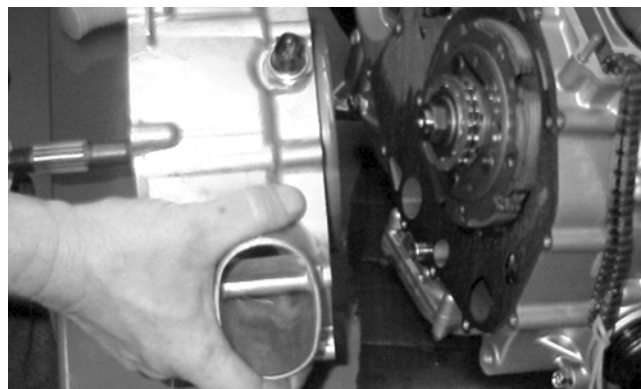
7. Using an impact screwdriver, remove the three Phillips-head cap screws holding the air intake plate. Remove the air intake plate.



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.

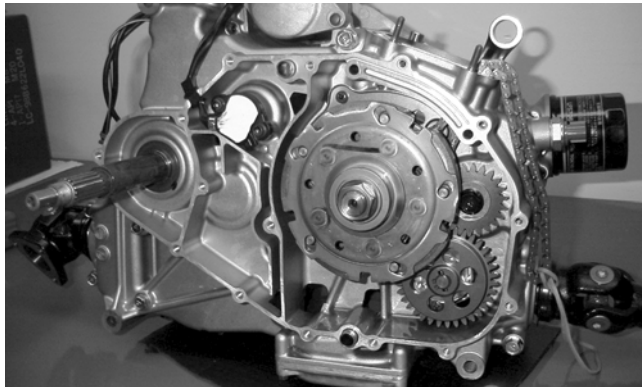


MD1115

3

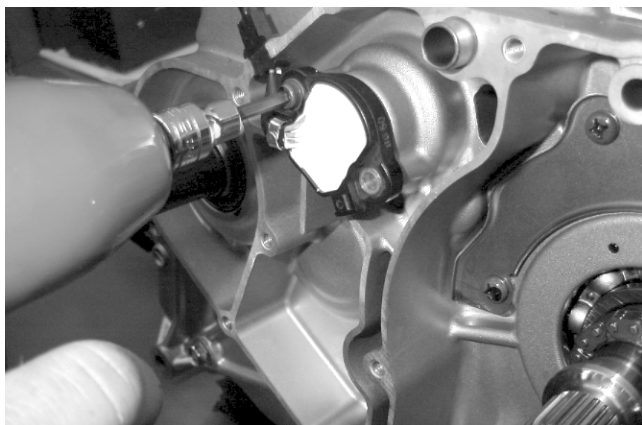
D. Gear Position Switch
E. Centrifugal Clutch Assembly
F. Oil Pump Drive Gear
G. Oil Pump Driven Gear

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



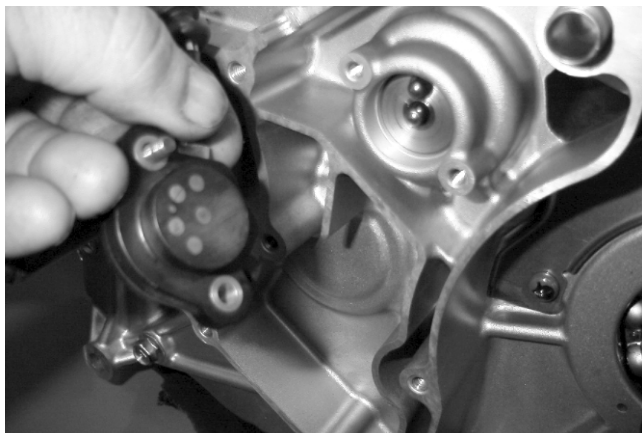
MD1072

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



MD1041

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



MD1040



MD1043

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

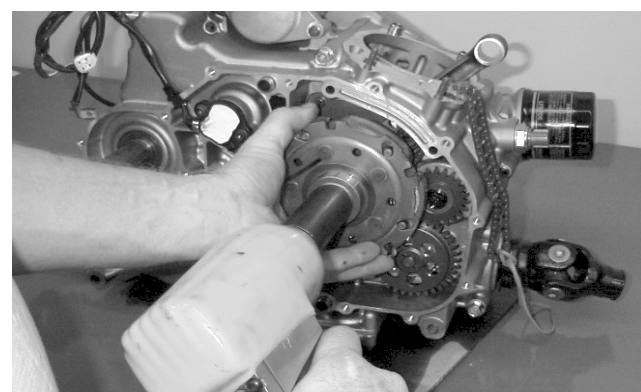


MD1286

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.



MD1014



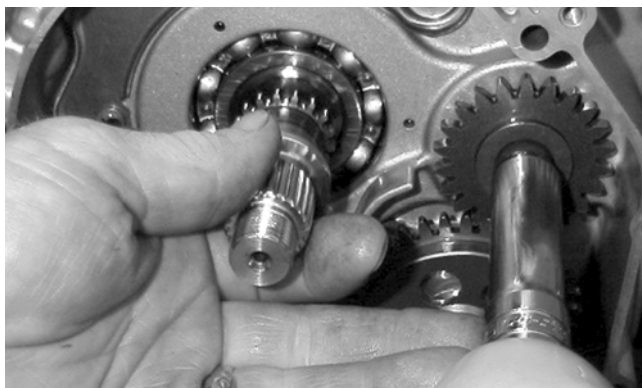
MD1016

14. Remove the cam chain.



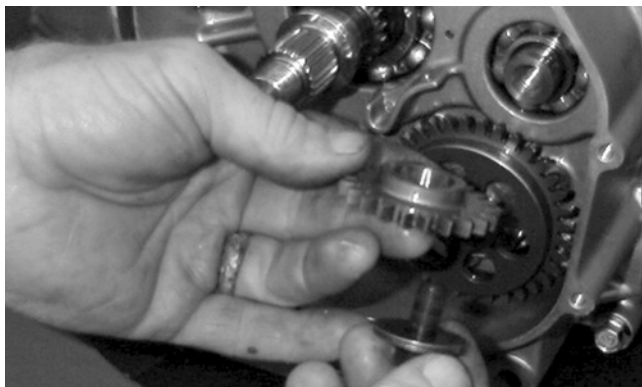
MD1335

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

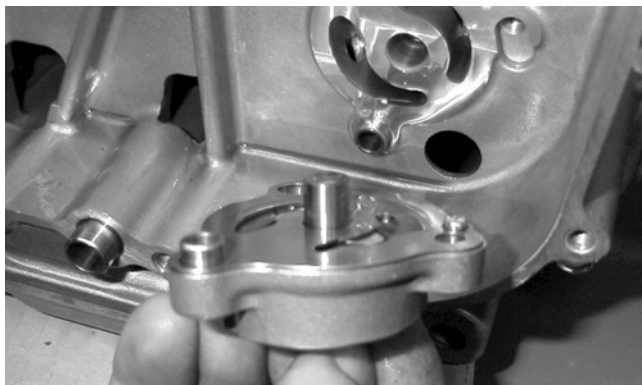
To service clutch components, see Servicing Right-Side Components sub-section.

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.

3



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.

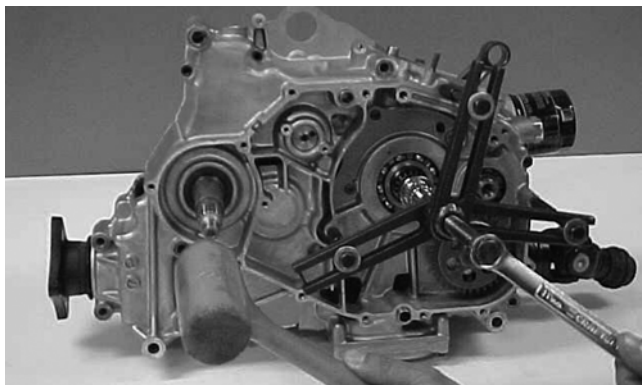


MD1006



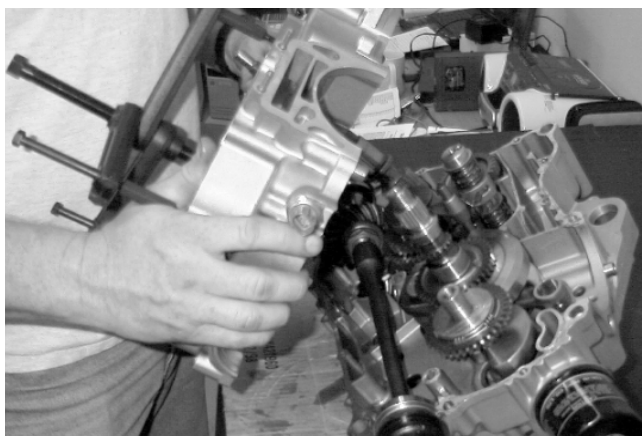
MD1012

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

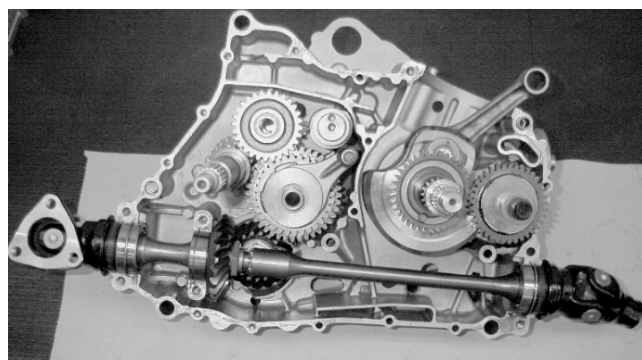
■ **NOTE:** To keep the shaft/gear assemblies intact for identification, tap the shafts toward the left-side crankcase half when separating the halves.



MD1313

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.



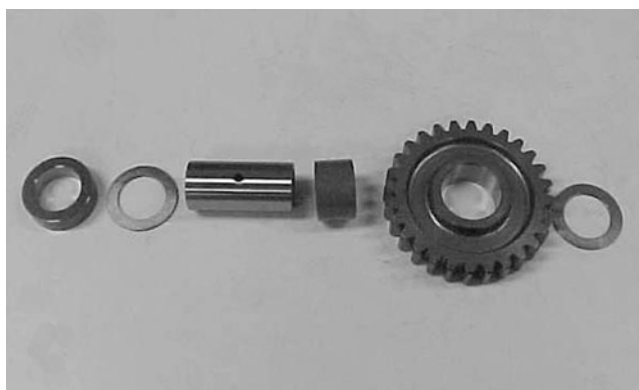
MD1317

■ **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



CC870

3. Remove the driveshaft.



MD1326

4. Remove the shift fork shaft and the outer shift fork.

3



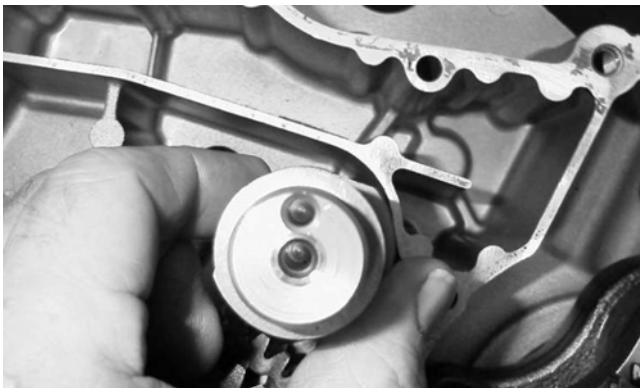
MD1327

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.



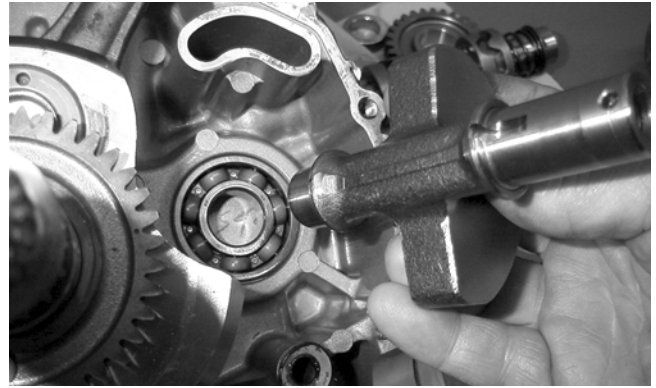
MD1328

6. Noting the position of the two holes on the end, remove the shift cam assembly. Account for inner and outer washers.



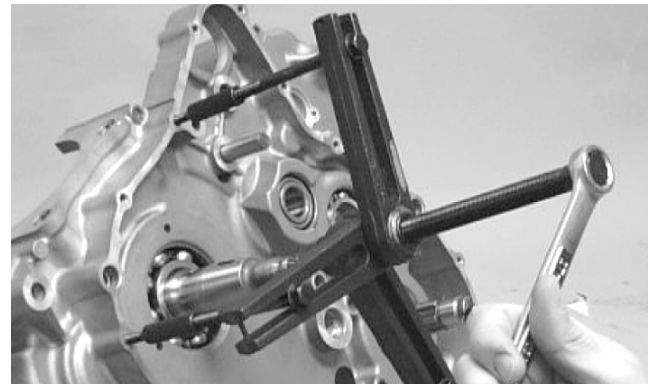
MD1329

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.

Servicing Top-Side Components	3-93
Valve Assembly	3-93
Piston Assembly	3-96
Cylinder/Cylinder Head Assembly	3-98
Servicing Left-Side Components	3-101
Recoil Starter	3-101
Servicing Right-Side Components	3-104
Inspecting Centrifugal Clutch Shoe	3-104
Inspecting Centrifugal Clutch Housing	3-104
Inspecting Primary One-Way Drive	3-104
Inspecting Oil Pump	3-105
Driven Pulley Assembly	3-105
Servicing Center Crankcase Components	3-109
Secondary Gears	3-109
Crankshaft Assembly	3-110
Countershaft	3-111
Crank Balancer Driven Gear	3-112

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

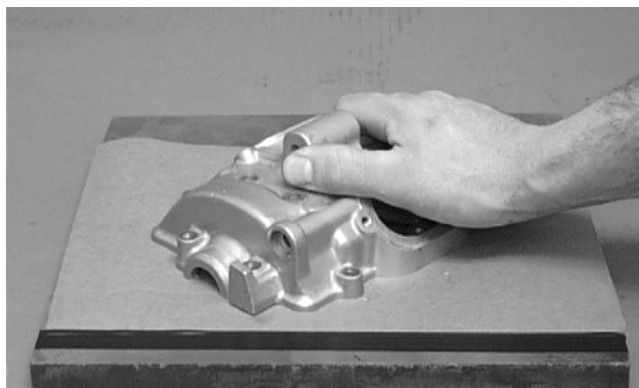
■ **NOTE:** If the valve cover cannot be trued, the cylinder head assembly must be replaced.

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

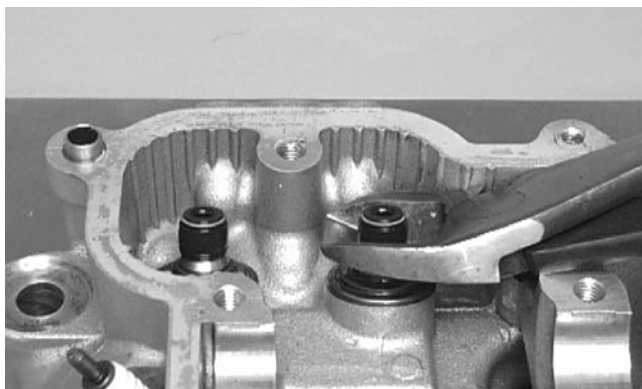
■ **NOTE:** Keep all valves and valve components as a set. Note the original location of each valve set for use during installation. Return each valve set to its original location during installation.

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

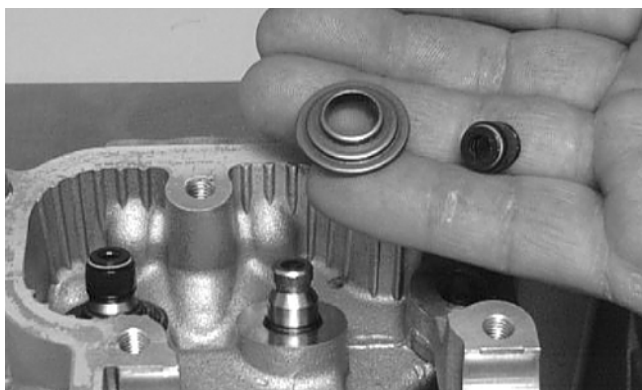


CC994

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



CC134D



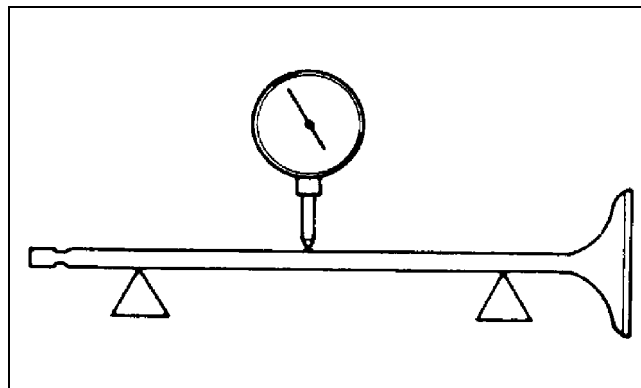
CC136D

■ **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

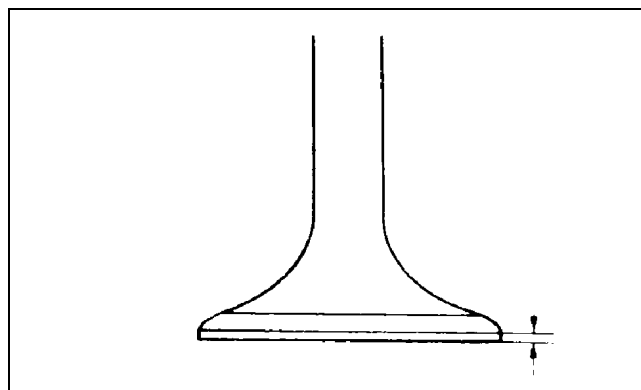
2. Maximum runout must not exceed specifications.

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.

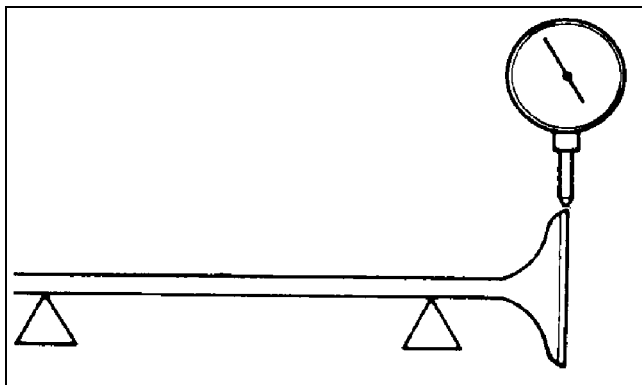


ATV-1004

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.

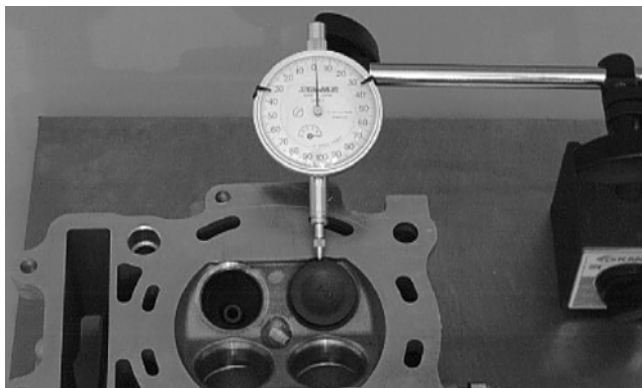


ATV1082A

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)

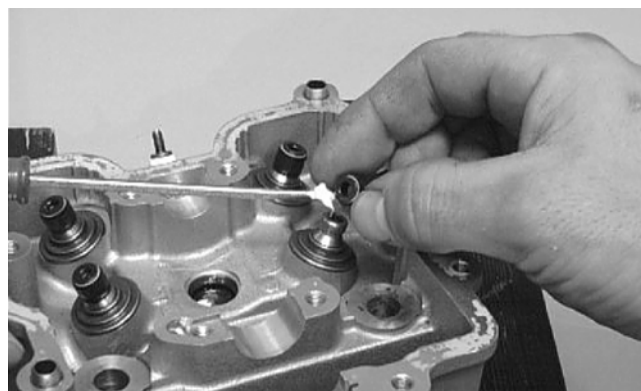
1. Using a dial calipers, measure the inside diameter of the rocker arm.
2. Acceptable inside diameter range must be within specifications.

Measuring Rocker Arm Shaft (Outside Diameter)

1. Using a micrometer, measure the outside diameter of the rocker arm shaft.
2. Acceptable outside diameter range must be within specifications.

Installing Valves

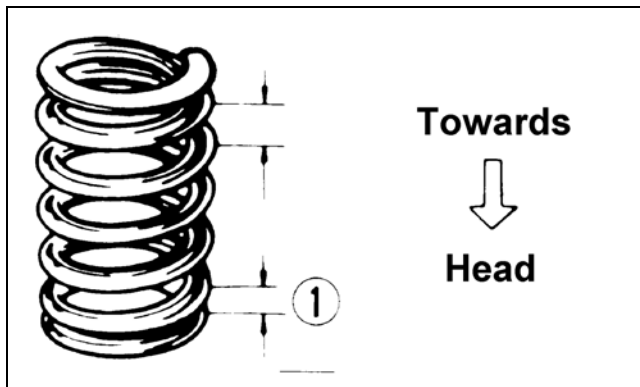
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



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.



ATV-1011A

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



CC994

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

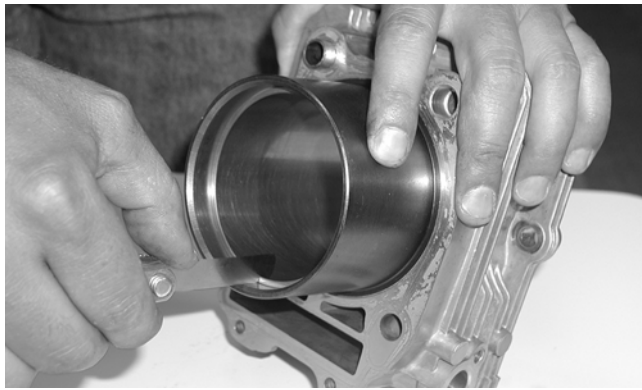
1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

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)

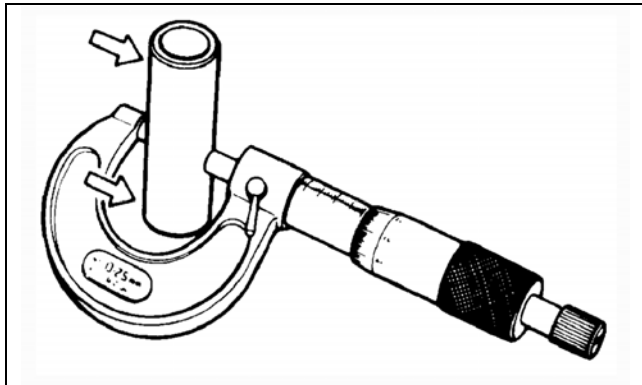
1. Place each piston ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must not exceed specifications.



CC995

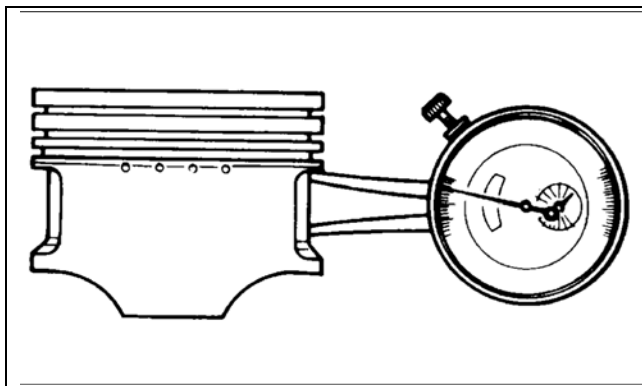
Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

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

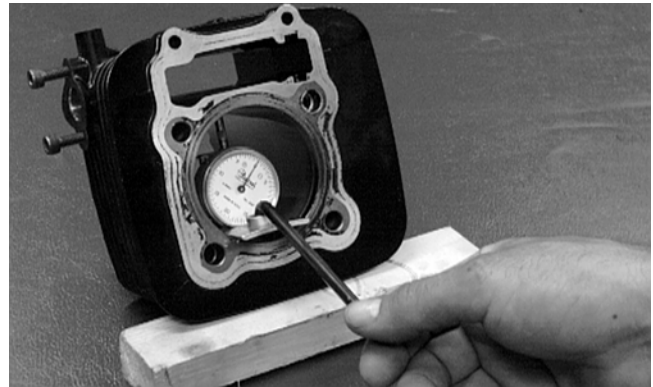
2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



ATV-1069

Measuring Piston Skirt/ Cylinder Clearance

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



CC397D

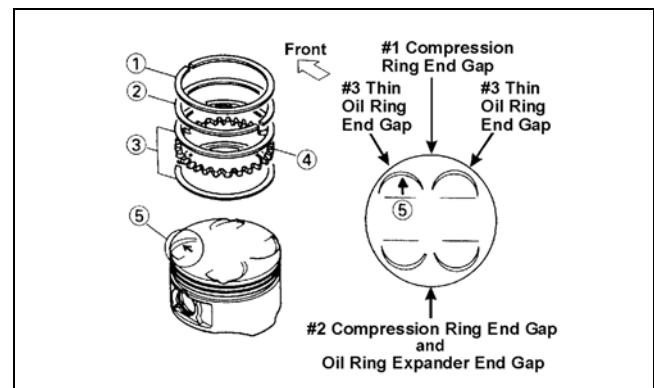
2. Measure the corresponding piston diameter at a point 15 mm (0.6 in.) above the piston skirt at a right angle to the piston-pin bore. Subtract this measurement from the measurement in step 1. The difference (clearance) must be within specifications.

3

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.

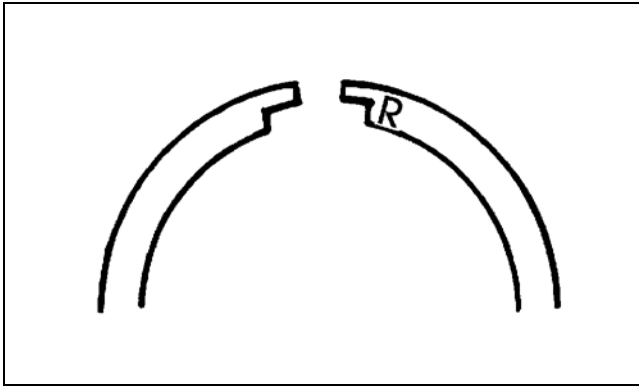
■ **NOTE:** Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.



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

⚠ 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

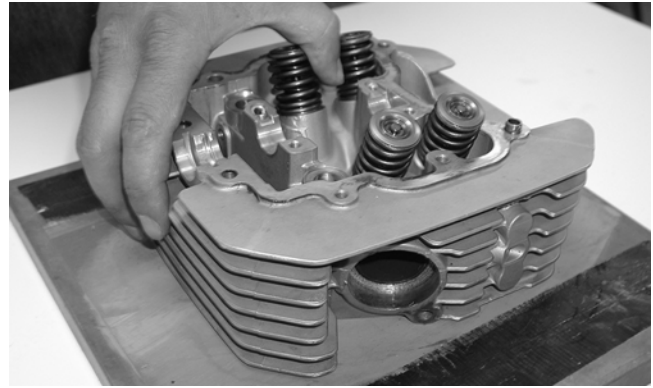
⚠ CAUTION

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.



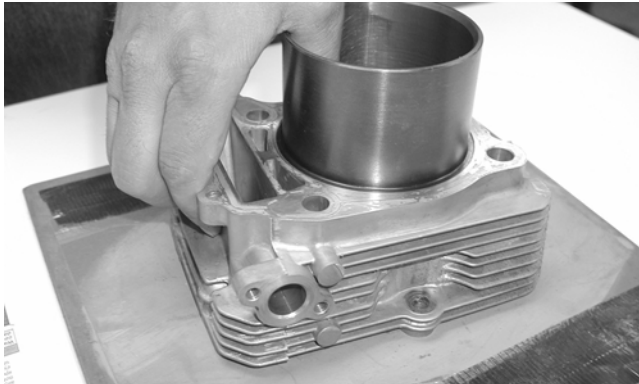
CC141D

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.



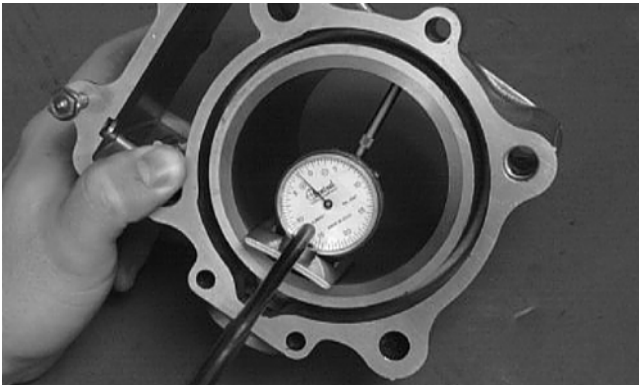
CC997

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

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.

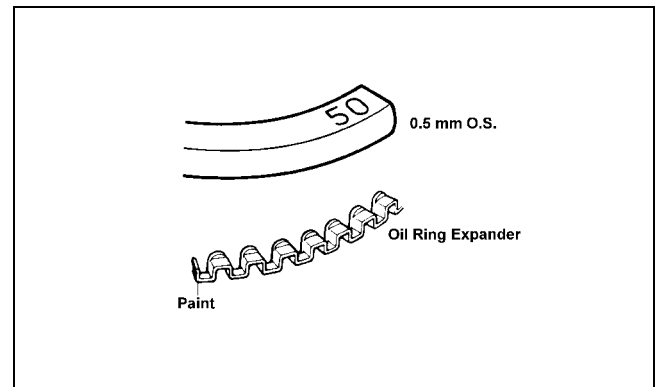
■ **NOTE:** To produce the proper 60° cross-hatch pattern, use a low RPM drill (600 RPM) at the rate of 30 strokes per minute. If honing oil is not available, use a lightweight petroleum-based oil. Thoroughly clean cylinder after honing using soap and hot water. Dry with compressed air; then immediately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

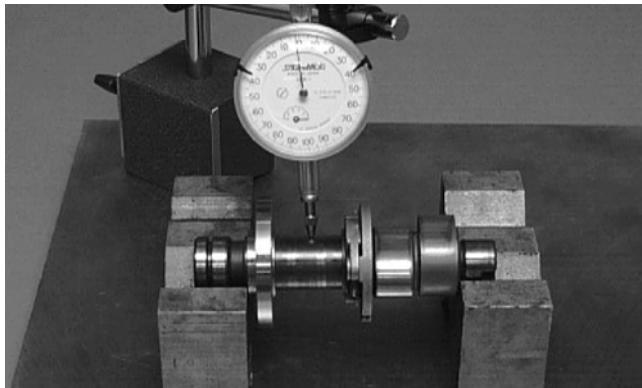


ATV-1068A

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.

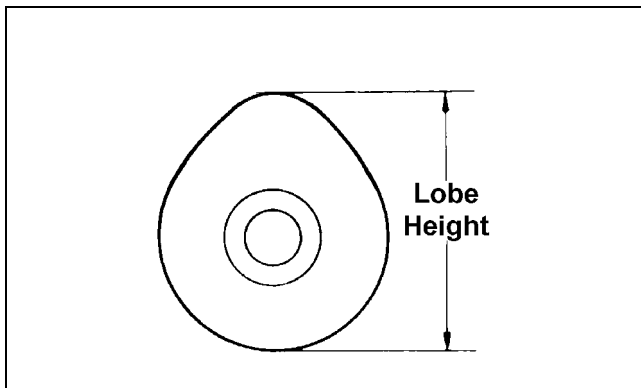


CC283D

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.

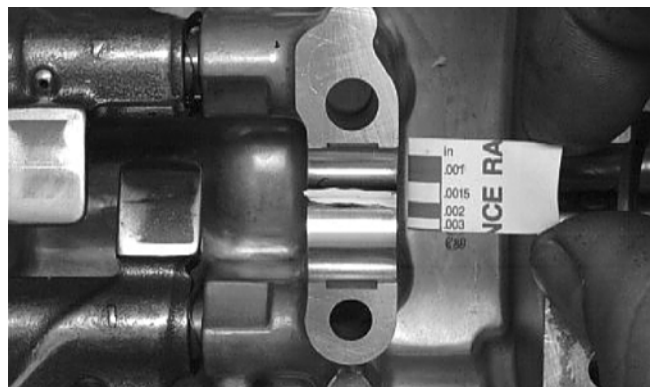
■ **NOTE:** Do not rotate the camshaft when measuring clearance.

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



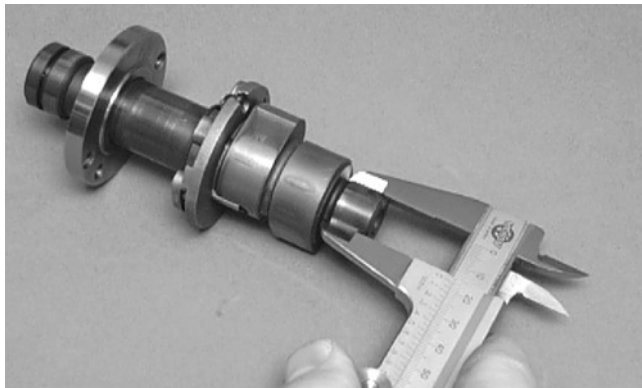
MD1261

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.

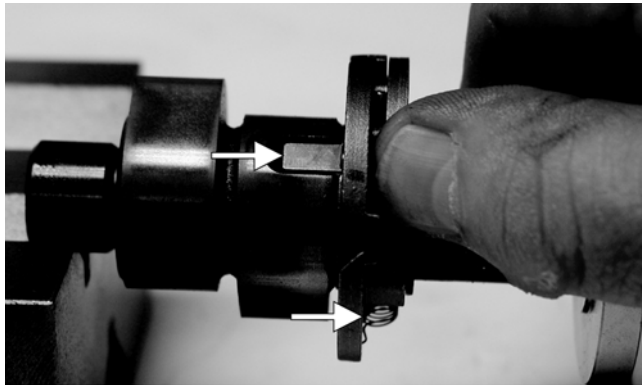


CC287D

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

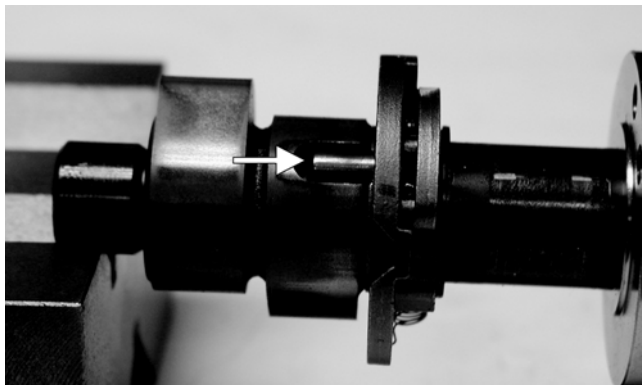
Inspecting Camshaft Spring/Drive Pin

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

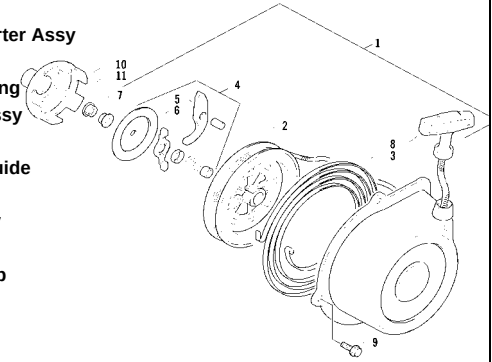
2. If damaged, the camshaft must be replaced.

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



0737-034

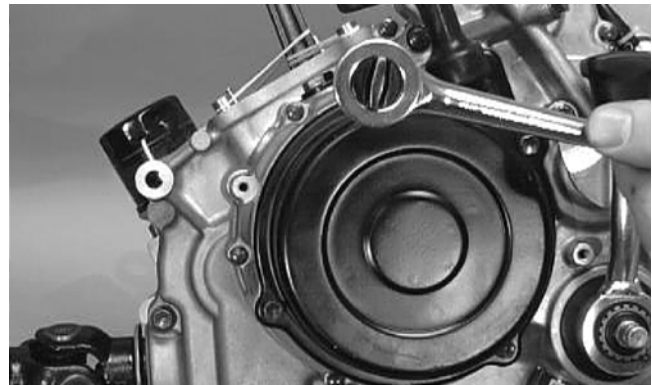


WARNING

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.



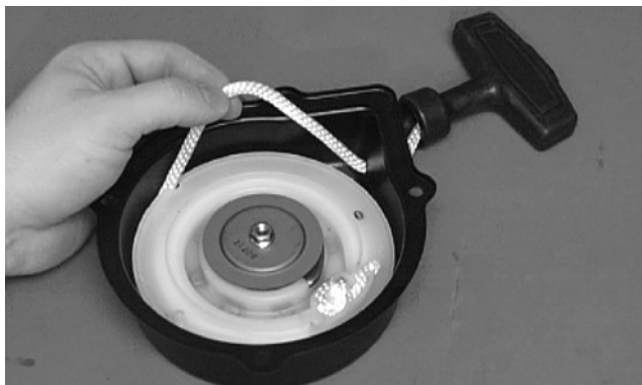
CC039D



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.



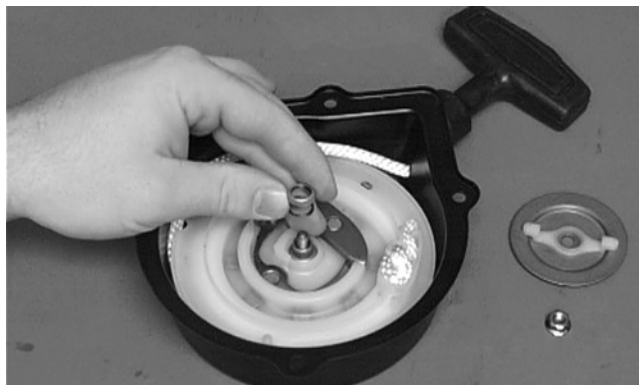
B601D

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.



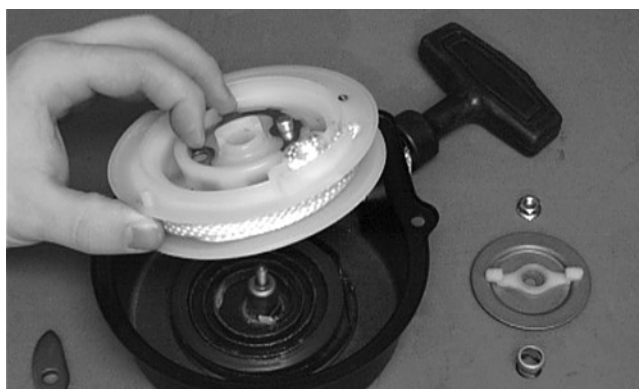
B603D

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.

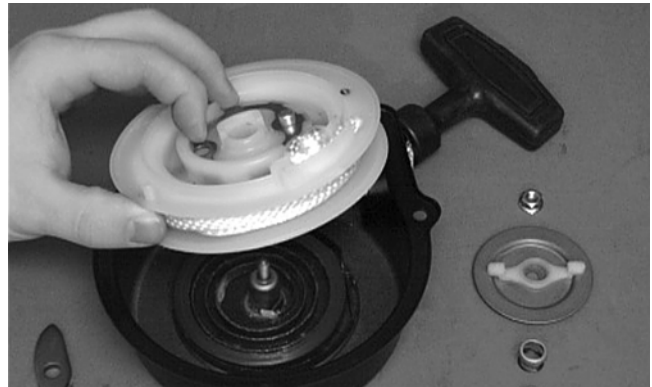
■ **NOTE:** The spiral spring must seat evenly in the recoil case.



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.



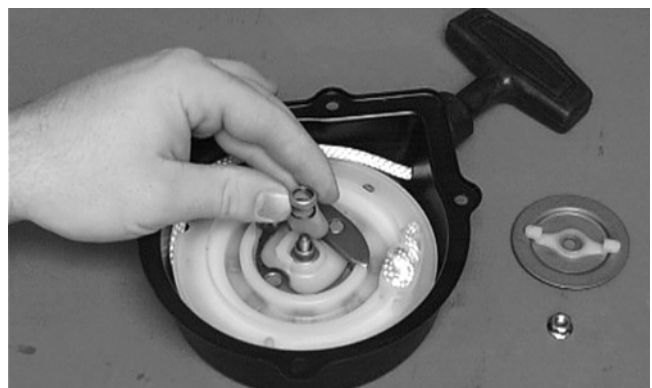
B605D

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



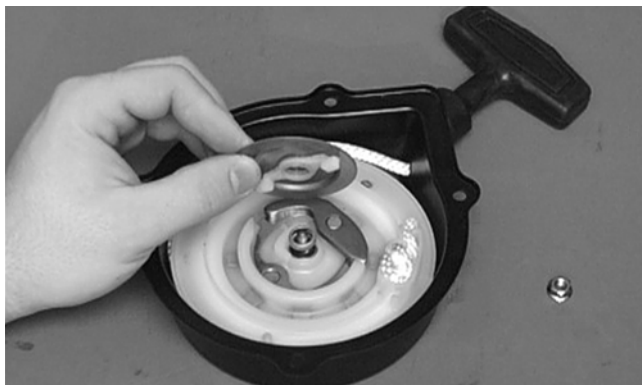
B604D

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

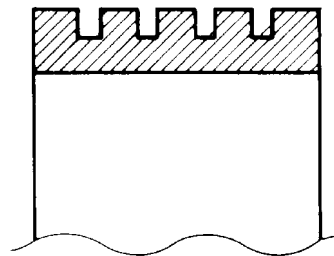
■ **NOTE:** Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.

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

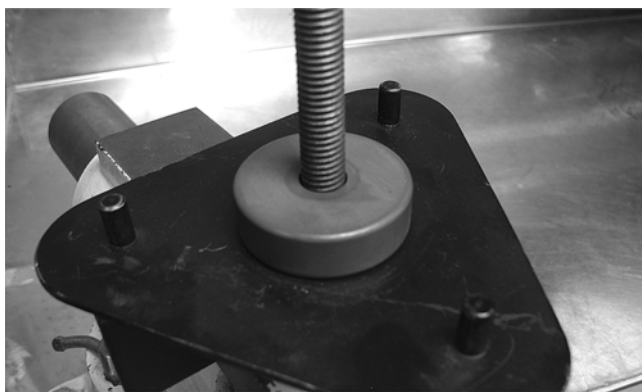
DRIVEN PULLEY ASSEMBLY

Disassembling

WARNING

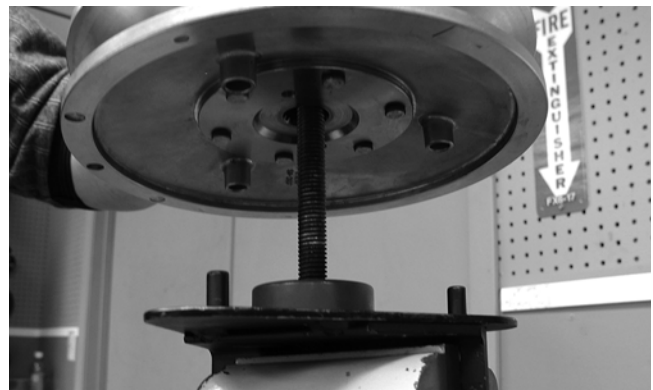
This procedure involves relaxing a compressed spring assembly. **DO NOT** attempt disassembling without the proper tools.

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.



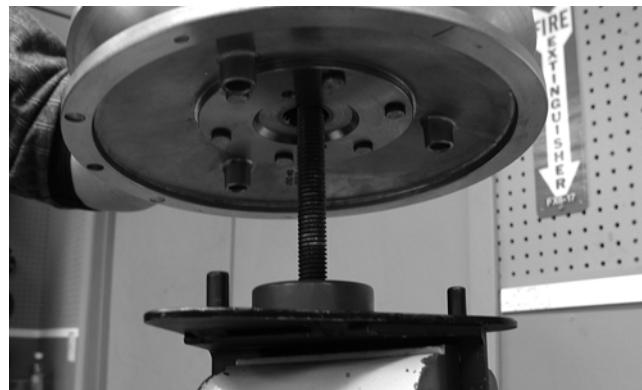
CF095A

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

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

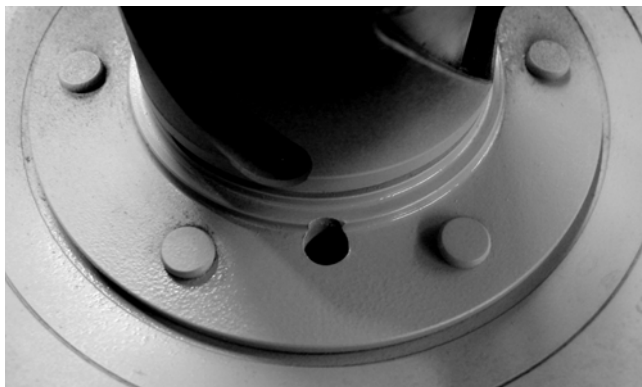
3. Install the three pins and spacers into the fixed face hub; then pack the cam slots in the movable face with multi-purpose grease.



CD061

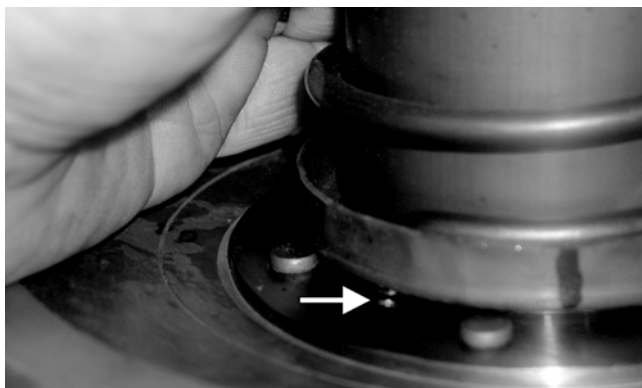
3

4. Install the movable face sleeve aligning the hole in the spring seat with the spring anchor hole in the movable face.



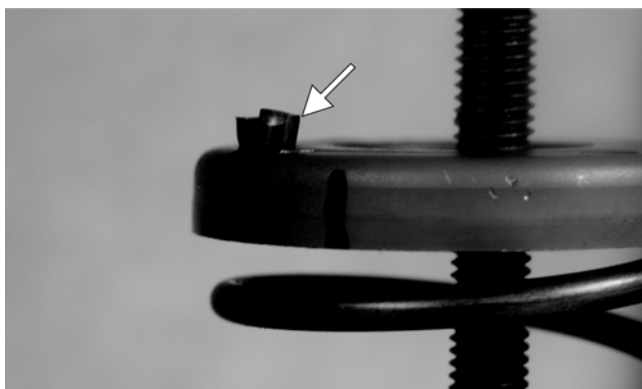
CF097

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 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

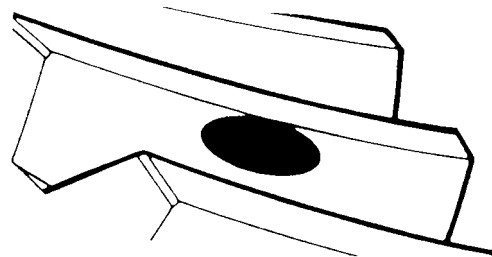
Checking Tooth Contact

■ **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.

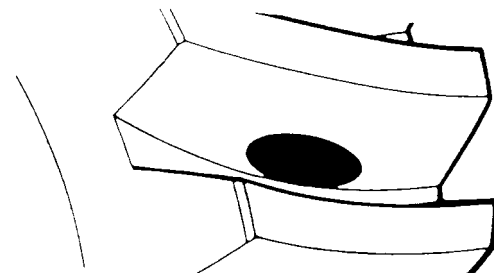
3

Incorrect (contact at tooth top)

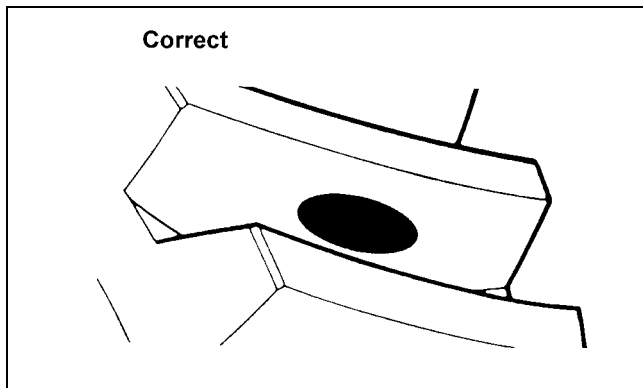


ATV-0103

Incorrect (contact at tooth root)



ATV-0105



ATV-0104

Correcting Tooth Contact

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

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

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

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

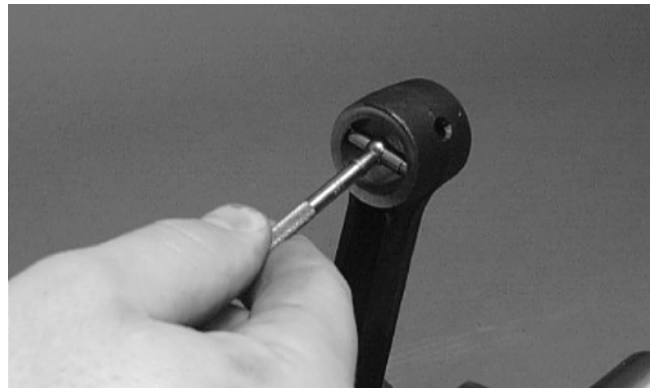
⚠ CAUTION

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

CRANKSHAFT ASSEMBLY

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

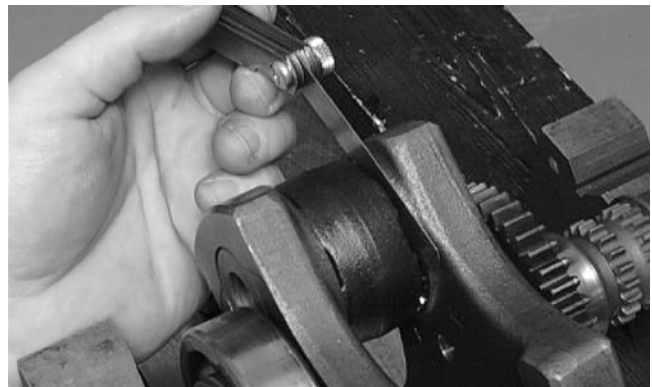
2. Maximum diameter must not exceed specifications.

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

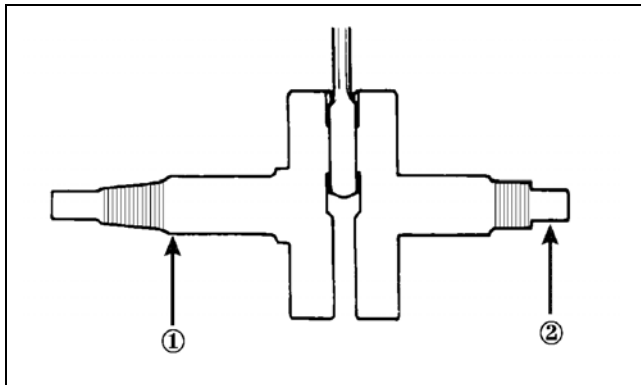
3. Acceptable gap range must be within specifications.

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.



3. Zero the indicator and rotate the crankshaft slowly.

CAUTION

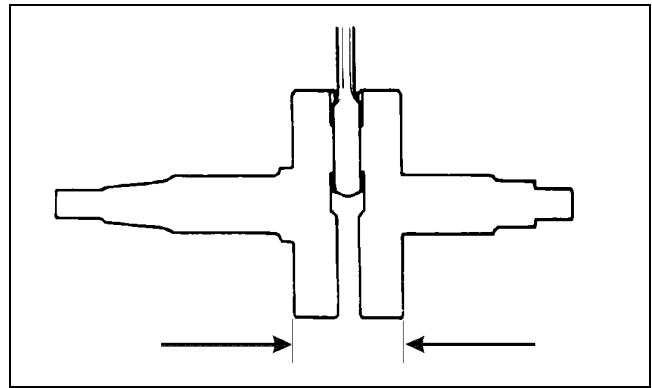
Care should be taken to support the connecting rod when rotating the crankshaft.

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.



2. Acceptable width range must be within specifications.

COUNTERSHAFT

CAUTION

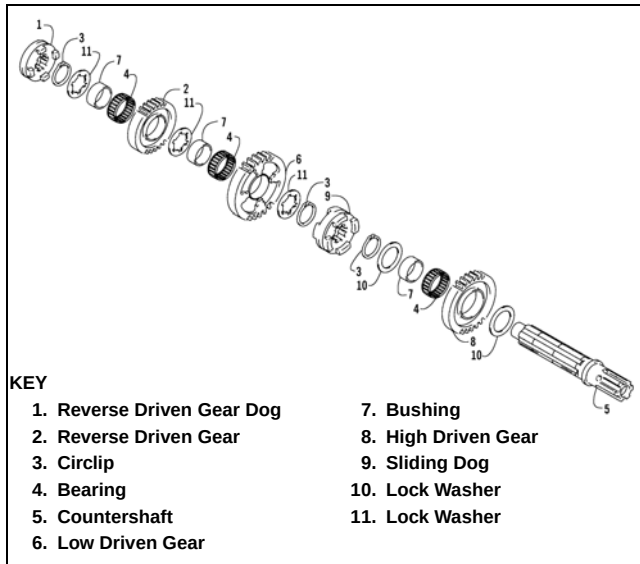
When disassembling the countershaft, care must be taken to note the direction each major component (dog, gear) faces. If a major component is installed facing the wrong direction, transmission damage may occur and/or the transmission will malfunction. In either case, complete disassembly and assembly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

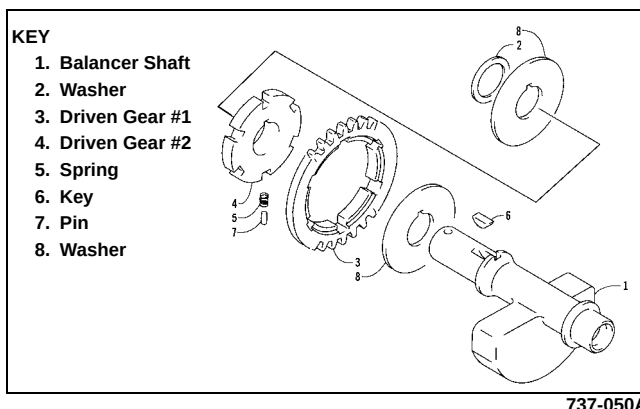
Assembling



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 countershaft 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



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.



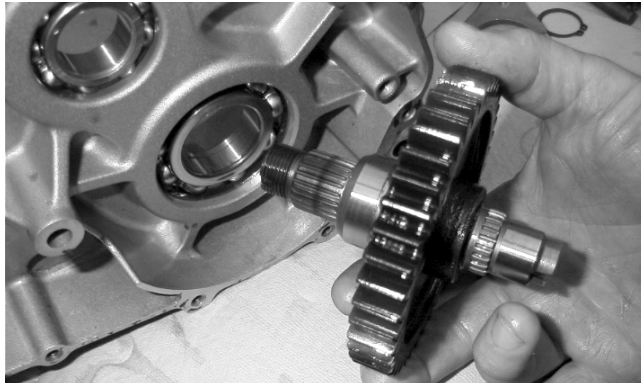
MD1199



MD1334

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

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



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.



MD1024

5. Keeping the counterbalance gear timing mark aligned with the one on the crankshaft gear, install the key and the counterbalance gear.



MD1333

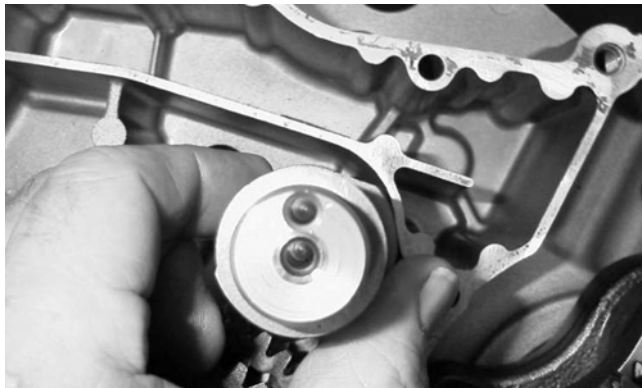
3. Apply a liberal amount of oil to the crankshaft bearing. Using a propane torch, heat the bearing until the oil begins to smoke; then slide the crankshaft assembly into place.



CC166D

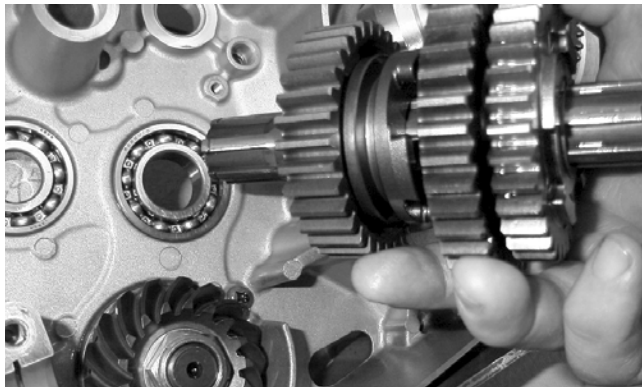
6. Keeping the two holes facing up, install the shift cam and inner and outer washers.

3

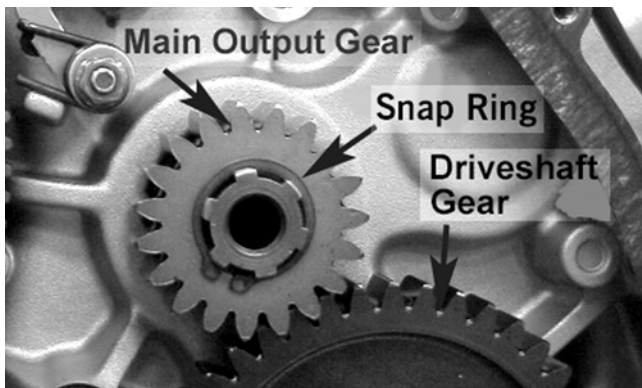


MD1329

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.

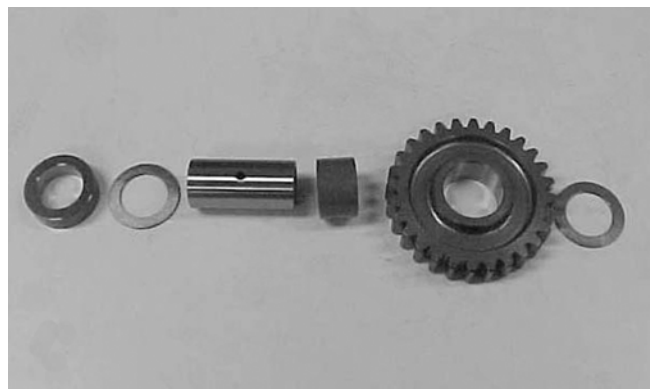


MD1327

9. Install the input driveshaft.



MD1326



CC870

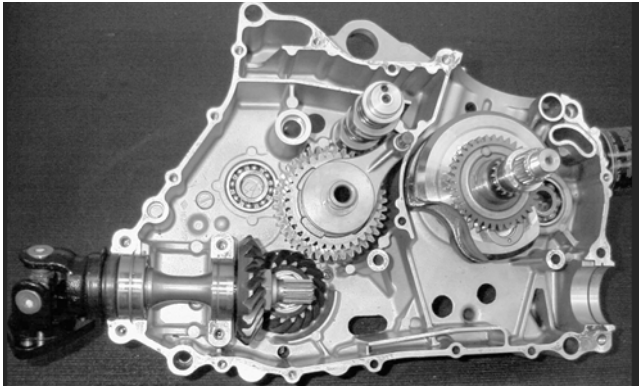
10. Install the washer, spacer, sleeve, reverse idler gear, and washer.



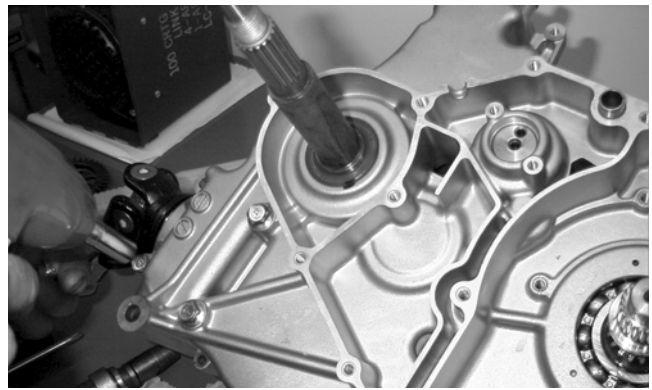
MD1357

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.



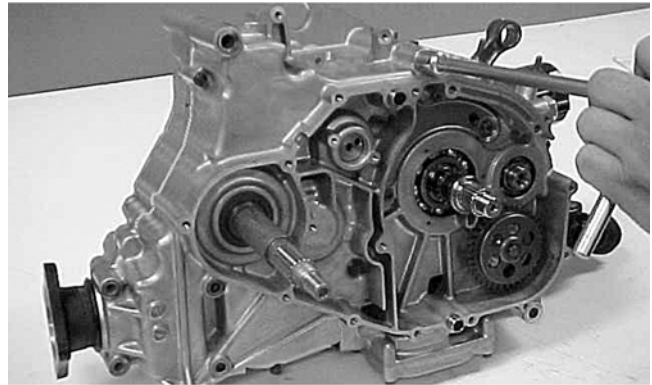
MD1316



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.

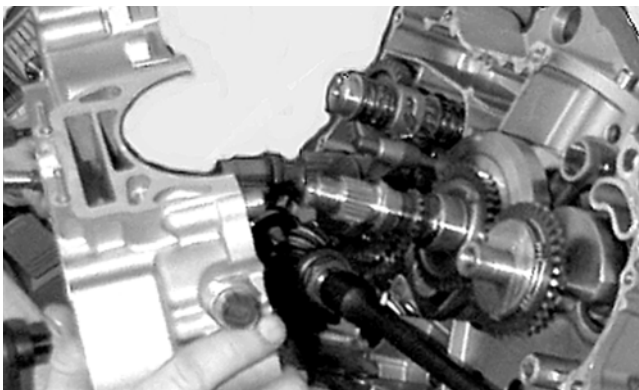


CC871

3

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

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.

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.

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.

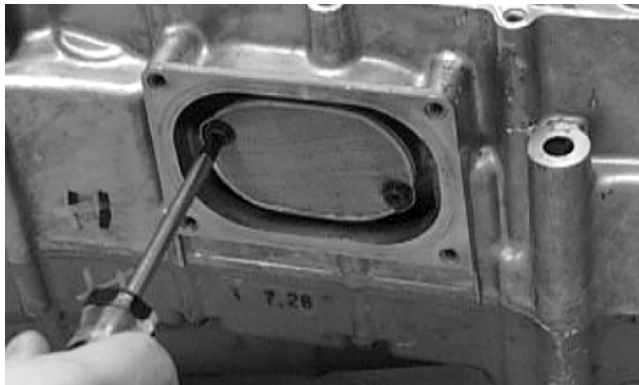
Installing Right-Side Components

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.



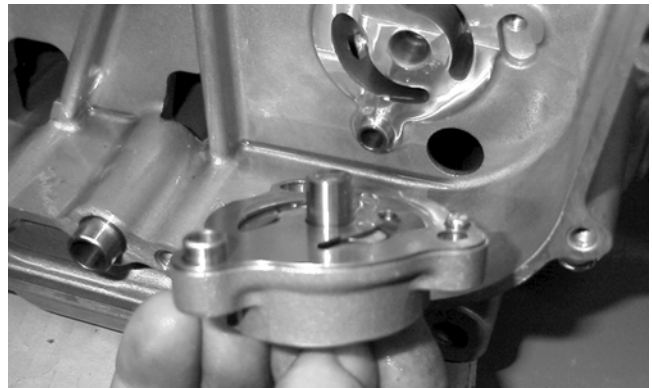
MD1337

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.



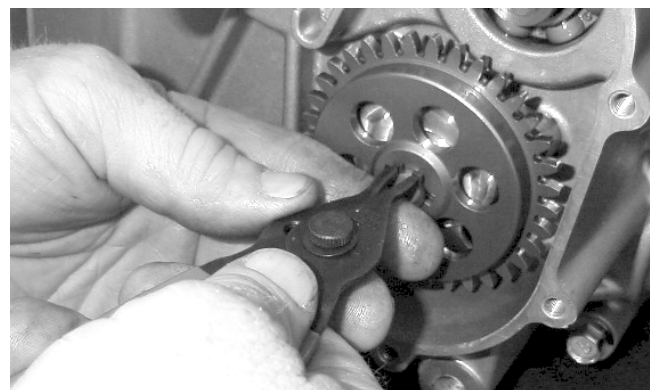
MD1060

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

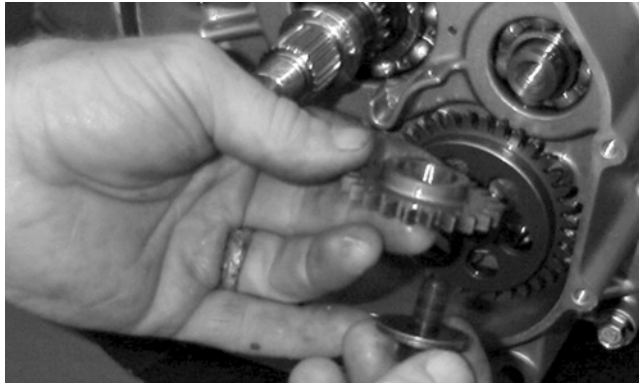


MD1019

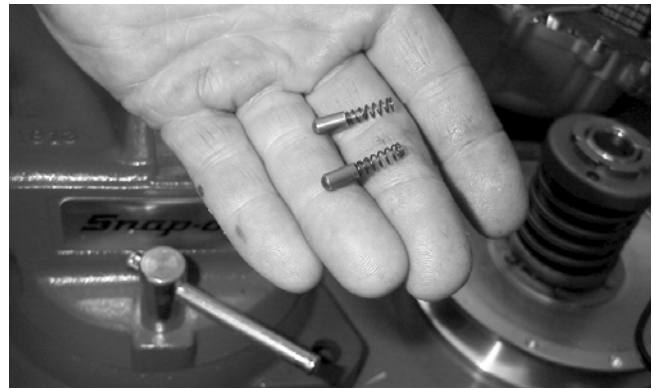
5. Install the cam chain.

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

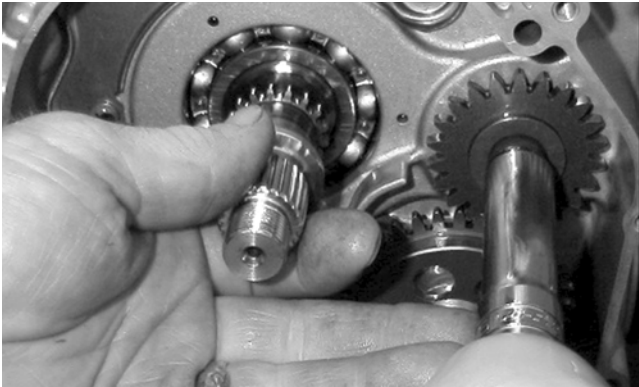
6. Place the pin into position, install the oil pump drive gear, and tighten the cap screw (coated with red Loctite #271) securely.



MD1017



MD1043



MD1018

7. Install the clutch shoe assembly on the crankshaft; 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

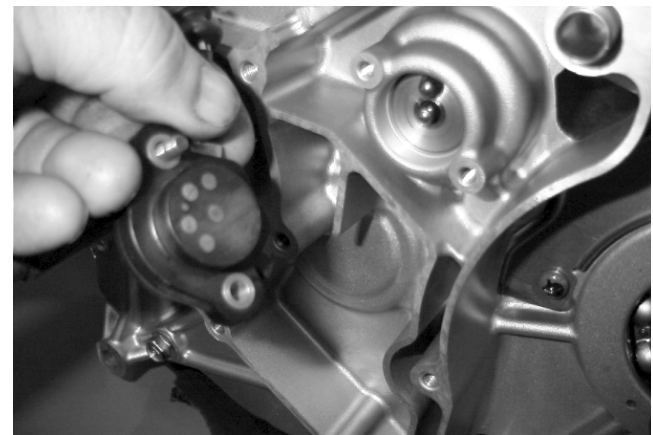
Care must be taken when installing the flange nut; it has "left-hand" threads.

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.



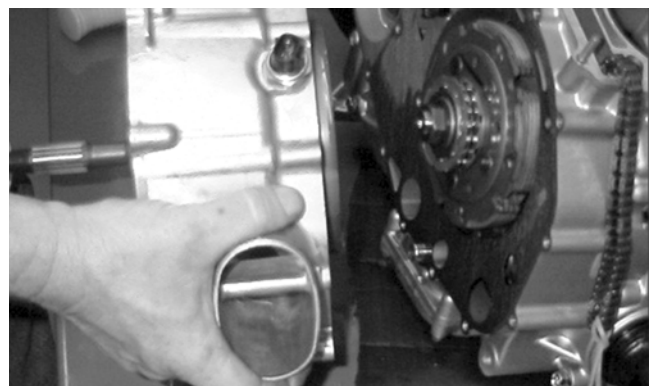
MD1040

10. Install gear position indicator switch making sure the O-ring is well-oiled and properly positioned. Tighten cap screws securely.

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

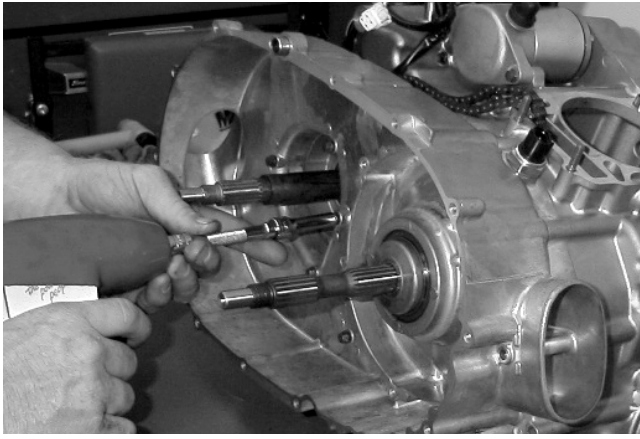
■ **NOTE:** Steps 1-10 in the preceding sub-section must precede this procedure.

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



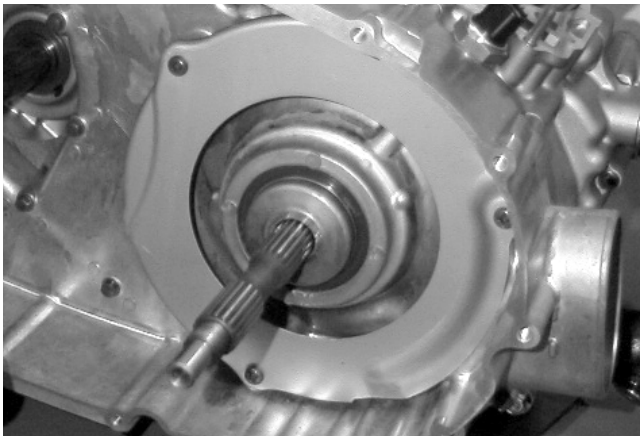
MD1115

12. Tighten the clutch cover cap screws to specifications.



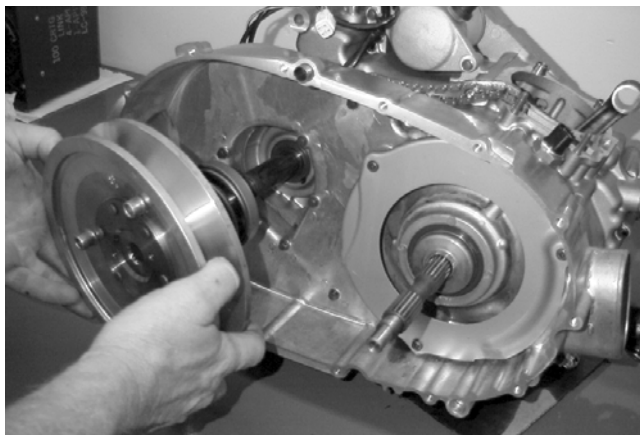
MD1117

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.

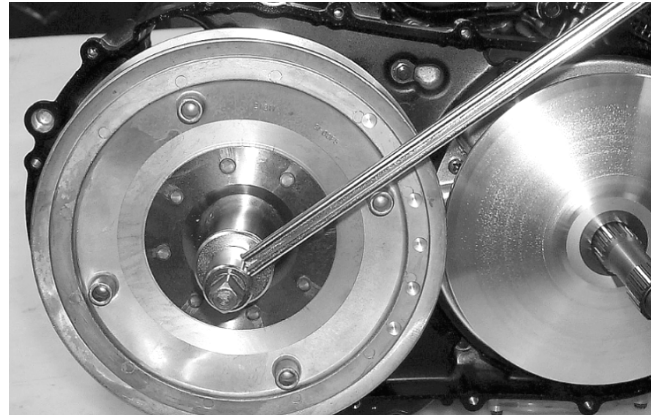


MD1342

14. Place the driven pulley assembly into position and secure with the nut (threads coated with red Loctite #271). Tighten to specifications.



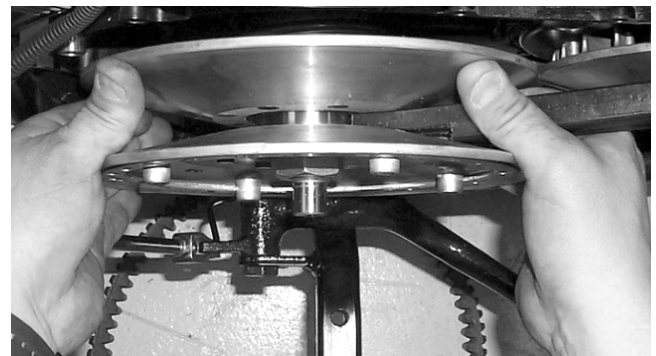
MD1068



MD1339

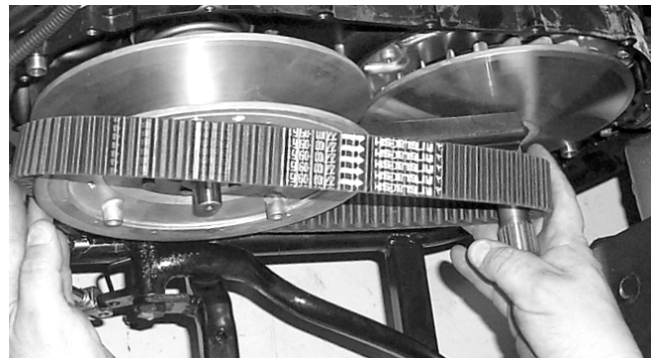
15. Slide the fixed drive face assembly onto the front shaft.

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

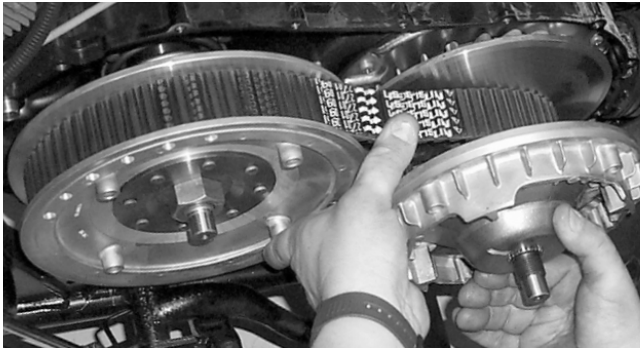
17. Place the V-belt into position on the driven pulley and over the front shaft.



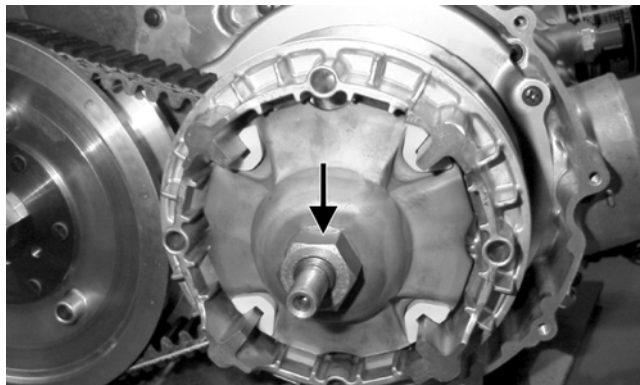
MD1341

- **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.

3



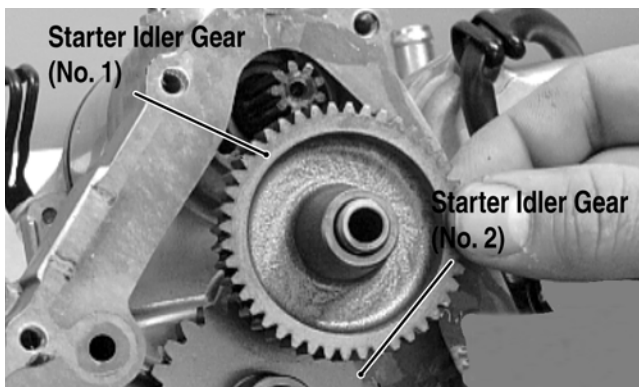
MD1086

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

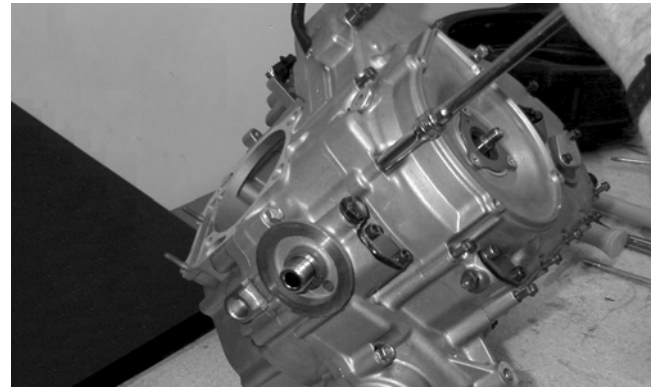
8. Place the key into its notch; then slide the rotor/flywheel (with the ring gear in place) over the crankshaft. Tighten the nut to specifications.

C. Cover

D. Recoil Starter

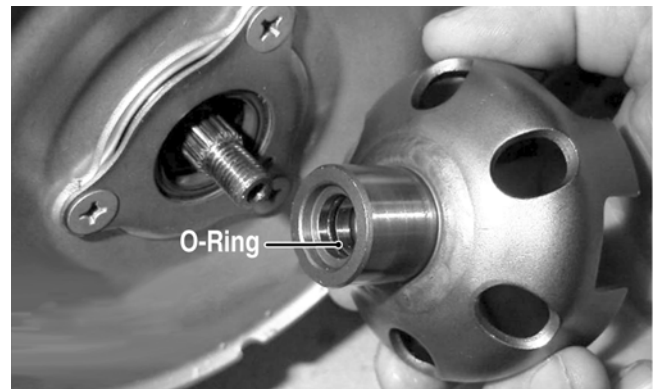
■ **NOTE:** Steps 1-8 in the preceding sub-section must precede this procedure.

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.

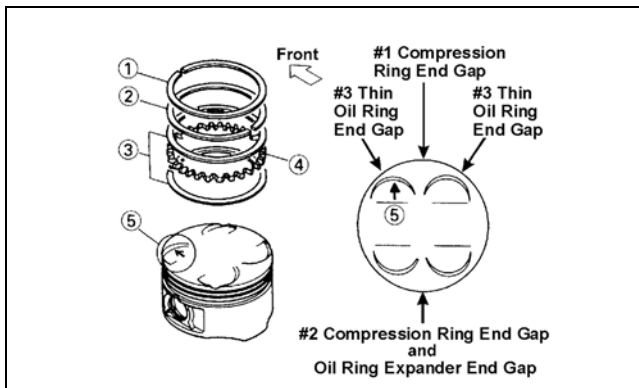
Installing Top-Side Components

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.

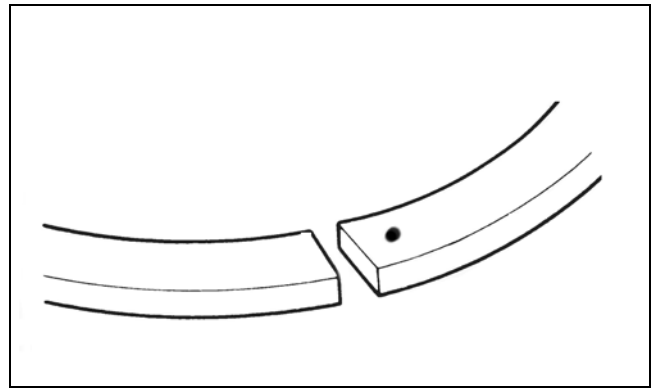


ATV-1085B

■ **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 according to the illustration.

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



MD1343

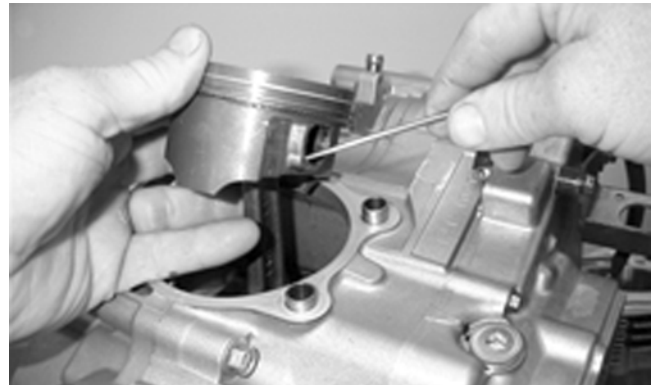
⚠ CAUTION

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.

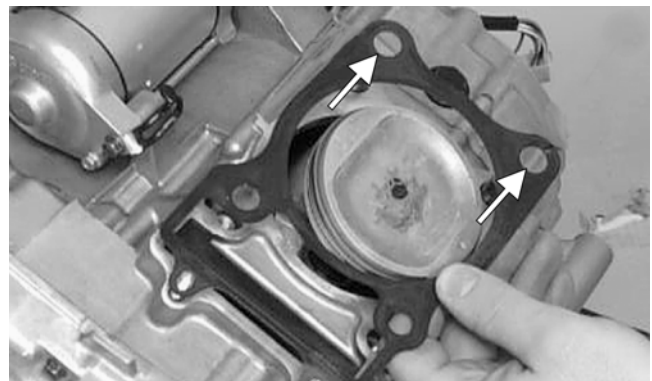
■ **NOTE:** The piston should be installed so the arrow points towards the exhaust.

3



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

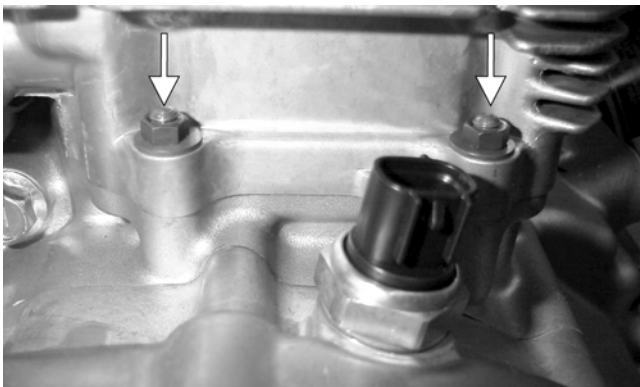
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



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.

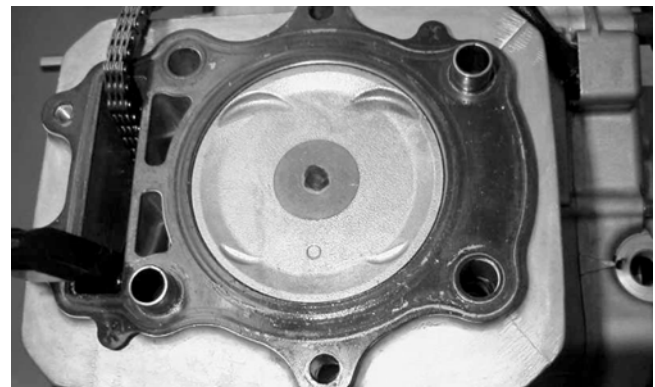


MD1349

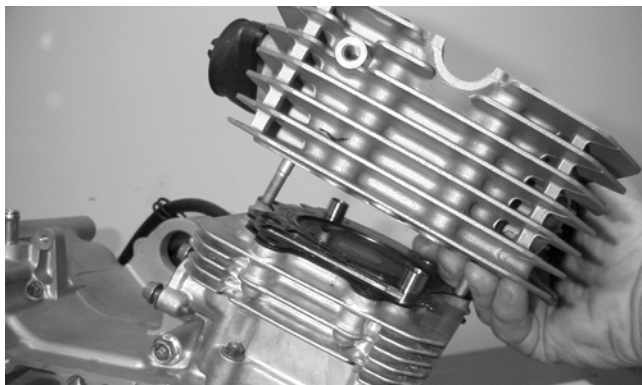
6. Place the head gasket into position on the cylinder. Place the alignment pins into position; then place the head assembly into position on the cylinder making sure the cam chain is routed through the chain cavity.

CAUTION

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

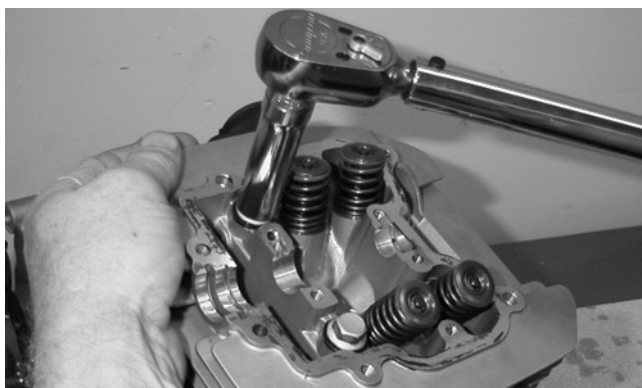


MD1347



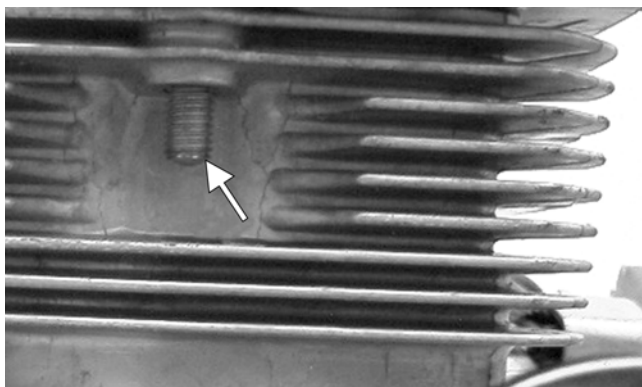
MD1163

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.



MD1270

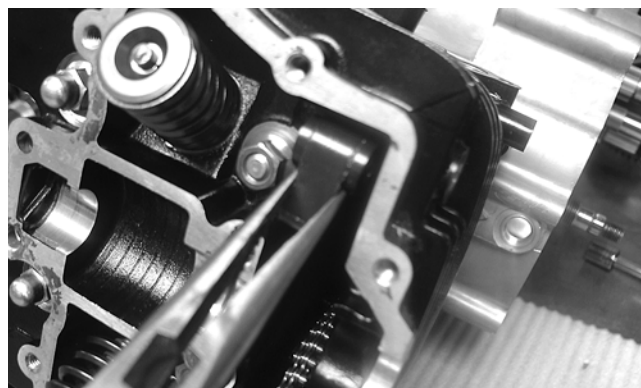
8. Install the two lower nuts securing the cylinder head to the cylinder, one in front and one in rear.



MD1192

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.

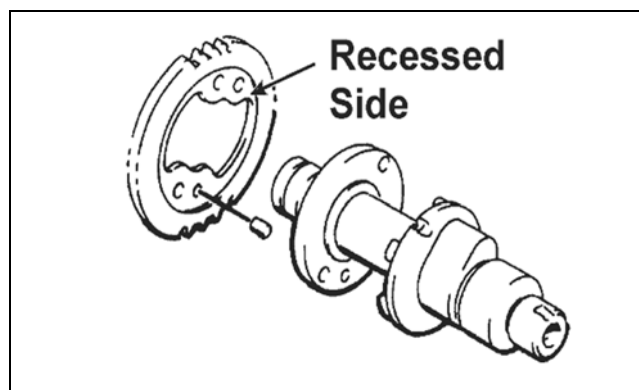


CD383

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.

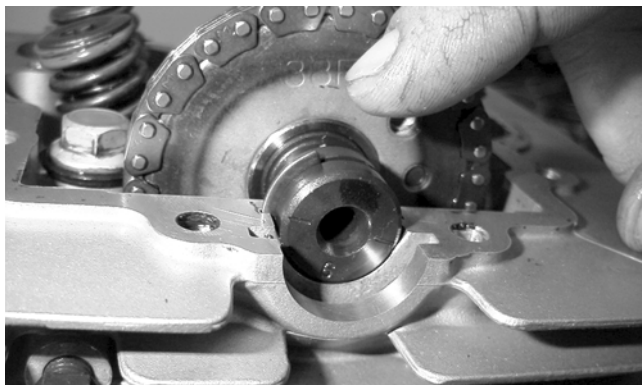
■ **NOTE:** When the camshaft assembly is seated, make sure the alignment pin in the camshaft aligns with the smallest hole in the sprocket.

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.



MD1359

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.

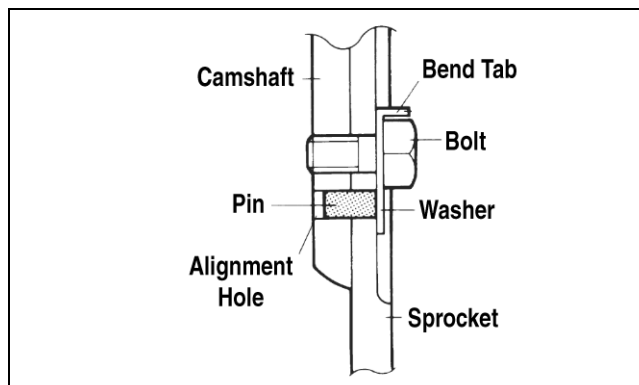
15. When the camshaft assembly is seated, ensure the following.

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

CAUTION

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

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

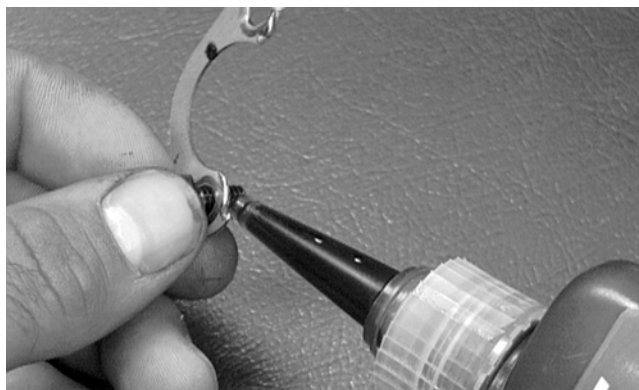


MD1363

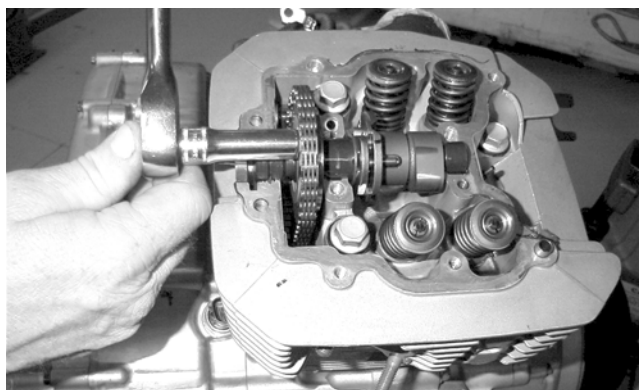
CAUTION

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

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

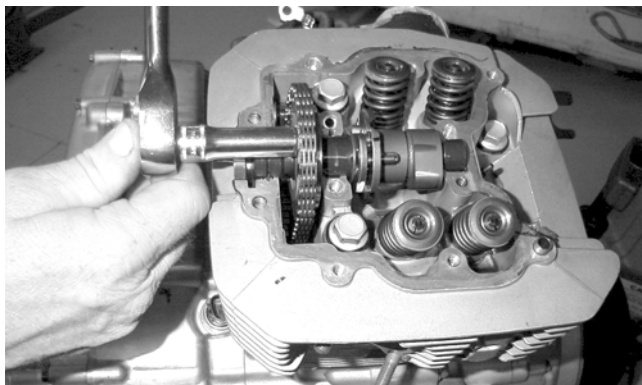


CC404D



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 camshaft 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.



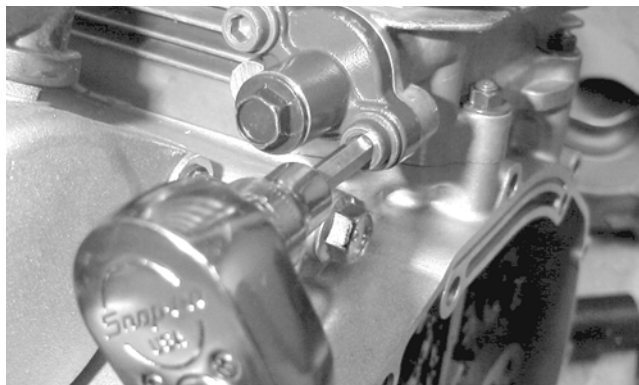
MD1248

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



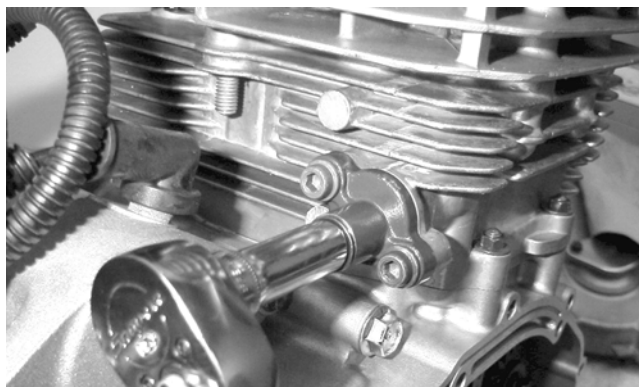
MD1146

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.

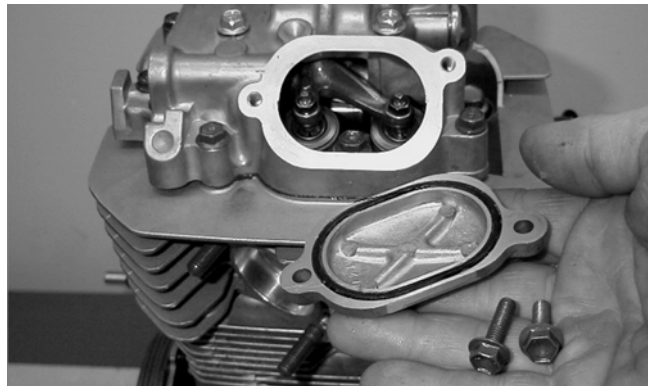


CD001

- 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

■ **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.



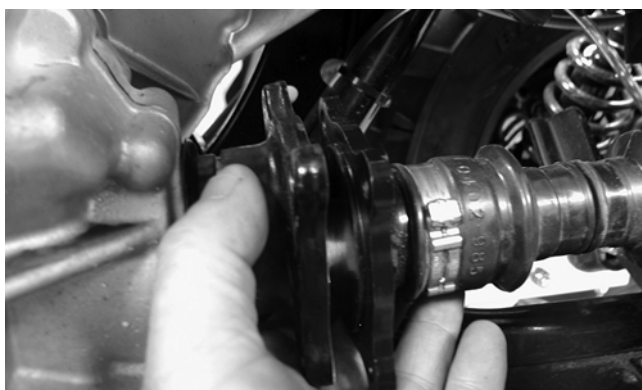
CD818

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.



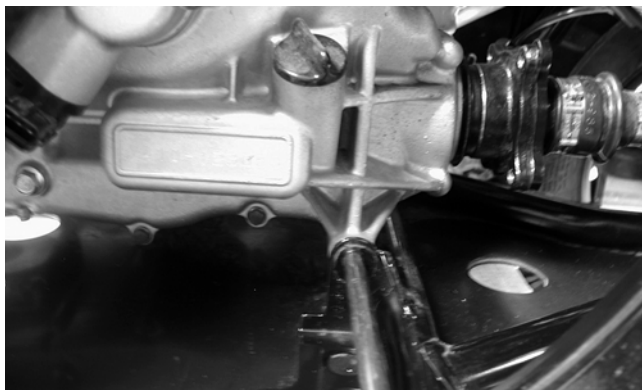
CD821

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.

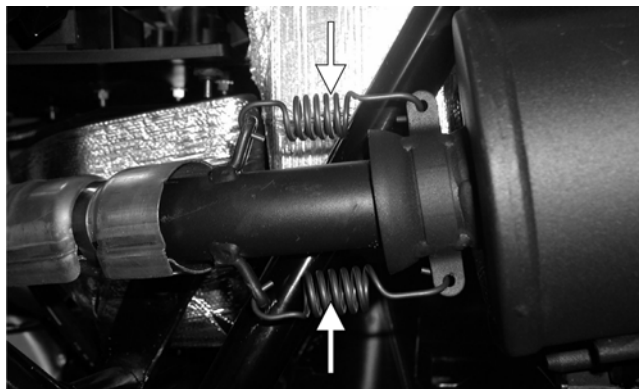


CD809

6. Secure the exhaust pipe to the engine with two cap screws; then install the muffler and the exhaust springs.



CC941



CF138A

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.

3

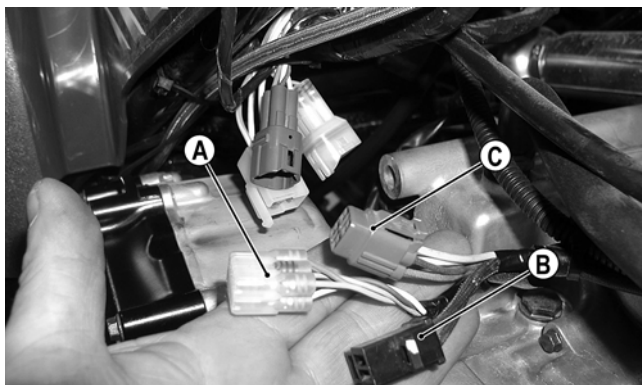


CD810



CD787

9. Connect the gear position indicator connector (A), stator connector (B), and the CDI connector (C) to the main wiring harness.



CD797A



CD785

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.



CD793

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



CD774

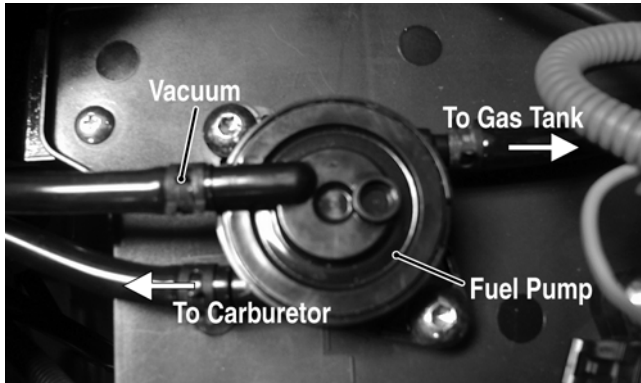
18. Install the front and rear body panels; then install the front and rear racks (see Section 8).

19. Install the left-side foot peg to the footrest. Tighten securely.



CD782

20. Connect the hose to the fuel pump; then connect the vacuum hose and secure with hose clamps.



CD766A

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.

Table of Contents

(500 - Automatic Transmission/ 650 H1)

Removing Engine/Transmission	3-130
Top-Side Components.....	3-134
Removing Top-Side Components	3-134
Left-Side Components	3-138
Removing Left-Side Components	3-138
Right-Side Components.....	3-141
Removing Right-Side Components.....	3-141
Center Crankcase Components	3-145
Separating Crankcase Halves.....	3-145
Disassembling Crankcase Half	3-145
Servicing Components.....	3-147
Assembling Crankcase Half.....	3-166
Joining Crankcase Halves.....	3-168
Installing Right-Side Components.....	3-169
Installing Left-Side Components	3-172
Installing Top-Side Components	3-175
Installing Engine/Transmission.....	3-181

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

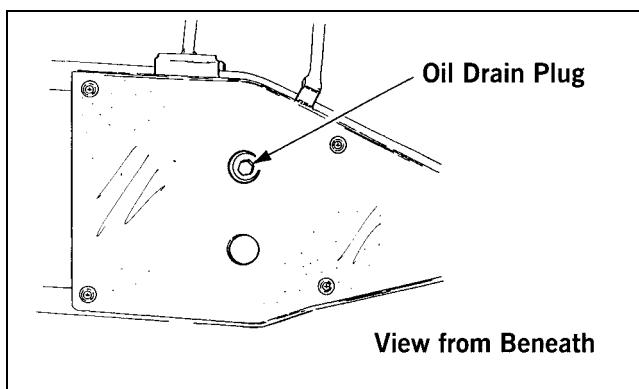
Battery acid is harmful if it contacts eyes, skin, or clothing. Care must be taken whenever handling a battery.

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.



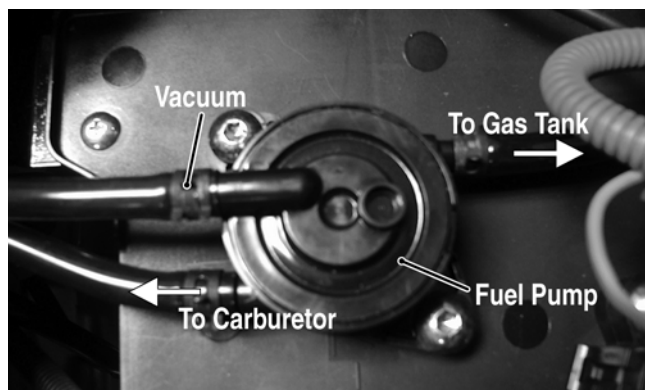
733-441A



CD799A

7. Remove the air filter (see Section 2).

8. Remove the vacuum hose and the fuel-pump-to-carburetor hose.



CD766A

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



CD785

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



CD787

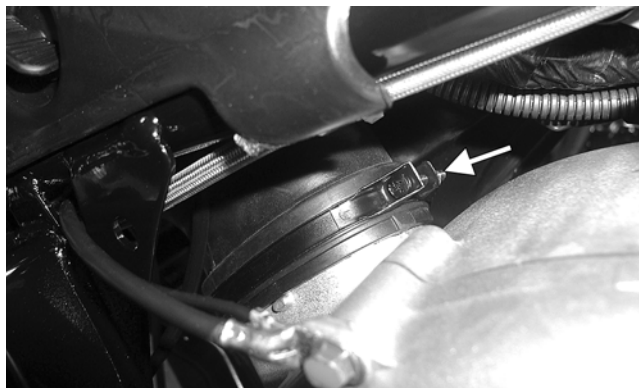


CD786

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



CD793



CD515A

12. Remove the left-side foot peg and footwell (see Section 8).



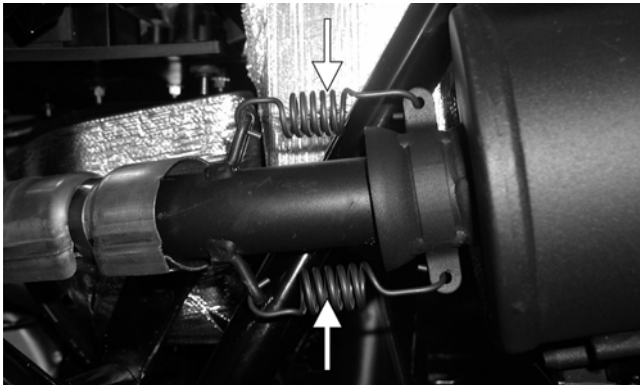
CD782

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.



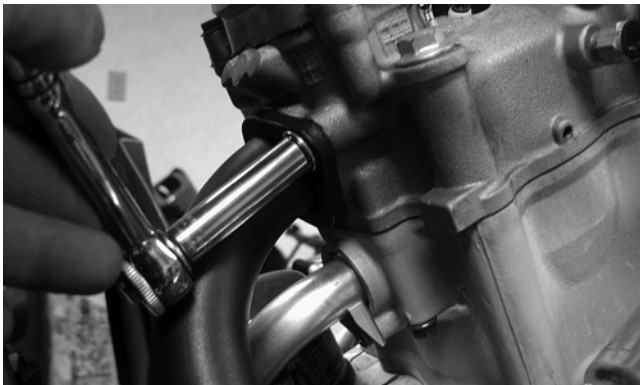
CD774

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 drive-shaft/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 drive-shaft.

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



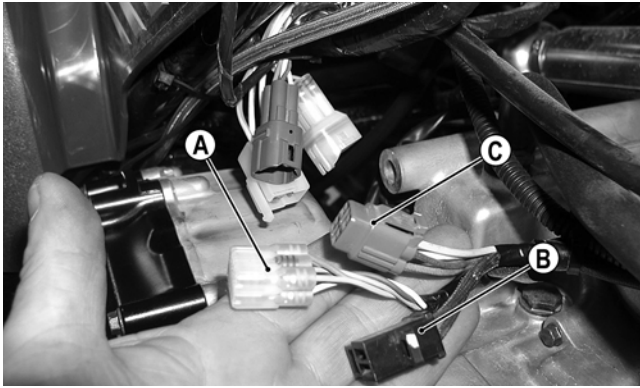
CD796

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.



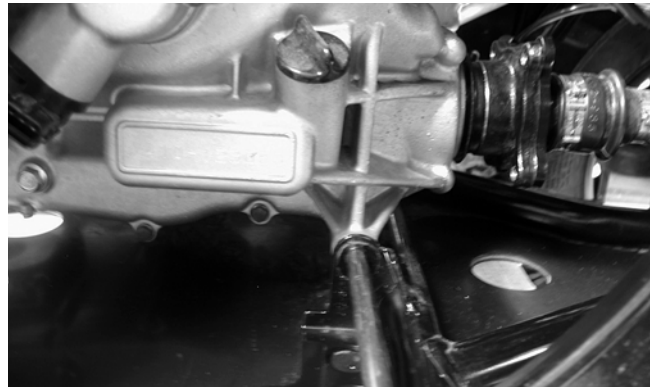
CD810

25. Remove the two engine mounting through-bolts. Account for a washer and a spacer on the bolts.



CD788

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



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.



CD814

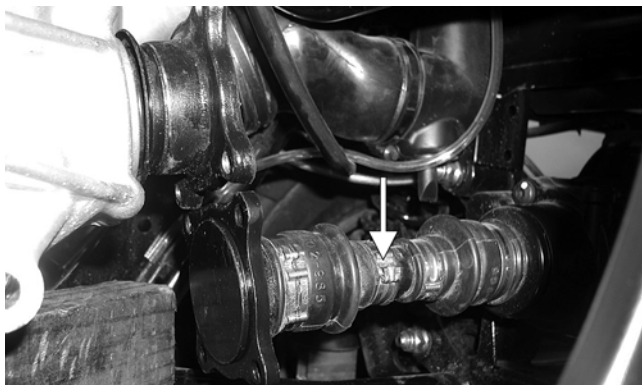
24. Remove the cap screw securing the engine ground wire to the engine.



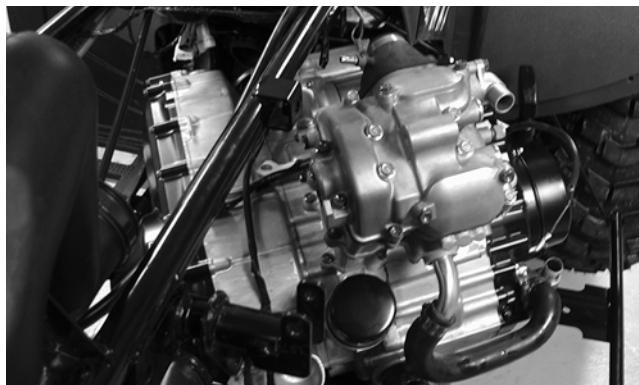
CD811

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

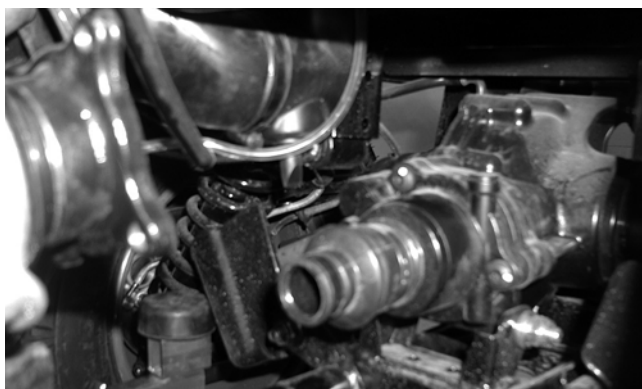
3



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.



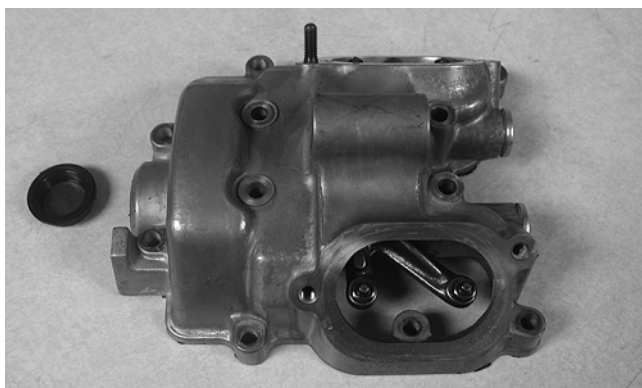
CC001D

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

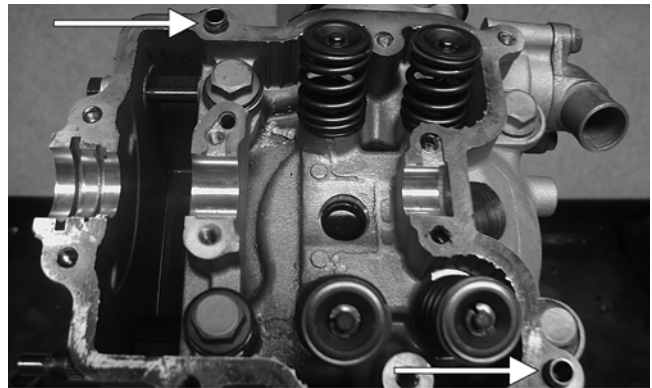
2. Remove the 12 cap screws securing the valve cover to the head; account for the four rubber washers on the top side cap screws. Remove the valve cover. Account for and note the orientation of the cylinder head plug. Note the location of two alignment pins.



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.

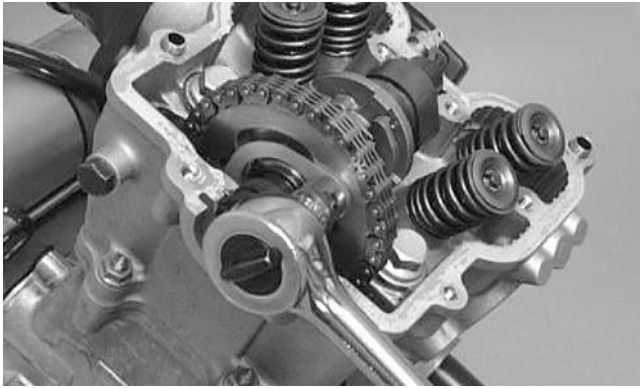
■ **NOTE:** Care should be taken not to drop the C-ring down into the crankcase.



CC012D

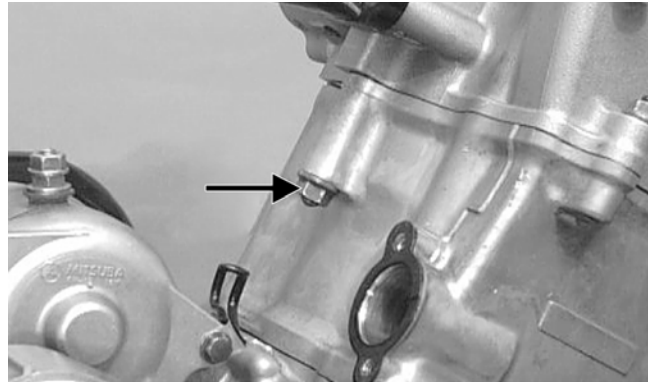
5. Bend the washer tabs down and remove the two cap screws securing the sprocket to the camshaft; then drop the sprocket off the camshaft.

3



CC013D

6. Remove the cap screw securing the chain tensioner (account for a washer); then remove the tensioner.

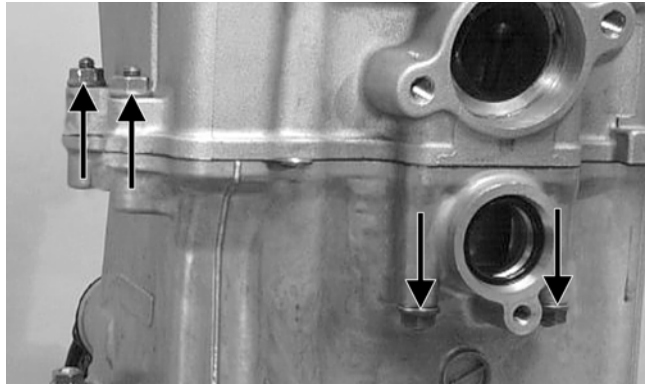


CC017D

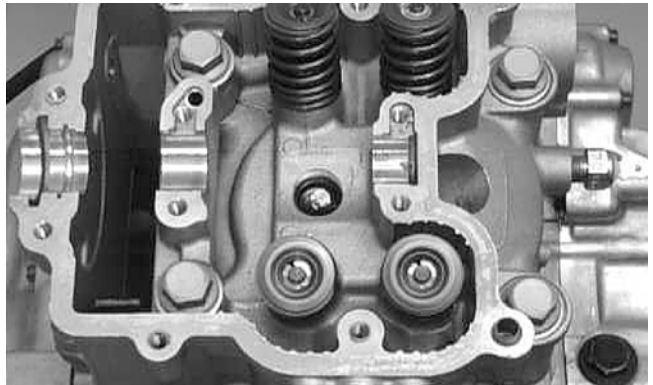


CC014D

7. While holding the chain, slide the sprocket and camshaft out of the cylinder head.

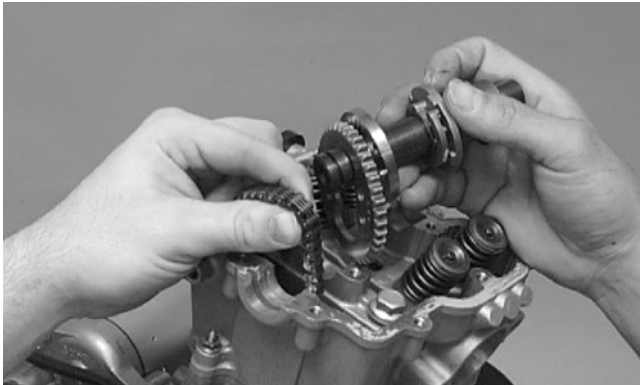


CC018D



CC016D

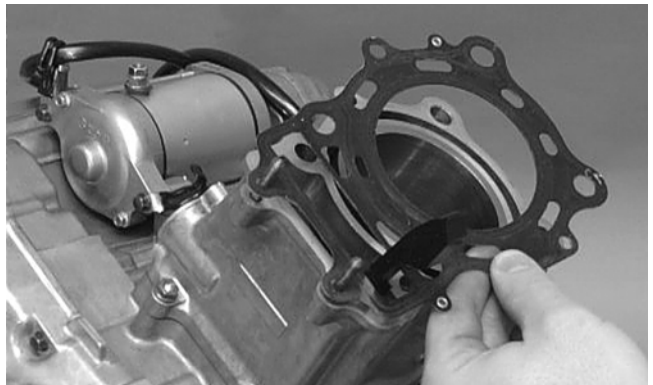
9. Remove the cylinder head from the cylinder, remove the gasket, and account for two alignment pins; then remove the cam chain guide.



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).



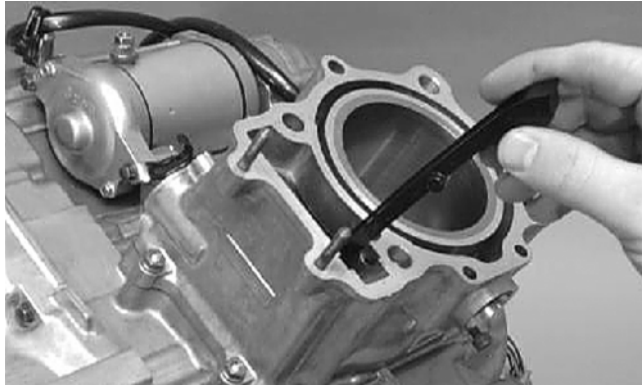
CC020D

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.



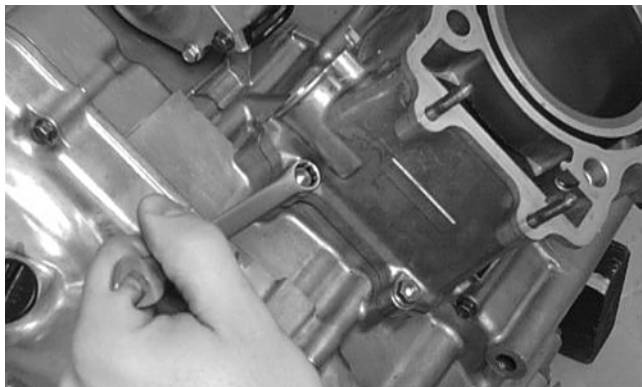
CC022D

C. Cylinder

D. Piston

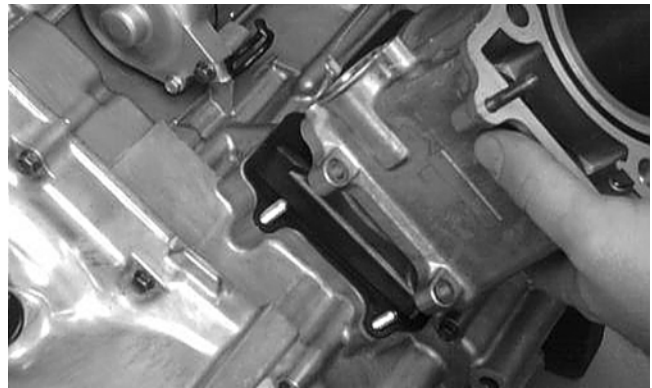
■ **NOTE:** Steps 1-9 in the preceding sub-section must precede this procedure.

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.

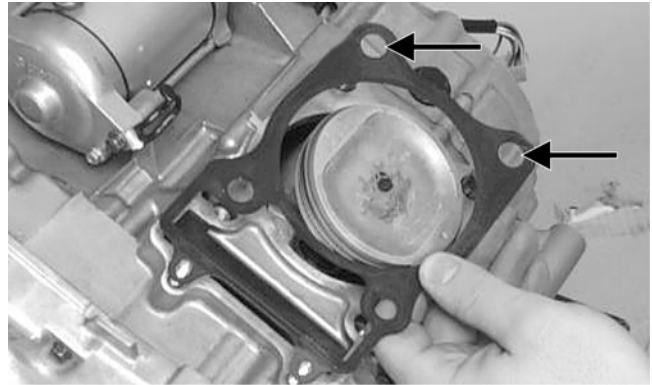


CC023D

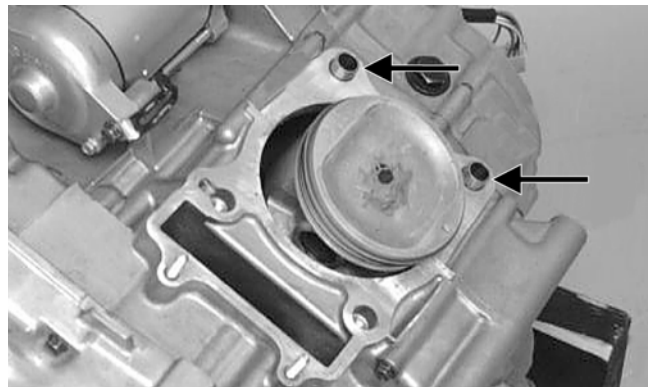
12. Lift the cylinder off the crankcase taking care not to allow the piston to drop against the crankcase. Account for the gasket and two alignment pins.



CC024D



CC025D



CC026D

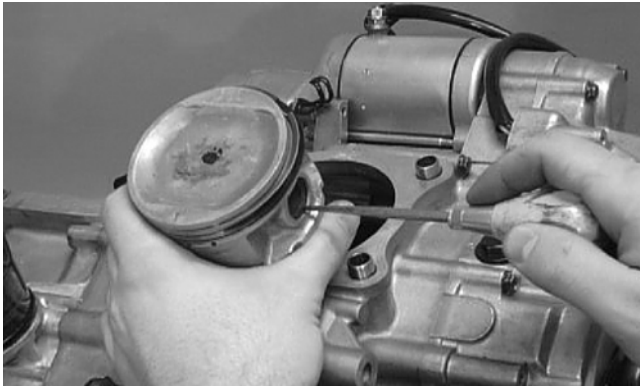
AT THIS POINT

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.

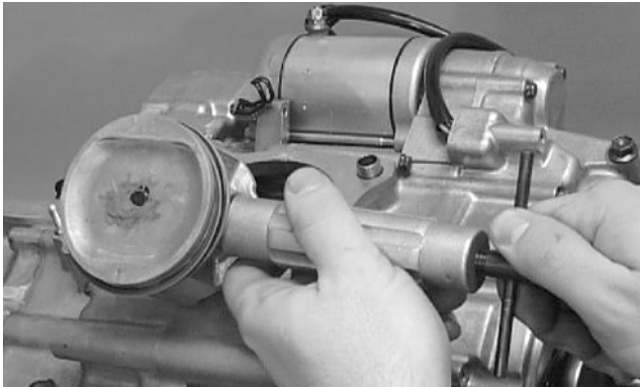
13. Using an awl, remove one piston-pin circlip.



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.



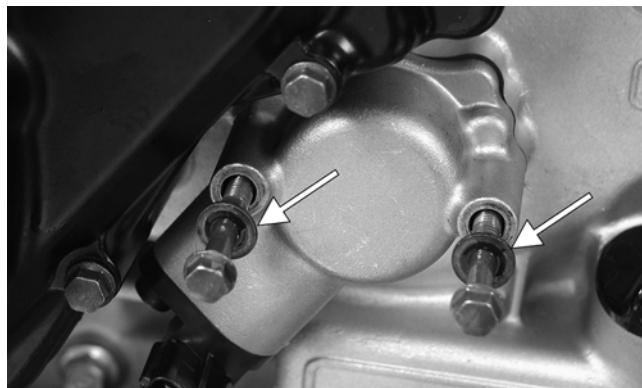
CD925A

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

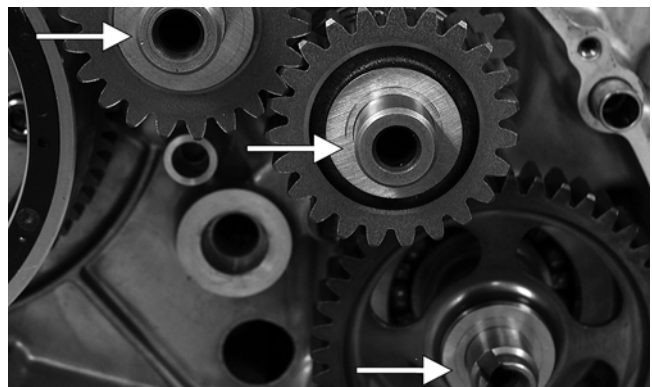
To service the water pump, see Section 4.

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.

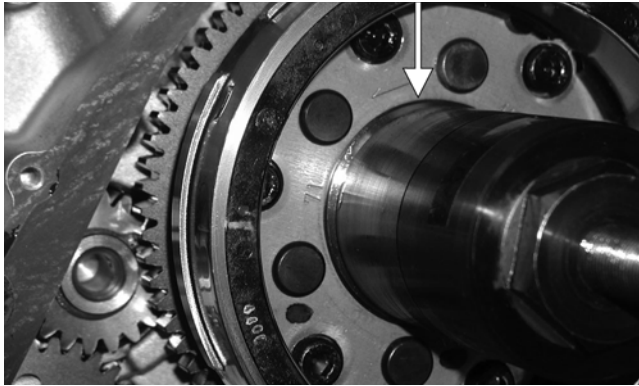


CF075A

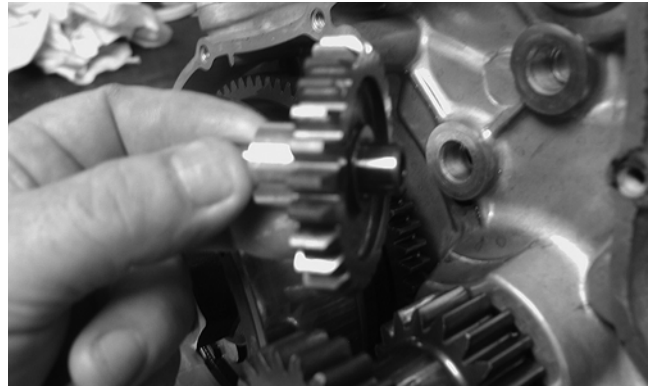
9. Remove the nut securing the magneto rotor to the crankshaft; then install the magneto rotor puller adapter.

■ **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

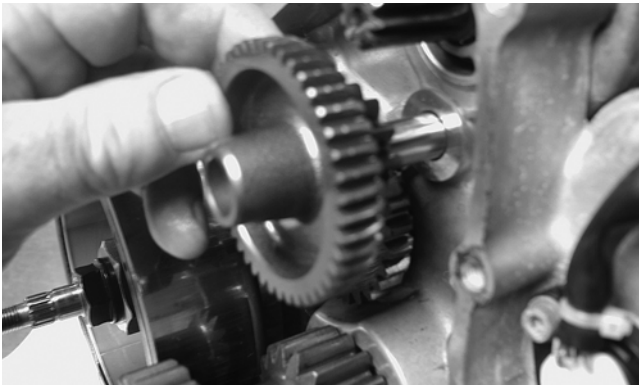


CD940A

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



CD944

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.
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.



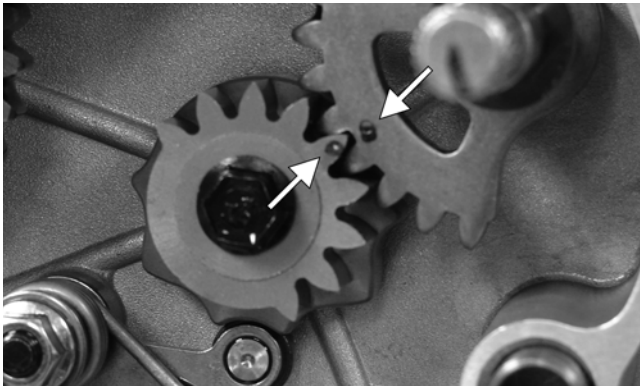
CD952A

■ **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.

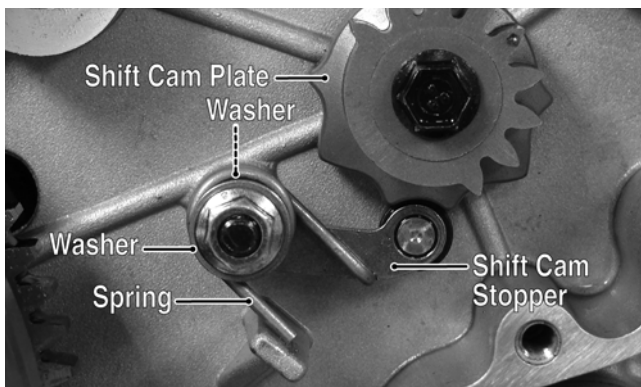


FI302



PR430A

15. Remove the gear shift cam plate; then remove the cam stopper and cam stopper spring. Account for two washers.



PR434A

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.

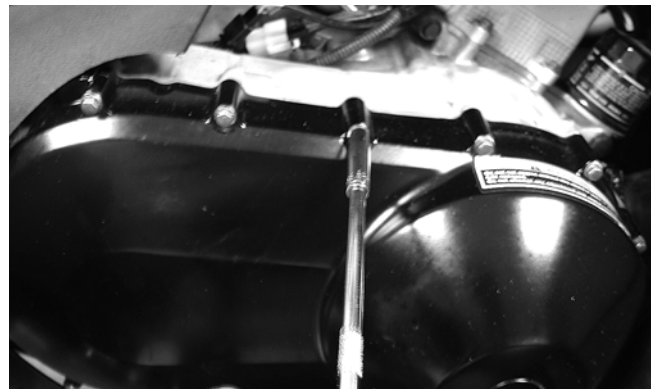
■ **NOTE:** The engine/transmission does not have to be removed from the frame for this procedure.

3

Removing Right-Side Components

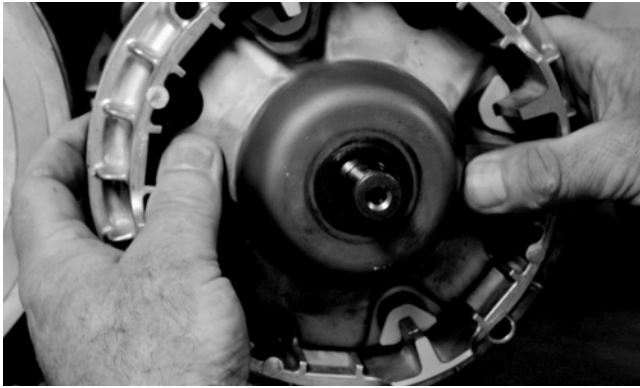
- A. V-Belt Cover**
- B. Driven Pulley**
- C. Clutch Cover**

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.



CD079

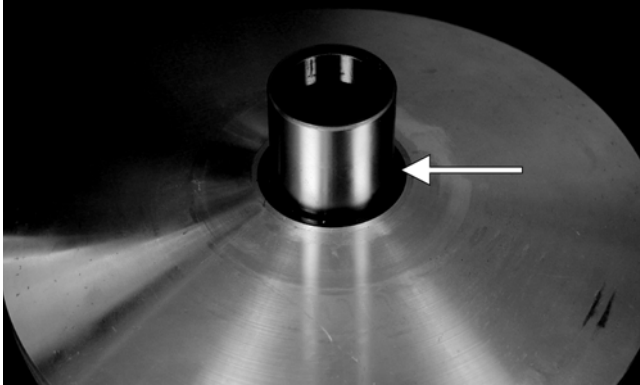
2. Remove the nut securing the movable drive face; then remove the face. Account for a spacer.



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.

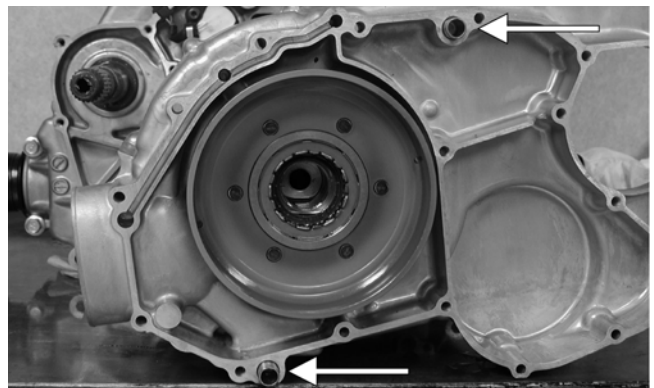
6. Using an impact driver, remove the cap screws securing the air intake plate; then remove the plate cushion.



CD973A

CAUTION

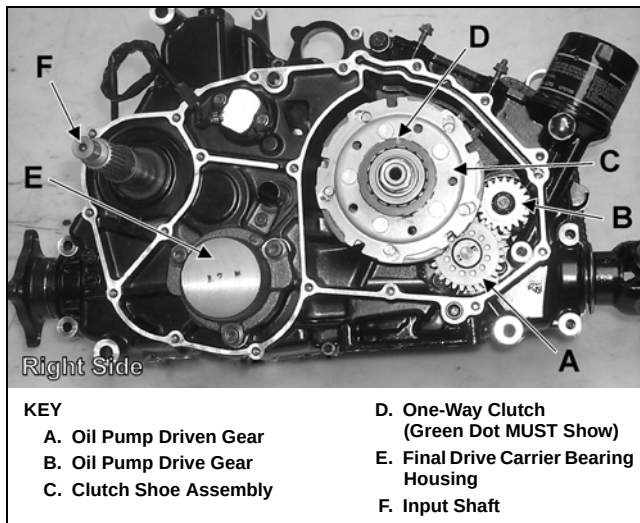
Care must be taken when removing the cover so the cover gasket is not damaged.



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.



CC829B

8. Remove the one-way clutch (D) from the clutch housing. Note the location of the green alignment dot (or the word OUTSIDE) for installing purposes.
9. Using a hydraulic press, remove the clutch housing assembly from the clutch cover. Account for the left fixed drive spacer and an O-ring inside the fixed drive spacer.

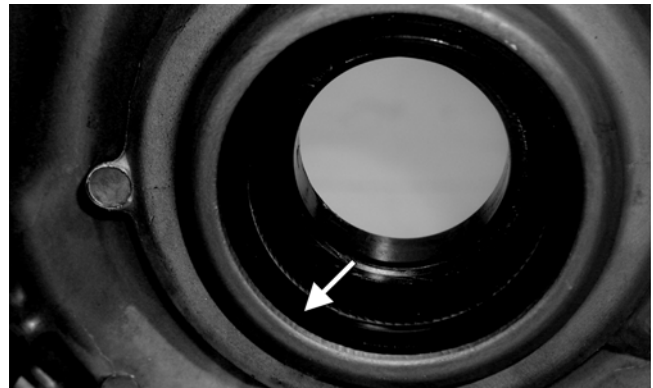


CF085



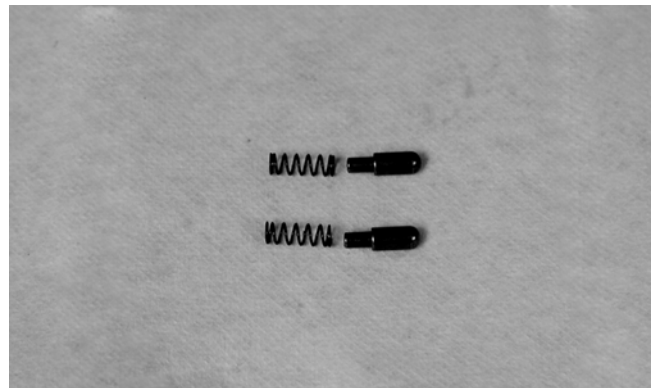
CC596

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



CF088A

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.



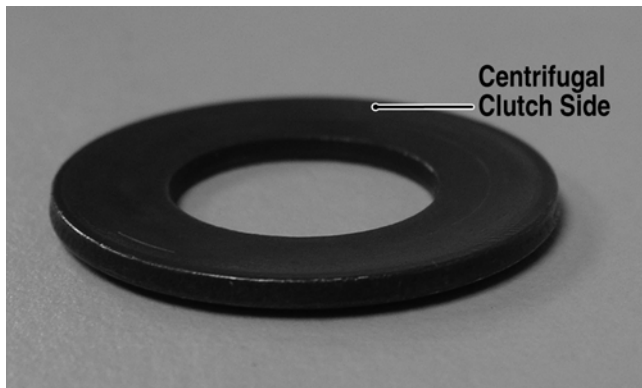
CD997

11. Remove the nut (left-hand threads) securing the clutch shoe assembly (C). Account for a washer.



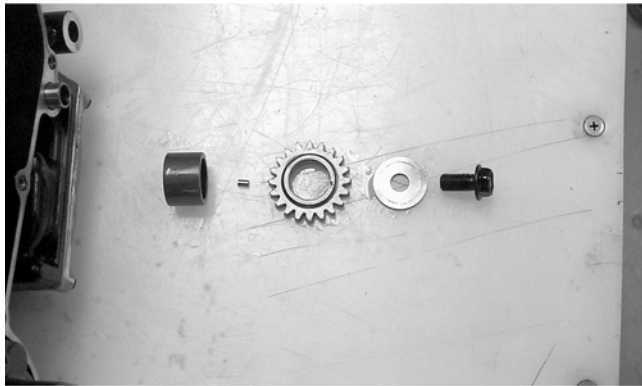
FI279A

■ **NOTE:** The washer is also directional. The flat side of the washer must face toward the centrifugal clutch assembly when installing.

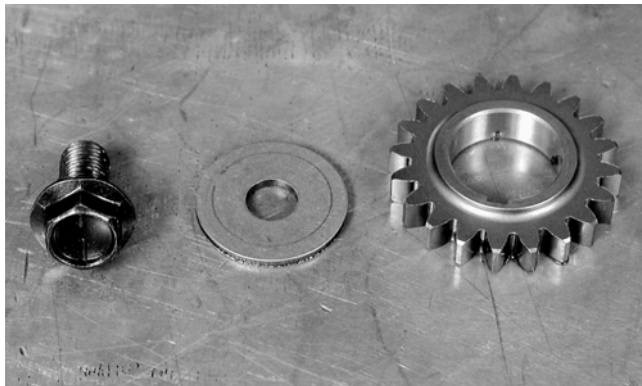


FI336A

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



CC606

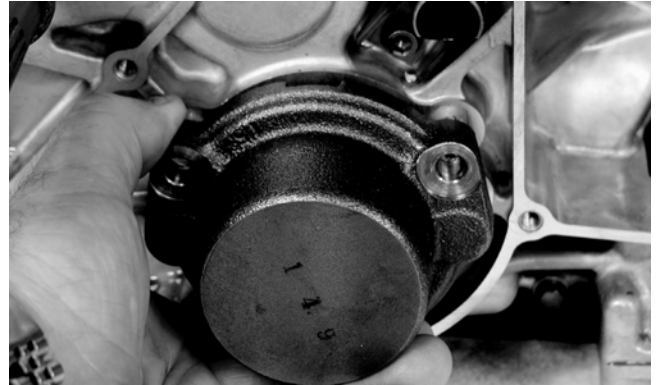


CD987



CD993

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.

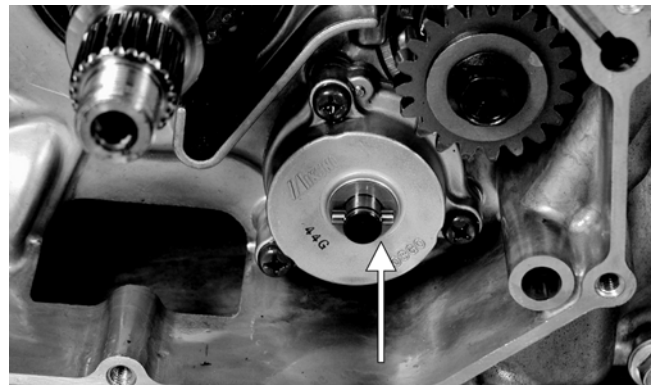


CD999

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



CD984



CD895A

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



CD988

Center Crankcase Components

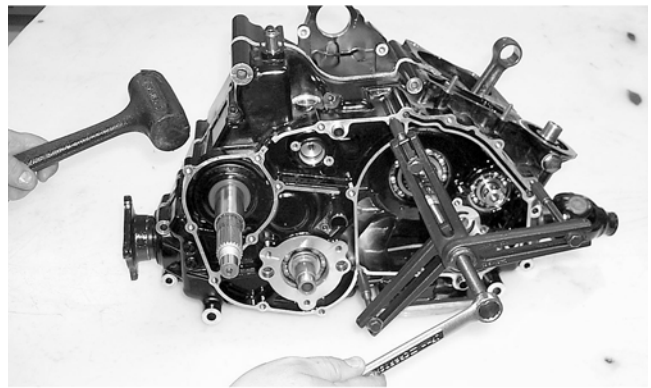
■ **NOTE:** This procedure cannot be done with the engine/transmission in the frame. Complete Removing procedures for Top-Side, Left-Side, and Right-Side must precede this procedure.

■ **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.

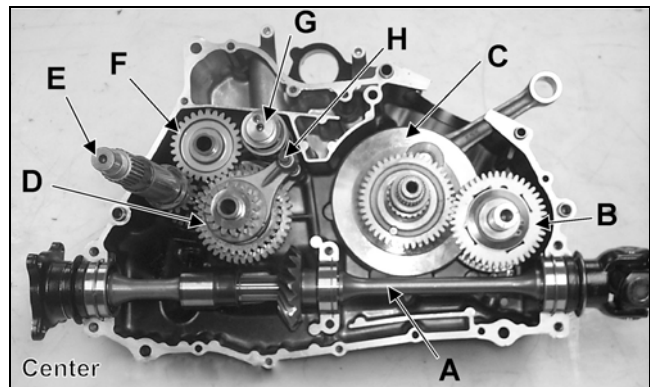
■ **NOTE:** To keep the shaft/gear assemblies intact for identification, tap the shafts toward the left-side crankcase half when separating the halves.



CC665

Disassembling Crankcase Half

■ **NOTE:** For steps 1-7, refer to illustration CC821B.

3


KEY

A. Secondary Driven Shaft Assembly	E. Driveshaft
B. Crank Balancer Assembly	F. Reverse Idler Gear Assembly
C. Crankshaft	G. Gear Shift Shaft
D. Countershaft Assembly	H. Shift Shaft with 2 Forks

CC821B

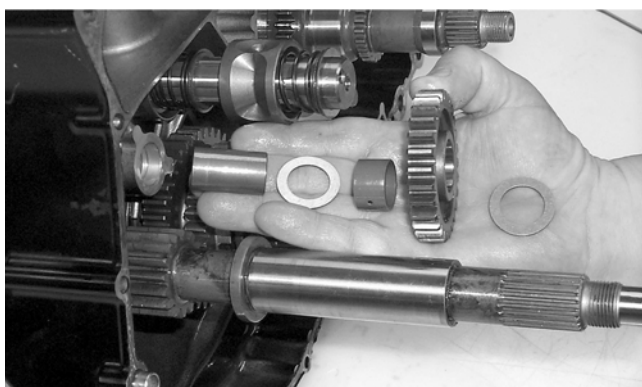
■ **NOTE:** To aid in installing, it is recommended that the assemblies are kept together and **IN ORDER**.

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.



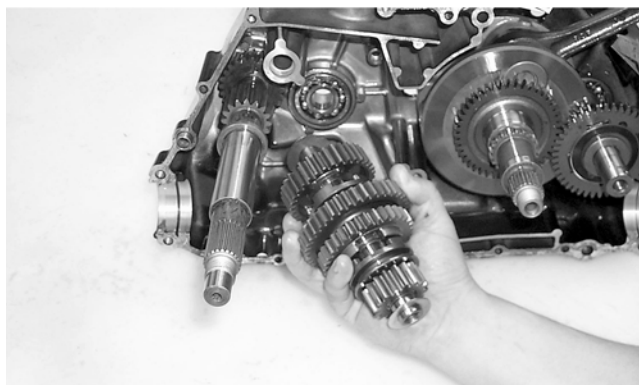
CC668

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

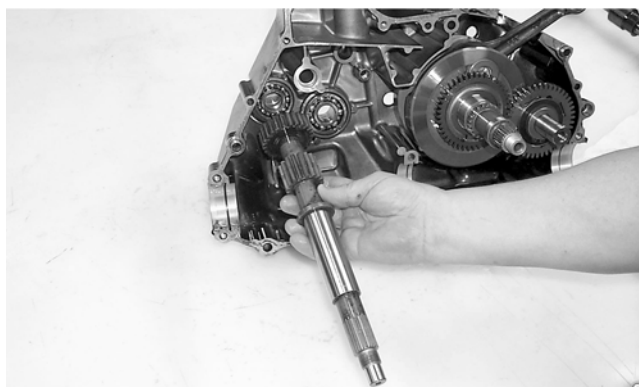
5. Remove the countershaft assembly (D). Account for a washer on each end of the countershaft.



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

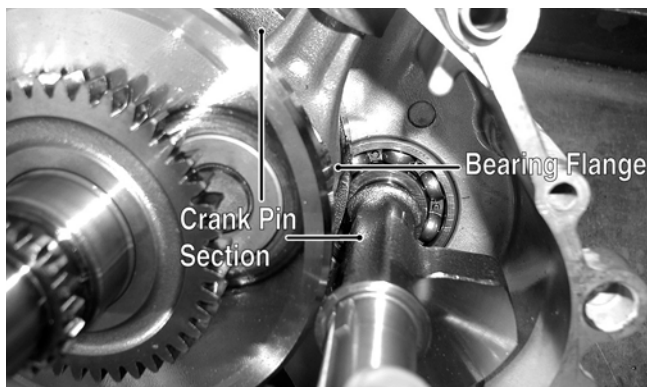
7. Note the timing marks on the crank balancer assembly (B) gear and crankshaft (C) gear for assembling purposes; then slide the crank balancer gear off the crank balancer. Account for the key in the keyway.



CD826

8. Remove the crank balancer.

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



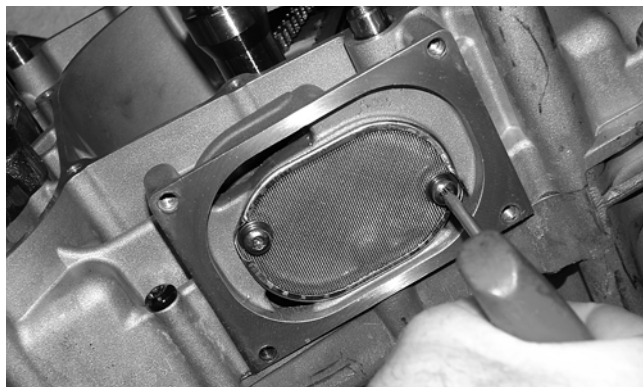
CD832B

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.

Servicing Top-Side Components	3-148
Valve Assembly	3-148
Piston Assembly	3-150
Cylinder/Cylinder Head Assembly.....	3-152
Servicing Left-Side Components	3-156
Recoil Starter	3-156
Servicing Right-Side Components	3-159
Inspecting Centrifugal Clutch Shoe	3-159
Inspecting Clutch Housing	3-159
Inspecting Primary One-Way Drive	3-159
Inspecting Oil Pump	3-159
Driven Pulley Assembly	3-159
Servicing Center Crankcase Components	3-163
Secondary Gears	3-163
Crankshaft Assembly	3-164
Countershaft	3-166

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.

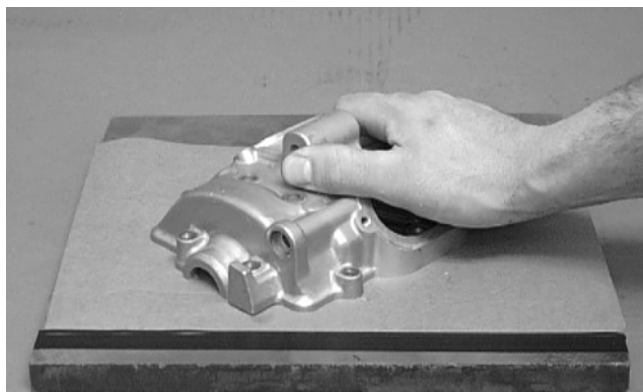
Cleaning/Inspecting Valve Cover

■ **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

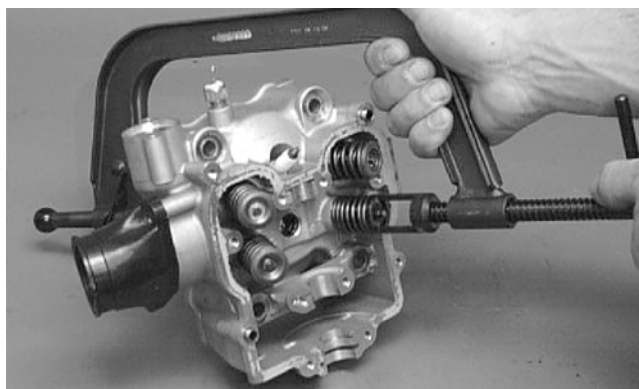
CAUTION

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

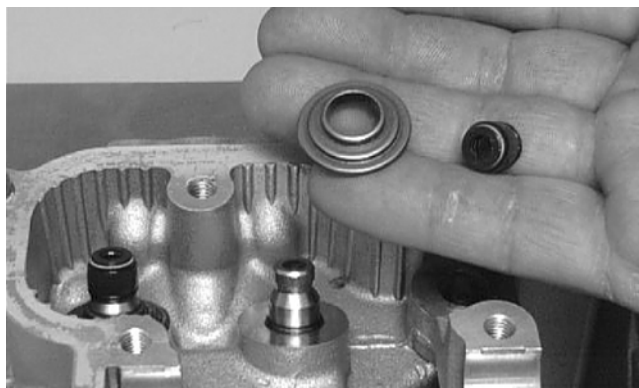
■ **NOTE:** Keep all valves and valve components as a set. Note the original location of each valve set for use during installation. Return each valve set to its original location during installation.

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



CC132D

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



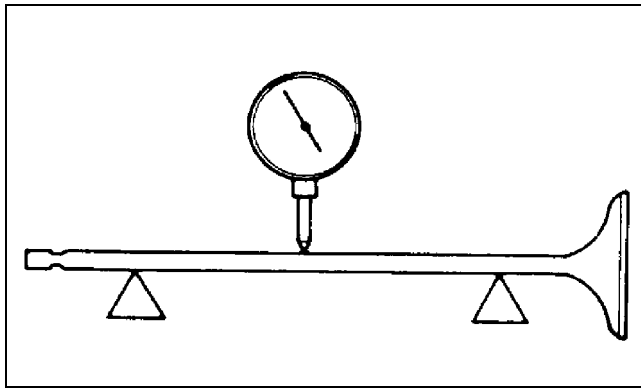
CC136D

■ **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.



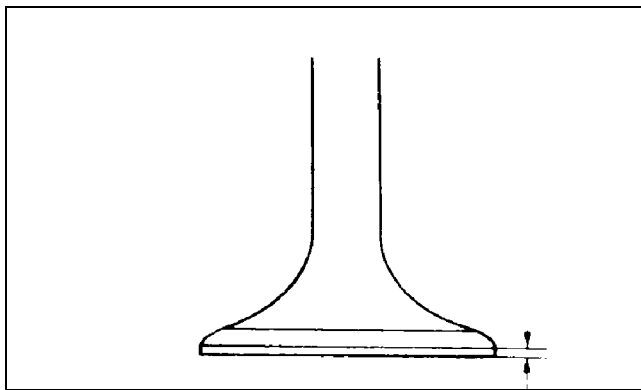
2. Maximum runout must not exceed specifications.

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

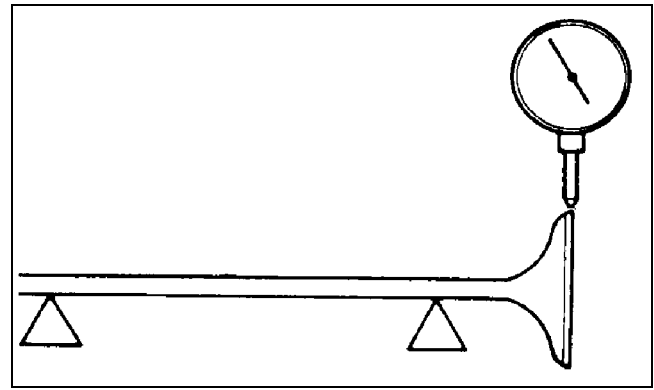
1. Using a micrometer, measure the width of the valve face.



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.

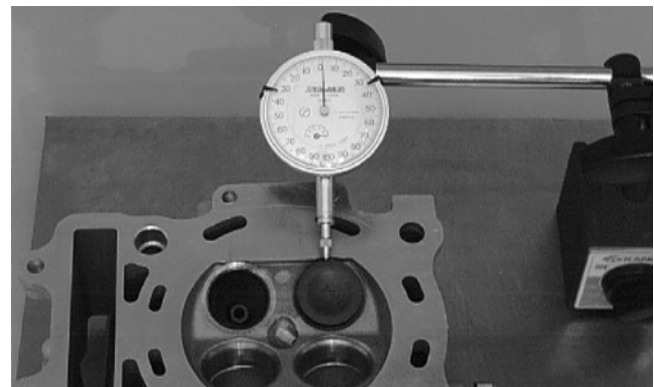


3. Rotate the valve in the V blocks.
4. Maximum runout must not exceed specifications.

Measuring Valve 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.

3



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)

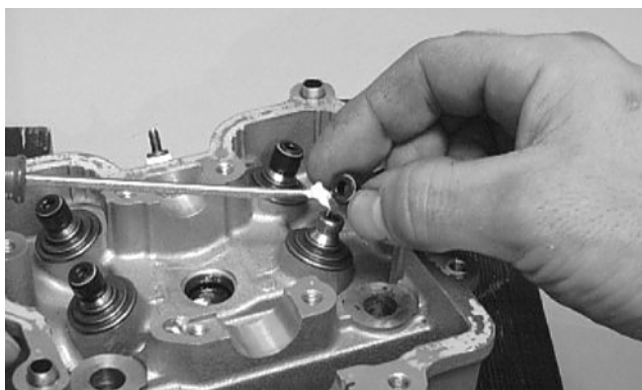
1. Using a dial calipers, measure the inside diameter of the rocker arm.
2. Acceptable inside diameter range must be within specifications.

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

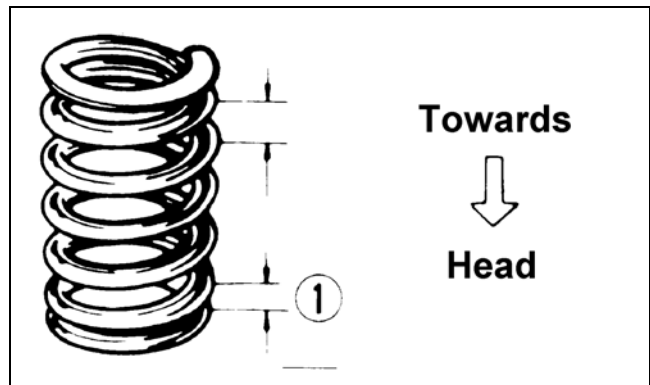
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



CC144D

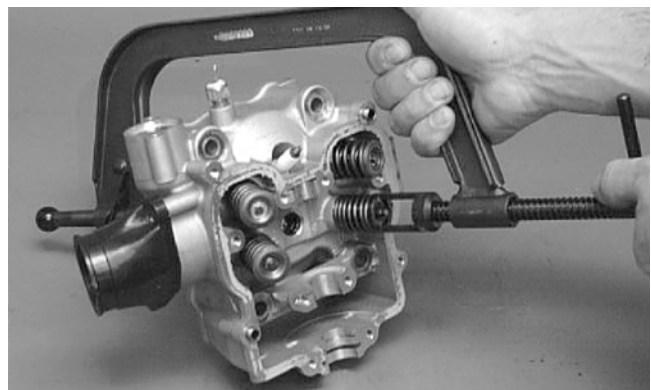
2. Insert each valve into its original location.
3. Install the valve springs with the painted end of the spring facing away from the cylinder head.

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



ATV-1011A

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



CC132D

PISTON ASSEMBLY

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

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

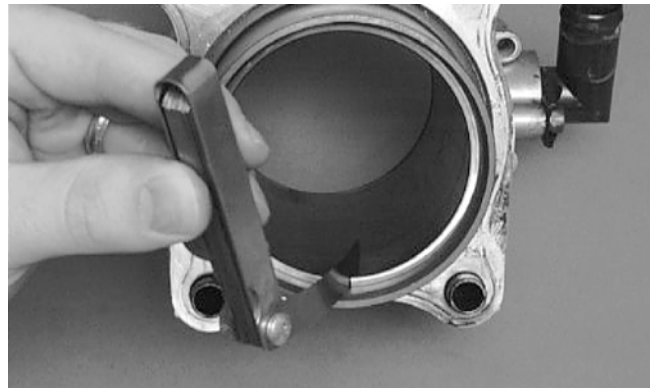
1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

⚠ 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)

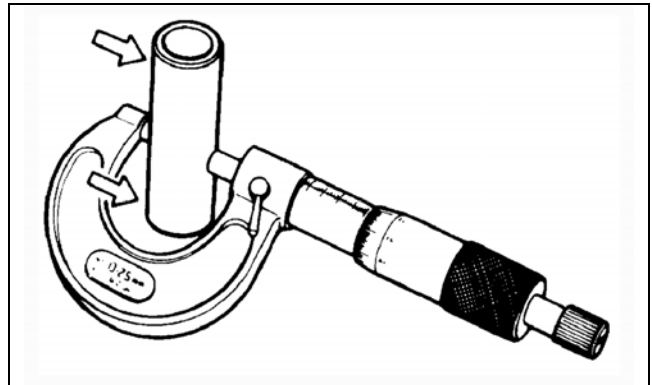
1. Place each compression ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must be within specifications.



CC280D

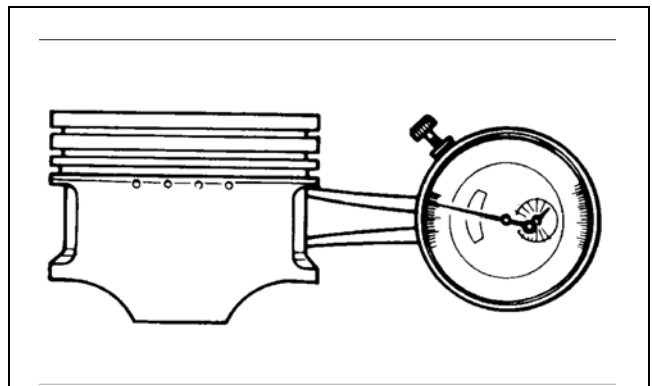
Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

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.



ATV-1070

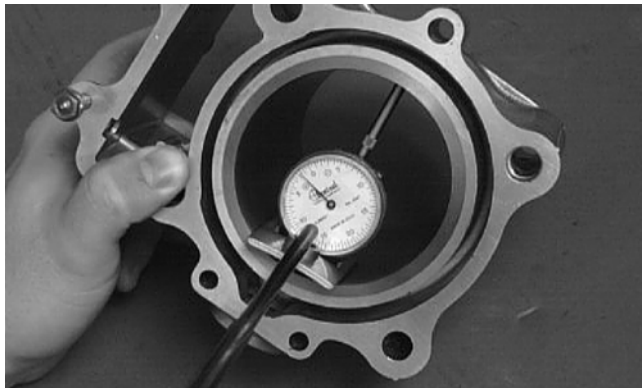
2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



ATV-1069

Measuring Piston Skirt/ Cylinder Clearance

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

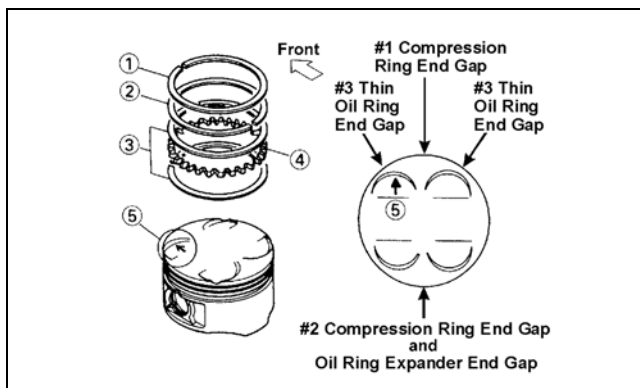


CC127D

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

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

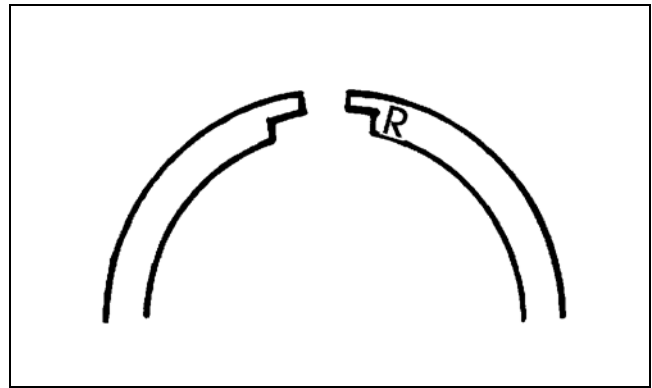


ATV-1085B

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

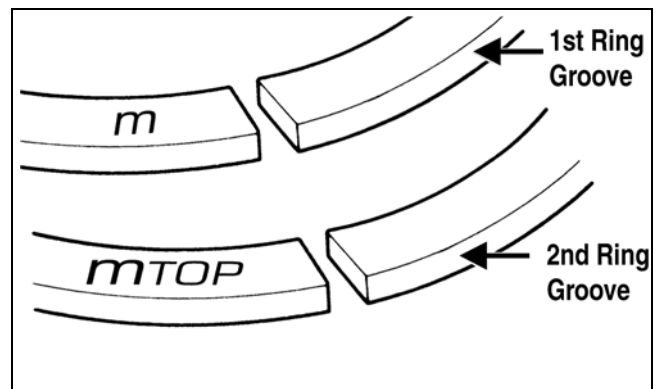
2. On the 500, install the compression rings (1 and 2) so the letter on the top surface of each ring faces the dome of the piston. Rotate the rings until the ring end gaps are on directly opposite sides of the piston (see illustration).

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



726-306A

3. On the 650 H1, the ring with the orientation mark (M TOP) 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

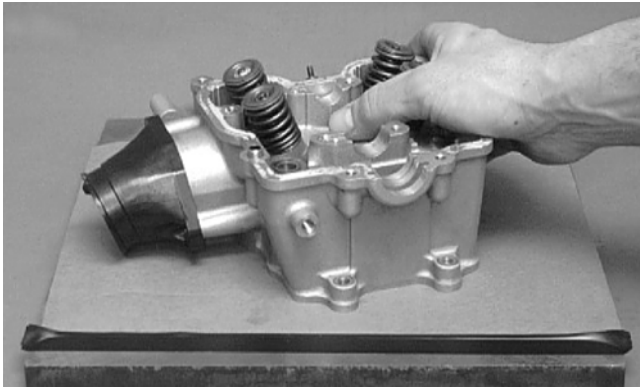
The cylinder head studs must be removed for this procedure.

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.

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

CAUTION

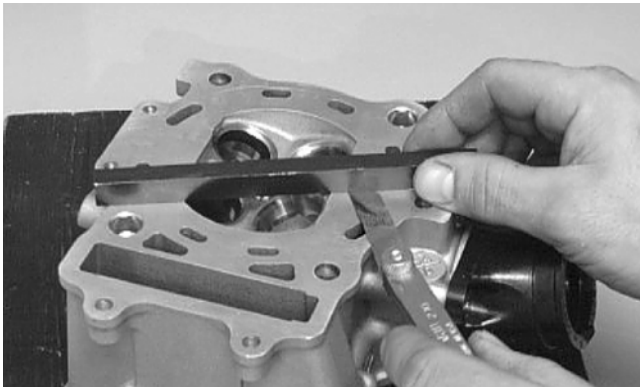
Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.



CC128D

Measuring Cylinder Head Distortion

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



CC141D

Cleaning/Inspecting Cylinder

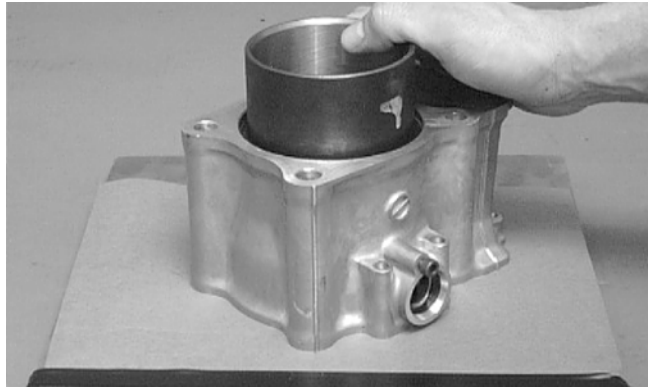
- Wash the cylinder in parts-cleaning solvent.

- 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).

- 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

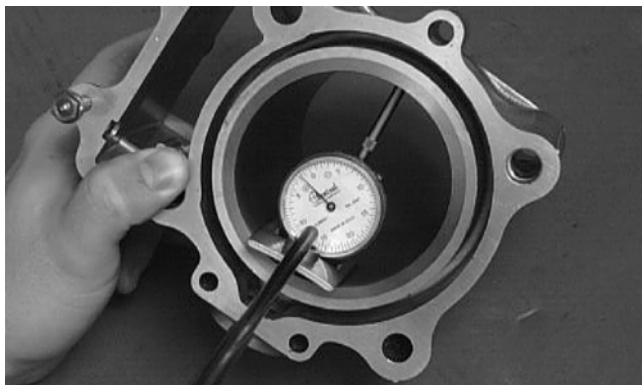
3

Inspecting Cam Chain Guide

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

Honing Cylinder

- 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.



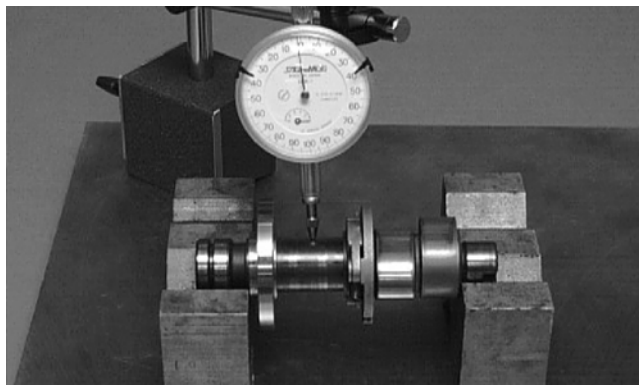
CC390D

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

Measuring Camshaft Runout

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

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

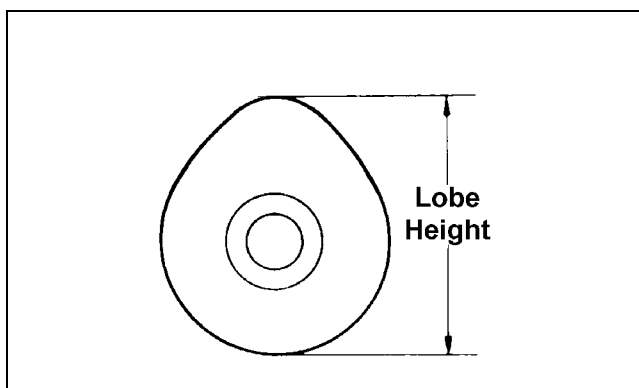


CC283D

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

Measuring Camshaft Lobe Height

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



ATV1013A

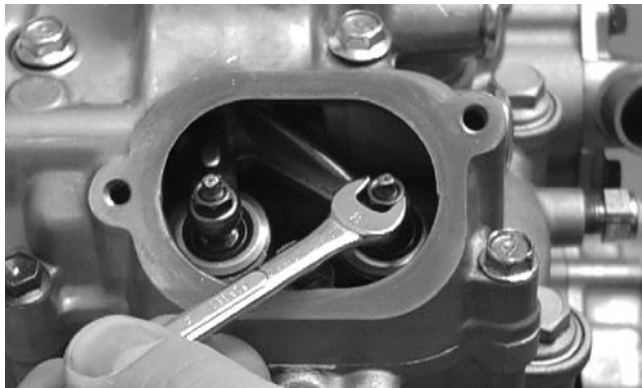
2. The lobe heights must not exceed minimum specifications.

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.

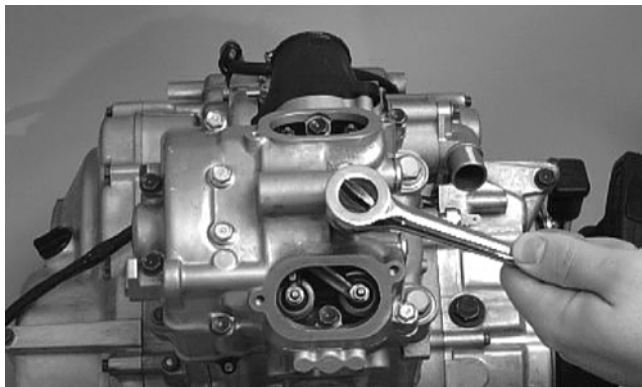


CC005D

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.



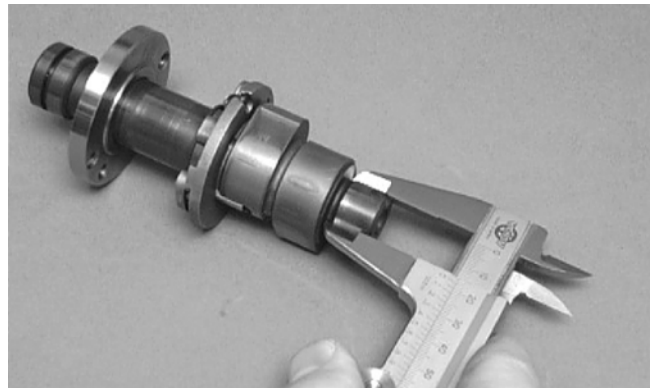
CC003D

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.



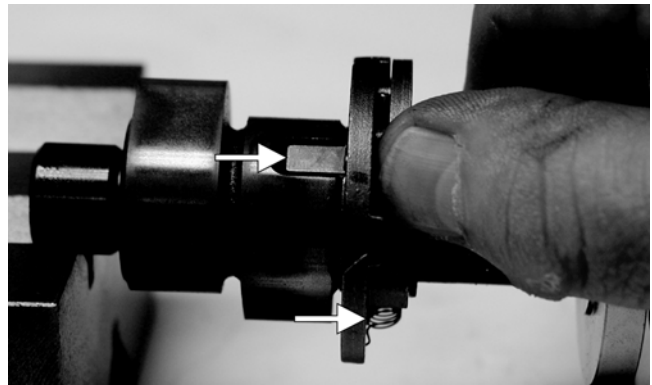
CC287D

■ **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.

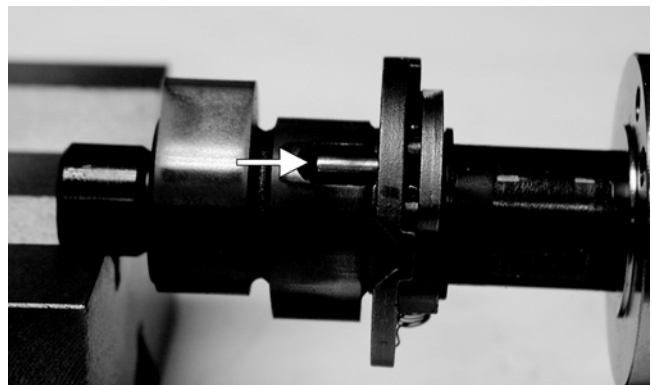
Inspecting Camshaft Spring/Drive Pin

1. Inspect the spring and drive pin for damage.

3



CF061A



CF060A

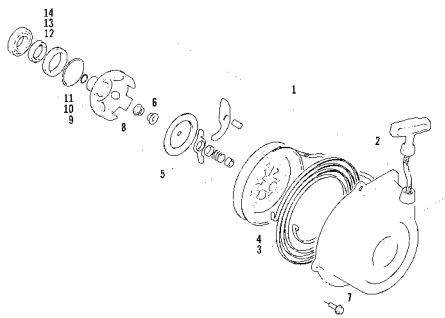
2. If damaged, the camshaft must be replaced.

Servicing Left-Side Components

RECOIL STARTER

KEY

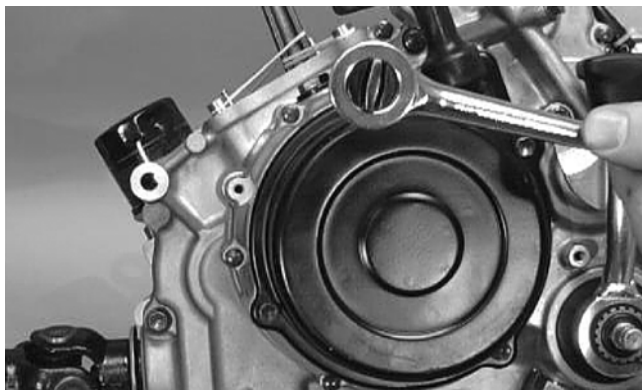
1. Recoil Starter Assy
2. Rope Assy
3. Spiral Spring
4. Reel
5. Ratchet Assy
6. Nut
7. Cap Screw
8. Nut
9. Starter Cup
10. O-Ring
11. O-Ring
12. Spacer
13. Oil Seal
14. Bearing



0737-764

Removing/Disassembling

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

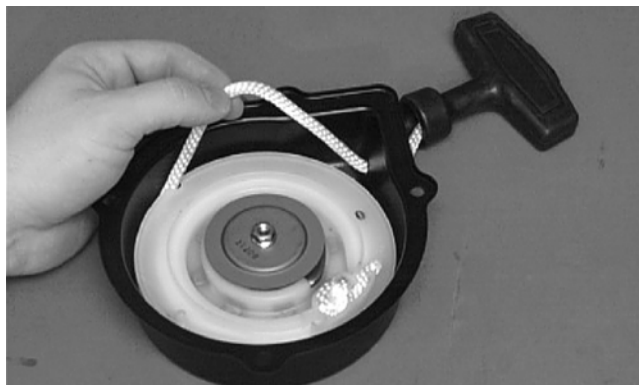


CC039D

⚠ 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.

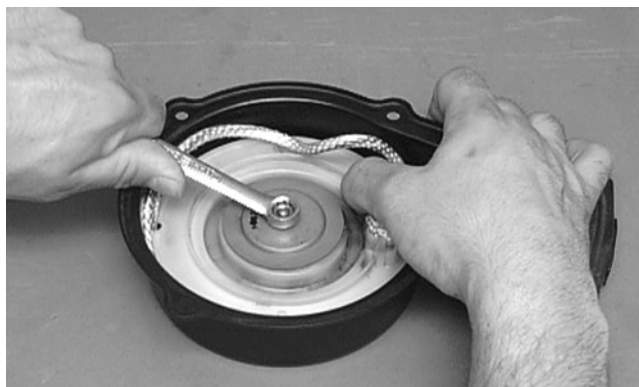


B600D

⚠ CAUTION

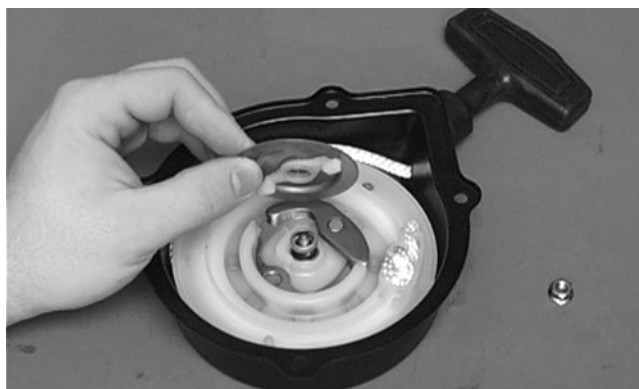
During the disassembly procedure, make sure all spring tension is released before continuing.

3. Remove the nut.



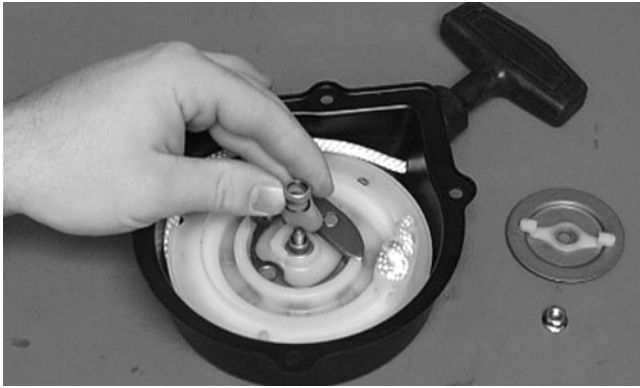
B601D

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.



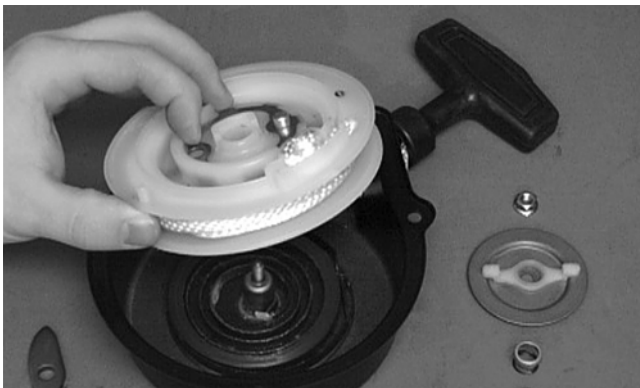
B603D

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.

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.

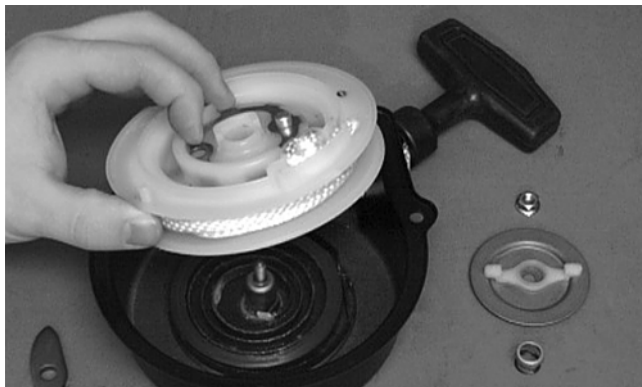
■ **NOTE:** The spiral spring must seat evenly in the recoil case.



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.



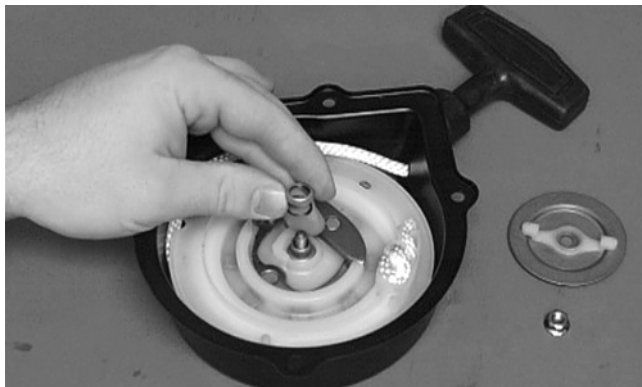
B605D

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



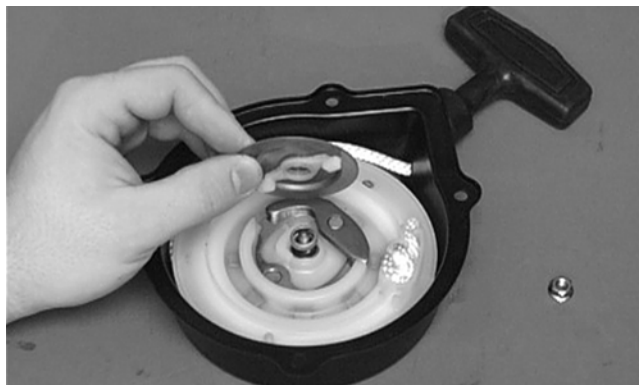
B604D

7. Install the friction spring and the spring cover.



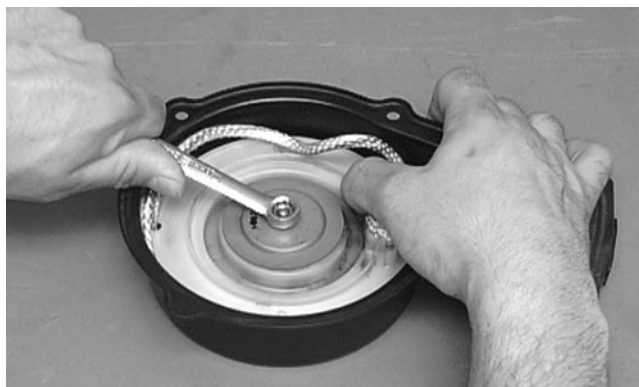
B603D

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

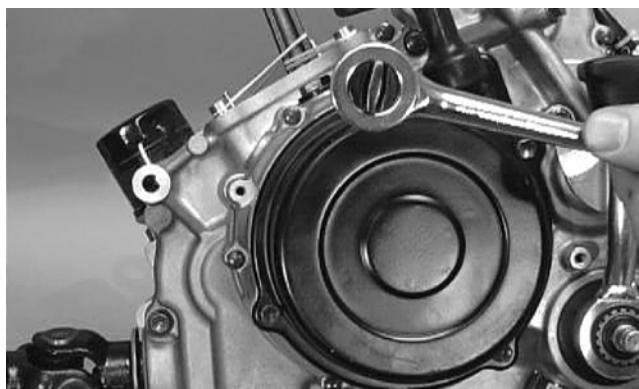
10. With the 50 cm (20 in.) of rope exposed, hook the rope in the notch of the reel.

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

Servicing Right-Side Components

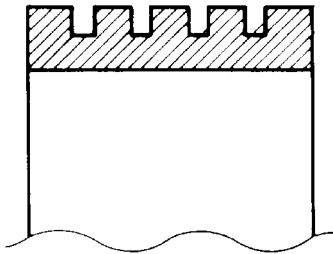
■ **NOTE:** Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.

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

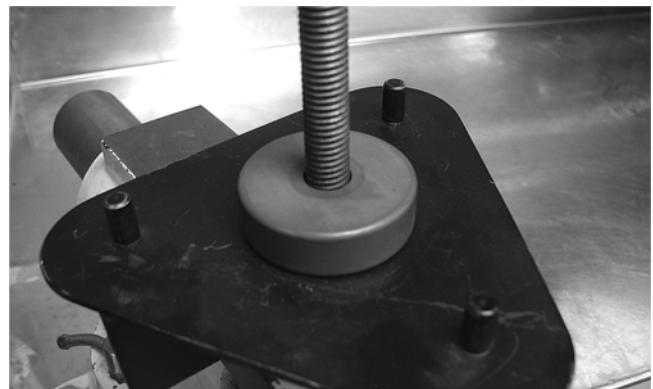
DRIVEN PULLEY ASSEMBLY

Disassembling

WARNING

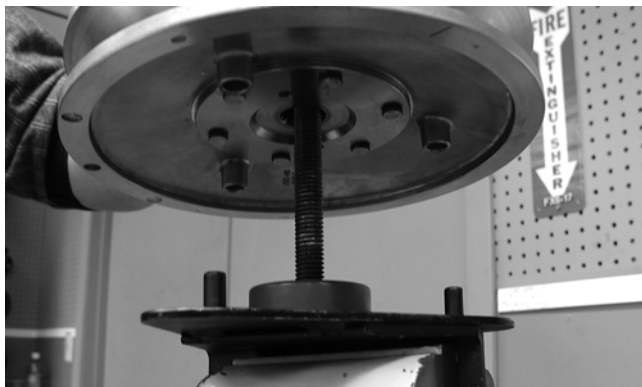
This procedure involves relaxing a compressed spring assembly. **DO NOT** attempt disassembling without the proper tools.

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.

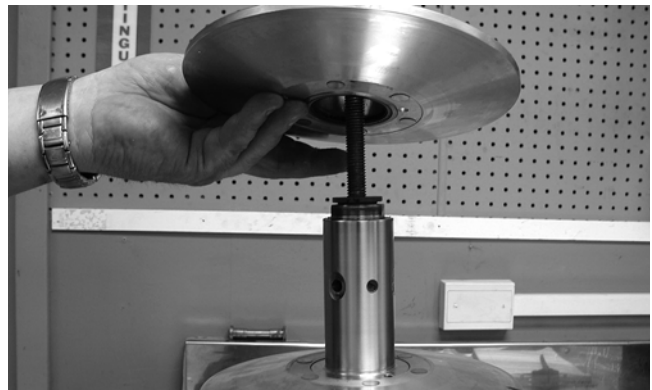


CD054

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.



CF092A

3. Inspect two grease seals in the movable face for nicks, cuts, or damage.



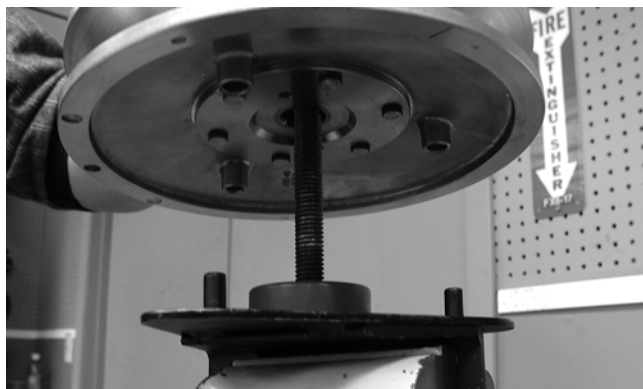
CF095A

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.



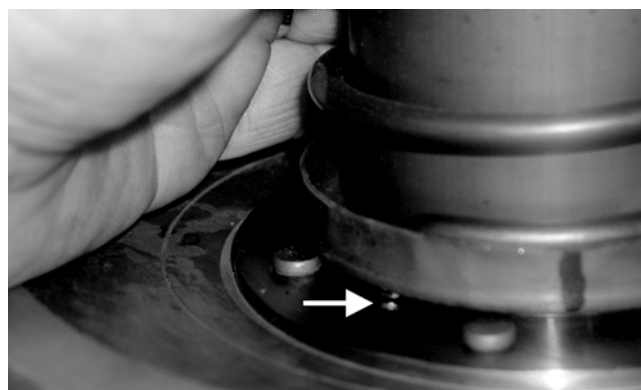
CF095A

4. Install the movable face sleeve aligning the hole in the spring seat with the spring anchor hole in the movable face.



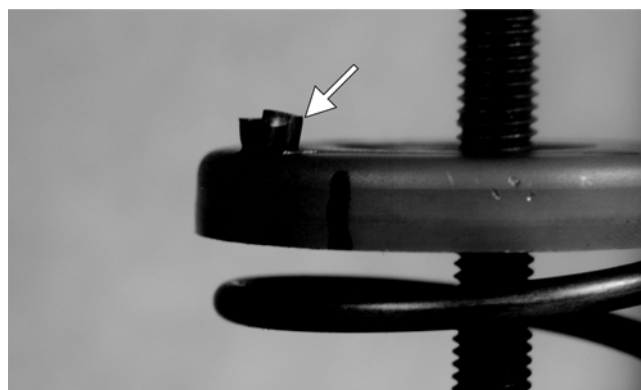
CF097

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 0.05-0.33 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.

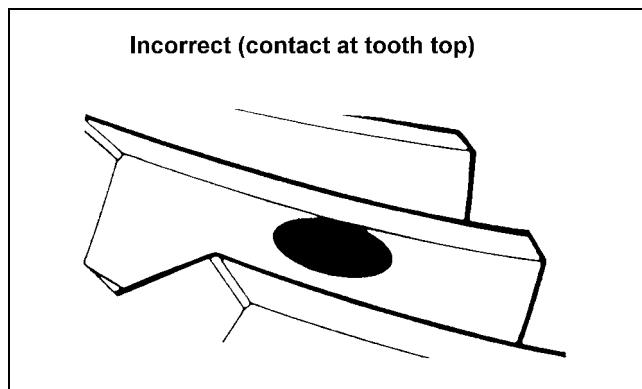
■ **NOTE:** Continue to remove, measure, and install until backlash measurement is within tolerance. Note the following chart.

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

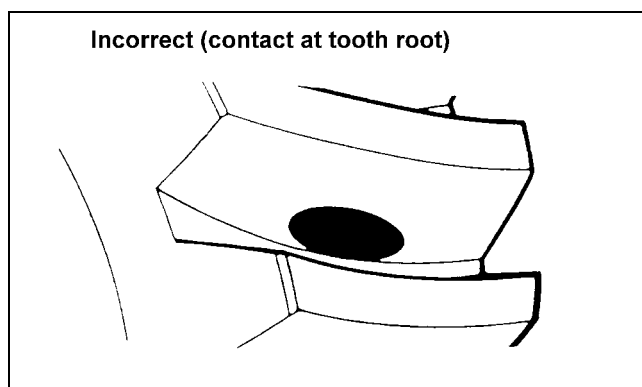
Checking Tooth Contact

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

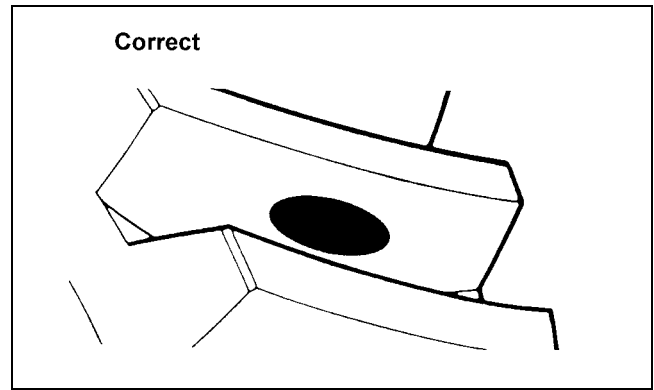
1. Remove the secondary driven output shaft assembly from the left-side crankcase half.
2. Clean the secondary driven bevel gear teeth of old oil and grease residue.
3. Apply a thin, even coat of a machinist-layout dye to several teeth of the gear.
4. Install the secondary driven output shaft assembly.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



ATV-0103



ATV-0105



ATV-0104

Correcting Tooth Contact

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

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

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

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



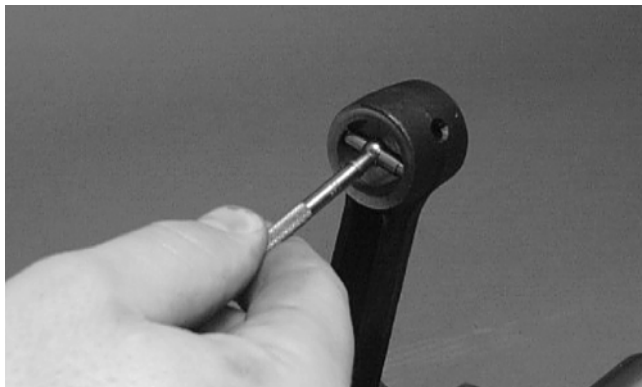
CAUTION

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

CRANKSHAFT ASSEMBLY

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

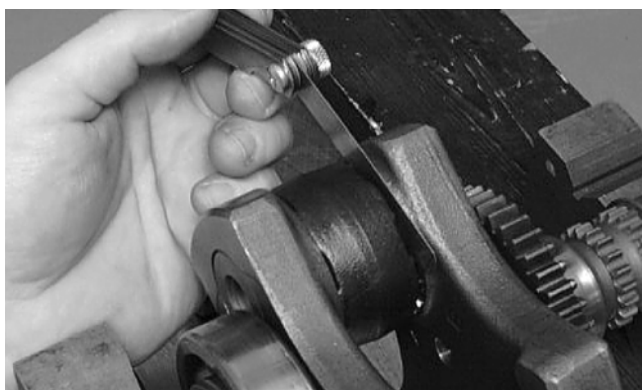
2. Maximum diameter must not exceed specifications.

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.

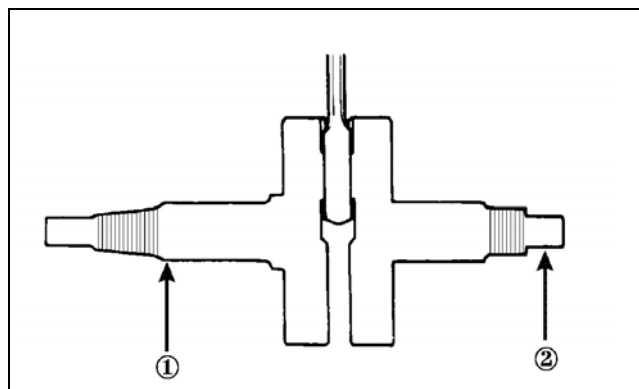
Measuring Connecting Rod (Big End Width)

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

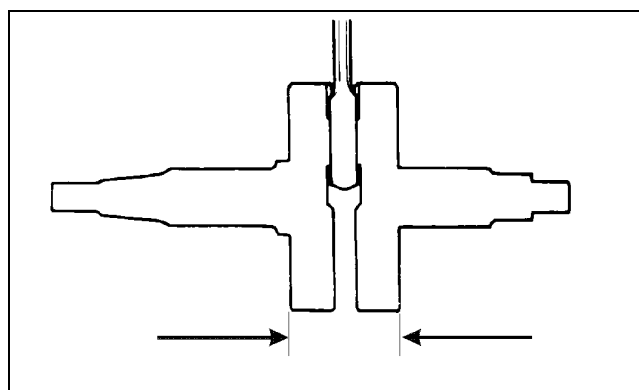
Care should be taken to support the connecting rod when rotating the crankshaft.

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.



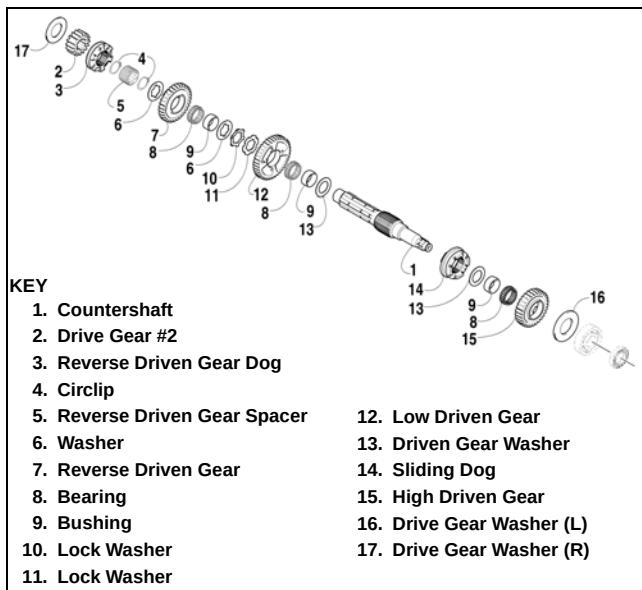
ATV-1017

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.



739-954A

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.



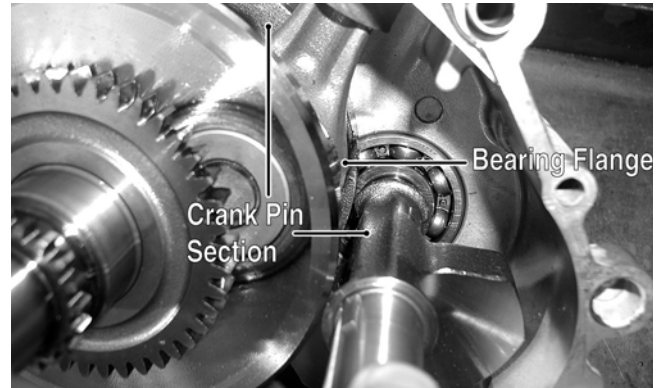
CC686

■ **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.



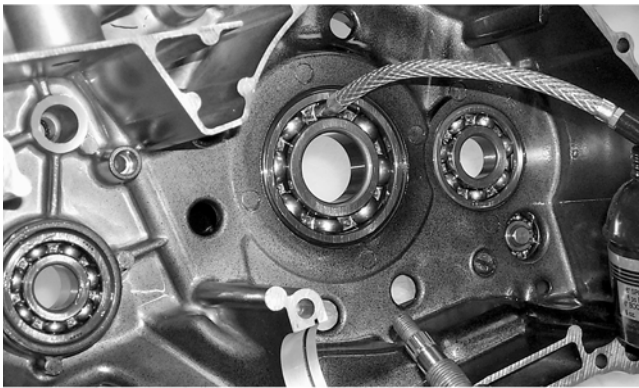
CC687



CD832B

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.

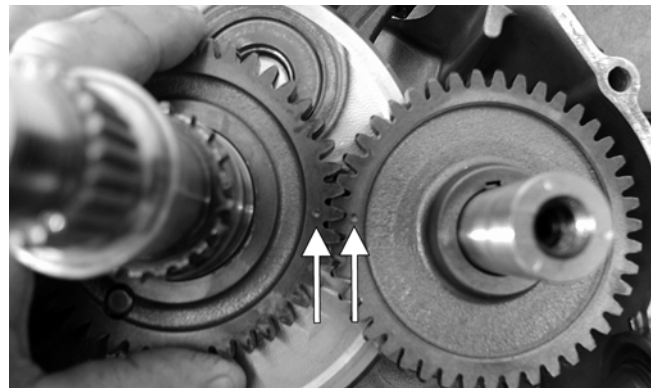
■ **NOTE:** It will be necessary to rotate the crank balancer until the counterweight is facing away from the crankshaft; then rotate the crankshaft clockwise into the journal area to allow the crank balancer to be fully seated.



CC688

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

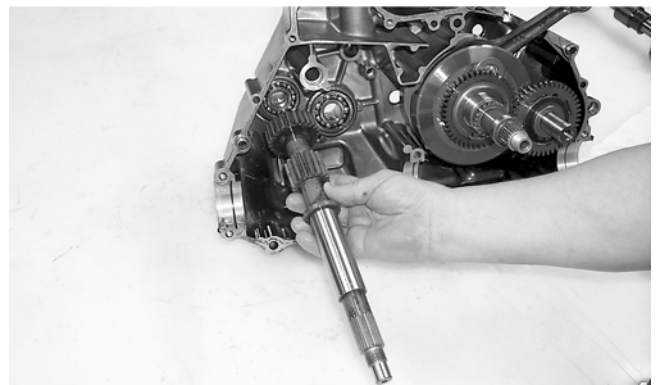


CC689

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

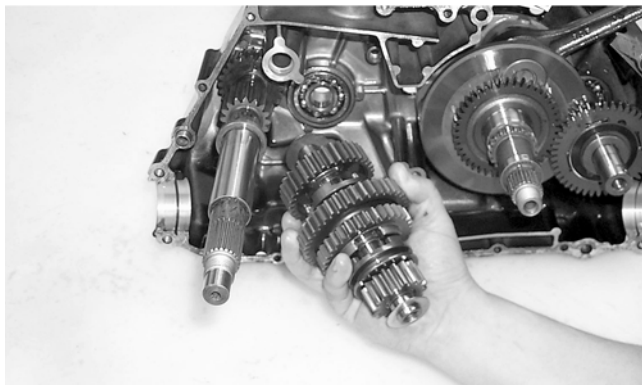
4. Install the crank balancer.

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.

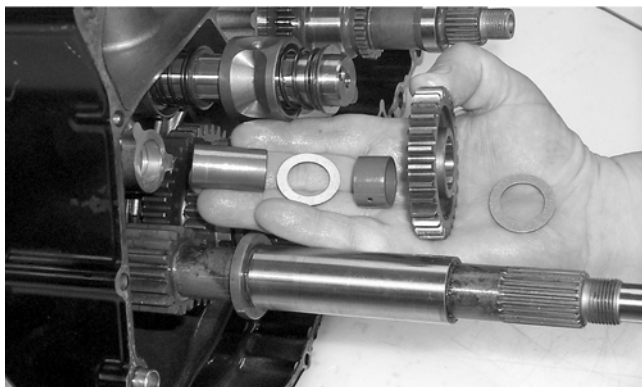
9. Insert the two shift forks into the sliding dogs noting the direction of the tabs from disassembling; then install the shift fork shaft.

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



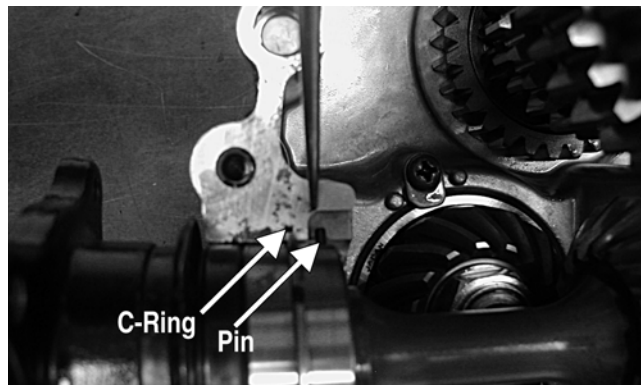
CC669

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.

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. 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.

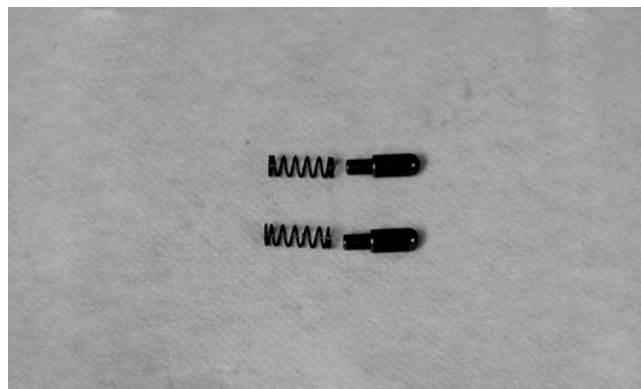
■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

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



CD994

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.

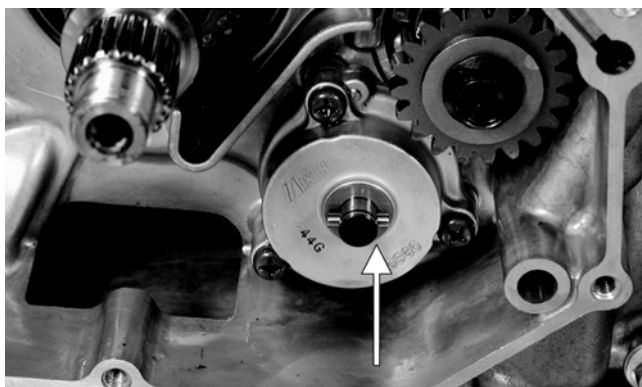
⚠ CAUTION

Care must be taken that the directional washer be installed correctly and note that the nut has left-hand threads.

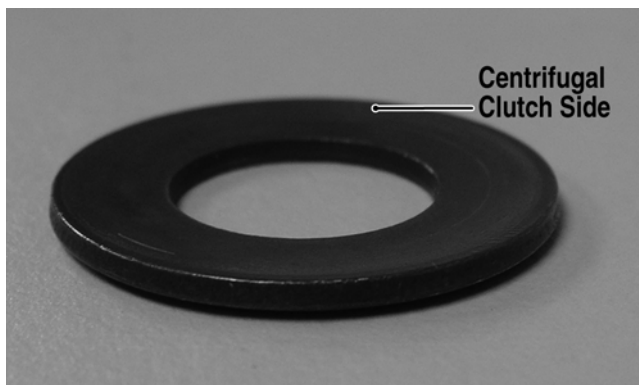


CD991

5. Grease the driven gear pin and insert it into the oil pump shaft; then install the driven gear (noting the direction of the sides of the gear from removing). Secure with a snap ring.



CD985A

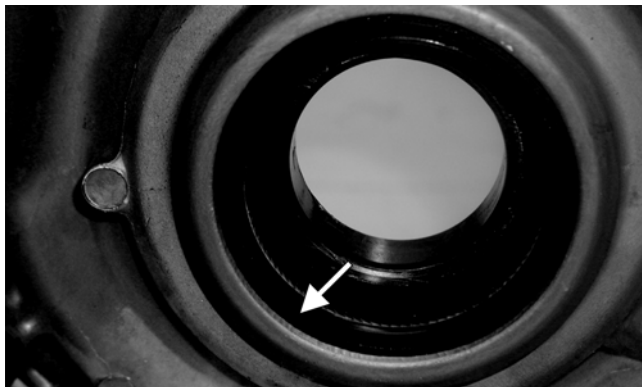


FI336A



FI279A

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

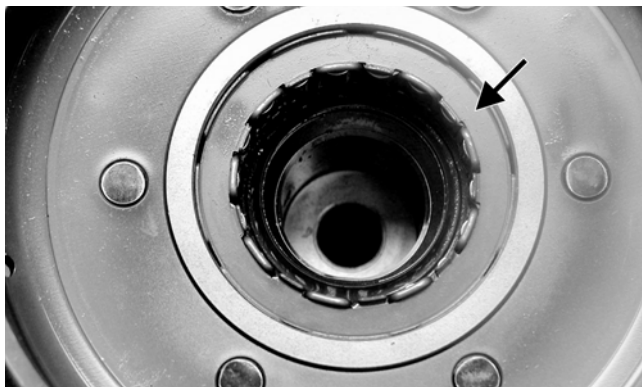


CF088A



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

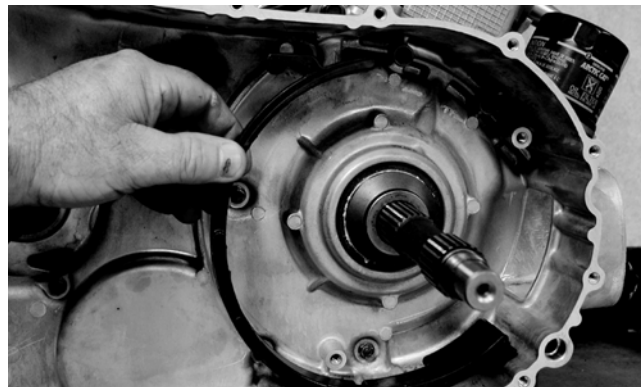


CAUTION

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.

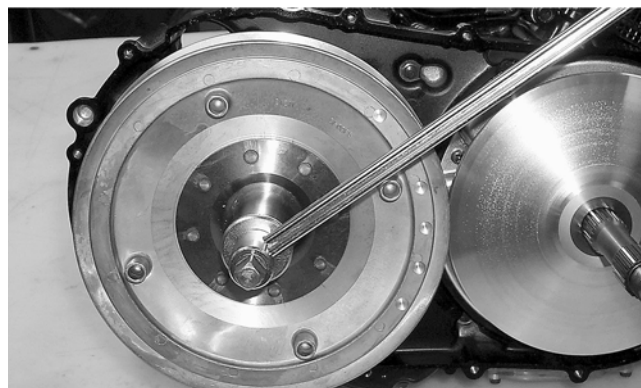


CD971



CD970

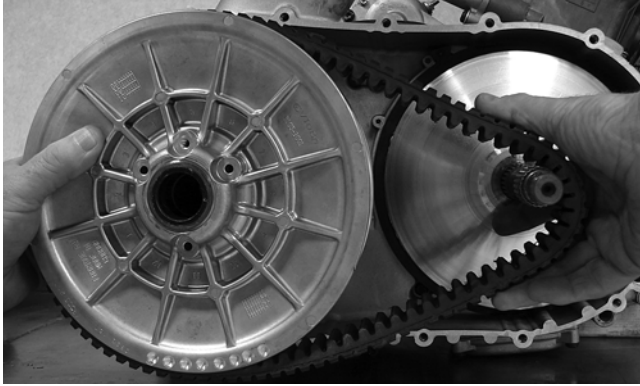
13. Place the driven pulley assembly into position and secure with the nut. Tighten to specifications.



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.

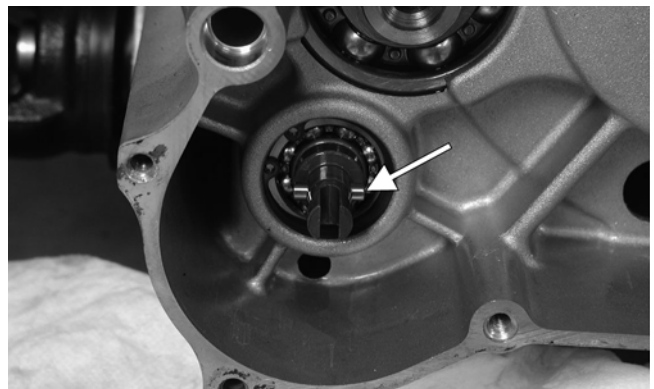


CD083

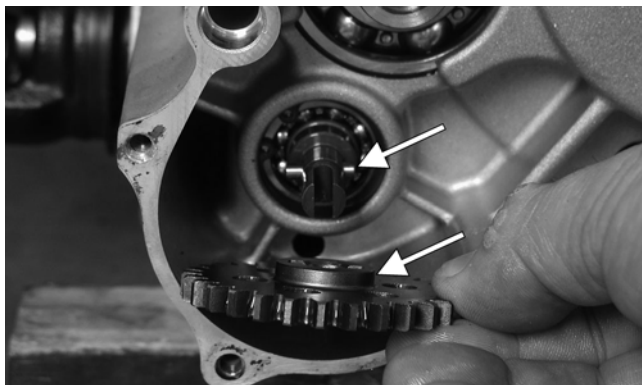
Installing Left-Side Components

■ **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.



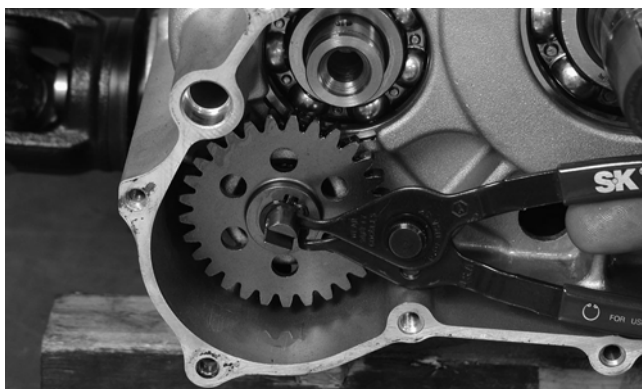
CD950A



CD952A



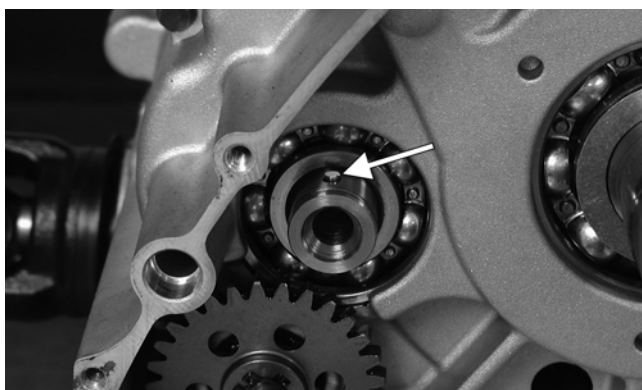
CD944



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

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

■ **NOTE:** Once the gears are secured, remove the oil passage plug from the crankcase.

3. Install the two starter gear shafts; then install the two starter gears (with the beveled side of the intermediate gear facing inward as noted in removing).

3

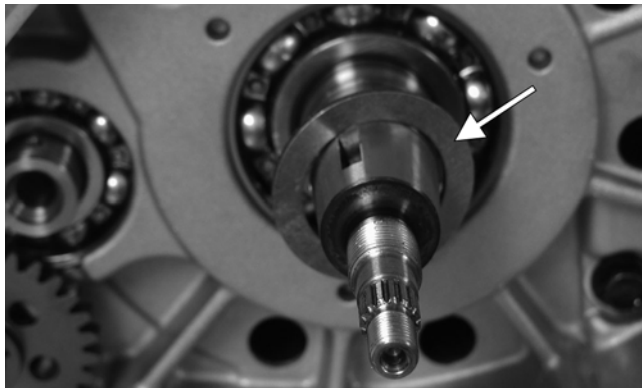


CD139

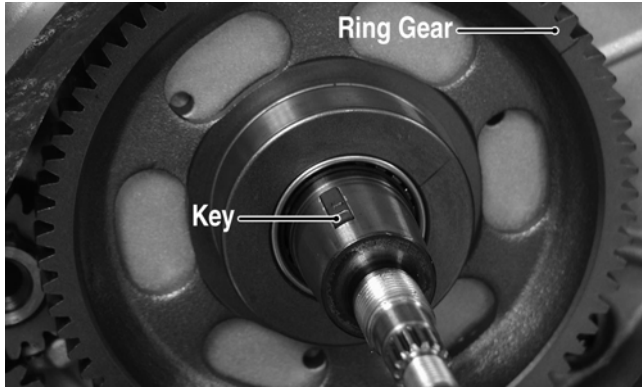


CD145

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.

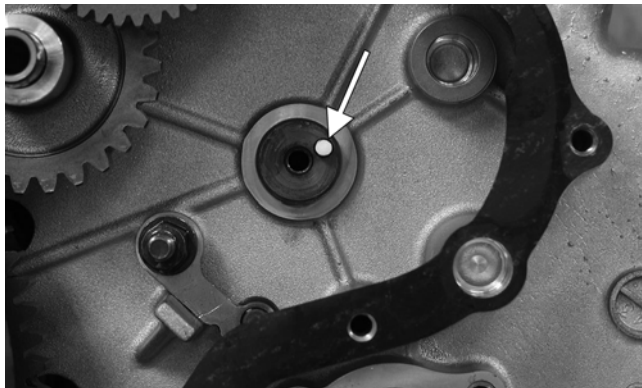


CD948A



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.

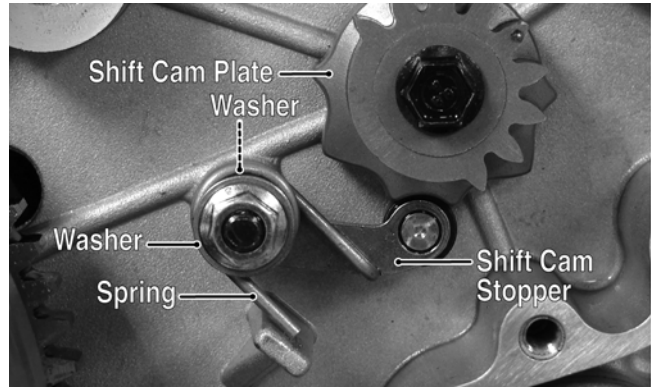


CD935A



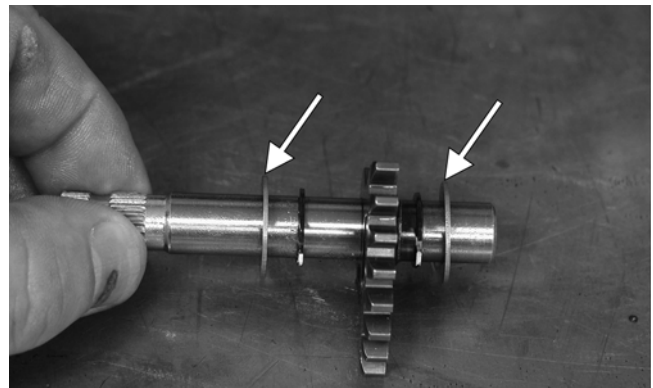
CD934

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.

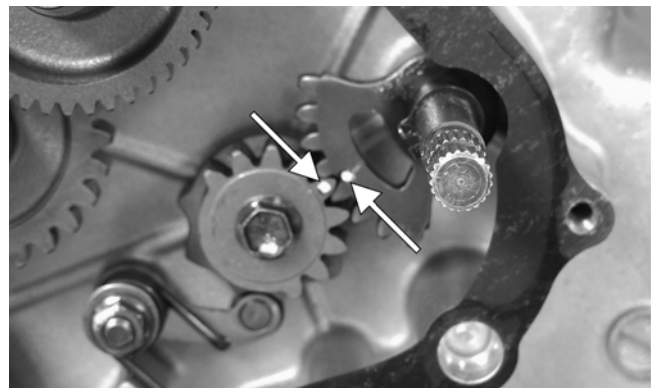


PR434A

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.

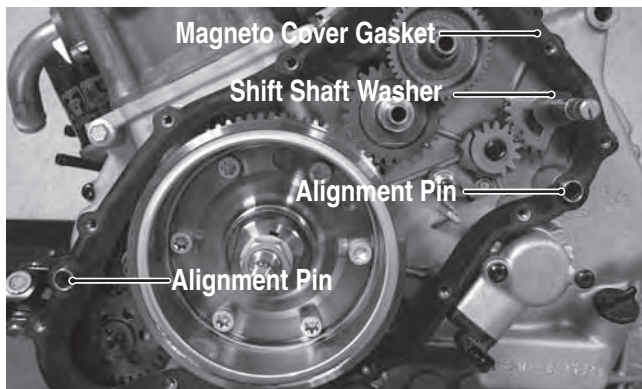


CD954A



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.



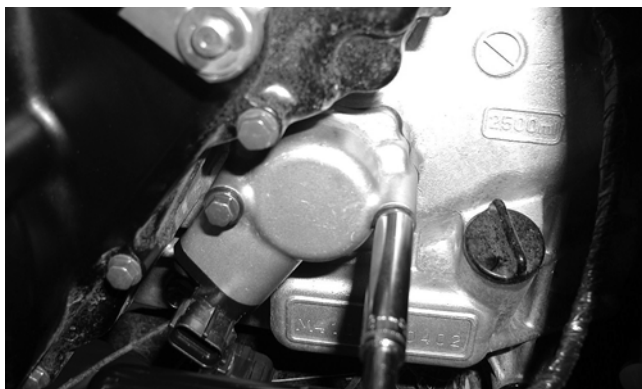
PR431A

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.

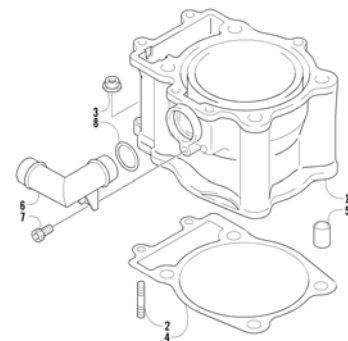
14. Install the crossover tube on the water pump and cylinder head making sure the O-ring is properly positioned.
15. Install the shift arm on the shift arm shaft making sure the scribed marks (from removing) are aligned. Tighten securely.
16. Place the gasket and recoil starter/outer magneto cover into position on the left-side cover; then tighten four cap screws to specifications.

Installing Top-Side Components

A. Piston B. Cylinder

KEY

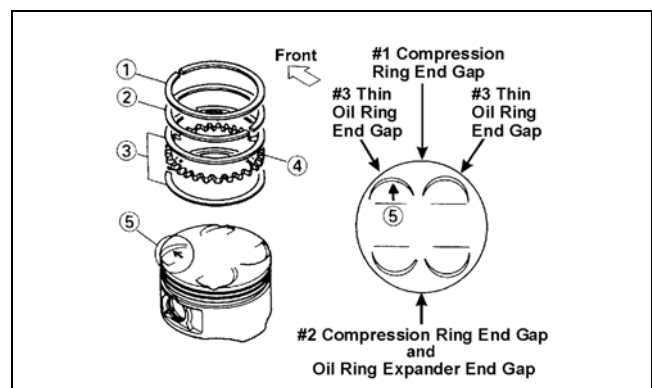
1. Cylinder
2. Stud Bolt
3. Nut
4. Cylinder Gasket
5. Pin
6. Water Hose Union
7. Cap Screw
8. O-Ring



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.

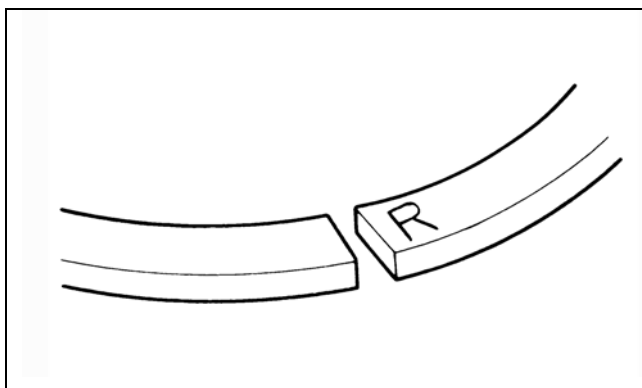


ATV-1085B

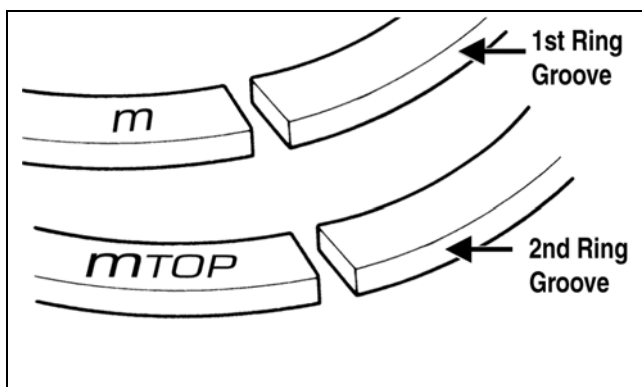
■ **NOTE:** Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.

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.



ATV-1024



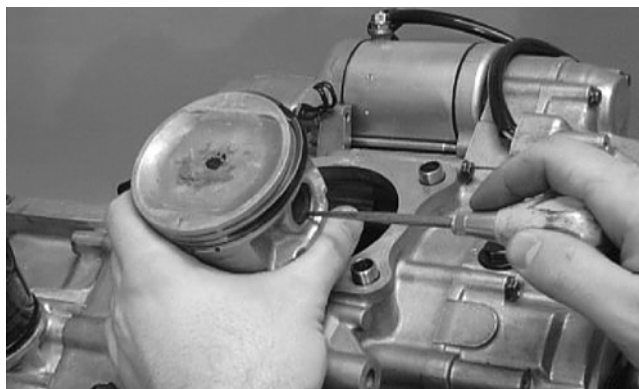
ATV-1024A

⚠ CAUTION

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

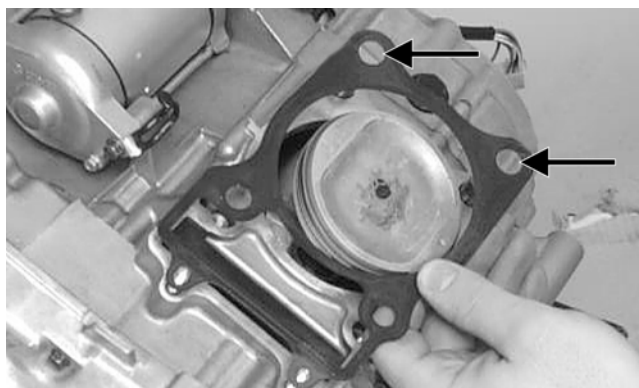
1. Install the piston on the connecting rod making sure there is a circlip on each side and the open end of the circlip faces upwards.

■ **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

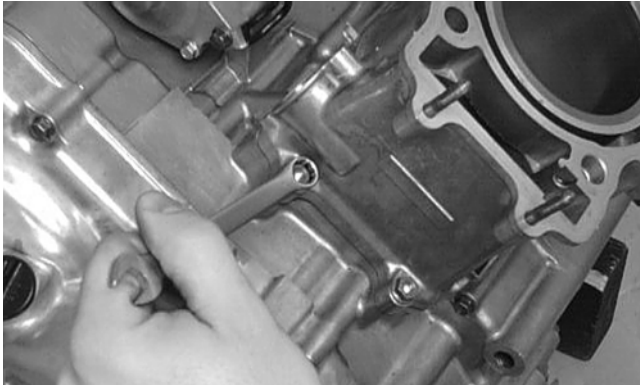
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



CC024D

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

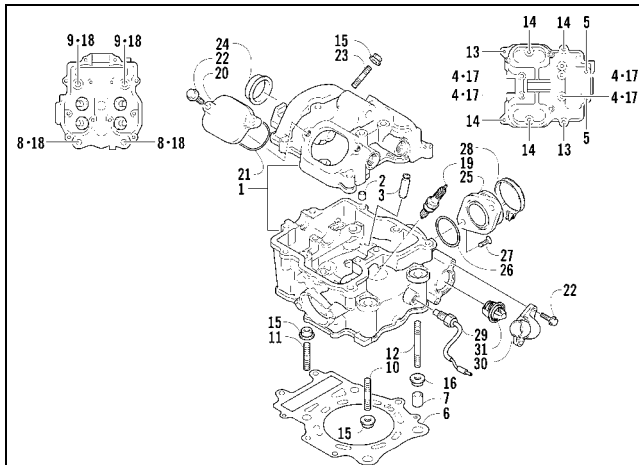
■ **NOTE:** The two cylinder-to-crankcase nuts will be tightened in step 10.



CC023D

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

C. Cylinder Head D. Valve Cover



KEY

1. Cylinder Head Assy	13. Cap Screw	25. Intake Pipe Assy
2. Valve Guide	14. Cap Screw	26. O-Ring
3. Pin	15. Nut	27. Cap Screw
4. Cap Screw	16. Nut	28. Clamp
5. Cap Screw	17. Gasket	29. Temperature Switch Assy
6. Cylinder Head Gasket	18. Gasket	30. Thermostat Cover
7. Pin	19. Spark Plug	31. Thermostat *Frost Plug
8. Cap Screw	20. Inspection Cap	
9. Cap Screw	21. O-Ring	
10. Stud Bolt	22. Cap Screw	
11. Stud Bolt	23. Stud Bolt	
12. Stud Bolt	24. Cylinder Head Plug	

*Not Illustrated

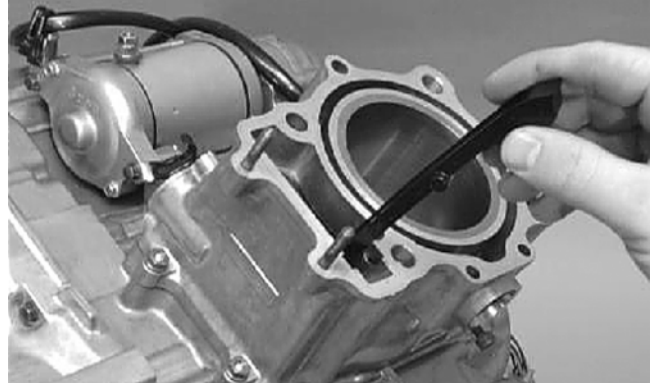
0737-755

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

6. Place the chain guide into the cylinder.

⚠ CAUTION

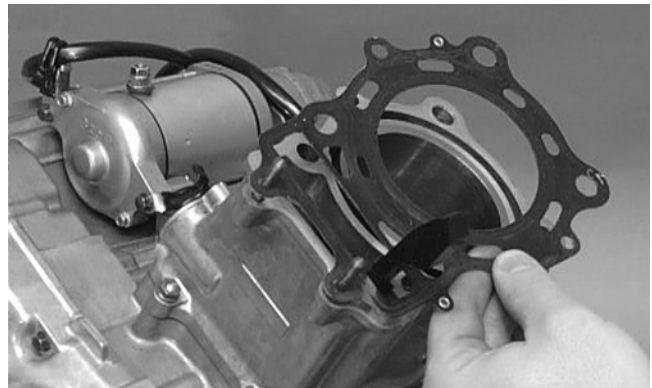
Care should be taken that the bottom of the chain guide is secured in the crankcase boss.



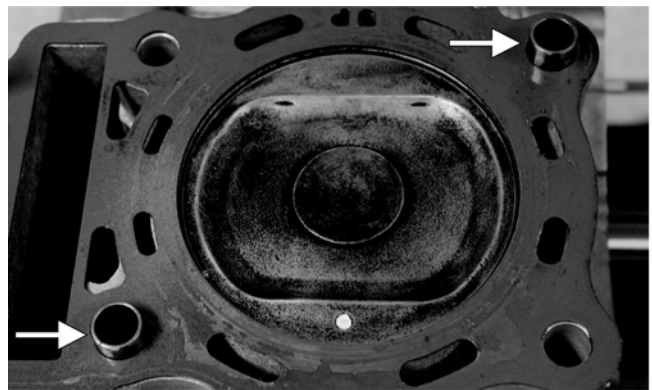
CC022D

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.

3

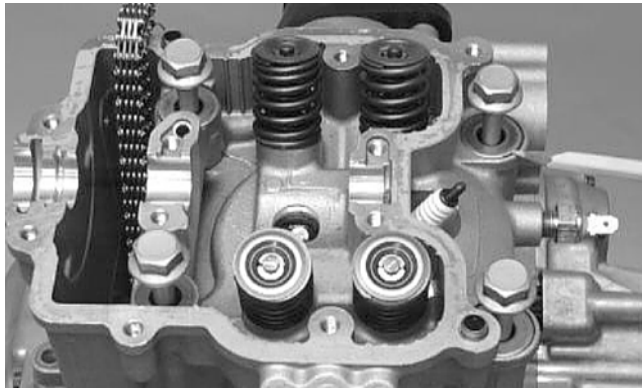


CC020D



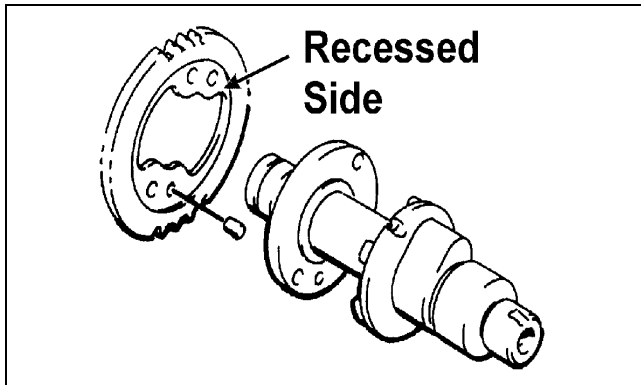
CF057A

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

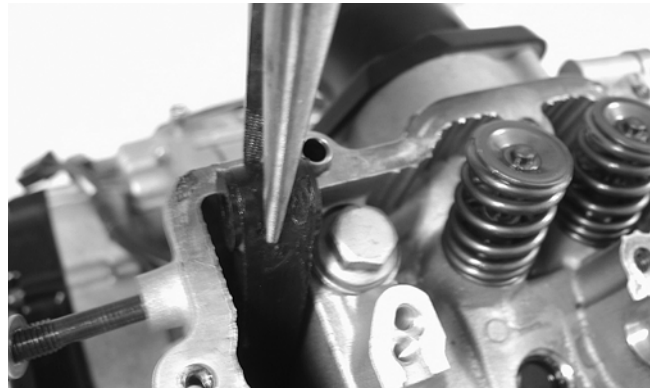
9. Loosely install the five cylinder head nuts.
10. In a crisscross pattern, tighten the four cylinder head cap screws (from step 8) to 3.8 kg-m (27.5 ft-lb) 500 models, 5.5 kg-m (40 ft-lb) 650 H1; then tighten the 8 mm nut (from step 9) to 2.5 kg-m (18 ft-lb). Using a crisscross pattern, tighten the 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.

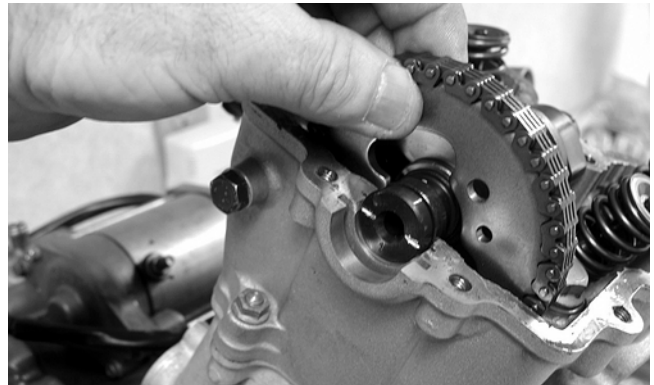
13. While holding the cam chain sprocket to the side, install the rear cam chain tensioner guide into the cylinder head. Install the pivot cap screw and washer.



CD461

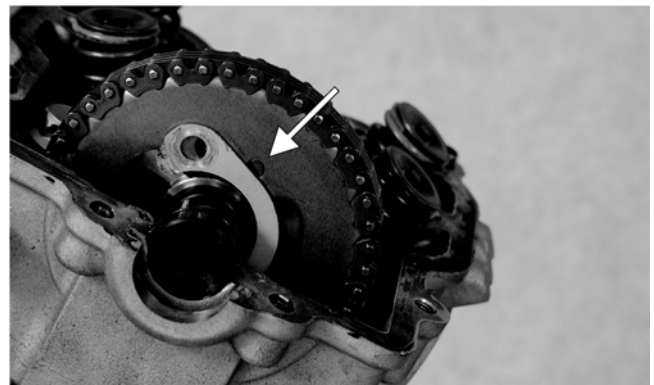
14. With the cam lobes directed down (toward the piston), maneuver the camshaft/sprocket assembly through the chain and towards its seating position; then loop the chain over the sprocket.

■ **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

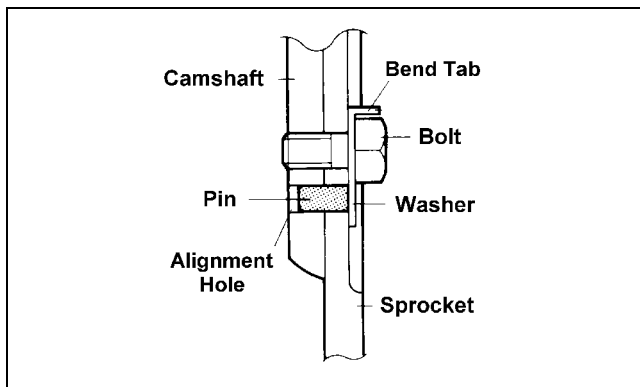
A. Piston still at top-dead-center.

- 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

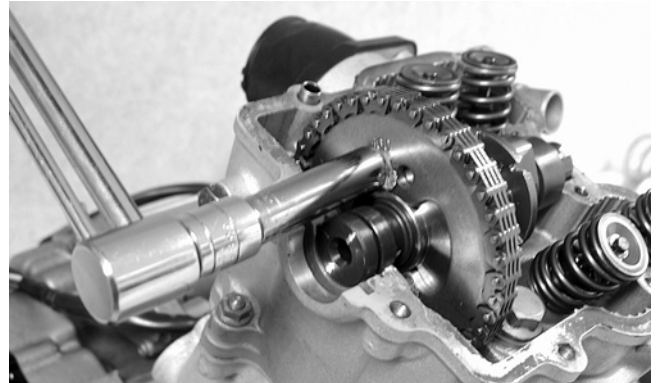
Care must be taken that the tab-washer is installed correctly to cover the alignment hole on the sprocket. If the alignment pin falls out, severe engine damage will result.

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

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.

3



CD466

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

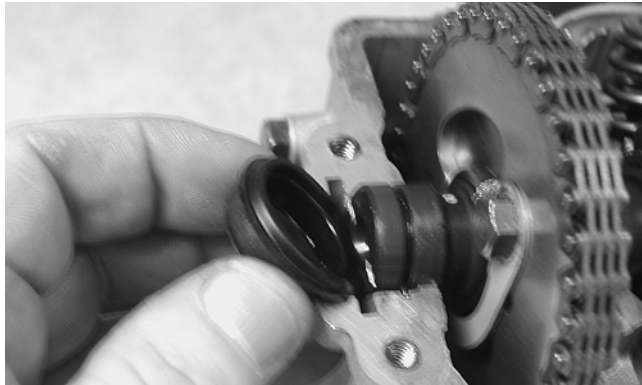


CC012D

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

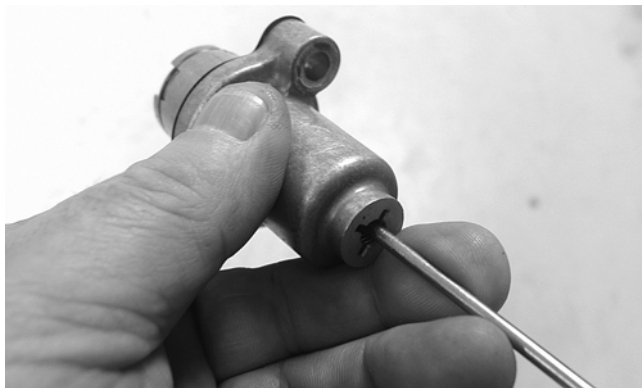
CAUTION

The open end of the plug must be positioned downward.



CD468

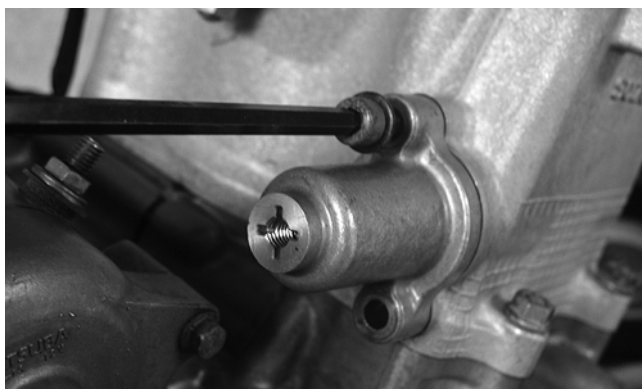
22. Remove the cap screw from the end of the chain tensioner; then using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner clockwise until the screw bottoms.



CD501

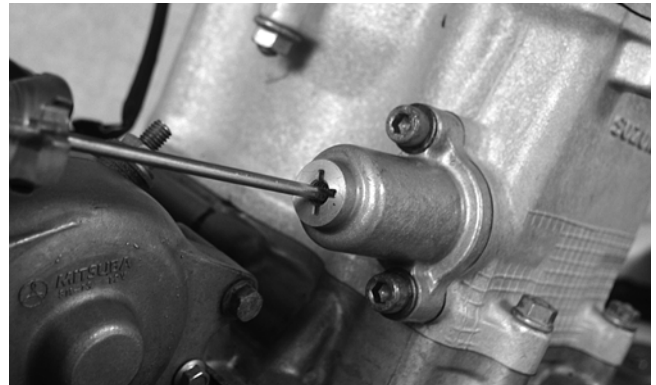
■ **NOTE:** The adjuster shaft will be drawn into the tensioner as the adjuster screw is rotated clockwise. The adjuster shaft tension will be released in step 24.

23. Place the chain tensioner adjuster assembly and gasket into position on the cylinder and secure with the two Allen-head cap screws.

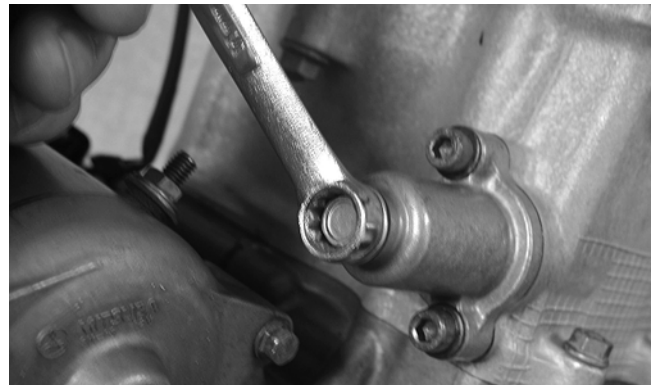


CD469

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.

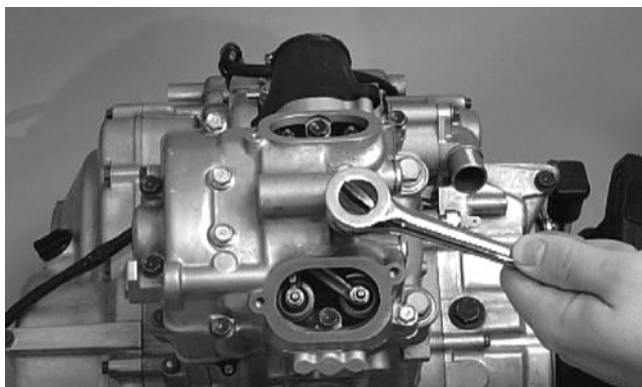


CC275D

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.

Installing Engine/Transmission

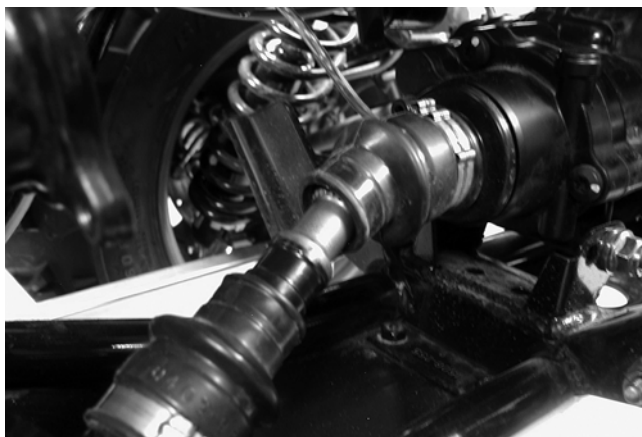
■ **NOTE:** Arctic Cat recommends that new gaskets and O-rings be installed whenever servicing the ATV.

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.



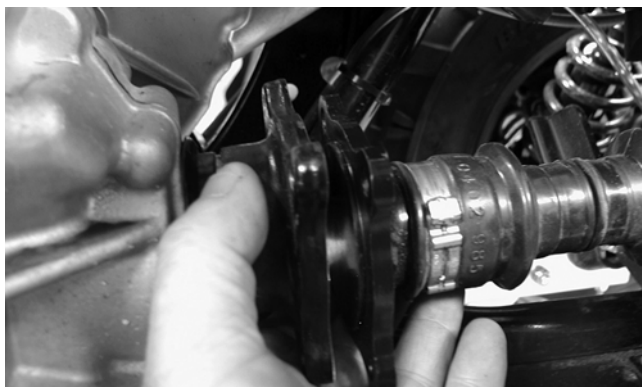
CD818

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.



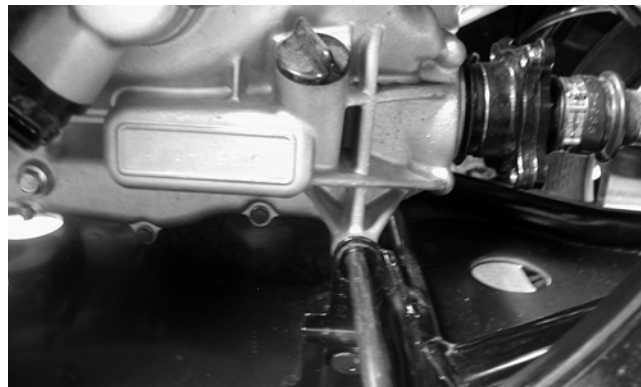
CD821

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.

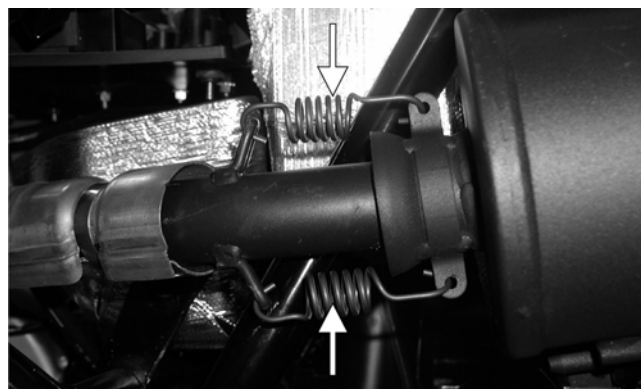


CD809

6. Secure the exhaust pipe to the engine with two cap screws making sure the mounting brackets engage the frame grommets; then install the muffler and tighten all mounting hardware to specifications.



CD803

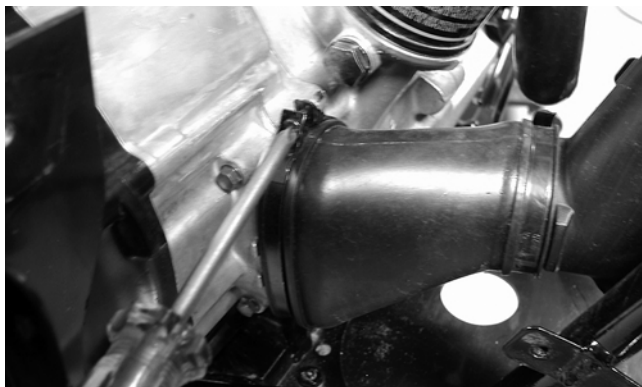


CF138A

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



CD515



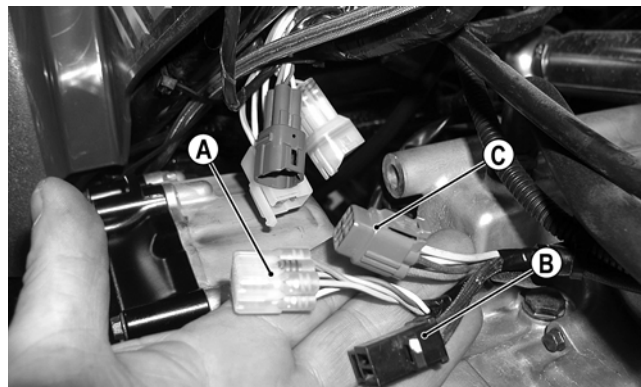
CD793

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 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.



CD774

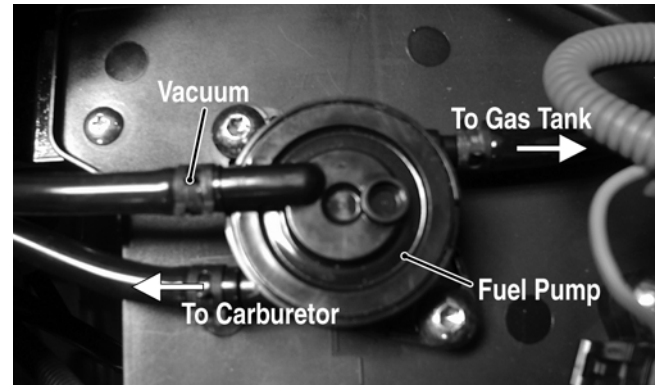
18. Place the left-side footwell and foot peg in position on the frame; then secure with existing hardware. Tighten to specifications.



CD782

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.



CD766A

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.

Table of Contents

(500 - Manual Transmission)

Removing Engine Transmission.....	3-185
Top-Side Components.....	3-189
Removing Top-Side Components	3-189
Left-Side Components	3-193
Removing Left-Side Components	3-193
Right-Side Components.....	3-198
Removing Right-Side Components.....	3-198
Center Crankcase Components.....	3-202
Separating Crankcase Halves.....	3-202
Disassembling Crankcase Half	3-204
Servicing Components.....	3-206
Assembling Crankcase Half.....	3-232
Joining Crankcase Halves.....	3-235
Installing Right-Side Components.....	3-236
Installing Left-Side Components	3-240
Installing Top-Side Components	3-245
Installing Engine/Transmission.....	3-251

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.

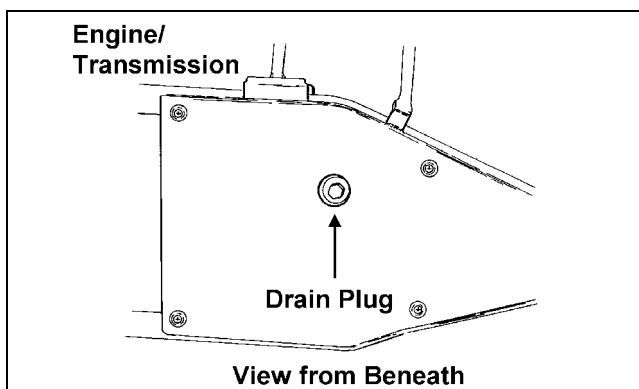
3. Remove the radiator access cover, steering post cover, and storage compartment cover assembly; then remove the storage compartment box.
4. Remove the reinstallable rivets securing the side panels; then remove the panels.



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.



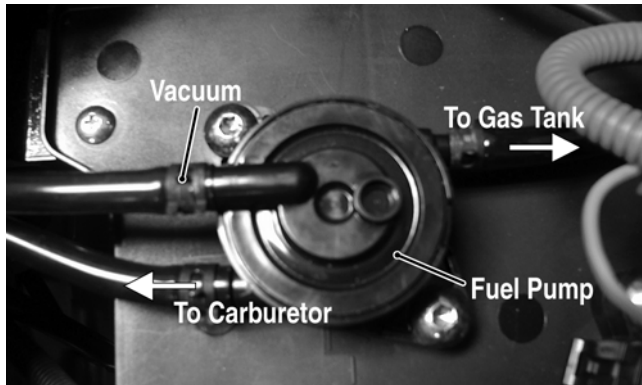
ATV-0109



CD799A

7. Remove the air filter (see Section 2).

8. Remove the vacuum hose and the fuel-pump-to-carburetor hose.



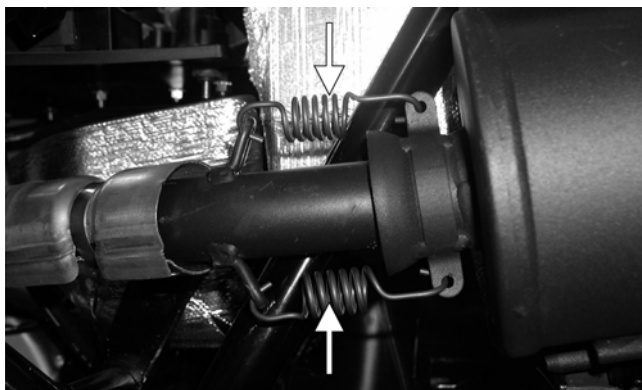
CD766A

9. Remove the cap screws securing the left-side foot peg and footwell to the footrest; then remove the footwell.



CD782

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



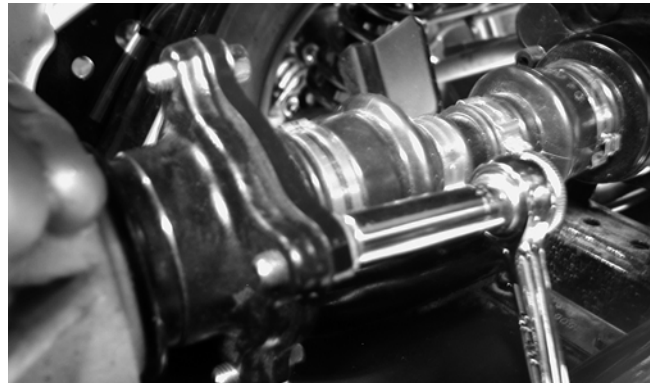
CF138A

11. Remove the cap screws securing the exhaust pipe to the head; then remove the exhaust pipe.



CD803

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.



CD805

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

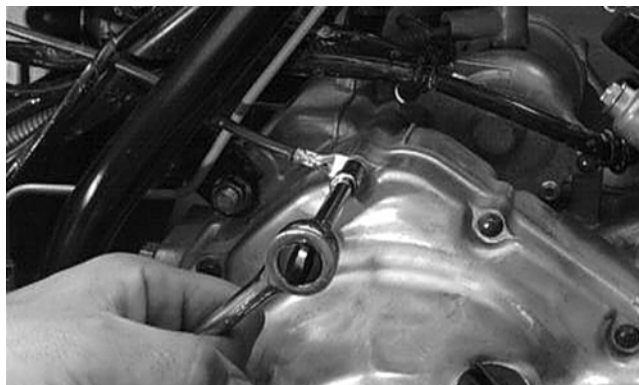


CD785

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



AR604D

17. Remove the clamp securing the upper coolant hose to the thermostat housing; then disconnect the hose.

20. Remove the clamp securing the lower coolant hose to the water pump housing; then disconnect the hose.



CC335D



CC334D

18. Disconnect the high tension lead from the spark plug; then remove the coil.

21. Loosen the clamp on the crankcase breather vent hose; then remove the hose.

19. Disconnect the battery ground (negative) cable from the crankcase cover; then disconnect the positive cable from the starter motor.



CC122D

3

22. Remove the engine/transmission mounting fasteners in the following sequence:

A. Lower front: One cap screw, nut, spacer, and washer.



CC123D

B. Lower rear: One cap screw, nut, spacer, and washer.



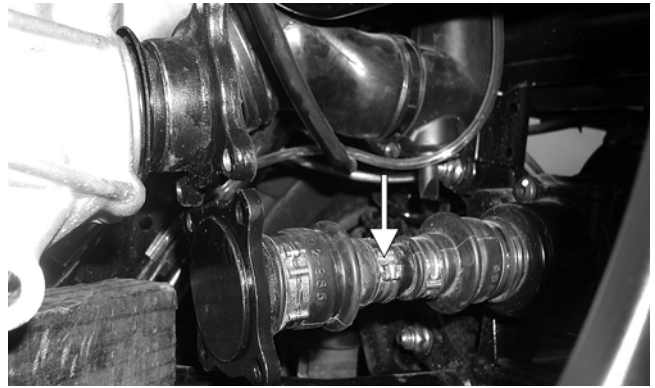
CC126D

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.

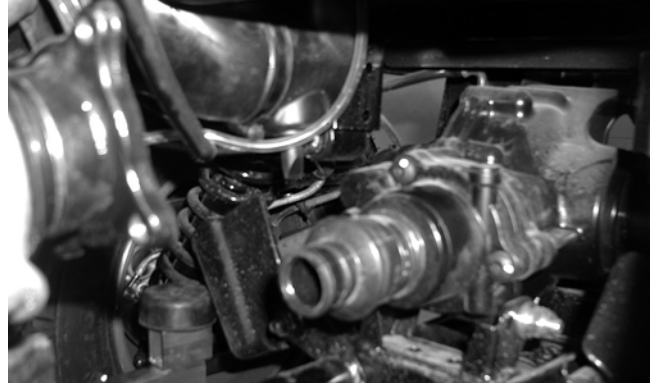


CD811

24. Remove the first small boot clamp; then slide the output flange and driveshaft out of the rear coupler.



CD812A



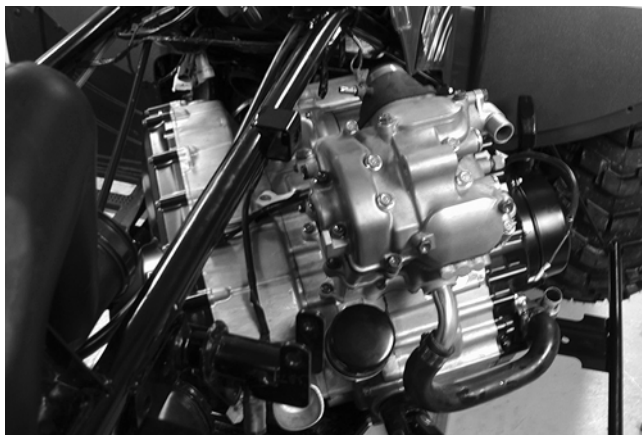
CD813

25. Remove the block and lower the rear of the engine; then remove the boot clamp on the front output drive yoke.



CD817

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

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

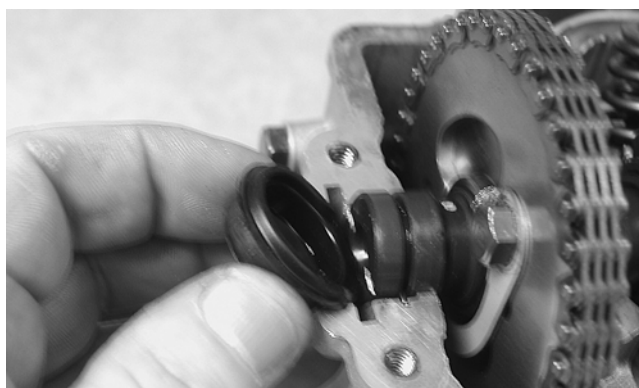
■ **NOTE:** Keep the mounting hardware with the covers for assembly purposes or thread them back into the head to keep them separated.

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.

3



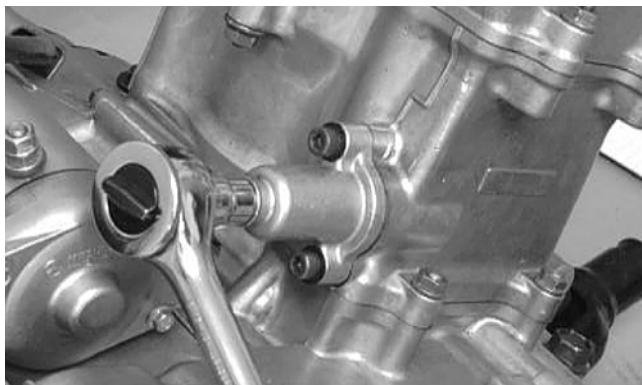
CD205



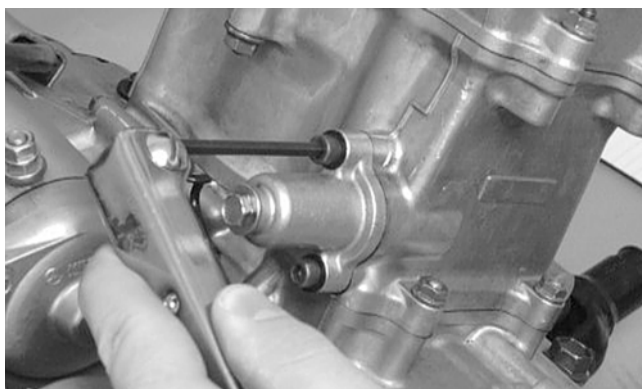
CD468

■ **NOTE:** Note that the opening of the head plug must be directed to the 6 o'clock position.

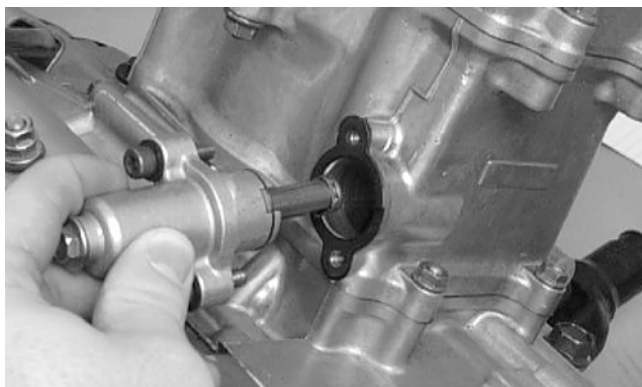
3. Loosen the cap screw on the end of the tensioner; then remove the two Allen-head cap screws securing the tensioner adjuster assembly and remove the assembly. Account for a gasket.



CC009D



CC010D



CC011D

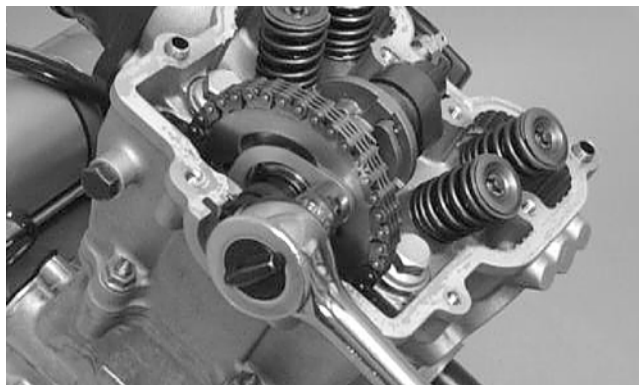
4. Using an awl, rotate the C-ring in its groove until it is out of the cylinder head; then remove the C-ring.

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

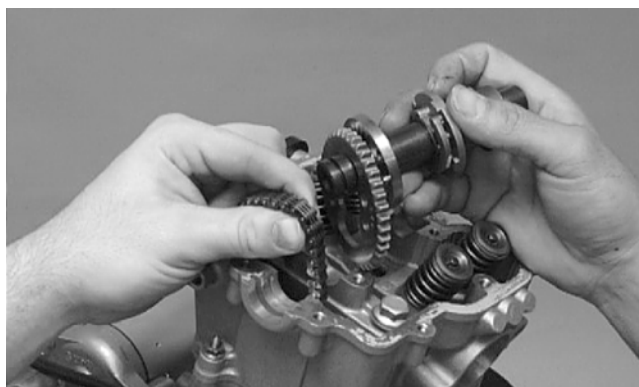


CC012D

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 camshaft out of the cylinder head.



CC013D



CC266D

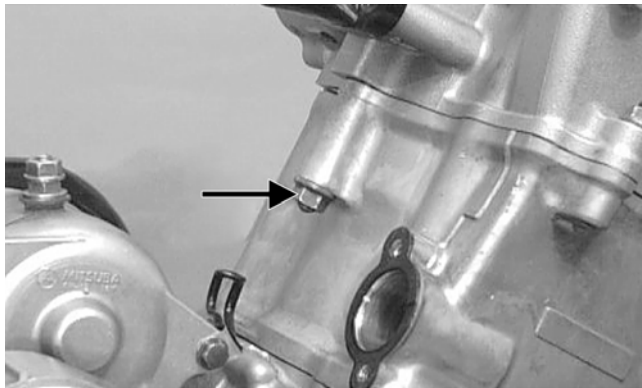
■ **NOTE:** Loop the chain over the cylinder and secure it to keep it from falling into the crankcase.

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

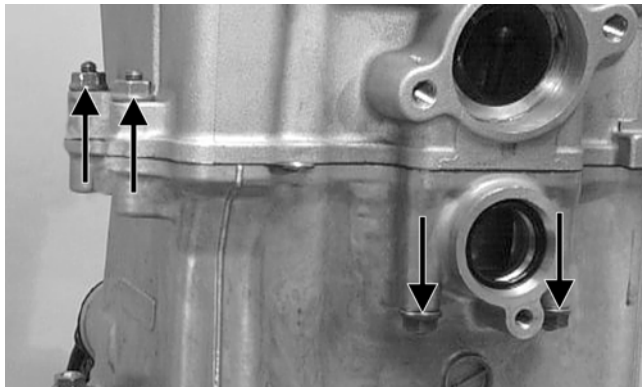
👉 AT THIS POINT

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

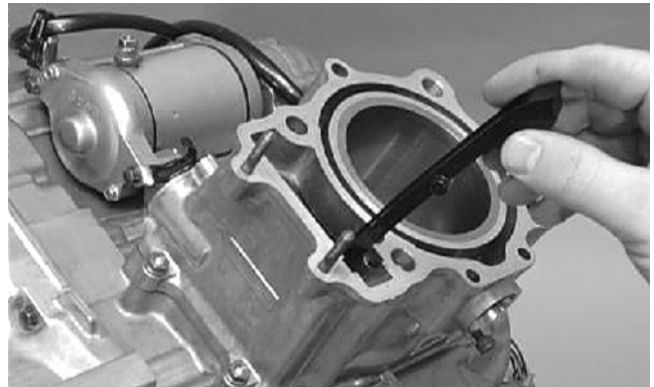
9. Remove the cam chain guide.

👉 AT THIS POINT

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



CC018D



CC022D

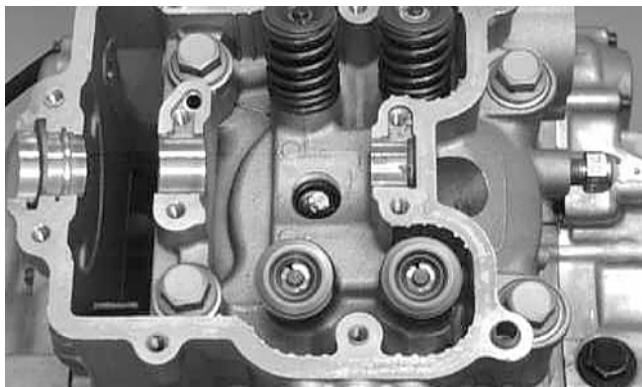
3

C. Cylinder D. Piston

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

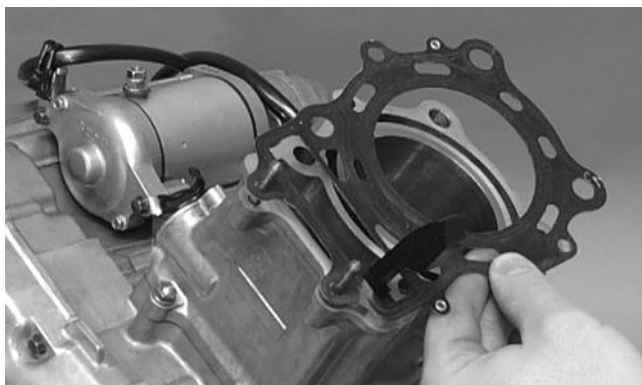
10. Loosen the clamp securing the coolant hose to the union; then detach the hose.

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

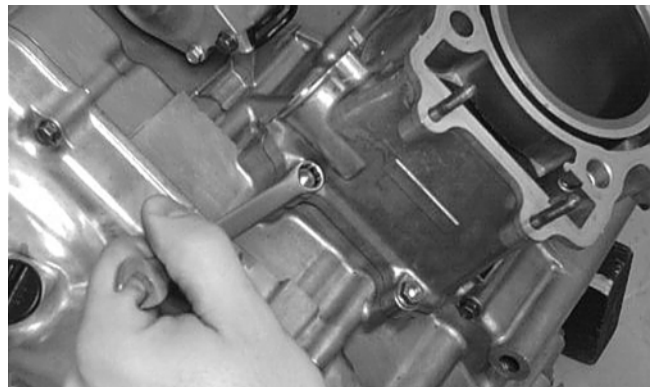


CC016D

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

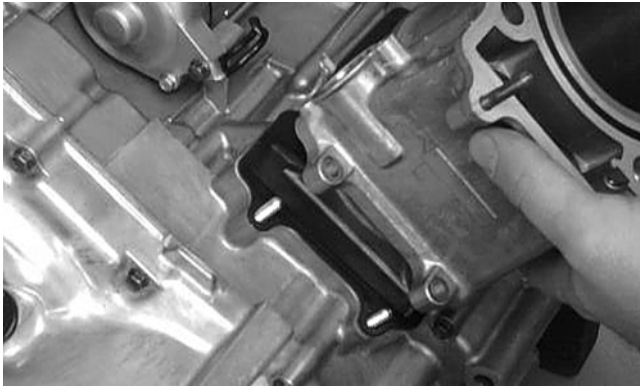


CC020D

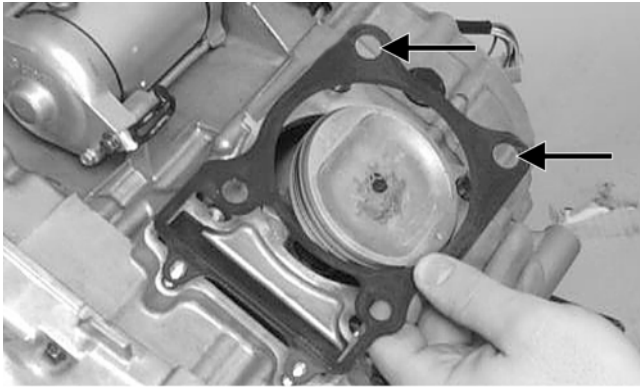


CC023D

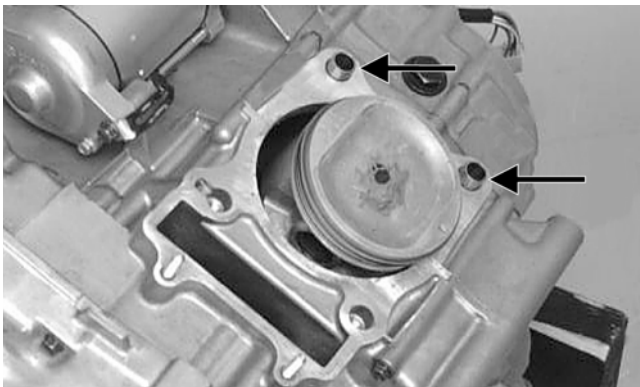
12. Lift the cylinder off the crankcase taking care not to allow the piston to drop against the crankcase. Account for the gasket and two alignment pins.



CC024D



CC025D



CC026D

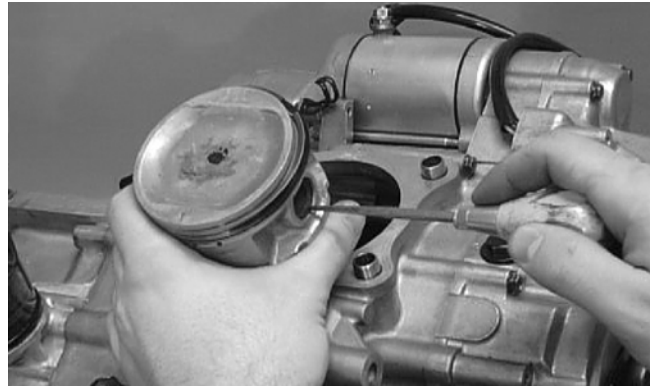
AT THIS POINT

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.

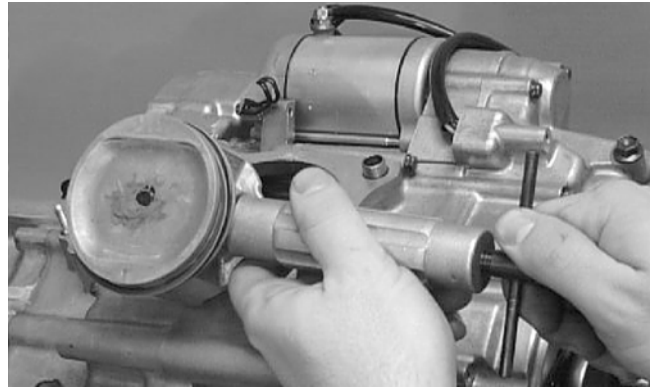
13. Using an awl, remove one piston-pin circlip.



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.

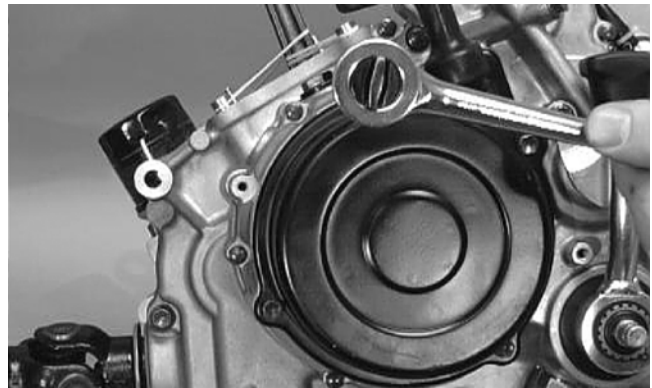
Removing Left-Side Components

- A. Recoil Starter**
- B. Hi/Low Shifter Assembly**
- C. Speed Sensor Housing**
- D. Cover**

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

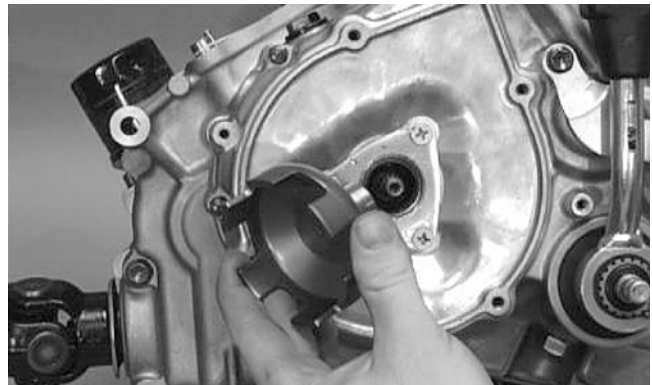
👉 AT THIS POINT

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



CC039D

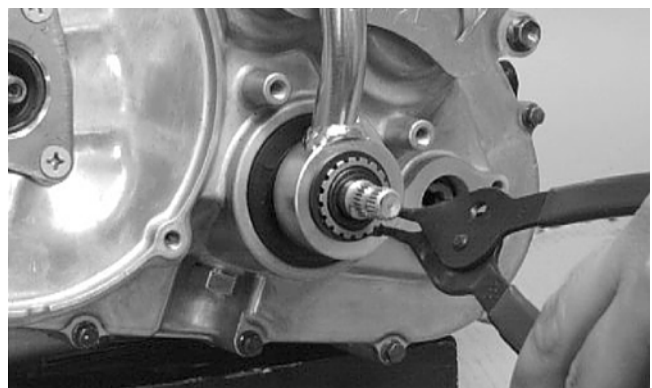
2. Remove the flange nut securing the starter cup to the crankshaft; then remove the starter cup. Account for the O-ring inside the cup.



CC041D

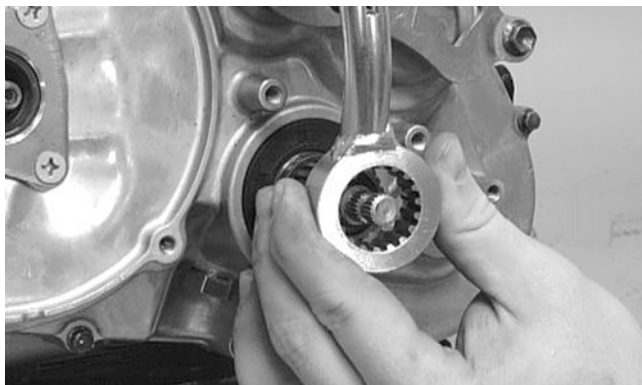
3. Put the shift lever into the hi-range position and remove the circlip from the hi/low range shift shaft; then remove the shift lever.

■ **NOTE:** It will be necessary to lift slightly on the shift lever to remove it from the shaft and plate.



CC044D

3



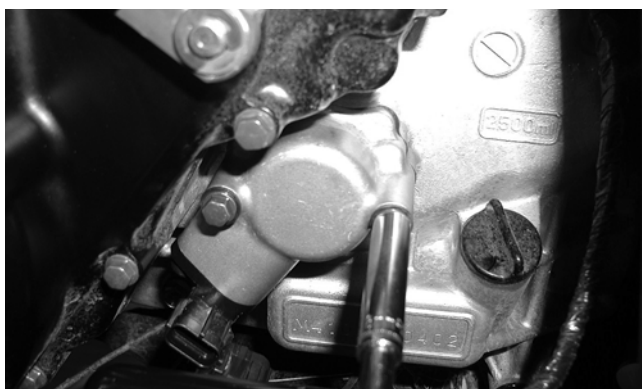
CC045D

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.



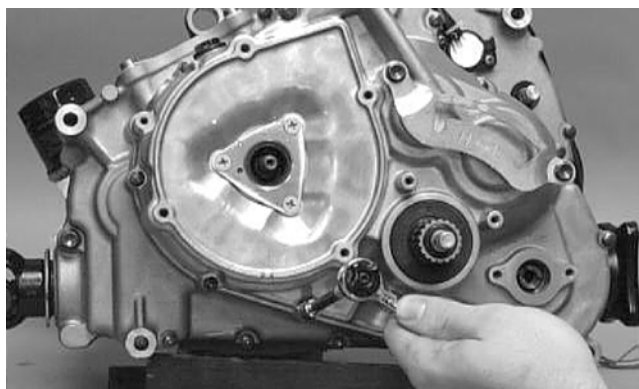
CD069

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.



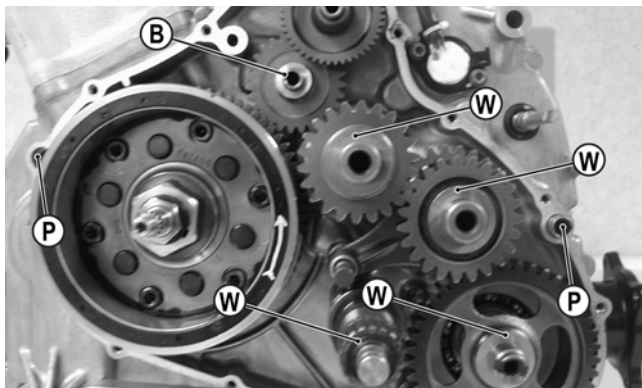
CC047D



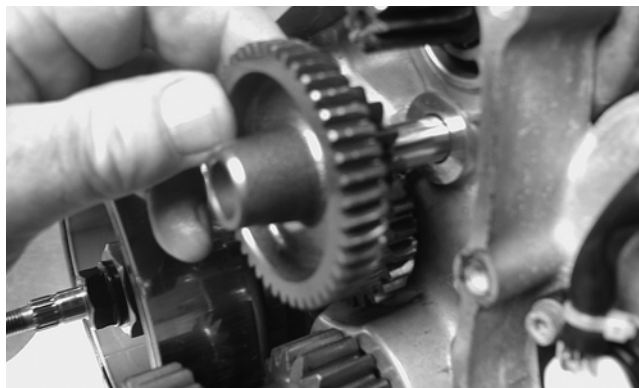
CF037A

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

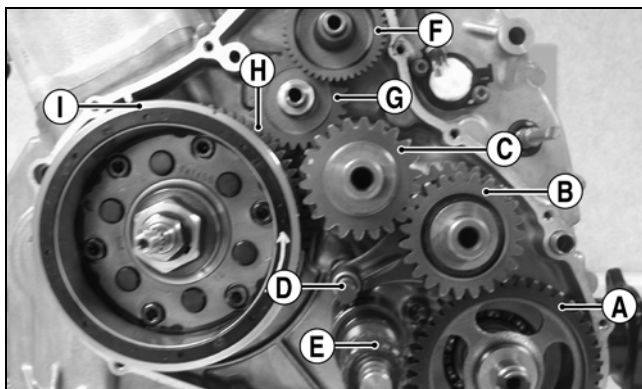


CD136

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.



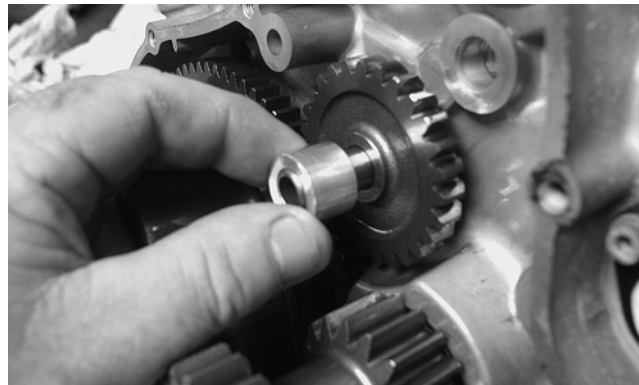
CD134B

KEY

- | | |
|----------------------------------|---------------------------------|
| A. Output Shaft with Driven Gear | F. Starter Gear Assembly |
| B. Drive Gears #1 & #2 | G. Starter Idler Gear |
| C. Idle Gear | H. Starter Clutch Gear Assembly |
| D. Shift Fork with Shaft | I. Rotor/Flywheel |
| E. Shift Shaft Assembly | |

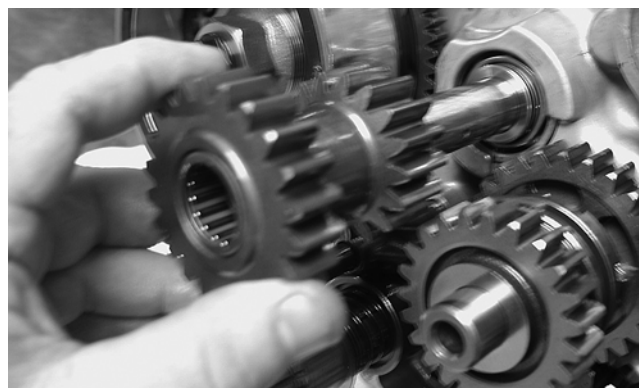
■ **NOTE:** To aid in installing, it is recommended that the assemblies are kept together and **IN ORDER**.

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.

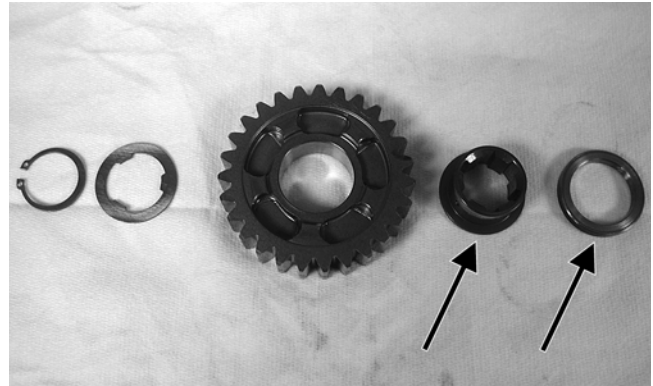
AT THIS POINT

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

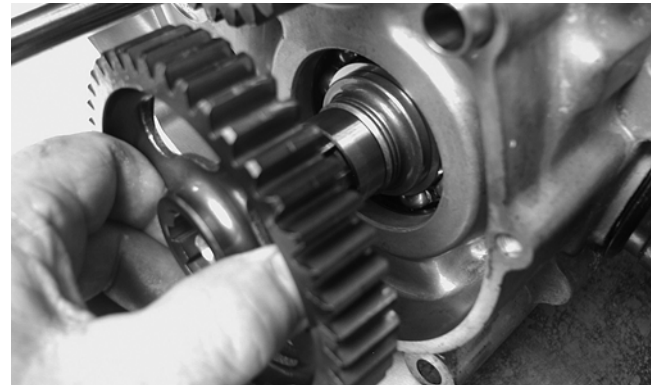


CD154A

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.

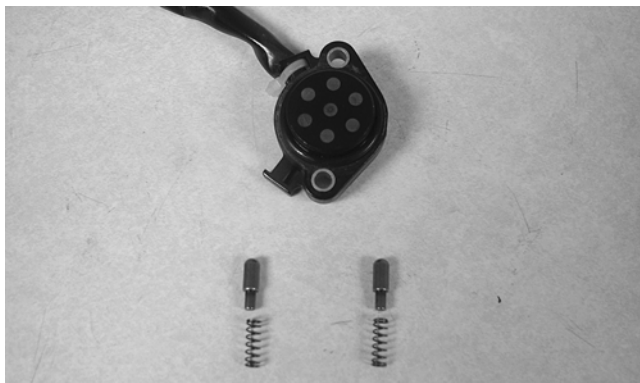


CD150

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.

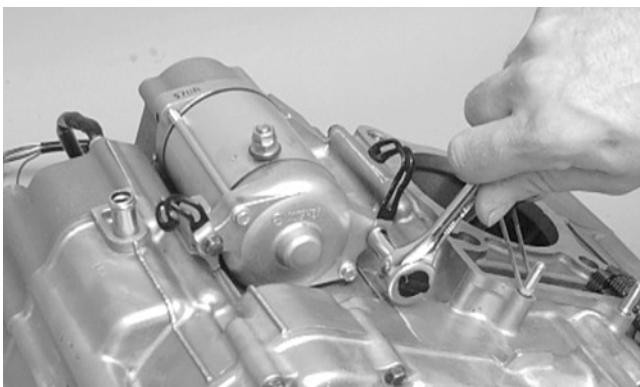


CC059D



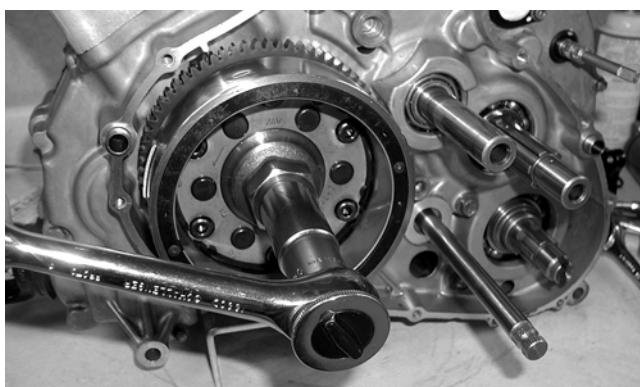
CD159

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

3

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.

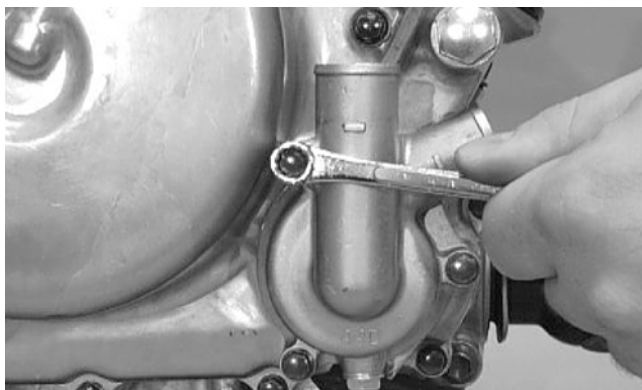
■ **NOTE:** The engine/transmission does not have to be removed from the frame for this procedure.

Removing Right-Side Components

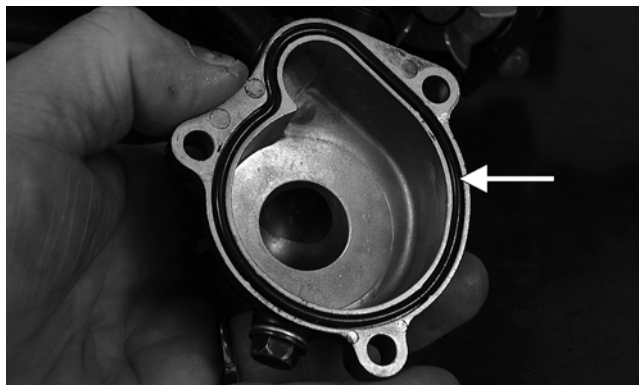
A. Oil Filter

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.

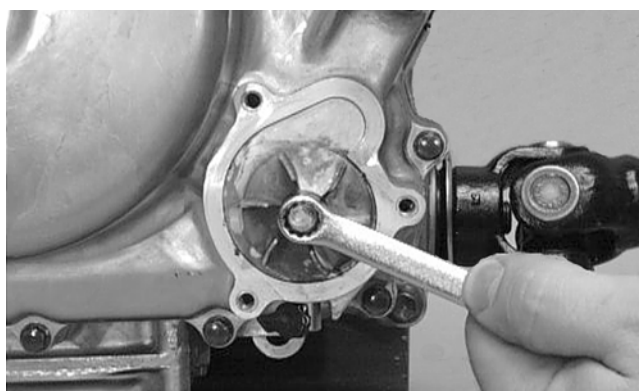


CC027D

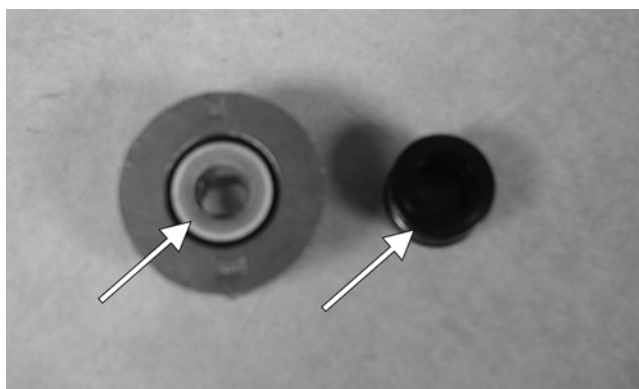


CF066A

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



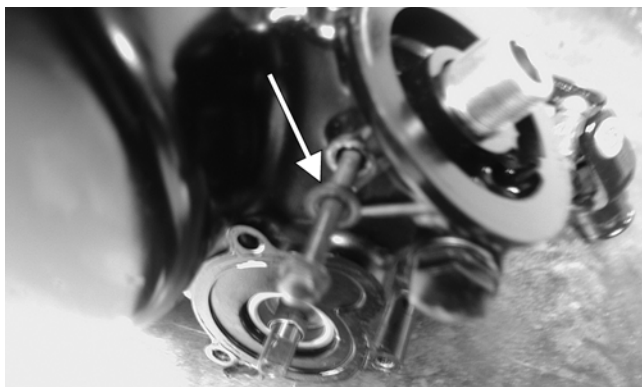
CD163A

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.



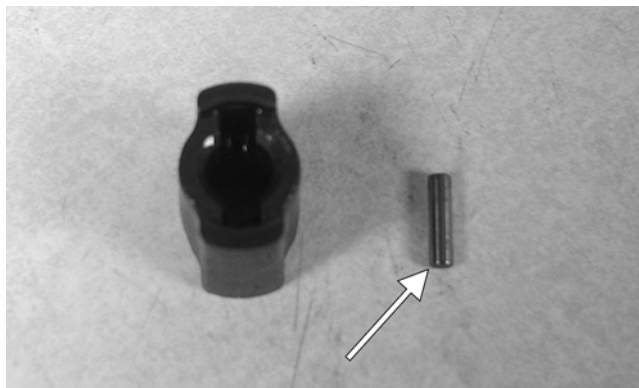
CD164A

■ **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.

7. Remove the reverse cam stopper housing and gasket and account for a stopper and spring.

3

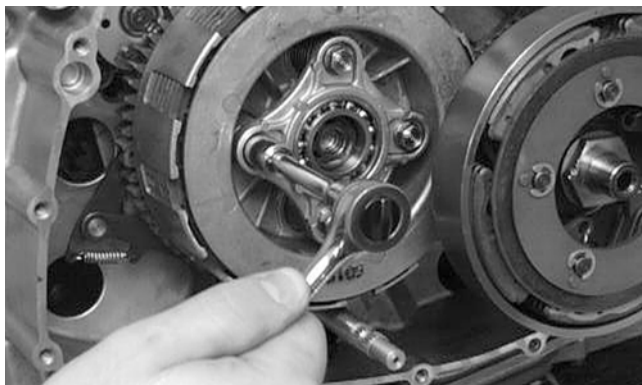


CC069D

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

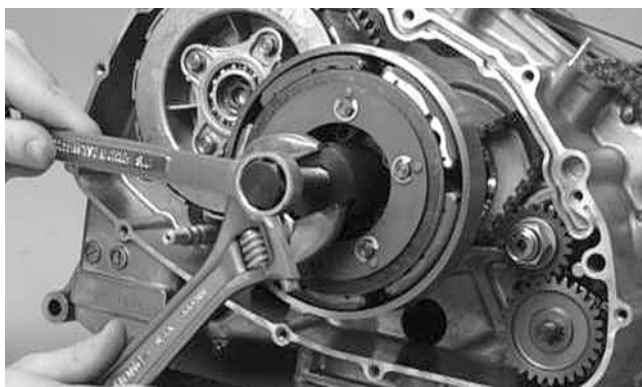


CC074D

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.



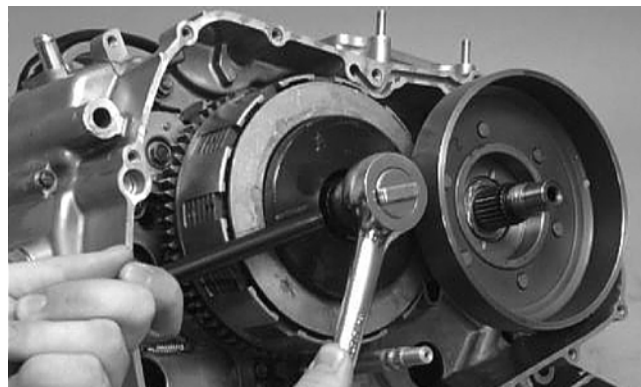
CC072D

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.



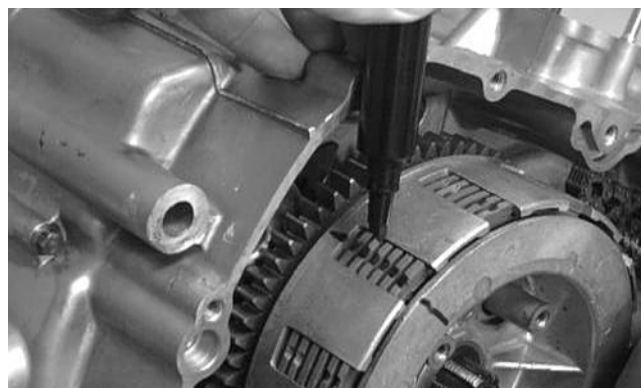
CF043

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

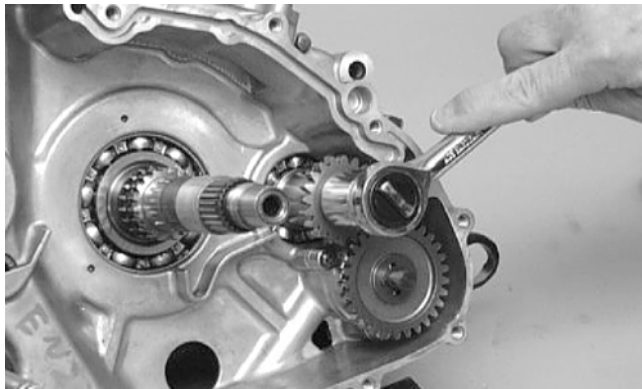
To service clutch components, see Servicing Right-Side Components sub-section.

F. Gear Shift Cam Plate/Guide

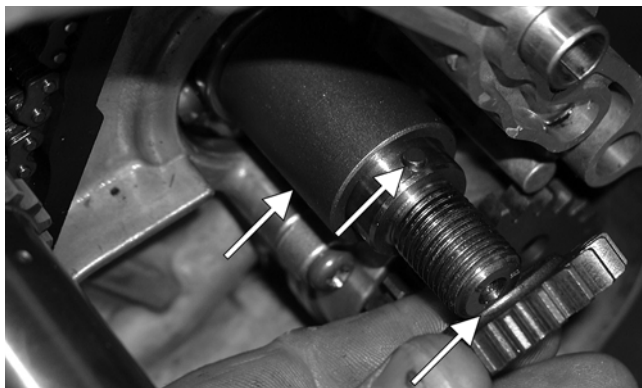
G. Oil Pump/Oil Strainer

■ **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.



CC080D



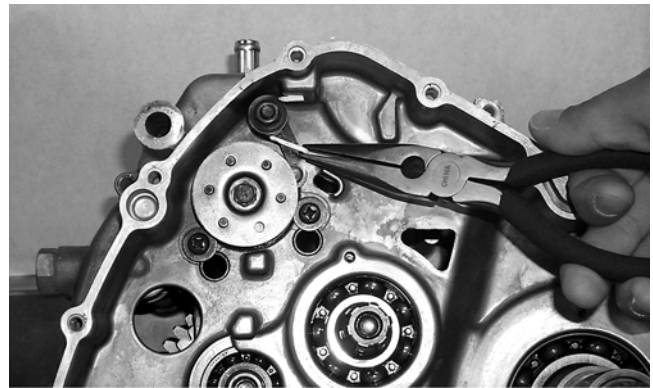
CF070A

17. Remove the gear shift shaft from the crankcase.



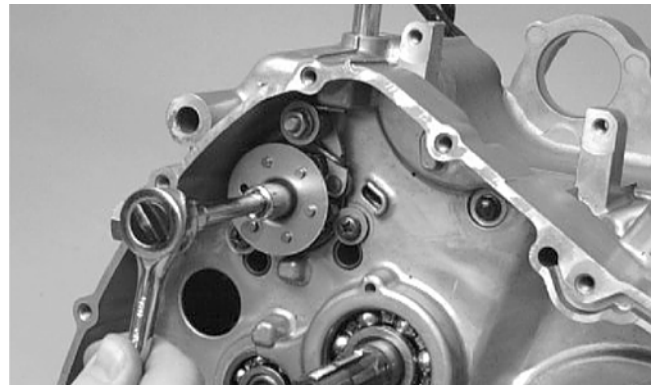
CC085D

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



CC086D

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.



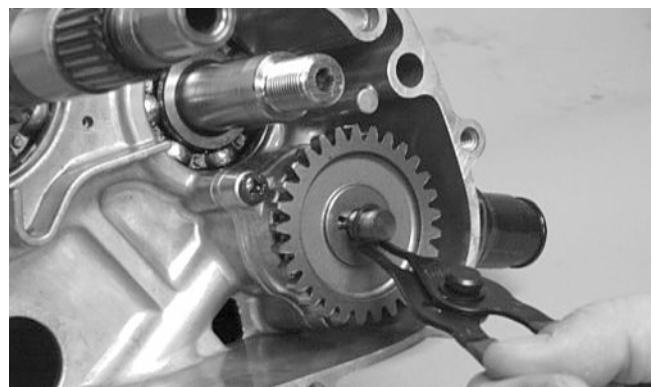
CC164D

⚠ CAUTION

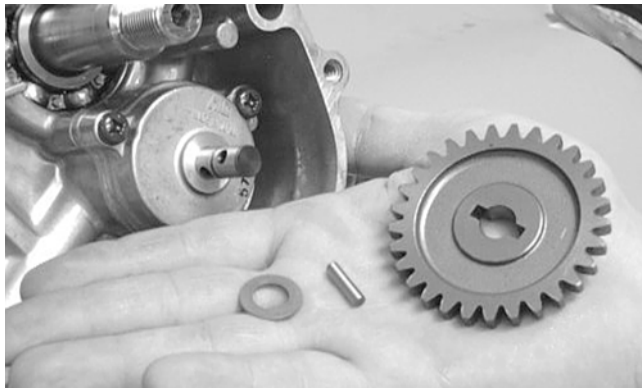
If servicing of the engine/transmission is due to a lubrication-related problem, replace the oil pump.

■ **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.



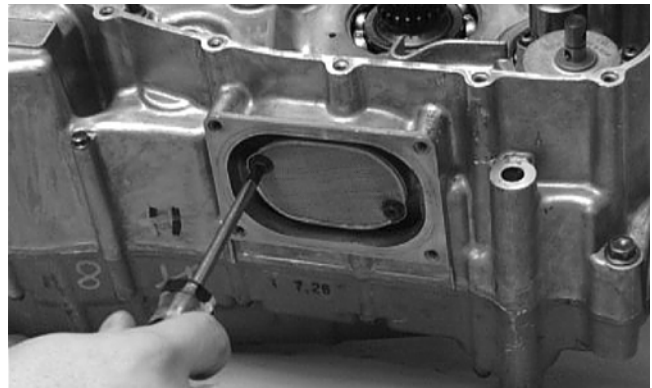
CC088D



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.

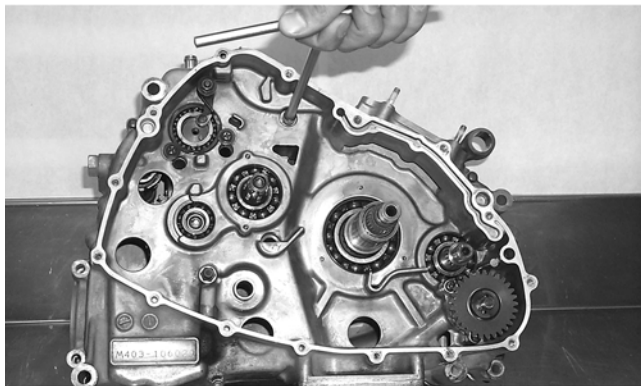
Center Crankcase Components

■ **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.

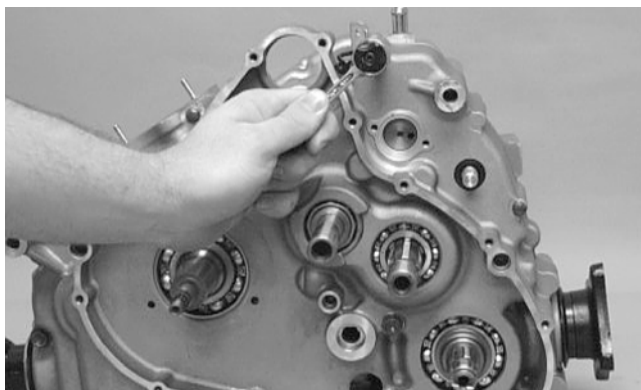
Separating Crankcase Halves

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.



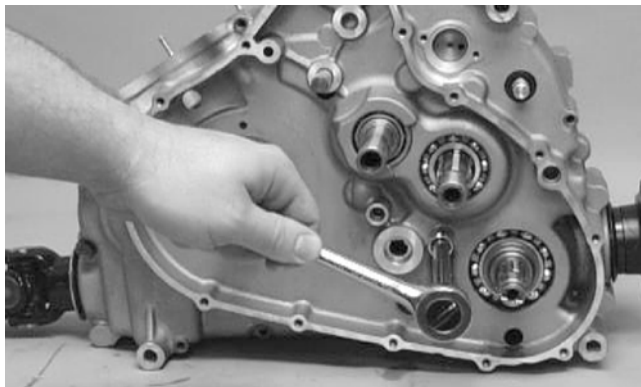
CC530D

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.



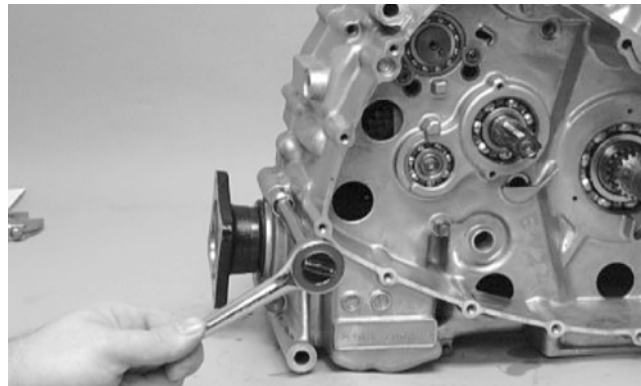
CC096D

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.

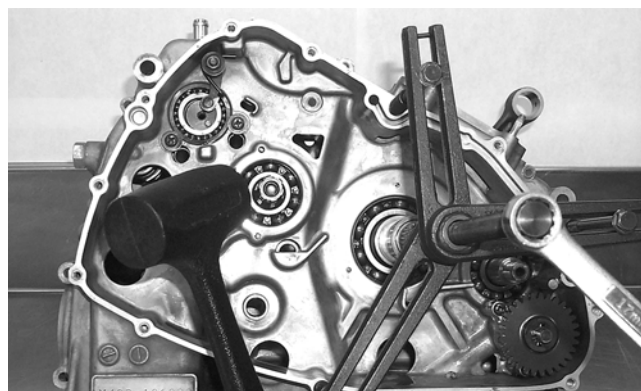


CC098D

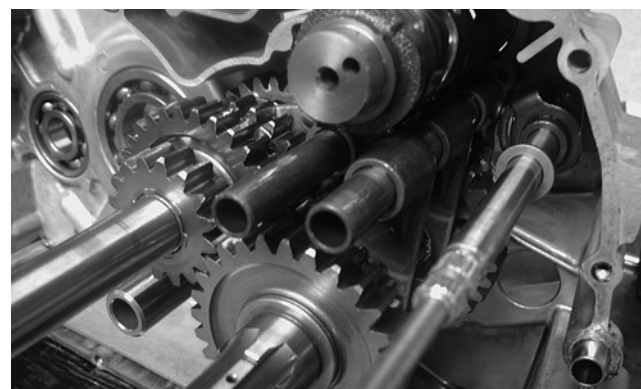
5. Using the Crankcase Separator/Crankshaft Remover (p/n 0444-009) and tapping lightly with a rubber mallet, separate the crankcase halves. Account for two alignment pins, an O-ring, and a washer.

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

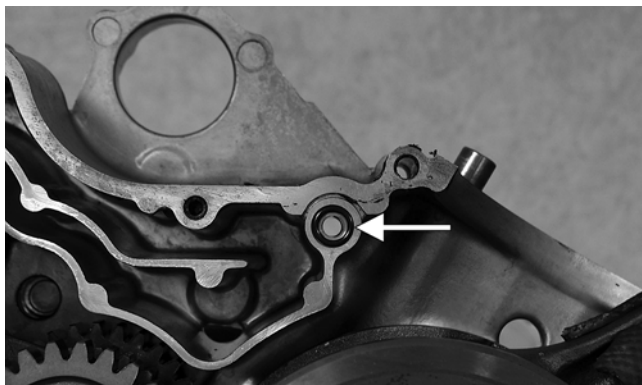
3



CC099D



CD227



CF078A

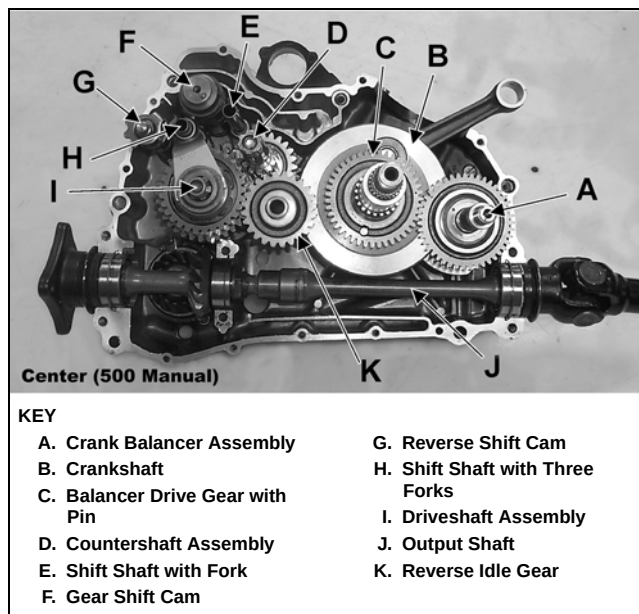


CC102D

Disassembling Crankcase Half

■ **NOTE:** For steps 1-10, refer to illustration CC803C.

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



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.

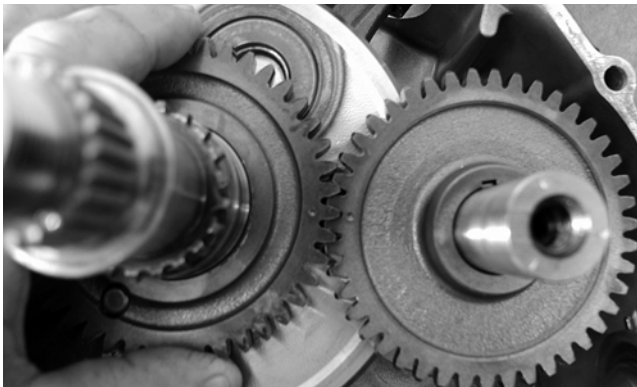
AT THIS POINT

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.

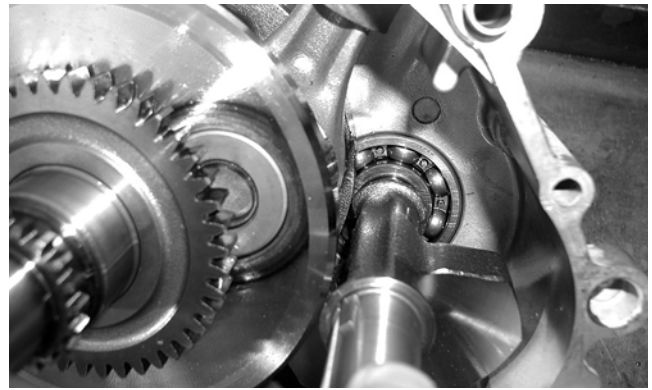
8. Remove the front output shaft (J) and rear shaft assemblies. Account for the bearing C-ring.

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



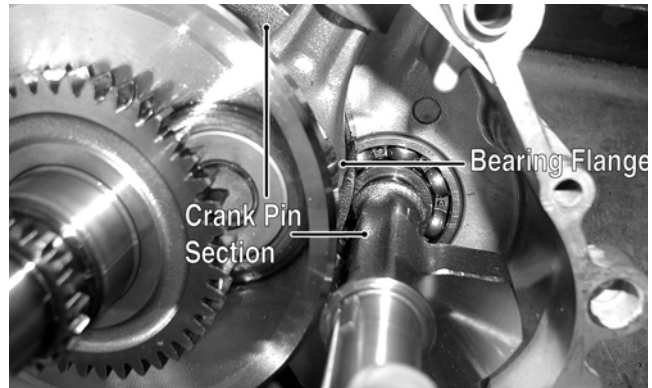
CD826

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



CD832

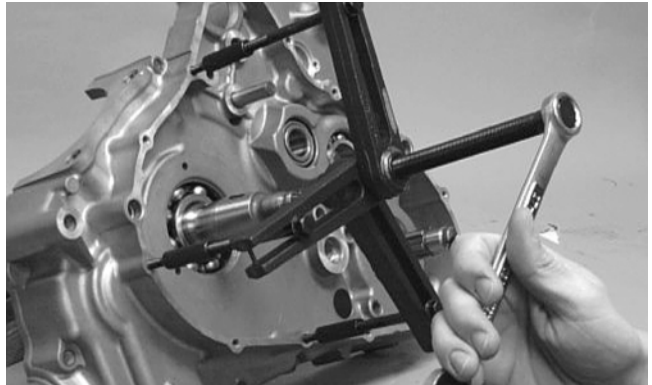
10. Remove the crank balancer assembly (A).



CD832B

■ **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.



CC115D

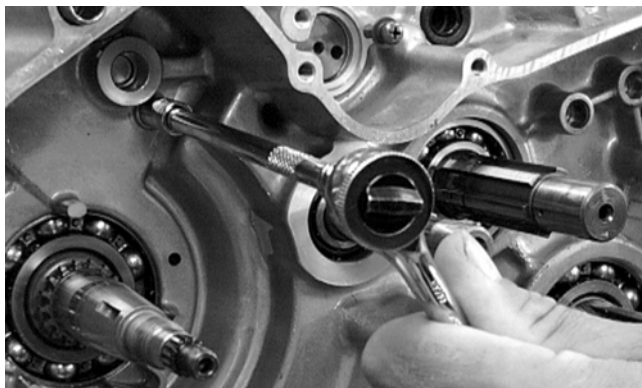
AT THIS POINT

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.

Servicing Top-Side Components.....	3-206
Valve Assembly.....	3-206
Piston Assembly	3-209
Cylinder/Cylinder Head Assembly	3-211
Servicing Left-Side Components	3-214
Recoil Starter	3-214
Measuring Shift Fork (Thickness)	3-217
Measuring Shift Fork Groove (Width)	3-218
Measuring Shift Fork To Groove (Side Clearance).....	3-218
Servicing Right-Side Components	3-218
Primary Clutch Assembly.....	3-218
Inspecting Oil Pump.....	3-221
Servicing Center Crankcase Components.....	3-221
Secondary Gears.....	3-221
Crankshaft Assembly	3-222
Driveshaft.....	3-224
Countershaft	3-230

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.

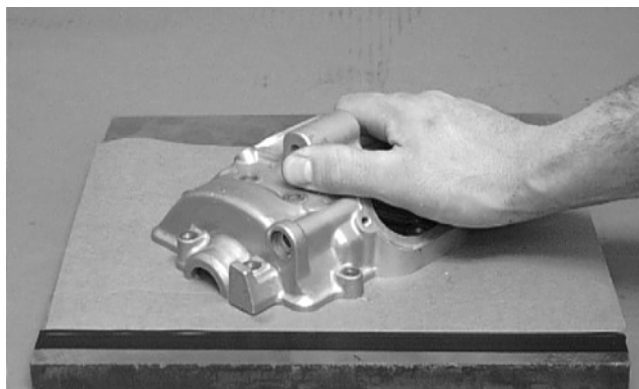
Cleaning/Inspecting Valve Cover

■ **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

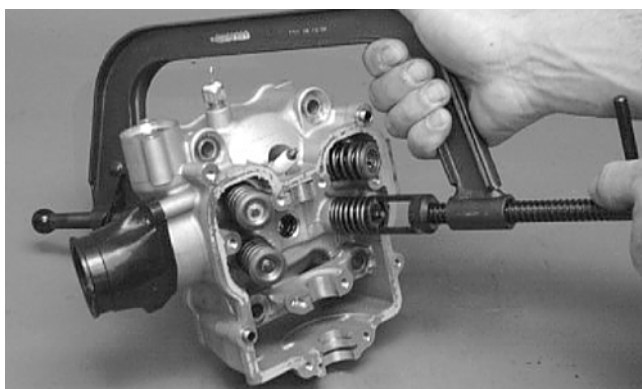
⚠ CAUTION

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

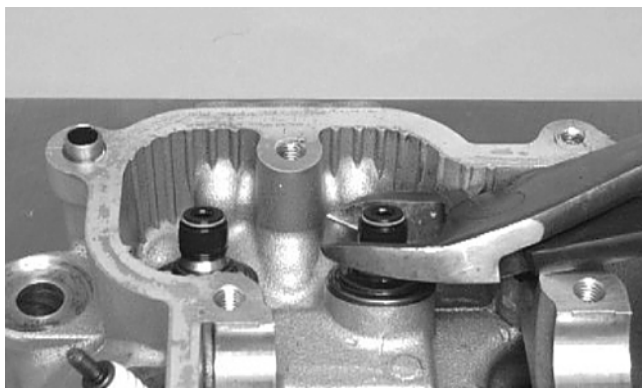
■ **NOTE:** Keep all valves and valve components as a set. Note the original location of each valve set for use during installation. Return each valve set to its original location during installation.

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

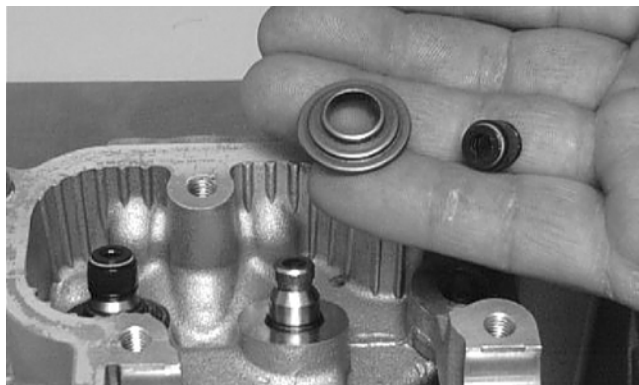


CC132D

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



CC134D



CC136D

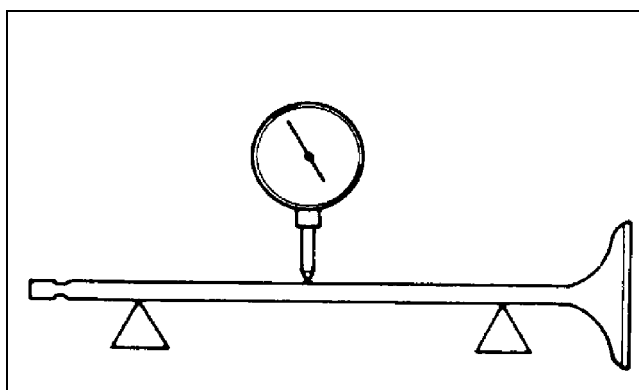
■ **NOTE:** The valve seals must be replaced.

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.

3



ATV-1082

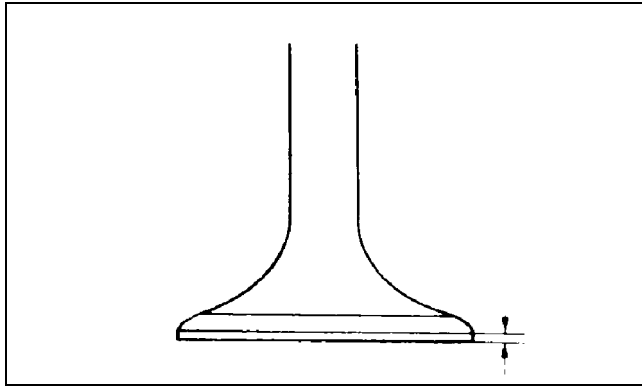
2. Maximum runout must not exceed specifications.

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.

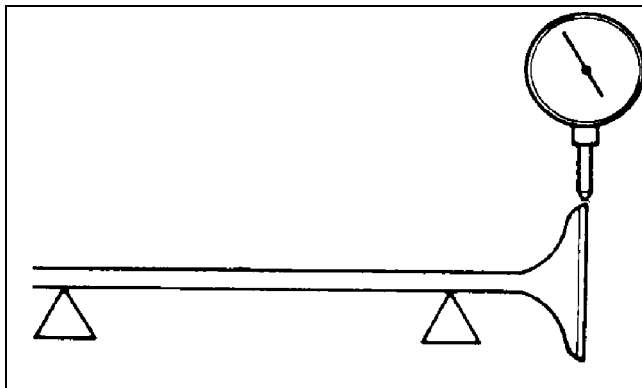


ATV-1004

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.

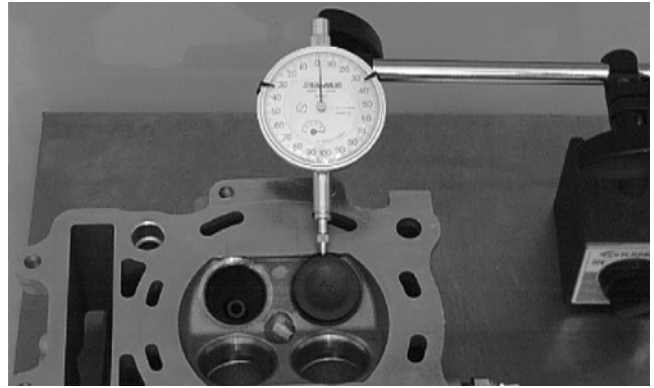


ATV1082A

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.

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.

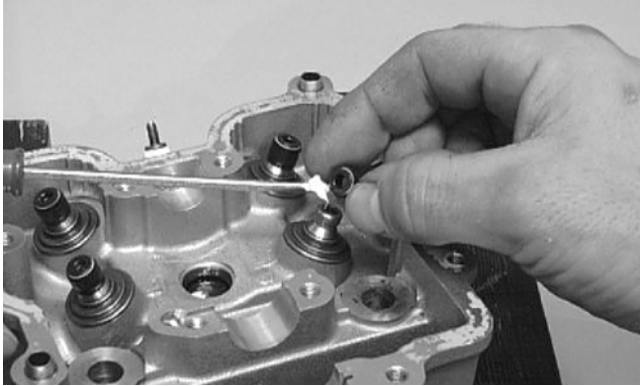
Measuring Rocker Arm Shaft (Outside Diameter)

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

2. Acceptable outside diameter range must be within specifications.

Installing Valves

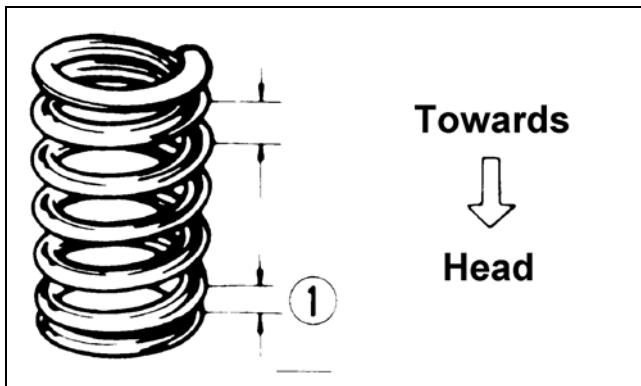
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



CC144D

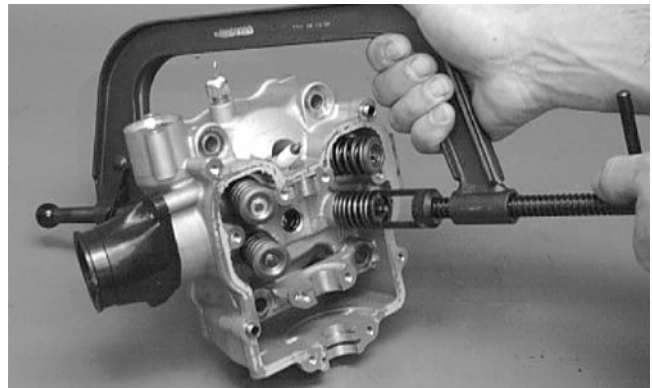
2. Insert each valve into its original valve location.
3. Install the valve springs with the painted end of the spring facing away from the cylinder head.

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



ATV-1011A

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



CC132D

PISTON ASSEMBLY

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

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

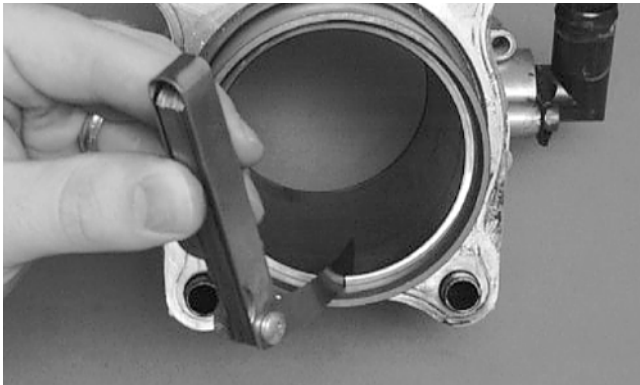
1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

⚠ 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)

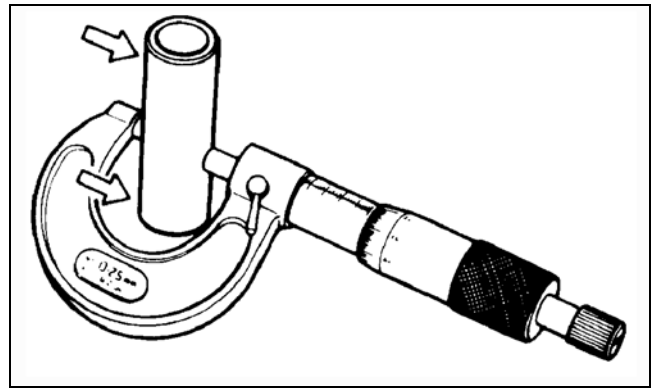
1. Place each piston ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must be within specifications.



CC280D

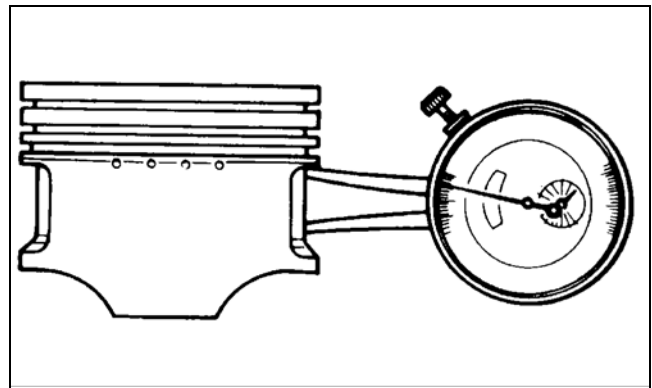
Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

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.



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

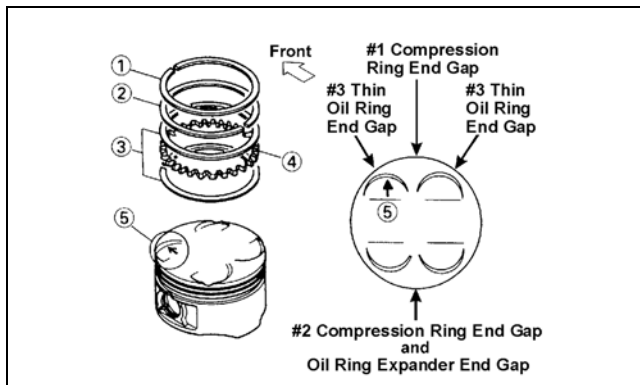
Measuring Piston Skirt/Cylinder Clearance

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

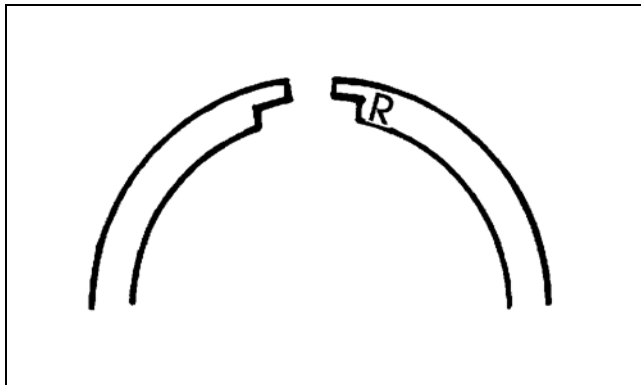
■ **NOTE:** Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.



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

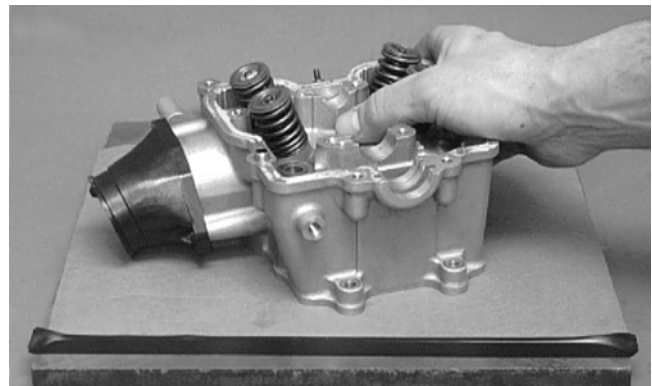
The cylinder head studs must be removed for this procedure.

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.



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.



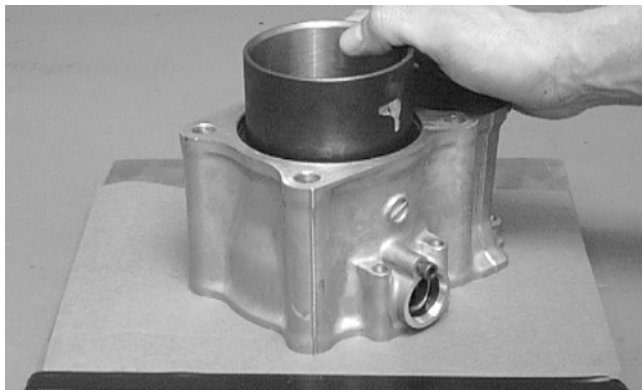
CC141D

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.



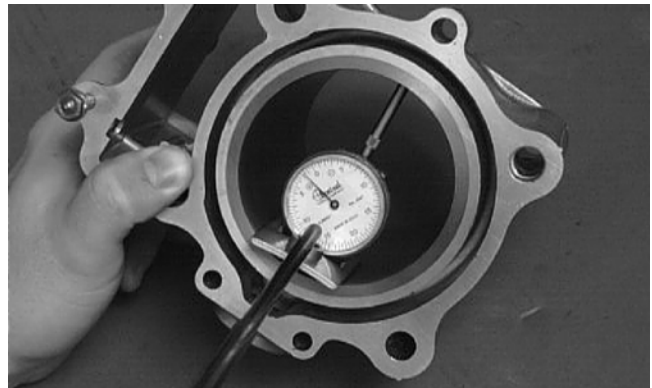
CC129D

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.



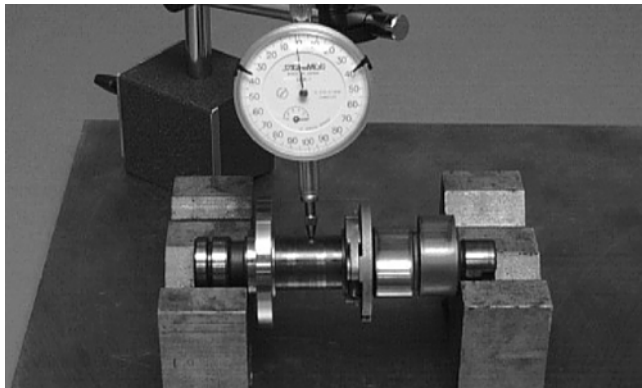
CC390D

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.

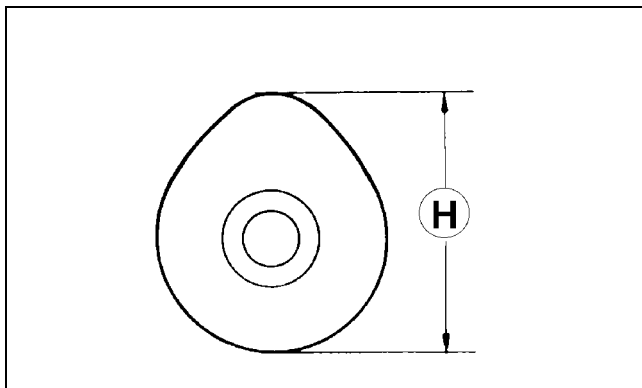


CC283D

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.

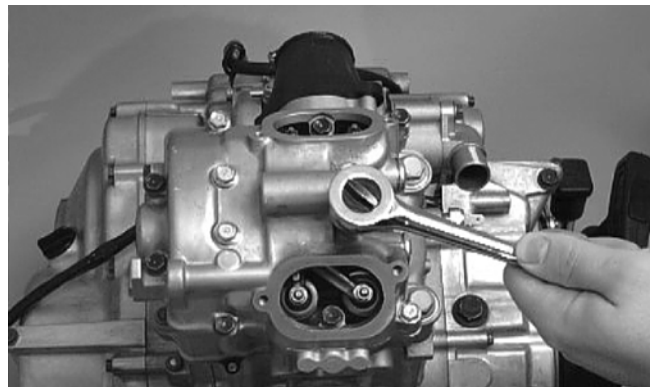


CC005D

2. Place a strip of plasti-gauge in each of the 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.

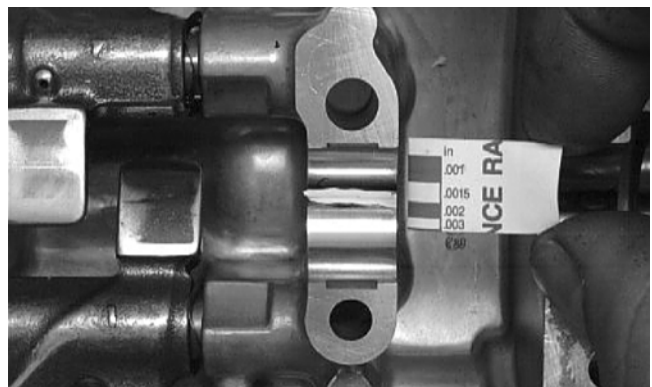
■ **NOTE:** Do not rotate the camshaft when measuring clearance.

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



CC003D

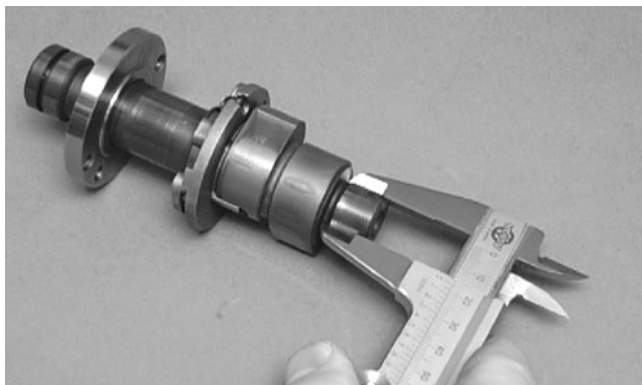
5. Match the width of the plasti-gauge with the chart found on the plasti-gauge packaging to determine camshaft to cylinder head and valve cover clearance.



CC145D

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

3

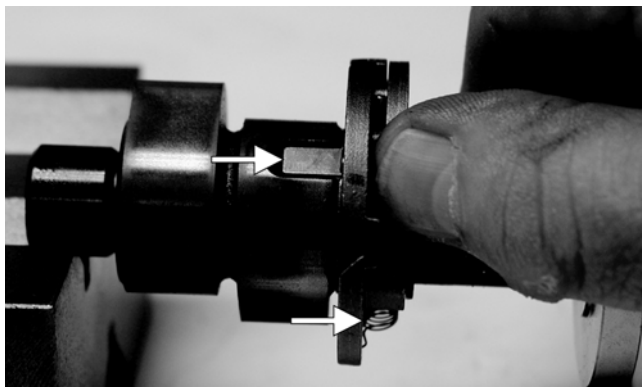


CC287D

■ **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.

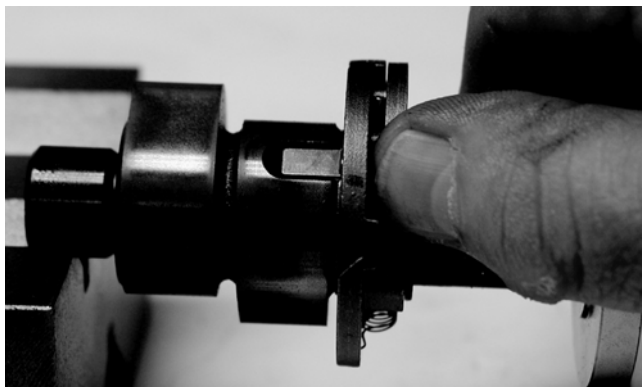
Inspecting Camshaft Automatic Decompression Spring/Unloader Assembly

1. Inspect the spring, weights, and unloader for damage and freedom of movement.



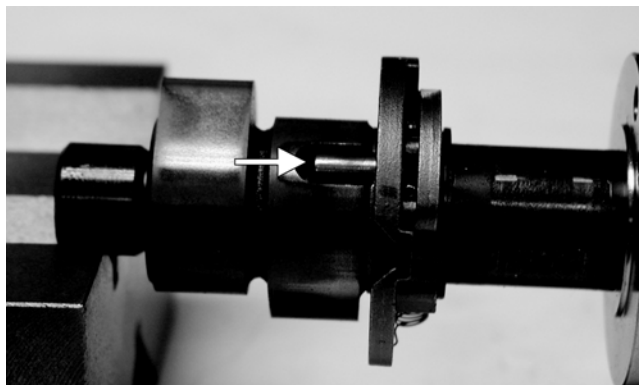
CF061A

■ **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.

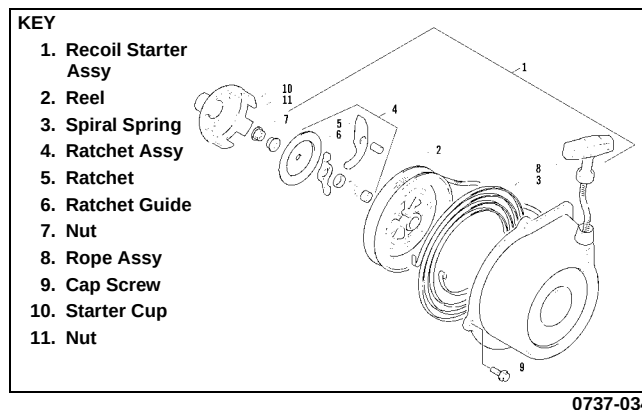


CF060A

2. If damaged, the camshaft must be replaced.

Servicing Left-Side Components

RECOIL STARTER



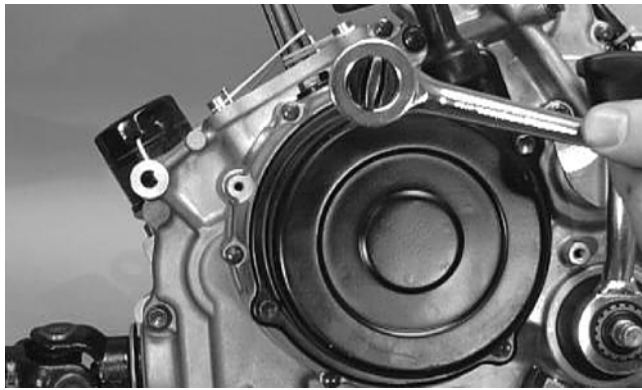
0737-034

⚠ 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.

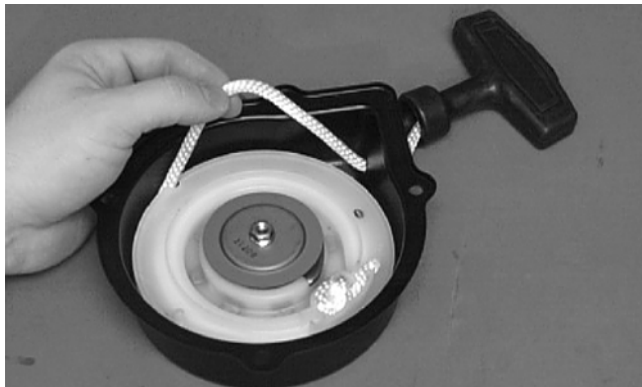


CC039D

⚠ 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.

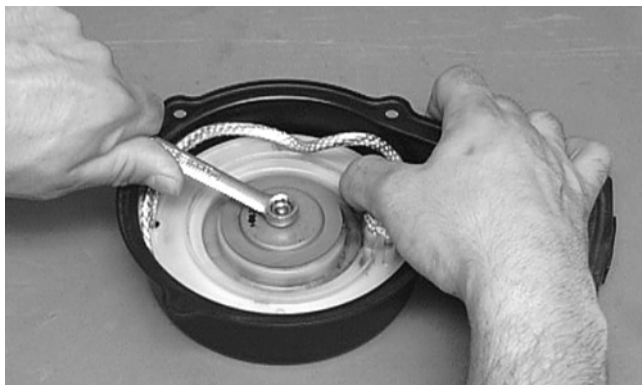


B600D

⚠ CAUTION

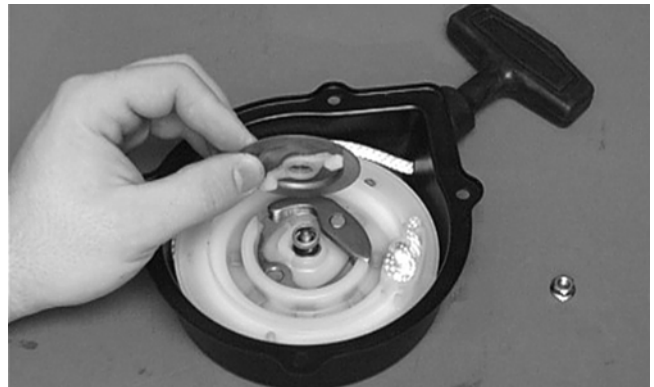
During the disassembly procedure, make sure all spring tension is released before continuing.

3. Remove the nut.



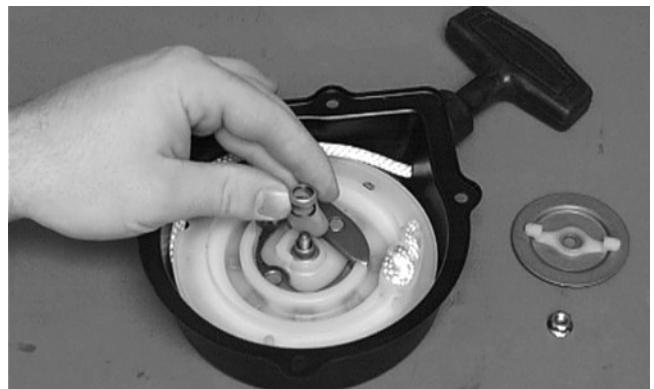
B601D

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

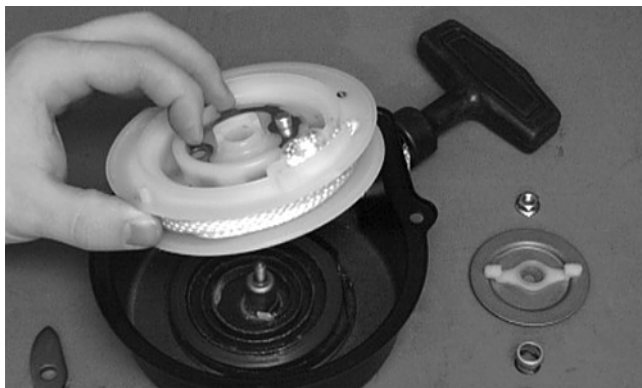
6. Remove the ratchet and account for the pin.



B604D

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

3



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

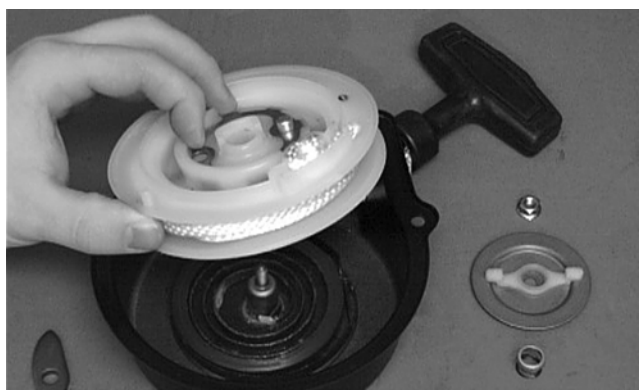
1. If removed, insert the spiral spring into the case with the outer end of the spring around the mounting lug in the case; then wind it in a counterclockwise direction until the complete spring is installed.

■ **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.



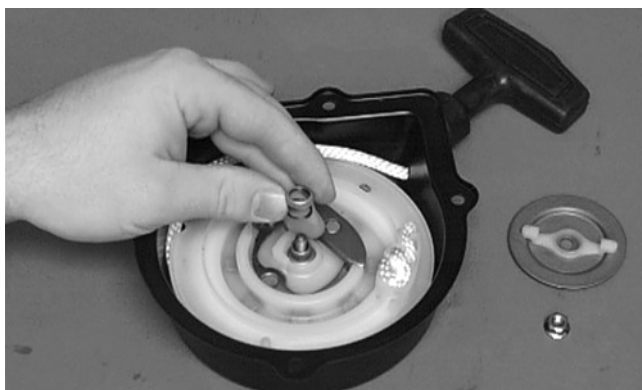
B605D

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.



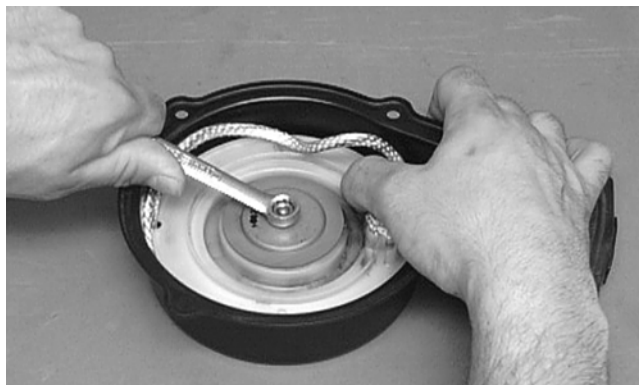
B603D

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.

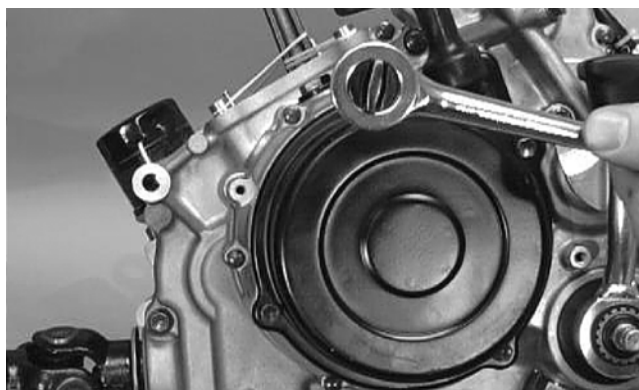
11. Rotate the reel four turns counterclockwise; then release the rope from the notch and allow the rope to retract.

12. Pull the rope out two or three times to check for correct tension.

■ **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.

3

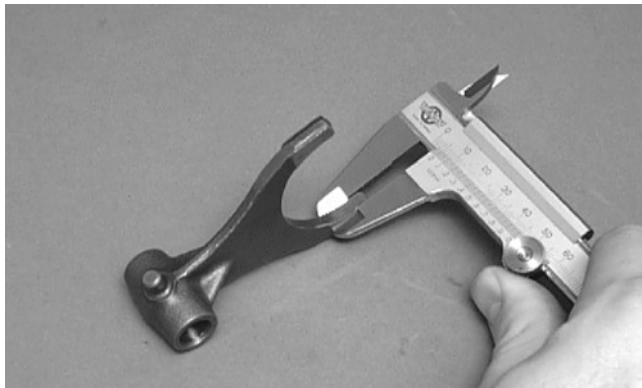


CC039D

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.

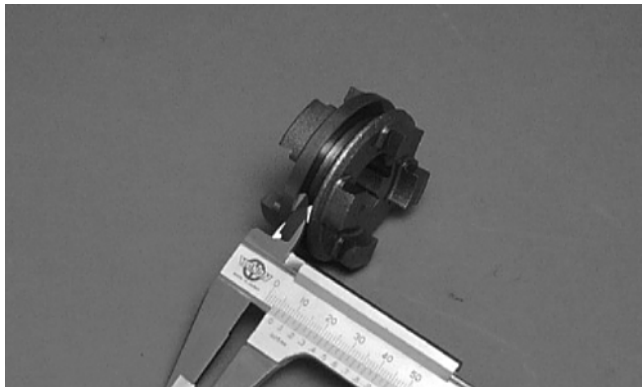


CC296D

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.

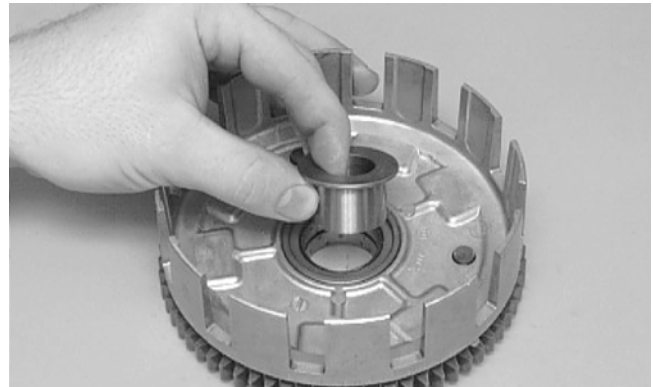
Servicing Right-Side Components

■ **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.

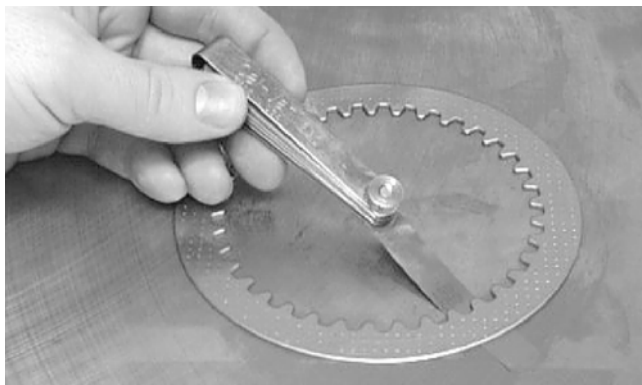
■ **NOTE:** When removing components from the primary gear assembly, account for the bushing that fits into the primary gear.



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.

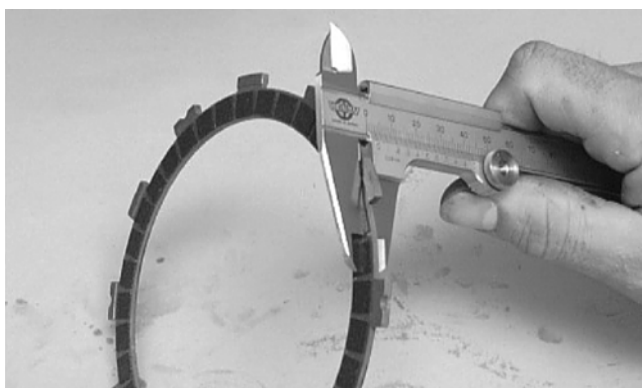


CC245D

- Maximum driven plate warpage must not exceed specifications.

Measuring Clutch Drive Plate (Fiber) Thickness

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



CC243D

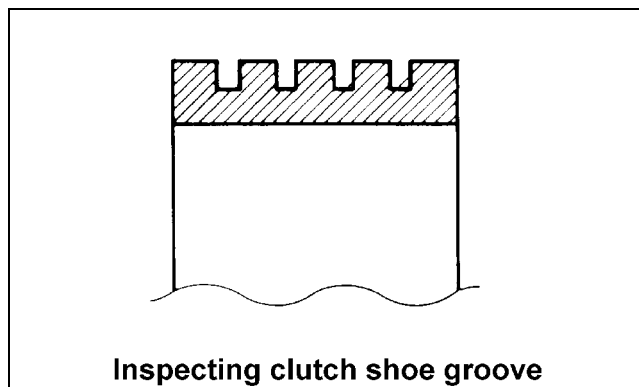
- Drive plate thickness must be within minimum specifications.
- If the fiber plate tabs are damaged, the plate must be replaced.
- Inspect the clutch sleeve hub for grooves or notches. If grooves or notches are present, replace the hub.

Inspecting Centrifugal Clutch Shoe

- Inspect the clutch shoe for uneven wear, chips, cracks, or discoloration.
- 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

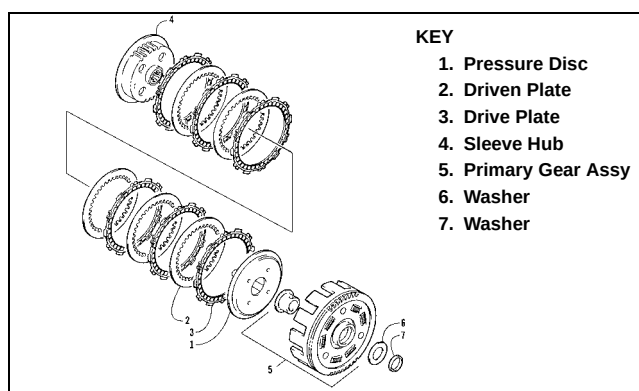
- Inspect the clutch housing for burns, marks, scuffs, cracks, scratches, or uneven wear.
- If the housing is damaged in any way, the housing must be replaced.

3

Inspecting Primary One-Way Drive

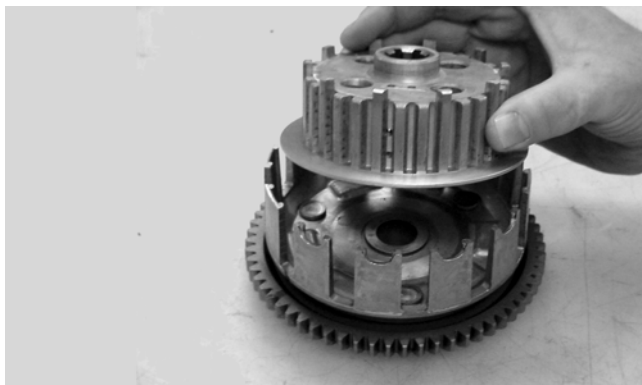
- Insert the drive into the centrifugal clutch housing.
- Rotate the inner race by hand and verify the inner race rotates only one direction.
- If the inner race is locked in place or rotates both directions, the drive assembly must be replaced.

Assembling Primary Clutch



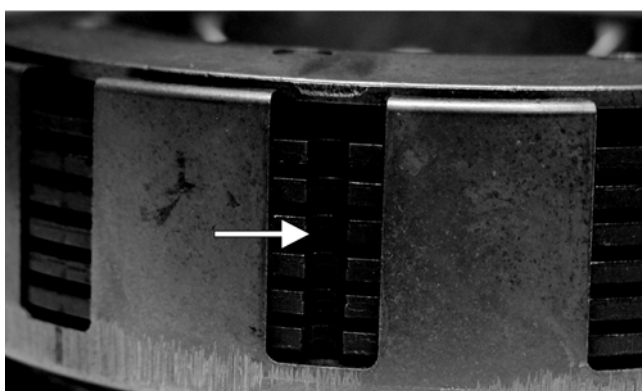
737-731A

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



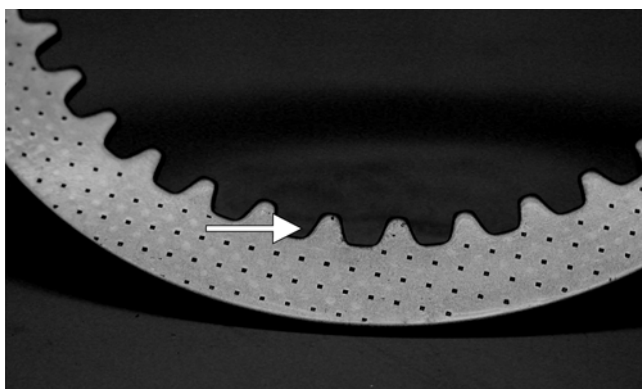
CC920

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.



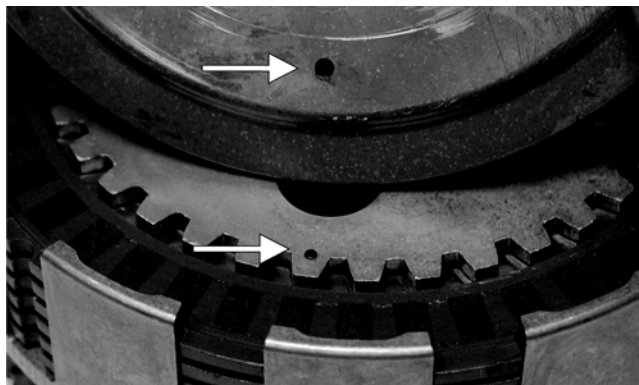
CF044A

■ **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.



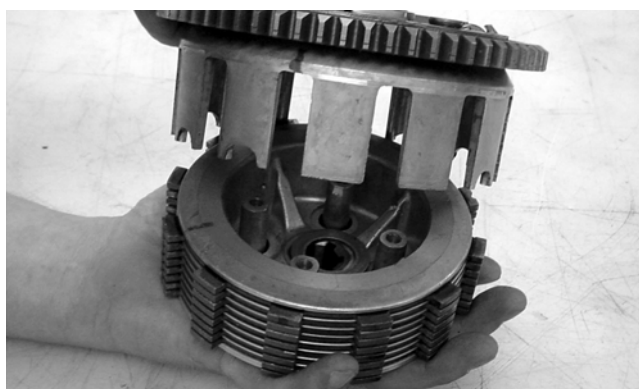
CF045A

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



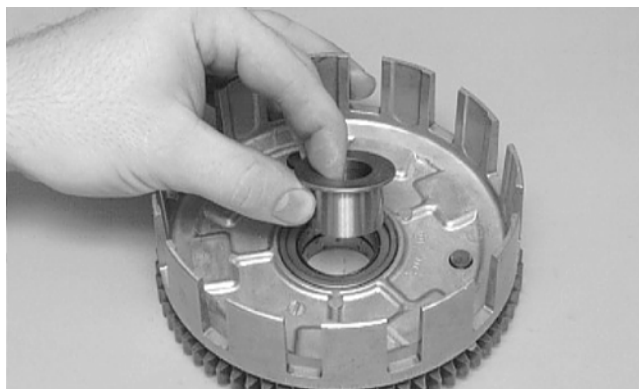
CF047A

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.



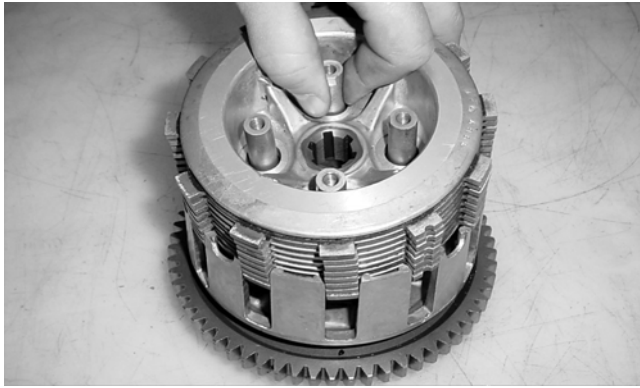
CC924

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

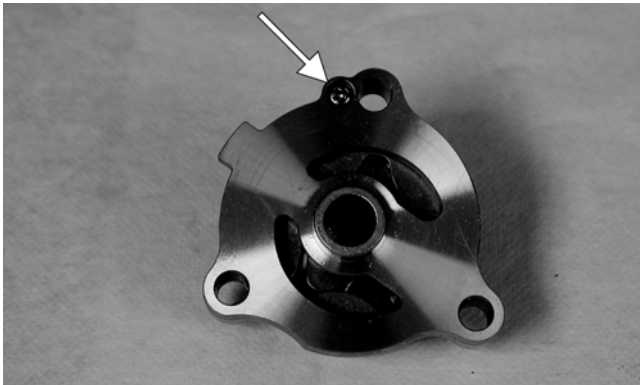
⚠ CAUTION

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.

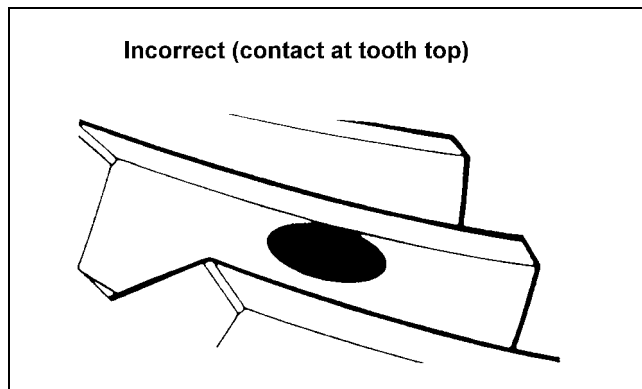
3

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

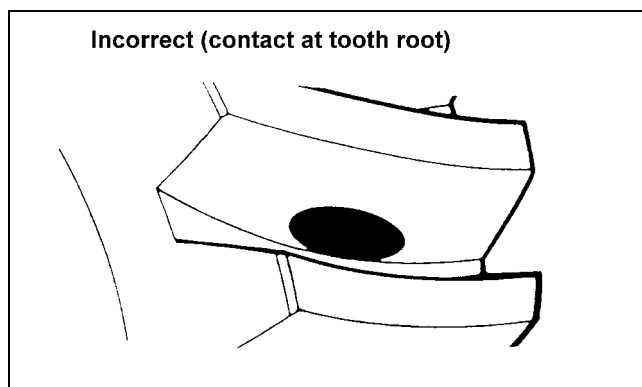
Checking Tooth Contact

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

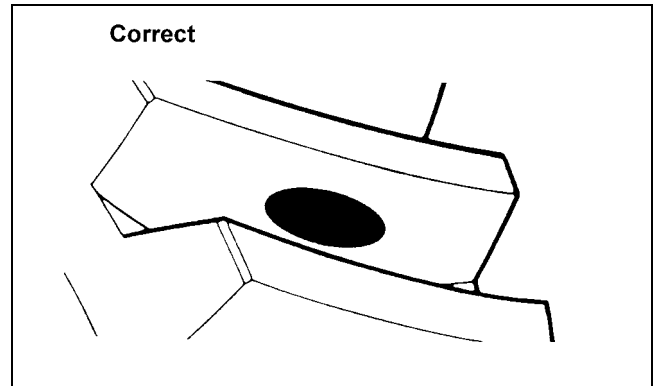
1. Remove the secondary driven output shaft assembly from the left-side crankcase half.
2. Clean the secondary driven bevel gear teeth of old oil and grease residue.
3. Apply a thin, even coat of a machinist-layout dye to several teeth of the gear.
4. Install the secondary driven output shaft assembly.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



ATV-0103



ATV-0105



ATV-0104

Correcting Tooth Contact

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

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

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

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

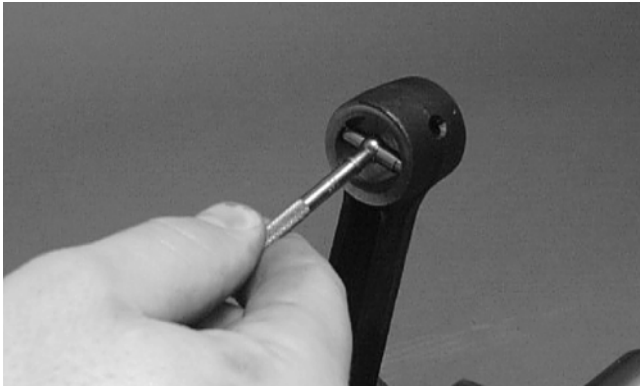
CAUTION

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

CRANKSHAFT ASSEMBLY

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

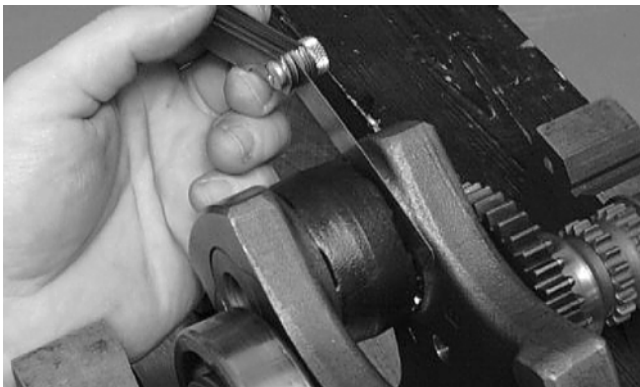
2. Maximum diameter must not exceed specifications.

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

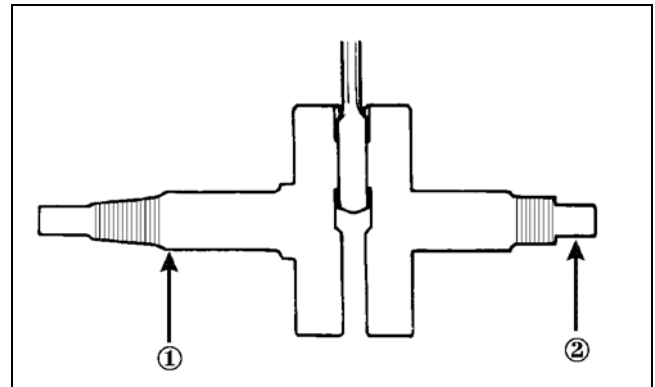
3. Acceptable gap range must be within specifications.

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

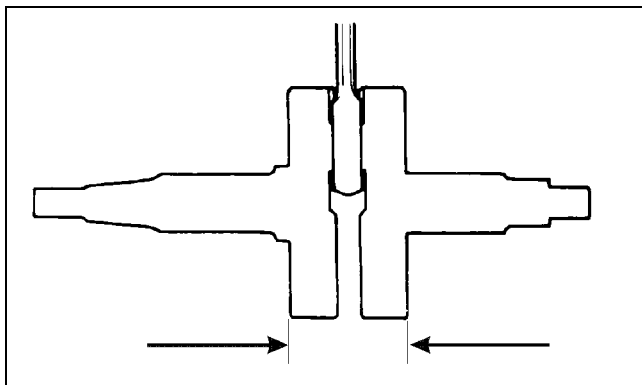
Care should be taken to support the connecting rod when rotating the crankshaft.

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-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.



CC228D



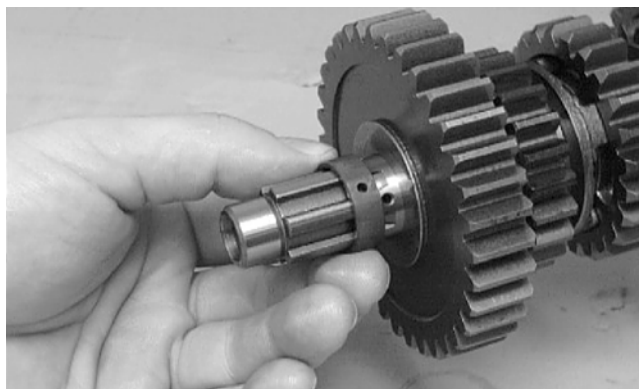
CC227D



CC226D



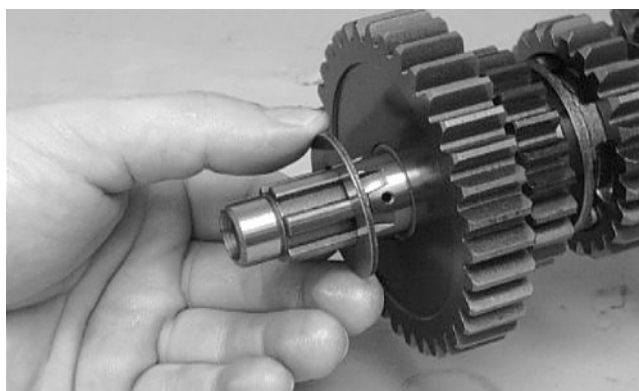
CC225D



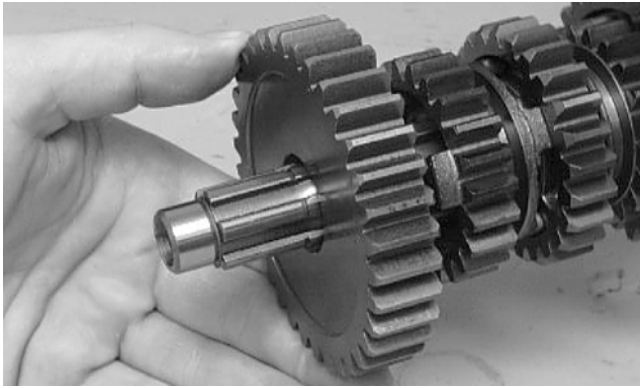
CC224D

■ **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.

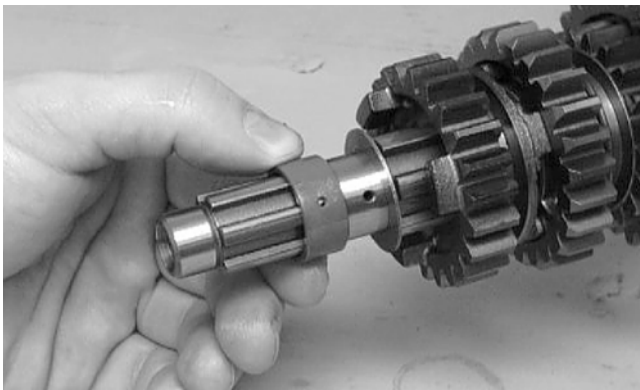


CC223D

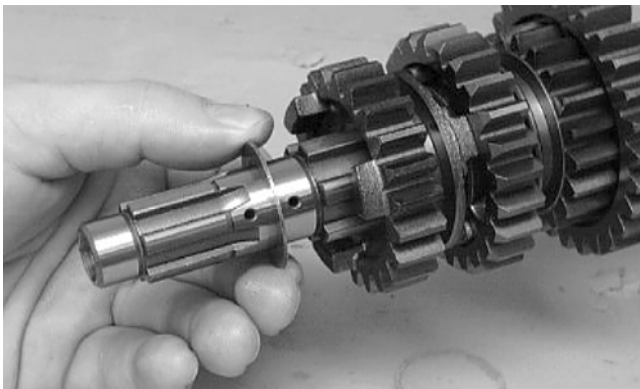


CC222D

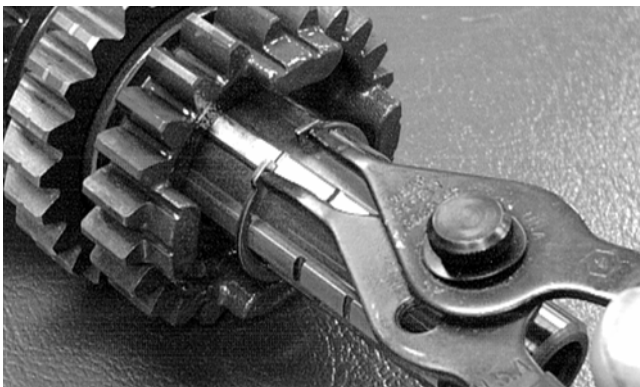
3. Remove the 1st driven bushing; then remove the 1st driven washer (left side) from the shoulder of the splined shaft. Remove the 4th driven circlip.



CC221D

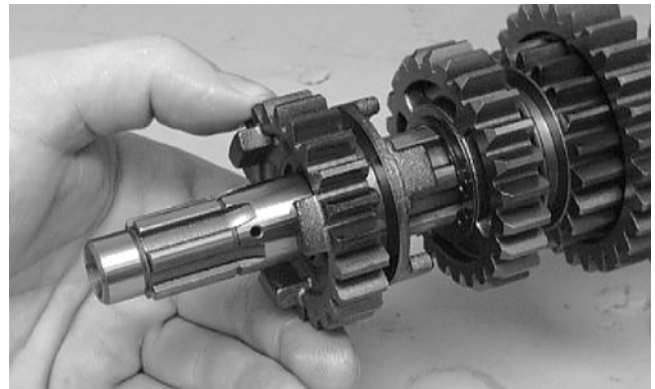


CC220D



CC508D

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

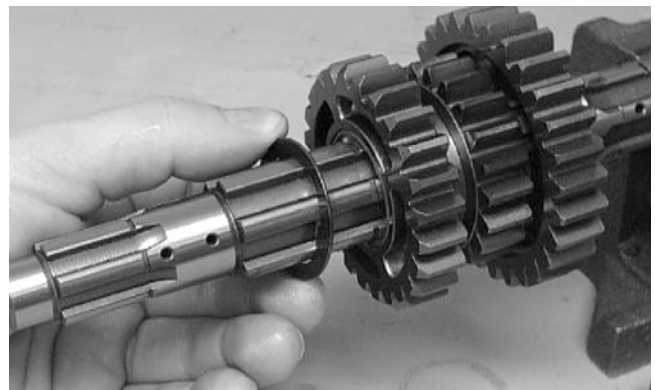


CC219D

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



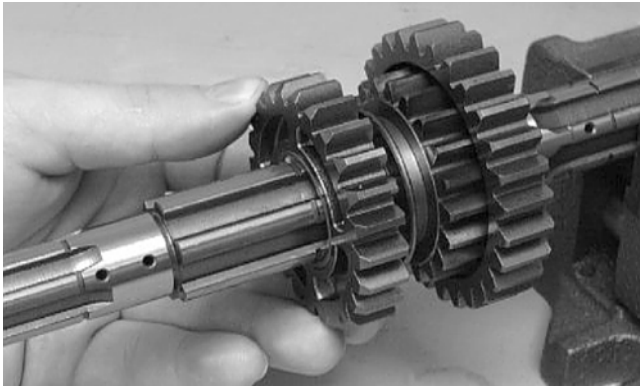
CC216D



CC215D

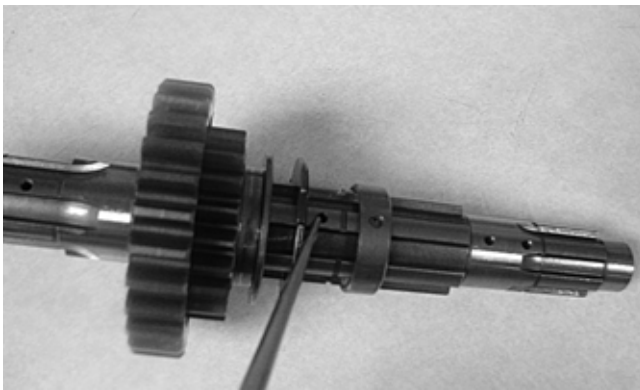
6. Remove the 3rd driven gear from the driveshaft.

3



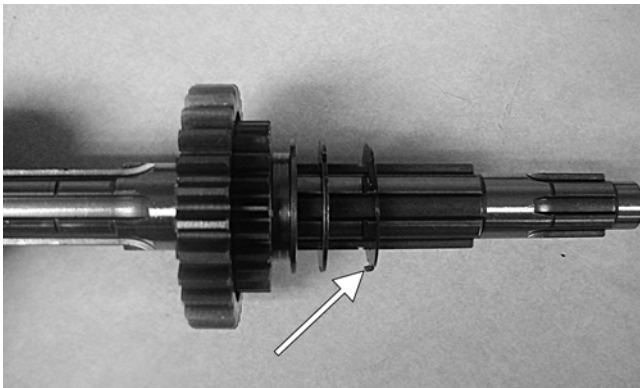
CC214D

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.



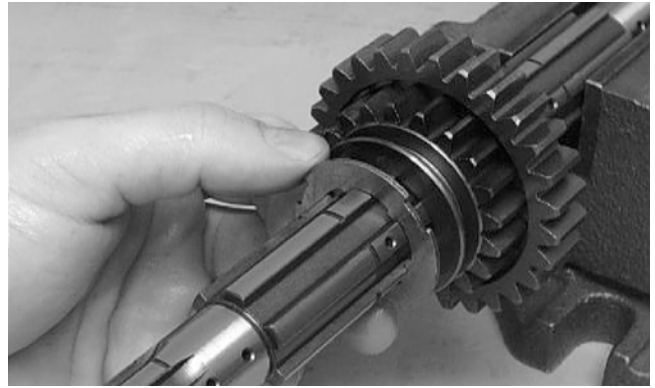
CD248

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



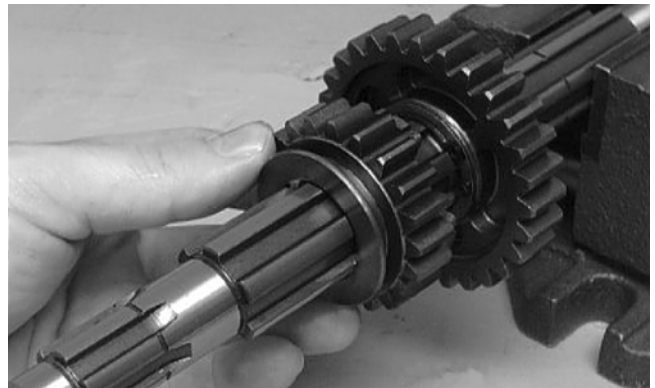
CD247A

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.

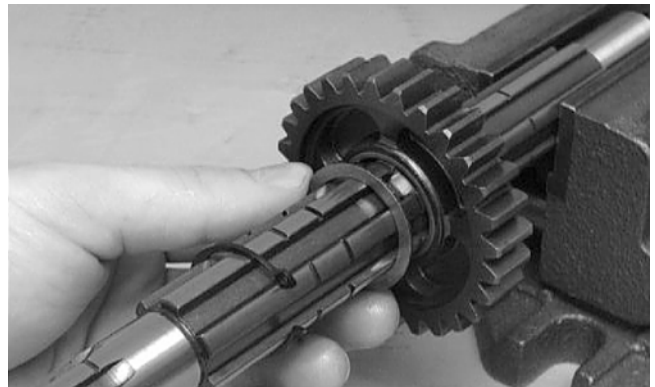


CC210D

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



CC209D



CC208D



CC207D

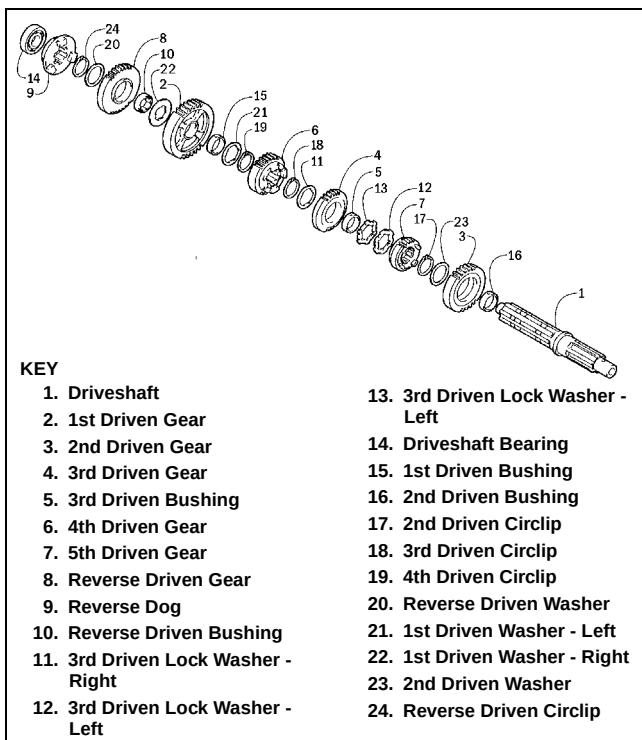


CC206D

AT THIS POINT

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

Assembling



737-733A

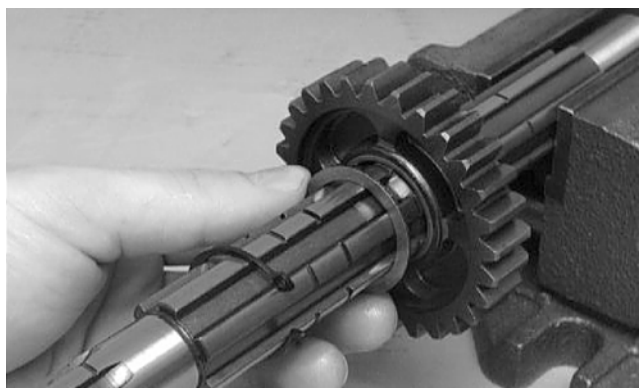
1. In order, install the 2nd driven bushing, gear, washer, and circlip onto the driveshaft.



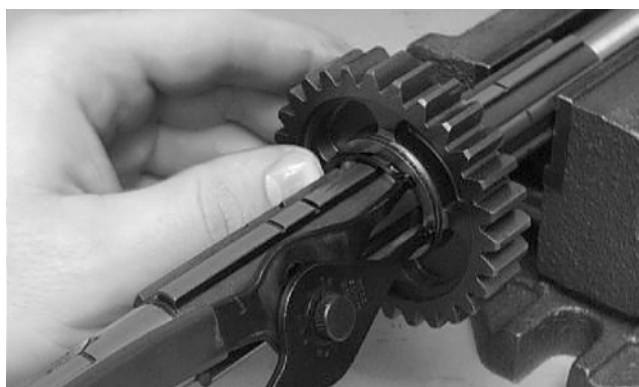
CC206D



CC207D



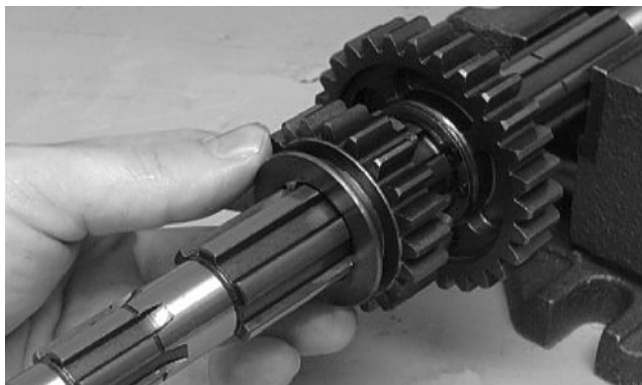
CC208D



CC209D

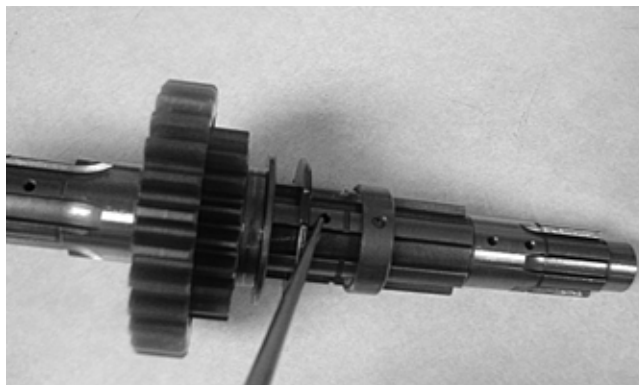
2. Install the 5th driven gear onto the driveshaft.

3



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.

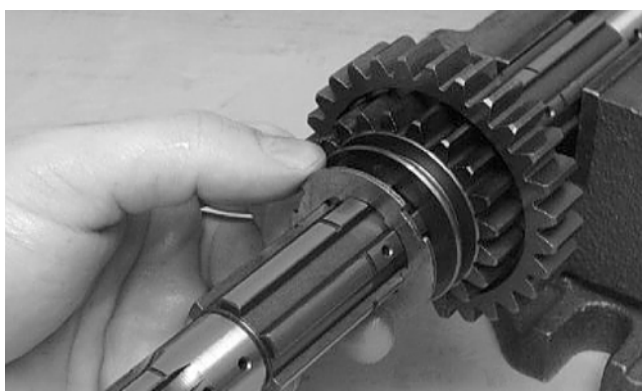


CD248

⚠ CAUTION

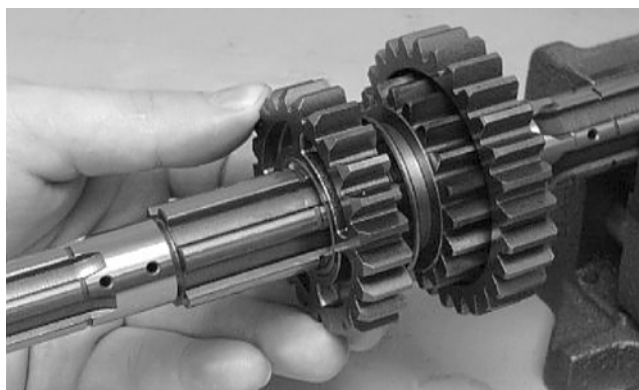
It is very important to assure the oil feed hole in the bushing and oil supply hole in the driveshaft align. If not aligned, engine damage will result.

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

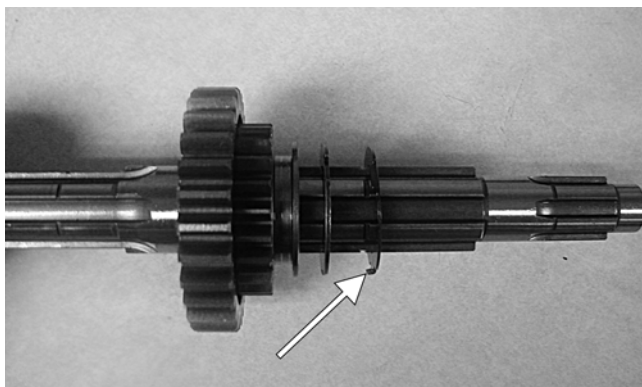


CC211D

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.

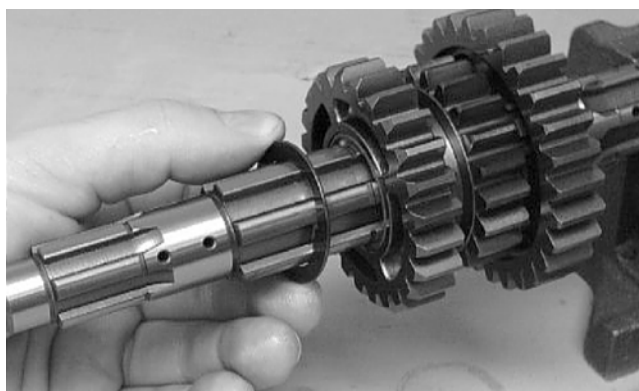


CC214D

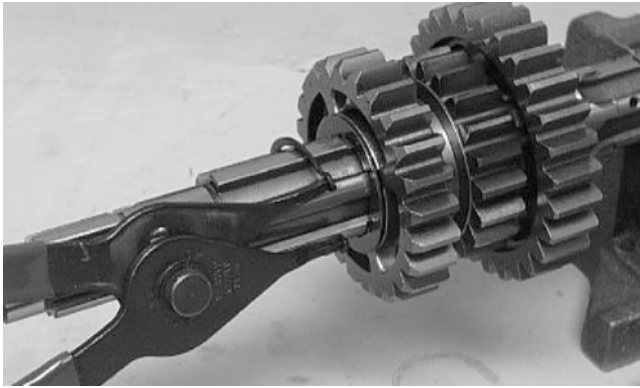


CD247A

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).

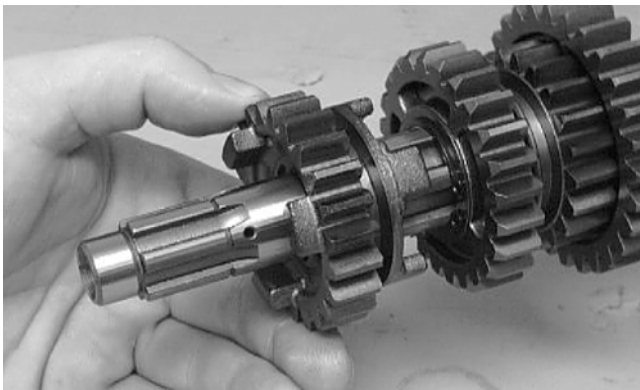


CC215D

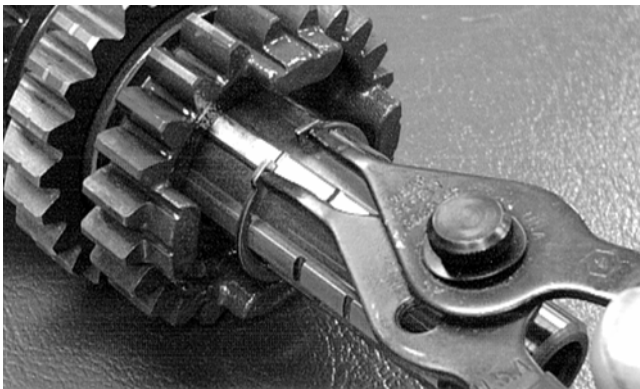


CC216D

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.

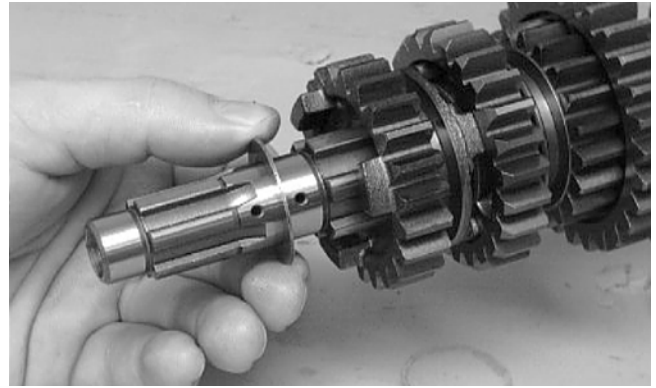


CC219D

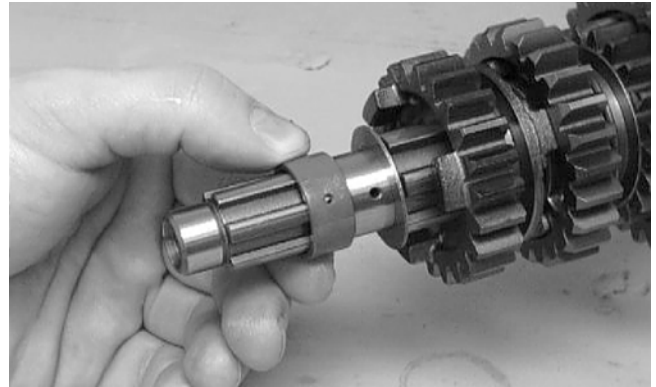


CC508D

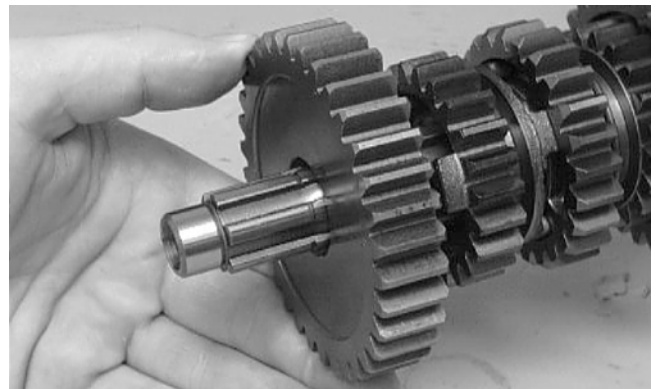
8. Install the 1st driven washer (left side) onto the shoulder of the splined shaft; then install the 1st driven bushing and gear.



CC220D

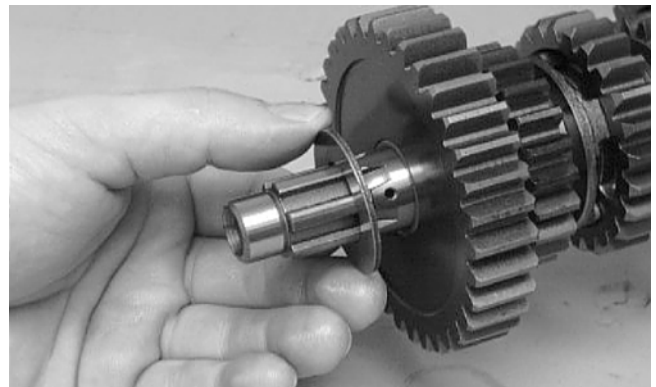


CC221D



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



CAUTION

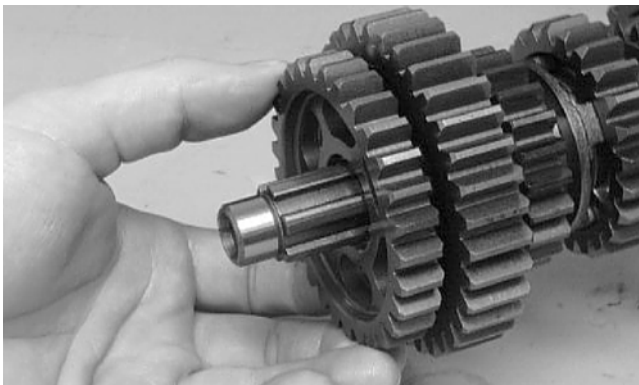
Failure to align the oil ports will result in serious engine damage.

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.



CC225D



CC226D



CC227D



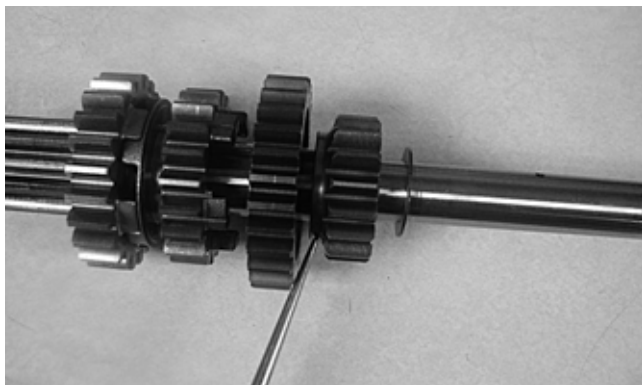
CC228D

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

COUNTERSHAFT

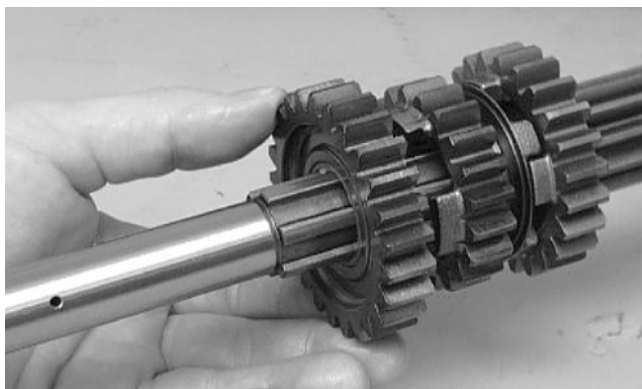
Disassembling

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



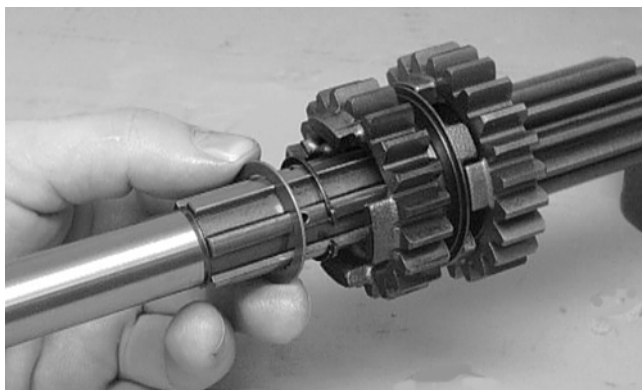
CD242

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

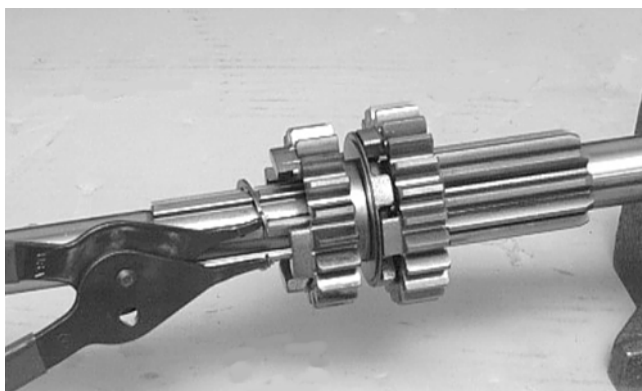


CC203D

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



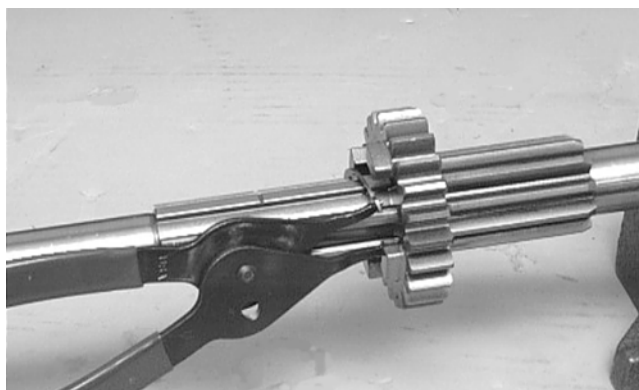
CC201D



CC200D

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

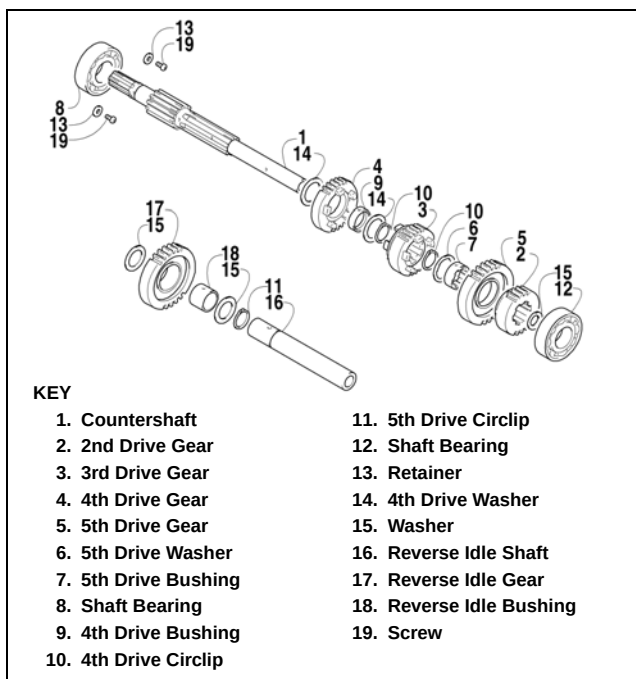
5. Remove the 4th drive circlip securing the 4th drive gear on the countershaft; then remove the first 4th drive washer and 4th drive gear. Account for the bushing.



CC199D

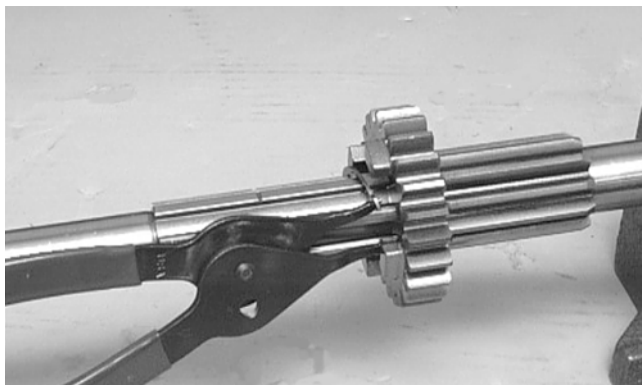
6. Remove the other 4th drive washer from the countershaft.

Assembling

3


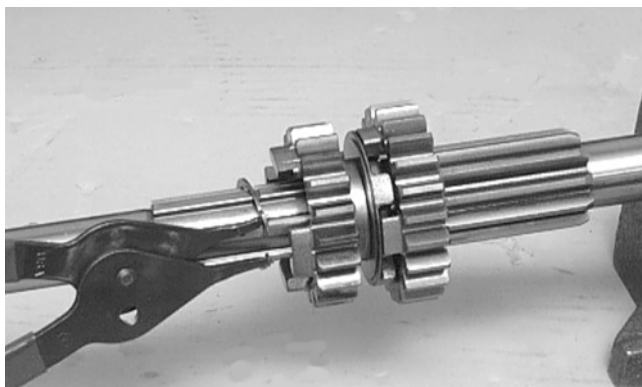
738-294A

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.



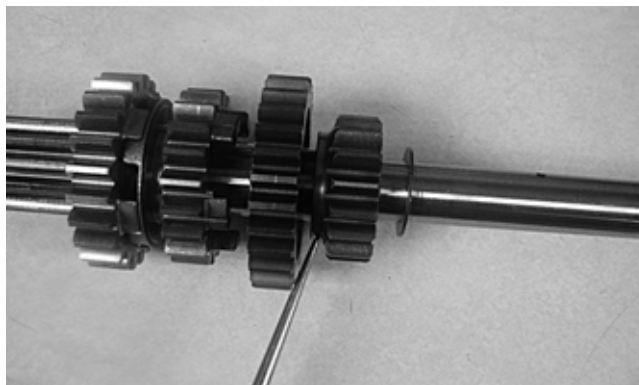
CC200D

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.



CD242

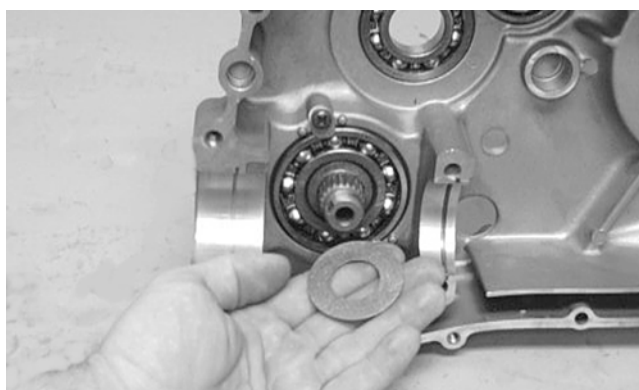
■ **NOTE:** The countershaft is now completely assembled for installation.

Assembling Crankcase Half

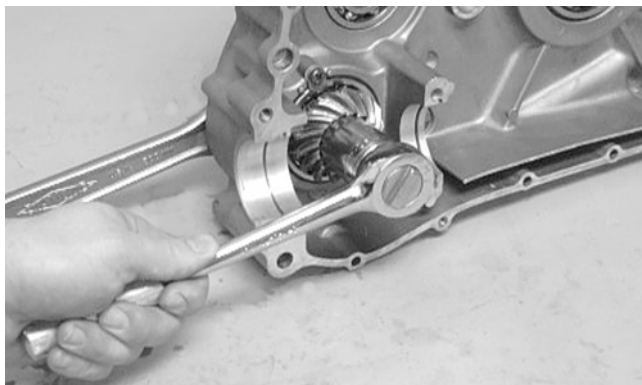
■ **NOTE:** For ease of assembly, install components on the left-side crankcase half.

■ **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.

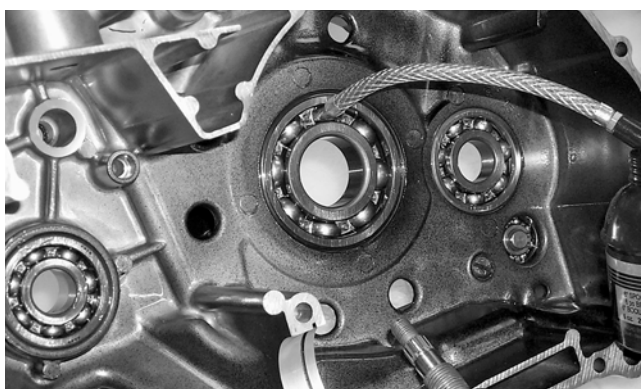


CC117D



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.

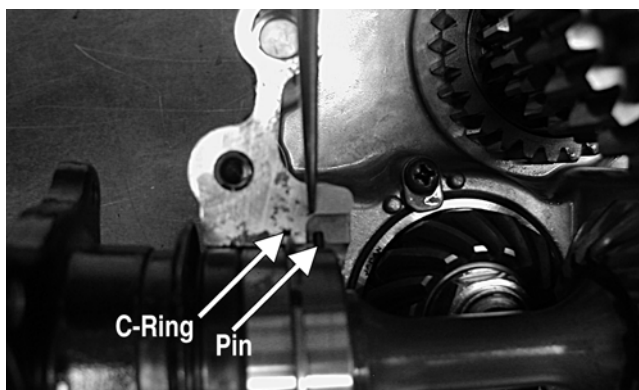


CD826

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

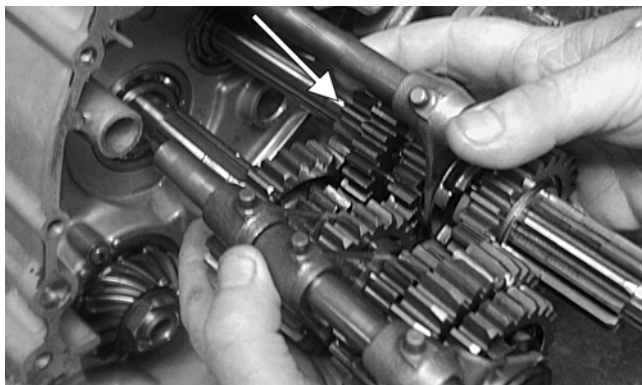
⚠ CAUTION

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.

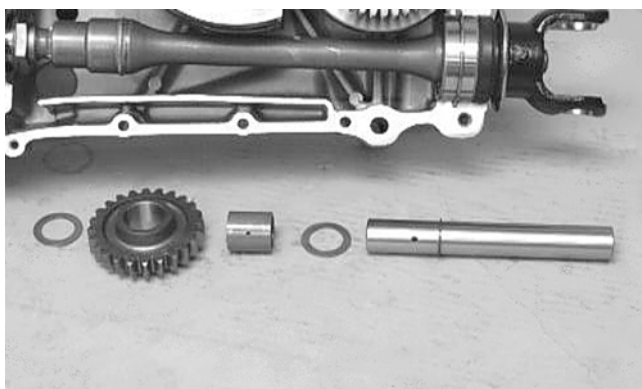


CD232A

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.

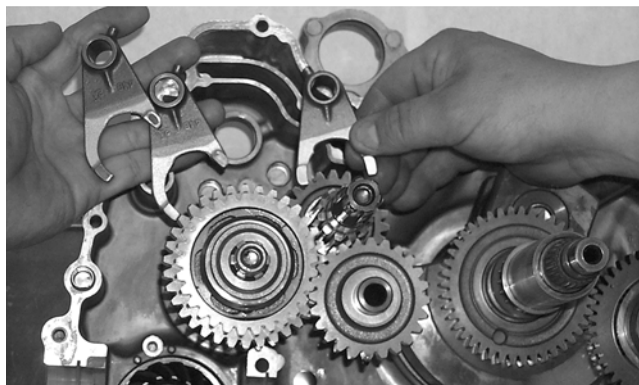


CF055



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

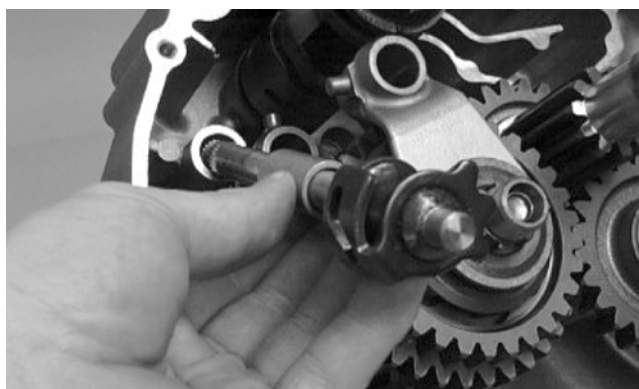


CC106D

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

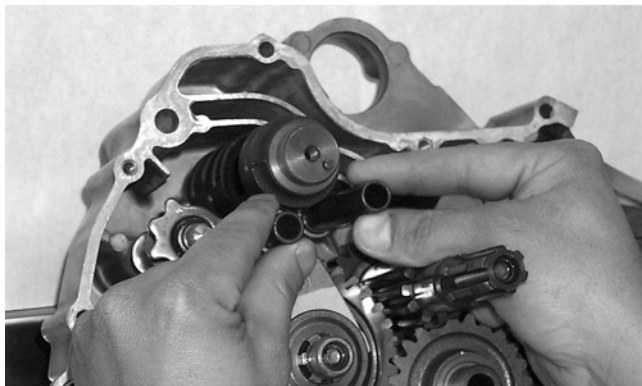


CC105D



CC103D

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

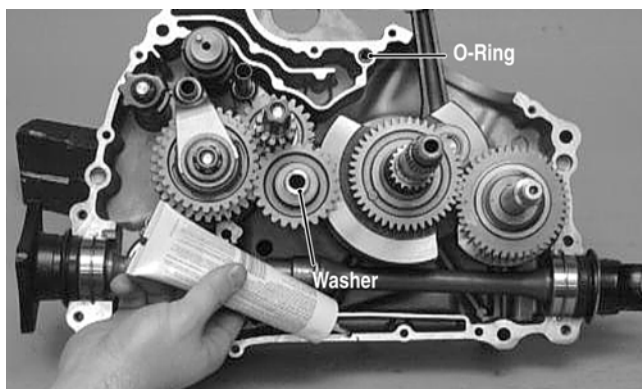


CC104D

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

Joining Crankcase Halves

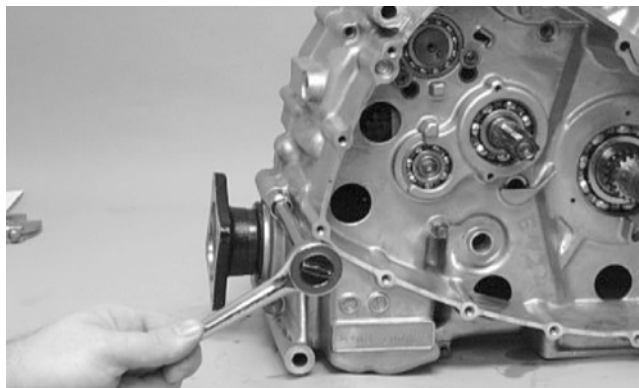
1. Place the O-ring in the left-side crankcase half and verify that the washer is on the idler shaft; then apply Three Bond Sealant to the mating surfaces. Place the right-side half onto the left-side half.



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.

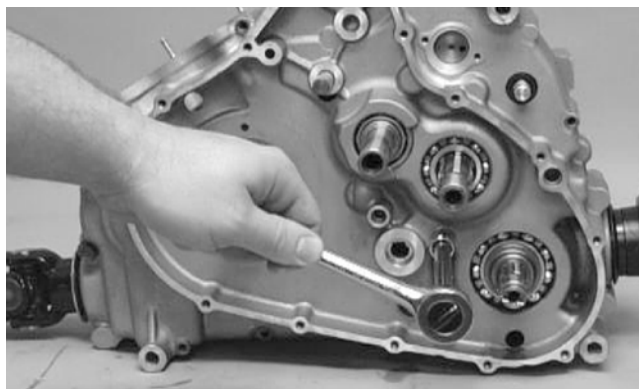
■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.



CC098D

4. From the right side, install the three case half 8 mm cap screws; then tighten only until snug.

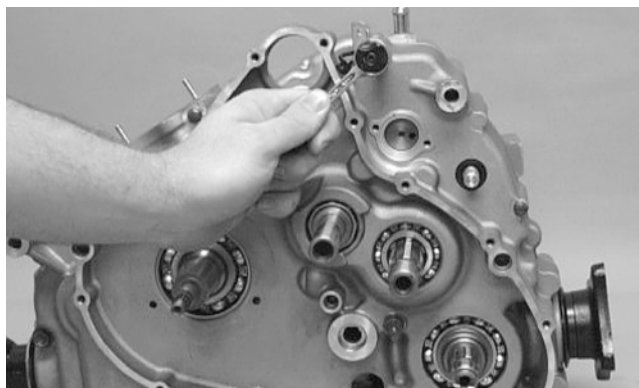
■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.



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.

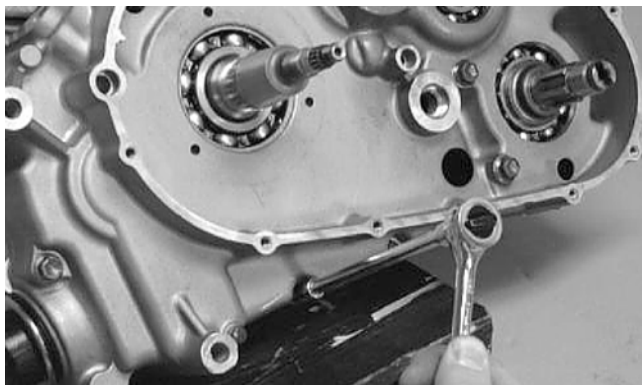


CC096D

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

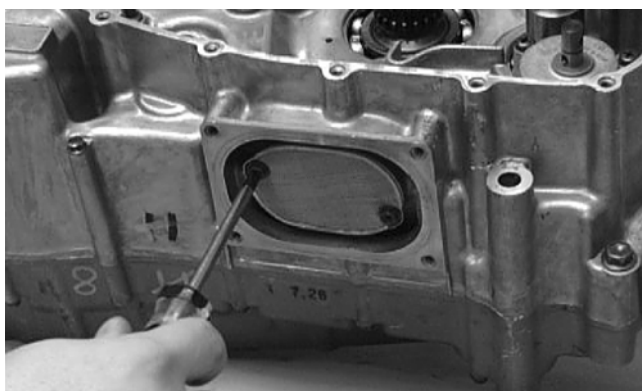
After completing center crankcase components, proceed to Installing Right-Side Components, to Installing Left-Side Components, and to Installing Top-Side Components.

Installing Right-Side Components

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.



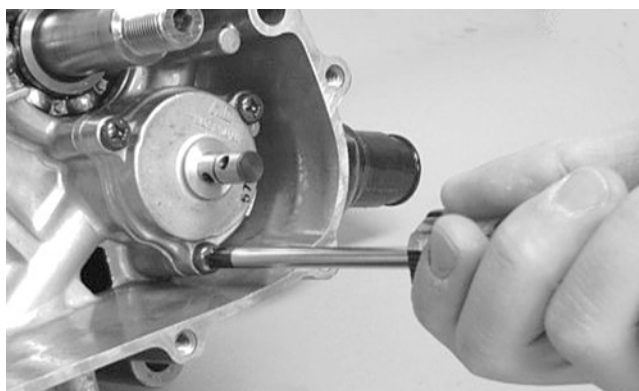
CC163D

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.



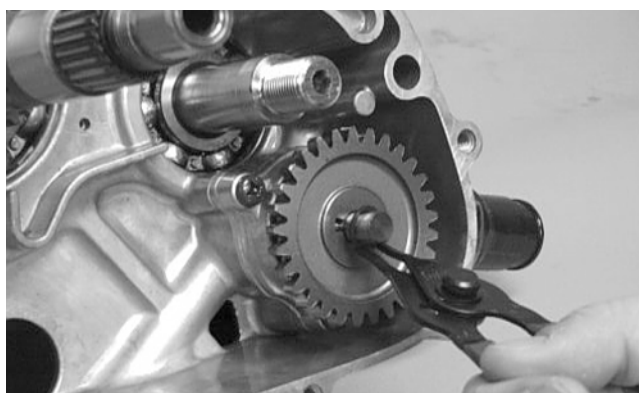
CC091D

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.



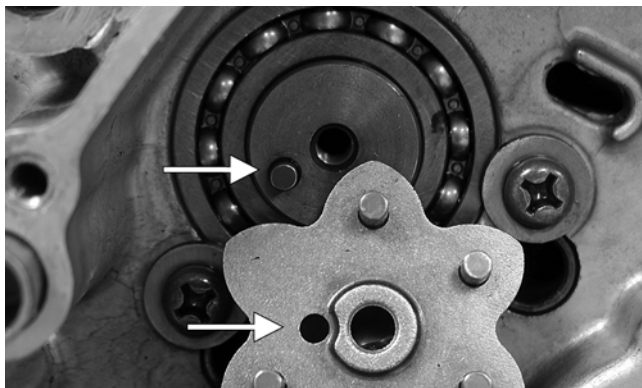
CC090D

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

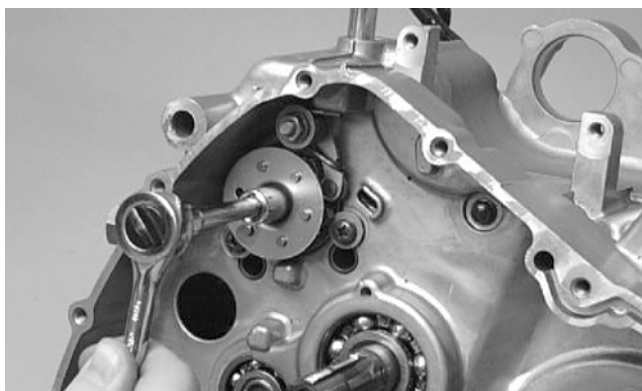
5. Place the gear shift cam plate and guide onto the gear shift cam making sure the alignment pin was installed. Secure assembly with the cap screw coated with blue Loctite #243. Tighten securely.



CF073A

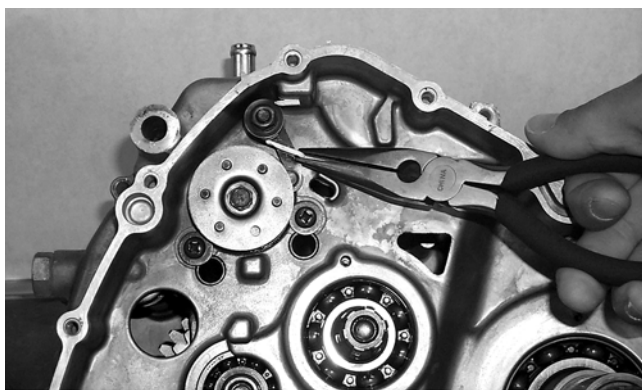


CC085D

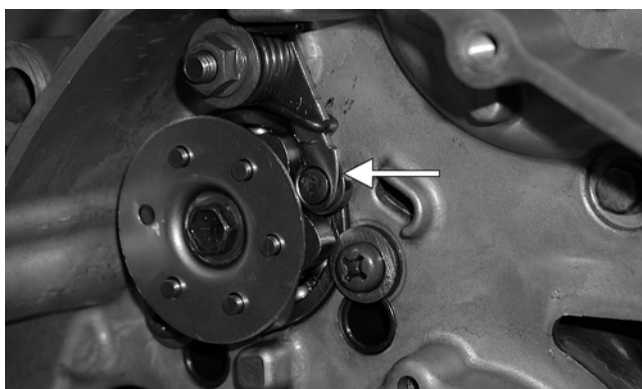


CC164D

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



CC086D



CF072A

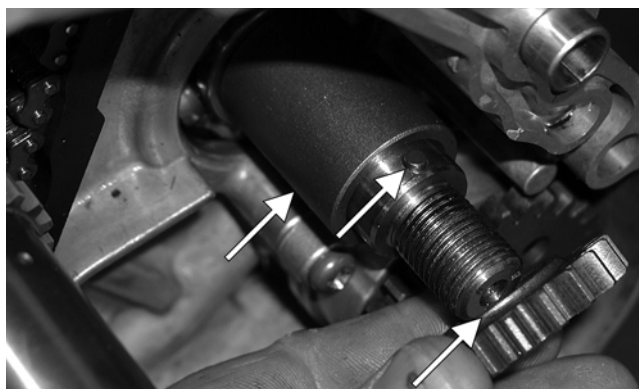
7. Install the gear shift shaft.

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.

3

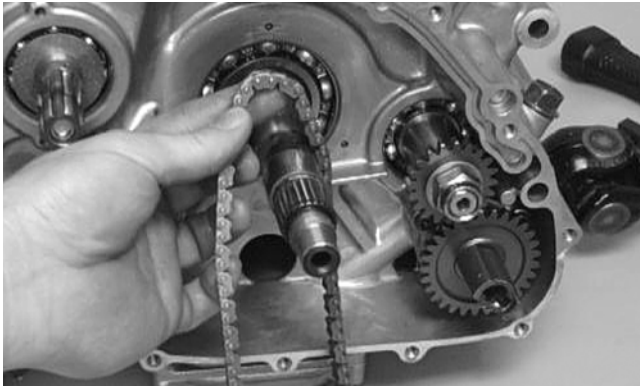


CF070A



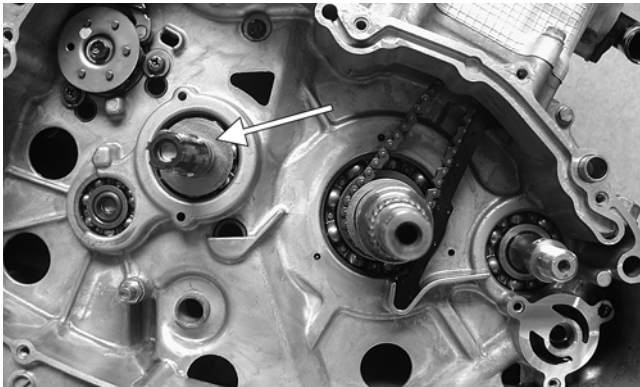
CD481

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.

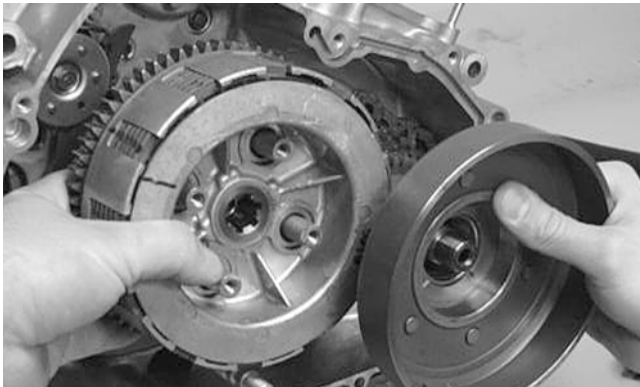


CD198B

⚠ 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

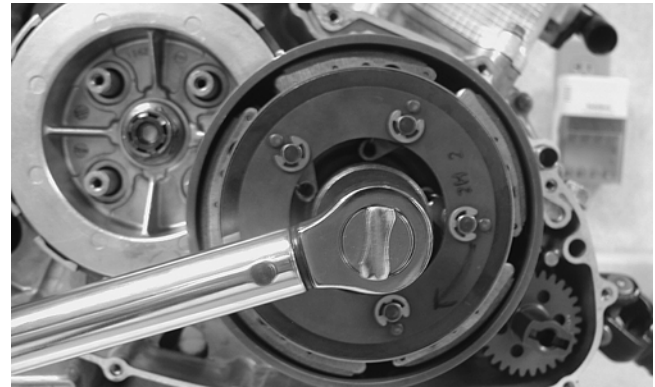
■ **NOTE:** Note the alignment mark scribed on the primary driven gear assembly during disassembly.

12. Using the Clutch Sleeve Hub Holder (p/n 0444-007), install the nut and washer. Tighten to specifications.



CD479

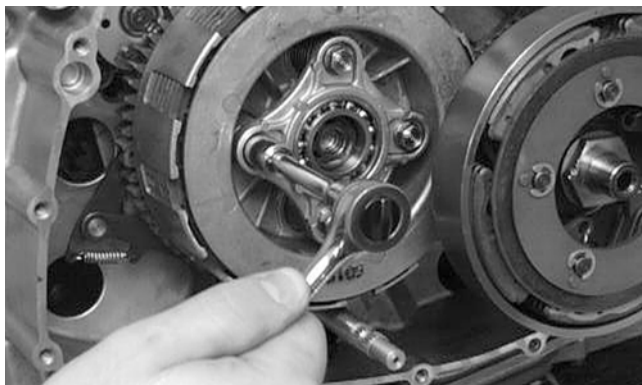
13. Place the primary drive one-way clutch into the starter clutch housing noting the word OUTSIDE for proper placement.



CD482

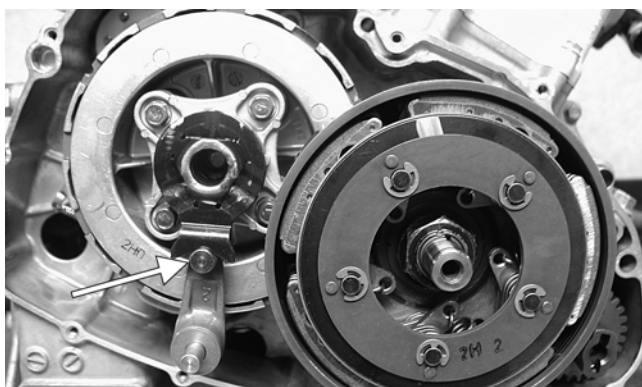
14. Install the clutch shoe and washer; then secure with the starter clutch shoe nut (left-hand threads). Tighten to specifications; then using a center punch, stake the nut.
15. Install the release roller assembly making sure the four springs are in position; then using a crisscross pattern, tighten 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.



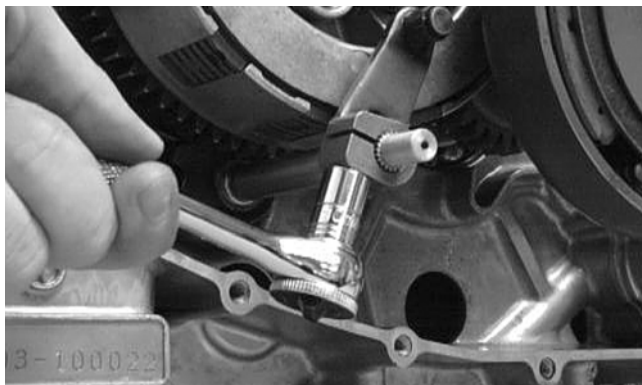
CC074D

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

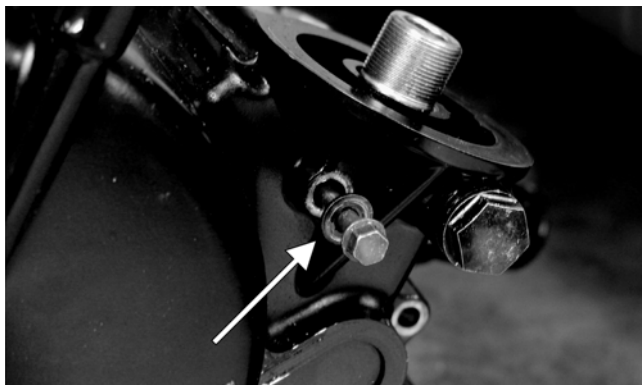
19. Place the water pump drive joint into position on the water pump shaft making sure the pin is properly positioned.



CF067

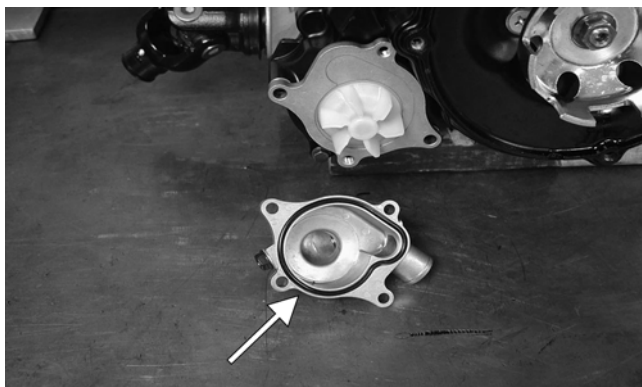
■ **NOTE:** Care should be taken that the alignment pins are installed in the right-side cover.

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.

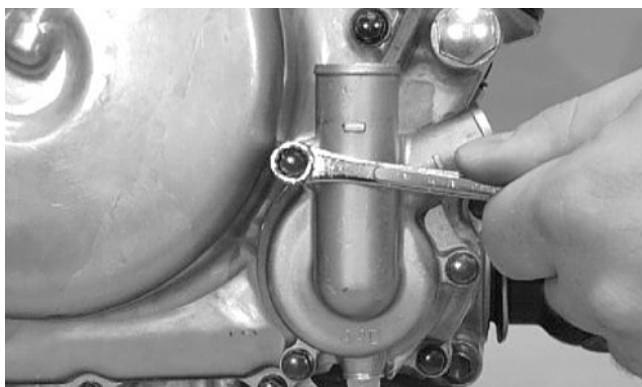


CF039A

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.



CD910A



CC027D

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



CC067D

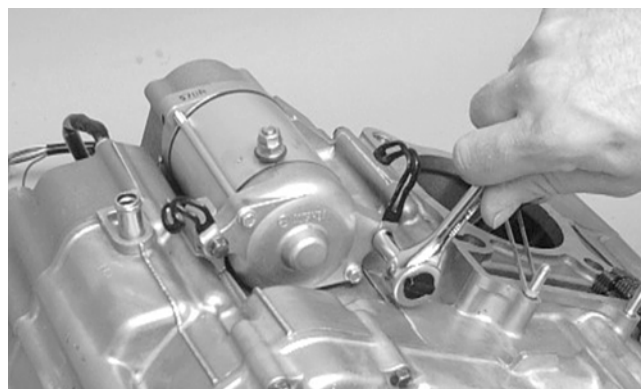
24. Install the coolant hose on the water pump and secure with the clamp.

Installing Left-Side Components

A. Idle Gear Assembly

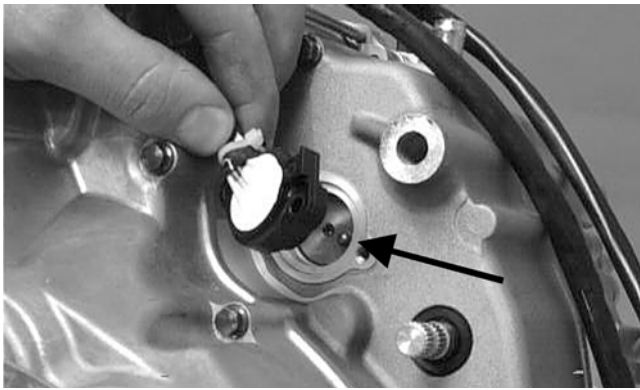
B. Magneto Rotor

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

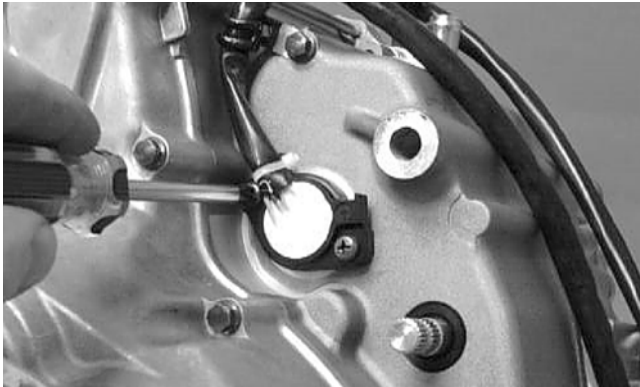


CC065D

2. Place the 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.

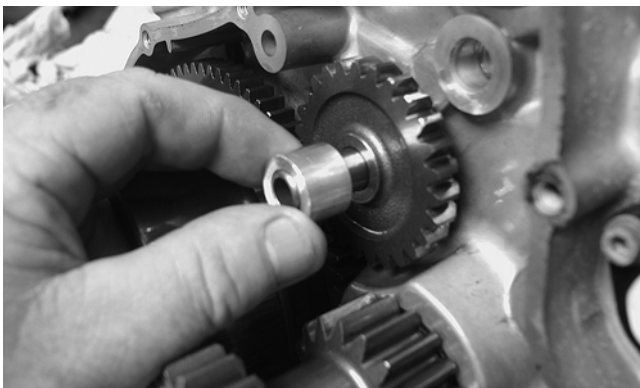


CC049D



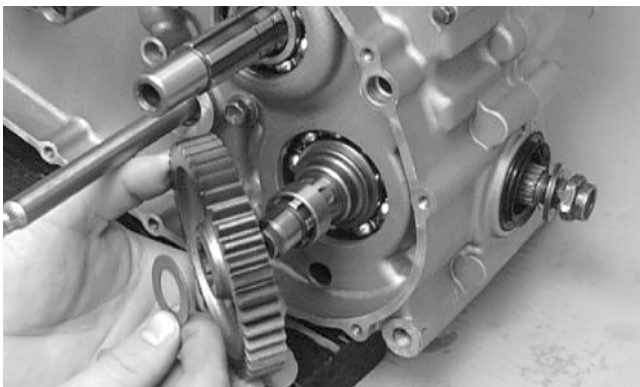
CC048D

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.



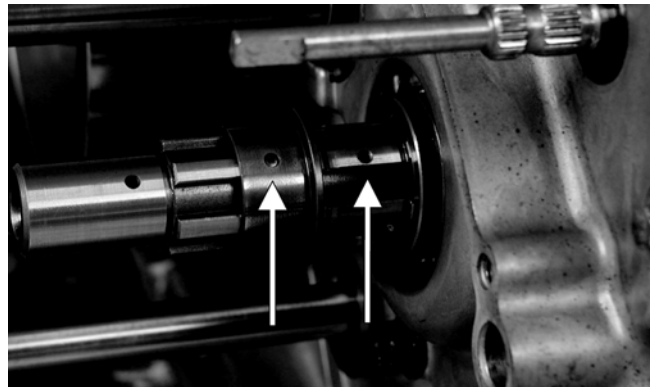
CC258D

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



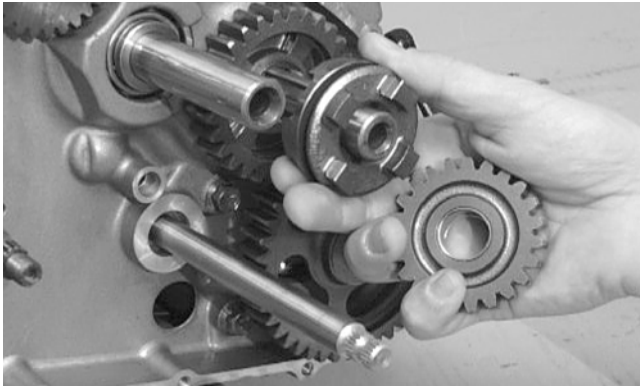
CF038A

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.

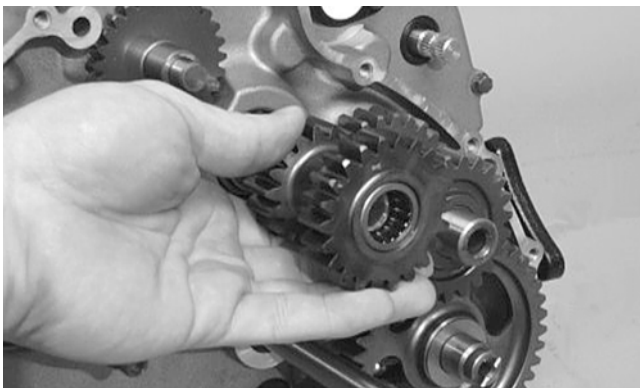


CC061D

9. Place the idle gear spacer and idle gear onto the countershaft.

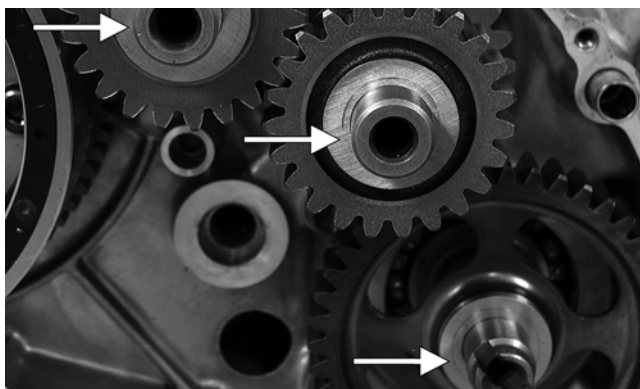


CC262D



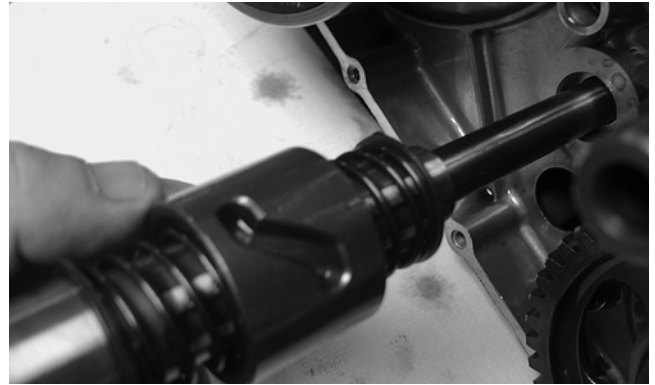
CC060D

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.



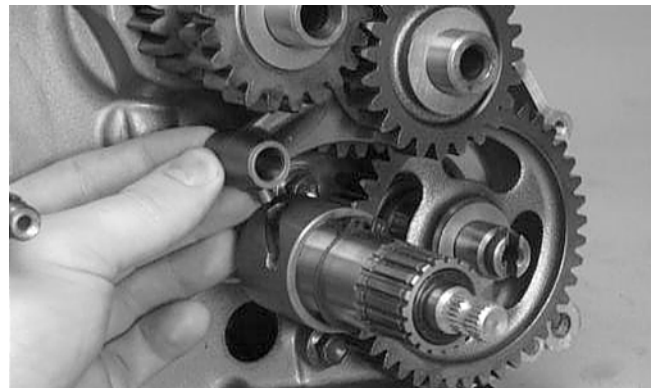
CD147

12. Place the left shaft washer on the shift shaft.



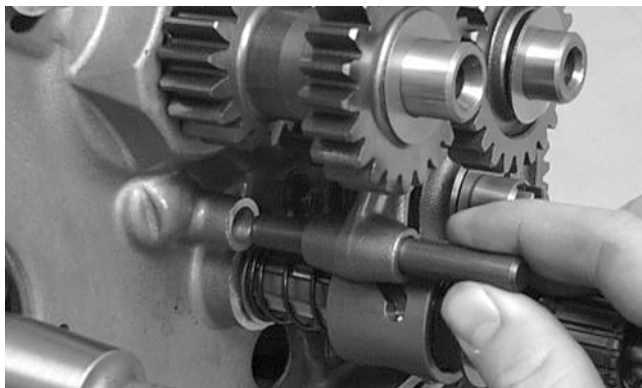
CC333D

13. With the shift fork peg positioned in the shift shaft assembly slot, install the shift fork in the select sliding dog gear.



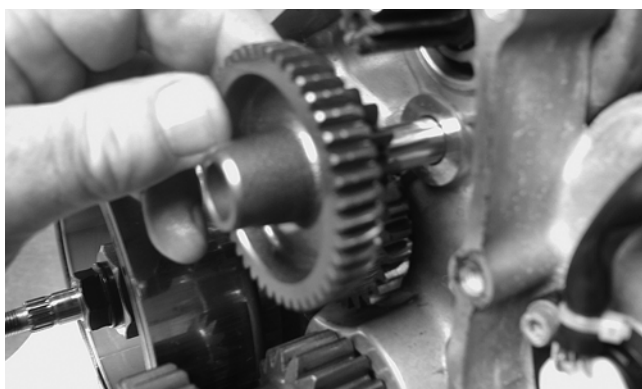
CC329D

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

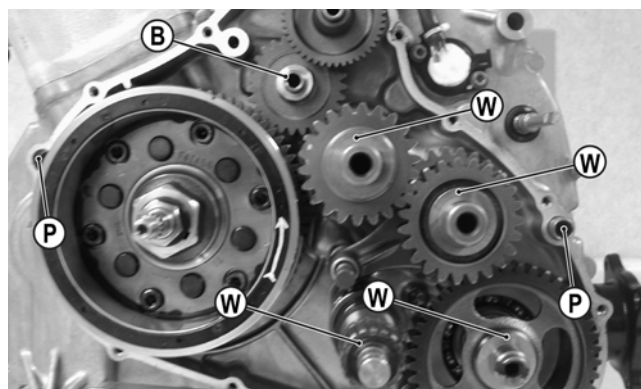
18. Place the rotor/flywheel into position on the crankshaft; then install the nut on the crankshaft and tighten until the rotor/flywheel is properly seated. Tighten to specifications.



CD444

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.



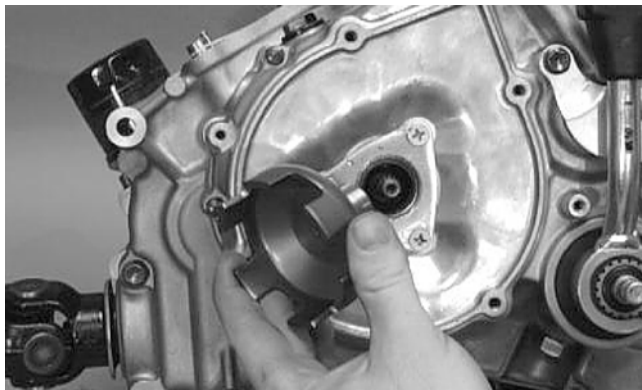
CF037A

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



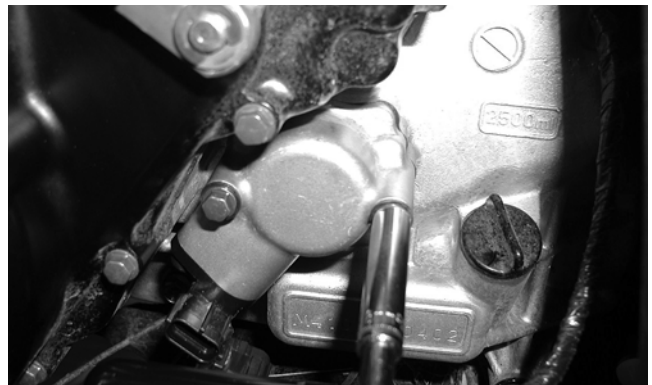
CC054D

25. Place the speed sensor housing and gasket into position and secure with the two cap screws. Tighten securely.



CC041D

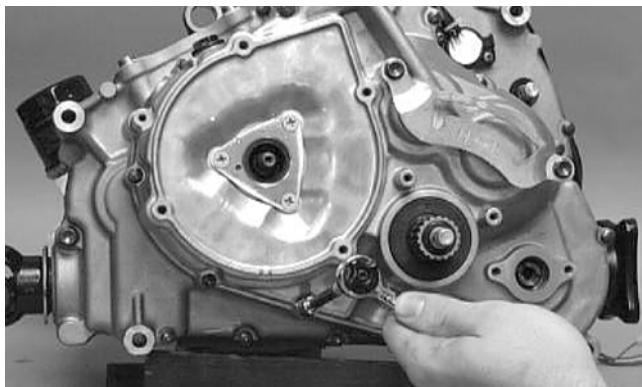
23. In a crisscross pattern, tighten the cap screws (from step 21) to specifications.



CD069

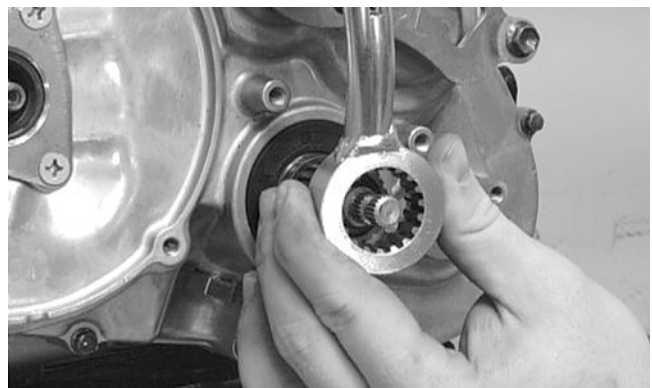
26. Install the inside circlip onto the hi/low range shift shaft with the sharp side of the circlip facing the engine; then place the shift lever assembly part way onto the shaft.

■ **NOTE:** Position the shift lever part way onto the splines and verify the subtransmission is in hi range. If not, shift into hi range.



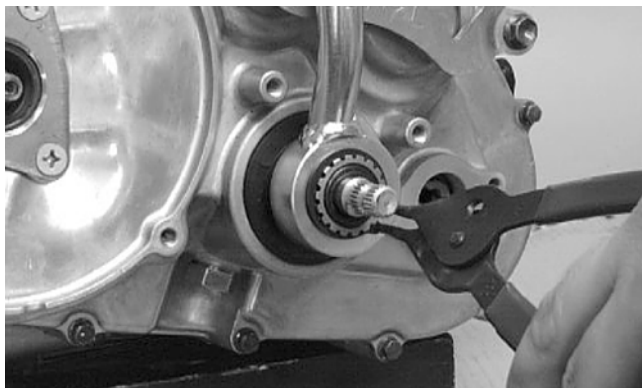
CC047D

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.



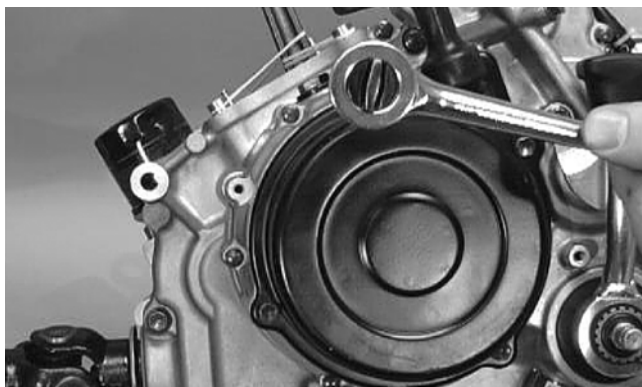
CC045D

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

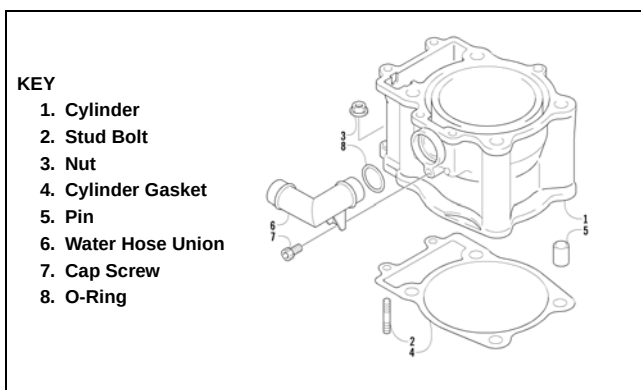
28. Place the recoil starter assembly into position on the left-side cover; then tighten four cap screws to specifications.



CC039D

Installing Top-Side Components

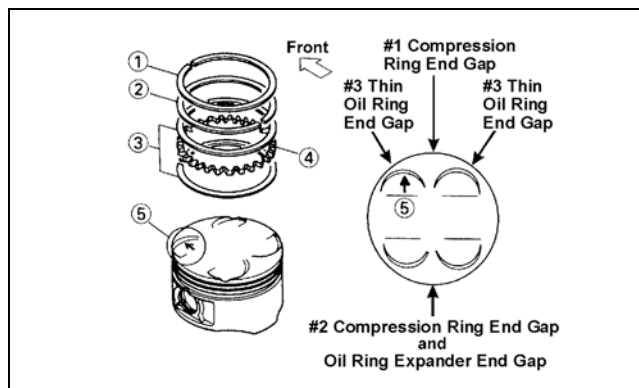
- A. Piston**
B. Cylinder



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.

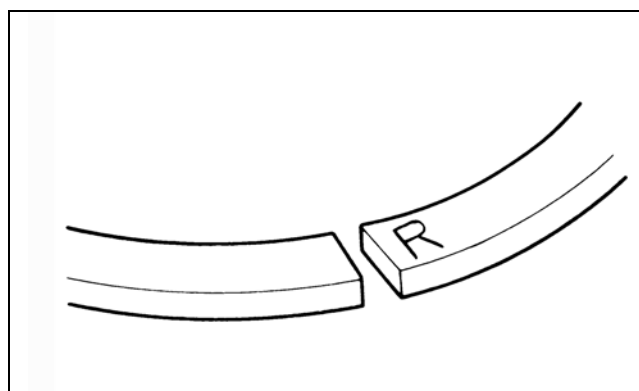


ATV-1085B

- 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).

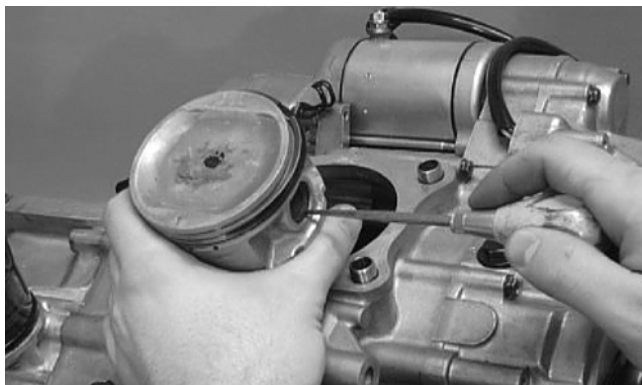
- **NOTE:** The chrome (silver) ring should be installed in the top position.

CAUTION

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

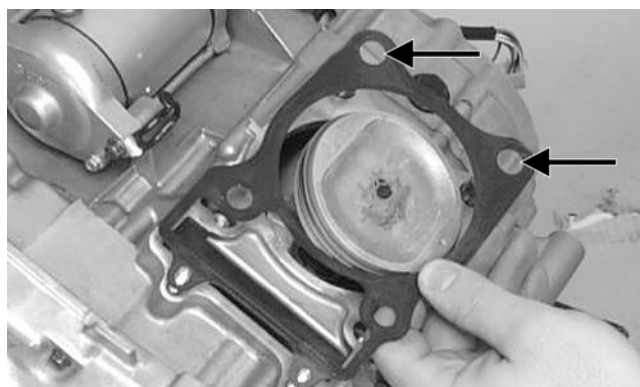
1. Install the piston on the connecting rod making sure there is a circlip on each side and the open end of the circlip faces upwards.

- **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

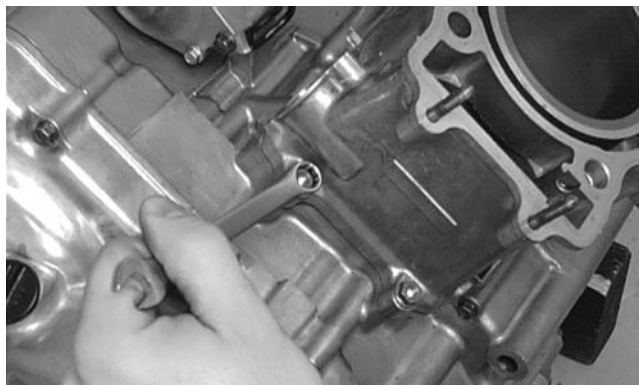
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



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.

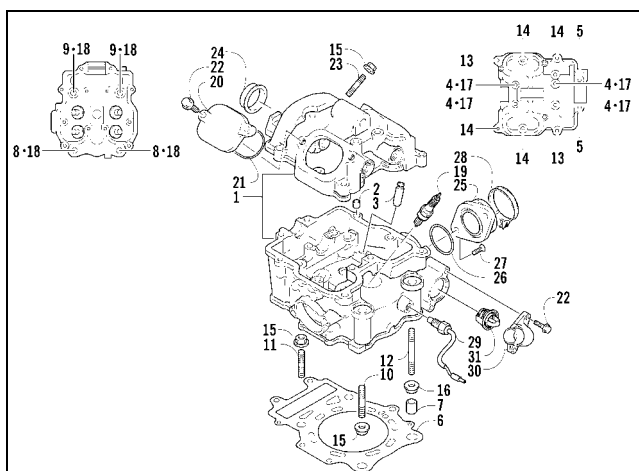


CC023D

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

C. Cylinder Head

D. Valve Cover



KEY

- | | |
|-------------------------|-----------------------------------|
| 1. Cylinder Head Assy | 18. Head Nut Gasket |
| 2. Valve Guide | 19. Spark Plug |
| 3. Dowel Pin | 20. Inspection Cap |
| 4. Cap Screw | 21. O-Ring |
| 5. Cap Screw | 22. Cap Screw |
| 6. Cylinder Head Gasket | 23. Stud Bolt |
| 7. Dowel Pin | 24. Cylinder Head Plug |
| 8. Cap Screw | 25. Intake Pipe Assy |
| 9. Cap Screw | 26. O-Ring |
| 10. Stud Bolt | 27. Cap Screw |
| 11. Stud Bolt | 28. Clamp |
| 12. Stud Bolt | 29. Water Temperature Switch Assy |
| 13. Cap Screw | 30. Thermostat Cover |
| 14. Cap Screw | 31. Thermostat |
| 15. Nut | *Frost Plug |
| 16. Nut | *Not Illustrated |
| 17. Gasket | |

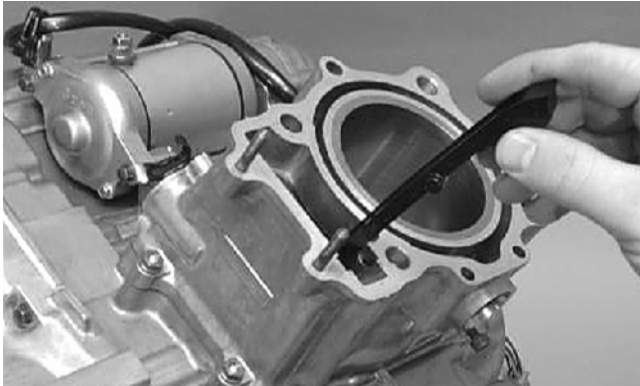
0737-755

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

6. Place the chain guide into the cylinder.

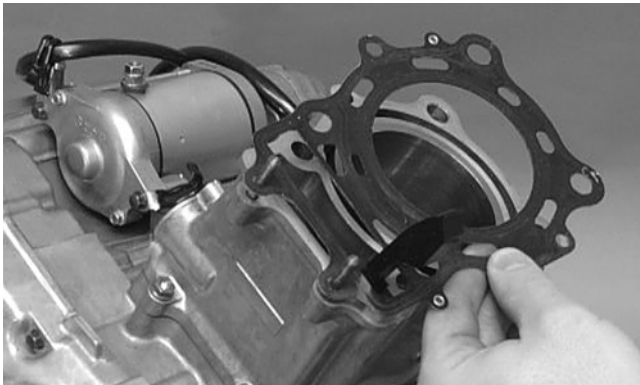
CAUTION

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

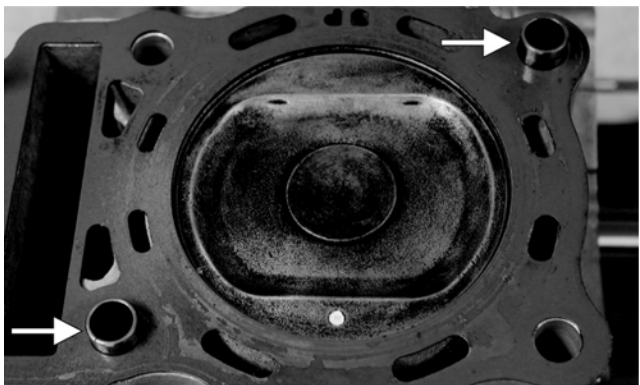


CC022D

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.

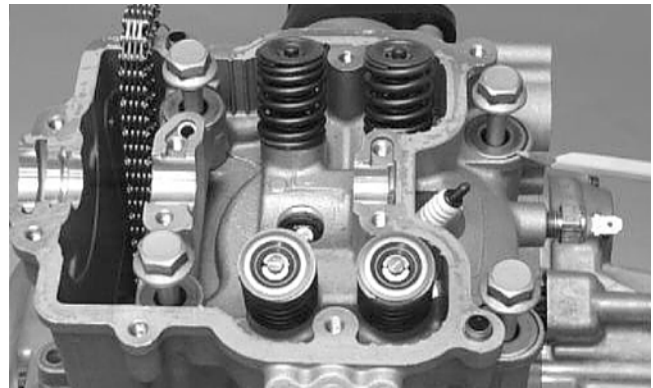


CC020D



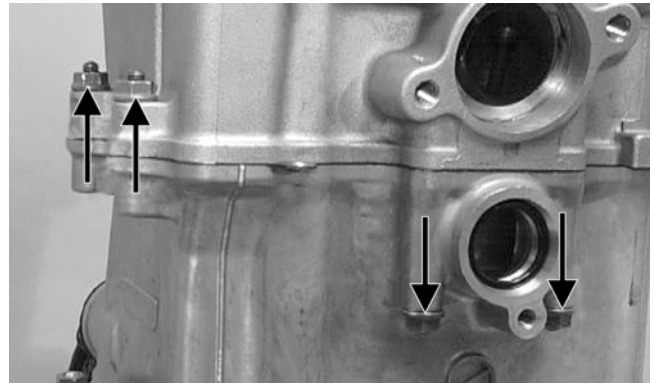
CF057A

8. Install the four cylinder head cap screws with copper washers (note the locations of the different-lengthed cap screws). Tighten only until snug.

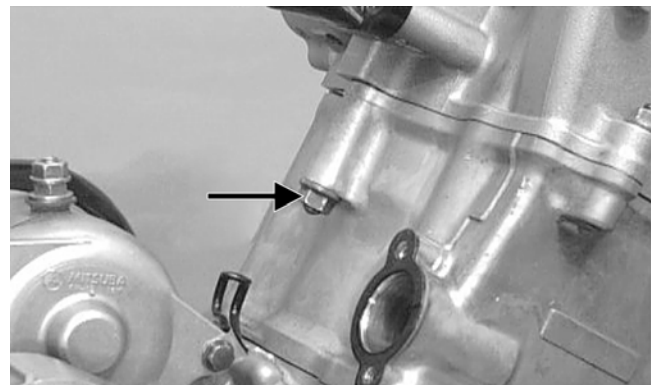


CC272D

9. Loosely install the five cylinder head nuts.

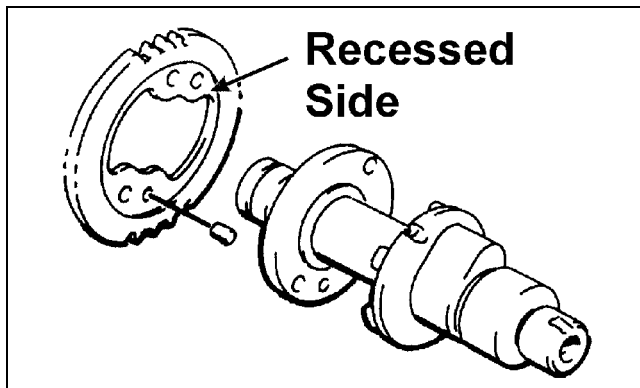


CC018D



CC017D

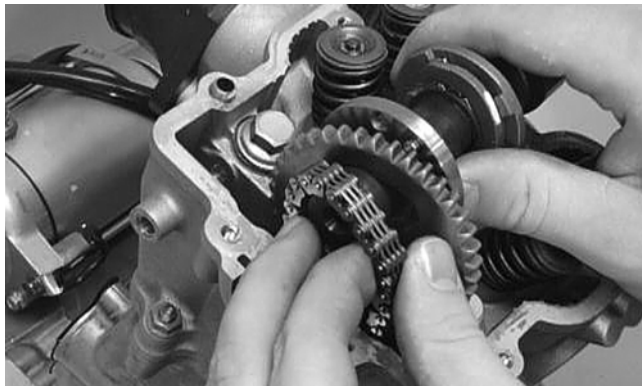
10. In a crisscross pattern, tighten the four cylinder head cap screws (from step 8) to 3.8 kg-m (27.5 ft-lb); then tighten the 8 mm nut (from step 9) to 2.5 kg-m (18 ft-lb). Using a crisscross pattern, tighten the four 6 mm nuts (from step 9) to 1.1 kg-m (8 ft-lb). Tighten the two cylinder-to-crankcase 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.



732-307B

■ **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.



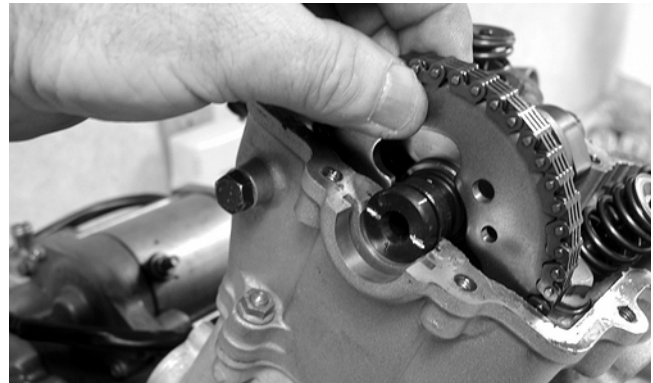
CC015D

■ **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.



CF030A

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.



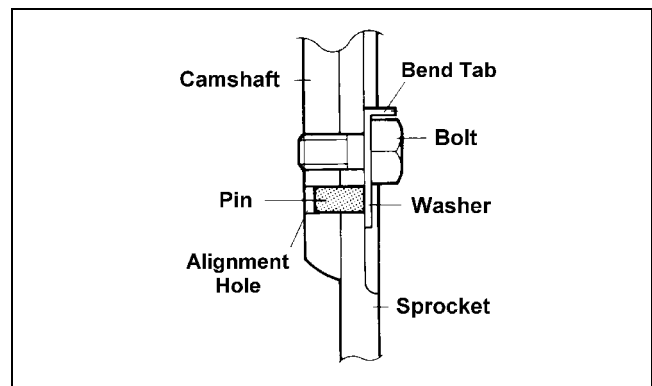
CD463

- 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.

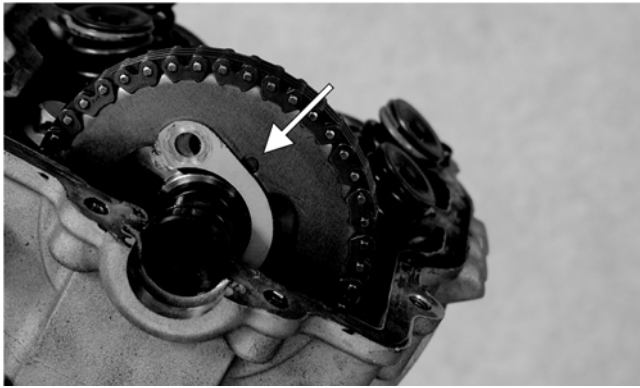
15. Place the tab-washer onto the sprocket making sure it covers the pin in the alignment hole.



ATV-1027

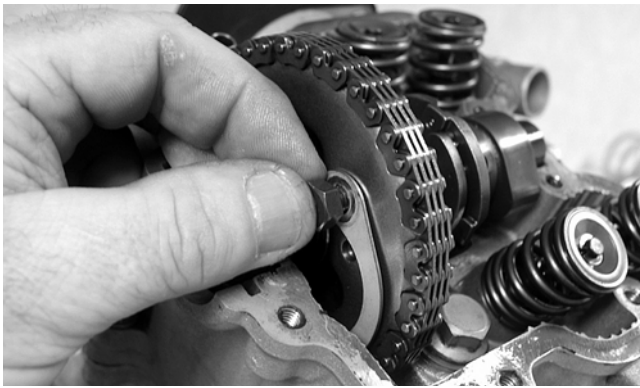
⚠ CAUTION

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



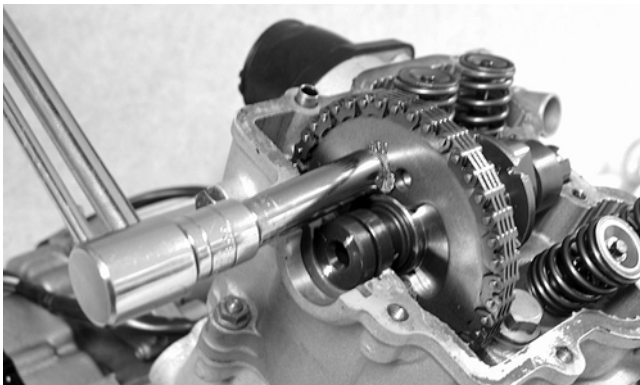
CF013A

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.



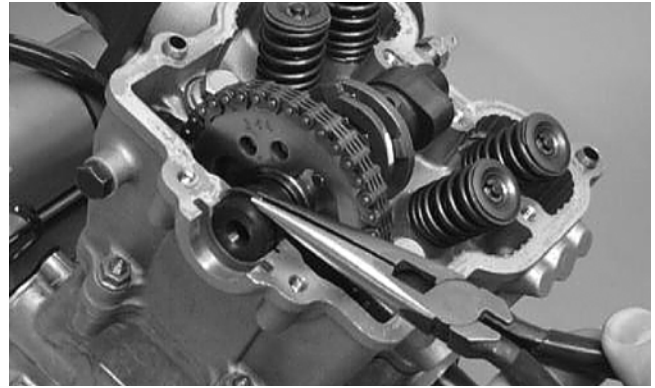
CD464

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.



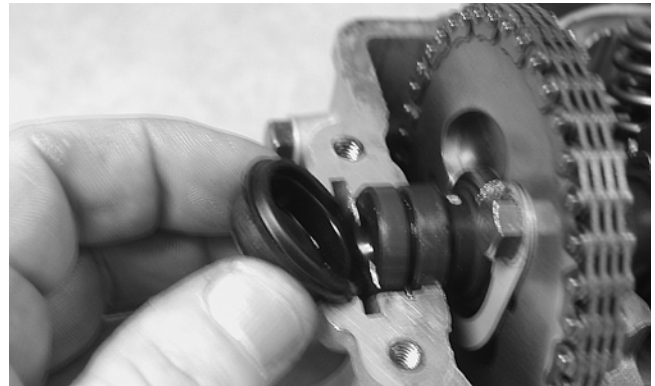
CD465

18. Rotate the crankshaft until the first cap screw (from step 16) securing the sprocket to the camshaft 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.



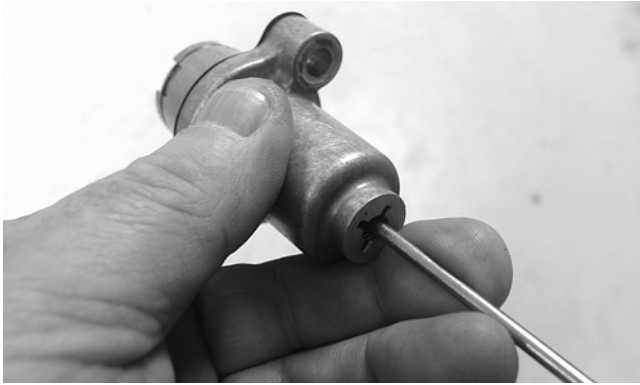
CD468

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.



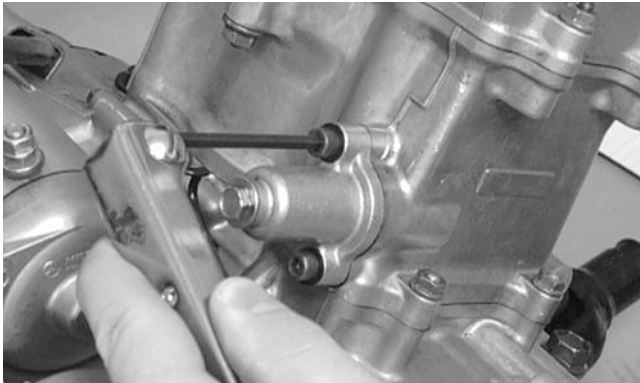
CD501

■ **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.

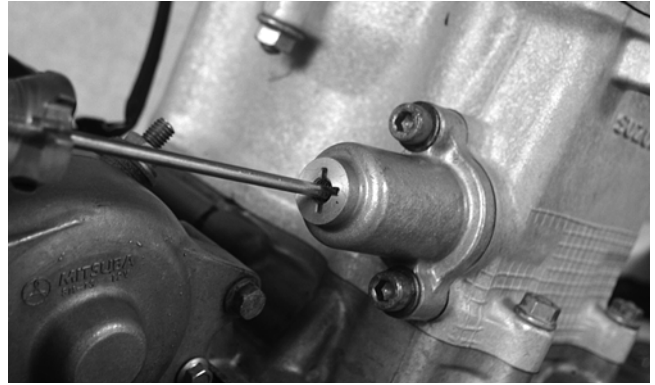


CD469

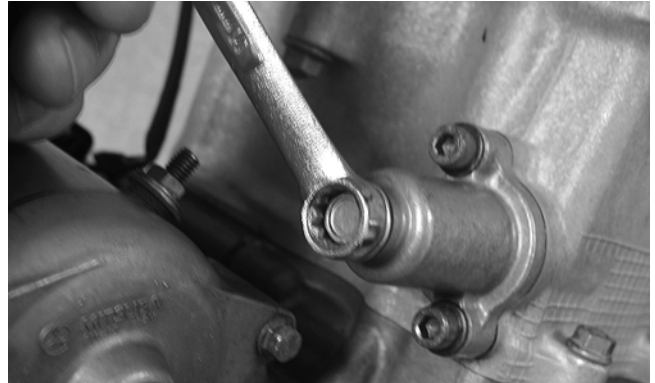


CC010D

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.

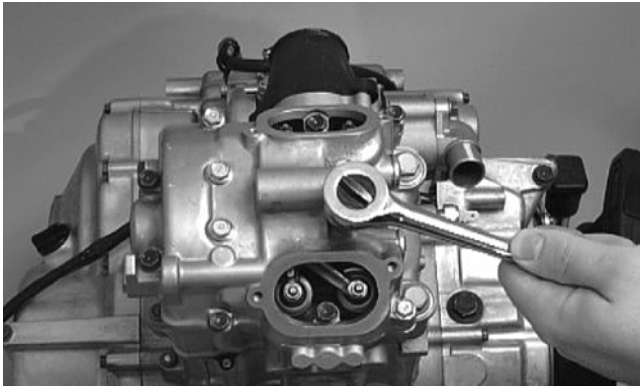


CC275D

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

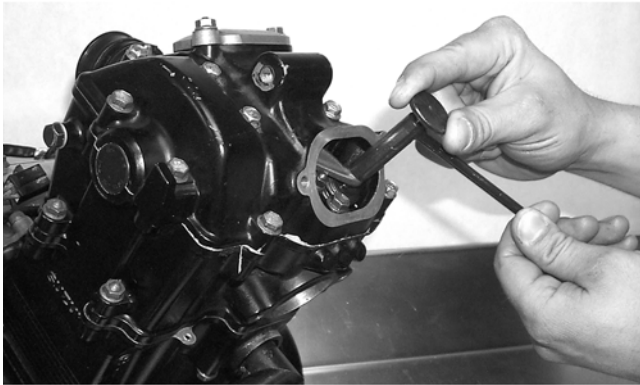
29. In a crisscross pattern starting from the center and working outward, tighten the cap screws (from step 28) securely.

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

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

3

Installing Engine/Transmission

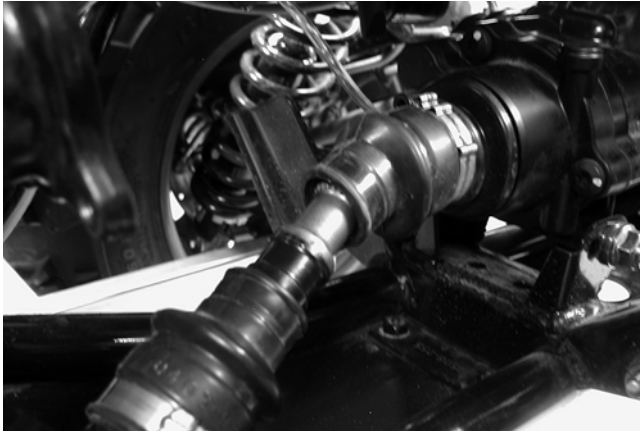
■ **NOTE:** Arctic Cat recommends that new gaskets and O-rings be installed whenever servicing the ATV.

1. From the left side, place the engine/transmission into the frame; then 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.

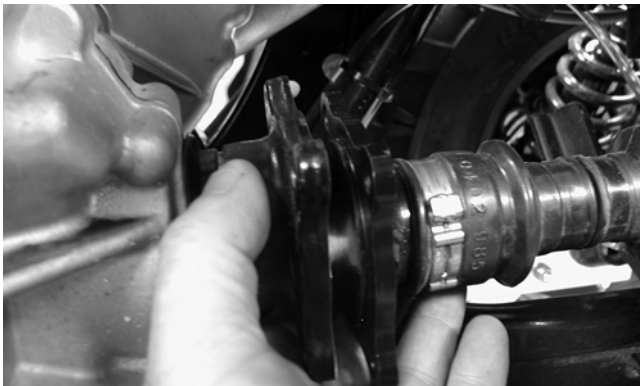


CD818

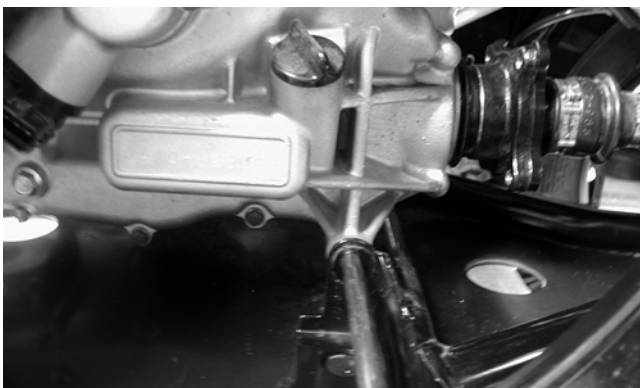
3. Raise the rear of the engine and place a block under it; then install the propeller shaft and output flange into the rear drive coupler.



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



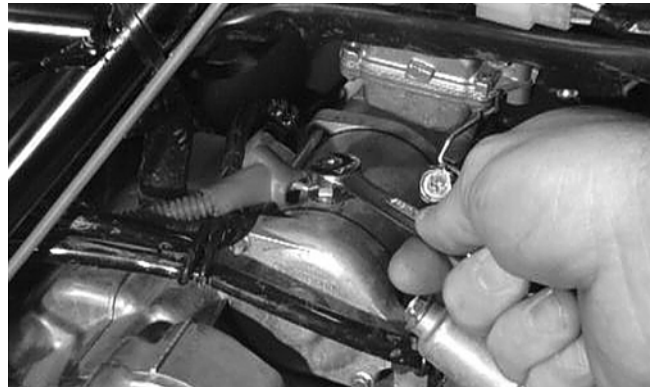
5. Install the lower rear engine mounting through-bolt, spacer, and washer; then install the lower front engine mounting through-bolt, spacer, and washer. Secure with the flange nuts. Tighten to specifications.



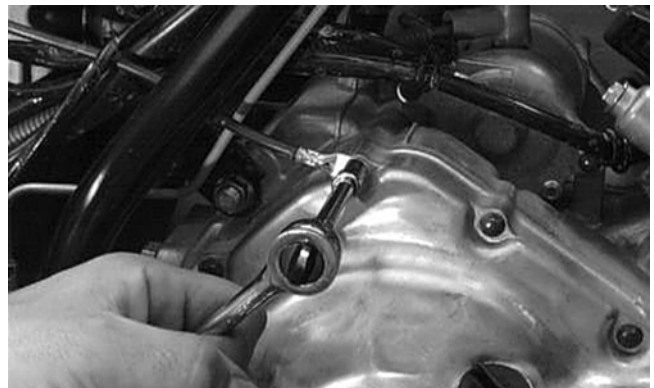
6. Connect the crankcase breather vent hose and secure with the clamp.
7. Connect the lower coolant hose to the water pump housing and secure with the clamp.



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



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

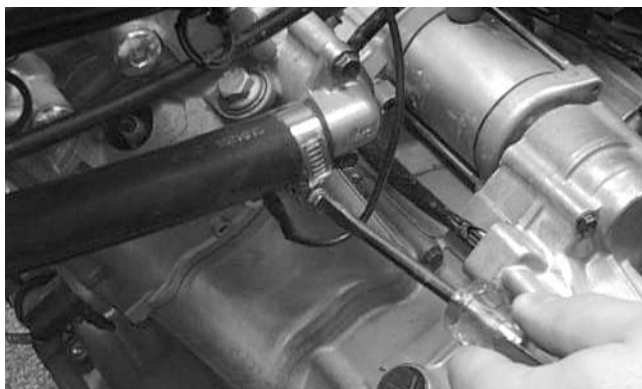


10. Install the coil and secure with two cap screws; then install the high tension lead on the spark plug.



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

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.

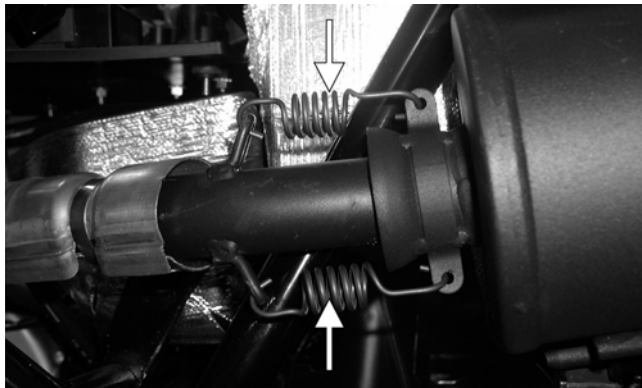


CD794

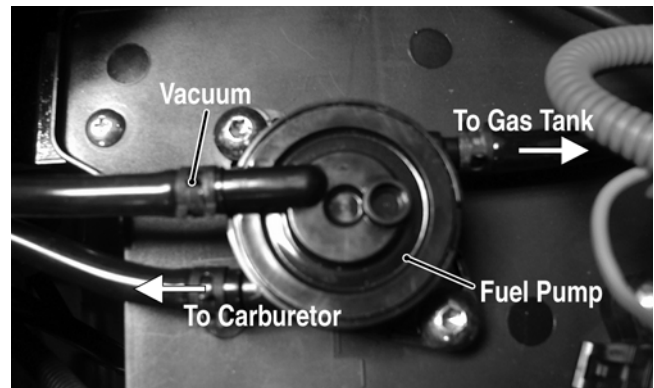
15. Install the exhaust pipe and secure with two cap screws making sure the mounting brackets engage the frame grommets; then install the muffler with the springs. Tighten all hardware to specifications.



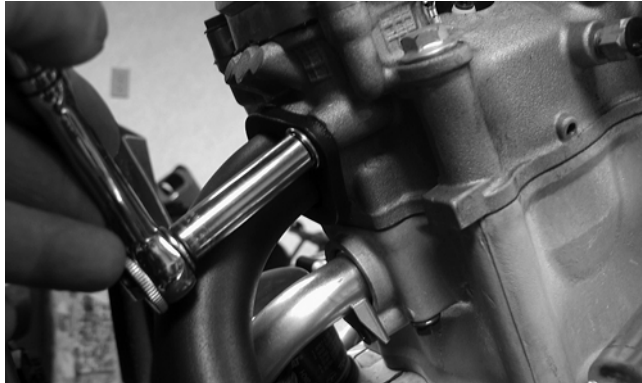
CD787



CF138A



CD766A



CD803

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.



CD788

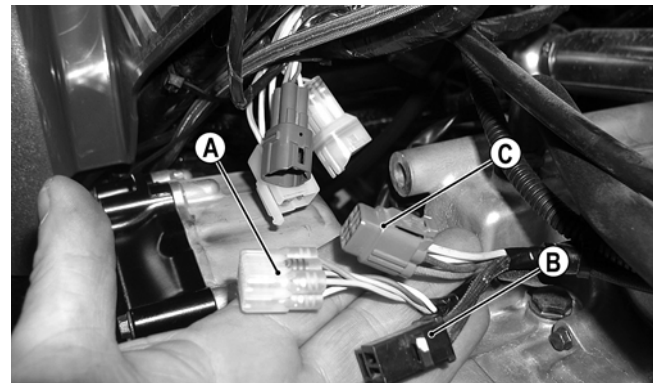
19. Connect the temperature sensor wire to the main harness.

20. Connect the gear position indicator connector (A), stator connector (B), and the CDI connector (C) to the main harness.



CD782

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



CD797A

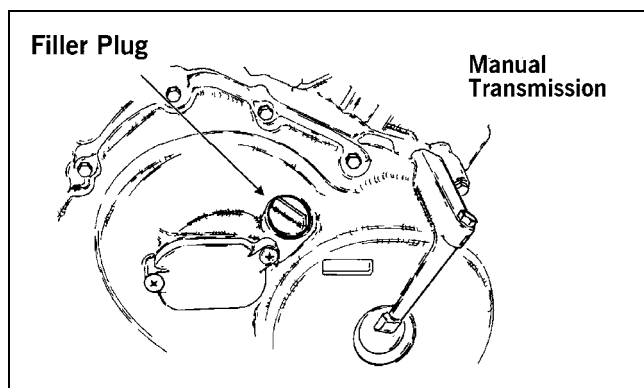
21. Install the front body panel and the front rack (see Section 8).

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.



ATV-0108

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.

Table of Contents (700 EFI)

Removing Engine/Transmission	3-256
Top-Side Components.....	3-260
Removing Top-Side Components	3-260
Left-Side Components	3-264
Removing Left-Side Components	3-264
Right-Side Components.....	3-268
Removing Right-Side Components.....	3-268
Center Crankcase Components	3-271
Separating Crankcase Halves.....	3-271
Disassembling Crankcase Half	3-272
Servicing Components.....	3-274
Assembling Crankcase Half.....	3-294
Joining Crankcase Halves.....	3-296
Installing Right-Side Components.....	3-297
Installing Left-Side Components	3-299
Installing Top-Side Components	3-303
Installing Engine/Transmission.....	3-307

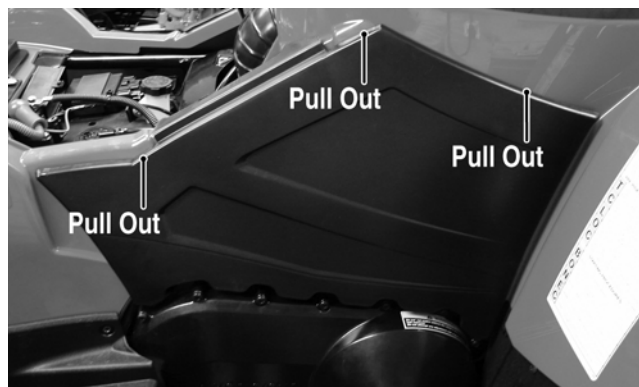
Removing Engine/ Transmission

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

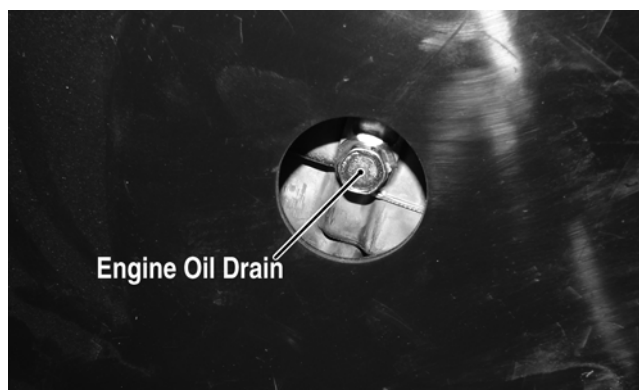
If the technician's objective is to service/replace left-side components, right-side components, and/or top-side components, the engine/transmission does not have to be removed from the frame.

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.

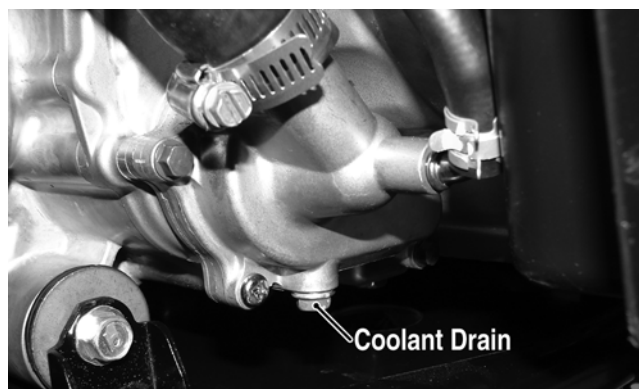


CF237A

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.

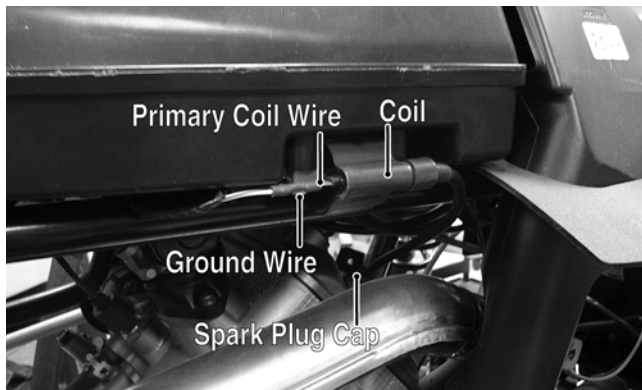


FI005A



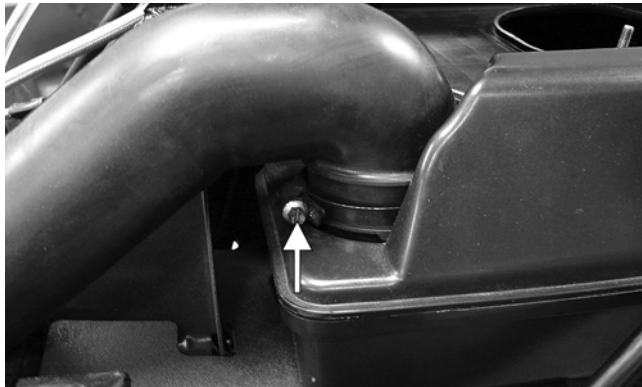
FI004A

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.



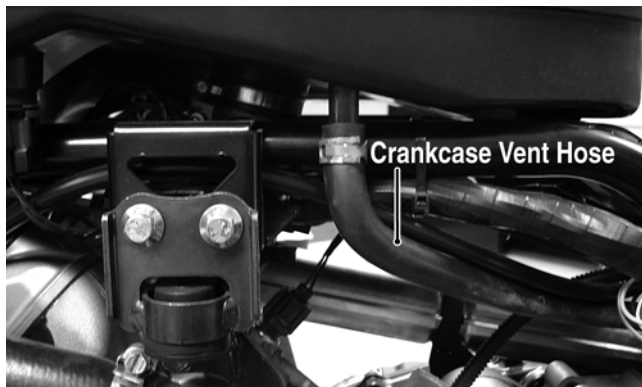
FI066A

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

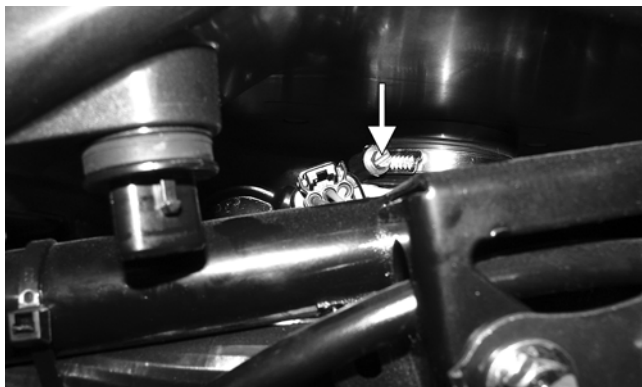


FI098A

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.



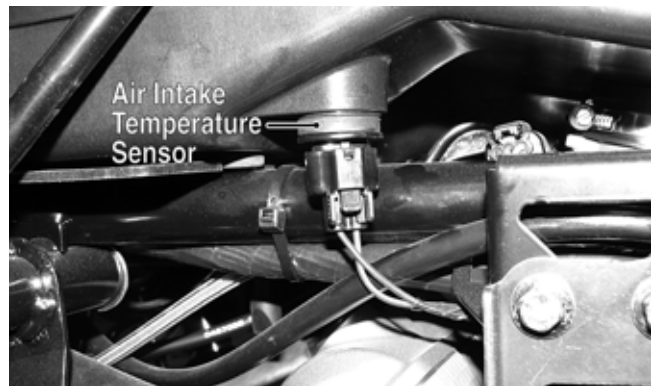
FI075



FI076

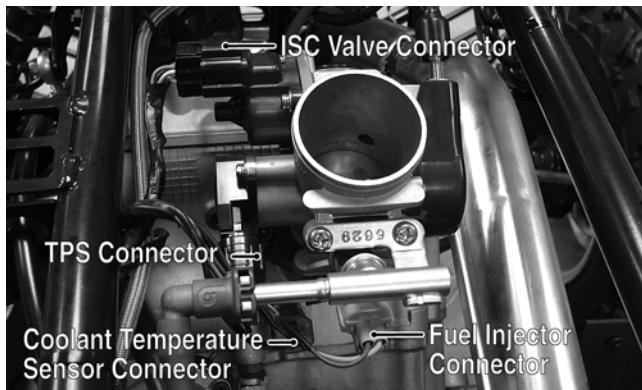
12. Remove the left-side foot peg and footwell (see Section 8).

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.



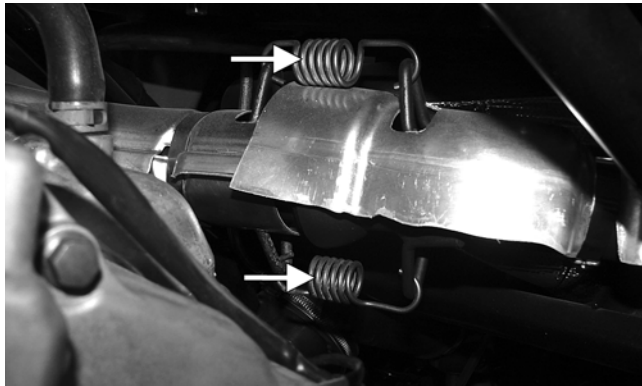
FI082A

14. Remove the ISC valve connector, the TPS connector, the coolant temperature sensor connector, and the fuel injector connector.



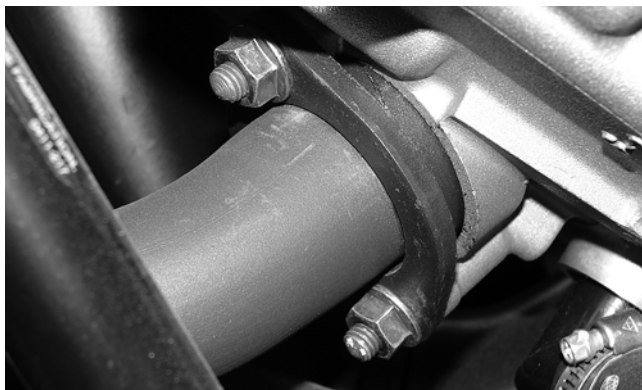
FI089A

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



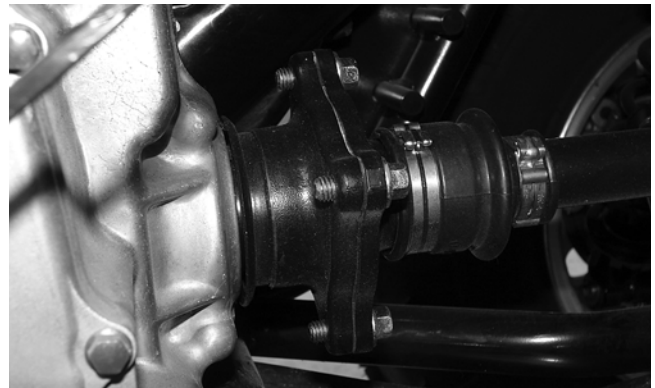
FI097A

16. Remove the two flange nuts securing the exhaust pipe to the cylinder head; then remove the pipe.



FI073

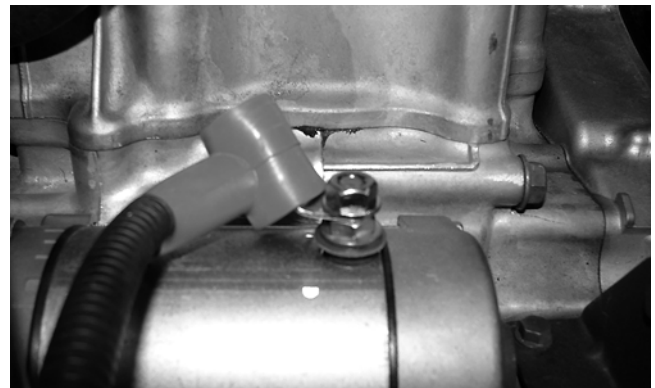
17. Remove the two coolant hoses from the engine; then route the hoses out of the way.
18. Remove the cap screws securing the rear drive-shaft/output flange to the rear output joint flange.



FI079

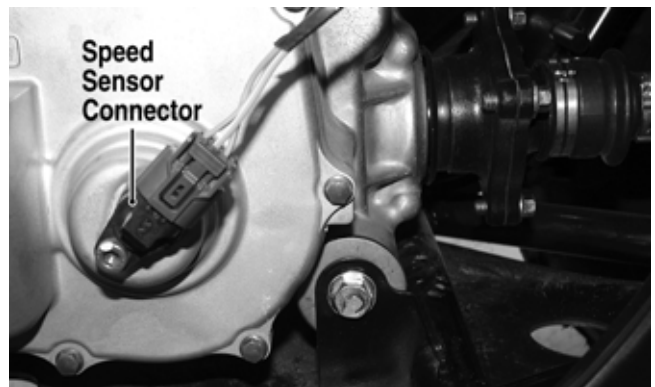
- **NOTE:** It is advisable to lock the brake when loosening the cap screws securing the rear drive-shaft.

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.

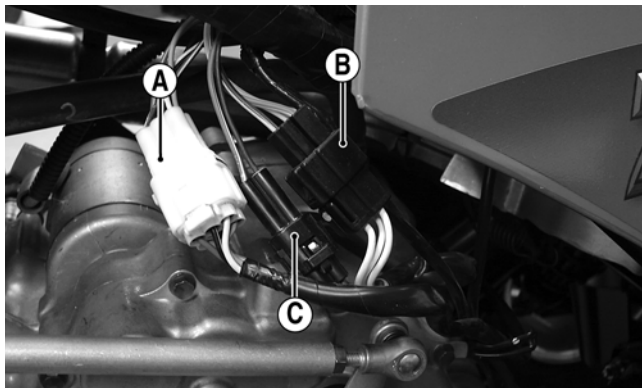


FI078A



FI085A

21. On the left side, disconnect the gear position indicator connector (A), stator connector (B), and the crankshaft position sensor connector (C).

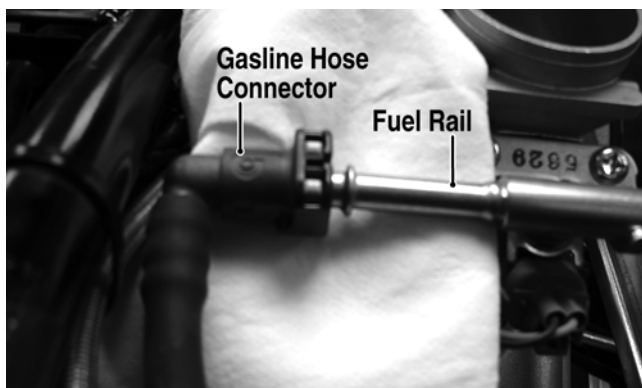


FI083A

22. Using an absorbent towel to catch any spilled gas, press the locking tab release on the gasoline hose connector; then slide the gasoline hose connector off the fuel rail.

WARNING

Whenever working on the fuel system if a gasoline 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 gasoline hose.



FI109A

23. Loosen the clamp securing the throttle body to the intake pipe; then remove the throttle body and secure it out of the way.

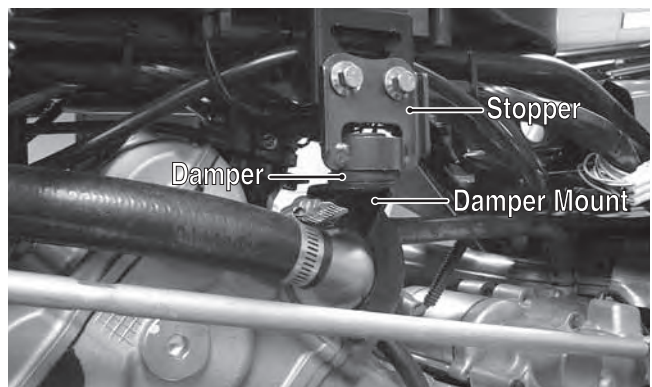
24. Remove the two cap screws securing the intake pipe to the cylinder head and remove the intake pipe. Account for an O-ring.

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

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.

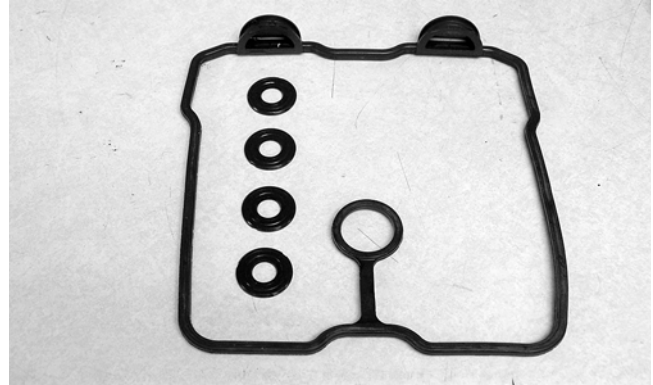
■ **NOTE:** The engine/transmission does not have to be removed from the frame for this procedure.

Removing Top-Side Components

- A. Cylinder Head Cover**
- B. Cylinder Head**

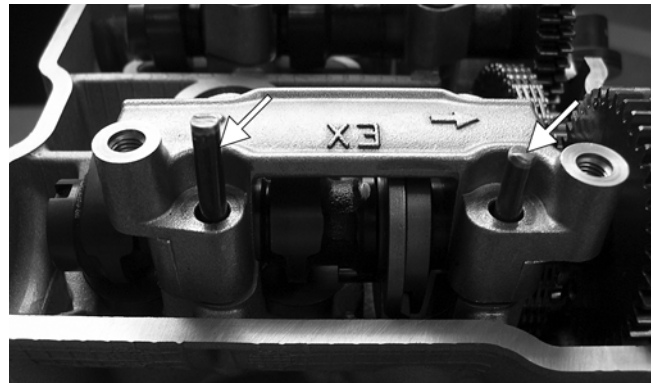
■ **NOTE:** Remove the spark plug and timing inspection plug; then using the recoil starter, rotate the crankshaft to top-dead-center of the compression stroke. Account for a copper washer on the timing inspection plug.

1. Remove the cylinder head cover. Account for a gasket and four seal washers.

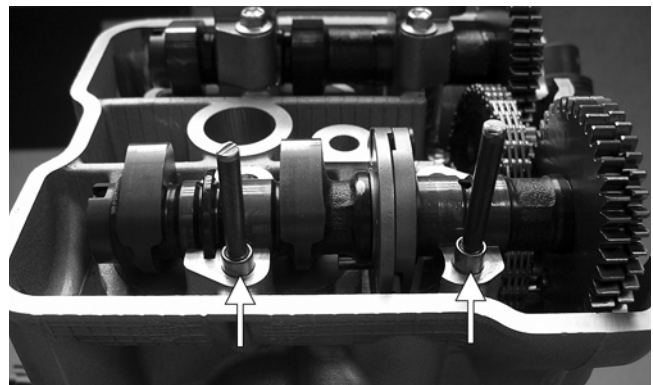


FI122

2. Check and record valve tappet clearance for reference when assembling (see Section 2).
3. Remove the eight cap screws securing the camshaft holders to the cylinder head.
4. Install two alignment studs in the exhaust camshaft holder; then carefully remove the camshaft holder. Account for two alignment pins.

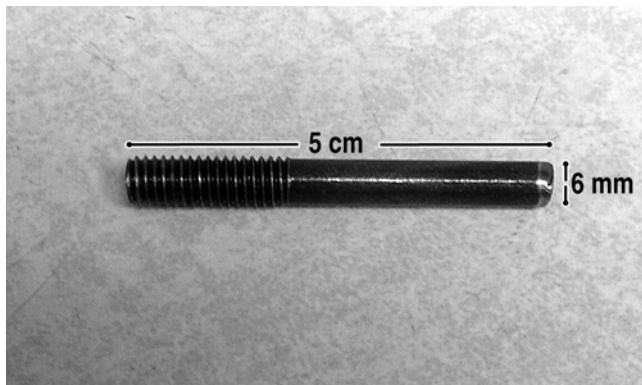


FI125A



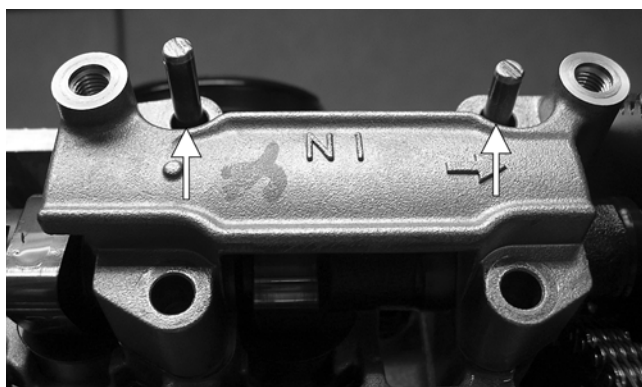
FI123A

■ **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

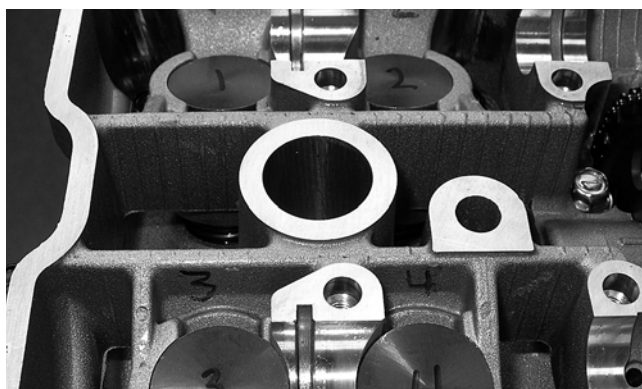
5. Remove the exhaust camshaft; then repeat step 4 for the intake camshaft. Account for two alignment pins.



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.

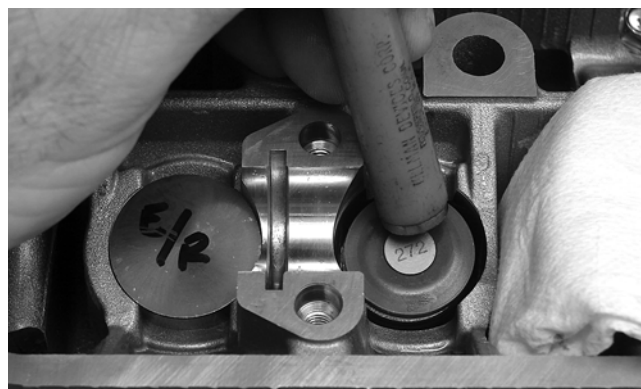


FI154

7. Using a magnet, withdraw the valve tappets from the cylinder head taking care to prevent loose adjusting shims from falling into the engine.

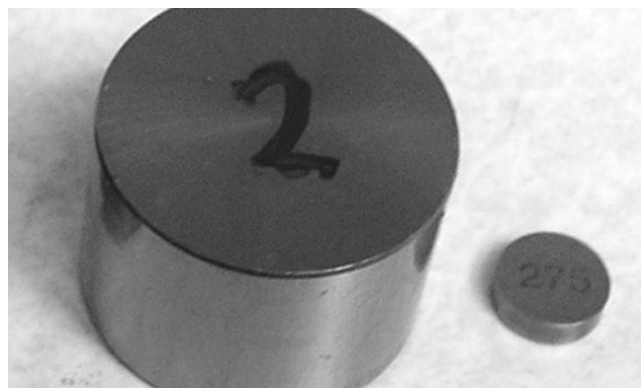


FI055



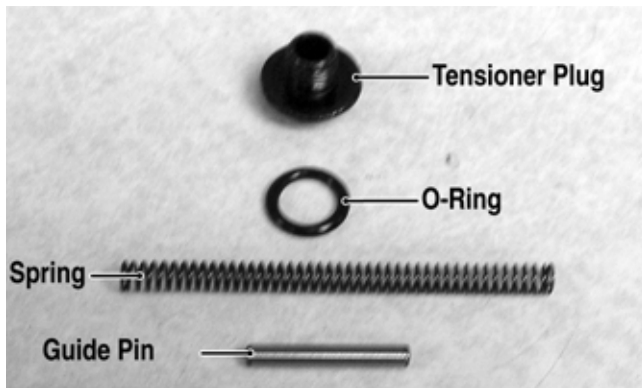
FI056

■ **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.

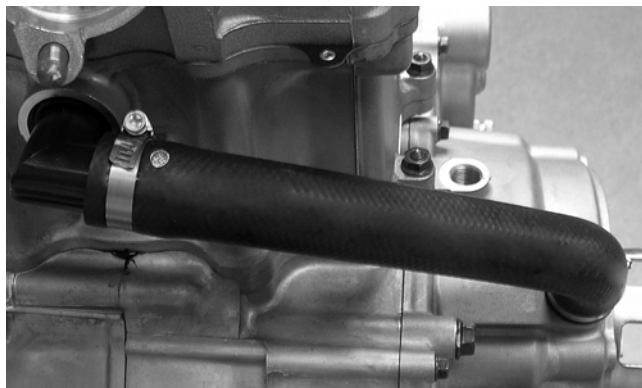


FI159A

9. Remove the coolant bypass hose from the cylinder head fitting; then remove the coolant crossover hose.



FI160

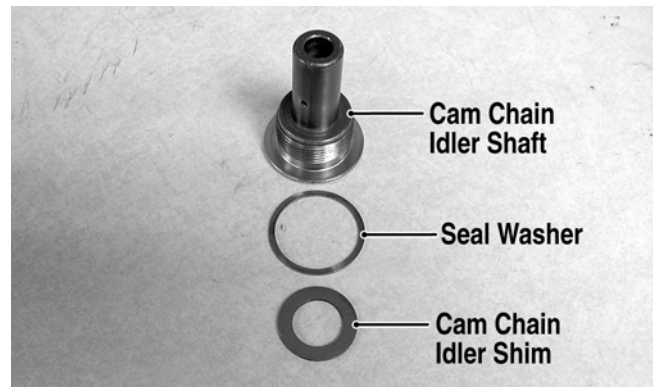


FI161

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.



FI162A

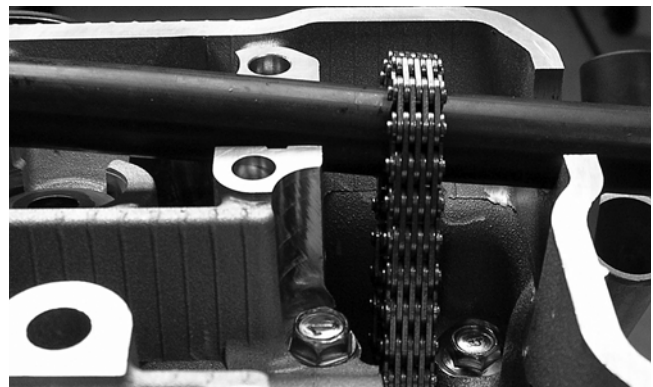


FI131A

⚠ 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.

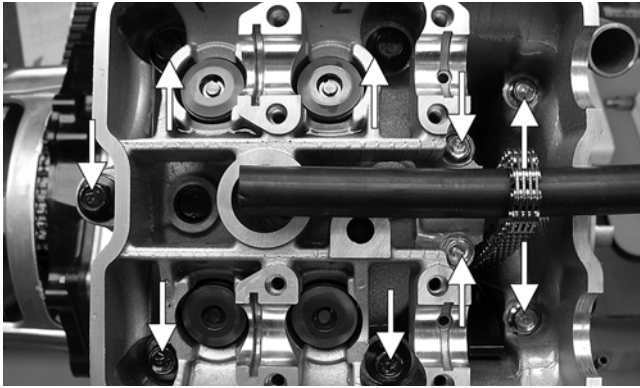


FI163

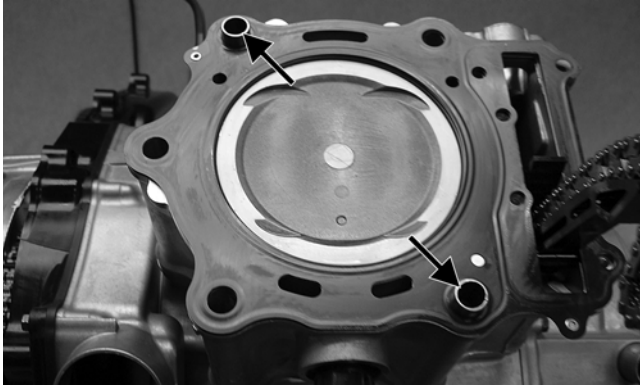
⚠ CAUTION

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.

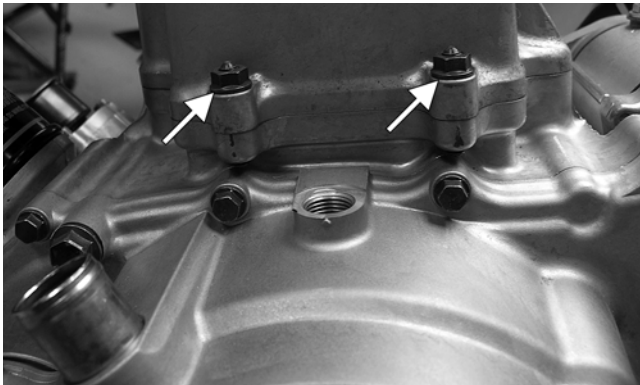
AT THIS POINT

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

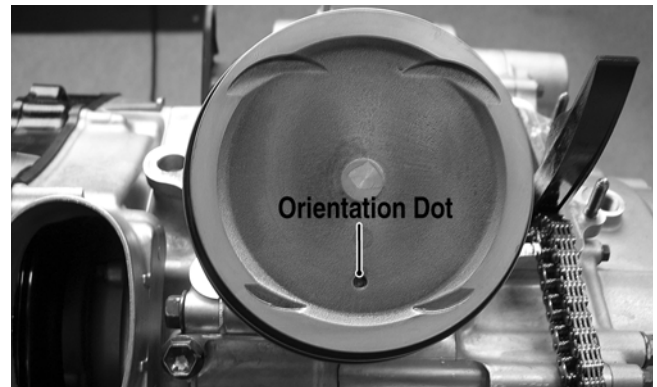
AT THIS POINT

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.

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.



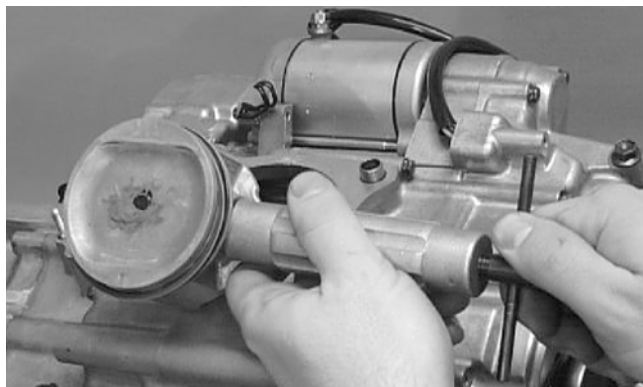
FI138A



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

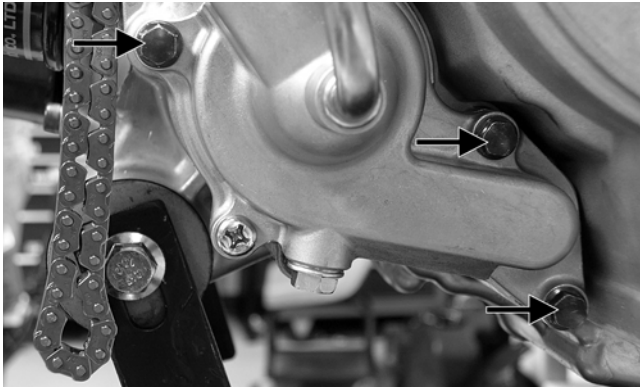
To service the recoil starter, see Servicing Left-Side Components sub-section.

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.

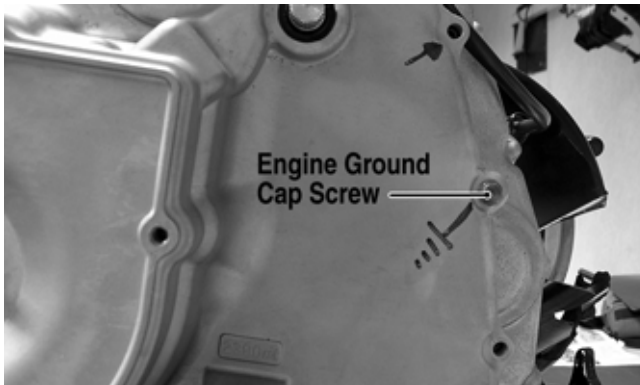


F1141A

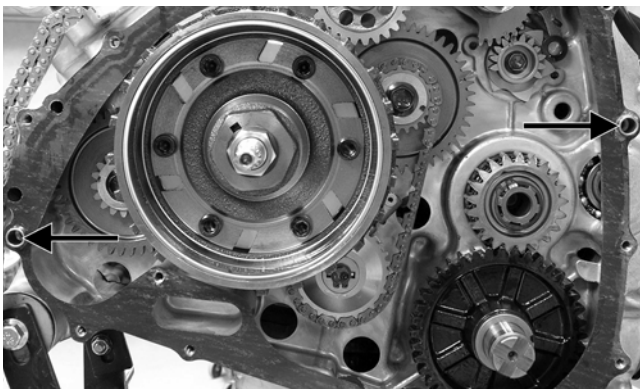
AT THIS POINT

To service the water pump, see Section 4.

4. Remove the cap screws securing the left-side cover to the crankcase noting the location of the engine ground cap screw for installing purposes; then remove the left-side cover. Account for a gasket and two alignment pins.

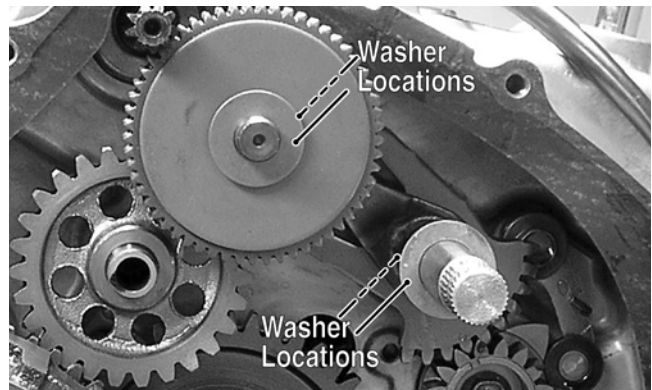


F1147A



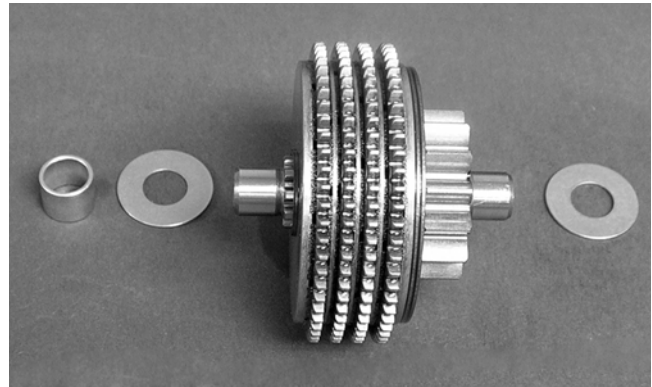
F1184A

■ **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.



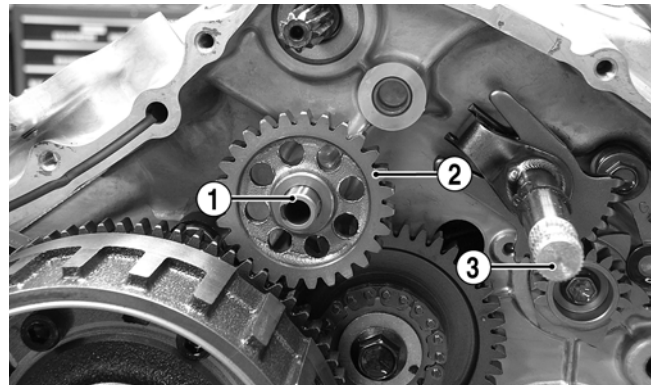
F1185A

5. Remove the starter torque limiter. Account for two washers, one bushing, and the shaft.



F1189

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.



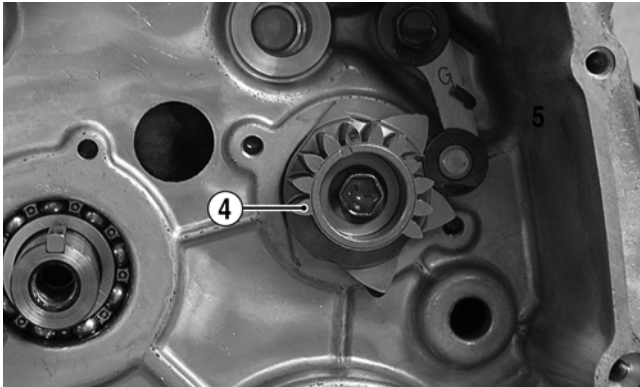
F1148A



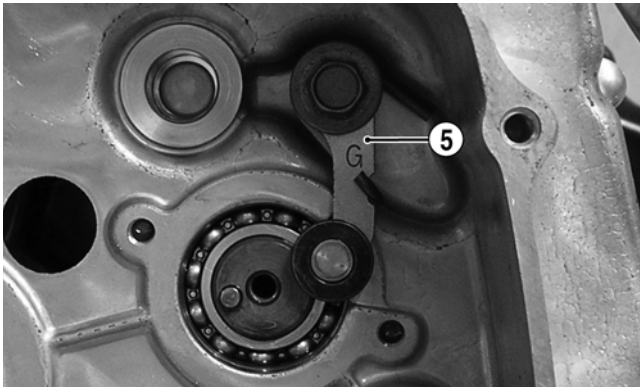
F1302

3

7. Remove the shift cam driven gear (4); then remove the cam stopper (5). Account for a spring.



FI311A

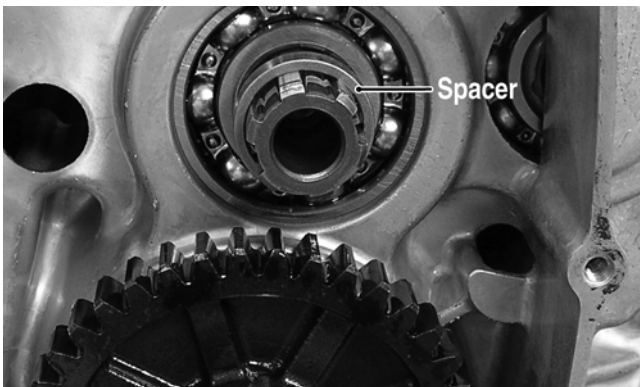


FI307A

8. Remove the circlip securing the drive gear on the countershaft; then remove the drive gear. Account for a spacer.

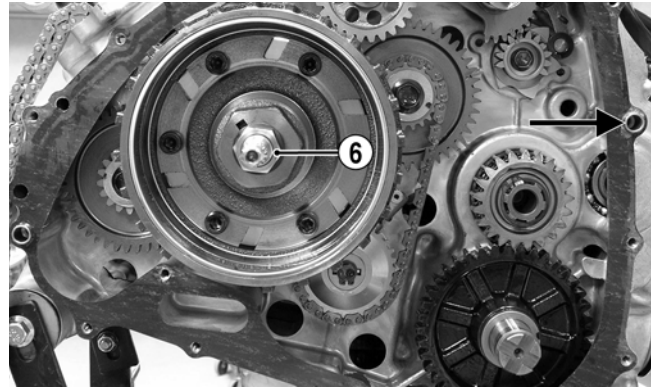


FI310

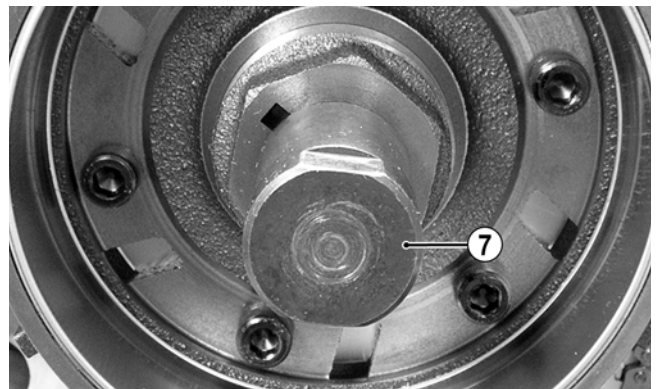


FI309A

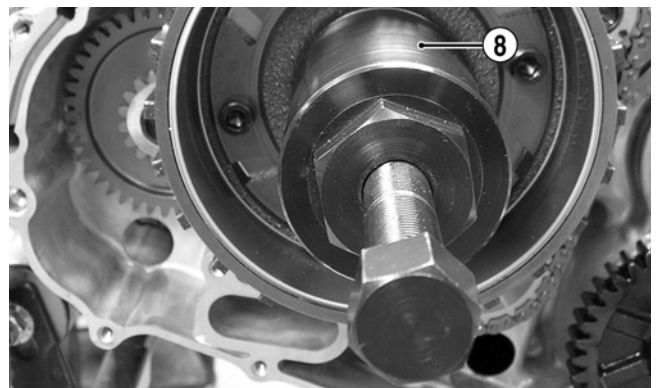
9. Remove the rotor/flywheel nut (6); then install the flywheel protector (7) and Magneto Rotor Remover (p/n 0444-206) (8) and remove the rotor/flywheel. Note the orientation of the one-way bearing.



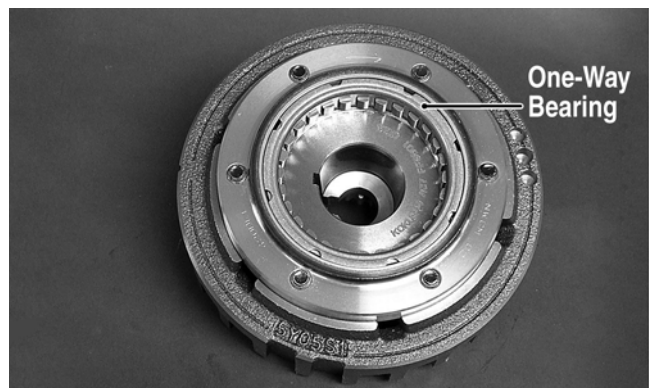
FI184B



FI191A



FI192A

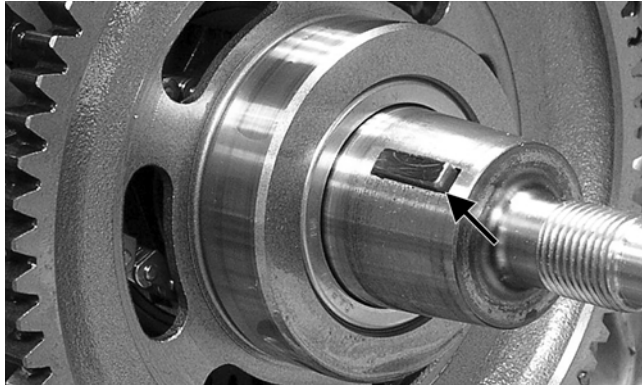


FI195A

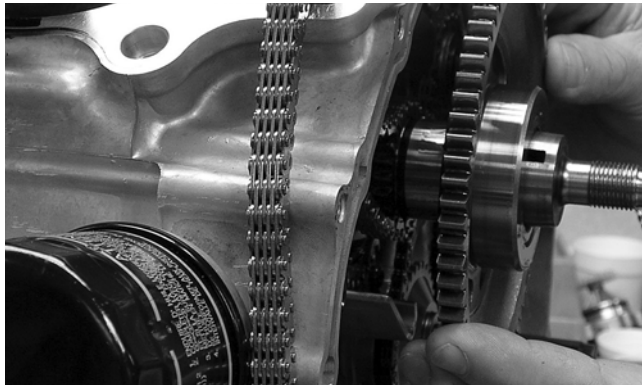
CAUTION

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.

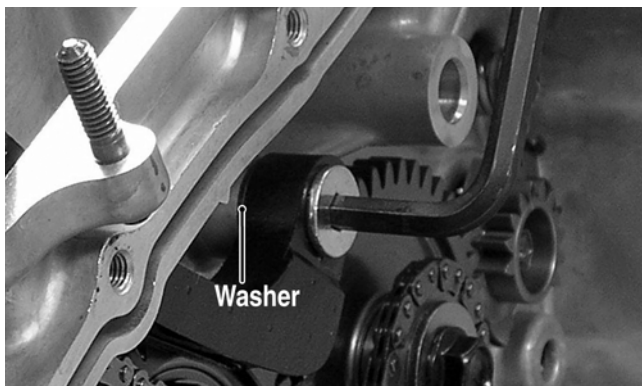


FI193A



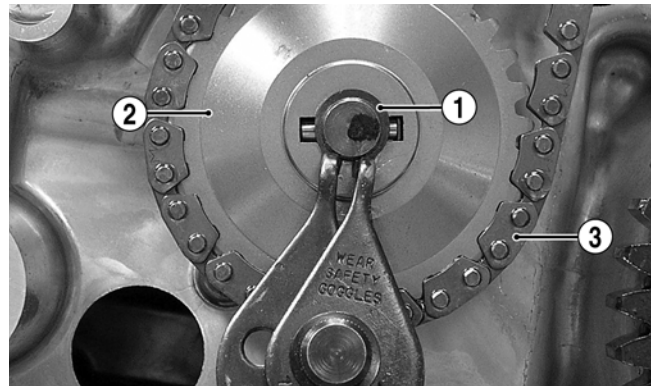
FI194

11. Remove the pivot bolt from the cam chain tensioner; then remove the cam chain tensioner and cam chain. Account for a washer.

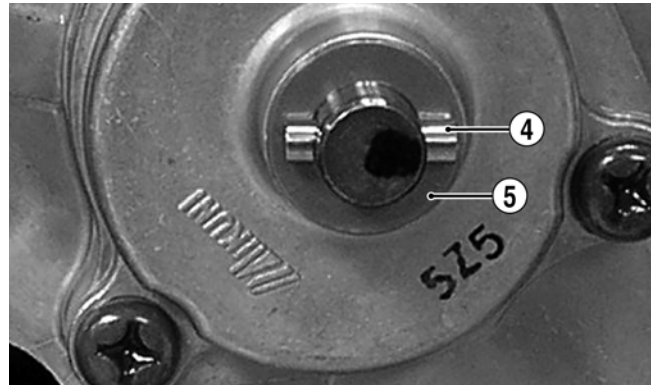


FI197A

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).



FI200A



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

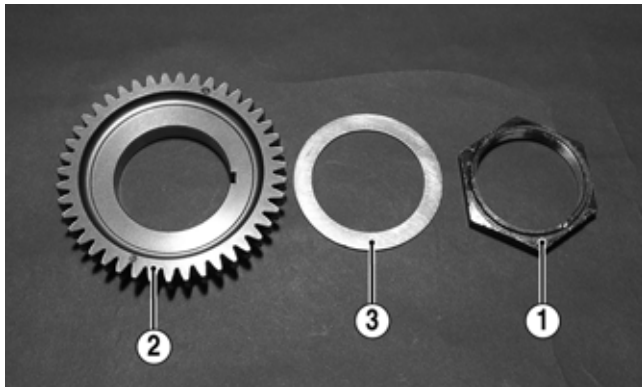
■ **NOTE:** The oil pump is not a serviceable component. Do not disassemble the oil pump. It is available only as a complete assembly.

14. Remove the cap screws from the crankshaft balancers; then remove the crankshaft balancer driven gears. Account for two washers and two keys.

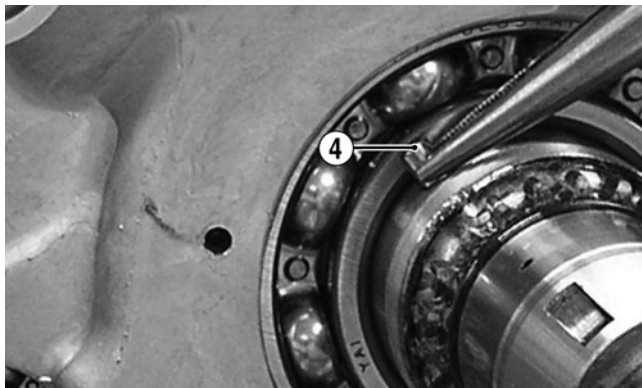


FI303A

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

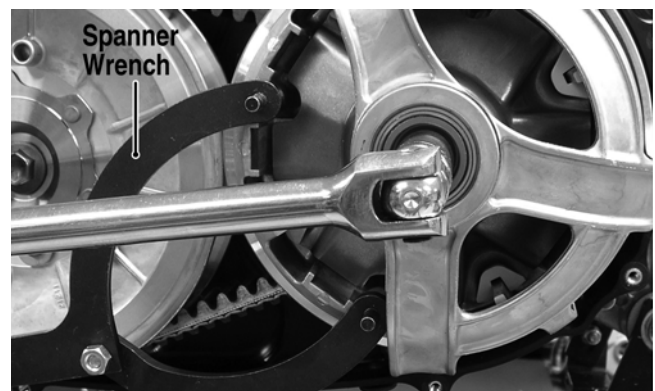
To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■ **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.

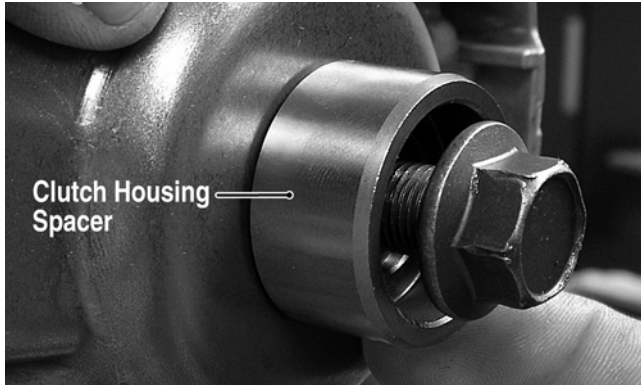


FI316A

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.

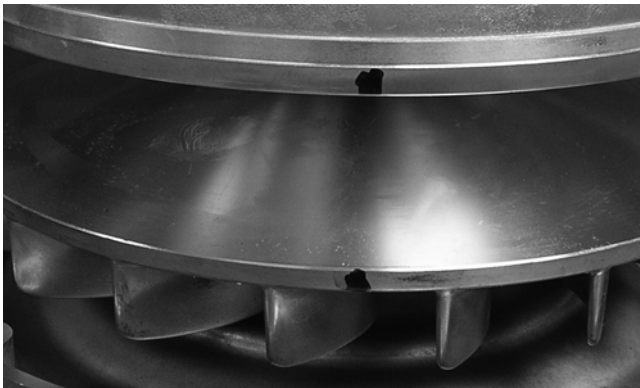


FI315



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.



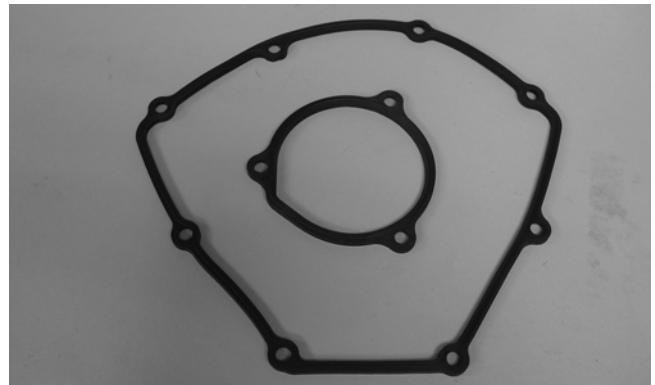
FI313

6. Remove the fixed drive face and center bushing.
7. Remove the eleven cap screws securing the inner V-belt cover to the clutch cover; then remove the inner V-belt cover. Account for two gaskets.



FI225A

3



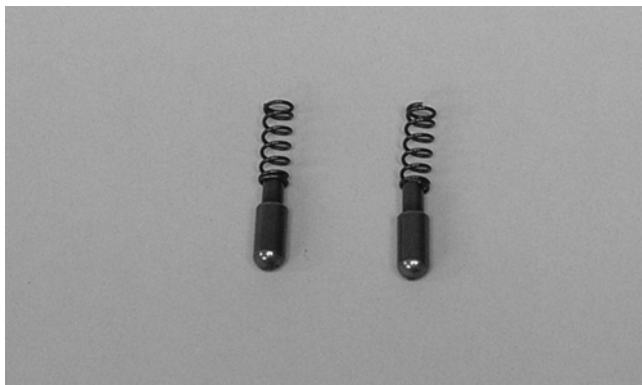
FI226

■ **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



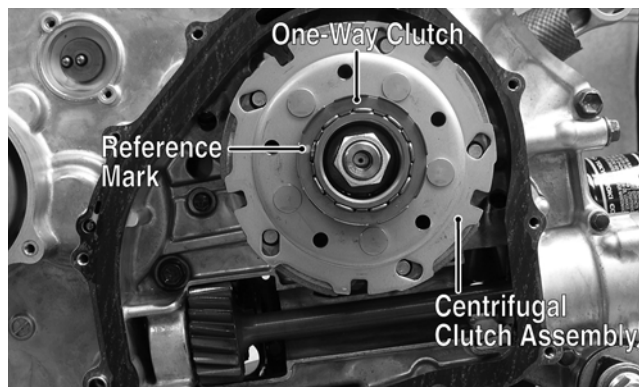
FI280

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 OUTSIDE stamped on the cage of the one-way clutch; then remove the one-way clutch.



FI271A

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.

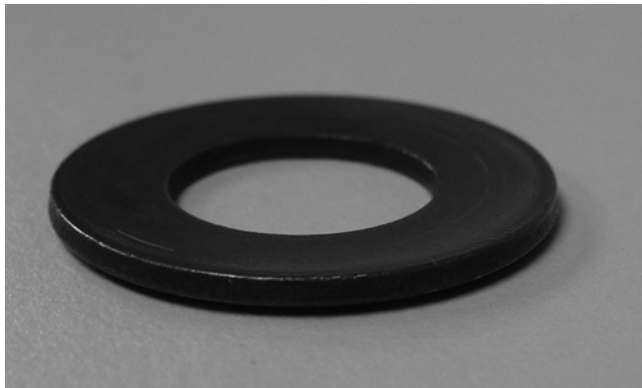


FI344

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

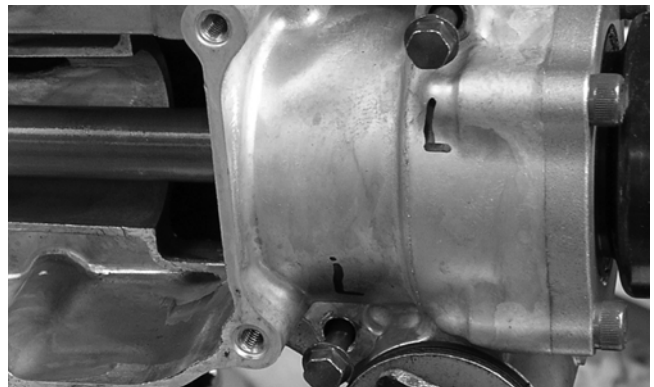


FI275

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.



FI276



FI277

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.

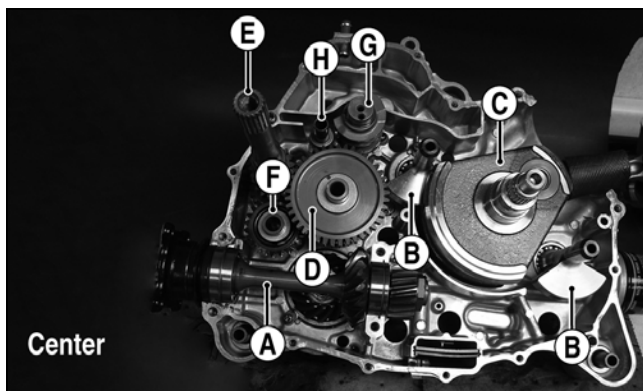
■ **NOTE:** To keep the shaft/gear assemblies intact for identification, tap the shafts toward the left-side crankcase half when separating the halves.



FI273

Disassembling Crankcase Half

■ **NOTE:** For steps 1-7, refer to illustration FI235A.



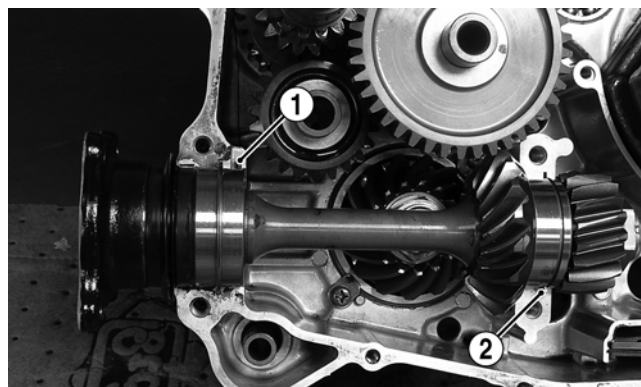
KEY

- | | |
|------------------------------------|------------------------------------|
| A. Secondary Driven Shaft Assembly | E. Driveshaft |
| B. Crank Balancer Assembly | F. Reverse Idler Gear Assembly |
| C. Crankshaft | G. Gear Shift Camshaft |
| D. Countershaft Assembly | H. Shift Fork Shaft with Two Forks |

FI235A

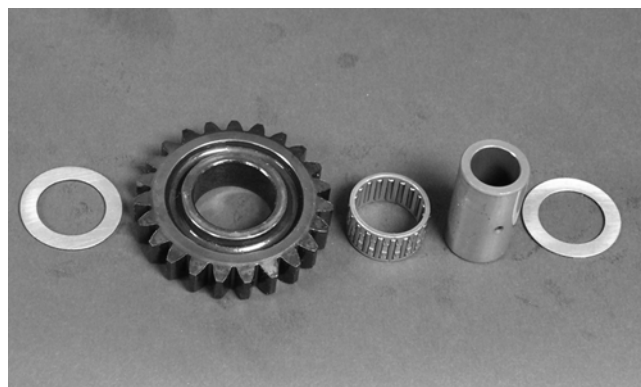
■ **NOTE:** To aid in assembling, it is recommended that the assemblies are kept together and **IN ORDER**.

1. Remove the secondary driven shaft assembly (A) noting the location of the bearing locating pin (1). Account for the bearing C-ring (2).



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.



FI282B

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



FI343

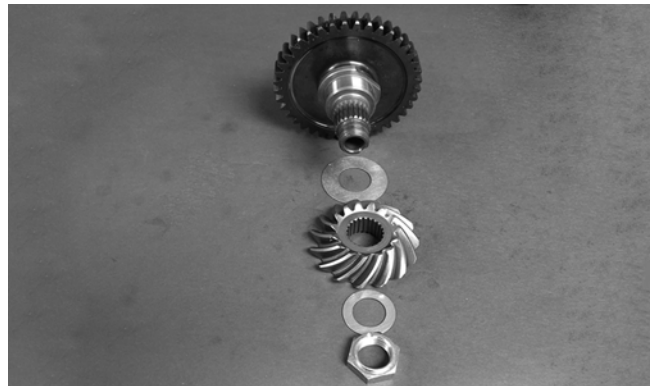
■ **NOTE:** Do not disassemble the countershaft assembly unless necessary. If necessary, see Servicing Center Crankcase Components sub-section.

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.



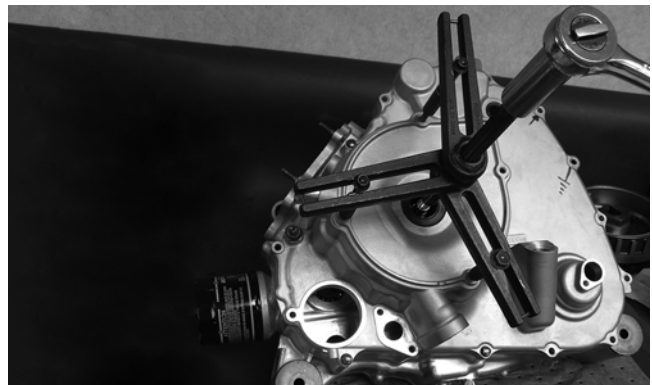
FI407

⚠ 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

Table of Contents (Servicing Components)

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

Servicing Top-Side Components	3-274
Cylinder Head/Valve Assembly	3-274
Piston Assembly	3-277
Cylinder Assembly	3-278
Servicing Left-Side Components	3-281
Recoil Starter	3-281
Inspecting Oil Pump	3-284
Servicing Right-Side Components	3-284
Inspecting Centrifugal Clutch Shoe	3-284
Inspecting Clutch Housing	3-284
Inspecting Primary One-Way Drive	3-285
Driven Pulley Assembly	3-285
Servicing Center Crankcase Components	3-289
Secondary Gears	3-289
Crankshaft Assembly	3-290
Countershaft	3-291

Servicing Top-Side Components

■ **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

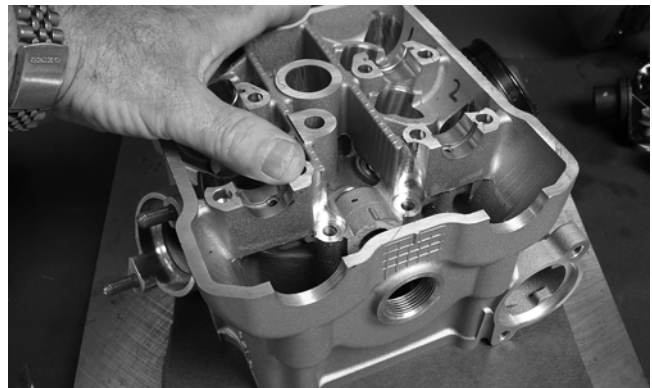
The cylinder head studs must be removed for this procedure.

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.

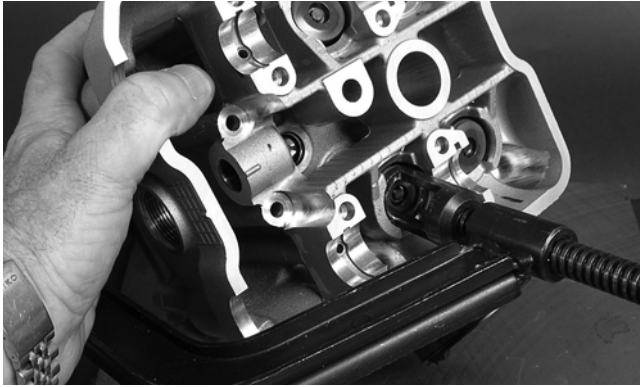


FI357

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.



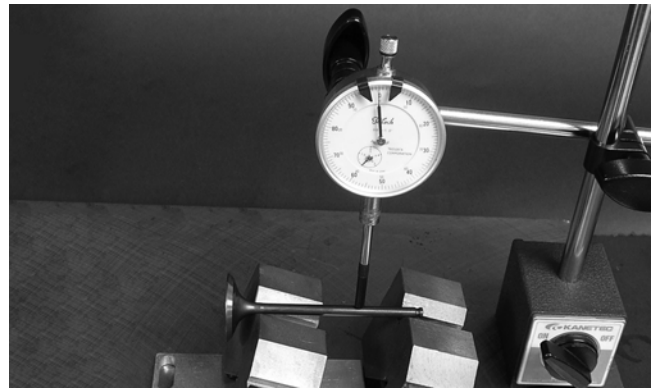
FI351

■ **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.

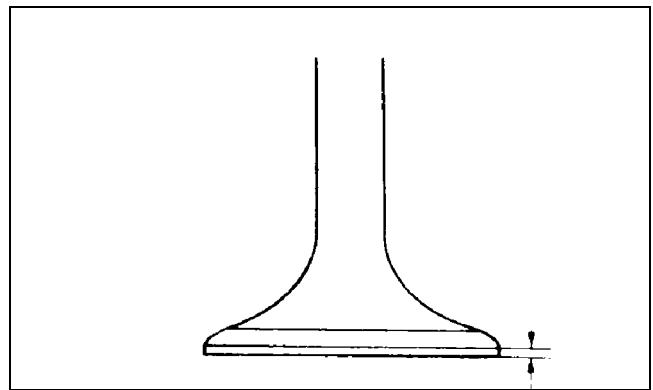
Measuring Valve Stem Outside Diameter

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.

3

Measuring Valve Face/Seat Width

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

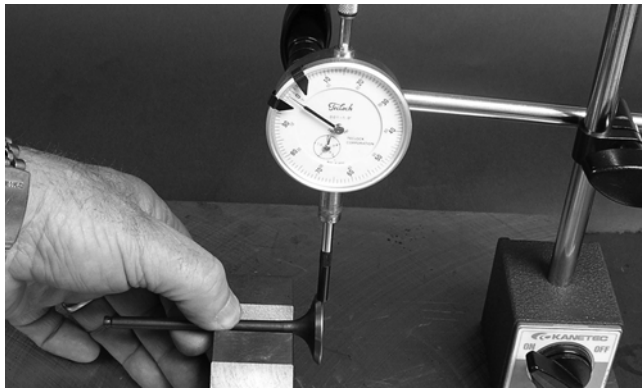


ATV-1004

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.

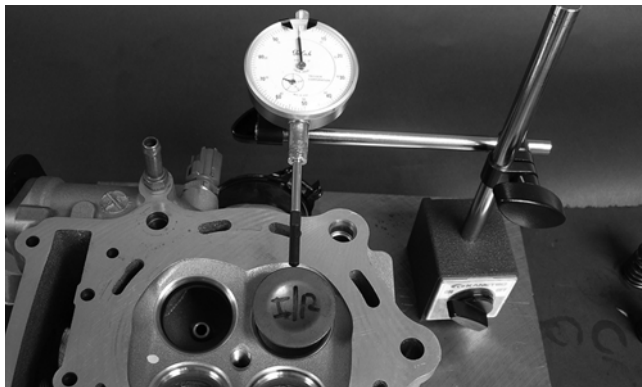


FI328

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.



FI323

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

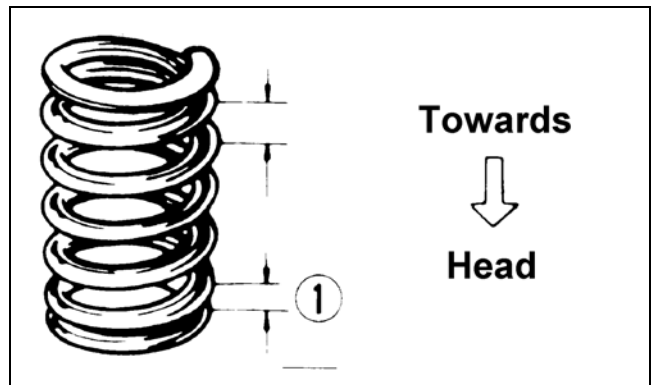
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



FI351

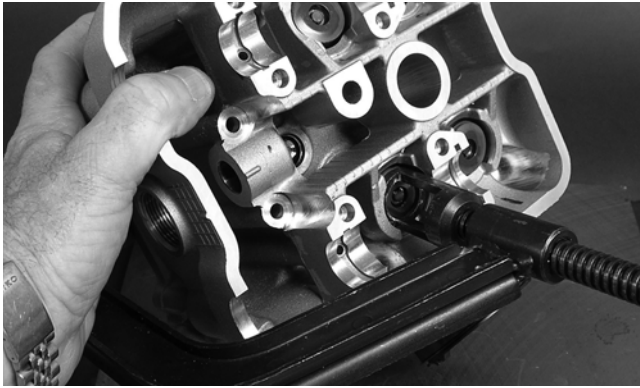
2. Insert each valve into its original valve location.
3. Install the valve springs with the painted end of the spring facing away from the cylinder head.

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



ATV-1011A

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



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

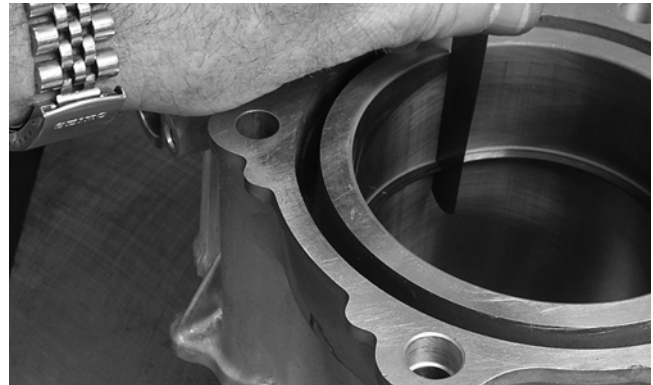
1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

⚠ 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)

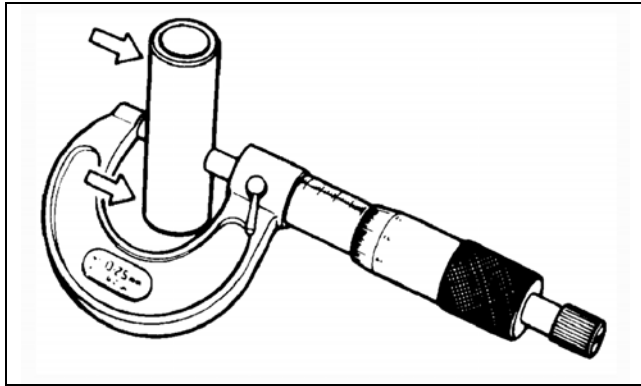
1. Place each compression ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must be within specifications.



FI327

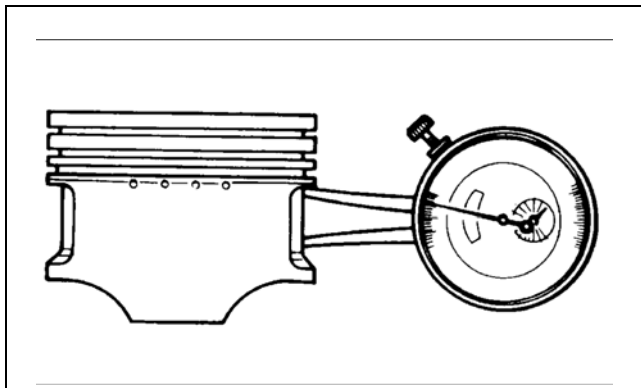
Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

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

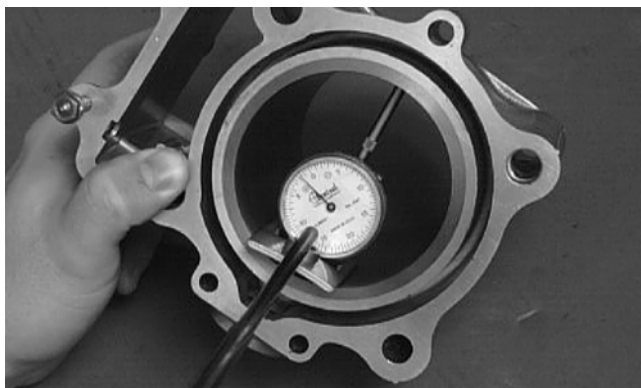
2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



ATV-1069

Measuring Piston Skirt/ Cylinder Clearance

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

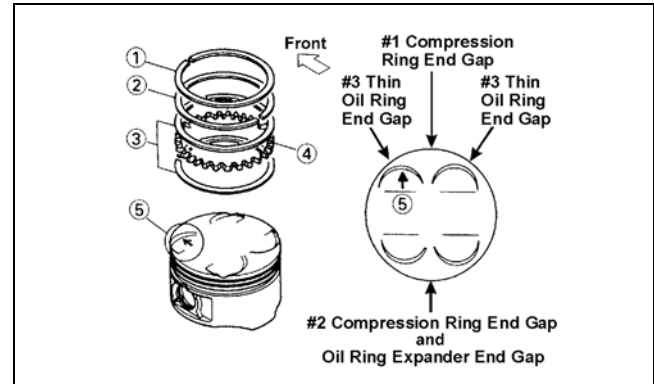


CC127D

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

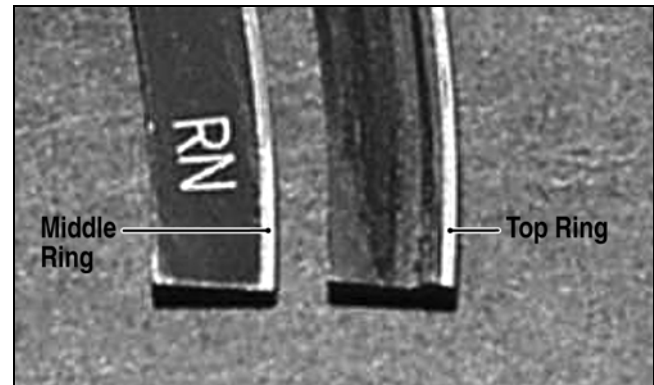
Install ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap. Stagger the end gaps of the upper and lower thin oil rings according to the illustration.



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.

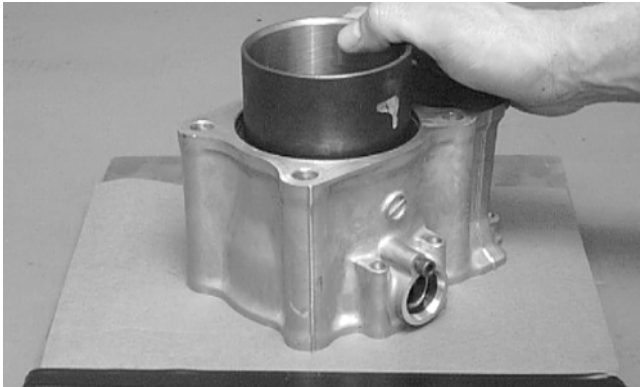
Cleaning/Inspecting Cylinder

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).

- 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.



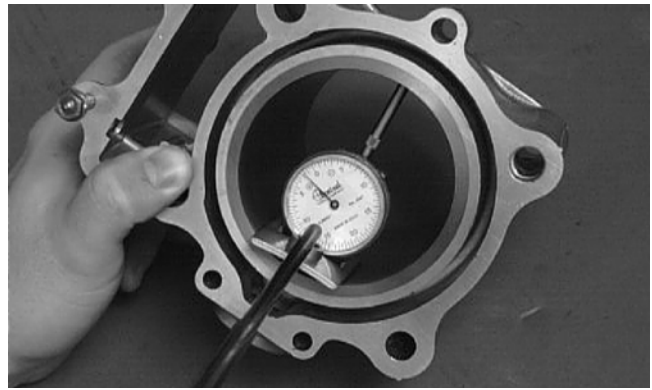
CC129D

Inspecting Cam Chain Guide

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

Honing Cylinder

- 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.



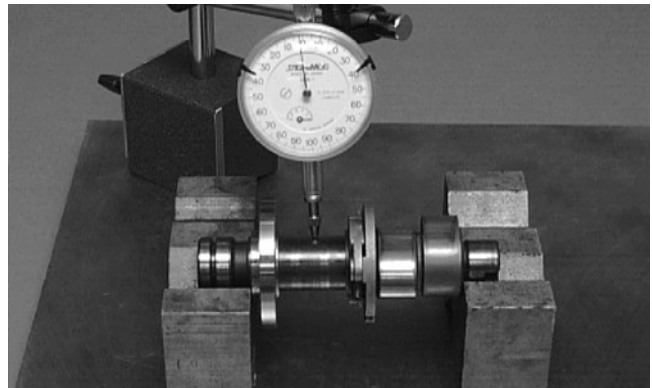
CC127D

- Wash the cylinder in parts-cleaning solvent.
- Inspect the cylinder for pitting, scoring, scuffing, and corrosion. If marks are found, replace the cylinder.
- 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.

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

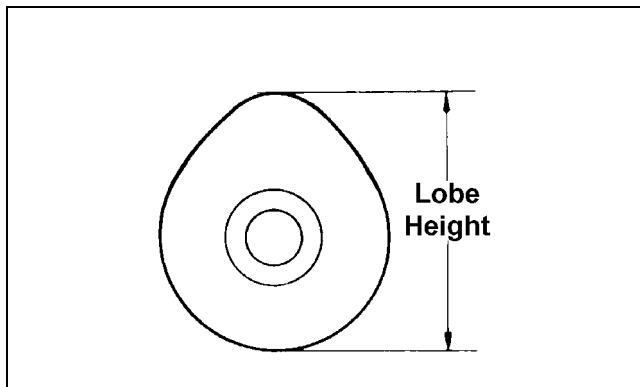


CC283D

- 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

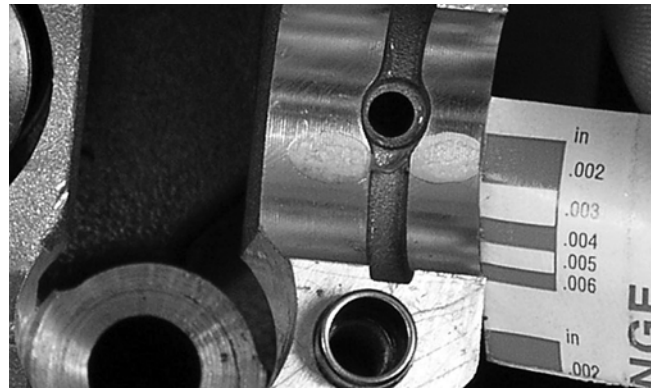
1. Inspect the bearing journal for scoring, seizure marks, or pitting.
2. If excessive scoring, seizure marks, or pitting is found, the cylinder head assembly must be replaced.

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.

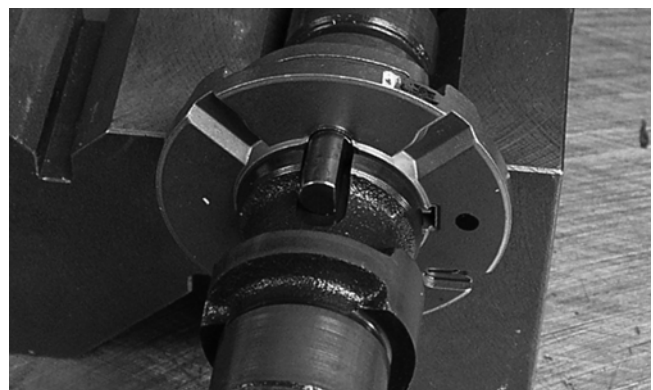


FI377

■ **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

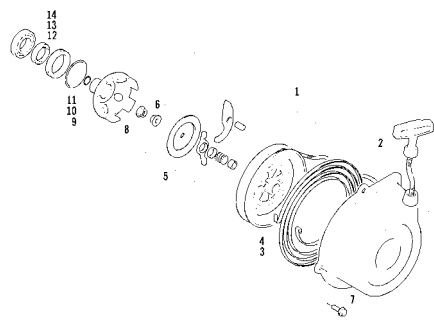
2. If damaged, the camshaft must be replaced.

Servicing Left-Side Components

RECOIL STARTER

KEY

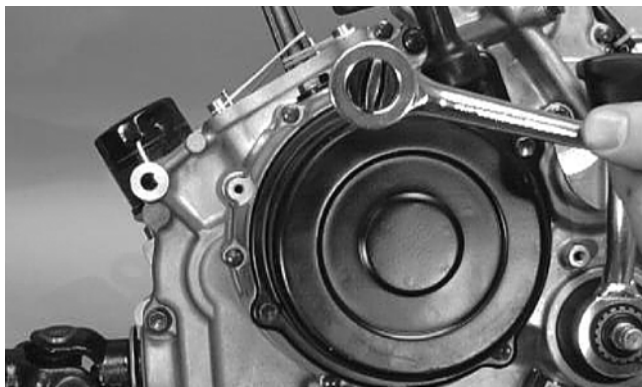
1. Recoil Starter Assy
2. Rope Assy
3. Spiral Spring
4. Reel
5. Ratchet Assy
6. Nut
7. Cap Screw
8. Nut
9. Starter Cup
10. O-Ring
11. O-Ring
12. Spacer
13. Oil Seal
14. Bearing



0737-764

Removing/Disassembling

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

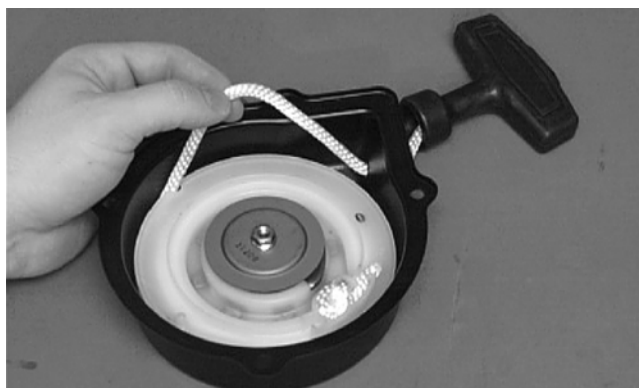


CC039D

⚠ 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.

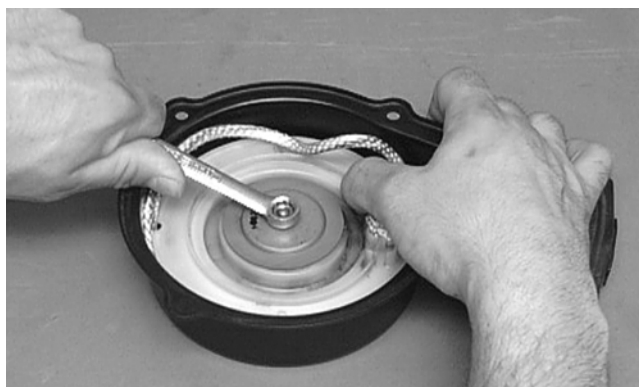


B600D

⚠ CAUTION

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

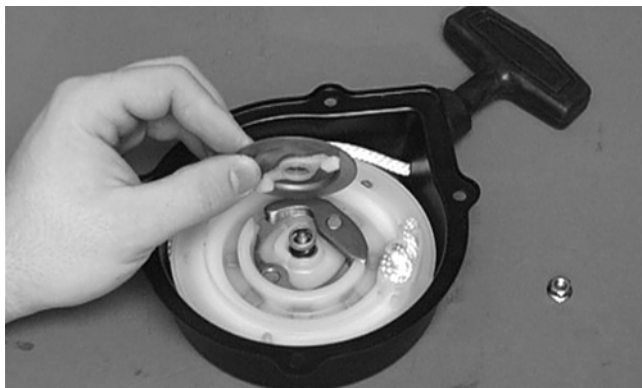
3. Remove the nut.



B601D

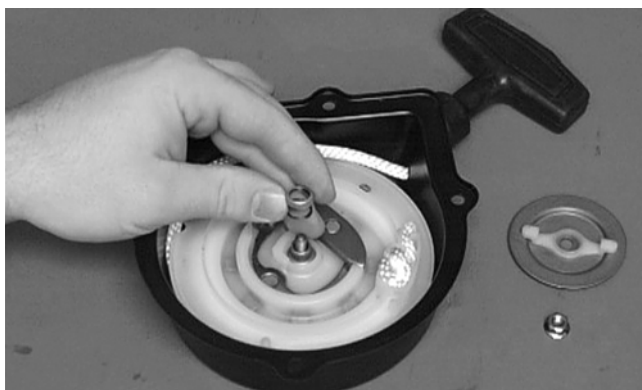
4. Slowly release the friction plate and lift the plate with ratchet guide free of the recoil case; then remove the ratchet guide from the friction plate.

3



B602D

5. Remove the spring, collar, and friction spring.



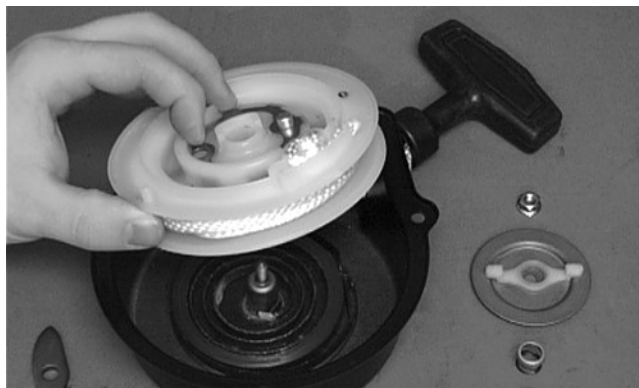
B603D

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

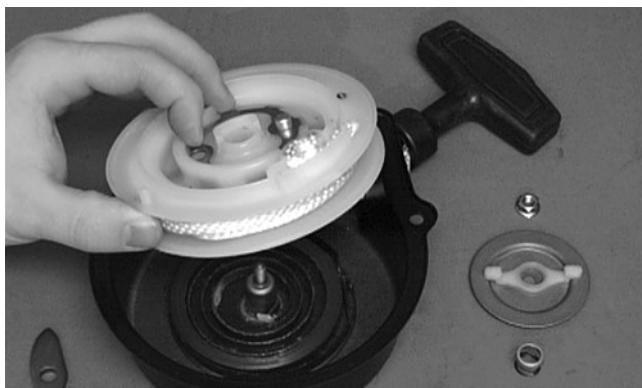
1. If removed, insert the spiral spring into the case with the outer end of the spring around the mounting lug in the case; then wind it in a counterclockwise direction until the complete spring is installed.

■ **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 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.



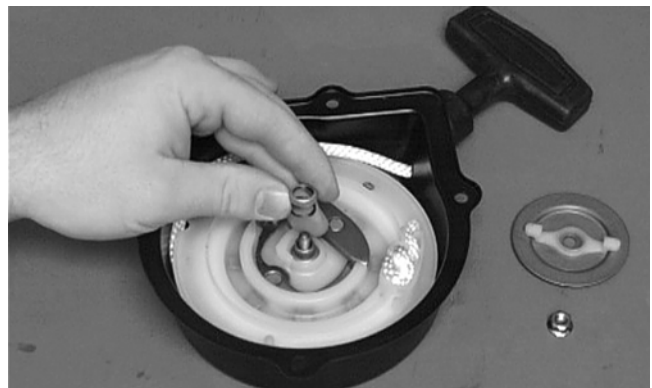
B605D

6. Install the ratchet 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

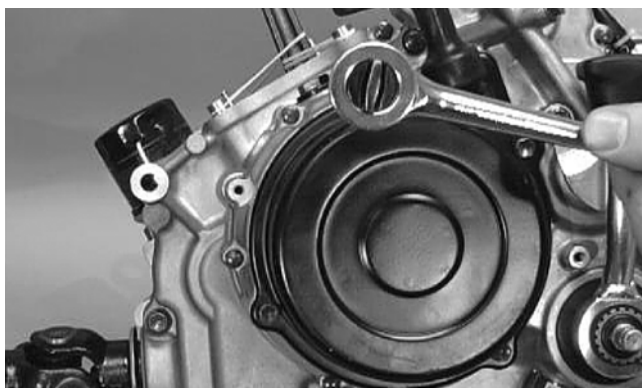
9. While pushing down on the reel, install the nut. Tighten securely.

3



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

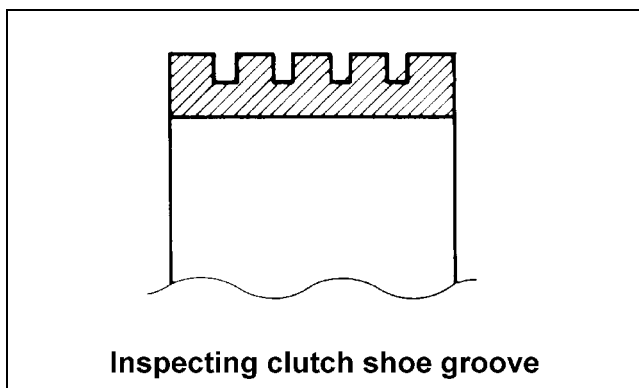
■ **NOTE:** Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.

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.



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.

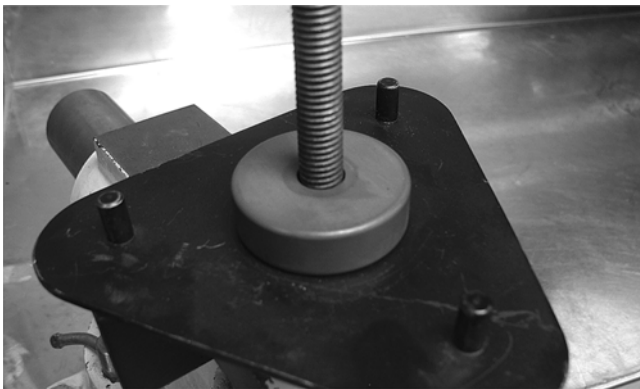
DRIVEN PULLEY ASSEMBLY

Disassembling

WARNING

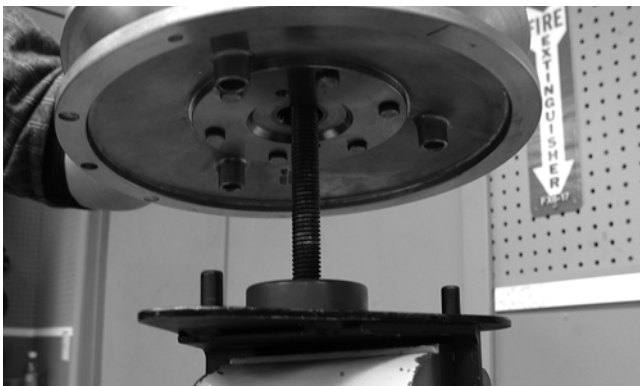
This procedure involves relaxing a compressed spring assembly. **DO NOT** attempt disassembling without the proper tools.

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.



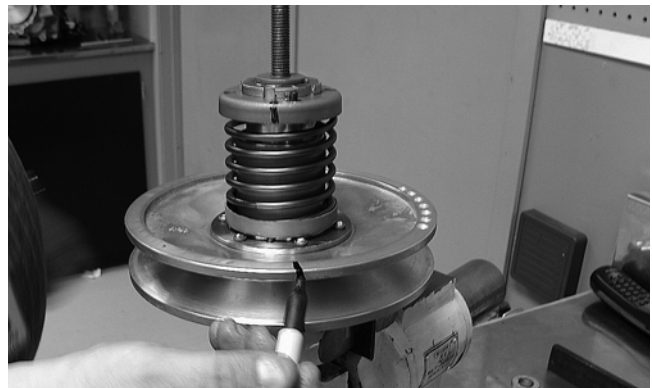
CD048

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.



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.



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.



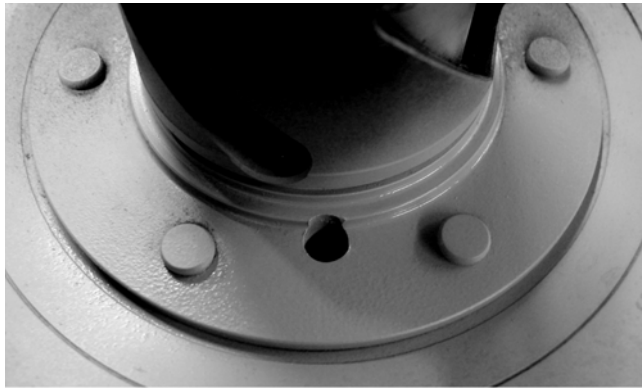
CD060

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.



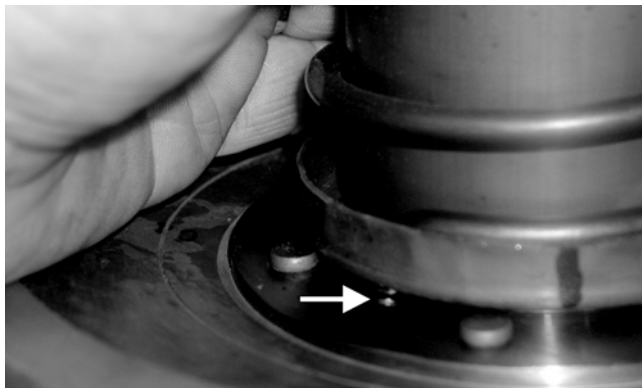
CF095A

4. Install the movable face sleeve aligning the hole in the spring seat with the spring anchor hole in the movable face.



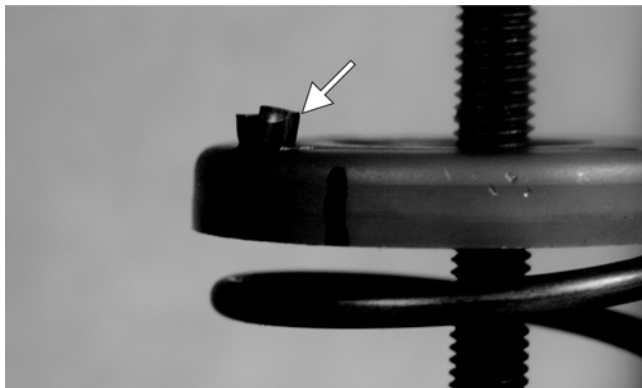
CF097

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 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.

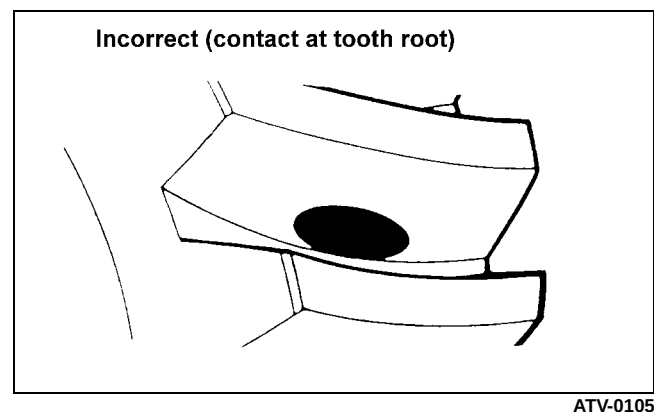
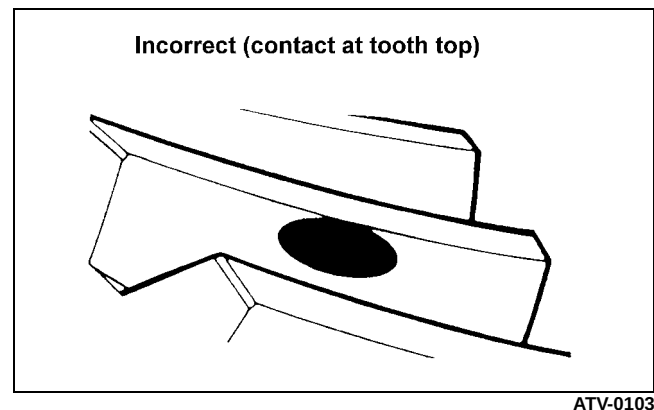
■ **NOTE:** Continue to remove, measure, and install until backlash measurement is within tolerance. Note the following chart.

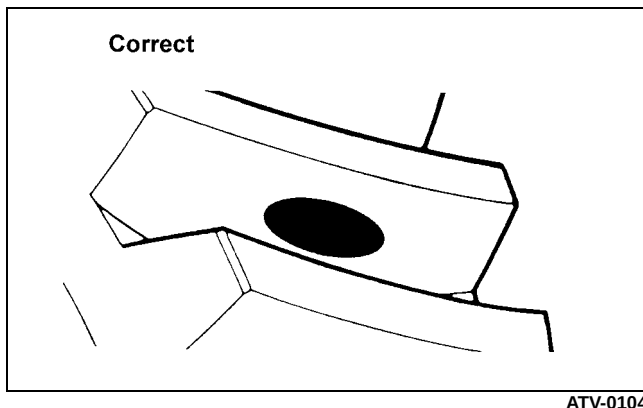
Backlash Measurement	Shim Correction
Under 0.03 mm (0.001 in.)	Increase Shim Thickness
At 0.03-0.15 mm (0.001-0.006 in.)	No Correction Required
Over 0.15 mm (0.006 in.)	Decrease Shim Thickness

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




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	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.

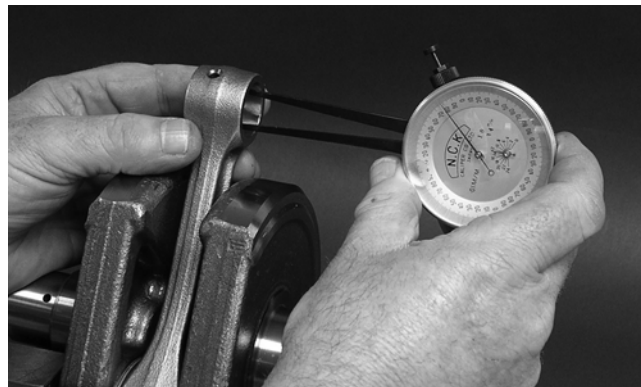
⚠ CAUTION

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.



FI267

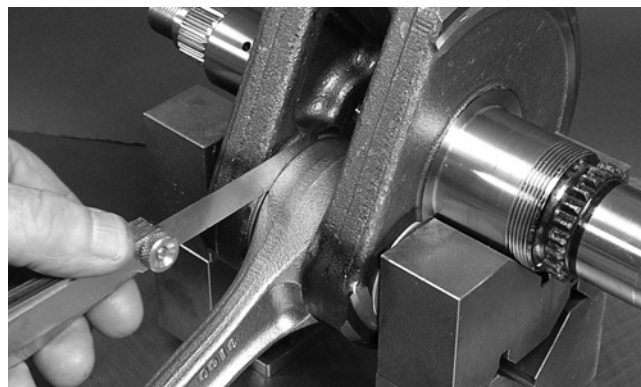
2. Maximum diameter must not exceed specifications.

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

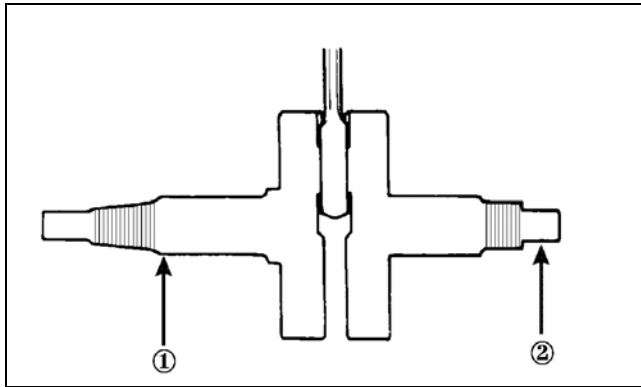
3. Maximum gap range must not exceed specifications.

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

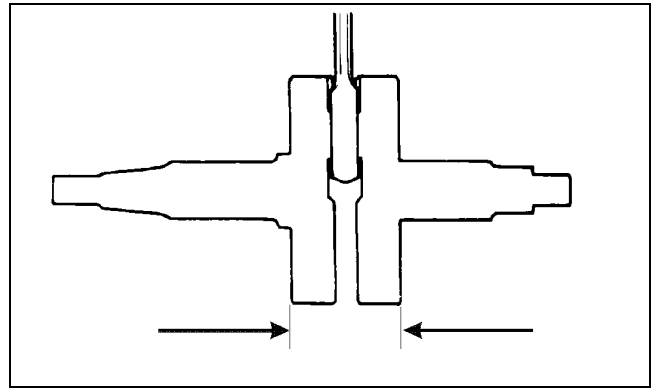
Care should be taken to support the connecting rod when rotating the crankshaft.

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-1017

2. Acceptable width range must be within specifications.

COUNTERSHAFT

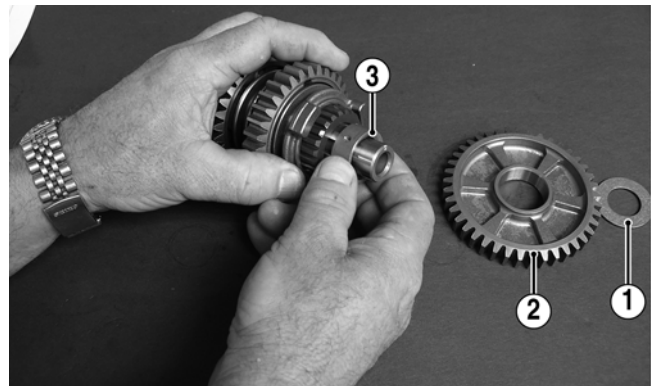
CAUTION

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

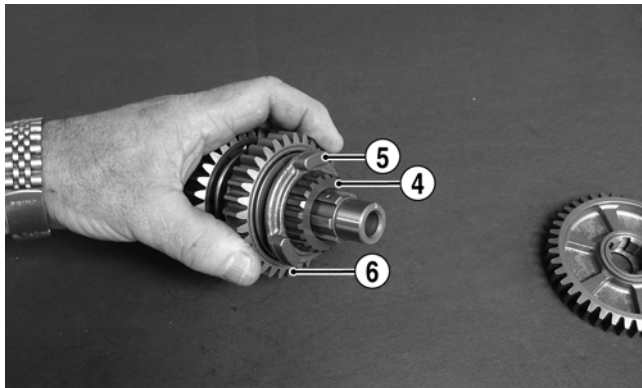
Disassembling

1. Remove the thrust washer (1); then remove the low driven gear (2) and the bushing (3) noting the orientation of the oil hole.

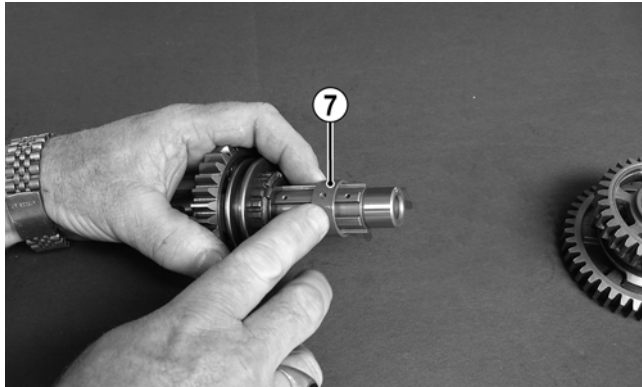


FI391A

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).

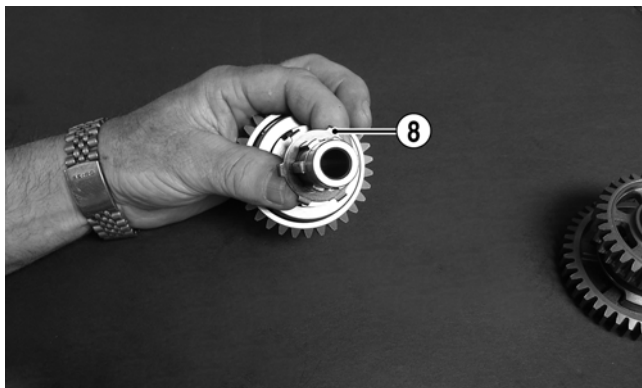


FI392A

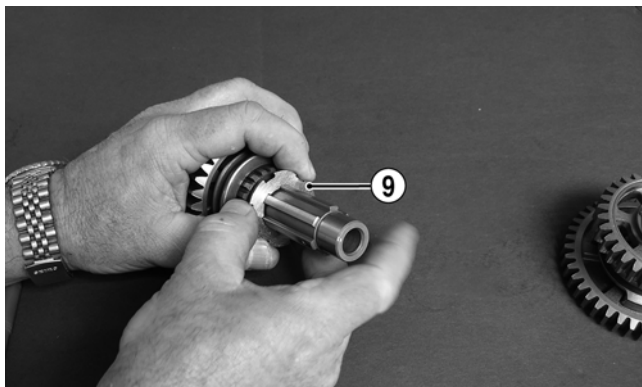


FI393A

3. Remove the locking tab washer (8); then rotate the thrust washer (9) and remove from the countershaft.

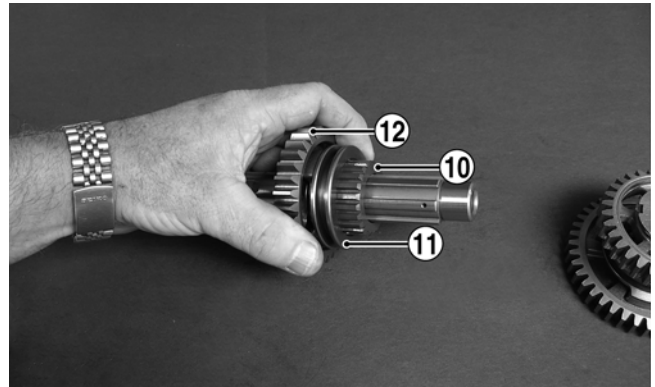


FI395A

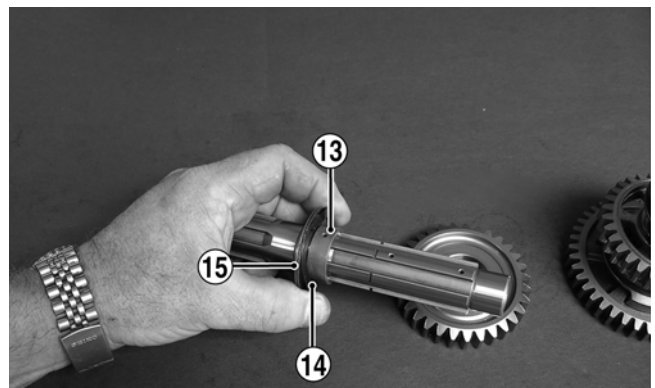


FI396A

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).



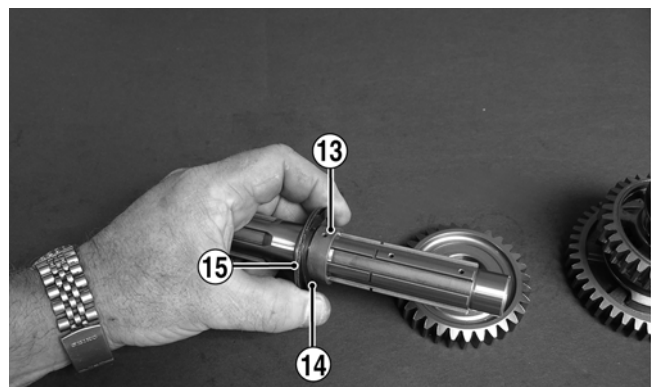
FI397A



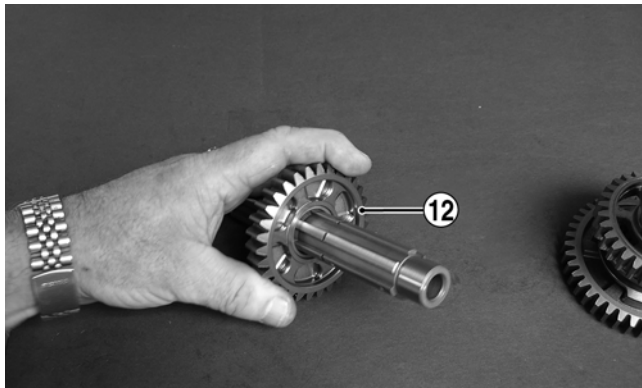
FI399A

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).

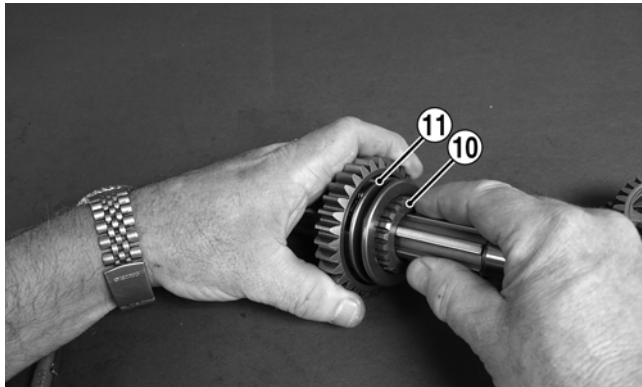


FI399A



FI398A

2. Install the high driven gear spacer (10) and high driven clutch dog (11).

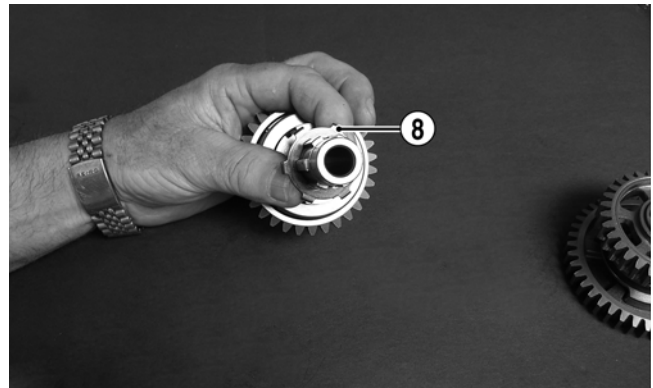


FI402A

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.

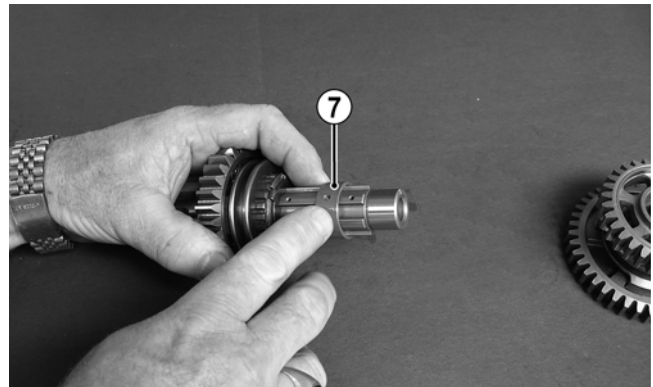


FI396A

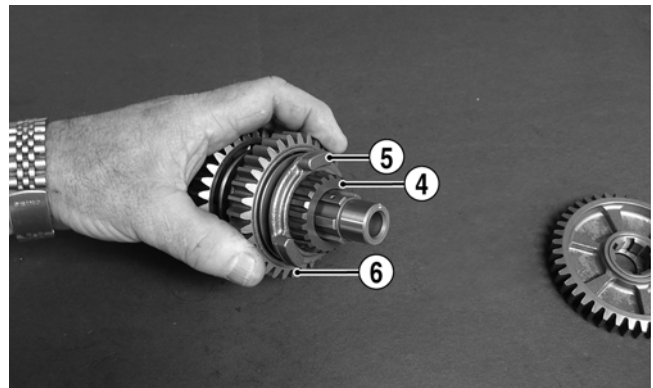


FI395A

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).



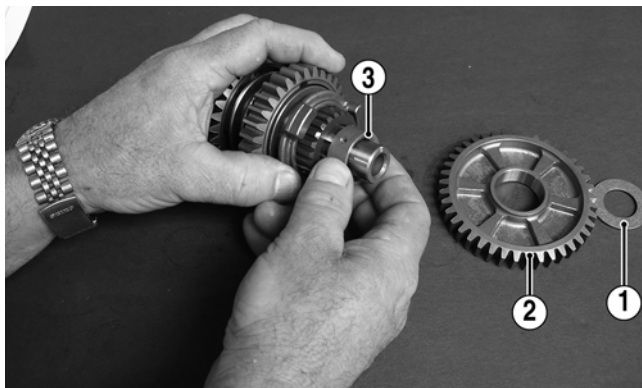
FI393A



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).

3



FI391A

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

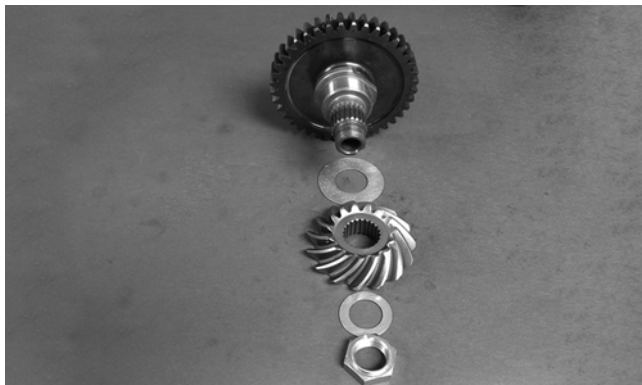


FI406

■ **NOTE:** When installing the countershaft assembly, account for the washer on each end of the shaft.

Assembling Crankcase Half

1. Install the output shaft assembly into the crankcase making sure the driven bevel gear, shim, washer, and nut are properly sequenced.



FI407

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

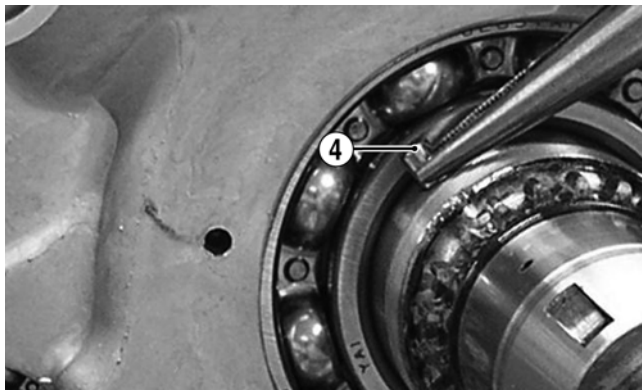
3. Apply a liberal amount of engine oil to the crankshaft bearing. Using a propane torch, heat the bearing until the oil begins to smoke; then slide the crankshaft assembly into place.



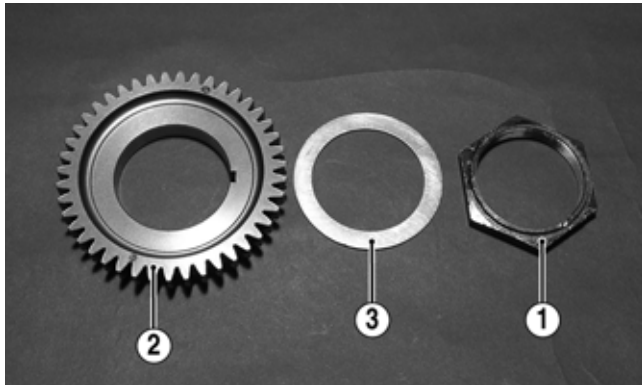
FI409

■ **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.

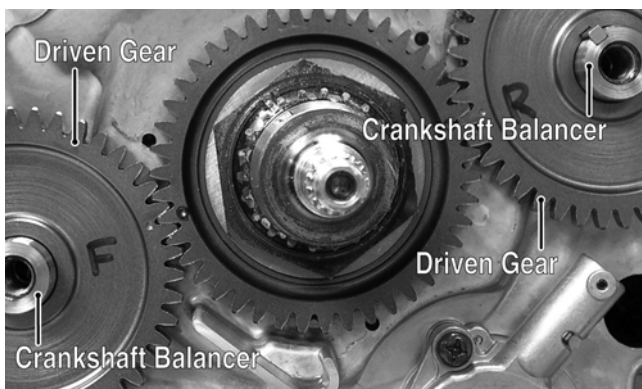


FI318A



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

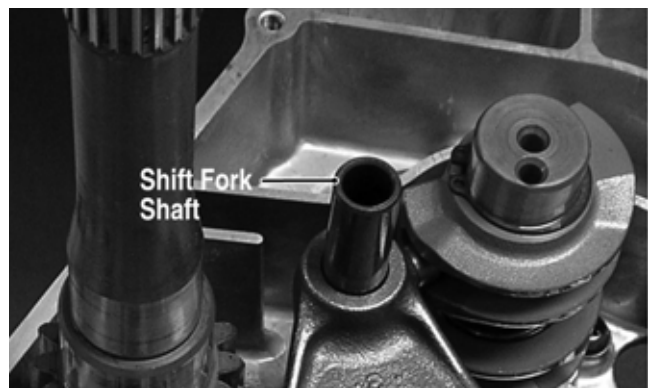
7. Install the assembled countershaft; then install the driveshaft.



FI343

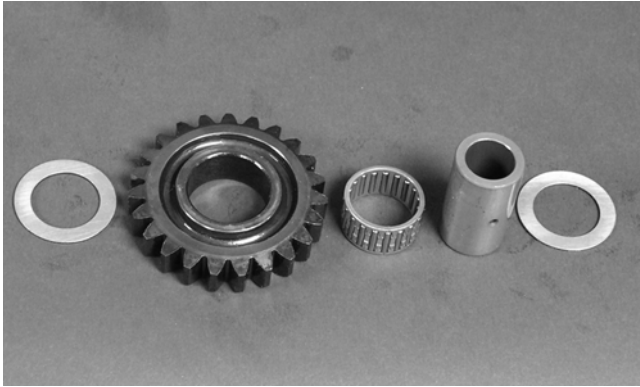
8. Install the shift cam assembly making sure the two holes on the end of the shaft are positioned vertically.
9. Insert the two shift forks into the sliding dogs noting the direction of the tabs from disassembling; then install the gear shift fork shaft.

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



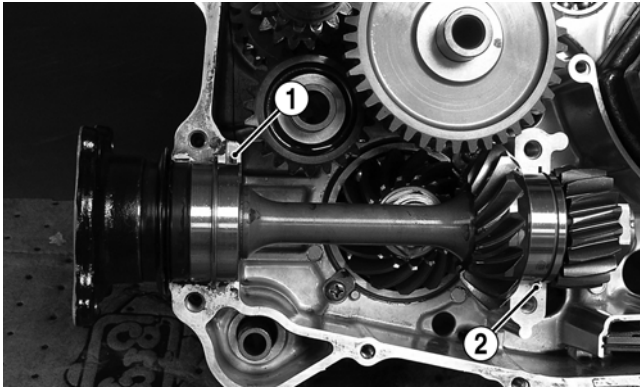
FI282A

10. Install the reverse idler gear assembly noting the positioning of the two washers, gear, bushing, and shaft.



F1291

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.



F1288A

12. Place the oil strainer into position in the left crankcase half.



F1299

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.

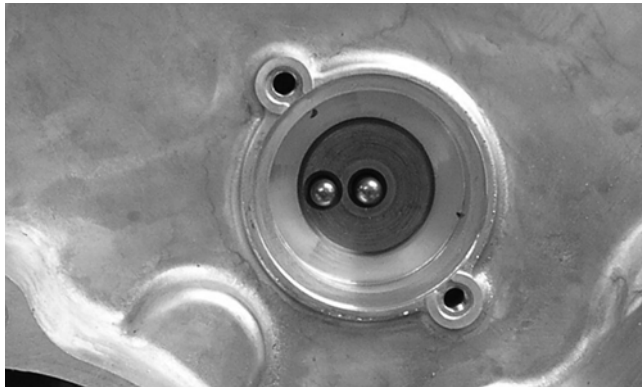
■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

AT THIS POINT

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



FI281

2. Using a new O-ring, install the oil jet in the right side of the crankcase.



FI337

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.

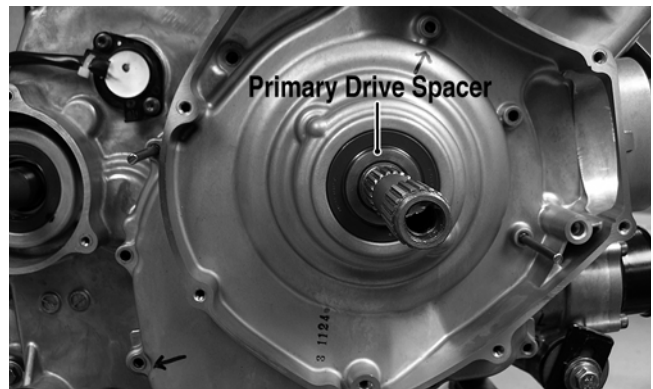


FI279A

4. Lightly grease the clutch housing seal; then insert the primary drive spacer.



FI344



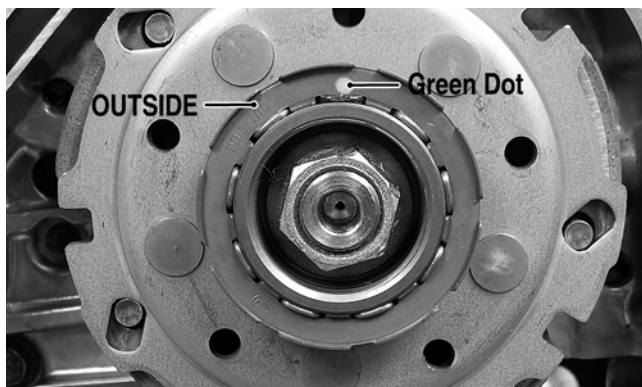
FI420A

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.

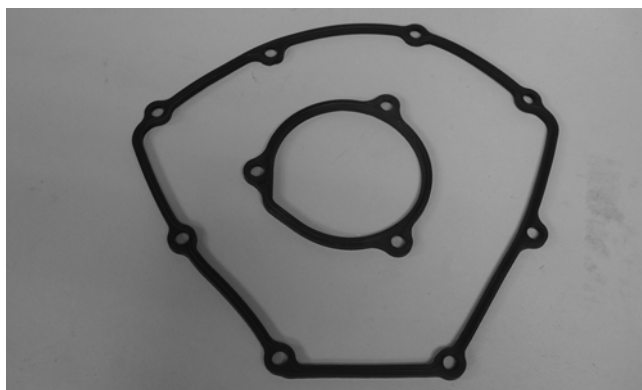
3



FI442A

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



FI225

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.

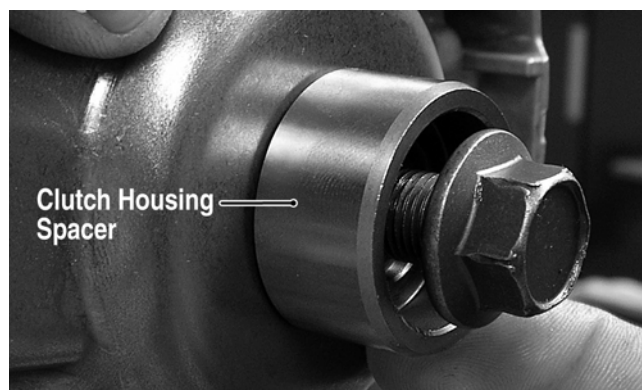
13. Place the V-belt into position over the front shaft.



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

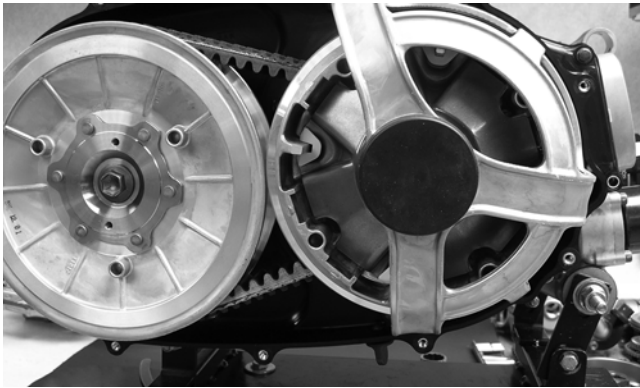
⚠ CAUTION

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.



F1220

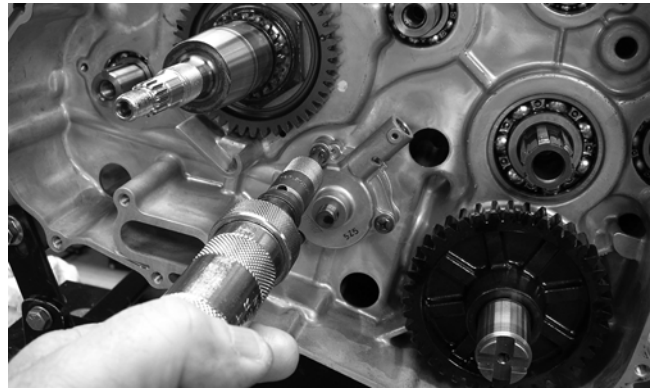
17. Place the V-belt cover gasket into position; then install the cover and secure with the cap screws making sure the different-lengthed cap screws are in their proper location. Tighten the cap screws to specifications.

Installing Left-Side Components

1. Install the oil pump securing it to the crankcase with three Phillips-head cap screws (threads coated with red Loctite #271). Tighten securely.



F1426



F1219

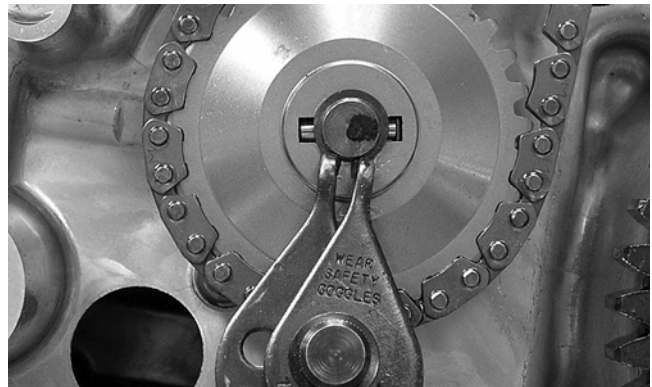
2. Install the drive pin in the oil pump shaft; then with the drive chain around both the drive sprocket and the driven sprocket, install the driven sprocket onto the oil pump engaging the drive pin. Secure with the circlip.

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

3



F1421



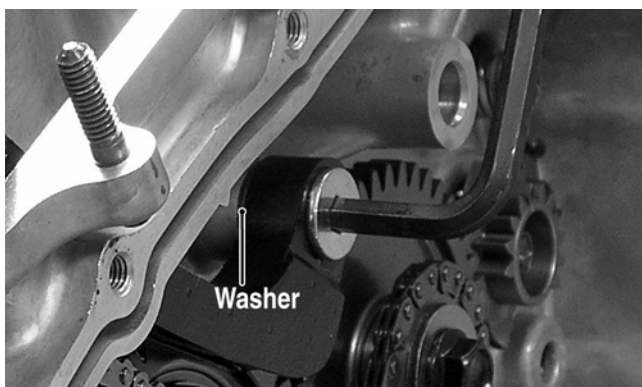
F1200

3. Apply red Loctite #271 to the two crankshaft balancer cap screws and tighten to specifications.



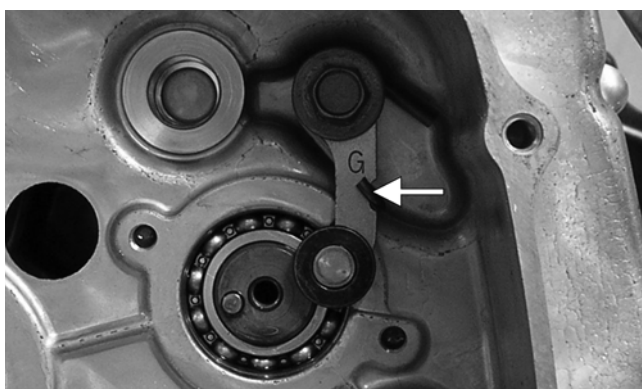
FI432A

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.

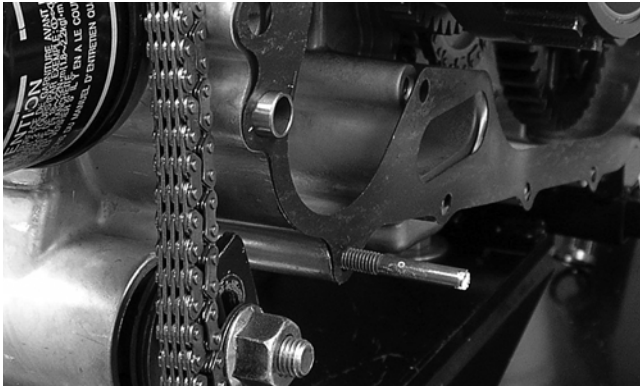


FI427



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.

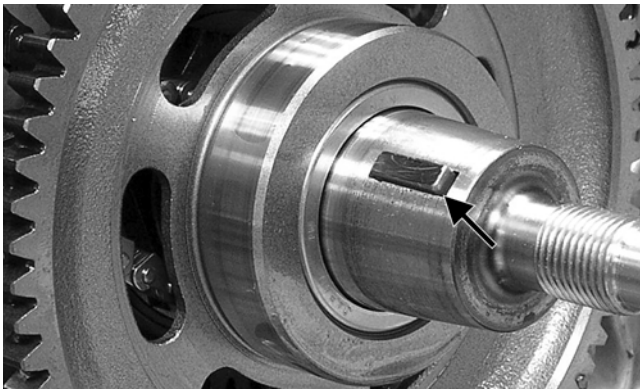


FI435

⚠ CAUTION

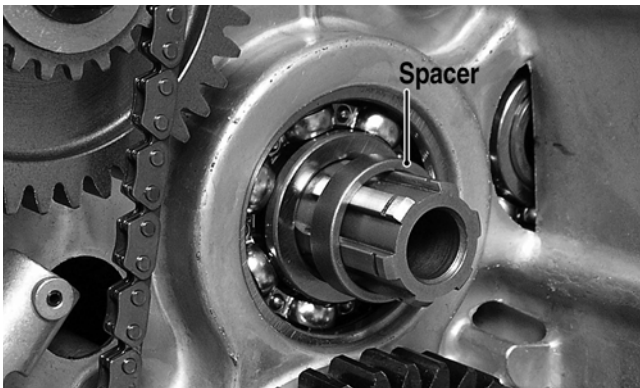
Do not turn the engine with the cam chain loose or severe engine damage will occur.

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.

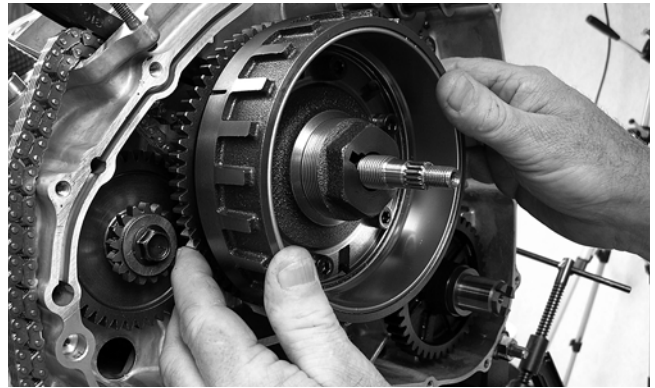


FI430A



FI422

11. Clean any oil or grease from the crankshaft and rotor/flywheel and secure with the flange nut. Tighten to specifications.



FI425

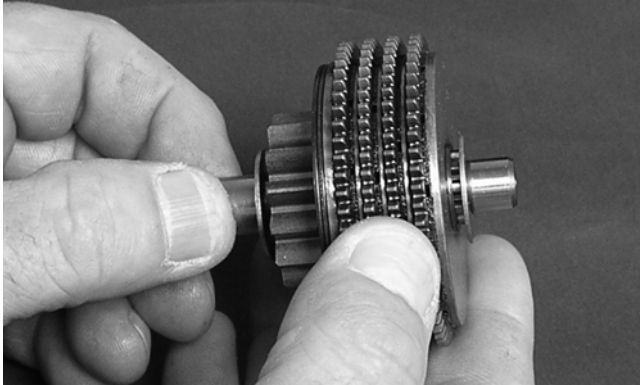


FI436

12. Install the starter idler gear and shaft; then with a washer on each side, install the starter torque limiter and bushings.



FI148



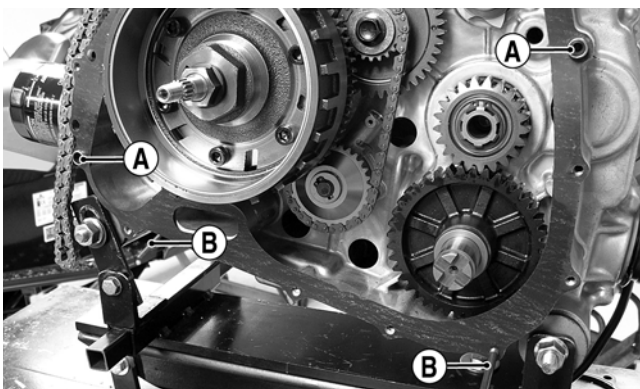
FI301

13. Install the two alignment pins (A) in the crankcase; then place the gasket in position.



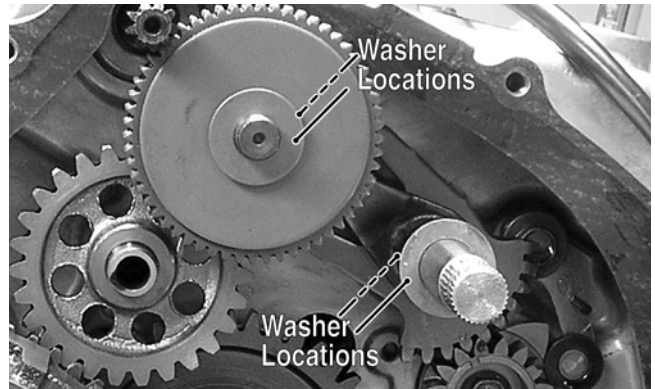
FI176A

■ **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

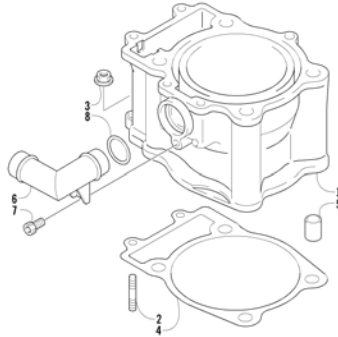
19. Place the gasket and recoil starter assembly into position on the left-side cover; then tighten four cap screws to specifications.

Installing Top-Side Components

A. Piston B. Cylinder

KEY

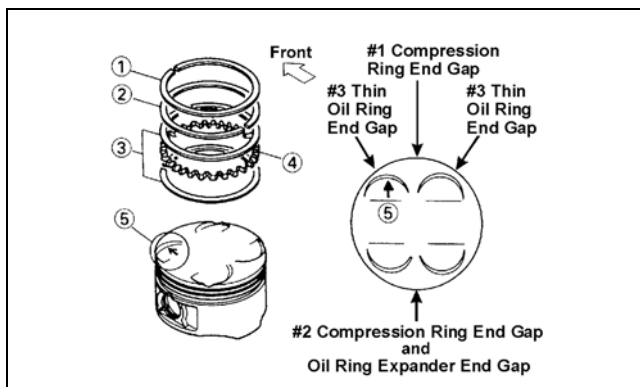
1. Cylinder
2. Stud Bolt
3. Nut
4. Cylinder Gasket
5. Pin
6. Water Hose Union
7. Cap Screw
8. O-Ring



0732-301

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

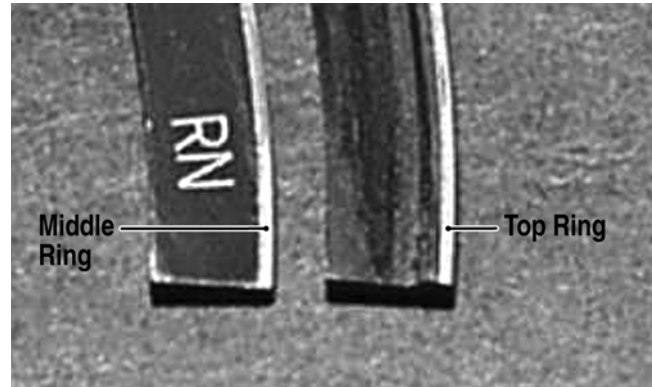
- A. Install ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap. Stagger the end gaps of the upper and lower thin oil rings according to the illustration.



ATV-1085B

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

- B. Install the 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

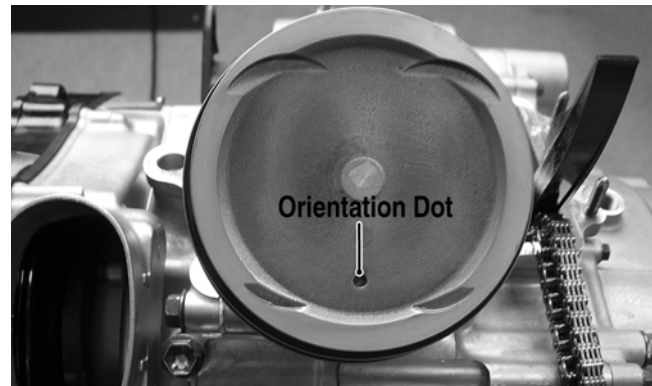
⚠ CAUTION

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.

■ **NOTE:** The piston should be installed so the orientation dot is directed toward the exhaust.

3



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.



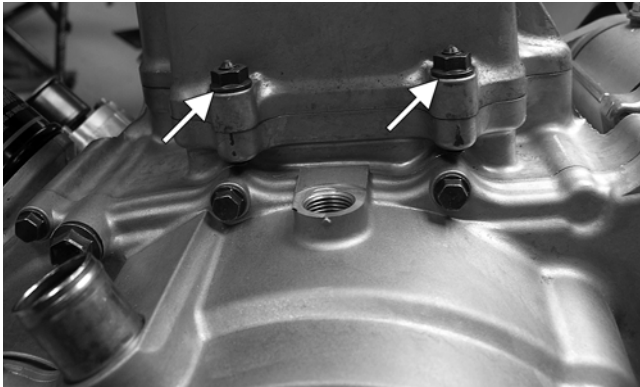
FI136A

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.

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.

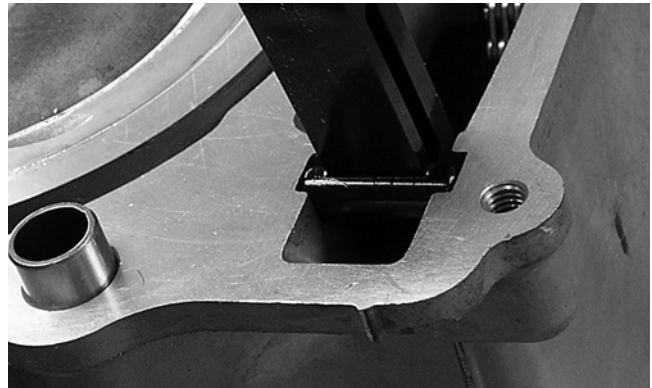
C. Cylinder Head

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

6. Place the chain guide into the cylinder.

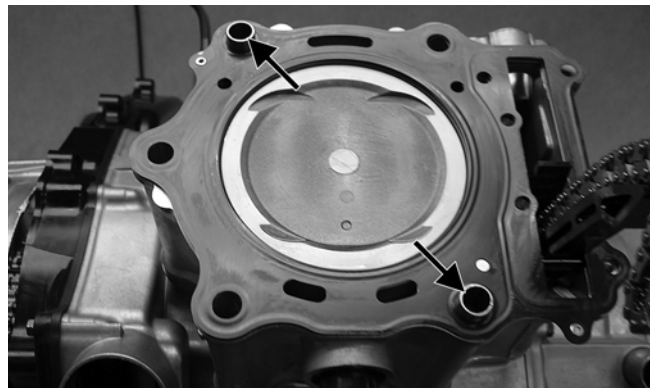
CAUTION

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



FI443

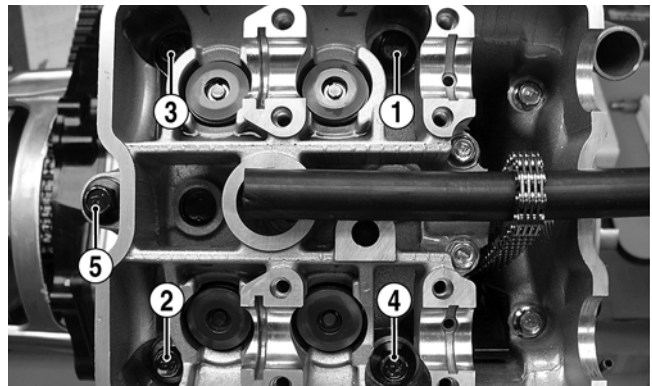
7. Place the head gasket into position on the cylinder. Place the alignment pins into position; then place the head assembly into position on the cylinder.



FI134A

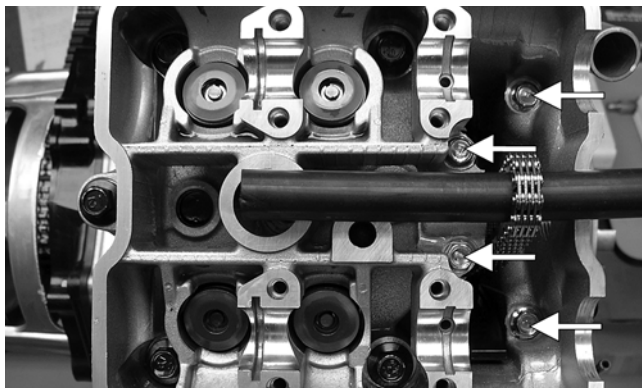
8. Install the five 10 mm cylinder head cap screws and tighten in the sequence shown to an initial torque of 2.5 kg-m (18 ft-lb); then using the same sequence, tighten to a final torque of 3.7 kg-m (27 ft-lb).

■ **NOTE:** Apply engine oil to the threads and both sides of the washers before installing the cylinder head cap screws.



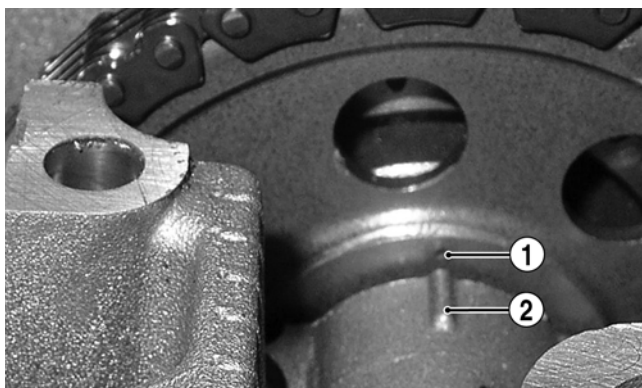
FI133B

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

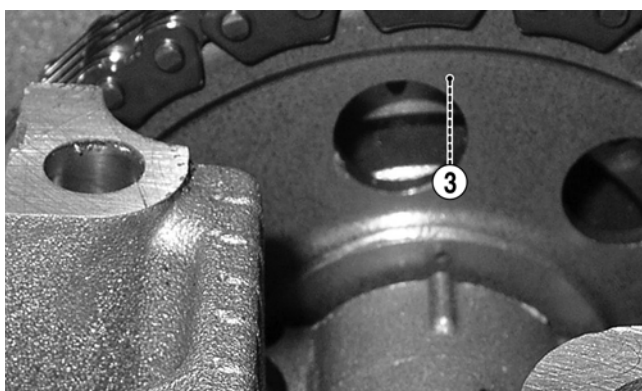
10. Align the TDC line on the rotor/flywheel with the index mark on the magneto cover; then install the camshaft idler into the cam chain and align the punch mark (1) with the index rib (2). Adjust the idler in the chain as necessary to align the marks.



FI447A

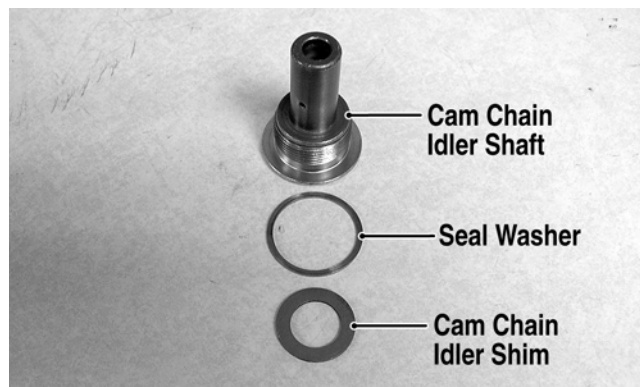
⚠ CAUTION

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.



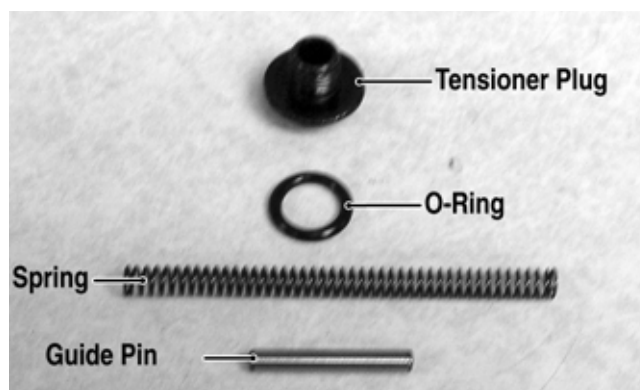
FI447B

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.



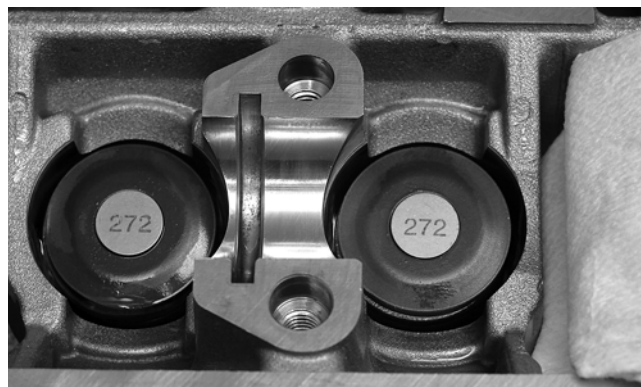
FI131A

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.



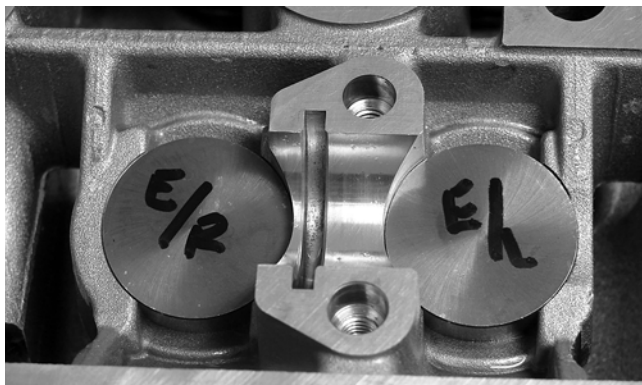
FI159A

14. Install the proper tappet shims on the corresponding valves as noted during removing; then install the tappets as noted during removing.



FI053

3

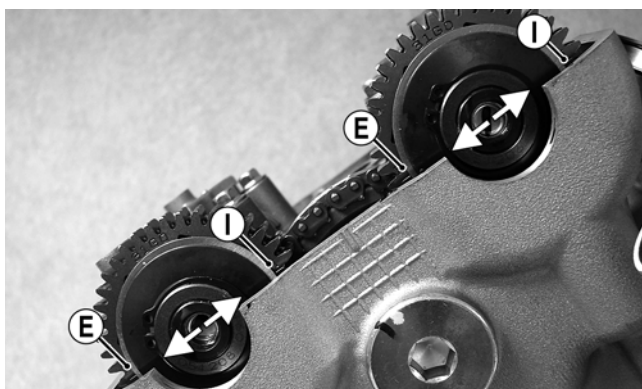


F1054

■ **NOTE:** The tappet shims must be installed with the numbers facing the tappet.

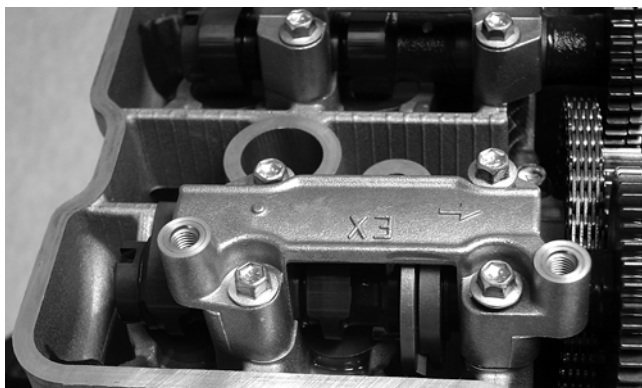
15. Oil the tappets, camshaft journals, and cylinder head journals with clean engine oil; then install the four camshaft holder alignment pins.

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.



F1044A

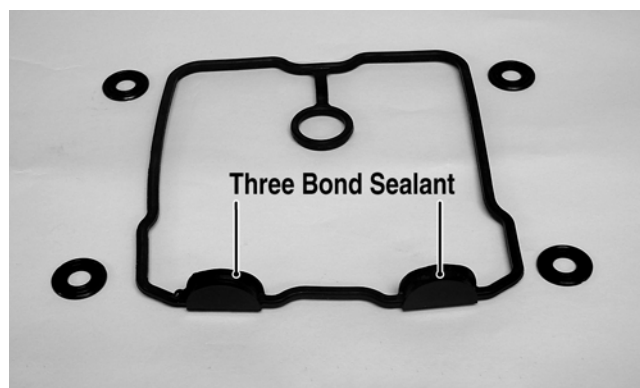
17. Install the camshaft holders on the respective camshaft with the arrows directed toward the cam gears; then secure with the eight cap screws and tighten to specifications.



F1047

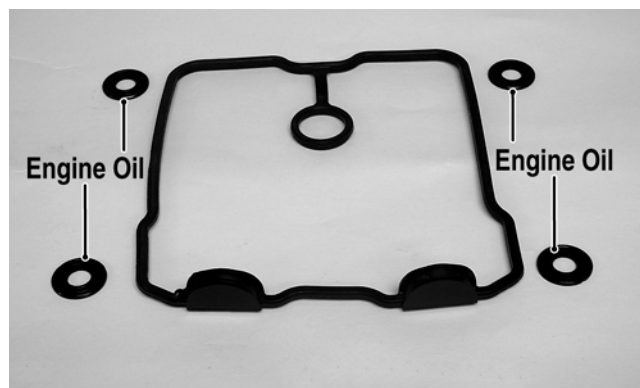
18. Rotate the engine through three or four revolutions; then rotate to top-dead-center (TDC) on the compression stroke and check valve adjustment (see Section 2).

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.



F1040A

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).



F1040B

21. Install the coolant crossover hose on the water pump and cylinder. Tighten the clamps securely.



F1161A

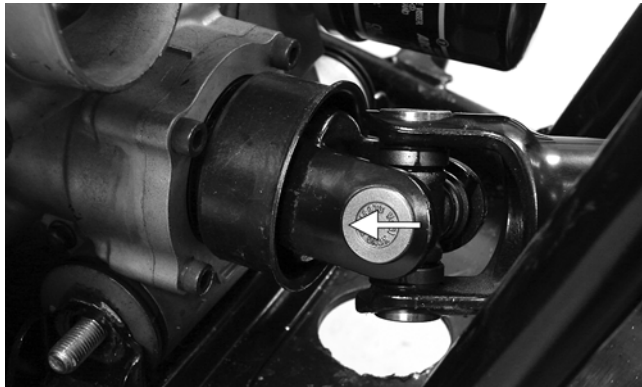
22. Install the timing inspection plug on the magneto cover and tighten to specifications.

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.

Installing Engine/Transmission

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

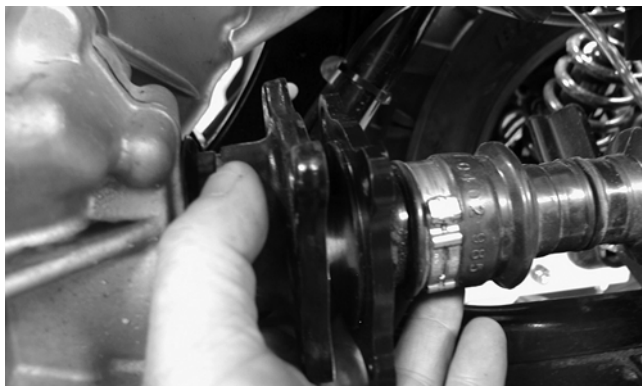
1. From the left side, place the engine/transmission into the frame; then slide the engine rearward as far as possible.
2. Raise the front of the engine and engage the front drive output yoke onto the splined output shaft; then lower the engine into the mounting brackets.



F1105B

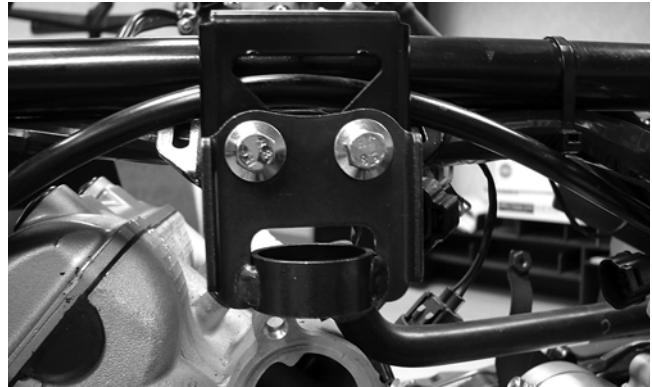
3. Install the front through-bolt; then install the rear through-bolt. Secure with new self-locking nuts and tighten to specifications.
4. Align the rear drive flanges and secure with four cap screws. Tighten to specifications.

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



CD824

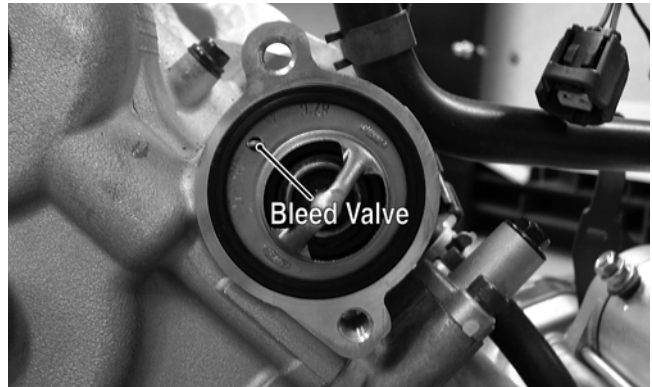
5. Secure the engine damper stopper to the frame with the cap screws. Tighten only until snug.



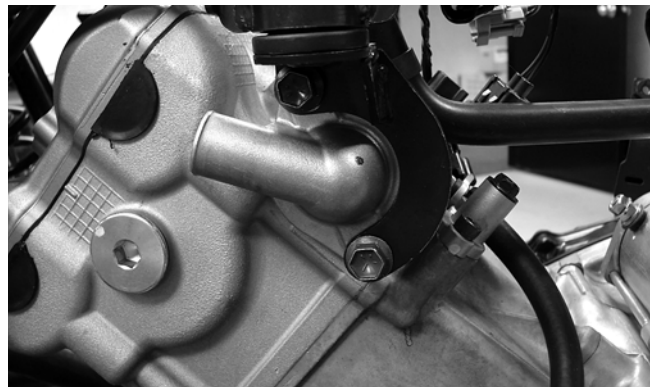
F1111

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.

3



F1108A

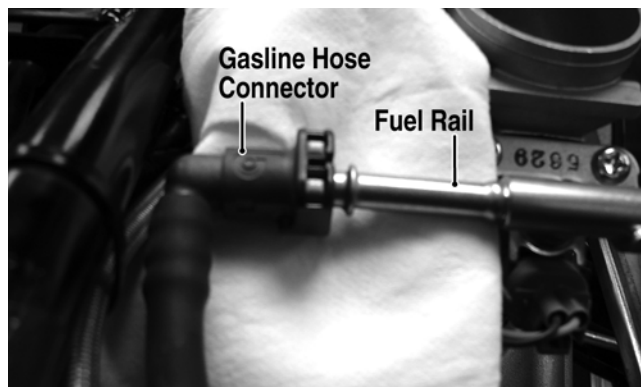


F1112

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.



F1104A



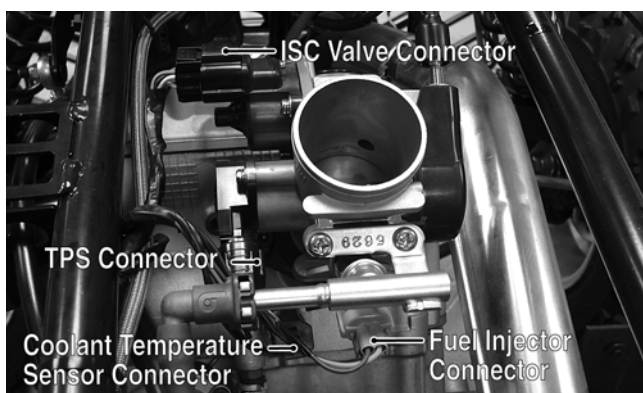
F1092A



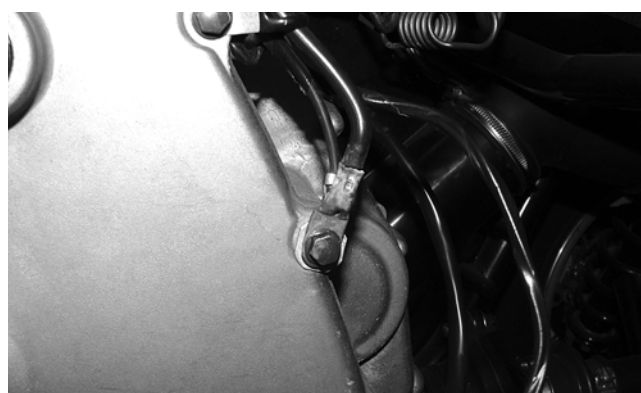
F1103

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 gasline hose connector to the fuel rail.

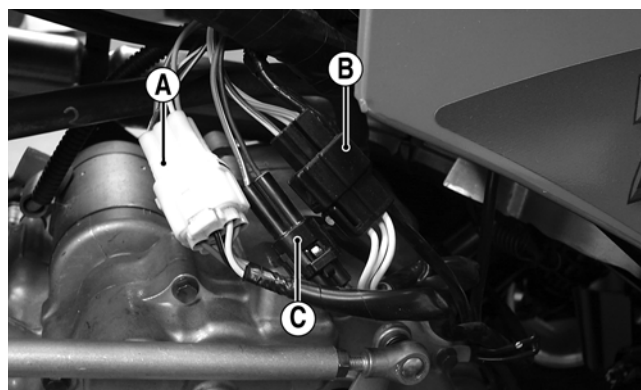


F1089A



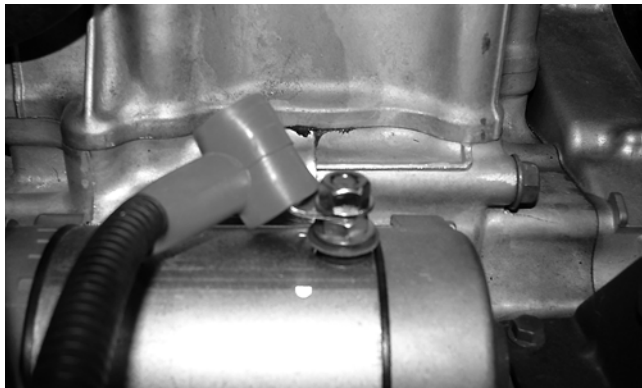
F1084

11. Connect the gear position indicator connector (A), stator connector (B), and the crankshaft position sensor connector (C) to the main wiring harness.



F1083A

12. Connect the starter positive cable to the starter and tighten the nut securely.



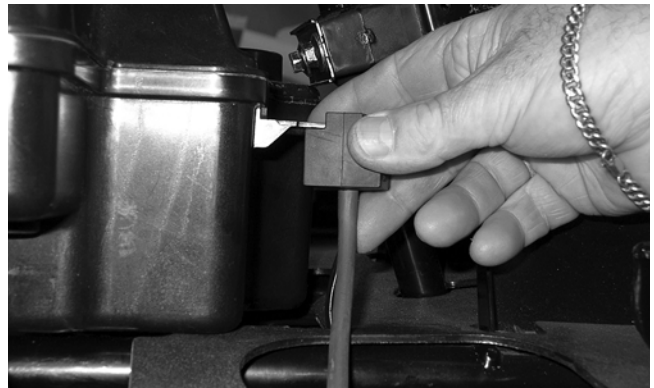
FI094

13. Place the shifter arm on the shift shaft aligning the match marks; then install the cap screw and tighten to specifications.

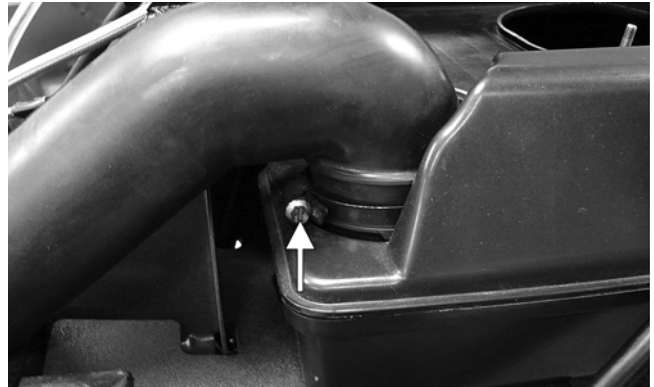


FI085A

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.

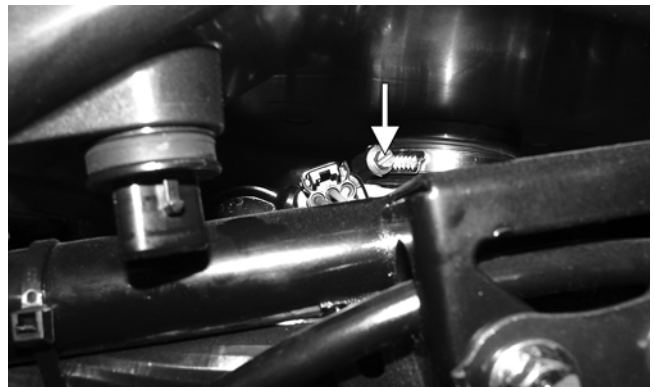


FI114

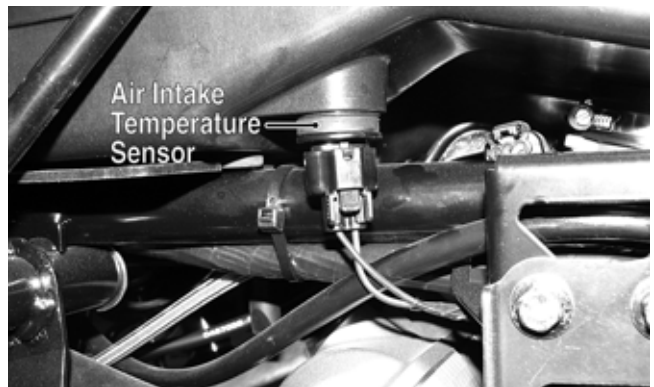


FI098A

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

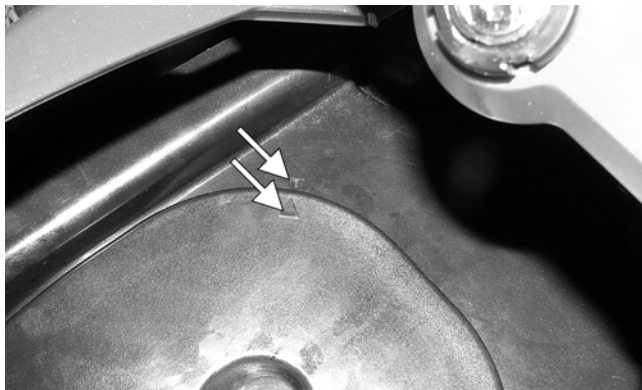


FI082A

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.

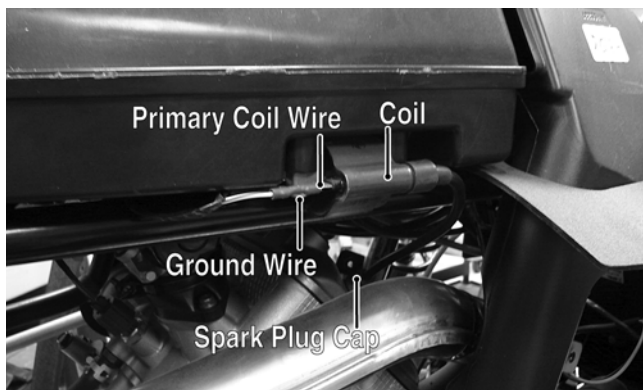


FI081A



FI035A

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.



FI066A

23. Place the left-side footwell and foot peg in position on the frame; then secure with existing hardware. Tighten securely.



CD782

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.

SECTION 4 - FUEL/LUBRICATION/COOLING

4

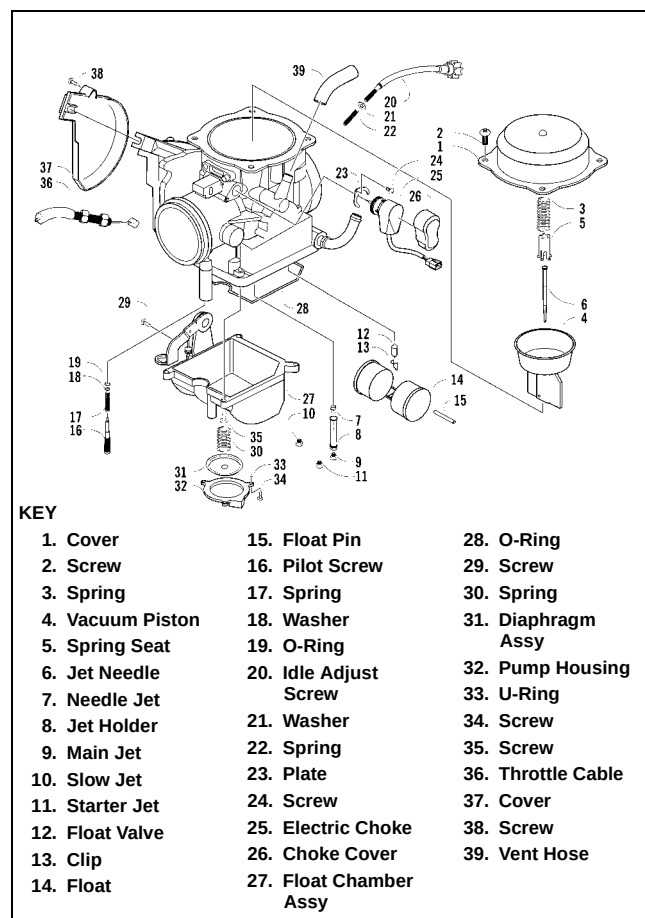
TABLE OF CONTENTS

Carburetor Specifications	4-2
Carburetor Schematics (400/500/650 H1).....	4-2
Throttle Body Assembly (700 EFI)	4-2
Carburetor (400/500/650 H1)	4-2
Electronic Fuel Injection (700 EFI)	4-7
Cleaning and Inspecting Carburetor (400/500/650 H1)	4-8
Throttle Cable Free-Play	4-9
Engine RPM (Idle)	4-9
Gas Tank	4-9
Gas/Vent Hoses	4-9
Electric Fuel Pump (700 EFI)	4-9
Vacuum Pulse Fuel Pump (400/500/650 H1)	4-9
Oil Flow Charts.....	4-10
Oil Filter/Oil Pump	4-11
Testing Oil Pump Pressure.....	4-11
Oil Cooler (400)	4-12
Oil Cooler (650 H1)	4-12
Liquid Cooling System (500/650 H1/700 EFI)	4-13
Radiator.....	4-13
Hoses/Thermostat (500/650 H1/700 EFI)	4-14
Fan	4-14
Servicing Water Pump (500 - Manual Transmission).....	4-14
Servicing Water Pump (500/650 H1/700 EFI - Automatic Transmission)	4-15
Testing Electric Fuel Pump (700 EFI).....	4-18
Testing Vacuum Pulse Fuel Pump (400/500/650 H1)	4-20

Carburetor Specifications

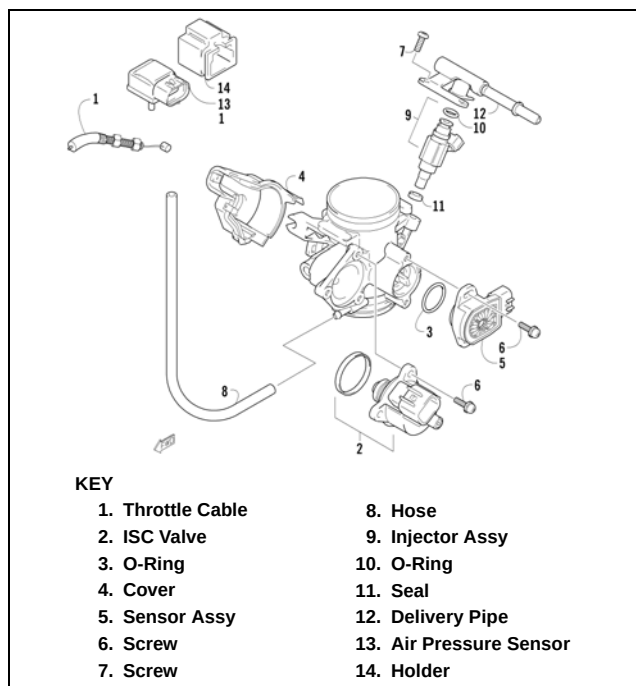
ITEM	400	500	650 H1
Carburetor	Keihin CVK34	Keihin CVK36	Keihin CVK36
Main Jet	135	138	132
Slow Jet	38	40	40
Pilot Screw Setting (turns)	1 3/4	1 3/4	1 1/4
Jet Needle	NAZG	NFKG	NFKS
Idle RPM (engine warm)	1250-1350	1250-1350	1250-1350
Starter Jet	75	85	85
Float Arm Height	17 mm (0.7 in.)	17 mm (0.7 in.)	17 mm (0.7 in.)
Throttle Cable Free-Play (at lever)	3-6 mm (1/8-1/4 in.)	3-6 mm (1/8-1/4 in.)	3-6 mm (1/8-1/4 in.)

Carburetor Schematics (400/500/650 H1)



0739-656

Throttle Body Assembly (700 EFI)



0741-277

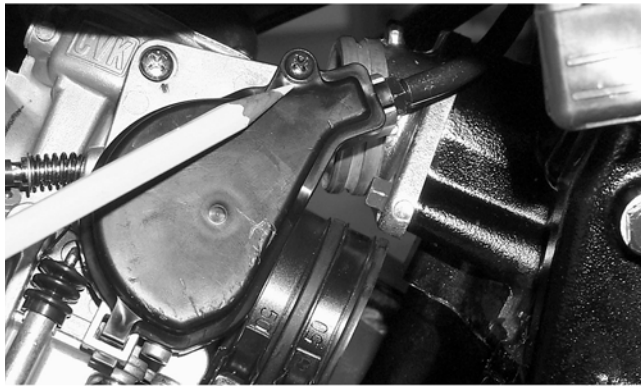
Carburetor (400/500/650 H1)

⚠ WARNING

Whenever any maintenance or inspection is performed on the fuel system during which there may be fuel leakage, there should be no welding, smoking, open flames, etc., in the area.

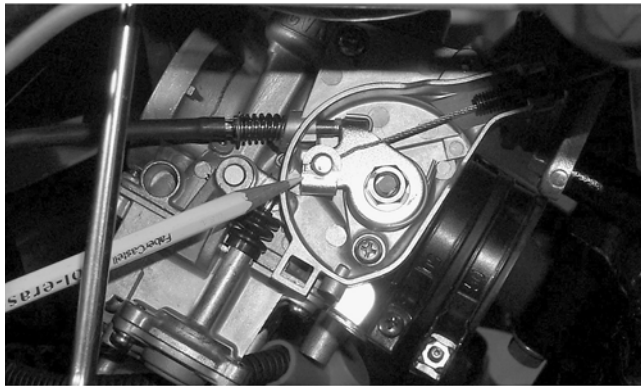
REMOVING

1. Remove the seat.
2. As necessary to access the carburetor, remove the air-intake snorkel, the air cleaner housing cover, or the air cleaner housing.
3. Disconnect the gasoline hose from the carburetor to the fuel pump.
4. Loosen the flange clamps; then remove the carburetor from the intake pipe.
5. Remove the screw securing the throttle actuator cover to the carburetor; then remove the cover.



CC743

6. Remove the throttle cable from the actuator arm.



CC742

7. Loosen the outer jam nut securing the throttle cable to the carburetor body; then route the cable out of the way.



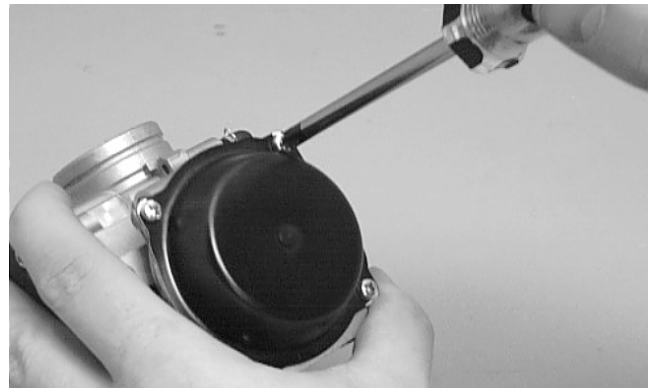
CC741

8. Disconnect the electric choke lead from the wiring harness.

9. Disconnect the vent hose; then remove the carburetor.

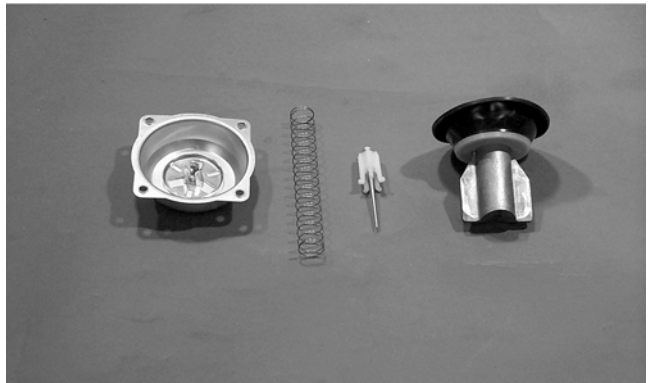
DISASSEMBLING

1. Remove the four Phillips-head screws securing the top cover; then remove the cover.



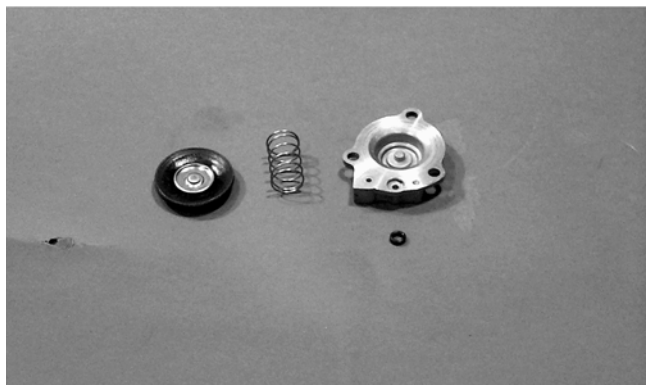
CH015D

2. Remove the vacuum piston assembly from the carburetor body. Account for a spring, spring seat, and the jet needle.



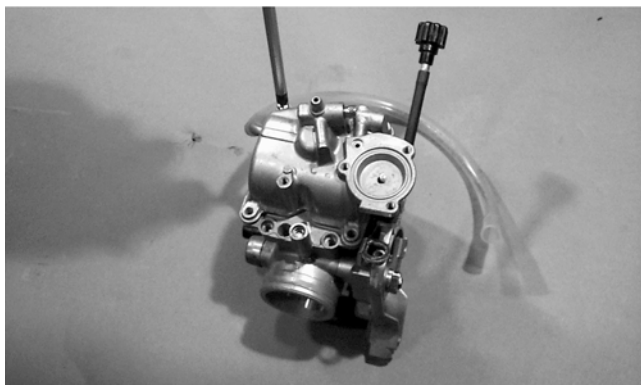
CC746

3. Remove the three screws securing the pump housing. Account for the diaphragm assembly, spring, and U-ring (in the housing).

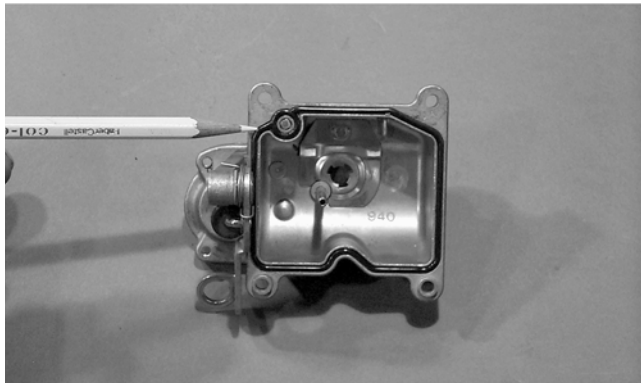


CC748

4. Remove the Phillips-head screws securing the float chamber; then remove the chamber. Account for the O-ring.

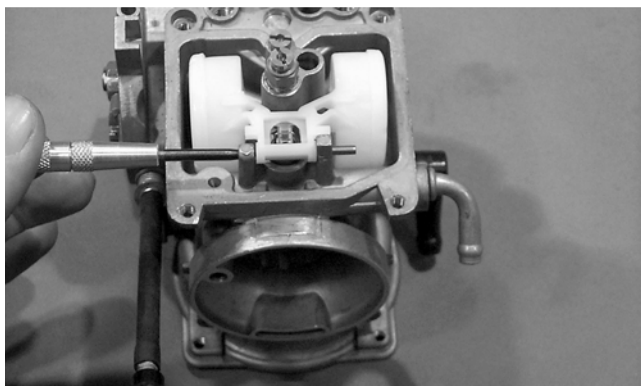


CC749



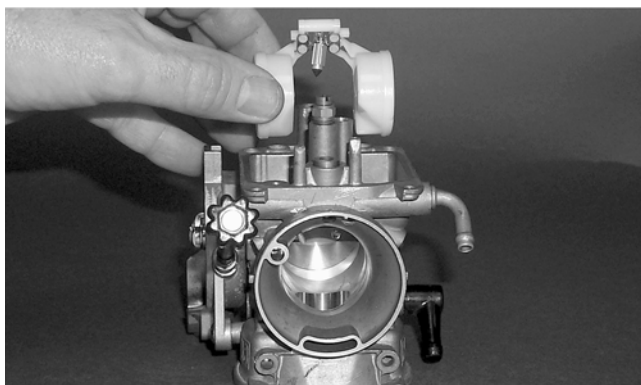
CC750

5. Remove the float pin.



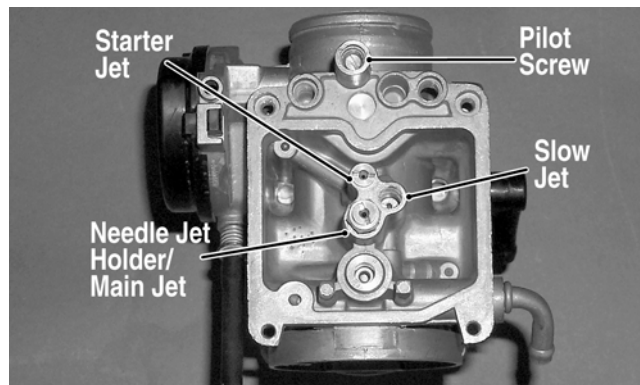
CC752

6. Lift the float assembly from the carburetor. Account for the float valve.



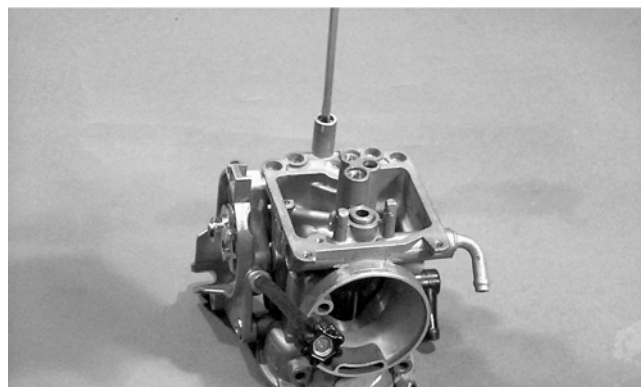
CC753

■ **NOTE:** Note the locations of the jets, pilot screw, and holder for disassembling procedures.



CC761A

7. Secure the needle jet holder with a wrench; then remove the main jet.
8. Remove the needle jet holder; then remove the needle jet, slow jet, and the starter jet.
9. Remove the pilot screw. Account for a spring, washer, and an O-ring.

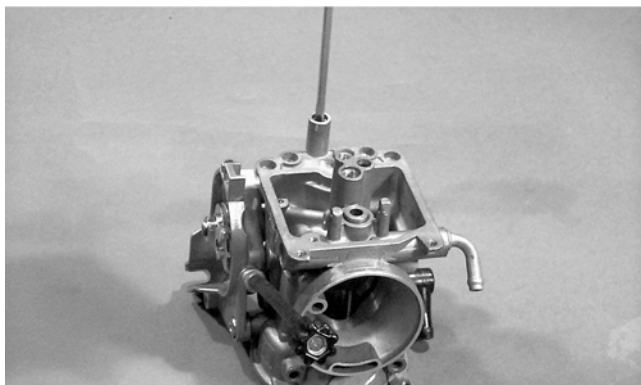


CC758

10. Unscrew and remove the idle adjust screw. Account for the spring and washer.

ASSEMBLING

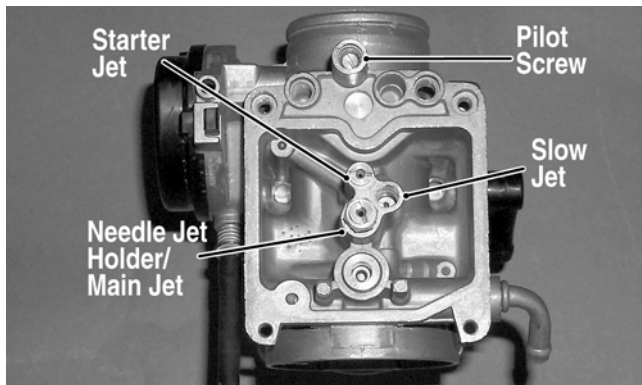
1. Screw the idle adjust screw into the carburetor making sure the washer and spring are properly positioned.
2. Install the pilot screw, spring, washer, and O-ring.



CC758

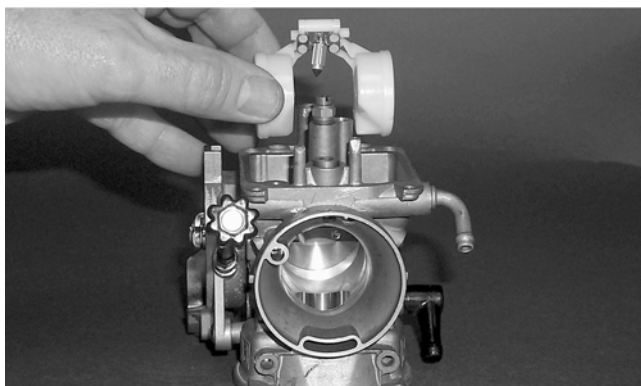
■ **NOTE:** Turn the pilot screw clockwise until it is lightly seated; then turn it counterclockwise the recommended number of turns as an initial setting.

■ **NOTE:** Note the locations of the jets and holder during assembling procedures.



CC761A

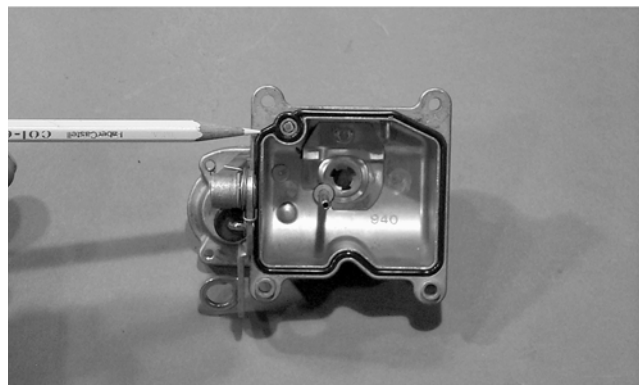
3. Install the slow jet. Tighten securely.
4. Install the main jet into the needle jet holder and tighten securely; then install the needle jet and needle jet holder assembly into the carburetor and tighten securely.
5. Place the float assembly (with float valve) into position and secure to the carburetor with the float pin.



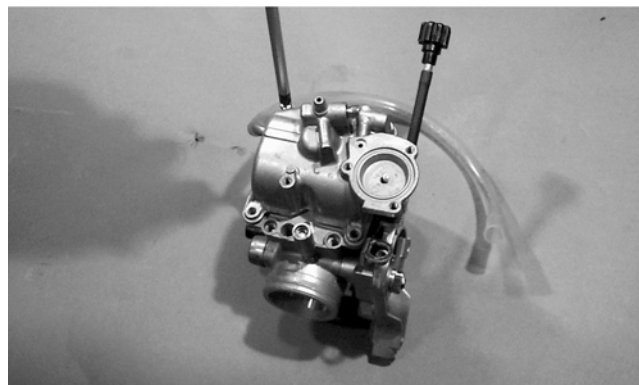
CC753

■ **NOTE:** Check float arm height by placing the carburetor on its side w/float contacting the needle; then measure with a caliper the height when the float arm is in contact with the needle valve. Float arm height should be 17 mm (0.7 in.).

6. Place the float chamber into position making sure the O-ring is properly positioned; then secure with the Phillips-head screws.

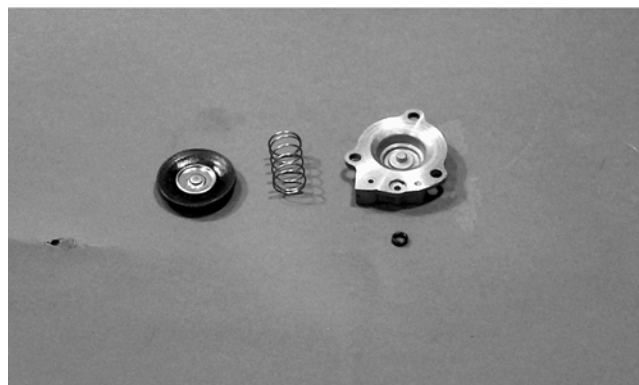


CC750



CC749

7. Place the U-ring into the pump housing. Position the spring and diaphragm assembly (lip toward the carburetor) onto the carburetor; then secure the assembly with the pump housing and three screws. Tighten securely.



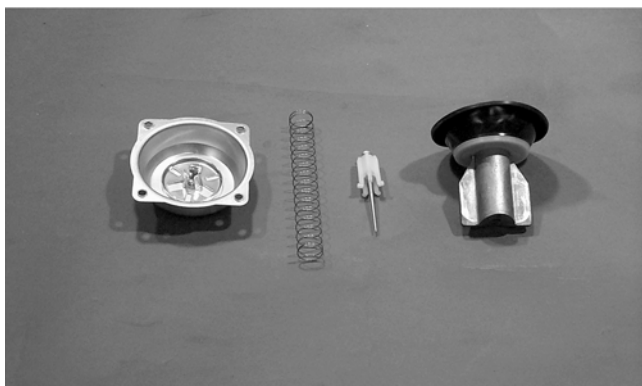
CC748

4

⚠ CAUTION

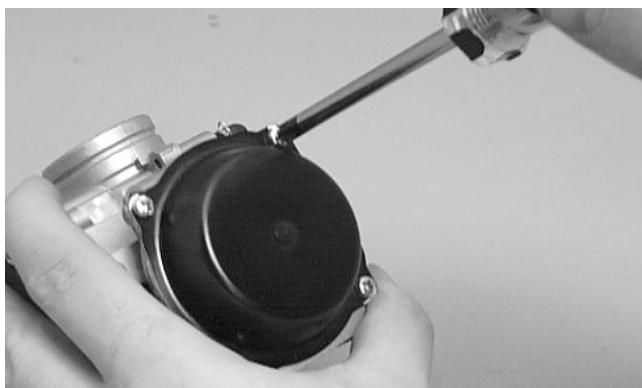
It is important to press down on the pump housing until it contacts the carburetor to make sure the diaphragm lip is properly seated in the groove in the carburetor. If the diaphragm is not properly seated, leakage will occur.

8. Place the jet needle, spring seat, and spring into the vacuum piston; then place the assembly down into the carburetor.



CC746

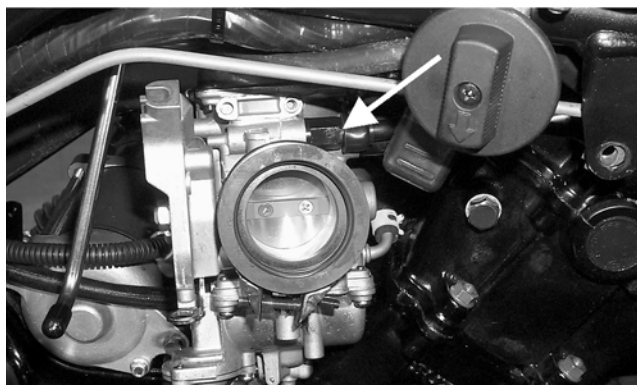
9. Place the top cover into position; then secure with the Phillips-head screws. Tighten securely.



CH015D

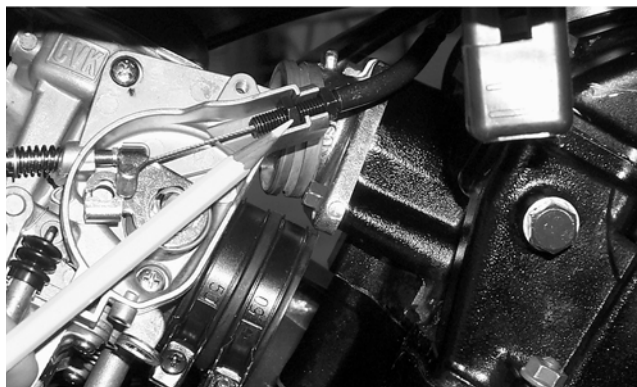
INSTALLING

1. Connect the gas and vent hoses onto the carburetor.
2. Connect the electric choke lead to the wiring harness.



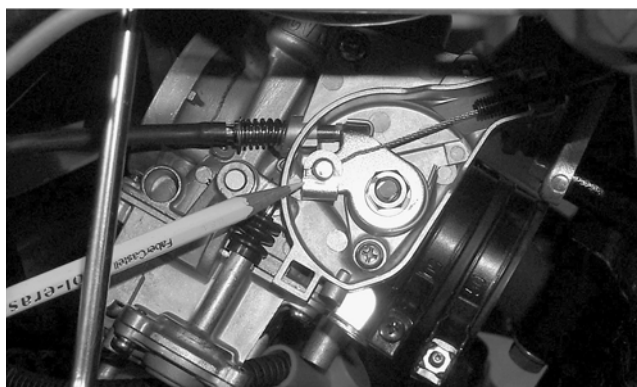
CC740A

3. Place the throttle cable into position and secure by tightening the outer jam nut.



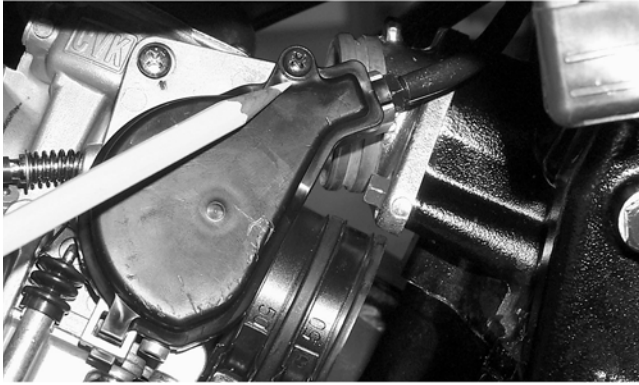
CC741

4. Connect the throttle cable to the actuator arm.



CC742

5. Place the throttle actuator cover into position on the carburetor; then secure with the screw.



CC743

6. Position the carburetor in the air cleaner boot and intake pipe assembly; then secure with the clamps.
7. Connect the hose from the carburetor to the gas tank.
8. As necessary, secure the air-intake snorkel, the air cleaner housing cover, or the air cleaner housing.
9. Install the seat.

Electronic Fuel Injection (700 EFI)

⚠ WARNING

Whenever any maintenance or inspection is performed on the fuel system during which there may be fuel leakage, there should be no welding, smoking, open flames, etc., in the area.

TROUBLESHOOTING

1. Verify that the electric fuel pump is operating by listening for a “whirring” sound for several seconds after the ignition switch is turned to the ON position. If no sound can be heard, see Testing Electric Fuel Pump (700 EFI) in this section.
2. Check for a flashing EFI icon on the LCD display. If EFI is flashing, see ECU Error Codes (700 EFI) in Section 5.
3. Make sure there is sufficient, clean gas in the gas tank.
4. Verify that the battery is sufficiently charged to crank the engine over at normal speed.
5. Check the air filter housing and air filter for contamination. Clean or replace as necessary (see Section 2).

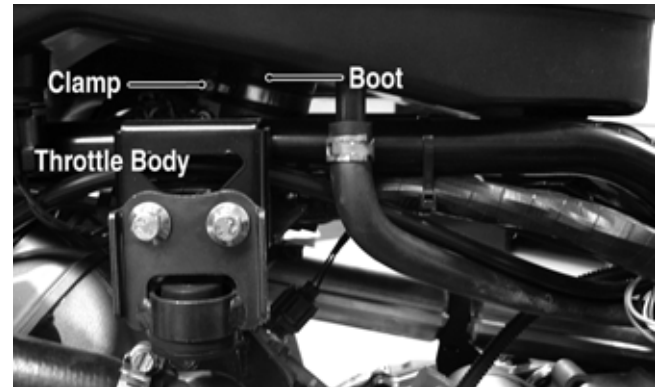
REMOVING

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

⚠ WARNING

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

2. Disconnect the battery; then remove the seat.
3. Remove the storage compartment cover and air filter housing cover; then remove the air filter.
4. Loosen the clamp securing the air filter housing boot to the throttle body inlet; then remove the boot from the throttle body.

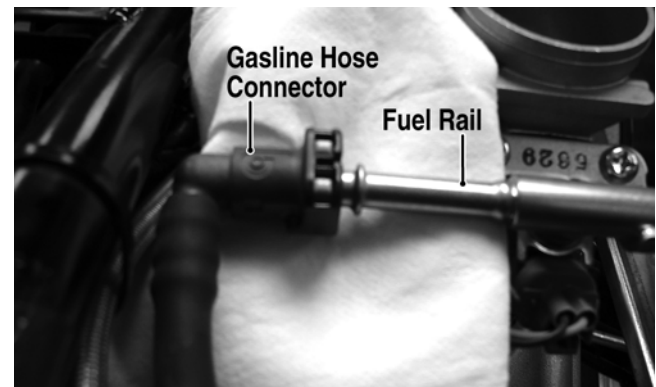


FI081B

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

⚠ WARNING

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

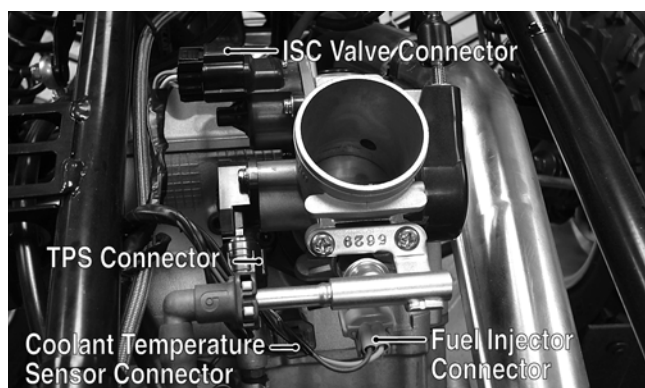


FI092A

6. Remove the screw securing the throttle actuator cover to the throttle body; then remove the cover.
7. Remove the throttle cable from the actuator arm.

4

8. Loosen the outer jam nut securing the throttle cable to the throttle body; then route the cable out of the way.
9. Remove the four electrical connectors from the throttle body components.



FI089A

10. Remove the cap screws securing the intake pipe to the cylinder head and remove the throttle body assembly; then remove the intake pipe from the throttle body. Account for an O-ring.



FI104A

11. Use tape to cover and seal the intake opening.

CAUTION

Any objects or liquid entering the intake opening will fall into the engine causing severe damage if the engine is turned over or started.

INSTALLING

1. Install the throttle body into the intake pipe and secure with the clamp. Tighten securely.
2. Place a new O-ring in the intake pipe; then position the pipe onto the engine and secure with two cap screws.
3. Connect the throttle cable to the throttle body and adjust throttle free-play (see Section 2); then connect the gasoline hose.

4. Connect the four electrical connectors to the throttle body components.
5. Install the air filter housing boot and secure with the clamp; then install the air filter, air filter cover, storage compartment, and storage compartment cover.
6. Install the seat making sure it locks securely in place.

Cleaning and Inspecting Carburetor (400/500/650 H1)

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

WARNING

When drying components with compressed air, always wear safety glasses.

CAUTION

DO NOT place any non-metallic components in parts-cleaning solvent because damage or deterioration will result.

1. Place all metallic components in a wire basket and submerge in carburetor cleaner.
2. Soak for 30 minutes; then rinse with fresh parts-cleaning solvent.
3. Wash all non-metallic components with soap and water. Rinse thoroughly.
4. Dry all components with compressed air only making sure all holes, orifices, and channels are unobstructed.
5. Inspect the carburetor body for cracks, nicks, stripped threads, and any other imperfections in the casting.
6. Inspect the vacuum piston/diaphragm for cracks, imperfections in the casting, or cracks and tears in the rubber.
7. Inspect float for damage.
8. Inspect gasket and O-rings for distortion, tears, or noticeable damage.
9. Inspect tips of the jet needle, pilot screw, and the needle jet for wear, damage, or distortion.

10. Inspect the slow jet and main jet for obstructions or damage.

■ **NOTE:** If the slow jet is obstructed, the mixture will be extremely lean at idle and part-throttle operation.

11. Inspect the float valve for wear or damage.
12. Inspect the carburetor mounting flange for damage and tightness.

Throttle Cable Free-Play

To adjust throttle cable free-play, see Section 2.

Engine RPM (Idle) (Carbureted Models)

To adjust the idle RPM, see Section 2.

Gas Tank

⚠ WARNING

Whenever any maintenance or inspection is made on the fuel system during which there may be fuel leakage, there should be no welding, smoking, open flames, etc., in the area.

REMOVING

1. Remove the seat.
2. Remove the rear rack and fenders (see Section 8).
3. Disconnect the hose from the fuel pump to the carburetor/throttle body.
4. Remove the cap screws securing the gas tank to the frame.
5. Disconnect the fuel gauge connector; then remove the gas tank.

CLEANING AND INSPECTING

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

1. Clean all gas tank components with parts-cleaning solvent.
2. Inspect all hoses for cracks or leaks.
3. Inspect tank cap and tank for leaks, holes, and damaged threads.

INSTALLING

1. Place the gas tank into position in the frame; then install the cap screws. Tighten securely.
2. Connect the gas hose from the carburetor/throttle body; then connect the fuel gauge connector.
3. Install the vent hose; then fill the gas tank with gasoline.
4. Start the engine and inspect for leakage.
5. Install the rear fenders and rack (see Section 8); then install the seat making sure it latches securely.

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.

Electric Fuel Pump (700 EFI)

The electric fuel pump and fuel level sensor are not serviceable components. If either fails, the fuel pump assembly must be replaced.

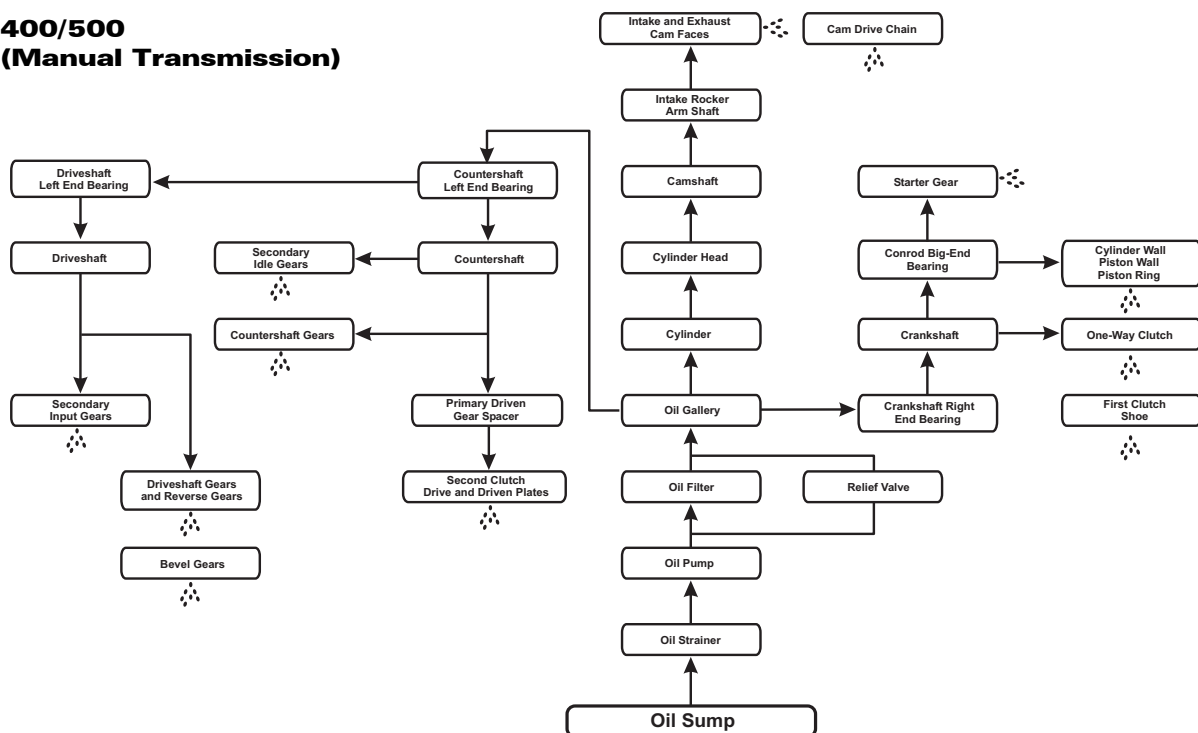
■ **NOTE:** To test the fuel pump, see **Testing Electric Fuel Pump (700 EFI)** in this section.

Vacuum Pulse Fuel Pump (400/500/650 H1)

The vacuum pulse fuel pump is not a serviceable component. If the pump fails, it must be replaced.

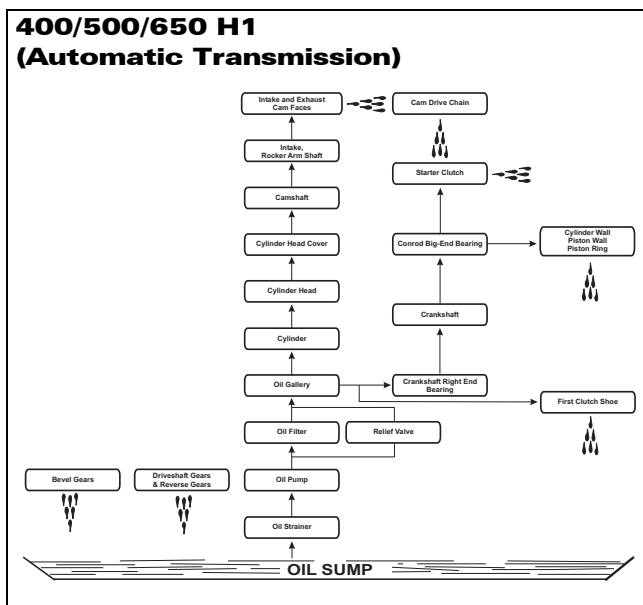
Oil Flow Charts

400/500 (Manual Transmission)



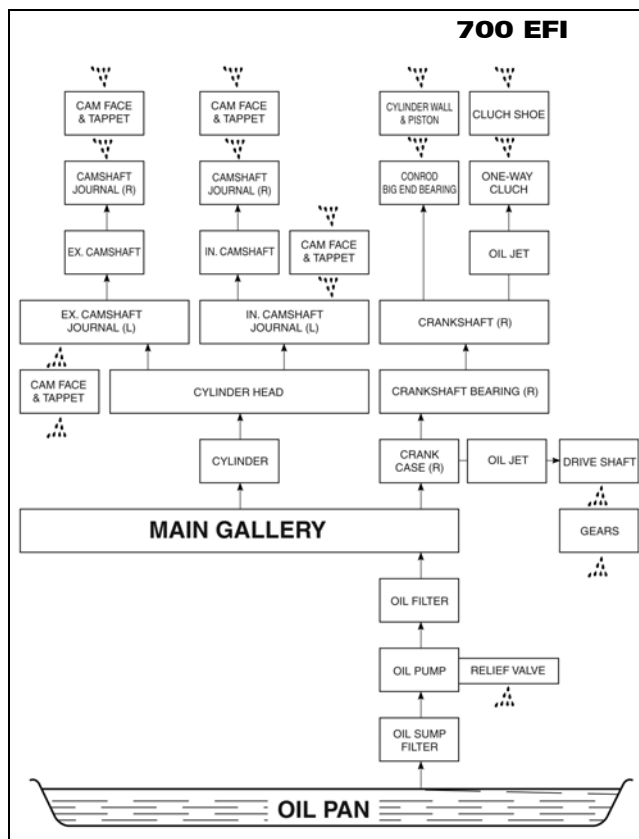
ATV-0111

400/500/650 H1 (Automatic Transmission)



ATV-1102

700 EFI



FI449

Oil Filter/Oil Pump

■ **NOTE:** Whenever internal engine components wear excessively or break and whenever oil is contaminated, the oil pump should be replaced. The oil pump is not a serviceable component.

Testing Oil Pump Pressure

■ **NOTE:** The engine must be warmed up to the specified temperature for this test.

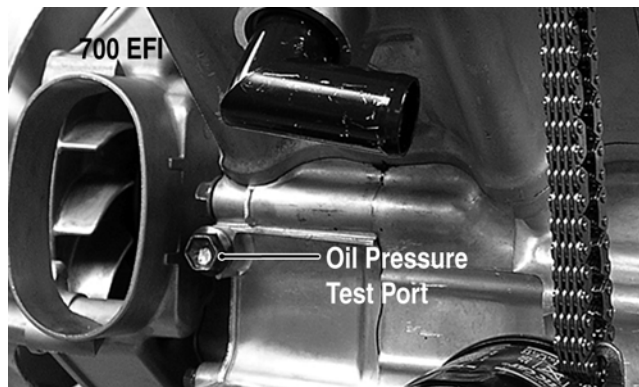
1. Connect the Tachometer (p/n 0644-275) to the engine.
2. Connect the Oil Pressure Test Kit (p/n 0644-495) to the oil filter drain plug (400/500), in the oil pressure test port (700 EFI), or to the upper oil cooler hose at the engine (650 H1).



CD457B



PR265B



FI439A

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

3. Start the engine and run at 3000 RPM. The oil pressure gauge must read as specified.

400 (Manual Transmission)
OIL PRESSURE
0.6-1.0 kg/cm ² (9-14 psi)
Oil Temperature - 60°C (140°F)
400 (Automatic Transmission)
OIL PRESSURE
1.1-1.5 kg/cm ² (16-21 psi)
Oil Temperature - 60°C (140°F)
500 (Manual Transmission)
OIL PRESSURE
1.2-1.6 kg/cm ² (17-23 psi)
Oil Temperature - 60°C (140°F)
500 (Automatic Transmission)
OIL PRESSURE
1.3-1.7 kg/cm ² (18-24 psi)
Oil Temperature - 60°C (140°F)
650 H1
OIL PRESSURE (From Oil Cooler)
1.40-2.46 kg/cm ² (15-25 psi)
Oil Temperature - 60°C (140°F)
700 EFI
OIL PRESSURE
1.4-1.8 kg/cm ² (20-26 psi)
Oil Temperature - 110°C (230°F)

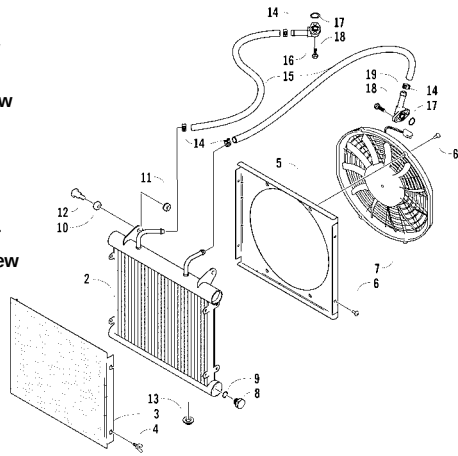
■ **NOTE:** If the oil pressure is lower than specified, check for an oil leak, damaged oil seal, defective oil pump, or oil cooler.

■ **NOTE:** If the oil pressure is higher than specified, check for too heavy engine oil weight (see Section 2), clogged oil passage, clogged oil filter, or improper installation of the oil filter.

Oil Cooler (400)

KEY

1. Oil Cooler Assy
2. Oil Cooler
3. Screen
4. Thumb Screw
5. Shroud
6. Machine Screw
7. Fan
8. Drain Plug
9. O-Ring
10. Grommet
11. Nut w/Washer
12. Shoulder Screw
13. Bushing
14. Clamp
15. Hose
16. Fitting
17. O-Ring
18. Cap Screw
19. Fitting



0739-573

REMOVING

■ **NOTE:** It is not necessary to drain the engine oil for this procedure.

1. Remove the input and output hoses from the fittings on the cooler.

CAUTION

Elevate and secure the hoses to avoid oil spillage.

2. Remove the cap screws securing the oil cooler to the frame. Account for grommets.



AL651D

3. Remove the oil cooler from the frame.

INSTALLING

1. Place the cooler into position in the frame.
2. Secure the cooler to the frame with the cap screws and grommets.



AL651D

3. Install the hoses onto their respective fittings and secure with the clamps.

Oil Cooler (650 H1)

REMOVING

1. Disconnect the oil hoses from the oil cooler located on the back of the radiator.
2. Remove the radiator (see Radiator) in this section.
3. Remove the fan and fan shroud; then separate the oil cooler from the radiator.

INSTALLING

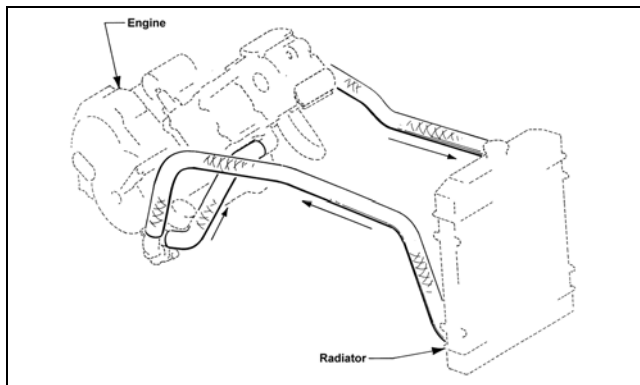
1. Place the oil cooler into position on the radiator and secure with the retainer brackets; then install the fan shroud and fan.
2. Install the radiator (see Radiator) in this section.
3. Connect the oil hoses to the oil cooler and tighten the clamps securely.
4. Warm up the engine and check for leaks; then shut off the engine and check for the proper oil level on the oil level stick. Add sufficient amount of oil to raise the level above the lower level mark.

Liquid Cooling System (500/650 H1/700 EFI)

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

To check the cooling system, see Section 2.

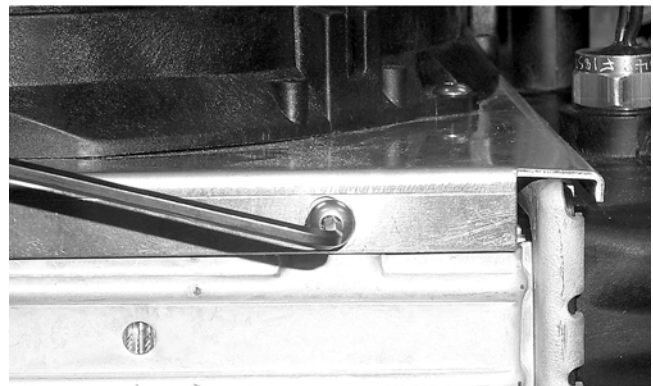
Radiator



0732-411

REMOVING

1. Drain the coolant at the engine.
2. Remove the front rack (see Section 8).
3. Remove the front bumper and front fender panel (see Section 8).
4. Remove the upper and lower coolant hoses.
5. Remove the cap screws and nuts securing the radiator to the frame.
6. Disconnect the fan wiring from the main wiring harness; then remove the radiator/fan assembly and account for the grommets and collars.
7. Remove the fan/fan shroud assembly from the radiator.



CC863

CLEANING AND INSPECTING

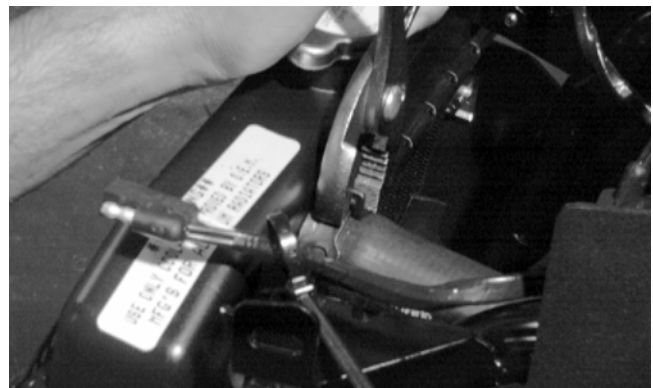
■ **NOTE:** Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

1. Flush the radiator with water to remove any contaminants.
2. Inspect the radiator for leaks and damage.
3. Inspect all hoses for cracks and deterioration.
4. Inspect all fasteners and grommets for damage or wear.

4

INSTALLING

1. Position the fan/fan shroud assembly on the radiator; then secure with existing hardware.
2. Place the radiator with grommets and collars into position on the frame; then install the cap screws and nuts. Tighten securely.
3. Install the upper and lower coolant hoses; then secure with hose clamps.



AF734D

4. Install the front bumper and front fender panel (see Section 8).
5. Install the front rack (see Section 8).

6. Fill the cooling system with the recommended amount of antifreeze. Check for leakage.
7. Connect the fan wiring to the main wiring harness.

Hoses/Thermostat (500/650 H1/700 EFI)

REMOVING

1. Drain approximately one qt of coolant from the cooling system.
2. Remove the two cap screws securing the thermostat housing to the cylinder head. Account for an O-ring and a thermostat.

INSPECTING

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

1. Inspect the thermostat for corrosion, wear, or spring damage.
2. Using the following procedure, inspect the thermostat for proper operation.
 - A. Suspend the thermostat in a container filled with water.
 - B. Heat the water and monitor the temperature with a thermometer.
 - C. The thermostat should start to open at 73.5-76.5° C (164-170° F) on the 500/650 H1 and 80.5-83.5° C (177-182° F) on the 700 EFI.
 - D. If the thermostat does not open, it must be replaced.
3. Inspect all coolant hoses, connections, and clamps for deterioration, cracks, and wear.

■ **NOTE:** All coolant hoses and clamps should be replaced every four years or 4000 miles.

INSTALLING

1. Place the thermostat and O-ring into the thermostat housing; then secure the thermostat housing to the cylinder head with the two cap screws.
2. Install the crossover coolant hose onto the water pump and engine water inlet. Secure with the two hose clamps.

3. Slide the upper hose onto the thermostat housing and radiator. Secure with the two hose clamps.
4. Install the lower coolant hose onto the water pump housing and radiator. Secure with the two hose clamps.
5. Fill the cooling system with the recommended amount of antifreeze. Check for leakage.

Fan

REMOVING

1. Remove the radiator (see Radiator in this section).
2. Remove the fan assembly from the radiator.

INSTALLING

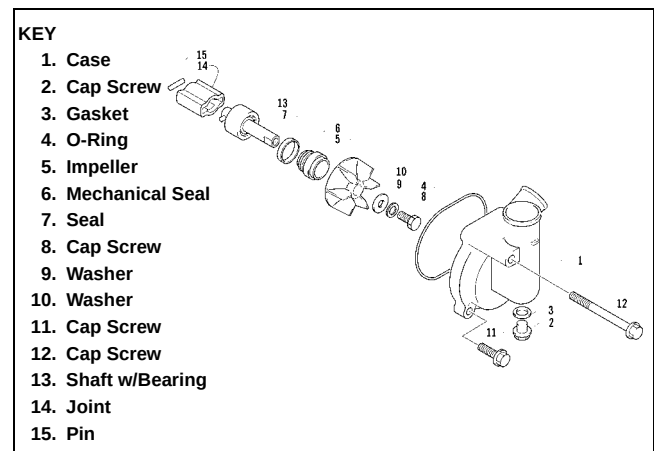
1. Position the fan assembly on the radiator; then secure with existing hardware.

■ **NOTE:** The fan wiring must be in the upper-right position.

2. Install the radiator (see Radiator in this section).

Servicing Water Pump (500 - Manual Transmission)

REMOVING/DISASSEMBLING



0738-290

1. Drain the coolant.

2. Remove the three cap screws securing the water pump case. Note the position of the long cap screw and account for the O-ring.
3. Remove the impeller cap screw, washer, and gasket.
4. Remove the mechanical seal using this procedure.
 - A. Tap the tip of a small sheet metal screw into the inner-metal edge of the seal.
 - B. Grip the screw with a pair of vise-grip pliers and pull the seal out. Account for the pump drive seal.

CLEANING AND INSPECTING

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

1. Clean all pump components in solvent.
2. Inspect the mechanical seal and pump drive seal for damage.

■ **NOTE:** If the mechanical seal and/or pump drive seal are damaged, they must be replaced as a set.

3. Inspect the impeller for corrosion or damage.

ASSEMBLING/INSTALLING

■ **NOTE:** Treat seals and O-rings with clean anti-freeze for initial lubrication.

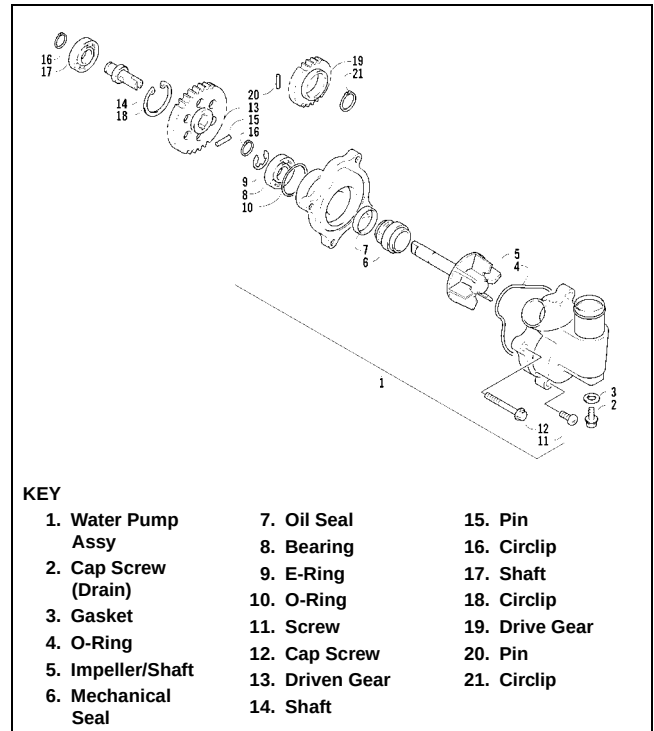
1. Press the mechanical seal with pump drive seal into the impeller by hand.
2. Install the mechanical seal assembly onto the water pump shaft and secure with the cap screw, washer, and gasket. Tighten the cap screw securely.
3. Place the water pump case into position and secure with the three cap screws. Note the position of the long cap screw from removal.
4. Fill the cooling system with the recommended amount of antifreeze.

■ **NOTE:** While the cooling system is being filled, air pockets may develop; therefore, run the engine for five minutes after the initial fill, shut the engine off, and then fill the cooling system.

5. Check the entire cooling system for leakage.

Servicing Water Pump (500/650 H1/700 EFI - Automatic Transmission)

■ **NOTE:** When servicing the water pump, it will be necessary to install a new oil seal and a new mechanical seal.



0737-766

REMOVING

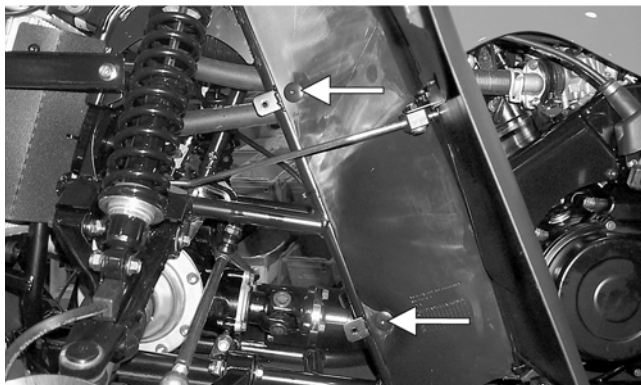
1. Remove the radiator cap; then remove the water pump drain and drain the coolant.



CC789

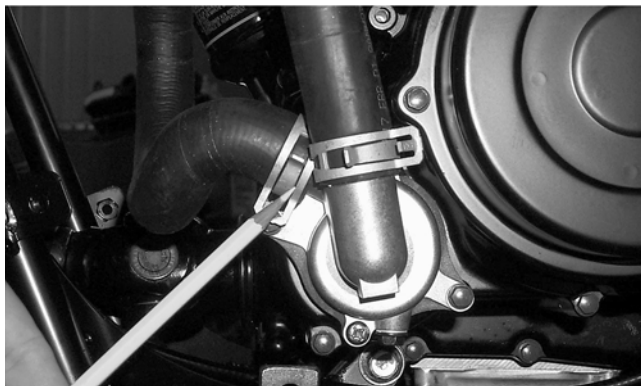
2. Drain the oil from the engine/transmission.
3. Remove the four torx-head cap screws securing the front and rear fenders to the footrest; then remove the four cap screws securing the footrest to the frame. Remove the footrest.

4. From inside the left-front wheel-well, remove the two torx-head cap screws securing the fender to the frame.



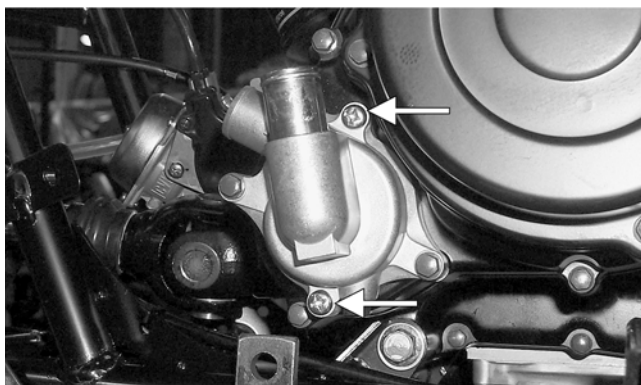
CC788A

5. Compress the tabs on the coolant hose clamps and slide the clamps away from the hose ends approximately 51 mm (2 in.); then remove both hoses from the water pump.



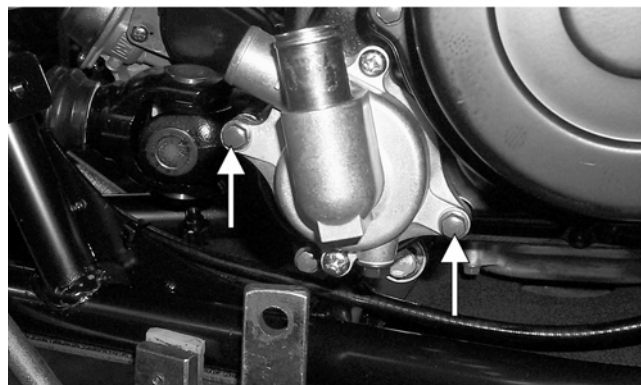
CC784

6. Using an impact driver, loosen but do not remove the two Phillips-head cover screws.



CC785A

7. Remove the two cap screws securing the water pump to the engine; then remove the water pump.



CC786A

DISASSEMBLING

1. Finish removing the two Phillips-head cap screws securing the cover to the bearing housing; then remove the cover. Account for the O-ring.
2. Remove the E-ring securing the impeller/shaft to the bearing housing; then remove the impeller/shaft.
3. Using Seal Removal Tool (p/n 0644-072), remove the mechanical seal and the oil seal from the bearing housing.



CC772

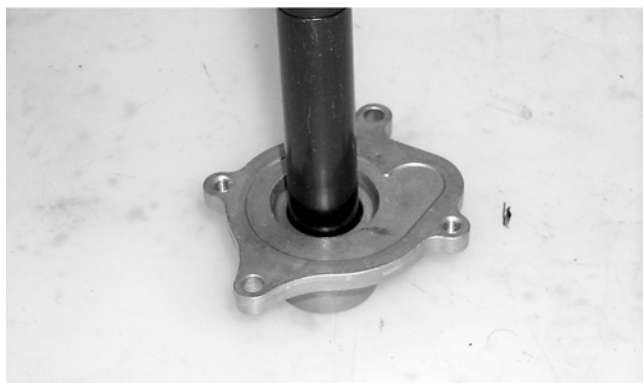
CLEANING AND INSPECTING

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

1. Clean all oil-pump components in cleaning solvent.
2. Inspect the impeller/shaft for corrosion or damage.

ASSEMBLING

1. Place the new oil seal into the bearing housing; then using a seal driver, gently tap the seal down until it is fully seated.



CC778

2. Place the new mechanical seal into the bearing housing; then tap it down until it is fully seated.

■ **NOTE:** A large deep-well socket can be used to drive the seal down evenly.

3. Install the impeller/shaft assembly into the bearing housing; then secure with the E-ring.

■ **NOTE:** Make sure the E-ring is fully seated and the impeller rotates freely.

4. While holding the bearing housing assembly in position on the engine, slowly rotate the impeller until the impeller/shaft engages properly with its slot in the driven shaft.

■ **NOTE:** The bearing housing will be flush with the engine when the two shafts are properly engaged.

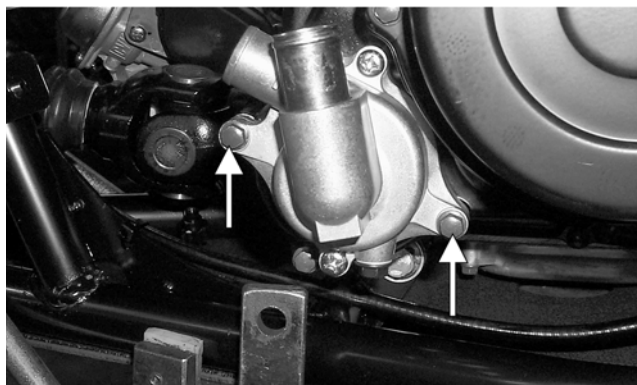
CAUTION

Failure to properly engage the two shafts could cause serious engine damage.

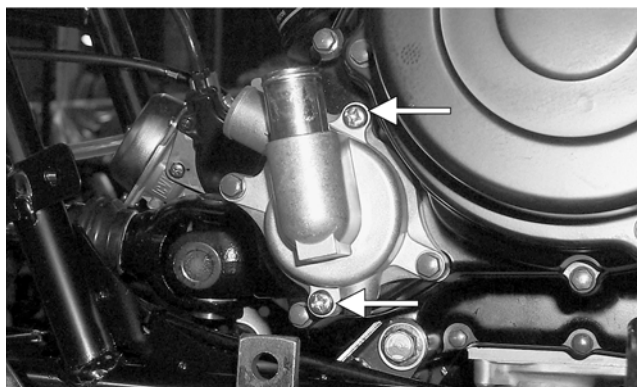
5. With the bearing housing assembly in position on the engine, place the cover (with O-ring installed) into position on the housing; then loosely secure with the two Phillips-head cap screws.

INSTALLING

1. Secure the water pump to the engine with the two cap screws tightened securely; then tighten the two Phillips-head cap screws securely.

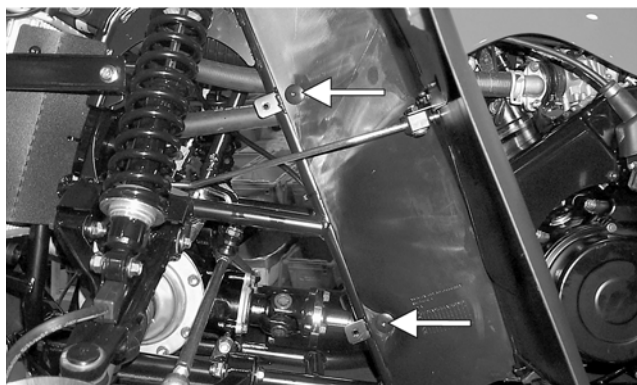


CC786A



CC785A

2. Connect the two coolant hoses to the water pump and secure with the clamps.
3. From inside the left-front wheel-well, secure the fender to the frame with the two torx-head cap screws. Tighten securely.



CC788A

4. Place the footrest into position on the frame and loosely secure with four cap screws; then secure the front and rear fenders to the footrest with the four torx-head cap screws. Tighten the four torx-head cap screws securely; then tighten the remaining cap screws to specifications.
5. Fill the engine/transmission with the proper amount of recommended oil.
6. Fill the cooling system with the proper amount of recommended coolant.

4

■ **NOTE:** While the cooling system is being filled, air pockets may develop; therefore, run the engine for five minutes after the initial fill, shut the engine off, and then fill the cooling system.

7. Check the entire cooling system for leakage.

CAUTION

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

Testing Electric Fuel Pump (700 EFI)

WARNING

Whenever any maintenance or inspection is made on the fuel system during which there may be fuel leakage, there should be no welding, smoking, open flames, etc., in the area.

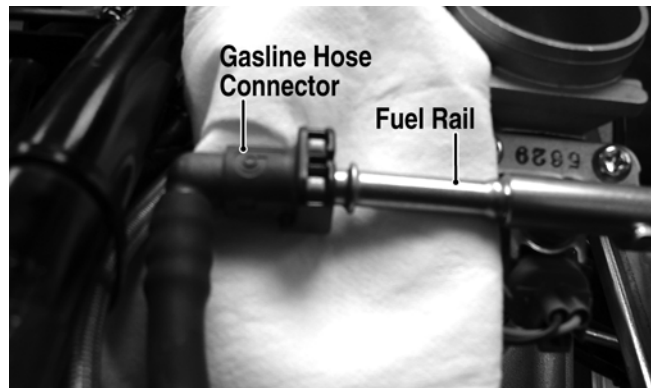
AT THIS POINT

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

1. Turn the ignition switch ON and listen for a momentary “whirring” sound of the pump building pressure. If the sound is heard (10 seconds), no electrical checks are necessary. Turn the ignition switch OFF.
2. Disconnect the gasoline hose from the throttle body; then install a suitable pressure gauge.

WARNING

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



F1092A

3. Turn the ignition switch to the ON position. The fuel pressure should build until the pump shuts off. Pressure should read 3.0 kg-cm² (43 psi).
4. If the pump is not running, disconnect the fuel pump/tank sensor connector by reaching under the rear rack from behind.
5. Connect a multimeter to the power supply leads with the red tester lead to the red wire and the black tester lead to the black wire; then turn the ignition switch to the ON position. The meter should read battery voltage. If battery voltage is indicated and the fuel pump does not run, replace the pump assembly. If no battery voltage is indicated, check the ECU and the vehicle tilt sensor.

REMOVING

1. Remove the rear rack and fenders (see Section 8); then disconnect the power supply/ fuel gauge connector.
2. Remove the spring clamp; then remove the fuel hose.
3. Remove the screws securing the fuel pump to the gas tank; then make a reference mark on the fuel pump and tank.
4. Lift out the fuel pump assembly carefully tilting it forward to clear the voltage regulator; then guide the pump and float lever through the opening in the gas tank.

CAUTION

Take care not to damage the float or float arm or replacement of the entire assembly will be necessary.

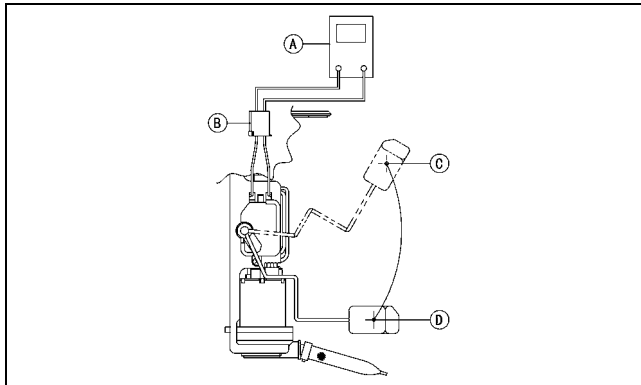
5. Using duct tape or other suitable means, cover the fuel pump opening.

INSPECTING

AT THIS POINT

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

1. Inspect the fuel screen and blow clean with low pressure compressed air.
2. Move the float lever and check for free movement. The float assembly should return to the lower position without force. If not, replace the fuel pump assembly.
3. Test the fuel gauge tank sensor by connecting a multimeter (A) to the fuel sensor leads (B); then select OHMS. The multimeter should show 5 ohms at full fuel position (C) and 95 ohms at empty fuel position (D).

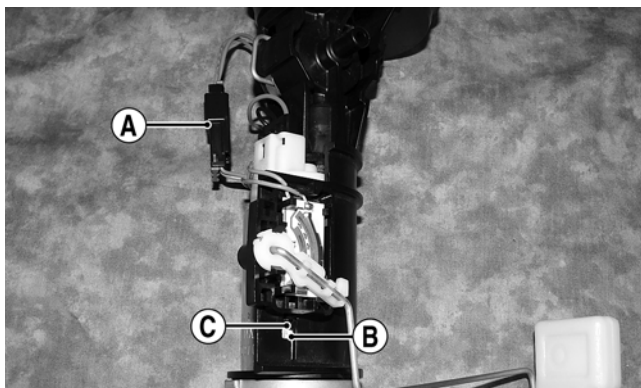


ATV2116

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

4. To replace the fuel gauge tank sensor, use the following procedure.

A. Disconnect the two-wire connector (A); then press the fuel gauge tank sensor toward the top of the fuel pump to release it from the mounting slot (B).

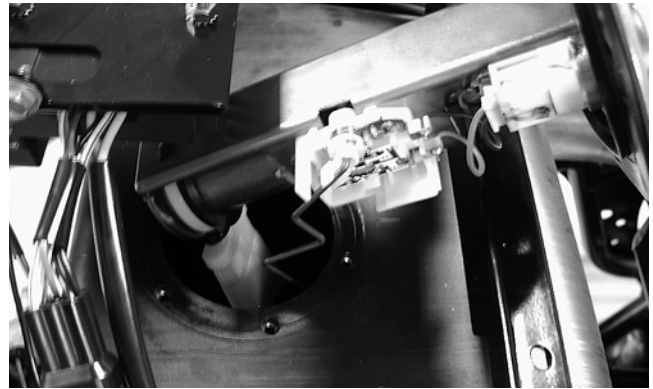


FI460A

B. Engage the tabs (C) of the fuel gauge tank sensor into the mounting slot (B) and press toward the bottom of the fuel pump to latch in place; then connect the two-wire connector (A).

INSTALLING

1. Mark the new fuel pump with a reference mark in the same location as the removed pump; then place the new gasket on the pump.
2. Remove the material covering the fuel pump opening; then carefully guide the fuel pump into position taking care not to damage the float or float lever.



KX190

3. Rotate the fuel pump until the match marks align; then install the mounting screws and tighten securely using a crisscross pattern.

■ **NOTE:** It is important to install the fuel pump with the correct orientation to ensure adequate float lever clearance.

4. Connect the wires, fuel hose, and spring clamp; then turn the ignition switch to the ON position. Note that the fuel pump runs momentarily and the fuel gauge indicates the proper fuel level.
5. With the transmission in neutral and brake lever lock engaged, start the engine and check for normal operation. Check for any fuel leaks.
6. Install any wire ties that were removed; then install the rear fenders, rack, and seat making sure the seat locks securely.

Testing Vacuum Pulse Fuel Pump (400/500/650 H1)

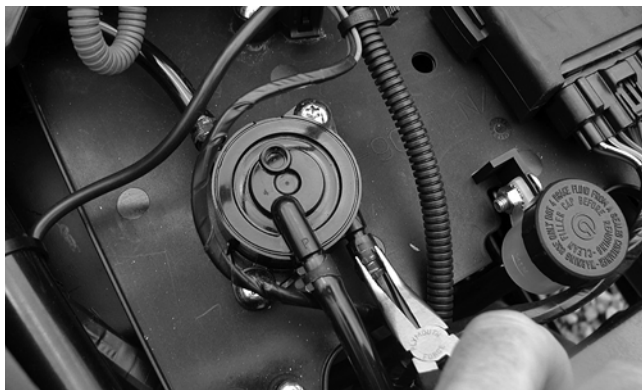
WARNING

Whenever any maintenance or inspection is made on the fuel system during which there may be fuel leakage, there should be no welding, smoking, open flames, etc., in the area.

AT THIS POINT

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

1. Disconnect the fuel pump/carburetor hose at the fuel pump; then connect a hose and suitable pressure gauge to the fuel pump output fitting.



CD815

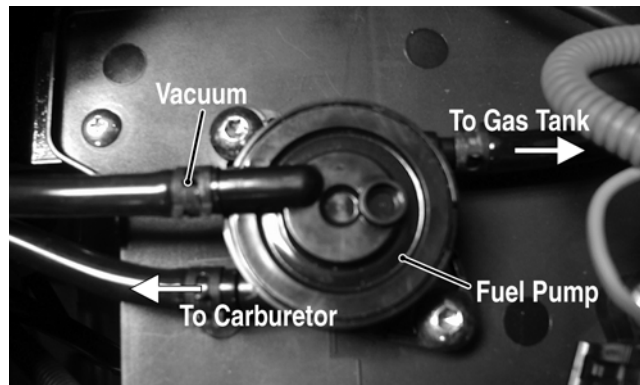


CD816

2. Start the engine. Fuel pump pressure should read 0.18-0.25 kg/cm² (2.5-3.5 psi).

REMOVING

1. Remove the seat; then remove the three clamps securing the gas hoses and vacuum hose and disconnect the hoses.



CD766A

2. Remove the two machine screws and flange nuts securing the fuel pump to the electrical tray; then remove the pump.

INSTALLING

1. Place the fuel pump into position on the electrical tray; then secure with the machine screws and flange nuts. Tighten securely.
2. Connect two gas hoses and one vacuum hose; then secure with the clamps.

SECTION 5 - ELECTRICAL SYSTEM

TABLE OF CONTENTS

Specifications	5-2
Battery	5-2
RPM Limiter.....	5-2
Testing Electrical Components	5-2
Accessory Receptacle/Connector	5-3
Brakelight Switch (Auxiliary)	5-3
Brakelight Switch (Handlebar Control)	5-3
Oil Temperature and Cooling Fan Switches (400)...	5-4
Coolant Temperature and Cooling Fan Switches (500/650 H1)	5-5
Cooling Fan Switch and Engine Coolant Temperature (ECT) Sensor (700 EFI)	5-5
Fan Motor	5-6
Fuse Block/Power Distribution Module	5-6
Fuses	5-7
Ignition Coil	5-7
EFI Sensors/Components (700 EFI)	5-8
Electronic Speedometer Speed Sensor	5-8
Ignition Switch	5-10
Handlebar Control Switches.....	5-10
Front Drive Selector Switch	5-11
Front Drive Selector Actuator	5-12
Differential Lock Switch	5-12
Magneto Coils (400/500/650 H1)	5-13
Stator Coil/Crankshaft Position (CKP) Sensor (700 EFI)	5-14
Starter Motor	5-15
Starter Relay	5-20
CDI Unit (400/TBX/500/650 H1).....	5-20
Electronic Control Unit (ECU) (700 EFI).....	5-20
Regulator/Rectifier.....	5-21
Neutral Start/Front Drive Actuator/Start-in-Gear/ Differential Lock/2WD Relays.....	5-21
Headlights	5-21
Taillight - Brakelight	5-21
Ignition Timing	5-22
ECU Error Codes (700 EFI)	5-22
Tilt Sensor (700 EFI)	5-23
Throttle Position Sensor (TPS) (700 EFI).....	5-24

Specifications

400		
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		
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 Output	(no load)	60 AC volts @ 5000 RPM (black to black)

500/650 H1		
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 (500) 4000 ohms (650 H1)
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)	140.0-215.0 DC volts - 500 142.4-213.6 DC volts - 650 H1 (terminal to ground)
MAGNETO		
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)

700 EFI		
Ignition Timing		N/A
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 (high tension - plug cap to terminal (+))
Ignition Coil Peak Voltage	(ECU)	80 volts or more (wire (+) to ground)
MAGNETO		
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)

Battery

For battery related information, see Section 2.

RPM Limiter

■ **NOTE:** The ATV is equipped with a CDI unit that retards ignition timing when maximum RPM is approached. When the RPM limiter is activated, it could be misinterpreted as a high-speed misfire.

Testing Electrical Components

All of the electrical tests should be made using the Fluke Model 73 Multimeter (p/n 0644-191) and when testing peak voltage, the Peak Voltage Reading Adapter (p/n 0644-307) must be used. If any other type of meter is used, readings may vary due to internal circuitry. When troubleshooting a specific component, always verify first that the fuse(s) are good, that the bulb(s) are good, that the connections are clean and tight, that the battery is fully charged, and that all appropriate switches are activated.

■ **NOTE:** For absolute accuracy, all tests should be made at room temperature of 68° F.

Accessory Receptacle/Connector

■ **NOTE:** This test procedure is for either the receptacle or the connector.

VOLTAGE

1. Turn the ignition switch to the ON position; then set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the red/white wire or the positive connector; then connect the black tester lead to ground.
3. The meter must show battery voltage.

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

Brakelight Switch (Auxiliary)

The switch connector is the two-prong connector on the brake switch lead above the transmission.

■ **NOTE:** The ignition switch must be in the ON position.

VOLTAGE (Wiring Harness Side)

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester to the orange wire; then connect the black tester lead to ground.



AR627D

3. The meter must show battery voltage.

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

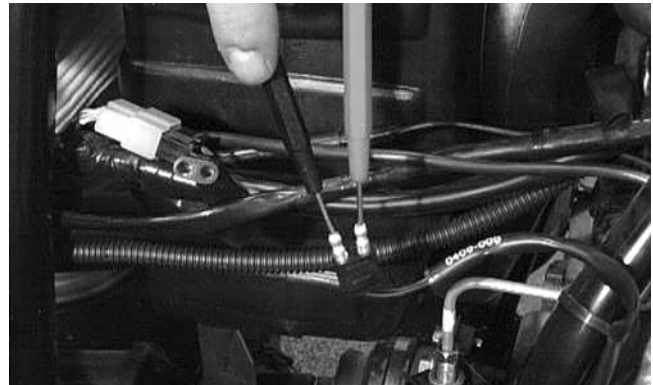
■ **NOTE:** If the meter shows battery voltage, the main wiring harness is good; proceed to test the switch/component, the connector, and the switch wiring harness for resistance.

RESISTANCE (Switch Connector)

⚠ CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to one black wire; then connect the black tester lead to the other black wire.



AR626D

3. When the brake pedal is depressed, the meter must show less than 1 ohm.

■ **NOTE:** If the meter shows more than 1 ohm of resistance, replace the switch.

Brakelight Switch (Handlebar Control)

To access the connector, remove the access panel.

■ **NOTE:** The ignition switch must be in the ON position.

VOLTAGE (Wiring Harness Connector)

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the orange wire; then connect the black tester lead to ground.



AR622D

3. The meter must show battery voltage.

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

■ **NOTE:** If the meter shows battery voltage, the main wiring harness is good; proceed to test the switch/component, the connector, and the switch wiring harness for resistance.

RESISTANCE (Switch Connector)

⚠ CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

■ **NOTE:** The brake lever must be compressed for this test. Also, the ignition switch must be in the OFF position.

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to one black wire; then connect the black tester lead to the other black wire.



AR621D

3. When the lever is compressed, the meter must show less than 1 ohm.

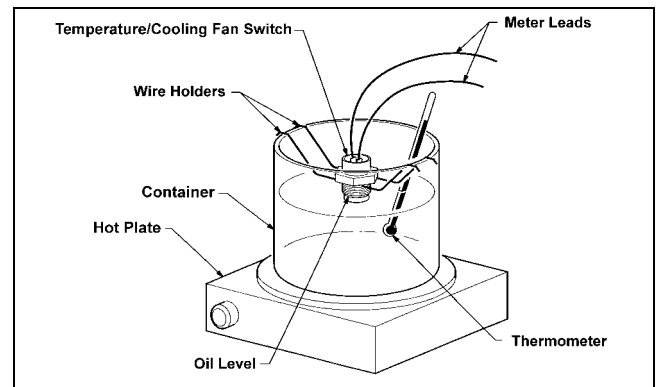
■ **NOTE:** If the meter shows more than 1 ohm of resistance, replace the switch.

Oil Temperature and Cooling Fan Switches (400)

■ **NOTE:** This model has an oil temperature switch and a cooling fan switch.

1. Connect the meter leads (selector in the OHMS position) to the switch contacts.
2. Suspend the switch and a thermometer in a container of oil; then heat the oil.

■ **NOTE:** Neither the switch nor the thermometer should be allowed to touch the bottom of the container or inaccurate readings will occur. Use wire holders to suspend switch and thermometer.



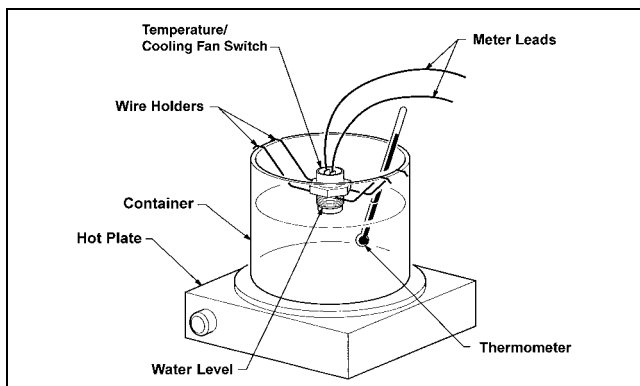
733-554C

3. On the oil temperature switch when the oil temperature reaches 160° C (320° F), the meter should read a closed circuit.
4. On the oil temperature switch, allow the oil to cool, and when the temperature is at (or just before) a temperature of 140° C (284° F), the meter should read an open circuit.
5. On the cooling fan switch when the temperature reaches 120° C (248° F), the meter should read a closed circuit.
6. On the cooling fan switch, allow the oil to cool, and when the temperature is at (or just before) a temperature of 110° C (230° F), the meter should read an open circuit.
7. If the readings are not as indicated, the switch must be replaced.
8. Apply thread tape to the threads of the switch; then install the switch and tighten securely.
9. Connect the switch leads.

Coolant Temperature and Cooling Fan Switches (500/650 H1)

1. Connect the meter leads (selector in the OHMS position) to the switch contacts.
2. Suspend the switch and a thermometer in a container of water; then heat the water.

■ **NOTE:** Neither the switch nor the thermometer should be allowed to touch the bottom of the container or inaccurate readings will occur. Use wire holders to suspend switch and thermometer.



733-554E

3. On the coolant temperature switch when the water temperature reaches 112-118° C (234-244° F), the meter should read a closed circuit.
4. On the coolant temperature switch, allow the water to cool, and when the temperature is within a temperature range of 108-111° C (226-232° F), the meter should read an open circuit.
5. On the cooling fan switch when the temperature reaches 66-68° C (150-155° F), the meter should read a closed circuit.
6. On the cooling fan switch, allow the water to cool, and when the temperature is within a temperature range of 62-65° C (145-149° F), the meter should read an open circuit.
7. If the readings are not as indicated, the switch must be replaced.
8. Install the switch and tighten securely.
9. Connect the switch leads.

Cooling Fan Switch and Engine Coolant Temperature (ECT) Sensor (700 EFI)

1. Connect the meter leads (selector in OHMS position) to the switch/sensor terminals.
2. Suspend the switch/sensor and a thermometer in a container of water; then heat the water.

■ **NOTE:** Neither the switch/sensor nor the thermometer should be allowed to touch the bottom of the container or inaccurate readings will occur. Use wire holders to suspend the switch/sensor and thermometer.

3. On the cooling fan switch when the water temperature reaches approximately 93° C (199° F), the meter should read less than 1.0 ohm.
4. On the cooling fan switch, allow the water to cool and when the temperature reaches approximately 87° C (189° F), the meter should read an open circuit.
5. On the ECT sensor when the temperature reaches 20° C (68° F), the meter should read approximately 2.45k ohms.
6. On the ECT sensor when the temperature reaches 50° C (122° F), the meter should read approximately 800 ohms.
7. On the ECT sensor when the temperature reaches 80° C (176° F), the meter should read approximately 318 ohms.
8. On the ECT sensor when the temperature reaches 110° C (230° F), the meter should read approximately 142 ohms.
9. If the readings are not as indicated, the switch/sensor must be replaced.
10. Install the switch/sensor and tighten securely.
11. Connect the leads.

Fan Motor

The connector is the black two-prong one located behind the fan assembly.

■ **NOTE:** The ignition switch must be in the ON position.

VOLTAGE (Main Harness Connector to Fan Motor)

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the black/red wire (500/650 H1/700 EFI) or the black/orange wire (400); then connect the black tester lead to ground.
3. The meter must show battery voltage.

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

■ **NOTE:** If the meter shows battery voltage, the main wiring harness is good. The connector should be checked for resistance.

RESISTANCE (Fan Motor Connector)

⚠ CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to the blue wire; then connect the black tester lead to the black wire.



AR645D

3. The meter must show less than 1 ohm.

■ **NOTE:** If the meter shows more than 1 ohm of resistance, troubleshoot or replace the switch/component, the connector, or the switch wiring harness.

■ **NOTE:** To determine if the fan motor is good, connect the blue wire from the fan connector to a 12 volt DC power supply; then connect the black wire from the fan connector to ground. The fan should operate.

⚠ CAUTION

Care should be taken to keep clear of the fan blades.

Fuse Block/Power Distribution Module

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

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

■ **NOTE:** The ignition switch must be in the LIGHTS position.

1. Remove all fuses from the distribution module.
2. Set the meter selector to the DC Voltage position.
3. Connect the black tester lead to ground.
4. Using the red tester lead, contact each end of the fuse holder connector terminals individually.
5. The meter must show battery voltage from one side of the connector terminal ends.

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

■ **NOTE:** When testing the HI fuse holder, the headlight dimmer switch must be in the HI position; when testing the LIGHTS fuse holder, the headlight dimmer switch can be in either position.

■ **NOTE:** If the meter shows no battery voltage, troubleshoot the battery, switches, distribution module, or the main wiring harness.

Fuses

CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to one spade end of the fuse; then connect the black tester lead to the other spade end.
3. The meter must show less than 1 ohm resistance. If the meter reads open, replace the fuse.

■ **NOTE:** Make sure the fuses are returned to their proper position according to amperage. Refer to the fuse block cover for fuse placement.

Ignition Coil

The ignition coil is on the frame above the engine. To access the coil, the side panel (see Section 2) must be removed.

RESISTANCE

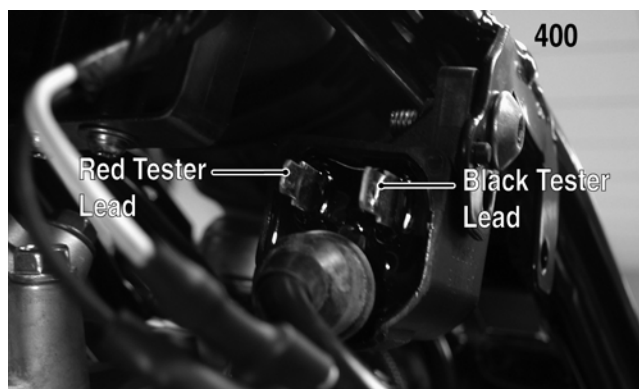
CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

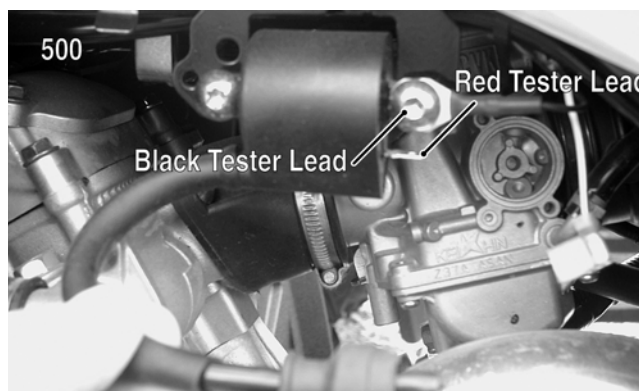
■ **NOTE:** For these tests, the meter selector should be set to the OHMS position and the primary wire(s) should be disconnected.

Primary Winding

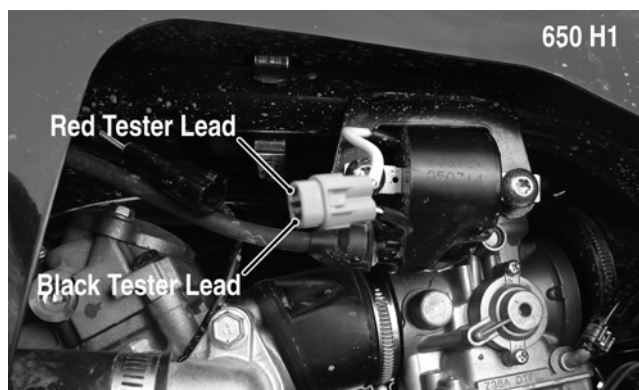
1. Connect the red tester lead to either terminal; then connect the black tester lead to the other terminal or on 500 models, to a suitable ground.



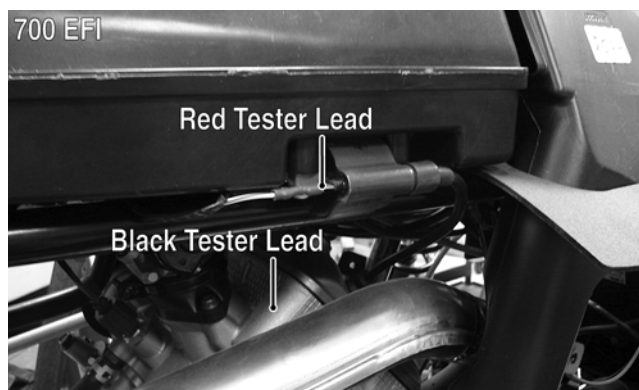
CF202A



CD882B



CF234A



FI066B

2. The meter reading must be within specification.

Secondary Winding

1. Remove the plug cap from the high tension lead; then connect the red tester lead to the high tension lead.

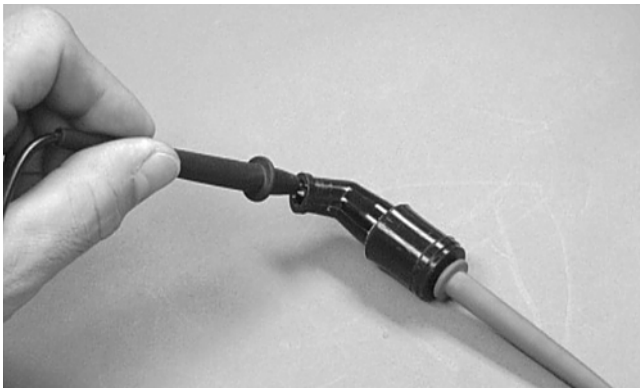
2. On the 400/650 H1, connect the black tester lead to either primary connector; on the 500/700 EFI, connect the black tester lead to the coil frame or to the primary connector.

3. The meter reading must be within specification.

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

Spark Plug Cap

1. Connect the red tester lead to one end of the cap; then connect the black tester lead to the other end of the cap.



AR603D

2. The meter reading must be within specification.

■ **NOTE:** If the meter does not read as specified, replace the spark plug cap.

PEAK VOLTAGE (400)

■ **NOTE:** All of the peak voltage tests should be made using the Fluke Model 73 Multimeter (p/n 0644-191) with Peak Voltage Reading Adapter (p/n 0644-307). If any other type of tester is used, readings may vary due to internal circuitry.

■ **NOTE:** The battery must be at full charge for these tests.

Primary/CDI

■ **NOTE:** The CDI is located beneath the seat and fender panel near the battery.

1. Set the meter selector to the DC Voltage position; then disconnect the blue/white primary wire from the coil.
2. Connect the red tester lead to the primary wire; then connect the black tester lead to ground.
3. Crank the engine over using the electric starter.
4. The meter reading must be within specification.

PEAK VOLTAGE (500/650 H1/700 EFI)

■ **NOTE:** All of the peak voltage tests should be made using the Fluke Model 73 Multimeter (p/n 0644-191) with Peak Voltage Reading Adapter (p/n 0644-307). If any other type of tester is used, readings may vary due to internal circuitry.

■ **NOTE:** The battery must be at full charge for these tests.

Primary/CDI (500/650 H1)/ ECU (700 EFI)

■ **NOTE:** The CDI/ECU is located beneath the seat near the battery.

1. Set the meter selector to the DC Voltage position; then disconnect the blue/white primary wire from the coil.
2. Connect the red tester lead to the primary wire; then connect the black tester lead to ground.
3. Crank the engine over using the electric starter.
4. The meter reading must be within specification.

EFI Sensors/ Components (700 EFI)

CRANKSHAFT POSITION (CKP) SENSOR

To test the CKP sensor, see Stator Coil/Crankshaft Position (CKP) Sensor (700 EFI) in this section.

AIR PRESSURE SENSOR (APS)

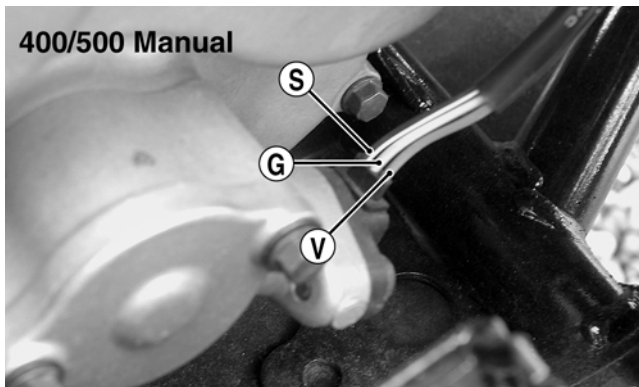
1. Disconnect the APS connector from the pressure sensor located on the right front-side of the air filter housing.
2. Select DC Voltage on the tester and turn the ignition switch to the ON position.
3. Connect the black tester lead to the black/green wire and the red tester lead to the brown wire. The meter should read 4.5-5.5 DC volts. If the meter does not read as specified, check the ECU connector or wiring.

4. Connect the APS to the harness; then using MaxiClips (p/n 0744-041), connect the red tester lead to the brown/white wire and the black tester lead to the black/green wire. With the engine running at idle speed, the meter should read approximately 2.6 DC volts.

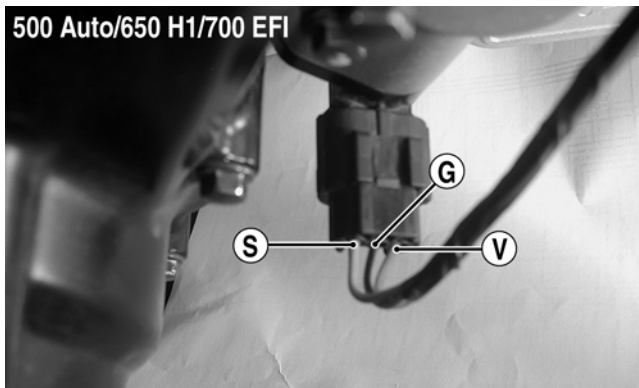
■ **NOTE:** If the meter does not read as specified, check the hose connecting the APS to the intake pipe or replace the sensor.

Electronic Speedometer Speed Sensor

■ **NOTE:** Prior to testing the speed sensor, inspect the three-wire connector on the sensor harness (400/500 manual models) or on the speed sensor (500 auto/650 H1/700 EFI models) for contamination, broken pins, and/or corrosion.



CD884A



CD885B

1. Set the meter selector to the DC Voltage position.
2. With appropriate needle adapters on the meter leads, connect the red tester lead to the voltage lead (V); then connect the black tester lead to the ground lead (G).
3. Turn the ignition switch to the ON position.

4. The meter must show 6 DC volts (500 auto/650 H1/700 EFI) or 12 DC volts (400/500 manual).
5. Leave the black tester lead connected; then connect the red tester lead to the signal lead (S) pin.
6. Slowly move the ATV forward or backward; the meter must show 0 and 6 DC volts alternately (500 auto/650 H1/700 EFI) or 0 and 12 DC volts alternately (400/500 manual).

■ **NOTE:** If the sensor tests are within specifications, the speedometer must be replaced. See Section 9.

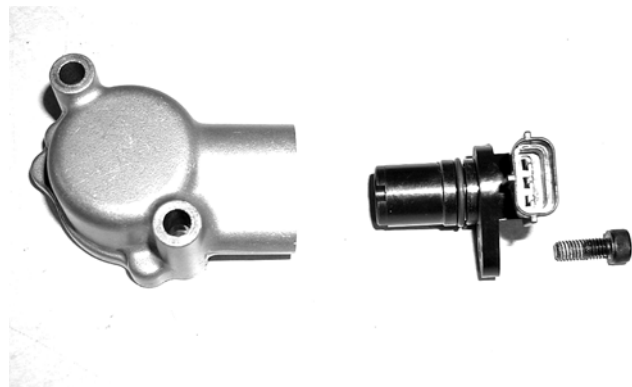
To replace a speed sensor, use the following procedure.

1. Disconnect the three-wire connector from the speed sensor harness or from the speed sensor; then remove the Allen-head cap screw securing the sensor to the sensor housing.
2. Remove the sensor from the sensor housing accounting for an O-ring.



CD070

3. Install the new speed sensor into the housing with new O-ring lightly coated with multi-purpose grease; then secure the sensor with the Allen-head cap screw (threads coated with blue Loctite #242). Tighten securely.



CD071

Ignition Switch

On the 400/500, the connector is the black three-wire one beneath the steering post cover. On the 650 H1/700 EFI, the connector is a four-wire one. To access the connector, the cover must be removed.

VOLTAGE

■ **NOTE:** Perform this test on the lower side of the connector.

1. Set the meter selector to the DC Voltage position.
2. Connect the red meter lead to the red wire; then connect the black meter lead to ground.
3. Meter must show battery voltage.

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

RESISTANCE

⚠ CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

■ **NOTE:** Perform this test on the upper side of the connector.

1. Turn the ignition switch to the ON position.
2. Set the meter selector to the OHMS position.
3. Connect the red tester lead to the red wire; then connect the black tester lead to the orange wire (400/500) or to the red/black wire (650 H1/700 EFI).
4. The meter must show less than 1 ohm.
5. Turn the ignition switch to the LIGHTS position.
6. Connect the red tester lead to the red wire; then connect the black tester lead to the orange wire (400/500) or to the red/black wire (650 H1/700 EFI).
7. The meter must show less than 1 ohm.
8. Connect the red tester lead to the red wire; then connect the black tester lead to the gray wire.

9. The meter must show less than 1 ohm.

10. With the switch in the OFF position, connect the red tester lead to the red wire and the black tester lead to each of the remaining wires. The meter must show an open circuit on all wires.

11. On the 650 H1/700 EFI, connect the red tester lead to the red wire and the black tester lead to the brown wire. With the switch in the ON position, the meter must show 980-1020 ohms.

■ **NOTE:** If the meter shows more than 1 ohm of resistance, troubleshoot or replace the switch/component, the connector, or the switch wiring harness.

Handlebar Control Switches

The connector is the yellow one next to the steering post. To access the connector, the steering post cover and the right-side fender splash shield must be removed (see Section 8).

■ **NOTE:** These tests should be made on the top side of the connector.

⚠ CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

RESISTANCE (HI Beam)

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to the yellow wire; then connect the black tester lead to the gray wire.
3. With the dimmer switch in the HI position, the meter must show less than 1 ohm.

■ **NOTE:** If the meter shows more than 1 ohm of resistance, troubleshoot or replace the switch/component, the connector, or the switch wiring harness.

RESISTANCE (LO Beam)

1. Connect the red tester lead to the white wire; then connect the black tester lead to the gray wire.
2. With the dimmer switch in the LO position, the meter must show an open circuit.

■ **NOTE:** If the meter reads resistance, troubleshoot or replace the switch/component, the connector, or the switch wiring harness.

DIODE (Starter Button)

■ **NOTE:** If voltage is not as specified, check the condition of the battery in the meter prior to replacing the switch. A low battery will result in a low voltage reading during a diode test.

1. Set the meter selector to the Diode position.
2. Connect the red tester lead to the orange/white wire; then connect the black tester lead to the yellow/green wire.
3. With the starter button depressed, the meter must show 0.5-0.7 DC volts.
4. With the starter button released, the meter must show 0 DC volts.
5. Connect the red tester lead to the yellow/green wire; then connect the black tester lead to the orange/white wire.
6. With the starter button depressed, the meter must show 0 DC volts.

■ **NOTE:** If the meter does not show as specified, replace the switch/component, connector, or switch harness.

RESISTANCE (Emergency Stop)

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

■ **NOTE:** If the meter shows more than 1 ohm of resistance, troubleshoot or replace the switch/component, the connector, or the switch wiring harness.

RESISTANCE (Reverse Override)

The connector is the four-prong white one next to the steering post. To access the connector, the front rack and front fenders must be removed (see Section 8).

1. Set the meter selector to the OHMS position.

2. Connect the red tester lead to one red/yellow wire; then connect the black tester wire to the other red/yellow wire. The meter must show less than 1 ohm.
3. Depress and hold the reverse override button. The meter must show an open circuit.
4. Connect the red tester lead to the blue wire; then connect the black meter lead to the black wire. The meter must show an open circuit.
5. Depress and hold the reverse override button. The meter must show less than 1 ohm.

■ **NOTE:** If the meter does not show as specified, replace the switch/component, connector, or switch harness.

Front Drive Selector Switch

The connector is the two-wire black snap-lock one in front of the steering post. To access the connector, the cover must be removed.

■ **NOTE:** Resistance tests should be made with the connector disconnected and on the selector-side of the connector.

RESISTANCE

⚠ CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

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

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

VOLTAGE

■ **NOTE:** The battery must be connected when performing voltage tests.

1. Set the meter selector to the DC Voltage position.

2. Connect the black tester lead to the negative battery terminal.
3. Connect the red tester lead to the red wire on the harness side of the connector.
4. Turn the ignition switch to the RUN position.
5. The meter must show 12 DC volts.

■ **NOTE:** If the meter shows other than specified, check the harness, connector, 30 amp fuse, and battery connections.

Front Drive Selector Actuator

■ **NOTE:** With the engine stopped and the ignition switch in the ON position, a momentary “whirring” sound must be noticeable each time the selector switch is moved to 2WD and 4WD. Test the switch, 30 amp fuse, and wiring connections prior to testing the actuator.

■ **NOTE:** The differential must be in the unlocked position for this procedure.

VOLTAGE

1. Select the 2WD position on the front drive selector switch; then disconnect the connector on the actuator wiring harness.
2. With the ignition switch in the OFF position, connect the black tester lead to the black wire in the supply harness; then connect the red tester lead to the orange wire in the supply harness.
3. Turn the ignition switch to the ON position. The meter must show 12 DC volts.
4. Connect the red tester lead to the white/red wire in the supply harness. The meter must show 12 DC volts.
5. Select the 4WD position on the front drive selector switch; then connect the red tester lead to the white/red wire in the supply harness. The meter must show 0 DC volts.

■ **NOTE:** The 4WD icon on the LCD should illuminate.

6. Connect the red tester lead to the orange wire in the supply harness. The meter must show 12 DC volts.

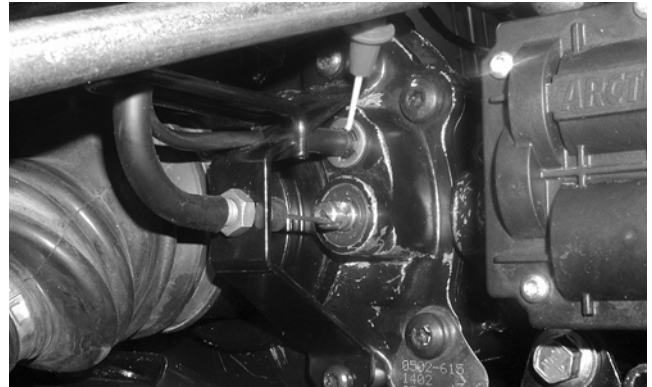
■ **NOTE:** If the voltage readings are as specified and the actuator does not function correctly, replace the actuator (see Section 6).

Differential Lock Switch

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

VOLTAGE

1. Select DC Voltage on the multimeter; then connect the red tester lead to the switch terminal (leaving the wire connected) and the black tester lead to ground.



CD575

2. Turn the ignition switch to the ON position. The meter must show 12 DC volts.

■ **NOTE:** If no voltage is indicated, check the wiring harness, fuse, or battery connections.

3. Select the lock position on the differential. The meter should drop to 0 volts, and the front drive selector actuator switch should operate to engage 4-wheel drive.

■ **NOTE:** It may be necessary to rock the ATV slightly to engage the differential lock fully.

■ **NOTE:** The 4WD and the LOCK icons on the LCD should illuminate.



CD576



CF094C

4. If the differential lock engages (front wheels locked) and the voltage does not drop to 0, the switch is faulty and must be cleaned or replaced.

Magneto Coils (400/500/650 H1)

VOLTAGE (Stator Coil - Regulated Output)

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the positive battery post; then connect the black tester lead to the negative battery post.
3. With the engine running at a constant 5000 RPM (with the headlights on), the meter must show 14-15.5 DC volts.

⚠ CAUTION

Do not run the engine at high RPM for more than 10 seconds.

■ NOTE: If voltage is lower than specified, test stator coil - no load.

VOLTAGE (Stator Coil - No Load)

The connector is the black three-pin one on the right side of the engine just above the starter motor.

■ NOTE: Test the connector that comes from the engine.

1. Set the meter selector to the AC Voltage position.
2. Test between the three black wires for a total of three tests.
3. With the engine running at the specified RPM, all wire tests must show 60 AC volts.

⚠ CAUTION

Do not run the engine at high RPM for more than 10 seconds.

■ NOTE: If both stator coil tests failed, check all connections, etc., and test again. If no voltage is present, replace the stator assembly.

RESISTANCE (Charging Coil)

⚠ CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

1. Set the meter selector to OHMS position.
2. Test between the three black wires for a total of three tests.
3. The meter reading must be within specification.

RESISTANCE (Trigger Coil)

⚠ CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

1. Disconnect the gray four-pin connector on the right side of the engine just above the starter motor.
2. Set the meter selector to the OHMS position.
3. Connect the red tester lead to the green wire; then connect the black tester lead to the blue wire. The meter reading must be within specification.

RESISTANCE (Source Coil)

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to the yellow wire; then connect the black tester lead to the white wire.
3. The meter reading must be within specification.

■ **NOTE:** If the meter shows other than specified in any resistance test, replace the stator assembly.

PEAK VOLTAGE (400)

■ **NOTE:** All of the peak voltage tests should be made using the Fluke Model 73 Multimeter (p/n 0644-191) with Peak Voltage Reading Adapter (p/n 0644-307). If any other type of tester is used, readings may vary due to internal circuitry.

■ **NOTE:** The battery must be at full charge for these tests.

Magneto Coil (Trigger)

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the green wire; then connect the black tester lead to the blue wire.
3. Crank the engine over using the electric starter.
4. The meter reading must be within specification.

Magneto Coil (Source)

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the yellow wire; then connect the black tester lead to the white wire.
3. Crank the engine over using the electric starter.
4. The meter reading must be within specification.

PEAK VOLTAGE (500/650 H1)

■ **NOTE:** All of the peak voltage tests should be made using the Fluke Model 73 Multimeter (p/n 0644-191) with Peak Voltage Reading Adapter (p/n 0644-307). If any other type of tester is used, readings may vary due to internal circuitry.

■ **NOTE:** The battery must be at full charge for these tests.

Magneto Coil (Trigger)

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the green wire; then connect the black tester lead to the blue wire.
3. Crank the engine over using the electric starter.
4. The meter reading must be within specification.

Magneto Coil (Source)

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the yellow wire; then connect the black tester lead to the white wire.
3. Crank the engine over using the electric starter.
4. The meter reading must be within specification.

Stator Coil/Crankshaft Position (CKP) Sensor (700 EFI)

VOLTAGE (Regulator/Rectifier - Output)

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the positive battery post; then connect the black tester lead to the negative battery post.
3. With the engine running at a constant 5000 RPM (with the headlights on), the meter must show 14-15.5 DC volts.

CAUTION

Do not run the engine at high RPM for more than 10 seconds.

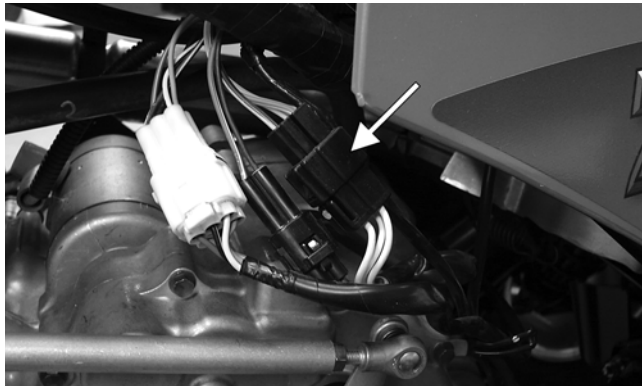
■ **NOTE:** If voltage is lower than specified, test stator coil - no load.

VOLTAGE (Stator Coil - No Load)

The connector is the black three-pin one on the left side above the shift lever.

■ **NOTE:** Test the connector that comes from the engine.

1. Set the meter selector to the AC Voltage position.
2. Test between the three yellow wires for a total of three tests.



FI083B

3. With the engine running at a constant 5000 RPM, all wire tests must be within specifications.

⚠ CAUTION

Do not run the engine at high RPM for more than 10 seconds.

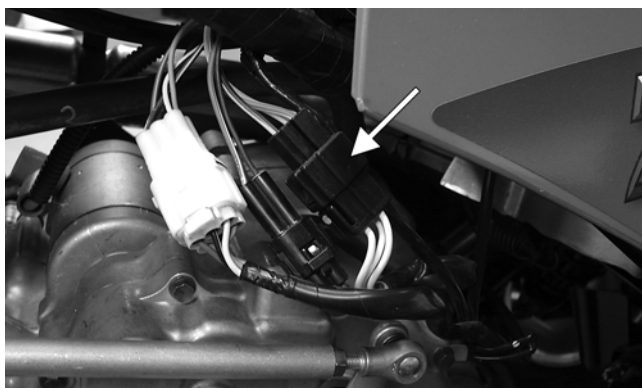
■ **NOTE:** If both stator coil tests failed, check all connections, etc., and test again. If no voltage is present, replace the stator assembly.

RESISTANCE (Charging Coil)

⚠ CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

1. Set the meter selector to OHMS position.
2. Test between the three yellow wires for a total of three tests.



FI083B

3. The meter reading must be within specification.

RESISTANCE (Crankshaft Position Sensor)

⚠ CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to the blue wire; then connect the black tester lead to the white wire. The meter reading must be within specification.

PEAK VOLTAGE

■ **NOTE:** All of the peak voltage tests should be made using the Fluke Model 73 Multimeter (p/n 0644-191) with Peak Voltage Reading Adapter (p/n 0644-307). If any other type of tester is used, readings may vary due to internal circuitry.

■ **NOTE:** The battery must be at full charge for these tests.

Crankshaft Position Sensor

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the blue wire; then connect the black tester lead to the white wire.
3. Crank the engine over using the electric starter.
4. The meter reading must be within specification.

5

Starter Motor

REMOVING/DISASSEMBLING

1. Disconnect the battery.

⚠ CAUTION

Always disconnect the negative battery cable from the battery first; then disconnect the positive cable.

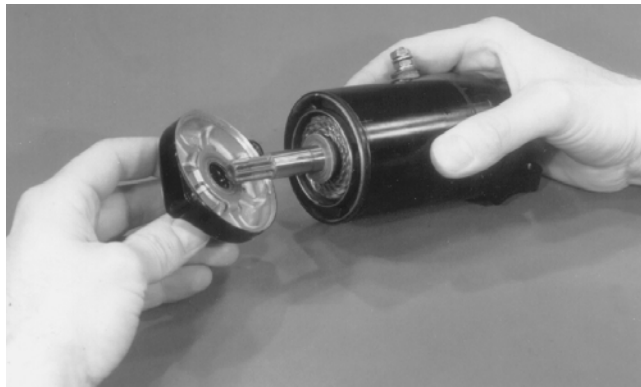
2. Remove the nut securing the positive cable to the starter; then remove the cable from the starter.
3. Remove the two cap screws securing the starter to the crankcase; then remove the starter. Account for the wiring forms and an O-ring.

4. For assembly purposes, scribe a line across the outside of the starter assembly.



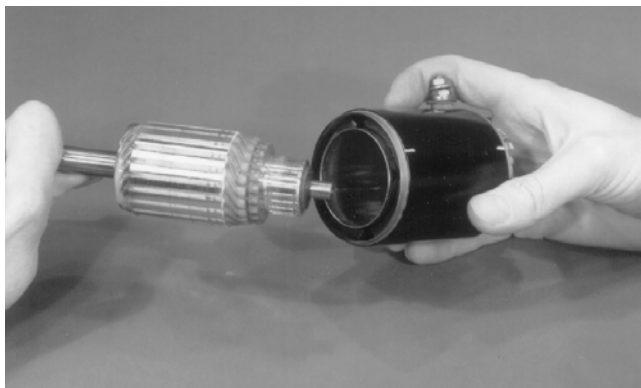
AR652D

5. Remove the two long starter cap screws securing the starter components.
6. Remove the front cover from the starter housing and armature shaft. Account for a seal protector and three washers.



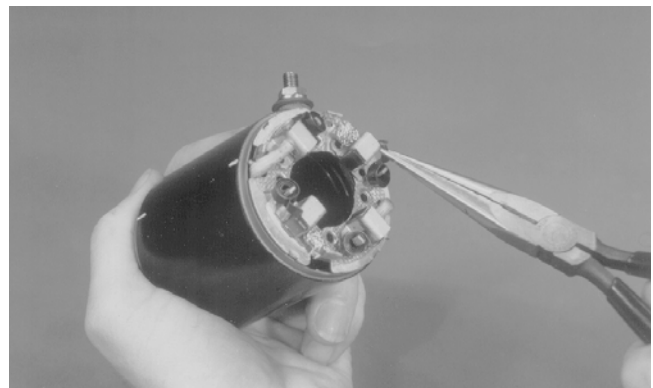
BC003

7. Remove the rear cover.
8. Slide the armature free of the starter housing.



BC006

9. Bend the two positive brushes outward; then remove the brush holder.

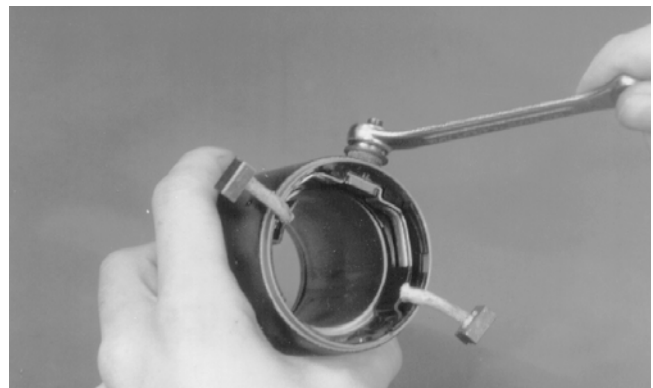


BC007



BC010

10. Remove the nut from the positive post. Account for the lock washer, flat washer, a fiber washer, and an O-ring.



BC008

11. Remove the positive brush assembly from the starter housing.



BC009

CLEANING AND INSPECTING

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

1. Thoroughly clean all components except the armature and brushes in parts-cleaning solvent; then dry with compressed air.

CAUTION

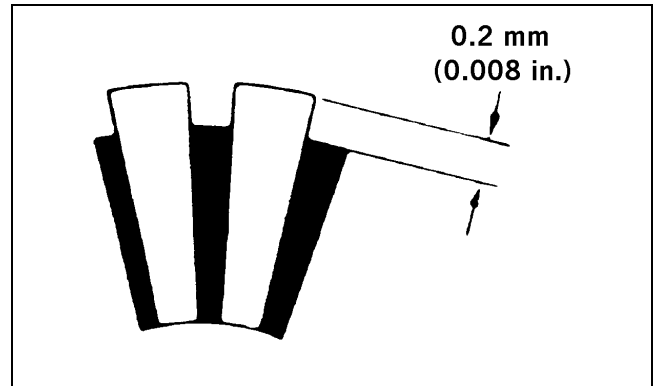
Do not wash the armature and brushes in any kind of solvent. Use only compressed air and a clean dry, lint-free cloth.

2. Inspect all threaded areas for damage or stripped threads.
3. Inspect the brush holder assembly and brushes for damage or wear. Using a caliper, measure the length of the brushes. If brush measurement is less than 10.1 mm (0.40 in.), replace with new brushes and brush springs as a set.
4. Inspect the brush leads for cracks, wear, or fraying. If any of these conditions exist, replace with new brushes and brush springs as a set.
5. Inspect the rear cover bushing for wear.
6. Inspect the front cover bearing for wear.
7. Inspect the brass commutator end of the armature for any discolored spots or damage. If the commutator is lightly discolored or damaged, the armature must be replaced. This is a molded commutator and turning it down in a lathe should not be attempted.

CAUTION

Do not use emery cloth to clean the commutator as emery particles will become imbedded in the brass commutator resulting in a short circuit. Use only #200 grit sandpaper.

8. Inspect the commutator end of the armature for buildup in the grooves. Carefully remove any buildup by undercutting using a thinly ground hacksaw blade. Do not undercut any deeper than the original groove which can be seen by looking at the end of the commutator.
9. Using a caliper, measure the undercut. Maximum undercut groove must be 0.2 mm (0.008 in.).



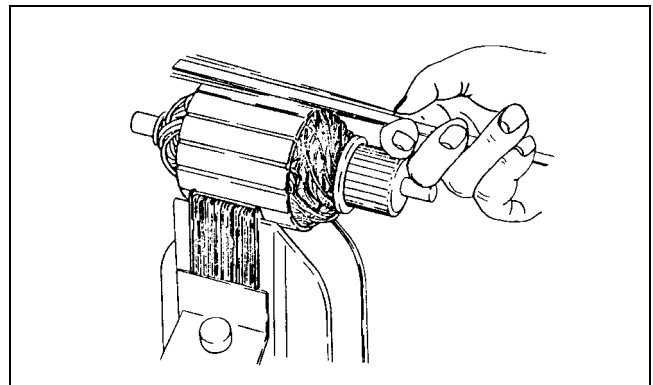
ATV-1054

CAUTION

Buildup in the grooves must be removed to prevent any chance of an electrical arc between individual sections of the commutator.

10. Inspect the commutator for shorting using a multimeter and the following procedure.
 - A. Set the selector to the OHMS position.
 - B. Touch the black lead to the armature shaft.
 - C. Using the red tester lead, probe the commutator end of the armature. The meter indicator should not change. If the indicator shows resistance, the armature is shorted and must be replaced.
11. Inspect the armature for shorting using a "growler" and the following procedure.
 - A. Place the armature in the "growler."
 - B. While holding a metal strip on the armature, rotate the armature an entire revolution. If the metal strip vibrates at any point on the armature, the armature is shorted and must be replaced.

5



0725-653

12. Inspect the ground brushes to make sure they are properly grounded. Use a multimeter and the following procedure.
 - A. Set the selector to the OHMS position.

B. Touch the black tester lead to a ground brush.

C. Touch the red tester lead to the brush holder assembly.

■ **NOTE:** If no resistance is indicated, check the ground connection for tightness and for cleanliness. If there is still no meter indication, replace the brush assembly.

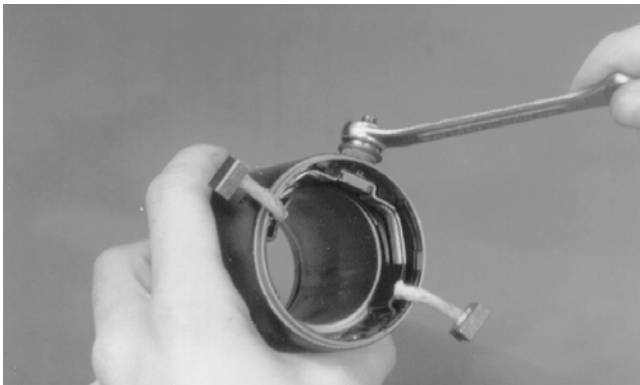
ASSEMBLING/INSTALLING

1. Install the positive post on the positive brush assembly; then install on the starter housing.



BC009

2. On the positive post, install an O-ring washer, a fiber washer, a flat washer, and a lock washer. Secure with the nut.



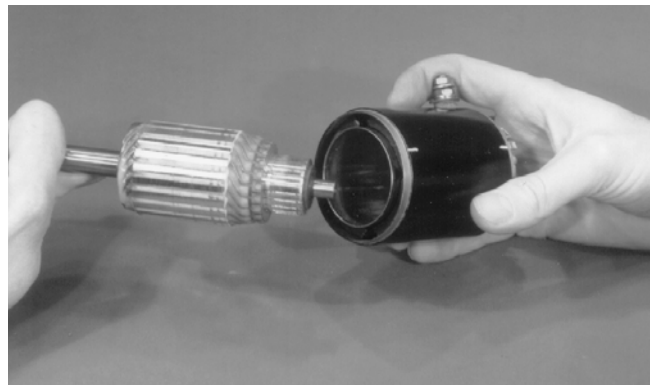
BC008

3. Align the tab on the brush holder with the notch in the starter housing; then install.



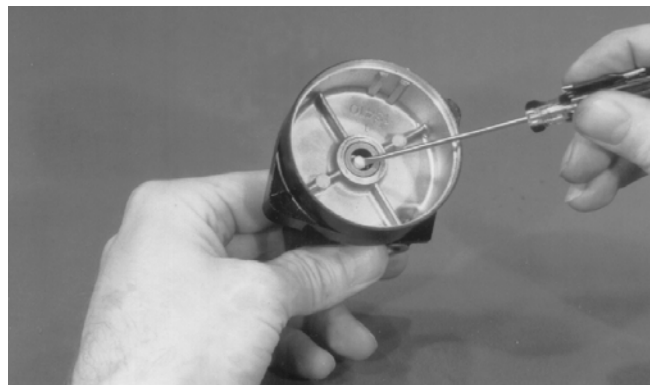
BC010

4. Install the armature into the starter housing; then while holding the brushes out, slide the commutator into the brush holder.



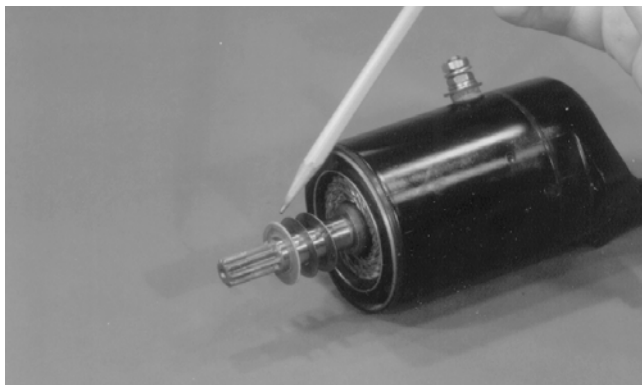
BC006

5. Apply a small amount of grease to the rear cover bushing; then install the cover on the starter housing making sure the reference marks align.



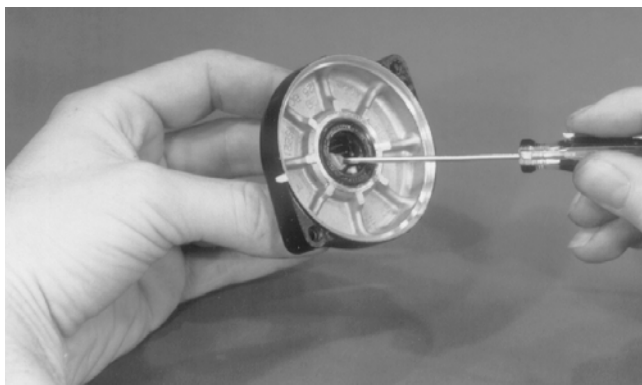
BC013

6. In order, install the thick metal washer, thin metal washer, and the fiber washer on the armature shaft; then install the housing O-ring on the starter housing.

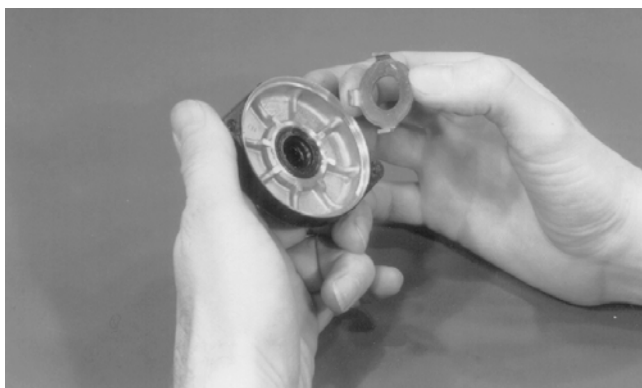


BC014

7. Apply a small amount of grease to the front cover bearing and seal; then install the seal protector.

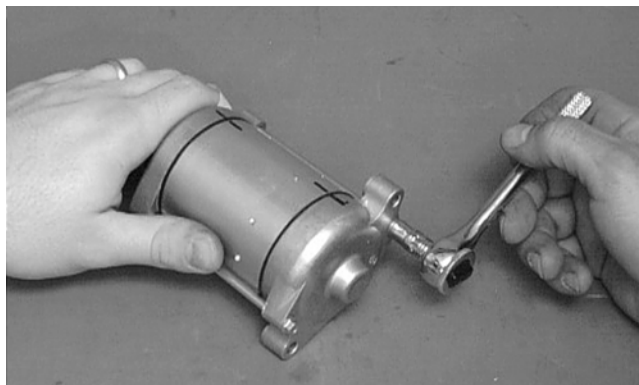


BC015



BC004

8. Place the front cover onto the starter housing making sure it seats properly.
9. Apply red Loctite #271 to the threads of the two long cap screws and install. Tighten to 0.8-1.2 kg-m (6-9 ft-lb).



AR653D

10. Apply a small amount of grease to the O-ring seal on the starter; then install the starter into the crankcase. Secure with two cap screws and wiring forms.

11. Secure the positive cable to the starter with the nut.

12. Connect the battery.

TESTING VOLTAGE

Perform this test on the starter motor positive terminal. To access the terminal, slide the boot away.

■ **NOTE:** The ignition switch must be in the ON position, the emergency stop switch in the RUN position, the reverse lever (on manual transmission models) in the FORWARD position, and the shift lever (on automatic transmission models) in the NEUTRAL position.

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the starter terminal; then connect the black tester lead to ground.
3. With the starter button depressed, the meter must show battery voltage and the starter motor should operate.



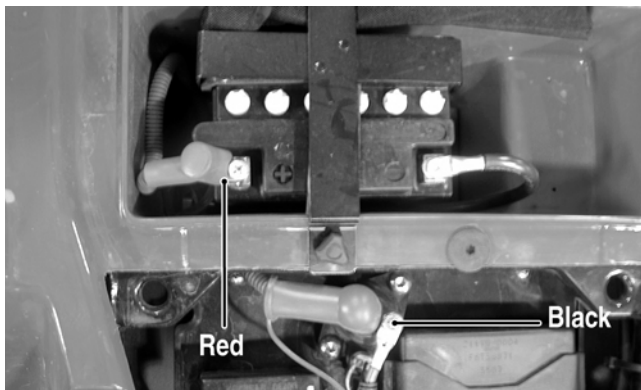
AR607D

■ **NOTE:** If the meter showed battery voltage but the starter did not operate or operated slowly, inspect battery voltage (at the battery), starter motor condition, and/or ground connections.

■ **NOTE:** If the meter showed no battery voltage, inspect the main fuse, ground connections, starter motor lead, battery voltage (at the battery), starter relay, or the neutral start relay.

Starter Relay

1. Remove the seat; then using the multimeter set to the DC Voltage position, check the relay as follows.
2. Connect the red tester lead to the positive battery terminal; then connect the black tester lead to the starter cable connection on the starter relay. The meter must show battery voltage.

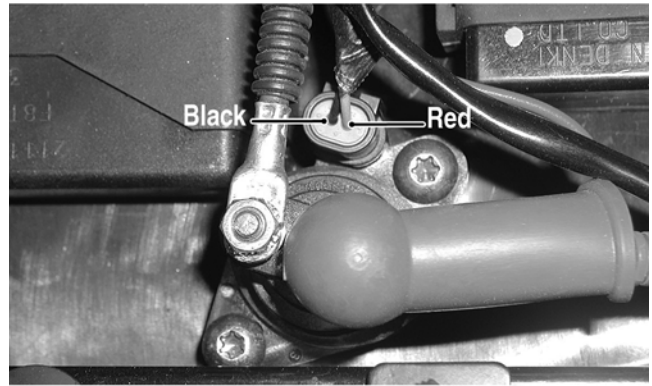


■ **NOTE:** Make sure that the ignition switch is in the ON position, transmission in neutral, brake lock released, and the emergency stop switch in the RUN position.

3. Depress the starter button while observing the multimeter. The multimeter should drop to 0 volts and a “click” should be heard from the relay.

■ **NOTE:** If a “click” is heard and any voltage is indicated by the multimeter, replace the starter relay. If no “click” is heard and the multimeter continues to indicate battery voltage, proceed to step 4.

4. Disconnect the two-wire plug from the starter relay; then connect the red tester lead to the green wire and the black tester lead to the black wire.



KX059A

5. Depress the starter button and observe the multimeter.

■ **NOTE:** If battery voltage is indicated, replace the starter relay. If no voltage is indicated, proceed to Neutral Start Relay check.

CDI Unit (400/TBX/500/650 H1)

The CDI is located beneath the seat near the battery.

■ **NOTE:** The CDI unit is not a serviceable component. If the unit is defective, it must be replaced.

The CDI is rarely the cause for electrical problems; however, if the CDI is suspected, substitute another CDI unit to verify the suspected one is defective.

■ **NOTE:** Prior to replacing the CDI unit to assure the CDI unit is defective, it is advisable to perform a CDI peak voltage test (see Ignition Coils in this section) and/or perform a continuity test of the wiring harness from the CDI connector to the CDI unit.

Electronic Control Unit (ECU) (700 EFI)

The electronic control unit (ECU) is located beneath the seat near the battery.

■ **NOTE:** The ECU is not a serviceable component. If the unit is defective, it must be replaced.

The ECU is rarely the cause for electrical problems; however, if the ECU is suspected, substitute another ECU to verify the suspected one is defective.

Error codes can be cleared by following the procedures located in the ECU Error Codes (700 EFI) sub-section in this section.

Regulator/Rectifier

The regulator/rectifier is located under the rear rack and rear fenders.

TESTING

1. Start engine and warm up to normal operating temperatures; then connect a multimeter to the battery as follows.
2. Select the DC Voltage position; then connect the red tester lead to the positive battery post and the black tester lead to the negative battery post.
3. Start the engine and slowly increase RPM. The voltage should increase with the engine RPM to a maximum of 15.5 DC volts.

■ **NOTE:** If voltage rises above 15.5 DC volts, the regulator is faulty or a battery connection is loose or corroded. Clean and tighten battery connections or replace the regulator/rectifier. If voltage does not rise, check Voltage (Charging Coil - No Load) in this section. If charging coil voltage is normal, replace the regulator/rectifier.

Neutral Start/Front Drive Actuator/Start-in-Gear/Differential Lock/2WD Relays

The relays are identical plug-in type located on the power distribution module. Relay function can be checked by switching relay positions. The relays are interchangeable.

■ **NOTE:** The module and wiring harness are not a serviceable component and must be replaced as an assembly.

Headlights

The connectors are the four 2-prong ones secured to the front bumper supports (two on each side) with cable ties.

BULB VERIFICATION (Low and High Beam)

■ **NOTE:** Perform this test on each headlight bulb. Also, a 12-volt external power supply w/jumpers will be needed.

1. Disconnect the wiring harness from the bulb to be tested.
2. Connect the power supply (positive) to one bulb contact; then connect the power supply (negative) to the remaining bulb contact.
3. The bulb should illuminate.
4. If the bulb fails to illuminate, it must be replaced.

VOLTAGE

■ **NOTE:** Perform this test in turn on the main harness side of all four connectors. Also, the ignition switch must be in the LIGHTS position.

■ **NOTE:** The LO beam is the outside bulb, and the HI beam is the inside bulb.

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to one wire; then connect the black tester lead to the other wire.
3. With the dimmer switch in the LO position, test the two outside connectors (LO beam). The meter must show battery voltage.
4. With the dimmer switch in the HI position, test the two inside connectors (HI beam). The meter must show battery voltage.

■ **NOTE:** If battery voltage is not shown in any test, inspect the fuses, battery, main wiring harness, connectors, or the left handlebar switch.

Taillight - Brakelight

The connector is the 3-prong one located under the rear fender assembly.

BULB VERIFICATION

■ **NOTE:** Perform this test on the taillight-brake-light side of the connector. Also, a 12-volt external power supply (jumper) will be needed.

1. Connect the power supply (positive) to the middle terminal; then connect the power supply (negative) to the bottom terminal.
2. The taillight should illuminate.
3. With the negative power supply still connected, connect the positive supply wire to the top terminal.
4. The brakelight should illuminate.

■ **NOTE:** If either the taillight or brakelight fails to illuminate, inspect the bulb, the connectors, or the component wiring harness.

VOLTAGE (Taillight)

■ **NOTE:** Perform this test on the main harness side of the connector. Also, the ignition switch should be in the LIGHTS position.

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the white wire; then connect the black tester lead to the black wire.
3. With the ignition key in the LIGHTS position, the meter must show battery voltage.

■ **NOTE:** If the meter shows no voltage, inspect fuses, wiring harness, connectors, and switches.

VOLTAGE (Brakelight)

■ **NOTE:** Perform this test on the main harness side of the connector. Also, the ignition switch should be in the ON position and the brake (either foot pedal or hand lever) must be applied.

■ **NOTE:** Make sure the brake lever (hand) and brake pedal (auxiliary) are properly adjusted for this procedure.

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the red/blue wire; then connect the black tester lead to the black wire.
3. With either brake applied, the meter must show battery voltage.

■ **NOTE:** If the meter shows no voltage, inspect bulb, fuses, wiring harness, connectors, and switches.

Ignition Timing

The ignition timing cannot be adjusted; however, verifying ignition timing can aid in troubleshooting other components. To verify engine timing, see Section 2.

ECU Error Codes (700 EFI)

If a sensor fails or an out-of-tolerance signal is sensed by the ECU, an error code will be generated by the ECU. This will result in the analog needle swinging full scale (LE model) or the LCD gauge going blank (standard model). The EFI icon will flash.

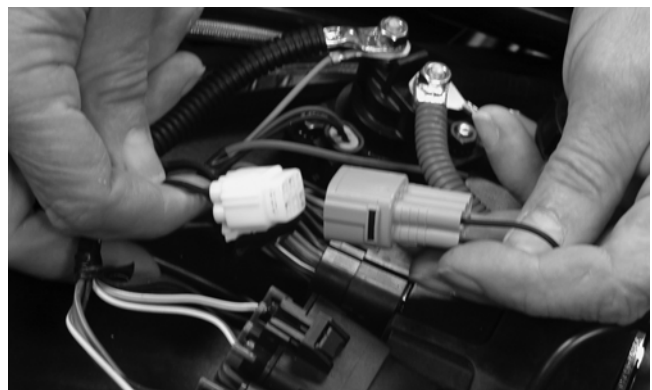
To read the error code, use the following procedure.

1. Make sure the ignition switch is in the OFF position; then remove the seat.

CAUTION

Always make sure the ignition switch is in the OFF position before disconnecting the ECU.

2. Locate the diagnostic plug in front of the ECU; then remove the black rubber cap.
3. Connect the Diagnostic Harness (p/n 0486-219) to the diagnostic plug.



ATV-112

4. Turn the ignition switch to the ON position and read the error code on the LCD. Refer to the following ECU Error Code List to identify the specific problem area.

ECU Error Code List

- EC00 = No Fault Detected
- EC12 = CKP (Crankshaft Position) Sensor
- EC13 = APS (Air Pressure Sensor)
- EC14 = TPS (Throttle Position Sensor)
- EC15 = Water Temperature Sensor
- EC20 = Differential Lock Relay
- EC21 = Air Temperature Sensor
- EC23 = Tilt Sensor
- EC24 = Ignition Coil #1
- EC32 = Fuel Injector #1
- EC40 = ISC Valve
- EC41 = Fuel Pump Relay
- EC99 = Start Not Possible

■ **NOTE:** EC99 indicates that the engine will not start and that the spark plug and fuel pump are disabled. EC99 will be displayed following EC23 (Tilt Sensor), EC24 (Ignition Coil), etc.

To clear an error code after repairs or adjustments are made, install the Diagnostic Harness (p/n 0486-219) by connecting it to the diagnostic plug; then turn the ignition switch to the ON position. After three seconds, turn the ignition switch to the OFF position and disconnect the diagnostic harness. When the ignition switch is turned on, the error code should not be displayed.

Tilt Sensor (700 EFI)

WARNING

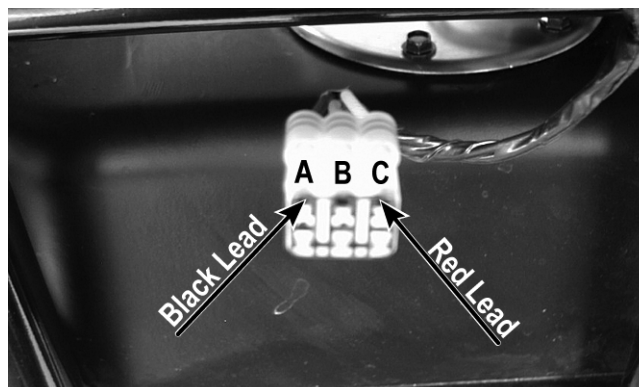
Incorrect installation of the tilt sensor could cause sudden loss of engine power which could result in loss of vehicle control resulting in injury or death.

CAUTION

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

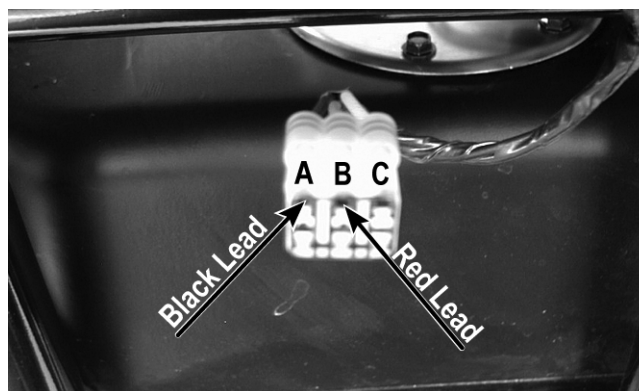
SUPPLY VOLTAGE

1. Disconnect the three-wire connector from the sensor; then select DC Voltage on the multimeter and connect the red tester lead to the orange wire (C) and the black tester lead to the black wire (A).



CD706A

2. Turn the ignition switch to the ON position. The multimeter should read battery voltage. If battery voltage is not indicated, check the 30-amp fuse, wiring harness, or the ignition switch.
3. Remove the red tester lead and connect to the blue/brown wire (B). The multimeter should read 0 DC volts. If the specified voltage is not indicated, check wire connections at the CDI or substitute another CDI to verify the test.



CD706B

OUTPUT VOLTAGE

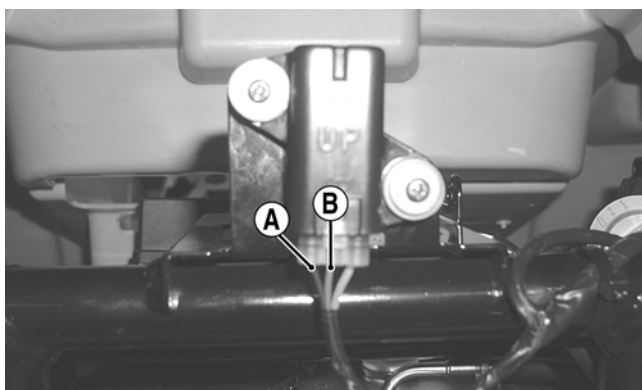
■ **NOTE:** Needle adapters will be required on the multimeter leads as the following tests are made with the sensor connected.

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



CD707

2. Install the needle adapters to the multimeter leads; then select DC Voltage on the multimeter.
3. Connect the red tester lead to the blue/brown wire (B) and the black tester lead to the black/yellow wire (A); then turn the ignition switch ON and observe the meter. The meter should read 0.8-3.0 DC volts.



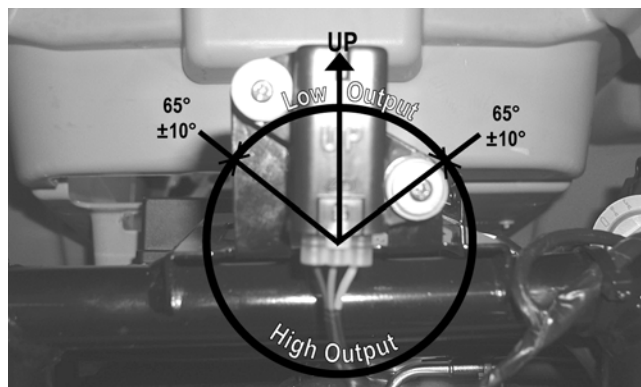
CD705B

4. Tilt the sensor 60° or more to the left and right observing the meter. The meter should read 4.0-8.0 DC volts after approximately one second in the tilted position. If the meter readings are not as specified, the tilt sensor is defective.



CD709

■ **NOTE:** When replacing the sensor after testing, make sure the arrow marking is directed up.



CD705A

Throttle Position Sensor (TPS) (700 EFI)

INSPECTING

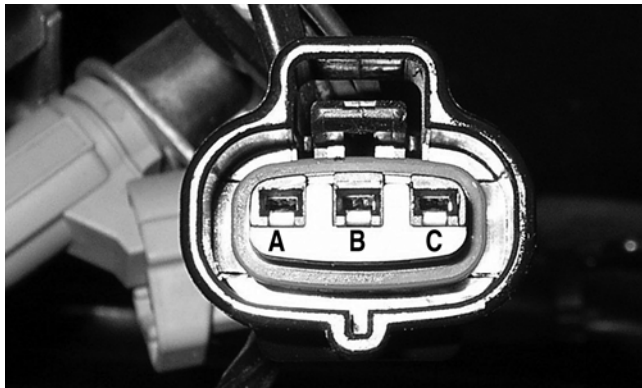
1. Remove the left-side engine cover; then disconnect the three-wire TPS connector plug.



FI450A

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

2. Make sure the ignition switch is in the OFF position; then select the DC Voltage position on the meter.
3. Connect the black tester lead to spade terminal C and the red tester lead to spade terminal A. Turn the ignition switch to the ON position. The meter should read 4.5-5.5 DC volts.



FI456A

4. Remove the red tester lead from spade terminal A and connect it to spade terminal B. The meter should read 4.5-5.5 DC volts.

■ **NOTE:** If the meter does not read as specified, check for poor connections at the ECU or open/broken wires in the wiring harness.

CAUTION

Always make sure the ignition switch is in the OFF position before disconnecting the ECU.

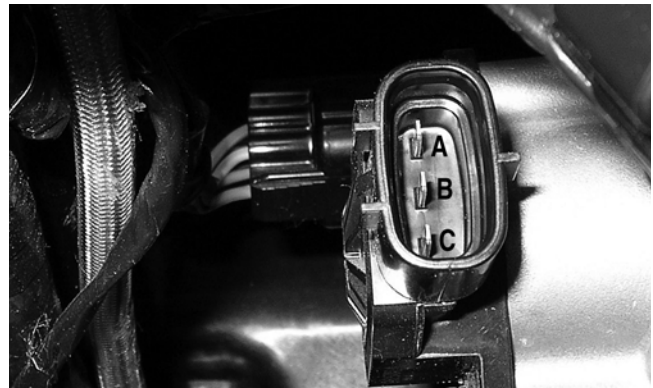
5. Turn the ignition switch to the OFF position; then disconnect the battery (negative cable first).

CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

6. Select the OHMS position on the meter; then perform the following resistance tests on the TPS.

- A. Pin (B) to ground - infinity (open circuit).
- B. Pin (A) to pin (B) - approximately 1.22k ohms (throttle closed).
- C. Pin (A) to pin (B) - approximately 4.36k ohms (throttle full-open).
- D. Pin (A) to pin (C) - approximately 4.05k ohms.



FI455A

■ **NOTE:** If any meter reading is not as specified, replace or adjust the TPS (see INSTALLING/ADJUSTING in this sub-section).

7. Connect the positive lead to the battery; then connect the negative lead.

8. Connect the main harness TPS connector to the TPS; then using MaxiClips (p/n 0744-041), connect the black tester lead to the green/black wire.



FI451A

9. Select the DC Voltage position on the meter and turn the ignition switch to the ON position. The meter should read approximately 1.12 DC volts with the throttle closed and approximately 4.32 DC volts with the throttle in the full-open position.

■ **NOTE:** If the meter readings are as specified, check the main harness connector at the ECU main harness wiring. If the meter readings are not as specified, replace the TPS and adjust to specifications (see INSTALLING/ADJUSTING in this sub-section).

CAUTION

Always make sure the ignition switch is in the OFF position before disconnecting the ECU.

10. Clear all ECU error codes after servicing is complete (see ECU Error Codes (700 EFI) in this section).

REMOVING

1. Remove the left-side engine cover; then disconnect the three-wire TPS connector plug.



FI450A

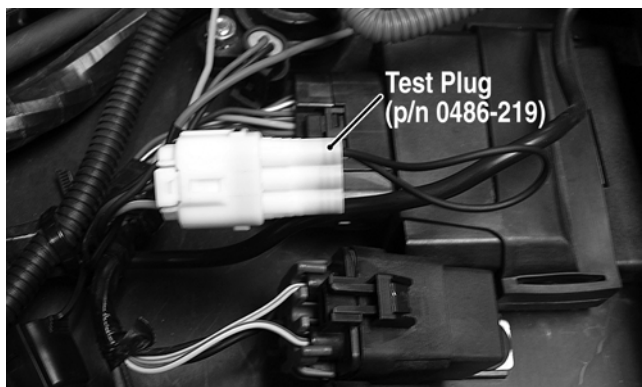
2. Remove the two screws securing the TPS to the throttle body and remove the TPS.

INSTALLING/ADJUSTING

1. Place the TPS into position on the throttle body and secure with the two screws. Do not tighten at this time.
2. Connect the main harness to the TPS.
3. Locate the diagnostic connector under the seat; then install the test plug from Test Plug/Error Code List Kit (p/n 0444-216) onto the connector.

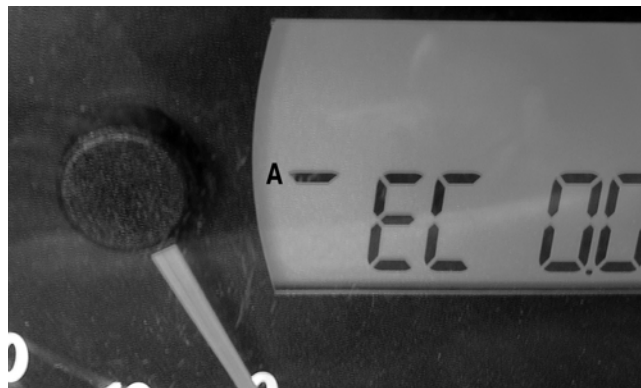


FI452A



FI453A

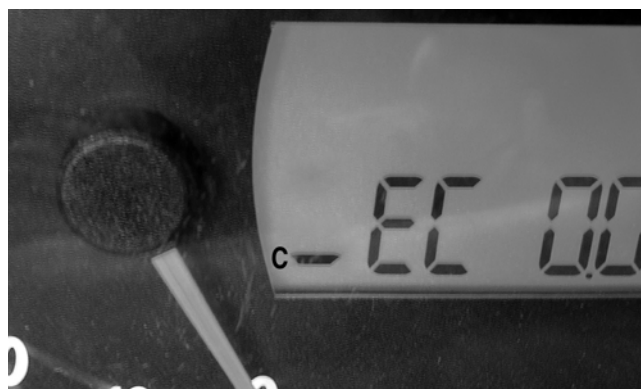
4. Turn the ignition switch to the ON position and note the position of the TPS indicator icon (A, B, or C); then adjust the TPS until the TPS icon appears in the center position (B).



FI459A



FI454A



FI459B

5. Tighten the mounting screws securely; then verify the TPS icon appears in the center position.
6. Remove the test plug; then install the left-side engine cover.

SECTION 6 - DRIVE SYSTEM

6

TABLE OF CONTENTS

Drive System	6-2
General Information.....	6-2
Front Drive Actuator	6-3
Front Differential	6-4
Drive Axles	6-18
Rear Gear Case	6-22
Hub.....	6-24
Hydraulic Brake Caliper.....	6-24

Drive System

■ **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.

General Information

All gear cases are tagged beneath a cover bolt. This tag is marked with a production date code, sequence code, and a ratio code.

- A. A “6” or “3.6” on the lower-right corner indicates a 3.6:1 gear set ratio (10:36 teeth).
- B. A “1” or “3.1” on the lower-right corner indicates a 3.1:1 gear set ratio (11:34 teeth).
- C. A “4.0” on the lower-right corner indicates a 4.0:1 gear set ratio (9:36 teeth).

The die-cast aluminum housings have been assembled with thread-rolling screws (trilobular). When assembling with these screws, start the screws carefully into the housing; then use the following torque values.

Size	New Housing	Reassembled Housing
M6 (Torx T-30 Recess)	1.1-1.3 kg-m (8-9.5 ft-lb)	0.9-1.2 kg-m (6.5-9 ft-lb)
M8 (Torx T-40 Recess)	3.5-4.3 kg-m (25-31 ft-lb)	2.9-3.5 kg-m (21-25 ft-lb)
M10 (Torx T-50 Recess)	5.1-6.3 kg-m (37-45.5 ft-lb)	4.3-5.3 kg-m (31-38 ft-lb)

SPECIFICATIONS

Specific specifications regarding the gear cases (capacities, lubricant type, etc.) can be found in Section 1 of this manual.

Ring Gear Backlash	0.28-0.38 mm (0.011-0.015 in.)
Ring Gear End Play	0.1-0.2 mm (0.004-0.008 in.)

SPECIAL TOOLS

A number of special tools must be available to the technician when servicing the gear case.

Description	p/n
CV Boot Clamp Tool	0444-120
Pinion Gear/Shaft Removal Tool	0444-127
Slide Hammer Kit	0444-225
Internal Hex Socket (48 mm)	0444-104

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

TROUBLESHOOTING

If a noise is heard from the gear case area, it can be difficult to locate and/or diagnose. If the noise is related to wheel speed, but not to engine RPM, the problem is probably in the final drive or engine/transmission bevel gear set. When a problem is localized, a number of inspections must be made to pinpoint that problem. The most obvious of the inspections include CV boots, wheel and hub nut tightness, wheel bearing damage, gear case lubricant contamination, low lubricant level, seal leakage, CV joints, or selector arm.

■ **NOTE:** Small metallic particles will collect on the magnetic drain plug as a normal part of break-in and will also give a metallic cast to drained lubricant. Contamination would include large particles or water which gives a “milky” look to the lubricant.

■ **NOTE:** Lubricant on a new pinion housing assembly could be grease. If the front of the gear case is leaking at the rear drive boot, wipe excess lubricant from the bottom of the pinion housing; then operate the ATV for a period of time. Inspect the pinion housing area for any signs of leakage. If lubricant is again on the bottom of the pinion housing, the seal must be replaced.

Additional troubleshooting could include the following.

- Binding/abrupt motion: CV boot torn (grease loss, foreign object damage, broken cage); gear lubricant loss or not filled (bearing seizure, broken gear teeth, seal leakage, bladder or hose leakage, missing filler/drain plug).
- Noise from drive system: wheel or gear case bearing damage, improper gear backlash, improper assembly, low or no gear case lubricant.
- Lockup: gear case lubricant loss or not filled, water contamination causing bearing seizure.

Front Drive Actuator

■ **NOTE:** The actuator is not a serviceable component. If it is defective, it must be replaced.

■ **NOTE:** The actuator will operate only when the ignition switch is in the ON position.

The front drive actuator is located on the left side of the front drive input housing. With the engine stopped and the ignition switch in the ON position, a momentary “whirring” sound can be heard each time the front drive selector switch is shifted. If no sound is heard, see Section 5. If the actuator runs constantly or makes squealing or grinding sounds, the actuator must be replaced.

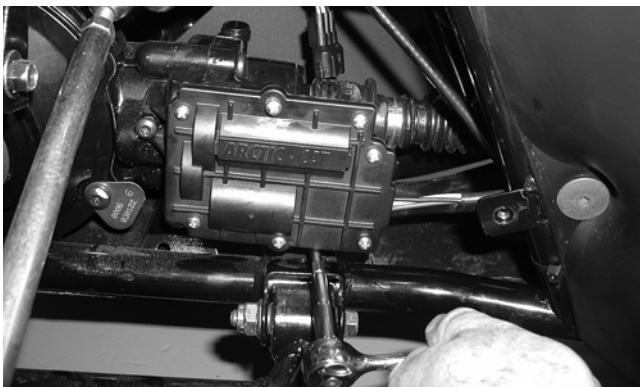
REMOVING

1. Remove the left-front inner fender panel; then disconnect the connector on the actuator harness.
2. Using a T-30 torx wrench, remove the mounting cap screw from the driveshaft side of the actuator.



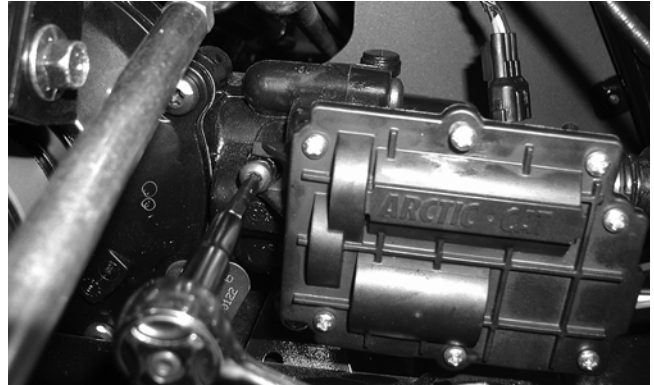
AG926

3. Remove the mounting cap screw from below the actuator on the suspension side.



AG927

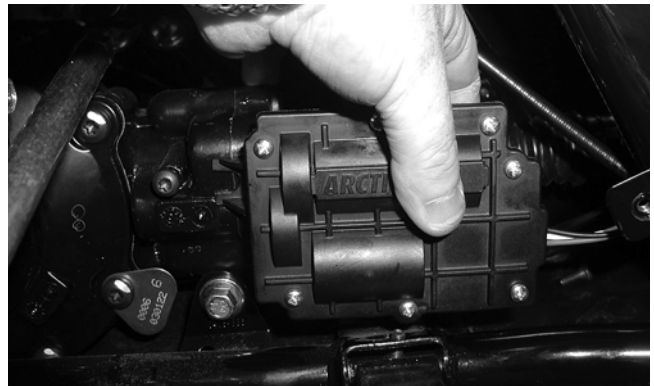
4. Loosen but do not remove the mounting cap screw at the front of the actuator; then slide the actuator to the rear enough to clear the slotted mounting tab and the selector shaft.



AG928

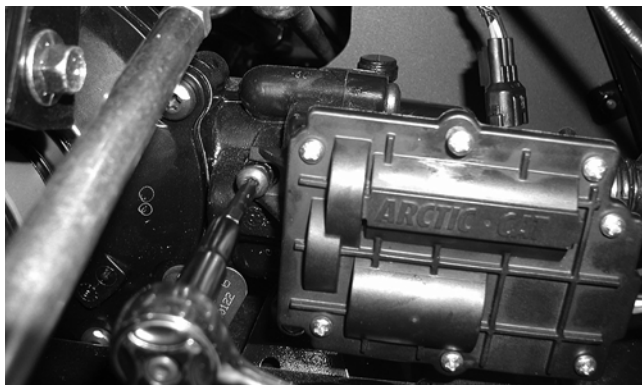
INSTALLING

1. Lubricate the O-ring on the actuator; then ensure that all mounting surfaces are clean and free of debris.
2. Align the actuator with the selector shaft and slide it forward onto the shaft taking care to engage the cap screw in the slot of the front mounting tab.



AG925

3. While holding the actuator firmly forward, tighten the front cap screw to hold the actuator in place; then install but do not tighten the two remaining cap screws.



AG928

4. Loosen the front cap screw; then tighten the cap screw on the driveshaft side.



AG926

■ **NOTE:** It is important to tighten this cap screw while the others are loose to ensure proper seating of the actuator.

5. Tighten the remaining cap screws; then connect the electrical plug to the main harness.
6. Turn the ignition switch to the ON position and check the operation by shifting the selector switch several times.
7. Secure the wiring harness to the frame with a nylon cable tie; then install the inner fender panel.

Front Differential

■ **NOTE:** To remove the rear gear case, see Rear Gear Case in this section.

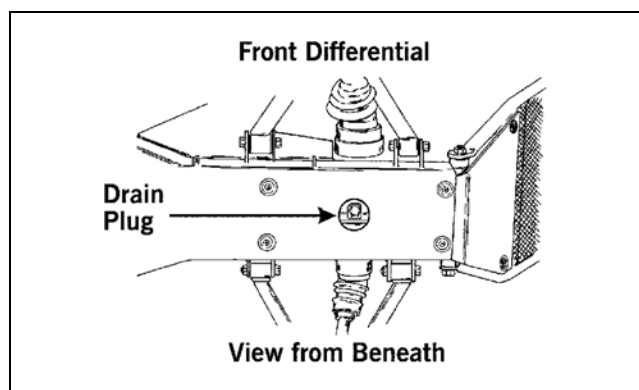
REMOVING DIFFERENTIAL

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

WARNING

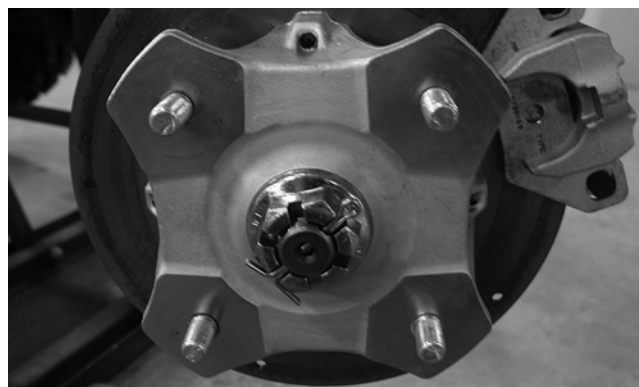
Make sure the ATV is solidly supported on the support stand to avoid injury.

2. Remove the drain plug and drain the gear lubricant into a drain pan; then reinstall the plug.



ATV0082A

3. Remove the front wheels.
4. Pump up the hand brake; then engage the brake lever lock.
5. Remove the cotter pin securing the hex nut; then remove the hex nut and washer.

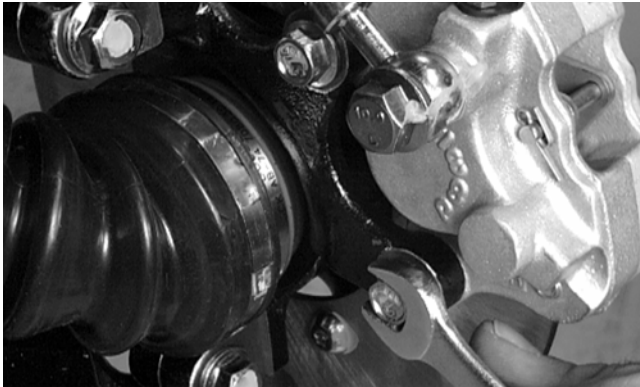


KX041

6. Release the brake lever lock.

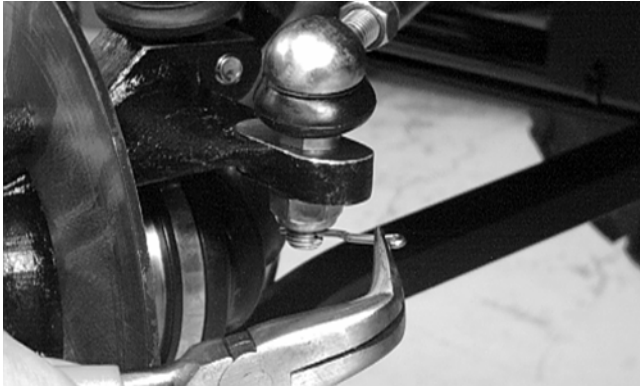
■ **NOTE:** It is not necessary to remove the brake hoses from the calipers for this procedure.

7. Remove the two brake calipers. Account for the four cap screws and four 0.76 mm (0.030 in.) spacer washers.



AF894D

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



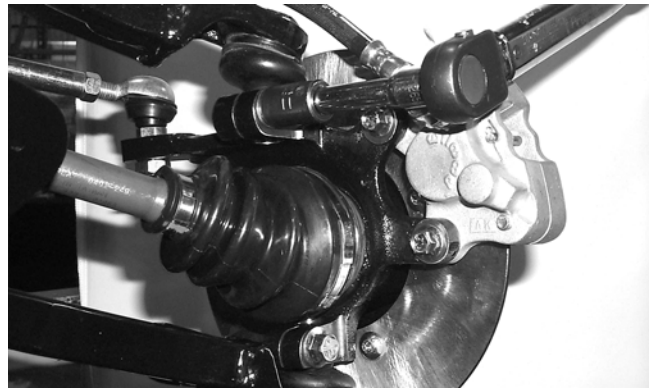
AF895D

9. Remove the tie rod lock nuts.



AF896D

10. Remove the upper ball joint cap screws taking care not to strip the threads on the ball joint shaft; then using a rubber mallet, tap the end of the axle and free it from the knuckle assembly.



AF628D

11. Pull the steering knuckle away from the axle taking care not to damage the seals with the axle end.



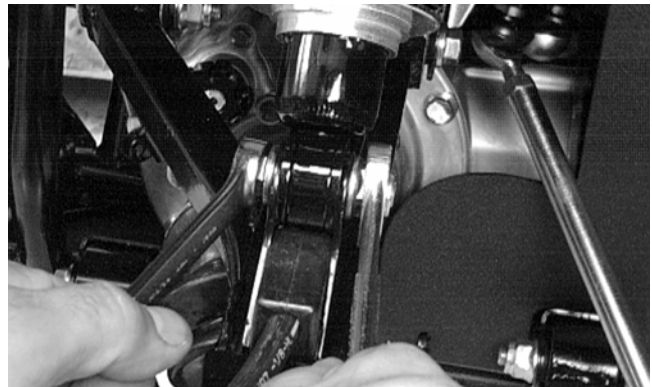
KX151

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

CAUTION

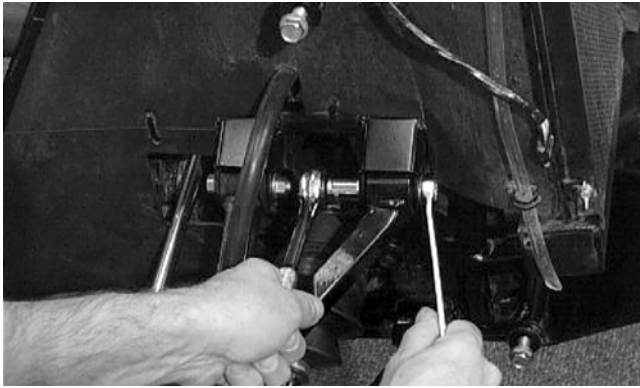
The axle must be supported. If the axle is allowed to drop or hang, damage to the inner CV joint may occur.

13. Remove the lower shock bolts. Account for the lock nuts; then move the shocks aside and secure them with a strap.



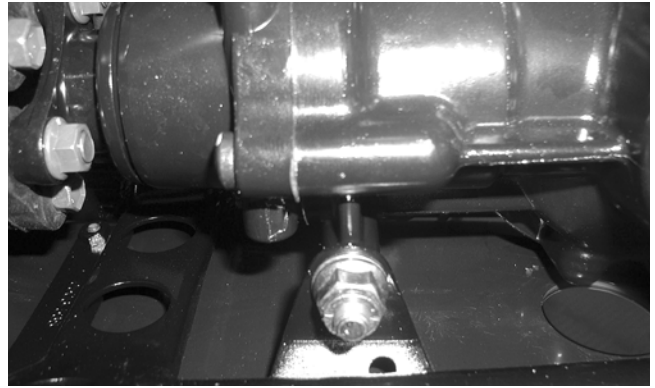
AF897D

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



AF610D

15. Using a slide hammer, remove the front axles.



CD026

19. Remove the upper differential mounting cap screws.



AF899D

16. Remove the inner fender panels.

17. Using a T-30 torx wrench, remove the three screws securing the front drive actuator to the gear case; then remove the actuator.



CD016

20. Free the differential assembly from the frame mountings; then shift the differential assembly forward enough to disengage the front drive-shaft from the output yoke.



AG925

18. Remove the lower differential mounting cap screw. Account for a lock nut and washers.



KX161

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



KX159

Disassembling Input Shaft

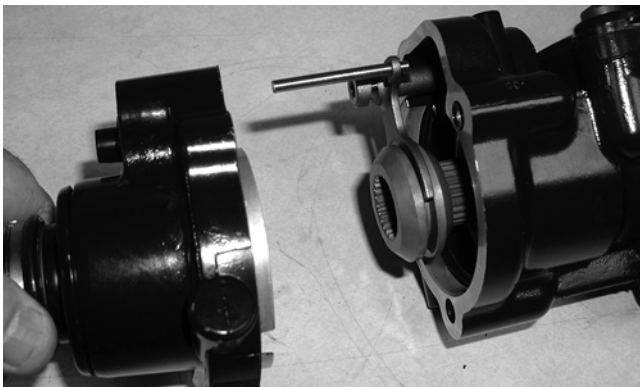
■ **NOTE:** This procedure can be performed on a rear gear case; however, some components may vary from model to model. The technician should use discretion and sound judgment.

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

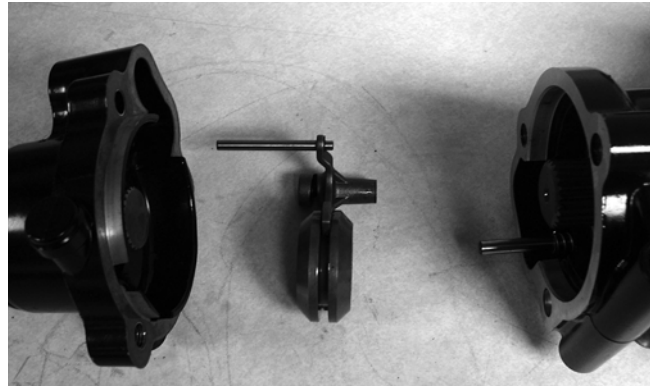


CD102

2. Using a rubber mallet, remove the housing. Account for a gasket. Remove the fork, collar, and spring. Note the location of all the components for assembling purposes.



CD103



CD106

3. Using a side-cutter (or suitable substitute), remove the boot clamps; then remove the boots and splined drive from the input shaft.



CD114

4. Remove the input shaft from the pinion housing.



CD107

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



AF982

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



AF983



AF984



KX219

Assembling Input Shaft

1. Place the pinion housing in a press and install the input shaft bearing. Secure the bearing with the existing snap ring making sure the sharp edge of the snap ring faces to the outside.



AF993



AF994

2. Install the input shaft seal making sure it is flush with the edge of the housing.
3. Lubricate the input shaft splines with High-Performance Grease (p/n 0436-905).

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



KX221



KX222

4. On the 400/500/650 H1, install the input shaft into the housing; then install the front boot and secure with Boot Clamp (p/n 0423-393) and the rear boot with Boot Clamp (p/n 0423-411).



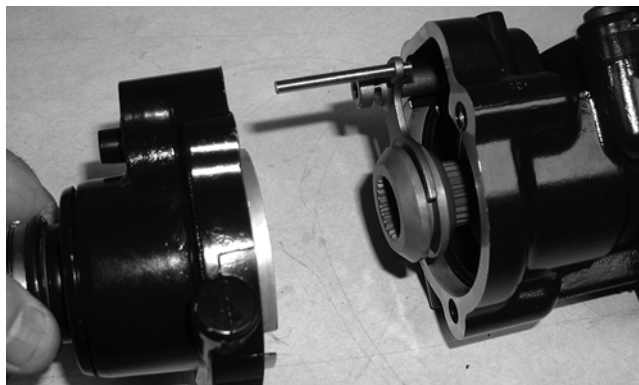
CD112



CD099

5. Place the pinion housing with new gasket onto the gear case housing; then secure with the existing cap screws. Tighten to specifications.

■ **NOTE:** If a new gear case housing is being installed, tighten the cap screws to 3.5-4.3 kg-m (25-31 ft-lb).



CD103

Disassembling Pinion Gear

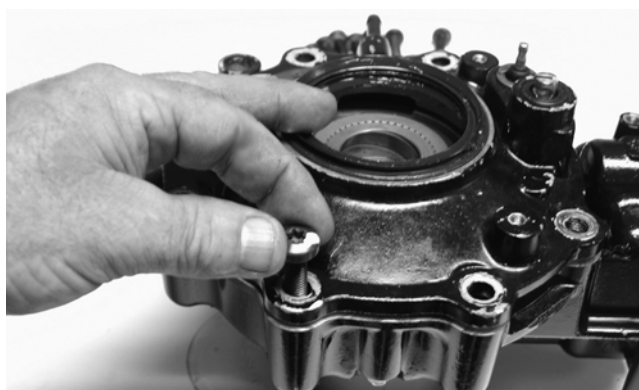
■ **NOTE:** This procedure can be performed on a rear gear case.

1. Using a T-40 torx wrench, remove the cap screws securing the pinion housing. Account for the coupler, fork, and spring.



KX209

2. Using a T-40 torx wrench, remove the cap screws securing the gear case cover. Account for and make note of the ID tag location for assembling purposes.



KX173

3. Using a plastic mallet, tap lightly to remove the differential cover. Account for an O-ring.



KX174

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

4. Remove the splined coupler, shifter fork, pin, and spring of the differential lock assembly and set aside. Note position of parts for assembling purposes.



KX175

5. Make match marks on the left bearing housing and differential housing; then remove the plate and account for a shim. Mark the shim as left-side.



KX176



KX177



KX178

6. Place the differential with the open side down; then lift the housing off the spider assembly. Account for shim(s) and mark as right-side.



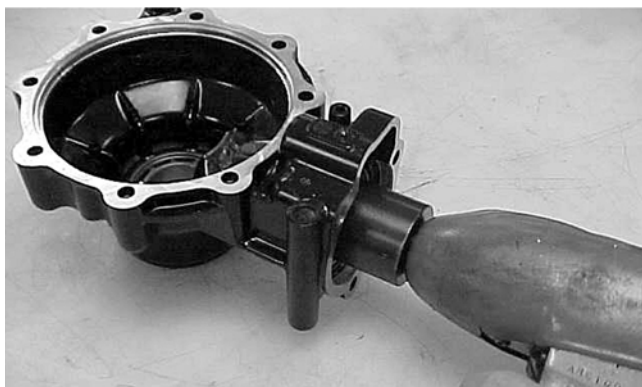
KX179



KX181

7. Using the 48 mm Internal Hex Socket (p/n 0444-104), remove the lock collar securing the pinion gear assembly.

■ **NOTE:** On a front differential, the lock collar has right-hand threads. On a rear gear case, the lock collar has left-hand threads.

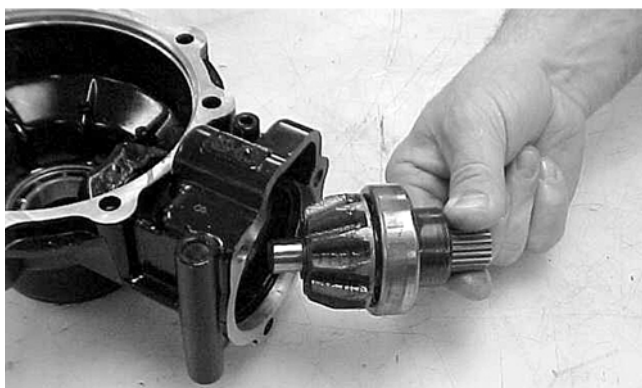


CC875



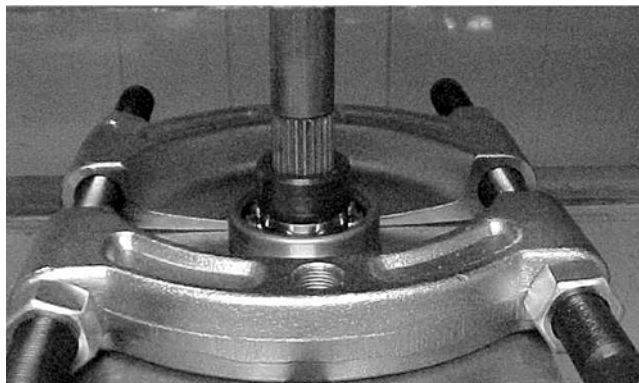
CC876

8. Using the Pinion Gear/Shaft Removal Tool (p/n 0444-127) and a hammer, remove the pinion gear from the gear case housing.



CC878

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



CC879

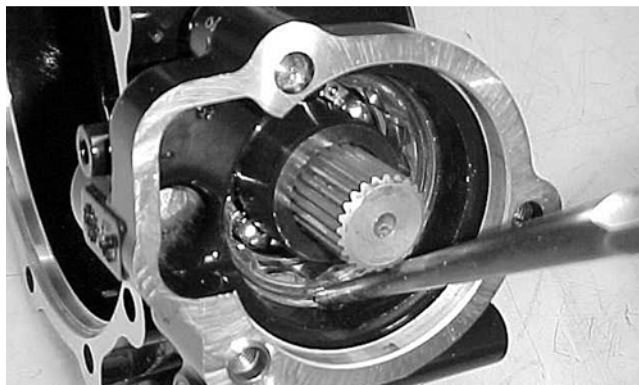
■ **NOTE:** If gears are being replaced, use the existing shims. The numbers are scribed onto the gears: the ring gear has the number on the opposite side of the gears, and the pinion gear has the number on the end of the pinion gear shaft by the splines. If no number is present, it should be considered as being in the 0 category.

■ **NOTE:** If the gear case housing is being replaced, proceed to the following Shimming Procedure/Shim Selection sub-section.

Shimming Procedure/Shim Selection

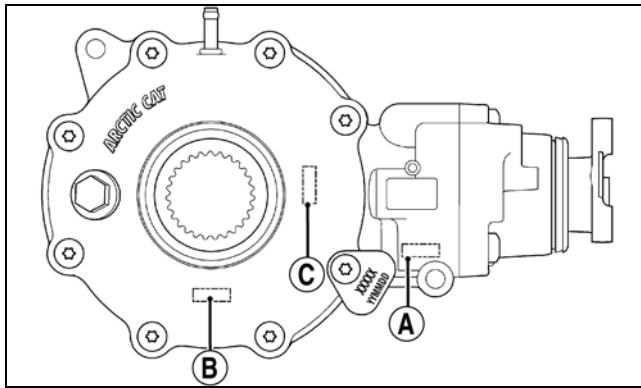
1. Press bearings into bores by outer ring to hard contact with seat.
2. Install the lock collar and tighten to specifications; then on final assembling, stake the lock collar edge approximately 1.5 mm (0.060 in.) into the lower oil channel.

6



CC891

3. Note the following shim selections (shims are nominally 1.5 mm/0.060 in. thick):



738-268B

A. Cover Side - add value A on the gear case housing to value B (all models except 400 TRV) or value C (400 TRV) on the gear case cover; then add 1.5 mm (0.060 in.). This will give you the proper shim thickness.

■ **NOTE:** When shimming a rear gear case, add value A to value B on all models.

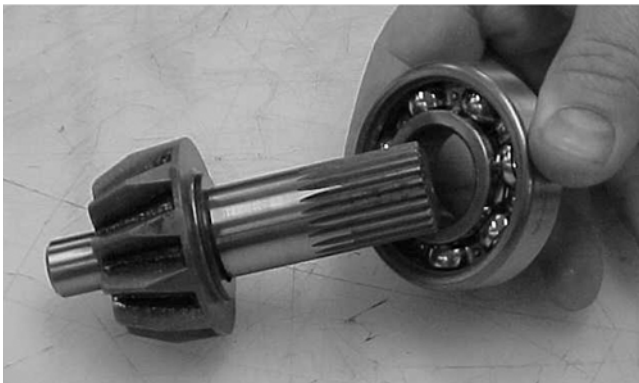
B. Gear Case Side - install a 1.3-1.4 mm (0.050-0.055 in.) shim and tighten the bolts to 3.5-4.3 kg-m (25-31 ft-lb). Verify backlash to be within a range of 0.28-0.38 mm (0.011-0.015 in.) and end-play to be within a range of 0.10-0.20 mm (0.004-0.008 in.). If not within specification range, reselect shim until backlash specification range can be verified.

4. Prior to final assembling, apply molybdenum disulfide grease to all oil seal lips.

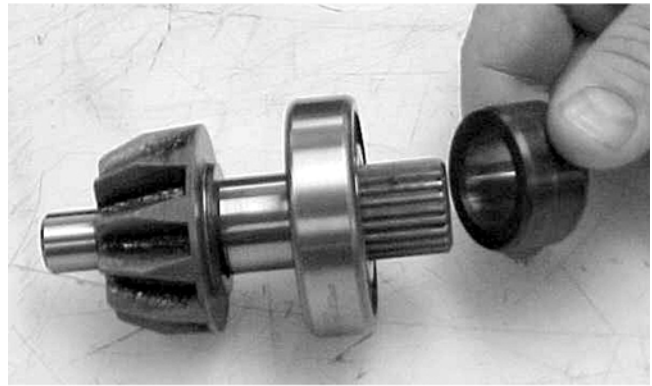
5. Prior to final assembling, prelubricate journal on pinion assembly with SAE 80W-90 hypoid gear lubricant prior to pressing assembly into gear case housing.

Assembling Pinion Gear

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

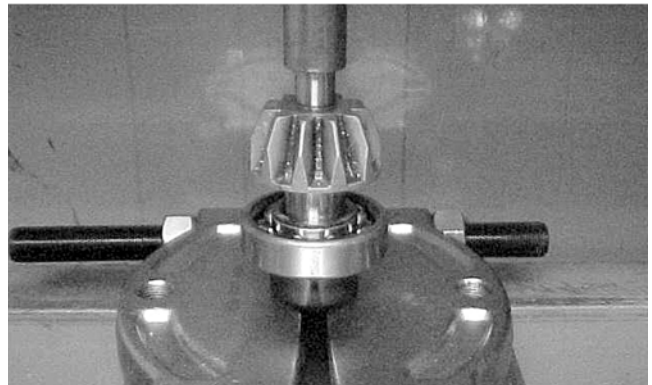


CC882



CC883

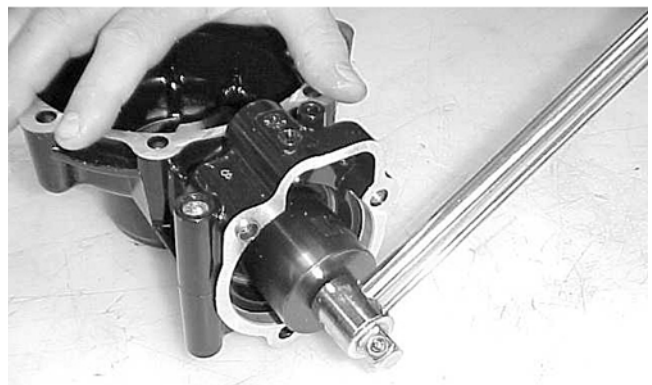
2. Place the pinion assembly in a bearing puller; then install the bearing using a press.



CC884

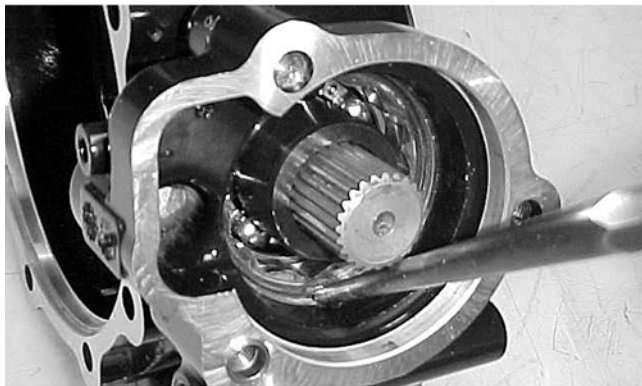
3. Install the pinion gear assembly into the housing. Using the 48 mm Internal Hex Socket (p/n 0444-104), secure the pinion gear assembly with the existing lock collar. Tighten to specifications.

■ **NOTE:** On a front differential, the lock collar has right-hand threads. On a rear gear case, the lock collar has left-hand threads.



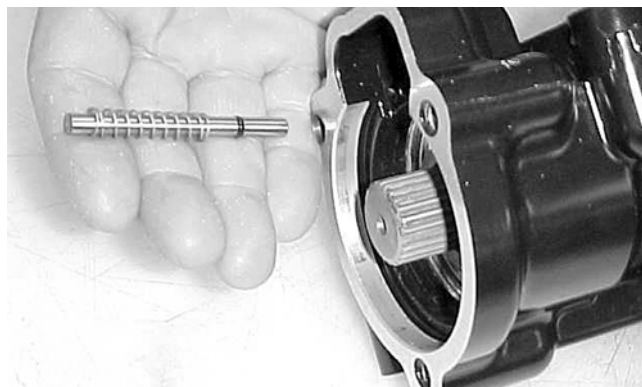
CC890

4. Place a punch on the edge of the lock collar in the oil gallery area; then using a hammer, stake the lock collar to ensure that the collar will remain securely tightened.



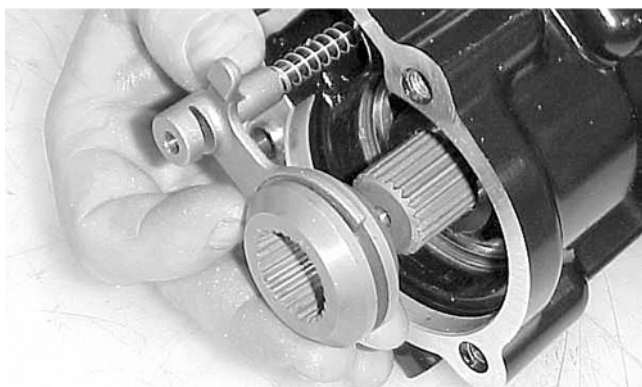
CC891

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



CC892

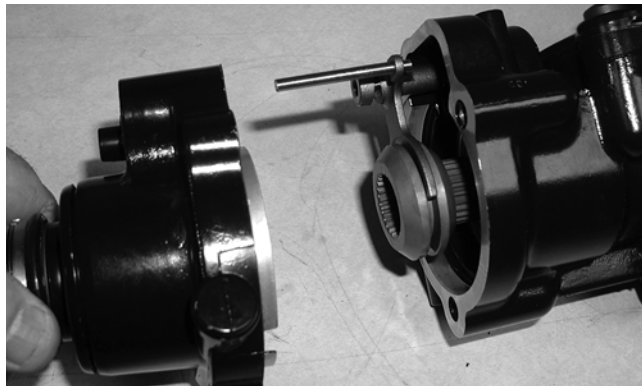
6. Install the shift fork assembly making sure the fork leg is facing upward. Apply a small amount of oil to the gasket; then install the gasket.



CC893

7. Place the input shaft assembly onto the gear housing; then secure with the existing cap screws. Tighten to specifications.

■ **NOTE:** If a new gear housing is being installed, tighten the cap screws to 3.5-4.3 kg-m (25-31 ft-lb).



CD103

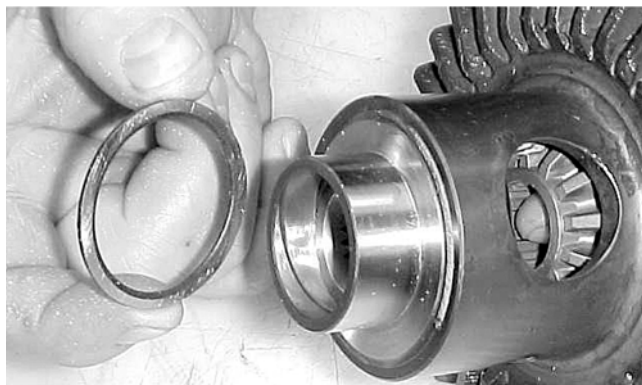


CD110

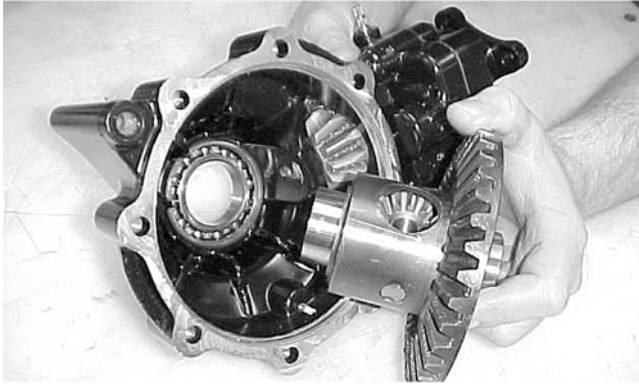
8. Install the proper shim onto the ring gear spider assembly making sure the chamfer side of the shim is facing toward the ring gear. Install the ring gear in the housing; then install the outside shim with the chamfer side of the shim toward the ring gear.

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

6



CC896



CC897



KX174



KX178

9. Install the left bearing housing aligning the match mark to the mark on the differential housing.



KX177

10. Install the differential lock assembly into the bearing housing; then place the O-ring on the gear case housing.



KX175

11. Making sure the O-ring is properly positioned on the gear case housing, install the housing with existing hardware. Account for the ID tag. Tighten the cap screws to specifications.

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

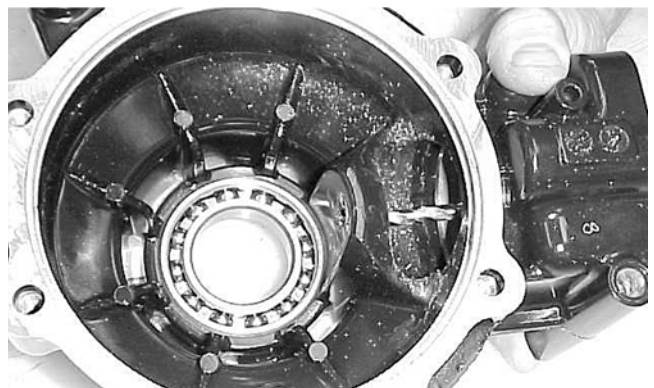
■ **NOTE:** If a new gear case housing is being installed, tighten the cap screws to 3.5-4.3 kg-m (25-31 ft-lb).

Removing Needle Bearing

■ **NOTE:** Removing the needle bearing is rarely necessary. Avoid removing the needle bearing unless the bearing is clearly damaged.

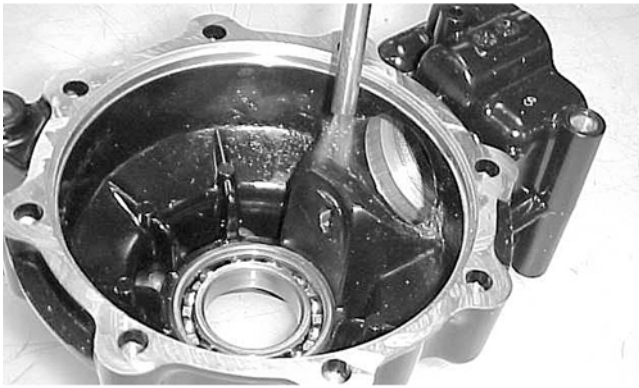
■ **NOTE:** This procedure can be performed on a rear gear case.

1. Place a 6.35 mm (1/4 in.) drill bit on the inside surface of the needle bearing (against the bottom side); then drill through the pinion shaft needle bearing housing.



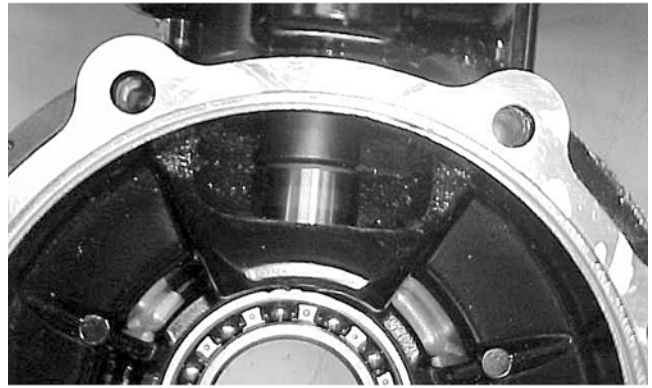
CC885

2. Using a propane torch, heat the area surrounding the needle bearing to soften the Loctite.



CC886

3. Using a flat-nosed punch, drive the bearing out of the housing.



CC889

3. Install the pinion shaft and secure with the existing 48 mm lock collar. Tighten to specifications.



CC887

Installing Needle Bearing

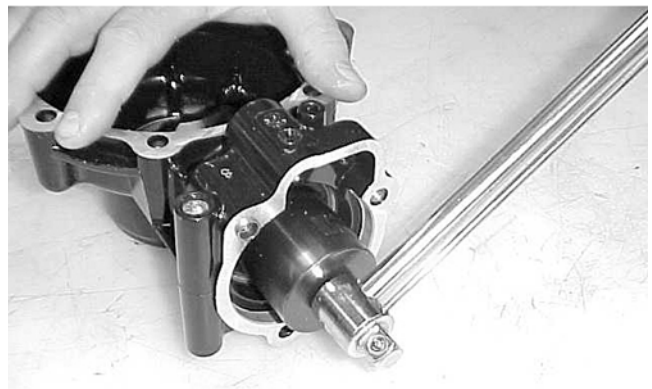
1. Apply red Loctite #271 to the outside of a new bearing; then place the new bearing into the housing.



CC888

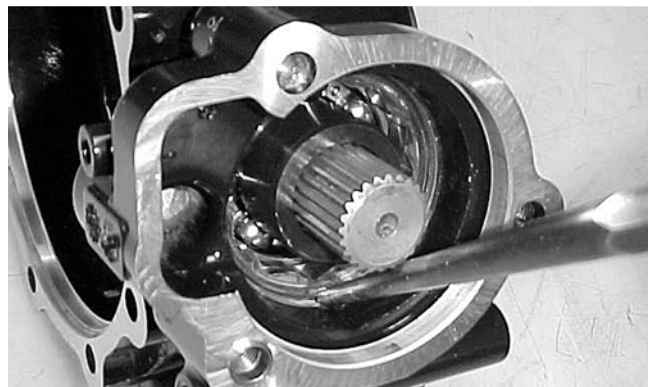
2. Using a suitable driver, install the needle bearing into the gear case housing making sure the bearing is seated.

■ **NOTE:** Do not push the bearing too far into the housing.



CC890

4. Place a punch on the edge of the lock collar in the oil gallery area; then using a hammer, stake the lock collar to ensure that the collar will remain securely tightened.



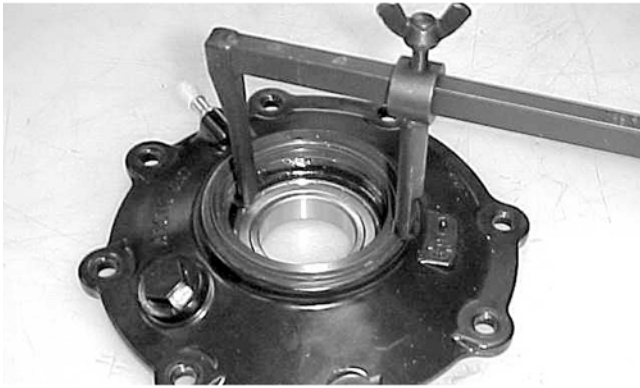
CC891

5. Install the pinion housing.

Removing/Installing Axle Seal

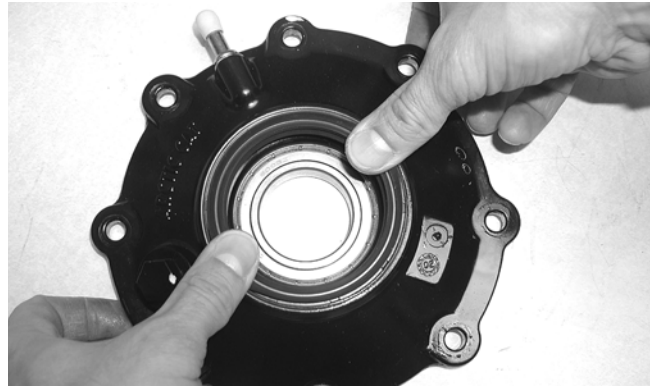
■ **NOTE:** This procedure can be performed on a rear gear case.

1. Remove the seal using a seal removal tool.



CC899

2. Using a press, remove the bearing.



CD018

5. Repeat steps 1-4 for the opposite side.

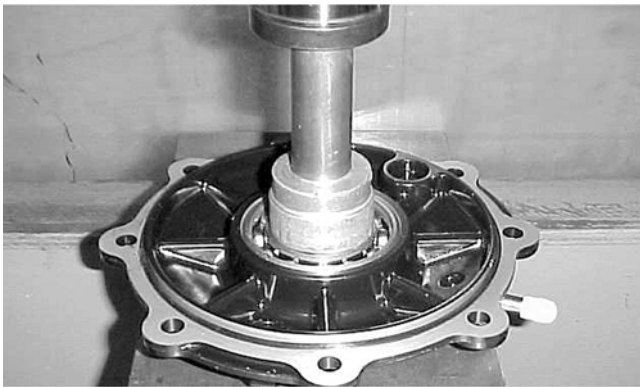
INSTALLING DIFFERENTIAL

1. Align the splined input yoke with the front output splines; then place the differential into position on the frame and install the cap screws, washers, and flex-lock nuts. Tighten to specifications. Make sure the rubber boot is properly seated on the input yoke.



CC900

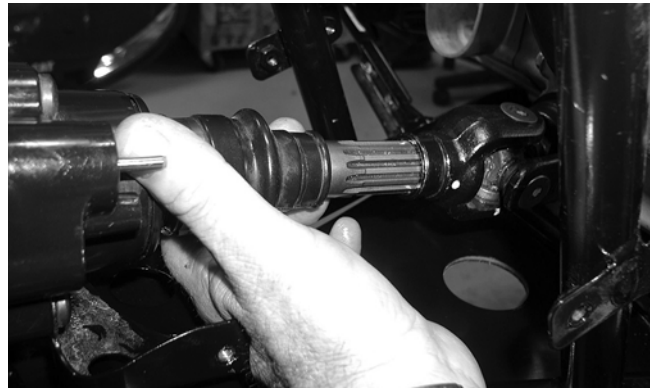
3. Using a press, install the new bearing into the housing.



CC901

■ **NOTE:** Prior to installing the seal, apply grease to the seal outside diameter.

4. Install the seal into the housing pressing evenly on the outside edge until the seal is seated.



CD857



CD859

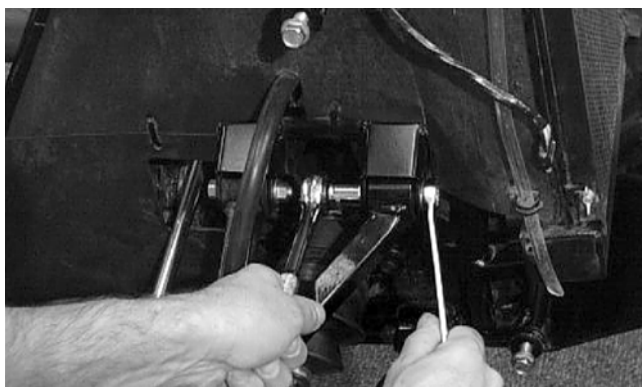
2. Pour 275 ml (9.3 fl oz) of SAE 80W-90 hypoid lubricant into the differential and install the filler plug. Tighten to specifications.

3. Install the front drive actuator with the three torx-head cap screws; then connect the wire connector to the main wiring harness.



AG925

4. Install the inner fender panels.
5. Install the front axles (see Drive Axles in this section).
6. Secure the upper A-arms with cap screws and lock nuts. Tighten to specifications.



AF610D

7. Secure the lower shock eyelets with cap screws and lock nuts. Tighten to specifications.



AF897D

8. Secure the tie rods with the lock nuts. Tighten to specifications; then install and spread the cotter pins.



AF896D



AF895D

9. Making sure that each caliper has the 0.76 mm (0.030 in.) spacer washers between the caliper and the knuckle, install the brake calipers. Secure with the cap screws tightened to specifications.



AF894D

10. Install the wheels and tighten to specifications.
11. Remove the ATV from the support stand.

6

Drive Axles

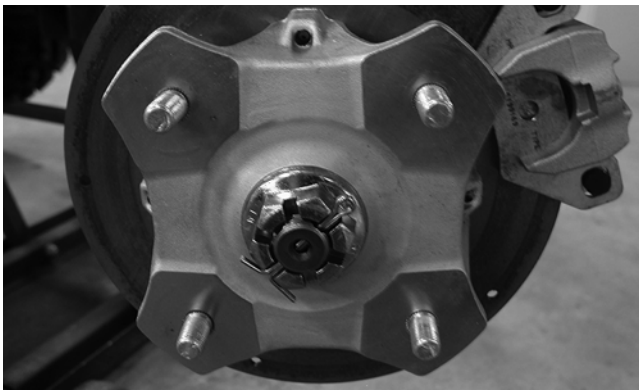
REMOVING REAR DRIVE AXLE

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

WARNING

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

2. Pump up the hand brake; then engage the brake lever lock.
3. Remove the wheel.
4. Remove the cotter pin securing the hex nut; then remove the hex nut. Release the brake lever lock.



KX041

5. Remove the two brake calipers (right side only).

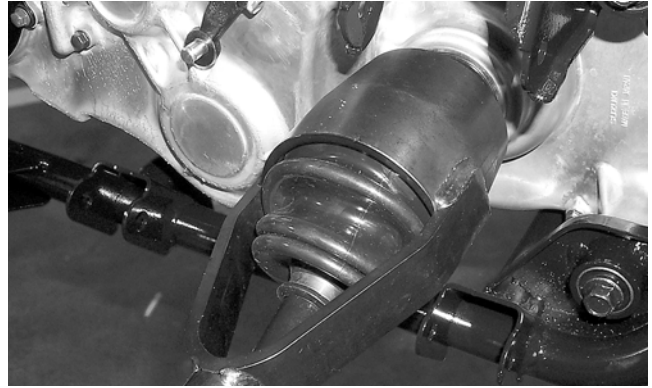
■ **NOTE:** Do not allow the brake calipers to hang from their cable/hose.

CAUTION

The calipers should be supported. If the calipers are allowed to hang from the cable/hose, damage may occur.

6. Slide the hub out of the knuckle and set aside.
 7. Remove the cap screw and lock nut securing the knuckle to the upper A-arm. Discard the lock nut.
- **NOTE:** Never reuse a lock nut. Once a lock nut has been removed, it must be replaced with a new lock nut.

8. While holding the drive axle stationary, pull the top of the knuckle out and down until it is free of the drive axle.
9. Place a drain pan under the ATV to contain any oil leakage; then using a slide hammer, remove the drive axle.



AF935

REMOVING FRONT DRIVE AXLE

■ **NOTE:** For removing a front drive axle, see Front Differential in this section.

CLEANING AND INSPECTING

■ **NOTE:** Always clean and inspect the drive axle components to determine if any service or replacement is necessary.

1. Using a clean towel, wipe away any oil or grease from the axle components.



CD019

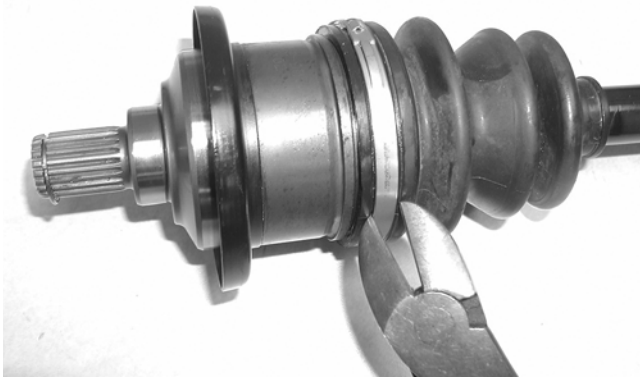
2. Inspect boots for any tears, cracks, or deterioration.

■ **NOTE:** If a boot is damaged in any way, it must be replaced with a boot kit.

3. Inspect the gear case seals for nicks or damage.

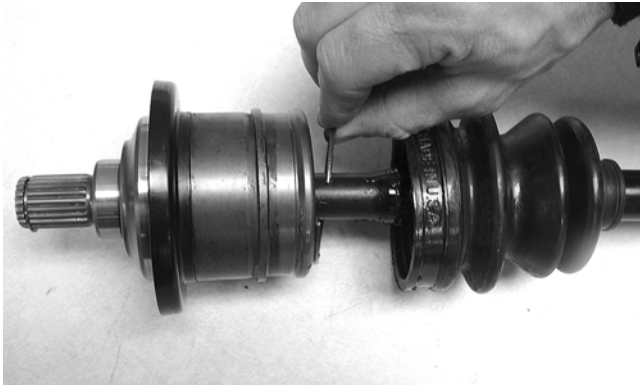
DISASSEMBLING AXLES

1. Using a side-cutters (or suitable substitute), remove the large clamp from the boot.



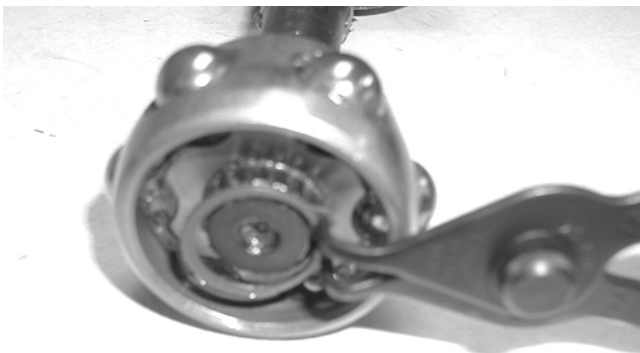
CD020

2. Wipe away excess grease to access the retaining ring. Using an awl or circlip pliers, remove the circlip.



CD021

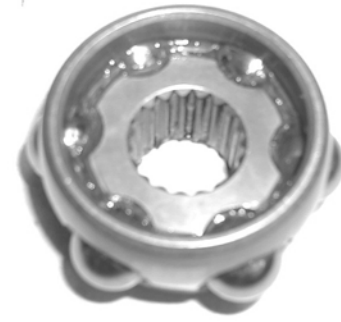
3. Using a snap ring pliers, remove the circlip securing the bearing ring to the shaft. Note the direction of the bearing for assembling purposes.



CD023

4. Note the difference inside each bearing ring end for assembling purposes; then remove the bearing ring.

■ **NOTE:** The recess of the bearing must face toward the housing.



CD022

5. Inspect the splines of the shaft, the bearing ring, and the housing for damage.

■ **NOTE:** If any damage is apparent to the splines, the bearing ring, and/or the housing, the drive axle must be replaced as an assembly.

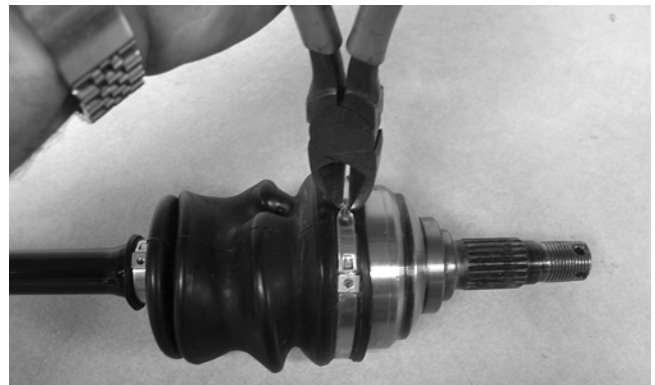
6. Using a side-cutters (or suitable substitute), remove the small clamp from the shaft.



CD752

■ **NOTE:** At this point if the outside boot is damaged, continue with step 7.

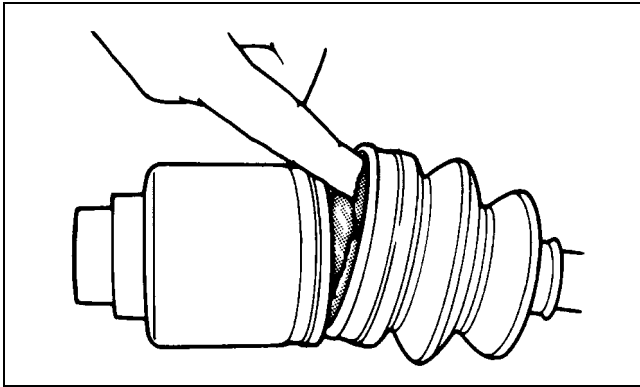
7. Using a side-cutters (or suitable substitute), remove both outside boot clamps from the shaft. Note the position of the different-sized clamps for assembling purposes.



CD751

6

8. Apply 40 grams (1/3 of contents) of grease from the Grease Pack (p/n 0441-173) into the knuckles and the new outside boot.



ATV-1052

■ **NOTE:** Grease Pack (p/n 0441-173) contains 120 grams of grease. The inside joint (double-offset) requires approximately 70-90 grams of grease and the outside (bell-type) requires approximately 35-55 grams. When replacing boots, use 2/3 of the pack for inside boots and 1/3 of the pack for outside boots.

CAUTION

Do no over-fill the joint as boot damage may occur resulting in joint failure.

9. Slide the new outside boot onto the shaft with the new clamps positioned as shown. Note the different-sized clamps from removal.

■ **NOTE:** The boot is positioned correctly when the small end of the boot seats down into the recessed groove.



CD754

10. Using a CV Boot Clamp Tool (p/n 0444-120), secure both outside boot clamps.

CAUTION

It is important that the clamps are positioned correctly or they may loosen when in motion.



CD024

ASSEMBLING AXLES

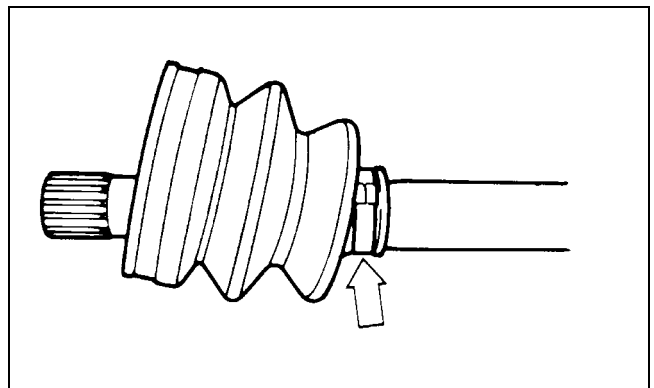
1. Install the inner boot with the small clamp making sure the ends of the clamp are positioned correctly.

■ **NOTE:** The boot is positioned correctly when the small end of the boot seats down into the recessed groove.



CD754

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



ATV-1048

3. Apply 80 grams (2/3 of contents) of grease from the pack into the bearing housing.
4. Install the bearing onto the shaft making sure the recess of the bearing is facing the housing.

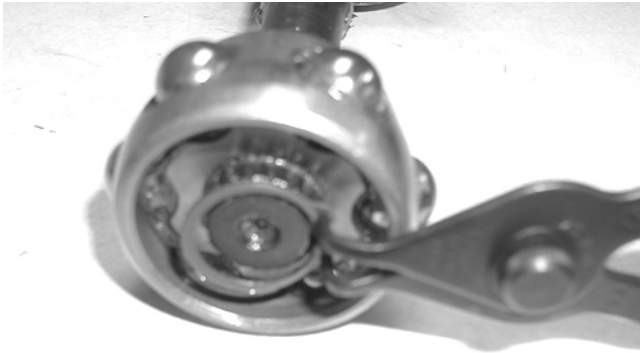


CD022

⚠ CAUTION

The bearing ring must go onto the shaft with the side without splines facing toward the small clamp of the inner boot or severe damage will result.

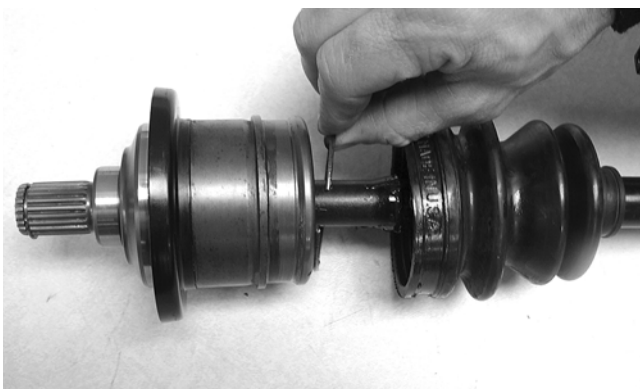
- Secure the bearing ring with the circlip making sure the sharp side of the circlip faces away from the boot.



CD023

- Making sure the marks made during disassembling align, slide the housing over the bearing ring; then completely seat the bearing ring into the housing and install the circlip.

■ **NOTE:** Pull the bearing ring out of the housing until it contacts the circlip; then slide the ring in half way. This will purge air from the housing and ensure the bearing is packed properly.



CD021

- Slide the boot over the housing; then using the boot clamp pliers, secure the boot with the clamp.



CD024

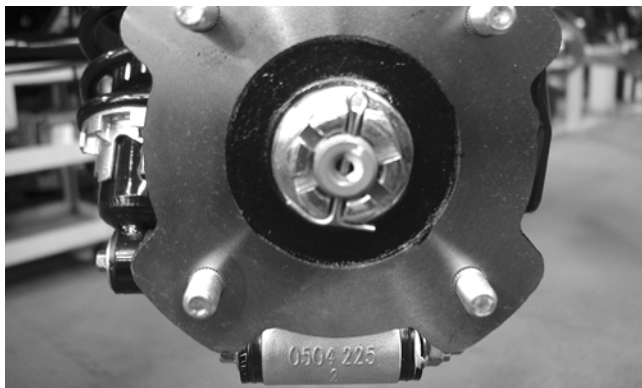
- Inspect the axle components for correct positioning of the four clamps. Also, inspect the boots for being correctly positioned on the shaft.

INSTALLING REAR DRIVE AXLE

- Slide the drive axle into place in the gear case.

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

- Swing the knuckle up and onto the drive axle; then place the knuckle into place in the upper A-arm. Secure the knuckle to the A-arm with a cap screw and a new lock nut. Tighten to specifications.
- Place the hub into position on the axle followed by a hex nut. Tighten the hex nut finger-tight at this time.
- If the brake calipers were removed, position them on the knuckle and secure with existing cap screws. Tighten the auxiliary brake caliper cap screws to specifications. Tighten the hydraulic brake caliper cap screws to specifications.
- Pump up the hand brake lever; then engage the brake lever lock.
- Tighten the hub hex nut (from step 3) to specifications; then install and spread a new cotter pin making sure each side of the pin is flush to the hub nut.

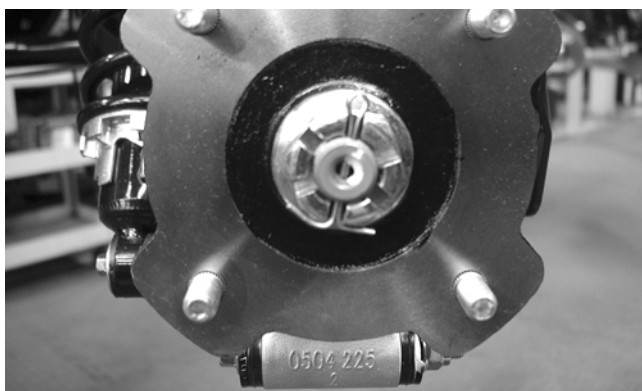


CD027

7. Install the wheel. Tighten to specifications.
8. Remove the ATV from the support stand and release the brake lever lock.

INSTALLING FRONT DRIVE AXLE

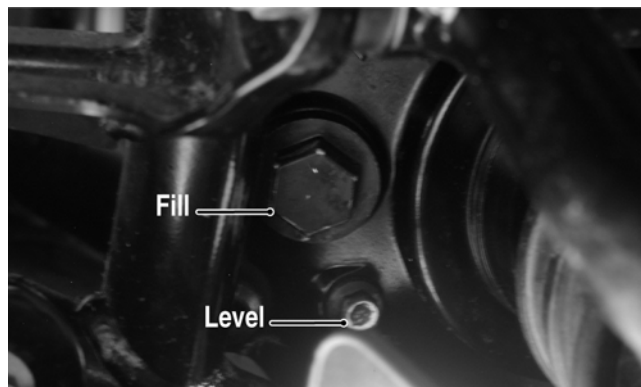
1. Position the drive axle in the gear case and steering knuckle; then insert the upper A-arm ball joint into the steering knuckle. Secure with a cap screw tightened to specifications.
2. Place the brake hose into position on the upper A-arm; then secure the lower shock eyelet to the A-arm with a cap screw and a new lock nut. Tighten to specifications.
3. Secure the tie rod to the steering knuckle with a new lock nut. Tighten securely; then install and spread a new cotter pin.
4. Slide the hub w/brake disc into position in the steering knuckle followed by a washer and hex nut. Tighten finger-tight at this time.
5. Install the brake caliper on the steering knuckle. Tighten to specifications; then pump up the hand brake lever and engage the brake lever lock.
6. Tighten the hub hex nut (from step 4) to specifications; then install and spread a new cotter pin making sure each side of the pin is flush to the hub nut.



CD027

7. Install the wheel and tighten to specifications.

8. Remove the ATV from the support stand and release the brake lever lock.
9. Check the front differential oil level and add oil as necessary.

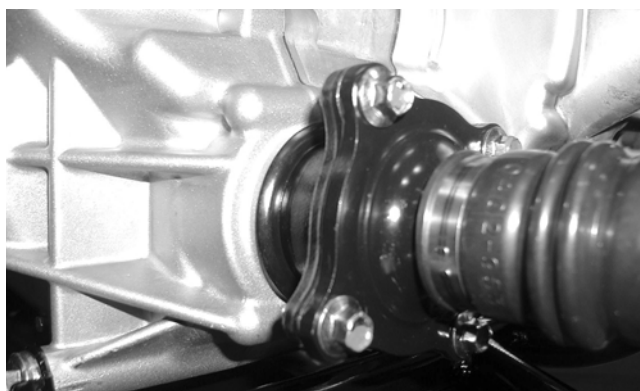


CF113A

Rear Gear Case

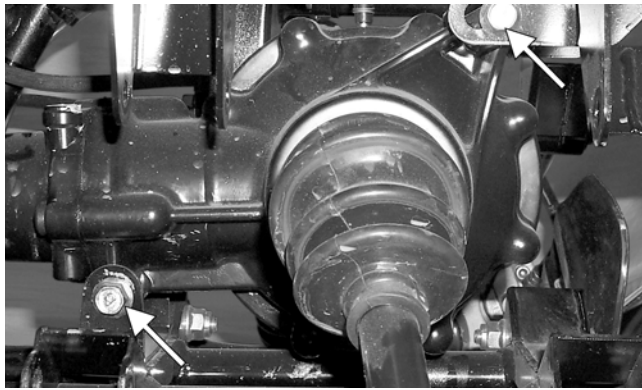
REMOVING

1. Remove the left-side rear A-arms (see Rear A-Arms in Section 7).
2. Remove both of the rear drive axles (see Drive Axles in this section).
3. Remove the four cap screws securing the engine output shaft to the rear gear case input flange.



CD028

4. Remove the two cap screws and lock nuts securing the rear gear case to the frame; then remove the gear case through the left side.



AF960A

AT THIS POINT

For servicing the input shaft, pinion gear, needle bearing, and axle seal, see Front Differential in this section.

INSTALLING

1. Slide the gear case into position through the left side of the frame; then secure it to the frame with cap screws and lock nuts. Tighten to specifications.

■ **NOTE:** If a new gear case is being installed, tighten the cap screws to 5.1-6.3 kg-m (37-45.5 ft-lb).

2. Secure the engine output shaft to the rear gear case input flange with three cap screws (coated with red Loctite #271) and lock nuts. Tighten to specifications.
3. Install the rear drive axles (see Drive Axles in this section).
4. Install the left-side rear A-arms (see Rear A-Arms in Section 7).

Hub

REMOVING

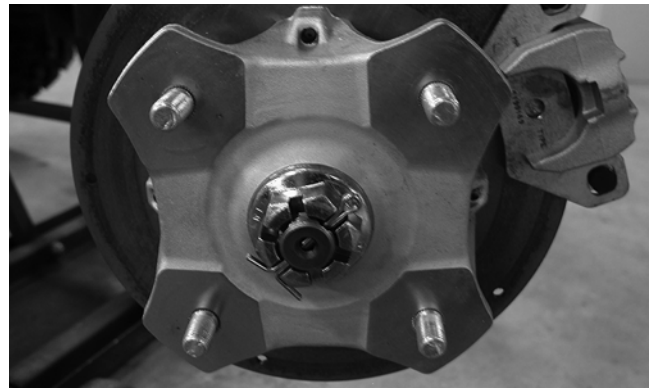
1. Secure the ATV on a support stand to elevate the wheel; then remove the wheel.

WARNING

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

2. Remove the cotter pin from the nut.

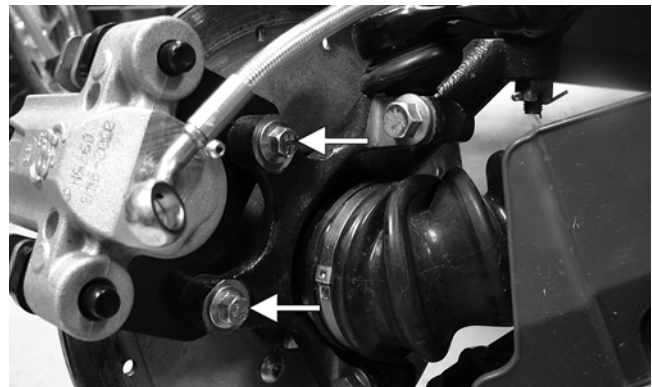
■ **NOTE:** During assembly, new cotter pins should be installed.



KX041

3. Remove the flange nut securing the hub.

4. Remove the brake caliper.



PR243A

5. Remove the hub assembly.

6. Remove the four cap screws securing the brake disc.

6

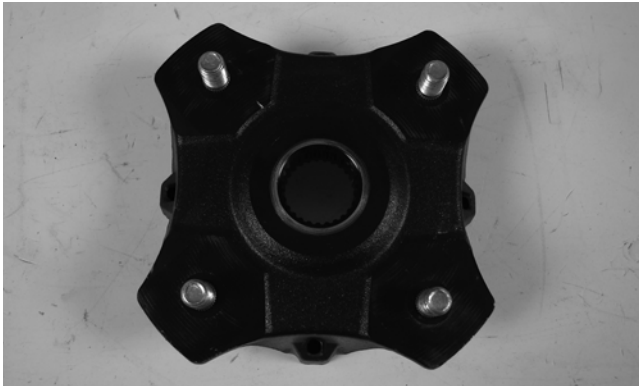
CLEANING AND INSPECTING

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

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

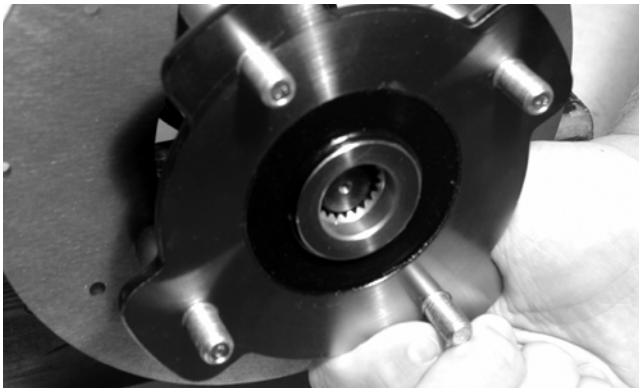
INSTALLING

1. Secure the brake disc to the hub with the four cap screws coated with blue Loctite #243. Tighten to specifications.
2. Apply grease to the splines in the hub.



PR291

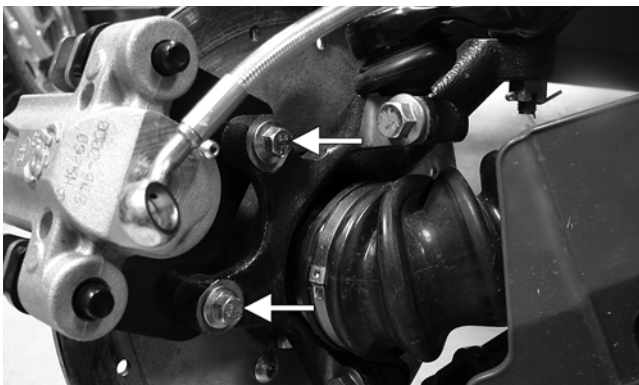
3. Install the hub assembly onto the shaft.



CD009

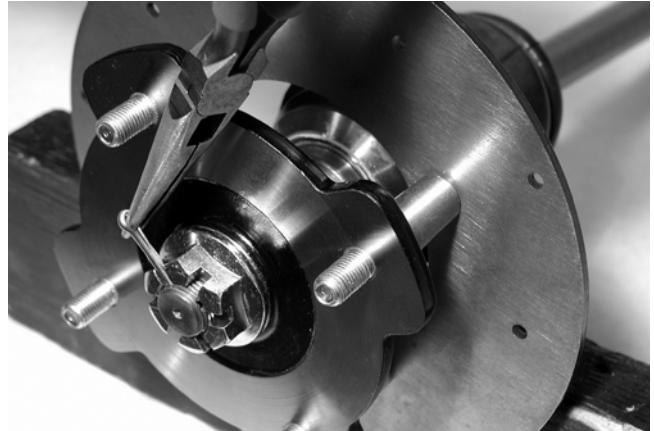
4. Secure the hub assembly with the nut. Tighten only until snug.

5. Secure the brake caliper to the knuckle with the two cap screws. Tighten the auxiliary caliper to specifications. Tighten the hydraulic caliper to specifications.



PR243A

6. Tighten the hub nut (from step 4) to specifications; then install and spread a new cotter pin making sure each side of the pin is flush to the hub nut.



CD008

7. Install the wheel and tighten to specifications.



CD006

8. Remove the ATV from the support stand.

Hydraulic Brake Caliper

■ **NOTE:** The brake caliper is a non-serviceable component; it must be replaced as an assembly (see Section 2).

SECTION 7 - SUSPENSION

TABLE OF CONTENTS

Suspension	7-2
Shock Absorbers	7-2
Front A-Arms	7-3
Rear A-Arms	7-5
Wheels and Tires	7-7

Suspension

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

Shock Absorbers

REMOVING

1. Secure the ATV on a support stand to elevate the wheels and to release load on the suspension.

WARNING

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

2. Remove the two cap screws and nuts securing each front shock absorber to the frame and the upper A-arm. Account for bushings and sleeves from each.



AF605D

CAUTION

Additional support stands are necessary to support the rear axle when the shock absorbers are removed or damage may occur.

3. Remove the two cap screws and nut securing each rear shock absorber to the frame and lower A-arm. Account for bushings and sleeves from each.



AF626D

4. Compress the shock absorber spring, remove the retainer, and remove the spring.



AF730D

CLEANING AND INSPECTING

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

1. Clean all shock absorber components in parts-cleaning solvent.
2. Inspect each shock rod for nicks, pits, rust, bends, and oily residue.
3. Inspect all springs, spring retainers, shock rods, sleeves, bushings, shock bodies, and eyelets for cracks, leaks, and bends.

INSTALLING

1. Place the shock absorber spring over the shock absorber, compress the spring, and install the retainer.

- Place bushings and sleeves (where appropriate) into shock eyelet; then install shock with two cap screws and nuts. Tighten all nuts to specifications.

CAUTION

Do not tighten the nuts beyond the 4.8 kg-m (35 ft-lb) specification or the shock eyelet or mount **WILL** be damaged.

■ **NOTE:** The rear shock absorber-to-lower A-arm torque factor is 2.8 kg-m (20 ft-lb).

- Remove the ATV from the support stand.

Front A-Arms

REMOVING

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

WARNING

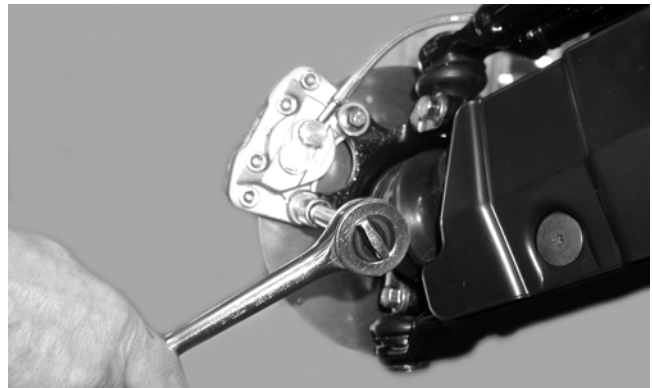
Make sure the ATV is solidly supported on the support stand to avoid injury.

- Remove the cotter pin from the nut. Discard the cotter pin.



CD008

- Remove the nut securing the hub.
- Remove the brake caliper. Account for two cap screws and two 0.76 mm (0.030 in.) spacer washers.



CD007

- Remove the hub assembly.
- Remove the cotter pin and slotted nut securing the tie rod end to the knuckle; then remove the tie rod end from the knuckle.



AF618D

- Remove the cap screws securing the ball joints to the knuckle.

CAUTION

Support the knuckle when removing the cap screws or damage to the threads will occur.

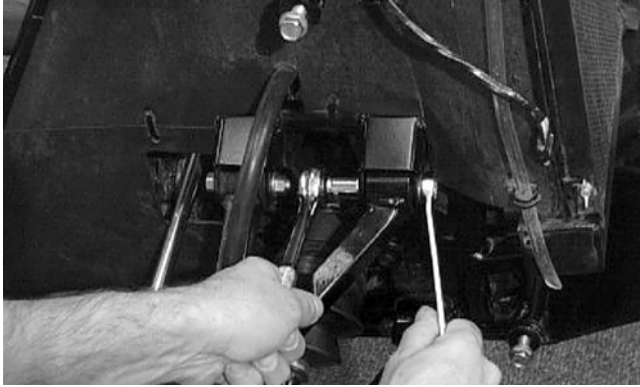
7



AF628D

- Tap the ball joints out of the knuckle; then remove the knuckle.
- Remove the lower shock absorber eyelet from the upper A-arm.

10. Remove the cap screws securing the A-arms to the frame.



AF610D

11. Remove the circlip from the ball joint; then remove the ball joint from the A-arm.



AF610D

CLEANING AND INSPECTING

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

1. Clean all A-arm components in parts-cleaning solvent.
2. Clean the ball joint mounting hole of all residual Loctite, grease, oil, or dirt for installing purposes.
3. Inspect the A-arm for bends, cracks, and worn bushings.
4. Inspect the ball joint mounting holes for cracks or damage.
5. Inspect the frame mounts for signs of damage, wear, or weldment damage.

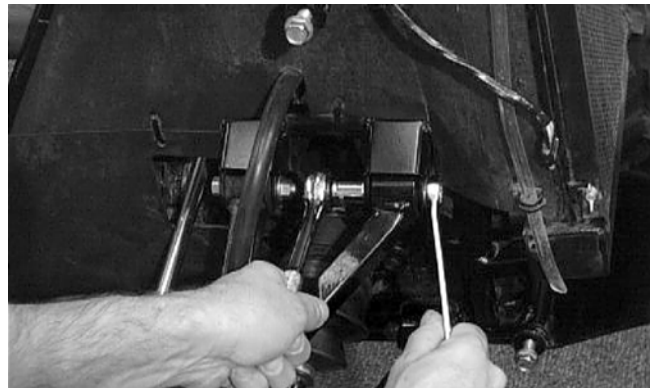
INSTALLING

1. Apply green Loctite #609 to the entire outside diameter of the ball joint; then install the ball joint into the A-arm and secure with the circlip.



AF616D

2. Install the A-arm assemblies into the frame mounts and secure with the cap screws. Only finger-tighten at this time.



AF610D

3. Route the brake hose through the upper A-arm shock absorber mount; then secure the hose to the A-arm with a cable tie and grommet.



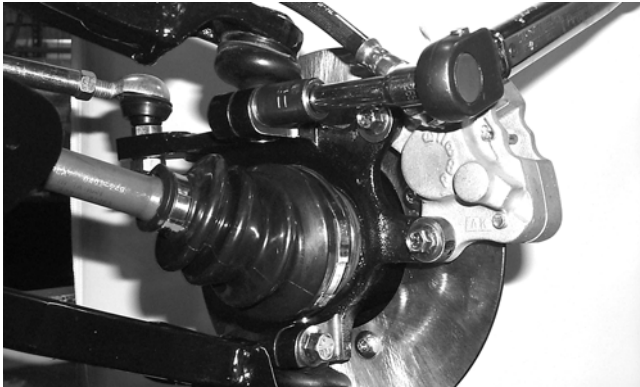
DE054A

4. Secure the lower eyelet of the shock absorber to the upper A-arm. Tighten nut to specifications.
5. Secure the A-arm assemblies to the frame mounts (from step 2). Tighten the cap screws to specifications.

CAUTION

Do not tighten the nut beyond the 4.8 kg-m (35 ft-lb) specification or the shock eyelet or mount WILL be damaged.

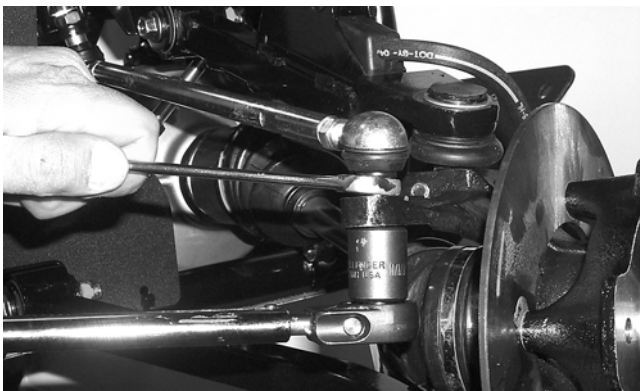
6. Install the knuckle assembly onto the ball joints and secure with cap screws. Tighten to specifications.



AF628D

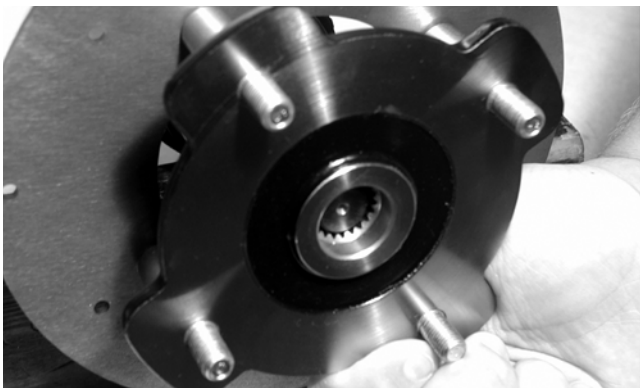
7. Install the tie rod end and secure with the nut. Tighten to specifications; then install a new cotter pin and spread the pin to secure the nut.

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



AF618D

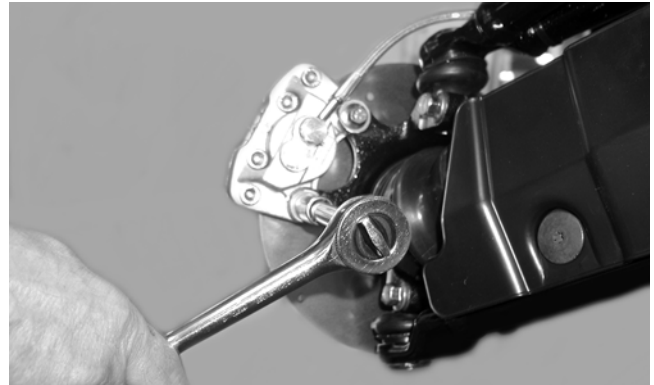
8. Apply grease to the hub and drive axle splines; then install the hub assembly onto the drive axle.



CD009

9. Secure the hub assembly with the nut. Tighten only until snug.

10. Secure the brake caliper to the knuckle with the two cap screws making sure the two 0.76 mm (0.030 in.) spacer washers are positioned between the caliper and the knuckle. Tighten to specifications.



CD007

11. Secure the hub nut (from step 9) to the shaft/axle. Tighten to specifications.

12. Install a new cotter pin and spread the pin to secure the nut.



CD008

13. Install the wheel and tighten to specifications.

14. Remove the ATV from the support stand.

Rear A-Arms

REMOVING

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

WARNING

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

2. Pump up the hand brake; then engage the brake lever lock.

3. Remove the wheel.
4. Remove the cotter pin securing the hex nut; then remove the hex nut. Release the brake lever lock.
5. Remove the caliper (right side only).

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

6. Remove the cap screws and lock nut securing the shock absorber to the frame and lower A-arm; then remove the shock absorber.
7. Remove the cap screws securing the boot guard to the lower A-arm.



AF934

8. Slide the hub out of the knuckle and set aside.
 9. Remove the cap screws and lock nuts securing the knuckle to the A-arms. Discard the lock nuts.
- **NOTE:** Never reuse a lock nut. Once a lock nut has been removed, it must be replaced with a new lock nut.
10. Remove the cap screws and lock nuts securing the A-arms to the frame; then remove the A-arms.

■ **NOTE:** If removing the upper right A-arm, it will be necessary to disconnect the brake hose from the A-arm.

CLEANING AND INSPECTING

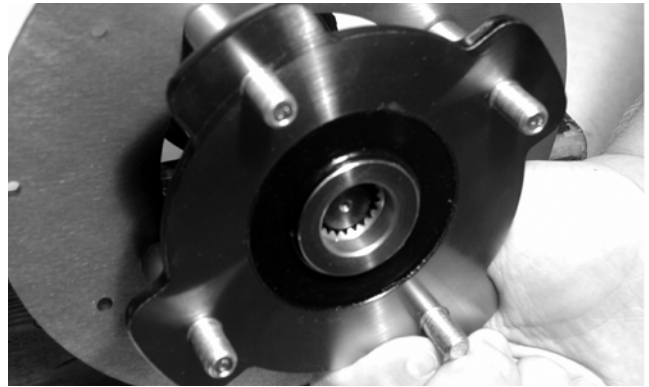
■ **NOTE:** Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

1. Clean all A-arm components in parts-cleaning solvent.
2. Inspect the A-arm for bends, cracks, and worn bushings.

3. Inspect the frame mounts for signs of damage, wear, or weldment damage.

INSTALLING

1. Install the A-arm assemblies into the frame mounts and secure with the cap screws and new lock nuts. Only finger-tighten at this time.
2. Slide the knuckle onto the drive axle and into position on the A-arms; then secure the knuckle to the A-arms with cap screws and new lock nuts. Tighten to specifications.
3. Tighten the hardware securing the A-arms to the frame mounts (from step 1) to specifications.
4. Apply grease on the drive axle splines; then install the hub assembly onto the drive axle.



CD009

5. Secure the hub assembly with the nut. Tighten only until snug.
6. Secure the brake caliper to the knuckle with the two cap screws (right side only). Tighten the caliper to specifications.

■ **NOTE:** Ensure that the brake hose is properly routed and secured to the upper A-arm.



DE054A

7. Compress the hand brake lever and engage the brake lever lock; then secure the hub nut (from step 5) to the drive axle. Tighten to specifications.

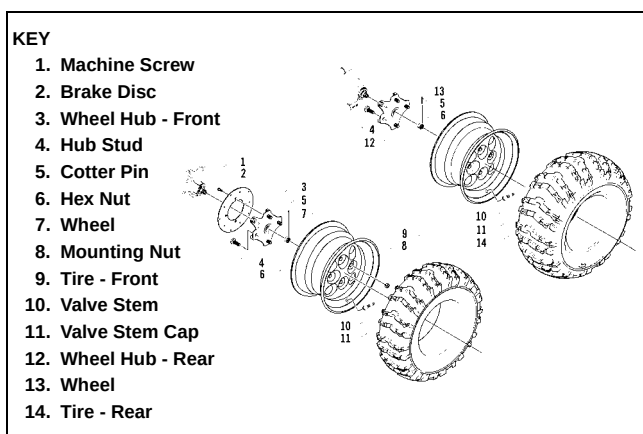
8. Install a new cotter pin and spread the pin to secure the nut.



CD008

9. Secure the shock absorber to the frame with a cap screw and new lock nut. Tighten to specifications.
10. Secure the shock absorber to the lower A-arm with a cap screw and new lock nut. Tighten to specifications.
11. Secure the boot guard to the lower A-arm with the two cap screws. Tighten securely.
12. Install the wheel and tighten to specifications.
13. Remove the ATV from the support stand.

Wheels and Tires



0739-534

TIRE SIZE

WARNING

Use only Arctic Cat approved tires when replacing tires. Failure to do so could result in unstable ATV operation.

The ATV is equipped with low-pressure tubeless tires of the size and type listed in the General Specifications (see Section 1). Do not under any circumstances substitute tires of a different type or size.

WARNING

Do not mix tire tread patterns. Use the same pattern type on front and rear. Failure to heed warning could cause poor handling qualities of the ATV and could cause excessive drive train damage not covered by warranty.

TIRE INFLATION PRESSURE

Front and rear tire inflation pressure should be 0.35 kg/cm² (5.0 psi).

REMOVING

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

WARNING

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

2. Remove the wheels.

■ **NOTE:** Keep left-side and right-side wheels separated for installing them on their proper sides.

CLEANING AND INSPECTING

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

1. Clean the wheels and hubs with parts-cleaning solvent.
2. Clean the tires with soap and water.
3. Inspect each wheel for cracks, dents, or bends.
4. Inspect each tire for cuts, wear, missing lugs, and leaks.

INSTALLING

1. Install each wheel on its hub.



CD006

■ **NOTE:** Make sure each wheel is installed on its proper hub as noted in removing (the “rotation arrow” (if applicable) must indicate forward direction of rotation).



AF612D

2. Tighten to specifications.

CHECKING/INFLATING

1. Using an air pressure gauge, measure the air pressure in each tire. Adjust the air pressure as necessary to meet the recommended inflation pressure.



CD005

2. Inspect the tires for damage, wear, or punctures.

WARNING

Do not operate the ATV if tire damage exists.

■ **NOTE:** If repair is needed, follow the instructions found on the tire repair kit or remove the wheel and have it repaired professionally.

■ **NOTE:** Be sure all tires are the specified size and have identical tread pattern.

3. Check the front wheel toe-in and toe-out and adjust as necessary (see Section 8).

4. Test drive the ATV on a dry, level surface and note any pulling to the left or right during acceleration, deceleration, and braking.

■ **NOTE:** If pulling is noted, measure the circumference of the front and rear tires on the pulling side. Compare the measurements with the tires on the opposite side. If pulling is noted during braking only, check and adjust the brakes as necessary and recheck operation (see Section 2).

5. Increase the air pressure in the tires with the smallest circumference measurement until all tires are equal in circumference.

6. Repeat steps 4-5 as necessary to ensure proper handling.

SECTION 8 - STEERING/FRAME

TABLE OF CONTENTS

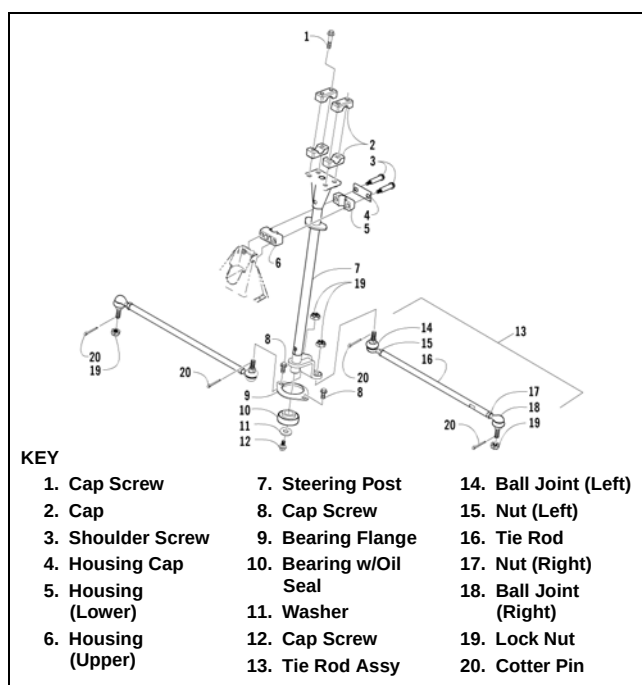
Steering/Frame.....	8-2
Steering Post/Tie Rods	8-2
Handlebar Grip	8-5
Steering Knuckles	8-6
Measuring/Adjusting Toe-In.....	8-8
Front Rack	8-9
Front Bumper Assembly	8-10
Front/Rear Body Panel	8-10
Front Body Panel/Side Panels (TBX/TRV/500/650 H1/700 EFI)	8-13
Footrests	8-17
Belly Panel	8-18
Exhaust System	8-18
Rear Body Panel/Rack	8-19
Side Storage Box (TBX Models)	8-20
Cargo Box (TBX Models)	8-21
Adjusting Headlight	8-22
Taillight Assembly	8-22
Seat.....	8-22

Steering/Frame

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

Steering Post/ Tie Rods

■ **NOTE:** Some components may vary from model to model. The technician should use discretion and sound judgment.



0739-774

REMOVING

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



CD759

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



CD666

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



CD667

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



CD669

5. Remove the storage compartment.



CD671

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



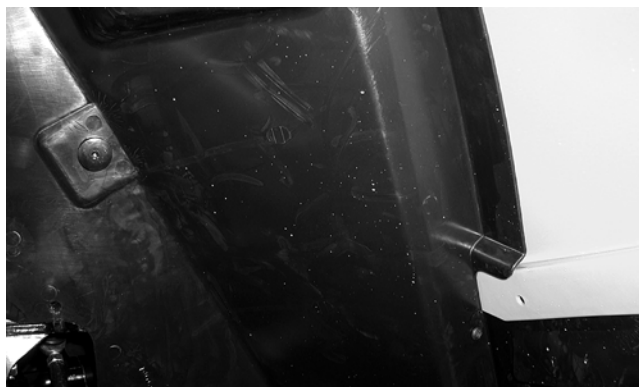
CD762

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



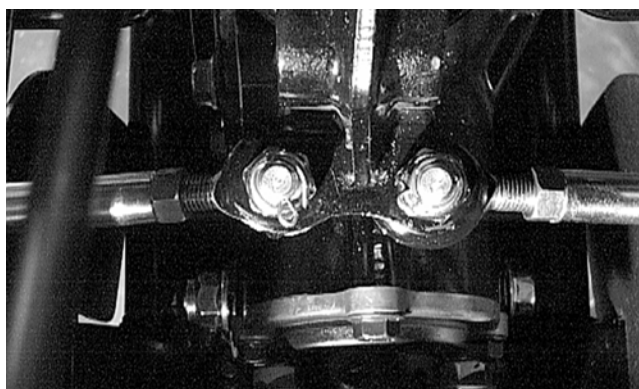
CD760

8. Using a suitable lift stand, raise the ATV enough to remove the front wheels; then remove the left-side and right-side splash panels.

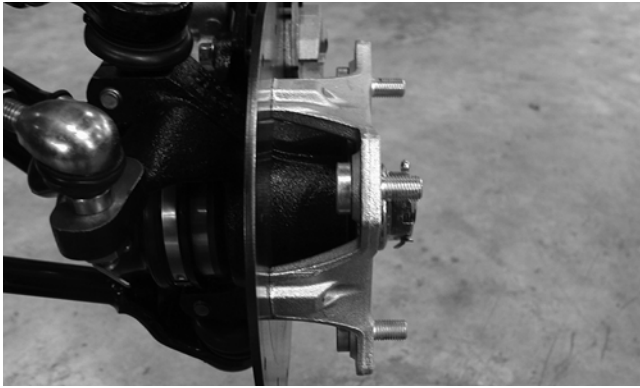


CD685

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

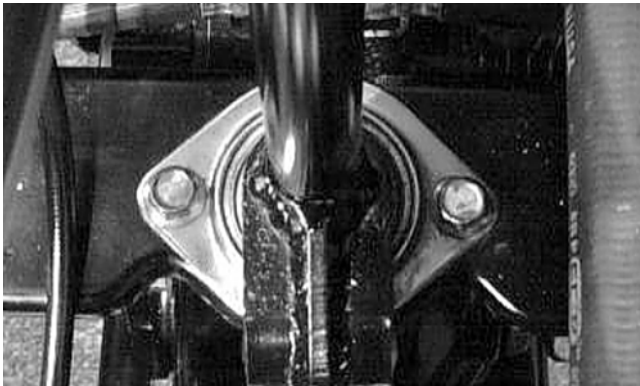


AF778D



KX039

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



AL600D

CLEANING AND INSPECTING

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

1. Wash the tie rod ends in parts-cleaning solvent. Dry with compressed air. Inspect the pivot area for wear. Apply a low-temperature grease to the ends.

WARNING

Always wear safety glasses when using compressed air.

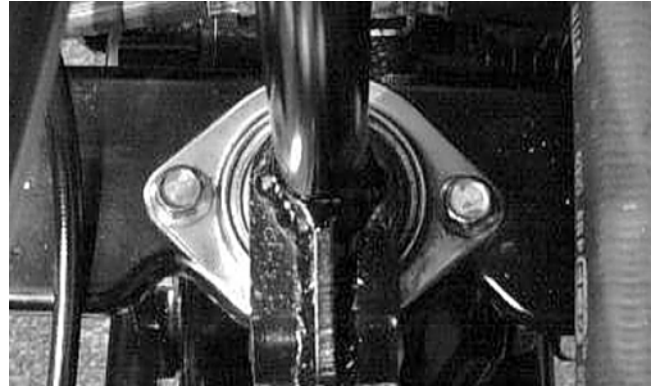
2. Inspect the tie rods for damaged threads or wear.
3. Inspect the tie rods for cracks or unusual bends.
4. Inspect all welded areas for cracks or deterioration.
5. Inspect the steering post and steering-post brackets for cracks, bends, or wear.
6. Inspect the bearing halves, bearing caps, and bearing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

7. Inspect the handlebar tube for cracks, wear, or unusual bends.

8. Inspect the handlebar grips for damage or wear.

INSTALLING

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



AL600D

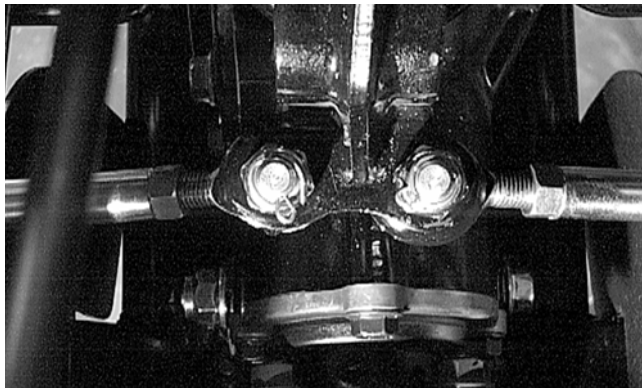
2. Place the upper steering post bearings into the housings; then position on the steering post and secure the housings to the frame with two cap screws. Tighten to specifications.



CD760

3. Install the tie rods and secure with the slotted nuts. Tighten to specifications; then install new cotter pins.

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



AF778D

4. Install the splash panels; then install the front wheels and tighten to specifications using a crisscross pattern.
5. Lower the ATV and place the handlebar and caps into position on the steering post; then position the speedometer on top of the caps and secure with the four cap screws. Tighten to specifications.
6. Install the storage compartment box; then attach the storage compartment cover assembly by engaging the lugs into the slots and sliding rearward. Lock the storage compartment lid to hold the assembly in place.



CD671



CD670

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



CD677



CD676

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

Handlebar Grip

REMOVING

1. Remove the plug from the head of the rivet.
2. Using a 1/8-in. drill bit, drill out the rivet.
3. Using compressed air between the grip and the handlebar, twist the grip back and forth until it slides free of the handlebar.

INSPECTING

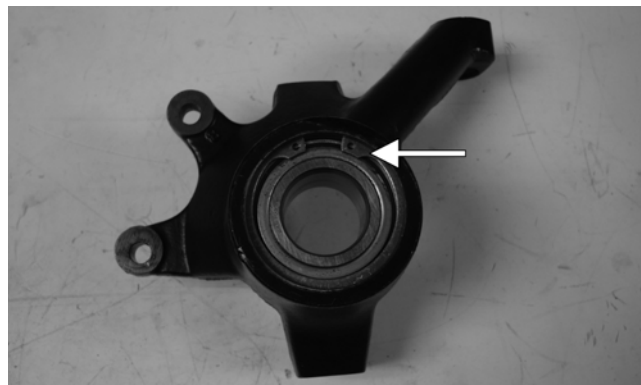
■ **NOTE:** Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

1. Inspect the grip for wear, cuts, or cracks.
2. Inspect the grip for deterioration.

INSTALLING

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

1. Apply a liberal amount of Handlebar Grip Adhesive to the inside of the grip.
2. Align the rivet hole in the grip with the rivet hole in the handlebar; then align the notch (inside the grip) with the slot in the handlebar and slide the grip onto the handlebar until it is fully seated.
3. Wipe off any excess glue; then secure the grip with a new rivet.
4. Install the plug on the head of the rivet.



PR287A

Steering Knuckles

REMOVING AND DISASSEMBLING

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

WARNING

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

2. Remove the wheel cap from the hub; then remove the cotter pin from the nut.
3. Remove the nut securing the hub.
4. Remove the brake caliper.
5. Remove the hub assembly.
6. Remove the cotter pin from the tie rod end and remove the tie rod end from the knuckle.
7. Remove the two cap screws securing the ball joints in the knuckle.
8. Tap the ball joint end out of the knuckle; then remove the knuckle.
9. Remove the snap ring from the knuckle; then remove the bearing.



PR288

CAUTION

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

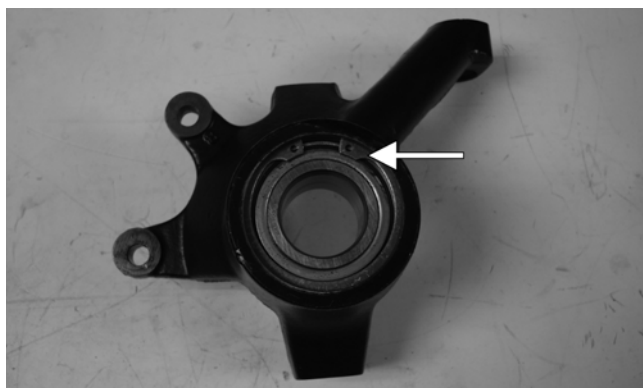
CLEANING AND INSPECTING

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

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

ASSEMBLING AND INSTALLING

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



PR287A

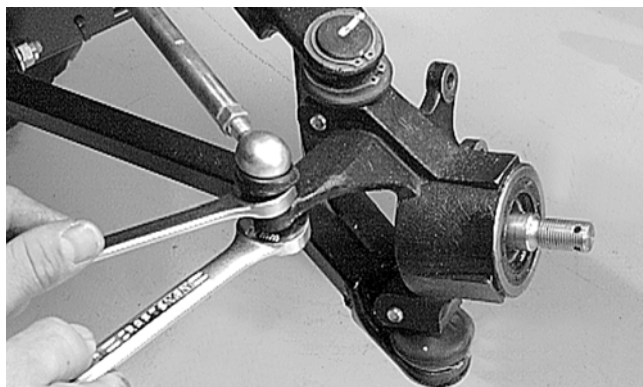
2. Install the knuckle to the upper and lower ball joints and secure with the two cap screws. Tighten to specifications.



AF760D

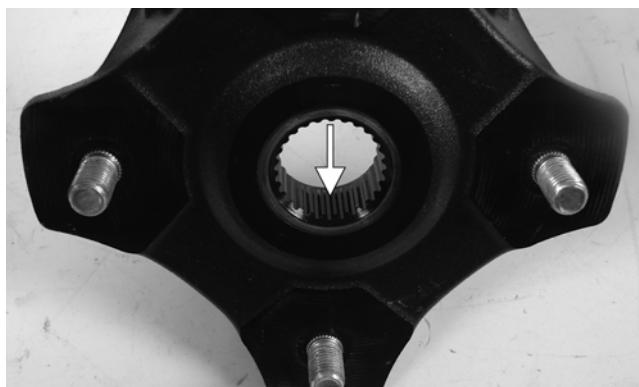
3. Install the tie rod end and secure with the nut. Tighten to specifications; then install a new cotter pin and spread the pin.

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



AF759D

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



PR290A

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



PR257

7. Secure the brake caliper to the knuckle with the two cap screws. Tighten to specifications.



PR264A

8. Pump the hand brake lever; then engage the brake lever lock.
9. Secure the hub nut (from step 6) to the shaft. Tighten to specifications.
10. Install a new cotter pin and spread the pin to secure the nut.
11. Install the wheel; then using a crisscross pattern, tighten to specifications.



CD006

12. Remove the ATV from the support stand.

Measuring/Adjusting Toe-In

1. Thoroughly wash the ATV to remove excess weight (mud, etc.).
2. Refer to the specifications and ensure the tires are properly inflated to the recommended pressure.

■ **NOTE:** Ensure the inflation pressure is correct in the tires or inaccurate measurements can occur.



CD005

3. Place the ATV in a level position taking care not to push down or lift up on the front end; then turn the handlebar to the straight ahead position.

■ **NOTE:** When measuring and adjusting, there should be a normal operating load on the ATV (without an operator but with Arctic Cat approved accessories).

4. Measure the distance from the outside edge of each handlebar grip to the seat catch brackets.



CD012A

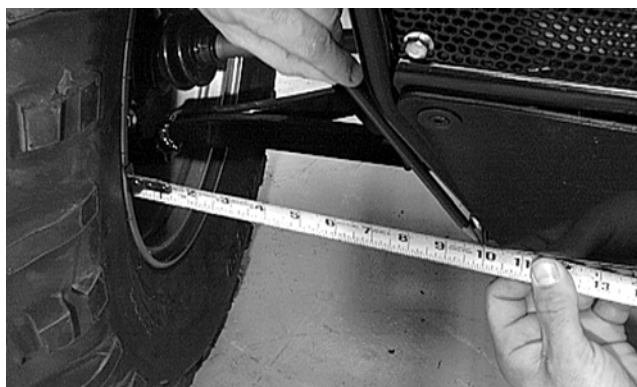
5. Adjust the handlebar direction until the two measurements are equal; then secure the handlebar to the rear rack using tie-down straps.

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

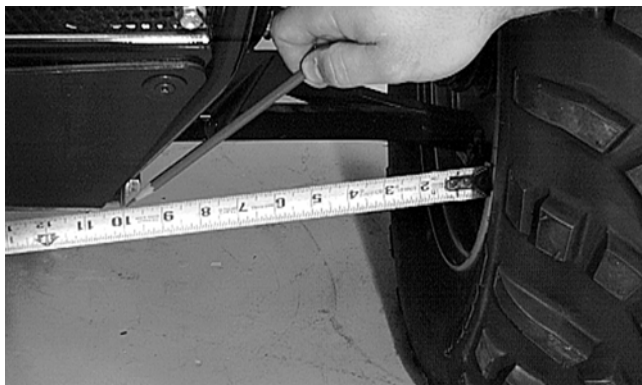


CD014

6. Measure the distance from the inside of each front rim to the lower frame tube.



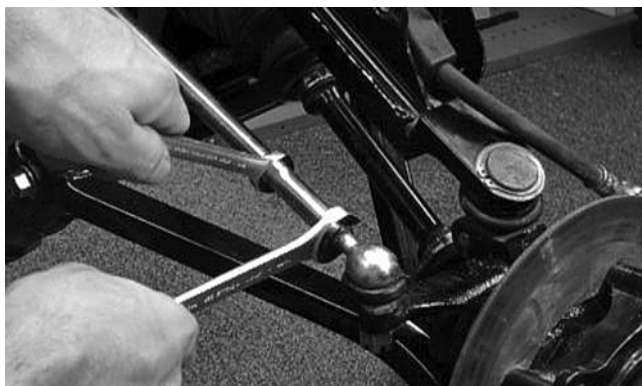
AF785D



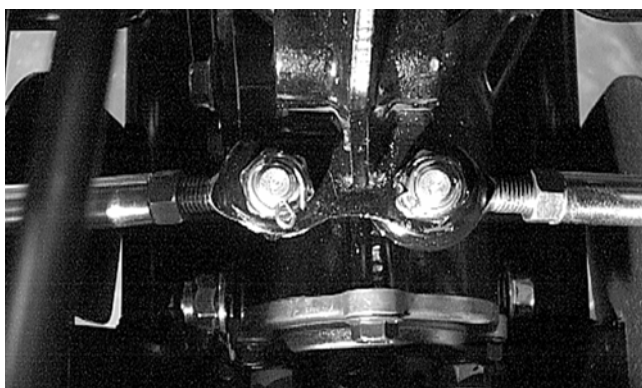
AF786D

■ **NOTE:** The distances from the inside rims to the frame tubes should be equal. If the measurements are equal, proceed to step 8; if the measurements are not equal, proceed to step 7.

7. To make the measurements equal, loosen the appropriate tie rod jam nuts and adjust accordingly; then proceed to step 8.



AF617D



AF778D

■ **NOTE:** The front wheels do not have to be removed to adjust the tie rod. Also, care should be taken not to disturb the handlebar position.

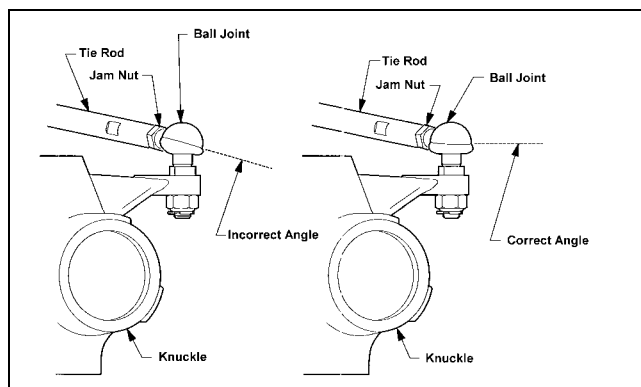
8. Using a permanent marker of some type, mark the center of each front tire (at a height parallel to the belly panel).



AF789D

9. Measure the distance between the marks (at a height parallel to the belly panel) at the front side; then record the measurement.
10. Push the ATV forward until the marks are parallel to the belly panel on the back side; then measure the distance between the marks.
11. The difference in the measurements must show 3.2-6.4 mm (1/8-1/4 in.) toe-in (the front measurement 3.2-6.4 mm (1/8-1/4 in.) less than the rear measurement).
12. If the difference in the measurements is not within specifications, adjust both tie rods equally until within specifications.

■ **NOTE:** Prior to locking the jam nuts, make sure the ball joints are at the center of their normal range of motion and at the correct angle.



733-559A

Front Rack

REMOVING

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

3. Remove the front rack from the ATV.

CLEANING AND INSPECTING

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

1. Clean all rack components with parts-cleaning solvent.
2. Inspect all welds for cracking or bending.
3. Inspect threaded areas of all mounting bosses for stripping.
4. Inspect for missing decals and/or reflectors.

INSTALLING

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

Front Bumper Assembly

REMOVING

1. Remove the two flange bolts and lock nuts securing the upper bumper supports to the bumper.
2. Remove the through-bolt and lock nut securing the bumper to the frame; then remove the bumper.

CLEANING AND INSPECTING

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

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

INSTALLING

1. Place the front bumper assembly into position and install the through-bolt. Start the lock nut and finger-tighten only.
2. Install the two flange bolts and lock nuts on the upper supports. Tighten all hardware securely.

Front/Rear Body Panel

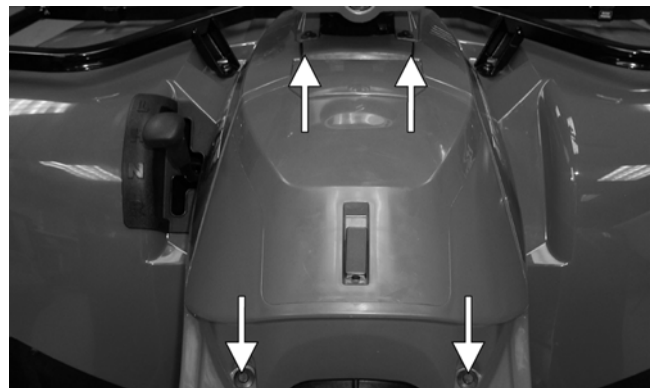
REMOVING

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

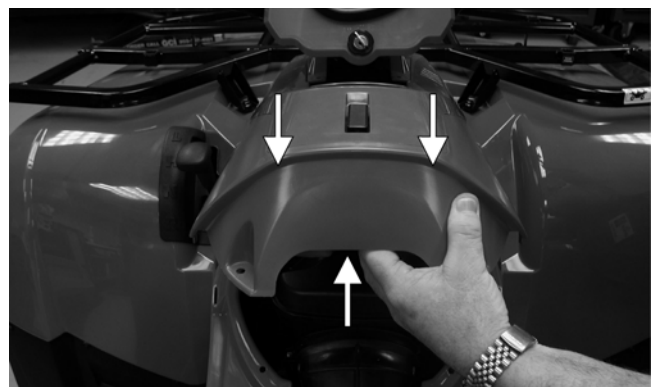
CAUTION

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

3. Remove four reinstallable rivets securing the storage compartment to the body; then remove the storage compartment and the steering post cover.

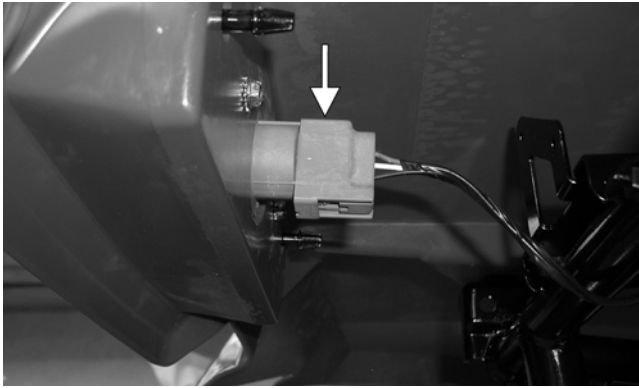


CF145A



CF143A

4. Remove the left-side and right-side fender splash panels; then remove one press-in fastener and one reinstallable rivet from the left side and right side of the air-intake splash shroud. Do not remove the shroud.
5. Disconnect the four headlight connectors and the taillight/brakelight connector from the sockets.

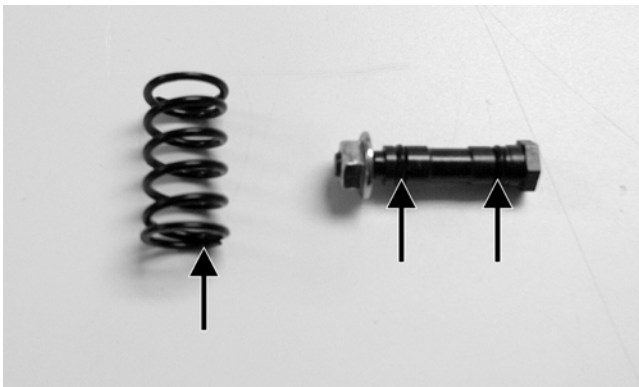


CF135A

6. Remove the shift knob; then remove the nut and axle pivot bolt securing the lever to the shift lever axle. Remove the shift lever. Account for the two O-rings on the axle bolt and one spring.

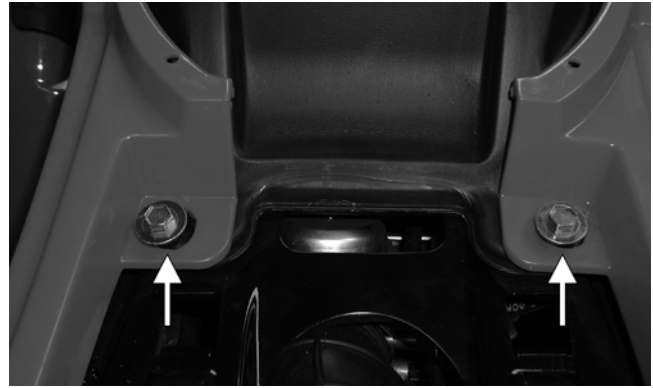


CD779



CD780A

7. Remove the front and rear racks; then remove the two body bolts adjacent to the air filter housing and two push nuts located behind the grille.



CF201A



CF160A

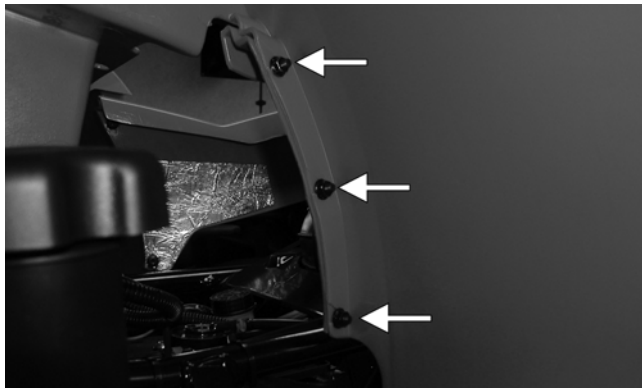
8. Remove the two cap screws and lock nuts securing the left foot peg and remove the foot peg.



CD782

9. Remove eight cap screws and lock nuts and one reinstallable rivet securing the right-side footwell to the fenders.

10. Lift and support the rear of the body to allow access to the torx-head cap screws securing the front and rear body sections together; then remove six self-locking nuts (three from each side). Remove the rear body panel; then remove the front one.



CF213A

■ **NOTE:** To aid in removing the body without separating the front and rear panels, it is advisable to have an assistant help with lifting and guiding the body clear of the handlebar.

CLEANING AND INSPECTING

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

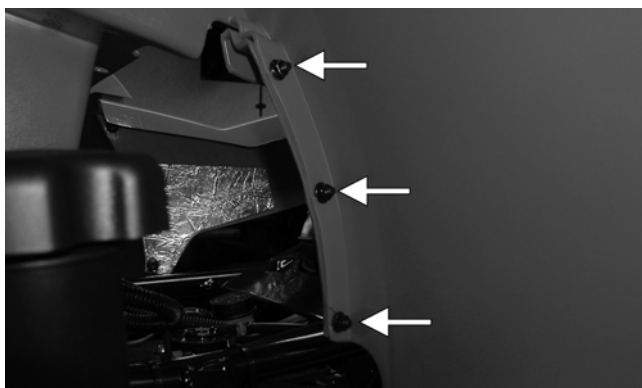
1. Clean all fender components with part-cleaning solvent and soap and water.
2. Inspect fenders for cracks and/or loose rivets.
3. Inspect for any missing decals.

INSTALLING

1. Place the body assembly into position on the ATV.

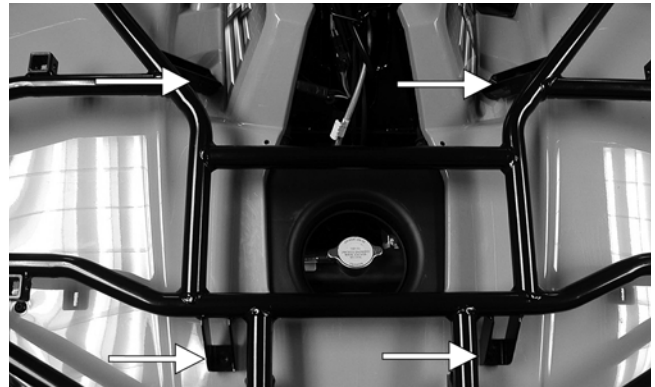
■ **NOTE:** If the front and rear body panels have been separated, proceed to step 2; if the panels have not been separated, proceed to step 3.

2. Install the torx-head cap screws and lock nuts securing the front and rear body panels together. Tighten securely.



CF213A

3. Making sure the body mounting grommets are in place, position the front and rear racks; then install the eight flanged cap screws and lock nuts. Do not tighten at this time.



CD679A

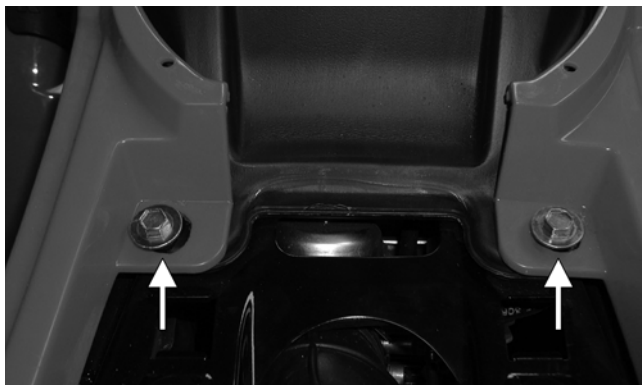


CD690A

4. Install four rack-to-body machine screws and lock nuts on the front and rear racks, two push nuts behind the grille, and two body bolts adjacent the air filter housing; then tighten all fasteners (from step 3 and 4) securely.

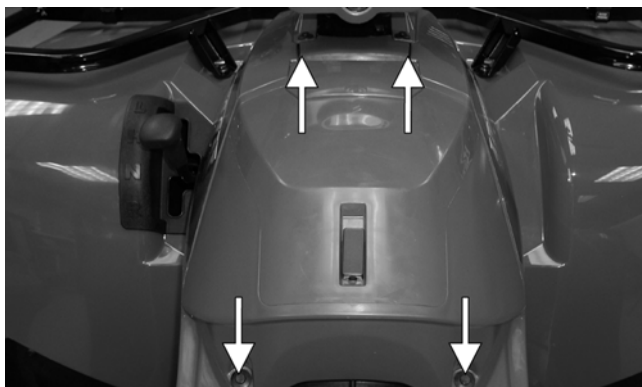


CF160A

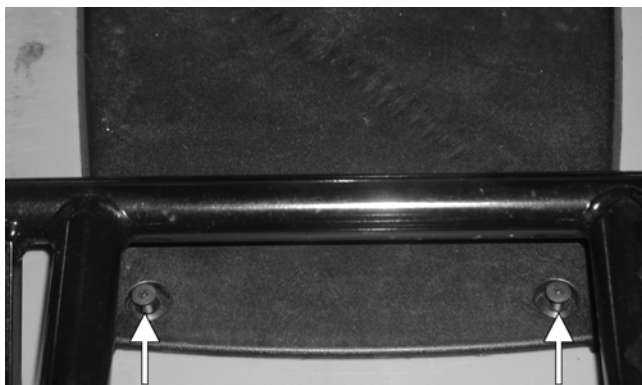


CF201A

5. Install eight cap screws and lock nuts securing the right-side footwell to the front and rear fenders; then place the left-side foot peg into position and secure with two cap screws and lock nuts. Tighten securely.
6. Place the storage compartment into position; then install the steering post cover. Secure with the reinstallable rivets.



CF145A



CF134A

7. Place the shift lever into position making sure the spring is installed; then secure with the axle pivot bolt and lock nut.
8. Install the shift knob and the left-side and right-side splash panels; then reconnect the headlights. Tighten all fasteners securely.
9. Place the battery into position in the battery box; then connect the vent hose.

10. Connect the positive battery cable; then connect the negative battery cable. Tighten the battery terminal cap screws securely.
11. Install the battery cover/tool tray; then install the seat. Make sure the seat locks securely.

Front Body Panel/ Side Panels

(TBX/TRV/500/650 H1/700 EFI)

REMOVING

1. Remove the reinstallable rivets securing the radiator access cover and remove the cover; then remove four reinstallable rivets securing the steering post cover and remove the cover.



CD666



CD667

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



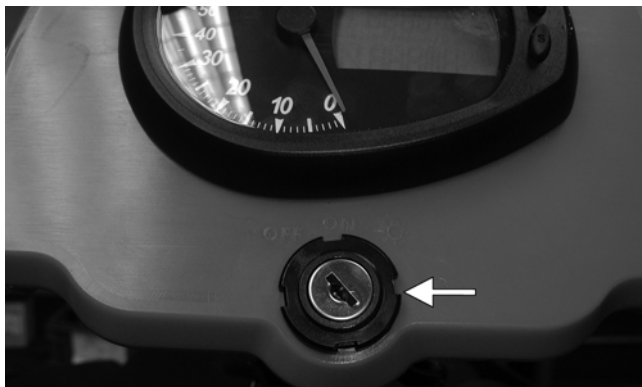
CD669

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



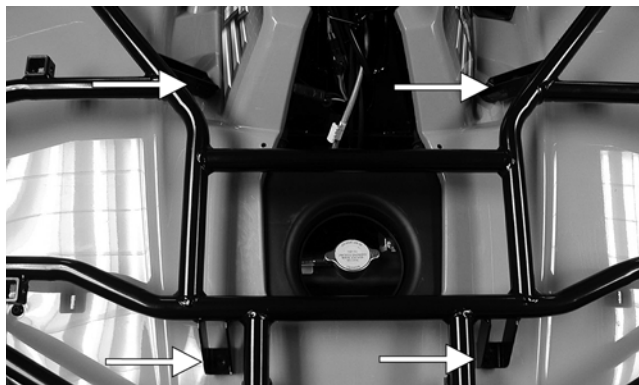
CD671

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



CF207A

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



CD679A

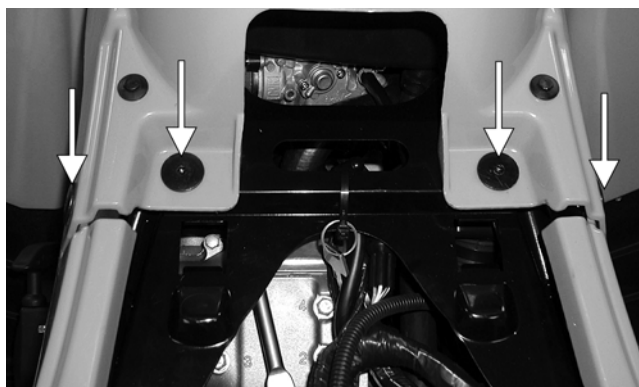


CD680

6. Remove three reinstallable rivets securing the right side panel; then remove two torx-head cap screws securing the rear of the front panel to the frame.



CD683A



CD684A

7. Remove the torx-head cap screws and nylon ties securing the left-side and right-side splash panels; then remove the panels.



CD685

8. Remove one shoulder screw and four plastic rivets on each side to separate the front panel lower fenders from the left-side and right-side footwells.



CD691

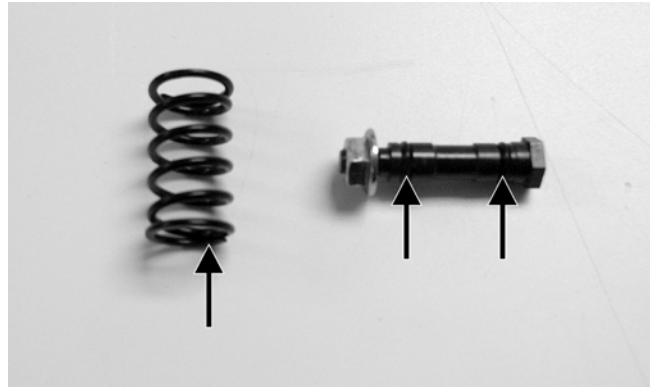


CD682

9. Remove the shift knob retaining pin and remove the shift knob; then remove the shift lever pivot axle nut and remove the axle and shift lever. Account for a spring and two O-rings.



CD779



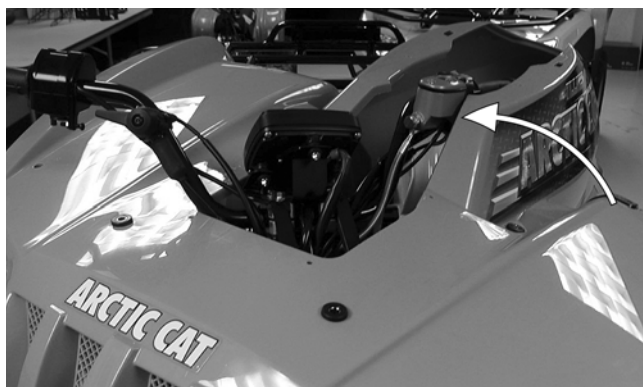
CD780A

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



CD681

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



CD765A

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

CLEANING AND INSPECTING

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

1. Clean all fender components with part-cleaning solvent and soap and water.
2. Inspect fenders for cracks and/or loose rivets.
3. Inspect for any missing decals.

INSTALLING

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



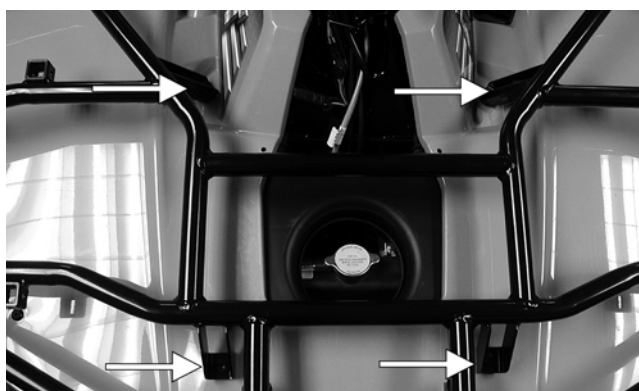
CD765

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



CD681

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

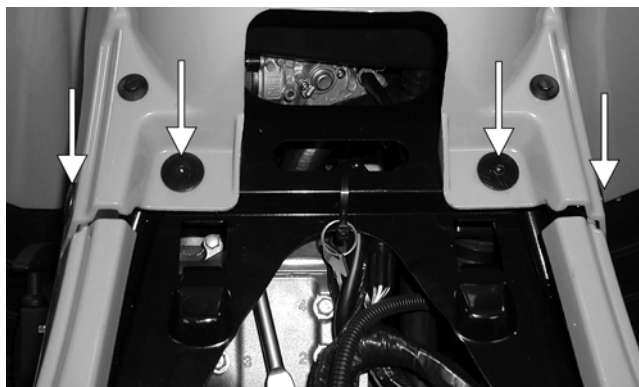


CD679A

4. Install one machine screw and flange nut and four plastic rivets on each side to secure the front fenders to the footwells. Tighten the flange nuts securely.

■ **NOTE:** If the footwells have been removed, see Footrests in this section.

5. Install four cap screws securing the front body panel to the frame and rear panel.



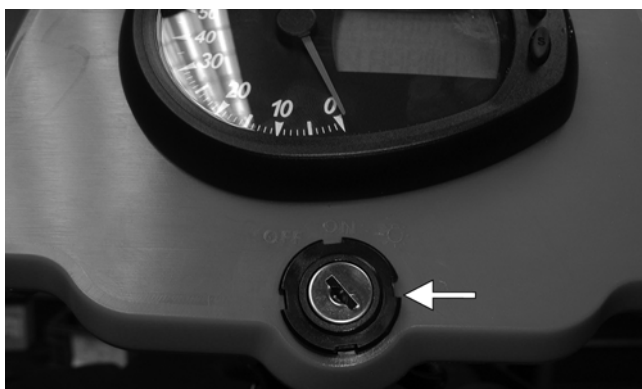
CD684A

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



CD779

7. Install the left-side and right-side splash panels and tighten the cap screws securely. Install new nylon ties in the appropriate locations.
8. Install the instrument pod and ignition switch; then secure with two reinstallable rivets and the ignition switch lock collar.

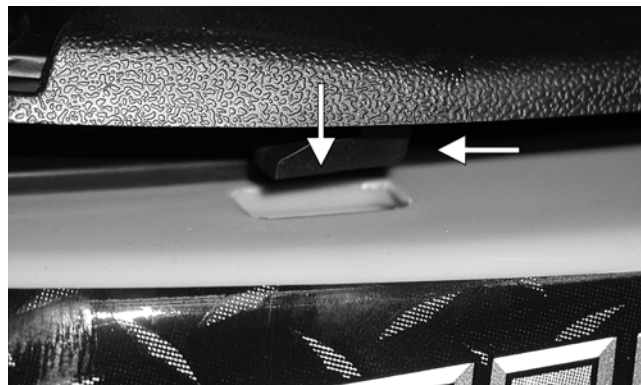


CF207A

9. Set the storage compartment box into position; then install the storage compartment cover making sure the mounting lugs engage the slots. Slide rearward to secure and lock by engaging the lid lock.



CD671



CD670A

10. Install the steering post cover and secure with the reinstallable rivets; then install and secure the radiator access panel.
11. Install the left and right side panels and secure with reinstallable rivets.



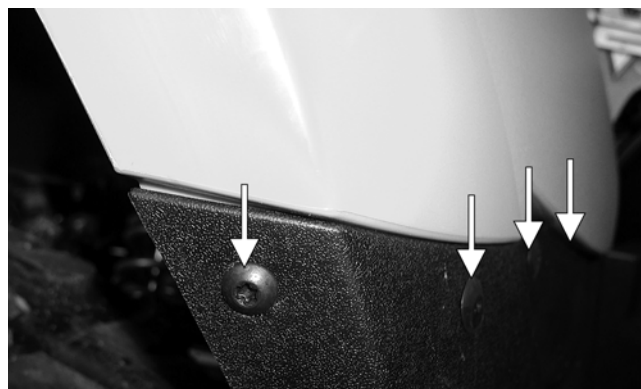
CD683A

Footrests

REMOVING

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

8



CD691A

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



CD782

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

CLEANING AND INSPECTING

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

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

INSTALLING

1. Secure the footrests to the frame with four cap screws and two flange nuts; then tighten securely.
2. Place the footwells onto the footrests; then put the foot pegs in position and secure with two cap screws.



CD782

3. Install the machine screws and flange nuts securing the front and rear fenders to the footwells.

Belly Panel

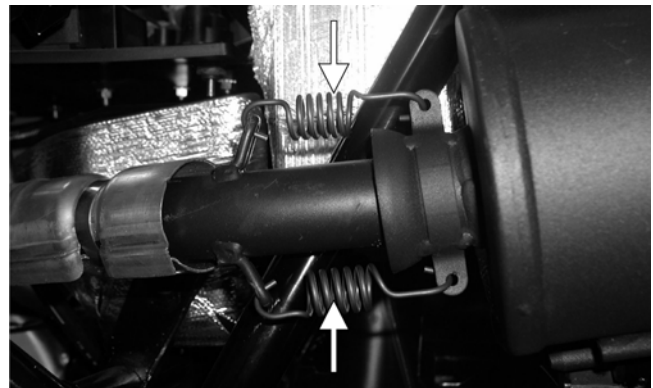
REMOVING/INSTALLING

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

Exhaust System

REMOVING MUFFLER

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



CF138A

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

INSPECTING MUFFLER

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

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

■ **NOTE:** For additional details on cleaning the muffler/spark arrester, see Section 2.

INSTALLING MUFFLER

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

Rear Body Panel/Rack

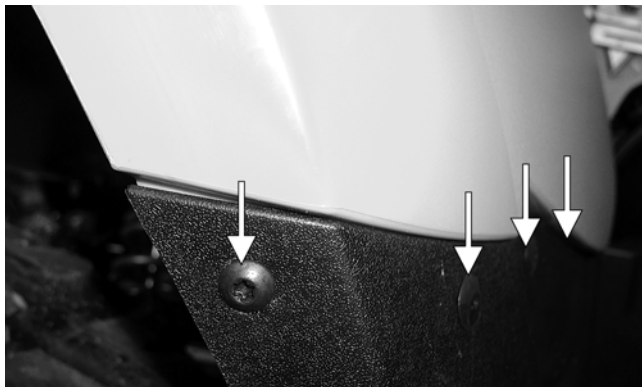
REMOVING

1. Remove four machine screws and flanged nuts securing the rear rack; then remove the rear rack. Account for four bushings.



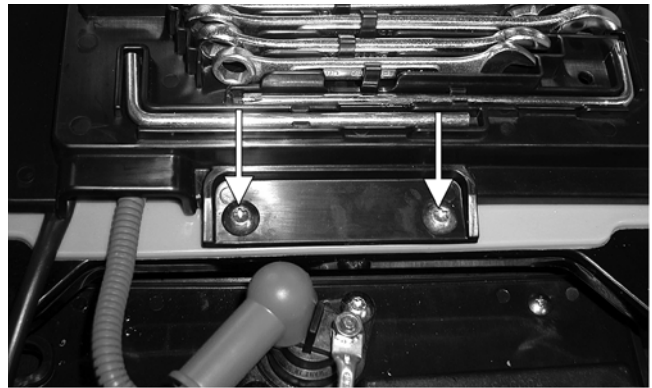
CD690A

2. Remove one shoulder screw and lock nut and three plastic rivets (on each side) securing the rear body panel to the footwells.



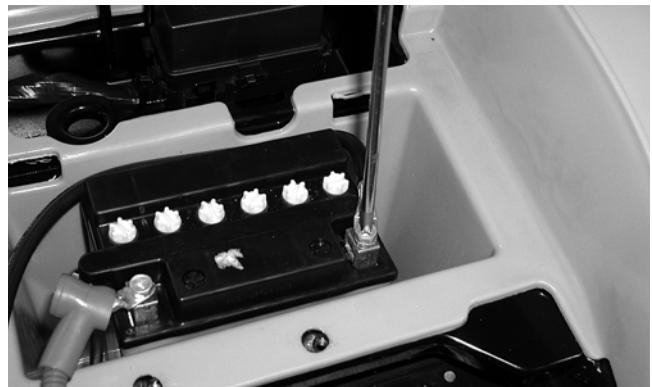
CD691A

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



CD687A

4. Disconnect the battery (negative cable first); then remove the battery.



CD688

5. Disconnect the taillight/brakelight; then remove the gas tank cap and lift off the rear body panel. Install the gas tank cap.

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

CLEANING AND INSPECTING

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

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

INSTALLING

1. Remove the gas tank cap and set the rear body panel in position; then install the cap and connect the taillight/brakelight connector.
2. Place the rear rack in position with four bushings and secure with four machine screws and flanged nuts. Tighten securely.



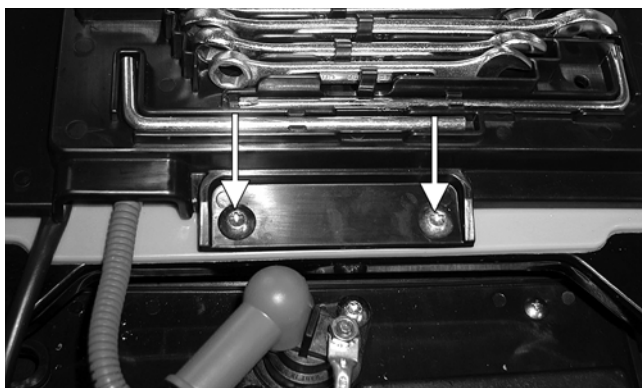
CD690A

3. Install one shoulder screw and three plastic rivets (on each side) to secure the front of the rear body panel to the footwells.



CD691

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



CD687A

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

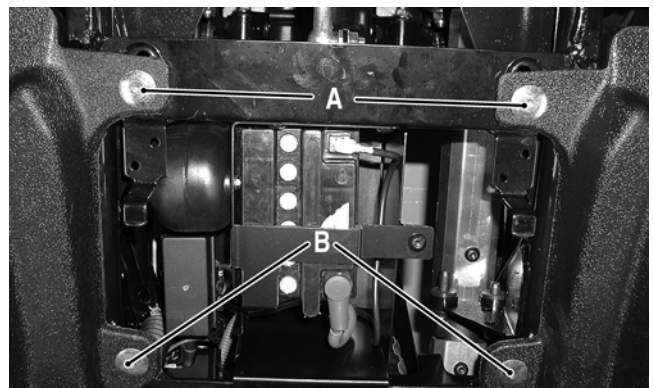
■ **NOTE:** If the front body panel has not been installed, see Front Body Panel/Side Panels in this section.

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

Side Storage Box (TBX Models)

REMOVING

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



CD045A

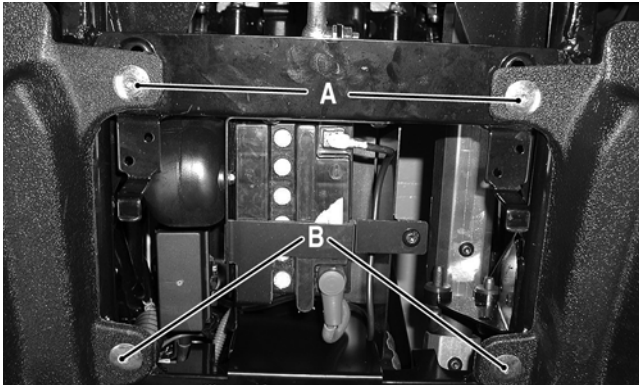
CLEANING AND INSPECTING

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

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

INSTALLING

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



CD045A

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

Cargo Box (TBX Models)

REMOVING

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



CD771

2. Remove the nut from the lower end of the box lift support.

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



CD122

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

CLEANING AND INSPECTING

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

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

INSTALLING

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



CD122

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

Adjusting Headlight

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.

To check/adjust headlight beam, see Section 2.

WARNING

Do not operate the ATV unless the headlight beam is adjusted properly. An incorrectly adjusted beam will not provide the operator the optimum amount of light.

Taillight Assembly

REMOVING

1. Unplug the three-prong connector and free the taillight wiring harness from the frame.
2. Remove the torx-head cap screws securing the taillight assembly to the frame. Account for any washers.
3. Remove the taillight assembly.

INSPECTING

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

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

INSTALLING

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

Seat

■ **NOTE:** Some components may vary from model to model. The technician should use discretion and sound judgment.

REMOVING/INSTALLING

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

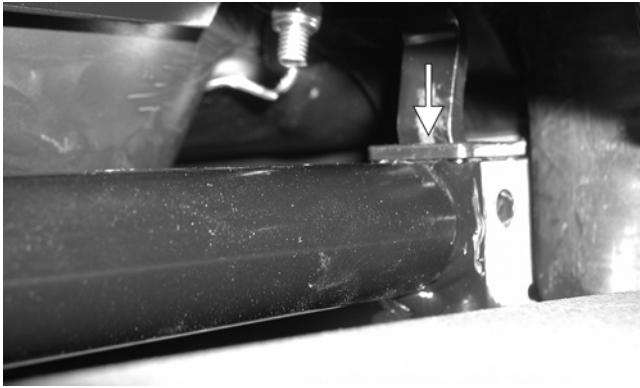
REMOVING/INSTALLING (TRV)

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



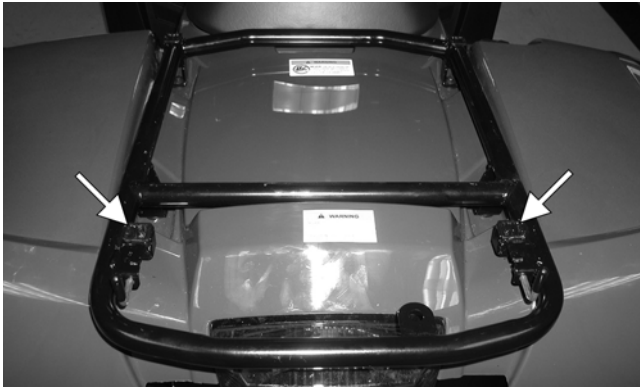
CF226

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



CF227A

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



CF229A

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



CF226A

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

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

SECTION 9 - CONTROLS/INDICATORS

TABLE OF CONTENTS

Hand Brake Lever/Master Cylinder Assembly	9-2
Throttle Control	9-3
Gearshift Pedal (Manual Transmission).....	9-5
Drive Selector	9-5
Front Differential Lock	9-5
Shift Lever	9-5
Speedometer/Tachometer/LCD	9-6

Hand Brake Lever/ Master Cylinder Assembly

■ **NOTE:** The master cylinder is a non-serviceable component; it must be replaced as an assembly.

REMOVING

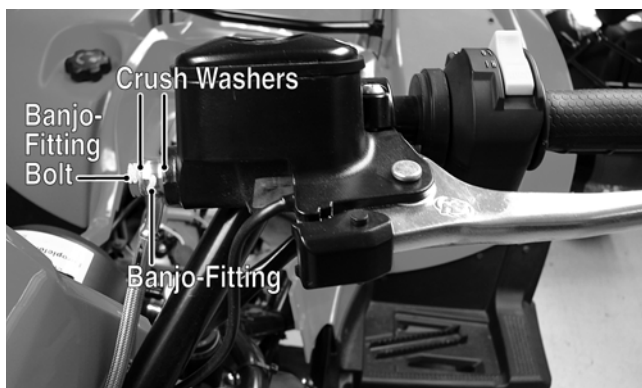
- Slide a piece of flexible tubing over one of the wheel bleeder valves and direct the other end into a container. Remove the reservoir cover; then open the bleeder valve. Allow the brake fluid to drain completely.

■ **NOTE:** Compressing the brake lever several times will quicken the draining process.



AF637D

- Place an absorbent towel around the connection to absorb brake fluid. Remove the banjo-fitting from the master cylinder. Account for two crush washers and a banjo-fitting bolt.



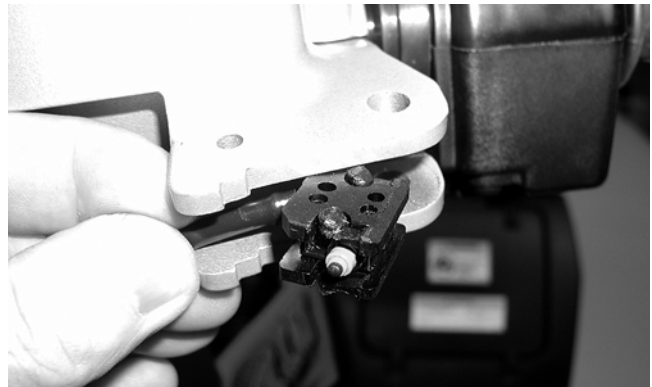
DE059A

⚠ CAUTION

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

- Remove the circlip and pivot pin securing the brake lever to the master cylinder housing; then remove the brake lever and set aside.

- Dislodge the brakelight switch from the master cylinder housing by gently pressing it toward the pivot pin hole in the housing; then lay it aside leaving the switch and wiring harness connected.



BC205

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



DE058A

INSPECTING

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

- Inspect the pin securing the brake lever for wear.
- Inspect the brake lever for elongation of the pivot hole.
- Inspect the reservoir for cracks and leakage.
- Inspect the banjo-fitting for cracks and deterioration and the condition of the fittings (threaded and compression).
- Inspect the brakelight switch for corrosion, cracks, missing or broken mounting tabs, or broken and frayed wiring.

■ **NOTE:** If the brakelight switch is determined to be not serviceable, see Section 5.

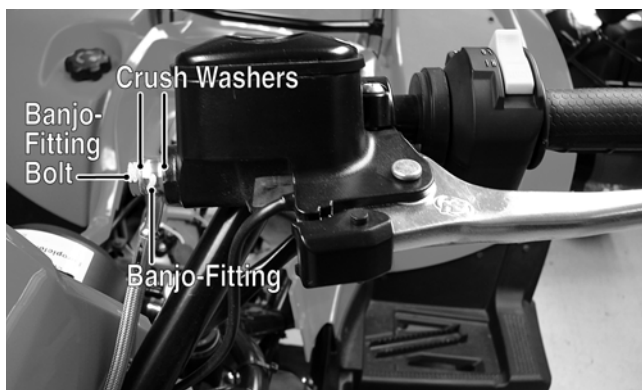
INSTALLING

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



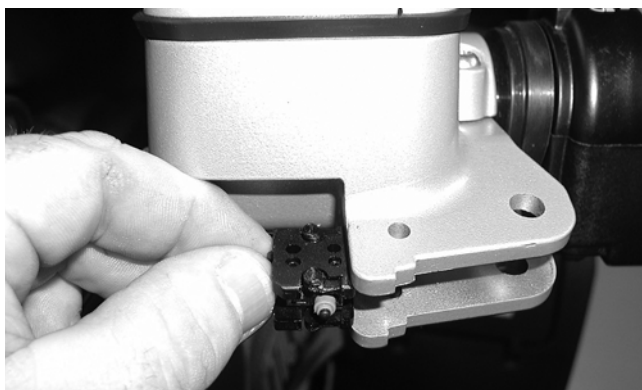
DE058A

2. Using two new crush washers, connect the banjo-fitting to the master cylinder; then secure with the banjo-fitting bolt.



DE059A

3. Gently press the brakelight switch into the housing (left to right) until the mounting tabs snap into the four locating holes; then install the brake lever, pivot pin, and circlip.



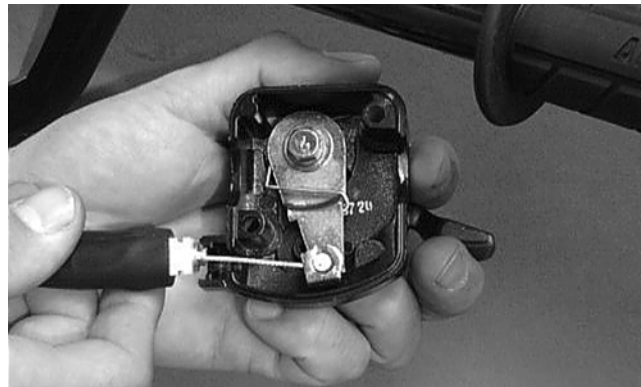
BC206

4. Bleed the brake system (see Section 2).

Throttle Control

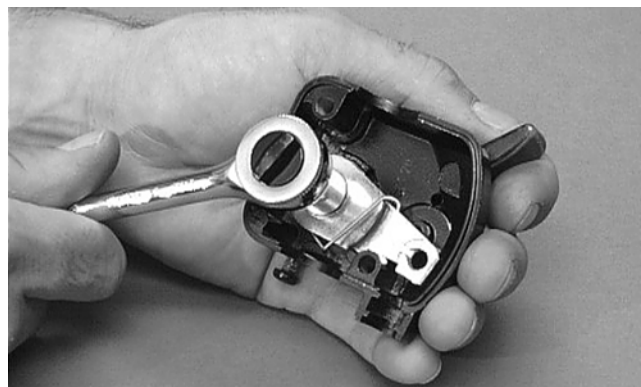
REMOVING

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



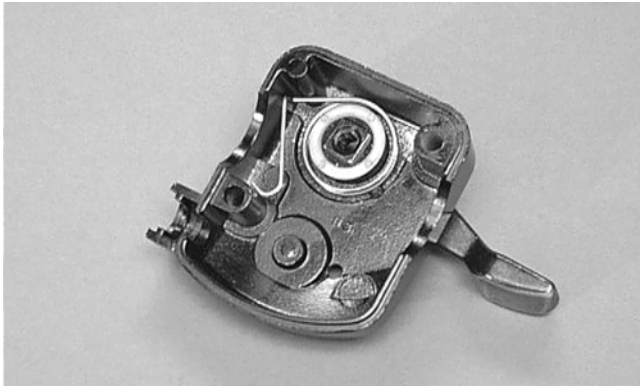
AF676D

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



AF677D

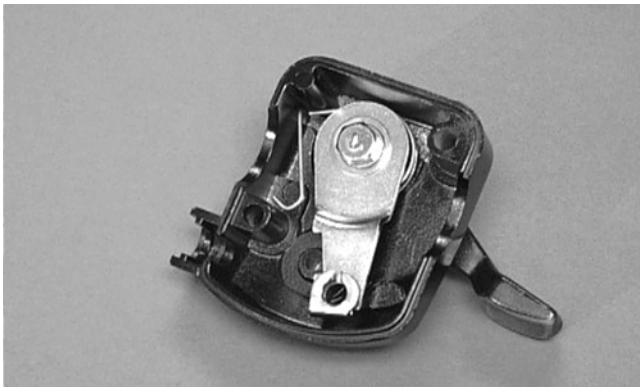
4. Remove the actuator arm and account for a bushing. Note the position of the return spring for installing purposes.



AF678D

INSTALLING

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



AF679D

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

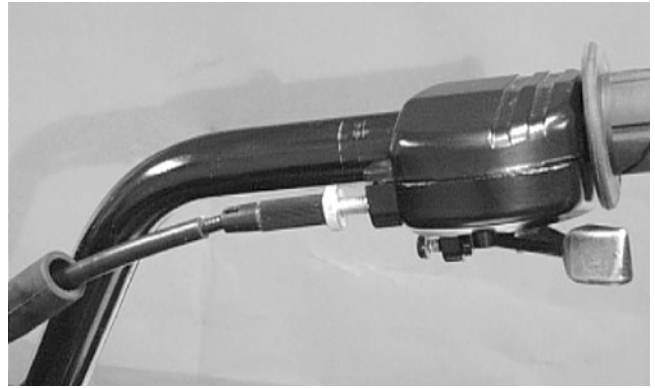


AF680D

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

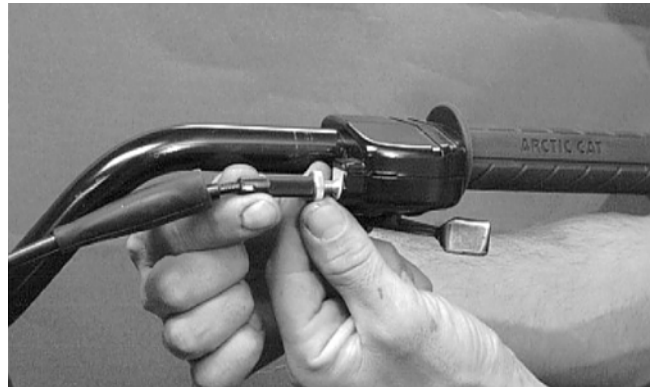
ADJUSTING

1. Slide the boot back to reveal the jam nut; then loosen the jam nut.



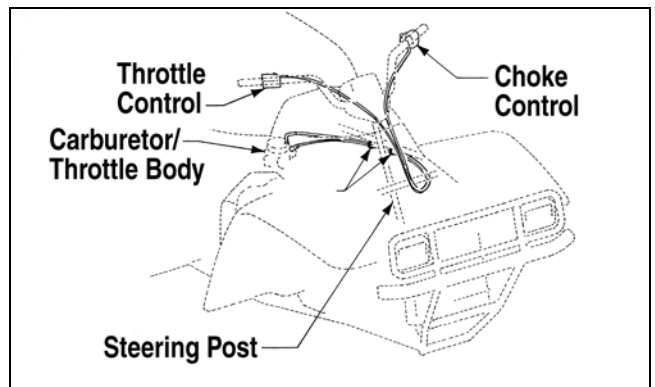
AF682D

2. Rotate the adjuster sleeve until 0.5-1.0 mm (0.02-0.04 in.) is attained.



AL611D

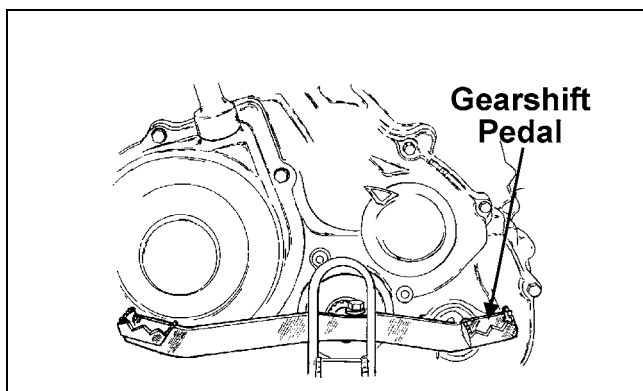
3. Secure the adjustment by tightening the jam nut; then slide the boot over the jam nut.



0732-412

Gearshift Pedal (Manual Transmission)

The gearshift pedal is attached to a ratchet mechanism in the transmission. Each time a gear is selected, the gearshift pedal will return to its normal position ready to select the next gear. To return to neutral, press down repeatedly (once for each gear) on the front of the pedal. Shift into gears by pressing down on the back of the pedal once for each gear. The ratchet mechanism makes it impossible to upshift or downshift more than one gear at a time.

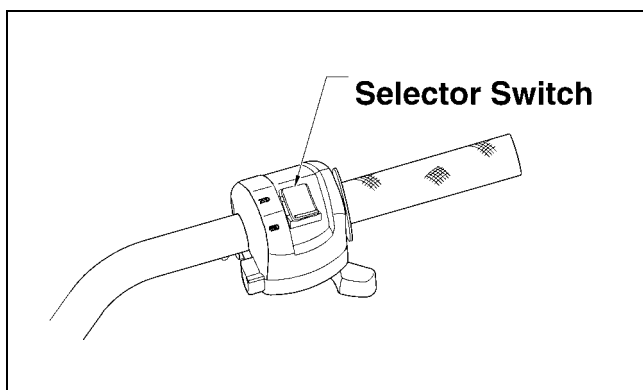


ATV0078C

Drive Selector

The automatic drive selector allows the operator to operate in either 2-wheel drive (rear wheels) or 4-wheel drive (all wheels). For normal riding on flat, dry, hard surfaces, 2-wheel drive should be sufficient. In situations of aggressive trail conditions, 4-wheel drive would be the desired choice.

To either engage or disengage the front wheels, move the switch to the 4WD position or to the 2WD position.



738-422A

CAUTION

Do not attempt to either engage or disengage the front differential while the ATV is moving.

Front Differential Lock

Certain ATV models are equipped with a front differential lock. The front differential lock allows the operator to mechanically lock the differential to apply equal power to both front wheels. To engage the front differential lock, rotate the handle fully clockwise to LOCK; to disengage the front differential lock, rotate the handle fully counterclockwise to UNLOCK.



KX016A

To adjust the differential lock cable, see Section 2.

Shift Lever

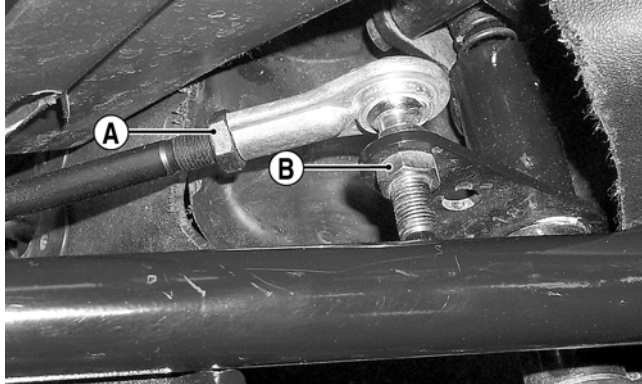
REMOVING

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

INSTALLING

1. Place the shift rod into position on the engine shift arm and secure with the existing E-clip.
2. Using a new lock nut (B), secure the shift rod to the upper shift arm; then using two open-end wrenches, tighten securely.



AF941A

3. Place the spring into position between the upper shift arm and shift lever; then making sure the O-rings are in place on the axle, secure the shift lever to the arm with the existing axle and nut.
4. Check shift lever adjustment (see Section 2); then tighten jam nut (A) securely.
5. Install the left-side splash panel.

Speedometer/ Tachometer/LCD

REPLACING

To replace the speedometer, use the following procedure.

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

SECTION 10 - AIDS FOR MAINTENANCE

TABLE OF CONTENTS

10

Torque Specifications (400/500 - Manual Transmission)	10-2
Torque Specifications (400/500 - Automatic Transmission/650 H1)	10-3
Torque Specifications (700 EFI)	10-5
Tightening Torque (General Bolts)	10-7
Torque Conversions	10-7

Torque Specifications

(400/500 - Manual Transmission)

DRIVE TRAIN COMPONENTS			
Part	Part Bolted To	Torque	
		kg-m	ft-lb
Engine (Lower Rear/Front)	Frame	5.5	40.0
Front Differential*	Frame/Differential Bracket	6.2	45.0
Pinion Housing	Differential Housing	2.9-3.5	21.0-25.0
Differential Housing Cover***	Differential Housing	2.9-3.5	21.0-25.0
Drive Bevel Gear Nut***	Shaft	10.0	72.0
Differential Gear Case***	Hub	2.3-3.0	16.5-22.0
Lock Collar	Differential Housing	17.3	125.0
Hub Nut	Shaft/Axle (max)	27.6	200.0
Oil Drain Plug	Front Differential/Rear Drive	0.5	3.5
Oil Fill Plug	Front Differential/Rear Drive	2.2	16.0
Oil Drain Plug	Engine	2.2	16.0
Inspection Plug	Front Differential/Rear Drive	0.5	3.5
Wheel	Hub	5.5	40.0
Oil Fitting (400)	Engine	0.8	6.0
EXHAUST COMPONENTS			
Exhaust Pipe	Engine	2.8	20.0
ELECTRICAL COMPONENTS			
Coil*	Frame	1.7	12.0
Ground Wire	Engine	1.1	8.0
STEERING COMPONENTS			
Handlebar Block	Steering Post	2.8	20.0
Steering Post Bearing Housing	Frame	2.8	20.0
Steering Post Bearing Flange	Frame	2.8	20.0
Lower Steering Bearing Washer Cap Screw***	Steering Post	5.5	40.0
Tie Rod End	Knuckle/Steering Post	4.2	30.0

BRAKE COMPONENTS			
Part	Part Bolted To	Torque	
		kg-m	ft-lb
Brake Disc*	Hub	2.1	15.0
Brake Hose	Caliper	2.8	20.0
Brake Hose	Master Cylinder	2.8	20.0
Brake Hose	Auxiliary Brake Cylinder	2.8	20.0
Master Cylinder (Rear)	Frame	3.5	25.0
Master Cylinder Cover	Master Cylinder	0.1	1.0
Auxiliary Brake Pedal	Lever Axle	3.5	25.0
Hydraulic Caliper	Knuckle/Axle Retainer Assembly	2.8	20.0
Auxiliary Caliper	Knuckle/Axle Retainer Assembly	2.8	20.0
CHASSIS COMPONENTS			
Footrest	Frame (8 mm)	2.8	20.0
Footrest	Frame (10 mm)	5.5	40.0
Shift Lever*	Shift Axle	1.1	8.0
SUSPENSION COMPONENTS (Front)			
A-Arm	Frame	4.8	35.0
Ball Joint Cap Screw	Knuckle	4.8	35.0
Shock Absorber	Frame	4.8	35.0
Shock Absorber	Upper A-Arm	4.8	35.0
Knuckle	A-Arm	4.8	35.0
SUSPENSION COMPONENTS (Rear)			
Axle Retainer Assembly	Axle Housing	5.5	40.0
Shock Absorber (Upper)	Frame	4.8	35.0
Shock Absorber (Lower)	Lower A-Arm	2.8	20.0
A-Arm	Frame	4.8	35.0
Swing Arm	Axle Housing/Case	4.8	35.0
Knuckle	A-Arm	4.8	35.0

ENGINE/TRANSMISSION			
Part	Part Bolted To	Torque	
		kg-m	ft-lb
Clutch Shoe	Crankshaft	13.0	94.0
Clutch Sleeve Hub	Countershaft	10.0	72.0
Crankcase Half (6 mm)	Crankcase Half	0.9-1.3	6.5-9.5
Crankcase Half (8 mm)	Crankcase Half	2-2.4	14.5-17.0
Cylinder Head (Cap Screw)	Cylinder	3.8	27.5
Cylinder Head (6 mm Nut)	Cylinder	1.1	8.0
Cylinder Head (8 mm Nut)	Cylinder	2.5	18.0
Cylinder Head Cover	Cylinder Head	1.0	7.0
Left-Side Cover	Crankcase Half	0.9-1.3	6.5-9.5
Mechanical Water Pump Impeller	Pump Shaft	1.05	7.5
Oil Pump Drive Gear	Crank Balancer Shaft	8.0	58.0
Oil Pump*	Crankcase	1.0	7.0
Output Shaft Gear	Output Shaft	10.0	72.0
Rear Output Shaft	Output Joint	2.8	20.0
Recoil Starter	Left-Side Cover	0.8	6.0
Reverse Cam Stopper Housing	Crankcase	2.3	16.5
Right-Side Cover	Crankcase	0.9-1.3	6.5-9.5
Rotor/Flywheel Nut	Crankshaft	16.0	116.0
Shift Stop Housing	Crankcase	2.3	16.5
Cam Sprocket**	Camshaft	1.5	11.0
Starter Cup	Crankshaft	3.5	25.0
Spark Plug	Engine	1.7	12.0

* w/Blue Loctite #243

** w/Red Loctite #271

*** w/Green Loctite #609

Torque Specifications (400/500 - Automatic Transmission/650 H1)

DRIVE TRAIN COMPONENTS			
Part	Part Bolted To	Torque	
		kg-m	ft-lb
Engine Mounting Through-Bolt (400/500)	Frame	5.5	40.0
Engine (650 H1)	Engine Cradle	5.5	40.0
Engine Cradle (650 H1/TRV)**	Rubber Mount	3.5	25.0
Rubber Mount (650 H1/TRV)	Frame Bracket	4.8	35.0
Front Differential*	Frame/Differential Bracket	6.2	45.0
Rear Output Joint Assembly	Engine	2.8	20.0
Input Housing	Differential Housing	2.9-3.5	21.0-25.0
Differential Housing Cover***	Differential Housing	2.9-3.5	21.0-25.0
Drive Bevel Gear Nut***	Shaft	10.0	72.0
Differential Gear Case***	Hub	2.3-3	16.5-22
Lock Collar	Differential Housing	17.3	125.0
Hub Nut	Shaft/Axle (max)	27.6	200.0
Oil Drain Plug	Front Differential/Rear Drive	0.5	3.5
Oil Fill Plug	Front Differential/Rear Drive	2.2	16.0
Oil Drain Plug	Engine	2.2	16.0
Inspection Plug	Rear Drive	0.5	3.5
Wheel	Hub	5.5	40.0
EXHAUST COMPONENTS			
Exhaust Pipe (400/500)	Engine	2.8	20.0
Exhaust Pipe (650 H1)	Engine	2.8	20.0
ELECTRICAL COMPONENTS			
Coil*	Frame	1.7	12.0
Ground Wire	Engine	1.1	8.0

STEERING COMPONENTS			
Part	Part Bolted To	Torque	
		kg-m	ft-lb
Handlebar Block	Steering Post	2.8	20.0
Steering Post Bearing Housing	Frame	2.8	20.0
Steering Post Bearing Flange	Frame	2.8	20.0
Lower Steering Bearing Washer Cap Screw***	Steering Post	5.5	40.0
Tie Rod End	Knuckle/Steering Post	4.2	30.0
BRAKE COMPONENTS			
Brake Disc*	Hub	2.1	15.0
Brake Hose	Caliper	2.8	20.0
Brake Hose	Master Cylinder	2.8	20.0
Brake Hose	Auxiliary Brake Caliper	2.8	20.0
Master Cylinder Cover	Master Cylinder	0.1	1.0
Auxiliary Brake Pedal	Lever Axle	3.5	25.0
Hydraulic Caliper	Knuckle	2.8	20.0
Auxiliary Caliper	Knuckle	2.8	20.0
CHASSIS COMPONENTS			
Footrest	Frame (8 mm)	2.8	20.0
Footrest	Frame (10 mm)	5.5	40.0
Shift Lever*	Shift Axle	1.1	8.0
SUSPENSION COMPONENTS (Front)			
A-Arm	Frame	4.8	35.0
Ball Joint Cap Screw	Knuckle	4.8	35.0
Shock Absorber	Frame	4.8	35.0
Shock Absorber	Upper A-Arm	4.8	35.0
Knuckle	A-Arm	4.8	35.0
SUSPENSION COMPONENTS (Rear)			
A-Arm	Frame	4.8	35.0
Shock Absorber (Upper)	Frame	4.8	35.0
Shock Absorber (Lower)	Lower A-Arm	2.8	20.0
Knuckle	A-Arm	4.8	35.0
SUSPENSION COMPONENTS (Rear) TBX Model			
Shock Absorber	Frame	4.8	35.0
Shock Absorber	A-Arm	2.8	20.0
Tilt Box Frame	ATV Frame	3.3	24.0
Cargo Box (Plastic)	Tilt Box Frame	1.7	12.0
Side Box	Frame	2.8	20.0
Side Box	Footwell	1.1	8.0
Rear CV Joint**	Engine	2.8	20.0

ENGINE/TRANSMISSION (400/500 - Automatic Transmission)			
Part	Part Bolted To	Torque	
		kg-m	ft-lb
Clutch Shoe	Crankshaft	13.0	94.0
Clutch Cover/Housing Assembly	Crankcase	1.1	8.0
Crankcase Half (6 mm)	Crankcase Half	0.9-1.3	6.5-9.5
Crankcase Half (8 mm)	Crankcase Half	2-2.4	14.5-17
Cylinder Head (Cap Screw)	Crankcase	3.8	27.5
Cylinder Head (6 mm)	Cylinder	1.1	8.0
Cylinder Head (8 mm)	Cylinder	2.5	18.0
Cylinder Head Cover	Cylinder Head	1.0	7.0
Driven Pulley Nut**	Fixed Face	10.4-11.8	75.0-85.0
Fixed Driven	Clutch Shaft	10.4-11.8	75.0-85.0
Ground Wire	Engine	1.1	8.0
Magneto Cover	Crankcase	1.1	8.0
Mechanical Water Pump Impeller	Pump Shaft	1.05	7.5
Movable Drive Face**	Driveshaft	10.4-11.8	75.0-85.0
Oil Pump Drive Gear	Crank Balancer Shaft	5.0	36.0
Output Shaft Gear	Output Shaft	10.0	72.0
Recoil Starter	Left-Side Cover	0.8	6.0
Rotor/Flywheel Nut	Crankshaft	16.0	116.0
Cam Sprocket**	Camshaft	1.5	11.0
Starter Cup	Crankshaft	3.5	25.0
V-Belt Cover	Crankcase	1.1	8.0
Spark Plug	Engine	1.7	12.0

* w/Blue Loctite #243

** w/Red Loctite #271

*** w/Green Loctite #609

ENGINE/TRANSMISSION (650 H1)			
Part	Part Bolted To	Torque	
		kg-m	ft-lb
Clutch Shoe	Crankshaft	31.8	230.0
Clutch Cover/Housing Assembly	Crankcase	1.1	8.0
Crankcase Half (6 mm)	Crankcase Half	0.9-1.3	6.5-9.5
Crankcase Half (8 mm)	Crankcase Half	2.8	20.0
Cylinder Head (Cap Screw)	Crankcase	5.5	40.0
Cylinder Head (6 mm)	Cylinder	1.1	8.0
Cylinder Head (8 mm)	Cylinder	2.5	18.0
Cylinder Head Cover	Cylinder Head	1.1-1.2	8.0-9.0
Driven Pulley Nut	Fixed Face	13.5	97.5
Fixed Driven**	Clutch Shaft	13.5	97.5
Ground Wire	Engine	1.1	8.0
Magneto Cover	Crankcase	1.1	8.0
Mechanical Water Pump Impeller	Pump Shaft	1.05	7.5
Movable Drive Face**	Driveshaft	10.4-11.8	75-85
Oil Pump Drive Gear	Crank Balancer Shaft	8.5	61.5
Output Shaft Gear	Output Shaft	8.5	61.5
Outer Magneto Cover	Left-Side Cover	0.8	6.0
Recoil Starter (Certain 650 H1 Models)	Left-Side Cover	0.8	6.0
Rotor/Flywheel Nut	Crankshaft	14.5	105.0
Cam Sprocket**	Camshaft	1.35	9.8
Starter Cup/Spacer	Crankshaft	3.8	27.5
V-Belt Cover	Crankcase	1.1	8.0
Spark Plug	Engine	1.7	12.0

* w/Blue Loctite #243

** w/Red Loctite #271

*** w/Green Loctite #609

Torque Specifications (700 EFI)

DRIVE TRAIN COMPONENTS			
Part	Part Bolted To	Torque	
		kg-m	ft-lb
Engine Mounting Through-Bolt	Frame	5.5	40.0
Engine Mount (Rear)	Frame	5.5	40.0
Front Differential****	Frame/Differential Bracket	6.2	45.0
Rear Drive Gear Case	Frame	6.2	45.0
Pinion Housing	Differential Housing	2.9-3.5	21.0-25.0
Differential Housing Cover***	Differential Housing	2.9-3.5	21.0-25.0
Drive Bevel Gear Nut***	Shaft	11.0-13.0	79.5-94.0
Lock Collar	Differential Housing	17.3	125.0
Hub Nut	Shaft/Axle (max)	27.6	200.0
Oil Drain Plug	Front Differential/Rear Drive	0.5	3.5
Oil Fill Plug	Front Differential/Rear Drive	2.2	16.0
Oil Drain Plug	Engine	2.2	16.0
Inspection Plug	Front Differential	0.5	3.5
Wheel	Hub	5.5	40.0
EXHAUST COMPONENTS			
Muffler	Frame	2.8	20.0
Exhaust Pipe	Cylinder Head	1.9	14.0
ELECTRICAL COMPONENTS			
Coil****	Frame	1.7	12.0
Ground Wire	Engine	1.1	8.0
STEERING COMPONENTS			
Handlebar Block	Steering Post	2.8	20.0
Steering Post Bearing Housing	Frame	2.8	20.0
Steering Post Bearing Flange	Frame	2.8	20.0
Lower Steering Bearing Washer Cap Screw***	Steering Post	5.5	40.0
Tie Rod End	Knuckle/Steering Post	4.2	30.0

BRAKE COMPONENTS			
Part	Part Bolted To	Torque	
		kg-m	ft-lb
Brake Disc****	Hub	2.1	15.0
Brake Hose	Caliper	2.8	20.0
Brake Hose	Master Cylinder	2.8	20.0
Brake Hose	Auxiliary Brake Cylinder	2.8	20.0
Master Cylinder Cover	Master Cylinder	0.1	1.0
Auxiliary Brake Pedal	Lever Axle	3.5	25.0
Hydraulic Caliper	Suspension Knuckle	2.8	20.0
CHASSIS COMPONENTS			
Footrest	Frame (8 mm)	2.8	20.0
Footrest	Frame (10 mm)	5.5	40.0
Shift Lever****	Shift Axle	1.1	8.0
SUSPENSION COMPONENTS (Front)			
A-Arm	Frame	4.8	35.0
Ball Joint Cap Screw	Knuckle	4.8	35.0
Shock Absorber	Frame	4.8	35.0
Shock Absorber	Upper A-Arm	4.8	35.0
Knuckle	A-Arm	4.8	35.0
SUSPENSION COMPONENTS (Rear)			
A-Arm	Frame	5.5	40.0
Shock Absorber (Upper)	Frame	4.8	35.0
Shock Absorber (Lower)	Lower A-Arm	2.8	20.0
Knuckle	A-Arm	4.8	35.0

ENGINE/TRANSMISSION			
Clutch Shoe	Crankshaft	15.0	108.0
Clutch Cover/Housing Assembly	Crankcase	0.9	6.5
Crankcase Half (6 mm)	Crankcase Half	1.0	7.0
Crankcase Half (8mm)	Crankcase Half	2.6	19.0
Cylinder Head (Cap Screw)	Crankcase (Step 1) (Step 2)	2.5 3.7	18.0 27.0
Cylinder Head (6 mm)	Cylinder	1.0	7.0
Cylinder Head Cover	Cylinder (Step 1) Head (Step 2)	1.0 1.4	7.0 10.0
Driven Pulley Nut	Fixed Face	10.9	79.0
Fixed Driven**	Clutch Shaft	10.9	79.0
Ground Wire	Engine	1.1	8.0
Magneto Cover	Crankcase	1.1	8.0
Movable Drive Face**	Driveshaft	10.9	79.0
Oil Pump Drive Gear	Crank Balancer Shaft	15.0	108.0
Output Shaft Gear	Output Shaft	10.0	72.0
Recoil Starter	Left-Side Cover	0.8	6.0
Rotor/Flywheel Nut	Crankshaft	16.0	116.0
Cam Idler Shaft	Cylinder Head	4.1	29.5
Starter Cup	Crankshaft	3.8	27.5
V-Belt Cover	Crankcase	0.9	6.5
Spark Plug	Engine	1.1	8.0

* w/Blue Loctite #242

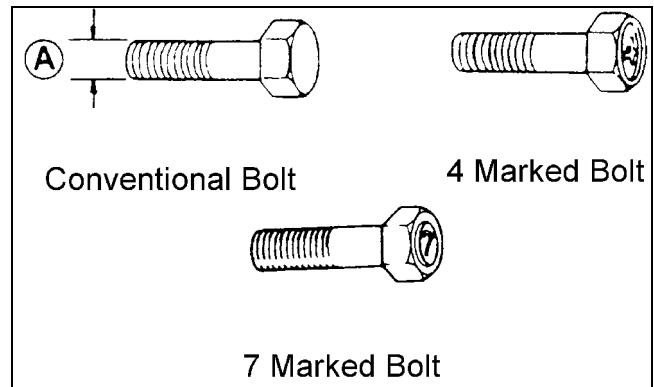
** w/Red Loctite #271

*** w/Green Loctite #609

****w/Blue Loctite #243

Tightening Torque (General Bolts)

Type of Bolt	Thread Diameter A (mm)	Tightening Torque	
		kg-m	ft-lb
(Conventional or 4 Marked Bolt)	5	0.2-0.4	1.5-3.0
	6	0.4-0.7	3.0-5.0
	8	1.0-1.6	7.0-11.5
	10	2.2-3.5	16.0-25.5
(7 Marked Bolt)	5	0.3-0.6	2.0-4.5
	6	0.8-1.2	6.0-8.5
	8	1.8-2.8	13.0-20.0
	10	4.0-6.0	29.0-43.5



Torque Conversions

ft-lb	kg-m	ft-lb	kg-m	ft-lb	kg-m	ft-lb	kg-m	ft-lb	kg-m
1	0.1	21	2.9	41	5.7	61	8.4	81	11.2
2	0.3	22	3.0	42	5.8	62	8.6	82	11.3
3	0.4	23	3.2	43	5.8	63	8.7	83	11.5
4	0.6	24	3.3	44	6.1	64	8.9	84	11.6
5	0.7	25	3.5	45	6.2	65	9.0	85	11.8
6	0.8	26	3.6	46	6.4	66	9.1	86	11.9
7	1.0	27	3.7	47	6.5	67	9.3	87	12.0
8	1.1	28	3.9	48	6.6	68	9.4	88	12.2
9	1.2	29	4.0	49	6.8	69	9.5	89	12.3
10	1.4	30	4.2	50	6.9	70	9.7	90	12.5
11	1.5	31	4.3	51	7.1	71	9.8	91	12.6
12	1.7	32	4.4	52	7.2	72	10.0	92	12.8
13	1.8	33	4.6	53	7.3	73	10.1	93	12.9
14	1.9	34	4.7	54	7.5	74	10.2	94	13.0
15	2.1	35	4.8	55	7.6	75	10.4	95	13.1
16	2.2	36	5.0	56	7.7	76	10.5	96	13.3
17	2.4	37	5.1	57	7.9	77	10.7	97	13.4
18	2.5	38	5.3	58	8.0	78	10.8	98	13.6
19	2.6	39	5.4	59	8.2	79	10.9	99	13.7
20	2.8	40	5.5	60	8.3	80	11.1	100	13.8

SECTION 11 - TROUBLESHOOTING

TABLE OF CONTENTS

Engine	11-2
Drive	11-5
Fuel System (400/500/650 H1)	11-6
Fuel System (700 EFI)	11-6
Electrical.....	11-7
Steering/Suspension	11-9
Brakes	11-10

Engine

■ **NOTE:** A Condition/Remedy marked with an asterisk (*) is for manual transmission models only.

Problem: Engine will not start or is hard to start (Compression too low)	
Condition	Remedy
1. Valve clearance out of adjustment 2. Valve guides worn - seated poorly 3. Valves mistimed 4. Piston rings worn excessively 5. Cylinder bore worn 6. Spark plug seating poorly 7. Starter motor cranks too slowly - does not turn	1. Adjust clearance 2. Repair - replace guides 3. Adjust valve timing 4. Replace rings 5. Replace - rebore cylinder 6. Tighten plug 7. See Electrical in this section
Problem: Engine will not start or is hard to start (No spark)	
Condition	Remedy
1. Spark plug fouled 2. Spark plug wet 3. Magneto defective 4. CDI unit/ECU defective 5. Ignition coil defective 6. High-tension lead open - shorted	1. Clean - replace plug 2. Clean - dry plug 3. Replace magneto 4. Replace CDI unit/ECU 5. Replace ignition coil 6. Replace high tension lead
Problem: Engine will not start or is hard to start (No fuel reaching the carburetor/fuel injector)	
Condition	Remedy
1. Gas tank vent hose obstructed 2. Carburetor float valve defective 3. Fuel hose obstructed 4. Fuel screens obstructed 5. Fuel pump defective	1. Clean vent hose 2. Replace valve 3. Clean - replace hose 4. Clean - replace inlet screen - valve screen 5. Replace fuel pump
Problem: Engine stalls easily	
Condition	Remedy
1. Spark plug fouled 2. Magneto defective 3. CDI unit/ECU defective 4. Carburetor jets/fuel injector obstructed 5. Valve clearance out of adjustment	1. Clean plug 2. Replace magneto 3. Replace CDI unit/ECU 4. Clean jets/replace fuel injector 5. Adjust clearance
Problem: Engine noisy (Excessive valve chatter)	
Condition	Remedy
1. Valve clearance too large 2. Valve spring(s) weak - broken 3. Rocker arm - rocker arm shaft worn 4. Camshaft worn 5. Valve tappets worn	1. Adjust clearance 2. Replace spring(s) 3. Replace arm - shaft 4. Replace camshaft 5. Replace tappets
Problem: Engine noisy (Noise seems to come from piston)	
Condition	Remedy
1. Piston - cylinder worn 2. Combustion chamber carbon buildup 3. Piston pin - piston pin bore worn 4. Piston rings - ring groove(s) worn	1. Replace - service piston - cylinder 2. Clean chamber 3. Replace - service pin - bore 4. Replace rings - piston
Problem: Engine noisy (Noise seems to come from timing chain)	
Condition	Remedy
1. Chain stretched 2. Sprockets worn 3. Tension adjuster malfunctioning	1. Replace chain 2. Replace sprockets 3. Repair - replace adjuster

Problem: Engine noisy (Noise seems to come from clutch)	
Condition *	Remedy *
1. Crankshaft splines - bearings worn 2. Countershaft - hub splines worn 3. Clutch plate teeth worn 4. Driven - drive clutch plates distorted - broken 5. Clutch dampers weak	1. Replace crankshaft - bearings 2. Replace countershaft - hub 3. Replace clutch plate(s) 4. Replace clutch plate(s) 5. Replace dampers
Problem: Engine noisy (Noise seems to come from crankshaft)	
Condition	Remedy
1. Bearing worn - burned 2. Lower rod-end bearing worn - burned 3. Connecting rod side clearance too large	1. Replace bearing 2. Replace bearing 3. Replace thrust washer(s)
Problem: Engine noisy (Noise seems to come from transmission)	
Condition	Remedy
1. Gears worn - rubbing 2. Splines worn 3. Primary gears worn - rubbing 4. Bearings worn 5. Bushing worn	1. Replace gears 2. Replace shaft(s) 3. Replace gears 4. Replace bearings 5. Replace bushing
Problem: Engine noisy (Noise seems to come from secondary-transmission/left-side cover)	
Condition *	Remedy *
1. Gears - shaft(s) worn 2. Bearing(s)/bushing(s) damaged	1. Replace gears - shafts 2. Replace bearing(s)/bushing(s)
Problem: Engine noisy (Noise seems to come from secondary bevel gear and final driven shaft)	
Condition	Remedy
1. Drive - driven bevel gears damaged - worn 2. Backlash excessive 3. Tooth contact improper 4. Bearing damaged 5. Gears worn - rubbing 6. Splines worn 7. Final driven shaft thrust clearance too large	1. Replace gears 2. Adjust backlash 3. Adjust contact 4. Replace bearing 5. Replace gears 6. Replace shaft(s) 7. Replace thrust washer(s)
Problem: Clutch slipping	
Condition *	Remedy *
1. Release roller out of adjustment - loss of free-play 2. Clutch springs weak 3. Clutch shoes worn 4. Pressure disc worn - distorted 5. Clutch plates (driven - drive) distorted	1. Adjust clutch bolts 1 & 2 2. Replace springs 3. Replace shoes 4. Replace disc 5. Replace plates
Problem: Clutch dragging	
Condition *	Remedy *
1. Clutch release roller out of adjustment - too much free-play 2. Clutch springs weak 3. Pressure disc - clutch plates distorted 4. Clutch release mechanism worn - damaged	1. Adjust clutch bolts 1 & 2 2. Replace springs 3. Replace disc - plates 4. Adjust - replace mechanism
Problem: Transmission will not shift	
Condition *	Remedy *
1. Gearshift cam broken 2. Gearshift forks distorted 3. Gearshift shaft worn 4. Clutch release mechanism worn - damaged 5. Gearshift linkage adjusted improperly	1. Replace cam 2. Replace forks 3. Replace shaft 4. Adjust - replace mechanism 5. Adjust linkage

Problem: Transmission will not shift back	
Condition *	Remedy *
1. Reverse shift cam broken 2. Shift shafts rubbing - sticking 3. Gearshift forks distorted - worn 4. Gearshift lever return spring broken - damaged	1. Replace cam 2. Replace shafts 3. Replace forks 4. Replace spring
Problem: Transmission jumps out of gear	
Condition *	Remedy *
1. Shifting gears (driveshaft - countershaft) worn 2. Gearshift forks distorted - worn 3. Cam stopper spring (gearshift cam) weak 4. Gearshift lever stopper pin worn	1. Replace gears 2. Replace forks 3. Replace spring 4. Replace pin
Problem: Secondary-transmission will not shift or shift back	
Condition *	Remedy *
1. Sliding dog broken - worn 2. Gearshift fork broken - worn 3. Shift lever out of adjustment 4. Gearshift cam worn 5. Cam stopper spring weak 6. Gearshift fork shaft worn	1. Replace dog 2. Replace fork 3. Adjust lever 4. Replace cam 5. Replace spring 6. Replace shaft
Problem: Engine idles poorly	
Condition	Remedy
1. Valve clearance out of adjustment 2. Valve seating poor 3. Valve guides defective 4. Rocker arms - arm shaft worn 5. Magneto defective 6. CDI unit/ECU defective 7. Spark plug fouled - gap too wide 8. Ignition coil defective 9. Float out of adjustment 10. Jets obstructed 11. Pilot screw setting improper 12. Fuel injector obstructed	1. Adjust clearance 2. Replace - service seats - valves 3. Replace guides 4. Replace arms - shafts 5. Replace magneto 6. Replace CDI unit/ECU 7. Adjust gap - replace plug 8. Replace ignition coil 9. Adjust float height 10. Clean jets 11. Adjust pilot screw 12. Replace fuel injector
Problem: Engine runs poorly at high speed	
Condition	Remedy
1. High RPM "cut out" against RPM limiter 2. Valve springs weak 3. Valve timing out of adjustment 4. Cams - rocker arms - tappets worn 5. Spark plug gap too narrow 6. Ignition coil defective 7. Float level too low 8. Air cleaner element obstructed 9. Fuel hose obstructed 10. Fuel pump defective	1. Shift into higher gear - decrease speed 2. Replace springs 3. Adjust timing 4. Replace cams - arms - tappets 5. Adjust gap 6. Replace ignition oil 7. Adjust float height 8. Clean element 9. Clean or replace hose 10. Replace fuel pump
Problem: Exhaust smoke dirty or heavy	
Condition	Remedy
1. Oil (in the engine) overfilled - contaminated 2. Piston rings - cylinder worn 3. Valve guides worn 4. Cylinder wall scored - scuffed 5. Valve stems worn 6. Stem seals defective	1. Drain excess oil - replace oil 2. Replace - service rings - cylinder 3. Replace guides 4. Replace - service cylinder 5. Replace valves 6. Replace seals

Problem: Engine lacks power	
Condition	Remedy
1. Valve clearance incorrect 2. Valve springs weak 3. Valve timing incorrect 4. Piston ring(s) - cylinder worn 5. Valve seating poor 6. Spark plug fouled 7. Rocker arms - shafts worn 8. Spark plug gap incorrect 9. Carburetor jets/fuel injector obstructed 10. Float level out of adjustment 11. Air cleaner element obstructed 12. Oil (in the engine) overfilled - contaminated 13. Intake manifold leaking air 14. Cam chain worn	1. Adjust clearance 2. Replace springs 3. Re-time valve gear 4. Replace - service rings - cylinder 5. Repair seats 6. Clean - replace plug 7. Replace arms - shafts 8. Adjust gap - replace plug 9. Clean jets - replace injector 10. Adjust float height 11. Clean element 12. Drain excess oil - change oil 13. Tighten - replace manifold 14. Replace cam chain
Problem: Engine overheats	
Condition	Remedy
1. Carbon deposit (piston crown) excessive 2. Oil low 3. Octane low - gasoline poor 4. Oil pump defective 5. Oil circuit obstructed 6. Gasoline level (in float chamber) too low 7. Intake manifold leaking air 8. Coolant level low 9. Fan malfunctioning 10. Fan switch malfunctioning 11. Thermostat stuck - closed 12. Radiator hoses - cap damaged - obstructed	1. Clean piston 2. Add oil 3. Drain - replace gasoline 4. Replace pump 5. Clean circuit 6. Adjust float height 7. Tighten - replace manifold 8. Fill - examine system for leaks 9. Check fan fuse - replace fan 10. Replace fan switch 11. Replace thermostat 12. Clear obstruction - replace hoses

Drive

Problem: Power not transmitted from engine to wheels	
Condition	Remedy
1. Rear axle shaft serration worn - broken	1. Replace shaft
Problem: Power not transmitted from engine to either front wheel	
Condition	Remedy
1. Secondary drive - driven gear teeth broken 2. Propeller shaft serration worn - broken 3. Coupling damaged 4. Coupling joint serration worn - damaged 5. Front drive - driven bevel gears broken - damaged 6. Front differential gears/pinions broken - damaged 7. Sliding dog/shaft/fork worn - damaged 8. Front drive axle worn - damaged 9. Front drive axle serration worn - damaged	1. Replace gear(s) 2. Replace shaft 3. Replace coupling 4. Replace joint 5. Replace gear(s) 6. Replace gears - pinions 7. Replace gear(s) 8. Replace axle 9. Replace axle

Fuel System (400/500/650 H1)

Problem: Starting impaired	
Condition	Remedy
1. Starter jet obstructed 2. Starter jet passage obstructed 3. Carburetor leaking air 4. Gas contaminated	1. Clean jet 2. Clean passage 3. Replace gasket 4. Drain gas tank and fill with clean gas
Problem: Idling or low speed impaired	
Condition	Remedy
1. Slow jet obstructed - loose 2. Slow jet outlet obstructed 3. Low speed fuel screw setting incorrect 4. Float height incorrect 5. TPS out of adjustment	1. Clean - tighten jet 2. Clean outlet 3. Adjust screw 4. Adjust float height 5. Adjust TPS
Problem: Medium or high speed impaired	
Condition	Remedy
1. High RPM "cut out" against RPM limiter 2. Main jet obstructed 3. Needle jet obstructed 4. Vacuum piston not operating properly 5. Filter obstructed 6. Float height incorrect	1. Shift into higher gear - decrease RPM speed 2. Clean main jet 3. Clean needle jet 4. Check piston operation 5. Clean filter 6. Adjust float height
Problem: Overflow and fuel level fluctuations	
Condition	Remedy
1. Float valve worn - damaged 2. Float valve spring broken 3. Float not working properly 4. Float valve dirty 5. Float height too high - too low	1. Replace valve 2. Replace spring 3. Adjust float height - replace float 4. Clean valve 5. Adjust float height

Fuel System (700 EFI)

Problem: Starting impaired	
Condition	Remedy
1. Gas contaminated	1. Drain gas tank and fill with clean gas
Problem: Idling or low speed impaired	
Condition	Remedy
1. TPS out of adjustment	1. Adjust TPS
Problem: Medium or high speed impaired	
Condition	Remedy
1. High RPM "cut out" against RPM limiter	1. Decrease RPM speed

Electrical

Problem: Spark absent or weak	
Condition	Remedy
1. Ignition coil defective 2. Spark plug defective 3. Magneto defective 4. CDI unit/ECU defective 5. Pick-up coil defective	1. Replace ignition coil 2. Replace plug 3. Replace magneto 4. Replace CDI unit/ECU 5. Replace pick-up coil
Problem: Spark plug fouled with carbon	
Condition	Remedy
1. Mixture too rich 2. Idling RPM too high 3. Gasoline incorrect 4. Air cleaner element dirty 5. Spark plug incorrect (too cold) 6. Valve seals cracked - missing 7. Oil rings worn - broken	1. Adjust carburetor 2. Adjust carburetor 3. Change to correct gasoline 4. Clean element 5. Replace plug 6. Replace seals 7. Replace rings
Problem: Spark plug electrodes overheat or burn	
Condition	Remedy
1. Spark plug incorrect (too hot) 2. Engine overheats 3. Spark plug loose 4. Mixture too lean	1. Replace plug 2. Service cooling system 3. Tighten plug 4. Adjust carburetor
Problem: Magneto does not charge	
Condition	Remedy
1. Lead wires/connections shorted - loose - open 2. Magneto coils shorted - grounded - open 3. Regulator/rectifier defective	1. Repair - replace - tighten lead wires 2. Replace magneto coils 3. Replace regulator/rectifier
Problem: Magneto charges, but charging rate is below the specification	
Condition	Remedy
1. Lead wires shorted - open - loose (at terminals) 2. Stator coils (magneto) grounded - open 3. Regulator/rectifier defective 4. Electrolyte low 5. Cell plates (battery) defective	1. Repair - tighten lead wires 2. Replace stator coils 3. Replace regulator/rectifier 4. Add distilled water 5. Replace battery
Problem: Magneto overcharges	
Condition	Remedy
1. Internal battery short circuited 2. Regulator/rectifier resistor damaged - defective 3. Regulator/rectifier poorly grounded	1. Replace battery 2. Replace resistor 3. Clean - tighten ground connection
Problem: Charging unstable	
Condition	Remedy
1. Lead wire intermittently shorting 2. Magneto internally shorted 3. Regulator/rectifier defective	1. Replace lead wire 2. Replace magneto 3. Replace regulator/rectifier

Problem: Starter button not effective	
Condition	Remedy
1. Battery charge low 2. Switch contacts defective 3. Starter motor brushes not seating 4. Starter relay defective 5. Emergency stop - ignition switch off 6. Wiring connections loose - disconnected	1. Charge - replace battery 2. Replace switch 3. Repair - replace brushes 4. Replace relay 5. Turn on switches 6. Connect - tighten - repair connections
Problem: Battery "sulfation" (Acidic white powdery substance or spots on surfaces of cell plates)	
Condition	Remedy
1. Charging rate too low - too high 2. Battery electrolyte insufficient 3. Specific gravity too low 4. Battery run-down - damaged 5. Electrolyte contaminated	1. Replace battery 2. Keep electrolyte to prescribed level 3. Charge battery - add distilled water 4. Replace battery 5. Replace battery
Problem: Battery discharges too rapidly	
Condition	Remedy
1. Electrolyte contaminated 2. Specific gravity too low 3. Charging system not charging 4. Cell plates overcharged - damaged 5. Battery short-circuited 6. Specific gravity too low	1. Replace battery 2. Charge battery - add distilled water 3. Check magneto - regulator/rectifier - circuit connections 4. Replace battery - correct charging system 5. Replace battery 6. Charge battery
Problem: Battery polarity reversed	
Condition	Remedy
1. Battery incorrectly connected	1. Reverse connections - replace battery - repair damage

Steering/Suspension

Problem: Handling too heavy or stiff	
Condition	Remedy
1. Front wheel alignment incorrect 2. Lubrication inadequate 3. Tire inflation pressure low 4. Tie rod ends seizing 5. Linkage connections seizing	1. Adjust alignment 2. Lubricate appropriate components 3. Adjust pressure 4. Replace tie rod ends 5. Repair - replace connections
Problem: Steering oscillation	
Condition	Remedy
1. Tires inflated unequally 2. Wheel(s) wobbly 3. Wheel hub cap screw(s) loose - missing 4. Wheel hub bearing worn - damaged 5. Tie rod ends worn - loose 6. Tires defective - incorrect 7. A-arm bushings damaged 8. Bolts - nuts (frame) loose	1. Adjust pressure 2. Replace wheel(s) 3. Tighten - replace cap screws 4. Replace bearing 5. Replace - tighten tie rod ends 6. Replace tires 7. Replace bushings 8. Tighten bolts - nuts
Problem: Steering pulling to one side	
Condition	Remedy
1. Tires inflated unequally 2. Front wheel alignment incorrect 3. Wheel hub bearings worn - broken 4. Frame distorted 5. Shock absorber defective	1. Adjust pressure 2. Adjust alignment 3. Replace bearings 4. Repair - replace frame 5. Replace shock absorber
Problem: Tire wear rapid or uneven	
Condition	Remedy
1. Wheel hub bearings worn - loose 2. Front wheel alignment incorrect 3. Tire inflation pressure incorrect	1. Replace bearings 2. Adjust alignment 3. Adjust pressure
Problem: Steering noise	
Condition	Remedy
1. Caps screws - nuts loose 2. Wheel hub bearings broken - damaged 3. Lubrication inadequate	1. Tighten cap screws - nuts 2. Replace bearings 3. Lubricate appropriate components
Problem: Suspension too soft	
Condition	Remedy
1. Spring(s) weak 2. Shock absorber damaged 3. Shock absorber preload too low	1. Replace spring(s) 2. Replace shock absorber 3. Adjust shock absorber preload
Problem: Suspension too stiff	
Condition	Remedy
1. A-arm-related bushings worn 2. Shock absorber preload too high	1. Replace bushing 2. Adjust shock absorber preload
Problem: Suspension noisy	
Condition	Remedy
1. Cap screws (suspension system) loose 2. A-arm-related bushings worn	1. Tighten cap screws 2. Replace bushings

Problem: Rear wheel oscillation	
Condition	Remedy
1. Rear wheel hub bearings worn - loose 2. Tires defective - incorrect 3. Wheel rim distorted 4. Wheel hub cap screws loose 5. Axle shaft nut loose (Manual Transmission) 6. Auxiliary brake adjusted incorrectly 7. Rear suspension arm-related bushing worn 8. Rear shock absorber damaged 9. Rear suspension arm nut loose	1. Replace bearings 2. Replace tires 3. Replace rim 4. Tighten cap screws 5. Tighten nut (Manual Transmission) 6. Adjust brake 7. Replace bushing 8. Replace shock absorber 9. Tighten nut

Brakes

Problem: Braking poor	
Condition	Remedy
1. Pad worn 2. Pedal free-play excessive 3. Brake fluid leaking 4. Hydraulic system spongy 5. Master cylinder/brake cylinder seal worn	1. Replace pads 2. Replace pads 3. Repair - replace hydraulic system component(s) 4. Bleed hydraulic system - correct or repair leaks 5. Replace master cylinder
Problem: Brake lever travel excessive	
Condition	Remedy
1. Hydraulic system entrapped air 2. Brake fluid low 3. Brake fluid incorrect 4. Piston seal - cup worn	1. Bleed hydraulic system 2. Add fluid to proper level 3. Drain system - replace with correct fluid 4. Replace master cylinder
Problem: Brake fluid leaking	
Condition	Remedy
1. Connection joints loose 2. Hose cracked 3. Piston seal worn	1. Tighten joint 2. Replace hose 3. Replace brake caliper