FOREWORD

This Arctic Cat Service Manual contains service, maintenance, and troubleshooting information for certain 2012 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:

- **2012 Y-12+ Service Manual**
- **2012 T-14 Service Manual**
- **2012 300 DVX/Utility Service Manual**
- **2012 350 Service Manual**
- **2012 425 Service Manual**
- **2012 700 Diesel Service Manual**
- **2012 450 XC Service Manual**
- **2012 650 Service Manual**
- **2012 550/700 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. A **CAUTION** identifies unsafe practices which may result in ATV-related damage. Follow the directive because it deals with the possibility of damaging part or parts of the ATV. The symbol ■ **NOTE:** identifies supplementary information worthy of particular attention. The symbol ☞ **AT THIS POINT** directs the technician to certain and specific procedures to promote efficiency and to improve clarity.

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

All materials and specifications are subject to change without notice.

Keep this manual accessible in the shop area for reference.

Product Service and
Warranty Department
Arctic Cat Inc.

August 2011

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450 Models
1000 Models

ARCTIC CAT®
SHARE OUR PASSION.™

SECTION 1 - GENERAL INFORMATION/ SPECIFICATIONS

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General Specifications

450	
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/cm² (5 psi)
MISCELLANY	
Spark Plug Type	NGK CR7E
Spark Plug Gap	0.7-0.8 mm (0.028-0.031 in.)
Gas Tank Capacity	21.6 L (5.7 U.S. gal.) - FIS 20.0 L (5.3 U.S. gal.) - TRV
Coolant Capacity	2.9 L (3.0 U.S. qt)
Rear Drive Capacity	250 ml (8.5 fl oz)*
Front Differential Capacity	275 ml (9.3 fl oz)**
Engine Oil Capacity (approx)	2.85 L (3.0 U.S. qt) - Overhaul 2.50 L (2.6 U.S. qt) - Change
Gasoline (recommended)	87 Octane Regular Unleaded
Engine Oil (recommended)	Arctic Cat ACX All Weather (Synthetic)
Differential/Rear Drive Lubricant	SAE Approved 80W-90 Hypoid
Drive Belt Width (minimum)	28.5 mm (1.12 in.)
Brake Fluid	DOT 4
Taillight/Brakelight	12V/8W/27W
Headlight	12V/37W (2)
ELECTRICAL SYSTEM	
Ignition Timing	10° BTDC @ 1500 RPM
Spark Plug Cap	5000 ohms
Ignition Coil Resistance (primary) (secondary)	Less than 5.0 ohms (terminal (+) to terminal (-)) 12k-19k ohms (high tension - plug cap - to terminal (+))
Ignition Coil Primary Voltage	Battery Voltage (orange (+) to blue/white(-))
Stator Coil Resistance (crankshaft position sensor) (AC generator)	150-250 ohms (blue to green) Less than 1 ohm (yellow to yellow)
Crankshaft Position Sensor AC Voltage	2.0 volts or more (blue to green)
AC Generator Output (no load)	75 AC volts @ 5000 RPM (yellow to yellow)

1000	
CHASSIS	
Brake Type	Hydraulic w/Brake Lever Lock and Auxiliary Brake
Tire Size (Mud Pro) (Mud Pro) (Cruiser) (Cruiser)	Front - 25 x 9-12 Rear - 25 x 11-12 Front - 28 x 9-14 Rear - 28 x 11-14 Front - 25 x 8-12 Rear - 25 x 10-12
Tire Inflation Pressure	0.35 kg/cm² (5 psi) - Mud Pro 0.49 kg/cm² (7 psi) - TRV/ Cruiser
MISCELLANY	
Spark Plug Type	NGK CPR8E
Spark Plug Gap	0.5-0.6 mm (0.019-0.024 in.)
Gas Tank Capacity	21.6 L (5.7 U.S. gal.) - FIS 20.0 L (5.3 U.S. gal.) - Cruiser/TRV
Coolant Capacity	3.3 L (3.5 U.S. qt)
Differential Capacity	275 ml (9.3 fl oz)*
Rear Drive Capacity	250 ml (8.5 fl oz)**
Engine Oil Capacity (approx)	2.6 L (2.75 U.S. qt) - Overhaul 1.9 L (2.0 U.S. qt) - Change
Gasoline (recommended)	87 Octane Regular Unleaded
Engine Oil (recommended)	Arctic Cat ACX All Weather (Synthetic)
Front Differential/Rear Drive Lubricant	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)
ELECTRICAL SYSTEM	
Ignition Timing	10° BTDC @ 1500 RPM
Spark Plug Cap	5000 ohms
Ignition Coil Resistance (primary) (secondary)	4.8 ohms (terminal (+) to terminal (-)) 12k-19k ohms (high tension - plug cap to terminal)
Ignition Coil Primary Voltage	Battery Voltage (orange to ground)
Stator Coil Resistance (crankshaft position sensor) (AC generator)	150-250 ohms (blue to green) Less than 1 ohm (gray to gray)
Crankshaft Position Sensor AC Voltage	2.0 volts or more (blue to green)
Generator Output (no load)	75 AC volts or more @ 5000 RPM (black to black)

Specifications subject to change without notice.

* One inch below plug threads.

** At the plug threads.

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Torque Specifications

EXHAUST COMPONENTS			
Part	Part Bolted To	Torque ft-lb	Torque N-m
Exhaust Pipe	Engine	20	27
Spark Arrester	Muffler	48 in.-lb	5.5
ELECTRICAL COMPONENTS			
Engine/Harness Ground Cap Screw	Crankcase	8	11
Coil	Air Filter Housing	7	10
STEERING COMPONENTS			
Steering Post Bearing Housing	Frame	20	27
Steering Post Bearing Flange	Frame	20	27
Lower Steering Bearing Washer Cap Screw***	Steering Post	40	54
Tie Rod End	Knuckle/Steering Post	30	41
EPS Housing	Frame	35	47
BRAKE COMPONENTS			
Brake Disc*	Hub	15	20
Brake Hose	Caliper	20	27
Brake Hose (Banjo-Fitting)	Master Cylinder	20	27
Brake Hose	Auxiliary Brake Cylinder	20	27
Master Cylinder (Rear)	Frame	12	16
Hydraulic Caliper	Knuckle (w/"Patch-Lock")	20	27
Master Cylinder Clamp	Master Cylinder	6	8
Brake Pedal	Brake Pedal Axle	25	34
CHASSIS COMPONENTS			
Footrest	Frame (8 mm)	20	27
Footrest	Frame (10 mm)	40	54
SUSPENSION COMPONENTS (Front)			
A-Arm	Frame	50	68
Knuckle	Ball Joint	35	47
Shock Absorber	Frame/Upper A-Arm	50	68
Knuckle	A-Arm	50	68
SUSPENSION COMPONENTS (Rear)			
Shock Absorber (Upper)	Frame	50	68
Shock Absorber (Lower)	Lower A-Arm	20	27
A-Arm	Frame	50	68
Knuckle (450)	A-Arm	35	47
Knuckle (1000)	A-Arm	50	68

DRIVE TRAIN COMPONENTS (450)			
Part	Part Bolted To	Torque ft-lb	Torque N-m
Engine Mounting Through-Bolt	Frame	35	47
Front Differential	Frame/Differential Bracket	38	52
Output Flange	Rear Flange Output Joint	20	27
Pinion Housing	Differential Housing	23	31
Differential Housing Cover***	Differential Housing	23	31
Drive Bevel Gear Nut**	Shaft	72	98
Lock Collar	Differential Housing	125	169
Hub Hex Nut	Shaft/Axle (max)	200	272
Oil Drain Plug	Front Differential/Rear Drive	45 in.-lb	5
Oil Fill Plug	Front Differential/Rear Drive	16	22
Oil Drain Plug	Engine	16	22
Rear Drive Input Shaft/Housing	Differential Housing	23	31
Wheel (Steel)	Hub	40	54
Wheel (Aluminum)	Hub	80	108
Rear Drive Gear Case	Frame	38	52
Engine Output Shaft**	Rear Gear Case Input Flange	20	27
ENGINE/TRANSMISSION (450)			
Clutch Shoe**	Crankshaft	147	199
Clutch Cover/Housing Assembly	Crankcase	8	11
Left-Side Cover	Crankcase	8	11
Crankcase Half (6 mm)	Crankcase Half	10	13.5
Crankcase Half (8 mm)	Crankcase Half	21	28
Cylinder Nut	Crankcase Half	8	11
Cylinder Head (Cap Screw)	Crankcase	28	38
Cylinder Head Nut	Cylinder	20	27
Valve Cover****	Cylinder Head	8	11
Oil Pump Drive Gear**	Crankshaft	63	86
Driven Pulley Nut**	Driveshaft	147	199
Ground Cable	Engine	8	11
Output Shaft Flange Nut	Output Shaft	59	80
Magneto Rotor Nut	Crankshaft	107	146
Cam Sprocket**	Camshaft	11	15
Cam Chain Tensioner Guide	Cylinder	11	15
Stator Coil**	Crankcase	8	11
Starter Motor	Crankcase	8	11
V-Belt Cover	Crankcase	8	11
Valve Adjuster Jam Nut	Valve Adjuster	7	9.5
Oil Fitting	Engine	8	11
Oil Pump**	Crankcase	8	11
Tappet Cover	Valve Cover	8	11
Cam Chain Tensioner	Cylinder	10	13.5
Magneto Cover	Crankcase	8	11
Rear Driveline	Output Drive Flange	20	27
Starter One-Way Clutch**	Flywheel	26	35
Movable Drive Face Nut**	Clutch Shaft	147	199
Water Pump Cover/Housing	Magneto Cover	8	11
Water Pump Drive Gear	Crankshaft	28	38

* w/Blue Loctite #243
** w/Red Loctite #271
*** w/Green Loctite #609
**** w/Three Bond Sealant

DRIVE TRAIN COMPONENTS (1000)			
Part	Part Bolted To	Torque ft-lb	Torque N-m
Engine Mount (Rear)	Frame	45	61
Front Differential	Frame/Differential Bracket	38	52
Rear Gear Case	Frame	38	52
Pinion Housing	Differential Housing	23	31
Differential Housing Cover***	Differential Housing	23	31
Lock Collar	Differential Housing	125	169
Hub Nut	Shaft/Axle (max)	200	272
Oil Drain Plug	Front Differential/ Rear Drive	45 in.-lb	5
Oil Fill Plug	Front Differential/ Rear Drive	16	22
Oil Drain Plug	Engine	16	22
Wheel (Steel)	Hub	40	54
Wheel (Aluminum)	Hub	80	108
Rear Drive Input Shaft/Housing	Differential Housing	23	31
Rear Output Drive Flange	Rear Yoke Flange	20	27
Shift Cam Stopper	Shift Stopper	8	11
Shift Cam Plate	Shift Cam Shaft	8	11
Shifter Housing	Crankcase	8	11
Engine Output Shaft**	Rear Gear Case Input Flange	20	27
ENGINE/TRANSMISSION (1000)			
Clutch Shoe**	Crankshaft	221	300
Clutch Cover/Housing Assembly	Crankcase	8	11
Crankcase Half	Crankcase Half	8	11
Crankcase Lower Cover (6 mm)	Crankcase	8	11
Crankcase Lower Cover (8 mm)	Crankcase	20	27
Cylinder Head (Cap Screw)	Crankcase	37	50
Cylinder Head (6 mm)	Cylinder	8	11
Cylinder Head (8 mm)	Cylinder	18	24
Cylinder Head Cover	Cylinder Head	8.5	11.5
Driven Pulley Nut**	Driveshaft	80	108
Ground Wire	Engine	8	11
Magneto Cover	Crankcase	8	11
Oil Filler Cover	Crankcase	8	11
Speed Sensor Housing	Crankcase	8	11
Starter Motor	Crankcase	8	11
V-Belt Housing	Crankcase	8	11
Intake Manifold	Cylinder	8	11
Output Shaft Yoke Nut	Output Shaft	59	80
Rotor/Flywheel Nut	Crankshaft	107	145
Cam Sprocket**	Camshaft	10	13.5
V-Belt Cover	Clutch Cover	8	11
Movable Drive Face Nut**	Clutch Shaft	165	224
Oil Pump Cover*	Crankcase	8	11
Oil Strainer Cap	Crankcase	8	11
Shift Cam Stopper	Crankcase	8	11
Shift Cam Stopper Spring	Shift Cam Stopper	8	11
Shift Cam Plate	Shift Cam Shaft	8	11
Shifter Housing	Crankcase	8	11
Secondary Drive Gear Nut	Gear	74	100
Starter One-Way Clutch**	Flywheel	26	35
Output Yoke Nut	Output Shaft	74	100

* w/Blue Loctite #243
** w/Red Loctite #271
*** w/Green Loctite #609
**** w/Three Bond Sealant

Torque Conversions (ft-lb/N-m)

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

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.

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 (see Periodic Maintenance Chart in Section 2).

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

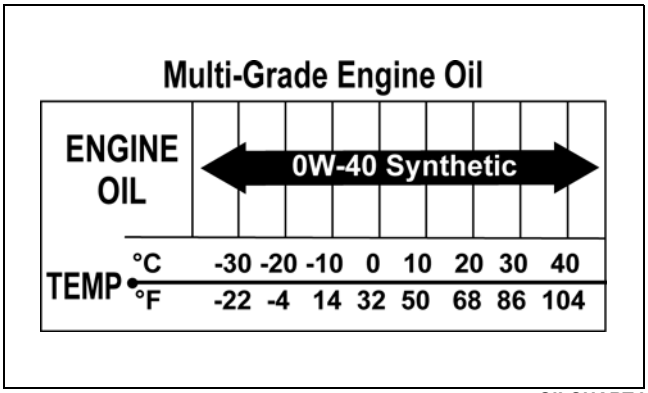
Do not use white gas. Only Arctic Cat approved gasoline additives should be used.

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



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RECOMMENDED FRONT DIFFERENTIAL/REAR DRIVE LUBRICANT

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

CAUTION

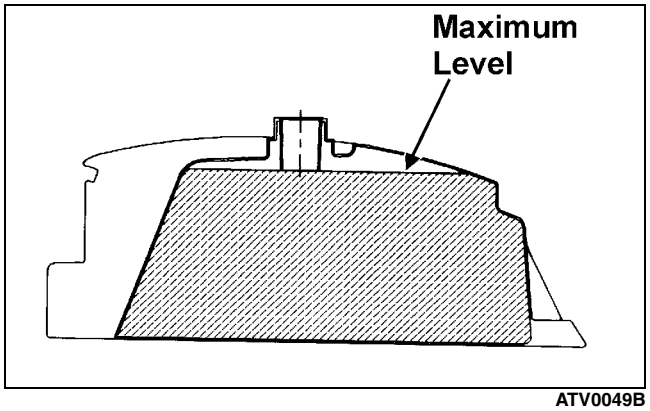
Any lubricant used in place of the recommended lubricant could cause serious front differential/rear drive damage.

FILLING GAS TANK

⚠ WARNING

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

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



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⚠ WARNING

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

⚠ WARNING

Do not over-fill the gas tank.

Tighten the gas tank cap securely after filling the tank.

Genuine Parts

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

Preparation For Storage

CAUTION

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

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

1. Clean the seat cushion (cover and base) with a damp cloth and allow it to dry.
2. Clean the ATV thoroughly by washing dirt, oil, grass, and other foreign matter from the entire ATV. Allow the ATV to dry thoroughly. DO NOT get water into any part of the engine or air intake.
3. Either drain the gas tank or add Fuel Stabilizer to the gas in the gas tank. Remove the air filter housing cover and air filter. Start the engine and allow it to idle; then using Arctic Cat Engine Storage Preserver, rapidly inject the preserver into the air filter opening for a period of 10 to 20 seconds. 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. Plug the exhaust hole in the exhaust system with a clean cloth.
5. Apply light oil to the upper steering post bushing and plungers of the shock absorbers.
6. 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.
7. Fill the cooling system to the bottom of the stand pipe in the radiator neck with properly mixed coolant.
8. Disconnect the battery cables; then remove the battery, clean the battery posts and cables, and store in a clean, dry area.
9. 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. 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.
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(s). Clean or replace as necessary.

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SECTION 2 - PERIODIC MAINTENANCE

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Periodic Maintenance Chart

A = Adjust I = Inspect
C = Clean L = Lubricate
D = Drain R = Replace
T = Tighten

Item	Initial Service After Break-In (First Month or 100 Miles)	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	I			I			R
Valve/Tappet Clearance	I				I		A
Engine Compression						I	
Spark Plug(s)	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
Engine-Transmission Oil Level		I					A
Engine-Transmission Oil/Filter	R			R*/R**/R***			R
Oil Strainer							C
Front Differential/Rear Drive Lubricant	I		I				R (4 Yrs)
Tires/Air Pressure	I	I					R
Steering Components	I	I		I			R
V-Belt	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				T
Ignition Timing						I	
Headlight/Taillight-Brakelight	I	I					R
Switches	I	I					R
Shift Lever					I		A-L
Handlebar Grips		I					R
Handlebar	I	I					R
Gauges/Indicators	I	I					R
Frame/Welds/Racks	I				I		
Electrical Connections	I				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.

** When using an API certified SM 0W-40 oil.

*** When using Arctic Cat ACX All Weather synthetic oil, oil change interval can be increased to every 1,000 miles or every year.

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Periodic Maintenance

This section has been organized into sub-sections which show common maintenance procedures for the Arctic Cat ATV.

■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 1.

SPECIAL TOOLS

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

Description	p/n
Compression Tester Kit	0444-213
Oil Filter Wrench	0644-389
Tachometer	0644-275
Timing Light	0644-296
Valve Clearance Adjuster	0444-255

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

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

B. Brake Lever Pivot

C. Auxiliary Brake Pedal Pivot

Air Filter

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

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

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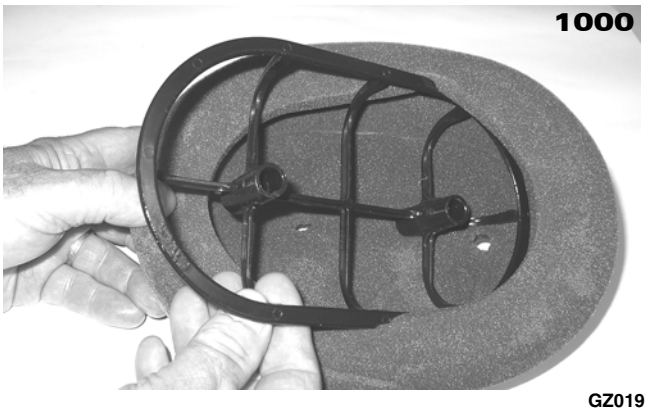

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4. Fill a wash pan larger than the element with a non-flammable solvent; then dip the element in the solvent and wash it.

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

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

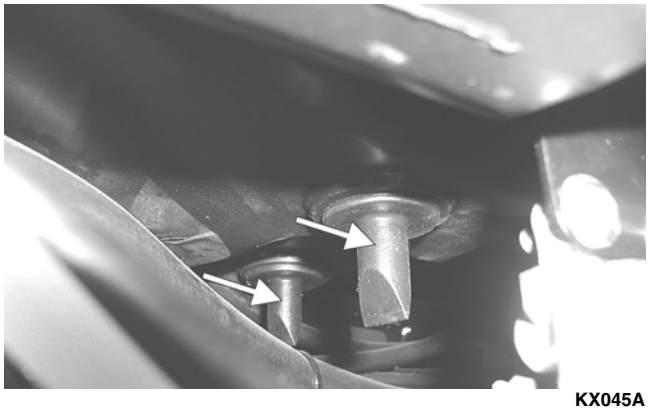
CAUTION

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

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

CHECKING AND CLEANING DRAINS

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



KX045A

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

CAUTION

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

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

Valve/Tappet Clearance

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

1. Remove the timing inspection plug; then remove the tappet covers and spark plug(s) (for more detailed information, see Section 3 - Servicing Top-Side Components).

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

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

GZ063

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

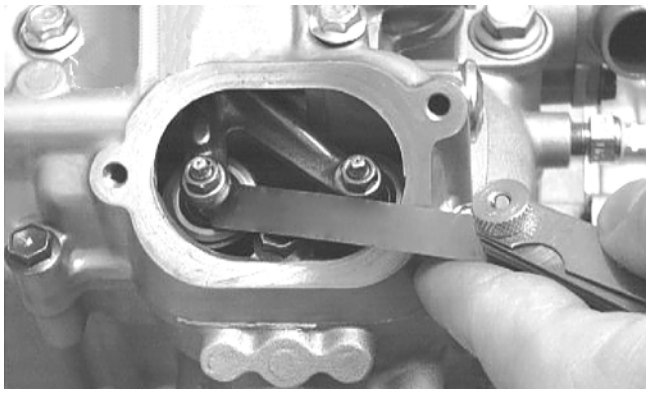
Feeler Gauge Procedure

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	
450	0.08-0.12 mm (0.003-0.005 in.) - Intake 0.15-0.20 mm (0.006-0.008 in.) - Exhaust
1000	0.08-0.12 mm (0.003-0.005 in.) - Intake 0.13-0.17 mm (0.005-0.007 in.) - Exhaust



CC007DC

B. On the 1000 models, rotate the engine 270° to the TDC position of the rear cylinder; then repeat step A.

GZ059

Valve Adjuster Procedure

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

A. Place Valve Clearance Adjuster onto the jam nut securing the tappet adjuster screw; then rotate the valve adjuster dial clockwise until the end is seated in the tappet adjuster screw.

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B. While holding the valve adjuster dial in place, use the valve adjuster handle and loosen the jam nut; then rotate the tappet adjuster screw clockwise until friction is felt.

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

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

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

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

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

F. Rotate the engine 270° to the TDC position of the rear cylinder; then repeat steps A-E for the rear cylinder.

3. Install the timing inspection plug; then on the 1000 models, remove the cap screw and install the crankcase end cap.
4. Place the tappet covers into position making sure the proper cap screws are with the proper cover. Tighten the cap screws securely.
5. Install the spark plug(s).

Testing Engine Compression

To test engine compression, use the following procedure.

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

⚠ WARNING

Always wear safety glasses when using compressed air.

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

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

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

COMPRESSION		
Model	**PSI Hot (WOT)**	**PSI Cold (WOT)**
450	95-115	N/A
1000 (Front)	125-145	80-120
1000 (Rear)	165-185	150-190

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

A. Verify starter cranks engine over at normal speed (approximately 400 RPM).

B. Gauge functioning properly.

C. Throttle lever in the full-open position.

D. Valve/tappet clearance correct.

E. Engine warmed up.

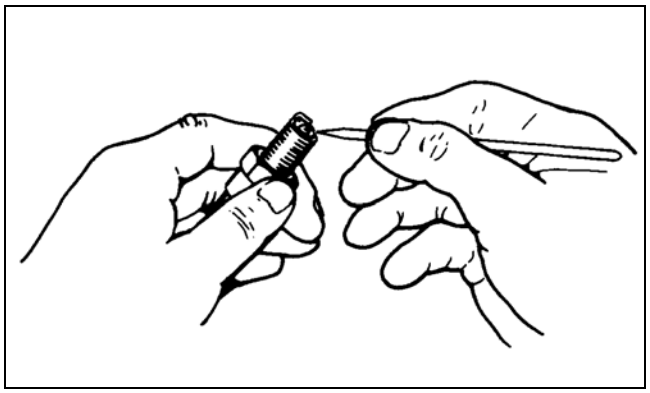
F. Intake not restricted.

■NOTE: To service valves, see 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(s)

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

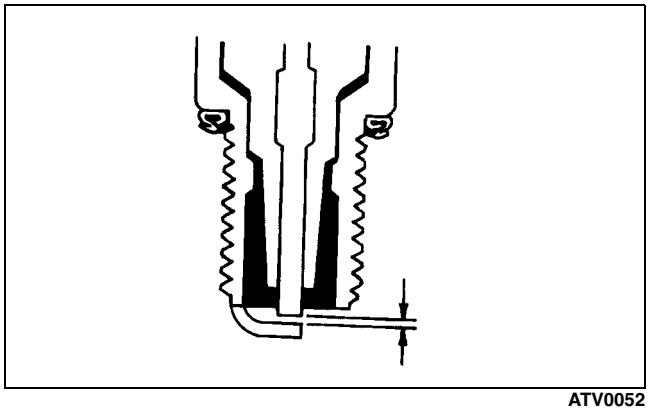


ATV-0051

CAUTION

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

Adjust the gap to correct specification (see Section 1 for proper type and gap). Use a feeler gauge to check the gap.



ATV0052

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.

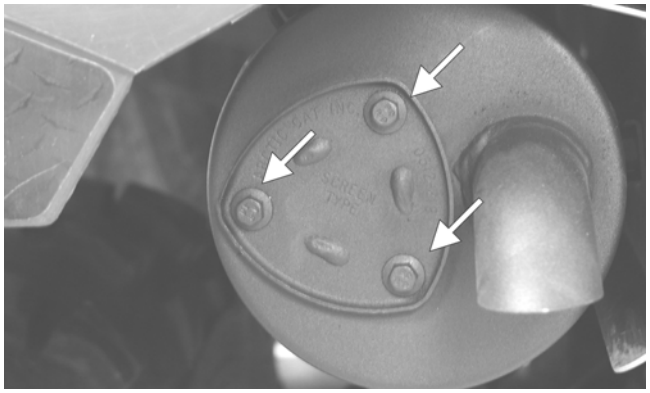
Muffler/Spark Arrester

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.

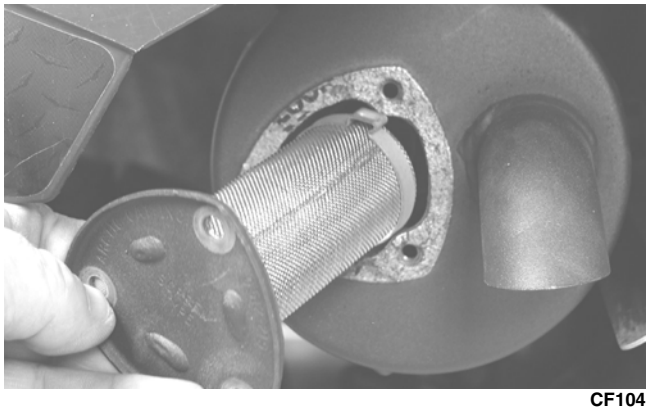


CF105A

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 48 in.-lb.



CF104

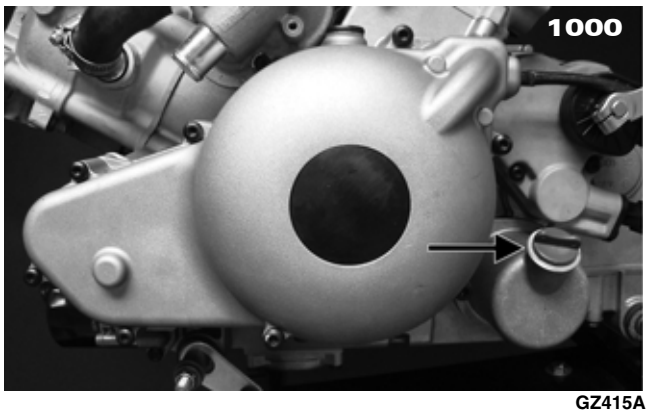
Engine/Transmission Oil - Filter - Strainer

OIL - FILTER

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

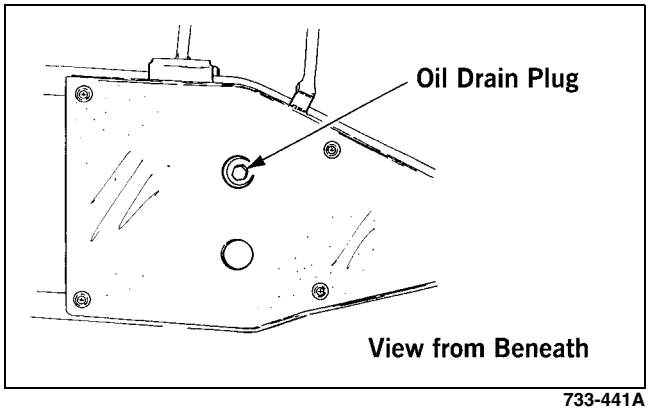
1. Park the ATV on level ground.
2. Remove the oil level stick/filler plug.

KC372A



GZ415A

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



733-441A

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

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

6. 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.

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

CAUTION

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

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

GZ461A

CAUTION

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

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

Liquid Cooling System

■NOTE: Debris in front of the engine or packed between the cooling fins of the radiator can reduce cooling capability. Using a garden hose, wash the radiator to remove any debris preventing air flow.

CAUTION

Arctic Cat does not recommend using a pressure washer to clean the radiator core. The pressure may bend or flatten the fins causing restricted air flow, and electrical components on the radiator could be damaged. Use only a garden hose with spray nozzle at normal tap pressure.

The cooling system capacity can be found in Section 1. The cooling system should be inspected daily for leakage and damage. If leakage or damage is detected, take the ATV to an authorized Arctic Cat ATV dealer for service. Also, the coolant level should be checked periodically.

CAUTION

Continued operation of the ATV with high engine temperature may result in engine damage or premature wear.

■NOTE: High engine RPM, low vehicle speed, or heavy load can raise engine temperature. Decreasing engine RPM, reducing load, and selecting an appropriate transmission gear can lower the temperature.

When filling the cooling system, use a coolant/water mixture which will satisfy the coldest anticipated weather conditions of the area in accordance with the coolant manufacturer's recommendations. While the cooling system is being filled, air pockets may develop; therefore, run the engine for five minutes after the initial fill, shut the engine off, and then fill the cooling system to the bottom of the stand pipe in the radiator neck.

Checking/Filling

1. On the 1000 models, remove the two screws from the front of the radiator access panel. On the 450 models, remove the four screws securing the radiator access panel.

FI465A

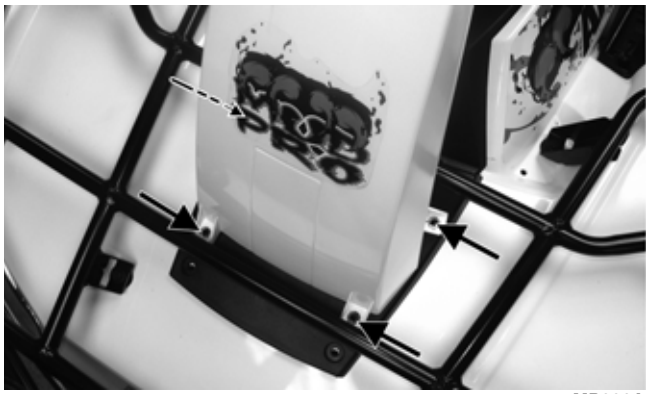
FI476

2. On the 1000 models, lift the front of the access panel; then slide the panel forward to disengage the two rear tabs.

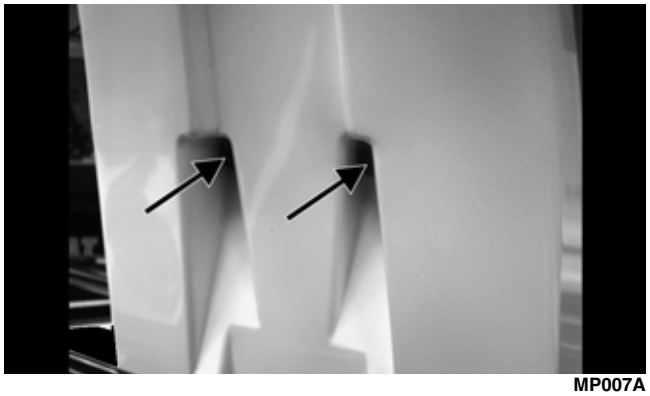
3. On the 1000 models, move the panel rearward until free of the rack. On the 450 models, move the panel forward until free of the ATV.

■NOTE: Steps 4-6 are for Mud Pro models; for other models, proceed to step 7.

4. Remove four cap screws securing the snorkel housing to the front inspection panel; then remove two cap screws from the rear of the snorkel housing.



MP006A



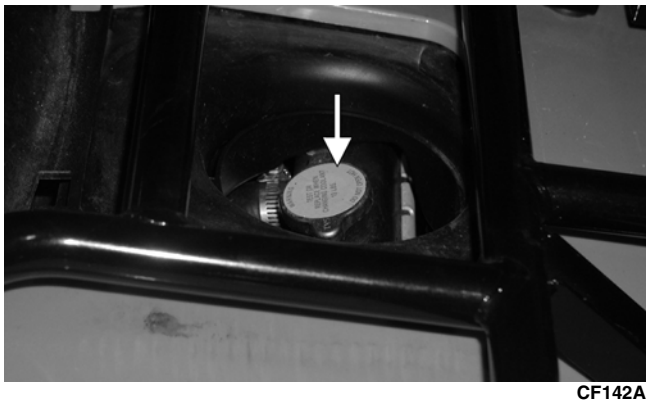
MP007A

5. Separate the front of the snorkel housing from the rear; then remove the snorkel housing.

MP003

6. Remove two reinstallable rivets and remove the splash guard. The radiator cap can now be accessed in front of the snorkels.

7. Carefully rotate the radiator cap counterclockwise to release pressure; then remove the cap.



CF142A

8. Add coolant as necessary; then install the radiator cap and access panel or snorkel housing.

■NOTE: Use a good quality, biodegradable glycol-based, automotive-type antifreeze.

⚠ WARNING

Never check the coolant level when the engine is hot or the cooling system is under pressure.

CAUTION

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

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Front Differential/Rear Drive Lubricant

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

CAUTION

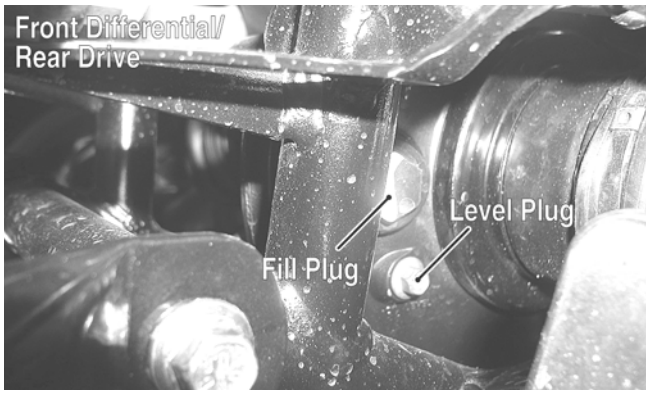
Any lubricant used in place of the recommended gear case lubricant could result in premature failure of the shock limiter. Do not use any lubricant containing graphite or molybdenum additives or other friction-modified lubricants as these may cause severe damage to shock limiter components.

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

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

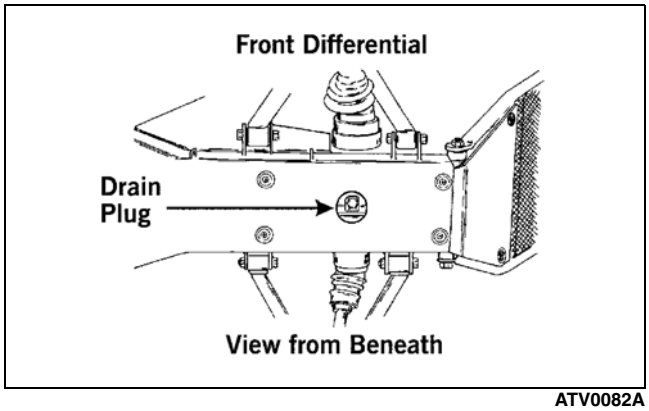
To change the lubricant, use the following procedure.

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

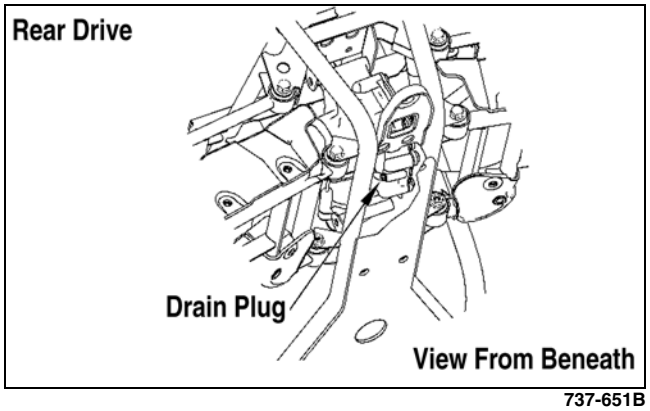


AL677C

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



ATV0082A



737-651B

4. After all the lubricant has been drained, install the drain plugs and tighten to 45 in.-lb.
5. Pour the appropriate amount of approved SAE 80W-90 hypoid gear lubricant into the filler hole.

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

6. Install the fill plugs; then tighten to 16 ft-lb.

CAUTION

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

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 1).

Headlights/Taillight-Brakelight

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

⚠ WARNING

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

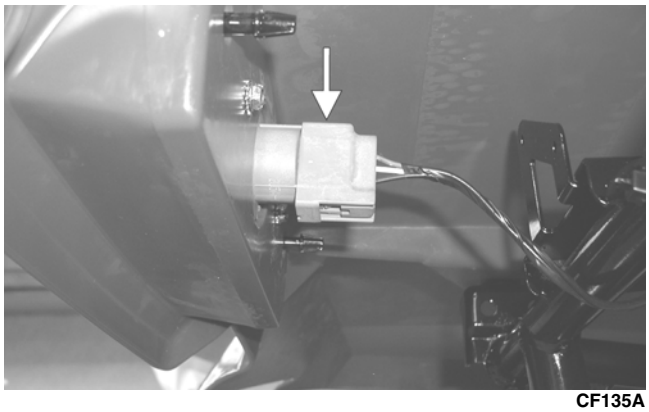
To replace a headlight bulb, use the following procedure.

1. Rotate the bulb assembly counterclockwise and remove from the headlight housing; then disconnect from the wiring harness.

2. Connect the new bulb assembly to the wiring harness connector; then insert into the headlight housing and rotate fully clockwise.

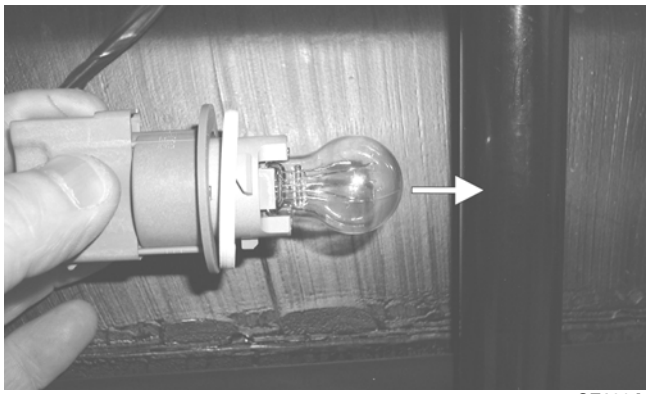
To replace the taillight-brakelight bulb, use the following procedure.

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



CF135A

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



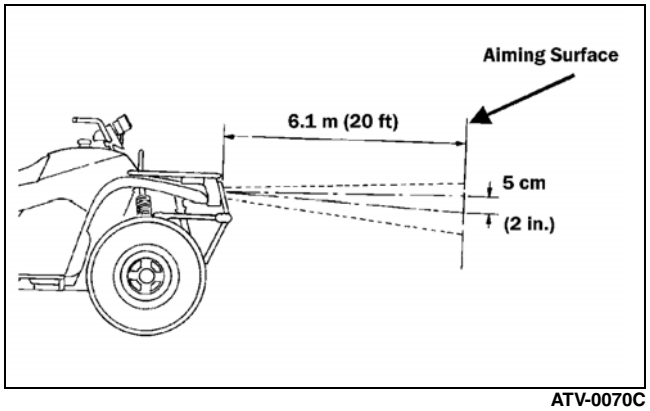
CF132A

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

CHECKING/ADJUSTING HEADLIGHT AIM

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

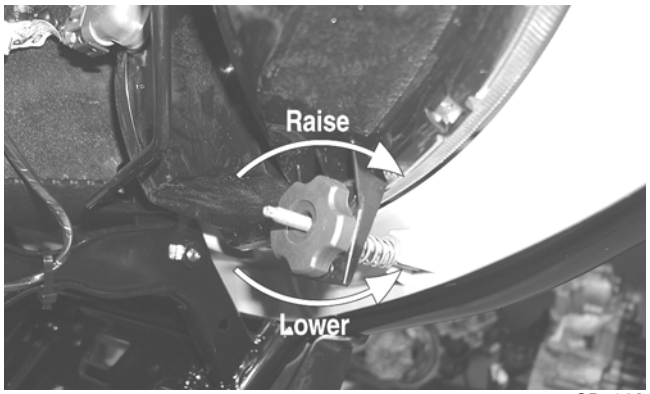
1. Position the ATV on a level floor so the headlights are approximately 6.1 m (20 ft) from an aiming surface (wall or similar aiming surface).



ATV-0070C

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

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



CD714A

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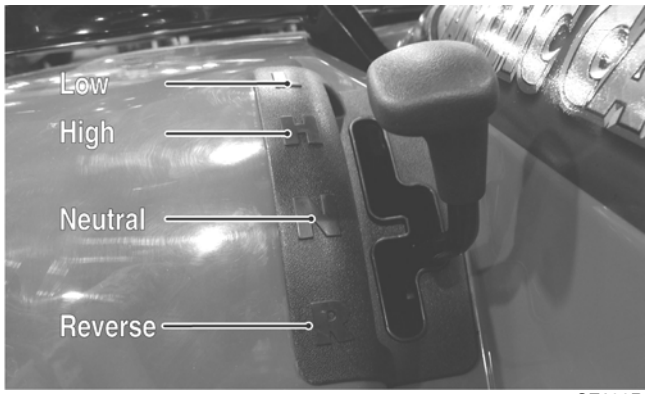
Shift Lever

CHECKING ADJUSTMENT



CF130B

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

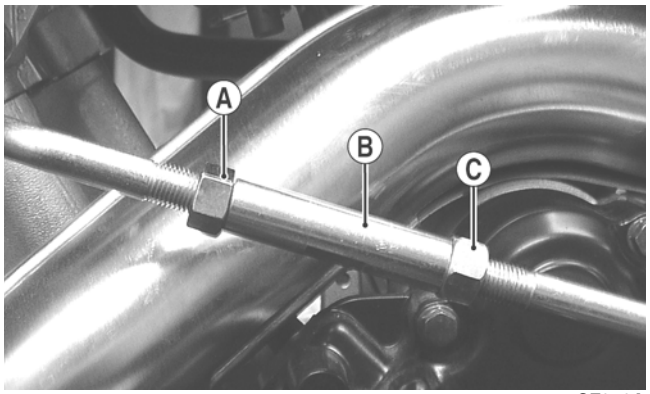
⚠ WARNING

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

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



CF258A

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

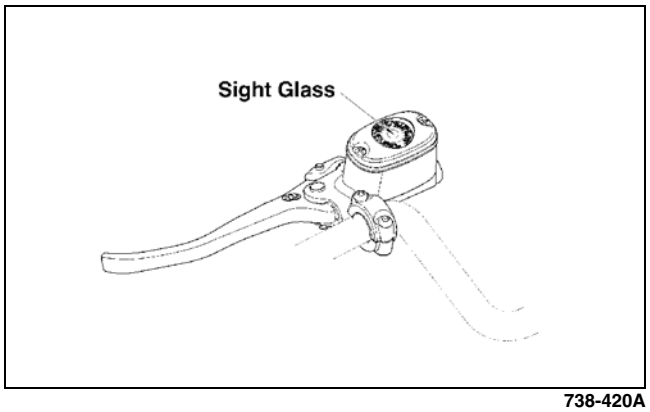
■NOTE: An E (Error) in the gear position icon indicates no signal or a poor ground wire connection in the circuit. Troubleshoot the harness connectors, gear position switch connector, gear position switch, and LCD connector.

Hydraulic Brake Systems

CHECKING/BLEEDING

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

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



738-420A

AL681

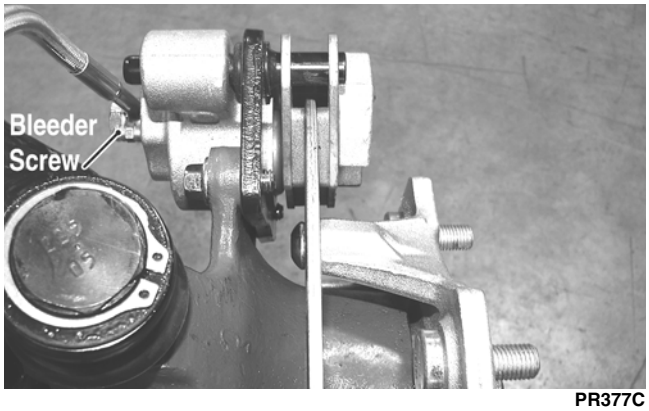
2. Compress the brake lever/pedal several times to check for a firm brake. If the brake is not firm, the system must be bled.
3. To bleed the main brake system, use the following procedure.

   A. Remove the cover and fill the reservoir with DOT 4 Brake Fluid; then install and secure the cover.

   B. Slowly compress the brake lever several times.

C. Remove the protective cap, install one end of a clear hose onto 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



PR377C

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

D. At this point, perform step B and C on the other FRONT bleeder screw; then move to the REAR bleeder screw and follow the same procedure.

E. Repeat step D until the brake lever is firm.

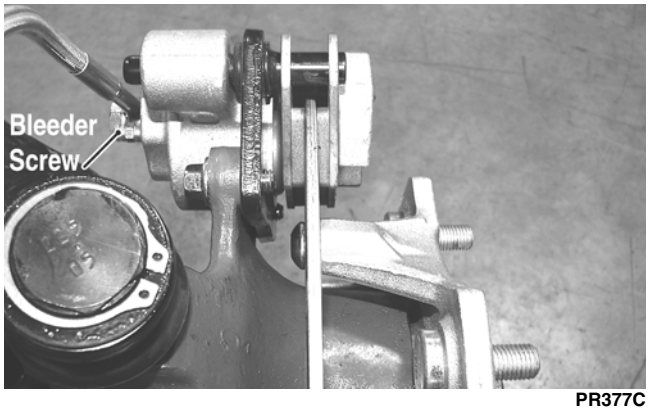
4. To bleed the auxiliary brake system, use the following procedure.

A. Remove the cover and fill the reservoir with DOT 4 Brake Fluid; then install and secure the cover.

B. Slowly compress the brake pedal several times.

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

AF637D



PR377C

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

D. Repeat step B and C until the brake pedal is firm.

5. Carefully check the entire hydraulic brake system that all hose connections are tight, the bleed screws are tight, the protective caps are installed, and no leakage is present.

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

INSPECTING HOSES

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

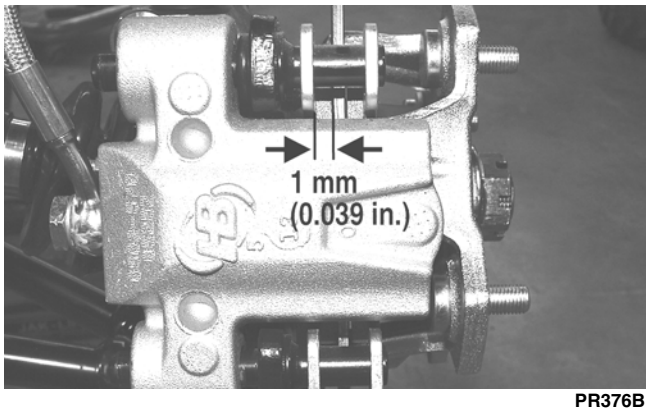
CHECKING/REPLACING PADS

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

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

1. Remove a front wheel.

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



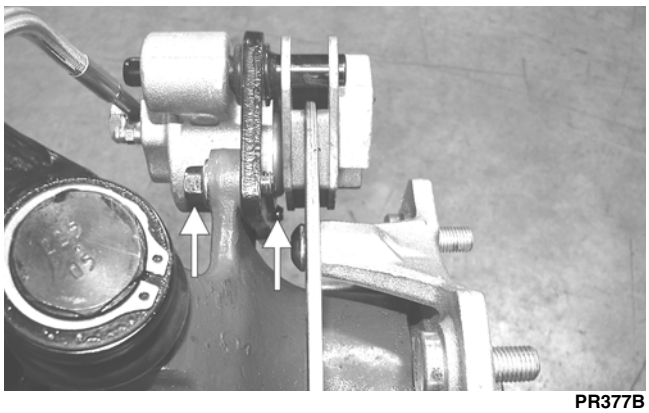
PR376B

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

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

PR237

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



PR377B

   E. Install the wheel. Tighten to 40 ft-lb (steel wheels) or 80 ft-lb (aluminum wheels).
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

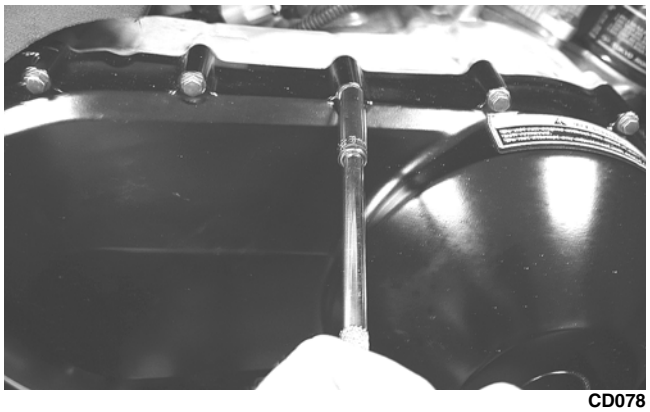
Failure to properly burnish the brake pads could lead to premature brake pad wear or brake loss. Brake loss can result in severe injury.

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 twenty times.
4. Verify that the brakelight illuminates when the hand lever is compressed or the brake pedal is depressed.

Checking/Replacing V-Belt

REMOVING

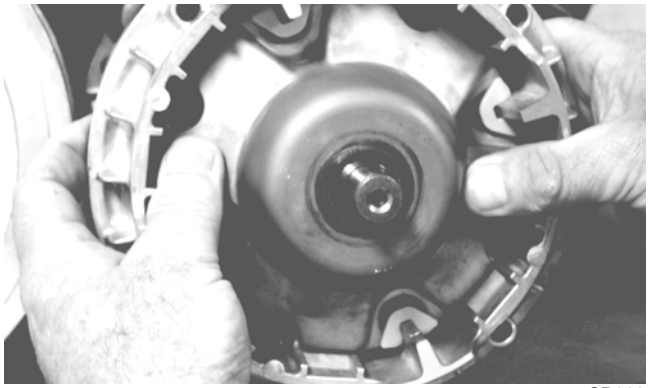
1. Remove the right-side footrest (see Section 8).
2. Remove the cap screws securing the V-belt cover noting the location of the different-lengthed cap screws for installing purposes; then using a rubber mallet, gently tap on the cover tabs to loosen the cover. Remove the cover.



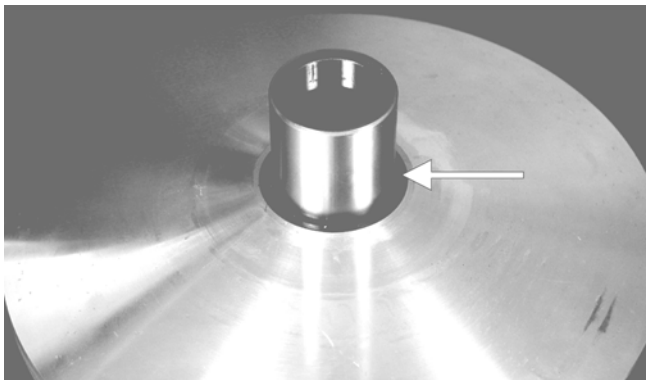
CD078

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

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



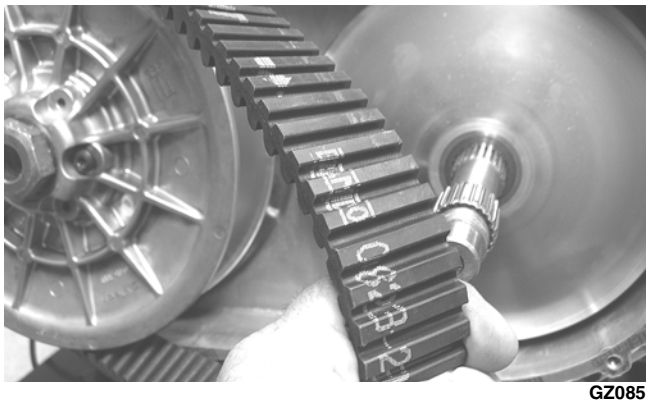
CD963



CD966A

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

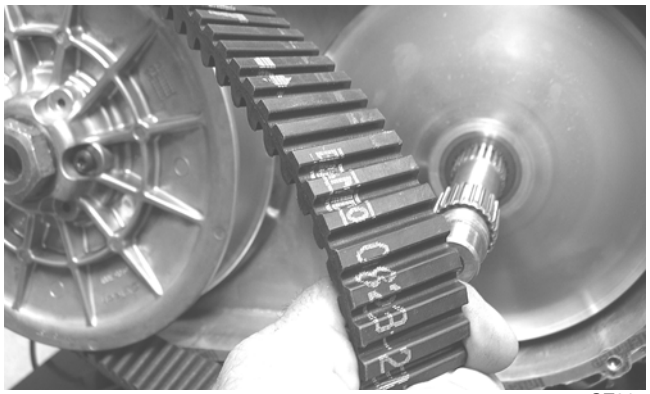
GZ076



GZ085

INSTALLING

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



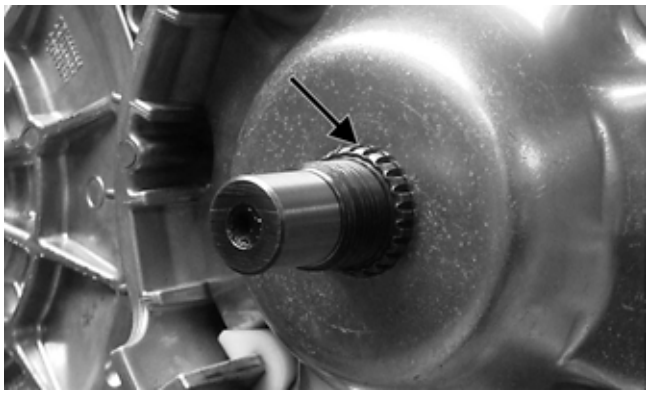
GZ085

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

2. Pinch the V-belt together near its center and slide the spacer and movable drive face onto the driveshaft. Secure the drive face with a washer and nut (coated with red Loctite #271). Tighten the nut to 147 ft-lb (450 models) or 165 ft-lb (1000 models).

CAUTION

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



GZ485A

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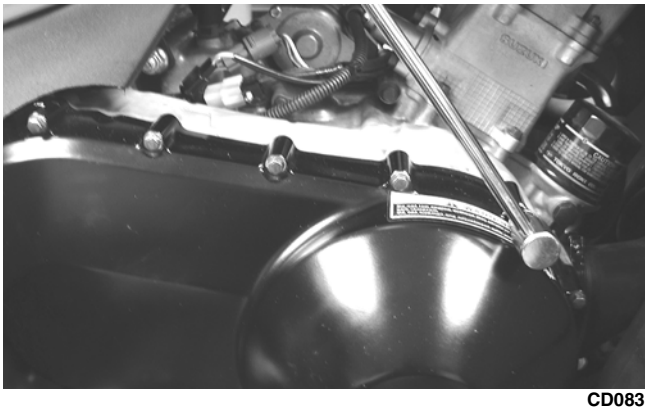
■**NOTE: At this point, the push-bolt can be removed.**

3. Rotate the V-belt and clutches until the V-belt is flush with the top of the driven clutch.
4. 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 8 ft-lb.



CD083

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

SECTION 3 - ENGINE/TRANSMISSION

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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 1.

SPECIAL TOOLS

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

Description	p/n
Clutch Sleeve Hub Holder	0444-007
Connecting Rod Holder	0444-006
Crankcase Separator/Crankshaft Remover	0444-152
Driven Pulley Compressor	0444-121
Driven Pulley Compressor	0444-140
Magneto Rotor Remover Set	0444-254
Oil Filter Wrench	0644-389
Piston Pin Puller	0644-328
Seal Protector Tool	0444-852
Spanner Wrench	0444-153
Surface Plate	0644-016
Valve Clearance Adjuster	0444-255
V Blocks	0644-535

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

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Specifications (450)

VALVES AND GUIDES		
Valve Face Diameter (max)	(intake) (exhaust)	35.0 mm 30.5 mm
Valve/Tappet Clearance (cold engine)	(intake) (exhaust)	0.08-0.12 mm 0.15-0.20 mm
Valve Guide/Stem Clearance (max)	(intake) (exhaust)	0.1 mm 0.3 mm
Valve Guide Inside Diameter		5.000-5.012 mm
Valve Stem Outside Diameter	(intake) (exhaust)	4.975-4.990 mm 4.955-4.970 mm
Valve Stem Runout	(max)	0.10 mm
Valve Margin (min)	(intake)	1.1 mm
Valve Face/Seat Width	(min)	0.99 mm
Valve Seat Angle		45° +30'
Valve Face Radial Runout	(max)	0.15 mm
Valve Spring Free Length	(min)	44.73 mm
Valve Spring Tension @ 32.5 mm	(outer)	17.23 kg (37.98 lb)
CAMSHAFT AND CYLINDER HEAD		
Cam Lobe Height (min)	(intake) (exhaust)	34.71 mm 34.48 mm
Camshaft Journal/Cylinder Head Clearance	(max)	0.074 mm
Camshaft Journal Holder Inside Diameter	(right & center) (left)	22.01-22.04 mm 17.51-17.54 mm
Camshaft Journal Outside Diameter	(left) (right & center)	17.466-17.480 mm 21.966- 21.980 mm
Camshaft Runout	(max)	0.03 mm
Rocker Arm Inside Diameter		10.00-10.15 mm
Rocker Arm Shaft Outside Diameter		9.972-9.987 mm
Cylinder Head/Cover Distortion	(max)	0.05 mm
CYLINDER, PISTON, AND RINGS		
Piston Skirt/Cylinder Clearance		0.025-0.055 mm
Piston Diameter 8 mm from Skirt End		88.96-88.98 mm
Cylinder Bore		89.005-89.015 mm
Piston Ring Free End Gap (min)	(1st) (2nd)	8.0 mm 8.3 mm
Bore x Stroke		89.0 x 71.2 mm
Cylinder Trueness	(max)	0.01 mm
Piston Ring End Gap - Installed	(min)	0.38 mm
Piston Ring to Groove Clearance (max)	(1st/2nd)	0.06 mm
Piston Ring Groove Width	(1st) (2nd) (oil)	1.01-1.03 mm 1.21-1.23 mm 2.01-2.03 mm
Piston Ring Thickness	(1st) (2nd)	0.97-0.99 mm 1.17-1.19 mm
Piston Pin Bore	(max)	20.008 mm
Piston Pin	(min)	19.994 mm
CRANKSHAFT		
Connecting Rod (small end inside diameter)	(max)	20.021 mm
Connecting Rod (big end side-to-side)		0.7 mm
Connecting Rod (small end deflection)	(max)	3.0 mm
Crankshaft (web-to-web)		60.8-60.9 mm
Crankshaft Runout	(max)	0.03 mm

Specifications subject to change without notice.

Specifications (1000)

VALVES AND GUIDES		
Valve Face Diameter (max)	(intake) (exhaust)	31.6 mm 27.9 mm
Valve/Tappet Clearance (cold engine)	(intake) (exhaust)	0.08-0.12 mm 0.13-0.17 mm
Valve Guide/Stem Clearance	(max)	0.013 mm
Valve Guide/Valve Stem Deflection (wobble method)	(max)	0.35 mm
Valve Guide Inside Diameter		5.000-5.012 mm
Valve Stem Outside Diameter		4.972-4.987 mm
Valve Stem Runout	(max)	0.1 mm
Valve Head Thickness	(min)	2.3 mm
Valve Face/Seat Width (max)	(intake) (exhaust)	2.25 mm 2.60 mm
Valve Seat Angle		45° +15'/+30'
Valve Face Radial Runout	(max)	0.2 mm
Valve Spring Free Length	(min)	38.7 mm
Valve Spring Tension @ 31.5 mm		19.0 kg (42 lb)
CAMSHAFT AND CYLINDER HEAD		
Cam Lobe Height	(min)	33.53 mm
Camshaft Journal/Cylinder Head Clearance	(max)	0.04 mm
Camshaft Journal Holder Inside Diameter	(right & center) (left)	21.98-22.04 mm 17.48-17.53 mm
Camshaft Journal Outside Diameter	(right & center) (left)	21.96-21.98 mm 17.47-17.48 mm
Camshaft Runout	(max)	0.05 mm
Rocker Arm Inside Diameter		12.000-12.018 mm
Rocker Arm Shaft Outside Diameter		11.97-11.98 mm
Cylinder Head/Cover Distortion	(max)	0.05 mm
CYLINDER, PISTON, AND RINGS		
Piston Skirt/Cylinder Clearance	(max)	0.05 mm
Cylinder Bore		91.992-92.008 mm
Piston Diameter 15 mm from Skirt End		91.949-91.959 mm
Piston Ring End Gap (min)	(1st/2nd)	12.5 mm
Bore x Stroke		92 x 71.5 mm
Cylinder Trueness	(max)	0.075 mm
Piston Ring End Gap - Installed (max)		0.38 mm
Piston Ring to Groove Clearance (max)	(1st) (2nd)	0.034 mm 0.033 mm
Piston Ring Groove Width	(1st/2nd) (oil)	1.202-1.204 mm 2.501-2.503 mm
Piston Ring Thickness	(1st/2nd)	1.170-1.195 mm
Piston Pin Bore	(max)	20.012 mm
Piston Pin Outside Diameter	(min)	19.995 mm
CRANKSHAFT		
Connecting Rod (small end inside diameter)	(max)	20.021 mm
Connecting Rod (big end side-to-side)	(max)	0.95 mm
Connecting Rod @ 150 mm (small end deflection)	(max)	0.3 mm
Crankshaft (web-to-web)	(max)	98 mm
Crankshaft Runout	(max)	0.03 mm
Oil Pump Gerotor Clearance	(max)	0.15 mm

Specifications subject to change without notice.

Troubleshooting

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 3. **Valve timing** incorrect 4. **Piston rings** worn excessively 5. **Cylinder bore** worn 6. **Starter motor** cranks too slowly - does not turn	1. Adjust clearance 2. Repair - replace guides 3. Replace cam chain/sprocket and retime engine 4. Replace rings 5. Replace cylinder 6. See Section 5 - Troubleshooting
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. **ECU** defective 5. **Ignition coil** defective 6. **High-tension lead** open - shorted	1. Clean - replace plug 2. Clean - dry plug 3. Replace stator coil 4. Replace ECU 5. Replace ignition coil 6. Replace high tension lead
Problem: Engine will not start or is hard to start (No fuel reaching the fuel injector)	
Condition	**Remedy**
1. **Gas tank vent hose** obstructed 2. **Fuel hose** obstructed 3. **Fuel screens** obstructed 4. **Fuel pump** defective	1. Clean vent hose 2. Clean - replace hose 3. Clean - replace inlet screen - valve screen 4. Replace fuel pump
Problem: Engine stalls easily	
Condition	**Remedy**
1. **Spark plug** fouled 2. **Magneto** defective 3. **ECU** defective 4. **Fuel injector** obstructed 5. **Valve clearance** out of adjustment	1. Clean plug 2. Replace magneto 3. Replace ECU 4. 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 cylinder head and piston 3. Replace - service pin - bore 4. Replace rings - piston
Problem: Engine noisy (Noise seems to come from timing chain)	
Condition	**Remedy**
1. **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 crankshaft)	
Condition	**Remedy**
1. **Main bearing** worn - burned 2. **Lower rod-end bearing** worn - burned 3. **Connecting rod side clearance** too large	1. Replace bearing 2. Replace crankshaft assembly 3. Replace crankshaft assembly
Problem: Engine noisy (Noise seems to come from transmission)	
Condition	**Remedy**
1. **Gears** worn 2. **Splines** worn 3. **Primary gears** worn 4. **Bearings** worn 5. **Bushing** worn	1. Replace gears 2. Replace shaft(s) 3. Replace gears 4. Replace bearings 5. Replace bushing

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Problem: Engine noisy (Noise seems to come from secondary bevel gear and final driven shaft)	
Condition	**Remedy**
1. **Drive - driven bevel gears** damaged - worn	1. Replace gears
2. **Backlash** incorrect	2. Adjust backlash
3. **Tooth contact** improper	3. Adjust contact
4. **Bearing** damaged	4. Replace bearing
5. **Gears** worn	5. Replace gears
6. **Splines** worn	6. Replace shaft(s)
Problem: Engine idles poorly	
Condition	**Remedy**
1. **Valve clearance** incorrect	1. Adjust clearance
2. **Valve seating** poor	2. Replace - service seats - valves
3. **Valve guides** defective	3. Replace guides
4. **Rocker arms - arm shaft** worn	4. Replace arms - shafts
5. **Magneto** defective	5. Replace stator coil
6. **ECU** defective	6. Replace ECU
7. **Spark plug** fouled - gap incorrect	7. Adjust gap - replace plug
8. **Ignition coil** defective	8. Replace ignition coil
9. **Fuel injector** obstructed	9. Replace fuel injector
Problem: Engine runs poorly at high speed	
Condition	**Remedy**
1. **High RPM "cut out"** against RPM limiter	1. Shift into higher gear - decrease speed
2. **Valve springs** weak	2. Replace springs
3. **Valve timing** incorrect	3. Time valves
4. **Cams - rocker arms - tappets** worn	4. Replace cams - arms - tappets
5. **Spark plug gap** incorrect	5. Adjust gap
6. **Ignition coil** defective	6. Replace ignition oil
7. **Fuel pump** defective	7. Replace fuel pump
8. **Air cleaner element** obstructed	8. Clean element
9. **Fuel hose** obstructed	9. Clean or replace hose
Problem: Exhaust smoke dirty or heavy	
Condition	**Remedy**
1. **Engine oil** overfilled - contaminated	1. Drain excess oil - replace oil
2. **Piston rings - cylinder** worn	2. Replace - service rings - cylinder
3. **Valve guides** worn	3. Replace guides
4. **Cylinder wall** scored	4. Replace - service cylinder
5. **Valve stems** worn	5. Replace valves
6. **Stem seals** defective	6. Replace seals
Problem: Engine lacks power	
Condition	**Remedy**
1. **Valve clearance** incorrect	1. Adjust clearance
2. **Valve springs** weak	2. Replace springs
3. **Valve timing** incorrect	3. Re-time valve gear
4. **Piston ring(s) - cylinder** worn	4. Replace - service rings - cylinder
5. **Valve seating** poor	5. Repair seats
6. **Spark plug** fouled	6. Clean - replace plug
7. **Rocker arms - shafts** worn	7. Replace arms - shafts
8. **Spark plug gap** incorrect	8. Adjust gap - replace plug
9. **Fuel injector** obstructed	9. Replace injector
10. **Cam chain** worn	10. Replace cam chain
11. **Air cleaner element** obstructed	11. Clean element
12. **Engine oil** overfilled - contaminated	12. Drain excess oil - change oil
13. **Intake manifold** leaking air	13. Tighten - replace manifold
Problem: Engine overheats	
Condition	**Remedy**
1. **Carbon deposit (piston crown)** excessive	1. Clean piston
2. **Oil** low	2. Add oil
3. **Octane** low - gasoline poor	3. Drain - replace gasoline
4. **Oil pump** defective	4. Replace pump
5. **Oil circuit** obstructed	5. Clean circuit
6. **Radiator hoses - cap** damaged - obstructed	6. Clear obstruction - replace hoses
7. **Intake manifold** leaking air	7. Tighten - replace manifold
8. **Coolant level** low	8. Fill - examine system for leaks
9. **Fan** malfunctioning	9. Check fan fuse - replace fan
10. **Fan relay** malfunctioning	10. Replace fan relay
11. **Thermostat** stuck - closed	11. Replace thermostat

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Removing Engine/ Transmission

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

☞ AT THIS POINT

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

☞ AT THIS POINT

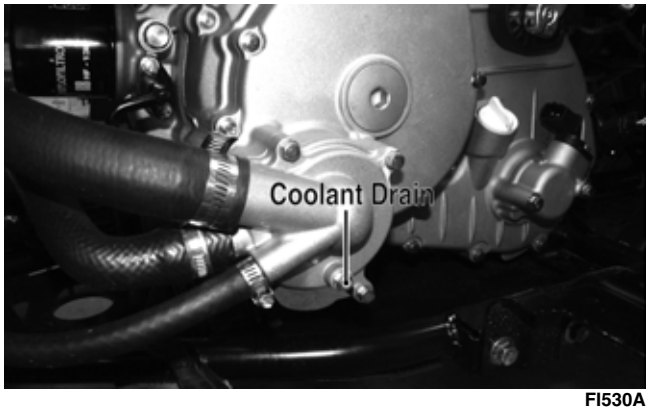
If the technician's objective is to service/replace magneto cover oil seals or the oil strainer (from beneath the engine/transmission), the engine/transmission does not have to be removed from the frame.

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

⚠ WARNING

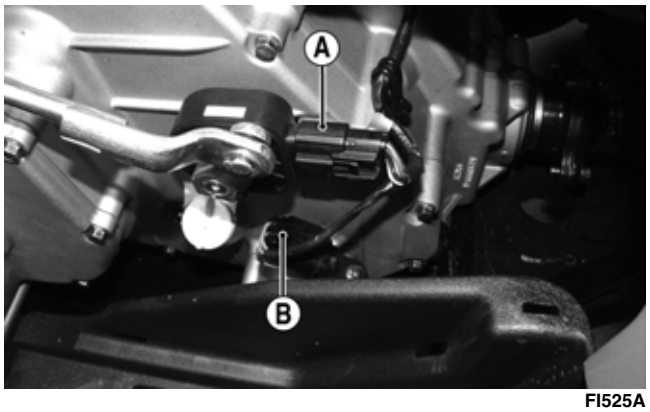
Make sure the ATV is solidly supported on the support stand to avoid injury.

1. Remove the seat and tool tray; then disconnect the negative battery cable.
2. Remove the left footwell, footrest, and footwell support assembly; then drain the coolant into a suitable container.



FI530A

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



FI525A

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

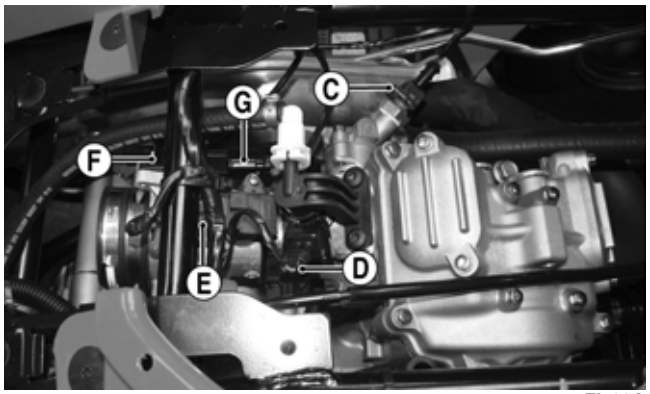
FI516A

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

FI519A

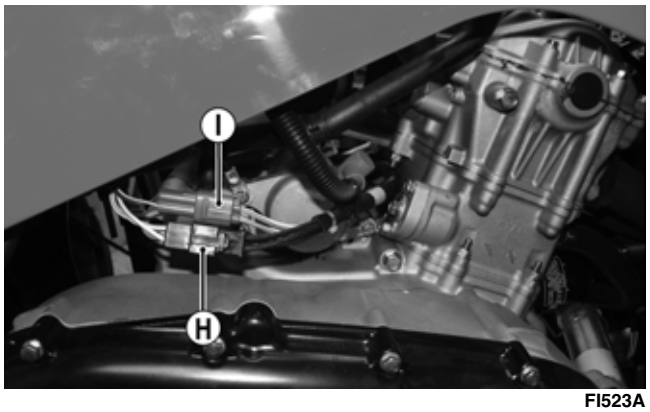
8. Disconnect the crankcase breather hose from the air filter housing and remove the air filter assembly.

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

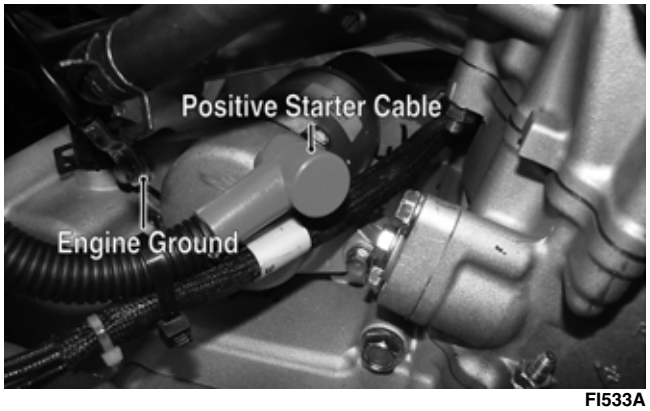


FI522A

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

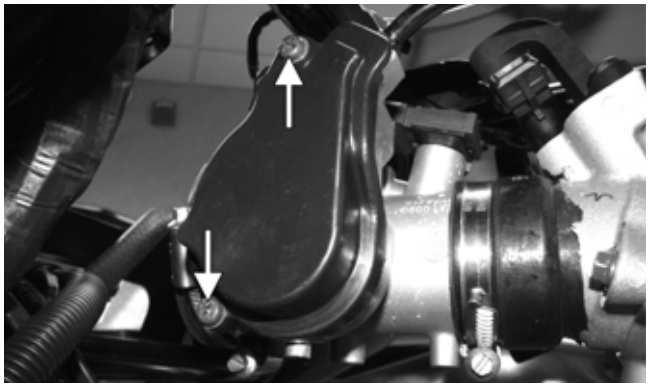


FI523A



FI533A

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

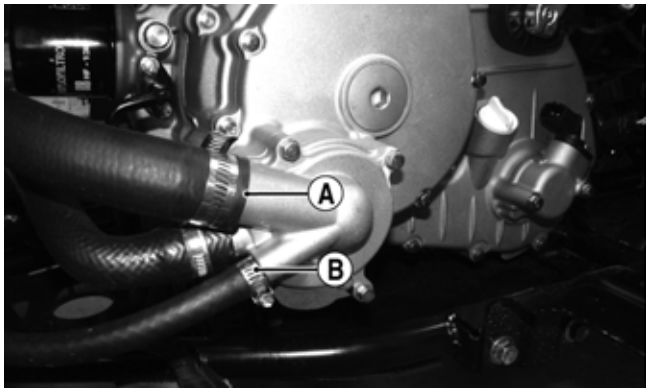


FI536A

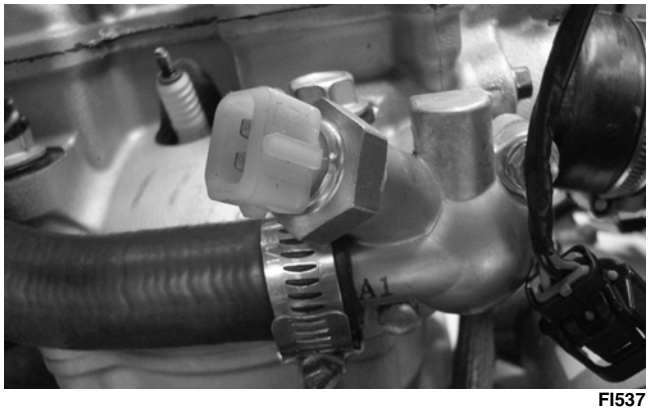
12. Remove the cap screws securing the exhaust pipe to the cylinder head; then remove the springs securing the muffler to the exhaust pipe.

13. Remove the muffler and exhaust pipe. Account for a grafoil seal on each end of the exhaust pipe.

14. Remove coolant hoses (A) and (B) from the water pump; then remove the upper coolant hose from the thermostat housing.



FI530B



FI537

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

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 removed from the frame for this procedure.

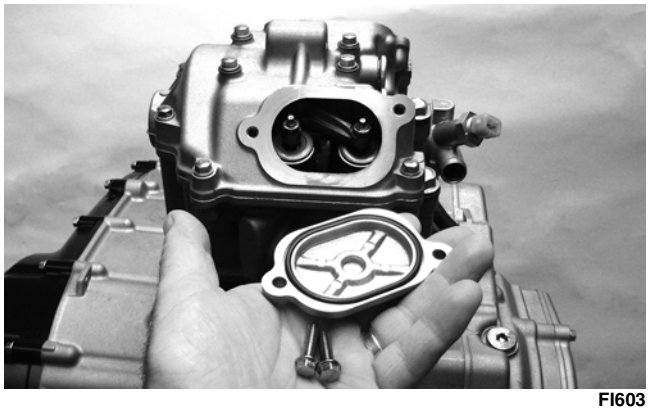
Removing Top-Side Components

A. Cylinder Head Cover/ Rocker Arms
B. Cylinder Head/Camshaft

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

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

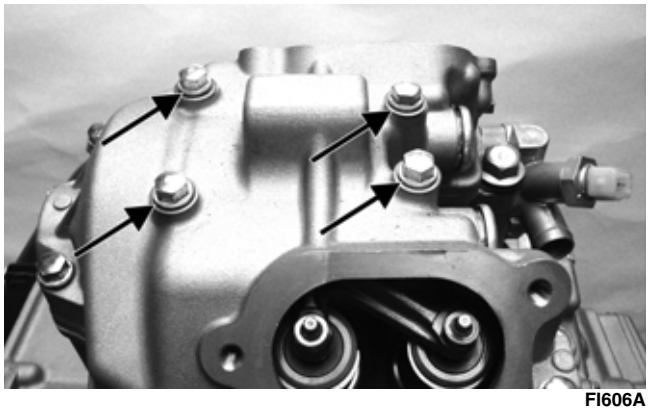
1. Remove the cap screws securing the two tappet covers. Remove the two tappet covers. Account for the O-rings.



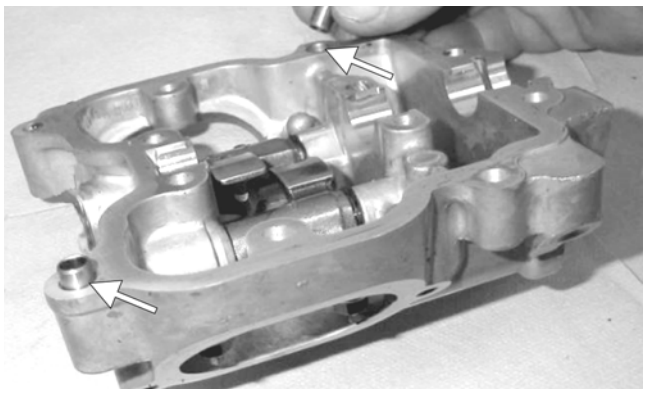
FI603

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

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



FI606A



MD1354A

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

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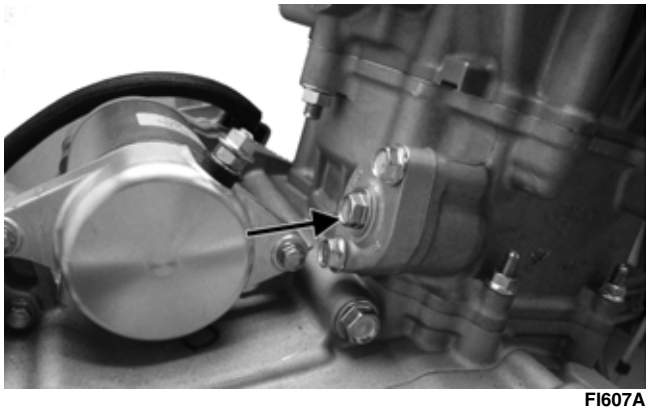
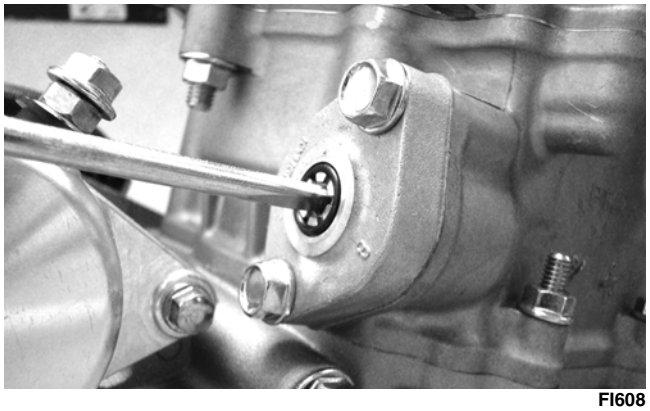


FI607A

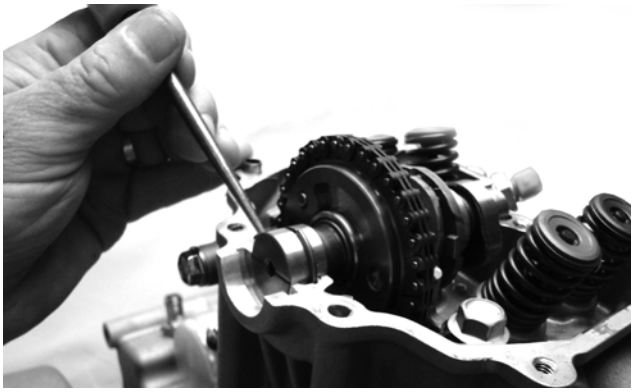


FI608

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

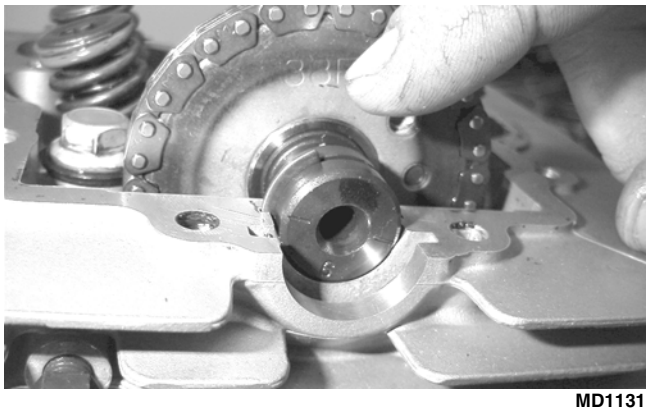
FI612

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



FI613

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



MD1131

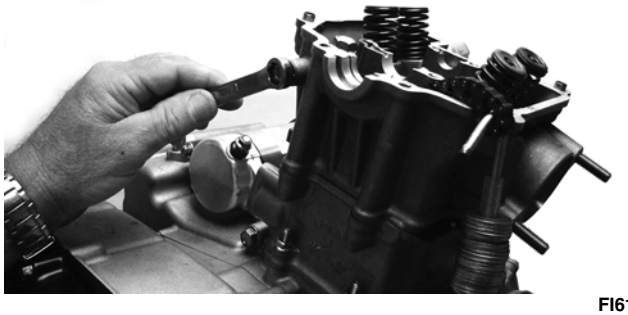
6. Noting the timing marks for installing purposes, drop the sprocket off the camshaft. While holding the cam chain, slide the sprocket and camshaft out of the cylinder head. Account for an alignment pin.

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

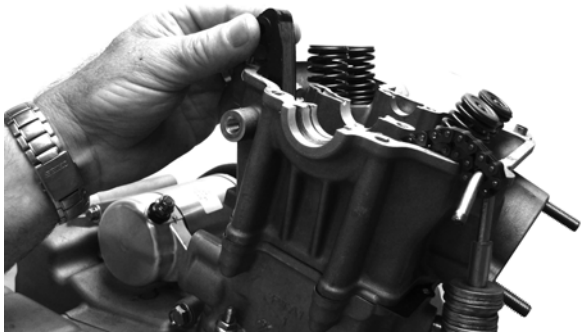
FI620

FI617A

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



FI616



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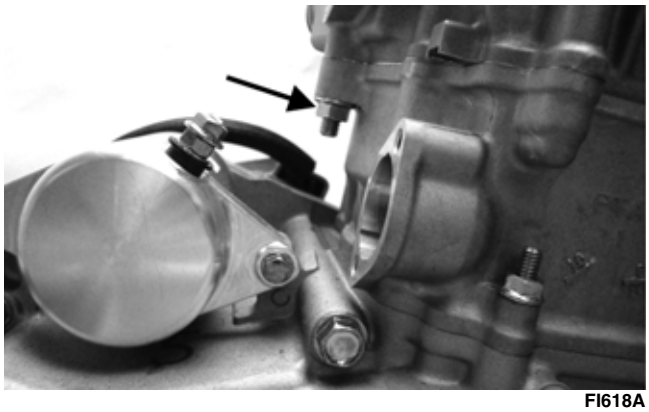
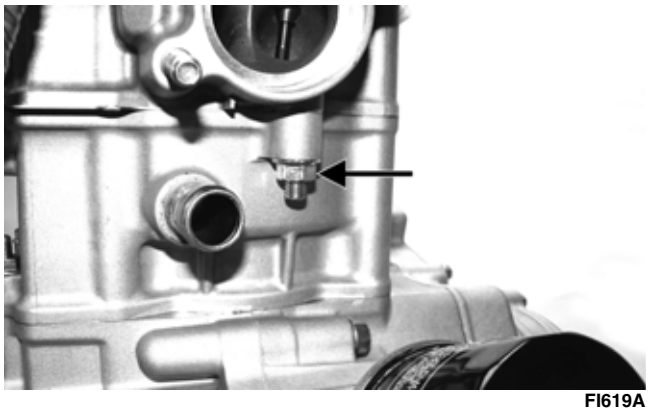


FI618A

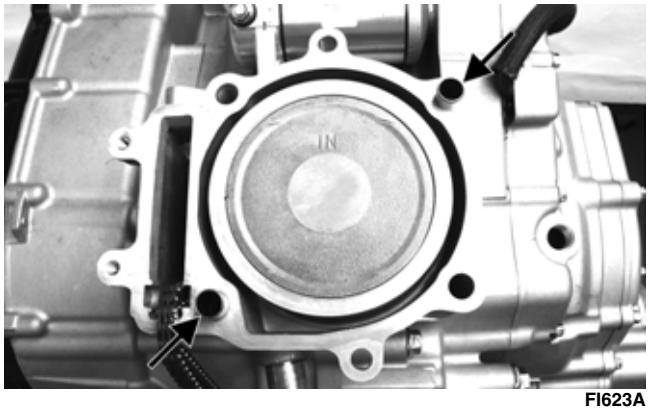


FI619A

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

CD211

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



FI623A

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

10. Remove the cam chain guide.

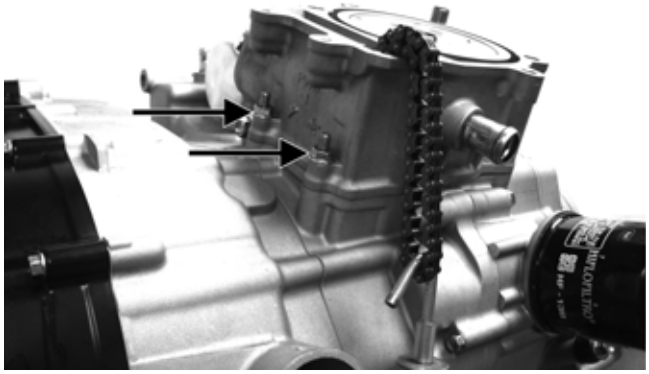
☞AT THIS POINT
To inspect cam chain guide, see Servicing Top-Side Components sub-section.

FI621

C. Cylinder
D. Piston

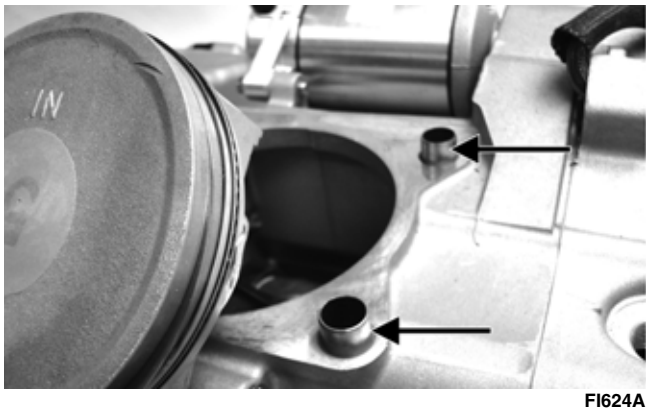
■NOTE: Steps 1-10 in the preceding sub-section must precede this procedure.

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



FI622A

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

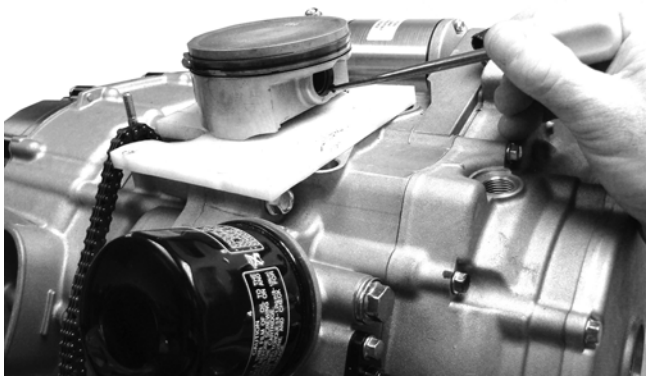


FI624A

☞ AT THIS POINT
To service cylinder, see Servicing Top-Side Components sub-section.

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

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



FI625

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

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

MD1219

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

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

☞ AT THIS POINT
To service piston, see Servicing Top-Side Components sub-section.

☞ AT THIS POINT
To service center crankcase components only, proceed to Removing Left-Side Components.

3

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 Cylinder Head Cover

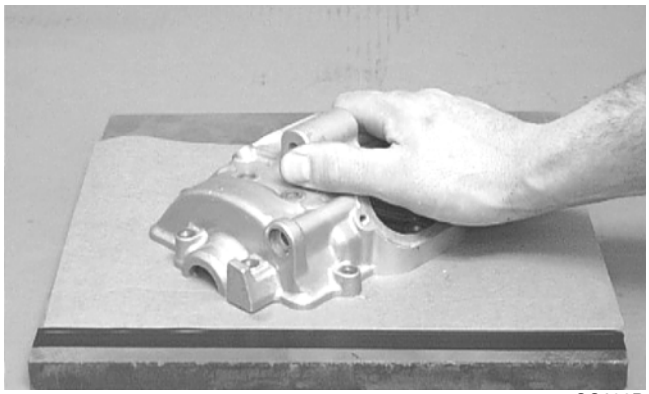
■NOTE: If the cylinder head cover cannot be trued, the cylinder head assembly must be replaced.

1. Wash the cylinder head cover in parts-cleaning solvent.

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

CAUTION

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



CC130D

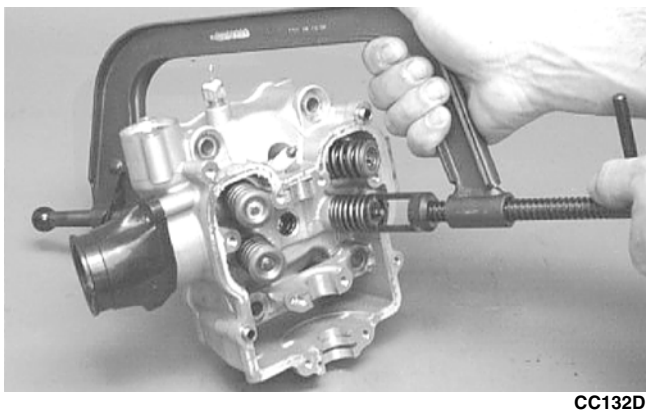
CAUTION

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

Removing Valves

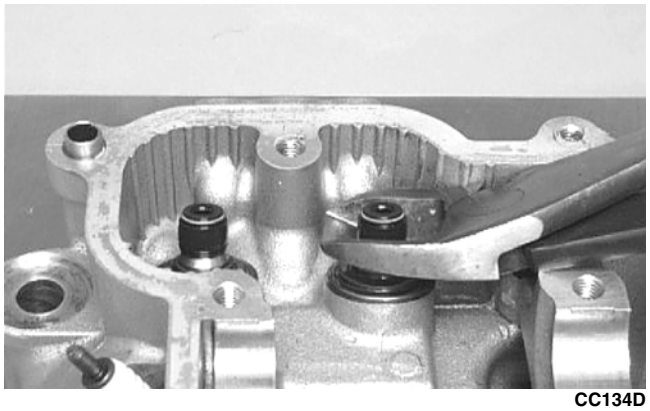
■NOTE: Index all valves, springs, and cotters to their original position when removing. When installing, all valve components should be installed in their original position.

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

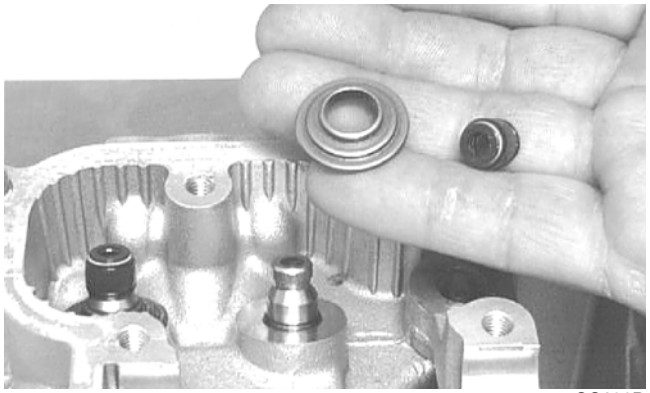


CC132D

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



CC134D



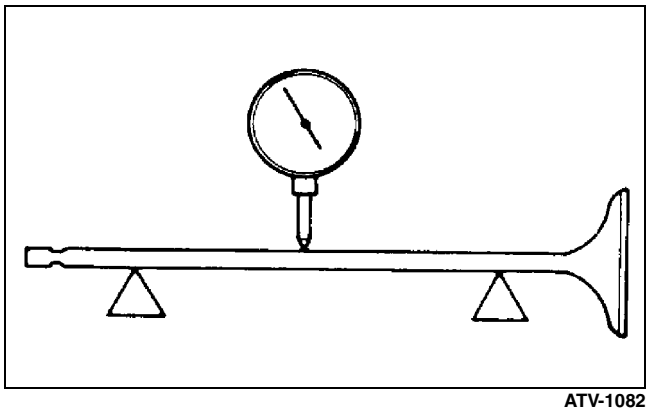
CC136D

■NOTE: The valve seals must be replaced.

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

Measuring Valve Stem Runout

1. Support each valve stem end with the V Blocks; 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 ranges must be within specifications.

Measuring Valve Face/Seat Width

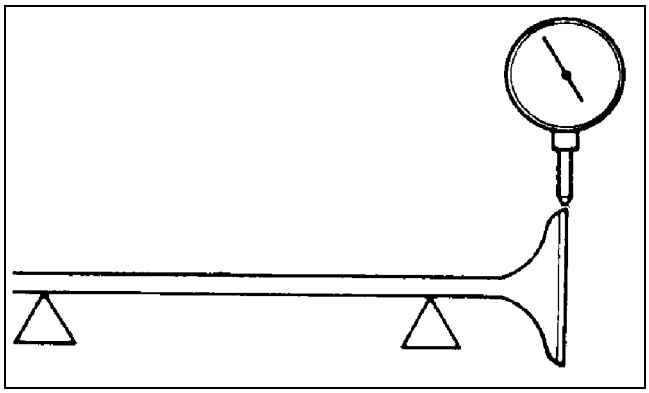
1. Using a calipers, measure the width of the valve face.

FI367

2. Acceptable width must be at or above 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 (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, the cylinder head must be replaced.

Servicing Valves/Valve Guides/Valve Seats

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

CAUTION

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

Measuring Rocker Arm (Inside Diameter)

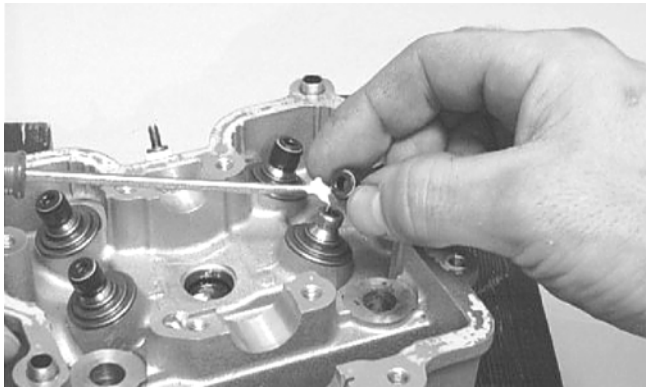
1. Using a dial calipers, measure the inside diameter of the rocker arm.
2. Acceptable inside diameter range must be within specifications.

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

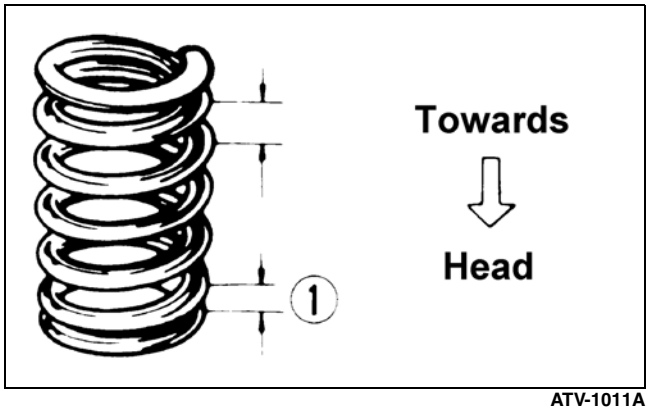
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



CC144D

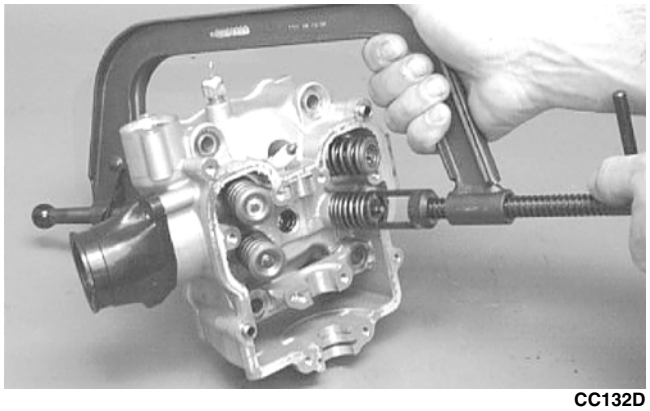
2. Insert each valve into its original valve location.
3. Install the valve springs with the painted end of the spring facing away from the cylinder head.

■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 keepers.



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

Removing Piston Rings

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

CC400D

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

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

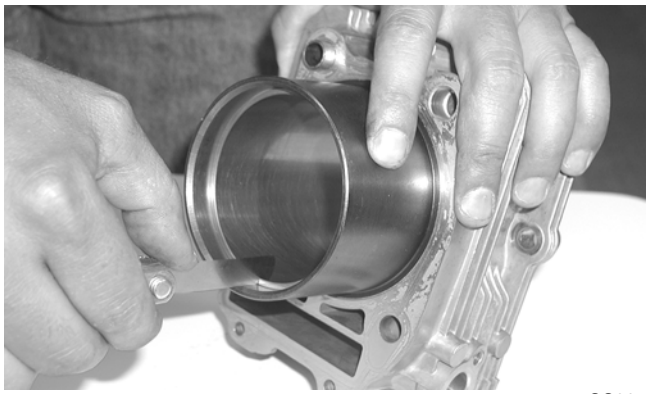
Cleaning/Inspecting Piston Ring Grooves

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

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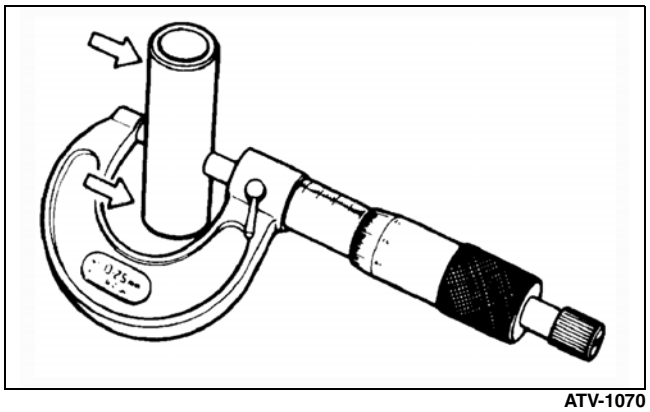
Measuring Piston Pin, Connecting Rod Small End, and Piston-Pin Bore

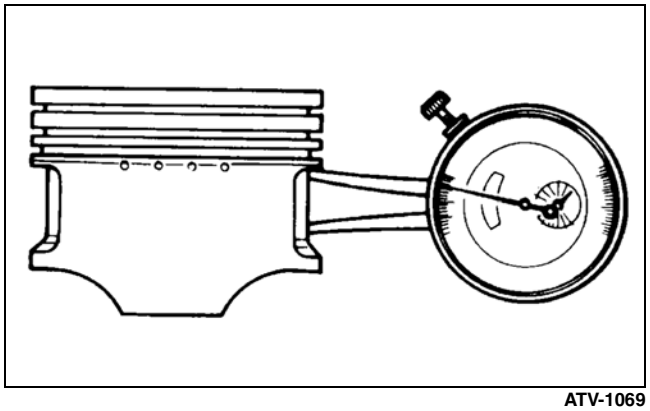
1. Measure the piston pin outside diameter at each end and in the center. If measurement does not meet specifications, the piston pin must be replaced.



ATV-1070

2. Inspect and measure the connecting rod small end inside diameter. If the measurement exceeds specifications, the connecting rod must be replaced (see Center Crankcase Components in this section).

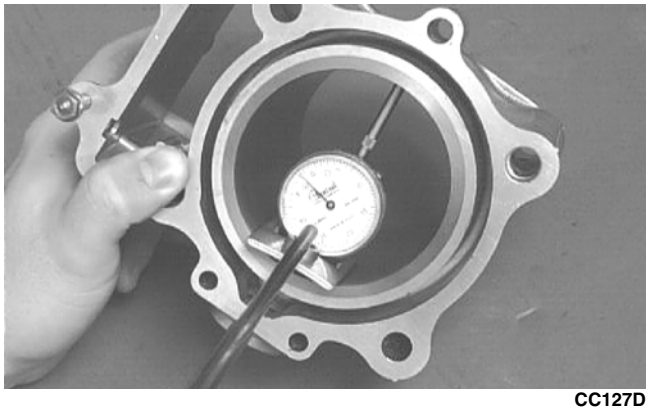
3. Insert an inside dial indicator into the piston-pin bore. Take two measurements to ensure accuracy. The diameter must not exceed specifications. If the diameter exceeds specifications, the piston must be replaced.



ATV-1069

Measuring Piston Skirt/ Cylinder Clearance

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



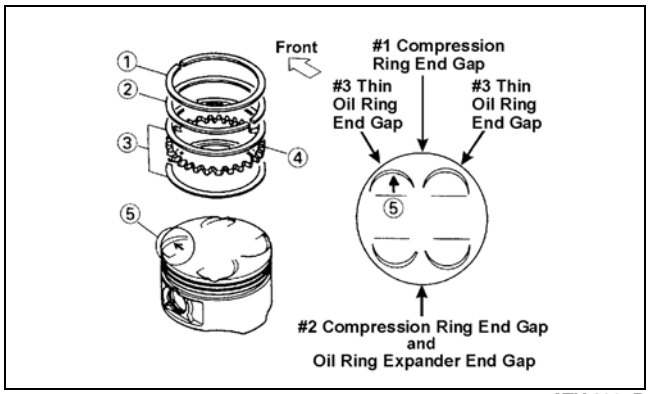
CC127D

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

Installing Piston Rings

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

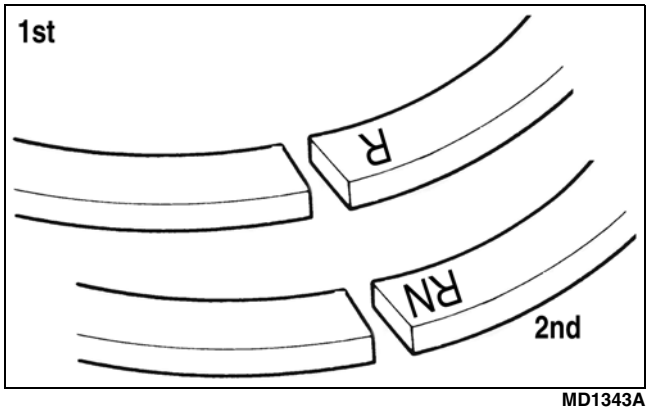
■NOTE: Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.



ATV-1085B

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

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



MD1343A

CAUTION

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

CYLINDER/CYLINDER HEAD ASSEMBLY

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

Cleaning/Inspecting Cylinder Head

CAUTION

The cylinder head studs must be removed for this procedure.

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

CAUTION

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

Measuring Cylinder Head Distortion

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

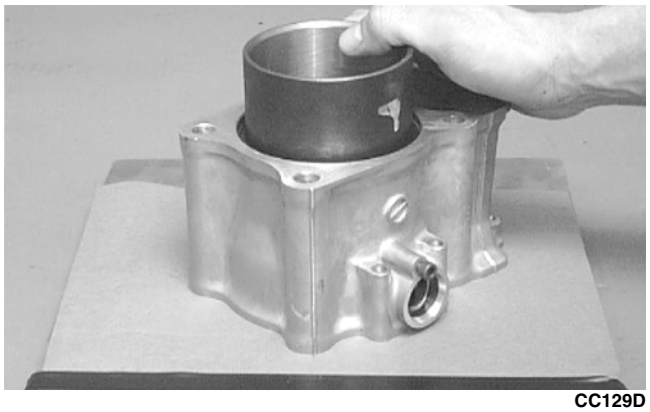

CC141D

Cleaning/Inspecting Cylinder

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

CAUTION

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

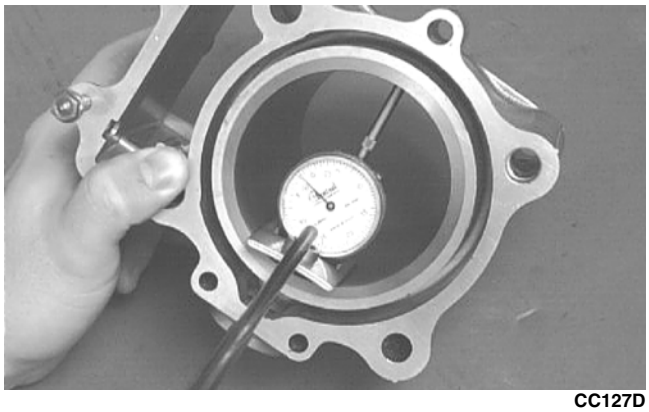

CC129D

Inspecting Cam Chain Guide

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

Honing Cylinder

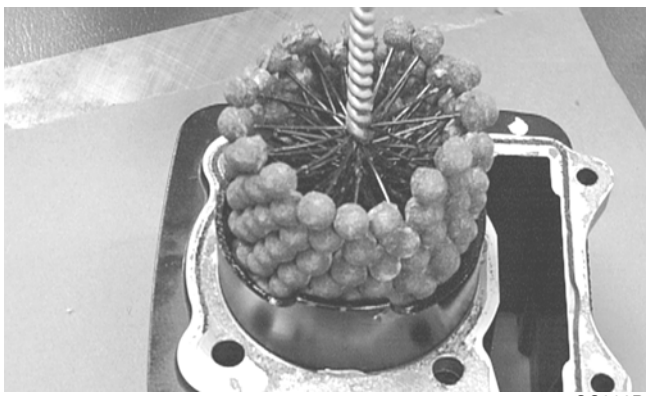
1. Using a slide gauge and a dial indicator or a snap gauge, measure the cylinder bore diameter in three locations from top to bottom and again from top to bottom at 90° from the first measurements for a total of six measurements. The trueness (out-of-roundness) is the difference between the highest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



CC127D

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

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



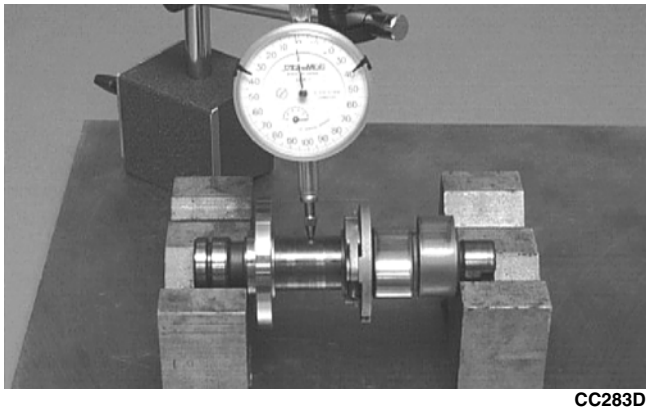
CC390D

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

Measuring Camshaft Runout

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

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

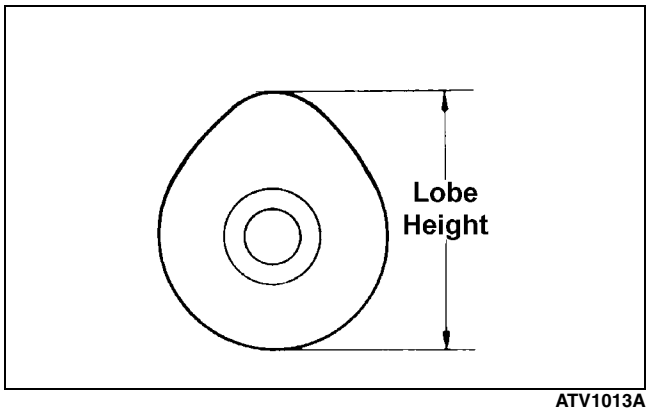


CC283D

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

Measuring Camshaft Lobe Height

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



ATV1013A

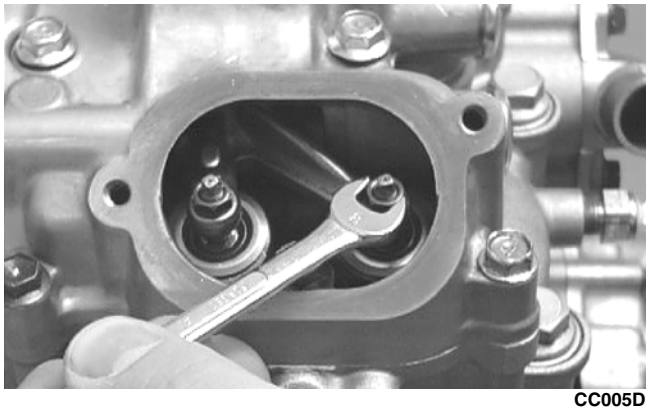
2. The lobe heights must be greater than minimum specifications.

Inspecting Camshaft Bearing Journal

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

Measuring Camshaft to Cylinder Head Clearance

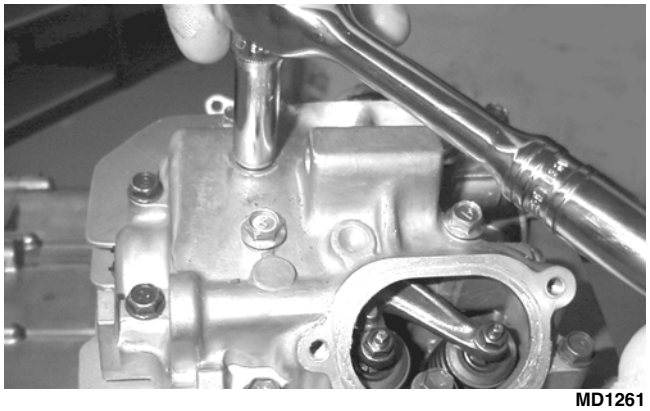
1. Loosen the jam nuts and adjuster screws.


CC005D

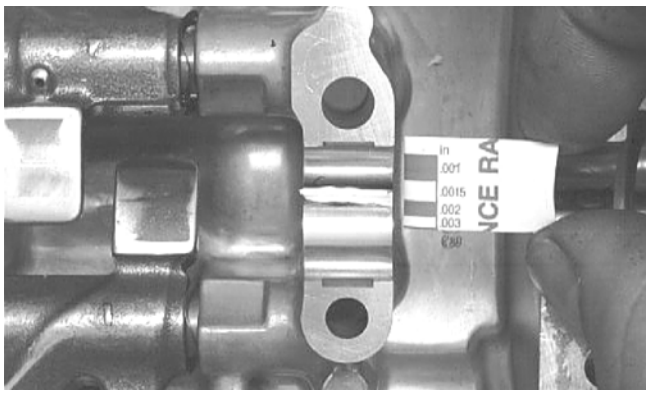
2. Place a strip of plasti-gauge in each of the camshaft lands in the cylinder head.
3. Place the valve cover on the cylinder head and secure with the valve cover cap screws. Tighten securely.

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

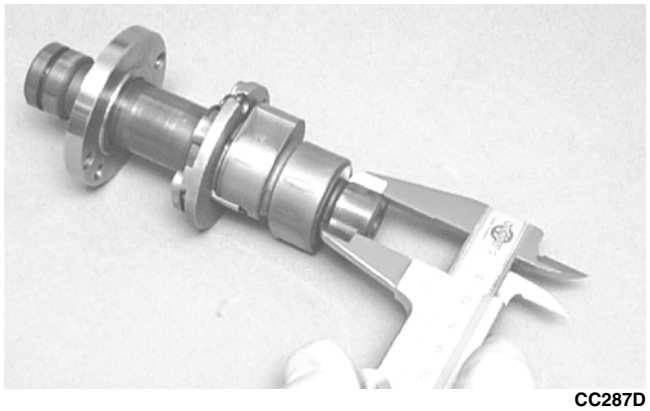
4. Remove the cap screws securing the valve cover to the cylinder; then remove the valve cover and camshaft.


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

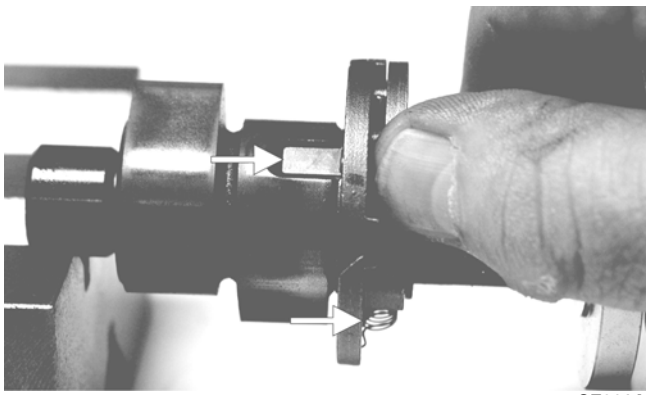
6. If clearance is excessive, measure the journals of the camshaft.


CC287D

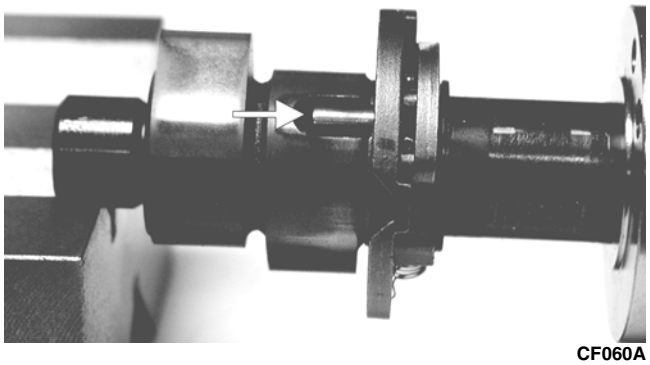
■NOTE: If the journals are worn, replace the camshaft; then measure the clearance again. If it is still out of tolerance, replace the cylinder head.

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.

Installing Top-Side Components

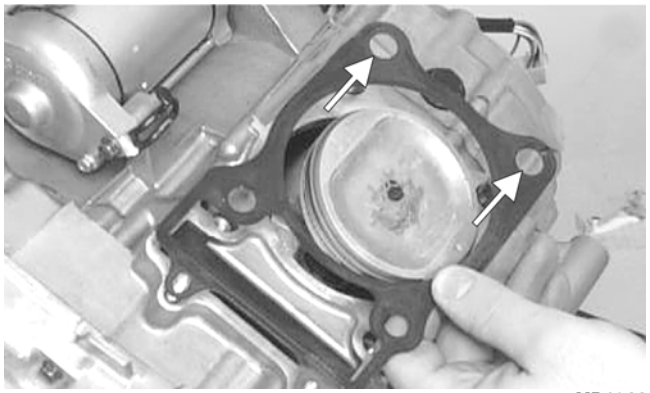
A. Piston
B. Cylinder

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

FI626

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

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

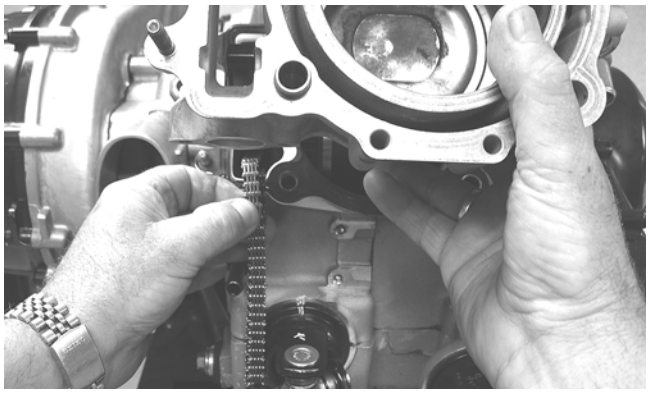


MD1344

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

CAUTION

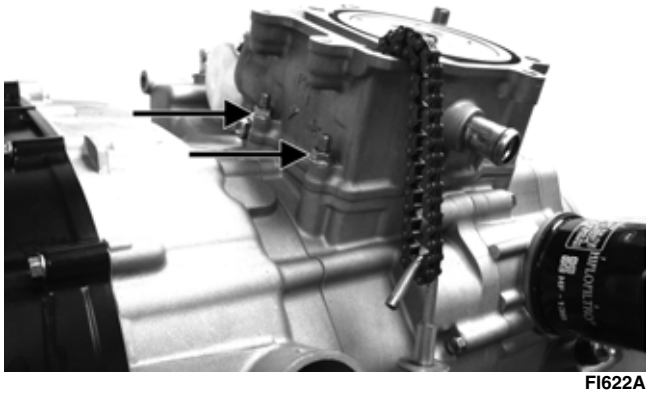
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



GZ142

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

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



FI622A

C. Cylinder Head/Camshaft
D. Cylinder Head Cover/ Rocker Arms

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

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

CAUTION

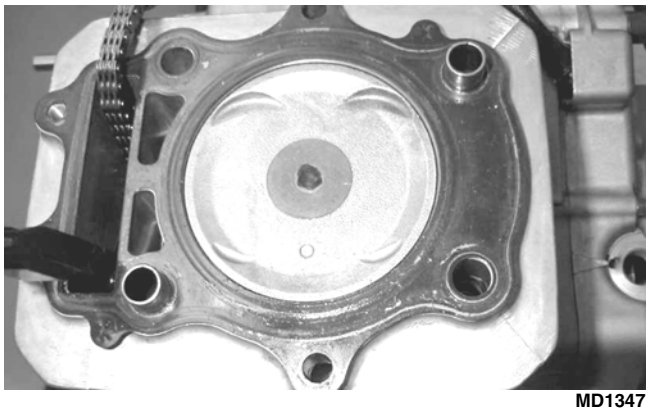
Care should be taken that the bottom of the chain guide is secured in the crankcase boss.

FI621

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

CAUTION

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



MD1347

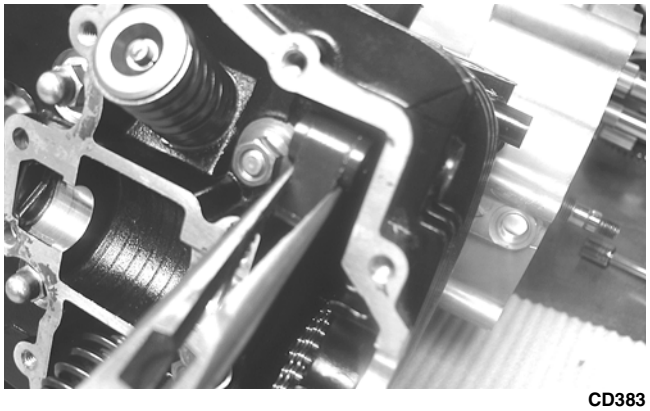
7. Install the four cylinder head cap screws with washers. Note that the two cap screws on the right side of the cylinder head nearest the cam sprocket are longer than the two cap screws on the left (spark plug) side. Tighten only until snug.

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

9. In a crisscross pattern, tighten the four cylinder head cap screws (from step 7) to 28 ft-lb. Tighten the two lower cylinder head nuts (from step 8) to 20 ft-lb and the cylinder-to-crankcase nuts (from step 4) to 8 ft-lb.

10. With the timing inspection plug removed and the cam chain held tight, rotate the crankshaft until the piston is at top-dead-center.

11. While holding the cam chain to the front, install the rear cam chain tensioner guide into the cylinder head. Install the pivot cap screw and washer. Tighten to 11 ft-lb.



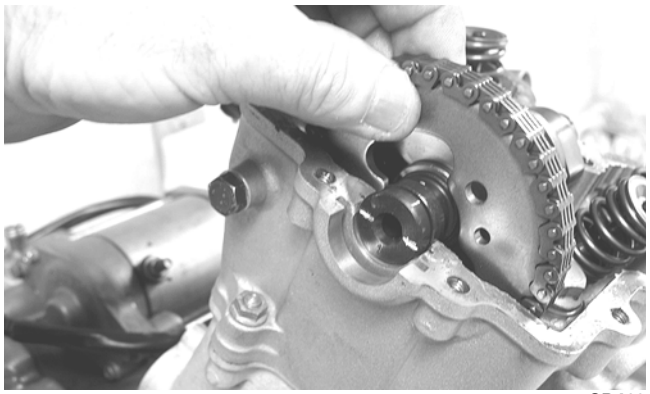
CD383

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

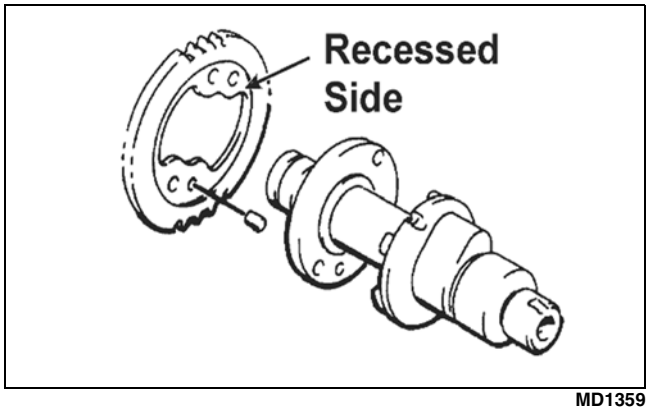
GZ190C

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

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



CD463



MD1359

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

FI615

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

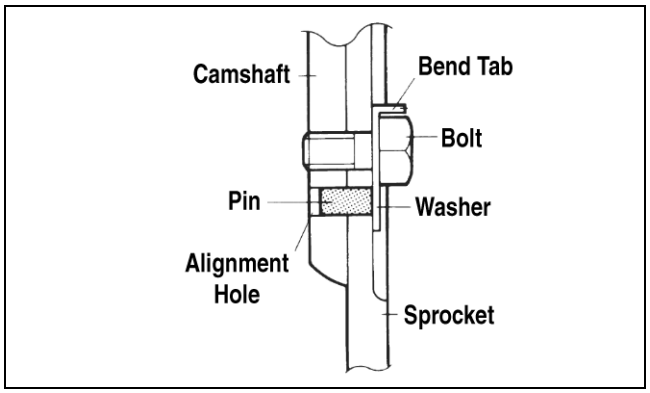
■NOTE: Note the position of the alignment marks on the end of the camshaft. They must be parallel with the valve cover mating surface. If rotating the camshaft and sprocket is necessary for alignment, do not allow the crankshaft to rotate and be sure the cam lobes end up in the down position.

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

CAUTION

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

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

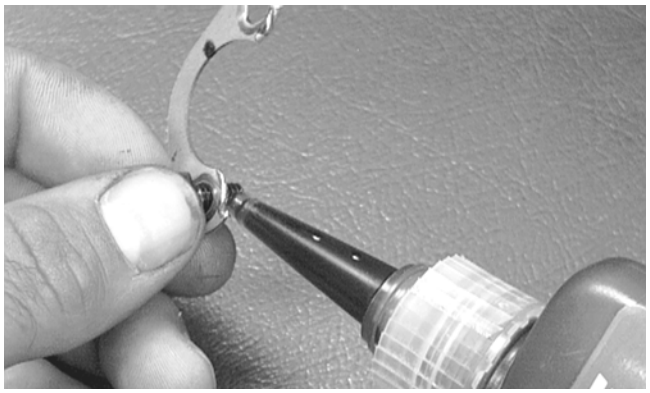


MD1363

CAUTION

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

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

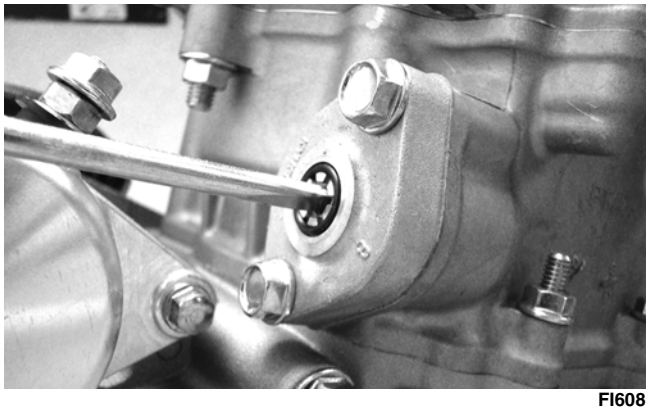


CC404D

FI612

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

19. Rotate the crankshaft until the first cap screw (from step 17) securing the sprocket to the camshaft can be addressed; then tighten to 11 ft-lb. Bend the tab to secure the cap screw.
20. Install the cylinder head plug with the cupped end facing the camshaft and the opening directed downwards.
21. Place the cam chain tensioner assembly and gasket into the cylinder. Tighten to 10 ft-lb.
22. Using a flat-blade screwdriver, turn the tensioner screw counterclockwise to apply tension to the cam chain; then install the cap screw plug and washer and tighten securely.

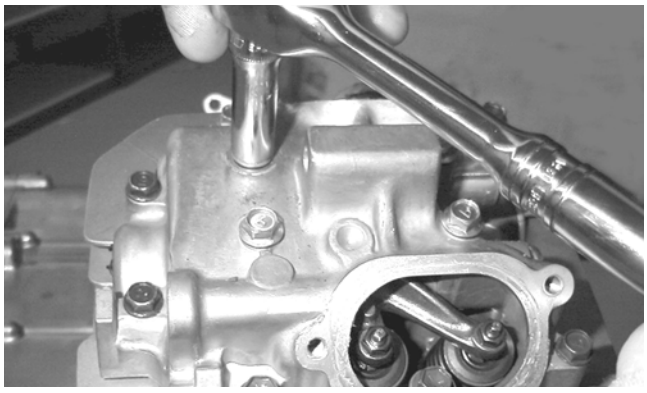


FI608

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

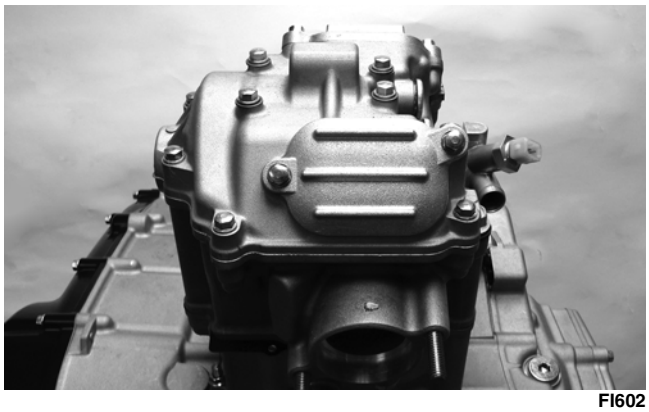
■NOTE: At this point, the rocker arms and adjuster screws must not have pressure on them.

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



MD1261

26. In a crisscross pattern starting from the center and working outward, tighten the cap screws (from step 25) to 8 ft-lb.
27. Adjust valve/tappet clearance (see Section 2).
28. Place the two tappet covers with O-rings into position; then install and tighten the cap screws to 8 ft-lb.



FI602

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

Left-Side Components

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

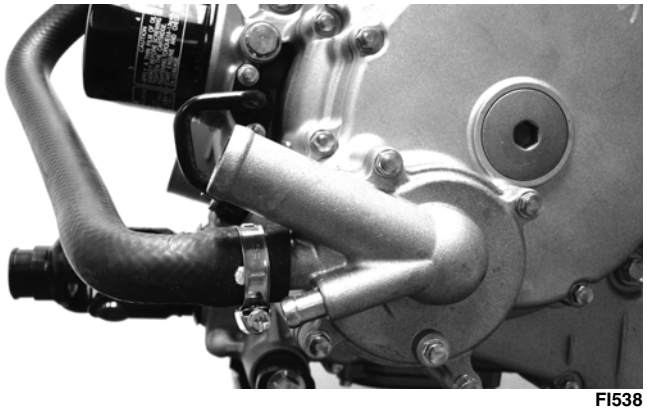
☞ AT THIS POINT
To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

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

Removing Left-Side Components

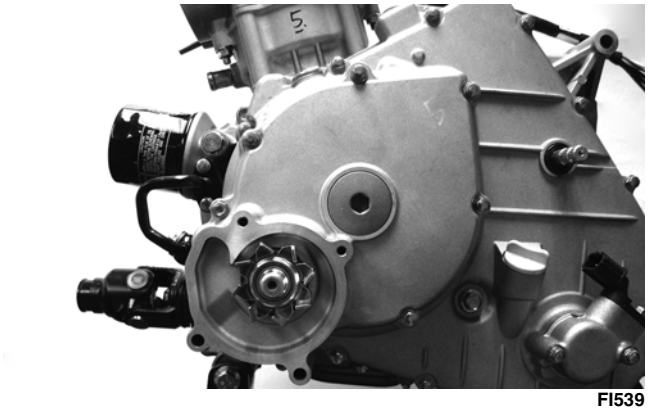
A. Water Pump
B. Speed Sensor
C. Magneto Cover/ Stator Assembly

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

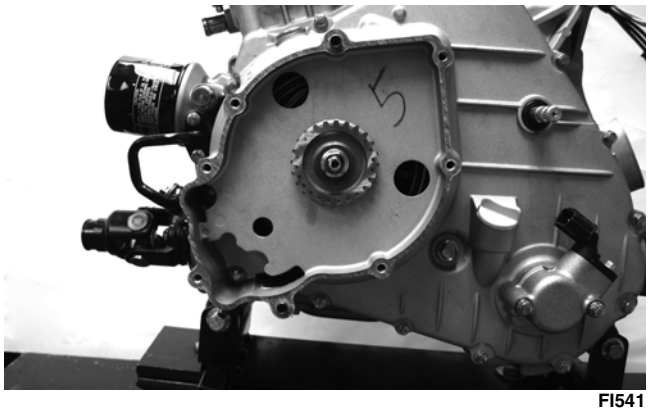


FI538

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

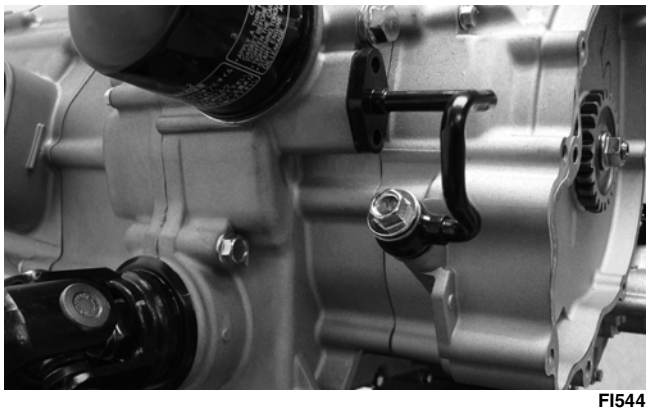


FI539



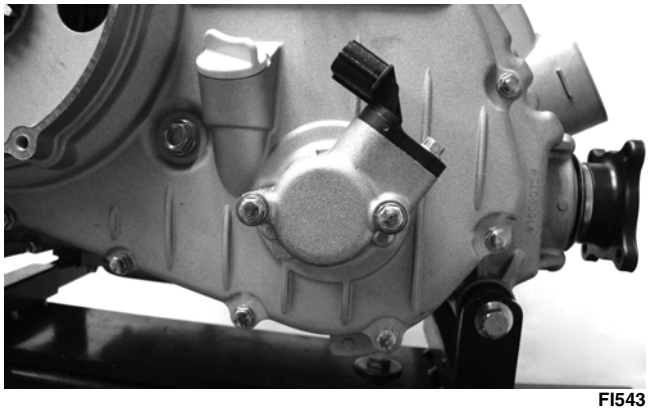
FI541

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



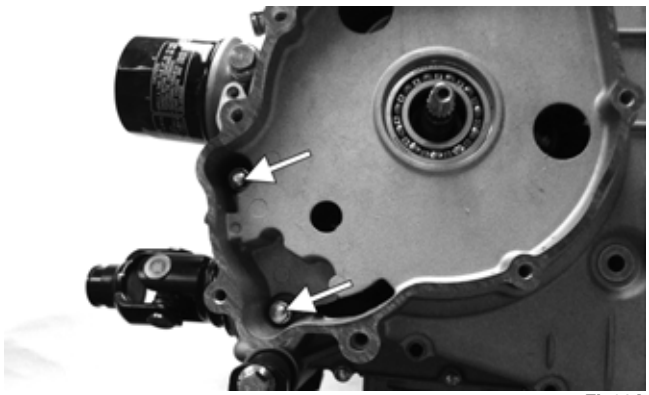
FI544

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



FI543

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



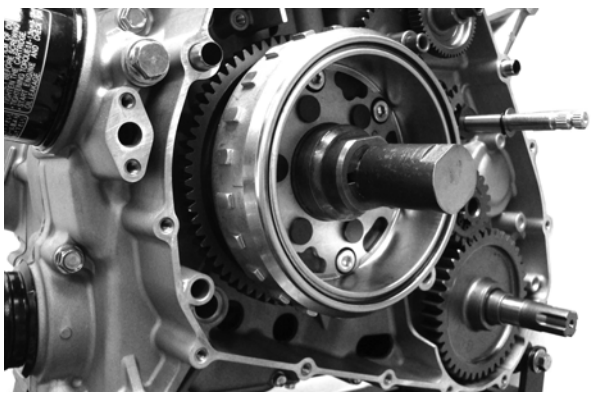
FI596A

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

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

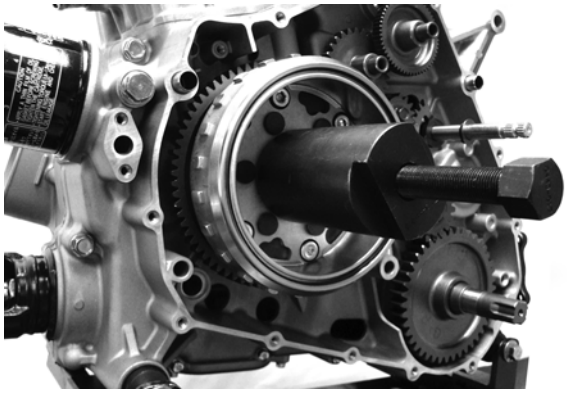
■NOTE: Steps 1-6 in the preceding sub-section must precede this procedure.

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



FI549

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

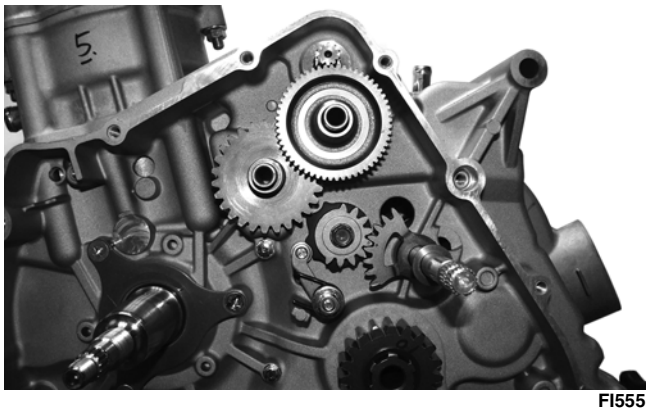


FI550

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

FI551A

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



FI555

G. Shift Shaft
H. Drive Gear

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

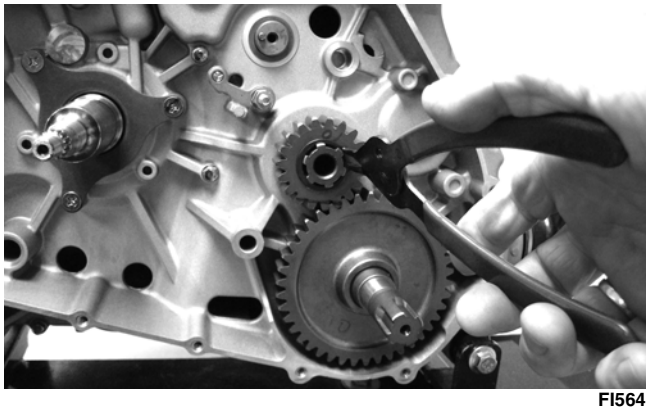
11. Remove the shift shaft noting a washer on each end; then remove the cap screw securing the gear shift cam plate and remove the plate from the shaft.

FI559

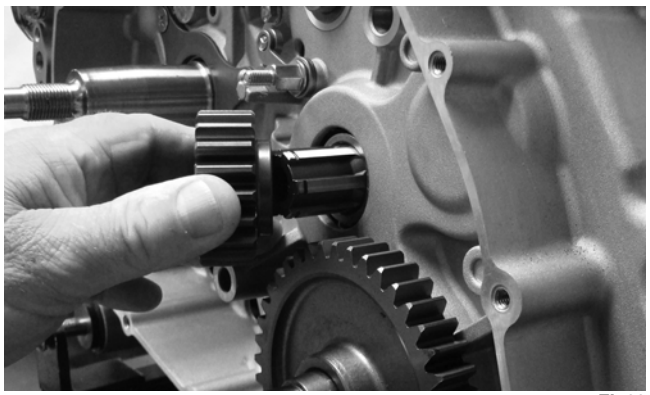
12. Remove the shift detent cam arm and spring.

FI560

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



FI564



FI566

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Servicing Left-Side Components

INSPECTING STARTER CLUTCH/GEAR

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

FI569

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

FI572

REPLACING STARTER CLUTCH ASSEMBLY

1. Remove the cap screws securing the one-way clutch assembly to the flywheel; then remove from the flywheel.

FI570

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

FI576A

FI578

REPLACING STARTER GEAR BEARING

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

FI583

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

FI580

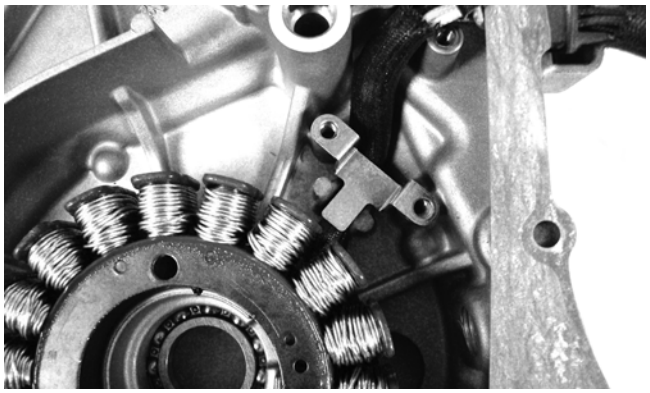
INSPECTING STATOR/MAGNETO COVER ASSEMBLY

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

FI588

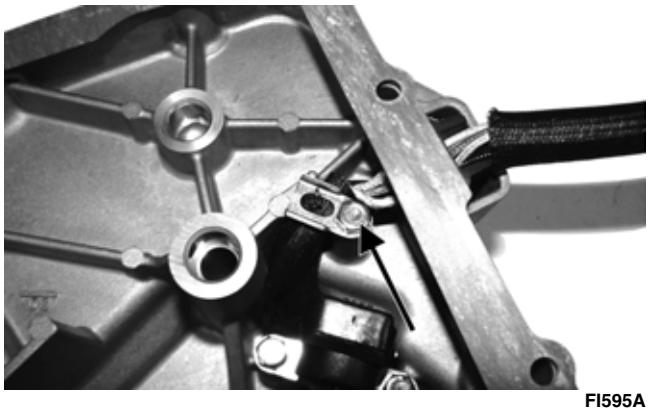
REPLACING STATOR COIL/ CRANKSHAFT POSITION SENSOR

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



FI590

3. Install the new stator coil assembly and secure with three cap screws using a drop of red Loctite #271 on each. Tighten to 8 ft-lb.
4. Place the stator wire harness hold-down into position; then install the crankshaft position sensor and secure with two cap screws. Tighten securely.
5. Install the upper cable hold-down and secure with a cap screw. Tighten securely.



FI595A

REPLACING MAGNETO COVER BEARINGS

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

FI593

FI594

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

Installing Left-Side Components

A. Starter Clutch/Gear
B. Rotor/Flywheel

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

MD1122

2. Install the starter motor and tighten the two cap screws securely.
3. Install the shift detent cam making sure the washer is installed.

MD1086

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

FI559

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

FI555A

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

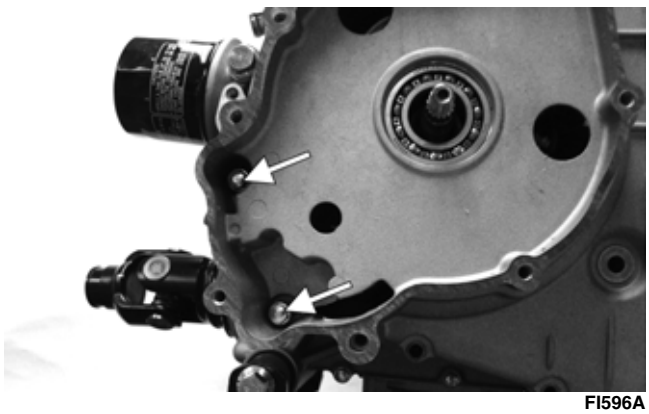

FI551A

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

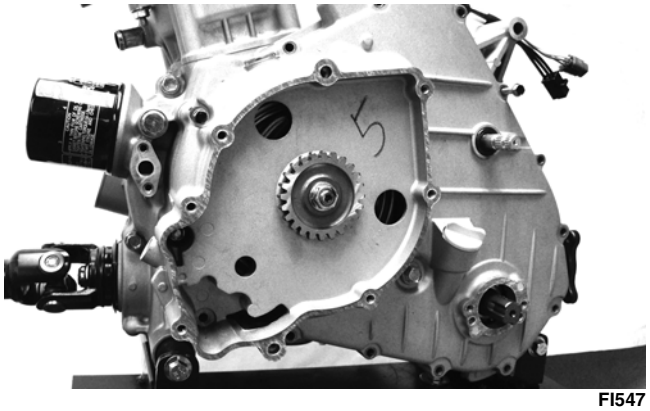
C. Magneto Cover
D. Water Pump

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

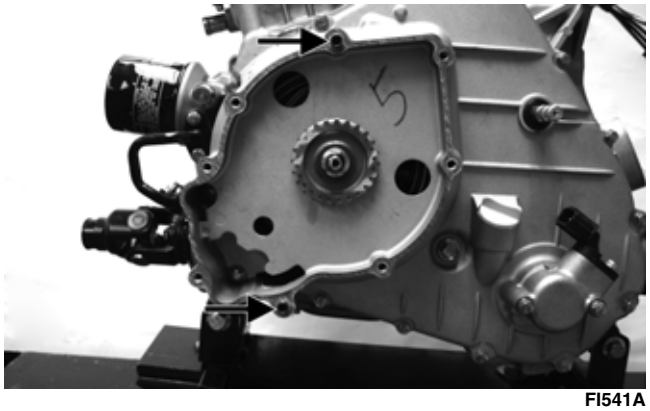
9. Install two alignment pins and place the magneto cover gasket into position. Install the magneto cover. Noting the different-lengthed 6 mm cap screws and the location of the two internal cap screws, tighten cap screws in a crisscross pattern to 8 ft-lb.

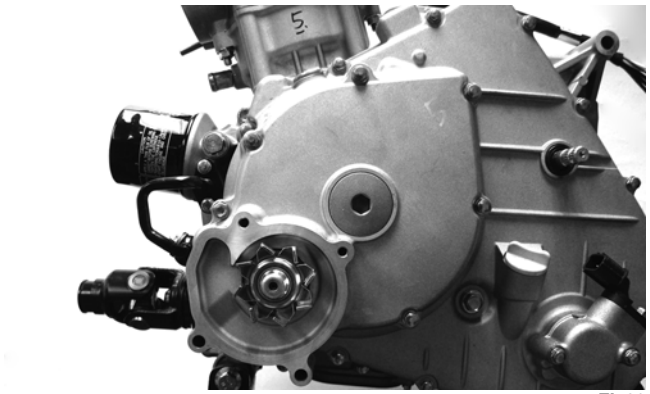

FI596A

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

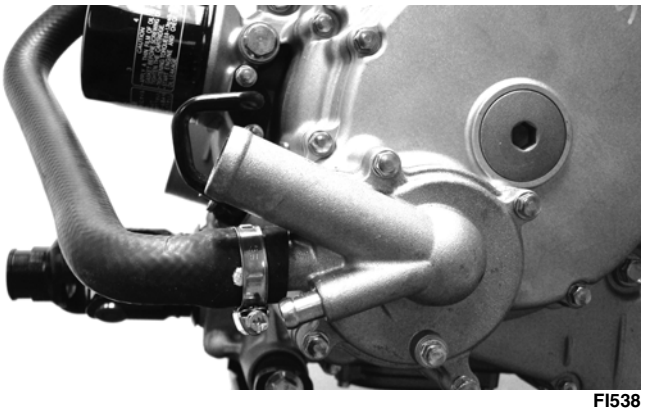

FI547

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


FI541A


FI539

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


FI538

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

Right-Side Components

☞ AT THIS POINT
To service center crankcase components only, proceed to Removing Right-Side Components.

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

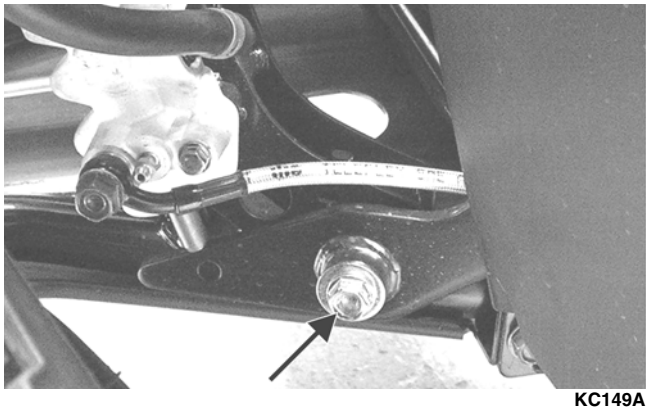
☞ AT THIS POINT
To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

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

Removing Right-Side Components

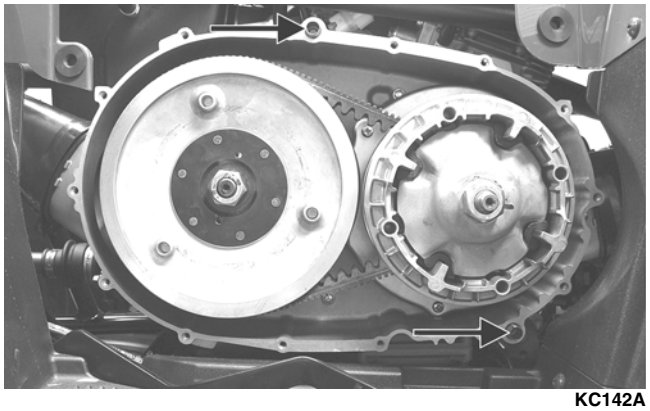
A. V-Belt Cover
B. Driven Pulley
C. Clutch Cover

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



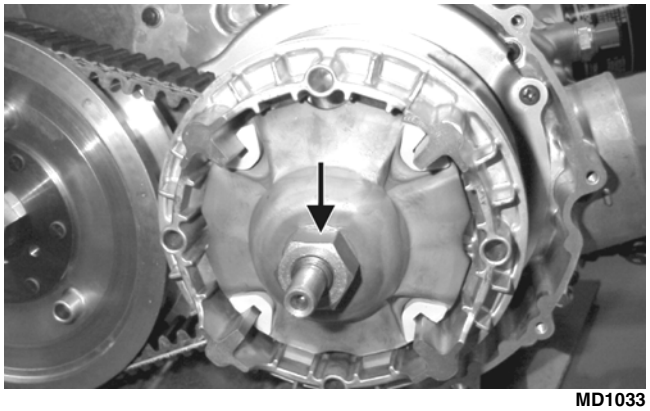
KC149A

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



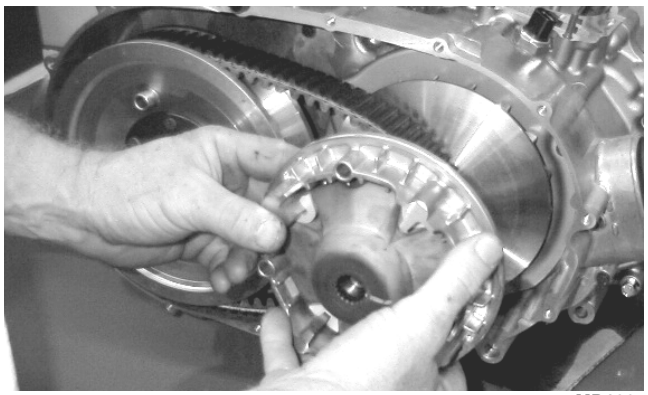
KC142A

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

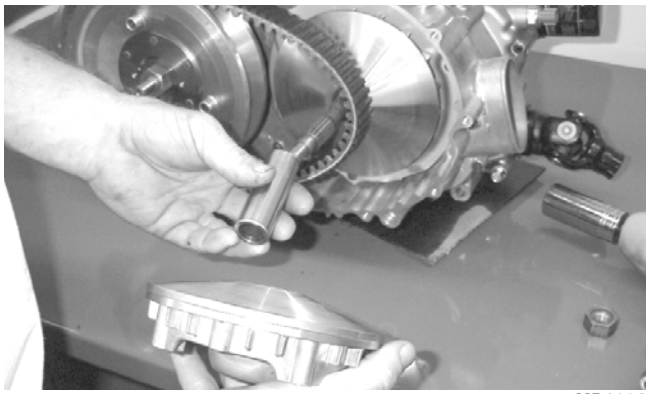


MD1033

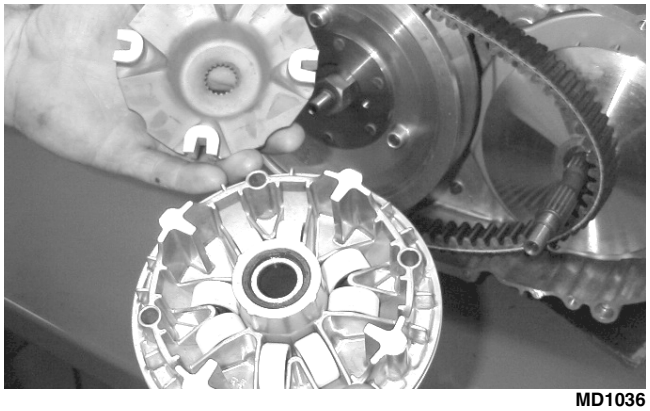
4. Remove the movable drive face and spacer. Account for the movable drive face rollers and outer drive face cover.



MD1035

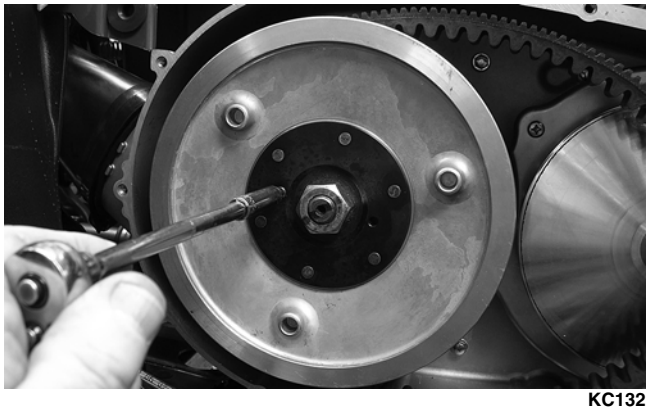


MD1034



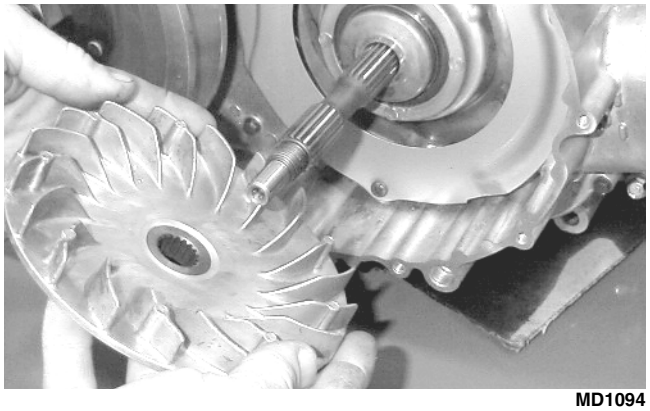
MD1036

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



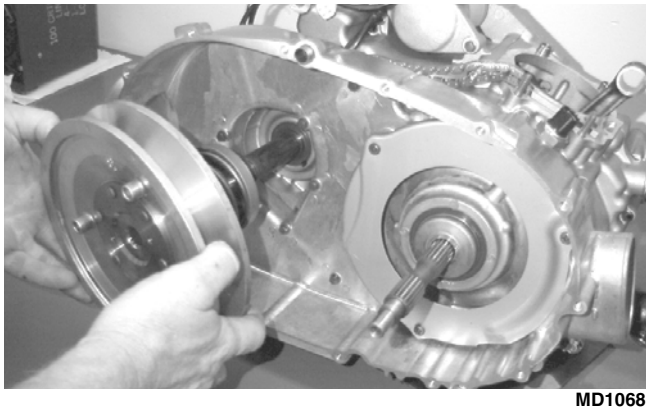
KC132

6. Remove the fixed drive face.



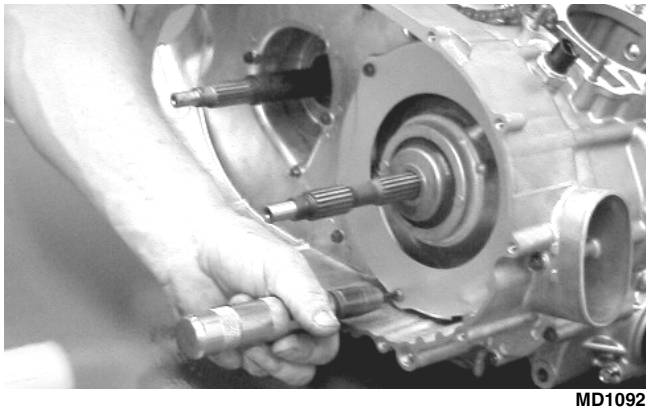
MD1094

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



MD1068

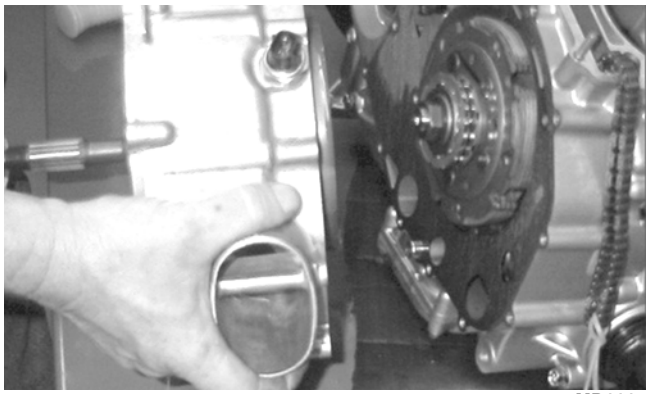
8. Using an impact screwdriver, remove the three Phillips-head cap screws holding the air intake plate. Remove the air intake plate.



MD1092

9. Remove the cap screws holding the clutch cover onto the right-side crankcase half. Note the positions of the different-lengthed cap screws for installing purposes.

10. Using a rubber mallet, loosen the clutch cover; then pull it away from the right-side crankcase half. Account for two alignment pins and gasket.



MD1115

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

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

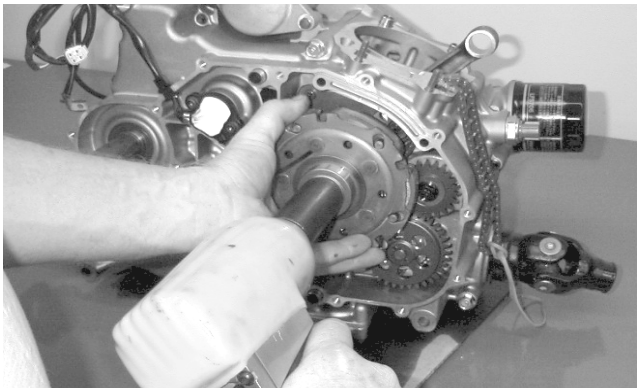
11. Remove the one-way clutch noting the direction of the green dot or the word OUTSIDE for installing purposes.

MD1286

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

CAUTION

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



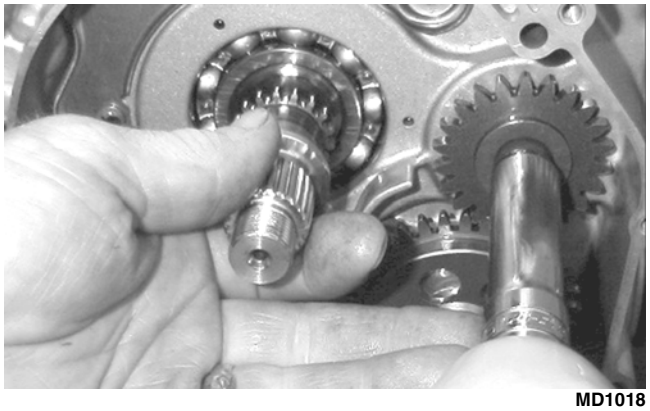
MD1014

MD1016

13. Remove the cam chain.

FI630

14. Remove the oil pump drive gear cap screw.

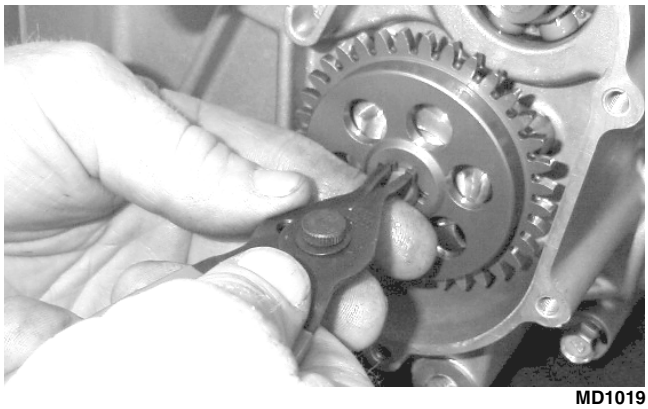


MD1018

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

MD1017

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

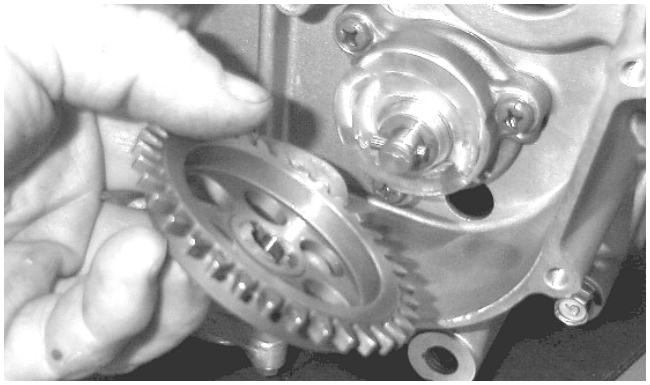


MD1019

3

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

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



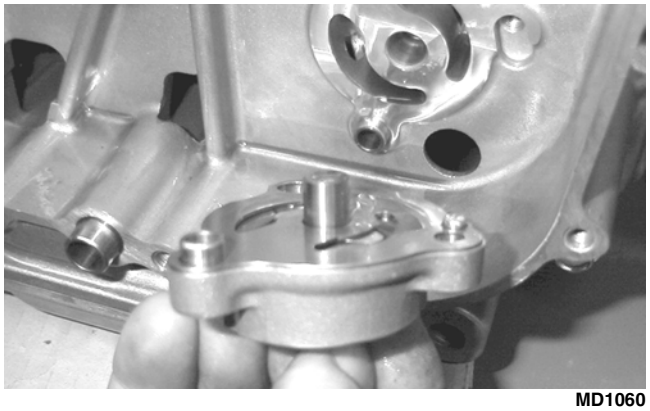
MD1020

☞ AT THIS POINT
To service clutch components, see Servicing Right-Side Components sub-section.

G. Oil Pump/Oil Strainer

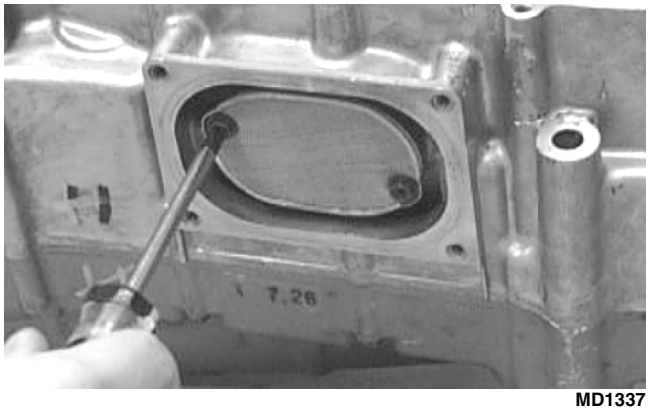
■NOTE: Steps 1-17 in the preceding sub-sections must precede this procedure.

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



MD1060

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



MD1337

MD1208

☞ AT THIS POINT
To service center crankcase components only, proceed to Separating Crankcase Halves.

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.

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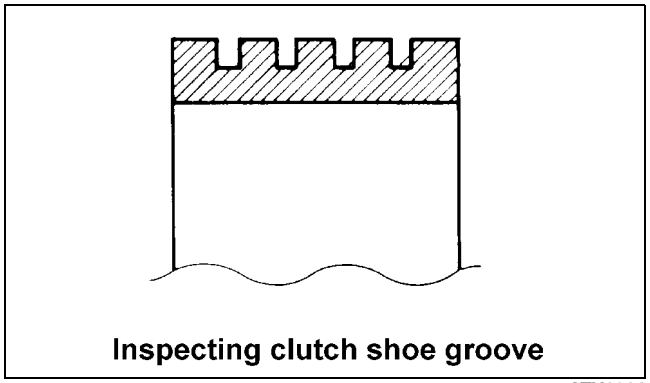


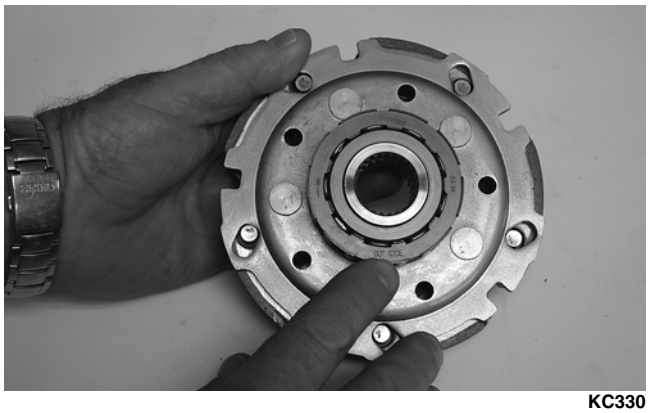
ATV1014

INSPECTING CENTRIFUGAL CLUTCH HOUSING

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

INSPECTING PRIMARY ONE-WAY DRIVE

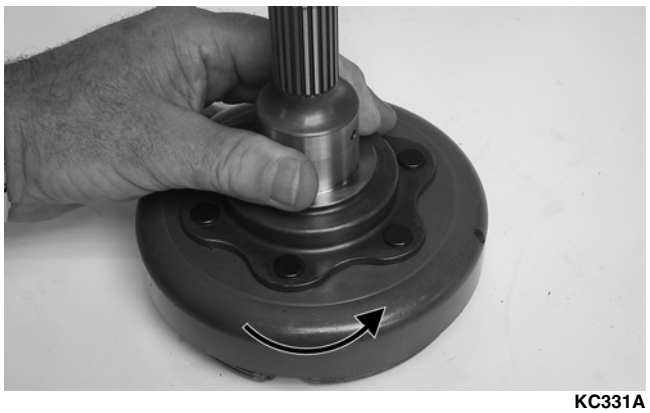
1. Place the one-way clutch onto the clutch shoe assembly with the green dot or the word "OUTSIDE" directed away from the clutch shoe.



KC330

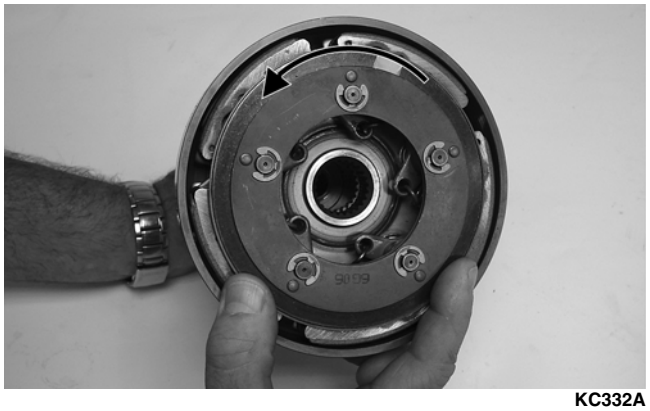
2. Place the clutch housing onto the clutch shoe/one-way clutch.

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



KC331A

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



KC332A

INSPECTING OIL PUMP

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

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

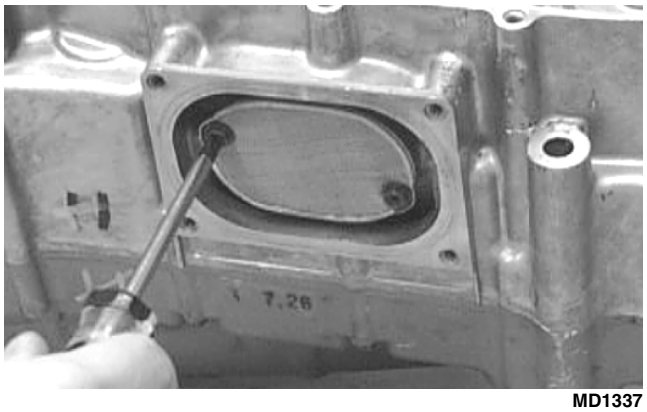
DRIVEN PULLEY ASSEMBLY

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

Installing Right-Side Components

A. Oil Strainer/Oil Pump

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

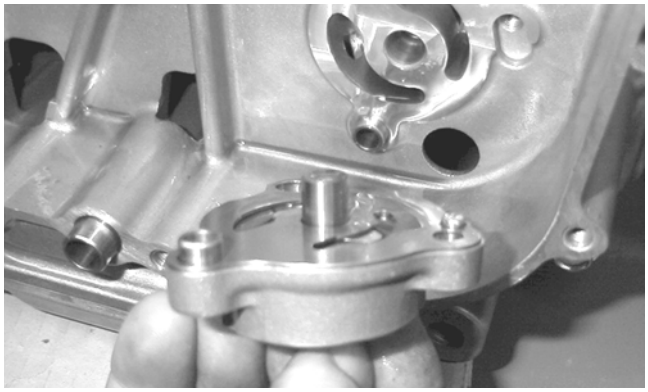


MD1337

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

MD1208

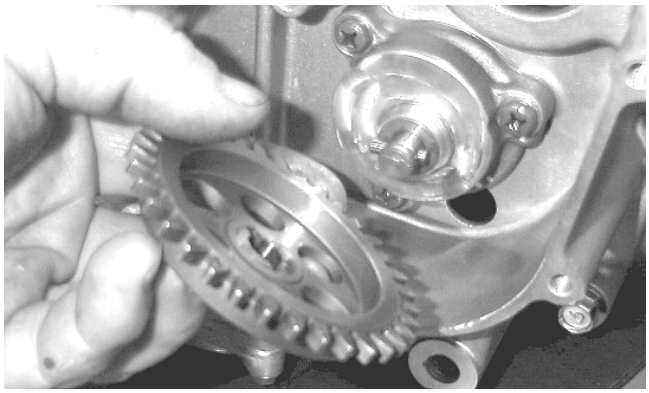
3. Place two alignment pins and the oil pump into position on the crankcase and secure with the Phillips-head screws coated with red Loctite #271. Tighten to 8 ft-lb.



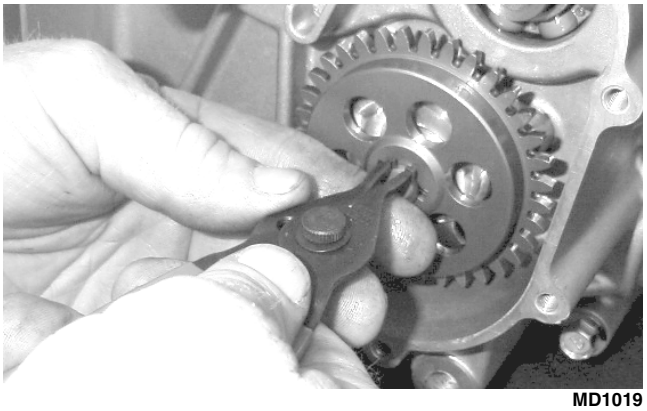
MD1060

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

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



MD1020



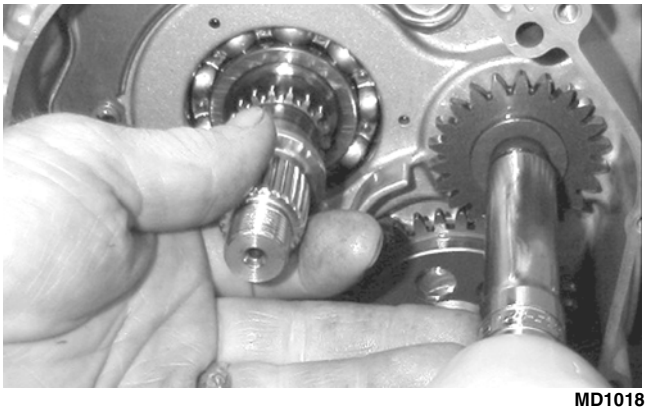
MD1019

5. Install the cam chain.

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

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

MD1017



MD1018

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

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

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

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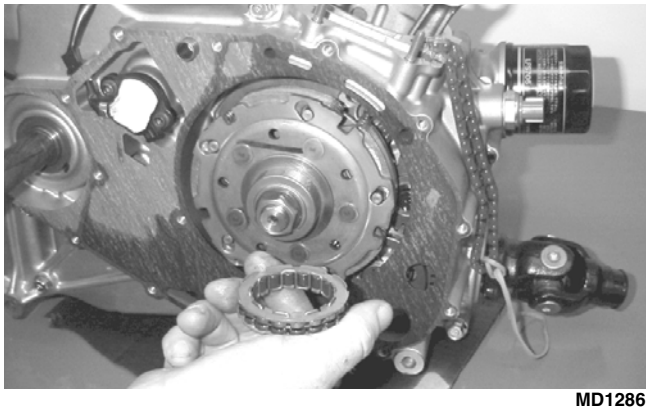
8. Install the one-way clutch making sure that the green dot or the word OUTSIDE is directed away from the crankcase.

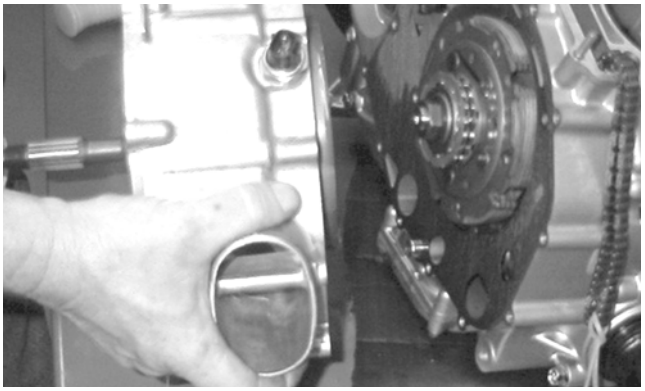


MD1286

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

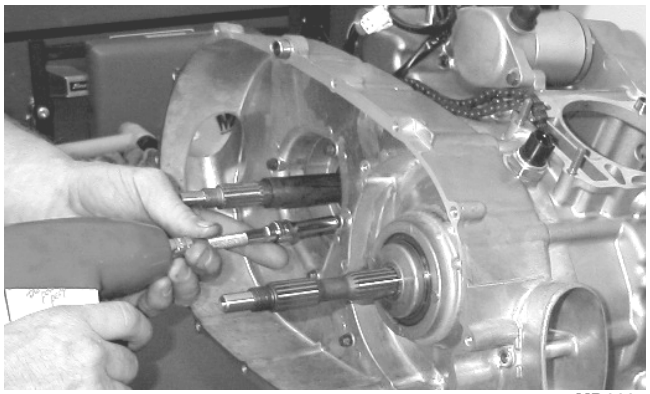
■NOTE: Steps 1-8 in the preceding sub-section must precede this procedure.

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



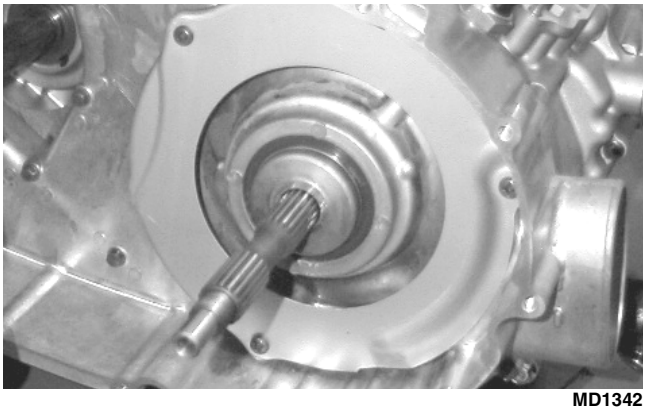
MD1115

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



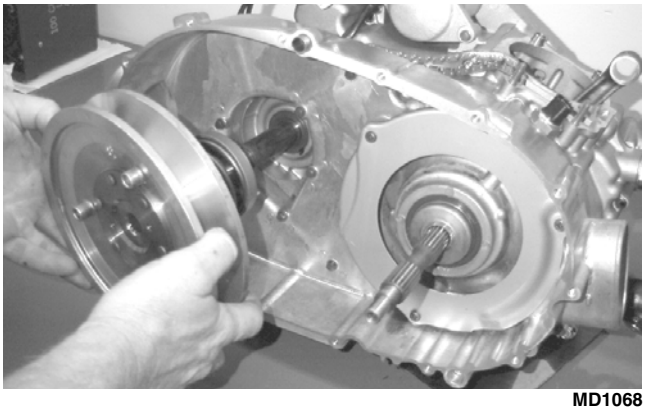
MD1117

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

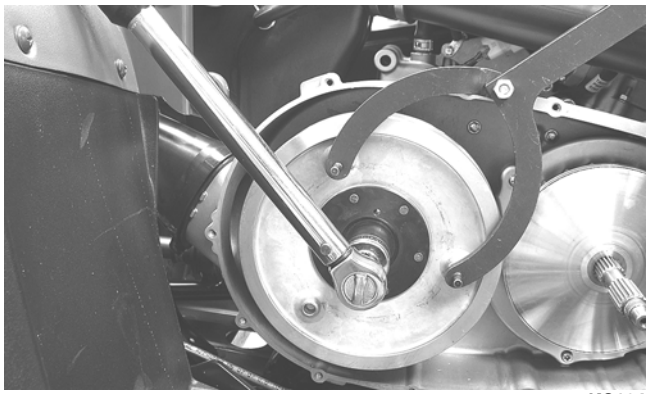


MD1342

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



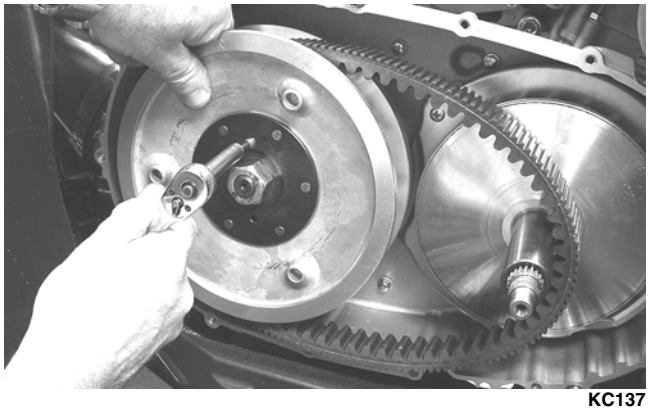
MD1068



KC134

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

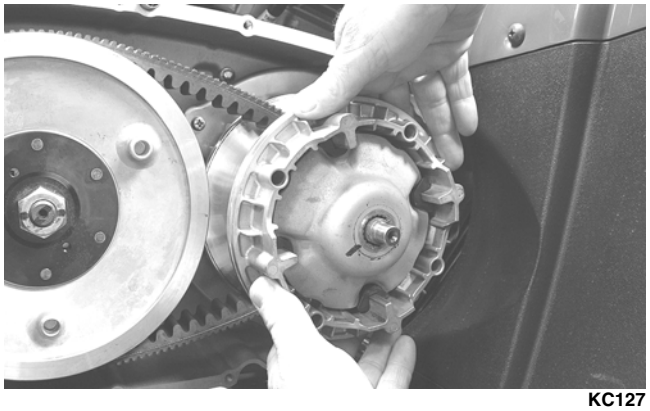
14. Spread the faces of the driven pulley by threading a V-belt cover cap screw into the fixed driven face and tightening until the faces open sufficiently to allow the V-belt to drop into the pulley approximately 3/4 in.



KC137

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

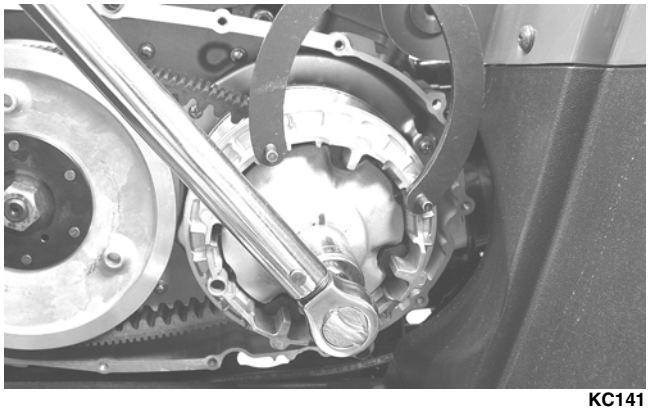
15. Making sure the movable drive face rollers are in position, pinch the V-belt together near its center and slide the spacer and movable drive face onto the shaft.



KC127

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

KC138

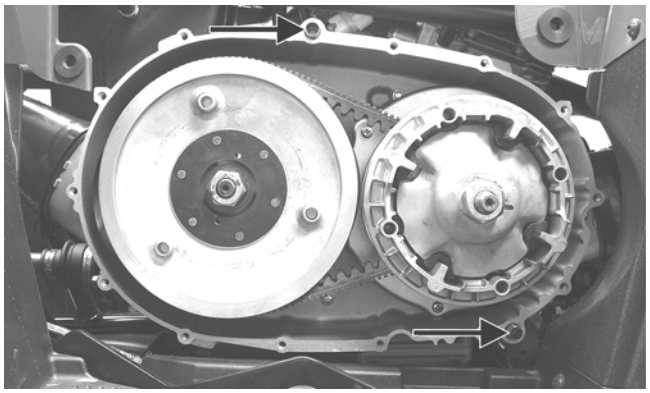


KC141

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

17. Rotate the V-belt and drive/driven assemblies until the V-belt is flush with the top of the driven pulley.

18. Install two alignment pins and place a new V-belt cover gasket into position on the clutch cover. In a crisscross pattern, tighten cap screws to 8 ft-lb.



KC142A

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.

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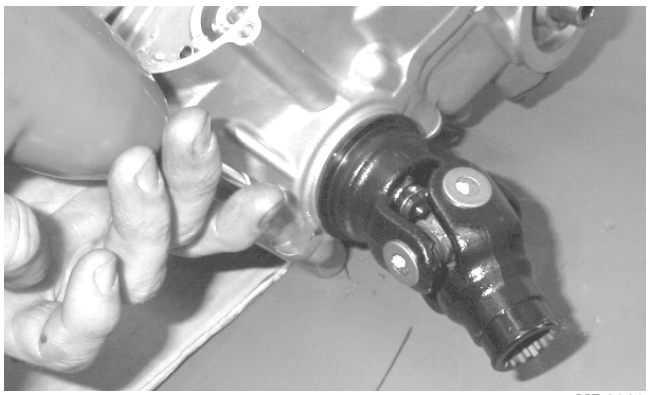
Separating Crankcase Halves

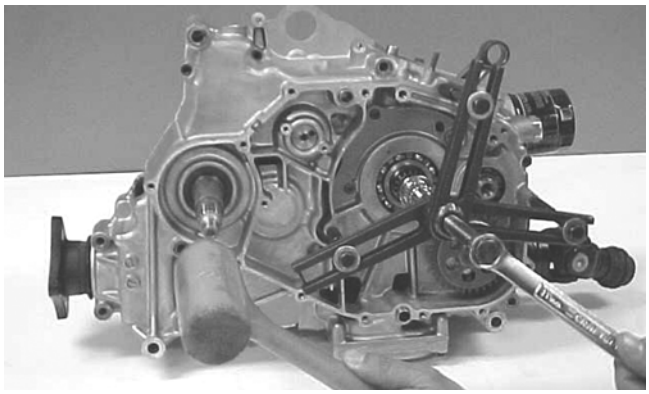
1. Remove the left-side and right-side cap screws securing the crankcase halves noting the position of the different-sized cap screws for joining purposes.

MD1006



MD1012

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



CC869

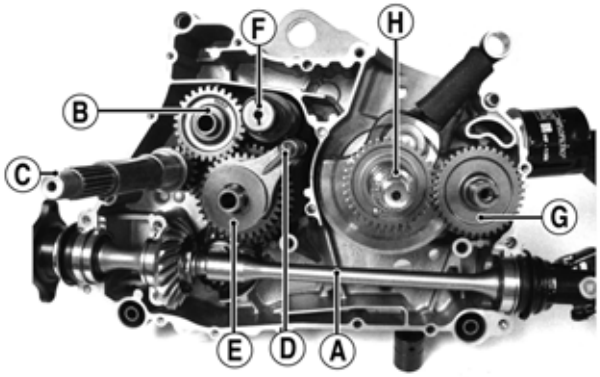
■NOTE: To keep the shaft/gear assemblies intact for identification, tap the shafts toward the left-side crankcase half when separating the halves.

MD1313

Disassembling Crankcase Half

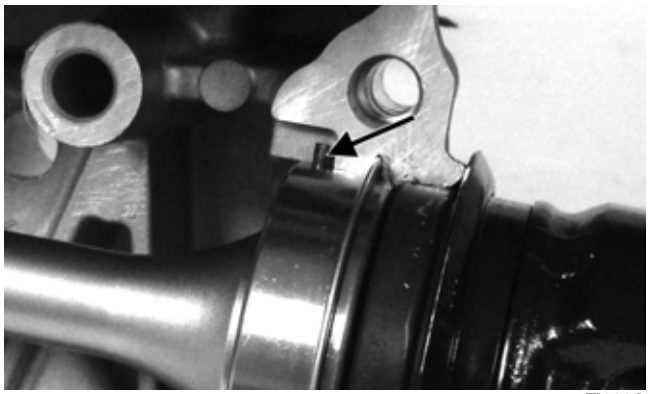
■NOTE: To aid in installing, it is recommended that the assemblies be kept together and in order.

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

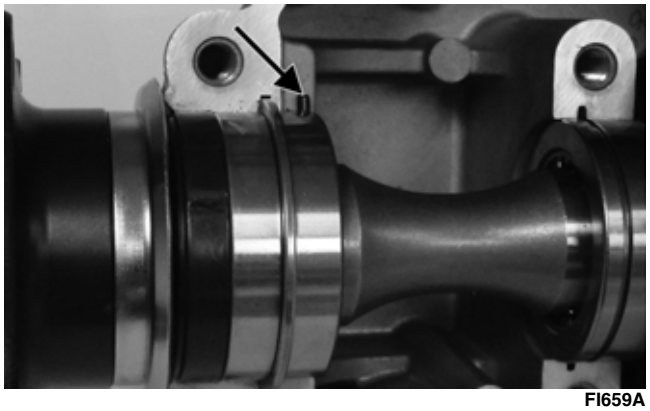


FI639A

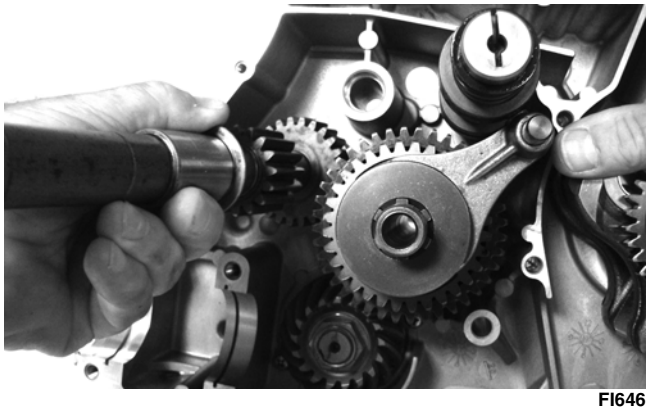
1. Remove the secondary driven shaft assembly (A) noting the location of the front and rear bearing locating pins and the center bearing locating ring.



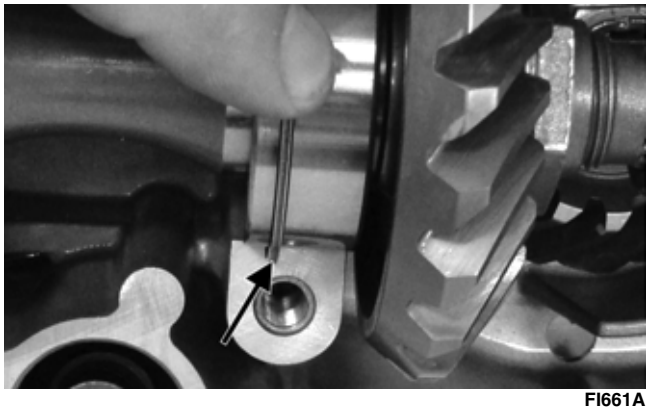
FI660A



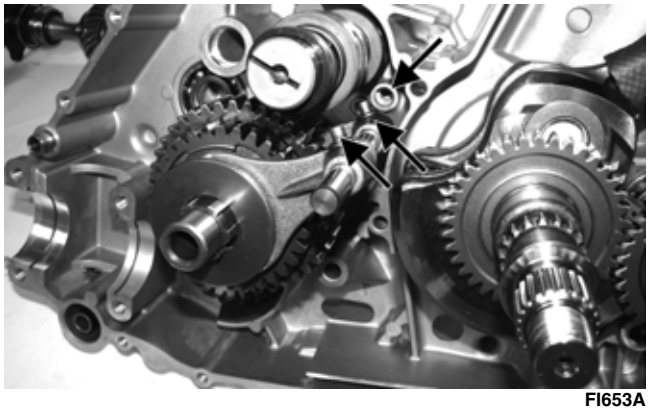
FI659A



FI646



FI661A



FI653A

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

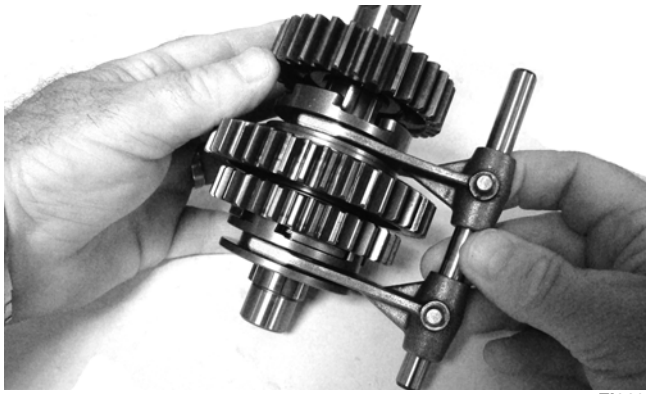
FI641A

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

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

FI650A

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



FI662

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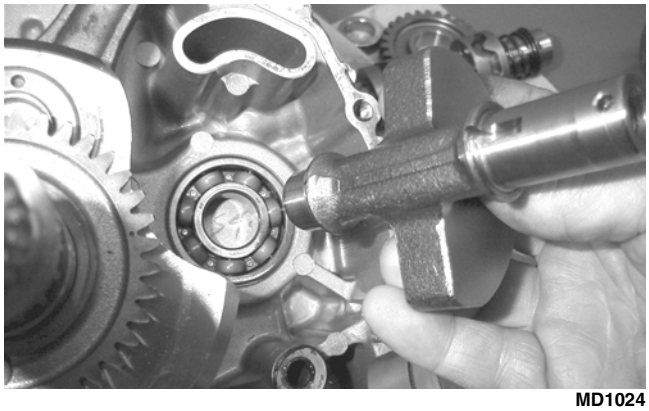
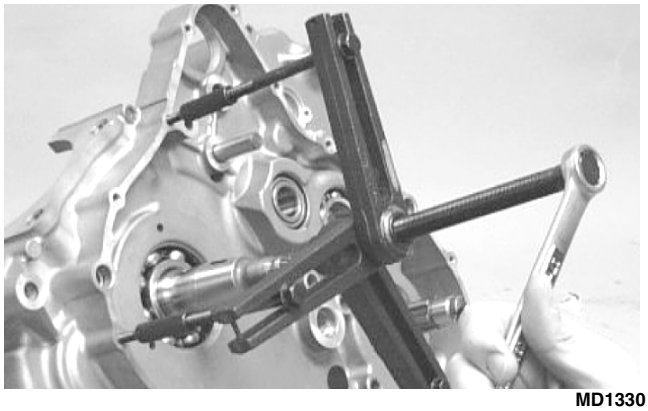
6. Remove the crank balancer driven gear (G) and account for a key; then remove the crankshaft balancer shaft.



MD1024

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



MD1330

CAUTION

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

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

☞ AT THIS POINT

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

Servicing Center Crankcase Components

■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 (centered on the gear tooth).
4. While rocking the driven bevel gear back and forth, note the maximum backlash reading on the gauge.
5. Acceptable backlash range is 0.05-0.33 mm (0.002-0.013 in.).

Correcting Backlash

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

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

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

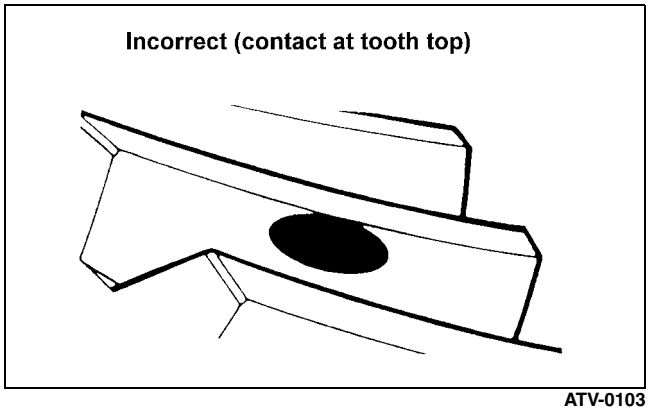
Backlash Measurement	Shim Correction
Under 0.05 mm (0.002 in.)	Decrease Shim Thickness
At 0.05-0.33 mm (0.002-0.013 in.)	No Correction Required
Over 0.33 mm (0.013 in.)	Increase Shim Thickness

Checking Tooth Contact

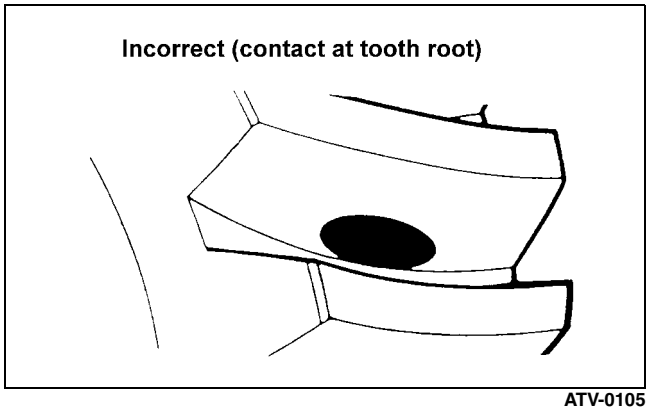
■NOTE: After correcting backlash of the secondary driven bevel gear, it is necessary to check tooth contact.

1. Remove the secondary driven output shaft assembly from the left-side crankcase half.

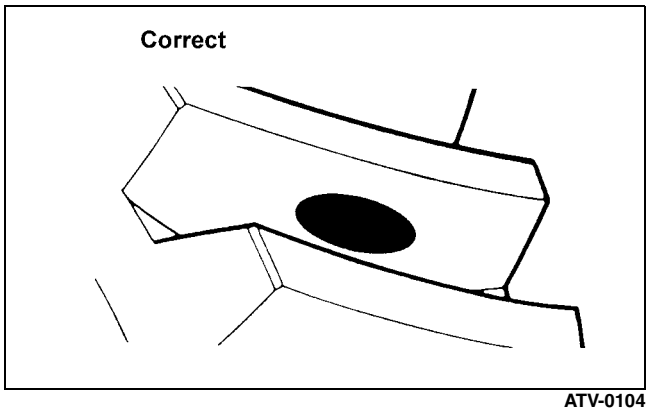
2. Clean the secondary driven bevel gear teeth of old oil and grease residue.
3. Apply a thin, even coat of a machinist-layout dye to several teeth of the gear.
4. Install the secondary driven output shaft assembly.
5. Rotate the secondary driven bevel gear several revolutions in both directions.
6.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



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

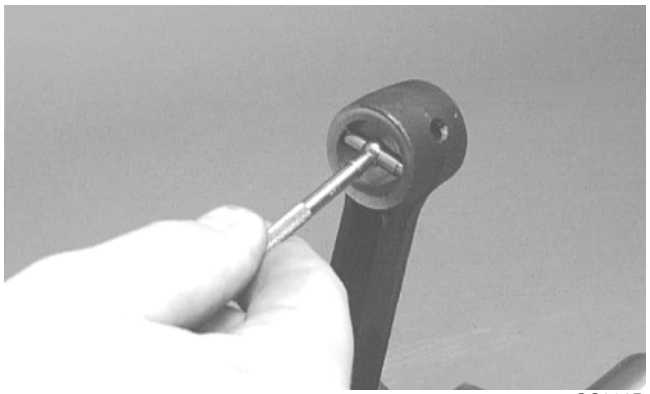
After correcting tooth contact, backlash must again be checked and corrected (if necessary). Continue the correcting backlash/correcting tooth contact procedures until they are both within tolerance values.

CRANKSHAFT ASSEMBLY

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

Measuring Connecting Rod (Small End Inside Diameter)

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


CC290D

2. Maximum diameter must not exceed specifications.

Measuring Connecting Rod (Small End Deflection)

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

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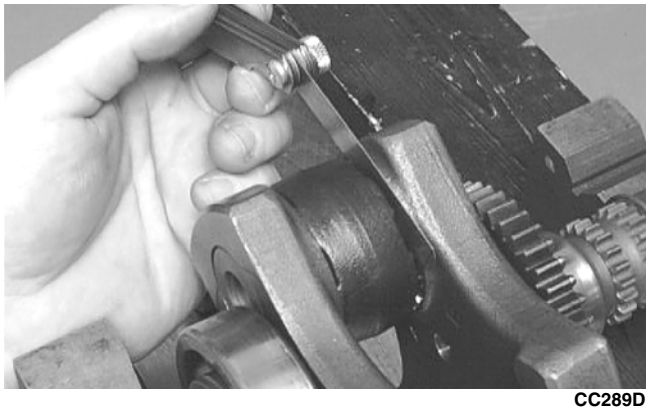
Measuring Connecting Rod (Big End Side-to-Side)

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

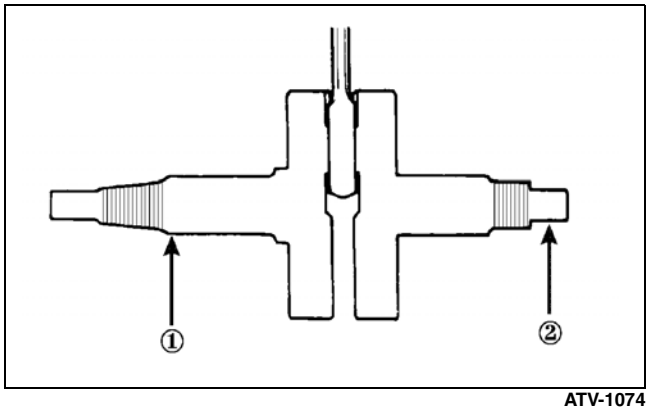


CC289D

3. Acceptable gap range must be within specifications.

Measuring Crankshaft (Runout)

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



ATV-1074

3. Zero the indicator and rotate the crankshaft slowly.

CAUTION

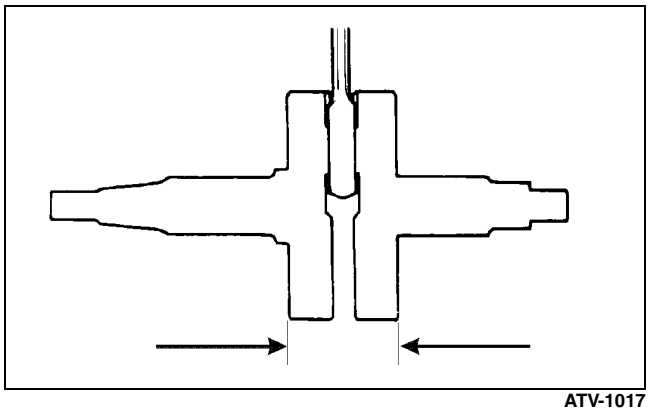
Care should be taken to support the connecting rod when rotating the crankshaft.

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 3-4.

Measuring Crankshaft (Web-to-Web)

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



ATV-1017

2. Acceptable width range must be within specifications.

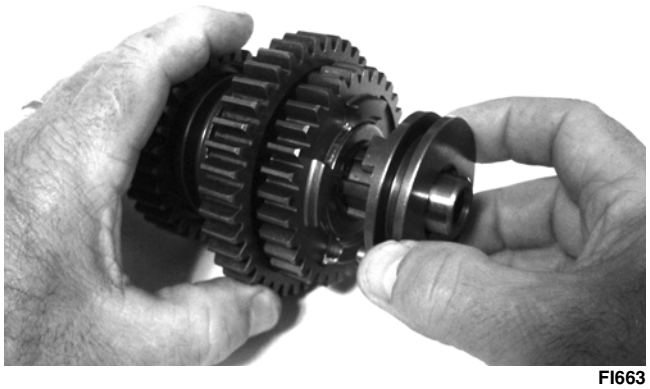
COUNTERSHAFT

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.

Disassembling

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



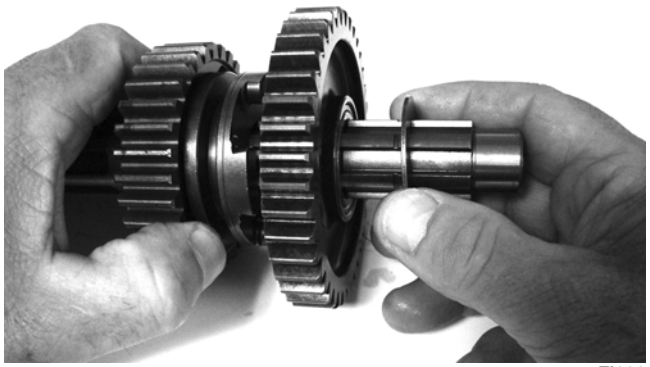
FI663

FI664

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

FI665

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

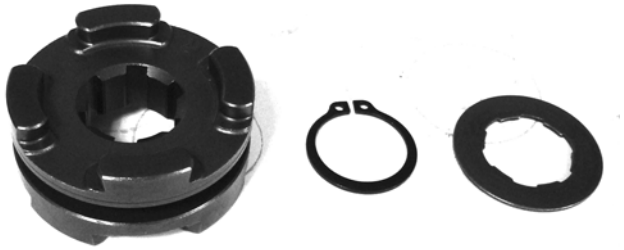


FI666

FI667

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

FI668



FI669

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

FI670

FI671

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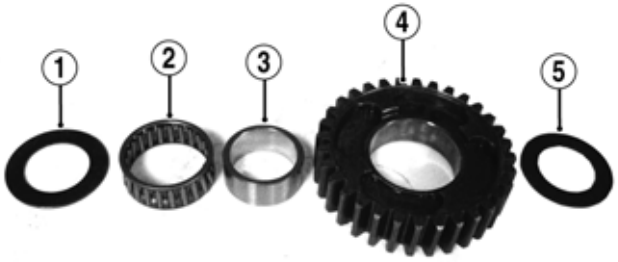
ASSEMBLING

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



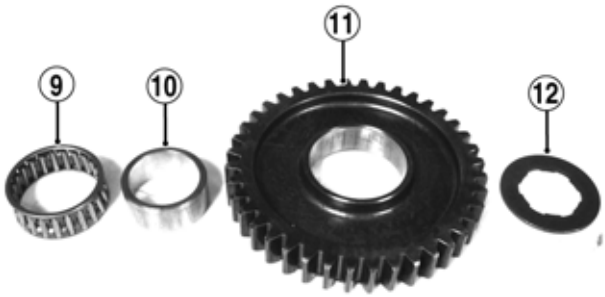
FI671A

FI670

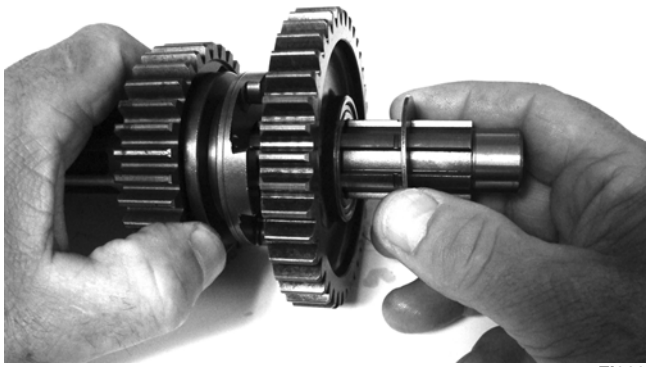
2. Install the high/low shift dog (6) on the countershaft and secure with snap-ring (7); then install the splined washer (8).

FI668A

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

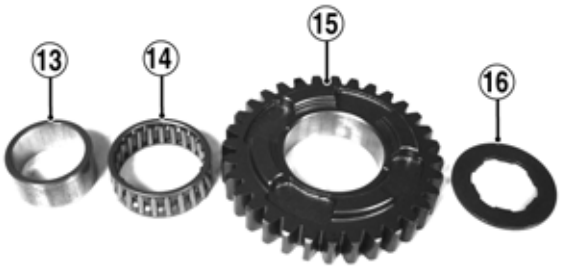


FI667A



FI666

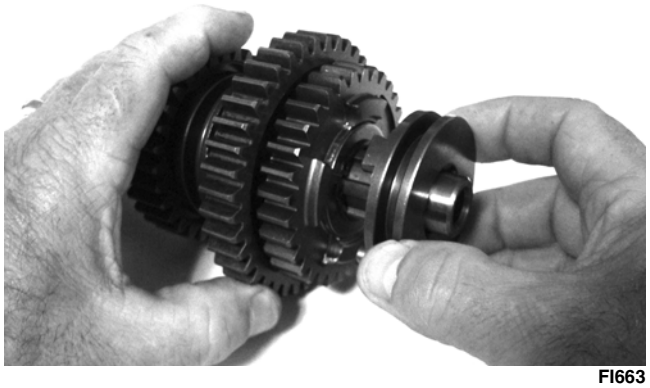
4. Place the reverse driven bushing (13) onto the shaft; then install the bearing (14), gear (15), and splined washer (16). Secure with a snap-ring.

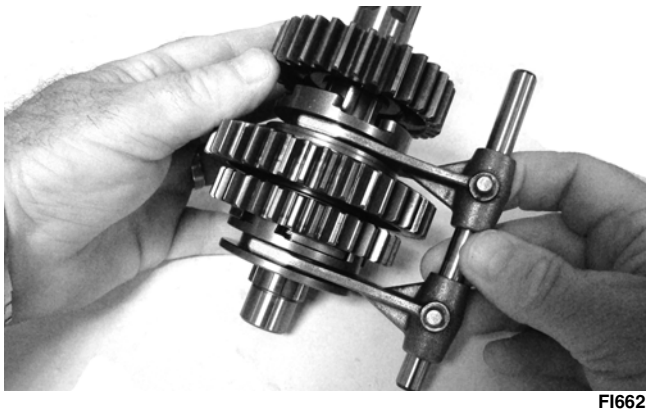


FI665A

FI664

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


FI663


FI662

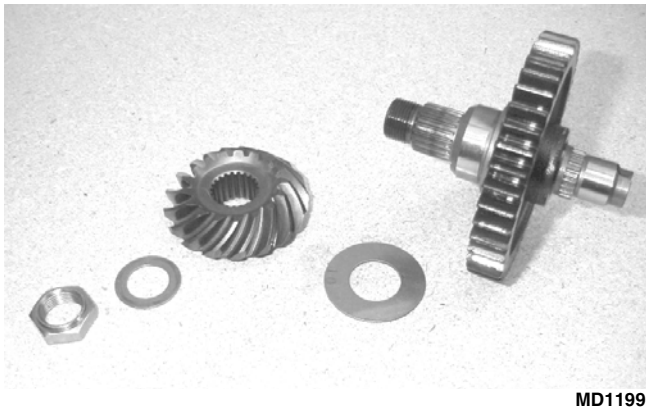
■**NOTE: The countershaft assembly is now ready to be installed.**

Assembling Crankcase Half

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

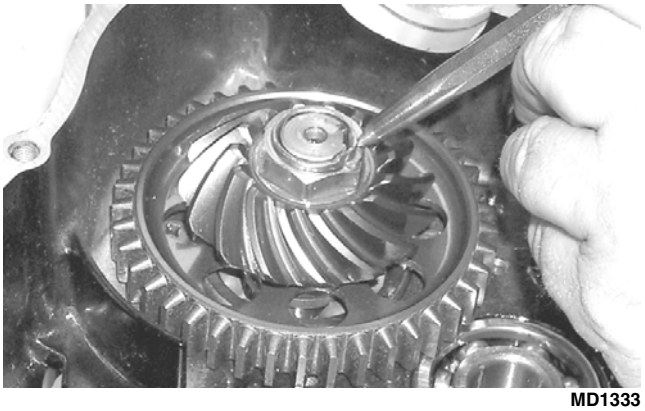
■**NOTE: If the output shaft was removed, make sure that the proper shim is installed.**

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

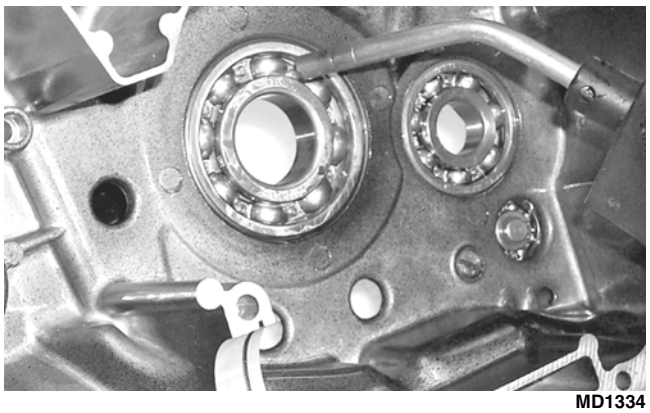

MD1199


MD1079

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


MD1333

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


MD1334

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

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

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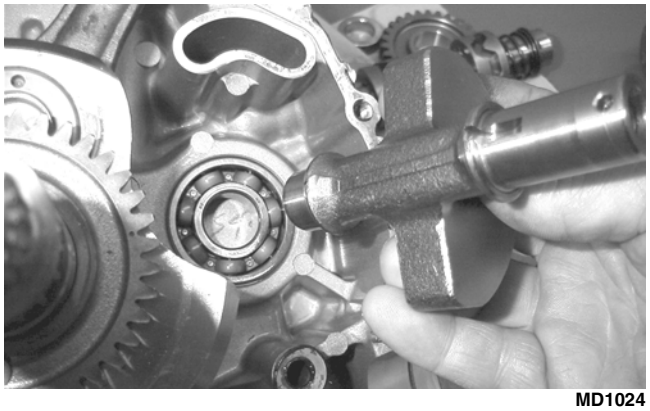
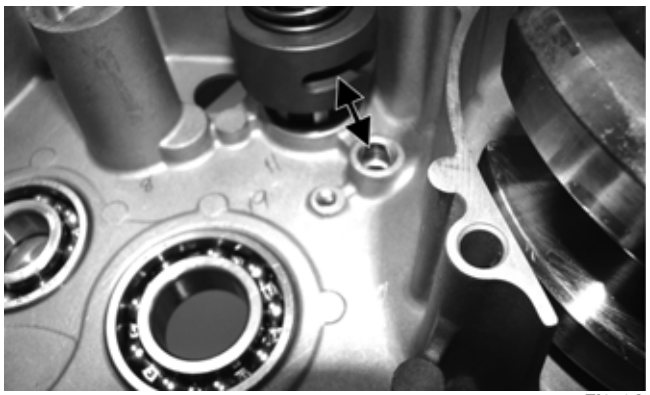


MD1024

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

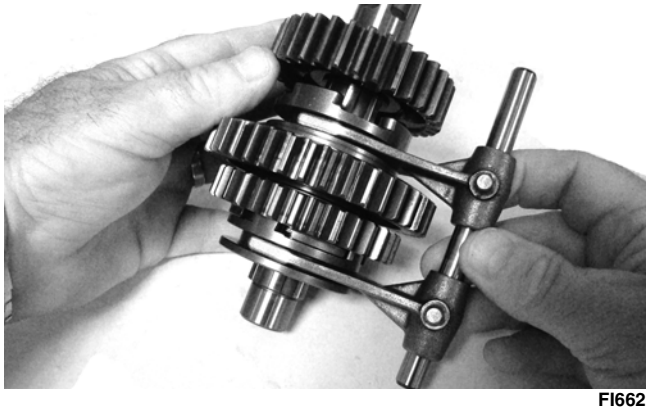
FI658

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

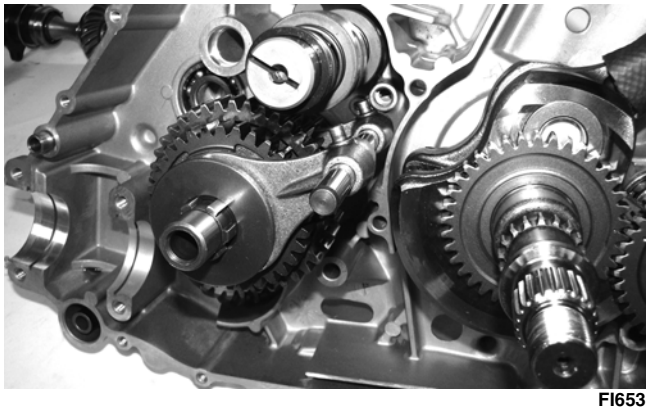


FI652A

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

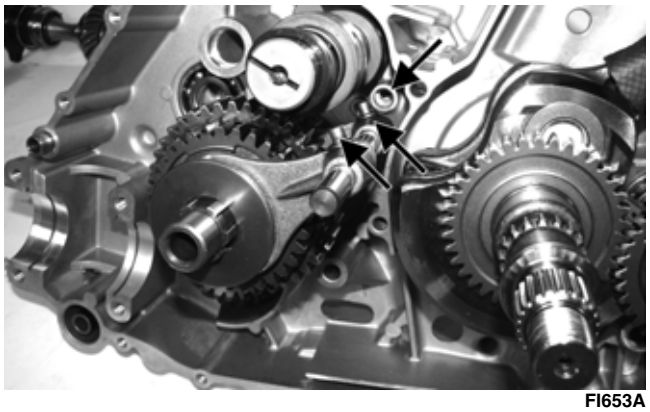


FI662



FI653

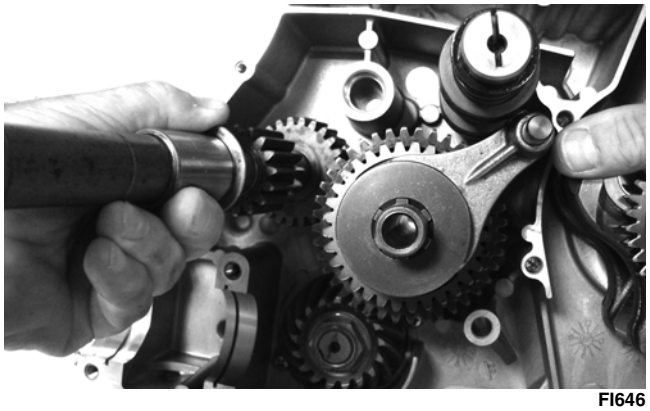
8. Align the shift forks to allow engagement with the shift cam; then engage the shift forks and slide the shift fork shaft into the locating boss in the crankcase.



FI653A

FI655A

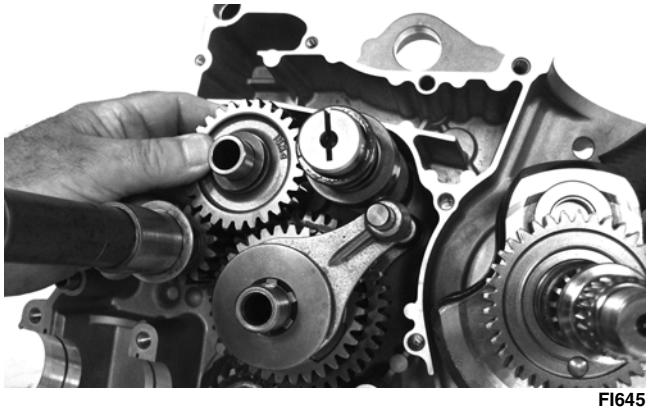
9. Install the input driveshaft.



FI646

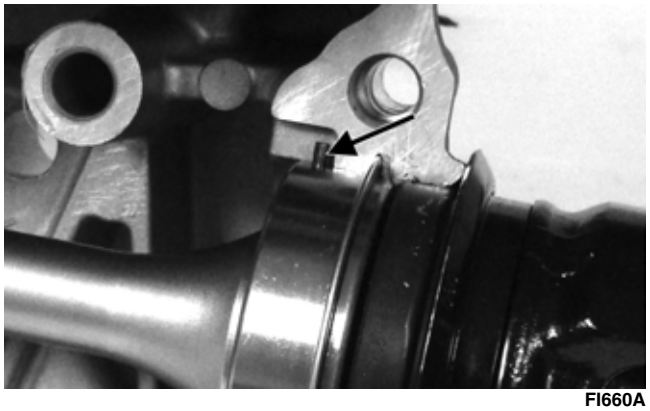
10. Install the spacer (1), shaft (2), reverse idler gear, and washer (3).

FI641A

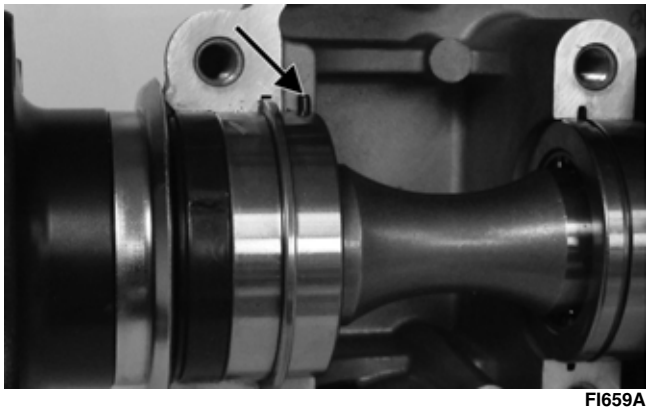


FI645

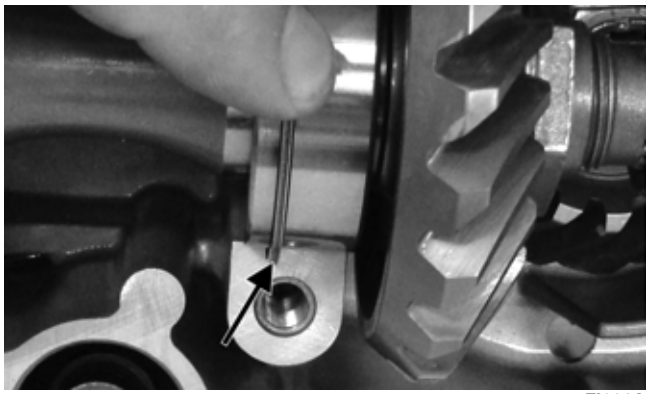
11. Install the secondary output driveshaft assembly into the crankcase half making sure the front and rear bearing alignment pins are seated in the recesses; then install the center carrier bearing alignment C-ring.



FI660A



FI659A



FI661A

Joining Crankcase Halves

1. Verify that the two alignment pins (A) are in place and that both case halves are clean and grease free. Apply Three Bond Sealant to the mating surfaces. Place the right-side half onto the left-side half.

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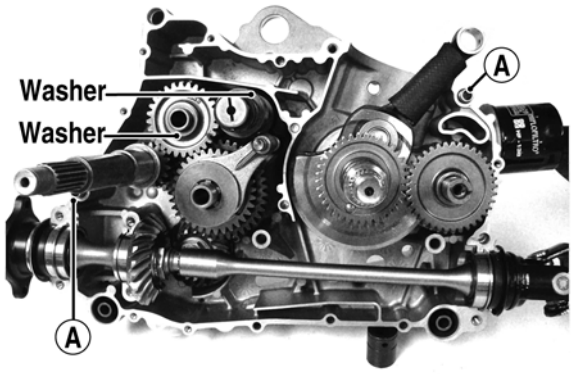
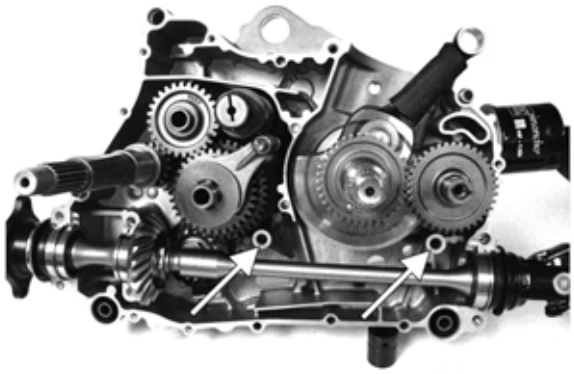


FI639B

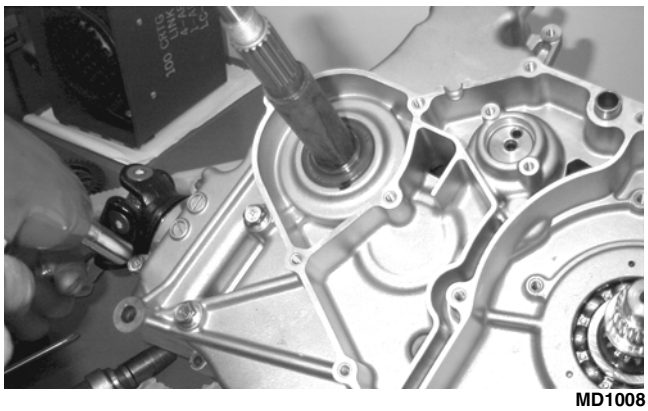
■**NOTE: Be sure to apply sealant to the inside radius of all cap screw locations and the entire surface of the internal cap screw bosses.**



FI639C

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

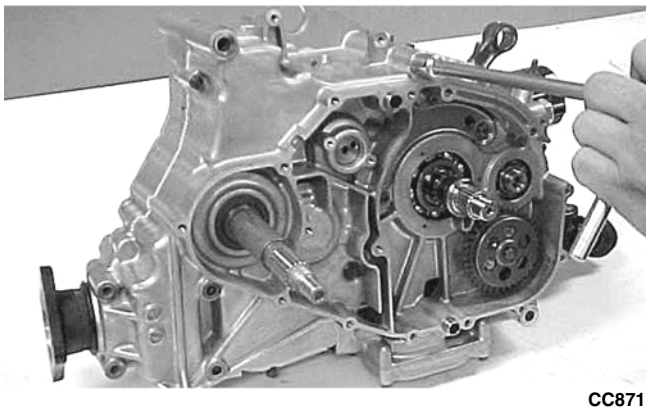
■**NOTE: Rotate the shafts back and forth to ensure no binding or sticking occurs while tightening the cap screws.**



MD1008

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

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



CC871

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

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

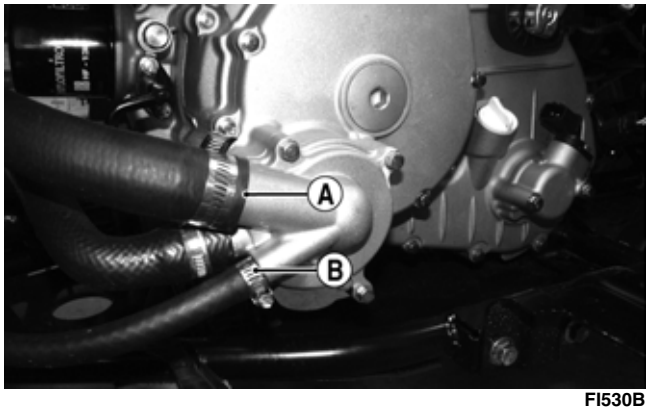
6. In a crisscross pattern, tighten the 6 mm cap screws to 10 ft-lb.

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

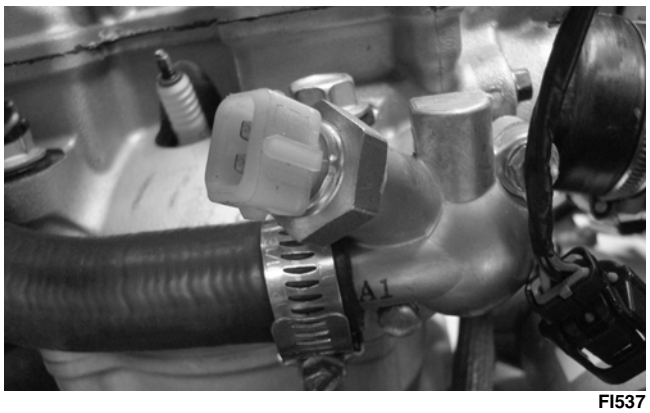
☞ AT THIS POINT
After completing center crankcase components, proceed to Installing Right-Side Components, to Installing Left-Side Components, and to Installing Top-Side Components.

Installing Engine/Transmission

1. From the left side, place the engine into the frame (rear of engine first) tilting the rear up to allow cylinder head to clear frame.
2. With engine moved rearward, engage the splines of the front driveline into the front output drive yoke; then move into position and install the two through-bolts. Secure with lock nuts and tighten to 35 ft-lb.
3. Install the four cap screws securing the rear driveline to the output drive flange and tighten to 20 ft-lb.
4. Connect coolant hoses (A) and (B) to the water pump and connect the upper coolant hose to the thermostat housing. Tighten all clamps securely.



FI530B


FI537

5. Install the exhaust pipe using a new seal at the cylinder head and loosely install the retaining cap screws; then install the muffler with a new grafoil seal and secure with two springs. Tighten the exhaust pipe retainer cap screws to 20 ft-lb.

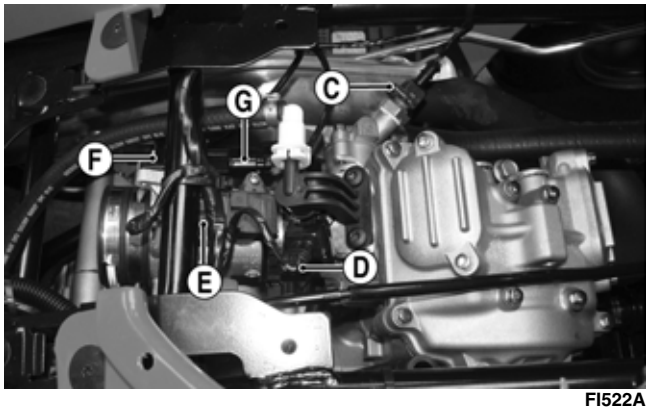
6. Connect the throttle cable and adjust free-play to specifications (see Section 4); then tighten the jam-nut securely and install the cover. Tighten the screws securely.

7. Connect the stator connector (H) and crankshaft position sensor connector (I) to the main harness; then connect the positive cable to the starter motor and tighten securely.

FI534A

8. Connect the engine ground cable to the starter mounting flange and secure with a cap screw tightened to 8 ft-lb.

9. From the top side, install the ECT sensor connector (C), fuel injector connector (D), MAP/IAT sensor connector (E), ISC connector (F), and the TPS connector (G).



FI522A

10. Place the air filter assembly into position and connect the crankcase breather securing with the clamp; then connect the front air inlet duct and secure with a hose clamp.

11. Install the harness connector onto the coil and install the spark plug cap.

12. Connect the air ducts to the CVT housing and tighten the clamps securely; then connect the air duct to the air filter housing and the throttle body and secure with the clamps.

13. Install the storage compartment and connect the negative battery cable; then install the tool tray.

14. Pour the specified amount of coolant into the radiator and the specified amount and grade of oil into the engine.

15. Install the left footwell support assembly, footwell, and footrest. Tighten all fasteners securely.

16. Install the seat making sure it locks securely in place; then start the engine and allow to warm up while checking for leaks.

17. Shut engine off and inspect coolant and oil levels. Add fluids as required.

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Removing Engine/ Transmission

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

☞ AT THIS POINT

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

☞ AT THIS POINT

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

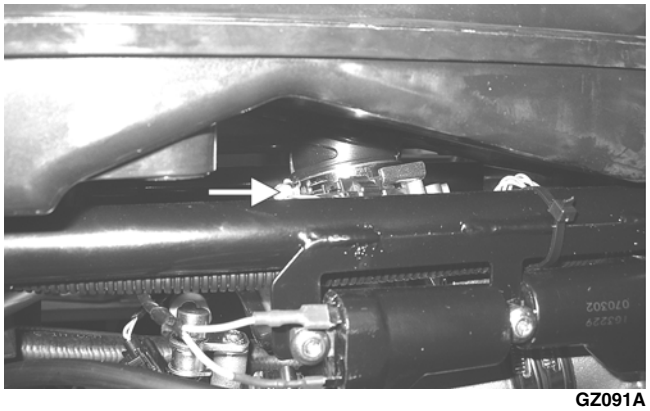
Secure the ATV on a support stand to elevate the wheels.

⚠ WARNING

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

1. Remove the seat and tool tray; then remove the negative battery cable.
2. Remove the front rack, gauge pod, footwells and footrests; then remove the front body panel (see Section 8).
3. Disconnect the IAT sensor connector; then loosen the clamp securing the inlet air boot to the throttle body and remove the air filter housing assembly.

GZ013

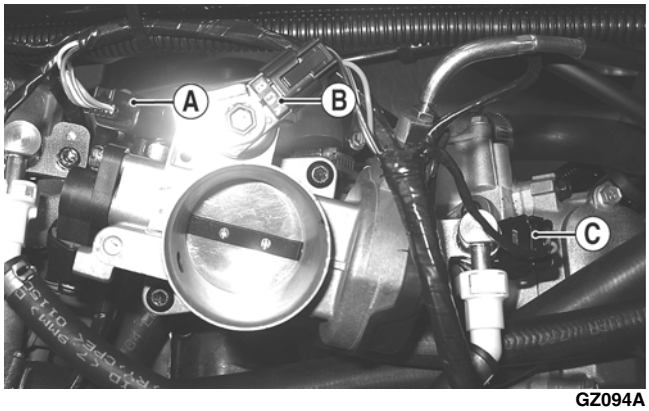


GZ091A

4. Using an absorbent towel, clean any spilled gasoline; then press the gasline hose connectors and remove from the fuel rails.

GZ124

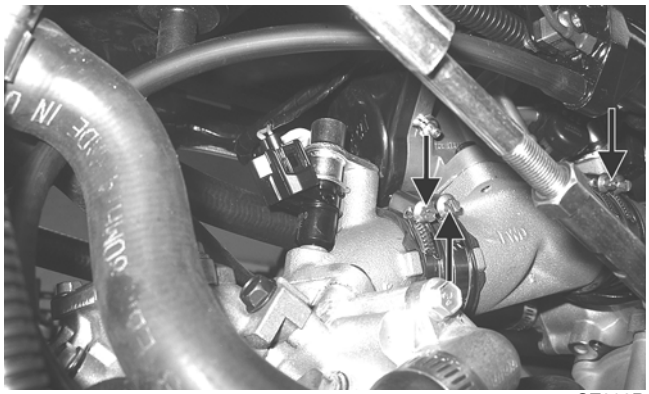
5. Disconnect the TPS connector (A), MAP sensor connector (B), and ISC valve connector (C) from the throttle body; then route the harness and connectors away from the engine.



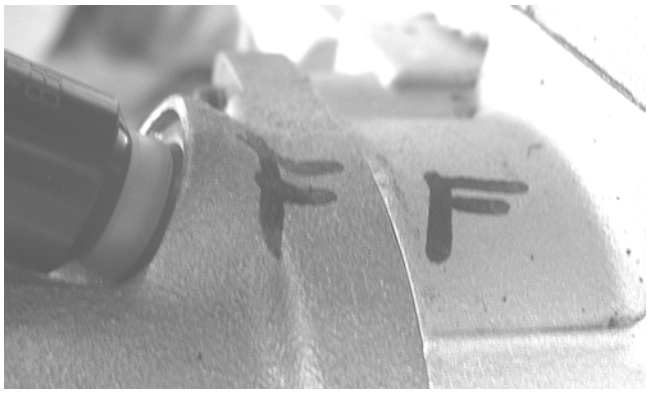
GZ094A

■NOTE: Using a suitable marker, mark the locations of any ties that are removed to relocate wiring out of the way.

6. Loosen the clamps securing the throttle body to the intake manifolds; then remove the throttle body and leaving the throttle cable connected, lay the assembly over the handlebar.

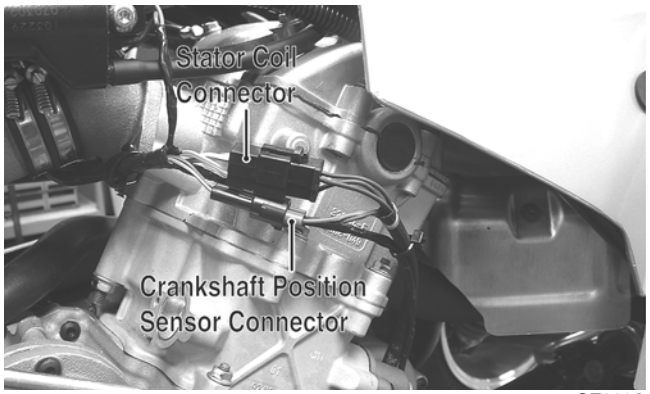

GZ090B

7. Disconnect the fuel injector wiring connectors; then remove the intake manifolds leaving the injectors installed.


GZ106

GZ107

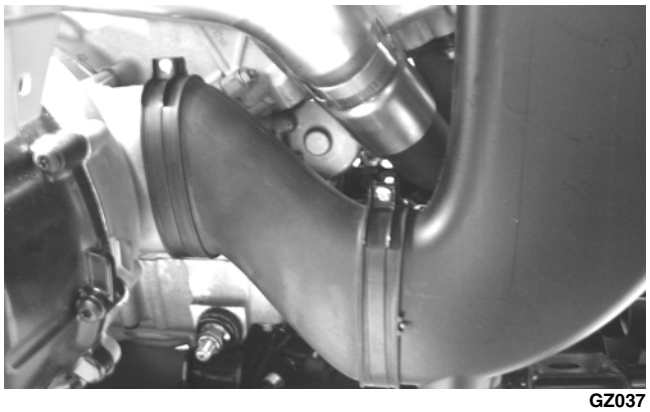
8. Disconnect the stator coil connector and the crankshaft position sensor connector; then disconnect the gear position switch connector from the gear position switch.



GZ069A

GZ493A

9. Loosen the clamps securing the V-belt cooling ducts to the V-belt housing; then disconnect the cooling ducts.


GZ037

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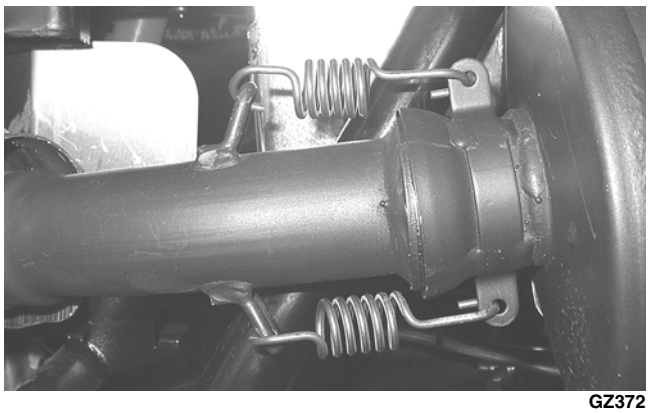
GZ103B

10. Remove the E-clips securing the shift linkage to the shift lever and shift shaft; then remove the shift linkage. Account for two bushings and two flat washers.
11. Remove the cap screws securing the rear driveshaft yoke flange to the rear output flange.

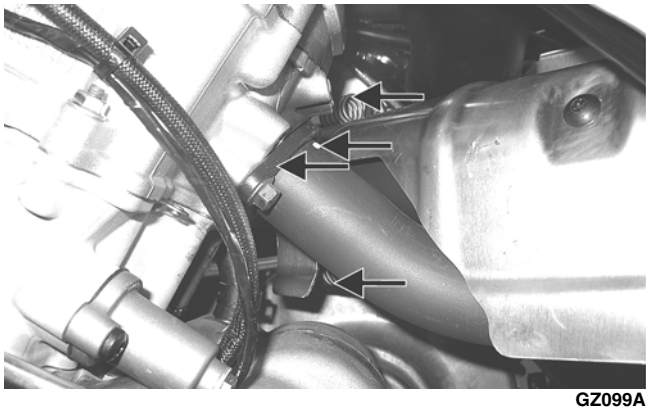
GZ374

12. Remove the exhaust pipe springs at the muffler and remove the muffler. Account for the grafoil seal.



GZ372

13. Remove the nuts securing the rear exhaust pipe to the cylinder; then remove the springs securing the rear exhaust pipe to the front exhaust pipe and remove the rear exhaust pipe. Account for a grafoil seal on the pipe juncture and a seal in the cylinder.

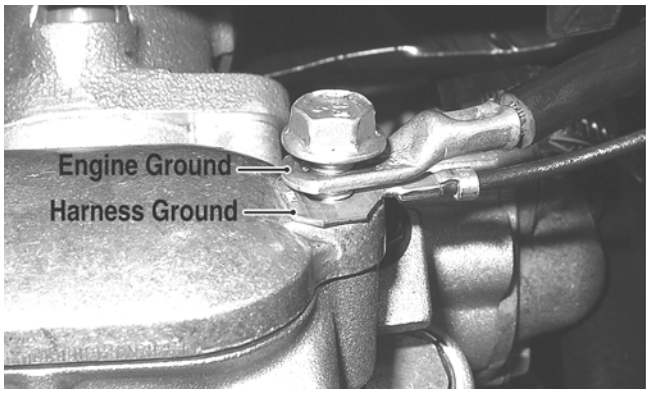


GZ099A

14. Remove the front and rear spark plug wires from the spark plugs; then disconnect the primary wire connectors from the coils and remove the coils from the left side of the frame.

GZ071A

15. Remove the cap screw securing the engine and harness grounds to the engine.

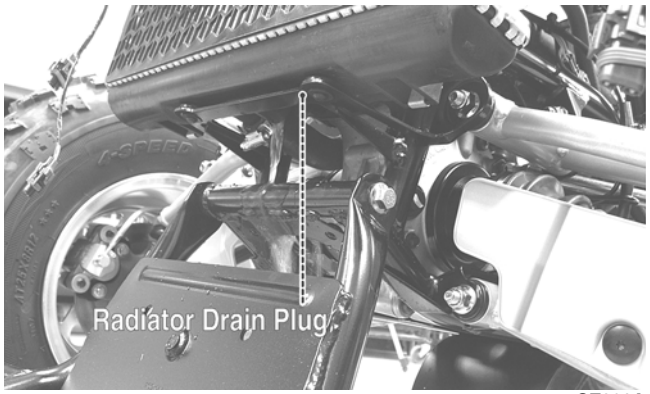


GZ064A

16. Remove the cap screws securing the upper bumper support to the frame and swing the bumper forward allowing access to the radiator drain plug.

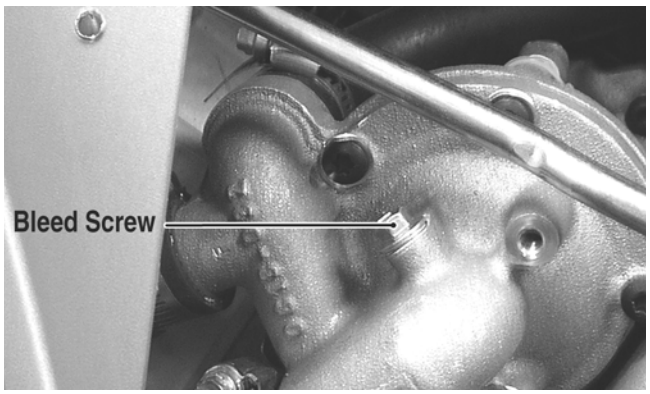
GZ068

17. Place a suitable drain pan under the radiator; then remove the radiator drain plug. Do not loosen the radiator cap at this time.



GZ086A

18. Remove the bleed screw from the water pump; then after coolant has drained, apply compressed air to the bleed opening to purge the remaining coolant from the system. Install the bleed screw and radiator drain plug and tighten securely.

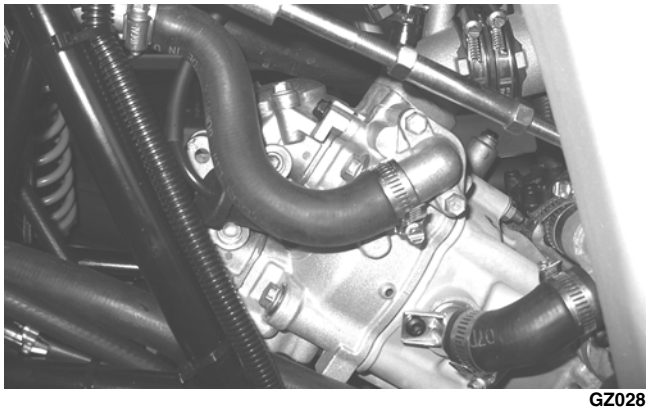


GZ009A

⚠ WARNING

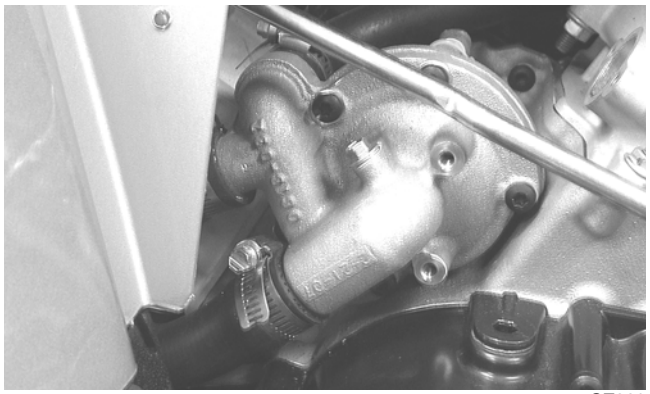
Always wear safety glasses when using compressed air.

19. Remove the coolant hoses from the upper engine coolant outlet pipes; then remove the lower coolant hose from the water pump.



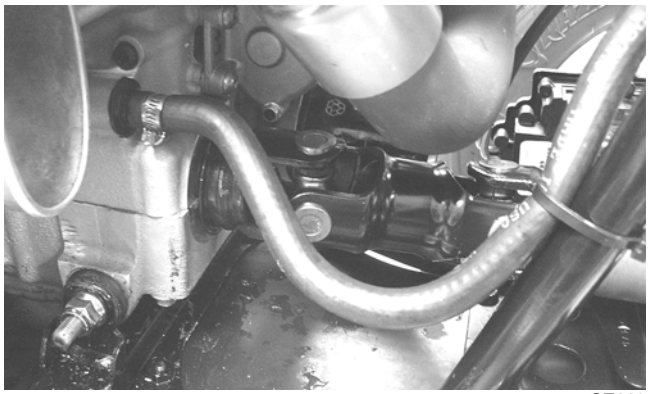
GZ028

GZ369A

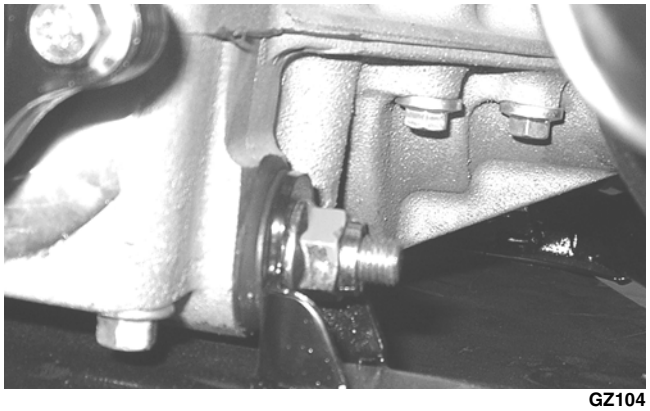


GZ008

20. Remove the flange nuts from the front and rear engine through-bolts; then rock the engine slightly to relieve engine mount pressure and remove the through-bolts.

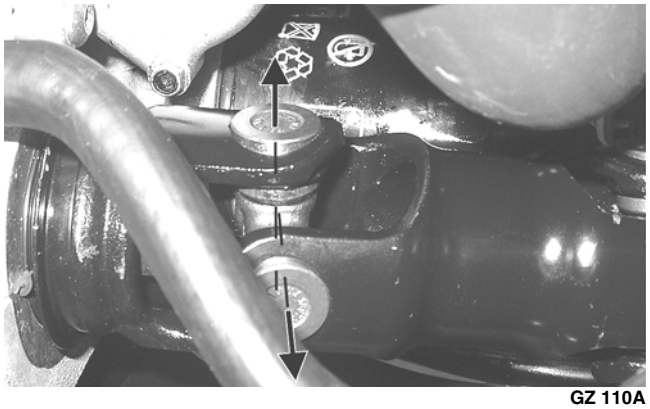


GZ118



GZ104

21. Rotate the front driveshaft until the output yoke universal joint is in the vertical plane; then raise the front of the engine/transmission until the front drive splines disengage from the differential.



GZ 110A

GZ117A

22. Fold the front drive line up and secure against the front of the engine; then lift the engine clear of the mountings and remove from the right side of the frame.

GZ123

Top-Side Components

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

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

■**NOTE: The engine/transmission must be removed to service the rear cylinder head, cylinder, and piston.**

Removing Top-Side Components

3

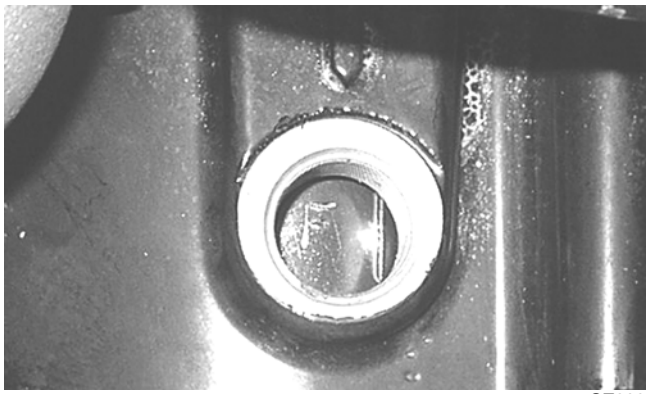
A. Valve Cover/Rocker Arms
B. Cylinder Head/Camshaft

1. Remove the timing inspection plug, spark plugs, and magneto housing cover; then install the 10 mm cap screw (left-hand threads) in the crankshaft and rotate the desired cylinder to top-dead-center of the compression stroke.

GZ027

GZ026

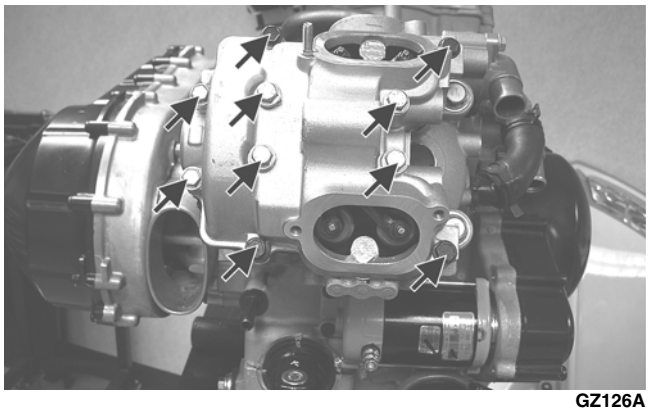
■NOTE: Timing marks on the rotor/flywheel are stamped with an "F" (front cylinder) and "R" (rear cylinder) adjacent to the mark.



GZ063

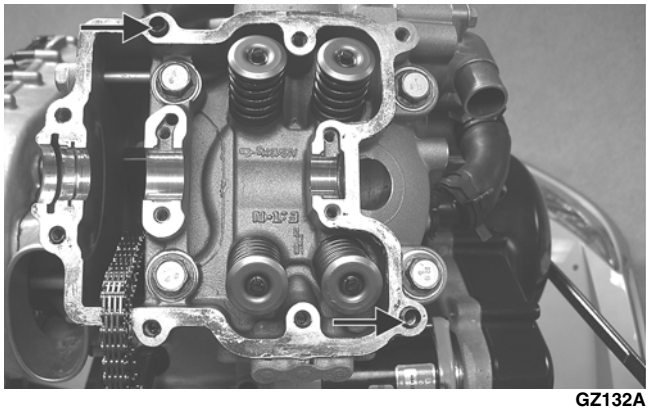
GZ059

2. Remove the tappet covers on the cylinder being serviced. The tappets should not have pressure on them.
3. Remove the 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 camshaft plug. Note the location of two alignment pins.



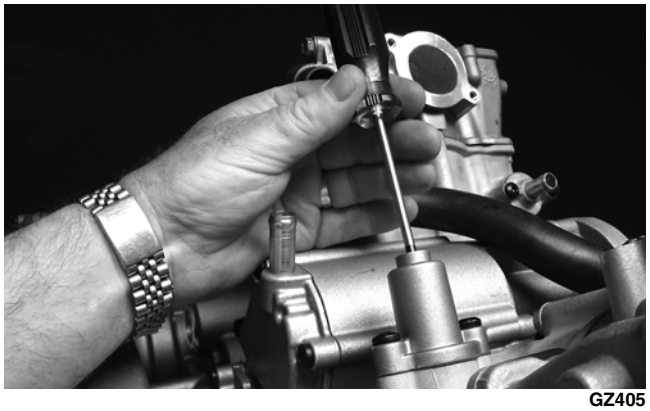
GZ126A

GZ162



GZ132A

4. Remove the cap screw on the end of the tensioner; then using a flat-blade screwdriver, turn the tensioner clockwise to remove the tension. Remove the two cap screws securing the tensioner adjuster assembly and remove the assembly. Account for a gasket.



GZ405

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

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

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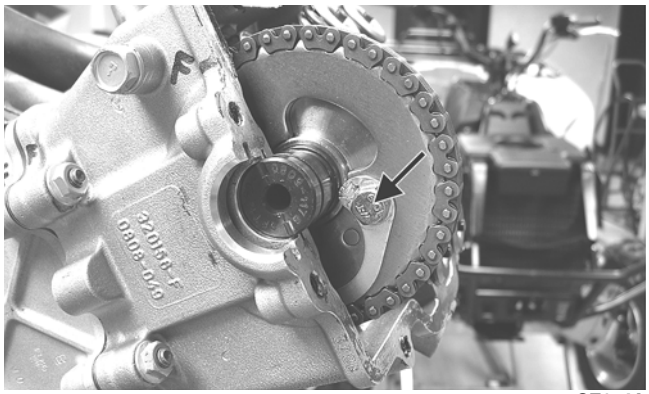
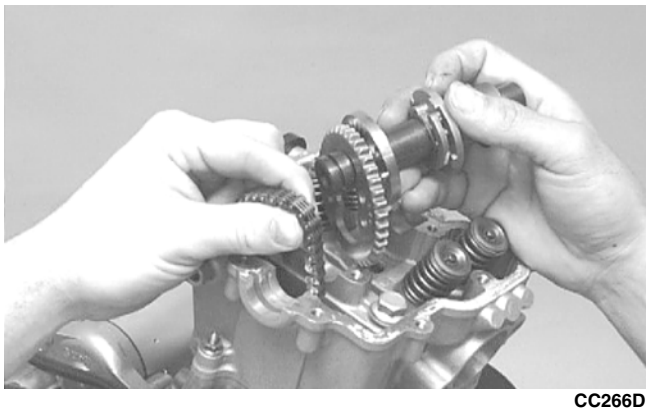
GZ155

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



GZ154A

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

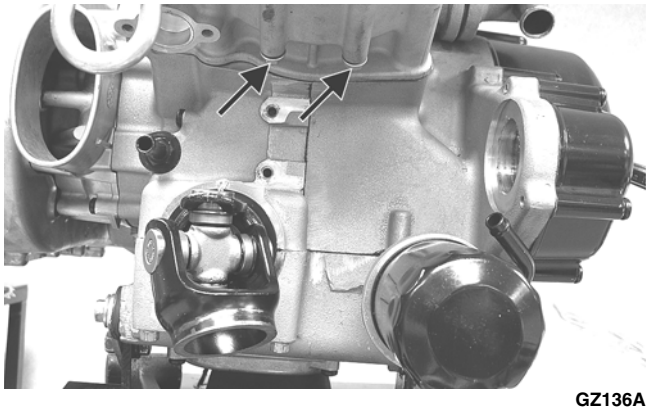


CC266D

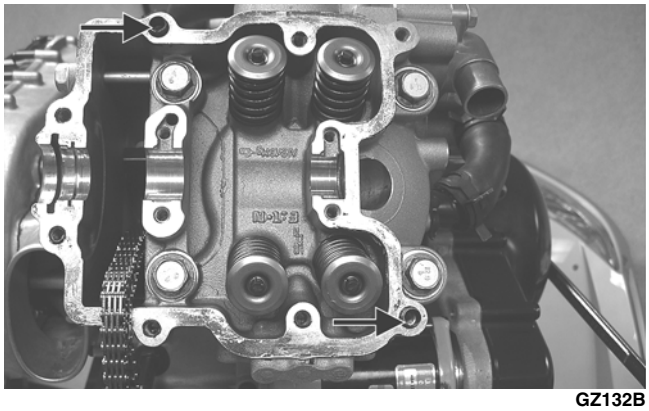
■NOTE: Loop the chain over the cylinder head and secure it to keep it from falling into the crankcase.

8. Remove the five nuts securing the cylinder head to the cylinder; then remove the four cylinder head cap screws and washers.

■NOTE: Removing the starter will simplify removal of the front cylinder base nuts.

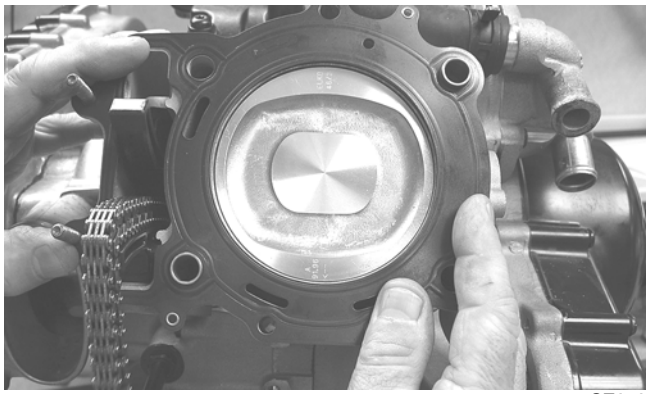


GZ136A



GZ132B

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



GZ151

GZ161

10. If the remaining cylinder head is to be serviced, apply tension to the loose timing chain and rotate the second cylinder to top-dead-center of the compression stroke; then repeat steps 2-9 on the other cylinder head.

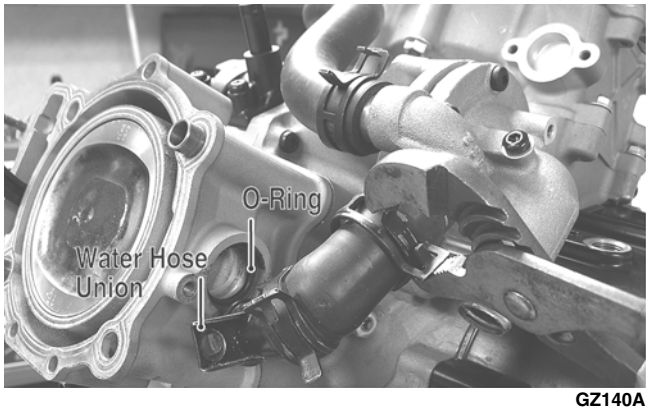
☞ AT THIS POINT
To service valves and cylinder head, see Servicing Top-Side Components sub-section.

☞ AT THIS POINT
To inspect cam chain guide, see Servicing Top-Side Components sub-section.

C. Cylinders
D. Pistons

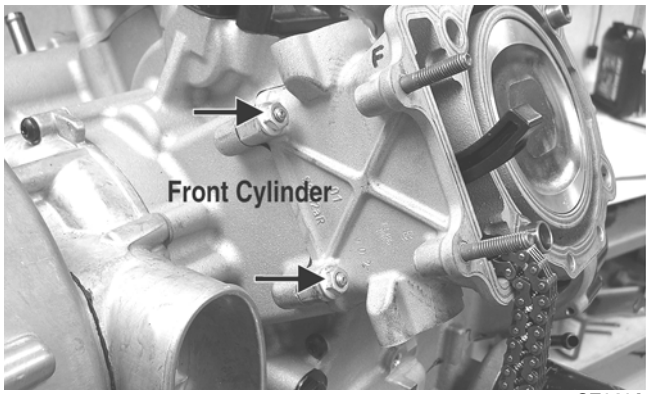
■NOTE: Steps 1-10 in the preceding sub-section must precede this procedure.

11. Remove the cap screws securing the water hose union to the cylinder; then remove the union from the cylinder. Account for an O-ring.

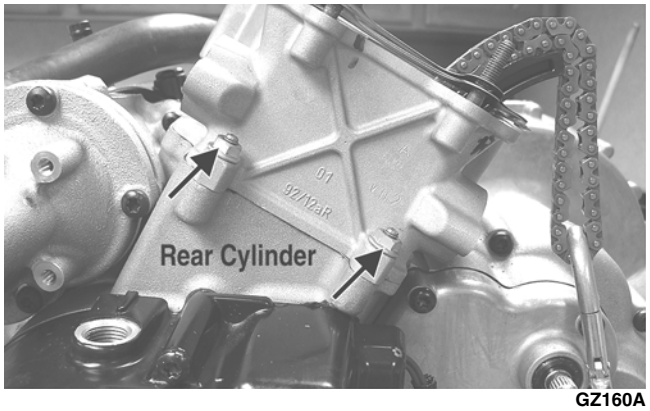


GZ140A

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

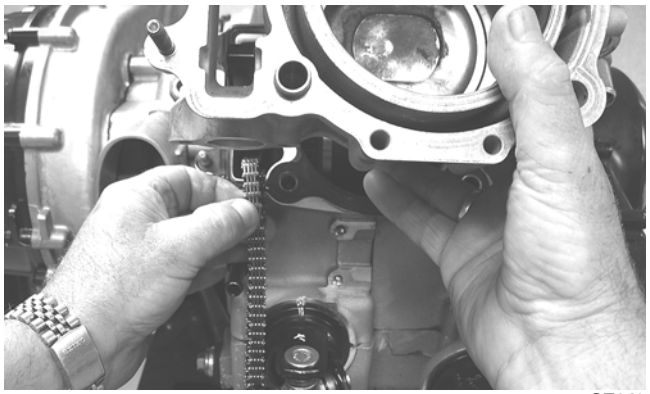


GZ141A



GZ160A

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.


GZ142


GZ144

☞ AT THIS POINT
To service cylinder, see Servicing Top-Side Components sub-section.

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

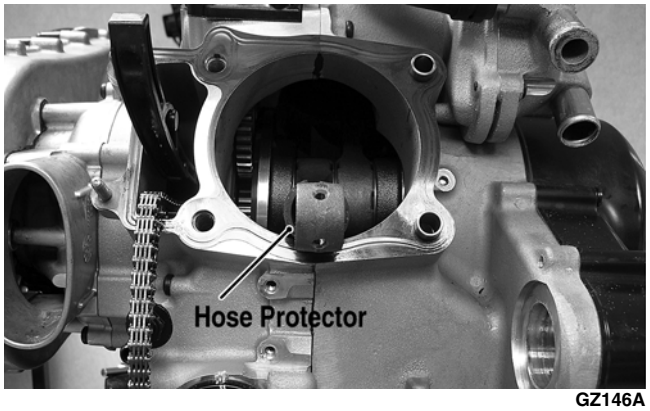
14. Using an awl, remove one piston-pin circlip.

GZ145

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

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

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



GZ146A

CAUTION

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

■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.

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.

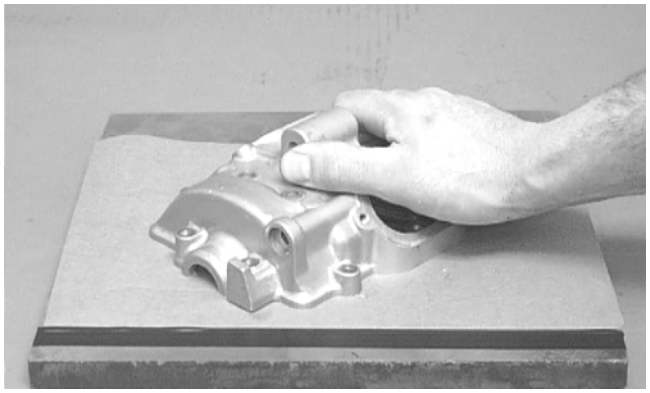
Cleaning/Inspecting Valve Cover

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

CAUTION

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



CC130D

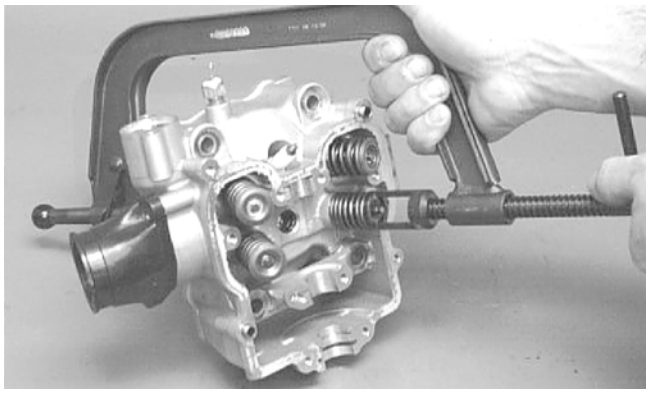
CAUTION

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

Removing Valves

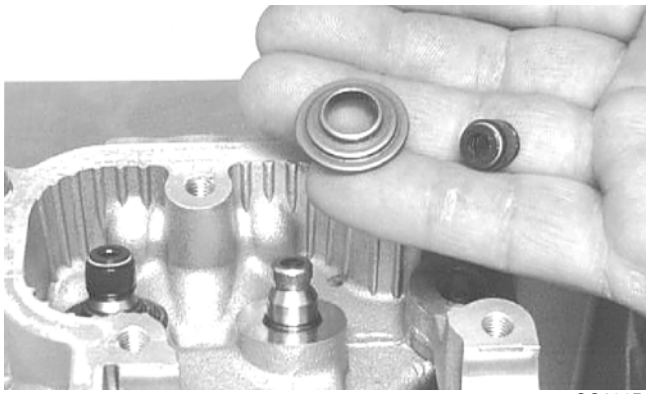
■NOTE: Index all valves, springs, and cotters to their original position when removing. When installing, all valve components should be installed in their original position.

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



CC132D

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



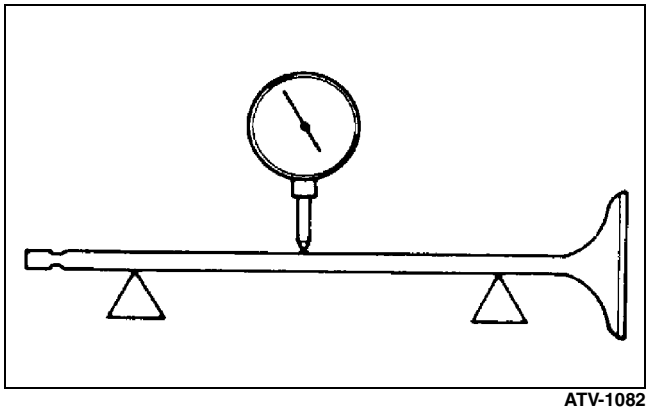
CC136D

■NOTE: The valve seals must be replaced.

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

Measuring Valve Stem Runout

1. Support each valve stem end with the V Blocks; then check the valve stem runout using a dial indicator.



ATV-1082

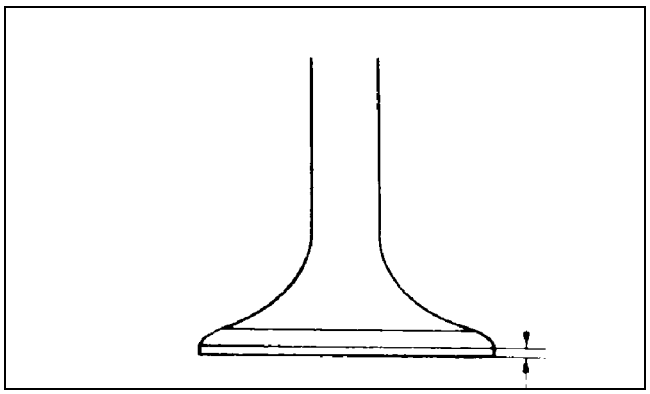
2. Maximum runout must not exceed specifications.

Measuring Valve Stem Outside Diameter

1. Using a micrometer, measure the valve stem outside diameter.
2. Acceptable diameter range 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 (intake valve) must not exceed specifications.
3. Acceptable width (exhaust valve) must not exceed specifciations.

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.

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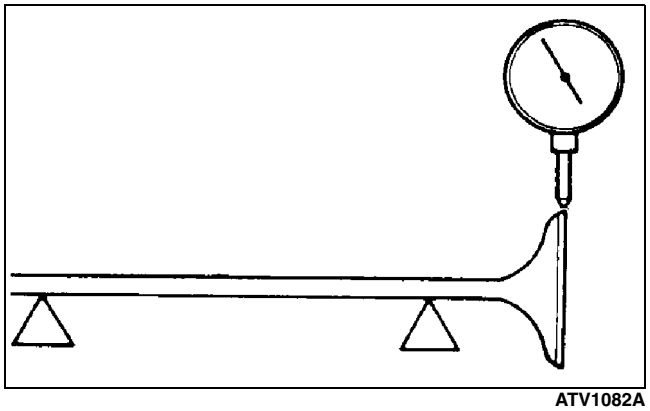
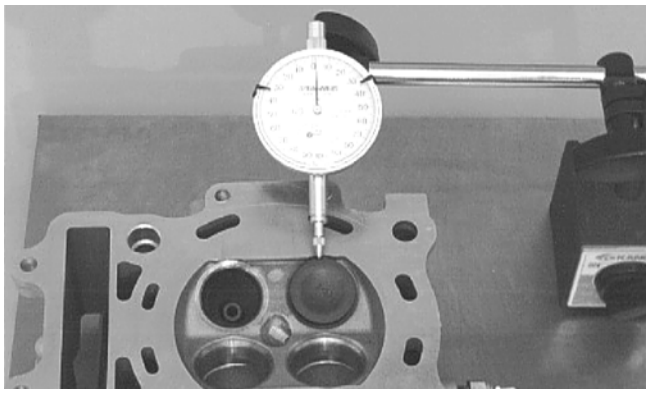


ATV1082A

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)

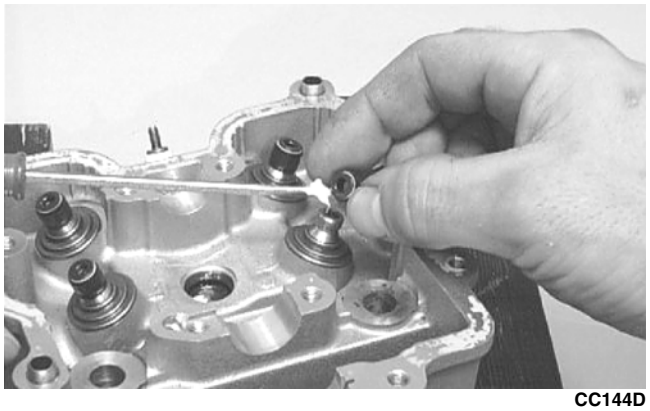
1. Using a dial calipers, measure the inside diameter of the rocker arm.
2. Acceptable inside diameter range must be within specifications.

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

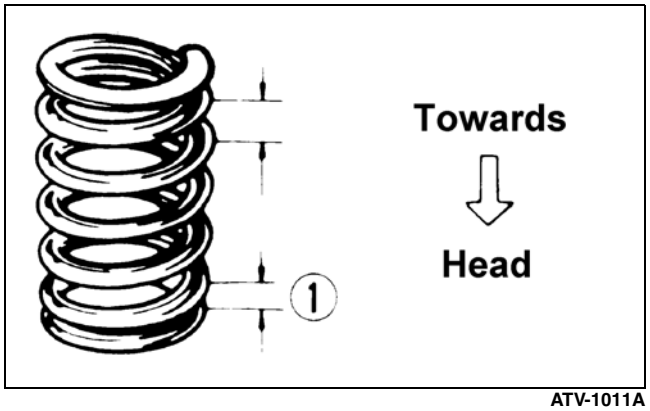
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



CC144D

2. Insert each valve into its original 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.

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

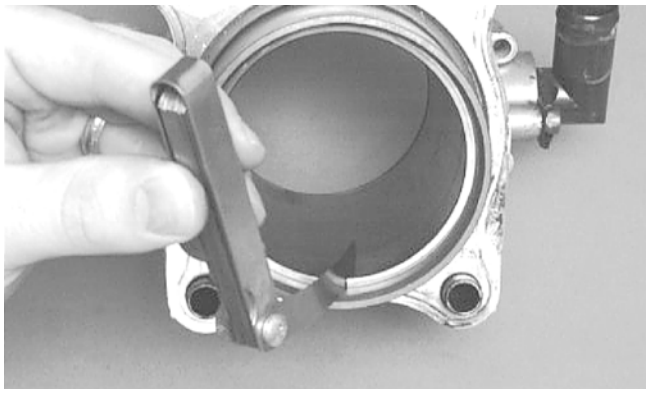
1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

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)

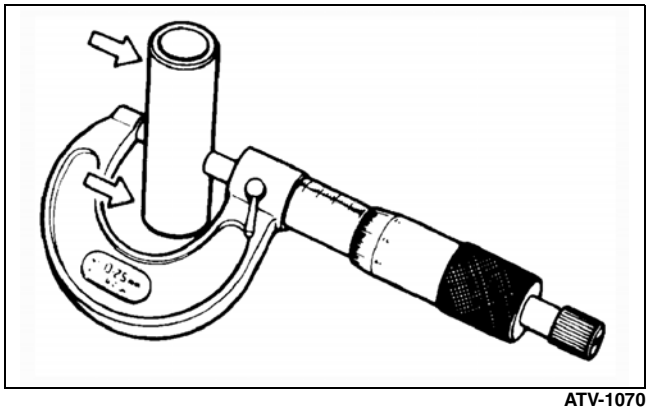
1. Place each compression ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must not exceed specifications.



CC280D

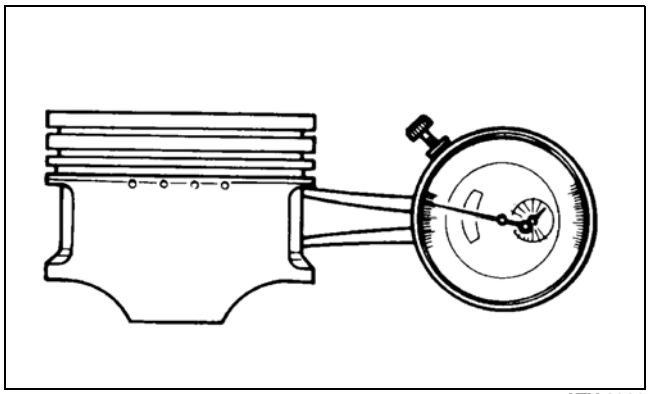
Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

1. Measure the piston pin outside diameter at each end and in the center. If measurement exceeds specifications, the piston pin must be replaced.



ATV-1070

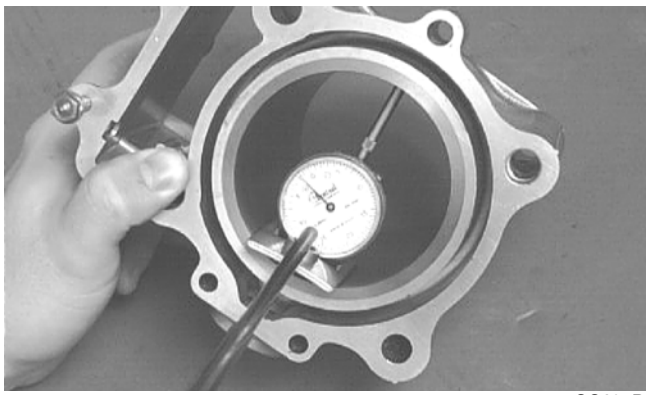
2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



ATV-1069

Measuring Piston Skirt/Cylinder Clearance

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

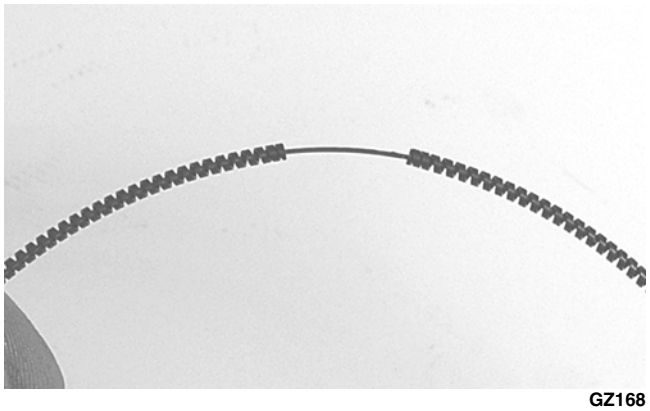


CC127D

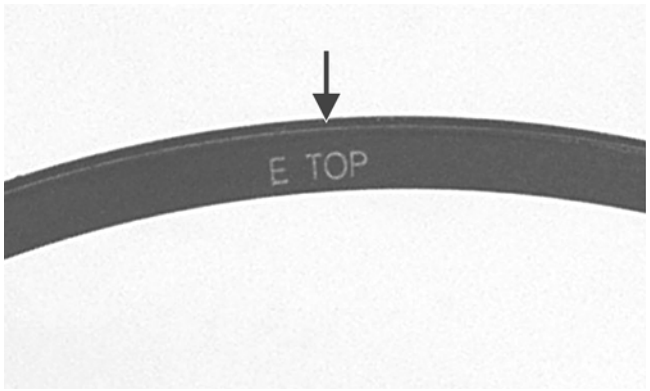
2. Measure the corresponding piston diameter at a point 15 mm (0.6 in.) above the piston skirt at a right angle to the piston-pin bore. Subtract this measurement from the measurement in step 1. The difference (clearance) must not exceed specifications.

Installing Piston Rings

1. Install the expander spring making sure the ends are aligned on the wire; then install the oil ring with the ring gap 90° from the spring gap and the marking "E TOP" directed toward the top of the piston.



GZ168

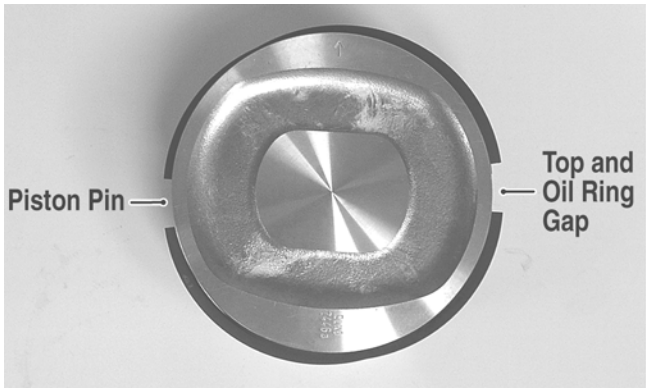


GZ169A

2. Install the second compression ring with the marking "E TOP" directed toward the top of the piston.

GZ167

3. Install the first (unmarked) compression ring; then rotate the rings so the ring gaps are approximately 180° apart and oriented to the piston pin.



GZ187A

CAUTION

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

CYLINDER/CYLINDER HEAD ASSEMBLY

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

Cleaning/Inspecting Cylinder Head

CAUTION

The cylinder head studs must be removed for this procedure.

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

CAUTION

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

Measuring Cylinder Head Distortion

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

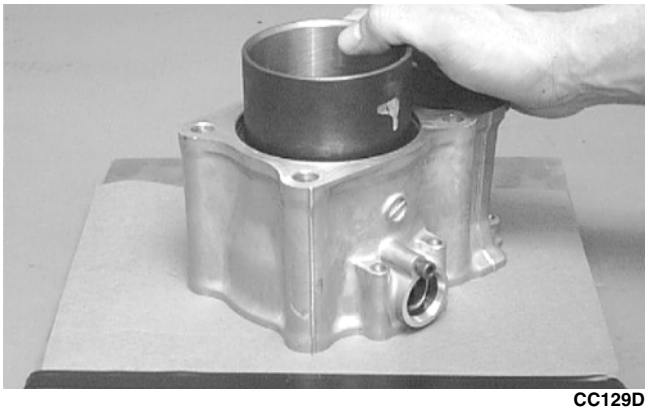
CC141D

Cleaning/Inspecting Cylinder

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

CAUTION

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



CC129D

Inspecting Cam Chain Guide

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

Inspecting Cylinder

1. Using a slide gauge and a dial indicator or a snap gauge, measure the cylinder bore diameter in three locations from top to bottom and again from top to bottom at 90° from the first measurements for a total of six measurements. The trueness (out-of-roundness) is the difference between the highest and lowest reading. Maximum trueness (out-of-roundness) must be within specifications.

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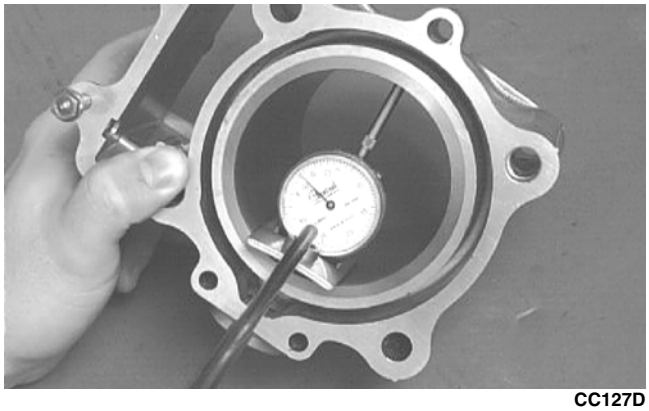
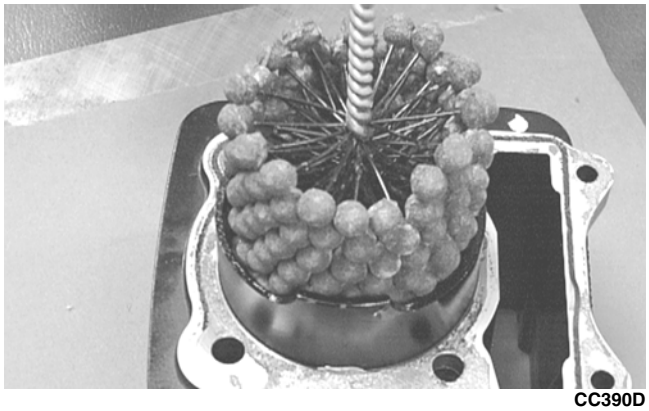


CC127D

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

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



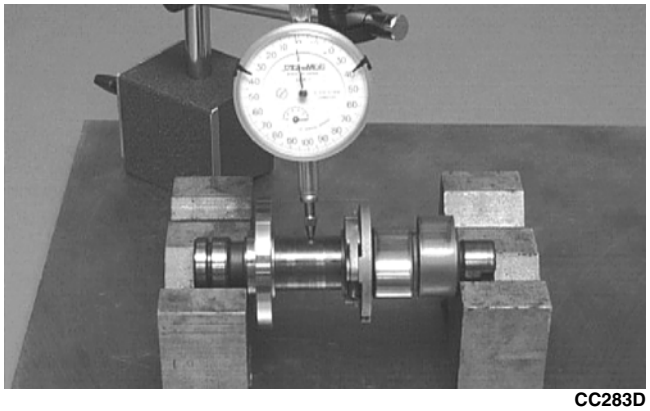
CC390D

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

Measuring Camshaft Runout

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

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

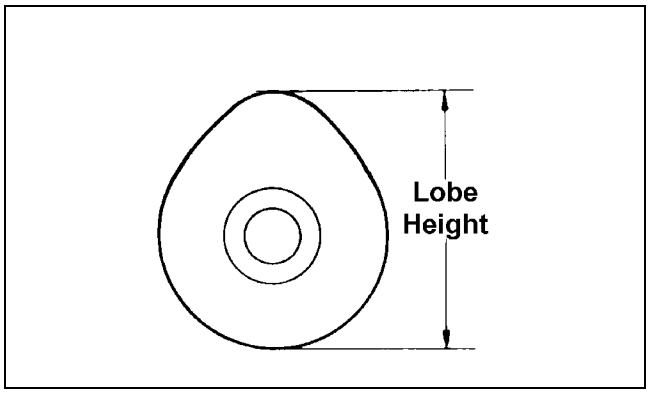


CC283D

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

Measuring Camshaft Lobe Height

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



ATV1013A

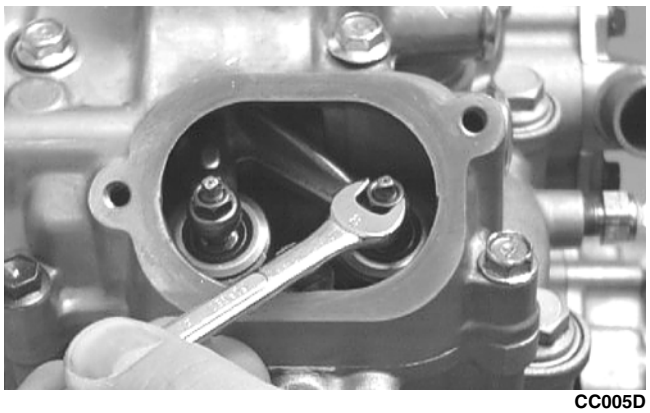
2. The lobe heights must be greater than minimum specifications.

Inspecting Camshaft Bearing Journal

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

Measuring Camshaft to Cylinder Head Clearance

1. Remove the adjuster screws and jam nuts.

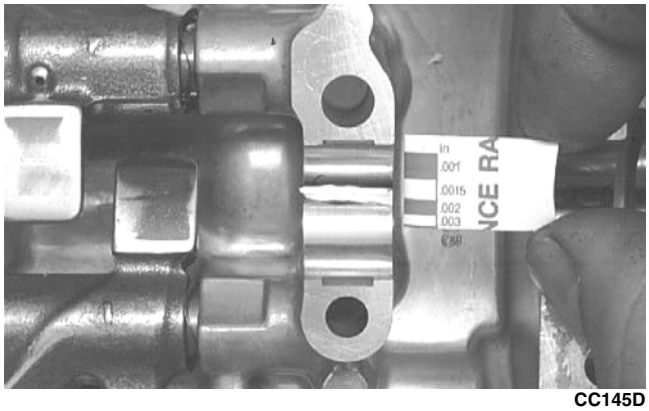


CC005D

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.

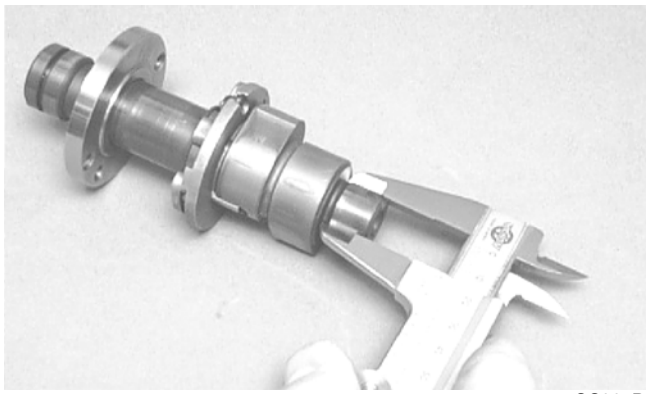
■NOTE: Do not rotate the camshaft when measuring clearance.

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

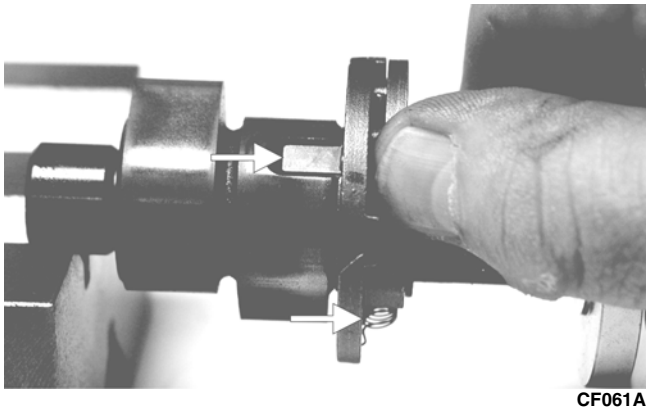
6. If clearance is excessive, measure the journals of the camshaft.

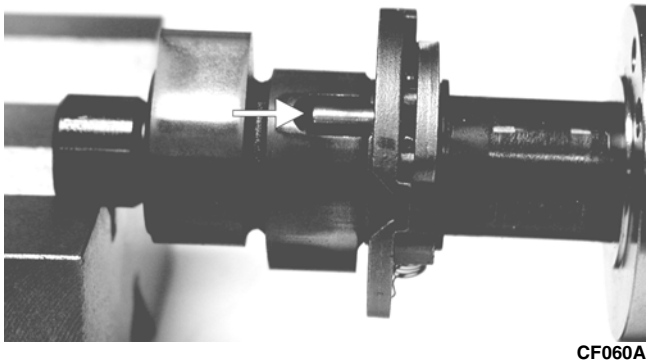

CC287D

■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 (Front Camshaft Only)

1. Inspect the spring and drive pin for damage.


CF061A


CF060A

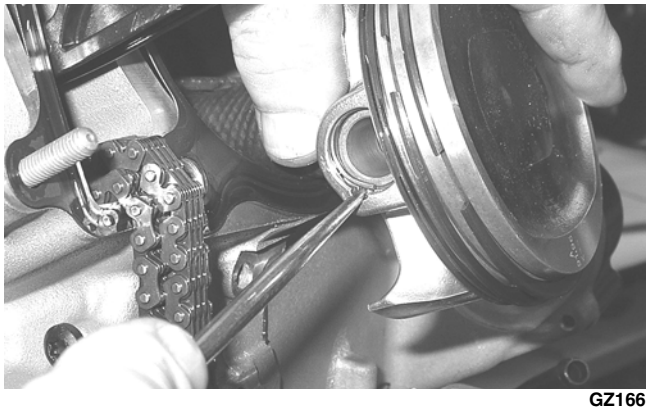
2. If damaged, the camshaft must be replaced.

Installing Top-Side Components

A. Pistons
B. Cylinders

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

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


GZ166

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

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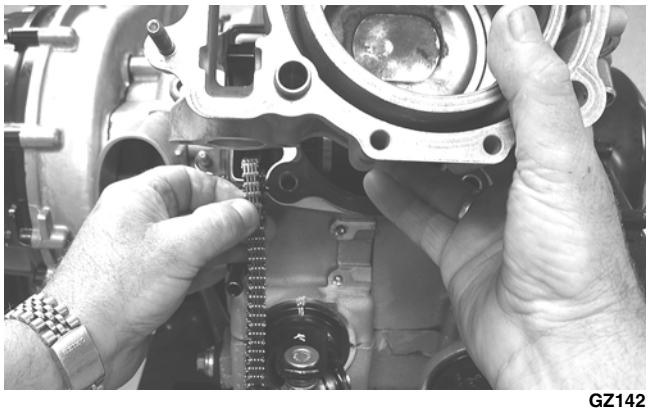
GZ159

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

CAUTION

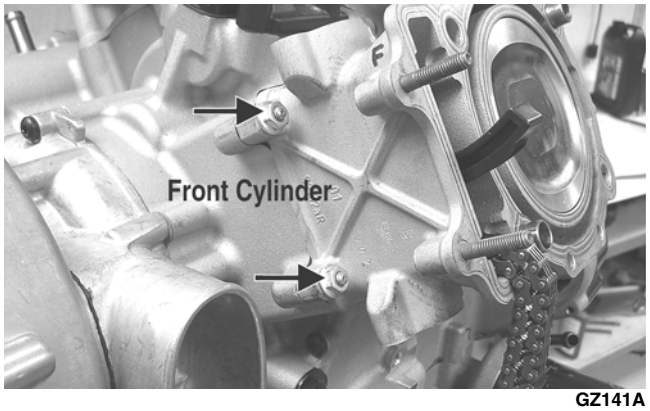
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



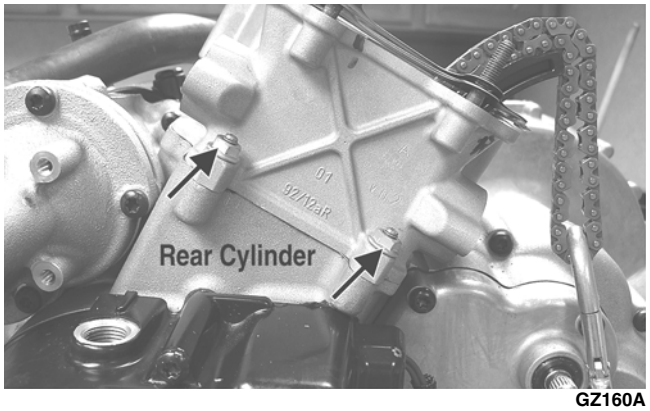
GZ142

4. Loosely install the two nuts securing the cylinder to the crankcase.

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



GZ141A



GZ160A

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

C. Cylinder Head
D. Valve Cover

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

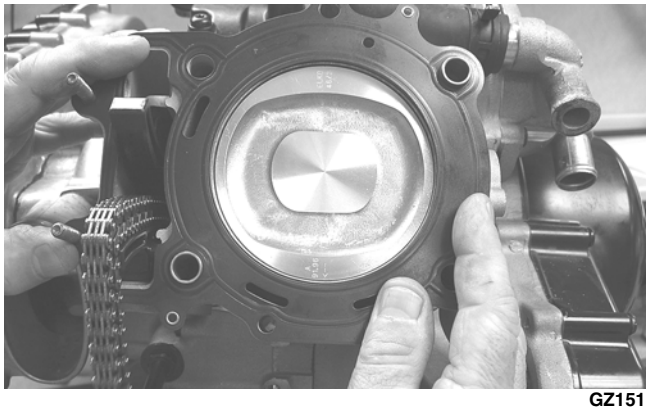
6. Place the chain guide into the cylinder.

CAUTION

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

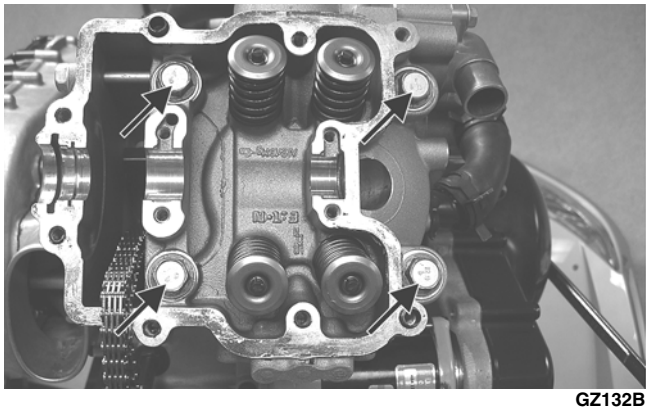
GZ161A

7. Place a new head gasket into position on the cylinder. Place the alignment pins into position; then place the head assembly into position on the cylinder while guiding the cam chain through the cylinder head.



GZ151

8. Apply a light coat of grease to the cylinder head cap screw threads and washers; then install the cap screws.

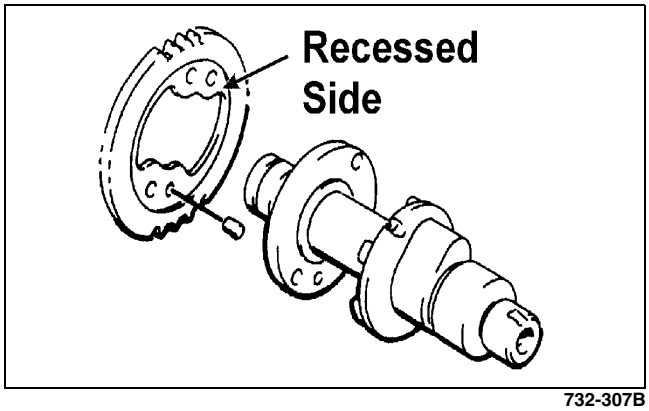


GZ132B

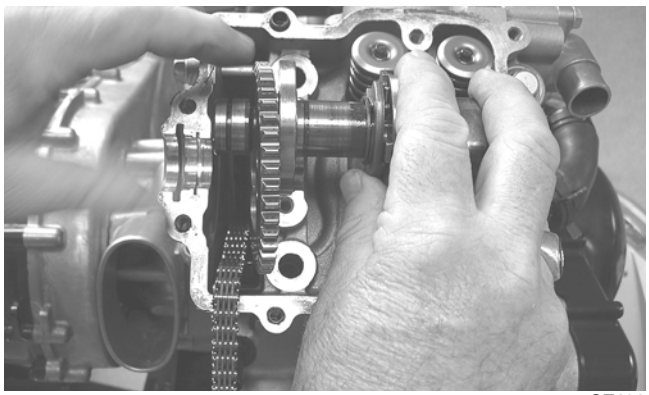
9. Loosely install the five cylinder head nuts.
10. In a crisscross pattern, tighten the four cylinder head cap screws (from step 8) initally to 20 ft-lb; then increase to 30 ft-lb, and finally to 37 ft-lb. Tighten the 8 mm nut (from step 9) to 18 ft-lb; then using a crisscross pattern, tighten the 6 mm nuts (from step 9) to 8 ft-lb. Tighten the two cylinder-to-crankcase nuts (from step 4) securely.

■NOTE: If both cylinders have been removed, repeat steps 1-10 for the remaining cylinder.

11. With the timing inspection plug removed and the chains held tight, rotate the crankshaft until the front 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

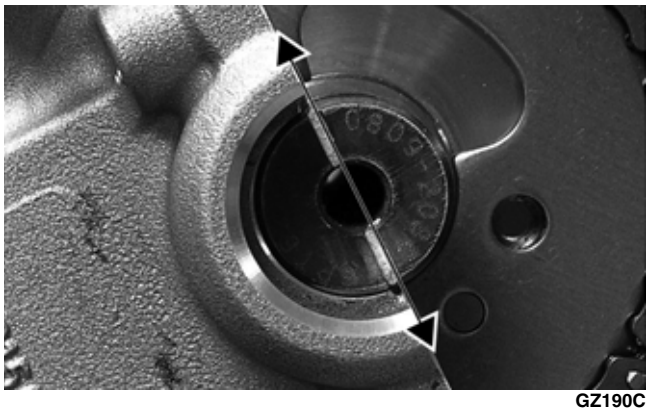


GZ130

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

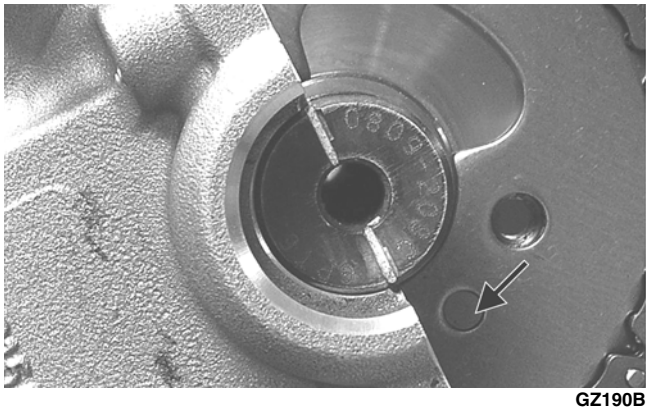
13. With the cam lobes directed down (toward the piston), maneuver the camshaft/sprocket assembly through the chain and towards its seating position; then loop the chain over the sprocket.

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



GZ190C

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



GZ190B

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.

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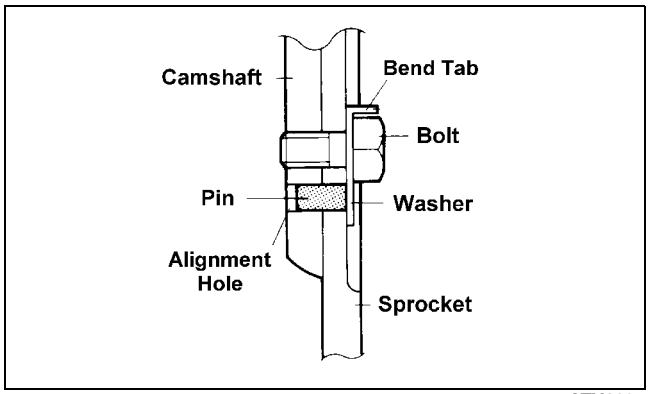
15. Place the tab-washer onto the sprocket making sure it covers the pin in the alignment hole.

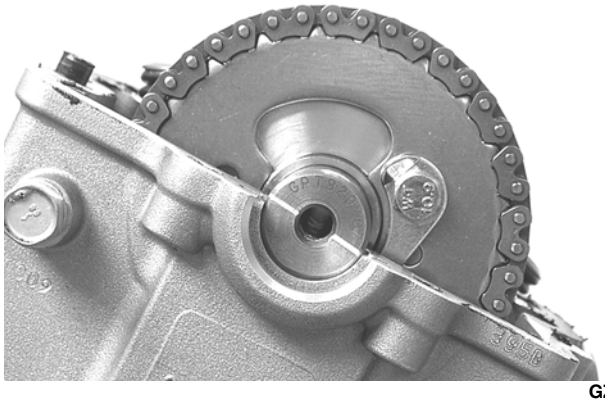


ATV1027

CAUTION

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

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

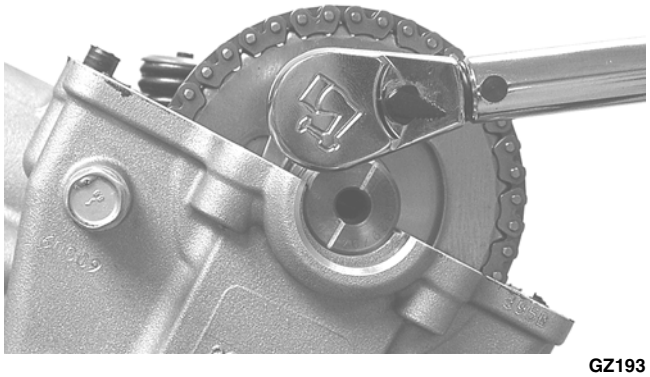


GZ195

17. Keeping tension on the opposite cam chain, rotate the crankshaft until the second cap screw securing the sprocket to the camshaft can be installed; then install the cap screw (threads coated with red Loctite #271) and tighten to 10 ft-lb. Bend the tab to secure the cap screw.

CAUTION

Failure to keep tension on any loose cam chain may cause severe engine damage.



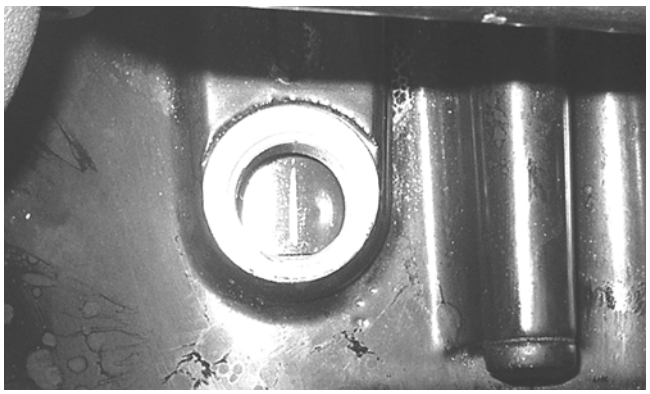
GZ193

18. Rotate the crankshaft until the first cap screw (from step 16) can be tightened; then tighten to 10 ft-lb. Bend the tab to secure the cap screw.

☞AT THIS POINT

Return the engine to TDC on the front cylinder making sure the cam lobes are directed downward to ensure correct starting point for step 19.

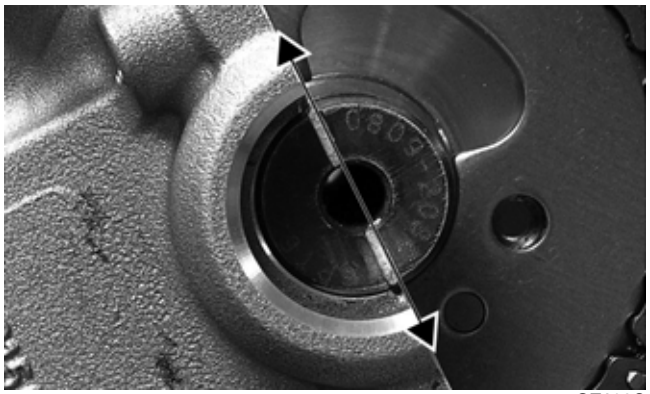
19. Keeping tension on the rear cam chain, rotate the engine forward 270° until rear piston is at TDC indicated by timing mark R.



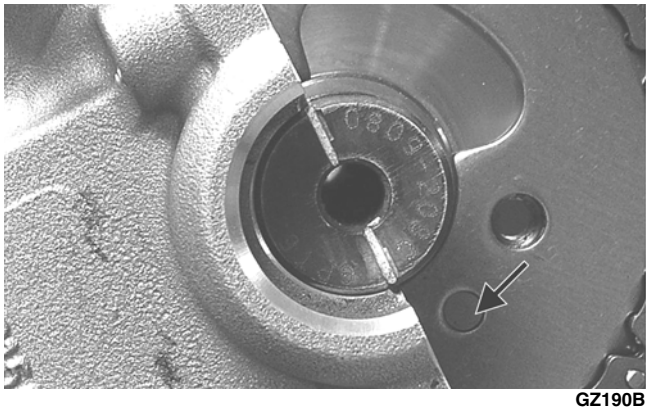
GZ060

20. 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 and sproket is necessary for alignment, do not allow the crankshaft to rotate and be sure the cam lobes end up in the down position.

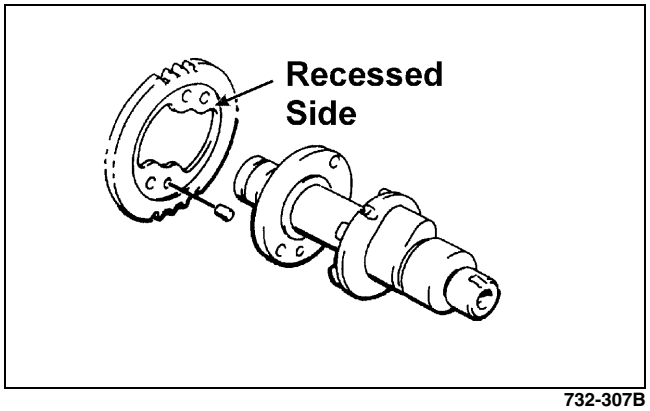


GZ190C



GZ190B

21. 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.



732-307B

A. Piston still at top-dead-center.

B. Camshaft lobes directed down (toward the piston).

C. Camshaft alignment marks offset 5° from the valve cover mating surface.

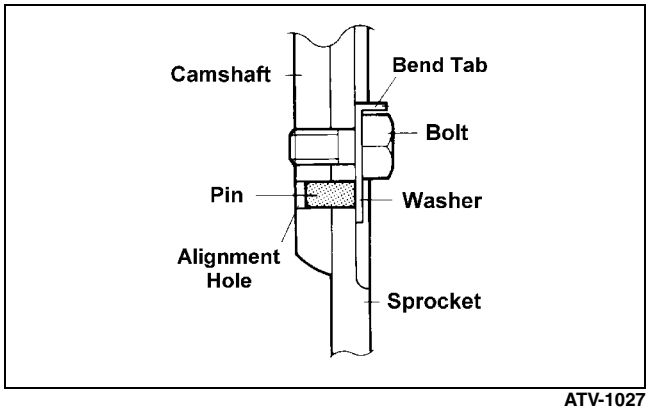
D. Recessed side of the sprocket directed toward the cam lobes.

E. Camshaft alignment pin and sprocket alignment hole (smallest) are aligned.

CAUTION

If any of the above factors are not as stated go back to step 19 and carefully proceed.

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

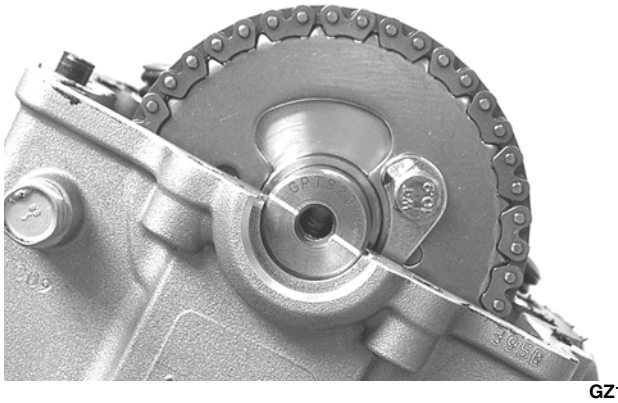


ATV-1027

CAUTION

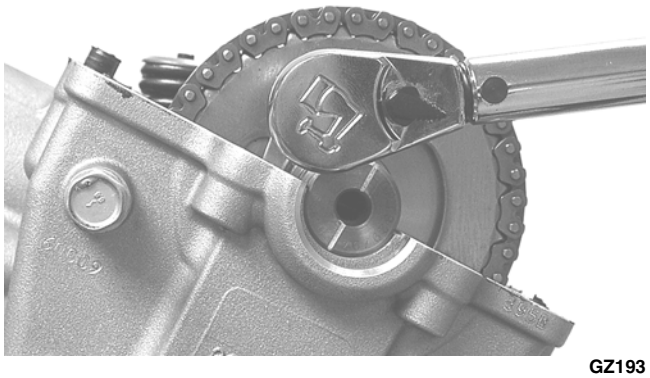
Care must be taken that the tab-washer is installed correctly to cover the alignment hole on the sprocket. If the alignment pin falls out, severe engine damage will result.

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



GZ195

24. Rotate the crankshaft until the second cap screw securing the sprocket to the camshaft can be installed; then install the cap screw (threads coated with red Loctite #271) and tighten to 10 ft-lb. Bend the tab to secure the cap screw.



GZ193

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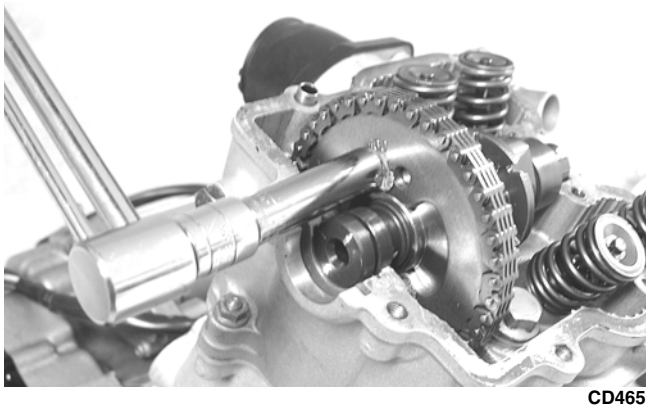
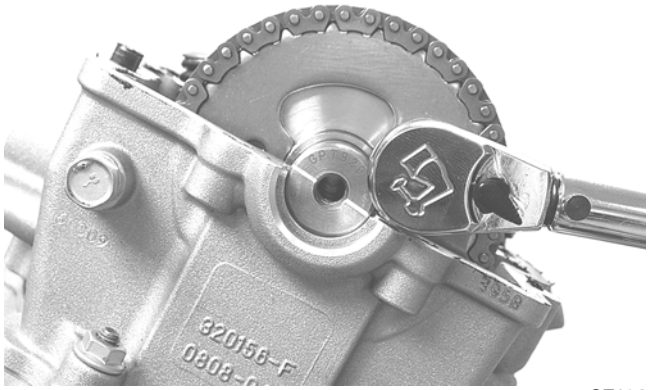


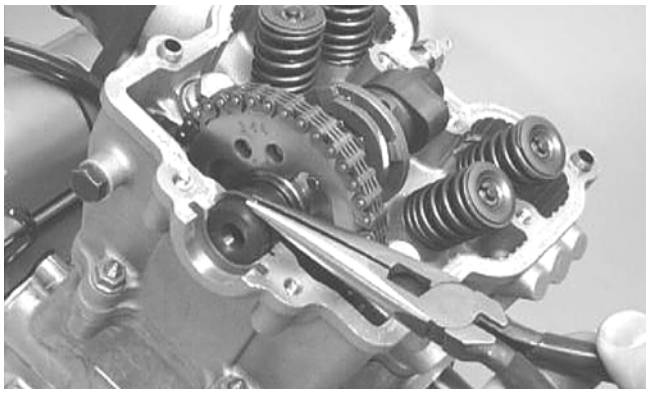
CD465

25. Rotate the crankshaft until the first cap screw (from step 23) can be addressed; then tighten to 10 ft-lb. Bend the tab to secure the cap screw.



GZ194

26. Place the C-rings into position in their grooves in the cylinder heads.



CC012D

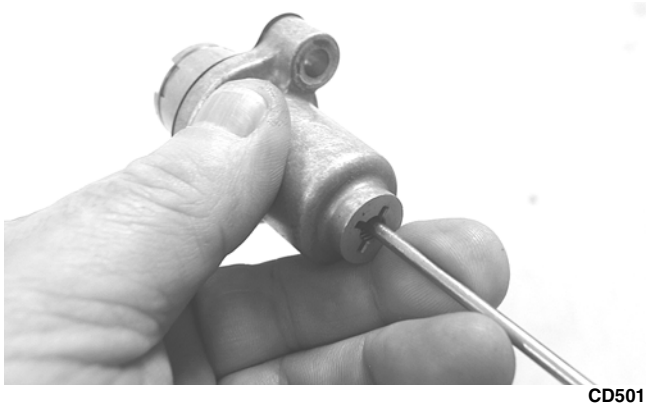
27. Install the cylinder head plugs in the cylinder heads with the open end facing downward and toward the inside.

CAUTION

The open end of the plug must be positioned downward.

CD468

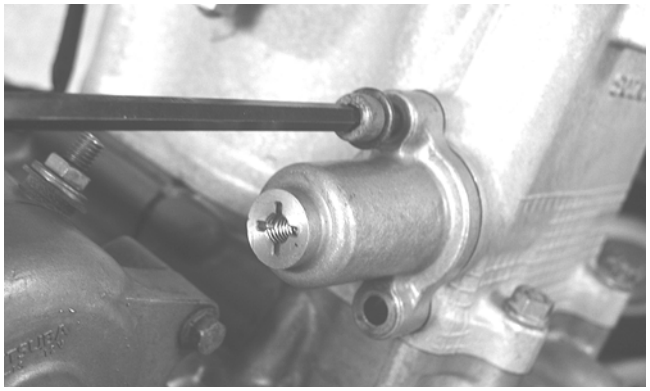
28. Remove the cap screw from the end of the chain tensioner; then using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner clockwise until the screw bottoms.



CD501

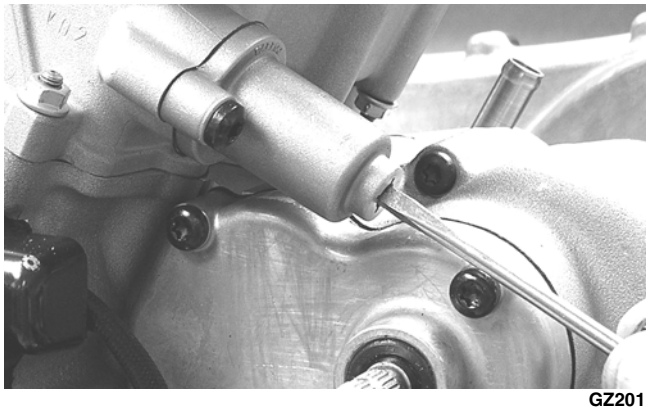
■NOTE: The adjuster shaft will be drawn into the tensioner as the adjuster screw is rotated clockwise. The adjuster shaft tension will be released in step 30.

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

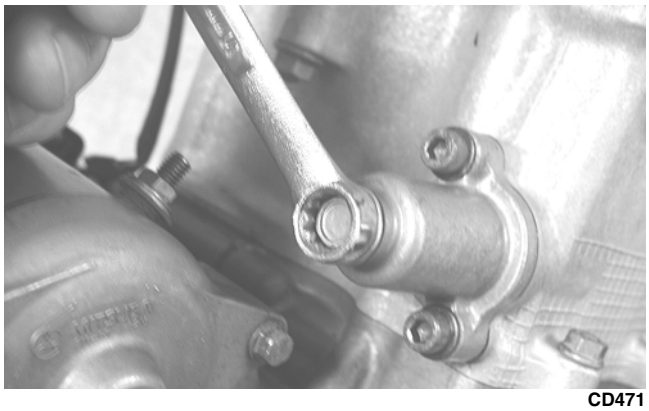


CD469

30. Using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner counterclockwise until all tension is released; then install the cap screw into the end of the chain tensioner.

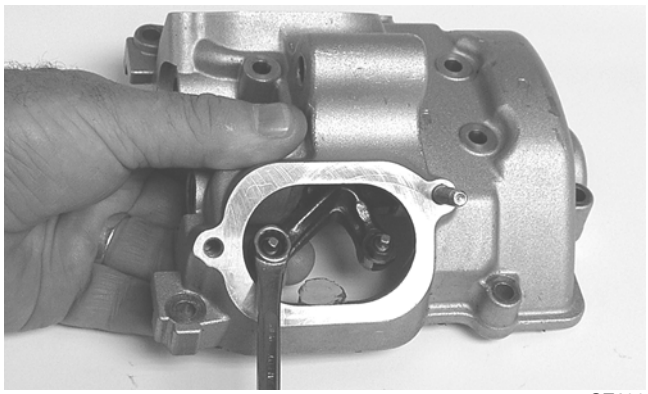


GZ201



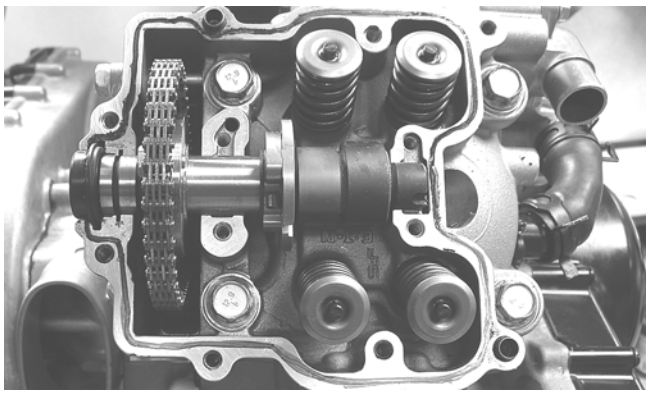
CD471

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



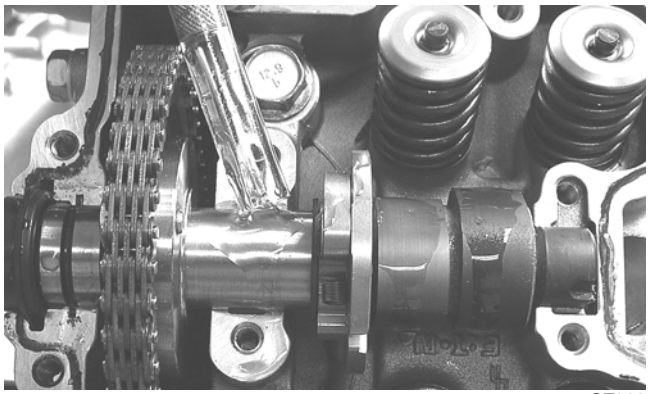
GZ199

32. Apply a thin coat of Three Bond Sealant to the mating surfaces of the cylinder heads.



GZ202

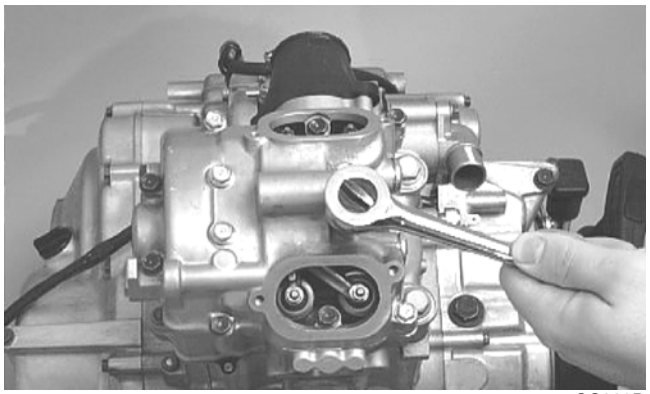
33. Lubricate the camshaft journals and lobes with engine oil; then place the valve cover into position.



GZ206

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

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

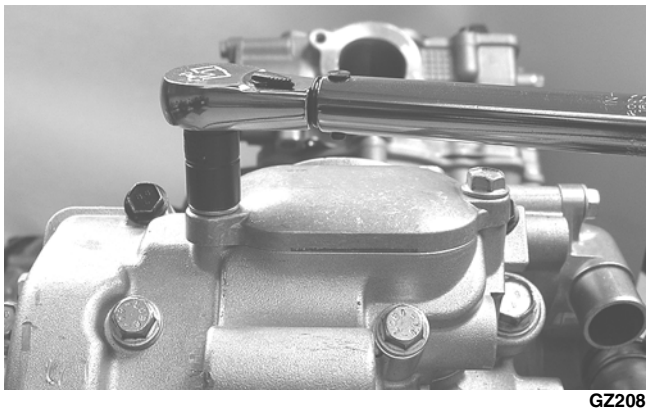


CC003D

35. In a crisscross pattern starting from the center and working outward, tighten the cap screws on both valve covers securely.

36. Adjust valve/tappet clearance (see Section 2).

37. Place the tappet covers into position making sure the O-rings are properly installed. Tighten the cap screws securely.



GZ208

38. If removed, install the spark plugs. Tighten securely.

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Left-Side Components

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

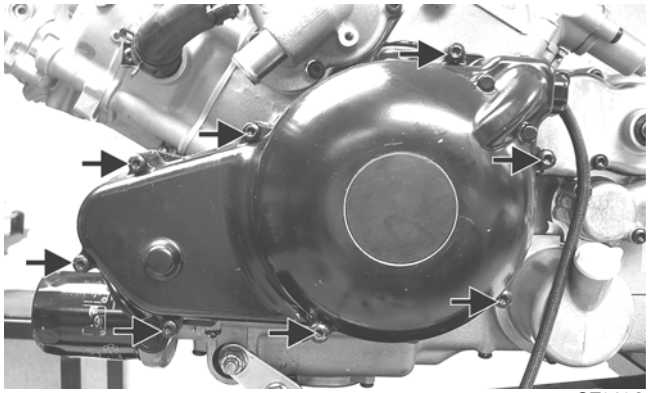
☞ AT THIS POINT
To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

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

Removing Left-Side Components

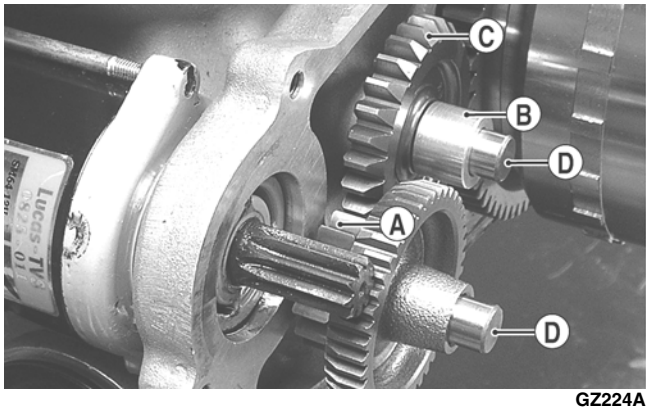
A. Magneto Cover/Stator Coils
B. Water Pump
C. Shifter Assembly
D. Rotor/Flywheel/Starter Clutch
E. Speed Sensor/Trigger Assembly

1. Remove the cap screws securing the magneto cover to the crankcase; then remove the magneto cover. Account for the gasket.



GZ212A

2. Remove the starter motor, starter driven gear (A), starter countershaft bushing (B), and starter countershaft gear (C); then remove the starter gear shafts (D) noting that the longer shaft is nearest the starter.



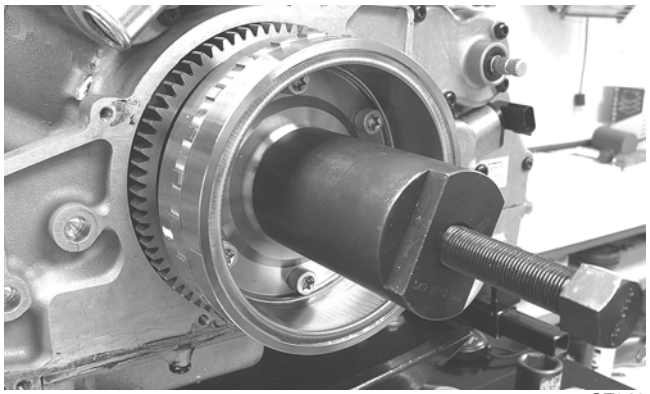
GZ224A

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

3. Remove the rotor/flywheel nut; then install the appropriate crankshaft protector into the crankshaft.

PR440

4. Install Magneto Rotor Remover Set and loosen the rotor/flywheel; then remove the crankshaft protector and rotor/flywheel from the crankshaft. Account for the flywheel key.



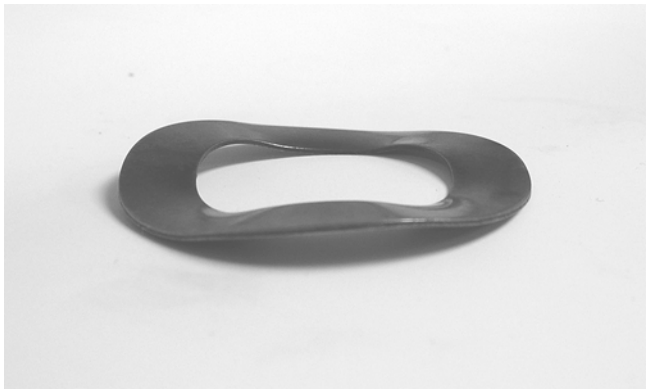
GZ216

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

GZ217

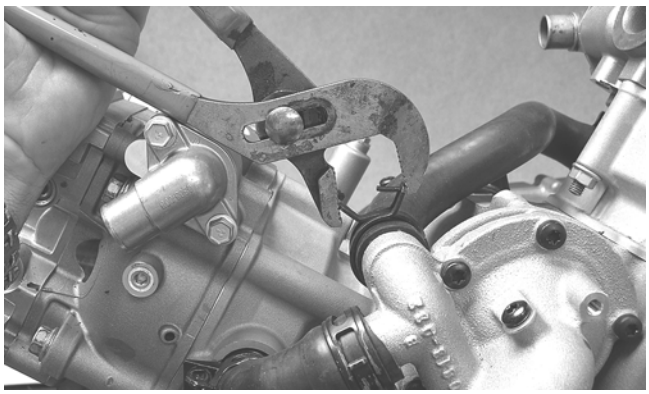
5. With the flywheel key removed, remove the starter ring-gear and spacer washer.

GZ226



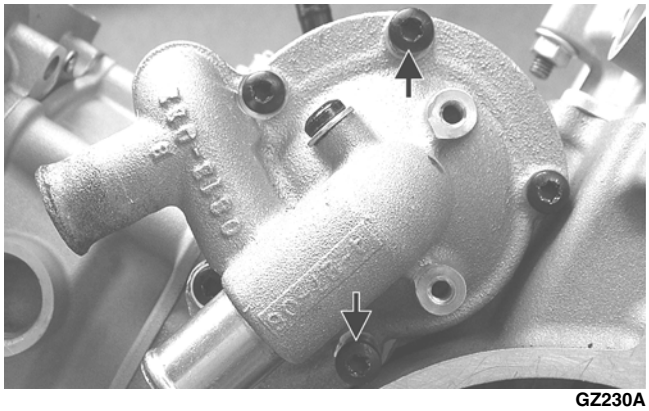
GZ249

6. Remove the hose clamps from the water pump; then remove the coolant hoses from the water pump outlets and coolant pipes.



GZ218

7. Remove the two cap screws securing the water pump to the crankcase; then remove the water pump. Account for an O-ring.

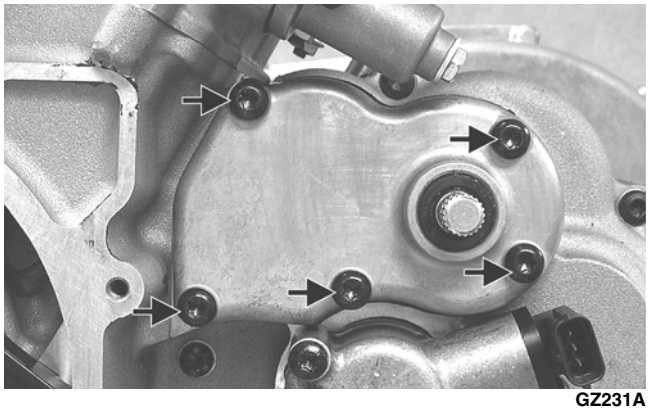


GZ230A

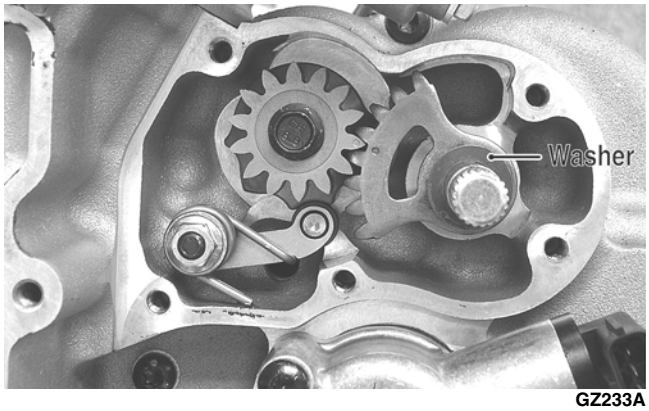
■NOTE: The water pump is a non-serviceable component and must be replaced as a complete assembly.

8. Remove the cap screws securing the gear shift cover to the crankcase; then remove the gear shift cover. Account for a gasket and washer.

■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.



GZ231A



GZ233A

9. Remove the nut (A) from the shift cam stopper bolt (B); then remove the cam stopper spring (C). Account for a flat washer (D).

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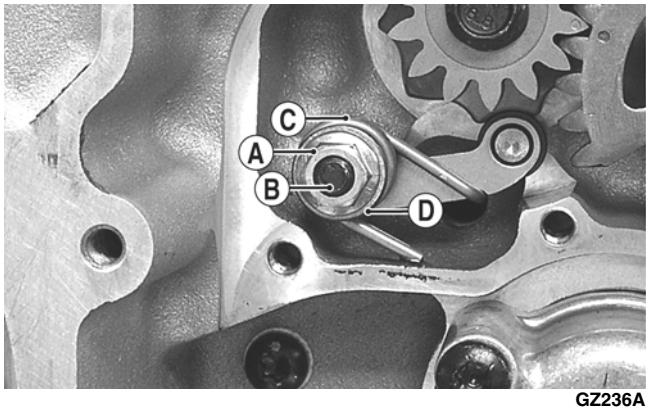
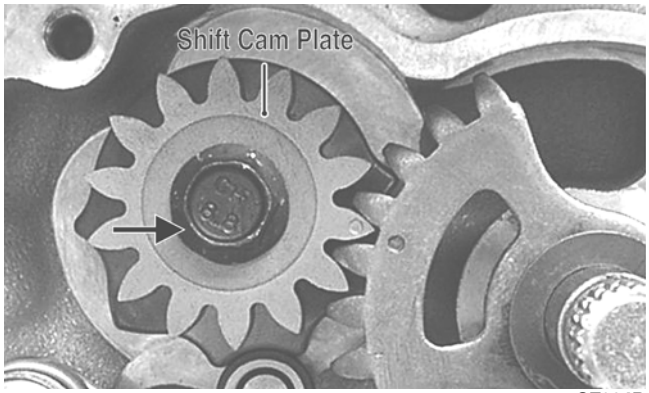


GZ236A

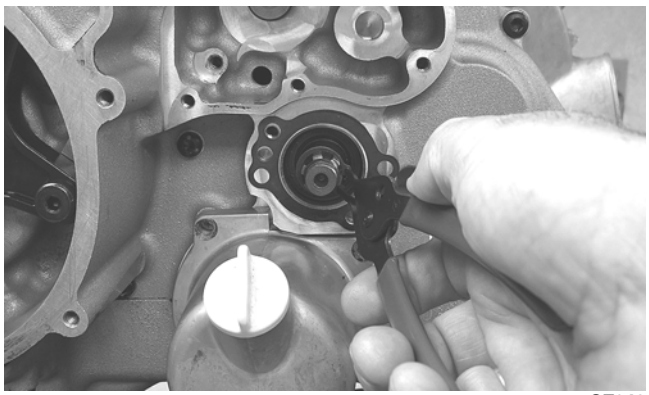
10. Remove the cap screw securing the shift cam plate to the shift cam shaft and remove the shift cam plate; then remove the shift shaft. Account for a washer.



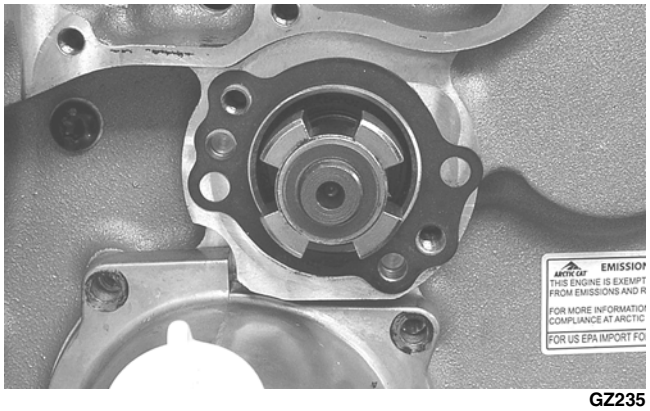
GZ234B

11. Remove the cap screws securing the speed sensor housing to the crankcase and remove the housing assembly; then remove the snap ring securing the speed sensor trigger to the shift and remove the trigger. Account for a gasket.

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



GZ243



GZ235

12. Remove the cap screws securing the oil filler cover to the crankcase; then remove the cover. Account for an O-ring.

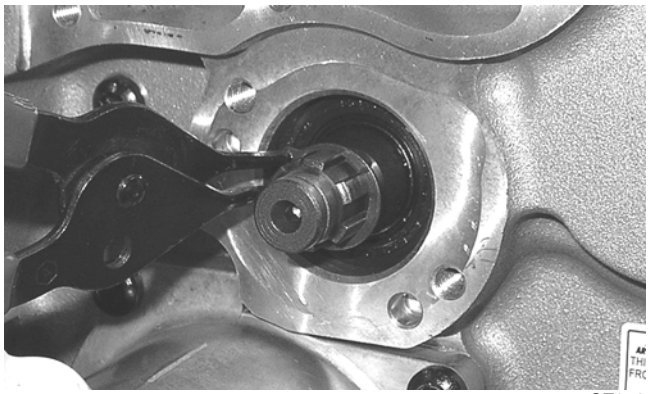
GZ250

Installing Left-Side Components

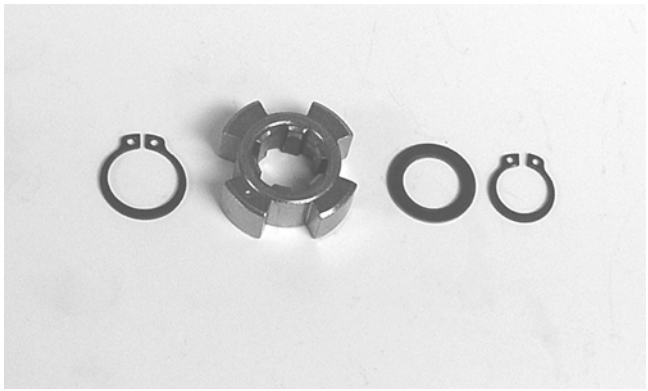
1. Thoroughly clean all gasket material and sealant from mating surfaces.
2. Install a new O-ring on the oil filler cover and coat it with clean engine oil; then install the oil filler cover into the crankcase and secure with the cap screws. Tighten to 8 ft-lb.

GZ250

3. Clean the countershaft and trigger splines throughly and install the inner snap ring onto the shaft; then apply green Loctite #620 to the trigger and countershaft splines and install the trigger. Secure with a flat washer and outer snap ring.

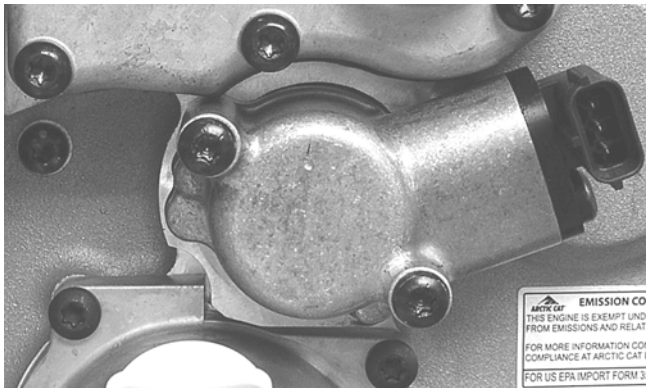


GZ253



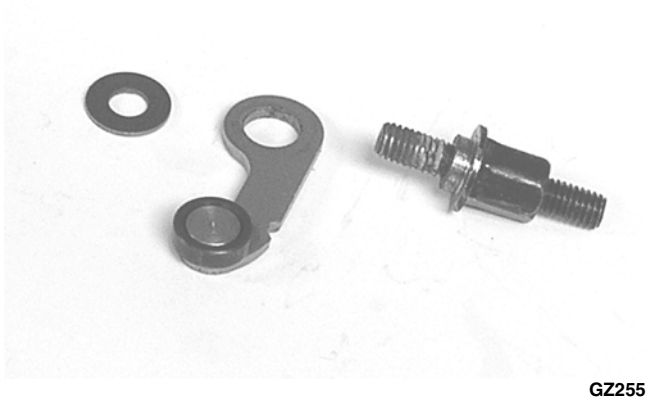
GZ254

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

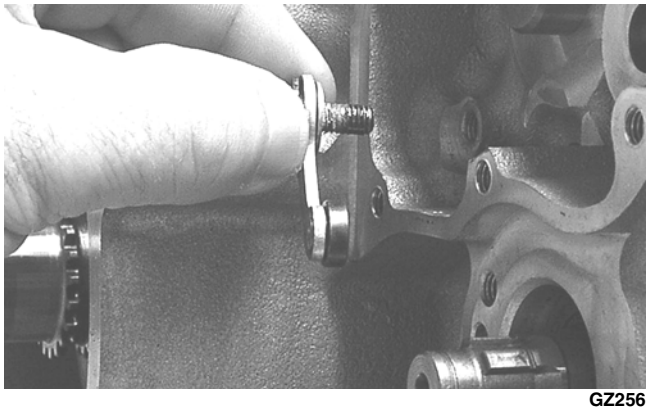


GZ232

5. If removed, install the shift cam stopper on the support; then with the flat washer in place, install the shift cam stopper assembly into the crankcase and tighten to 8 ft-lb.

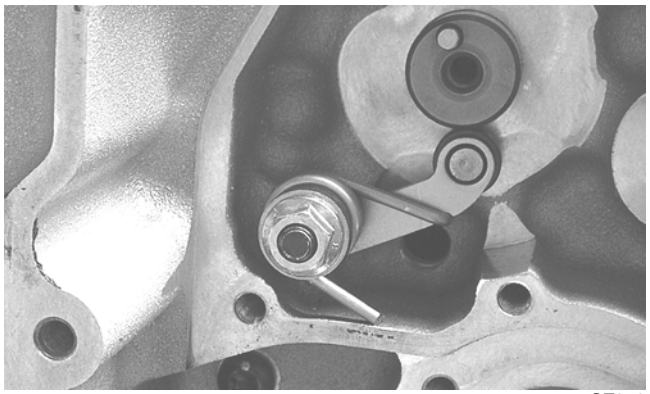


GZ255



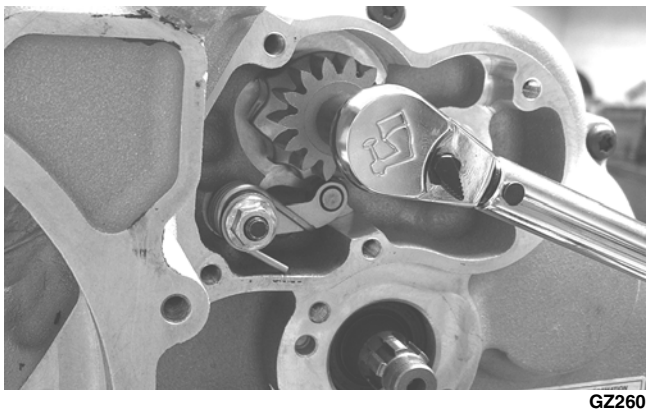
GZ256

6. Install the shift cam stopper spring onto the shift cam stopper and secure with a flat washer and flange nut. Tighten to 8 ft-lb.



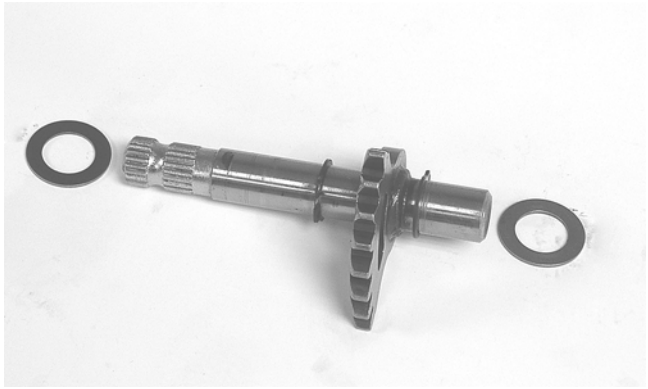
GZ259

7. Install the shift cam plate onto the shift cam shaft and secure with the cap screw. Tighten to 8 ft-lb.



GZ260

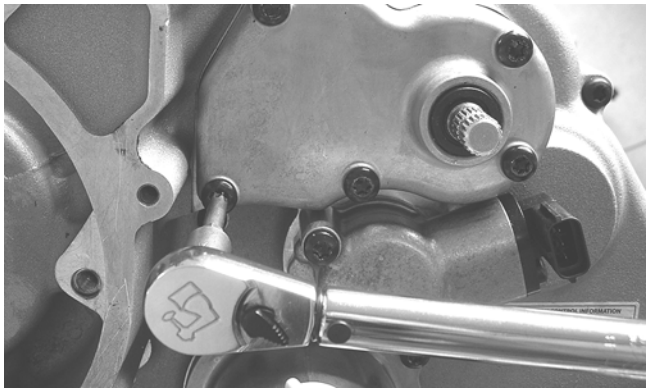
8. Install the shift shaft into the crankcase making sure the washers are properly located; then align the timing reference marks and completely seat the shift shaft.



GZ258

GZ261

9. Apply grease to the lips of the shift shaft seal in the shifter housing; then using a new gasket, install the shifter housing and secure with the cap screws. Tighten in a crisscross pattern to 8 ft-lb.



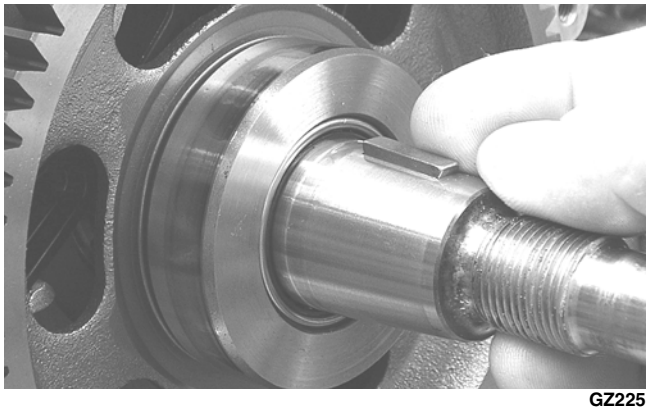
GZ262

10. Install the spacer washer on the crankshaft; then install the starter ring gear.

GZ249

GZ226

11. Place the key into the keyway in the crankshaft; then wipe all oil from the crankshaft surface and rotor/flywheel bore and install the rotor/flywheel onto the crankshaft aligning the keyway with the key. Secure with the nut and tighten to 107 ft-lb.

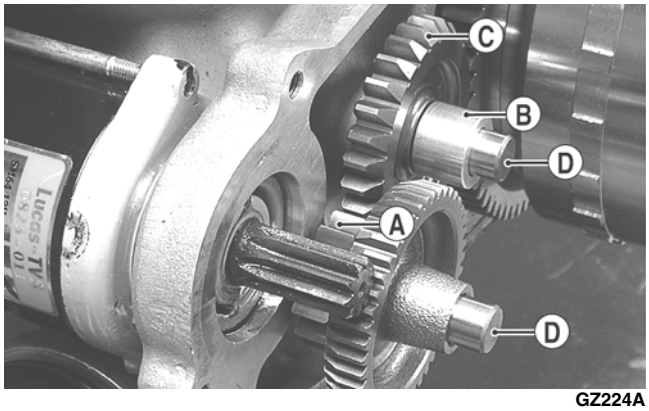


GZ225

CAUTION

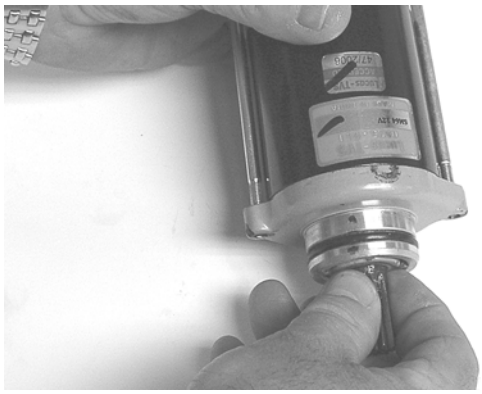
Make sure the one-way starter clutch is properly engaged with the starter ring gear before installing and tightening the rotor/flywheel nut or damage to the clutch assembly could occur.

12. Install the starter driven and counter gear shafts (D) into the crankcase (longer shaft to the front); then install the starter countershaft gear (C), starter driven gear (A), and bushing (B) making sure the chamfered gear teeth on the countershaft gear are directed outward.



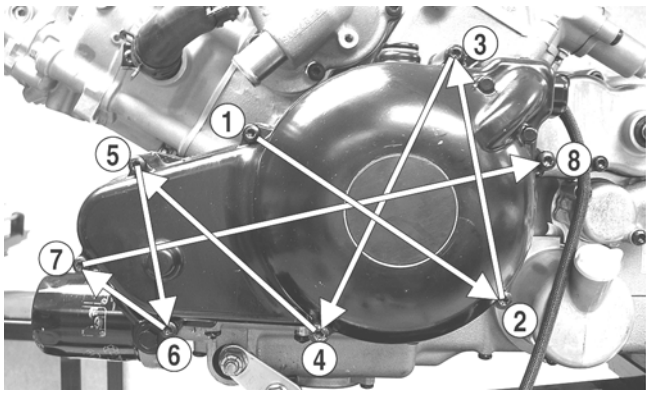
GZ224A

13. Install the starter motor with a new O-ring lightly lubricated with grease; then tighten the mounting cap screws to 8 ft-lb.



GZ251

14. Place the seal protector into the end of the crankshaft; then install the magneto cover using a new gasket and secure with the cap screws. Using the pattern shown, tighten to 8 ft-lb.



GZ212B

Right-Side Components

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

☞ AT THIS POINT

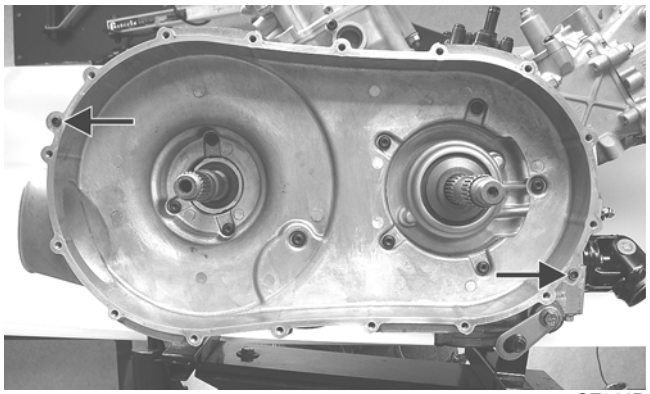
To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

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

Removing Right-Side Components

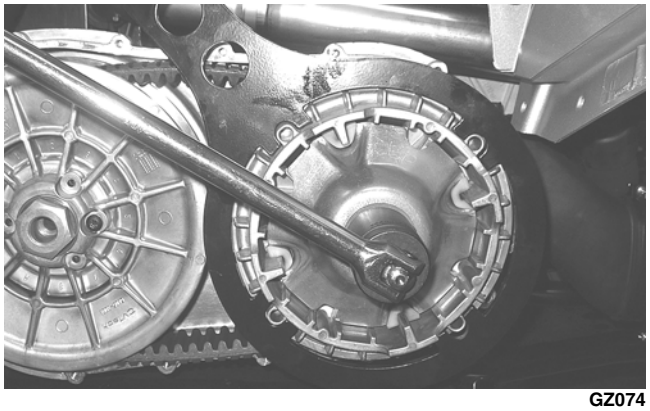
A. V-Belt Cover
B. Driven Pulley
C. Clutch Cover
D. Centrifugal Clutch

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 and two alignment pins.



GZ244B

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



GZ074

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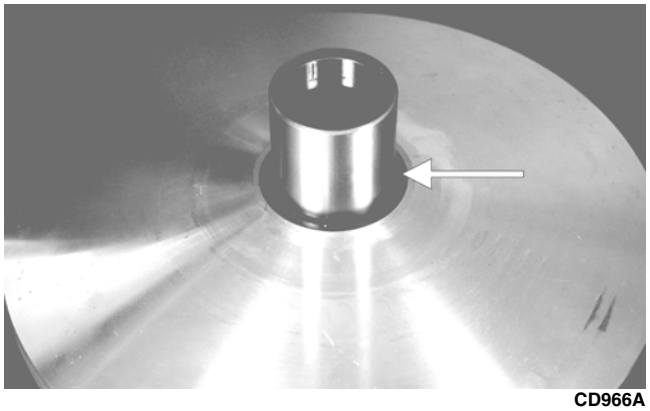
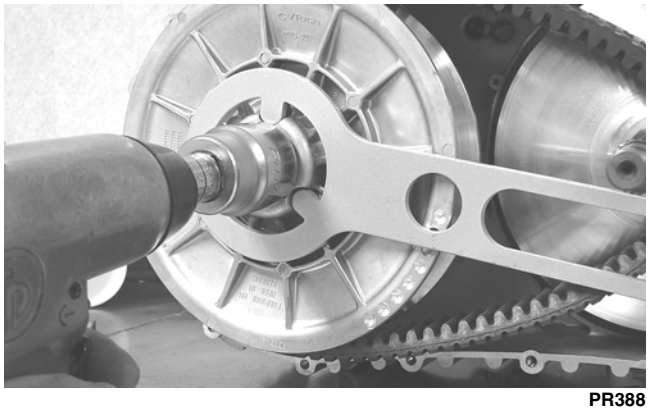


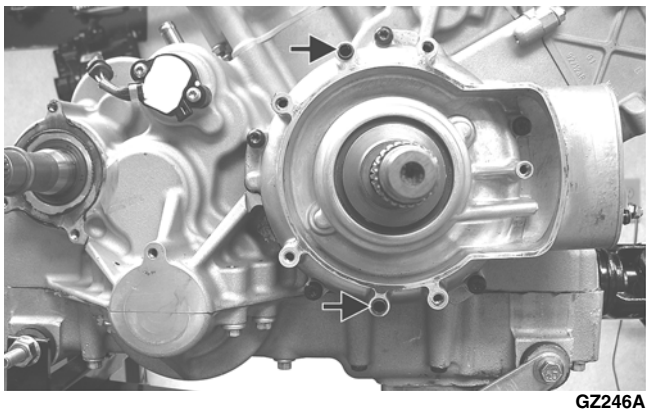
CD966A

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



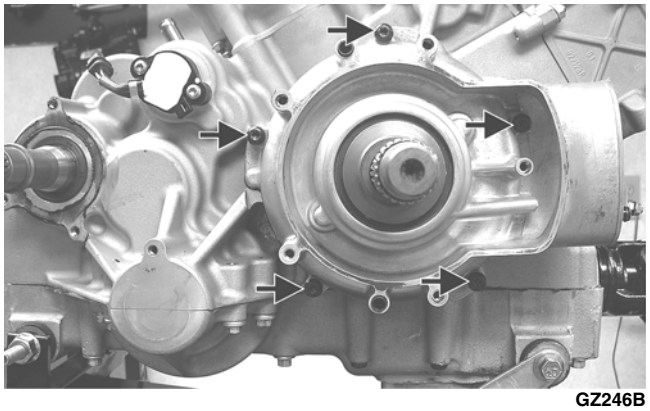
PR388

5. Remove the fixed drive face.
6. Remove the cap screws securing the V-belt housing to the crankcase; then remove the V-belt housing. Account for two alignment pins.

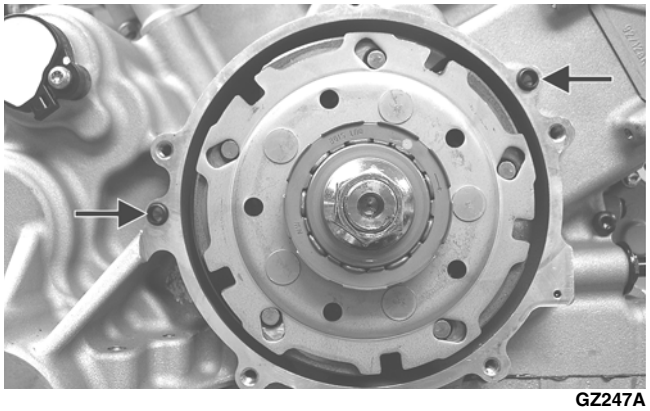


GZ246A

7. Remove the cap screws securing the clutch cover; then using a rubber mallet, carefully remove the cover. Account for two alignment pins.



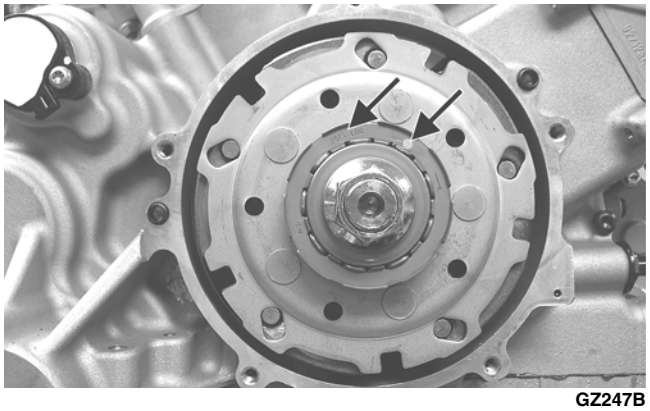
GZ246B



GZ247A

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

8. Remove the one-way clutch from the centrifugal clutch. Note the location of the green dot (or the word OUTSIDE) for installing purposes.



GZ247B

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.**

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

GZ248A

Servicing Right-Side Components

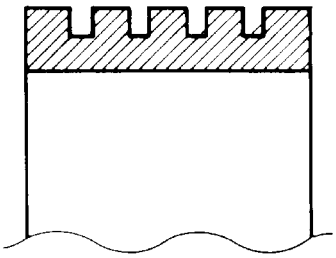
■**NOTE: Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.**

INSPECTING CENTRIFUGAL CLUTCH SHOE

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

CAUTION

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



Inspecting clutch shoe groove

ATV1014

INSPECTING CLUTCH HOUSING

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

INSPECTING PRIMARY ONE-WAY DRIVE

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

DRIVEN PULLEY ASSEMBLY

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

Installing Right-Side Components

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

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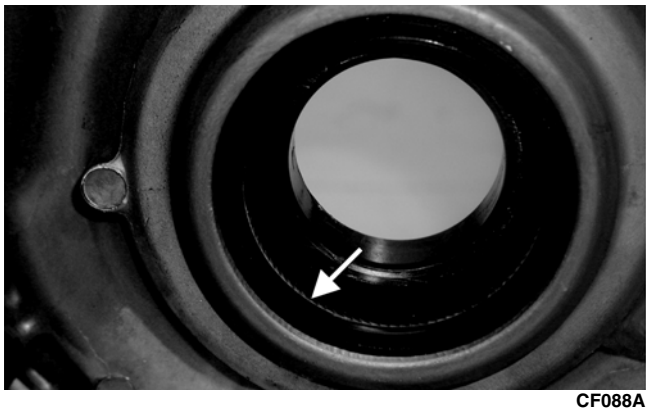
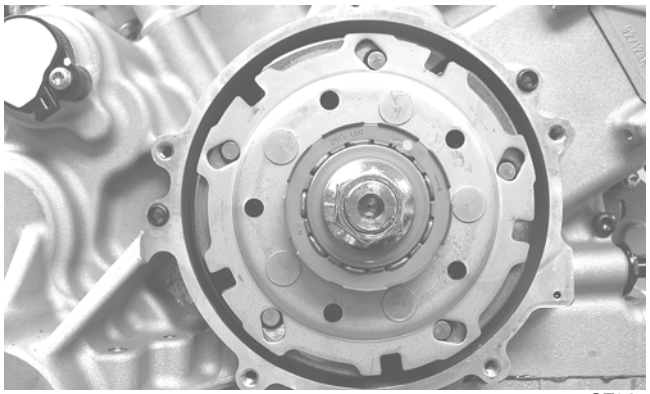
GZ241

2. Install the clutch cover alignment pins into the crankcase, apply oil to the cover gasket, and install the gasket onto the crankcase.
3. Apply grease to the outer edges of the clutch housing; then from inside the clutch cover, install the clutch housing into the cover.
4. Lightly grease the clutch housing seal; then insert the left fixed drive spacer.



CF088A

5. Install the one-way clutch onto the clutch shoe assembly.

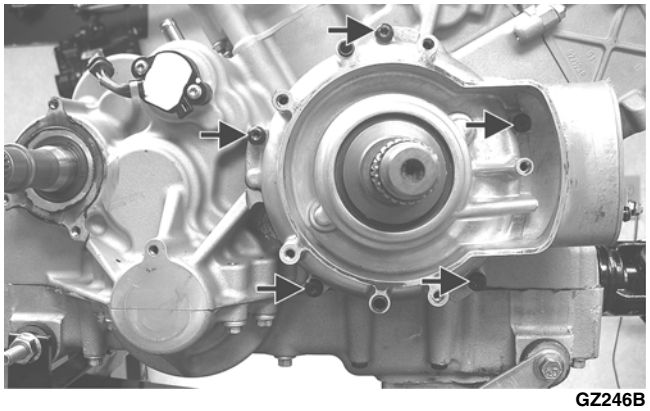


GZ247

CAUTION

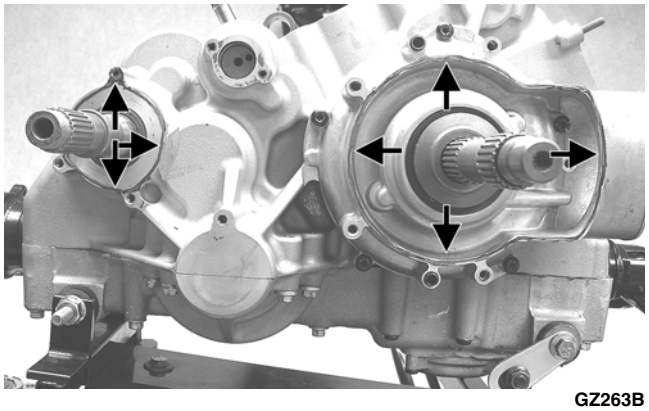
When installed correctly, the green alignment dot (or the word OUTSIDE) on the one-way clutch is visible.

6. Place the clutch cover/clutch housing assembly into position on the crankcase; then secure with the cap screws. Tighten in a crisscross pattern to 8 ft-lb.

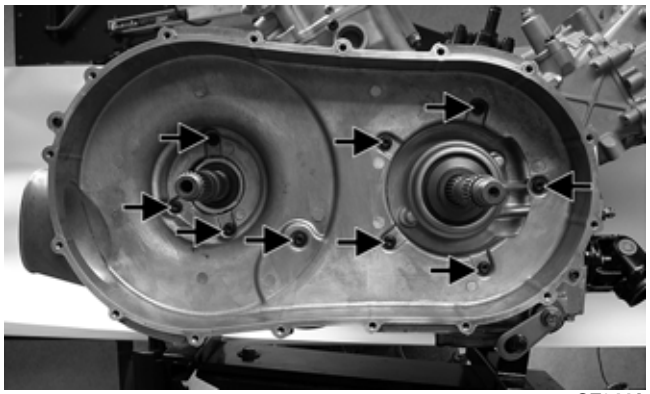


GZ246B

7. Making sure the alignment pins are correctly installed, place a bead of silicone sealant on the mating surfaces and install the V-belt housing. Secure with the cap screws tightened to 8 ft-lb.



GZ263B

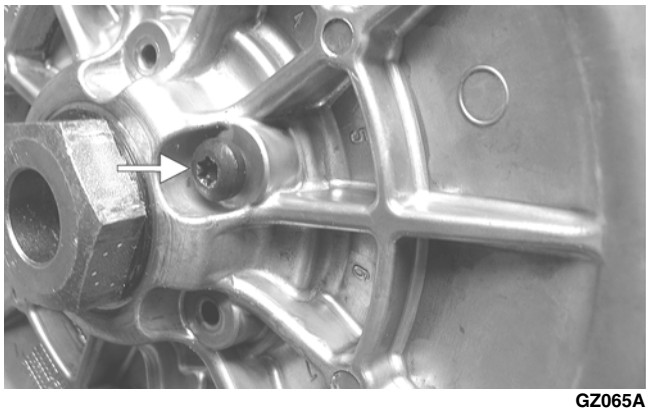


GZ244A

8. Place the driven pulley assembly into position and secure with the nut (coated with red Loctite #271). Tighten to 80 ft-lb.

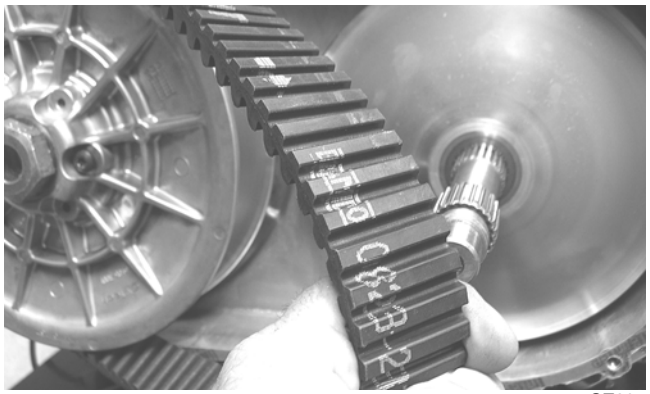
GZ066

9. Slide the fixed drive face onto the clutch shaft.
10. Spread the faces of the driven pulley by threading in a cap screw; then when the faces are separated, insert the belt and push down between the faces.



GZ065A

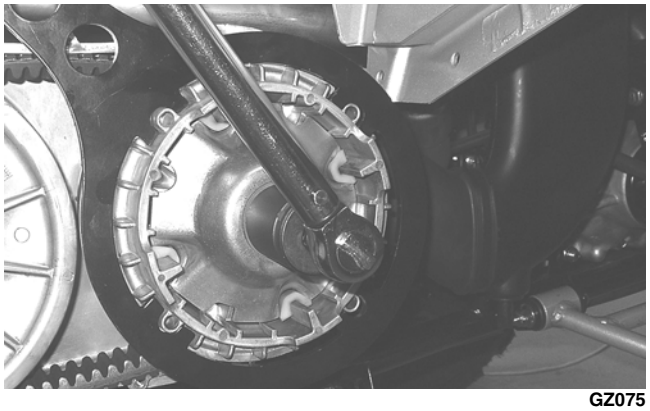
11. Place the V-belt into position on the driven pulley and over the front shaft.



GZ085

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

12. 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 flat washer and a nut (threads coated with red Loctite #271). Tighten the nut to 165 ft-lb.



GZ075

CAUTION

Make sure the splines extend beyond the drive face and washer or a false torque reading and spline damage may occur.

PR386

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

13. Rotate the V-belt and drive/driven assemblies until the V-belt is flush with the top of the driven pulley.
14. Place the V-belt cover gasket into position; then install the cover and secure with the cap screws. Tighten the cap screws to 8 ft-lb.

Center Crankcase Components

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

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

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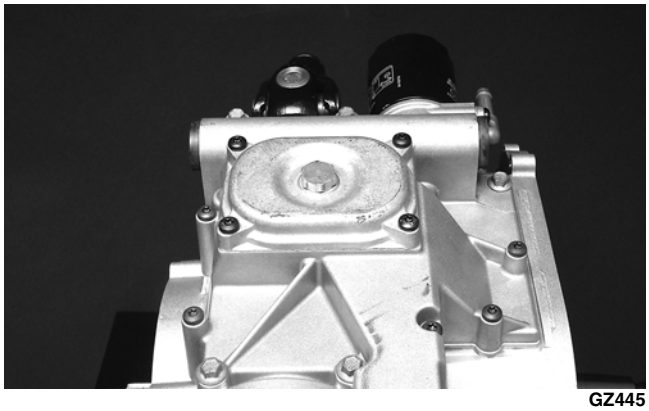
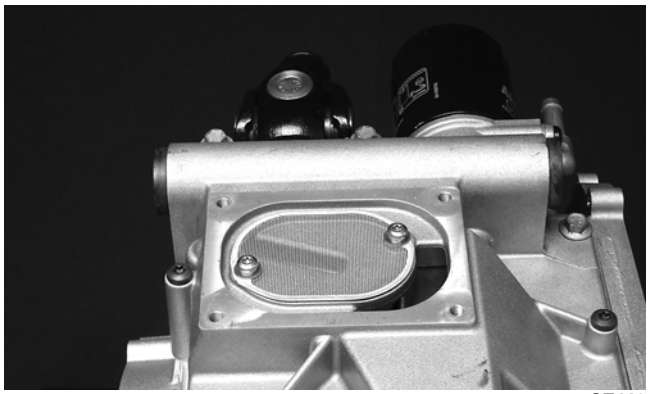
Separating Crankcase Halves

1. Remove the oil strainer cap; then remove the oil strainer.

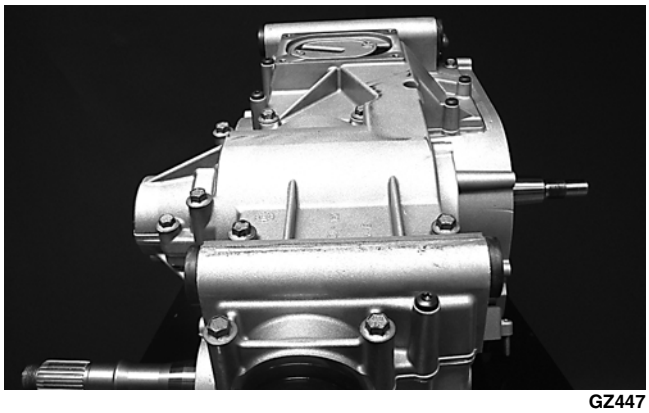


GZ445



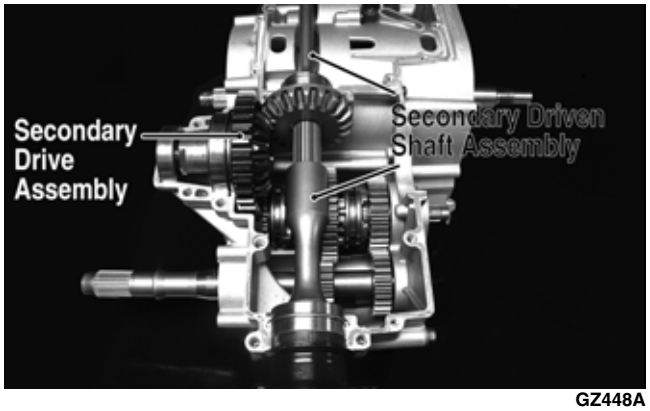
GZ446

2. Remove the cap screws securing the lower crankcase to the upper crankcase halves; then using a rubber hammer, free the lower crankcase and remove. Account for two alignment pins.

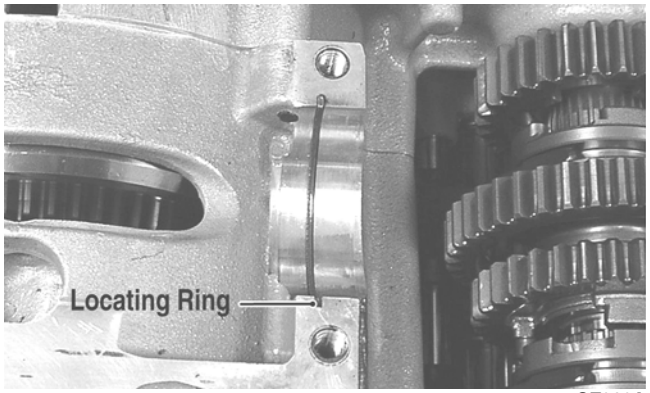


GZ447

3. Remove the secondary drive assembly; then remove the secondary driven shaft assembly and set aside. Account for one locating ring.



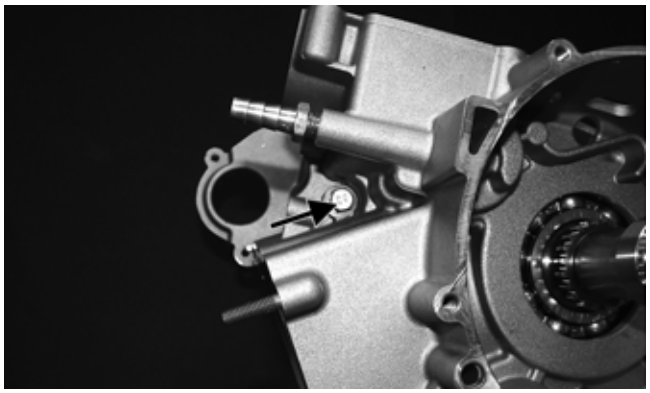
GZ448A



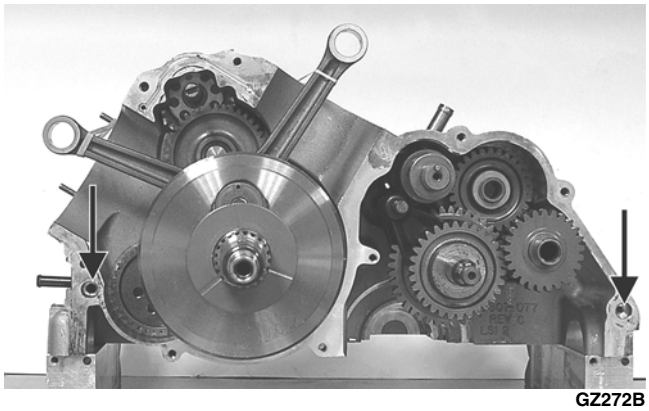
GZ269A

■NOTE: Do not disassemble these assemblies unless service is required. If disassembled, secondary gear sets will have to be reset for backlash and gear contact (see Servicing Center Crankcase Components in this section).

4. Remove one cap screw from the right-side crankcase and eight cap screws from the left-side crankcase; then using a rubber mallet, separate the crankcase halves leaving all components in the right-side case. Account for a thrust washer on the crankshaft and flat washers on gear shift shaft, countershaft, and reverse idler. Note the location of two alignment pins.



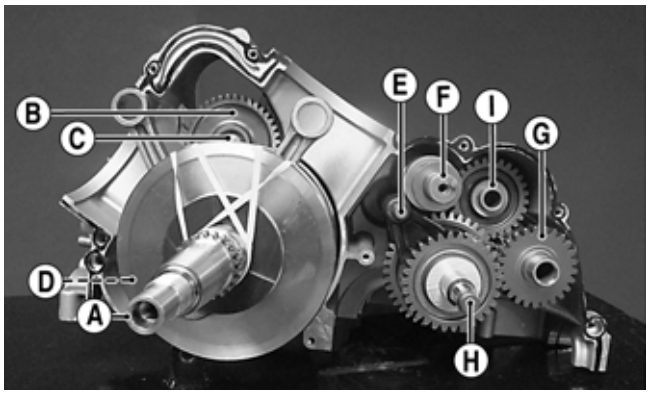
GZ454A



GZ272B

Disassembling Crankcase Half

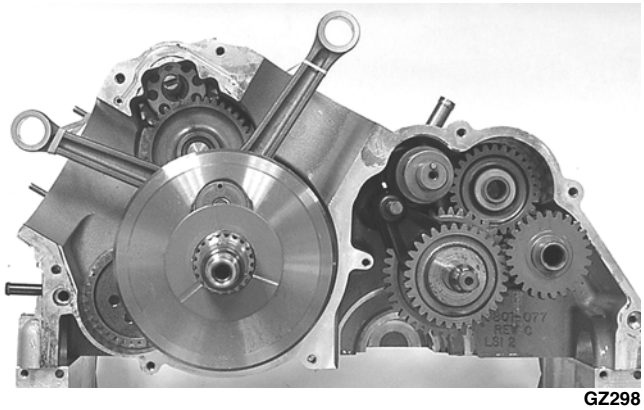
■**NOTE: For steps 1-8, refer to illustration GZ474A.**



GZ474A

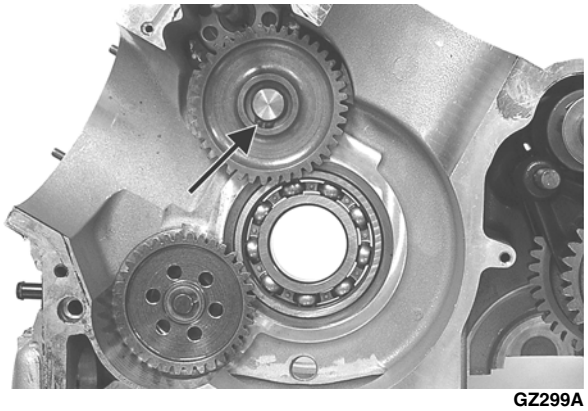
■**NOTE: To aid in installing, it is recommended that the assemblies are kept together and IN ORDER.**

1. Support the right-side crankcase assembly on suitable support blocks; then carefully remove the crankshaft assembly (A) from the crankcase.



GZ298

2. Remove the snap ring securing the water pump drive idler (B) to the idler shaft; then remove the drive idler.

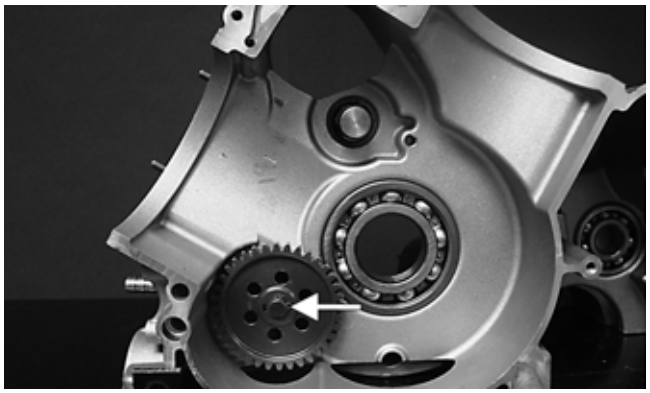


GZ299A

3. Remove the snap ring securing the water pump idler shaft (C) in the crankcase; then remove the shaft and bearings.

GZ463A

4. Remove the snap ring securing the oil pump driven gear (D) to the oil pump driveshaft; then remove the gear. Account for a drive pin and washer.



GZ463B

5. Remove the shift fork shaft (E); then remove the gear shift shaft assembly (F). Account for a washer and a spacer.

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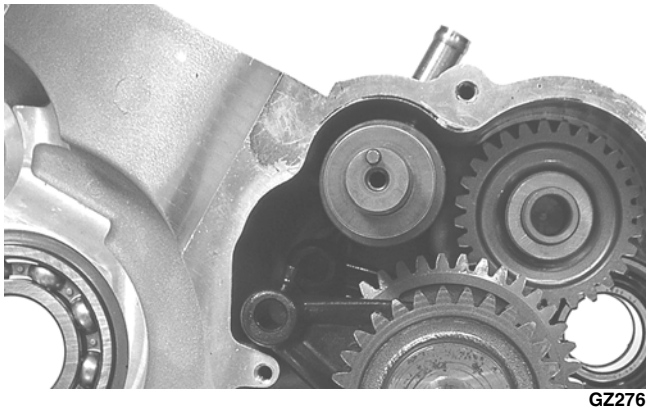
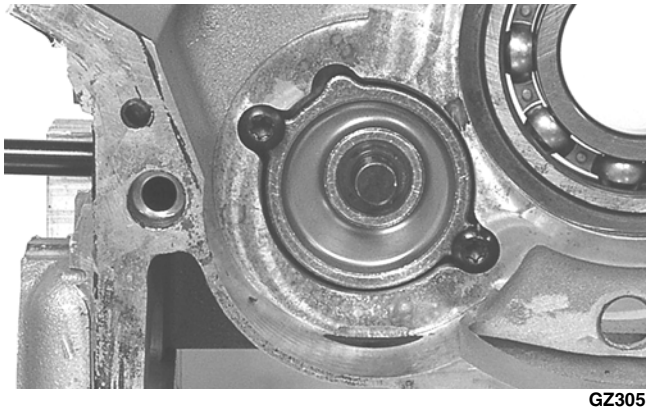
DE677A



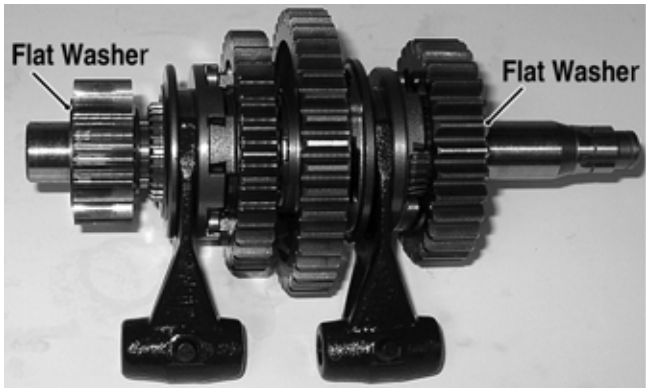
GZ276

6. Remove two cap screws securing the oil pump in the crankcase and remove the oil pump.



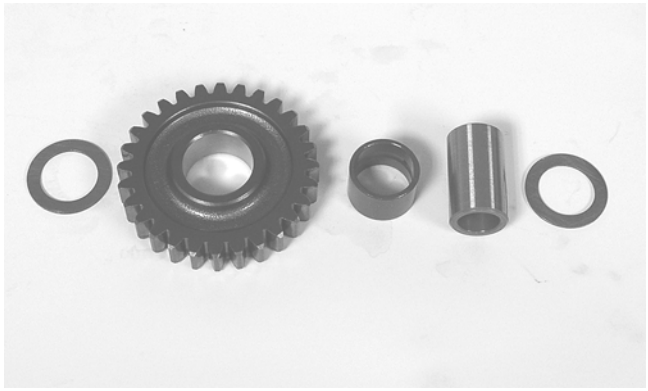
GZ305

7. Remove the driveshaft (G); then remove the countershaft assembly (with shift forks) (H). Account for two flat washers on the countershaft.



GZ280B

8. Remove the reverse idler gear (I), shaft bushing, and two washers.



GZ279

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

Servicing Center Crankcase Components

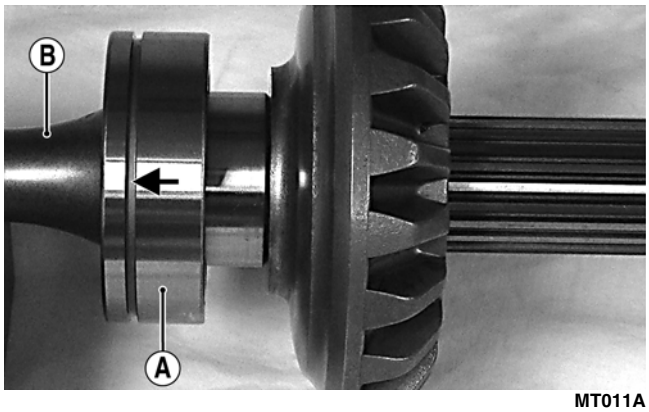
■**NOTE: Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.**

SECONDARY OUTPUT DRIVE GEARS

Initial Set-Up

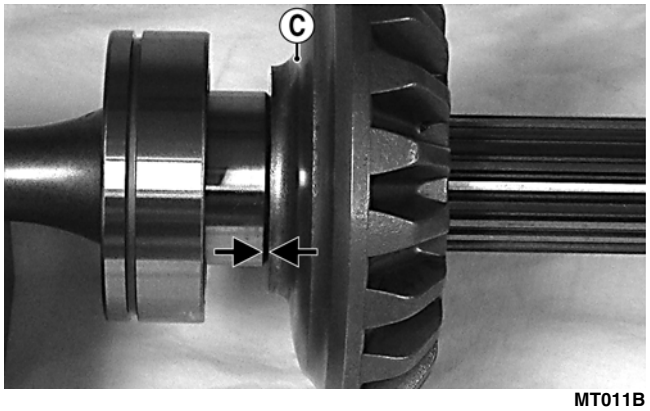
■**NOTE: If the secondary output driven shaft is replaced or disassembled, the initial set-up must be performed to establish correct gear tooth contact. If only the secondary output driveshaft or secondary output driven gear are replaced, proceed to Correcting Backlash in this sub-section.**

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



MT011A

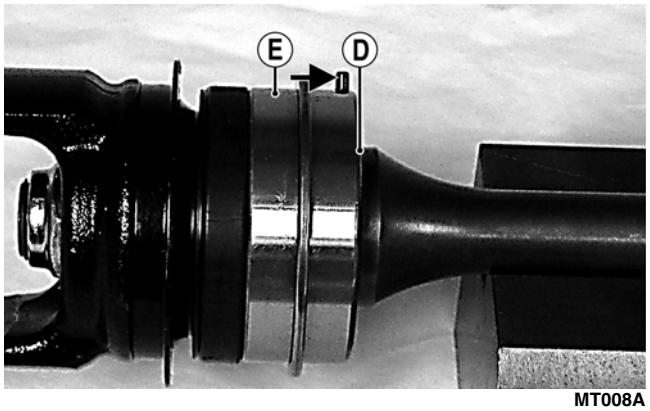
2. Using a suitable press, install the driven gear (C) on the shaft until the gear firmly seats on the shoulder of the shaft.



MT011B

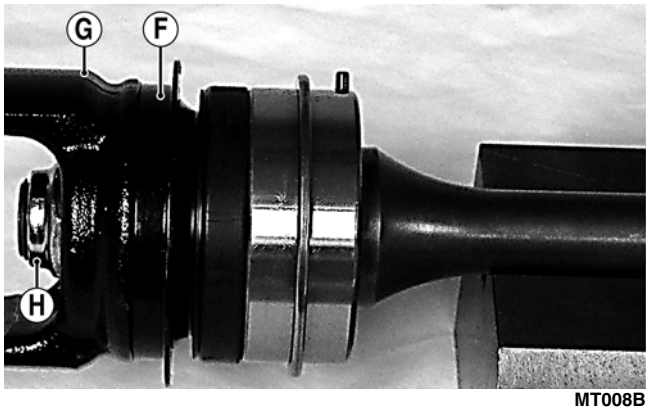
3. If installing the existing shaft, start with the shims removed during disassembly or if installing a new shaft, start with approximately 1.0 mm shims at point (D); then install the output driveshaft bearing (E) making sure the locating pin is directed toward the center of the shaft.

MT012



MT008A

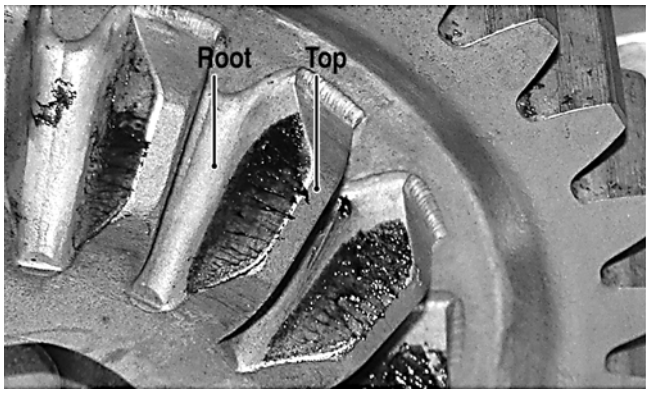
4. Install a new seal (F), output yoke (G), and nut (H) and tighten to 74 ft-lb.



MT008B

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

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



MT016A

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

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

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

Checking Backlash

1. Install the drive bevel gear assembly and driven bevel gear/output shaft assembly into the crankcase bottom cover.

2. Mount the dial indicator so the tip is contacting a tooth on the secondary drive bevel gear.

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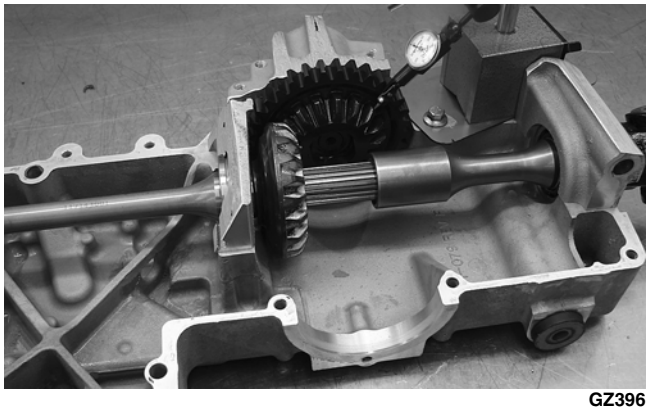
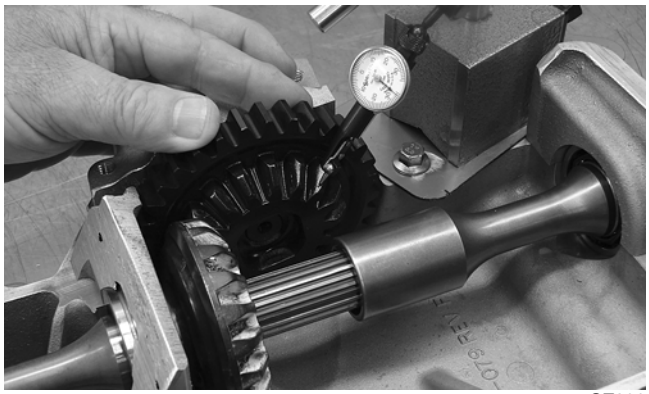


GZ396

3. Firmly hold the bearings down and while rocking the drive bevel gear back and forth, note the maximum backlash reading on the gauge.



GZ398

4. Acceptable backlash range is 0.127-0.381 mm (0.005-0.015 in.).

Correcting Backlash

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

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

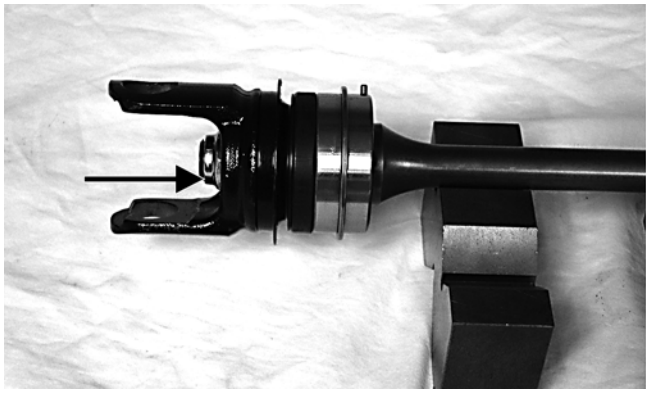
GZ393A

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

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

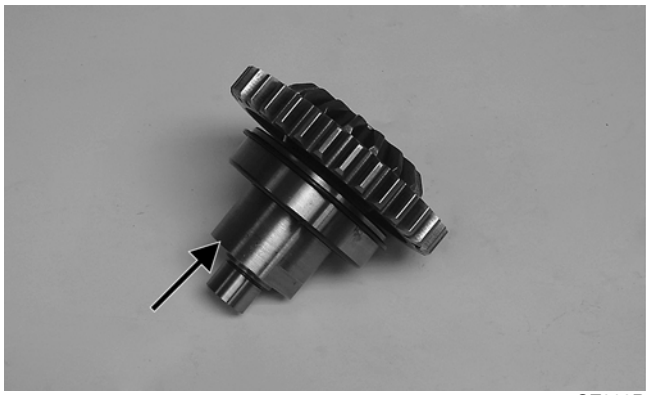
Backlash Measurement	Shim Correction
Under 0.127 mm (0.005 in.)	Decrease Shim Thickness
At 0.127-0.381 mm (0.005-0.015 in.)	No Correction Required
Over 0.381 mm (0.015 in.)	Increase Shim Thickness

3. Once correct gear pattern and backlash are established, install a new lock nut on the output shaft yoke and tighten to 59 ft-lb. Peen the lock nut to the shaft.



MT007A

4. Using an appropriate holding fixture and wrench adapter, install the secondary drive gear nut and tighten to 74 ft-lb. The output drive assembly is now ready for installation.



GZ393B

OIL PUMP ASSEMBLY

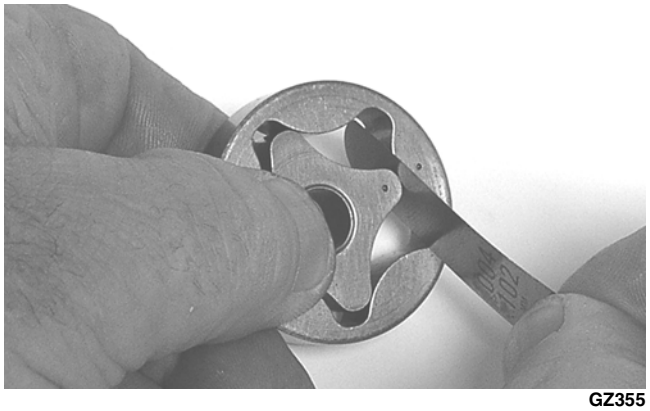
Disassembling and Inspecting

1. Remove the oil pump cover; then remove the gerotor set, shaft, and pin (see Disassembling Crankcase Half in this section).

2. Inspect the crankcase for scoring, discoloration, or cracks in the gerotor bore. If scored, crankcase assembly must be replaced.

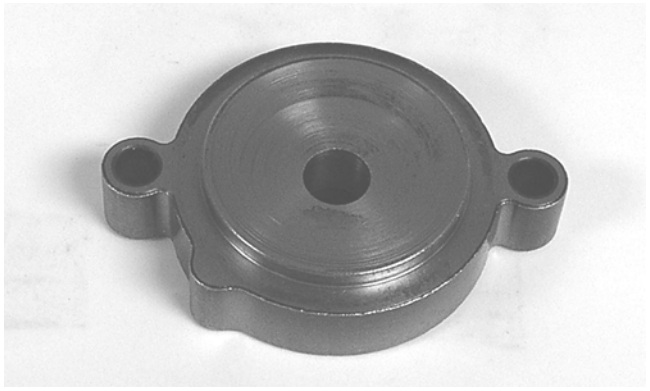
GZ357

3. Inspect the gerotor set for scoring, discoloration, or cracks; then using a feeler gauge, check the inner to outer rotor clearance. If measurements exceed specifications, the gerotor set must be replaced.



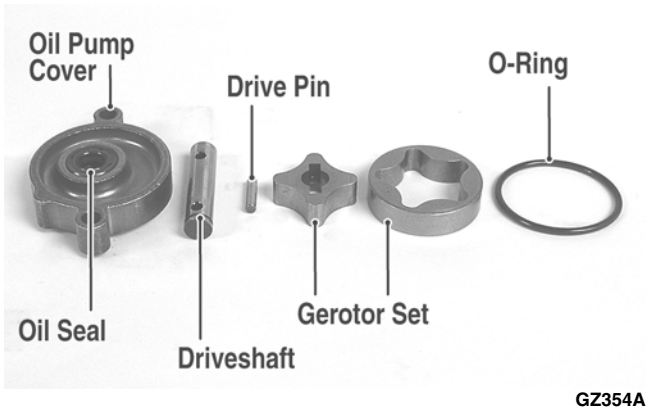
GZ355

4. Inspect the oil pump cover for scoring, discoloration, or cracks. Replace if damaged.



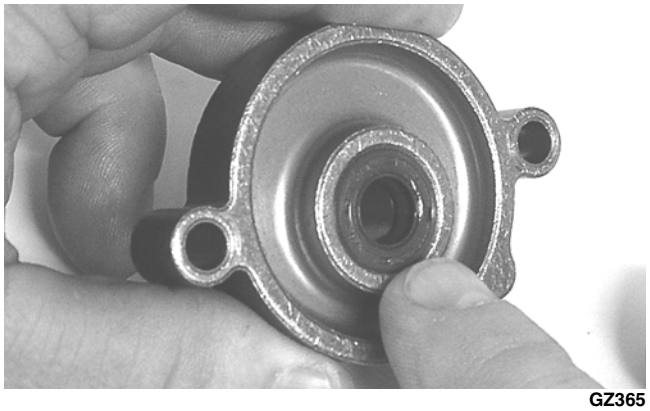
GZ358

5. Inspect the oil pump driveshaft and drive pin for excessive wear or grooving. Replace as required.



GZ354A

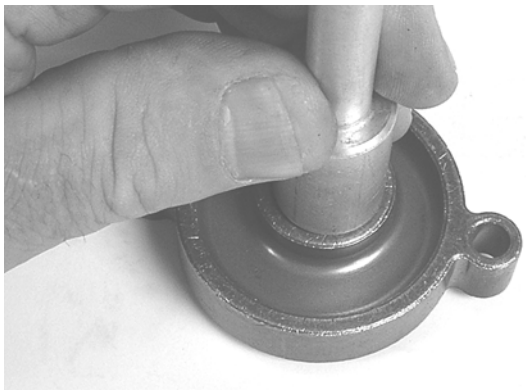
6. Remove the oil seal from the oil pump cover.



GZ365

Assembling

1. Install a new oil seal into the oil pump cover; then coat the lips of the seal with grease and install the pump driveshaft from the seal side.



GZ359

2. Noting the reference dots on the gerotor set, separate the inner rotor from the outer rotor and with the reference dot directed toward the oil pump cover, place the rotor on the shaft; then install the drive pin and push the shaft into the rotor.

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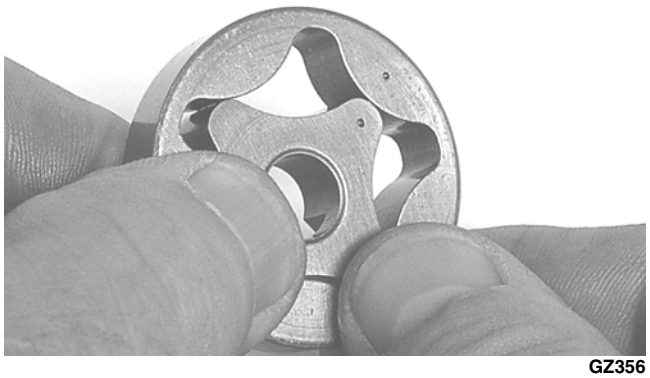
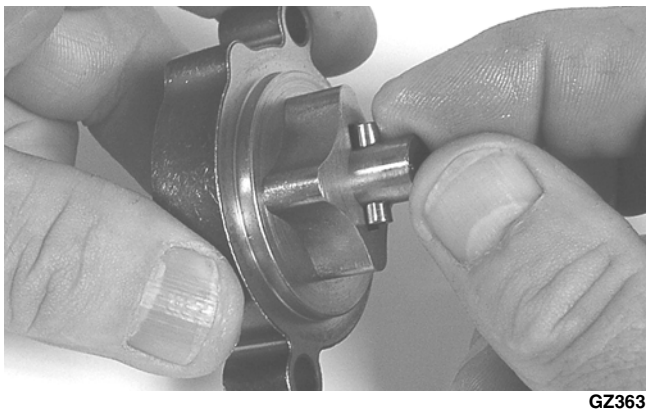


GZ356

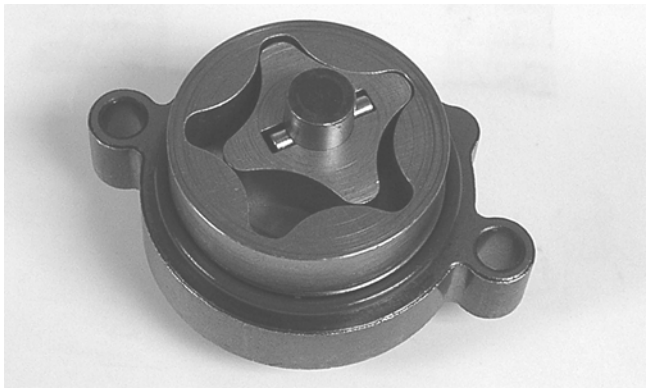


GZ363

3. With the outer rotor reference dot directed toward the oil pump cover, install the rotor onto the inner rotor.

GZ360

4. Place a new O-ring seal on the outside of the oil pump cover. The oil pump assembly is now ready for assembly into the crankcase.



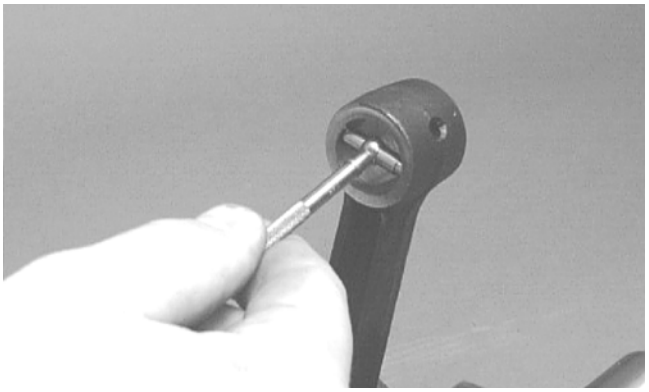
GZ362

CRANKSHAFT ASSEMBLY

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

Measuring Connecting Rod (Small End Inside Diameter)

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



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.

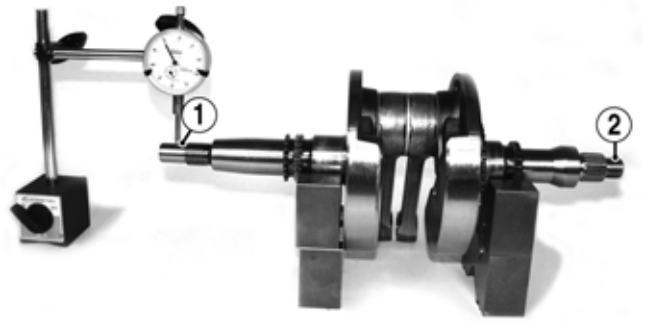
Measuring Connecting Rod (Big End Side-to-Side)

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.
3. Acceptable gap range must be within specifications.

GZ491

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.



GZ489A

3. Zero the indicator and rotate the crankshaft slowly.

CAUTION

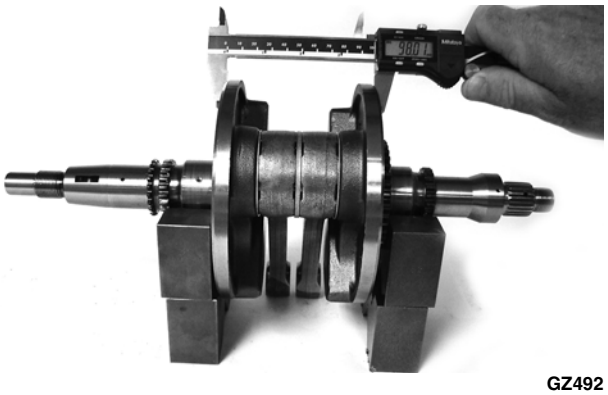
Care should be taken to support the connecting rod when rotating the crankshaft.

4. Maximum runout must not exceed specifications.

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

Measuring Crankshaft (Web-to-Web)

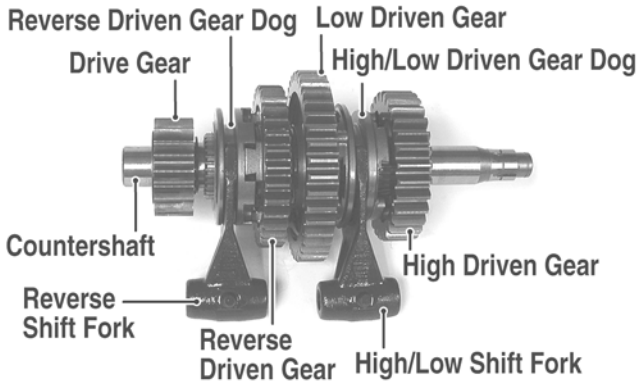
1. Using a calipers, measure the distance from the outside edge of one web to the outside edge of the other web.



GZ492

2. Acceptable width range must be within specifications.

COUNTERSHAFT



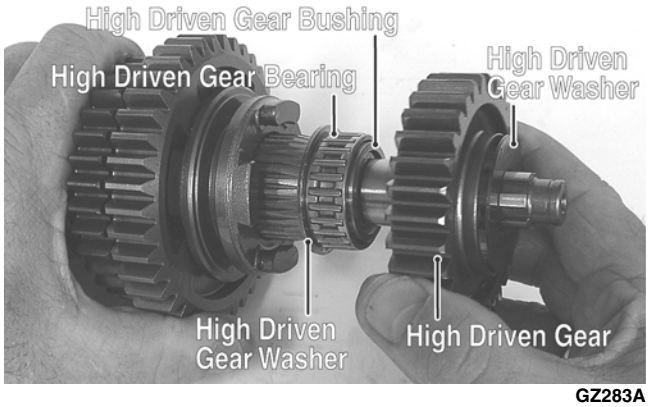
GZ281A

CAUTION

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

Disassembling

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



GZ283A

2. Remove the drive gear; then remove the snap ring securing the reverse driven gear dog and bushing to the countershaft.

GZ296

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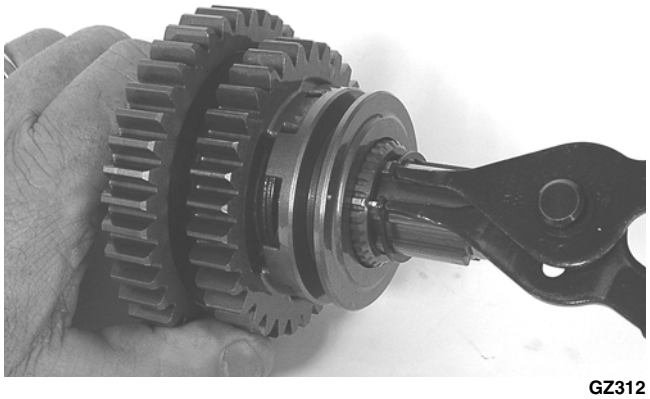
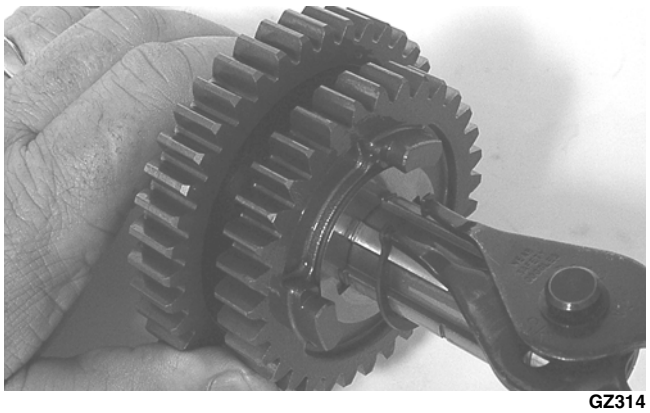


GZ312

3. Remove the reverse driven gear dog.

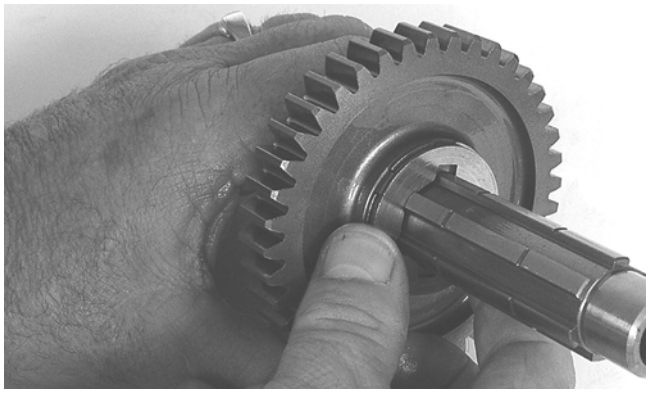
GZ313A

4. Remove the snap ring securing the reverse driven gear and washer; then remove the washer and gear.



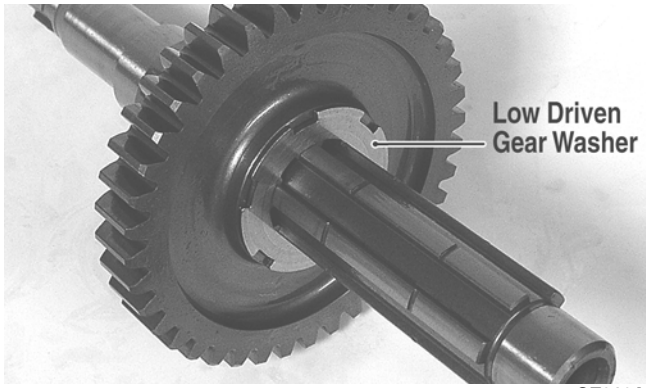
GZ314

5. Remove the reverse driven washer; then remove the low driven gear locking washer.



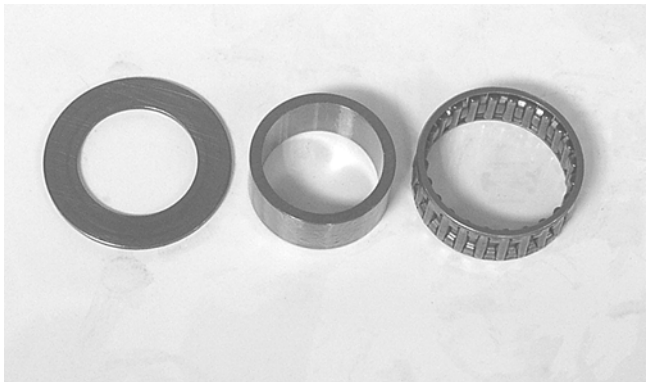
GZ320

GZ319



GZ318A

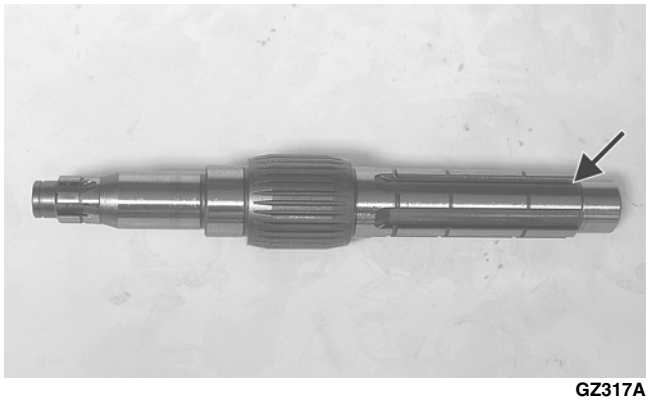
6. Remove the low driven gear. Account for a bearing, bushing, and thrust washer.



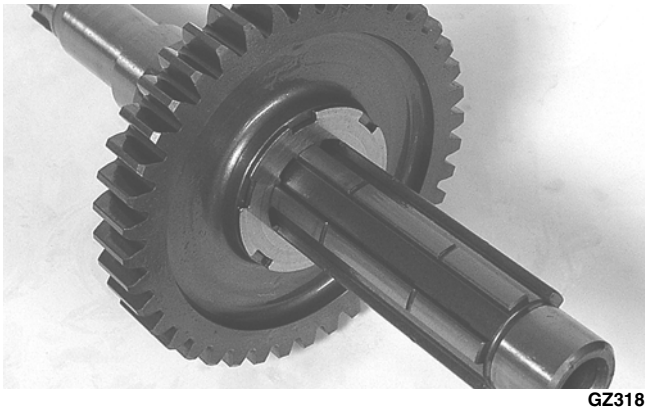
GZ316

Assembling

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



GZ317A

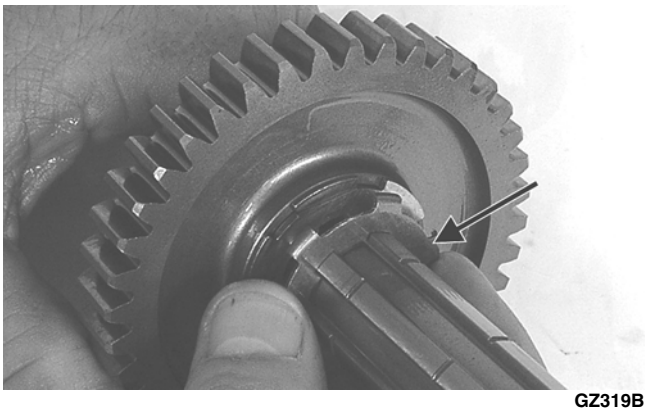


GZ318

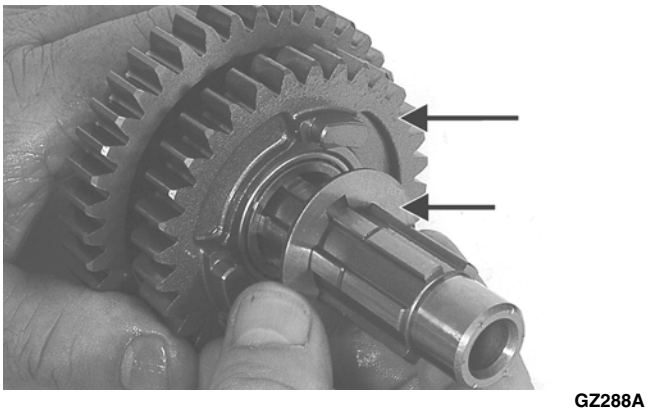
2. Install the low driven gear locking washer; then install the inner reverse driven gear washer.

GZ287

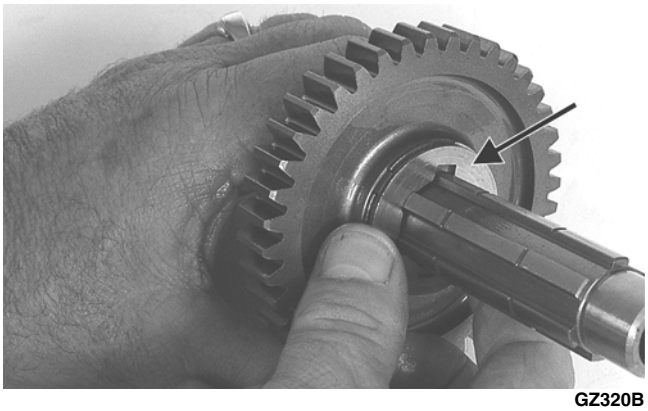
4. Install the outer reverse driven washer; then secure the reverse driven gear assembly with a snap ring.



GZ319B

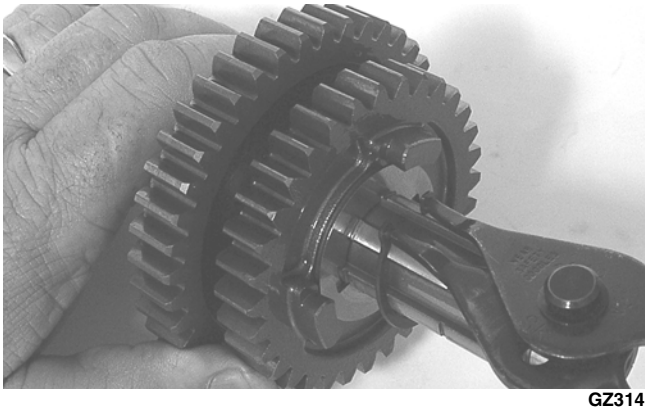


GZ288A



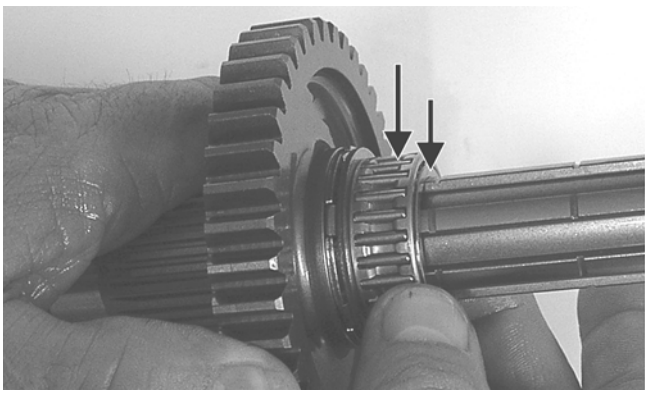
GZ320B

3. Install the reverse driven bushing and bearing; then install the reverse driven gear.



GZ314

5. Install the reverse driven gear dog onto the counter-shaft and secure with a snap ring.



GZ286A

GZ313A

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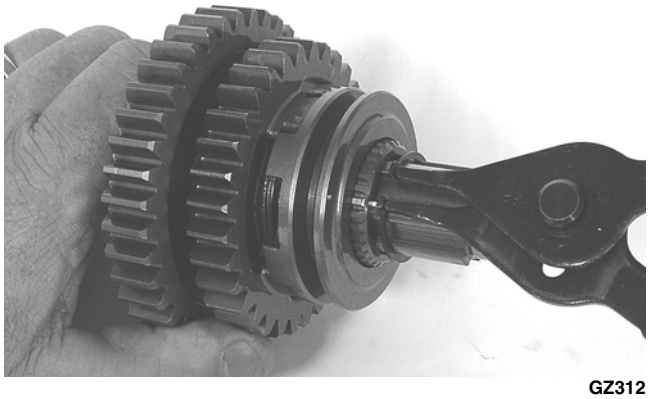
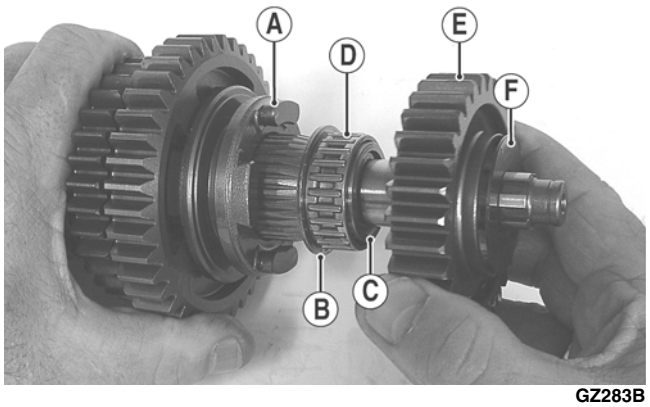


GZ312

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

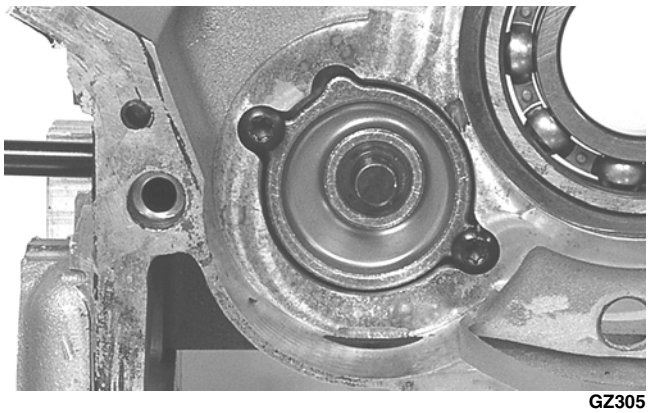


GZ283B

7. Install the drive gear washer and the shift forks. The countershaft is now ready for installation.

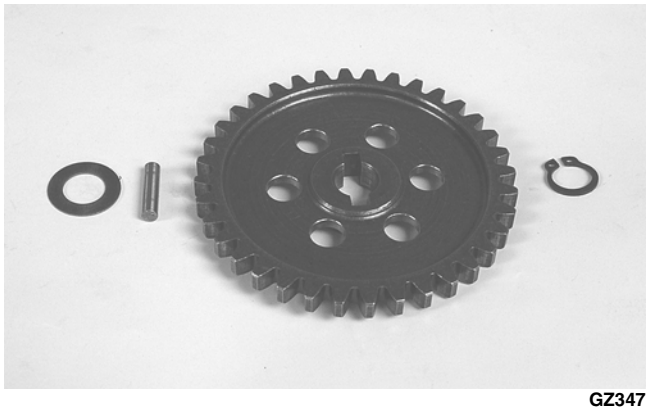
Assembling Crankcase Half

1. Install the oil pump gerotor assembly and oil pump cover in the crankcase and secure with two cap screws. Coat the threads with blue Loctite #243 and tighten securely to 8 ft-lb.



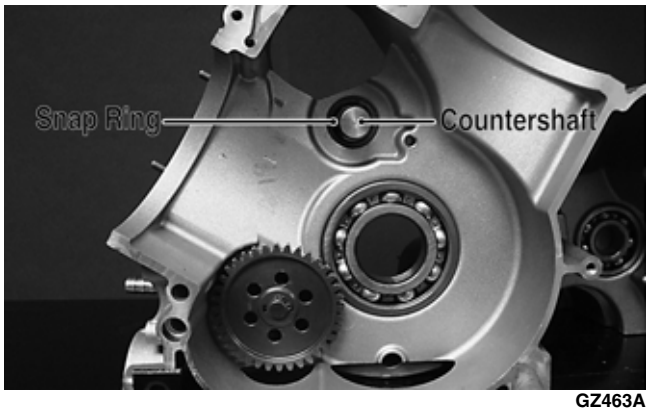
GZ305

2. Install a flat washer, drive pin, and drive gear onto the oil pump shaft; then secure with a snap ring (flat-side away from the gear).



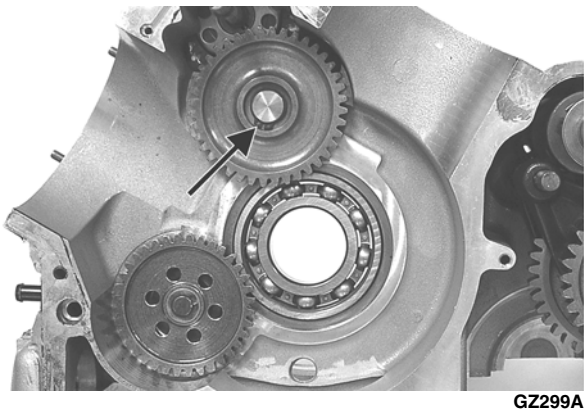
GZ347

3. Install the countershaft into the crankcase and secure with the snap ring (flat side away from the bearing).



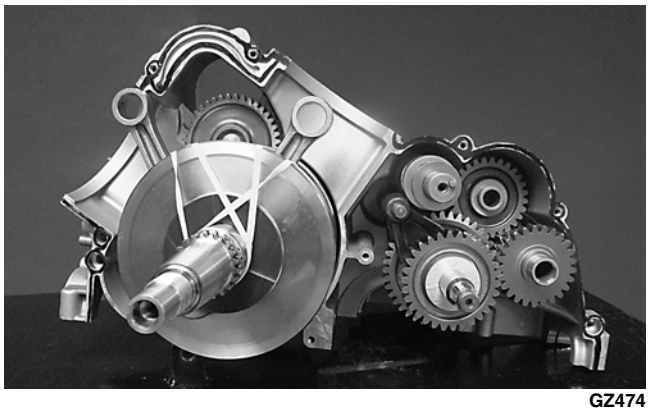
GZ463A

4. Install the countershaft gear onto the countershaft and secure with a snap ring (flat-side away from the gear).



GZ299A

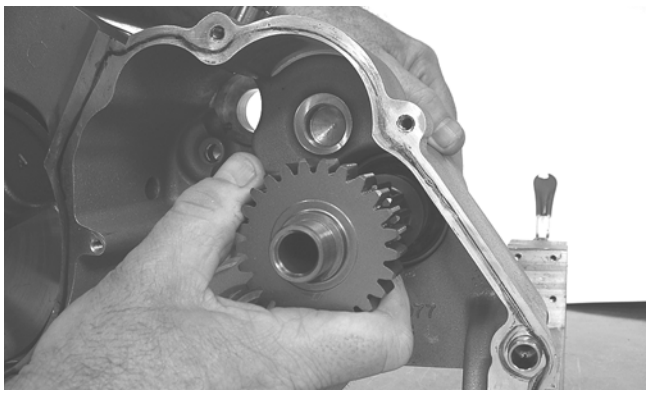
5. Using rubber bands to support the connecting rods, carefully install the crankshaft assembly into the crankcase.



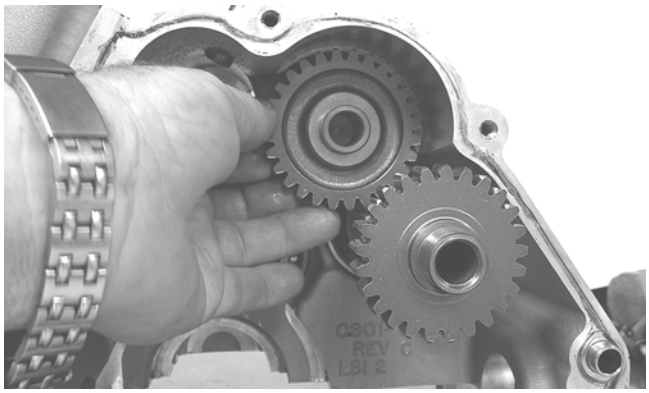
GZ474

■NOTE: It will be necessary to rotate the crankshaft back and forth to engage the teeth of the oil pump and countershaft gears.

6. Install the driveshaft; then with a flat washer on each end of the reverse idler assembly, install into the crankcase.



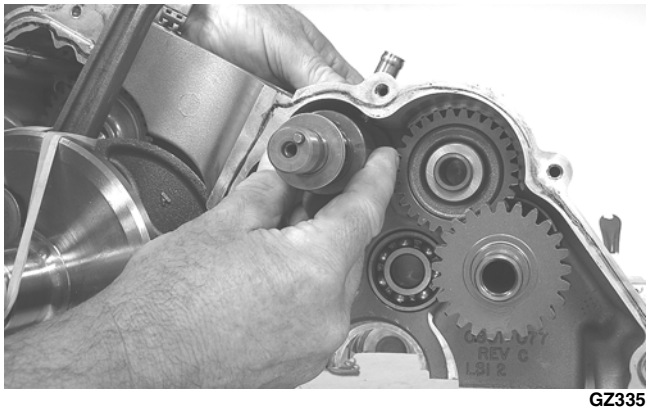
GZ332



GZ333

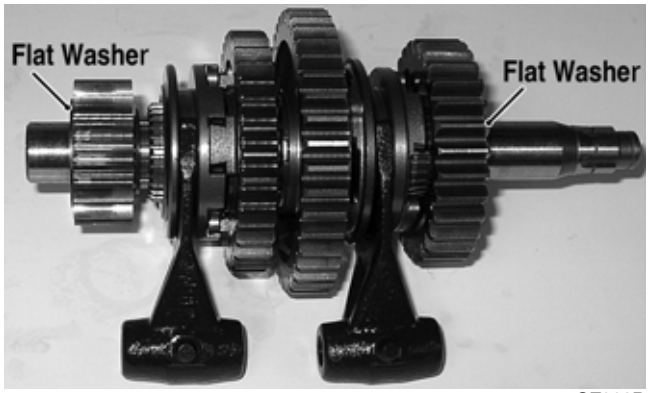
7. Install the gear shift shaft into the crankcase making sure the flat washer is in place on the right case end and the spacer bearing assembly on the gear shift stop end.

DE677A

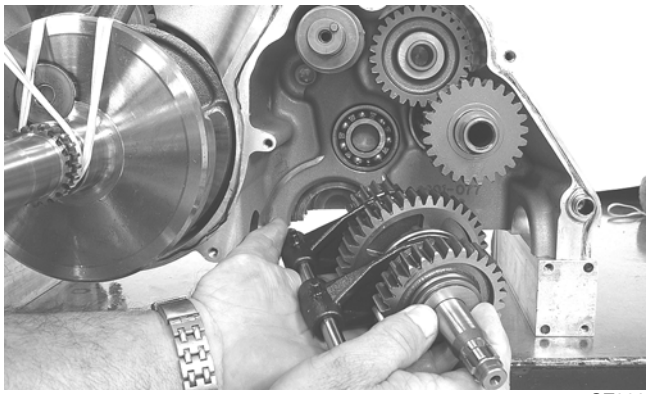


GZ335

8. Place the larger flat washer on the drive gear end of the countershaft and the smaller flat washer on the high driven gear end; then with shift forks and shift fork shaft, install the countershaft assembly into the crankcase.

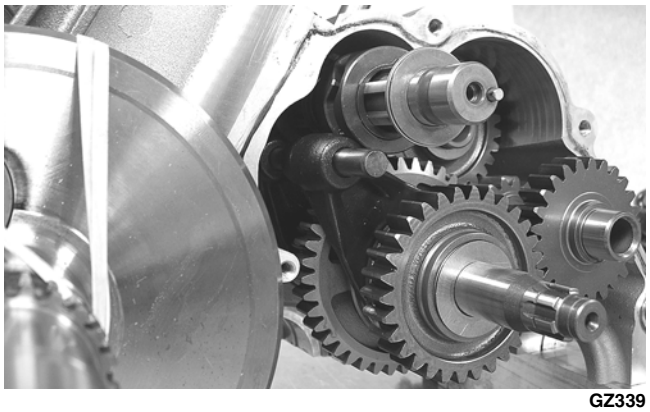


GZ280B



GZ336

9. Engage the shift forks into the gear shift shaft and push the shift fork shaft into the crankcase.



GZ339

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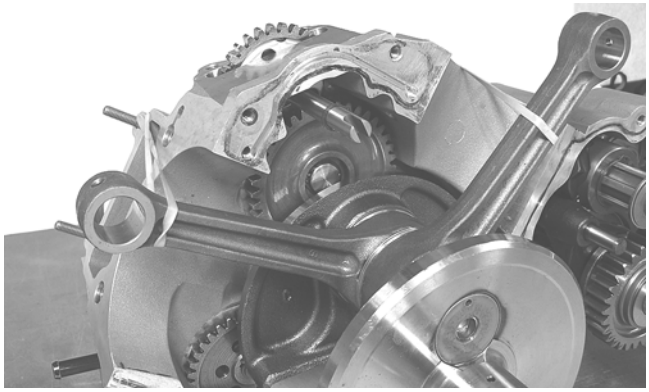
☞ AT THIS POINT
Proper transmission shifting should be verified by turning the gear shift shaft to select High, Low, Neutral, and Reverse while rotating the input shaft and observing the countershaft rotation.

☞ AT THIS POINT
The right-side crankcase is now ready for installation to the left-side crankcase. Proceed to Joining Crankcase Halves.

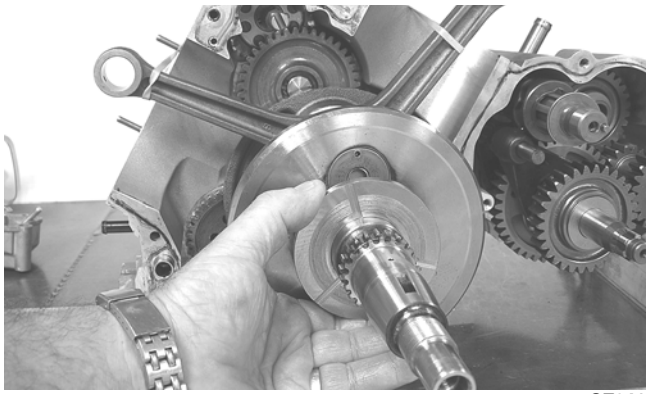
Joining Crankcase Halves

1. Using rubber bands, support the connecting rods to align with the cylinder bores.



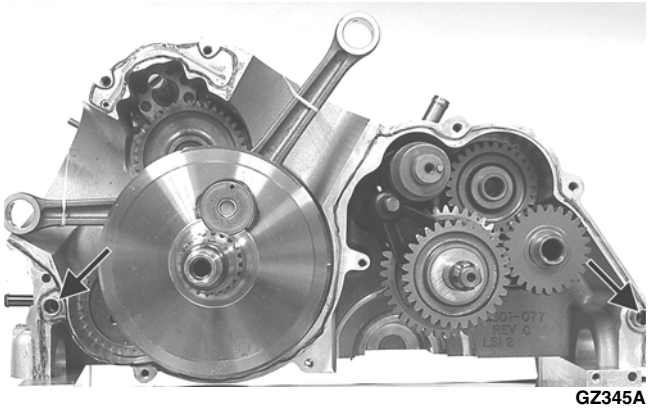
GZ340

2. Coat both sides with engine oil; then install the spacer washer on the crankshaft with the radius directed toward the crankshaft.



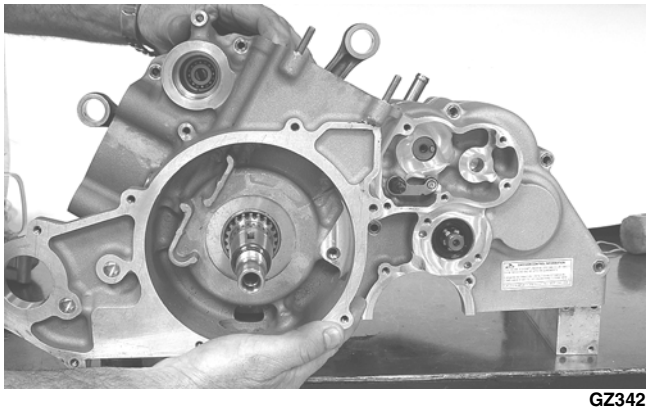
GZ341

3. Install the two alignment pins; then apply a thin bead of silicone sealant to the crankcase mating surface.



GZ345A

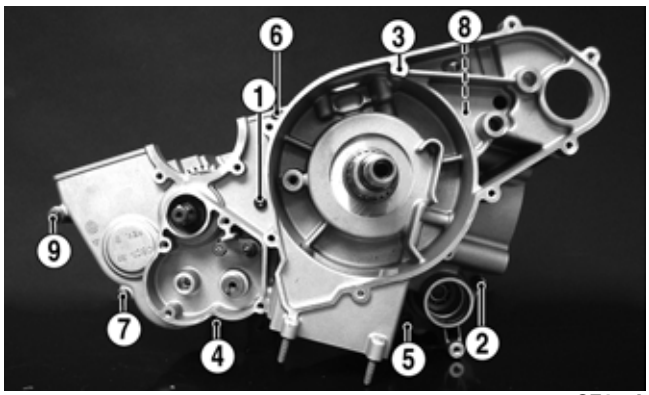
4. Carefully join the crankcase halves by placing the left-side crankcase onto the assembled right side. Secure with the cap screws (eight left side and one right side).



GZ342

5. Tighten the 6 mm cap screws to 8 ft-lb and the 8 mm cap screws to 20 ft-lb using the pattern shown and turning the shafts frequently to ensure there is no binding.

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

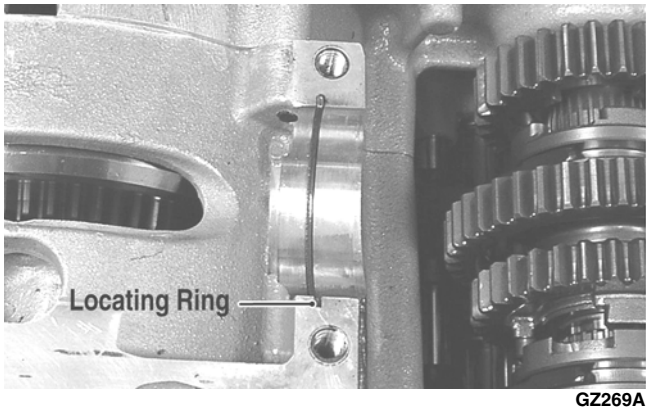


GZ457A

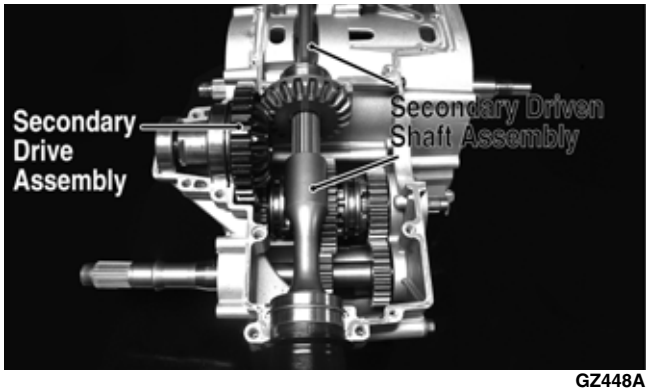
■NOTE: Cap screw number eight (8) is installed from the right side.

■NOTE: If the secondary drive/driven assemblies have been disassembled, refer to Servicing Center Crankcase Components for proper gear tooth contact and backlash.

6. Install the locating ring in the crankcase assembly; then install the secondary driven shaft assembly and secondary drive assembly making sure the locating ring and bearing engage correctly.

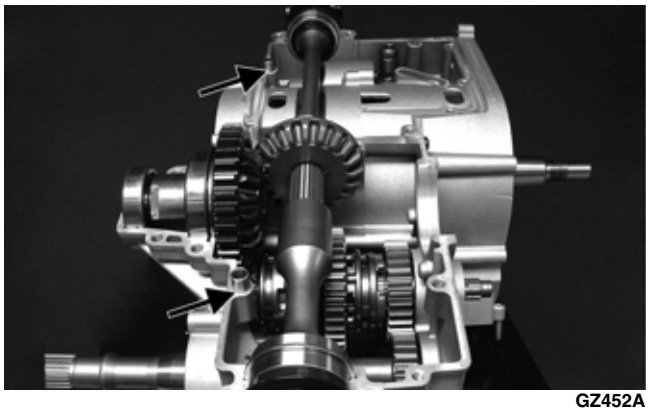


GZ269A

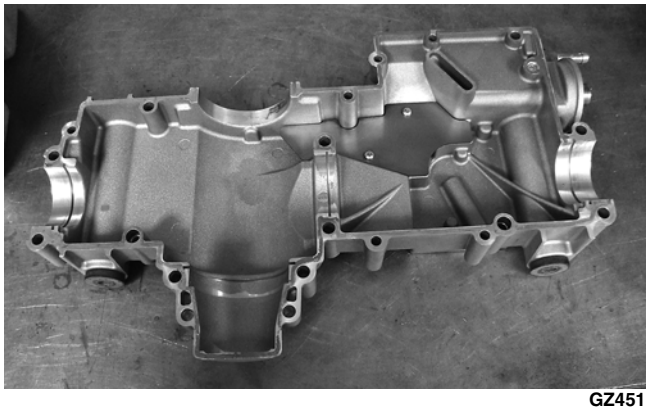


GZ448A

7. Make sure the locating pins on the front and rear bearings are correctly seated in the crankcase.
8. Install two alignment pins into the upper crankcase assembly; then apply a thin bead of silicone sealant to the lower crankcase cover.

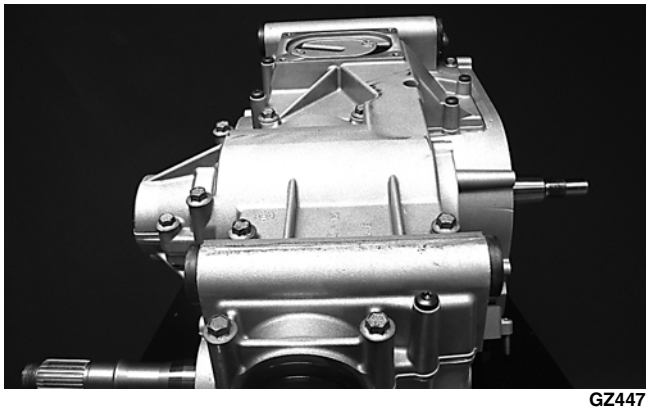


GZ452A



GZ451

9. Carefully place the lower crankcase cover onto the joined crankcase halves; then secure with the cap screws. Tighten the 6 mm cap screws to 8 ft-lb and the 8 mm cap screws to 20 ft-lb.



GZ447

10. Install the oil strainer; then apply a thin bead of silicone sealant to the oil strainer cap and secure with the cap screws. Tighten to 8 ft-lb.

☞ AT THIS POINT

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

Installing Engine/Transmission

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

1. Turn the front driveline to place the output drive yoke universal joint in the horizontal plane; then secure the driveshaft to the right and against the engine.

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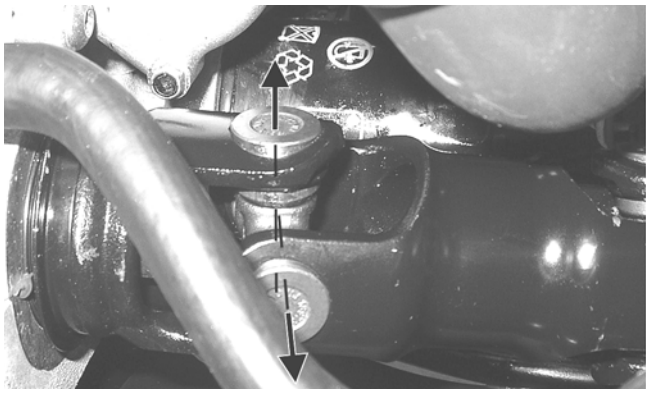
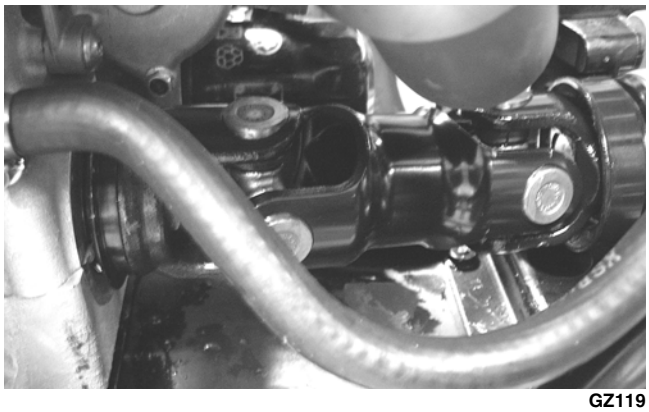
GZ117A

2. Install the engine/transmission into the frame from the right side.
3. Rotate the driveshaft 90°; then lift the front of the engine sufficiently to engage the splined shaft into the front differential. Lower the front of the engine.

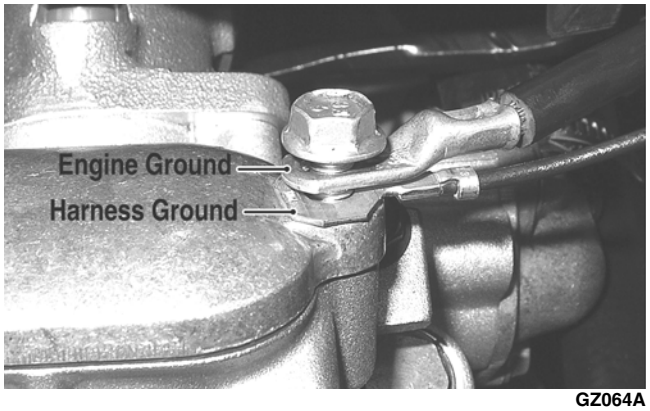


GZ110A



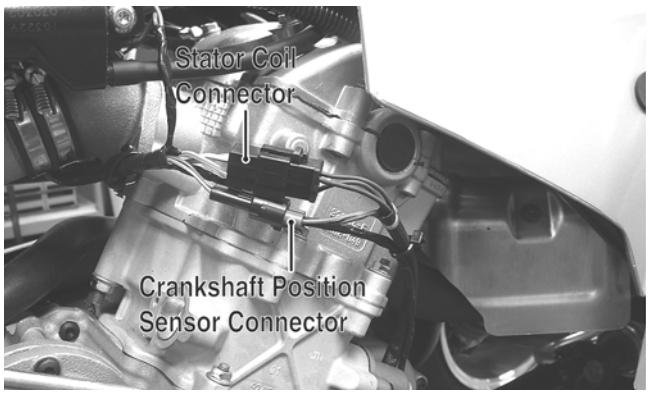
GZ119

4. Align the rear output drive flange and the rear yoke flange and install the cap screws. Tighten to 20 ft-lb.
5. Align the engine with the mounting brackets and install the through-bolts with flat washers; then install the flange nuts and tighten to 45 ft-lb.
6. Connect the coolant hose and tighten the clamps securely.
7. Secure the engine and harness grounds to the engine and tighten the cap screw to 8 ft-lb.



GZ064A

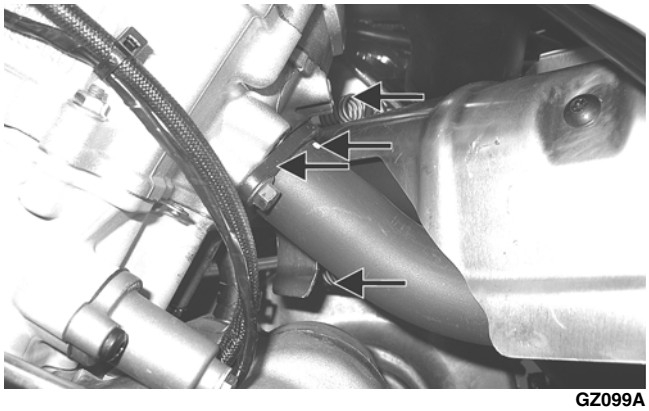
8. Install the ignition coils and tighten the cap screws to 7 ft-lb; then connect the primary wires, grounds, and spark plug caps.
9. Connect the stator coil connector and crankshaft position sensor connector; then connect the gear position switch connector.



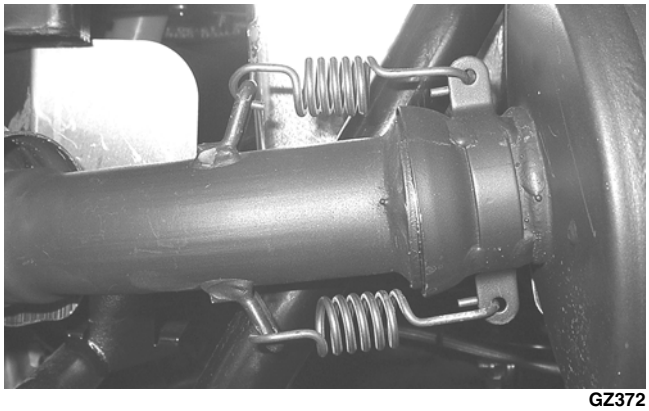
GZ069A

GZ493A

10. Install the front the rear exhaust pipes with new grafoil seals and tighten the retaining nuts to 20 ft-lb; then install the muffler and connect all exhaust juncture springs.



GZ099A



GZ372

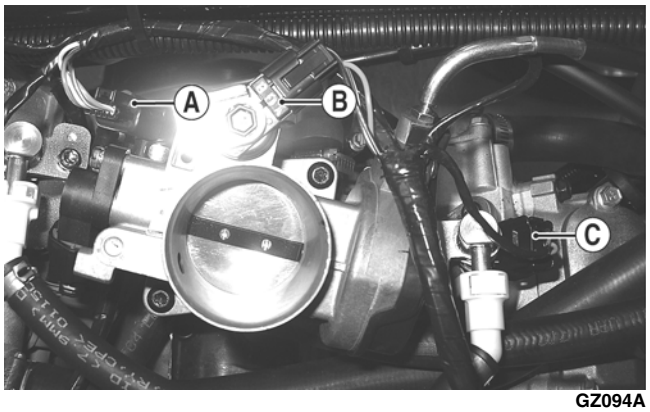
11. Install the intake manifolds and tighten to 8 ft-lb; then install the throttle body and secure with the hose clamps.

GZ106

GZ107

GZ090B

12. Connect the fuel injector, TPS connector (A), MAP sensor connector (B), and ISC valve connector (C).



GZ094A

13. Install the shift linkage with bushings and secure with E-clips.

14. Connect the gasline hose connectors to the fuel rails; then install any nylon ties that were removed during disassembly.

GZ124

15. Install the air filter housing and secure to the throttle body with a hose clamp; then connect the IAT sensor connector.

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GZ013

16. Install the V-belt cooling duct and boots. Tighten securely.
17. Install the front body panel, footrests, foot wells, and front rack; then install the upper bumper support-to-frame cap screws (see Section 8).
18. Connect the negative battery cable; then secure the battery with the tool tray and install the seat.
19. Pour in the proper quantities of engine/transmission oil and coolant; then start the engine and warm up to operating temperature.
20. Check for fluid leaks; then shut off engine and check fluid levels (see Section 2).

SECTION 4 - FUEL/LUBRICATION/COOLING

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Fuel/Lubrication/Cooling

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

■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 1.

SPECIAL TOOLS

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

Description	p/n
Oil Pressure Test Kit	0644-495
Seal Removal Tool	0644-072
Tachometer	0644-275

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

Electronic Fuel Injection

⚠ 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 Electric Fuel Pump/Fuel Level Sensor in this section.
2. Check for a flashing DTC (Diagnostic Trouble Code) on the LCD. If a code is flashing, see appropriate Diagnostic Trouble Codes (DTC) 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 (450)

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

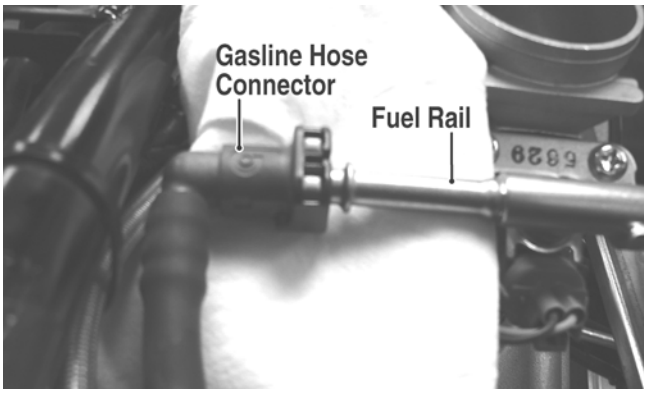
⚠ WARNING

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

2. Remove the seat; then disconnect the battery.
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.
5. Slowly disconnect the gasline hose connector from the fuel rail.

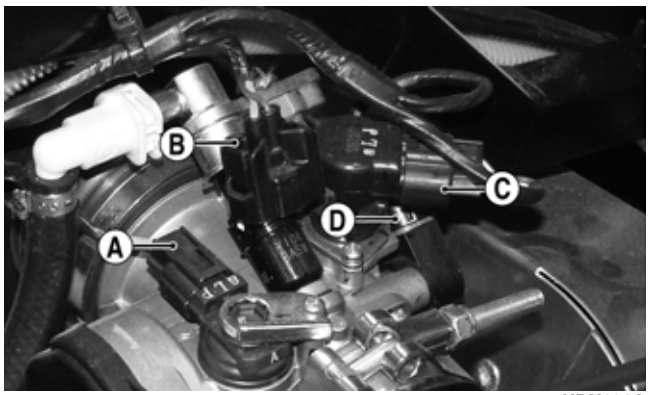
⚠ WARNING

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



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



HDX136A

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

FI104A

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

CAUTION

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

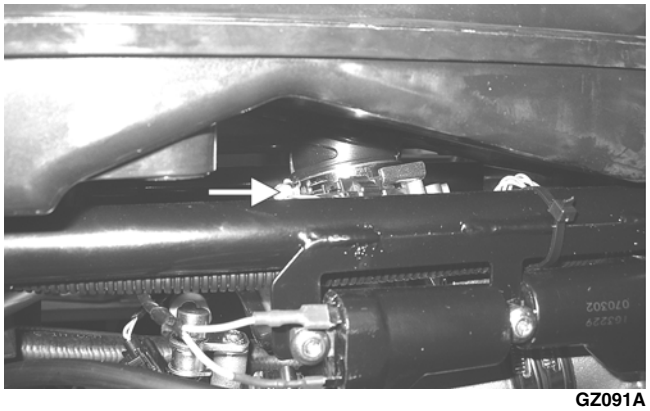
REMOVING (1000)

⚠ WARNING

Whenever the gasline hoses are removed (other than for pressure testing), the battery must be disconnected to prevent inadvertent activation of the electronic fuel pump.

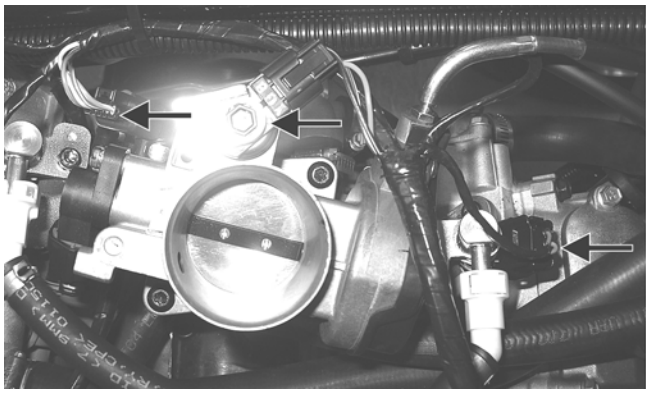
1. Remove the front rack and body panel (see Section 8).
2. Disconnect the wires from the IAT sensor; then loosen the clamp and remove the inlet air boot from the air filter housing.

GZ379

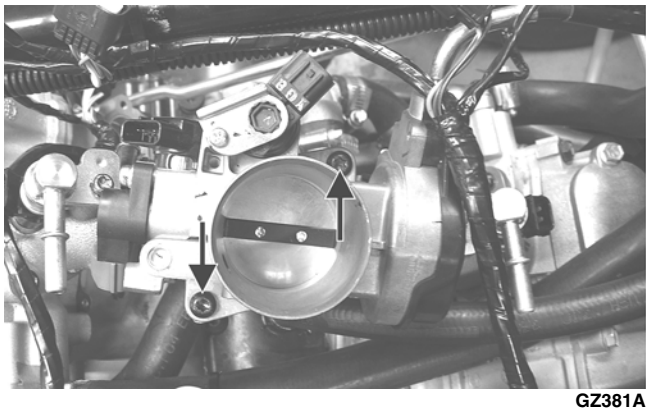


GZ091A

3. Loosen the clamp on the throttle body intake boot; then remove the air filter housing from the ATV.
4. Disconnect the three wiring connectors from the sensors on the throttle body; then remove the cap screws securing the throttle body to the intake manifold.



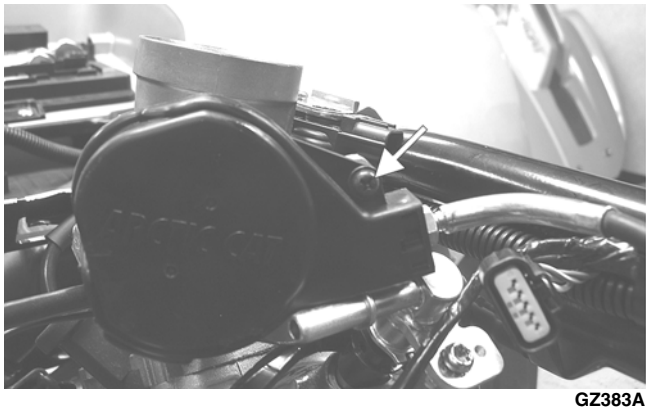
GZ094B



GZ381A

5. Remove the throttle arm cover and disconnect the throttle cable; then remove the throttle body from the ATV.

4



GZ383A

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

CAUTION

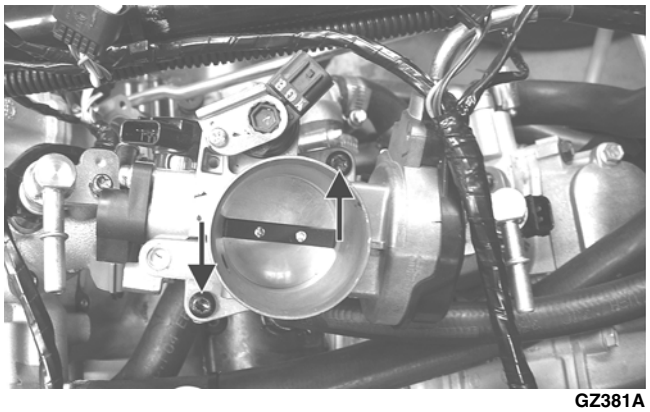
Any objects or liquid entering the intake opening will fall into the engine causing severe damage if the engine is turned over or started.

INSTALLING (450)

1. Install the throttle body into the intake pipe and secure with the clamp. Tighten securely.
2. Place a new O-ring in the intake pipe; then position the pipe onto the engine and secure with two cap screws.
3. Connect the throttle cable to the throttle body and adjust throttle cable free-play (see Throttle Cable Fre-Play in this section); then connect the gasline hose.
4. Connect the four electrical connectors to the throttle body components.
5. Install the air filter housing boot and secure with the clamp; then install the air filter, air filter cover, storage compartment, and storage compartment cover.
6. Connect the battery (positive cable first); then install the seat making sure it locks securely in place.

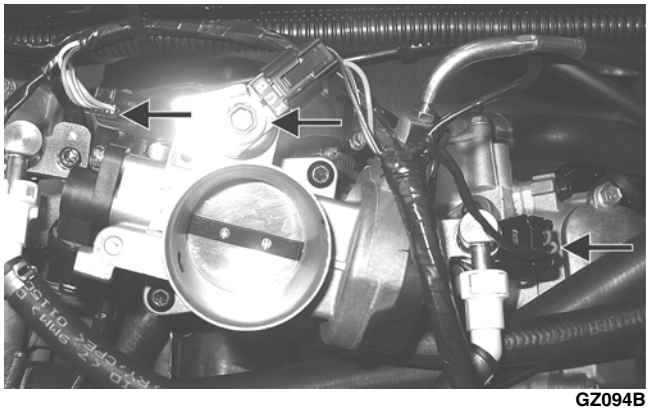
INSTALLING (1000)

1. Connect the throttle cable to the throttle body; then remove the tape from the intake manifold and install the throttle body using a new O-ring. Tighten the cap screws securely.



GZ381A

2. Connect the three wiring connectors to the sensors; then install the air filter housing and connect all hoses. Tighten all clamps securely.



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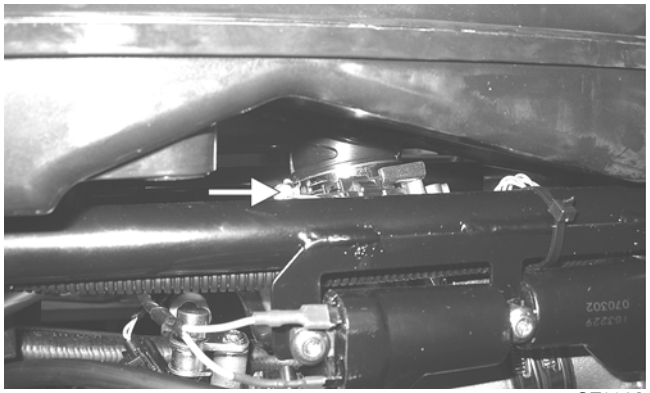


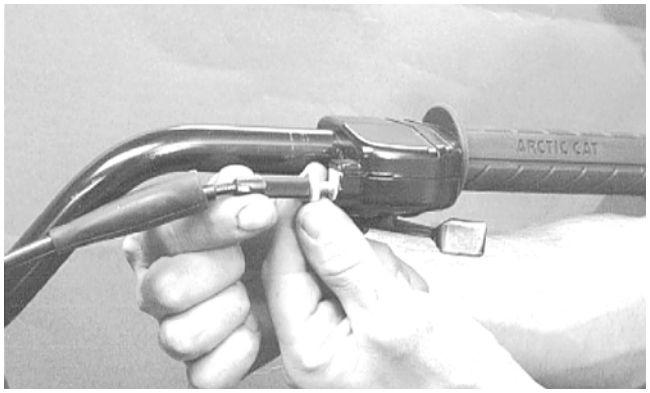
GZ091A

3. Connect the wiring connector to the IAT sensor.
4. Install the front rack and body panel (see Section 8).
5. Install the seat making sure it locks securely in place.

Throttle Cable Free-Play

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

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



AL611D

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

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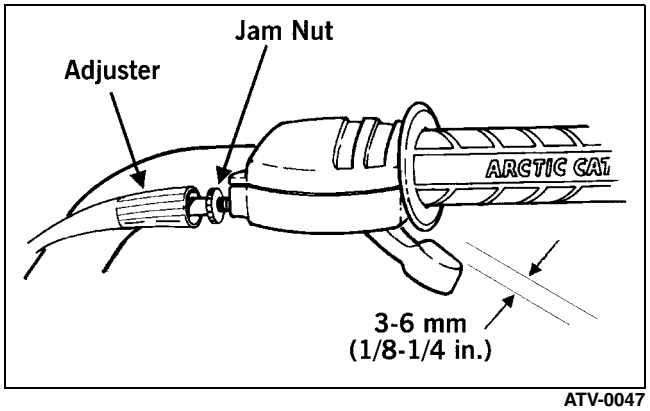


ATV-0047

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

Engine RPM (Idle)

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

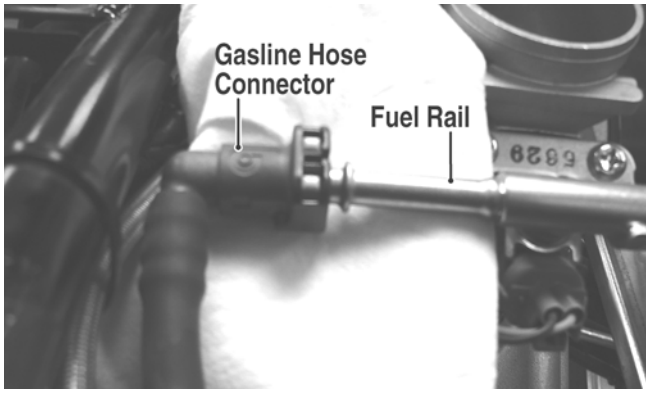
Gas Tank

⚠ 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 throttle body by compressing the release on the connector.



FI092A

4. Remove the cap screws securing the gas tank to the frame.
5. Disconnect the fuel gauge connector; then remove the gas tank.

CLEANING AND INSPECTING

■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.
4. Remove the fuel level sensor/fuel pick-up assembly and inspect the fuel level sensor and fuel screen.

■NOTE: If the fuel level sensor has failed or may be faulty, see Electric Fuel Pump/Fuel Level Sensor in this section.

INSTALLING

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

Oil Filter/Oil Pump

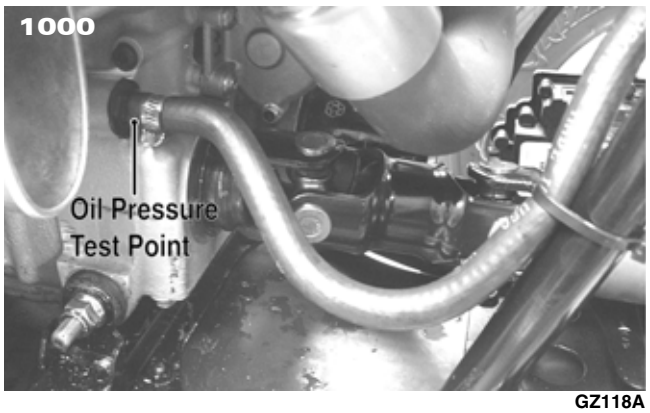
■NOTE: Whenever internal engine components wear excessively or break and whenever oil is contaminated, the oil pump should be replaced. The oil pump is not a serviceable component.

Testing Oil Pump Pressure

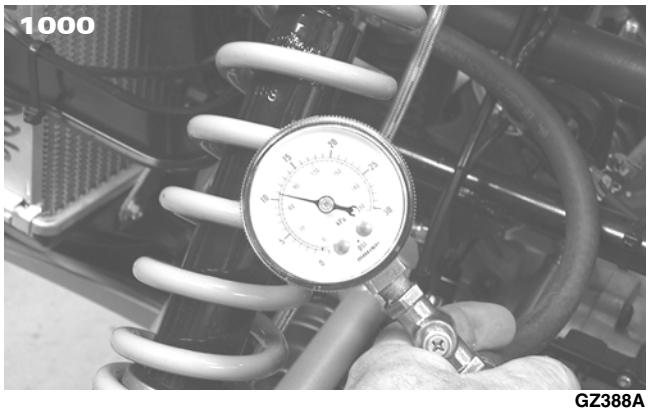
■NOTE: The engine must be warmed up to the specified temperature for this test.

1. Connect the Tachometer to the engine or utilize the LCD (if equipped).
2. Connect the Oil Pressure Test Kit to the oil pressure test port (450 models) or the oil cooler to oil filter line (1000 models).

KC370A



GZ118A



GZ388A

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

3. Start the engine and run at 3000 RPM. With the oil temperature at 60° C (140° F), the oil pressure gauge must read as specified.

450	0.6-0.7 kg/cm^2 (8.5-10 psi)
1000	1.05-1.2 kg/cm^2 (15-17 psi)

■NOTE: If the oil pressure is lower than specified, check for low oil level, defective oil pump, or restricted oil cooler (1000 models).

■NOTE: If the oil pressure is higher than specified, check for too heavy engine oil weight (see Section 1), clogged oil passage, clogged oil filter, or improper installation of the oil filter.

Oil Cooler (1000)

REMOVING

■NOTE: It is not necessary to drain the engine oil for this procedure.

1. Remove the input and output hoses from the fittings on the cooler.

CAUTION
Elevate and secure the hoses to avoid oil spillage.

2. Remove the cap screws securing the oil cooler to the frame. Account for grommets.
3. Remove the oil cooler from the frame.

INSTALLING

1. Place the cooler into position in the frame.
2. Secure the cooler to the frame with the cap screws and grommets.
3. Install the hoses onto their respective fittings and secure with the clamps.

Liquid Cooling System

When filling the cooling system, use premixed Arctic Cat Antifreeze. While the cooling system is being filled, air pockets may develop; therefore, 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.

RADIATOR

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.

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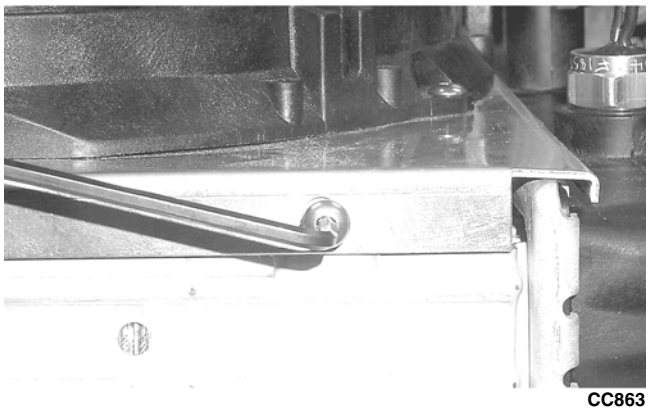


CC863

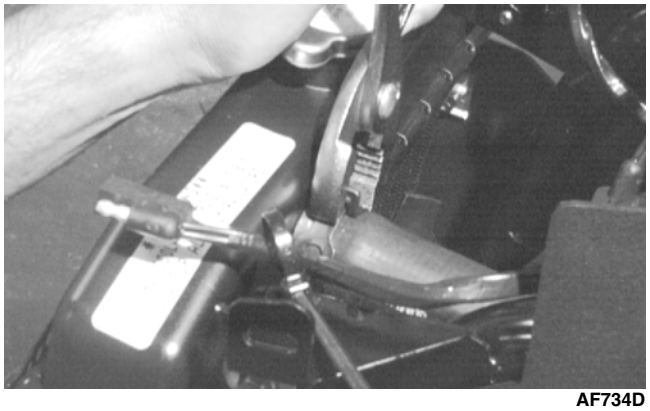
Cleaning and Inspecting

■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.

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.

THERMOSTAT

Removing (450)

1. Drain approximately one quart of coolant from the cooling system.
2. Remove the two cap screws securing the thermostat housing to the cylinder head. Account for an O-ring and a thermostat.

Removing (1000)

■NOTE: The thermostat is located in a housing in-line with the upper radiator hoses under the air filter housing.

GZ036A

1. Drain approximately one quart of coolant from the cooling system.
2. Remove the machine screws securing the thermostat housing together. Remove the thermostat and account for an O-ring.

Inspecting

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

1. Inspect the thermostat for corrosion or spring damage.
2. Using the following procedure, inspect the thermostat for proper operation.
   A. Suspend the thermostat in a container filled with water.
   B. Heat the water and monitor the temperature with a thermometer.
   C. The thermostat should start to open at 71-86° C (160-187° F).
   D. If the thermostat does not open, it must be replaced.
3. Inspect all coolant hoses, connections, and clamps for deterioration, cracks, and wear.

■NOTE: All coolant hoses and clamps should be replaced every four years or 4000 miles.

Installing (450)

1. Place the thermostat and O-ring into the thermostat housing; then secure the thermostat housing to the cylinder head with the two cap screws.
2. Fill the cooling system with the recommended amount of antifreeze. Check for leakage.

Installing (1000)

1. Place the thermostat and O-ring into the thermostat housing; then secure the thermostat housing together with the machine screws.
2. Fill the cooling system with the recommended amount of antifreeze. Check for leakage.

COOLING FAN

Removing

1. Remove the radiator (see Radiator in this sub-section).
2. Remove the fan assembly from the radiator.

Installing

1. Position the fan assembly on the radiator; then secure with existing hardware.

■NOTE: The fan wiring must be in the upper-right position.

2. Install the radiator.

WATER PUMP (450)

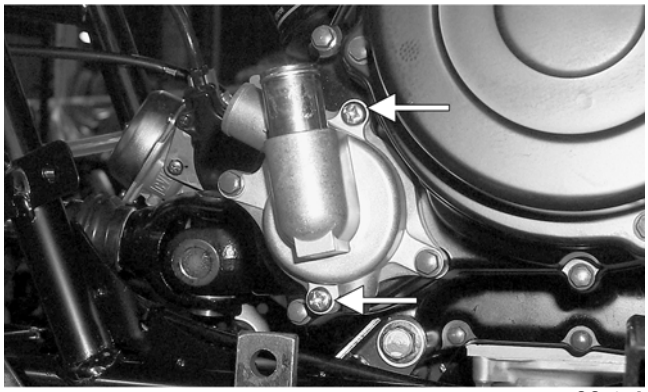
■NOTE: The water pump is a non-serviceable component. It must be replaced as an assembly.

Removing

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

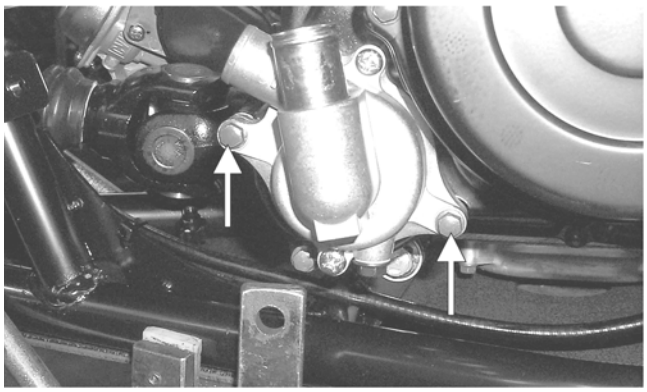
CC789

2. Drain the oil from the engine/transmission.
3. Remove the four torx-head cap screws securing the front and rear fenders to the footrest; then remove the four cap screws securing the footrest to the frame. Remove the footrest.
4. Loosen the hose clamps and slide the clamps away from the hose ends approximately 2 in.; then remove both hoses from the water pump.
5. Using an impact driver, loosen but do not remove the two Phillips-head cover screws.



CC785A

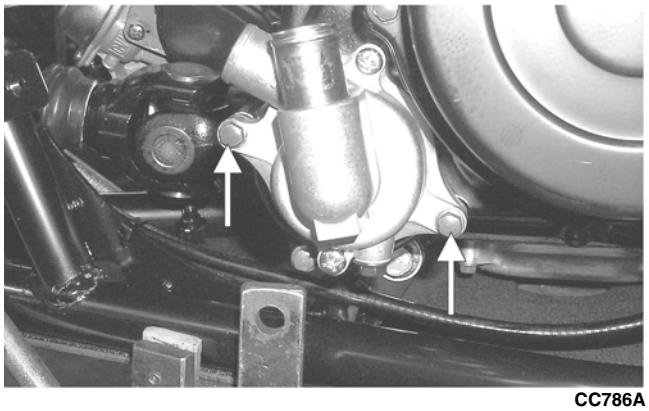
6. Remove the two cap screws securing the water pump to the engine; then remove the water pump.



CC786A

Installing

1. Secure the water pump to the engine with the two cap screws tightened securely; then tighten the two Phillips-head cover screws securely.



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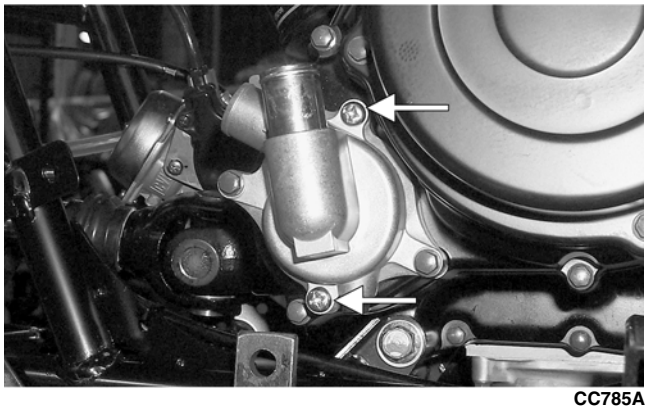


CC785A

2. Connect the two coolant hoses to the water pump and secure with the clamps. Tighten securely.
3. Place the footrest into position on the frame and loosely secure with four cap screws; then secure the front and rear fenders to the footrest with the four torx-head cap screws. Tighten the four torx-head cap screws securely; then tighten the 8 mm cap screws to 20 ft-lb and the 10 mm cap screws to 40 ft-lb.
4. Fill the engine/transmission with the proper amount of recommended oil.
5. Fill the cooling system with the proper amount of recommended coolant.

■NOTE: While the cooling system is being filled, air pockets may develop; therefore, run the engine for five minutes after the initial fill, shut the engine off, and then fill the cooling system.

6. Check the entire cooling system for leakage.

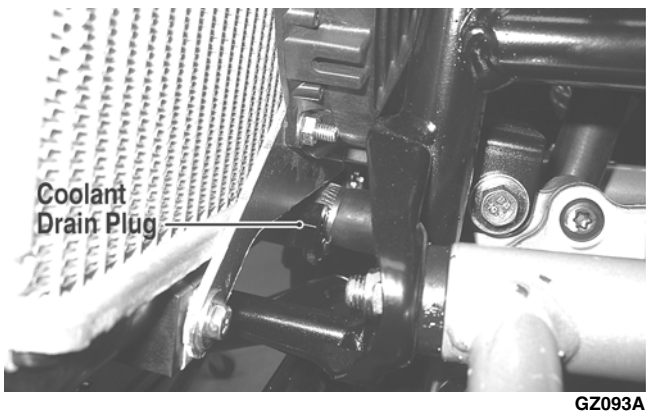
CAUTION
After operating the ATV for the initial 5-10 minutes, stop the engine, allow the engine to cool down, and check the coolant level. Add coolant as necessary.

WATER PUMP (1000)

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

Removing

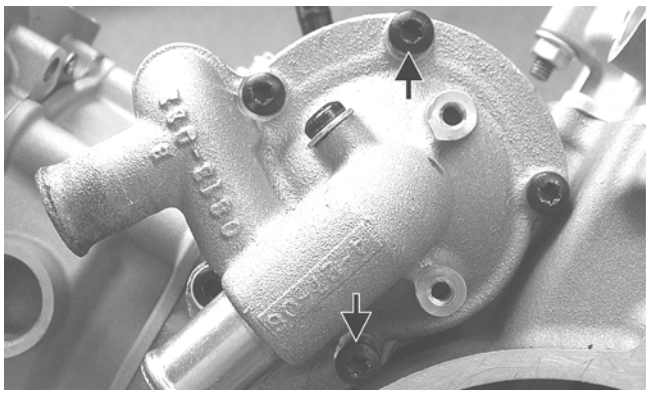
1. Remove the coolant drain plug; then remove the radiator cap and drain the coolant into a suitable container.



GZ093A

■NOTE: Always use a large container and have sufficient floor drying material available when draining the coolant in case of coolant spillage.

2. Remove the coolant hoses from the water pump; then remove two cap screws securing the water pump to the crankcase.

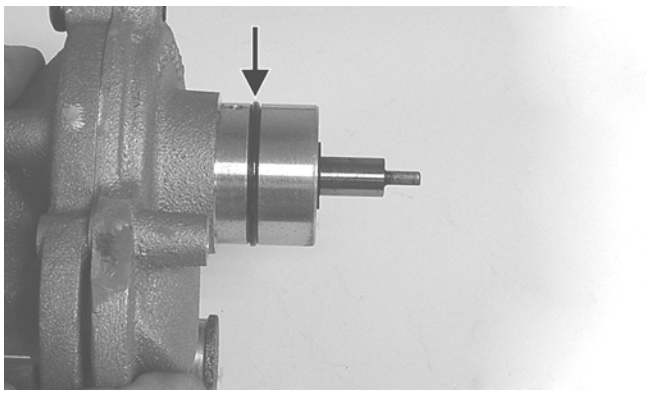


GZ230A

3. Remove the water pump from the engine.

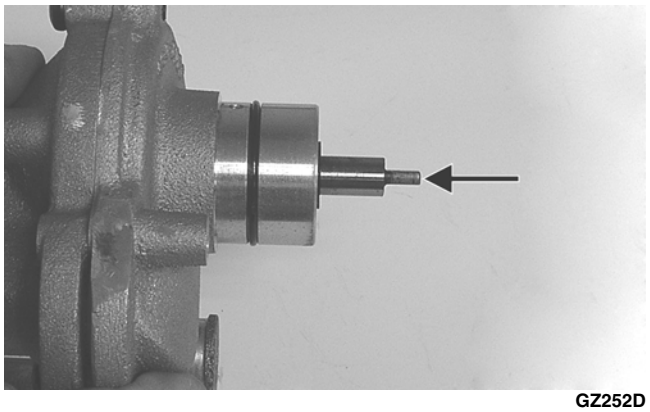
Installing

1. Install a new O-ring onto the water pump and lightly coat with clean engine oil.



GZ252C

2. Install the water pump assembly onto the engine aligning the flat drive on the water pump to the slot in the driveshaft.



GZ252D

CAUTION
Do not force the water pump housing into the crankcase or severe engine damage may occur.

3. Secure the water pump with the two cap screws and tighten securely; then connect the coolant hoses and secure with hose clamps.
4. Install and tighten the coolant drain plug securely; then fill the cooling system with the proper amount of recommended coolant and install the radiator cap.
5. Start the engine and check for coolant leaks; then add coolant if necessary to proper level.

CAUTION

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

Electric Fuel Pump/Fuel Level Sensor

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

TESTING

⚠ WARNING

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

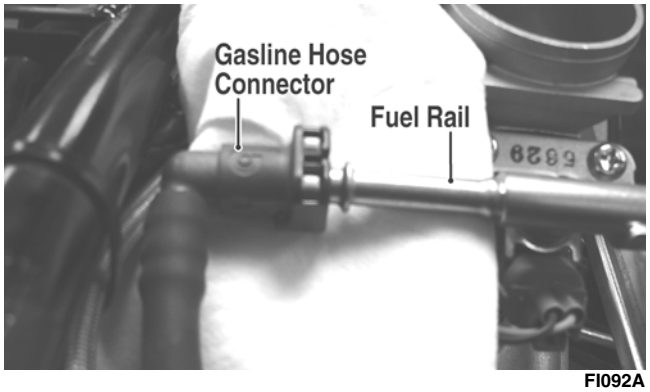
☞ AT THIS POINT

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

1. Turn the ignition switch ON and listen for a momentary "whirring" sound of the pump building pressure. If the sound is heard (10 seconds), no electrical checks are necessary. Turn the ignition switch OFF.
2. Disconnect the gasline 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.



FI092A

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-cm^2 (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 hose connector.
2. Remove the spring clamp; then remove the fuel hose.
3. Remove the screws securing the fuel pump to the gas tank; then make a reference mark on the fuel pump and tank.
4. Lift out the fuel pump assembly carefully tilting it forward to clear the voltage regulator; then guide the pump and float lever through the opening in the gas tank.

CAUTION

Take care not to damage the float or float arm or replacement of the entire assembly will be necessary.

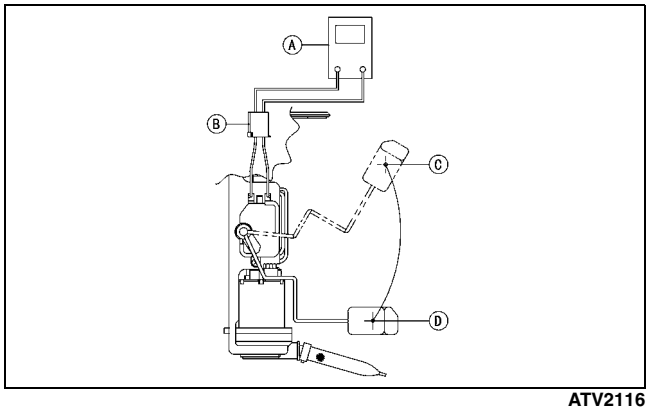
5. Using duct tape or other suitable means, cover the fuel pump opening.

INSPECTING

☞ AT THIS POINT

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

1. Inspect the fuel screen and blow clean with low pressure compressed air.
2. Move the float lever and check for free movement. The float assembly should return to the lower position without force. If not, replace the fuel pump assembly.
3. Test the fuel level sensor by connecting a multimeter (A) to the fuel level sensor leads (B); then select OHMS. The multimeter should show 5 ohms at full fuel position (C) and 95 ohms at empty fuel position (D).

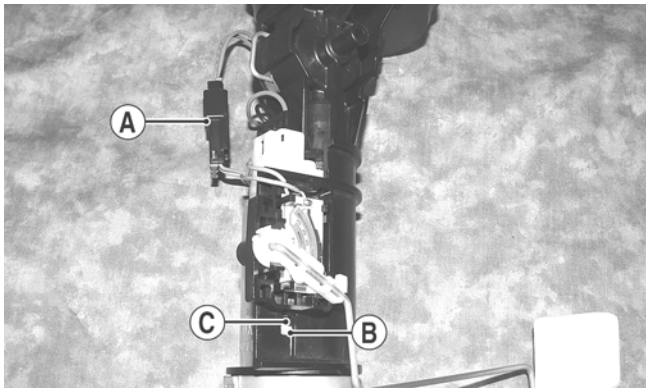


ATV2116

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

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

   A. Disconnect the two-wire connector (A); then press the fuel level sensor toward the top of the fuel pump to release it from the mounting slot (B).

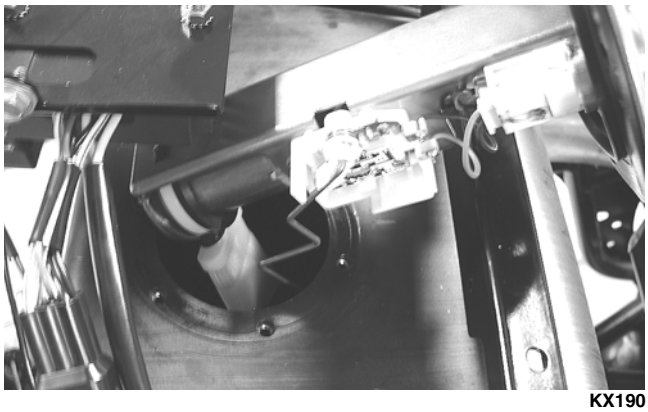


FI460A

   B. Engage the tabs (C) of the fuel level 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.

4

Troubleshooting

Problem: Starting impaired	
Condition	**Remedy**
1. **Gas** contaminated	1. Drain gas tank and fill with clean gas
Problem: Idling or low speed impaired	
Condition	**Remedy**
1. **TPS** out of adjustment	1. Adjust TPS
Problem: Medium or high speed impaired	
Condition	**Remedy**
1. **High RPM "cut out"** against RPM limiter	1. Decrease RPM speed

SECTION 5 - ELECTRICAL SYSTEM

TABLE OF CONTENTS

Electrical System

This section has been organized into sub-sections which show procedures for the complete servicing of the Arctic Cat ATV electrical system.

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

SPECIAL TOOLS

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

Description	p/n
Diagnostic Harness	0486-219
Fluke Model 77 Multimeter	0644-559
MaxiClips	0744-041
Peak Voltage Reading Adapter	0644-307
Tachometer	0644-275
Test Plug/Code List	0444-216
Timing Light	0644-296

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

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.

Battery

After being in service, batteries require regular cleaning and recharging in order to deliver peak performance and maximum service life. The following procedure is recommended for cleaning and maintaining a sealed battery. Always read and follow instructions provided with battery chargers and battery products.

■NOTE: Refer to all warnings and cautions provided with the battery or battery maintainer/charger.

Loss of battery charge may be caused by ambient temperature, ignition OFF current draw, corroded terminals, self discharge, frequent start/stops, and short engine run times. Frequent winch usage, snowplowing, extended low RPM operation, short trips, and high amperage accessory usage are also reasons for battery discharge.

Maintenance Charging

■NOTE: Arctic Cat recommends the use of the CTEK Multi US 800 or the CTEK Multi US 3300 for battery maintenance charging. Maintenance charging is required on all batteries not used for more than two weeks or as required by battery drain.

800E

1. When charging a battery in the vehicle, be sure the ignition switch is in the OFF position.
2. Clean the battery terminals with a solution of baking soda and water.

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

3. Be sure the charger and battery are in a well-ventilated area. Be sure the charger is unplugged from the 110-volt electrical outlet.
4. Connect the red terminal lead from the charger to the positive terminal of the battery; then connect the black terminal lead of the charger to the negative terminal of the battery.

■NOTE: Optional battery charging adapters are available from your authorized Arctic Cat dealer to connect directly to your vehicle from the recommended chargers to simplify the maintenance charging process. Check with your authorized Arctic Cat dealer for proper installation of these charging adapter connectors.

5. Plug the battery charger into a 110-volt electrical outlet.
6. If using the CTEK Multi US 800, there are no further buttons to push. If using the CTEK Multi US 3300, press the Mode button (A) at the left of the charger until the Maintenance Charge Icon (B) at the bottom illuminates. The Normal Charge Indicator (C) should illuminate on the upper portion of the battery charger.

■NOTE: The maintainer/charger will charge the battery to 95% capacity at which time the Maintenance Charge Indicator (D) will illuminate and the maintainer/charger will change to pulse/float maintenance. If the battery falls below 12.9 DC volts, the charger will automatically start again at the first step of the charge sequence.

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3300A

■NOTE: Not using a battery charger with the proper float maintenance will damage the battery if connected over extended periods.

Charging

■NOTE: Arctic Cat recommends the use of the CTEK Multi US 800 or the CTEK Multi US 3300 for battery maintenance charging.

1. Be sure the battery and terminals have been cleaned with a baking soda and water solution.

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

2. Be sure the charger and battery are in a well-ventilated area. Be sure the charger is unplugged from the 110-volt electrical outlet.
3. Connect the red terminal lead from the charger to the positive terminal of the battery; then connect the black terminal lead of the charger to the negative terminal of the battery.
4. Plug the charger into a 110-volt electrical outlet.
5. By pushing the Mode button (A) on the left side of the charger, select the Normal Charge Icon (E). The Normal Charge Indicator (C) should illuminate on the upper left portion of the charger.
6. The battery will charge to 95% of its capacity at which time the Maintenance Charge Indicator (D) will illuminate.

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

7. Once the battery has reached full charge, unplug the charger from the 110-volt electrical outlet.

■NOTE: If, after charging, the battery does not perform to operator expectations, bring the battery to an authorized Arctic Cat dealer for further troubleshooting.

RPM Limiter

■NOTE: The ATV is equipped with an ECU 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 77 Multimeter and when testing peak voltage, the Peak Voltage Reading Adapter 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 gas tank on the right side.

■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 the red/blue wire.

FI510

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)

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to one black wire; then connect the black tester lead to the other black wire.

FI502

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 the red/blue wire.

FI489

3. The meter must show battery voltage.

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

■**NOTE: If the meter shows battery voltage, the main wiring harness is good; proceed to test the switch/component, the connector, and the switch wiring harness for resistance.**

RESISTANCE (Switch Connector)

■**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.

FI490

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.**

Engine Coolant Temperature (ECT) Sensor

1. Connect the meter leads (selector in OHMS position) to the sensor terminals.
2. Suspend the sensor and a thermometer in a container of cooking oil; then heat the oil.

■NOTE: Neither the sensor nor the thermometer should be allowed to touch the bottom of the container or inaccurate readings will occur. Use wire holders to suspend the sensor and thermometer.

⚠ WARNING

Wear insulated gloves and safety glasses. Heated oil can cause severe burns.

3. On the ECT sensor when the temperature reaches 20° C (68° F), the meter should read approximately 2.45k ohms.
4. On the ECT sensor when the temperature reaches 50° C (122° F), the meter should read approximately 800 ohms.
5. On the ECT sensor when the temperature reaches 80° C (176° F), the meter should read approximately 318 ohms.
6. On the ECT sensor when the temperature reaches 110° C (230° F), the meter should read approximately 142 ohms.
7. If the readings are not as indicated, the sensor must be replaced.
8. Install the sensor and tighten securely.
9. Connect the leads.

Fan Motor

The connector is the black two-prong one located above the oil cooler/radiator.

■NOTE: The ignition switch must be in the ON position.

RESISTANCE (Fan Motor Connector)

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.

FI501A

3. The meter must show less than 1 ohm.

■NOTE: If the meter shows more than 1 ohm of resistance, troubleshoot or replace the fan motor.

■NOTE: To determine if the fan motor is good, connect the red wire from the fan connector to the positive side of a 12 volt battery; then connect the black wire from the fan connector to the negative side. The fan should operate.

⚠ WARNING

Care should be taken to keep clear of the fan blades.

Power Distribution Module (PDM)

The fuses are located in a power distribution module under the seat. If there is any type of electrical system failure, always check the fuses first.

■NOTE: The ignition switch must be in the LIGHTS position.

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.

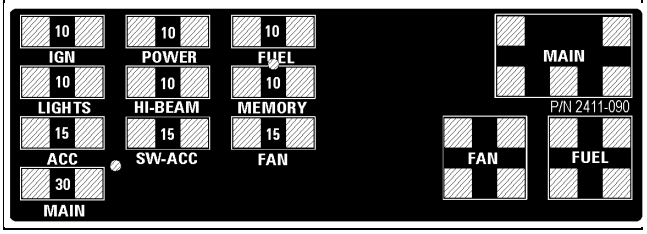
■NOTE: When testing the HI fuse holder, the headlight dimmer switch must be in the HI position; when testing the LIGHTS fuse holder, the headlight dimmer switch can be in either position.

■NOTE: If the meter shows no battery voltage, troubleshoot the battery, switches, distribution module, or the main wiring harness.

FUSES

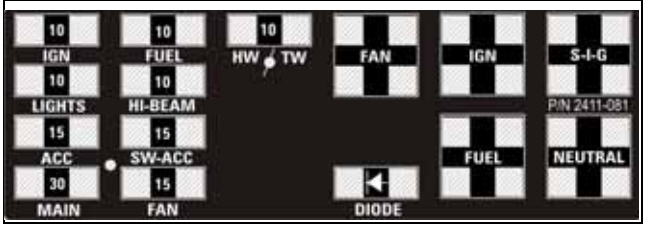
■NOTE: To remove a fuse, compress the locking tabs on either side of the fuse case and lift out.

450/450 TRV



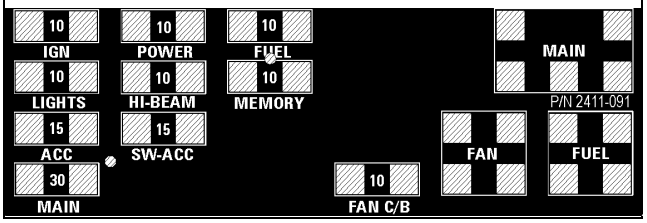
2411-090

1000 Cruiser



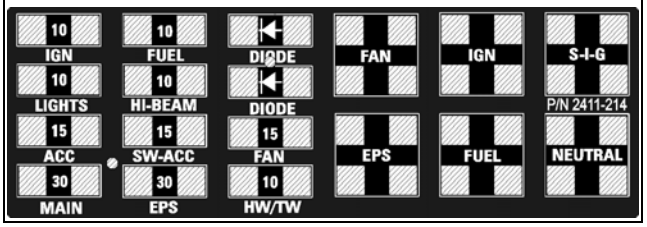
2411-081

1000 Mud Pro



2411-091

1000 Cruiser PS



2411-214

CAUTION

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

CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to one spade end of the fuse; then connect the black tester lead to the other spade end.
3. The meter must show less than 1 ohm resistance. If the meter reads open, replace the fuse.

■NOTE: Make sure the fuses are returned to their proper position according to amperage. Refer to the fuse block decal for fuse placement.

RELAYS

The 4-pin relays are identical plug-in type. Relay function can be checked by switching relay positions. The relays are interchangeable.

■NOTE: The module and wiring harness are not a serviceable components and must be replaced as an assembly.

Ignition Coil

■NOTE: On the 1000 models, the following procedures should be performed on both ignition coils.

The ignition coil is on the frame above the engine. To access the coil, the side panel must be removed (see Section 8).

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.
2. The meter reading must be within specification.

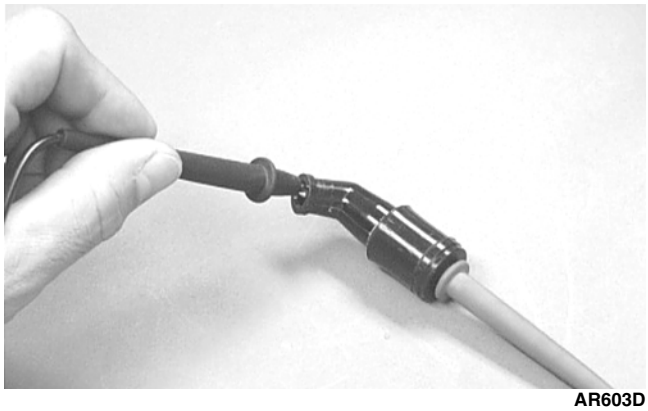
Secondary Winding

1. Remove the plug cap from the high tension lead; then connect the red tester lead to the high tension lead.
2. Connect the black tester lead to either 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.

Primary Voltage - ECU (1000)

■NOTE: The ECU is located beneath the rear body panel near the taillight.

1. Set the meter selector to the DC Voltage position; then disconnect the orange primary wire from the coil.
2. Connect the red tester lead to the orange primary wire; then connect the black tester lead to ground.
3. Turn the ignition switch to the ON position.
4. The meter reading must show battery voltage.

EFI Sensors/Components

CRANKSHAFT POSITION (CKP) SENSOR

To test the CKP sensor, see Stator Coil/Crankshaft Position (CKP) Sensor in this section.

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR (1000 Models)

1. Disconnect the MAP connector from the pressure sensor located on top of the throttle body.
2. Select DC Voltage on the tester and turn the ignition switch to the ON position.
3. Connect the black tester lead to the black/green wire and the red tester lead to the orange/blue wire. The meter should read 4.5-5.5 DC volts. If the meter does not read as specified, check the ECU connector or wiring.
4. Connect the MAP to the harness; then using MaxiClips, 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 1.5 DC volts.

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

INLET AIR TEMPERATURE (IAT) SENSOR (1000 Models)

1. Connect the meter leads (selector in OHMS position) to the sensor terminals.
2. Suspend the sensor and a thermometer in a container of cooking oil; then heat the oil.

■NOTE: Neither the sensor nor the thermometer should be allowed to touch the bottom of the container or inaccurate readings will occur. Use wire holders to suspend the sensor and thermometer.

⚠ WARNING

Wear insulated gloves and safety glasses. Heated oil can cause severe burns.

3. On the sensor when the temperature reaches 20° C (68° F), the meter should read approximately 2.45k ohms.
4. On the sensor when the temperature reaches 50° C (122° F), the meter should read approximately 800 ohms.
5. On the sensor when the temperature reaches 80° C (176° F), the meter should read approximately 318 ohms.
6. On the sensor when the temperature reaches 110° C (230° F), the meter should read approximately 142 ohms.
7. If the readings are not as indicated, the sensor must be replaced.

MANIFOLD ABSOLUTE PRESSURE/ INLET AIR TEMPERATURE (MAP/IAT) SENSOR (450)

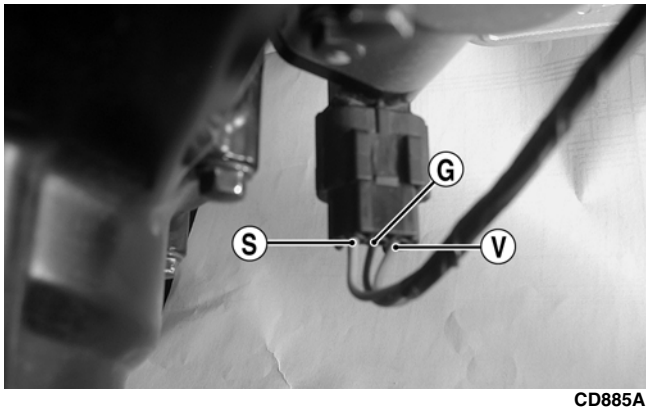
1. Disconnect the MAP/IAT connector from the sensor located on top of the throttle body.
2. Select DC Voltage on the tester and turn the ignition switch to the ON position.
3. Connect the black tester lead to the black/pink wire and the red tester lead to the orange/blue wire. The meter should read 4.5-5.5 DC volts. If the meter does not read as specified, check the ECU connector or wiring.
4. Connect the MAP/IAT to the harness; then using MaxiClips, connect the red tester lead to the brown/white wire and the black tester lead to the black/pink wire. With the engine running at idle speed, the meter should read approximately 2.5 DC volts (MAP sensor signal).
5. Connect the red tester lead to the green/red wire. With the engine at idle and at room temperature (approximately 60° F), the meter should read approximately 2.9 DC volts.

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

Speed Sensor

■NOTE: Prior to testing the speed sensor, inspect the three-wire connector on the speed sensor for contamination, broken pins, and/or corrosion.

1. Set the meter selector to the DC Voltage position.
2. With appropriate needle adapters on the meter leads, connect the red tester lead to the voltage lead (V); then connect the black tester lead to the ground lead (G).



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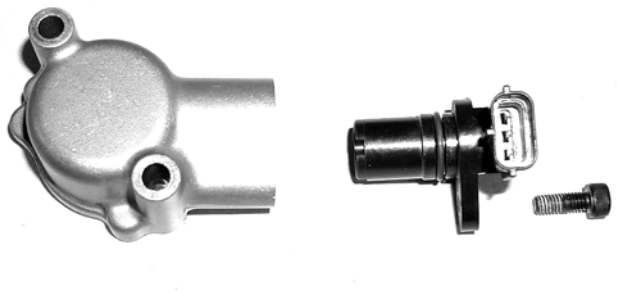
3. Turn the ignition switch to the ON position.
4. The meter must show 6-12 DC volts.
5. Leave the black tester lead connected; then connect the red tester lead to the signal lead (S) pin.
6. Slowly move the ATV forward or backward; the meter must show 0 and 6-12 DC volts alternately.

■NOTE: If the sensor tests are within specifications, the gauge must be replaced (see Section 8).

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.
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

Electronic Power Steering (EPS)

■NOTE: Certain models have been produced with electronic power steering. The following information is intended to be used when servicing these models.

The electronic power steering (EPS) system is an electro-mechanical device that utilizes 12 volt DC power to drive a motor linked to the steering shaft to assist the rider when rotating the handlebar. Rider steering inputs are detected by a torque-sensing transducer assembly within the EPS housing. These inputs are converted to electronic signals by the transducer and control circuitry to tell the motor which way to drive the steering shaft. When no steering input (pressure on the handlebar) is detected, no torque signal is generated, and no steering assist is provided by the motor.

The EPS system is battery-system powered; therefore, the battery must be in good condition and fully charged. Power delivery and overload protection are provided by an EPS relay and 30-amp fuse, located under the seat in the Power Distribution Module (PDM).

If a system malfunction occurs, a malfunction code "P0635" will be displayed on the LCD gauge. Initially, the gauge will go blank for 30 seconds and the code will flash: then the gauge will return to normal except the code will continue to be displayed.

The following is a list of conditions that can generate a malfunction code. All conditions with the exception of item 5 are external to the EPS assembly and therefore can be cleared without replacement of the EPS assembly. Make sure to thoroughly troubleshoot the entire system before replacing the EPS assembly.

■NOTE: The EPS assembly is not serviceable and no service parts or parts lists are available. The EPS is only serviceable as an assembly and must not be disassembled or EPS warranty will be voided.

CAUTION
Do not attempt to check resistance of the EPS motor (2-pin input receptacle). There are internal capacitors holding a charge that can cause internal damage to an ohmmeter.

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Malfunction code P0635 will appear if one of the following six conditions occur:

1. Battery system power failure:
   A. 30 amp EPS fuse blown
   B. EPS relay failure
   C. EPS voltage less than 8.5 DC volts for more than two seconds
2. Ignition switch ON for more than five minutes with the engine not running.
3. Vehicle Speed Signal Malfunction (engine speed must exceed 2700 RPM for more than 60 seconds to generate a malfunction code - timer resets if engine drops below 2700 RPM).
   A. Diode defective (open or shorted)
   B. Diode not installed
   C. Diode installed in reverse
   D. Speed sensor defective
   E. Speed sensor signal erratic
   F. Speed sensor signal present but without tachometer signal
   G. Speed sensor power from LCD gauge interrupted
   H. Incorrect LCD gauge installed
4. Engine Speed Signal Malfunction (vehicle speed must exceed 5 MPH for more than two seconds - timer resets if speed drops below 5 MPH.
   A. No engine speed signal
   B. Erratic engine speed signal
5. EPS Control Circuit Malfunction
6. Engine Stop Switch in Stop position with Ignition Key switch ON.

The following procedures may be helpful in determining the source of a malfunction code:

Condition: Ignition Key Switch ON and NO EPS assist when moving the handlebar. Code “P0635” flashing.

■NOTE: Prior to troubleshooting below, make sure that Ignition Key Switch has not been left on with the engine not started. After five minutes, this will deactivate the EPS and display the malfunction code. Turn Ignition Key Switch OFF and back to ON to reset and reactivate the EPS. If code and symptom persists, continue as follows:

1. Check 30 amp EPS fuse.
2. Check EPS relay (may be switched with any other 4-pin relay on PDM - replace relay if EPS normal after switching).
3. Disconnect 2-pin connector on the EPS assembly and connect a volt meter set to DC voltage to the harness (black meter lead to BLK and red meter lead to ORG/BRN) With the ignition switch to the ON position, the meter must read more than 8.5 DC volts (if correct voltage is not present, check connections and wiring harness - if correct voltage is present, replace EPS assembly - see Section 8 - Steering Post/Tie Rods sub-section).

CAUTION

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

Condition: Ignition switch ON and EPS assist normal when moving handlebar. Code “P0635” flashing.

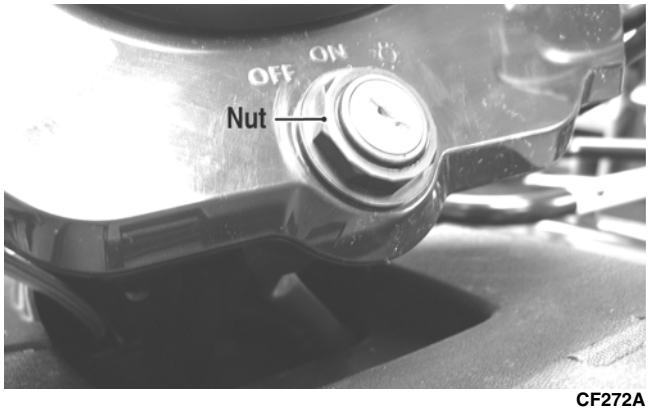
■NOTE: Prior to troubleshooting steps below, make sure that the Engine Stop Switch has not been used to stop the engine leaving the ignition switch in the ON position. If the engine stop switch is not in the RUN position, set to RUN position and cycle the ignition switch to OFF then ON. If malfunction code is still indicated, proceed as follows.

1. Check for speed sensor signal by disconnecting the 8-pin connector from the EPS assembly and using a multi-meter set to the DC volt position, connect the black lead to the PNK/YEL wire and the red lead to the ORG wire. With the ignition switch turned to the ON position, slowly move the vehicle forward or backward. The meter must alternate from 0 DC volts to approximately 12 DC volts. If meter readings are not as specified:
   A. Check EPS diode for correct installation or open diode (replace diode or install correctly).
   B. Check speed sensor using procedure found in this section (replace speed sensor/install proper gauge).
2. Check for engine speed signal by disconnecting the 8-pin connector from the EPS assembly and using a multi-meter set to the AC voltage position, connect one lead to any BLK wire and the other lead to YEL/VLT wire. Start the engine and with the engine idling the meter should read approximately 7.5 AC volts. If meter reading is not as specified:
   A. Check the wiring harness from EPS to gauge (YEL/VLT wire - repair wiring).
   B. Check the AC generator using the Stator Coil/Crankshaft Position (CKP) Sensor procedure found in this section. If not to specifications, replace the stator coil.

If after completing the above checks with normal results and malfunction code “P0635” persists, the EPS assembly must be replaced. To replace the EPS assembly, see Section 8 - Steering Post/Tie Rods sub-section.

Ignition Switch

The ignition switch harness connects to the switch with a four-pin connector. To access the connector, remove the ignition switch nut, remove the switch, and press the connector release tab. Pull the connector from the switch.



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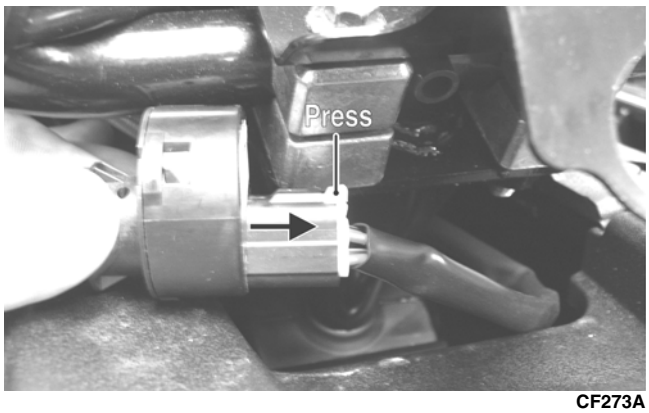

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VOLTAGE

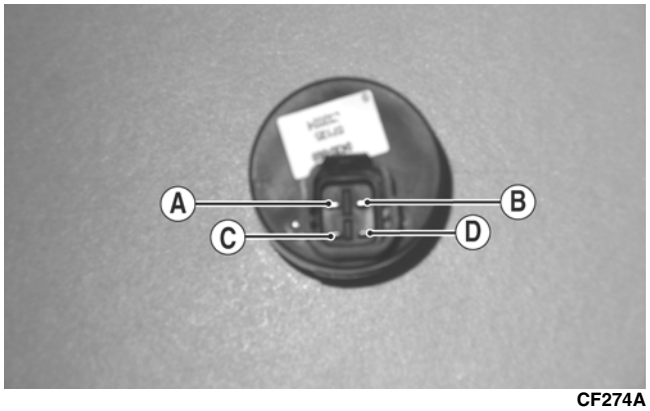
■NOTE: Perform this test on the harness connector.

1. Set the meter selector to the DC Voltage position.
2. Connect the red meter lead to either red wire; then connect the black meter lead to ground.
3. Meter must show battery voltage.

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

RESISTANCE

■NOTE: Perform this test on the switch using the following procedure.



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1. Turn the ignition switch to the ON position.
2. Set the meter selector to the OHMS position.
3. Connect either tester lead to pin C; then connect the other tester lead to pin D.
4. The meter must show less than 1 ohm.
5. Turn the ignition switch to the LIGHTS position.
6. Connect either tester lead to pin A; then connect the other tester lead to pin B.
7. The meter must show less than 1 ohm.
8. Connect either tester lead to pin C; then connect the other tester lead to pin D.
9. The meter must show less than 1 ohm.
10. With the switch in the OFF position, connect the red tester lead and the black tester lead to each of the remaining pins. The meter must show an open circuit on all pins.

■NOTE: If the meter shows more than 1 ohm of resistance, replace the switch.

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.

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.

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■NOTE: If the meter shows more than 1 ohm of resistance, replace the switch.

RESISTANCE (LO Beam)

1. Connect the red tester lead to the white wire; then connect the black tester lead to the gray wire.
2. With the dimmer switch in the LO position, the meter must show an open circuit.

■NOTE: If the meter reads resistance, replace the switch.

DIODE (Starter Button)

■NOTE: If voltage is not as specified, check the condition of the battery in the meter prior to replacing the switch. A low battery will result in a low voltage reading during a diode test.

1. Set the meter selector to the Diode position.
2. Connect the red tester lead to the orange/white wire; then connect the black tester lead to the yellow/green wire.
3. With the starter button depressed, the meter must show 0.5-0.7 DC volt.
4. With the starter button released, the meter must show 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.

RESISTANCE (Engine Stop Switch)

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

■NOTE: If the meter shows more than 1 ohm of resistance, replace the switch.

RESISTANCE (Reverse Override)

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.

Drive Select 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

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 an open circuit.
4. With the selector switch in the 4WD position, the meter must show less than 1 ohm.

■NOTE: If the meter does not show as specified, replace the drive select 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 white 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/Differential Lock Actuator

■NOTE: With the engine stopped and the ignition switch in the ON position, a momentary "whirring" sound must be noticeable each time the drive select switch is moved 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 drive select 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/orange wire in the supply harness. The meter must show 12 DC volts.
5. Connect the red tester lead to the white/green wire in the supply harness. The meter must show 10.2 DC volts.
6. Select the 4WD position on the drive select switch; then connect the red tester lead to the white/orange wire in the supply harness. The meter must show 12 DC volts.

■NOTE: The 4WD icon on the LCD should illuminate.

7. Connect the red tester lead to the white/green wire in the supply harness. The meter must show 0 DC volts.
8. Select Differential Lock on the drive select switch; then connect the red tester lead to the white/orange wire in the supply harness. The meter must show 0 DC volts.
9. Connect the tester lead to the white/green wire in the supply harness. The meter must show 0 DC volts.

■NOTE: The 4WD and LOCK icons on the LCD should illuminate.

■NOTE: If the voltage readings are as specified and the actuator does not function correctly, replace the actuator (see Section 6).

Stator Coil/Crankshaft Position (CKP) Sensor

VOLTAGE (AC Generator - 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.

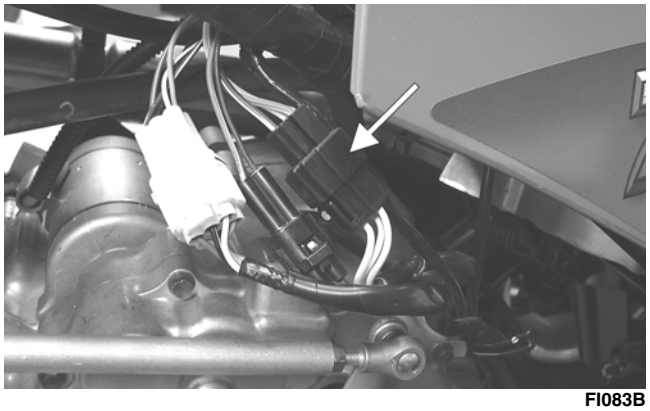
CAUTION

Do not run the engine at high RPM for more than 10 seconds.

■NOTE: If voltage is lower than specified, test AC Generator - No Load.

VOLTAGE (AC Generator - No Load)

The connector is a three-pin one in the harness coming from the generator.



FI083B

■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 (450) or black wires (1000) for a total of three tests.
3. With the engine running at a constant 5000 RPM, all voltage 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, replace the stator assembly.

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RESISTANCE (AC Generator)

1. Set the meter selector to OHMS position.
2. Test between the three yellow wires (450) or gray wires (1000) for a total of three tests.
3. The meter reading must be within specification.

RESISTANCE (Crankshaft Position Sensor)

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to the blue wire; then connect the black tester lead to the green wire. The meter reading must be within specification.

AC VOLTAGE

■NOTE: The battery must be at full charge for these tests.

Crankshaft Position Sensor

1. Set the meter selector to the AC Voltage position.
2. Connect the red tester lead to the blue wire; then connect the black tester lead to the green wire.
3. Crank the engine over using the electric starter.
4. The meter reading must be within specification.

Starter Relay

1. Remove the seat; then using the multimeter set to the DC Voltage position, check the relay as follows.
2. Connect the red tester lead to the positive battery terminal; then connect the black tester lead to the starter cable connection on the starter relay. The meter must show battery voltage.

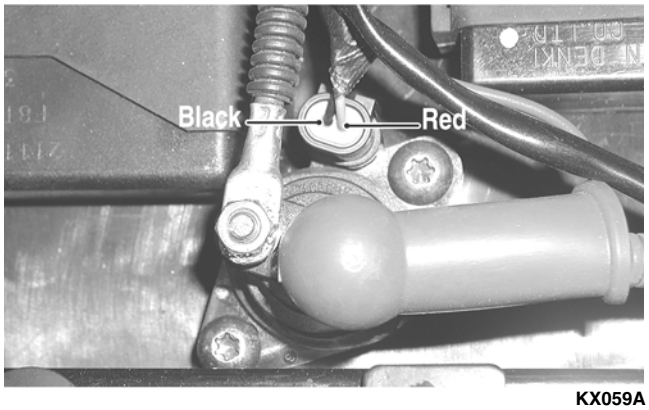
FI496

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

3. Depress the starter button while observing the multimeter. The multimeter should drop to 0 volts and a “click” should be heard from the relay.

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

4. Disconnect the two-wire plug from the starter relay; then connect the red tester lead to the 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 Power Distribution Module (PDM) check in this section.

Starter Motor

■NOTE: The starter motor is a non-serviceable component. If the following test does not result as specified, the starter motor must be replaced.

TESTING VOLTAGE

Perform this test on the starter motor positive terminal. To access the terminal, slide the boot away.

■NOTE: The ignition switch must be in the ON position, the engine stop switch in the RUN position, and the shift lever in the NEUTRAL position.

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the starter motor terminal; then connect the black tester lead to ground.
3. With the starter button depressed, the meter must show approximately 10.0 DC volts and the starter motor should operate.

AR607D

■NOTE: If the meter showed correct voltage but the starter motor did not operate or operated slowly, the starter motor is defective.

■NOTE: If the meter showed no voltage, inspect the main fuse, ground connections, starter motor lead, battery voltage (at the battery), starter relay, or the neutral start relay.

REMOVING

1. Disconnect the battery.

CAUTION
Always disconnect the negative battery cable from the battery first; then disconnect the positive cable.

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

INSTALLING

1. Apply a small amount of grease to the O-ring seal on the starter motor; then install the starter motor into the crankcase. Secure with two machine screws and wiring forms.
2. Secure the positive cable to the starter motor with the nut.
3. Connect the battery (positive cable first).

Electronic Control Unit (ECU)

The electronic control unit (ECU) is located beneath the seat near the battery (450) or under the fender near the taillight (1000).

■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 of the same part number to verify the suspected one is defective.

Codes can be cleared by following the procedures located in the appropriate Diagnostic Trouble Codes (DTC) 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 temperature; then connect a multimeter to the battery as follows.
2. Select the DC Voltage position; then connect the red tester lead to the positive battery post and the black tester lead to 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, see Stator Coil/Crankshaft Position (CKP) Sensor - Voltage in this section. If charging coil voltage is normal, replace the regulator/rectifier.

Headlights

The connectors are the four 2-prong ones plugged into the headlight bulbs (two on each side).

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.

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■NOTE: If battery voltage is not shown in any test, inspect the LIGHTS fuse, 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.

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.

1. Set the meter selector to the DC Voltage position.
2. Connect the red tester lead to the red/blue wire; then connect the black tester lead to the black wire.
3. With either brake applied, the meter must show battery voltage.

■NOTE: If the meter shows no voltage, inspect fuses, wiring harness, connectors, and switches.

Ignition Timing

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

1. Attach the Timing Light to the spark plug high tension lead; then remove the timing inspection plug from the left-side crankcase cover.
2. Using the Tachometer, 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 ECU may be faulty.

Tilt Sensor

⚠ WARNING

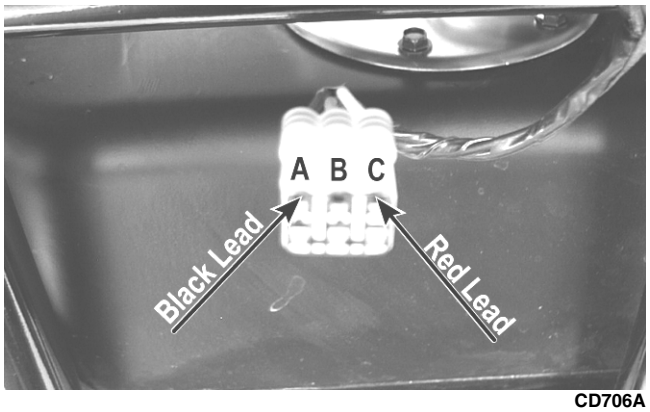
Incorrect installation of the tilt sensor could cause sudden loss of engine power which could result in loss of vehicle control resulting in injury or death.

CAUTION

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

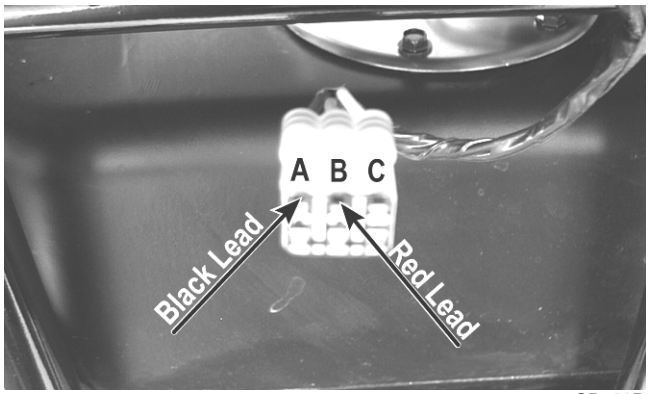
SUPPLY VOLTAGE

1. Disconnect the three-wire connector from the sensor; then select DC Voltage on the multimeter and connect the red tester lead to the orange wire (C) and the black tester lead to the black wire (A).



CD706A

2. Turn the ignition switch to the ON position. The multimeter should read battery voltage. If battery voltage is not indicated, check the 30-amp main and 10-amp ignition fuses, wiring harness, or the ignition switch.
3. Remove the red tester lead and connect to the blue/brown wire (B). The multimeter should read approximately 2.5 DC volts. If the specified voltage is not indicated, check wire connections at the ECU or substitute another ECU to verify the test.



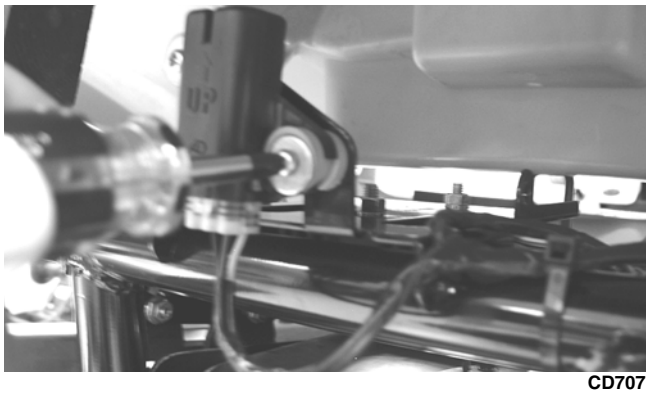
CD706B

5

OUTPUT VOLTAGE

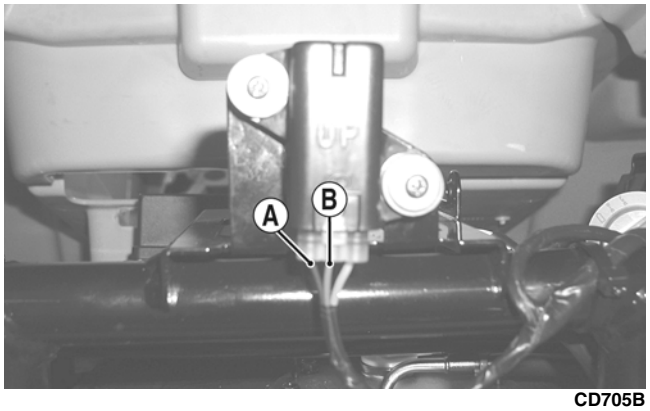
■NOTE: Needle adapters or a "break-out" harness will be required on the multimeter leads as the following tests are made with the sensor connected.

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



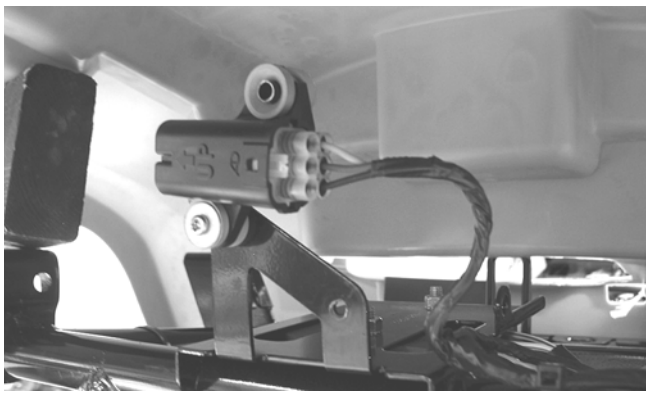
CD707

2. Install the needle adapters to the multimeter leads; then select DC Voltage on the multimeter.
3. Connect the red tester lead to the blue/brown wire (B) and the black tester lead to the black/yellow wire (A); then turn the ignition switch ON and observe the meter. The meter should read 0.3-1.5 DC volt.



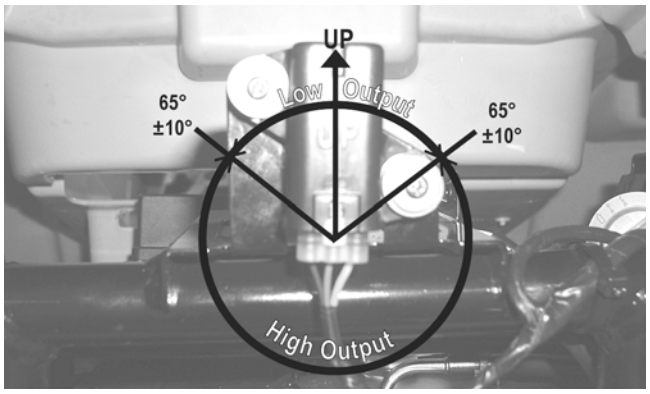
CD705B

4. Tilt the sensor 60° or more to the left and right observing the meter. The meter should read 3.0-7.0 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.

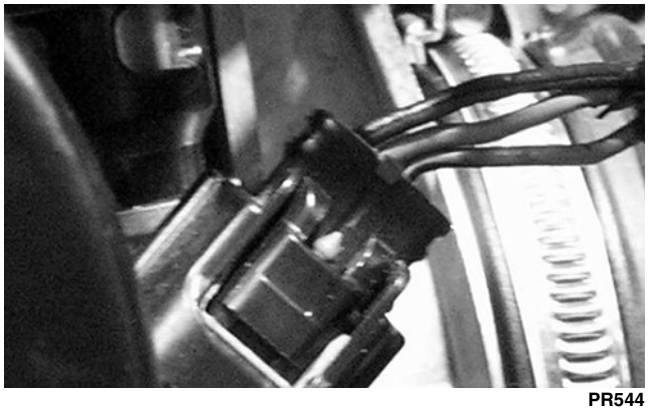


CD705A

Throttle Position Sensor (TPS) (450)

INSPECTING

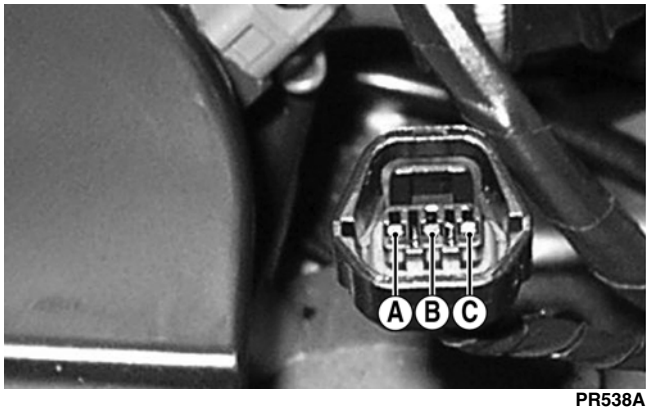
1. Remove the left-side engine cover; then disconnect the three-wire TPS connector plug.



PR544

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

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 terminal B and the red tester lead to terminal A. Turn the ignition switch to the ON position. The meter should read approximately 5.0 DC volts.



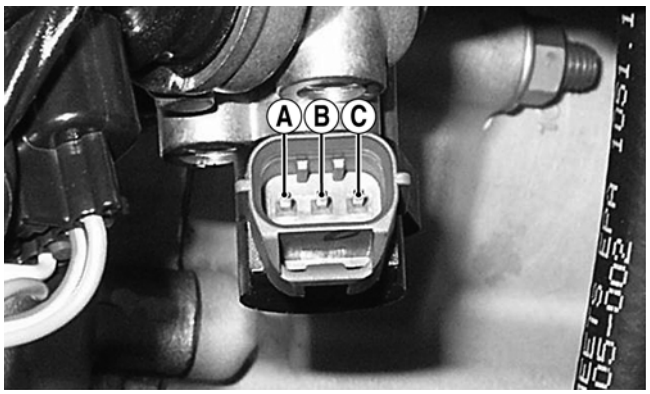
PR538A

■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.

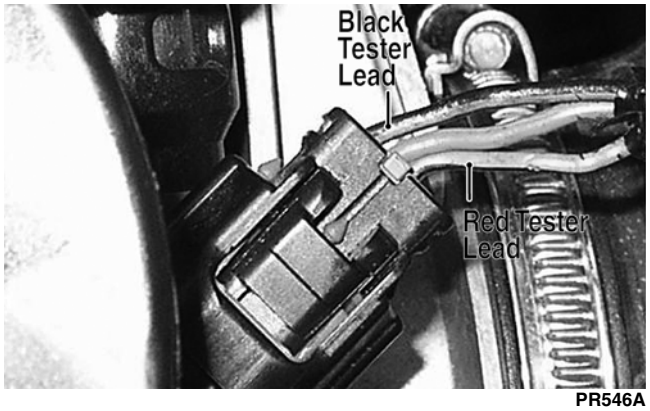
4. Turn the ignition switch to the OFF position.
5. Select the OHMS position on the meter; then perform the following resistance tests on the TPS.
   A. Pin (B) to ground - infinity (open circuit).
   B. Pin (A) to pin (B) - approximately 1.22k ohms (throttle closed).
   C. Pin (A) to pin (B) - approximately 4.5k ohms (throttle full-open).
   D. Pin (A) to pin (C) - approximately 5.5k ohms.



PR535A

■NOTE: If any meter reading is not as specified, replace or adjust the TPS (see INSTALLING/ADJUSTING in this sub-section).

6. Connect the positive lead to the battery; then connect the negative lead.
7. Connect the main harness TPS connector to the TPS; then using MaxiClips, connect the black tester lead to the black/green wire and the red tester lead to the green/black wire.



PR546A

8. Select the DC Voltage position on the meter and turn the ignition switch to the ON position. The meter should read approximately 4.5 DC volts with the throttle closed and approximately 1.5 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).

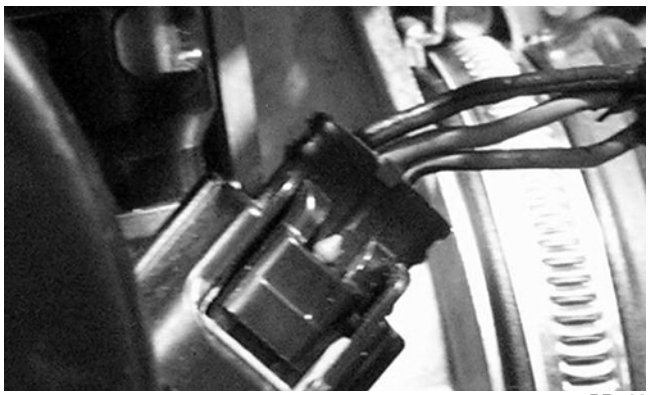
CAUTION

Always make sure the ignition switch is in the OFF position before disconnecting the ECU.

9. Verify all malfunction codes are closed after servicing is complete (see appropriate Diagnostic Trouble Codes (DTC) in this section).

REMOVING

1. Remove the left-side engine cover; then disconnect the three-wire TPS connector plug.


PR544

2. Remove the screw 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 screw. Do not tighten at this time.
2. Connect the TPS Multi-Analyzer Harness connector #8 to the TPS; then connect the harness to the TPS Analyzer Tool.

FI672

3. Using a multimeter, connect the black tester lead to the black socket (GND) on the analyzer and the red tester lead to the white socket (VAR); then select the Voltage position.

FI673A

4. Adjust the TPS until a reading of 0.68 DC volt is obtained; then tighten the screw securely. Open and close the throttle and determine the reading returns to 0.68 DC volt. Readjust as necessary.

FI674

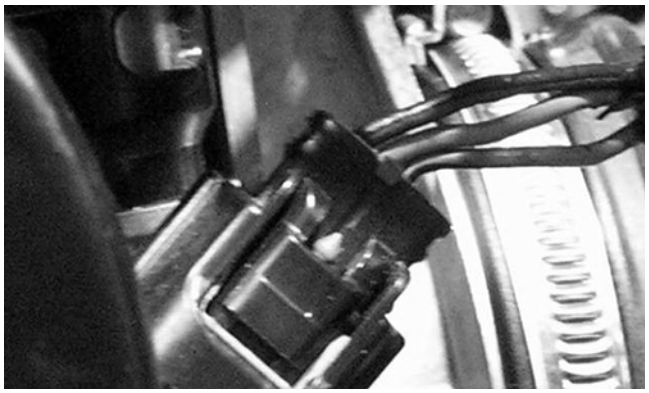
5. Disconnect the harness from the analyzer; then disconnect the harness from the TPS and reconnect the TPS main harness connector.

6. Tighten the mounting screw securely.

Throttle Position Sensor (TPS) (1000 FIS)

INSPECTING

1. Remove the left-side engine cover; then disconnect the three-wire TPS connector plug.

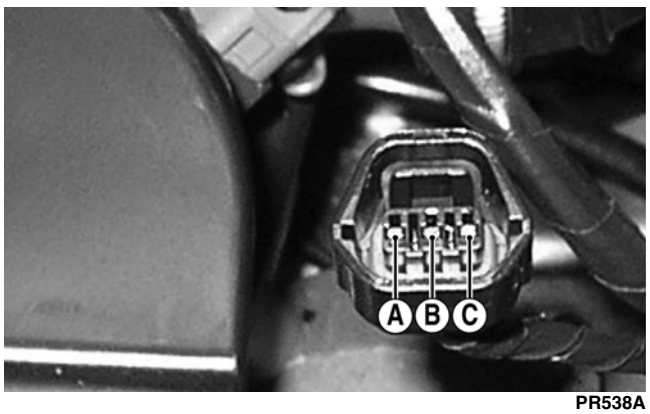


PR544

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

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 terminal C and the red tester lead to terminal B. Turn the ignition switch to the ON position. The meter should read approximately 5.0 DC volts.



PR538A

4. Remove the red tester lead from terminal B and connect it to terminal A. The meter should read 0 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.

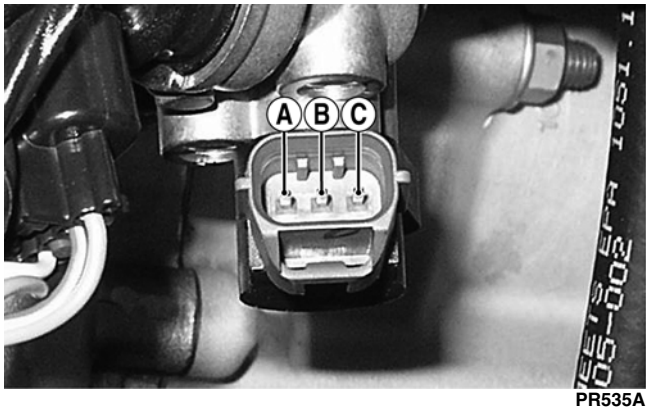
6. Select the OHMS position on the meter; then perform the following resistance tests on the TPS.

   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.

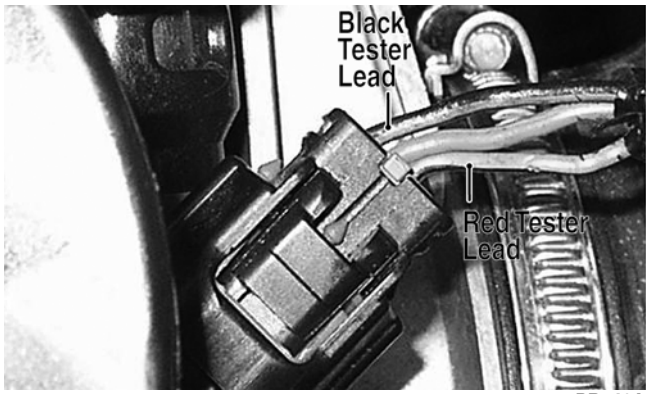


PR535A

■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, connect the black tester lead to the black/green wire and the red tester lead to the green/black wire.



PR546A

9. Select the DC Voltage position on the meter and turn the ignition switch to the ON position. The meter should read approximately 0.60 DC volt with the throttle closed and approximately 4.0 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).

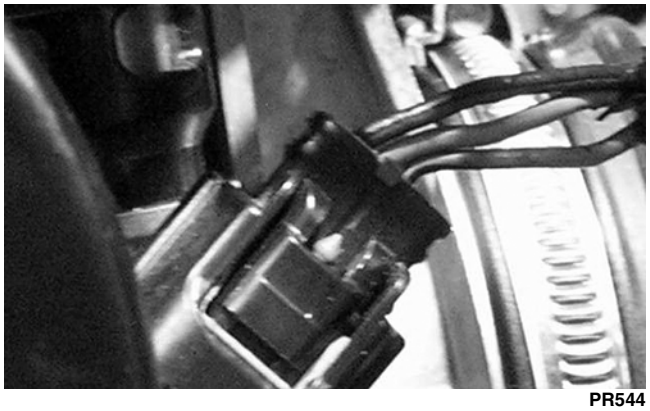
CAUTION

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 appropriate Diagnostic Trouble Codes (DTC) in this section).

REMOVING

1. Remove the left-side engine cover; then disconnect the three-wire TPS connector plug.


PR544

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 next to the PDM; then install the test plug from Test Plug/Code List kit onto the connector.

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).

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PR540A

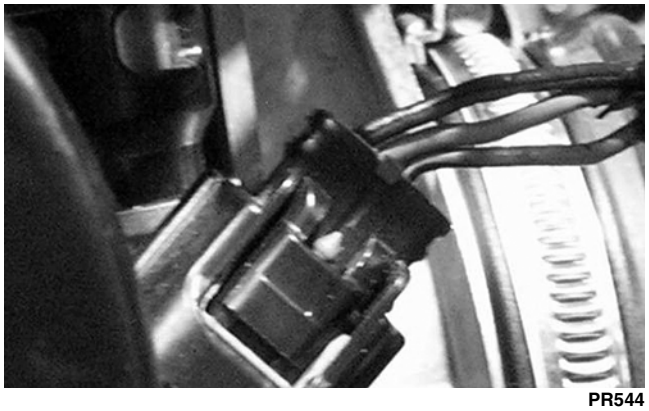
PR541A

5. Tighten the mounting screws securely; then verify the TPS icon appears in the center position (throttle in idle position).
6. Cycle the throttle lever from idle to approximately half throttle position several times; then return the throttle to idle. The display should return to (B) position.
7. Remove the test plug; then install the left-side engine cover.

Throttle Position Sensor (TPS) (1000 TRV/1000 Cruiser/1000 Mud Pro)

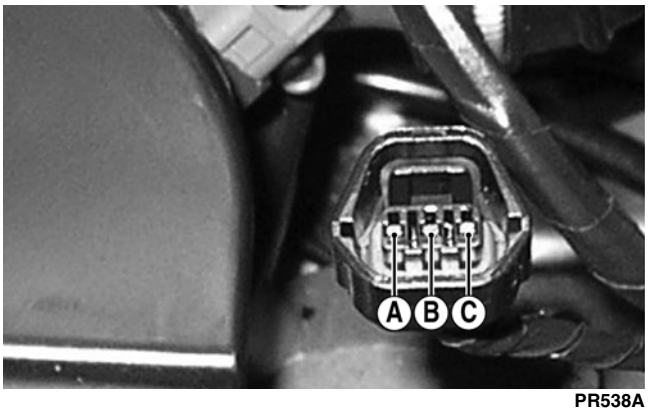
INSPECTING

1. Remove the seat, side covers, front rack, and front body panel (see Section 8); then remove the air filter assembly. Remove the TPS connector plug from the TPS.


PR544

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

2. Make sure the ignition switch is in the OFF position; then select the DC Voltage position on the meter.
3. Connect the red tester lead to terminal B and the black tester lead to terminal A. Turn the ignition switch to the ON position. The meter should read approximately 5.0 DC volts.



PR538A

■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.

4. Turn the ignition switch to the OFF position.
5. 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 (C) - approximately 1k ohms (throttle closed).
   C. Pin (A) to pin (C) - approximately 5k ohms (throttle full-open).
   D. Pin (A) to pin (B) - approximately 5k ohms.

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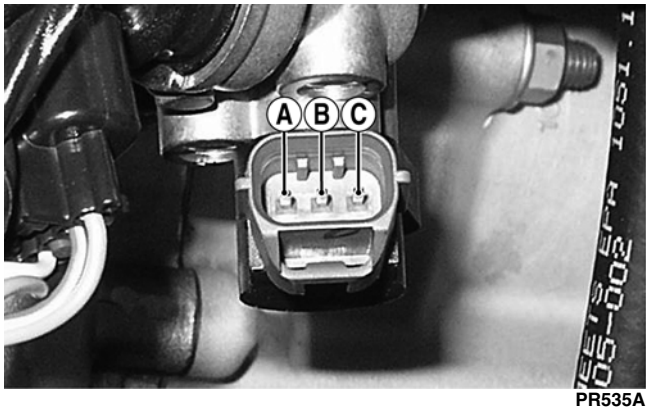
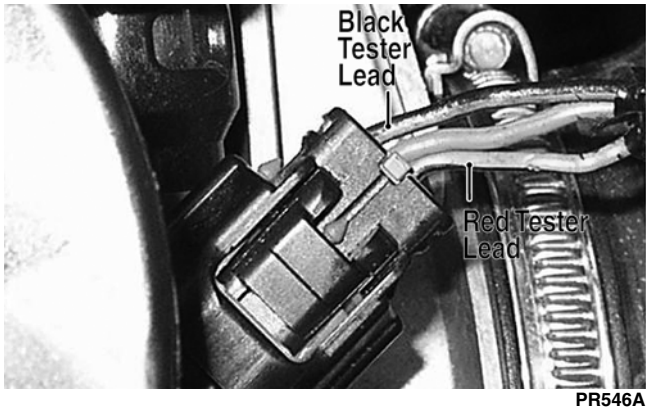


PR535A

■NOTE: If any meter reading is not as specified, replace or adjust the TPS (see INSTALLING/ADJUSTING in this sub-section).

6. Connect the positive lead to the battery; then connect the negative lead.

7. Connect the main harness TPS connector to the TPS; then using MaxiClips, connect the black tester lead to the black/green wire and the red tester lead to the green/black wire.



PR546A

8. Select the DC Voltage position on the meter and turn the ignition switch to the ON position. The meter should read approximately 0.6 DC volt with the throttle closed and approximately 4.0 DC volts with the throttle in the full-open position.

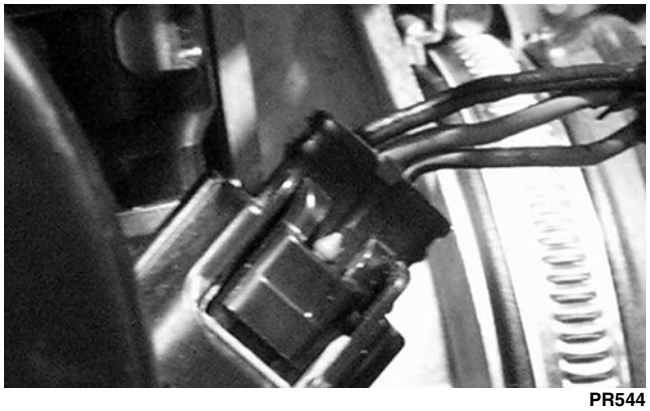
■NOTE: If the meter readings are as specified, check the main harness connector at the ECU main harness wiring. If the meter readings are not as specified, replace the TPS and adjust to specifications (see INSTALLING/ADJUSTING in this sub-section).

CAUTION
Always make sure the ignition switch is in the OFF position before disconnecting the ECU.

9. Verify all malfunction codes are cleared after servicing is complete (see appropriate Diagnostic Trouble Codes (DTC) in this section).

REMOVING

1. Remove the left-side engine cover; then disconnect the three-wire TPS connector plug.


PR544

2. Remove the screw 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 screw. Do not tighten at this time.

2. Connect the TPS Multi-Analyzer Harness connector #8 to the TPS; then connect the harness to the TPS Analyzer Tool.


FI672

3. Using a multimeter, connect the black tester lead to the white socket (VAR) on the analyzer and the red tester lead to the red socket (+SV); then select the DC Voltage position.

FI676A

4. Adjust the TPS until a reading of 0.6 DC volt is obtained; then tighten the screw securely. Open and close the throttle and determine the reading returns to 0.6 DC volt. Readjust as necessary.

5. Disconnect the harness from the analyzer; then disconnect the harness from the TPS and reconnect the TPS main harness connector.

Diagnostic Trouble Codes (DTC) (1000 FIS)

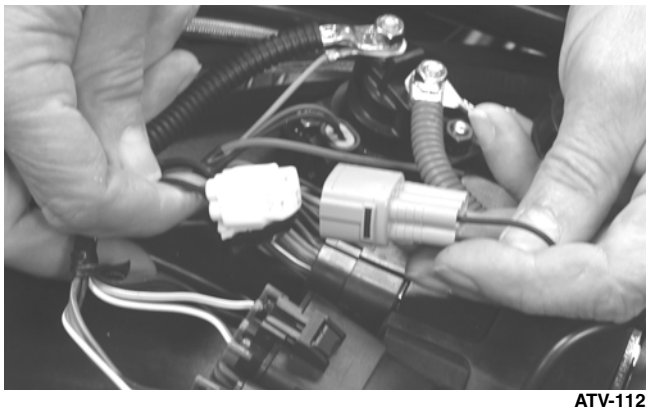
If a sensor fails or an out-of-tolerance signal is sensed by the ECU, a code will be generated by the ECU. This will result in the analog needle swinging full scale (if equipped) or the LCD gauge going blank (if equipped). The EFI icon will flash.

To read the code(s), use the following procedure.

1. Make sure the ignition switch is in the OFF position; then remove the seat.

2. Locate the diagnostic plug next to the PDM; then remove the black rubber cap.

3. Connect the Diagnostic Harness to the diagnostic plug.



ATV-112

4. Turn the ignition switch to the ON position and read the code on the LCD. Refer to the following Code List to identify the specific problem area.

Code List

■NOTE: Each of the following numerical codes will have a two-letter prefix. A prefix of AC (Active Code) or SC (Stored Code) will be displayed. Always correct and clear Active Codes before clearing Stored Codes.

- 00 = No Fault Detected (active code only)
- 12 = CKP (Crankshaft Position) Sensor*
- 13 = APS (Air Pressure Sensor) - H1
- 13 = MAP (Manifold Absolute Pressure) Sensor - H2
- 14 = TPS (Throttle Position Sensor)
- 15 = ECT (Engine Coolant Temperature) Sensor
- 16 = Speed Sensor
- 21 = IAT (Inlet Air Temperature) Sensor
- 23 = Tilt Sensor*
- 24 = Ignition Coil #1*
- 26 = Ignition Coil #2* - H2
- 32 = Fuel Injector #1*
- 34 = Fuel Injector #2* - H2
- 40 = ISC (Idle Speed Control) Valve
- 41 = Fuel Pump Relay*
- 60 = Cooling Fan Relay
- 95 = Sensor Power
- 96 = Incorrect ECU*
- 97 = ECU Memory Power (constant battery power)
- 98 = ECU to Gauge Comm Link - H2
- 99 = Start/Run Not Possible (active code only)

*Will initiate code 99.

After all active codes are cleared, clear stored code(s) using the following procedure.

■NOTE: The ignition switch should be in the OFF position.

1. With the diagnostic harness connected to the diagnostic plug and the drive select switch in the 4WD position, hold the reverse override switch down and turn the ignition switch to the ON position.

2. After ten seconds, release the reverse override switch and turn the ignition switch to the OFF position; then turn the ignition switch to the ON position. The display should read AC00 (no fault detected).

■NOTE: If the LCD still displays a code, continue troubleshooting the appropriate component.

3. Disconnect the diagnostic harness; then install the black rubber cap.

4. Install the seat making sure it locks securely in place.

Diagnostic Trouble Codes (DTC) (450/1000 TRV/1000 Cruiser/1000 Mud Pro)

If an EFI or related chassis component fails or an out-of-tolerance signal is detected by the ECU, a trouble code will be generated in the ECU and displayed on the LCD. For the first thirty seconds, the LCD will go blank and the code will be displayed alternately with a wrench icon or malfunction indicator light (MIL). After thirty seconds, the digital display will return to normal; however, the MIL and trouble code will continue to flash. On models equipped with the analog gauge, the needle will swing full-scale for thirty seconds; then return to normal with the MIL and code continuing to flash.

Code List

■NOTE: Each of the following numerical codes will have a one-letter prefix of C or P. A "C" prefix denotes a chassis malfunction and a "P" prefix denotes a power train malfunction.

■NOTE: Normal malfunction codes are cleared from the LCD when the component is replaced or the malfunction is corrected; however, intermittent codes must be cleared as noted in the code chart.

Gauge DTC	Wrench Icon Status	ECU PIN	Input/ Output	High/Low Variable	Description
C0063(1)		D2	I	V	Tilt Sensor Circuit High
C0064(1)	ON	D2	I	V	Tilt Sensor Circuit Low/SG/Open
P0107	ON	F2	I	V	MAP Sensor Circuit Low/SG/Open
P0108	ON	F2	I	V	MAP Sensor Circuit High/SP
P0112	ON	F3	I	V	Intake Air Temp Sensor Circuit Low/SG
P0113	ON	F3	I	V	Intake Air Temp Sensor Circuit High/Open
P0114(1)	OFF	F3	I	V	Intake Air Temp Sensor Circuit Intermittent
P0116	ON	F4	I	V	Engine Coolant Temp Sensor Circuit Range/Performance
P0117	ON	F4	I	V	Engine Coolant Temp Sensor Circuit Low/SG
P0118	ON	F4	I	V	Engine Coolant Temp Sensor Circuit High/Open/SP
P0119(1)	OFF	F4	I	V	Engine Coolant Temp Sensor Circuit Intermittent
P0121		G3	I	V	Throttle Position Sensor Range/Performance
P0122	ON	G3	I	V	Throttle Position Sensor Circuit Low/SG
P0123	ON	G3	I	V	Throttle Position Sensor Circuit High
P0219		N/A	N/A	N/A	Engine Over-Speed Condition
P0231	ON	J1	O	L	Fuel Pump Relay Circuit Low/SG/Open
P0232		J1	O	L	Fuel Pump Relay Circuit High
P0233(1)		J1	O	L	Fuel Pump Relay Circuit
P0261(2)	ON	L4	O	L	Rear Cylinder Injector Circuit Low/SG
P0262(2)	ON	L4	O	L	Rear Cylinder Injector Circuit High
P0263(2)	ON	L4	O	L	Rear Cylinder Injector Balance/Open
P0264(2)	ON	K4	O	L	Front Cylinder Injector Circuit Low/SG - H2
P0265(2)	ON	K4	O	L	Front Cylinder Injector Circuit High - H2
P0266(2)	ON	K4	O	L	Front Cylinder Injector Balance/Open - H2
P0336(1)	ON	D1/E1	I	V	Crankshaft Angle Sensor Synchronization
P0337(1)	ON	D1/E1	I	V	Crankshaft Angle Sensor Circuit/SG
P0339(1)	ON	D1/E1	I	V	Crankshaft Angle Sensor Intermittent/Erratic
P0480		K2	O	L	Fan Relay Control Circuit
P0484		K2	O	L	Fan Relay Control Circuit High
P0485	ON	K2	O	L	Fan Relay Control Circuit Low/SG/Open
P0500	Gauge Direct Error-Code	N/A	N/A	N/A	Vehicle Speed-Sensor
P0508	ON	C4/D3/D4/E4	I/O	V	Idle Air Control System Circuit Low/SG
P0509	ON	C4/D4	I/O	V	Idle Air Control System Circuit High/Open
P0562		L1	I	H	System Voltage Low
P0563		L1	I	H	System Voltage High
P0601		N/A	N/A	N/A	ECU Memory Check-Sum Error
P0615(1)		L3	O	L	Starter Relay Circuit
P0616	ON	L3	O	L	Starter Relay Circuit Low
P0617		L3	O	L	Starter Relay Circuit High
P0630	ON	N/A	N/A	N/A	VIN Not Programmed or Incompatible
P0635	Gauge Direct Error-Code	N/A	N/A	N/A	Power-Steering Controller Circuit
P0642		A1	O	H	Sensor Power Circuit Low
P0643	ON	A1	O	H	Sensor Power Circuit High
P0856	Gauge Direct Error-Code	N/A	N/A	N/A	Traction Controller Circuit
P2300(2)	ON	M1	O	L	Rear Ignition Coil Primary Circuit Low/SG/Open
P2301(2)	ON	M1	O	L	Rear Ignition Coil Primary Circuit High
P2303(2)	ON	M2	O	L	Front Ignition Coil Primary Circuit Low/Open - H2
P2304(2)	ON	M2	O	L	Front Ignition Coil Primary Circuit High - H2
P2531		A4	I	H	Ignition Switch Circuit Low
P2532		A4	I	H	Ignition Switch Circuit High
U0155		B1/C1	I/O	H/L	LCD Gauge Communication Lost
“FUEL OFF”	Gauge Direct Error-Code		N/A	N/A	Tilt Sensor Activation Operator-Code

High = Signal Level is too High (Possible Short-to-Battery (+))
Low = Signal Level is too Low (Possible Short-to-Ground or Short-to-Chassis)
SG = Possible Short-to-Ground or Short-to-Chassis
SP = Possible Short-to-Power or Short-to-Battery
Open = Open-Circuit (Possible Broken-Wire or No-Connection)

(1): These codes cleared by one complete power-cycle only (key-off, power-latch, key-on):
C0063, C0064, P0114, P0119, P0233, P0336, P0337, P0339, P0615

(2): These codes cleared by one complete starting-cycle only (key-off, power-latch, key-on, start, key-off, power-latch, key-on):
C0261, P0262, P0263, P0264, P0265, P0266, P2300, P2301, P2303, P2304

Troubleshooting

Problem: Spark absent or weak	
Condition	**Remedy**
1. **Ignition coil** defective 2. **Spark plug** defective 3. **Magneto** defective 4. **ECU** defective 5. **Pick-up coil** defective	1. Replace ignition coil 2. Replace plug 3. Replace stator coil 4. Replace ECU 5. Replace stator coil
Problem: Spark plug fouled with carbon	
Condition	**Remedy**
1. **Gasoline** incorrect 2. **Air cleaner element** dirty 3. **Spark plug** incorrect (too cold) 4. **Valve seals** cracked - missing 5. **Oil rings** worn - broken	1. Change to correct gasoline 2. Clean element 3. Replace plug 4. Replace seals 5. Replace rings
Problem: Spark plug electrodes overheat or burn	
Condition	**Remedy**
1. **Spark plug** incorrect (too hot) 2. **Engine** overheats 3. **Spark plug** loose	1. Replace plug 2. Service cooling system 3. Tighten plug
Problem: 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 coil (magneto)** grounded - open 3. **Regulator/rectifier** defective 4. **Cell plates (battery)** defective	1. Repair - tighten lead wires 2. Replace stator coil 3. Replace regulator/rectifier 4. Replace battery
Problem: 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 stator coil 3. Replace regulator/rectifier
Problem: Starter button not effective	
Condition	**Remedy**
1. **Battery charge** low 2. **Switch contacts** defective 3. **Starter relay** defective 4. **Emergency stop - ignition switch** off 5. **Wiring connections** loose - disconnected	1. Charge - replace battery 2. Replace switch 3. Replace relay 4. Turn on switches 5. Connect - tighten - repair connections
Problem: Battery “sulfation” (Acidic white powdery substance or spots on surfaces of cell plates)	
Condition	**Remedy**
1. **Charging rate** too low - too high 2. **Battery** run-down - damaged 3. **Electrolyte** contaminated	1. Replace battery 2. Replace battery 3. Replace battery

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Problem: Battery discharges too rapidly	
Condition	**Remedy**
1. **Charging system** not charging 2. **Cell plates** overcharged - damaged 3. **Battery** short-circuited 4. **Electrolyte** contaminated	1. Check magneto - regulator/rectifier - circuit connections 2. Replace battery - correct charging system 3. Replace battery 4. Replace battery
Problem: Battery polarity reversed	
Condition	**Remedy**
1. **Battery** incorrectly connected	1. Reverse connections - replace battery - repair damage

SECTION 6 - DRIVE SYSTEM/ BRAKE SYSTEM

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Drive System/Brake 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 1.

■NOTE: 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.)

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).

The die-cast aluminum housings have been assembled with thread-rolling screws (trilobular). When assembling with these screws, start the screws carefully into the housing; then use the following torque values.

Size	New Housing	Reassembled Housing
M6 (Torx T-30 Recess)	8-9.5 ft-lb	6.5-9 ft-lb
M8 (Torx T-40 Recess)	25-31 ft-lb	21-25 ft-lb
M10 (Torx T-50 Recess)	37-45.5 ft-lb	31-38 ft-lb

SPECIAL TOOLS

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

Description	p/n
Backlash Measuring Tool (24-Spline Axle)	0544-010
Backlash Measuring Tool (27-Spline Axle)	0544-011
CV Boot Clamp Tool	0444-120
Internal Hex Socket	0444-104
Pinion Gear/Shaft Removal Tool	0444-127
Gear Case Seal Installer Tool	0444-224

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

Front Drive Actuator/Differential Lock

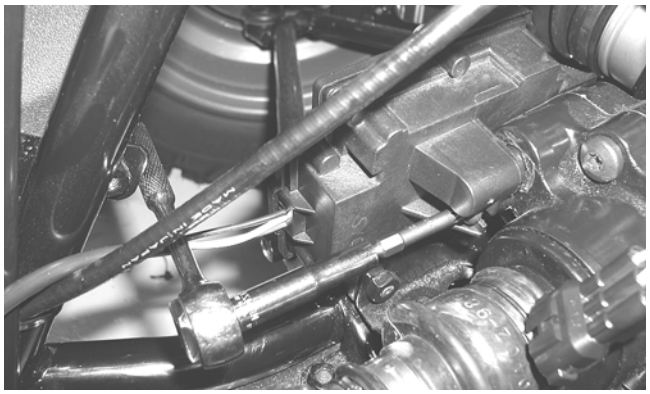
■NOTE: The actuator is not a serviceable component. If it is defective, it must be replaced.

■NOTE: The actuator will operate only when the ignition switch is in the ON position.

The front drive actuator is located on the side of the front drive input housing. With the engine stopped and the ignition switch in the ON position, a momentary “whirring” sound can be heard each time the drive select switch is shifted or the differential lock is activated. If no sound is heard, see Section 5. If the actuator runs constantly or makes squealing or grinding sounds, the actuator must be replaced.

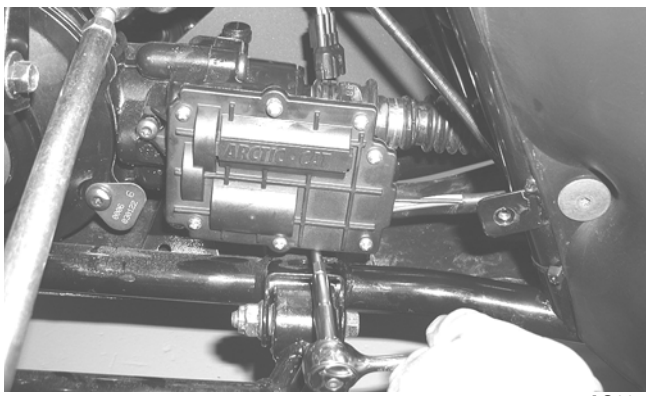
REMOVING

1. Disconnect the connector on the actuator harness.
2. Using a T-30 torx wrench, remove the mounting cap screw from the driveshaft side of the actuator.



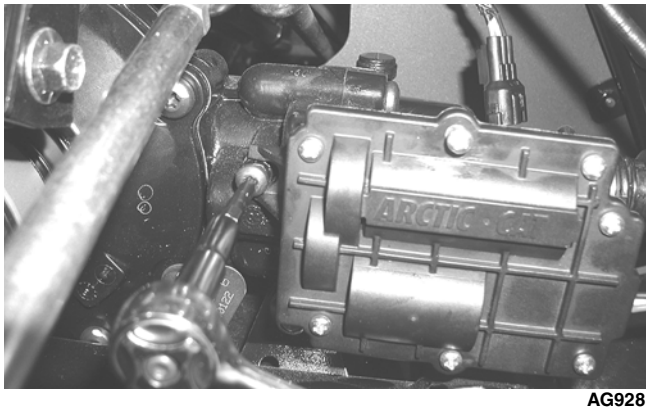
AG926

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.

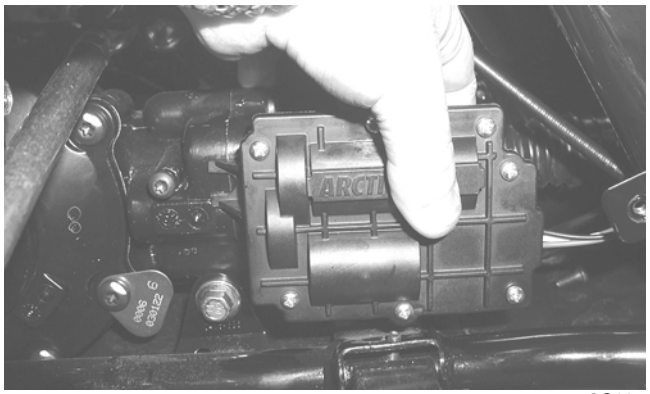


AG928

INSTALLING

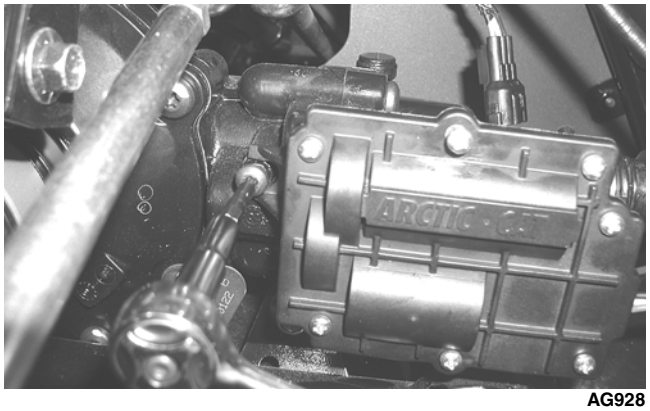
■NOTE: Make sure to properly align the differential lock actuator lever with the hole in the differential lock plunger.

1. Lubricate the O-rings on the actuator; then ensure that all mounting surfaces are clean and free of debris.
2. Align the actuator with the selector shaft and slide it forward onto the shaft taking care to engage the cap screw in the slot of the front mounting tab.



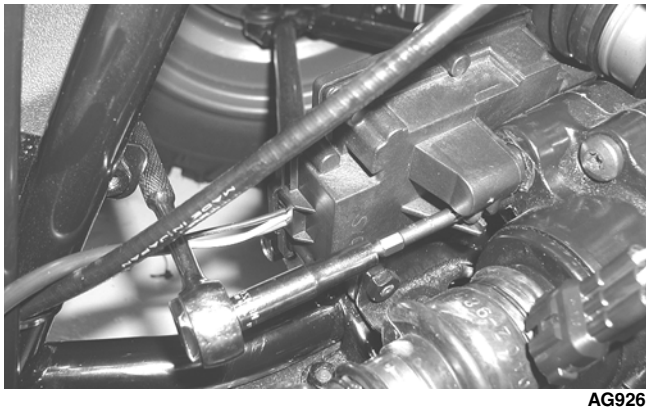
AG925

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 drive select switch several times.
7. Secure the wiring harness to the frame with a nylon cable tie.

Front Differential

■NOTE: To remove the rear gear case, see Rear Gear Case in this section.

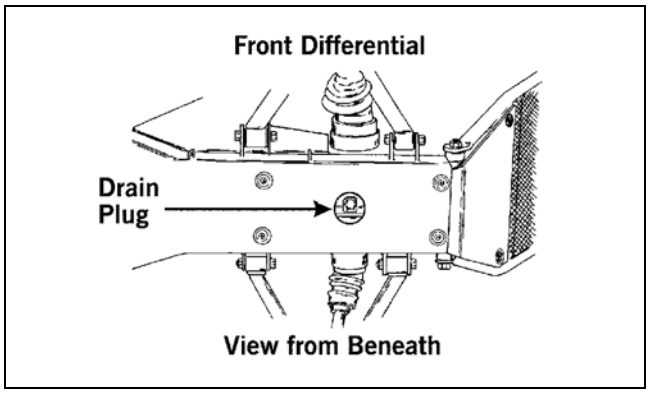
REMOVING DIFFERENTIAL

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.

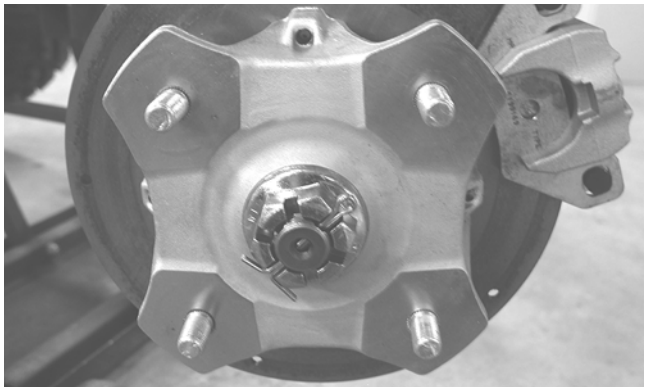
2. Remove the drain plug and drain the gear lubricant into a drain pan; then reinstall the plug and tighten to 45 in.-lb.



ATV0082A

3. Remove the front wheels.

4. Pump up the hand brake; then engage the brake lever lock.
5. Remove the cotter pin securing the hex nut; then remove the hex nut and washer.

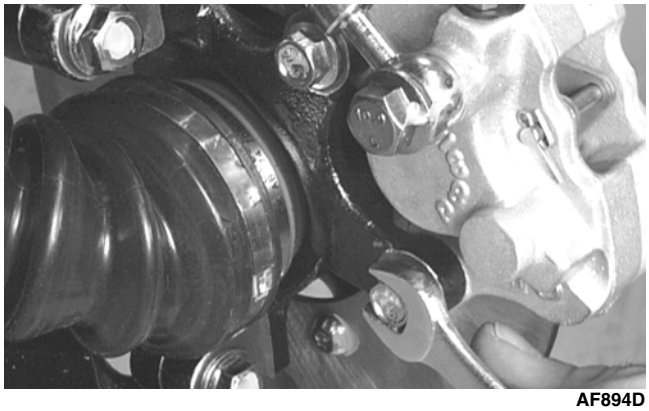


KX041

6. Release the brake lever lock.

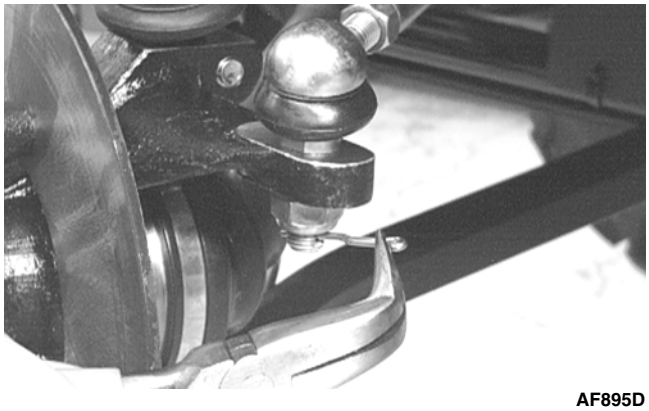
■NOTE: It is not necessary to remove the brake hoses from the calipers for this procedure.

7. Remove the two brake calipers. Account for the four cap screws.



AF894D

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

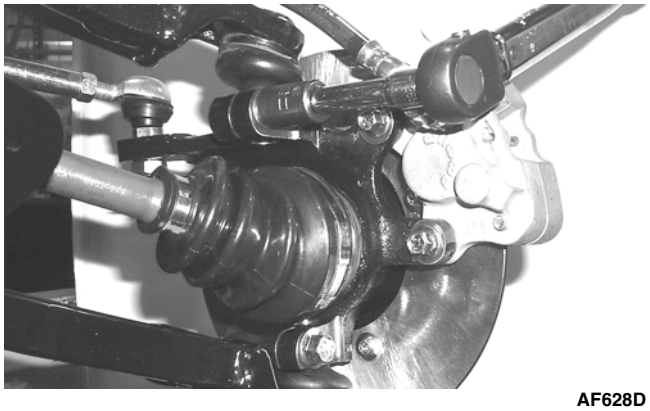


AF895D

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.

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.

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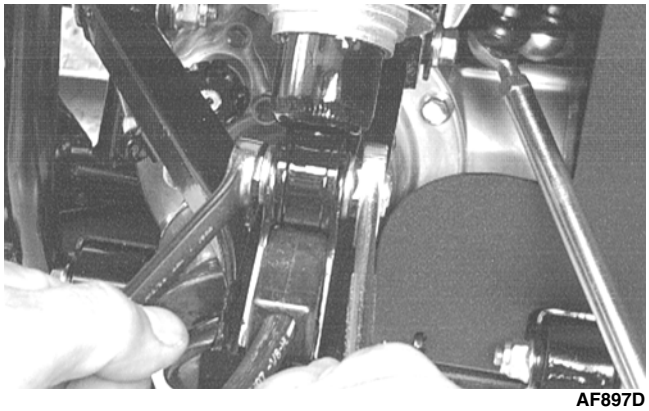
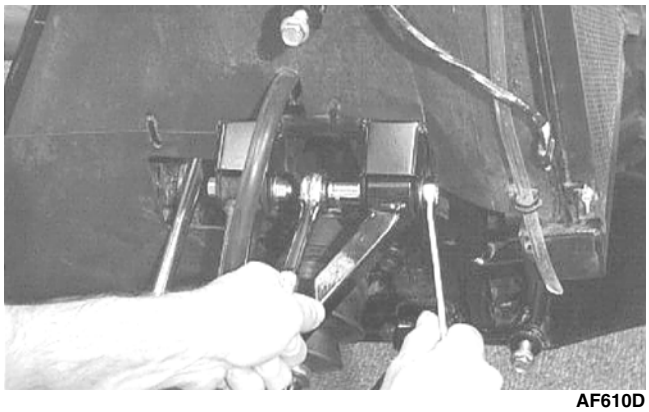


AF897D

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

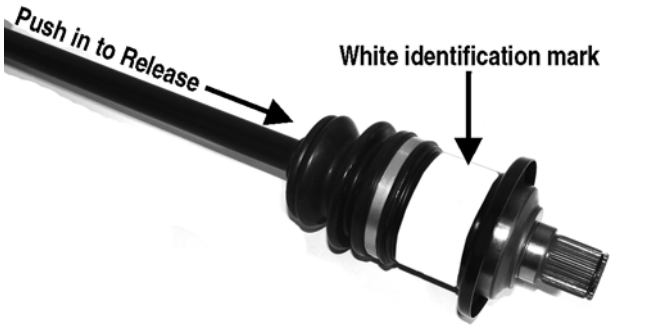


AF610D

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

CAUTION

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

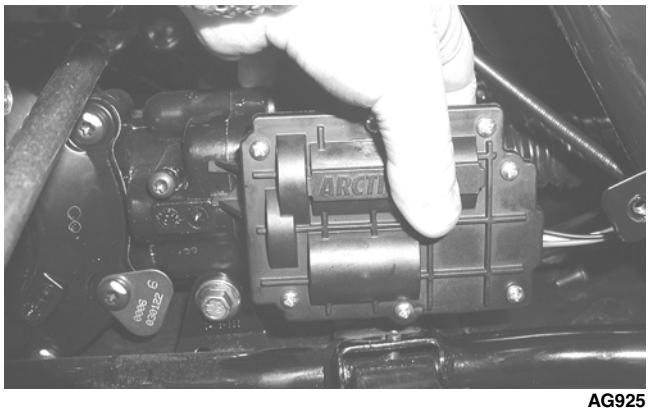


PR729B

PR725A

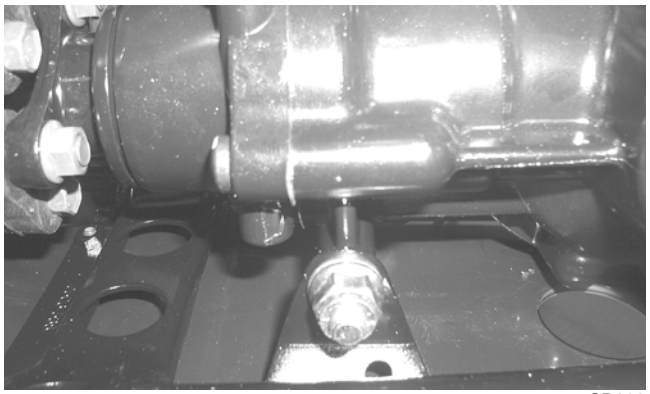
16. Remove the inner fender panels.

17. Using a T-30 torx wrench, remove the three screws securing the front drive actuator to the gear case; then remove the actuator.



AG925

18. Remove the lower differential mounting cap screw. Account for a lock nut and washers.



CD026

19. Remove the upper differential mounting cap screws.

6

CD016

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

KX161

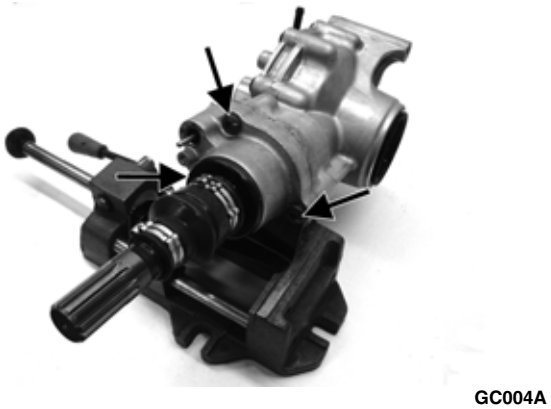
21. Place the differential on its right side; then remove it from the frame.

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.

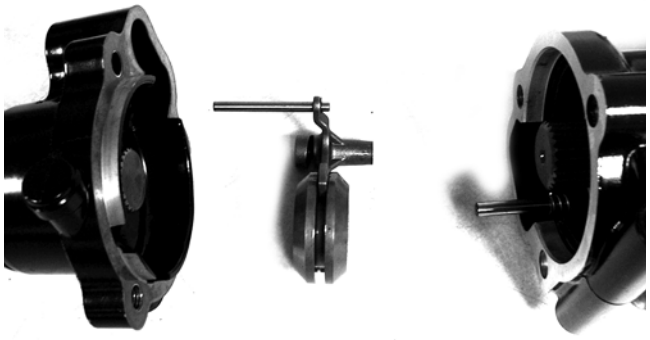
1. Using a T-40 torx wrench, remove the cap screws securing the pinion housing.



GC004A

2. Using a rubber mallet, remove the housing. Account for a gasket. Remove the fork, collar, and spring. Note the location of all the components for assembling purposes.

GC015



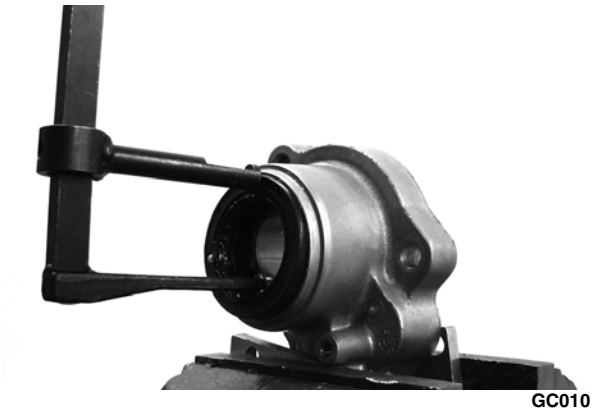
CD106

3. Using a boot-clamp pliers (or suitable substitute), remove the boot clamps; then remove the boots and splined drive from the input shaft.

4. Remove the snap ring; then remove the input shaft from the pinion housing.

CD107

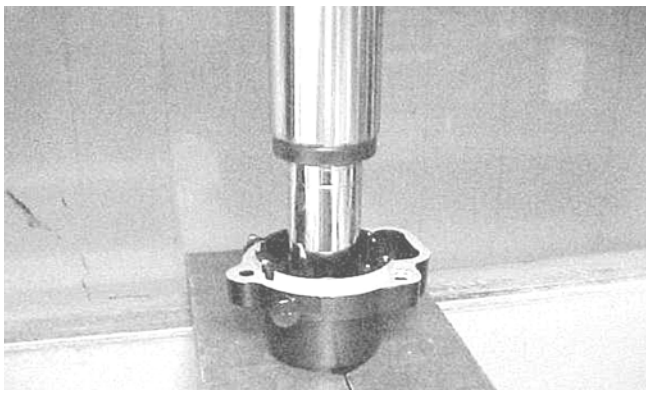
5. Using a seal removal tool, remove the input shaft seal. Account for a spacer.



GC010

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

GC011



AF984

KX219

Assembling Input Shaft

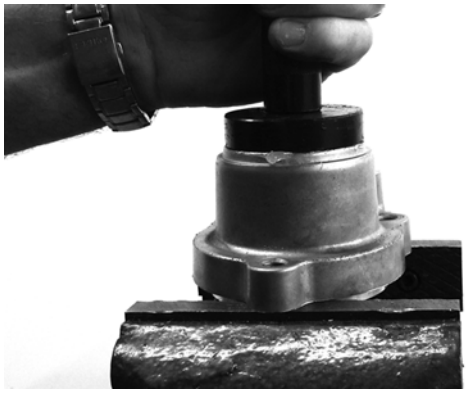
1. Place the pinion housing in a press and install the input shaft bearing. Secure the bearing with the existing snap ring making sure the sharp edge of the snap ring faces to the outside.

GC012

GC011

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

6



GC014

3. Lubricate the input shaft with High-Performance #2 Molybdenum Disulphide Grease packing the boot ribs and splines; then assemble allowing excess grease to freely escape. Slight pressure on the boot will be present during assembly. Secure with new clamps.

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

GC009A

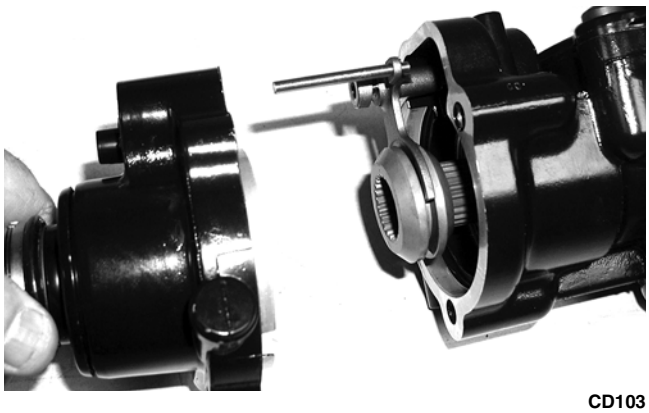
4. Install the input shaft into the pinion housing and secure with the snap ring; then install the front boot and secure with an appropriate boot clamp and the rear boot with an appropriate boot clamp.

CD112

CD099

5. Place the pinion housing with new gasket onto the gear case housing; then secure with the existing cap screws. Tighten to 23 ft-lb.

■NOTE: If a new gear case housing is being installed, tighten the cap screws to 25-31 ft-lb.



CD103

Disassembling Differential Assembly

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

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

GC015

2. Using a T-40 torx wrench, remove the cap screws securing the differential cover. Account for and make note of the ID tag location for assembling purposes.

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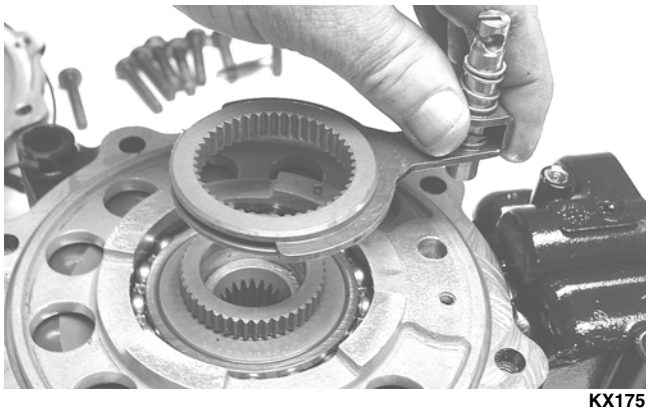
GC003

3. Using a plastic mallet, tap lightly to remove the differential cover. Account for an O-ring.

KX174

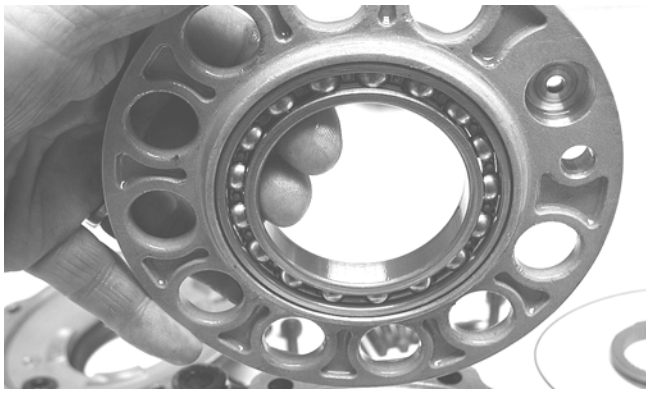
■NOTE: If the cover is difficult to remove, pry on the cover in more than one recessed location.

4. Remove the splined coupler, shifter fork, pin, and spring of the differential lock assembly and set aside. Note position of parts for assembling purposes.



KX175

5. Remove the left differential bearing flange assembly and account for a shim. Mark the shim as left-side.

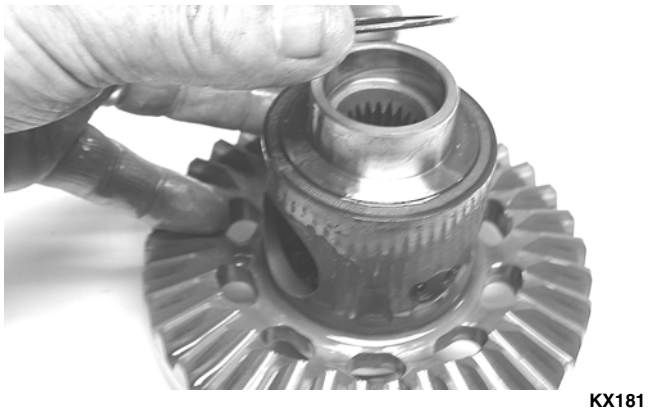


KX177

KX178

6. Place the differential with the open side down; then lift the housing off the spider assembly. Account for shim(s) and mark as right-side.

KX179

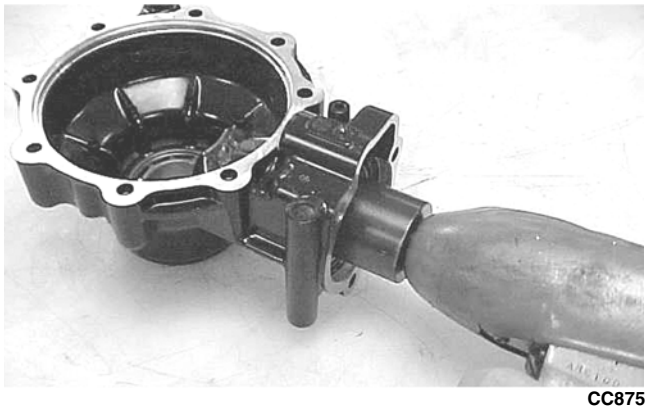


KX181

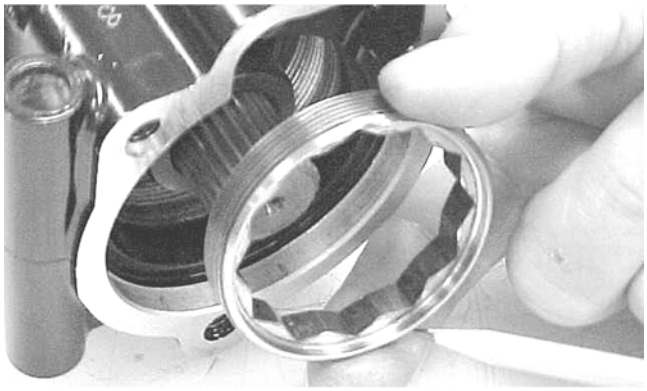
Disassembling Pinion Gear

■NOTE: Any service of the pinion gear or related bearings will require a new gear case/differential housing. The removal of the lock collar severely damages the threads in the housing.

1. Using the 48 mm Internal Hex Socket, remove the lock collar securing the pinion gear assembly.

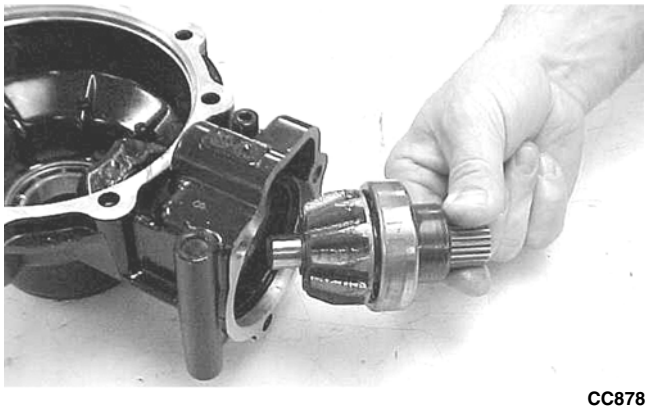


CC875



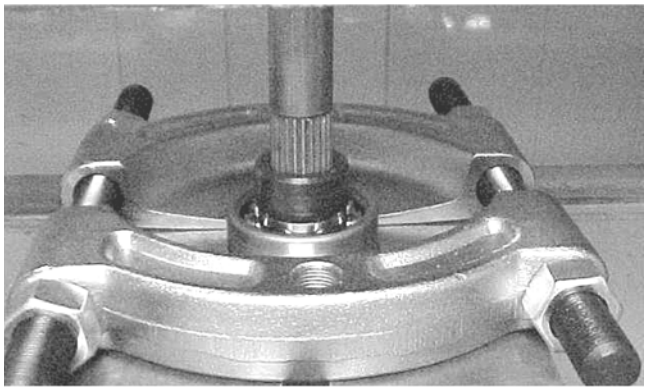
CC876

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



CC878

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

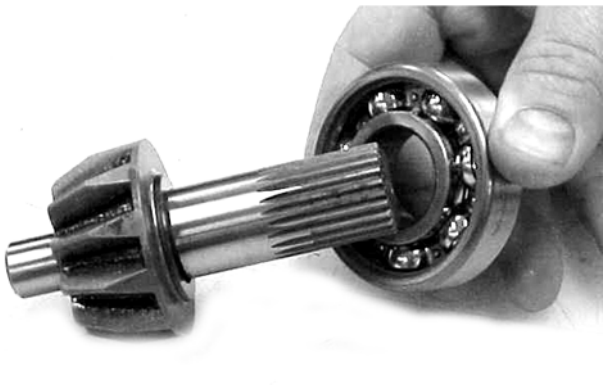


CC879

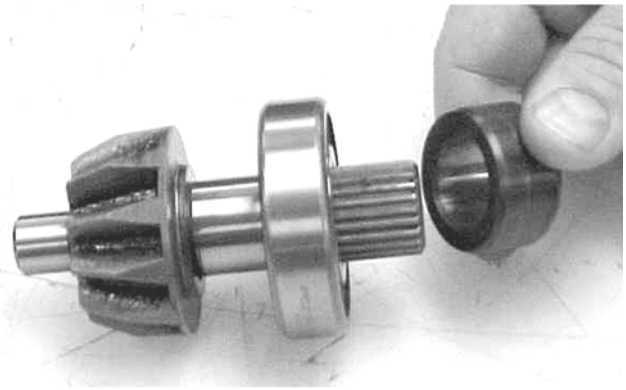
4. Remove any reusable parts from the gear case housing; then discard the housing and lock collar.

Assembling Pinion Gear

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



CC882



CC883

2. Place the pinion assembly in a bearing puller; then install the bearing using a press.

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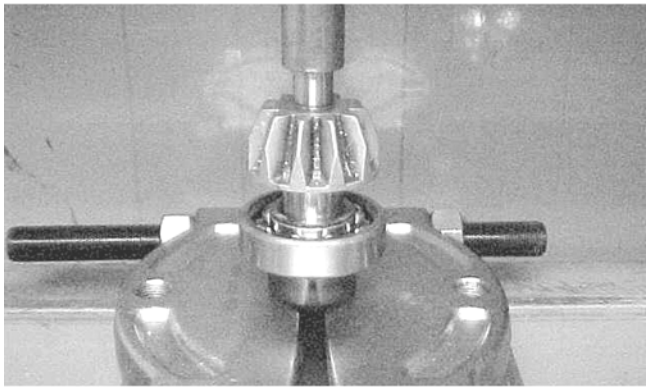


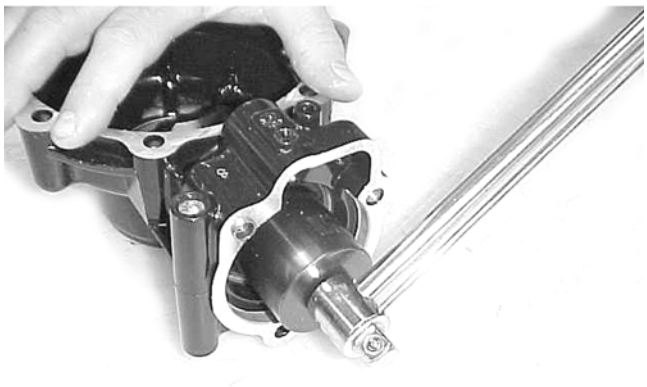
CC884

3. Coat a new needle bearing and the bearing pocket of a new gear case/differential housing with red Loctite #271; then using a suitable driver, install the bearing lightly seated against the bearing seats. Do not push the bearing too far into the pocket.

GC044

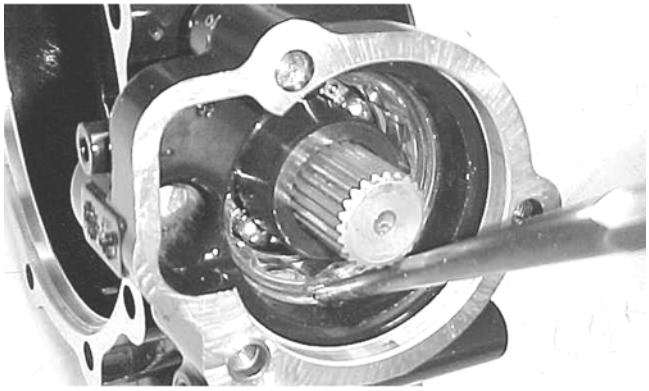
4. Install the pinion gear assembly into the housing. Using the 48 mm Internal Hex Socket, secure the pinion gear assembly with the existing lock collar. Tighten to 125 ft-lb.

■NOTE: On a front differential, the lock collar has right-hand threads. On a rear drive gear case, the lock collar has left-hand threads or a snap-ring.



CC890

5. 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

Shimming Procedure/Shim Selection

Case-side Shims (Backlash)		
p/n	mm	in.
0402-405	1.3	0.051
0402-406	1.4	0.055
0402-407	1.5	0.059
0402-408	1.6	0.063
0402-409	1.7	0.067

Cover-side Shims (Ring Gear End-Play)		
p/n	mm	in.
1402-074	1.3	0.051
1402-075	1.4	0.055
1402-076	1.5	0.059
1402-077	1.6	0.063
1402-078	1.7	0.067

It is very important to adjust bevel gears for the proper running tolerances. Gear life and gear noise are greatly affected by these tolerances; therefore, it is very important to properly adjust any gear set prior to final assembly.

The following procedure can be used on both front differential or rear drive gear case.

■NOTE: All bearings must be installed in the gear case and the pinion properly installed before proceeding.

Backlash

■NOTE: Always set backlash prior to any other shimming.

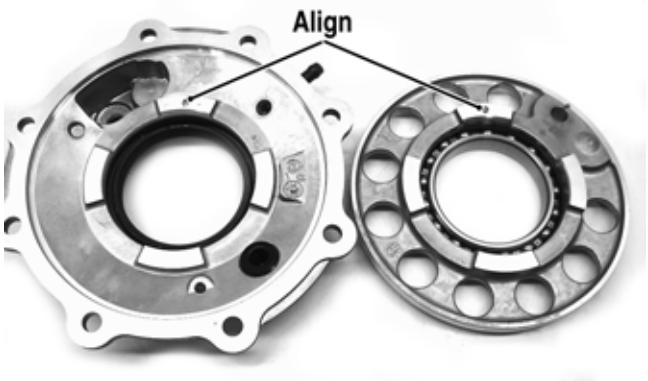
1. Install the existing shim or a 0.051-0.055-in. shim on the gear case side of the ring gear assembly.

GC031A

2. Install the ring gear with shim in the gear case; then while holding the pinion stationary, rock the ring gear forward and back to determine if any backlash exists. If no backlash exists, install a thicker shim and recheck.

GC036A

3. Install the bearing flange onto the gear case cover making sure the alignment/locating pin engages the locating hole in the cover; then make sure the bearing flange is completely seated in the cover.



GC032A

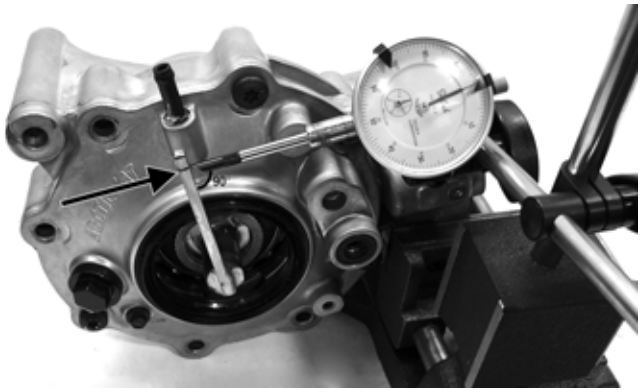
GC033A

4. Install the existing shim or a 0.063 in. shim on the cover side of the ring gear; then place the assembled gear case cover onto the gear case and secure with three cap screws. Tighten evenly using a crisscross pattern.

GC036B

5. Place the appropriate Backlash Measuring Tool into the splines of the ring gear and install a dial indicator making sure it contacts the gauge at a 90° angle and on the index mark.

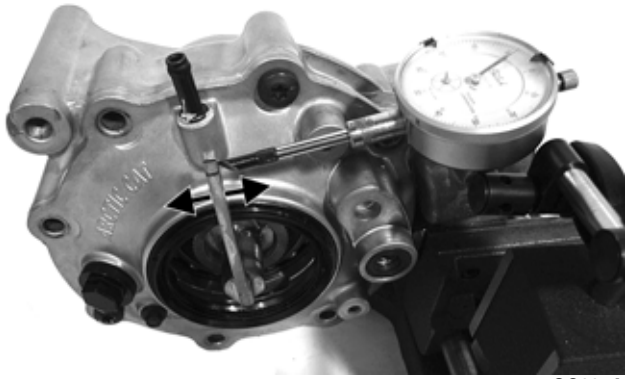
GC040



GC039A

6. Zero the dial indicator; then while holding the pinion stationary, rock the ring gear assembly forward and back and record the backlash. Backlash must be 0.011-0.015 in. If backlash is within specifications, proceed to Ring Gear End-Play. If backlash is not within specifications, increase shim thickness to increase backlash or decrease shim thickness to decrease backlash.

■NOTE: Higher backlash settings usually result in quieter gear operation.

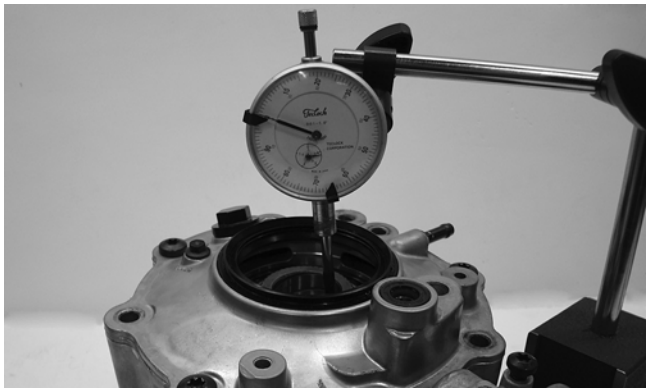


GC037A

Ring Gear End-Play

After correcting backlash, ring gear end-play can be adjusted. To adjust end-play, use the following procedure.

1. Secure the gear case in a holding fixture with the cover side up; then install a dial indicator contacting the ring gear axle flange.



GC035

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

3. To increase end-play, decrease the shim thickness. To decrease end-play, increase the shim thickness.

■NOTE: Once proper backlash and end play are established, the gear case can be assembled (see Assembling Differential Assembly in this sub-section).

CC888

Assembling Differential Assembly

1. With the pinion gear and new bearings installed, place the selected (backlash) shim on the gear case side of the ring gear with the chamfered side toward the ring gear; then install into gear case/differential housing.

GC031A

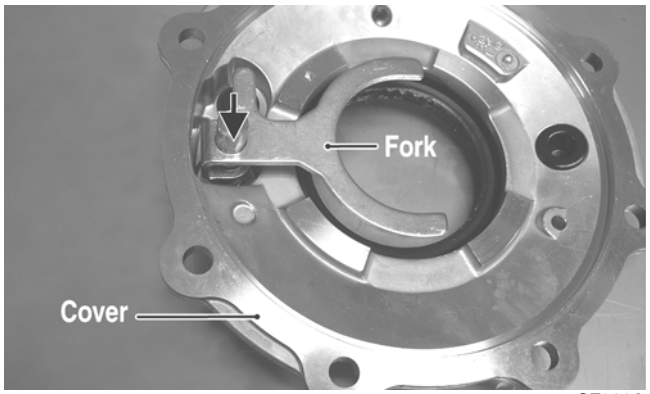
GC020

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

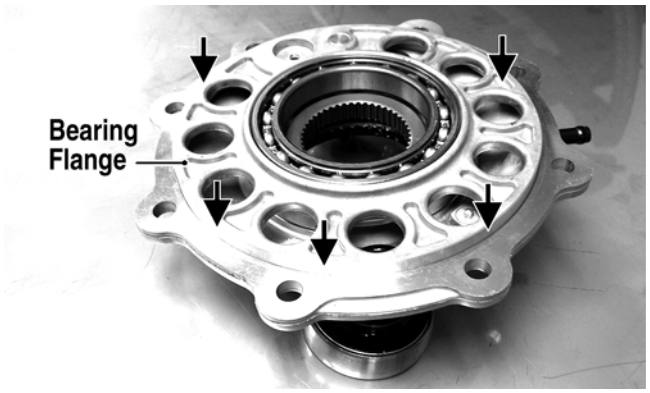
GC036B

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

3. Assemble the fork and sliding collar into the cover assembly; then install the left bearing flange/bearing assembly and seat firmly into the cover.



CF266A



CF267A

4. Apply a liberal coat of grease to the O-ring; then install it on the assembled cover assembly making sure to seat the O-ring completely down around the circumference of the bearing flange.

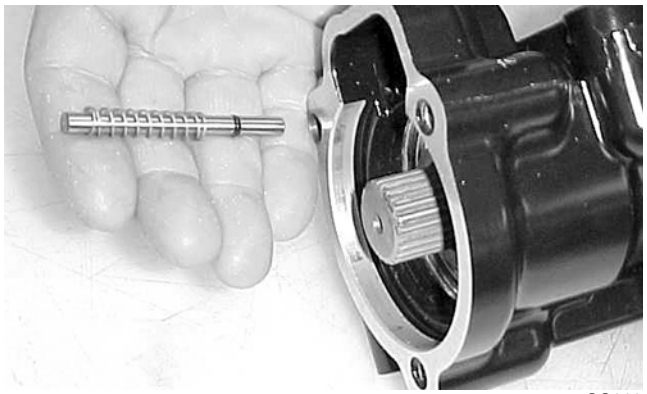
CF275A

5. Making sure the O-ring is properly positioned on the differential housing cover assembly, install the cover with existing cap screws (coated with green Loctite #609). Account for the ID tag. Tighten the cap screws evenly to 23 ft-lb.

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

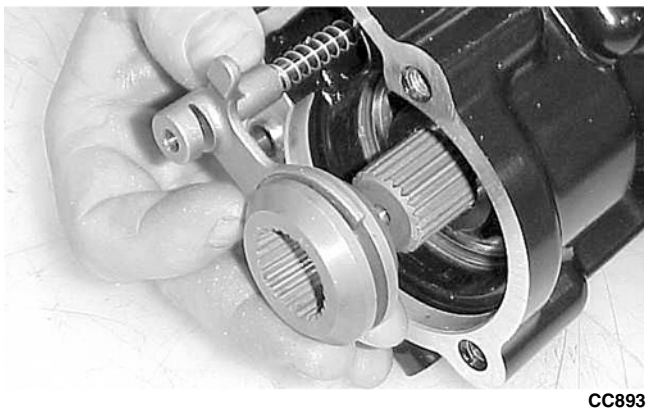
■NOTE: If a new housing is being installed, tighten the cap screws to 28 ft-lb.

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



CC892

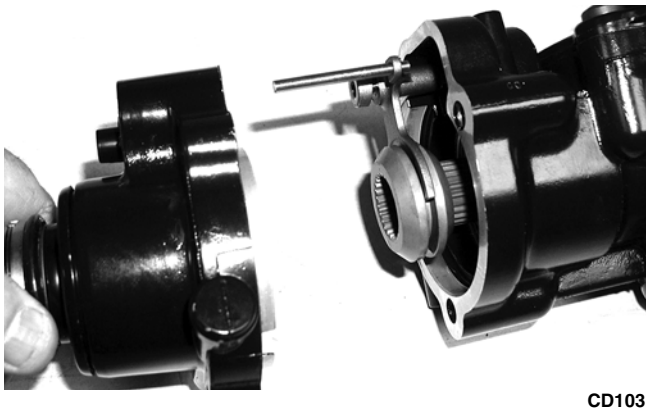
7. Install the shift fork assembly making sure the fork leg is facing upward. Apply a small amount of oil to the gasket; then install the gasket.



CC893

8. Place the input shaft assembly onto the gear case housing; then secure with the existing cap screws. Tighten to 23 ft-lb.

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



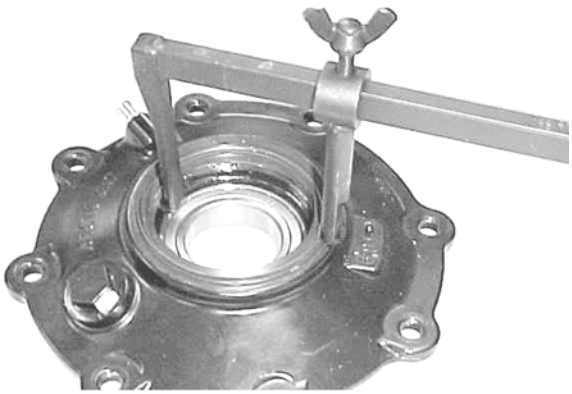
CD103

CD110

Removing/Installing Axle Seal

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

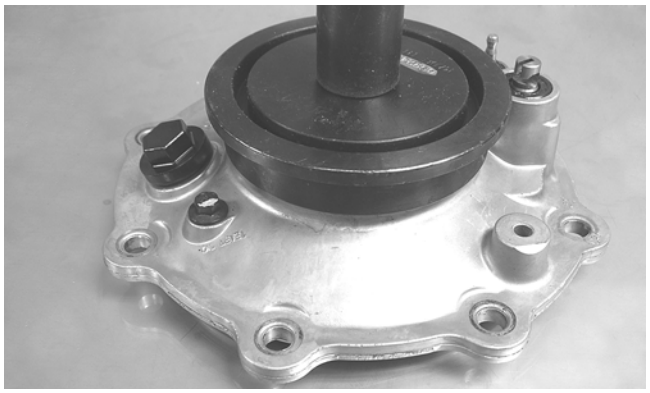
1. Remove the seal using a seal removal tool.



CC899

■NOTE: Prior to installing the seal, apply High-Performance #2 Molybdenum Disulphide grease to the seal outside diameter.

2. Using Gear Case Seal Installer Tool, evenly press the seal into the cover bore until properly seated.



CF278

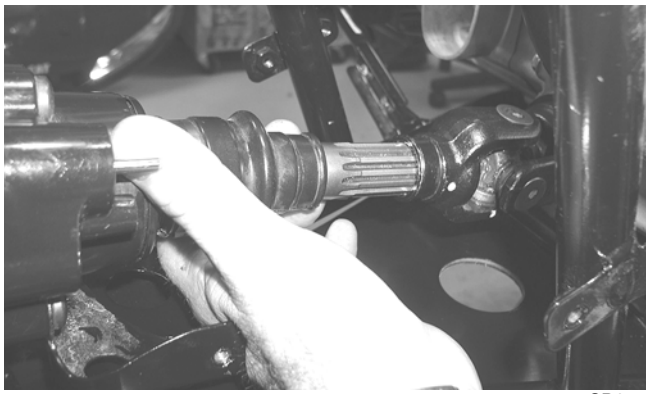
CAUTION

Make sure the tool is free of nicks or sharp edges or damage to the seal may occur.

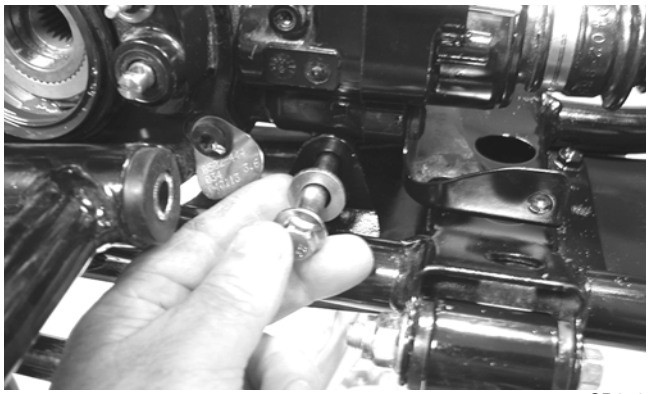
3. Repeat steps 1-2 for the opposite side.

INSTALLING DIFFERENTIAL

1. Align the splined input yoke with the front output splines; then place the differential into position on the frame and install the cap screws (coated with blue Loctite #243), washers, and flex-lock nuts. Tighten to 38 ft-lb. Make sure the rubber boot is properly seated on the input yoke.



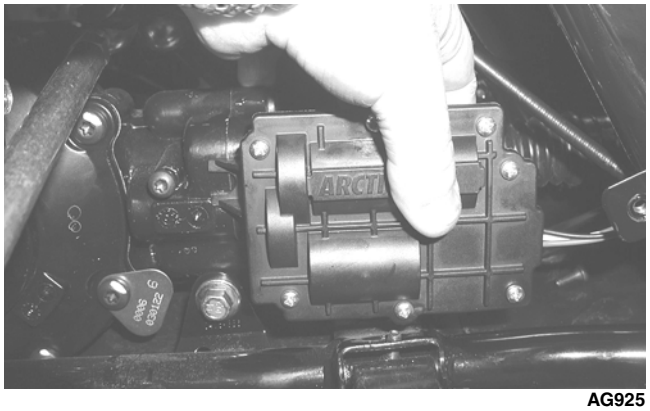
CD857



CD859

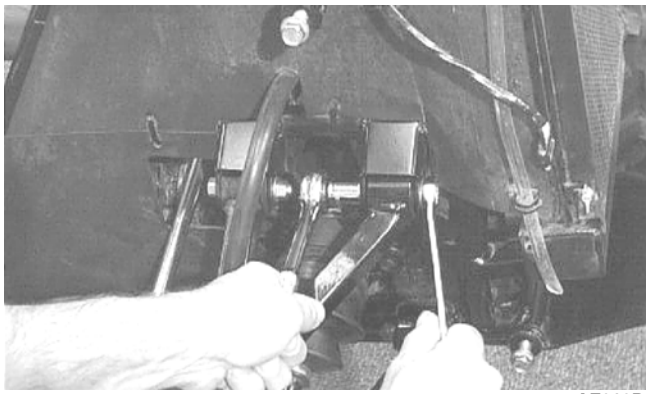
2. Pour 275 ml (9.3 fl oz) of SAE 80W-90 hypoid gear lubricant into the differential and install the fill plug. Tighten to 16 ft-lb.

3. Install the front drive actuator with the three torx-head cap screws; then connect the wire connector to the main wiring harness.



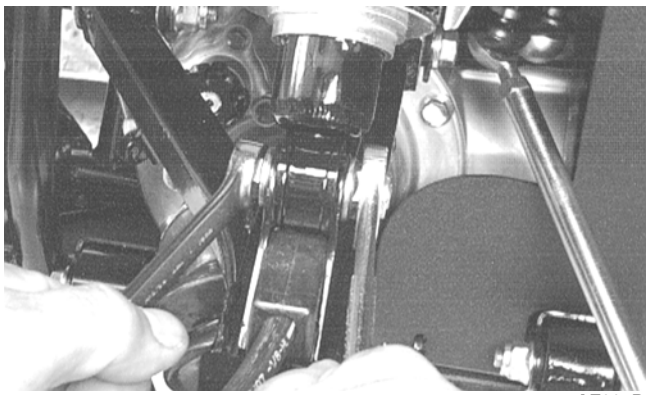
AG925

4. Install the 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 50 ft-lb.



AF610D

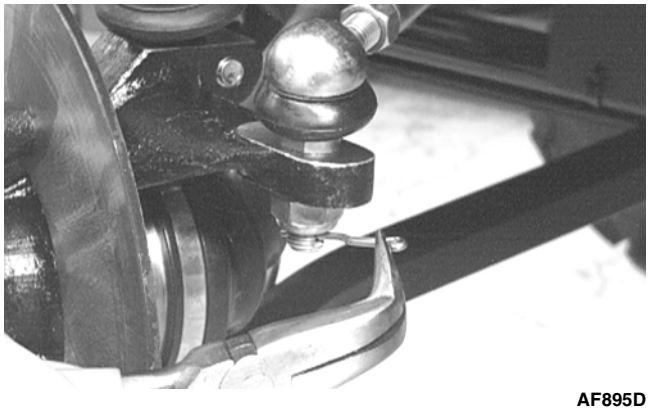
7. Secure the lower shock eyelets with cap screws and lock nuts. Tighten to 50 ft-lb.



AF897D

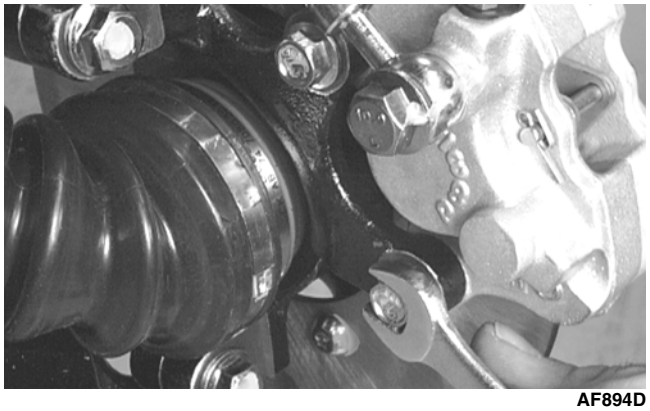
8. Secure the tie rods with the lock nuts. Tighten to 30 ft-lb; then install and spread the cotter pins.

AF896D



AF895D

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



AF894D

10. Install the wheels and tighten to 40 ft-lb (steel wheels) or 80 ft-lb (aluminum wheels).
11. Remove the ATV from the support stand.

Drive Axles

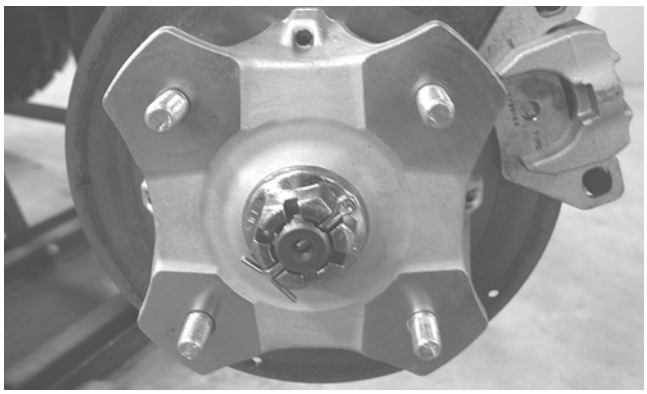
REMOVING REAR DRIVE AXLE

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

⚠ WARNING

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

2. Pump up the hand brake; then engage the brake lever lock.
3. Remove the wheel.
4. Remove the cotter pin securing the hex nut; then remove the hex nut. Release the brake lever lock.



KX041

5. Remove the two brake calipers (right side only).

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

CAUTION

The calipers should be supported. If the calipers are allowed to hang from the cable/hose, damage may occur.

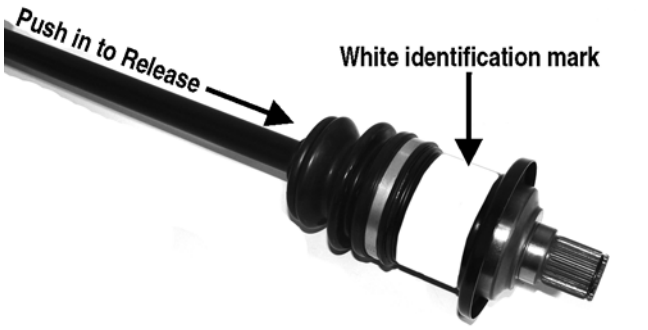
6. Slide the hub out of the knuckle and set aside.
7. Remove the cap screw and lock nut securing the knuckle to the upper A-arm. Discard the lock nut.

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

8. While holding the drive axle stationary, pull the top of the knuckle out and down until it is free of the drive axle.
9. Place a drain pan under the ATV to contain any oil leakage.
10. Push the axle shaft firmly toward the gear case to release the internal lock; then while holding the axle in, pull the CV cup from the gear case.

CAUTION

Do not attempt to use a slide hammer or gear case/axle damage will occur.



PR729B

PR725A

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.

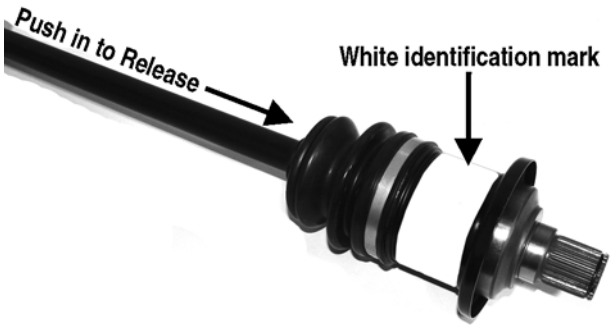
DISASSEMBLING/INSPECTING/ASSEMBLING AXLES

To disassemble/inspect/assemble the axles, follow the instruction contained in the appropriate boot repair kit.

INSTALLING REAR DRIVE AXLE

1. Push the axle shaft into the CV cup to release the detent balls; then while holding the axle firmly in, push the CV splined end into the gear case.

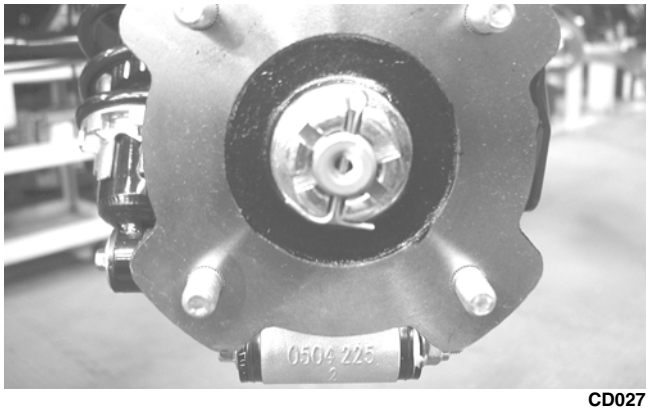
PR725A



PR729B

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

2. Swing the knuckle up and onto the drive axle; then place the knuckle into place in the upper A-arm. Secure the knuckle to the A-arm with a cap screw and a new lock nut. Tighten to 35 ft-lb (450) or to 50 ft-lb (1000).
3. Place the hub into position on the axle followed by a hex nut. Tighten the hex nut finger-tight at this time.
4. If the brake calipers were removed, position them on the knuckle and secure with new "patch-lock" cap screws. Tighten the auxiliary brake caliper cap screws to 20 ft-lb. Tighten the hydraulic brake caliper cap screws to 20 ft-lb.
5. Pump up the hand brake lever; then engage the brake lever lock.
6. Tighten the hub hex nut (from step 3) to 200 ft-lb; then install and spread a new cotter pin making sure each side of the pin is flush to the hex nut.

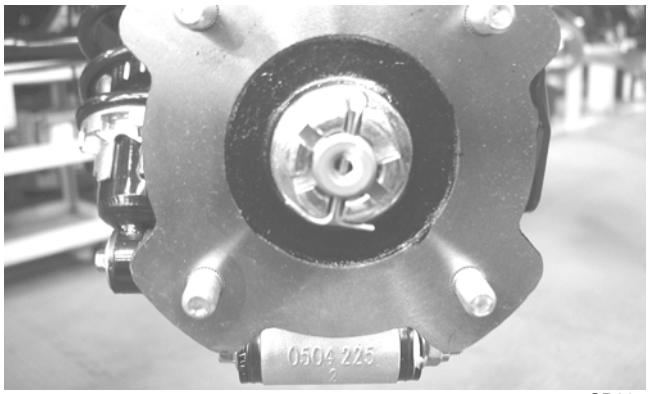


CD027

7. Install the wheel. Tighten to 40 ft-lb (steel wheels) or 80 ft-lb (aluminum wheels).
8. Remove the ATV from the support stand and release the brake lever lock.

INSTALLING FRONT DRIVE AXLE

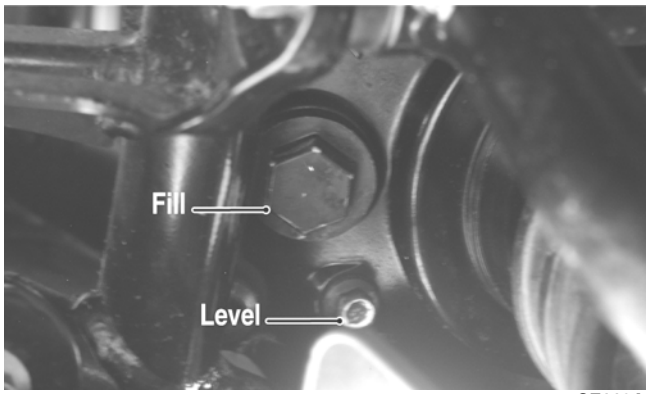
1. Position the drive axle in the gear case and steering knuckle; then insert the upper A-arm ball joint into the steering knuckle. Secure with a cap screw tightened to 50 ft-lb.
2. Place the brake hose into position on the upper A-arm; then secure the lower shock eyelet to the A-arm with a cap screw and a new lock nut. Tighten to 50 ft-lb.
3. Secure the tie rod to the steering knuckle with a new lock nut. Tighten securely; then install and spread a new cotter pin.
4. Slide the hub w/brake disc into position in the steering knuckle followed by a washer and hex nut. Tighten finger-tight at this time.
5. Install the brake caliper on the steering knuckle using new "patch-lock" cap screws. Tighten to 20 ft-lb; then pump up the hand brake lever and engage the brake lever lock.
6. Tighten the hub hex nut (from step 4) to 200 ft-lb; then install and spread a new cotter pin making sure each side of the pin is flush to the hex nut.



CD027

7. Install the wheel and tighten to 40 ft-lb (steel wheels) or 80 ft-lb (aluminum wheels).
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.

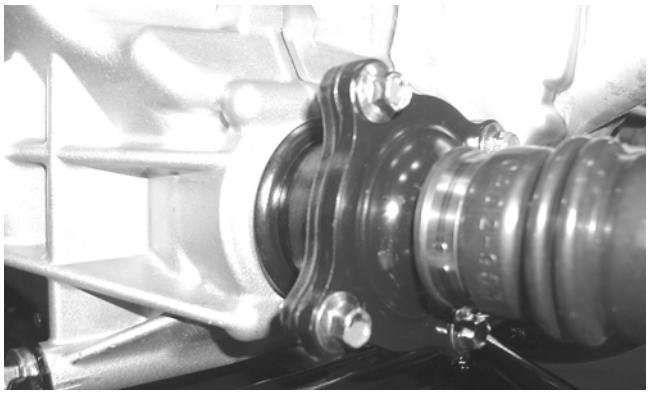


CF113A

Rear Gear Case

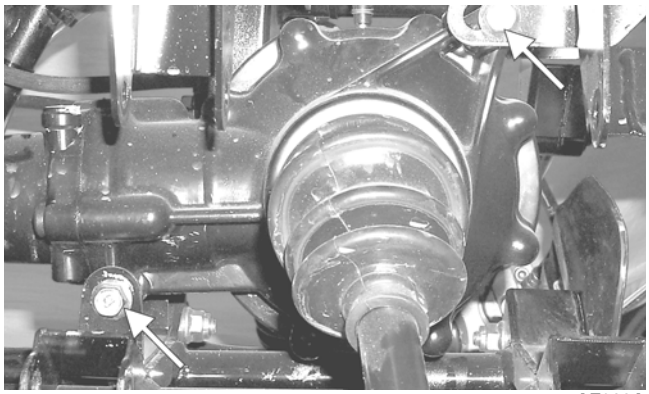
REMOVING

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 (450), pinion gear, needle bearing, ring gear, and axle seal, see Front Differential in this section.

RING GEAR/THRUST BUTTON

Removing

1. Remove the cap screws securing the gear case cover to the gear case; then remove the ring gear.
2. Remove the thrust button from the gear case cover (left-hand threads). Account for a shim.

Inspecting

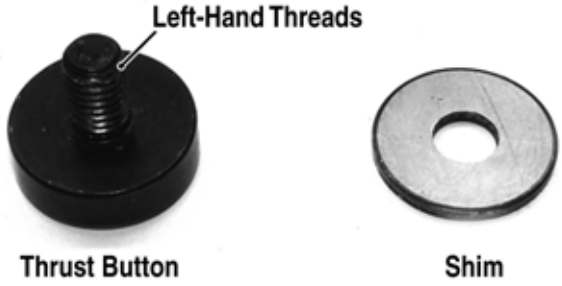
1. Inspect the ring gear for excessive wear, missing or chipped teeth, or discoloration.
2. Inspect the thrust button for excessive wear or discoloration.
3. Inspect the bearings for discoloration, roughness, or excessive wear.

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

Installing/Shimming

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

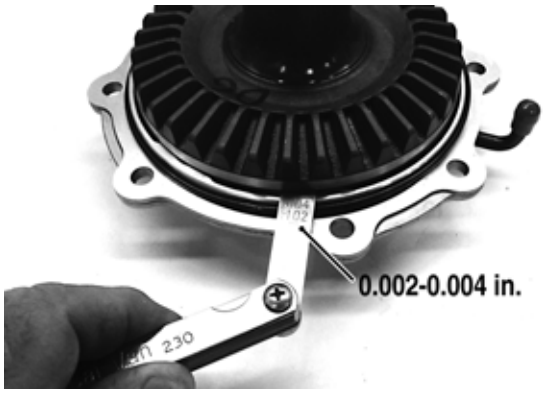
1. Install the thrust button with shim into the gear case cover and tighten securely (left-hand threads).



GC057A

2. Place the ring gear with selected shim into the cover and measure the ring gear to thrust button clearance with a thickness gauge. Clearance should be 0.002-0.004 in.

6



GC058A

3. If clearance is as specified, remove the ring gear and thrust button; then place a drop of red Loctite #271 on the threads and tighten to 8 ft-lb (left-hand threads).
4. If clearance is not as specified, repeat steps 1 and 2 using thicker (clearance too great) or thinner (clearance too small) until correct specification is reached.

REAR DRIVE INPUT SHAFT/ HOUSING (1000)

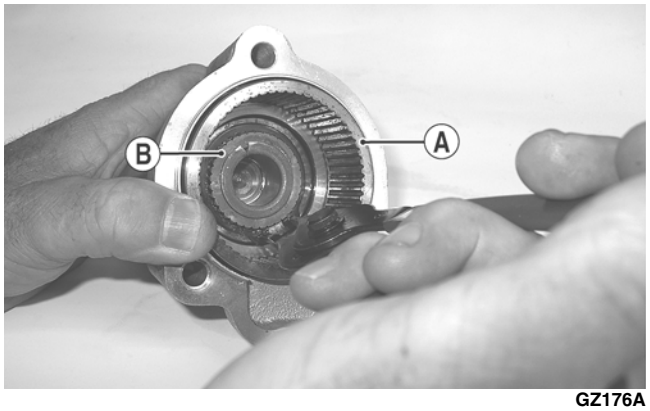
Removing/Disassembling

1. Remove the cap screws securing the rear drive input shaft/housing to the rear gear case; then remove the input housing assembly.

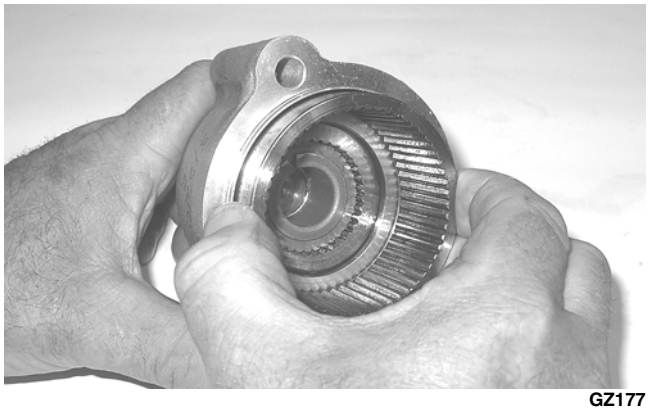
GZ183

2. Remove the clutch pack from the clutch basket; then remove the snap ring securing the clutch basket (A) to the input shaft (B) and remove the clutch basket.

GZ392



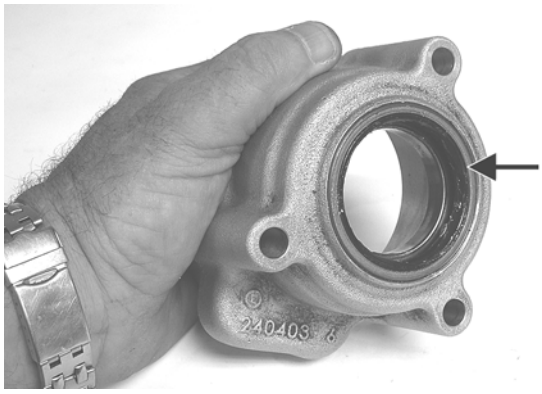
GZ176A



GZ177

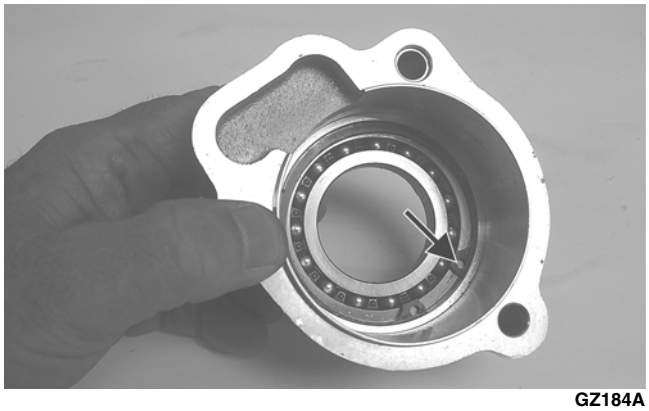
3. Remove the input shaft from the input housing; then remove the oil seal.

GZ180



GZ182A

4. Remove the snap ring retaining the input bearing and using an appropriate bearing driver, press the bearing from the housing.



GZ184A

Cleaning and Inspecting

1. Wash all parts in parts-cleaning solvent and dry with compressed air.

⚠ WARNING

Always wear safety glasses when working with compressed air.

2. Clean all gasket material and sealant from mating surfaces.
3. Inspect bearings, shafts, and housing for excessive wear, cracks, or discoloration.
4. Inspect the clutch basket for wear in splines or cracks in the housing.

GZ178A

5. Inspect the clutch pack for signs of discoloration.

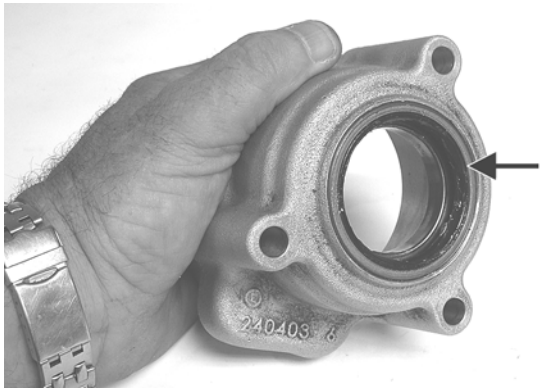
■NOTE: The clutch pack is not a serviceable component. If worn, discolored, or damaged in any way, it must be replaced.

Assembling/Installing

1. Install a new bearing into the input housing and secure with the snap ring (flat side directed away from bearing).

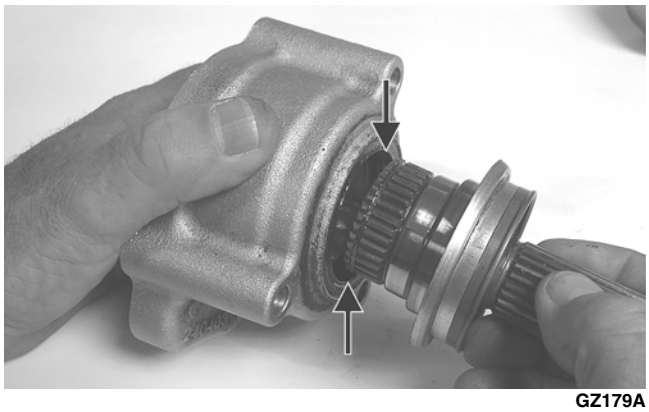
GZ184

2. Using a suitable seal driver, install a new oil seal into the front of the input housing until the seal flush with the housing.



GZ182A

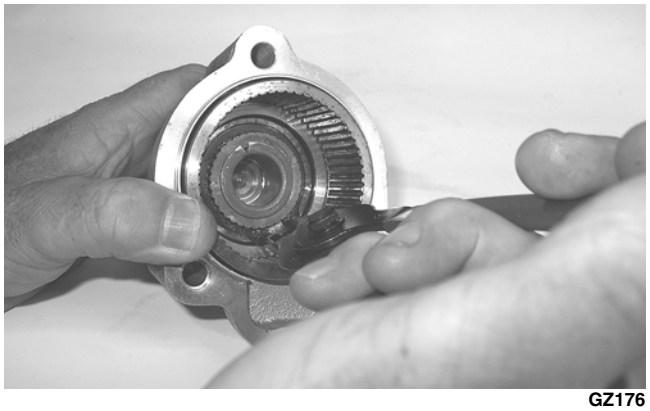
3. Apply grease to the lips of the oil seal; then install the input shaft into the input bearing and housing.



GZ179A

4. Install the clutch basket onto the input shaft and secure with the snap ring (flat side directed outward); then install the clutch pack into the basket.

6



GZ176

5. Using a new gasket, install the assembled rear drive input shaft/housing onto the rear drive gear case and secure with the three cap screws. Tighten to 23 ft-lb.

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 45 ft-lb.
2. Secure the engine output shaft to the rear gear case input flange with four cap screws and lock nuts. Tighten to 20 ft-lb.
3. Install the rear drive axles (see Drive Axles in this section).
4. Install the left-side rear A-arms (see Rear A-Arms in Section 7).

Hub

REMOVING

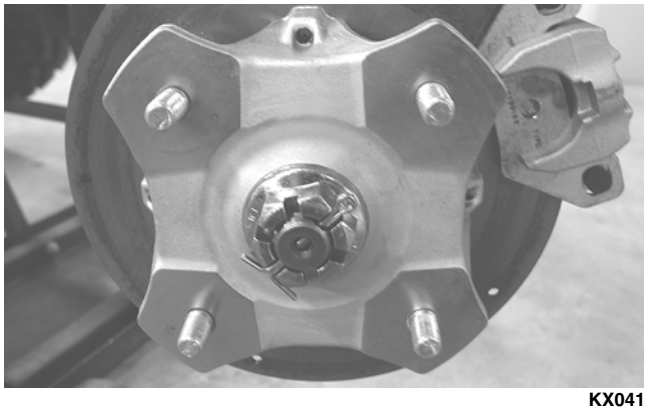
1. Secure the ATV on a support stand to elevate the wheel; then remove the wheel.

⚠ WARNING

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

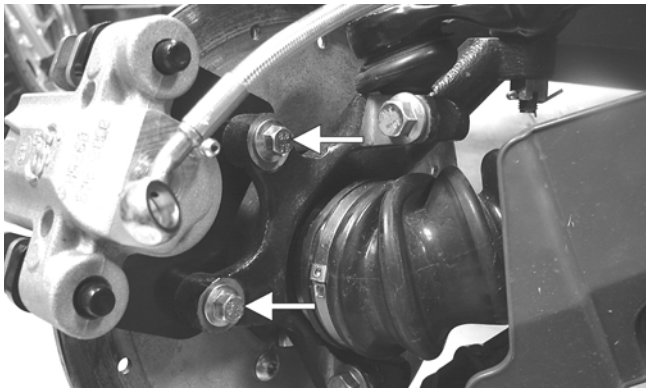
2. Remove the cotter pin from the nut.

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



KX041

3. Remove the hex 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.

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 15 ft-lb.
2. Apply grease to the splines in the hub.
3. Install the hub assembly onto the shaft.

PR290

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

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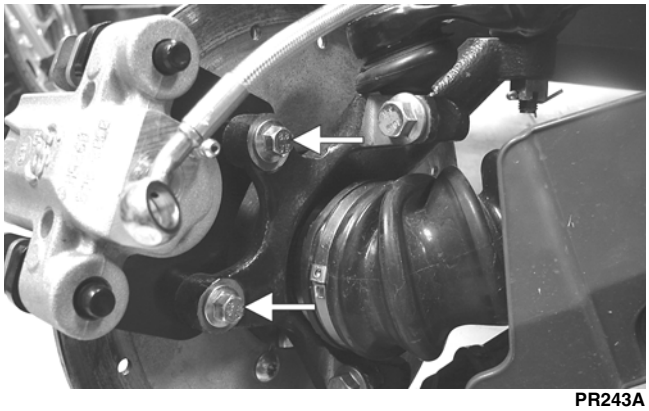


PR243A

6. Tighten the hex nut (from step 4) to 200 ft-lb; then install and spread a new cotter pin making sure each side of the pin is flush to the hex nut.

■NOTE: If the cotter pin does not line up, always tighten to the next alignment.

PR260

7. Install the wheel and tighten to 40 ft-lb (steel wheels) or 80 ft-lb (aluminum wheels).
8. Remove the ATV from the support stand.

Hand Brake Lever/Master Cylinder Assembly

■NOTE: The master cylinder is a non-serviceable component; it must be replaced as an assembly.

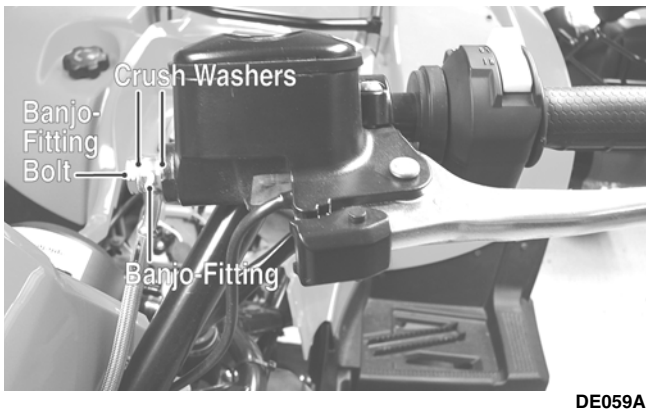
REMOVING

1. Slide a piece of flexible tubing over one of the wheel bleeder valves and direct the other end into a container. Remove the reservoir cover; then open the bleeder valve. Allow the brake fluid to drain completely.

■NOTE: Compressing the brake lever several times will quicken the draining process.

AF637D

2. Place an absorbent towel around the connection to absorb brake fluid. Remove the banjo-fitting from the master cylinder. Account for two crush washers and a banjo-fitting bolt.



DE059A

CAUTION

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

3. Remove the snap ring and pivot pin securing the brake lever to the master cylinder housing; then remove the brake lever and set aside.
4. Dislodge the brakelight switch from the master cylinder housing by gently pressing it toward the pivot pin hole in the housing; then lay it aside leaving the switch and wiring harness connected.

BC205

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

DE058A

INSPECTING

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

1. Inspect the pin securing the brake lever for wear.
2. Inspect the brake lever for elongation of the pivot hole.
3. Inspect the reservoir for cracks and leakage.
4. Inspect the banjo-fitting for cracks and deterioration and the condition of the fittings (threaded and compression).
5. Inspect the brakelight switch for corrosion, cracks, missing or broken mounting tabs, or broken and frayed wiring.

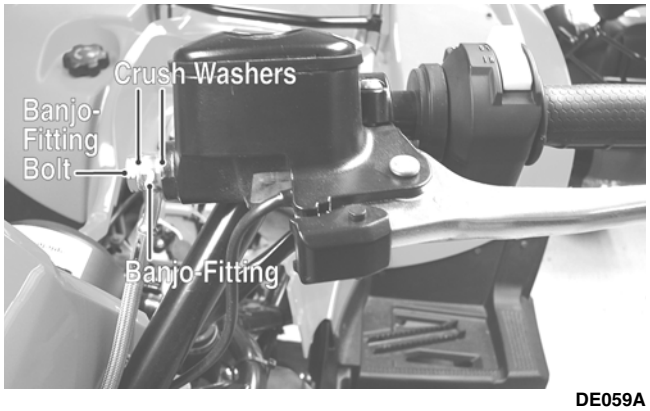
■NOTE: If the brakelight switch is determined to be not serviceable, see Section 5.

INSTALLING

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

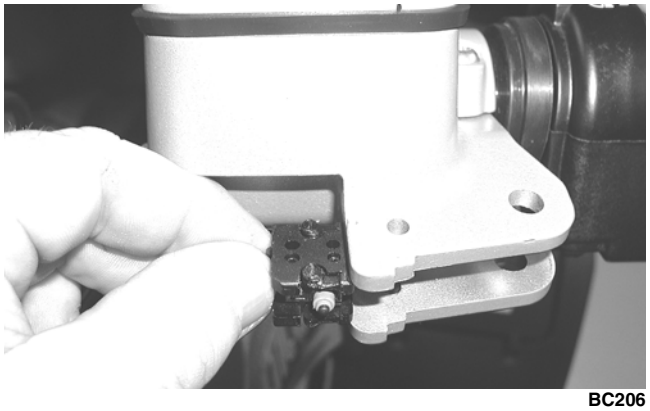
DE058A

2. Using two new crush washers, connect the banjo-fitting to the master cylinder; then secure with the banjo-fitting bolt. Tighten to 20 ft-lb.



DE059A

3. Gently press the brakelight switch into the housing (left to right) until the mounting tabs snap into the four locating holes; then install the brake lever, pivot pin, and snap ring.



BC206

4. Bleed the brake system (see Section 2).

Hydraulic Brake Caliper

⚠ WARNING

Arctic Cat recommends that only authorized Arctic Cat ATV dealers perform hydraulic brake service. Failure to properly repair brake systems can result in loss of control causing severe injury or death.

REMOVING/DISASSEMBLING

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

⚠ WARNING

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

⚠ WARNING

Never let brake fluid contact the eyes. Damage to the eyes will occur. Always wear appropriate protective safety goggles and latex gloves when handling brake fluid.

2. Drain the brake fluid from the caliper, hose, and master cylinder through the bleed screw by pumping the brake lever/pedal.

PR235

CAUTION

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

■NOTE: Whenever brake components are removed, disassembled, or repaired where brake fluid is exposed to air, drain all fluid and replace with new DOT 4 brake fluid from an unopened container. Brake fluid readily absorbs moisture from the air significantly lowering the boiling point. This increases the chance of vapor lock reducing braking power and increasing stopping distance.

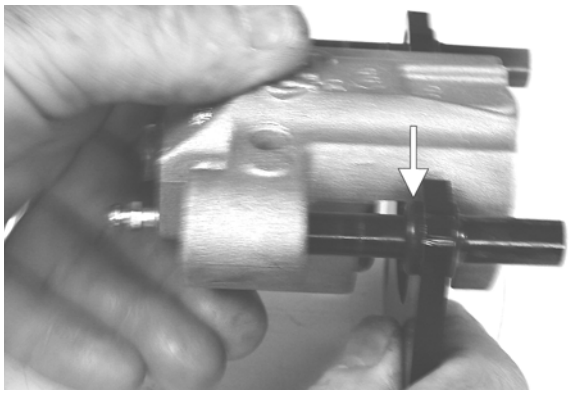
3. Remove the brake hose from the caliper and close the bleed screw; then remove the caliper.
4. Compress the caliper holder against the caliper (opposite the O-ring side) and remove the outer brake pad; then remove the inner brake pad.

■NOTE: If brake pads are to be returned to service, do not allow brake fluid to contaminate them.

PR237A

PR238

5. Remove the caliper holder from the caliper and discard the O-ring.



PR239B

■NOTE: The O-ring is used for shipping purposes and provides no function in operation.

6. Cover the piston end of the housing with a shop towel; then keeping fingers clear of piston travel, apply compressed air to the fluid port to blow the piston free of the housing. Account for two seal rings in the housing.

PR713A

6

PR715

⚠ WARNING

Make sure to hold the towel firmly in place or the piston could be ejected from the housing causing injury.

7. Using an appropriate seal removal tool, carefully remove the seals from the brake caliper housing; then remove four O-rings from the brake caliper housing noting the location of the different sized O-rings. Discard all seals, O-rings, and crush washers.

CLEANING AND INSPECTING

1. Clean all caliper components (except the brake pads) with DOT 4 brake fluid. Do not wipe dry.
2. Inspect the brake pads for damage and excessive wear.

■NOTE: For measuring brake pads, see Section 2.

3. Inspect the brake caliper housings for scoring in the piston bores, chipped seal ring grooves, or signs of corrosion or discoloration.
4. Inspect the piston surface for scoring, discoloration, or evidence of binding or galling.
5. Inspect the caliper holder for wear or bending.

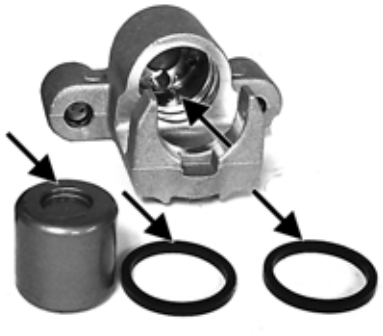
ASSEMBLING/INSTALLING

1. Install new seals into the brake caliper housing and apply a liberal amount of DOT 4 brake fluid to the cylinder bore of the housing, seals, and brake piston.

CAUTION

Make sure the seals are properly in place and did not twist or roll during installation.

PR715



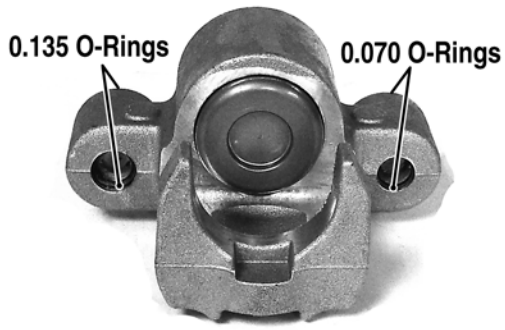
PR717A

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

PR711A

PR712

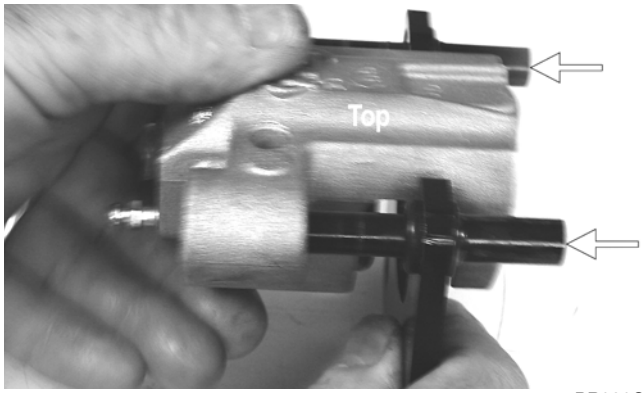
3. Apply high-temperature silicone grease (supplied with the O-ring kit) to the inside of the caliper holder bores and O-rings; then install the four O-rings into the caliper.



PR719C

4. Install the caliper onto the caliper holder making sure the caliper and holder are correctly oriented.

■NOTE: It is very important to apply silicone grease to the O-rings and caliper bores prior to assembly.



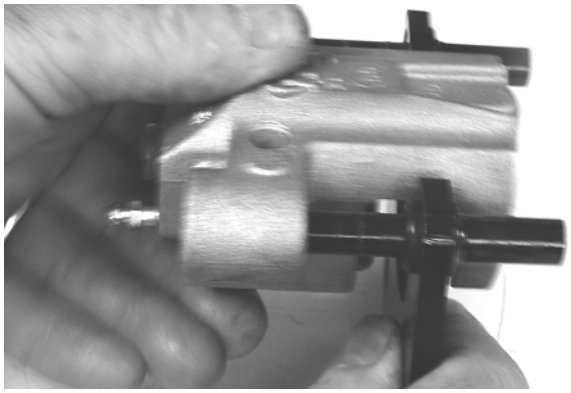
PR239C

5. Making sure brake fluid does not contact the brake pads, compress the caliper holder toward the caliper and install the inner brake pad; then install the outer pad.

CAUTION

If brake pads become contaminated with brake fluid, they must be thoroughly cleaned with brake cleaning solvent or replaced with new pads. Failure to do so will result in reduced braking and premature brake pad failure.

PR238



PR239

6. Place the brake caliper assembly into position and secure with new "patch-lock" cap screws. Tighten the caliper to 20 ft-lb.

7. Place a new crush washer on each side of the brake hose fitting and install it on the caliper. Tighten to 20 ft-lb.

8. Fill the reservoir; then bleed the brake system (see Section 2).

⚠ WARNING

Never use brake fluid from an open container or reuse brake fluid. Moisture-contaminated brake fluid could cause vapor build-up (expansion) during hard braking resulting in greatly increased stopping distance or loss of control leading to injury or death.

9. Install the wheel. Tighten to 40 ft-lb (steel wheels) or 80 ft-lb (aluminum wheels).

10. Remove the ATV from the support stand and verify brake operation.

Troubleshooting Drive System

Problem: Power not transmitted from engine to wheels	
Condition	**Remedy**
1. **Rear axle shafts serration** worn - broken	1. Replace shaft
Problem: Power not transmitted from engine to either front wheel	
Condition	Remedy
1. **Secondary drive - driven gear teeth** broken	1. Replace gear(s)
2. **Propeller shaft serration** worn - broken	2. Replace shaft
3. **Coupling** damaged	3. Replace coupling
4. **Coupling joint serration** worn - damaged	4. Replace joint
5. **Front drive - driven bevel gears** broken - damaged	5. Replace gear(s)
6. **Front differential gears/pinions** broken - damaged	6. Replace gears - pinions
7. **Sliding dogs/shaft fork** worn - damaged	7. Replace gear(s)
8. **Front drive axle** worn - damaged	8. Replace axle
9. **Front drive axle serration** worn - damaged	9. Replace axle

Troubleshooting Brake System

Problem: Braking poor	
Condition	**Remedy**
1. **Pad** worn	1. Replace pads
2. **Pedal free-play** excessive	2. Replace pads
3. **Brake fluid** leaking	3. Repair - replace hydraulic system component(s)
4. **Hydraulic system** spongy	4. Bleed hydraulic system - correct or repair leaks
5. **Master cylinder/brake cylinder seal** worn	5. Replace master cylinder
Problem: Brake lever travel excessive	
Condition	**Remedy**
1. **Hydraulic system** entrapped air	1. Bleed hydraulic system
2. **Brake fluid** low	2. Add fluid to proper level
3. **Brake fluid** incorrect	3. Drain system - replace with correct fluid
4. **Piston seal - cup** worn	4. Replace master cylinder
Problem: Brake fluid leaking	
Condition	**Remedy**
1. **Connection joints** loose	1. Tighten joint
2. **Hose** cracked	2. Replace hose
3. **Piston seal** worn	3. Replace brake caliper

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SECTION 7 - SUSPENSION

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Suspension

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

A. Shock absorber rods not bent, pitted, or damaged.

B. Rubber damper not cracked, broken, or missing.

C. Shock absorber body not damaged, punctured, or leaking.

D. Shock absorber eyelets not broken, bent, or cracked.

E. Shock absorber eyelet bushings not worn, deteriorated, cracked, or missing.

F. Shock absorber spring not broken or sagging.

■NOTE: Critical torque specifications are located in Section 1.

Shock Absorbers

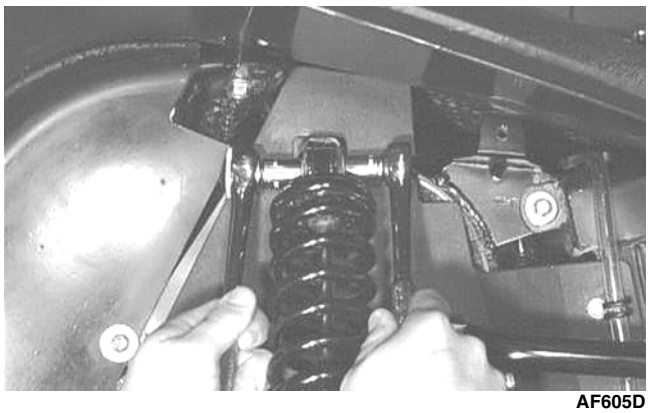
REMOVING

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.

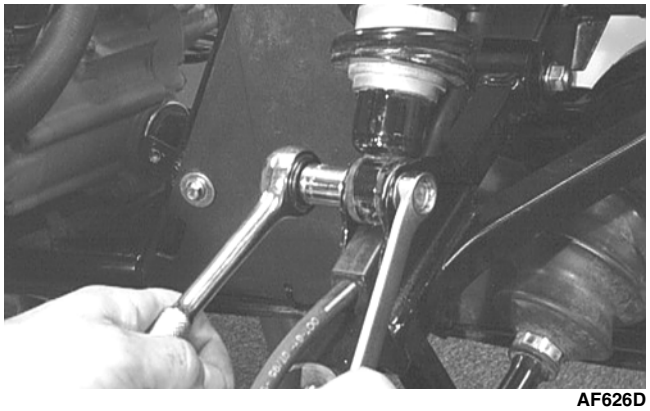


AF605D

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 using a pressure washer.
2. Inspect each shock rod for nicks, pits, rust, bends, and oily residue.
3. Inspect all springs, spring retainers, shock rods, sleeves, bushings, shock bodies, and eyelets for cracks, leaks, and bends.

INSTALLING

1. Place the shock absorber spring over the shock absorber, compress the spring, and install the retainer.
2. Place bushings and sleeves (where appropriate) into shock eyelet; then install shock with two cap screws and nuts. Tighten all front suspension nuts to 50 ft-lb. Tighten rear suspension nuts (upper) to 50 ft-lb; tighten lower shock-to-A-arm nuts to 20 ft-lb.

CAUTION

Do not tighten the nuts beyond the recommended specification or the shock eyelet or mount WILL be damaged.

■NOTE: The rear shock absorber-to-lower A-arm torque factor is 20 ft-lb.

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3. Remove the ATV from the support stand.

Front A-Arms

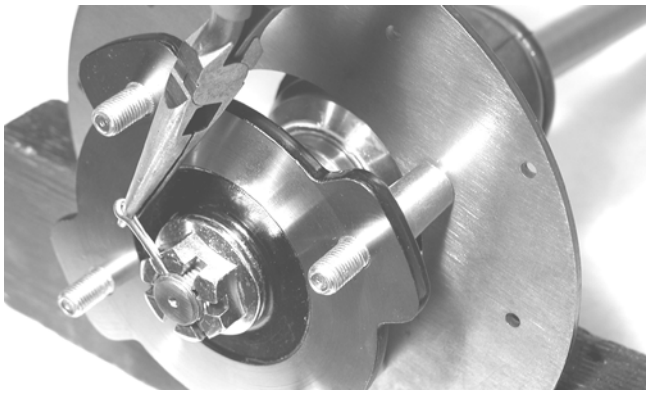
REMOVING

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

⚠ WARNING

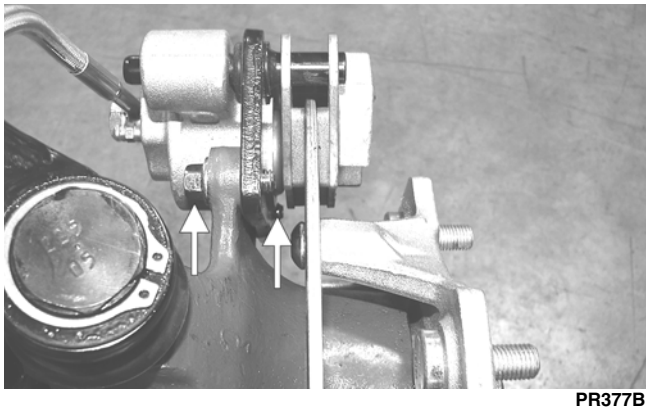
Make sure the ATV is solidly supported on the support stand to avoid injury.

2. Remove the cotter pin from the nut. Discard the cotter pin.



CD008

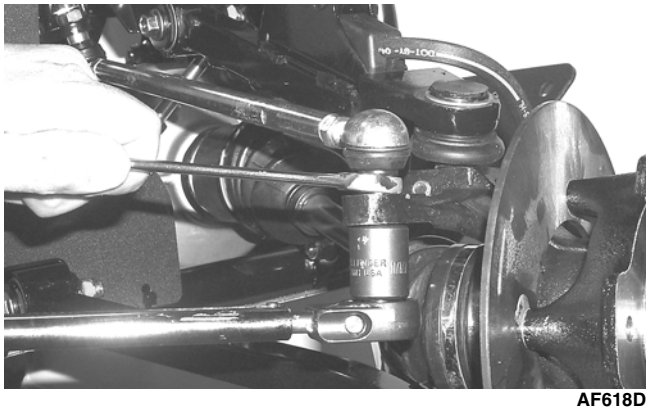
3. Remove the nut securing the hub.
4. Remove the brake caliper. Account for two cap screws.



PR377B

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

5. Remove the hub assembly.
6. Remove the cotter pin and slotted nut securing the tie rod end to the knuckle; then remove the tie rod end from the knuckle.

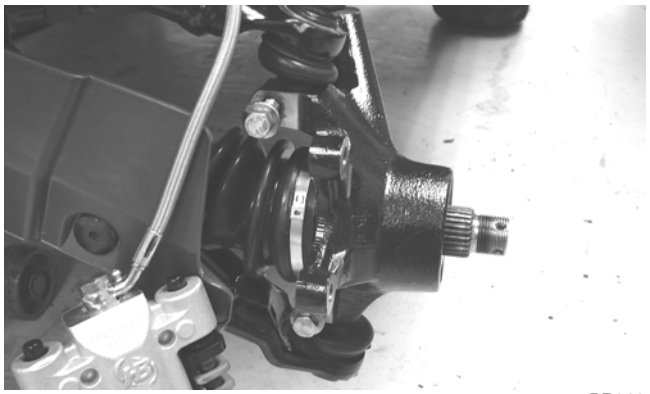


AF618D

7. Remove the cap screws securing the ball joints to the knuckle.

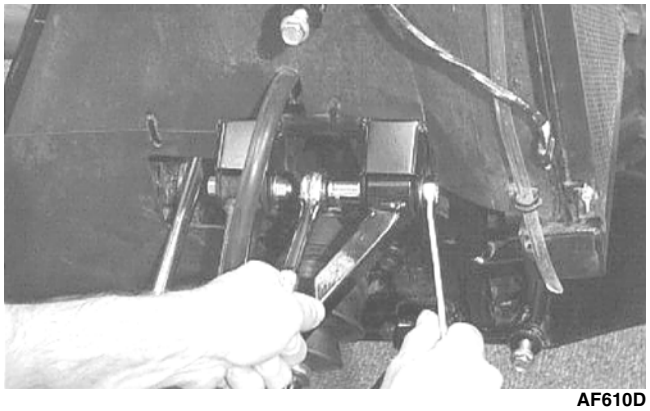
CAUTION

Support the knuckle when removing the cap screws or damage to the threads will occur.



PR203

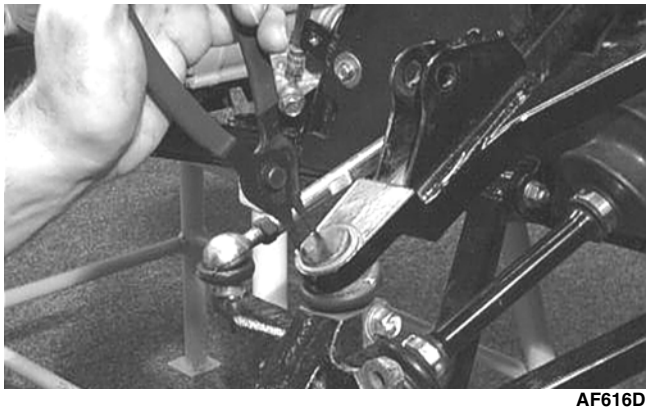
8. Tap the ball joints out of the knuckle; then remove the knuckle.
9. Remove the lower shock absorber eyelet from the upper A-arm.
10. Remove the cap screws securing the A-arms to the frame.



AF610D

11. Remove the circlip from the ball joint; then remove the ball joint from the A-arm.

7



AF616D

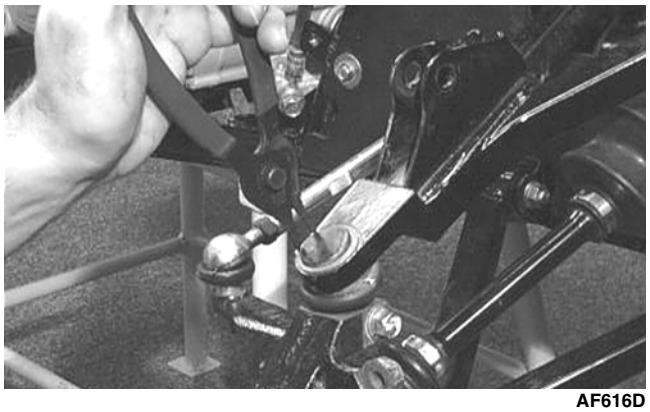
CLEANING AND INSPECTING

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

1. Clean all A-arm components using a pressure washer.
2. Clean the ball joint mounting hole of all residual Loctite, grease, oil, or dirt for installing purposes.
3. Inspect the A-arm for bends, cracks, and worn bushings.
4. Inspect the ball joint mounting holes for cracks or damage.
5. Inspect the frame mounts for signs of damage, wear, or weldment damage.

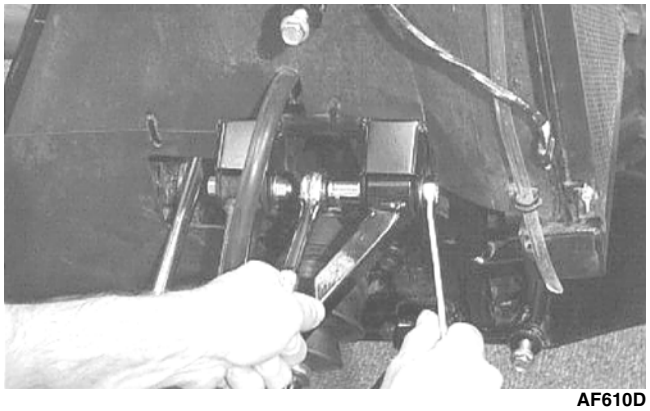
INSTALLING

1. Apply Loctite Primer "T" to the arm socket; then apply green Loctite #609 to the entire outside diameter of the ball joint. Install the ball joint into the A-arm and secure with the snap ring.



AF616D

2. Install the A-arm assemblies into the frame mounts and secure with the cap screws. Only finger-tighten at this time.



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.

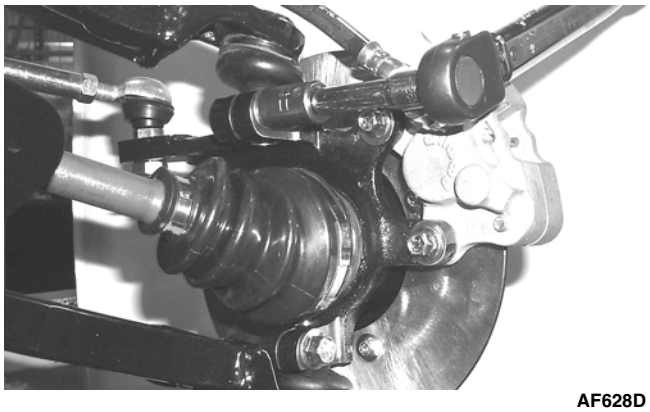
DE054A

4. Secure the lower eyelet of the shock absorber to the upper A-arm. Tighten nut to 50 ft-lb.
5. Secure the A-arm assemblies to the frame mounts (from step 2). Tighten the cap screws to 50 ft-lb.

CAUTION

Do not tighten the nut beyond the 50 ft-lb specification or the shock eyelet or mount WILL be damaged.

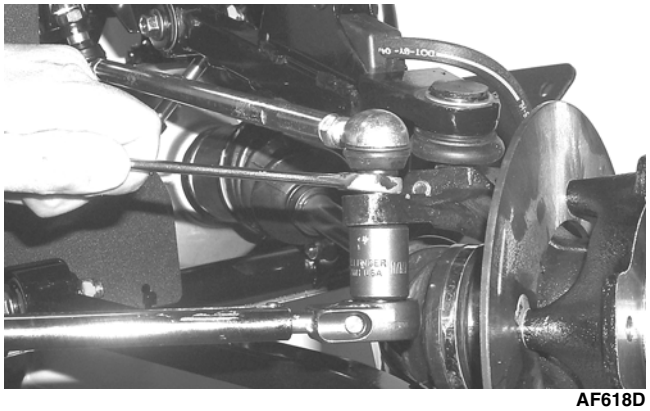
6. Install the knuckle assembly onto the ball joints and secure with cap screws. Tighten to 35 ft-lb.



AF628D

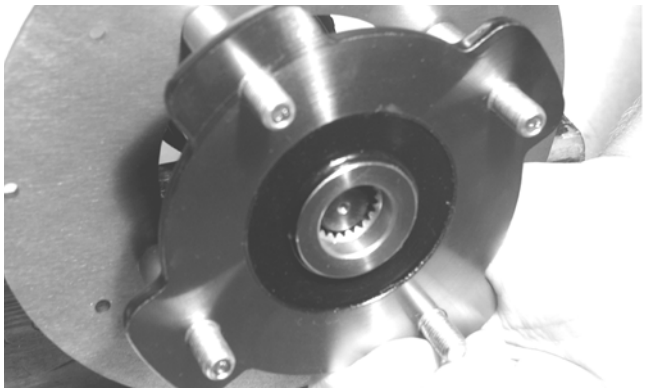
7. Install the tie rod end and secure with the nut. Tighten to 30 ft-lb; then install a new cotter pin and spread the pin to secure the nut.

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



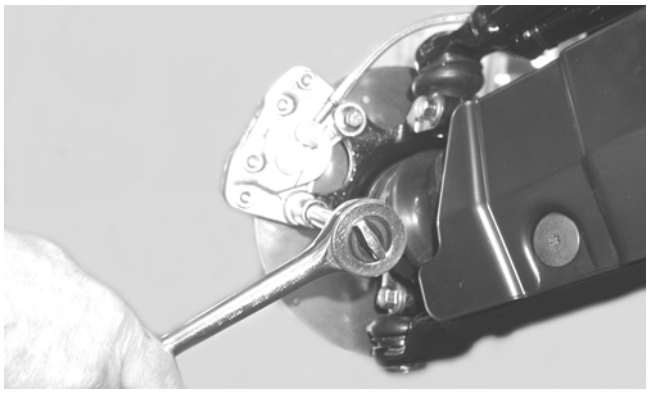
AF618D

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



CD009

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



CD007

11. Secure the hub nut (from step 9) to the shaft/axle. Tighten to 200 ft-lb.

■NOTE: If the cotter pin does not line up, always tighten to the next alignment.

12. Install a new cotter pin and spread the pin to secure the nut.

CD008

13. Install the wheel and tighten to 40 ft-lb (steel wheels) or 80 ft-lb (aluminum wheels).
14. Remove the ATV from the support stand.

Rear A-Arms

REMOVING

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

⚠ WARNING

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

2. Pump up the hand brake; then engage the brake lever lock.
3. Remove the wheel.
4. Remove the cotter pin securing the hex nut; then remove the hex nut. Release the brake lever lock.
5. Remove the caliper (right side only).

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

6. Remove the cap screws and lock nut securing the shock absorber to the frame and lower A-arm; then remove the shock absorber.
7. Remove the cap screws securing the boot guard to the lower A-arm.

AF934

8. Slide the hub out of the knuckle and set aside.
9. Remove the cap screws and lock nuts securing the knuckle to the A-arms. Discard the lock nuts.

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

10. Remove the cap screws and lock nuts securing the A-arms to the frame; then remove the A-arms.

■NOTE: If removing the upper right A-arm, it will be necessary to disconnect the brake hose from the A-arm.

CLEANING AND INSPECTING

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

1. Clean all A-arm components using a pressure washer.
2. Inspect the A-arm for bends, cracks, and worn bushings.
3. Inspect the frame mounts for signs of damage, wear, or weldment damage.

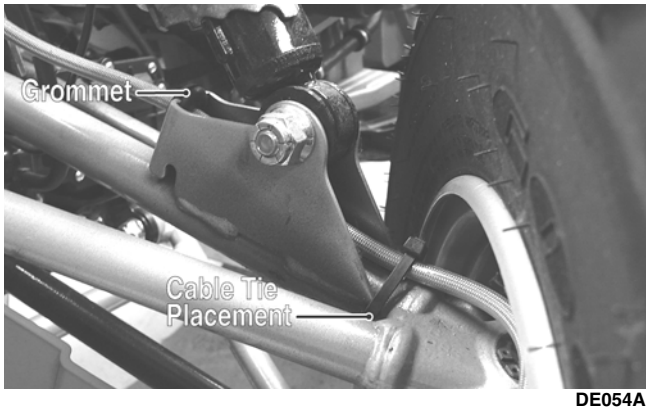
INSTALLING

1. Install the A-arm assemblies into the frame 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 35 ft-lb (450 models) or 50 ft-lb (1000 models).
3. Tighten the hardware securing the A-arms to the frame mounts (from step 1) to 50 ft-lb.
4. Apply grease on the drive axle splines; then install the hub assembly onto the drive axle.

PR290

5. Secure the hub assembly with the nut. Tighten only until snug.
6. Secure the brake caliper to the knuckle with two new "patch-lock" cap screws (right side only). Tighten the caliper to 20 ft-lb.

■NOTE: Ensure 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 200 ft-lb.
8. Install a new cotter pin and spread the pin to secure the nut.

■NOTE: If the cotter pin does not line up, always tighten to the next alignment.

PR260

9. Secure the shock absorber to the frame with a cap screw and new lock nut. Tighten to 50 ft-lb.
10. Secure the shock absorber to the lower A-arm with a cap screw and new lock nut. Tighten to 20 ft-lb.
11. Secure the boot guard to the lower A-arm with the two cap screws. Tighten securely.
12. Install the wheel and tighten to 40 ft-lb (steel wheels) or 80 ft-lb (aluminum wheels).
13. Remove the ATV from the support stand.

Wheels and Tires

TIRE SIZE

⚠ WARNING

Use only Arctic Cat approved tires when replacing tires. Failure to do so could result in unstable ATV operation.

The ATV is equipped with low-pressure tubeless tires of the size and type listed in Section 1. Do not under any circumstances substitute tires of a different type or size.

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⚠ WARNING

Do not mix tire tread patterns. Use the same pattern type on front and rear. Failure to heed warning could cause poor handling qualities of the ATV and could cause excessive drive train damage not covered by warranty.

TIRE INFLATION PRESSURE

Front and rear tire inflation pressure should be as specified in Section 1.

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 using a pressure washer.
2. Inspect each wheel for cracks, dents, or bends.
3. Inspect each tire for cuts, wear, missing lugs, and leaks.

INSTALLING

Install each wheel on its hub. Tighten to 40 ft-lb (steel wheels) or 80 ft-lb (aluminum wheels).

■NOTE: Make sure each wheel is installed on its proper hub as noted in removing (the "rotation arrow" (if applicable) must indicate forward direction of rotation).

AF612D

CHECKING/INFLATING

1. Using an air pressure gauge, measure the air pressure in each tire. Adjust the air pressure as necessary to meet the recommended inflation pressure.
2. Inspect the tires for damage, wear, or punctures.

⚠ WARNING

Do not operate the ATV if tire damage exists.

■NOTE: Be sure all tires are the specified size and have identical tread pattern.

■NOTE: If pulling is noted, measure the circumference of the front and rear tires on the pulling side. Compare the measurements with the tires on the opposite side. If pulling is noted during braking only, check and adjust the brakes as necessary and recheck operation (see Section 2).

Troubleshooting

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. **Auxiliary brake** adjusted incorrectly 6. **Rear suspension arm-related bushing** worn 7. **Rear shock absorber** damaged 8. **Rear suspension arm nut** loose	1. Replace bearings 2. Replace tires 3. Replace rim 4. Tighten cap screws 5. Adjust brake 6. Replace bushing 7. Replace shock absorber 8. Tighten nut
Problem: Vehicle pulling or steering erratic	
Condition	**Remedy**
1. **Vehicle steering** is erratic on dry, level surface 2. **Vehicle** pulls left or right on dry, level surface	1. Check front wheel alignment and adjust if necessary (see Section 8) 2. Check air pressure in tires and adjust to specifications

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SECTION 8 - STEERING/FRAME/CONTROLS

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Steering/Frame/Controls

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

A. Handlebar grips not worn, broken, or loose.

B. Handlebar not bent, cracked, and has equal and complete full-left and full-right capability.

C. Steering post bearing assembly/bearing housing not broken, worn, or binding.

D. Ball joints not worn, cracked, or damaged.

E. Tie rods not bent or cracked.

F. Knuckles not worn, cracked, or damaged.

G. Cotter pins not damaged or missing.

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

■**NOTE: Critical torque specifications are located in Section 1.**

LCD Gauge

REPLACING

To replace the gauge, use the following procedure.

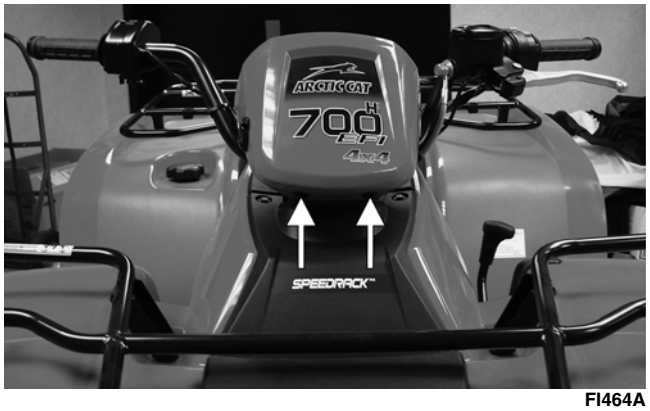
1. Remove the two reinstallable rivets securing the instrument pod; then remove the ignition switch retaining ring.
2. Remove the two nuts securing the mounting studs; then remove the gauge and disconnect the multi-pin connector.
3. Mount the gauge and secure with the two nuts; then connect the multi-pin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

Steering Post/Tie Rods

REMOVING

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

FI463A



FI464A

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

FI465A

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

FI466A

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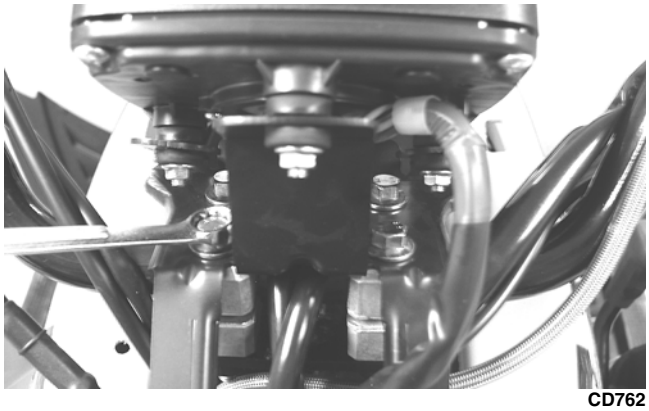
4. Unlatch the storage compartment lid; then slide the storage compartment cover assembly forward and lift off.

FI467A

5. Remove the storage compartment.

FI468

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

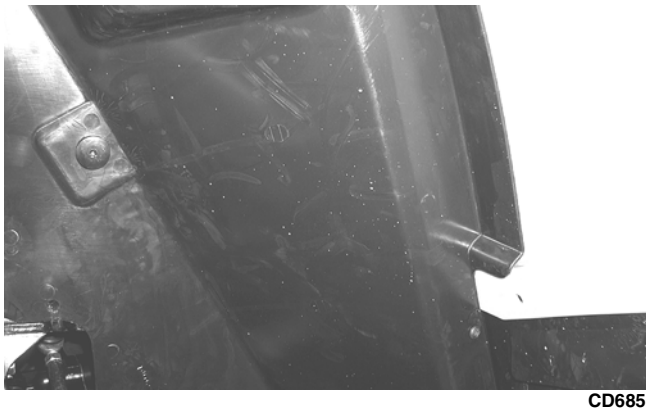


CD762

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

CD760

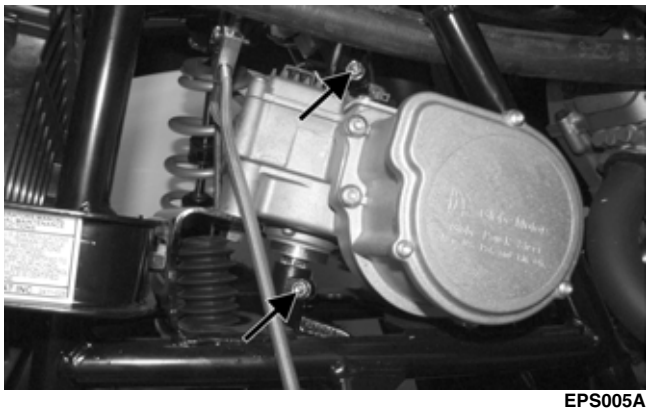
8. Using a suitable lift stand, raise the ATV enough to remove the front wheels.



CD685

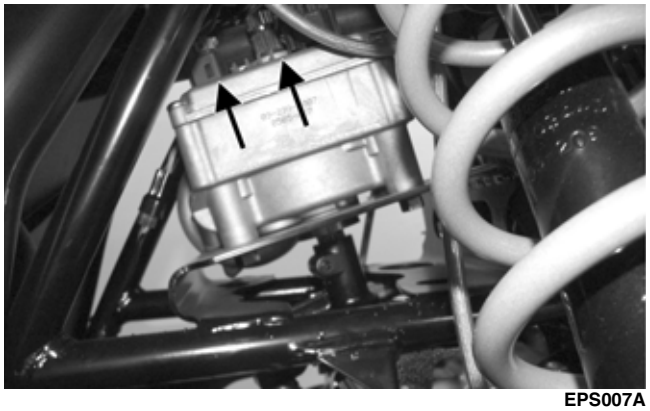
■NOTE: For models not equipped with electronic power steering, proceed to step 13.

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



EPS005A

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



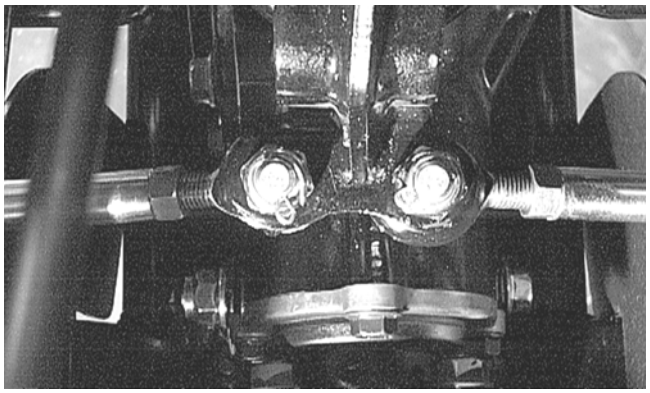
EPS007A

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

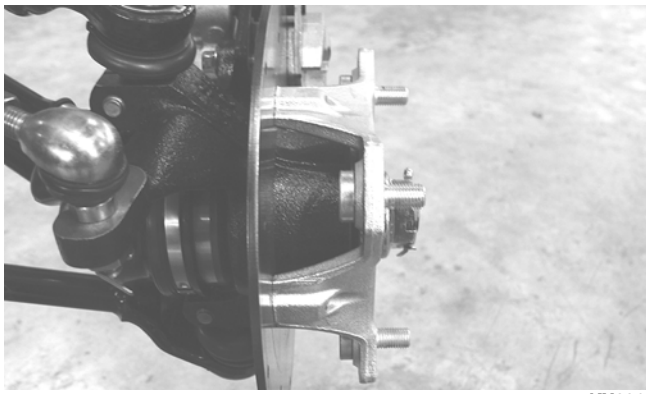
CAUTION

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

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

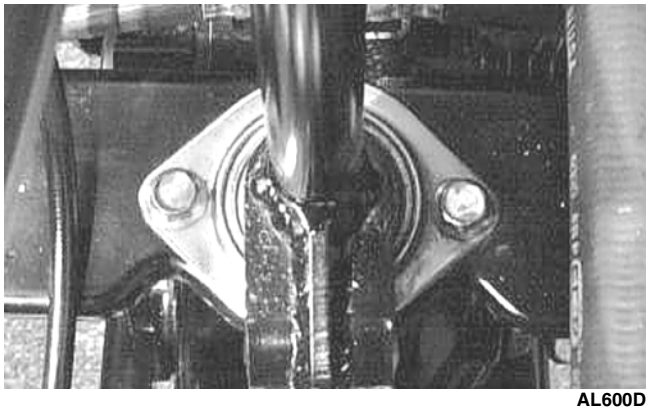


AF778D



KX039

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

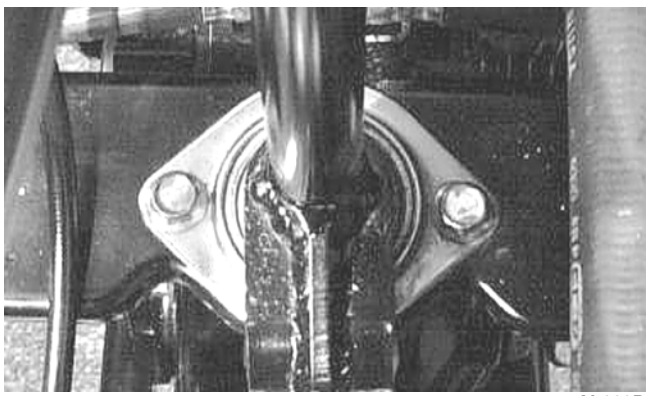
⚠ WARNING

Always wear safety glasses when using compressed air.

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

INSTALLING (Models Without Electronic Power Steering)

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



AL600D

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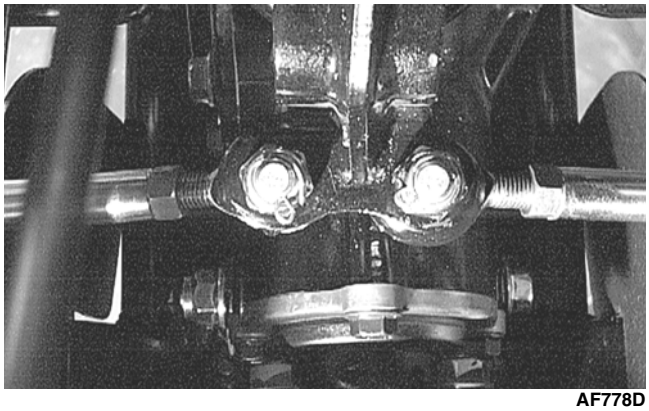
2. Place the upper steering post bearings into the housings; then position on the steering post and secure the housings to the frame with two cap screws. Tighten to 20 ft-lb.

CD760

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

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



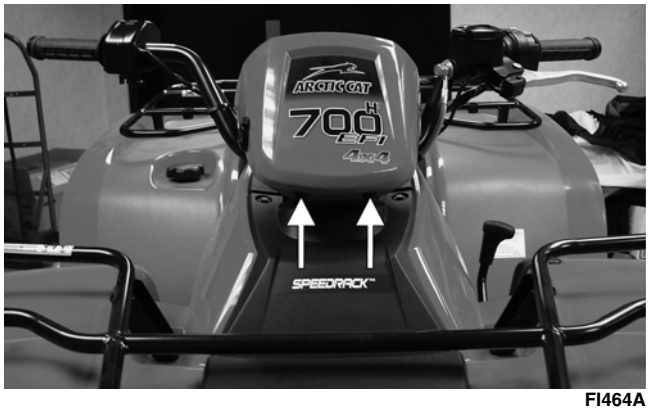
AF778D

4. Install the front wheels and tighten to 40 ft-lb (steel wheels) or 80 ft-lb (aluminum wheels) using a criss-cross pattern.

5. Lower the ATV and place the handlebar and caps into position on the steering post; then position the LCD gauge on top of the caps and secure with the four cap screws. Tighten securely.

6. Install the storage compartment box; then attach the storage compartment cover assembly by engaging the tabs into the slots and sliding rearward. Lock the storage compartment lid to hold the assembly in place.

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



FI464A

FI463A

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

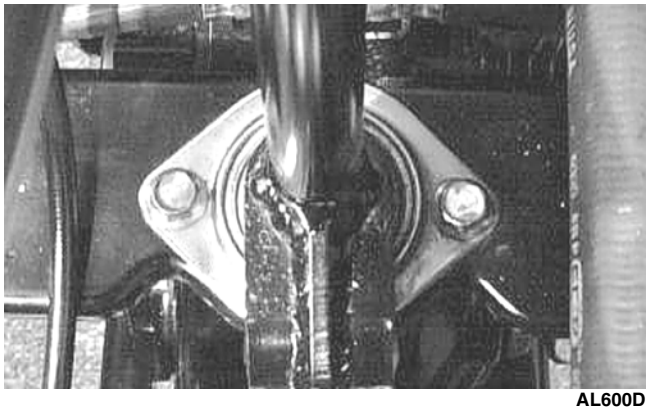
FI466A

FI465A

8

INSTALLING (Electronic Power Steering Models)

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



AL600D

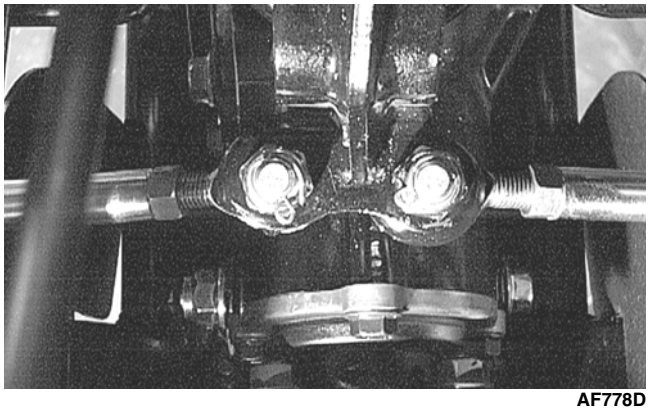
2. Making sure the double spline is aligned to the slot in the lower coupler, install the EPS output shaft into the lower coupler; then install the four caps screws securing the EPS housing to the frame. Tighten to 35 ft-lb.

EPS008A

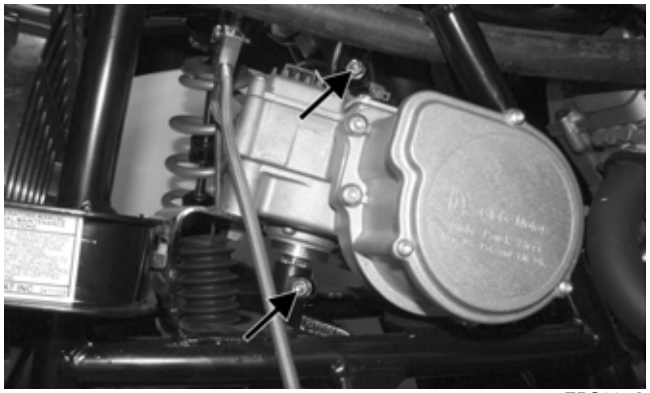
EPS007

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

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



AF778D



EPS005A

4. Connect the 2-pin and 8-pin connectors to the EPS assembly.
5. Install the upper steering post support to the frame and secure with two cap screws. Tighten to 20 ft-lb.
6. Install the storage compartment, steering post and radiator access panels, and storage compartment cover; then install the shock absorber and tighten to 50 ft-lb.
7. Install the front wheels and tighten the nuts to 40 ft-lb (steel wheels) or 80 ft-lb (aluminum wheels).

Handlebar Grip

REMOVING

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

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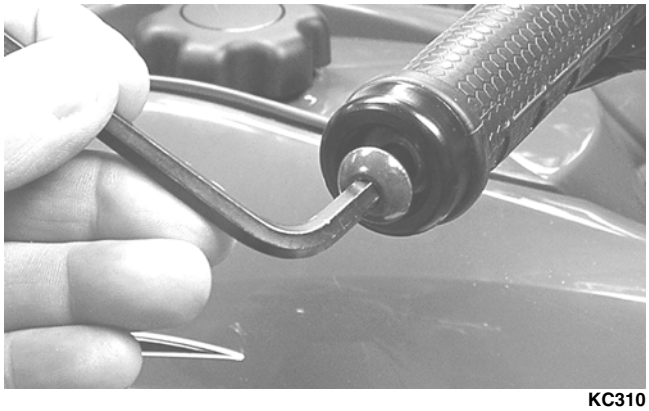
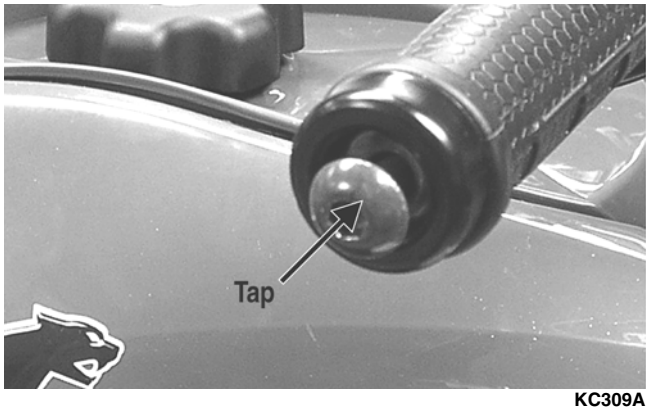


KC310



KC309A

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

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

INSTALLING

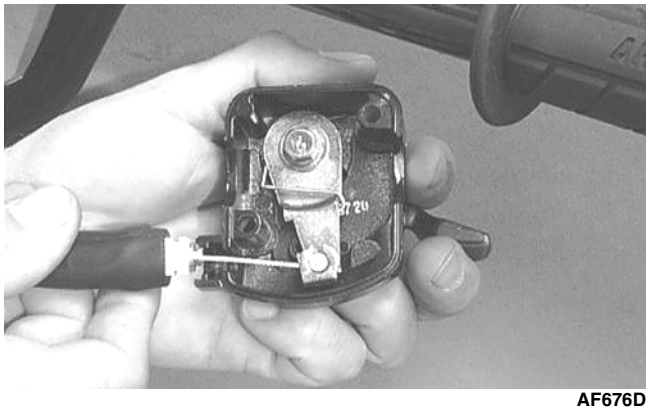
■NOTE: Before installing a grip, use contact removal spray or alcohol to clean the handlebar of glue residue, oil, or any other contaminant.

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

Throttle Control

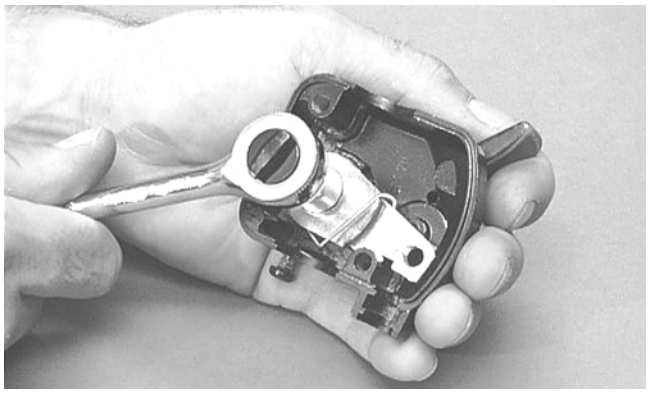
REMOVING

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

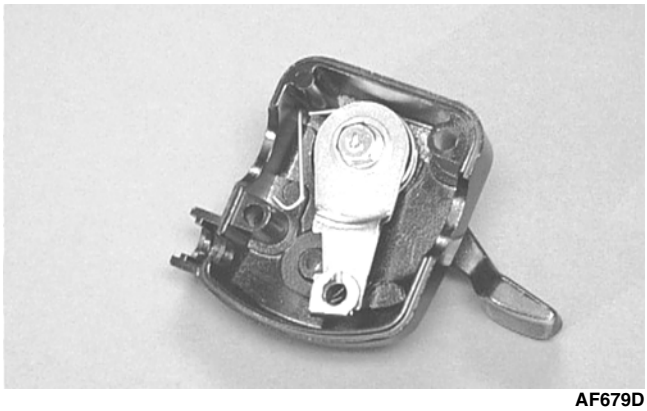
4. Remove the actuator arm and account for a bushing. Note the position of the return spring for installing purposes.

AF678D

INSTALLING

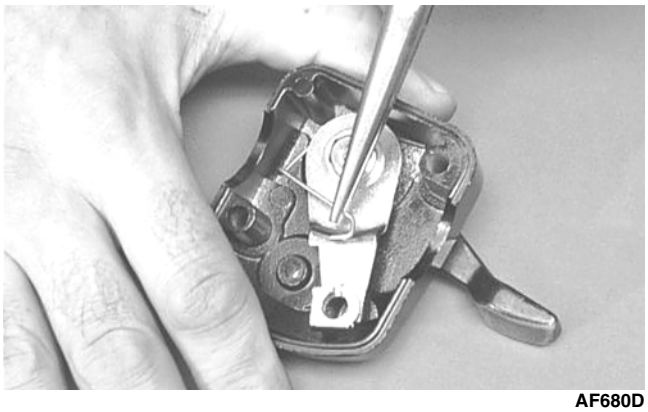
1. Place the return spring into the throttle control; then place the bushing and actuator arm into position. Secure with the cap screw, lock washer, and washer.

8



AF679D

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



AF680D

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

ADJUSTING

To adjust throttle cable free-play, see Section 4.

Steering Knuckles

REMOVING AND DISASSEMBLING

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

⚠ WARNING

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

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

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

5. Remove the hub assembly.
6. Remove the cotter pin from the tie rod end and remove the tie rod end from the knuckle.
7. Remove the two cap screws securing the ball joints in the knuckle.
8. Tap the ball joint end out of the knuckle; then remove the knuckle.
9. Remove the snap ring from the knuckle; then remove the bearing.

PR287A

PR288

CAUTION

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

CLEANING AND INSPECTING

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

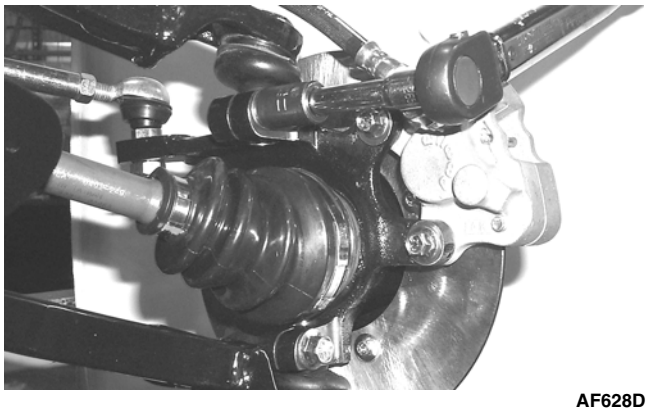
1. Clean all knuckle components.
2. Inspect the bearing for pits, gouges, rusting, or premature wear.
3. Inspect the knuckle for cracks, breaks, or porosity.
4. Inspect threads for stripping or damage.

ASSEMBLING AND INSTALLING

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

PR287A

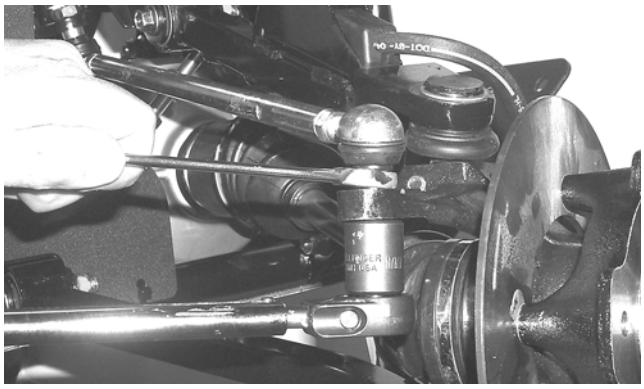
2. Install the knuckle to the upper and lower ball joints and secure with the two cap screws. Tighten to 35 ft-lb.



AF628D

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

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

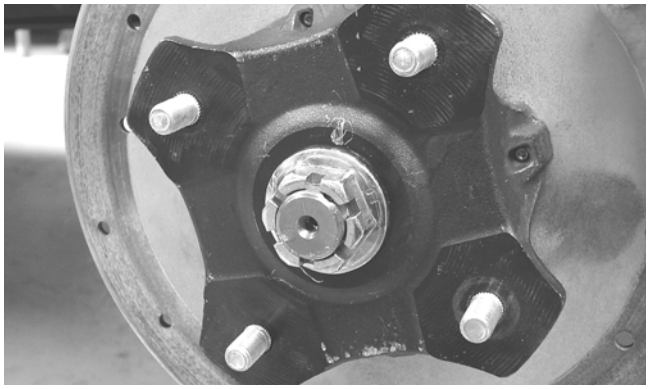


AF618D

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

PR290A

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



PR257

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

PR264A

8. Pump the hand brake lever; then engage the brake lever lock.
9. Secure the hub nut (from step 6) to the shaft. Tighten to 200 ft-lb.
10. Install a new cotter pin and spread the pin to secure the nut.
11. Install the wheel; then using a crisscross pattern, tighten to 40 ft-lb (steel wheels) or 80 ft-lb (aluminum wheels).
12. Remove the ATV from the support stand.

Measuring/Adjusting Toe-Out

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.

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.

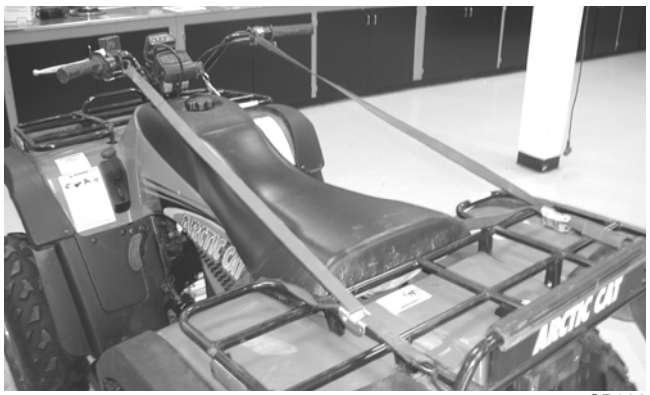
■NOTE: When measuring and adjusting, there should be a normal operating load on the ATV (without an operator but with Arctic Cat approved accessories).

4. Measure the distance from the outside edge of each handlebar grip to equal reference points on each.

DE047A

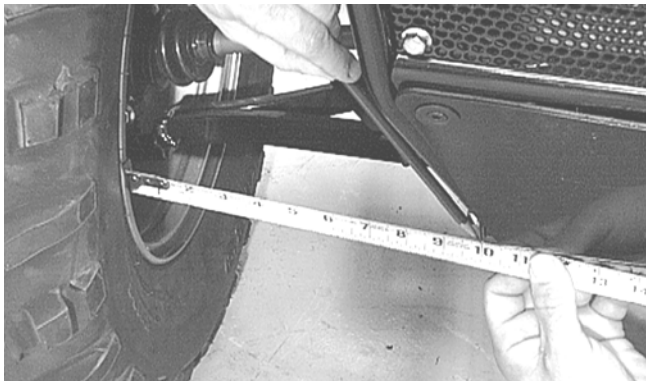
5. Adjust the handlebar direction until the two measurements are equal; then secure the handlebar to the rear rack using tie-down straps.

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

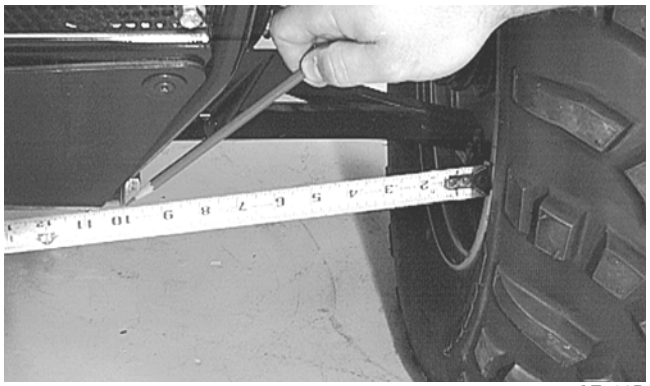


CD014

6. Measure the distance from the inside of each front rim to the lower frame tube.



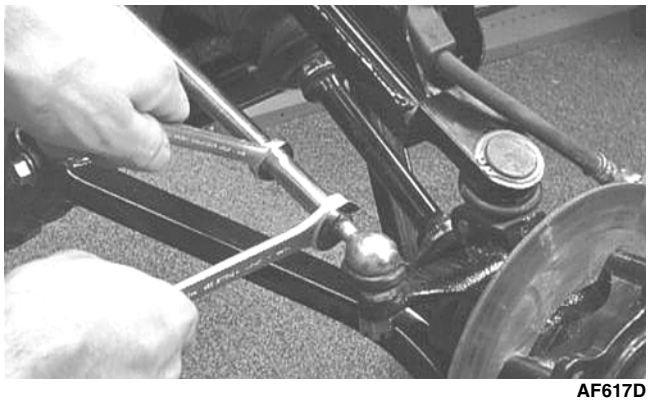
AF785D



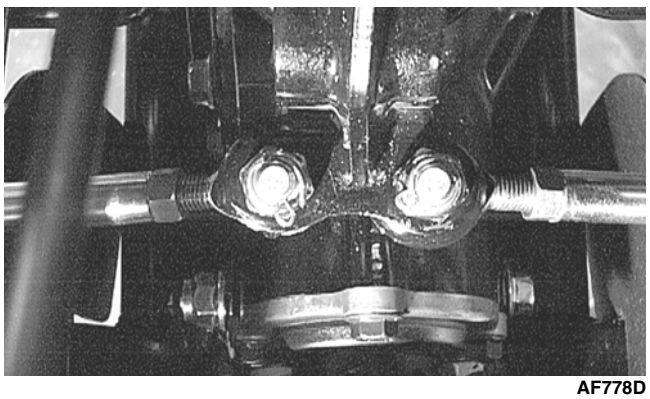
AF786D

■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

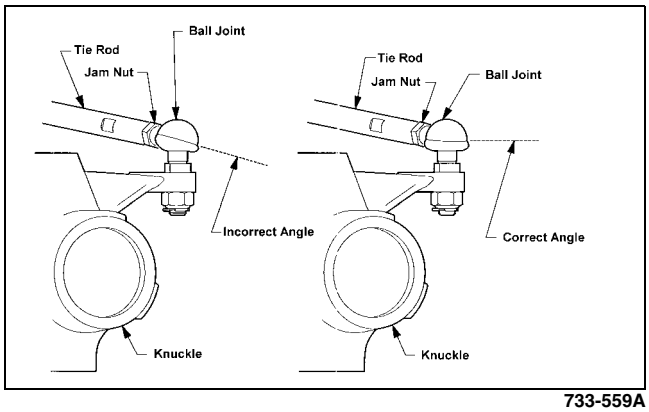
■NOTE: The front wheels do not have to be removed to adjust the tie rod. Also, care should be taken not to disturb the handlebar position.

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 1/8-1/4 in. toe-out (the front measurement 1/8-1/4 in. more 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

Shift Lever

REMOVING

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

INSTALLING

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

Front Rack

REMOVING

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

CLEANING AND INSPECTING

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

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

INSTALLING

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

Front Bumper Assembly

REMOVING

1. Remove the 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 Body Panel/Side Panels

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.

FI465A

FI466A

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

FI467

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

FI468

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

FI463A

FI464A

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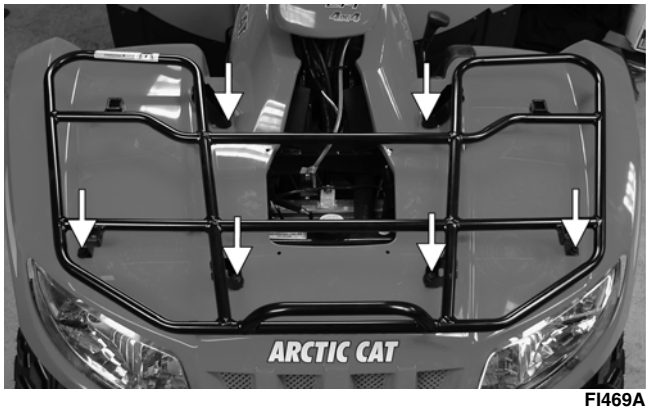
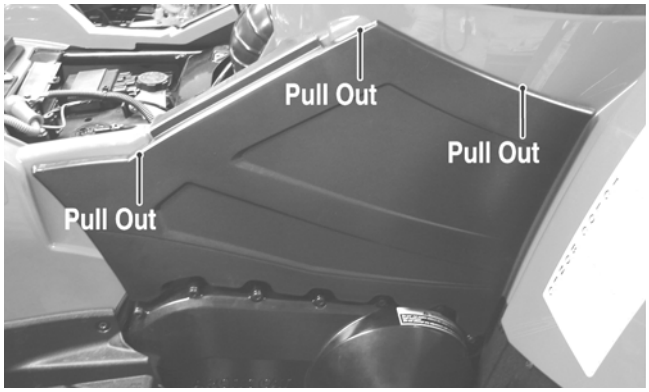
5. Remove the cap screws and lock nuts securing the front rack to the frame; then remove the front rack. Account for the grommets and bushings.

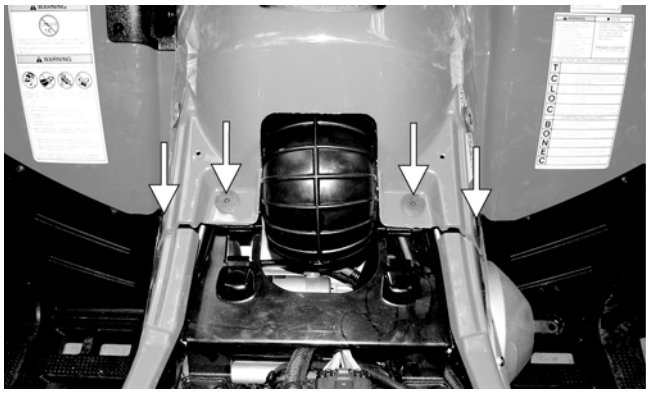


FI469A

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



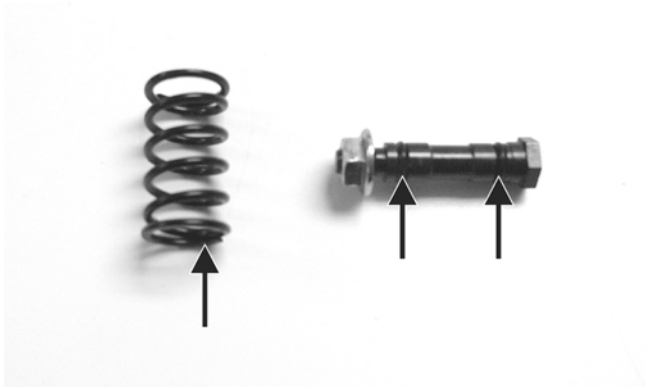
CF237A



FI470A

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

CD779



CD780A

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

CD681

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

CD765A

8

■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 warm 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 rubber grommets and bushings are in place; then place the front rack into position and secure with the cap screws and lock nuts. Tighten securely.
4. Install the footwells and foot rests. Tighten securely.
5. Install the cap screws securing the front body panel to the frame and rear panel.

FI470A

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

CD779

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

FI468

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FI467

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

FI466A

FI465A

10. Install the side panels.

Footrests

REMOVING

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

CD691A

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

CLEANING AND INSPECTING

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

Belly Panel

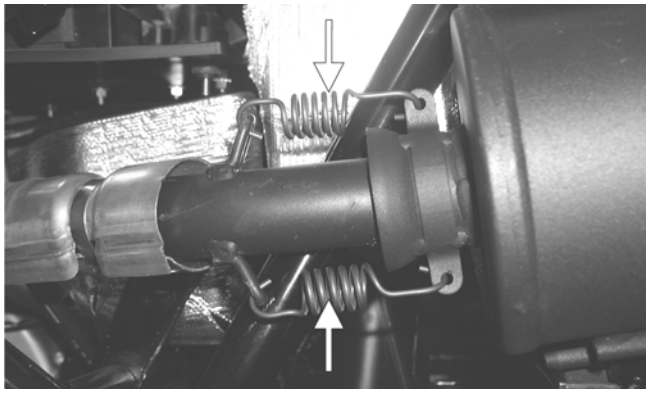
REMOVING/INSTALLING

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

Exhaust System

REMOVING MUFFLER

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



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

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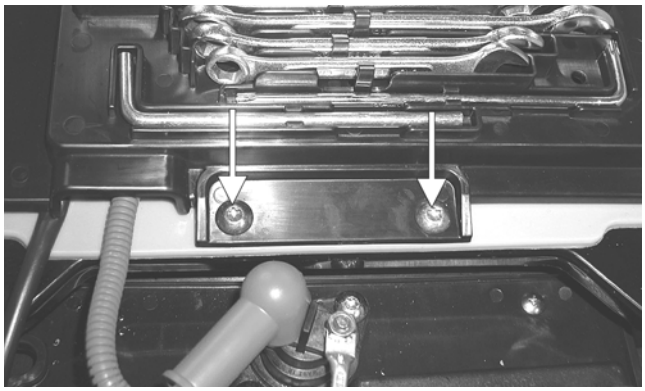
3. Remove two machine screws securing the battery cover and remove the cover.



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

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

CLEANING AND INSPECTING

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

1. Clean all rear body panel components with warm 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.

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2. Place the rear rack in position with the bushings and secure with the cap screws and lock nuts. Tighten securely.
3. Install one shoulder screw and three plastic rivets (on each side) to secure the front of the rear body panel to the footwells.

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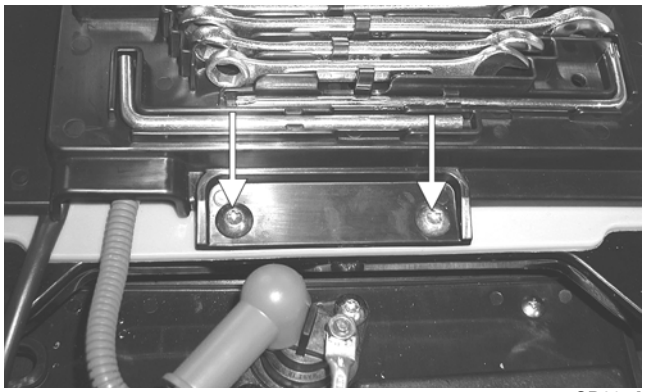
4. Place the battery into the battery box; then connect the battery (positive cable first) and secure with the battery cover.



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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.

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

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.

Troubleshooting

Problem: Handling too heavy or stiff	
Condition	**Remedy**
1. **Front wheel alignment** incorrect	1. Adjust alignment
2. **Lubrication** inadequate	2. Lubricate appropriate components
3. **Tire inflation pressure** low	3. Adjust pressure
4. **Tie rod ends** seizing	4. Replace tie rod ends
5. **Linkage connections** seizing	5. Repair - replace connections
Problem: Steering oscillation	
Condition	**Remedy**
1. **Tires** inflated unequally	1. Adjust pressure
2. **Wheel(s)** wobbly	2. Replace wheel(s)
3. **Wheel hub cap screw(s)** loose - missing	3. Tighten - replace cap screws
4. **Wheel hub bearing** worn - damaged	4. Replace bearing
5. **Tie rod ends** worn - loose	5. Replace - tighten tie rod ends
6. **Tires** defective - incorrect	6. Replace tires
7. **A-arm bushings** damaged	7. Replace bushings
8. **Bolts - nuts (frame)** loose	8. Tighten bolts - nuts
Problem: Steering pulling to one side	
Condition	**Remedy**
1. **Tires** inflated unequally	1. Adjust pressure
2. **Front wheel alignment** incorrect	2. Adjust alignment
3. **Wheel hub bearings** worn - broken	3. Replace bearings
4. **Frame** distorted	4. Repair - replace frame
5. **Shock absorber** defective	5. Replace shock absorber
Problem: Tire wear rapid or uneven	
Condition	**Remedy**
1. **Wheel hub bearings** worn - loose	1. Replace bearings
2. **Front wheel alignment** incorrect	2. Adjust alignment
3. **Tire inflation pressure** incorrect	3. Adjust pressure
Problem: Steering noise	
Condition	**Remedy**
1. **Cap screws - nuts** loose	1. Tighten cap screws - nuts
2. **Wheel hub bearings** broken - damaged	2. Replace bearings
3. **Lubrication** inadequate	3. Lubricate appropriate components

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