



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.

Specifications* (250/300)

VALVES AND GUIDES		
Valve Face Diameter	(intake) (exhaust)	33 mm (1.3 in.) 28 mm (1.1 in.)
Valve/Tappet Clearance (cold engine)	(intake) (exhaust) (exhaust)	0.03-0.08 mm (0.001-0.003 in.) 0.08-0.13 mm (0.003-0.005 in.)** 0.17-0.22 mm (0.007-0.009 in.)
Valve Guide/ Stem Clearance	(intake) (exhaust)	0.010-0.037 mm (0.0004-0.0015 in.) 0.030-0.057 mm (0.0012-0.0024 in.)
Valve Guide/Valve Stem Deflection (wobble deflection)	(max)	0.35 mm (0.014 in.)
Valve Guide Inside Diameter		5.500-5.512 mm (0.2165-0.2170 in.)
Valve Stem Outside Diameter	(intake) (exhaust)	5.475-5.490 mm (0.2156-0.2161 in.) 5.455-5.470 mm (0.2148-0.2154 in.)
Valve Stem Runout	(max)	0.05 mm (0.002 in.)
Valve Head Thickness	(min)	0.5 mm (0.02 in.)
Valve Stem End Length	(min)	2.5 mm (0.10 in.)
Valve Face/Seat Width		0.9-1.1 mm (0.035-0.043 in.)
Valve Seat Angle	(intake) (exhaust)	45° 45°
Valve Face Radial Runout	(max)	0.03 mm (0.001 in.)
Valve Spring Free Length (min)	(inner) (outer)	35.1 mm (1.38 in.) 41.0 mm (1.63 in.)** 39.9 mm (1.57 in.)
Valve Spring Tension @ 32.5 mm (1.28 in.)	(inner)	7.1-9.2 kg (15.7-20.3 lb) 7.4-9.3 kg (16.3-20.5 lb)**
Valve Spring Tension @ 36.0 mm (1.42 in.)	(outer)	17.3-21.3 kg (38.1-47.0 lb)

CAMSHAFT AND CYLINDER HEAD		
Cam Lobe Height (min)	(intake) (exhaust)	33.820 mm (1.331 in.) 33.480 mm (1.318 in.)** 33.490 mm (1.319 in.) 32.690 mm (1.2870 in.)**
Camshaft Journal Oil Clearance	(max)	0.15 mm (0.0059 in.)
Camshaft Journal Holder Inside		22.012-22.025 mm (0.8666-0.8671 in.)
Camshaft Journal Outside Diameter		21.959-21.980 mm (0.8645-0.8654 in.)
Camshaft Runout	(max)	0.10 mm (0.004 in.)
Rocker Arm Inside Diameter		12.000-12.018 mm (0.472-0.473 in.)
Rocker Arm Shaft Outside Diameter		11.977-11.995 mm (0.4715-0.4722 in.)
Cylinder Head Distortion	(max)	0.05 mm (0.002 in.)
Cylinder Head Cover Distortion	(max)	0.05 mm (0.002 in.)

CYLINDER, PISTON, AND RINGS		
Piston Skirt/Cylinder Clearance	(max)	0.12 mm (0.0047 in.)
Cylinder Bore	(max)	68.580 mm (2.700 in.) 66.09 mm (2.602 in.)**
Piston Diameter 18 mm (0.71 in.) from Skirt End		68.380 mm (2.6921 in.) 65.880 mm (2.5936 in.)**
Piston Ring Free End Gap (min)	(1st Ring) (2nd Ring)	6.6 mm (0.26 in.) 6.0 mm (0.24 in.)** 6.8 mm (0.22 in.) 7.2 mm (0.28 in.)**
Bore x Stroke	(300) (250)	68.5 x 76 mm (2.69 x 2.99 mm) 66 x 72 mm** (2.60 x 2.84 in.)**
Cylinder Trueness	(max)	0.05 mm (0.002 in.)
Piston Ring End Gap - Installed	(300) (250)	0.28-0.56 mm (0.011-0.022 in.) 0.25-0.50 mm** (0.010-0.020 in.)**
Piston Ring to Groove Clearance (max)	(1st) (2nd)	0.180 mm (0.0071 in.) 0.150 mm (0.0059 in.)
Piston Ring Groove Width	(1st) (2nd) (oil)	1.01-1.04 mm (0.040-0.041 in.) 1.22-1.24 mm (0.048-0.049 in.) 2.01-2.03 mm (0.079-0.080 in.)
Piston Ring Thickness	(1st) (2nd)	0.97-0.99 mm (0.038-0.039 in.) 1.17-1.19 mm (0.046-0.047 in.)
Piston Pin Bore	(max)	17.03 mm (0.6705 in.) 16.05 mm (0.6318 in.)**
Piston Pin Outside Diameter	(min)	16.98 mm (0.6685 in.) 15.98 mm (0.6291 in.)**

CRANKSHAFT		
Connecting Rod (small end inside diameter)	(max)	17.040 mm (0.6709 in.) 16.040 mm (0.6315 in.)**
Connecting Rod (big end side-to-side)		0.10-0.45 mm (0.004-0.018 in.)
Connecting Rod (big end width)		17.95-18.00 mm (0.707-0.709 in.)
Connecting Rod (small end deflection)	(max)	3 mm (0.12 in.)
Crankshaft (web-to-web)	(300) (250)	54.9-55.1 mm (2.161-2.169 in.) 52.9-53.1 mm** (2.08-2.09 in.)**
Crankshaft Runout (max)		0.08 mm (0.003 in.)
Oil Pump Reduction Ratio		1.566 (47/30)
Oil Pressure at 60°C (140°F) @ 3000 RPM	(above) (below)	0.3 kg/cm ² (4.3 psi) 0.7 kg/cm ² (10 psi)

CLUTCH		
Clutch Release Screw		1/8 turn back
Drive Plate (fiber) Thickness	(min)	2.4 mm (0.094 in.)
Drive Plate (fiber) Tab	(min)	11 mm (0.43 in.)
Driven Plate (warpage)	(max)	0.1 mm (0.004 in.)
Clutch Spring Length	(min)	27.5 mm (1.08 in.)
Clutch Wheel Inside Diameter	(max)	Scuffing of contact surface
Starter Clutch Shoe		No groove at any part
Clutch Engagement	RPM	2000 ± 200
Clutch Lock-Up	RPM	3400 ± 300
Primary Reduction Ratio		3.250 (65/20)
Secondary Reduction Ratio		1.125 (18/16)
Final Reduction Ratio	(front) (rear)	3.090 (34/11) 3.647 (62/17)
Secondary - Transmission Reduction Ratio	(super low) (low) (high)	3.176 (17/18 x 25/11 x 37/25) 1.480 (37/25) 1.112 (11/25 x 18/17 x 43/18)
Gear Ratios	(1st) (2nd) (3rd) (4th) (5th) (reverse)	3.083 (37/12) 1.933 (29/15) 1.388 (25/18) 1.095 (23/21) 0.913 (21/23) 2.833 (29/12 x 34/29)
Engine Fork to Groove (side clearance)		0.10-0.50 mm (0.004-0.020 in.)
Secondary Transmission Fork to Groove (side clearance)		0.05-0.50 mm (0.002-0.020 in.)
Reverse Fork to Groove (side clearance)		0.10-0.50 mm (0.004-0.020 in.)
Shift Fork Groove Width	(#1, #2, & #3)	4.5-4.6 mm (0.177-0.181 in.)
	(secondary transmission - #1 & #2) (reverse)	5.45-5.55 mm (0.215-0.219 in.) 4.0-4.1 mm (0.157-0.161 in.)
Shift Fork Thickness	(#1, #2, & #3)	4.3-4.4 mm (0.169-0.173 in.)
	(secondary transmission - #1 & #2) (reverse)	5.3-5.4 mm (0.209-0.213 in.) 3.8-3.9 mm (0.150-0.154 in.)
Engine Oil Thermo-Switch Operating Temperature	(off → on) (on → off)	160°C (320°F) 140°C (284°F)

* Specifications subject to change without notice.

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Specifications* (400 - Automatic Transmission)

VALVES AND GUIDES

Valve Face Diameter	(intake) (exhaust)	30.6 mm (1.20 in.) 27.0 mm (1.06 in.)
Valve/Tappet Clearance (cold engine)	(intake) (exhaust)	0.05-0.10 mm (0.002-0.004 in.) 0.22-0.27 mm (0.009-0.011 in.)
Valve Guide/Stem Clearance	(intake) (exhaust)	0.010-0.037 mm (0.0004-0.0015 in.) 0.030-0.057 mm (0.0012-0.0022 in.)
Valve Guide/Valve Stem Deflection (wobble deflection)	(max)	0.35 mm (0.014 in.)
Valve Guide Inside Diameter		5.000-5.012 mm (0.1969-0.1973 in.)
Valve Stem Outside Diameter	(intake) (exhaust)	4.975-4.990 mm (0.1959-0.1965 in.) 4.955-4.970 mm (0.1951-0.1957 in.)
Valve Stem Runout	(max)	0.05 mm (0.002 in.)
Valve Head Thickness	(min)	0.5 mm (0.02 in.)
Valve Stem End Length	(min)	2.3 mm (0.09 in.)
Valve Face/Seat Width		0.9-1.1 mm (0.035-0.043 in.)
Valve Seat Angle	(intake) (exhaust)	45° 45°
Valve Face Radial Runout	(max)	0.03 mm (0.001 in.)
Valve Spring Free Length (min)	(inner) (outer)	38.8 mm (1.53 in.) 38.8 mm (1.53 in.)
Valve Spring Tension @ 32.5 mm (1.28 in.)	(outer)	18.6-21.4 kg (41-47 lb)

CAMSHAFT AND CYLINDER HEAD

Cam Lobe Height (min)	(intake) (exhaust)	32.830 mm (1.293 in.) 32.830 mm (1.293 in.)
Camshaft Journal Oil Clearance	(max)	0.15 mm (0.0059 in.)
Camshaft Journal Holder Inside	(right & center) (left)	22.012-22.025 mm (0.8666-0.8671 in.) 17.512-17.525 mm (0.6894-0.6900 in.)
Camshaft Journal Outside Diameter	(right & center) (left)	21.959-21.980 mm (0.8645-0.8654 in.) 17.466-17.484 mm (0.6876-0.6883 in.)
Camshaft Runout	(max)	0.10 mm (0.004 in.)
Rocker Arm Inside Diameter		12.000-12.018 mm (0.472-0.473 in.)
Rocker Arm Shaft Outside Diameter		11.973-11.984 mm (0.4714-0.4718 in.)
Cylinder Head Distortion	(max)	0.05 mm (0.002 in.)
Cylinder Head Cover Distortion	(max)	0.05 mm (0.002 in.)

CYLINDER, PISTON, AND RINGS		
Piston Skirt/Cylinder Clearance		0.060-0.073 mm (0.0024-0.0029 in.)
Cylinder Bore		82.000-82.015 mm (3.2283-3.2289 in.)
Piston Diameter 15 mm (0.6 in.) from Skirt End		81.930-81.945 mm (3.2256-3.2262 in.)
Piston Ring Free End Gap (min)	(1st Ring) (2nd Ring)	8.9 mm (0.3504 in.) 8.3 mm (0.3268 in.)
Bore x Stroke		82 x 71.2 mm (3.29 x 2.80 in.)
Cylinder Trueness	(max)	0.05 mm (0.002 in.)
Piston Ring End Gap - Installed		0.33-0.61 mm (0.013-0.024 in.)
Piston Ring to Groove Clearance (max)	(1st) (2nd)	0.180 mm (0.0071 in.) 0.150 mm (0.0059 in.)
Piston Ring Groove Width	(1st) (2nd) (oil)	1.01-1.03 mm (0.0398-0.0406 in.) 1.01-1.03 mm (0.0398-0.0406 in.) 2.01-2.03 mm (0.0791-0.0799 in.)
Piston Ring Thickness	(1st) (2nd)	0.97-0.99 mm (0.0381-0.0389 in.) 0.97-0.99 mm (0.0381-0.0389 in.)
Piston Pin Bore	(max)	20.03 mm (0.789 in.)
Piston Pin Outside Diameter	(min)	19.98 mm (0.787 in.)

CRANKSHAFT		
Connecting Rod (small end inside diameter)	(max)	20.04 mm (0.7889 in.)
Connecting Rod (big end side-to-side)		0.10-0.55 mm (0.004-0.022 in.)
Connecting Rod (big end width)		21.95-22.00 mm (0.8642-0.8661 in.)
Connecting Rod (small end deflection)	(max)	3 mm (0.12 in.)
Crankshaft (web-to-web)		59.9-60.1 mm (2.358-2.366 in.)
Crankshaft Runout (max)		0.08 mm (0.003 in.)
Oil Pressure at 60°C (140°F) @ 3000 RPM	(above) (below)	1.1 kg/cm ² (16 psi) 1.5 kg/cm ² (21 psi)
Cooling Fan Thermo-Switch Operating Temperature	(off → on) (on → off)	120°C (248°F) 110°C (230°F)
Engine Oil Thermo-Switch Operating Temperature	(off → on) (on → off)	160°C (320°F) 140°C (284°F)

* Specifications subject to change without notice.

Specifications* (400 - Manual Transmission)

VALVES AND GUIDES		
Valve Face Diameter	(intake) (exhaust)	30.6 mm (1.20 in.) 27.0 mm (1.06 in.)
Valve/Tappet Clearance (cold engine)	(intake) (exhaust)	0.05-0.10 mm (0.002-0.004 in.) 0.22-0.27 mm (0.009-0.011 in.)
Valve Guide/Stem Clearance	(intake) (exhaust)	0.010-0.037 mm (0.0004-0.0015 in.) 0.030-0.057 mm (0.0012-0.0022 in.)
Valve Guide/Valve Stem Deflection (wobble deflection)	(max)	0.35 mm (0.014 in.)
Valve Guide Inside Diameter		5.000-5.012 mm (0.1969-0.1973 in.)
Valve Stem Outside Diameter	(intake) (exhaust)	4.975-4.990 mm (0.1959-0.1965 in.) 4.955-4.970 mm (0.1951-0.1957 in.)
Valve Stem Runout	(max)	0.05 mm (0.002 in.)
Valve Head Thickness	(min)	0.5 mm (0.02 in.)
Valve Stem End Length	(min)	2.3 mm (0.09 in.)
Valve Face/Seat Width		0.9-1.1 mm (0.035-0.043 in.)
Valve Seat Angle	(intake) (exhaust)	45° 45°
Valve Face Radial Runout	(max)	0.03 mm (0.001 in.)
Valve Spring Free Length (min)	(inner) (outer)	38.8 mm (1.53 in.) 38.8 mm (1.53 in.)
Valve Spring Tension @ 32.5 mm (1.28 in.)	(outer)	18.6-21.4 kg (41-47 lb)

CAMSHAFT AND CYLINDER HEAD		
Cam Lobe Height (min)	(intake) (exhaust)	32.830 mm (1.293 in.) 32.830 mm (1.293 in.)
Camshaft Journal Oil Clearance	(max)	0.15 mm (0.0059 in.)
Camshaft Journal Holder Inside	(right & center) (left)	22.012-22.025 mm (0.8666-0.8671 in.) 17.512-17.525 mm (0.6894-0.6900 in.)
Camshaft Journal Outside Diameter	(right & center) (left)	21.959-21.980 mm (0.8645-0.8654 in.) 17.466-17.484 mm (0.6876-0.6883 in.)
Camshaft Runout	(max)	0.10 mm (0.004 in.)
Rocker Arm Inside Diameter		12.000-12.018 mm (0.472-0.473 in.)
Rocker Arm Shaft Outside Diameter		11.973-11.984 mm (0.4714-0.4718 in.)
Cylinder Head Distortion	(max)	0.05 mm (0.002 in.)
Cylinder Head Cover Distortion	(max)	0.05 mm (0.002 in.)

CYLINDER, PISTON, AND RINGS		
Piston Skirt/Cylinder Clearance		0.060-0.073 mm (0.0024-0.0029 in.)
Cylinder Bore		82.000-82.015 mm (3.2283-3.2289 in.)
Piston Diameter 15 mm (0.6 in.) from Skirt End		81.930-81.945 mm (3.2256-3.2262 in.)
Piston Ring Free End Gap (min)	(1st Ring) (2nd Ring)	8.9 mm (0.3504 in.) 8.3 mm (0.3268 in.)
Bore x Stroke		82 x 71.2 mm (3.29 x 2.80 in.)
Cylinder Trueness	(max)	0.05 mm (0.002 in.)
Piston Ring End Gap - Installed		0.33-0.61 mm (0.013-0.024 in.)
Piston Ring to Groove Clearance (max)	(1st) (2nd)	0.180 mm (0.0071 in.) 0.150 mm (0.0059 in.)
Piston Ring Groove Width	(1st) (2nd) (oil)	1.01-1.03 mm (0.0398-0.0406 in.) 1.01-1.03 mm (0.0398-0.0406 in.) 2.01-2.03 mm (0.0791-0.0799 in.)
Piston Ring Thickness	(1st) (2nd)	0.97-0.99 mm (0.0381-0.0389 in.) 0.97-0.99 mm (0.0381-0.0389 in.)
Piston Pin Bore	(max)	20.03 mm (0.789 in.)
Piston Pin Outside Diameter	(min)	19.98 mm (0.787 in.)

CRANKSHAFT		
Connecting Rod (small end inside diameter)	(max)	20.04 mm (0.7889 in.)
Connecting Rod (big end side-to-side)		0.10-0.55 mm (0.004-0.022 in.)
Connecting Rod (big end width)		21.95-22.00 mm (0.8642-0.8661 in.)
Connecting Rod (small end deflection)	(max)	3 mm (0.12 in.)
Crankshaft (web-to-web)		59.9-60.1 mm (2.358-2.366 in.)
Crankshaft Runout (max)		0.08 mm (0.003 in.)
Oil Pressure at 60°C (140°F) @ 3000 RPM	(above) (below)	0.6 kg/cm ² (9 psi) 1.0 kg/cm ² (14 psi)
Cooling Fan Thermo-Switch Operating Temperature	(off → on) (on → off)	120°C (248°F) 110°C (230°F)
Engine Oil Thermo-Switch Operating Temperature	(off → on) (on → off)	160°C (320°F) 140°C (284°F)

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

* Specifications subject to change without notice.

Specifications*

(500 - Automatic Transmission)

VALVES AND GUIDES

Valve Face Diameter	(intake) (exhaust)	30.6 mm (1.20 in.) 27.0 mm (1.06 in.)
Valve/Tappet Clearance (cold engine)	(intake) (exhaust)	0.05-0.10 mm (0.002-0.004 in.) 0.17-0.22 mm (0.007-0.009 in.)
Valve Guide/ Stem Clearance	(intake) (exhaust)	0.010-0.037 mm (0.0004-0.0015 in.) 0.030-0.057 mm (0.0012-0.0022 in.)
Valve Guide/Valve Stem Deflection (wobble deflection)	(max)	0.35 mm (0.014 in.)
Valve Guide Inside Diameter		5.000-5.012 mm (0.1969-0.1973 in.)
Valve Stem Outside Diameter	(intake) (exhaust)	4.975-4.990 mm (0.1959-0.1965 in.) 4.955-4.970 mm (0.1951-0.1957 in.)
Valve Stem Runout	(max)	0.05 mm (0.002 in.)
Valve Head Thickness	(min)	0.5 mm (0.02 in.)
Valve Stem End Length	(min)	2.3 mm (0.09 in.)
Valve Face/Seat Width		0.9-1.1 mm (0.035-0.043 in.)
Valve Seat Angle	(intake) (exhaust)	45° 45°
Valve Face Radial Runout	(max)	0.03 mm (0.001 in.)
Valve Spring Free Length (min)	(inner) (outer)	38.8 mm (1.53 in.)
Valve Spring Tension @ 31.5 mm (1.24 in.)	(outer)	18.6-21.4 kg (41-47 lb)

CAMSHAFT AND CYLINDER HEAD

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

CYLINDER, PISTON, AND RINGS

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

CRANKSHAFT

Connecting Rod (small end inside diameter)	(max)	23.04 mm (0.9070 in.)
Connecting Rod (big end side-to-side)		0.10-0.65 mm (0.0039-0.0256 in.)
Connecting Rod (big end width)		24.95-25.00 mm (0.9822-0.9842 in.)
Connecting Rod (small end deflection)	(max)	3 mm (0.12 in.)
Crankshaft (web-to-web)		70.9-70.1 mm (2.796-2.804 in.)
Crankshaft Runout (max)		0.08 mm (0.003 in.)
Oil Pressure at 60°C (140°F) @ 3000 RPM	(above) (below)	1.3 kg/cm ² (18 psi) 1.7 kg/cm ² (24 psi)
Cooling Fan Thermo-Switch Operating Temperature	(off → on) (on → off)	88°C (190°F) 82°C (180°F) (min)
Engine Coolant Thermo-Switch Operating Temperature	(off → on) (on → off) (Approx)	115°C (239°F) 108°C (226°F)

* Specifications subject to change without notice.

Specifications*

(500 - Manual Transmission)

VALVES AND GUIDES

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

CAMSHAFT AND CYLINDER HEAD

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

CYLINDER, PISTON, AND RINGS

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

CRANKSHAFT

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

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

* Specifications subject to change without notice.

Specifications*

(650 H1)

VALVES AND GUIDES

Valve Face Diameter	(intake) (exhaust)	31.6 mm (1.24 in.) 27.9 mm (1.10 in.)
Valve/Tappet Clearance (cold engine)	(intake) (exhaust)	0.1016 mm (0.004 in.) 0.1524 mm (0.006 in.)
Valve Guide/Stem Clearance	(intake) (exhaust)	0.013 mm (0.0005 in.) 0.013 mm (0.0005 in.)
Valve Guide/Valve Stem Deflection (wobble method)	(max)	0.35 mm (0.014 in.)
Valve Guide Inside Diameter		5.000-5.012 mm (0.1969-0.1973 in.)
Valve Stem Outside Diameter	(intake) (exhaust)	4.972-4.987 mm (0.1957-0.1963 in.) 4.972-4.987 mm (0.1957-0.1963 in.)
Valve Stem Runout	(max)	0.1 mm (0.0039 in.)
Valve Head Thickness	(min)	2.3 mm (0.0906 in.)
Valve Stem End Length	(min)	3.97 mm (0.156 in.)
Valve Face/Seat Width	(intake) (exhaust)	2.25 mm (0.0886 in.) 2.60 mm (0.1024 in.)
Valve Seat Angle	(intake) (exhaust)	45° 15'-45° 30' 45° 15'-45° 30'
Valve Face Radial Runout	(max)	0.2 mm (0.0079 in.)
Valve Spring Free Length	(min)	38.7 mm (1.524 in.)
Valve Spring Tension @ 31.5 mm (1.24 in.)	(outer)	19.0 kg (42 lb)

CAMSHAFT AND CYLINDER HEAD

Cam Lobe Height (min)	(intake) (exhaust)	13.97 mm (0.55 in.) 13.97 mm (0.55 in.)
Camshaft Journal Oil Clearance	(max)	0.04 mm (0.0016 in.)
Camshaft Journal Holder Inside Diameter	(right & center) (left)	21.98-22.04 mm (0.8654-0.8677 in.) 17.48-17.53 mm (0.6882-0.6902 in.)
Camshaft Journal Outside Diameter	(right & center) (left)	21.96-21.98 mm (0.8646-0.8654 in.) 17.47-17.48 mm (0.6878-0.6882 in.)
Camshaft Runout	(max)	0.05 mm (0.002 in.)
Rocker Arm Inside Diameter		12.000-12.018 mm (0.4724-0.4731 in.)
Rocker Arm Shaft Outside Diameter		11.97-11.98 mm (0.4713-0.4717 in.)
Cylinder Head Distortion	(max)	0.05 mm (0.002 in.)
Cylinder Head Cover Distortion	(max)	0.05 mm (0.002 in.)

CYLINDER, PISTON, AND RINGS

Piston Skirt/Cylinder Clearance		0.045 mm (0.0018 in.)
Cylinder Bore		98 mm (3.858 in.)
Piston Diameter 15 mm (0.6 in.) from Skirt End		97.948-97.962 mm (3.856-3.857 in.)
Piston Ring Free End Gap	(1st ring) (2nd ring)	12.5 mm (0.492 in.) 12.5 mm (0.492 in.)
Bore x Stroke		97.9 x 85 mm (3.86 x 3.35 in.)
Cylinder Trueness	(max)	0.01 mm (0.004 in.)
Piston Ring End Gap - Installed		0.36 mm (0.014 in.)
Piston Ring to Groove Clearance (max)	(1st) (2nd)	0.03 mm (0.0012 in.) 0.03 mm (0.0012 in.)
Piston Ring Groove Width	(1st) (2nd) (oil)	1.202-1.204 mm (0.0473-0.0474 in.) 1.202-1.204 mm (0.0473-0.0474 in.) 2.01-2.03 mm (0.0791-0.0799 in.)
Piston Ring Thickness	(1st) (2nd)	1.970-1.990 mm (0.0776-0.0783 in.) 1.970-1.990 mm (0.0776-0.0783 in.)
Piston Pin Bore	(max)	23.0 mm (0.9055 in.)
Piston Pin Outside Diameter	(min)	22.99 mm (0.9051 in.)

CRANKSHAFT

Connecting Rod (small end inside diameter)	(max)	23.021 mm (0.9063 in.)
Connecting Rod (big end side-to-side)		0.6 mm (0.024 in.)
Connecting Rod (big end width)		25 mm (0.9843 in.)
Connecting Rod @ 150 mm (5.9 in.) (small end deflection)	(max)	0.3 mm (0.0118 in.)
Crankshaft (web-to-web)		71 mm (2.79 in.)
Crankshaft Runout	(max)	0.03 mm (0.0012 in.)
Oil Pressure at 60°C (140°F) @ 3000 RPM		1.40-2.46 kg/cm ² (20-35 psi)
Cooling Fan Thermo-Switch Operating Temperature	(off→on) (on→off)	90°C (194°F) 75°C (167°F)
Engine Coolant Thermo-Switch Operating Temperature	(off→on) (on→off) (Approx)	115°C (239°F) 108°C (226°F)

* Specifications subject to change without notice.

Specifications* (650 V-Twin)

VALVES AND GUIDES		
Valve Face Diameter	(intake) (exhaust)	29.4-29.6 mm (1.157-1.165 in.) 25.2-25.4 mm (0.992-1.000 in.)
Valve/Tappet Clearance (cold engine)	(intake) (exhaust)	0.10-0.15 mm (0.0039-0.0059 in.) 0.20-0.25 mm (0.0079-0.0098 in.)
Valve Guide/Valve Stem Deflection (wobble method)	(intake) (exhaust)	0.03-0.11 mm (0.0012-0.0043 in.) 0.09-0.17 mm (0.0035-0.0043 in.)
Valve Guide Inside Diameter		5.000-5.012 mm (0.1969-0.1973 in.)
Valve Stem Outside Diameter	(intake) (exhaust)	4.975-4.990 mm (0.1959-0.1965 in.) 4.955-4.970 mm (0.1951-0.1957 in.)
Valve Stem Runout	(max)	0.05 mm (0.002 in.)
Valve Head Thickness (min)	(intake) (exhaust)	0.5 mm (0.020 in.) 0.8 mm (0.031 in.)
Valve Face/Seat Width		0.5-1.0 mm (0.020-0.040 in.)
Valve Seat Angle	(intake) (exhaust)	45°/32°/60° 45°/32°/60°
Valve Spring Free Length (min)	(min)	41.3 mm (1.63 in.)
CAMSHAFT AND CYLINDER HEAD		
Cam Lobe Height	(intake) (exhaust)	35.52 mm (1.398 in.) 35.26 mm (1.388 in.)
Camshaft Journal Oil Clearance	22 mm (max) 18 mm (max)	0.15 mm (0.0059 in.) 0.14 mm (0.0055 in.)
Camshaft Journal Holder Inside Diameter	22 mm 18 mm	22.000-22.026 mm (0.8661-0.8670 in.) 18.000-18.018 mm (0.7087-0.7094 in.)
Camshaft Journal Outside Diameter	22 mm 18 mm	21.959-21.980 mm (0.8645-0.8654 in.) 17.966-17.984 mm (0.7073-0.7080 in.)
Camshaft Runout	(max)	0.10 mm (0.004 in.)
Rocker Arm Inside Diameter		12.000-12.018 mm (0.472-0.473 in.)
Rocker Arm Shaft Outside Diameter		11.973-11.984 mm (0.4714-0.4718 in.)
Cylinder Head Distortion	(max)	0.05 mm (0.002 in.)
Cylinder Head Cover Distortion	(max)	0.05 mm (0.002 in.)

CYLINDER, PISTON, AND RINGS		
Piston Skirt/Cylinder Clearance		0.030-0.040 mm (0.0011-0.0015 in.)
Cylinder Bore		79.994-80.006 mm (3.149-3.150 in.)
Piston Diameter 15 mm (0.6 in.) from Skirt End		79.949-79.964 mm (3.147-3.148 in.)
Cylinder Trueness	(max)	0.05 mm (0.002 in.)
Piston Ring End Gap - Installed	(1st) (2nd) (oil)	0.20 -0.30 mm (0.0079-0.0118 in.) 0.30-0.45 mm (0.0118-0.0177 in.) 0.20-0.70 mm (0.0079-0.0276 in.)
Bore x Stroke		79.9 x 63 mm (3.14 x 2.48 in.)
Piston Ring to Groove Clearance	(1st) (2nd)	0.040-0.080 mm (0.0016-0.0032 in.) 0.030-0.070 mm (0.0012-0.0028 in.)
Piston Ring Groove Width	(1st) (2nd)	1.030-1.050 mm (0.0405-0.0413 in.) 1.020-1.040 mm (0.0402-0.0409 in.)
Piston Ring Thickness	(1st) (2nd)	0.97-0.99 mm (0.0382-0.0390 in.) 0.97-0.99 mm (0.0382-0.0390 in.)
CRANKSHAFT		
Connecting Rod (big end inside diameter)	Marking: (None) Marking: O	43.000-43.016 mm (1.6929-1.6935 in.) 43.009-43.016 mm (1.6933-1.6935 in.)
Connecting Rod (big end side-to-side)		0.16-0.46 mm (0.0063-0.0181 in.)
Connecting Rod (big end brown bearing insert thickness)	Brown Yellow Green	1.482-1.486 mm (0.0583-0.0585 in.) 1.486-1.490 mm (0.0585-0.0586 in.) 1.490-1.494 mm (0.0586-0.0588 in.)
Connecting Rod Bend	(max)	0.2 mm - per 100 mm (0.008 in. - per 3.94 in.)
Crank Pin (diameter)	Marking: (None) Marking: O	39.984-39.992 mm (1.5742-1.5745 in.) 39.993-40.000 mm (1.5745-1.5748 in.)
Crankshaft Runout	(max)	0.10 mm (0.0039 in.)
CONNECTING ROD - BIG END BEARING SELECTION		
Rod Marking	Crank Pin Marking	Bearing Insert
None	O	Brown (p/n 3201-293)
None	None	Yellow (p/n 3201-294)
O	O	Yellow (p/n 3201-294)
O	None	Green (p/n 3201-295)

* Specifications subject to change without notice.

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Removing Engine/ Transmission

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

AT THIS POINT

If the technician's objective is to service/replace left-side cover oil seals (3), front output joint oil seal (1), rear output joint oil seal (1), and/or the oil strainer (from beneath the engine/transmission), the engine/transmission does not have to be removed from the frame.

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

WARNING

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

1. Remove the seat.
2. Disconnect the battery by removing the negative cable first and then the positive cable.

3. Remove the battery hold-down bracket; then remove the battery.

CAUTION

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

4. Drain the oil from the engine/transmission.

■ **NOTE:** To drain the oil completely, both the engine and transmission plugs must be removed.

5. Turn the gas tank valve to the OFF position; then remove the left and right side panels, rear rack, and fenders.
6. Remove the springs securing the exhaust pipe to the header.
7. Loosen the exhaust pipe from the muffler and the frame; then remove the exhaust pipe. Account for grafoil gaskets.
8. Mark the position of the hi/low range shifter arm; then remove the hi/low range shifter arm.

3



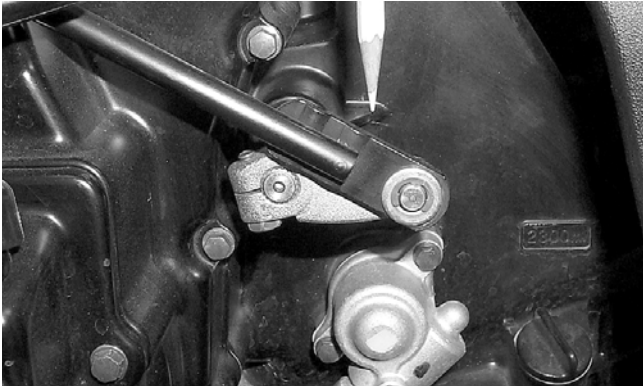
CH057D

9. Mark the gear shifter arm; then remove the cap screw securing the gear shifter arm.



CH059D

10. Mark the reverse gear shaft arm to the reverse shift shaft to aid in installing; then remove the cap screw securing the reverse gear shaft arm to the reverse shift shaft.



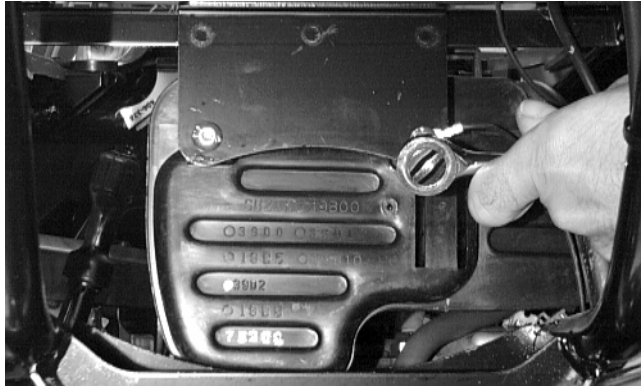
AF942

- 11. Remove the cap screws securing the air-intake snorkel to the frame; then loosen the hose clamp at the air-cleaner assembly.
- 12. Loosen the clamps securing the carburetor boots to the air intake and the engine.



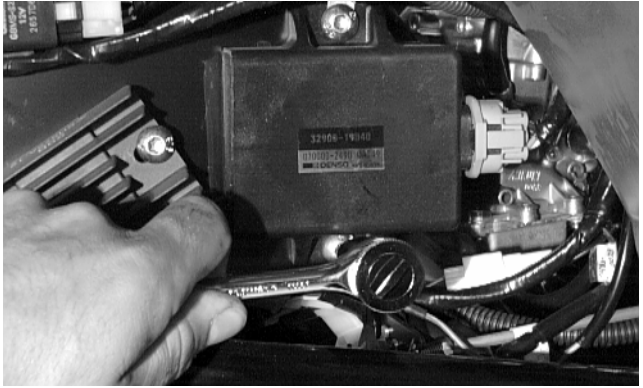
CH041D

- 13. Remove the cap screws securing the air-cleaner assembly to the rear of the ATV.



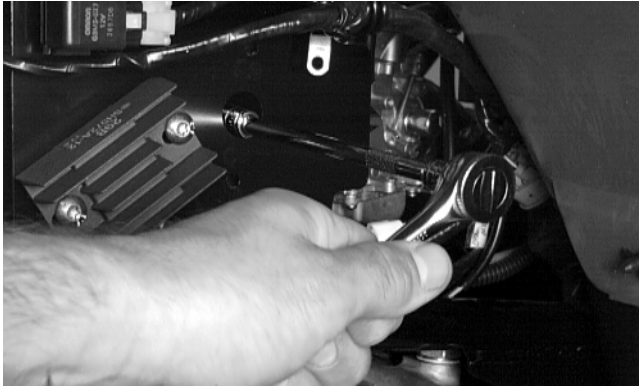
CH047D

- 14. Remove the cap screws securing the CDI unit.



AF882D

- 15. Remove the remaining cap screw securing the air-cleaner assembly to the frame; then remove the crankcase breather hoses from the air-cleaner assembly and remove the assembly.

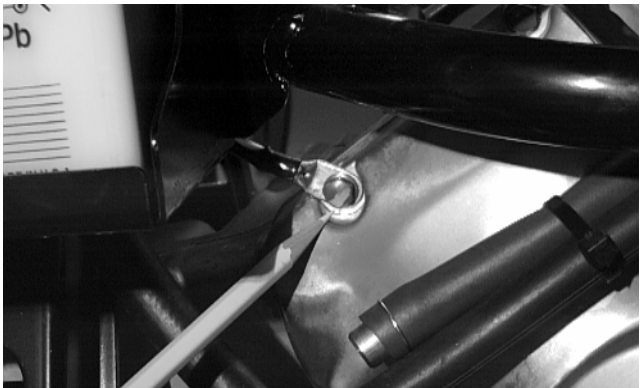


CH048D

- 16. Route the carburetor assembly up and away from the engine.

NOTE: It will not be necessary to disconnect the choke cable. Also, use cable ties or tape to secure the carburetor assembly to keep it from interfering with the removal procedure.

- 17. Disconnect the positive cable from the starter motor.
- 18. Disconnect the battery ground (negative) cable from the crankcase cover.



CH064D

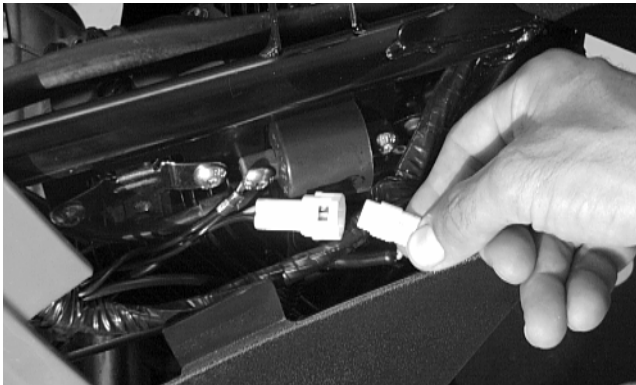
- 19. Disconnect the high tension lead from the spark plug.

20. Disconnect the main wiring harness connectors.



CH065D

21. Disconnect the oil light switch.



CH067D

22. Remove the rear hydraulic brake caliper.

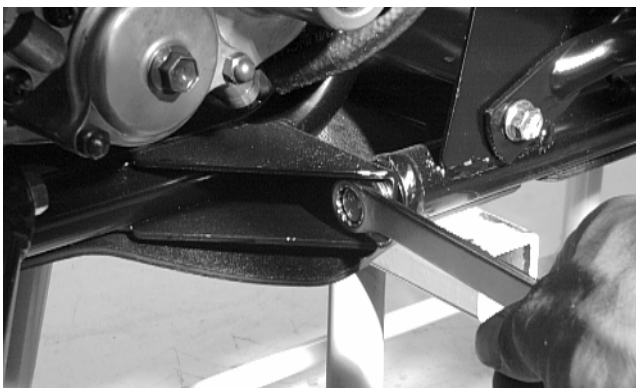
23. Remove the auxiliary brake.

24. Remove the torx-head screw securing the brake hose to the upper suspension arm.

25. Remove the two oil cooler hoses from the engine.

26. Remove the skid plate from the rear end assembly.

27. Remove the two lower cap screws securing the sub-frame/engine assembly to the frame.



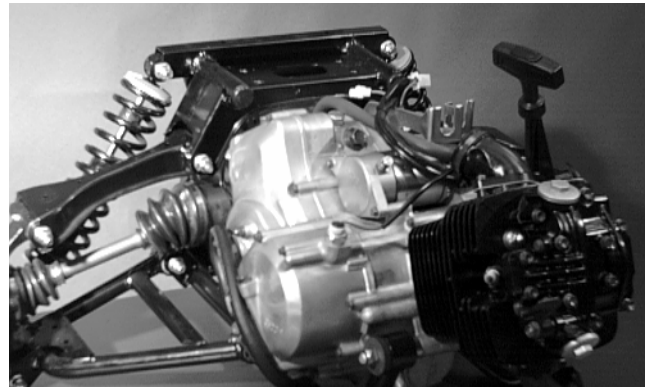
CH071D

28. Secure the upper rear of the ATV to the support stand using tie-down straps to help prevent the ATV from falling forward when the engine/sub-frame assembly is removed.

⚠ WARNING

Support the ATV so it doesn't fall off the support stand when the engine/sub-frame assembly is removed from the frame or severe damage, injury, or death may result.

29. Place a large floor/transmission jack under the engine assembly; then remove the upper four cap screws securing the sub-frame to the frame. Place the engine assembly on a suitable work stand and remove the rear wheels.



CH073D

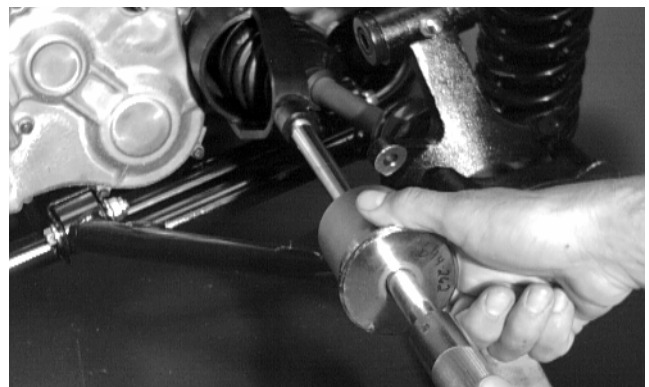
30. Remove the cap screw securing the front engine mount to the sub-frame. Account for spacers.

31. Remove the upper shock mount cap screw to allow access for removal of the two rear engine mount cap screws.

32. Remove the two rear cap screws and flat washers securing the engine to the sub-frame.

33. Remove the rear upper A-arm cap screws.

34. Using Front Drive Axle Puller/Gripper (p/n 0444-099), remove each drive axle assembly.



CH078D

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

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

Removing Top-Side Components

- A. Valve Cover
- B. Cylinder Head

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



CC411D

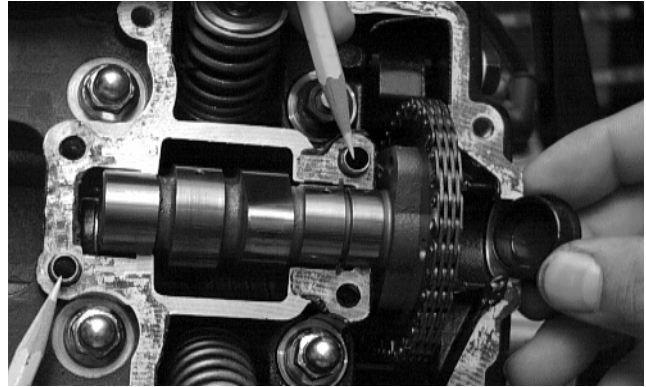
1. Remove the cap screws securing the two tappet covers; then remove the covers. Account for the O-rings.



CC366D

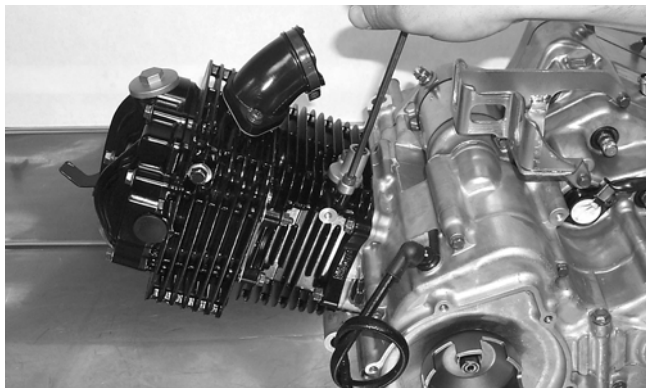
2. Remove the cap screws securing the valve cover to the head; account for the locations of any rubber washers on top side cap screws. Remove the valve cover. Account for the cylinder head plug. Note the location of two alignment pins.

■ **NOTE:** If removing the valve cover only, the two cap screws w/rubber washers next to the compression release lever do not have to be removed.



CC368D

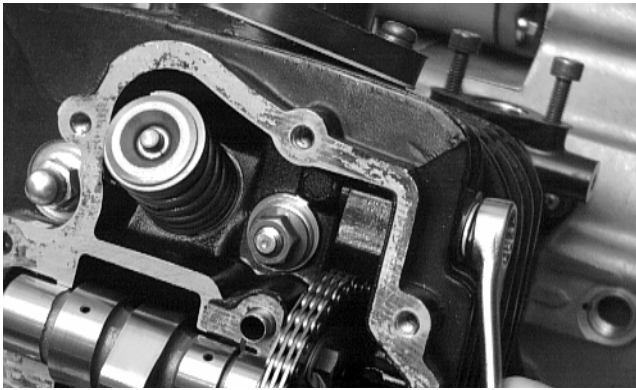
3. Loosen the cap screw on the end of the chain tensioner; then remove the two Allen-head cap screws securing the tensioner adjuster assembly and remove the assembly. Account for a gasket.



CC524D

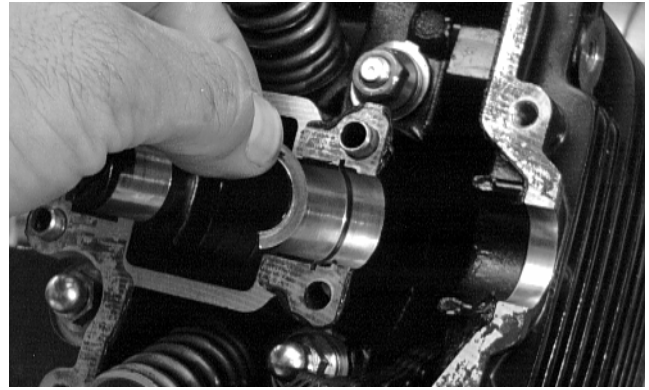
4. Remove the cap screw securing the chain tensioner pad (account for a washer).

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



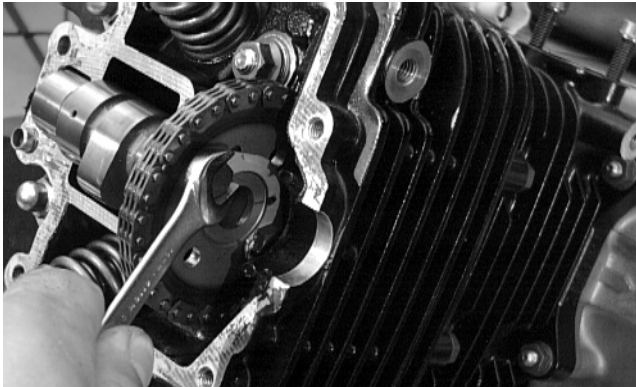
CC371D

5. Bend the washer tabs down and remove the two cap screws securing the sprocket to the camshaft; then drop the sprocket off the camshaft and remove it from the chain. While holding the chain, lift the camshaft out of the cylinder head. Account for an alignment pin.

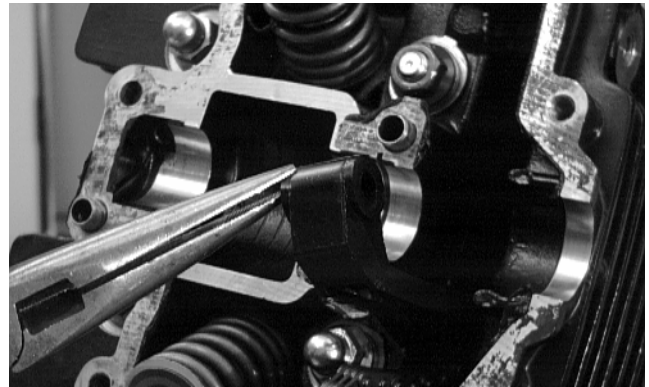


CC374D

7. Using a pair of needle-nose pliers, remove the chain tensioner pad.



CC372D



CC375D

8. Remove the nuts securing the cylinder head to the cylinder; then remove the three cylinder head cap nuts and one nut with copper washers (note location of the cap nuts and nuts).



CC373D

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

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



CC376D

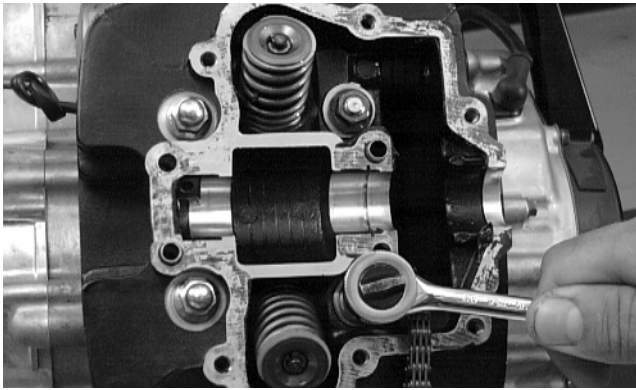
3

C. Cylinder
D. Piston

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

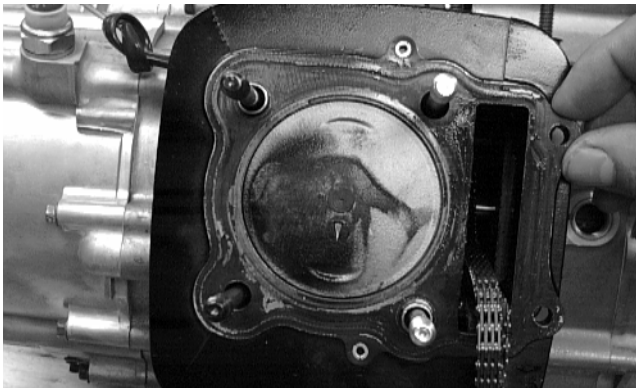
11. Remove the two nuts securing the cylinder to the crankcase.
12. Lift the cylinder off the crankcase taking care not to allow the piston to drop against the crankcase. Account for the gasket and two alignment pins.

■ **NOTE:** It may be necessary to remove the stud w/O-ring to aid in removing the cylinder; however, there is no stud O-ring on the 250.



CC377D

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

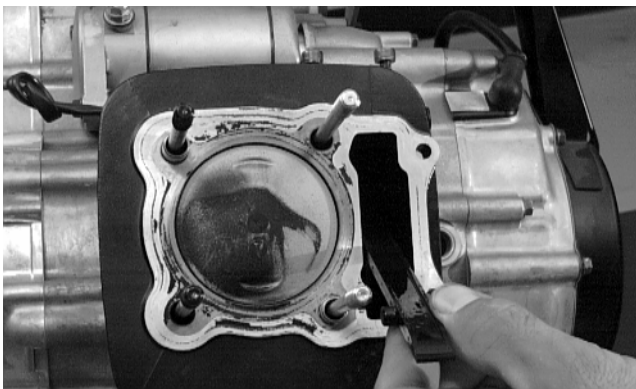


CC378D

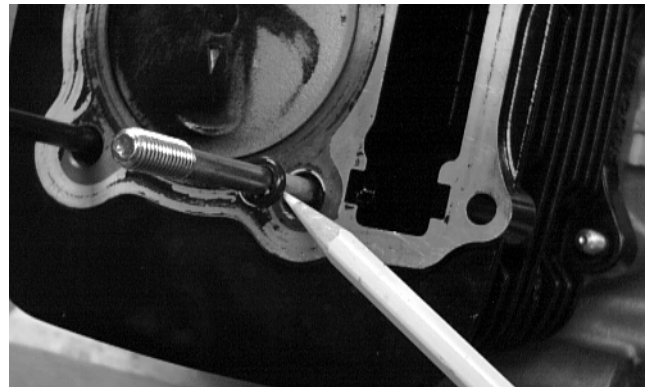
👉 AT THIS POINT
To service valves and cylinder head, see Servicing Top-Side Components sub-section.

10. Remove the cam chain guide.

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



CC379D



CC384D



CC381D

👉 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.

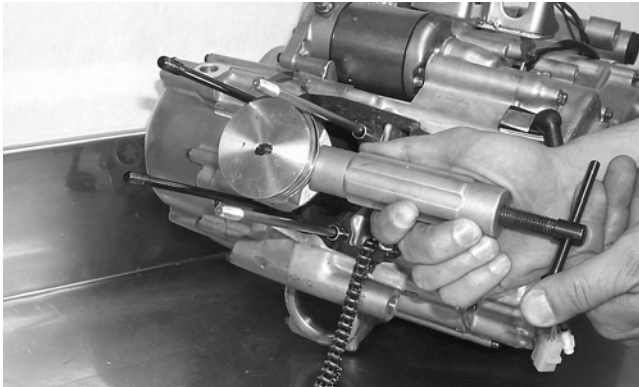
13. Using an awl, remove one piston-pin circlip.



CC382D

14. Using a 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.



CC526D

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

CAUTION

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

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

- 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.

3

Left-Side Components

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

AT THIS POINT

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

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

Removing Left-Side Components

- A. Recoil Starter
- B. Starter Cup
- C. Cover/Stator Assembly

1. Remove the cap screws securing the recoil starter assembly to the left-side cover; then remove the starter noting the location of the single washer. Account for the gasket.

AT THIS POINT

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

2. Remove the nut and lock washer securing the starter cup to the crankshaft; then remove the starter cup. Account for the O-ring inside the cup.
3. Remove the cap screws securing the left-side cover to the crankcase and note the location of the different-sized cap screws.
4. Using an appropriate slide hammer and adapter, remove the left-side cover w/stator assembly. Account for a gasket, two alignment pins, and a starter idler gear spacer.

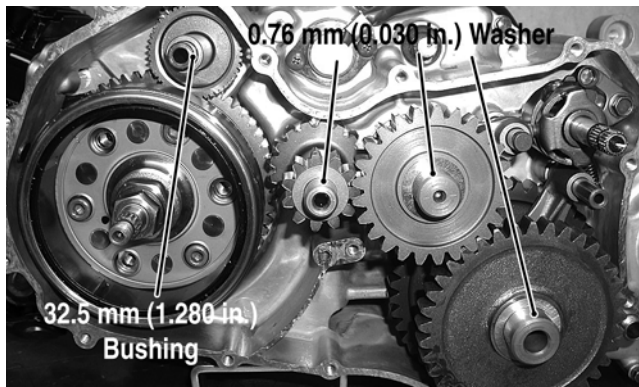


CD283

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



CD290



CD284A

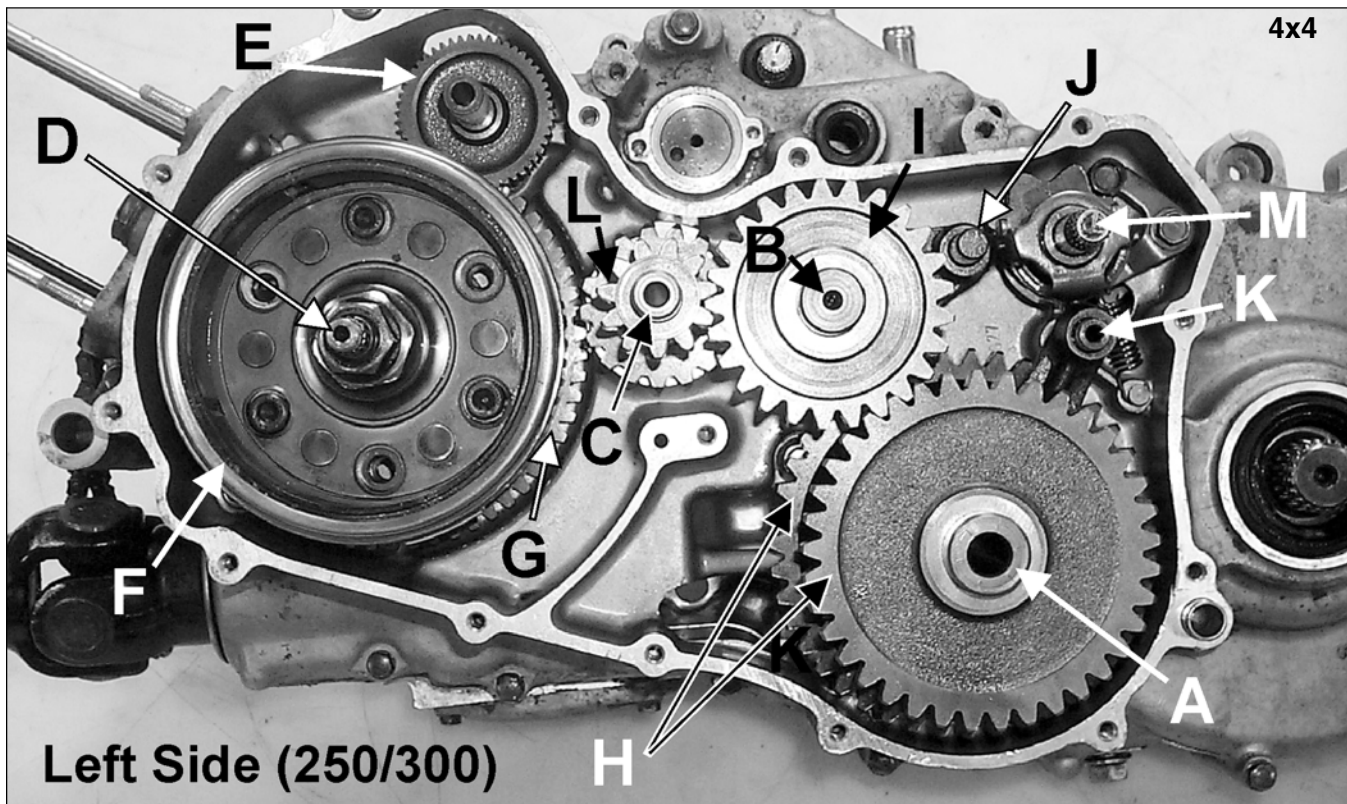
■ **NOTE:** For steps 5-21, refer to illustration CC846B (4x4) or to illustration CC873B (2x4).

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

5. Remove the nut securing the magneto rotor to the crankshaft (D).
6. Remove the starter idler gear assembly (E); then account for the spacer, the starter idler gear, and shaft.



CD291



3

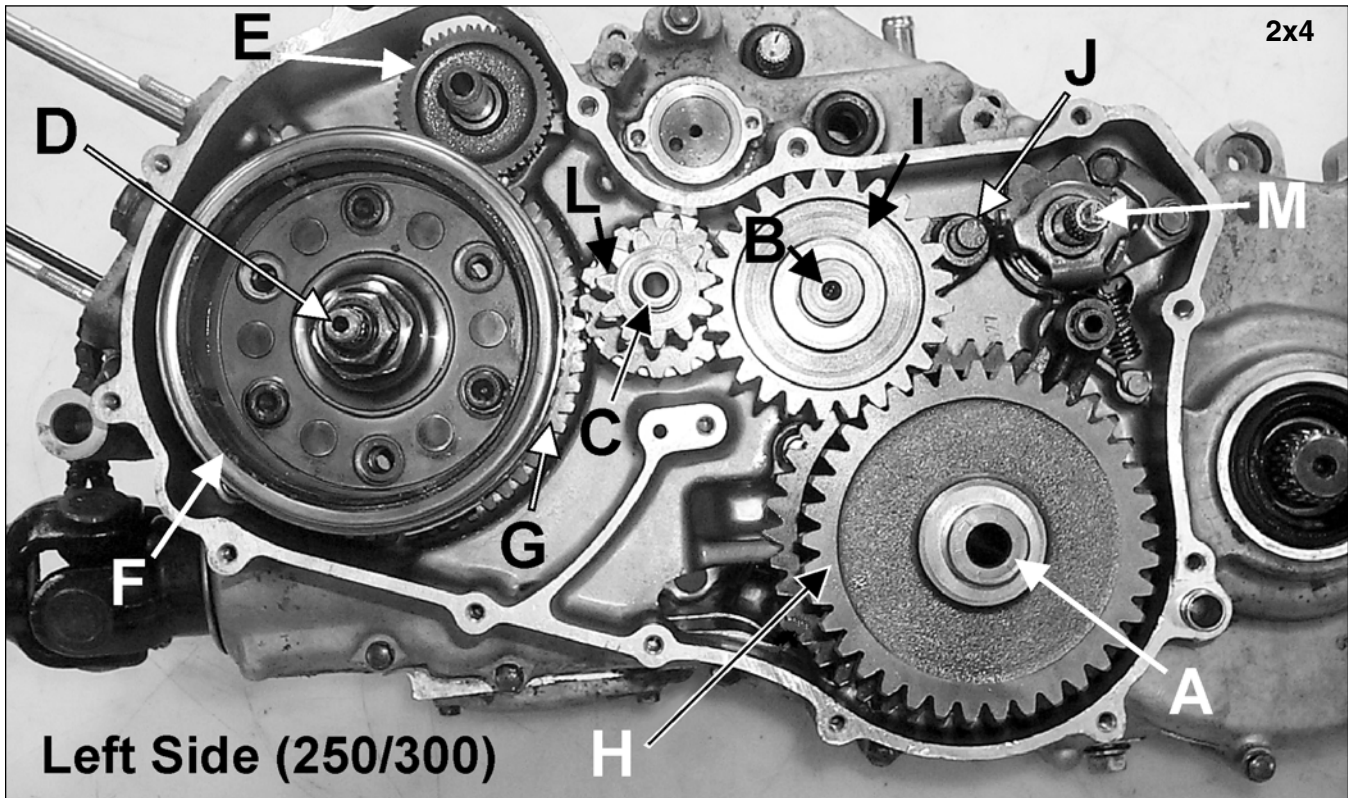
Left Side (250/300)

KEY

- A. Sub-Transmission Shaft
- B. Driveshaft
- C. Countershaft
- D. Crankshaft
- E. Starter Idler Gear Assembly
- F. Magneto Rotor Assembly
- G. Starter Clutch Gear Assembly

- H. Driven Gear (2) Assembly
- I. Drive Gear Assembly
- J. Shift Shaft with Fork (Short)
- K. Shift Shaft with Fork (Long, 4x4 only)
- L. Idler Gear with Two Washers
- M. Sub-Transmission Gear Cam

CC846B



KEY

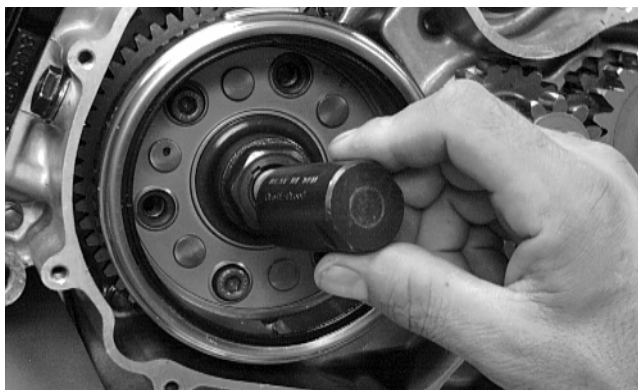
- | | |
|---------------------------------|--------------------------------|
| A. Sub-Transmission Shaft | H. Driven Gear (1) Assembly |
| B. Driveshaft | I. Drive Gear |
| C. Countershaft | J. Shift Shaft with Fork |
| D. Crankshaft | K. N/A |
| E. Starter Idler Gear Assembly | L. Idler Gear with Two Washers |
| F. Magneto Rotor Assembly | M. Sub-Transmission Gear Cam |
| G. Starter Clutch Gear Assembly | |

CC873B

**D. Magneto Rotor
E. Idle Gear Assembly**

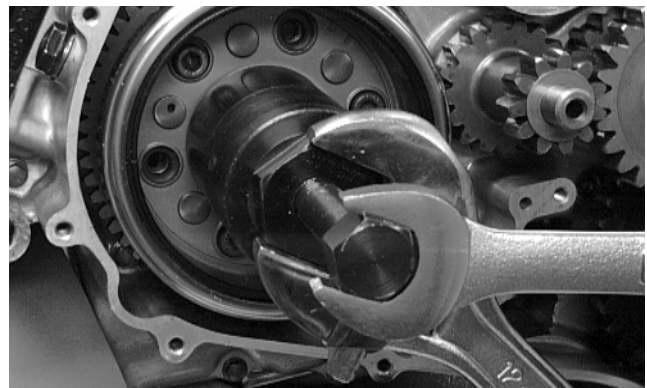
■ **NOTE:** Steps 1-6 in the preceding sub-section must precede this procedure.

7. Install the magneto rotor puller adapter.



CC417D

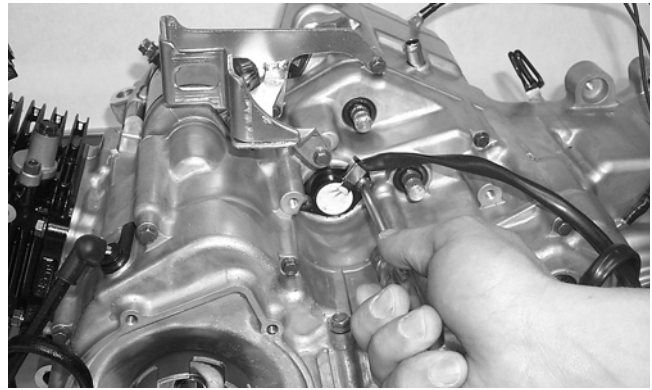
8. Using a magneto rotor remover; remove the magneto rotor assembly (F) from the crankshaft. Account for the key.



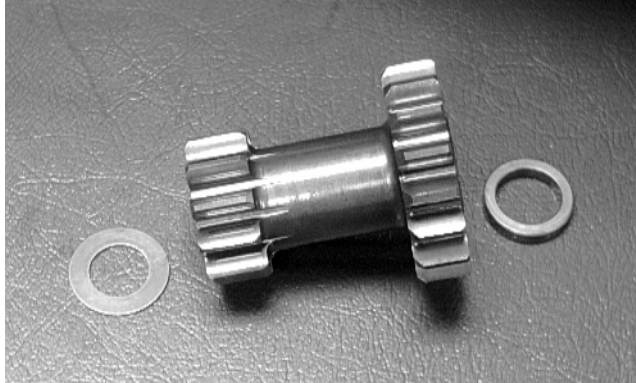
CC456D

9. Remove the starter clutch gear assembly (G) from the crankcase.
10. Remove the outer drive gear assembly (I) w/washer from the driveshaft.
11. Remove the circlip and washer from the sub-transmission shaft (A); then remove the driven gear/driven gear assembly (H) from the shaft.
12. Remove the short shift shaft (J) from the crankcase.
13. Remove the short shift fork.

14. Remove the long shift shaft (K) from the crankcase (4x4).
15. Remove the long shift fork (4x4).
16. Remove the driven gear dog (4x4) from the sub-transmission shaft (A).
17. Remove the drive gear dog from the driveshaft (B).
18. Remove the idler gear and washers from the countershaft (C). Account for the thick spacer on the inside.



CC478D



CC477D



CC479D

19. Remove the sub-transmission gear cam (M) from the crankcase.
20. Remove the inner drive gear circlip from the driveshaft (B); then remove the inner drive gear and washer from the driveshaft. Account for a bushing and a spacer. Note the location of the oil hole in the bushing for installing purposes.

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



CC476D

Right-Side Components

21. Remove the Phillips-head screws securing the shift-indicator sending unit; then remove the sending unit. Account for an O-ring, neutral contact, and spring.

■ **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.

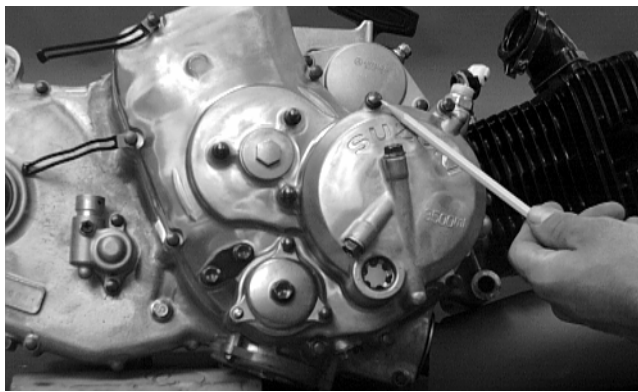
👉 AT THIS POINT
 To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

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

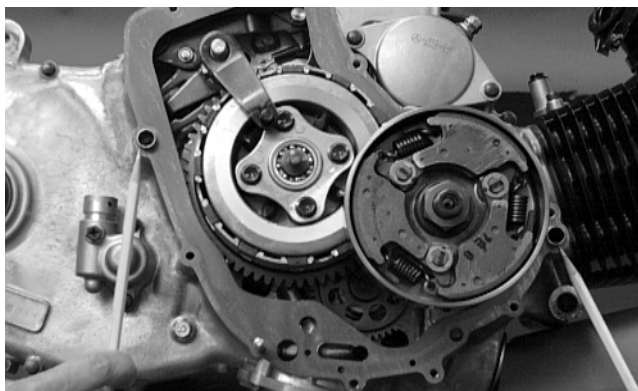
Removing Right-Side Components

A. Cover

1. Turn the gas tank valve to the OFF position.
2. Remove the two oil cooler hoses from the cover; then remove the cap screws securing the right-side cover to the crankcase.
3. Disconnect the oil temperature sensor and remove the cover. Note the locations of the long cap screw and rubber washer and the two wire forms. Account for the gasket and for two alignment pins.



CC421D



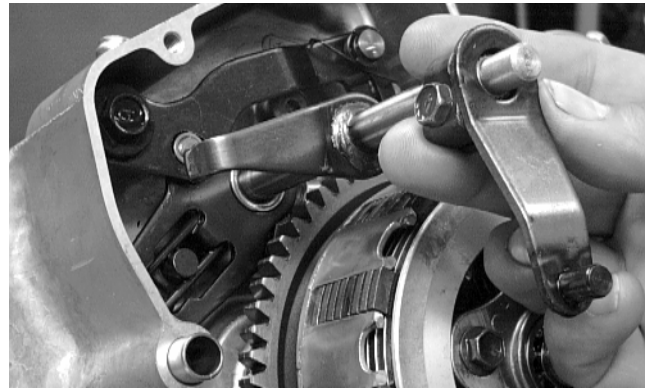
CC423D

■ **NOTE:** It will be necessary to remove the lower rear oil filter cover stud and the upper arm cap screws to provide clearance for removing the cover.

- B. Release Roller Assembly**
- C. Starter Clutch Shoe**
- D. Starter Clutch Housing**
- E. Primary Clutch**

■ **NOTE:** Steps 1-3 in the preceding sub-section must precede this procedure.

4. Slide the clutch release arm and gear shift shaft out of the crankcase; then in a crisscross pattern, remove the four cap screws securing the clutch release roller assembly.



CC424D

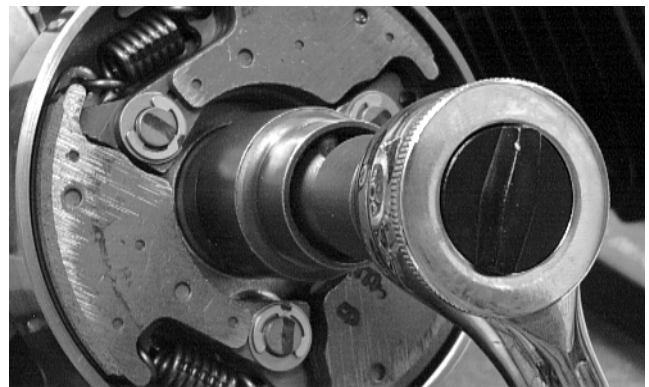


CC425D

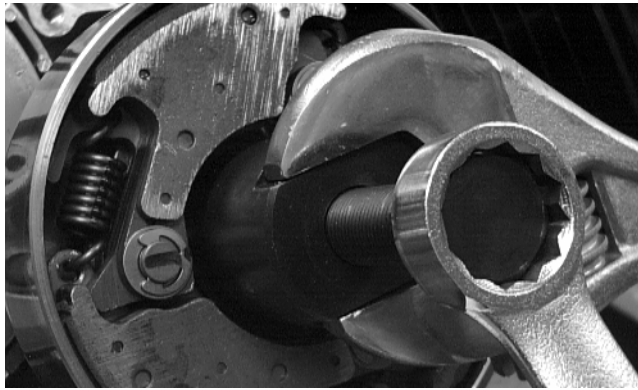
5. Remove the release roller assembly. Account for four springs.
6. Remove the primary clutch assembly nut (left-hand threads) and washer from the crankshaft; then using a clutch remover, remove the clutch assembly.

⚠ CAUTION

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



CC426D



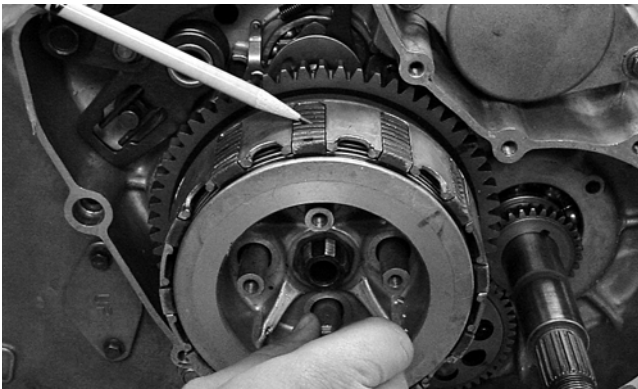
CC427D

7. Remove the primary drive one-way clutch and inner race; then remove the primary drive gear.
8. Using a clutch sleeve hub holder to hold the clutch hub, remove the nut and bevel washer.



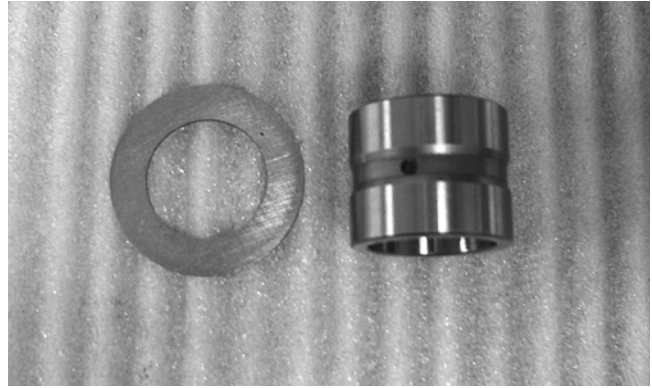
CD377

■NOTE: Note the location of the alignment notches in the clutch plates to aid in installing.



CC914

9. Remove the driven clutch assembly from the countershaft. Account for the bushing and washer.



CD314

AT THIS POINT

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

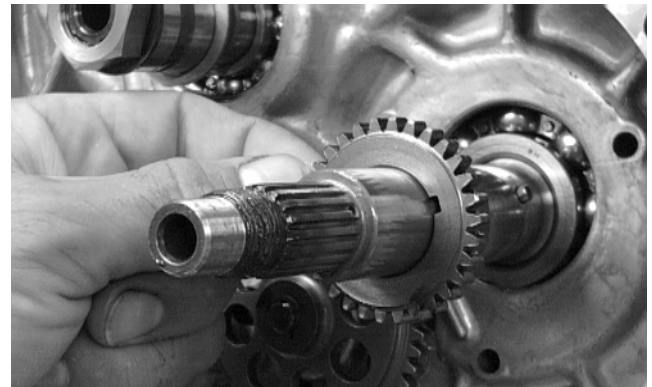
**F. Gear Shifting Arm
G. Oil Pump/Oil Strainer**

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

10. Remove the oil pump drive gear from the crankshaft; then account for the pin.

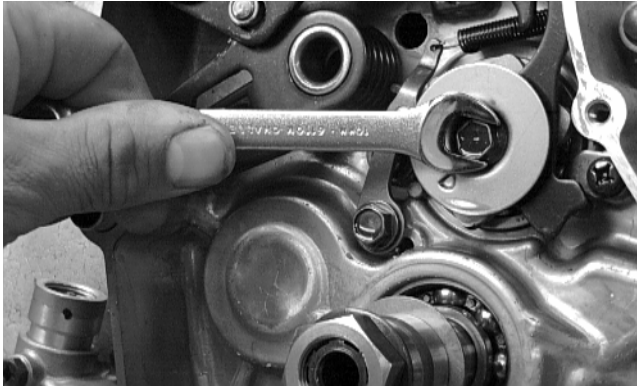
CAUTION

Care should be taken to not allow the pin to drop into the crankcase.



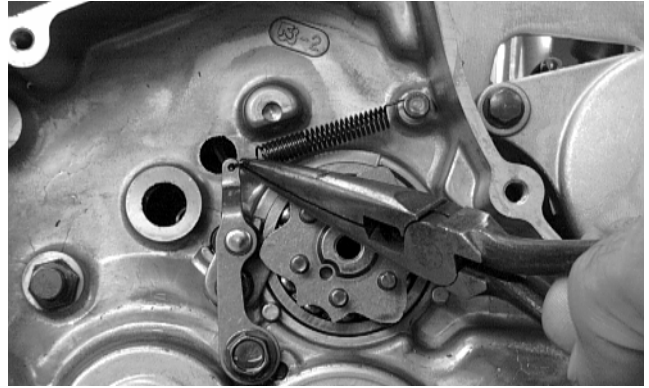
CC432D

11. Remove the cap screw securing the gear shift stopper plate pin retainer; then remove the retainer.



CC433D

12. Remove the cap screw securing the gear shifting arm assembly; remove the assembly and account for a washer and a roller.



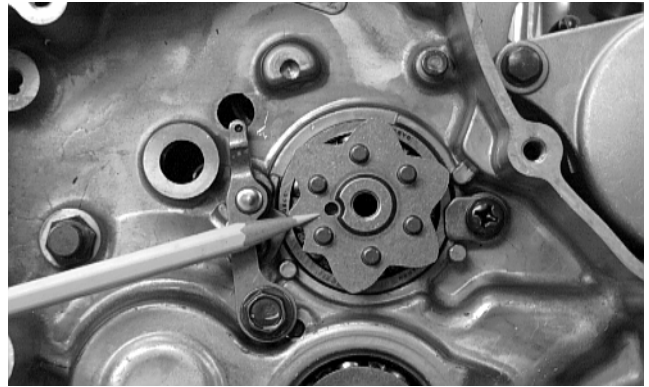
CC437D

15. Remove the stopper plate and account for six pins. Note the location of the alignment pin.



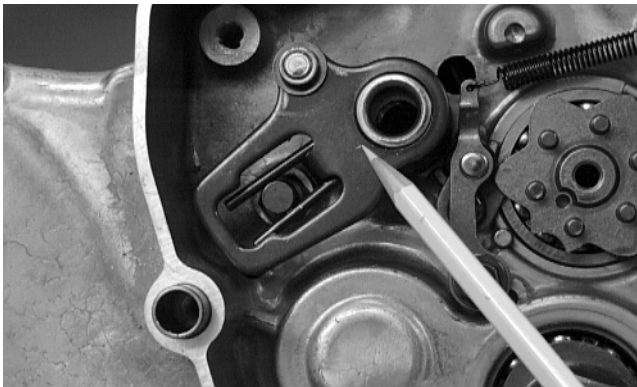
CD380

13. Remove the link arm and account for the spring and the roller.



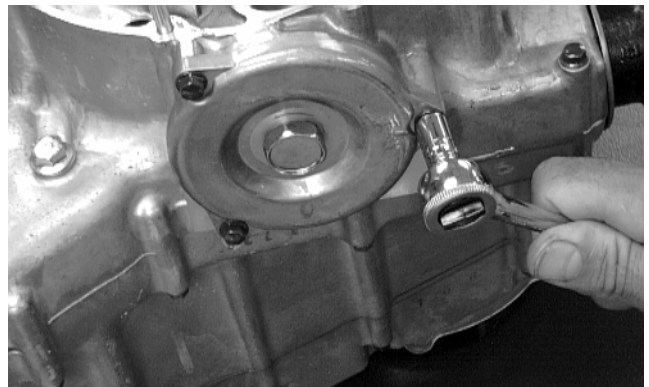
CC438D

16. Remove the cap screws securing the oil strainer cap. Note the arrow on the cap for assembly purposes.



CC436D

14. Remove the spring from the cam stopper.



CC442D

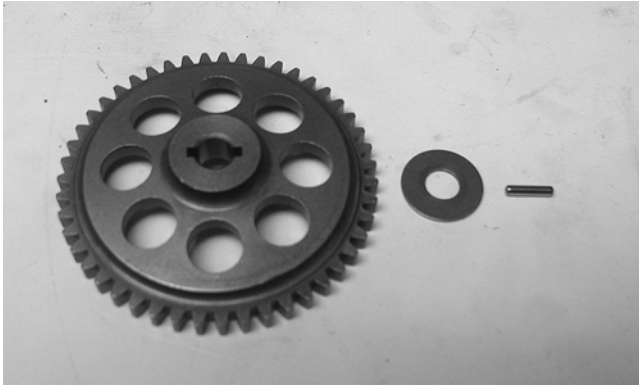
17. Remove the screws securing the strainer; then remove the strainer.



CC443D

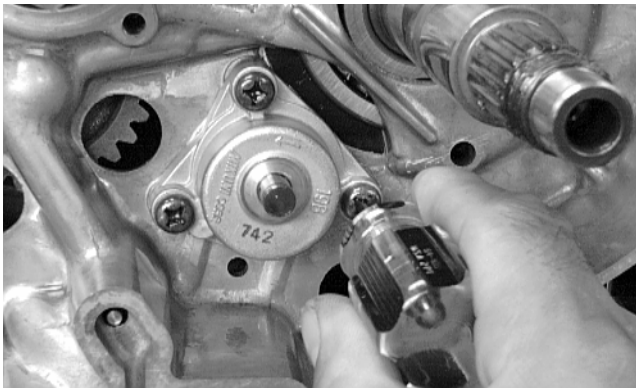
■ **NOTE:** If service on the oil pump is necessary, follow steps 18-19.

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



KX228

19. Remove the screws securing the oil pump; then remove the pump.



CC440D

👉 AT THIS POINT

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

Center Crankcase Components

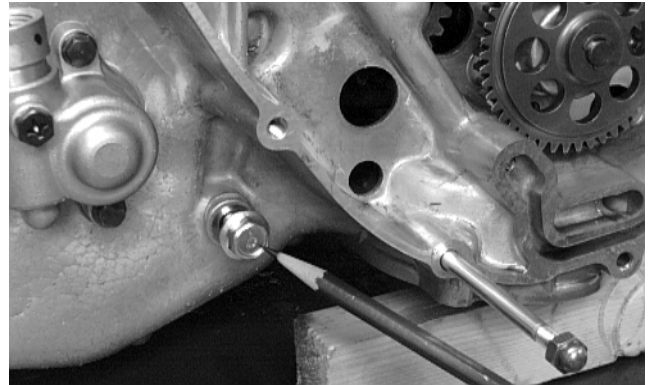
■ **NOTE:** This procedure cannot be done with the engine/transmission in the frame. Complete Removing procedures for Top-Side, Left-Side, and Right-Side must precede this procedure.

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

Separating Crankcase Halves

3

1. Remove the two cap screws securing the starter to the crankcase; then remove the starter. Account for the wiring forms and an O-ring.
2. Remove the right-side cap screws securing the crankcase halves. Note the location of the cap screw with the copper washer.



CC481D

3. Remove the left-side cap screws securing the crankcase halves. Note the location of the different-lengthed cap screws.
4. Using a crankcase separator and tapping lightly with a rubber mallet, separate the crankcase halves. Account for two alignment pins and an O-ring and remove a washer from the reverse shifting cam.

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

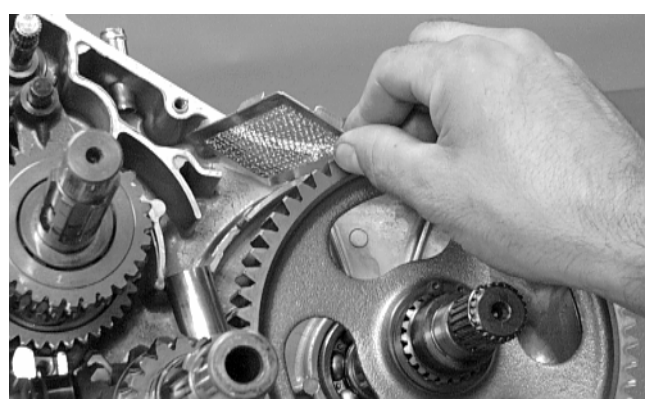
Disassembling Crankcase Half



CD392A



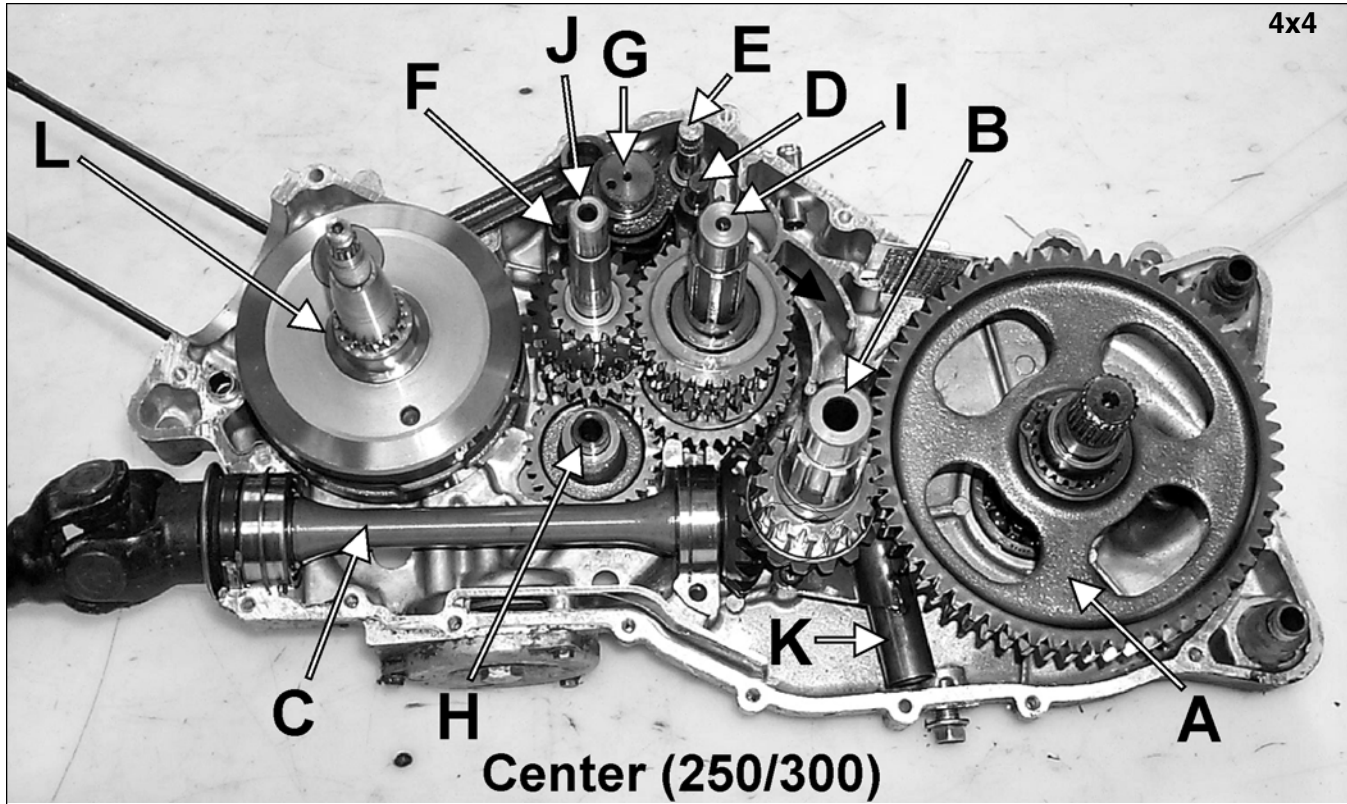
CC486D



CC487D

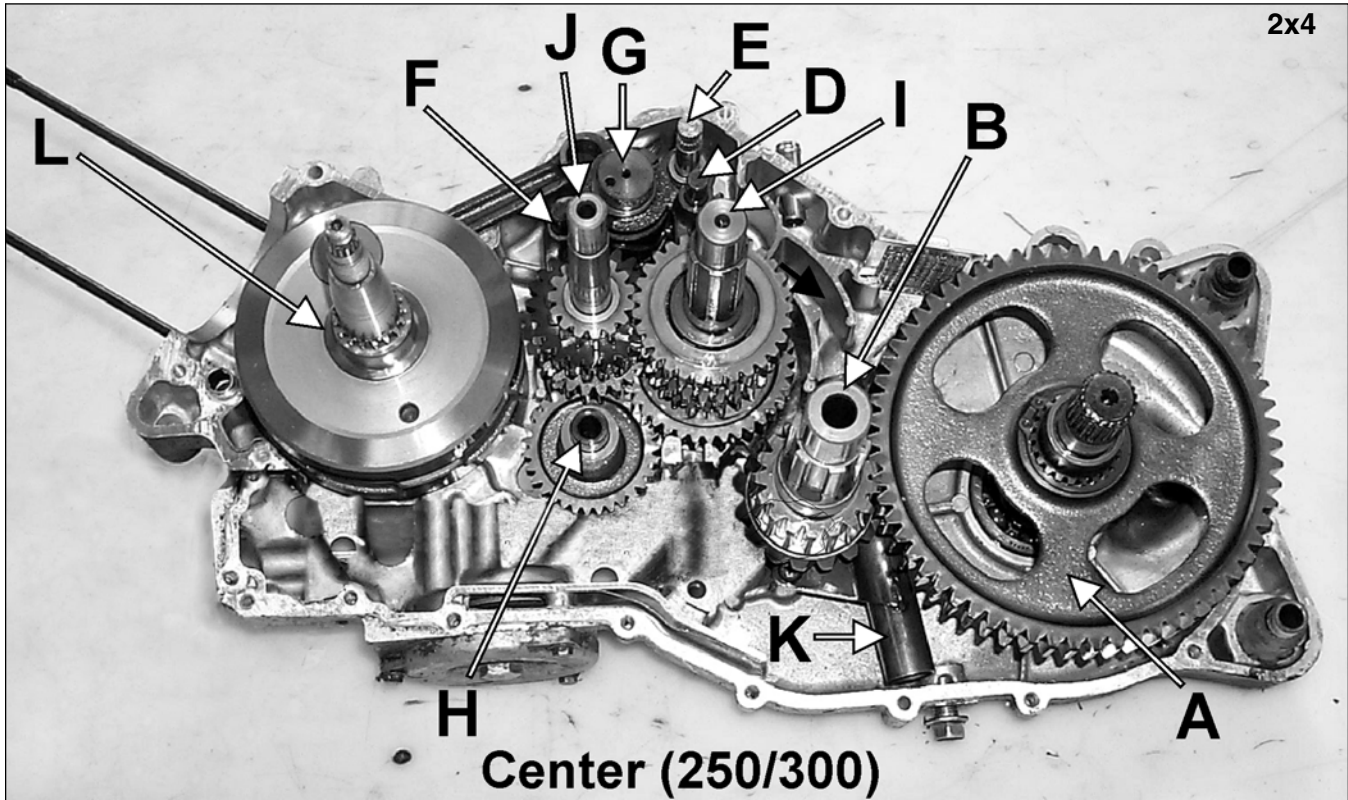
1. On the 300, remove the oil breather screen from the crankcase. Note the direction of the tabs for assembling purposes.

■ **NOTE:** For steps 2-17, refer to illustration CC836B (4x4) or to illustration CC872C (2x4).



- KEY**
- | | |
|--------------------------------------|---------------------------------|
| A. Final Driven Gear with Shaft | G. Gear Shifting Cam |
| B. Sub-Transmission Shaft Assembly | H. Reverse Idler Shaft Assembly |
| C. Secondary Output Shaft (4x4 only) | I. Driveshaft Assembly |
| D. Shift Shaft (Long) with 3 Forks | J. Countershaft Assembly |
| E. Reverse Shifting Cam | K. Oil Pipe |
| F. Shift Shaft (Short) with 1 Fork | L. Crankshaft Assembly |

CC836B



3

KEY

- | | |
|------------------------------------|---------------------------------|
| A. Final Driven Gear with Shaft | G. Gear Shifting Cam |
| B. Sub-Transmission Shaft Assembly | H. Reverse Idler Shaft Assembly |
| C. N/A | I. Driveshaft Assembly |
| D. Shift Shaft (Long) with 3 Forks | J. Countershaft Assembly |
| E. Reverse Shifting Cam | K. Oil Pipe |
| F. Shift Shaft (Short) with Fork | L. Crankshaft Assembly |

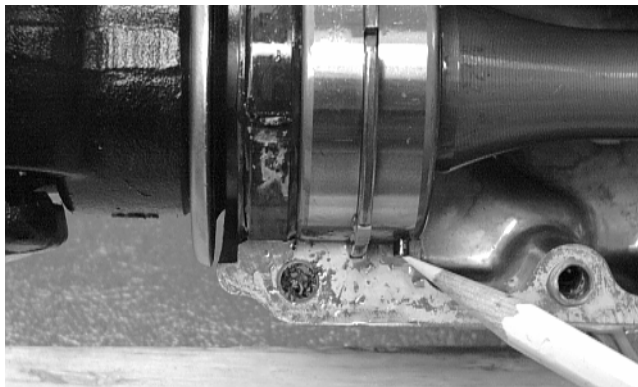
CC872C

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

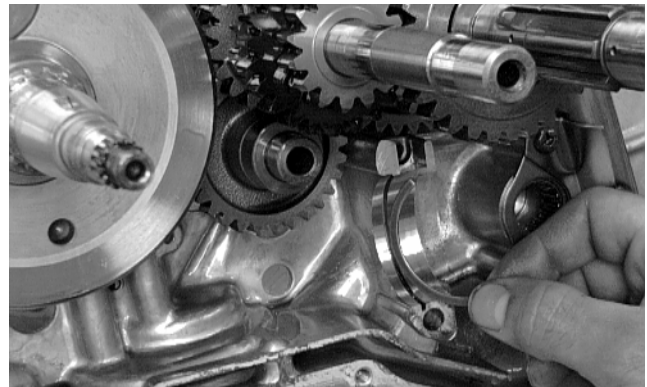
2. Remove the rear final driven gear w/shaft (A).
3. Remove the sub-transmission shaft assembly (B).

■ **NOTE:** On the 4x4, note the location of the bearing alignment pin on the secondary output shaft (C).

4. On the 4x4, remove the secondary output shaft (C); then account for the C-ring.

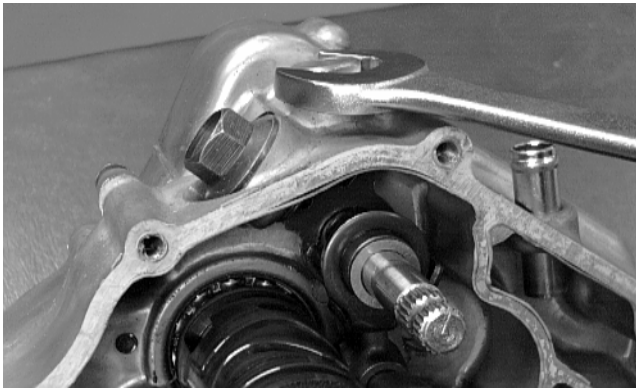


CC490D



CC492D

5. Remove the cam stopper detent and gasket from the crankcase.



CC493D

6. Remove the long shift shaft (D).
7. Remove the outer fork and center fork noting the difference in the forks for assembling purposes.



CD393

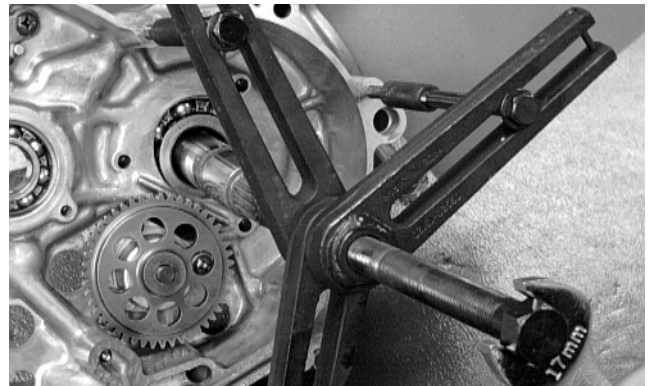
8. Remove the reverse shifting cam (E).
9. Remove the reverse fork (from the same shaft as in step 7).
10. Remove the front shift shaft (F).
11. Remove the fork.
12. Remove the gear shifting cam (G).
13. Remove the spacer from the reverse idle shaft assembly (H).

14. Remove the reverse idle shaft assembly (H). Account for the gear, bushing, and washer.
15. Simultaneously, remove the driveshaft assembly (I) and countershaft assembly (J) from the crankcase.



CC505D

16. Using a crankshaft remover, push the crankshaft assembly (L) out of the crankcase.



CC507D

AT THIS POINT

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

17. Remove the Phillips-head screws securing the oil pipe (K) to the crankcase.

Table of Contents

(Servicing Components)

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

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Servicing Top-Side Components

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

VALVE ASSEMBLY

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

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

Cleaning/Inspecting Valve Cover

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

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

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

CAUTION

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



CC385D

3

CAUTION

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

Removing Valves

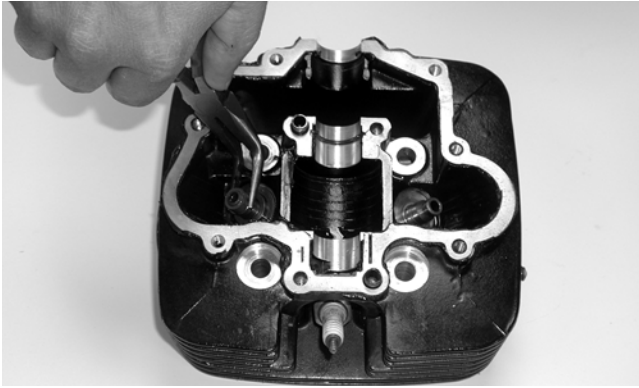
■ **NOTE:** Keep all valves and valve components as a set. Note the original location of each valve set for use during installation. Return each valve set to its original location during installation.

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

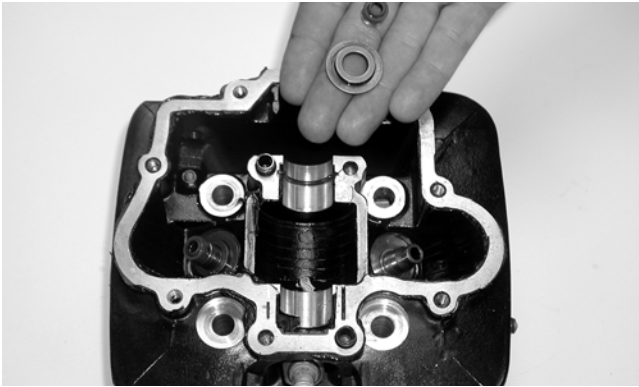


CC391D

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



CC928



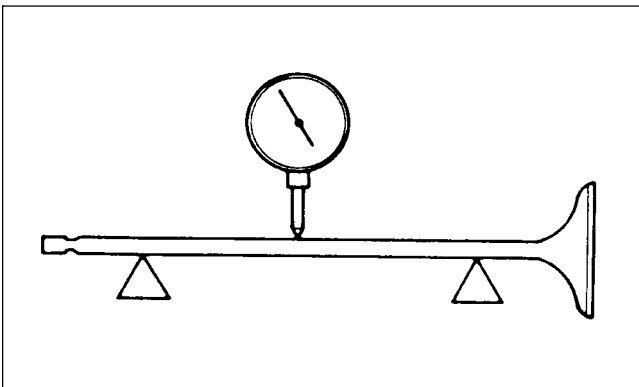
CC929

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

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

Measuring Valve Stem Runout

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



ATV-1082

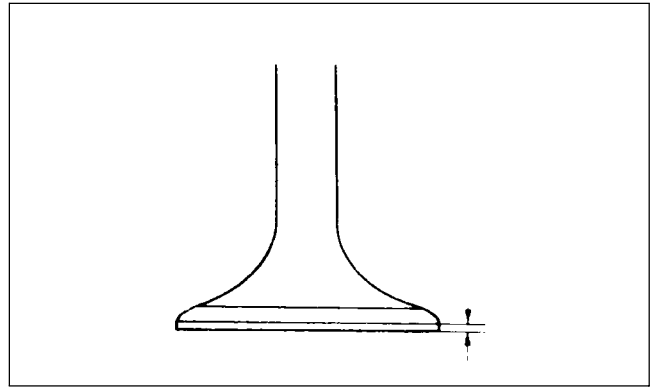
- Maximum runout must not exceed specifications.

Measuring Valve Stem Outside Diameter

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

Measuring Valve Face/Seat Width

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

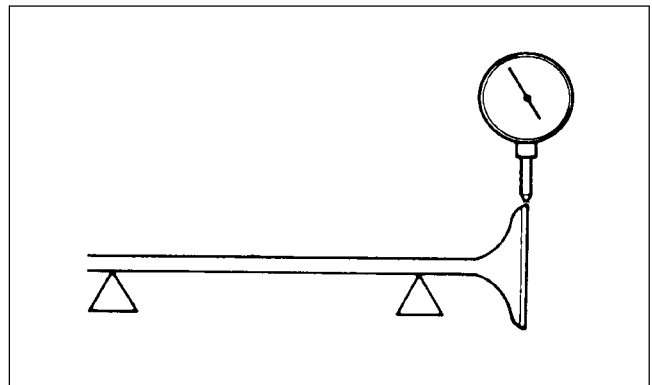


ATV-1004

- Acceptable width range must be within specifications.

Measuring Valve Face Radial Runout

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

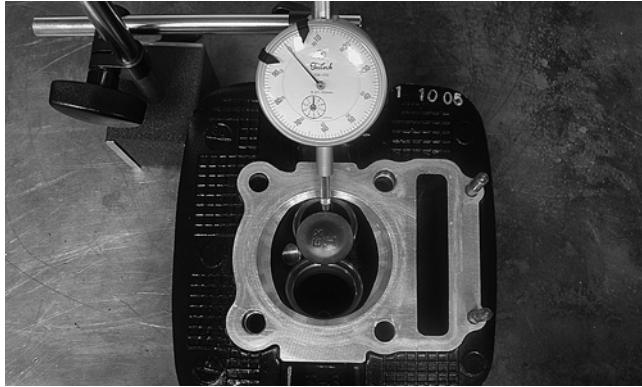


ATV1082A

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

Measuring Valve Guide/Valve Stem Deflection (Wobble Method)

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.



CD391

3. Push the valve from side to side; then from top to bottom.
4. Maximum “wobble” deflection must not exceed specifications.

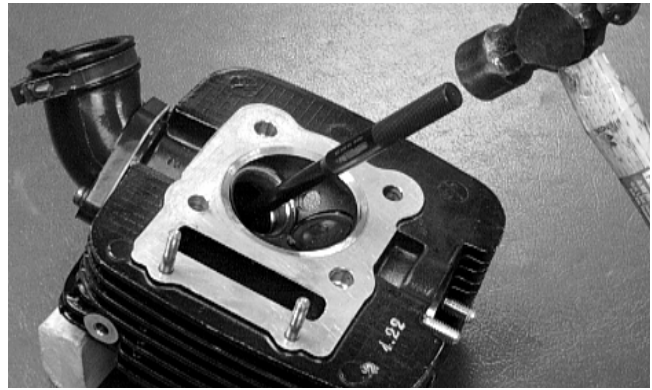
Measuring Valve Guide (Inside Diameter)

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.

Replacing Valve Guide

■NOTE: If a valve guide is worn or damaged, it must be replaced.

1. If a valve guide needs replacing, insert a valve guide remover into the valve seat side of the valve guide. Using a hammer, gently drive the valve guide out of the cylinder head.



CC393D

2. Using an appropriate reamer, remove any burrs or tight areas from the valve guide journals.



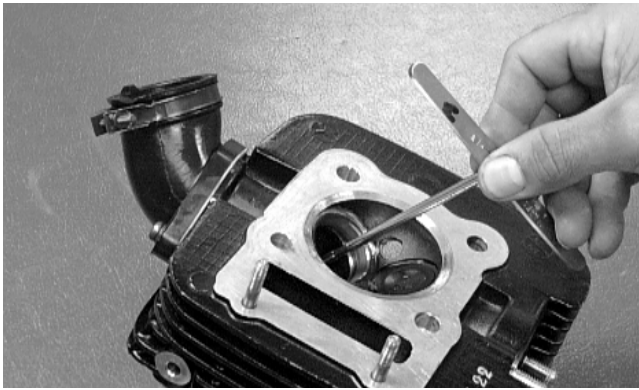
CC931

3. To install a valve guide, use a valve guide installer and gently drive a valve guide with a retaining clip into the bore from the valve spring side until the retaining clip just contacts the cylinder head.

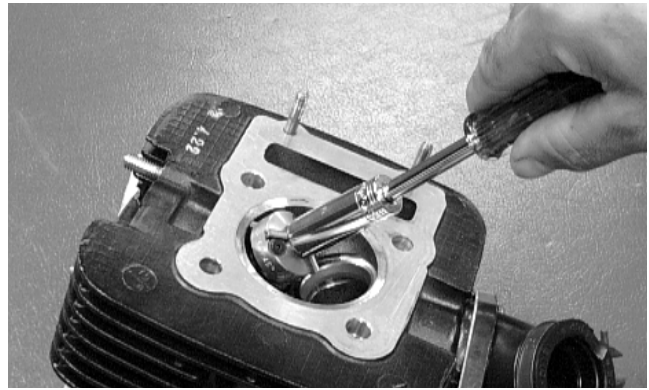


CC932

4. After installing the guide, use the standard valve guide reamer to remove all burrs and tight areas that may remain in each valve guide.

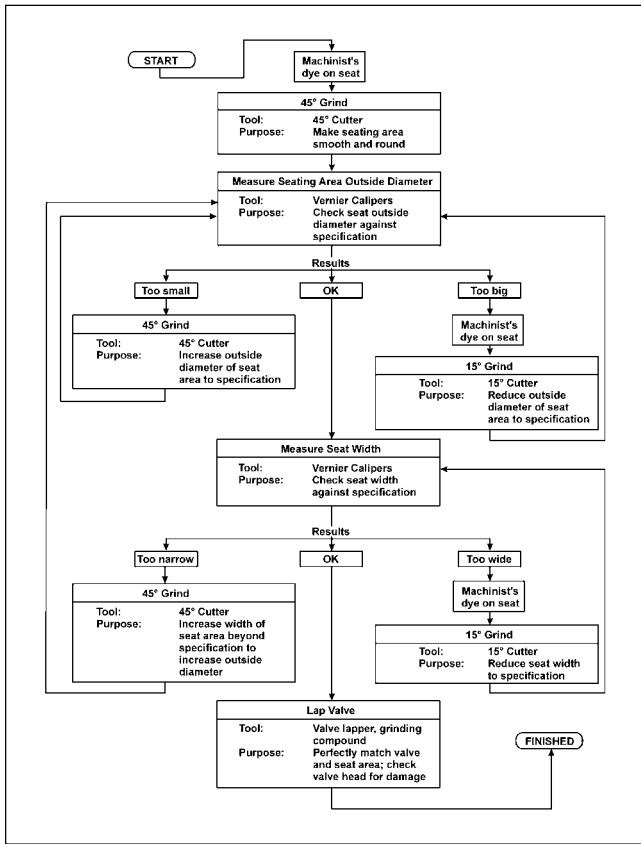


CC394D



CC396D

Valve Seat/Guide Servicing Flow Chart



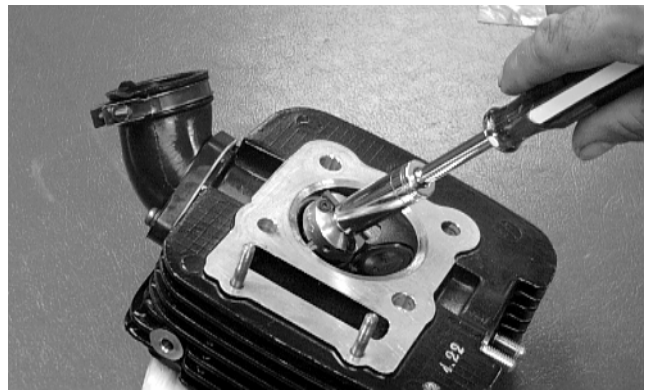
ATV-0107

Grinding Valve Seats

■ **NOTE:** If the valve seat is beyond servicing, the cylinder head must be replaced.

1. Insert an exhaust valve seat pilot shaft into the exhaust valve guide. Slide the exhaust valve seat grinding tool onto the pilot shaft; then using light pressure on a driver handle and a deep socket, grind the exhaust valve seat until within specifications.

2. Insert an intake valve seat pilot shaft into the intake valve guide. Slide the intake valve seat grinding tool onto the pilot shaft; then using light pressure on a driver handle and a deep socket, grind the intake valve seat until within specifications.



CC395D

Lapping Valves

■ **NOTE:** Do not grind the valves. If a valve is damaged, it must be replaced.

1. Remove all carbon from the valves.
2. Lubricate each valve stem with light oil; then apply a small amount of valve lapping compound to the entire seating face of each valve.
3. Attach the suction cup of a valve lapping tool to the head of the valve.
4. Rotate the valve until the valve and seat are evenly polished.
5. Clean all compound residue from the valve and seat.

Measuring Rocker Arm (Inside Diameter)

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

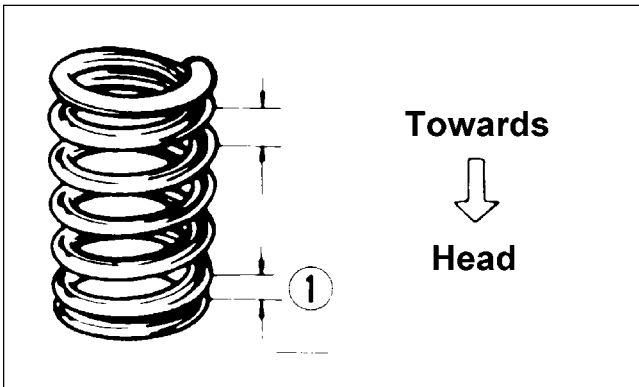
Measuring Rocker Arm Shaft (Outside Diameter)

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

Installing Valves

1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.
2. Insert each valve into its original valve location.
3. Install the valve springs with the painted end of the spring facing away from the cylinder head.

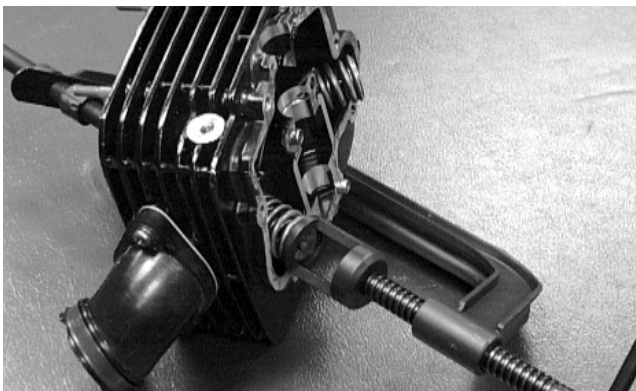
■ **NOTE:** If the painted end is not visible, install the ends of the springs with the closest coils toward the head.



ATV-1011A

■ **NOTE:** The 250 has only the larger spring.

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



CC391D

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.



AN135

3

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

4. Inspect the perimeter of the piston for signs of excessive “blowby.” Excessive “blowby” indicates worn piston rings or an out-of-round cylinder.

Removing Piston Rings

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



CC400D

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

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

Cleaning/Inspecting Piston Rings

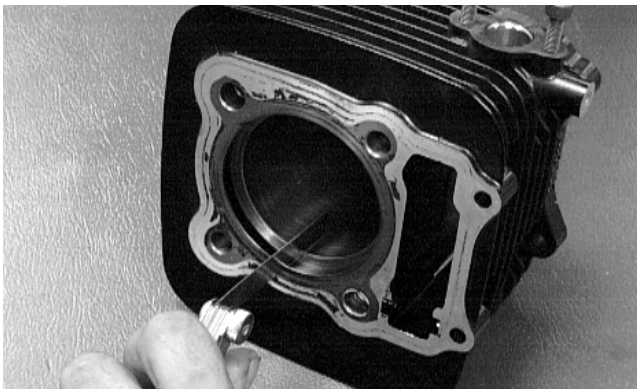
1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

CAUTION

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

Measuring Piston-Ring End Gap (Installed)

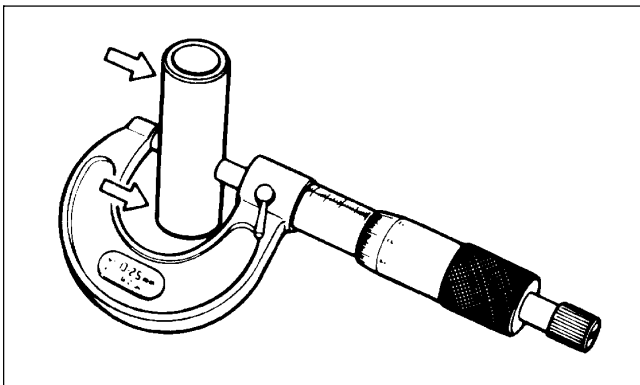
1. Place each piston ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must be within specifications.



CC386D

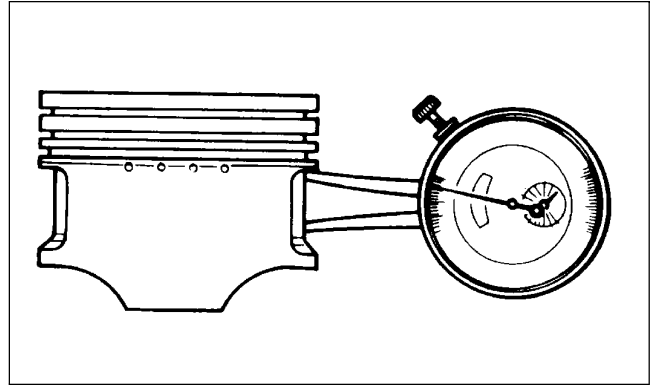
Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

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



ATV-1070

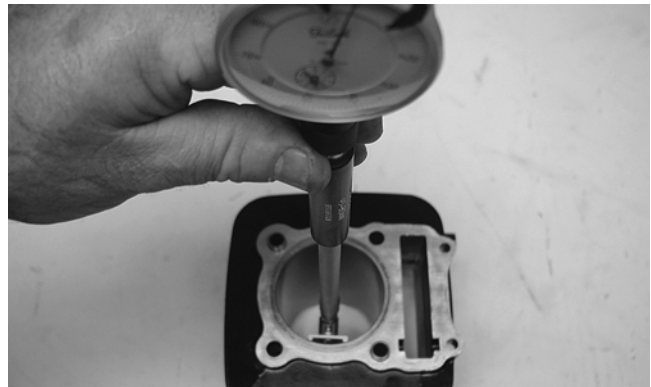
2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



ATV-1069

Measuring Piston Skirt/ Cylinder Clearance

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



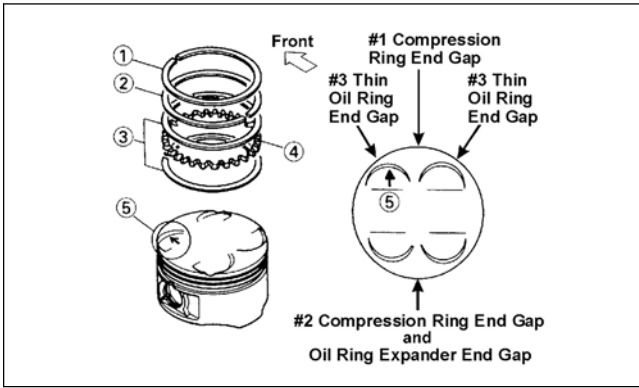
CD325

2. Measure the corresponding piston diameter at a point 18 mm (0.71 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 ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap. Stagger the end gaps of the upper and lower thin oil rings according to the illustration.

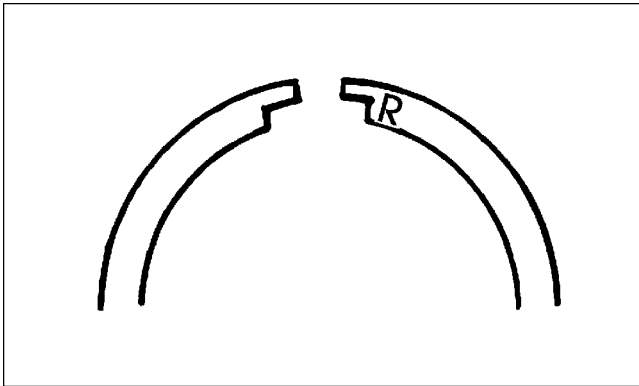
■ **NOTE:** Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.



ATV-1085B

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

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



726-306A

CAUTION

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

CYLINDER/CYLINDER HEAD ASSEMBLY

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

Cleaning/Inspecting Cylinder Head

CAUTION

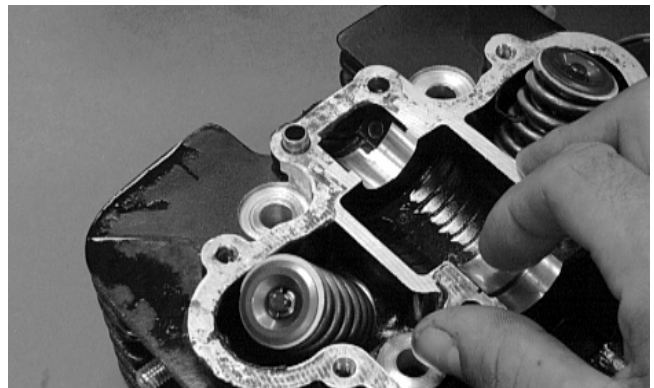
The cylinder head studs must be removed for this procedure.

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the combustion chamber being careful not to nick, scrape, or damage the combustion chamber or the sealing surface.

2. Inspect the spark plug hole for any damaged threads. Repair damaged threads using a “heli-coil” insert.
3. Place the cylinder head on the surface plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the cylinder head in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the cylinder head in a figure eight motion until a uniform bright metallic finish is attained.

CAUTION

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

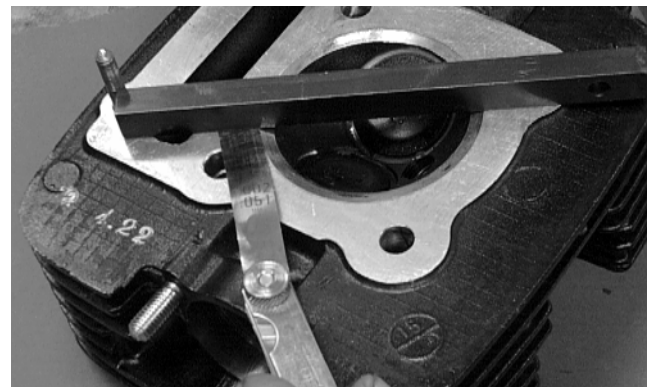


CC387D

3

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.



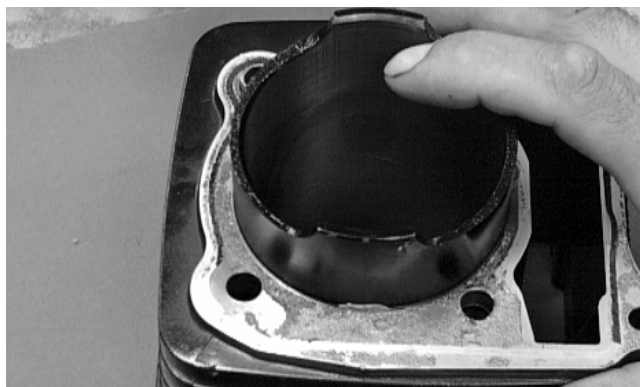
CC388D

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.



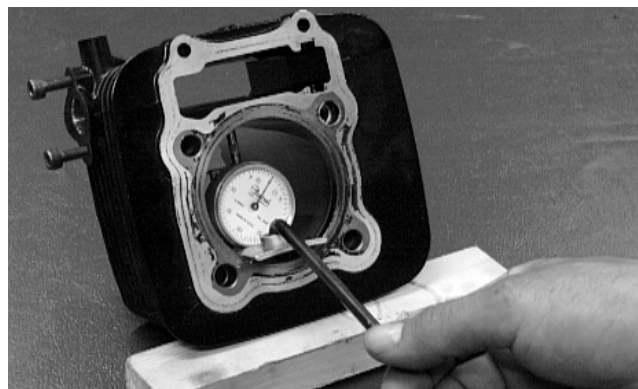
CC389D

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

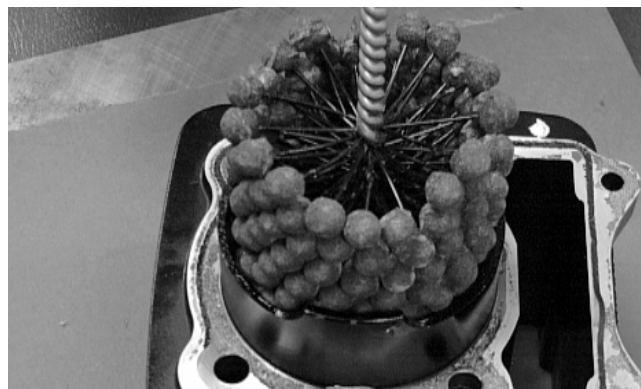
1. Using a slide gauge and a dial indicator or a snap gauge, measure the cylinder bore diameter in three locations from top to bottom and again from top to bottom at 90° from the first measurements for a total of six measurements. The trueness (out-of-roundness) is the difference between the highest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



CC397D

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

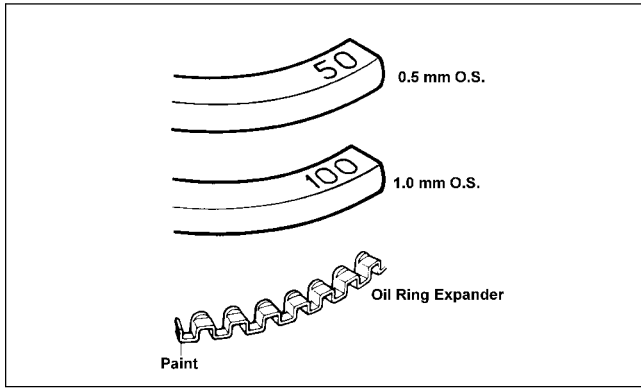
■ **NOTE:** To produce the proper 60° cross-hatch pattern, use a low RPM drill (600 RPM) at the rate of 30 strokes per minute. If honing oil is not available, use a lightweight petroleum-based oil. Thoroughly clean cylinder after honing using soap and hot water. Dry with compressed air; then immediately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



CC390D

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

■ **NOTE:** Oversized piston and rings are available. The oversized piston and rings are marked for identification.

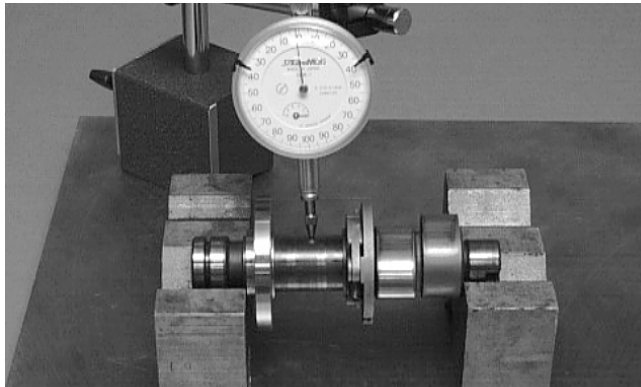


ATV-1068

Measuring Camshaft Runout

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

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

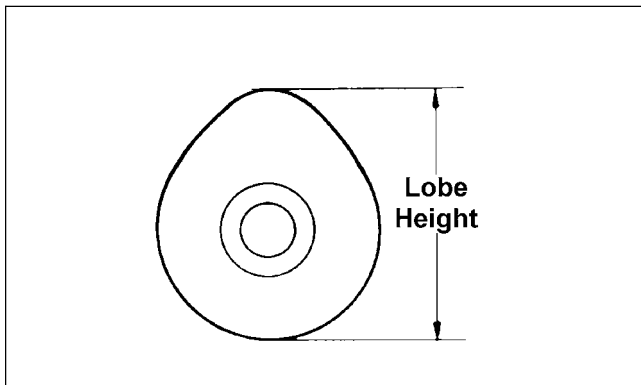


CC283D

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

Measuring Camshaft Lobe Height

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



ATV1013A

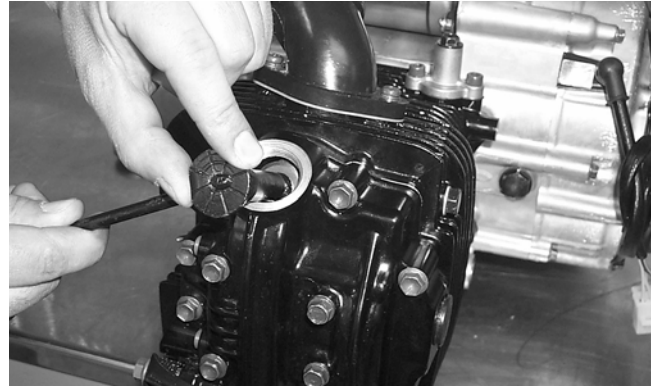
2. The lobe heights must not exceed minimum specifications.

Inspecting Camshaft Bearing Journal

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

Measuring Camshaft to Cylinder Head Clearance

1. Remove the adjuster screws and jam nuts.



CC522D

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.

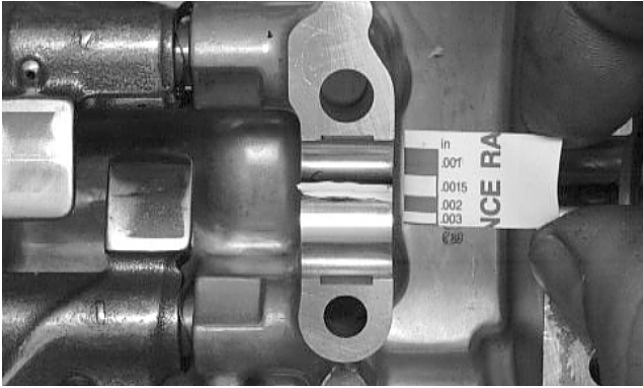
■ **NOTE:** Do not rotate the camshaft when measuring clearance.

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



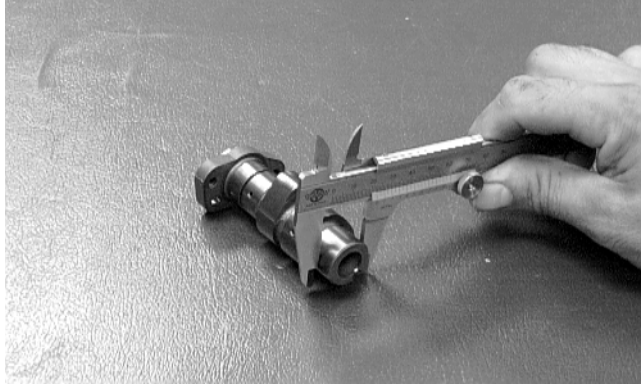
CC367D

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.

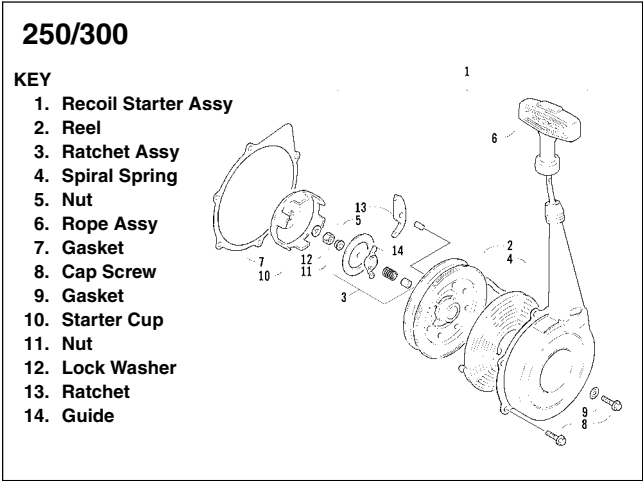


CC399D

■ **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.

Servicing Left-Side Components

RECOIL STARTER

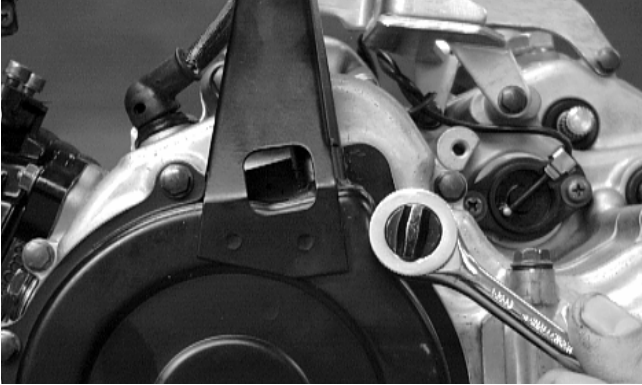


0736-194

⚠ WARNING
Always wear safety glasses when servicing the recoil starter.

Removing/Disassembling

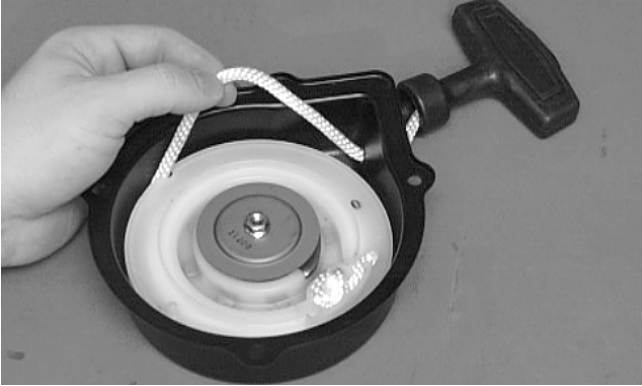
1. Remove the cap screws securing the recoil starter assembly to the left-side cover; then remove the starter noting the location of the single washer closest to the center of the crankcase. Account for a gasket.



CC412D

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

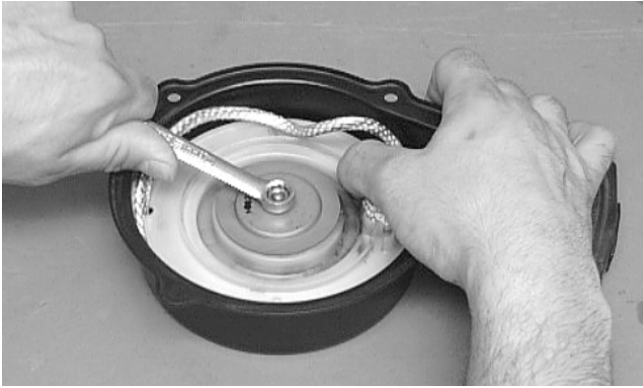
2. Rotate the reel counterclockwise until the notch of the reel is near the rope guide in the case. Guide the rope into the notch and slowly allow the reel to retract until all spiral spring tension is released.



B600D

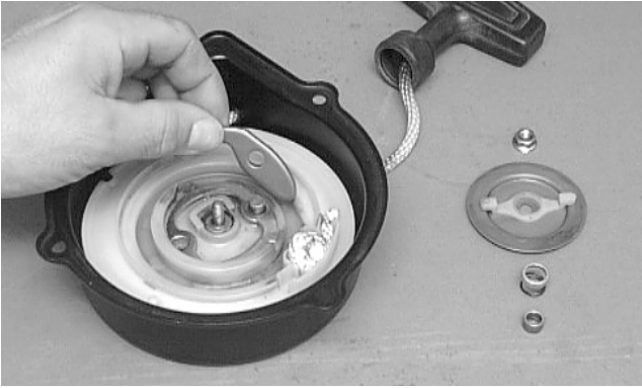
⚠ CAUTION
During the disassembly procedure, make sure all spring tension is released before continuing.

3. Remove the nut.



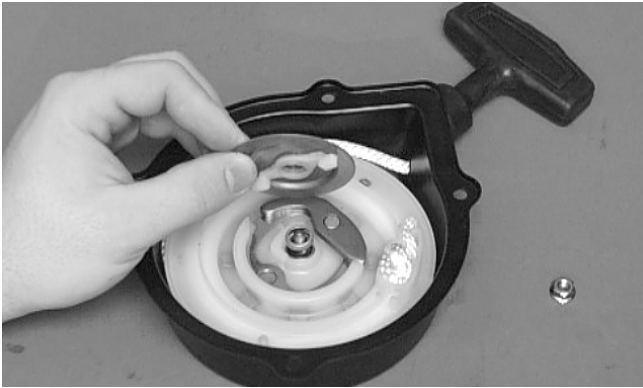
B601D

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



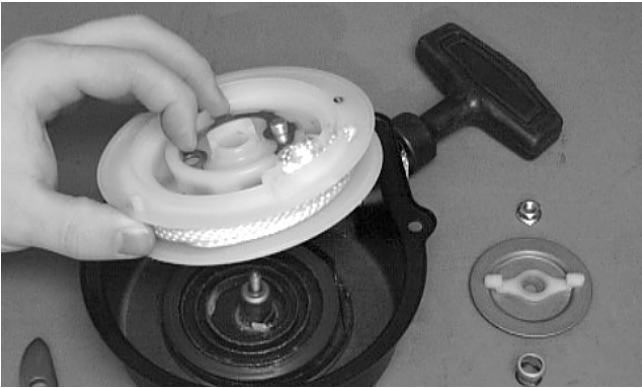
B604D

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



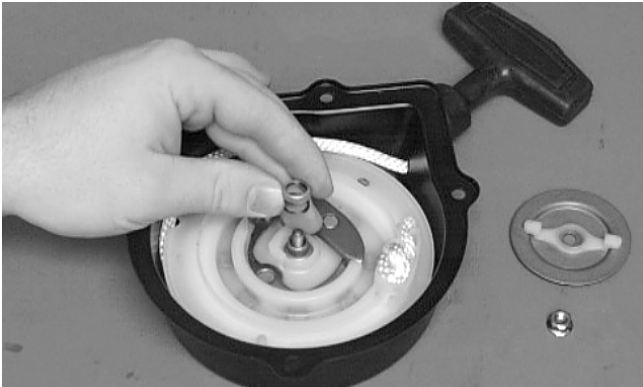
B602D

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



B605D

6. Remove the ratchet and account for the spring.



B603D

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

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

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

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

10. Unwind the rope from the reel and remove the rope.

Cleaning and Inspecting

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

1. Clean all components.

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

Assembling/Installing

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

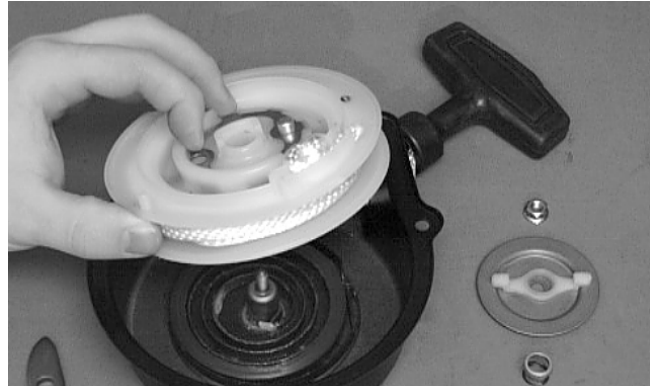
■ **NOTE:** The spiral spring must seat evenly in the recoil case.



B606D

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

5. Align the inner hook of the spiral spring with the notch in the reel.



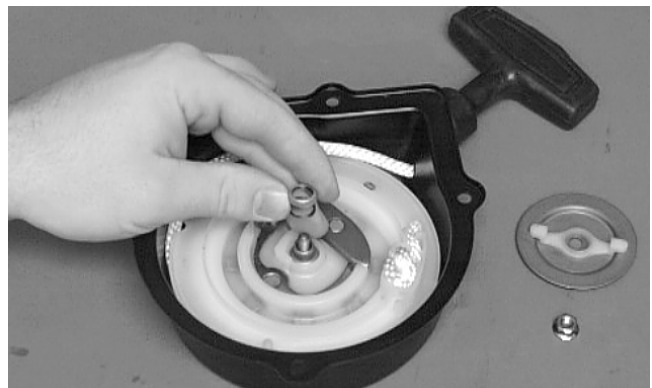
B605D

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



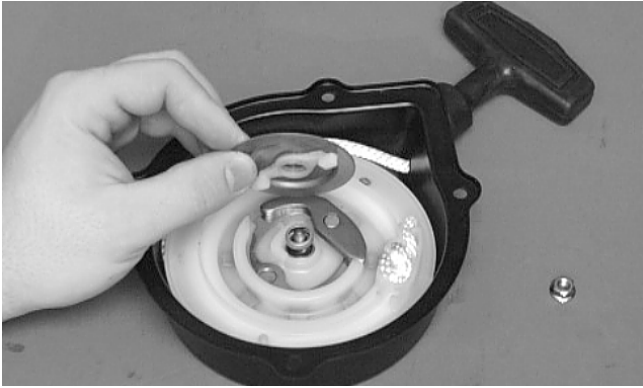
B604D

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



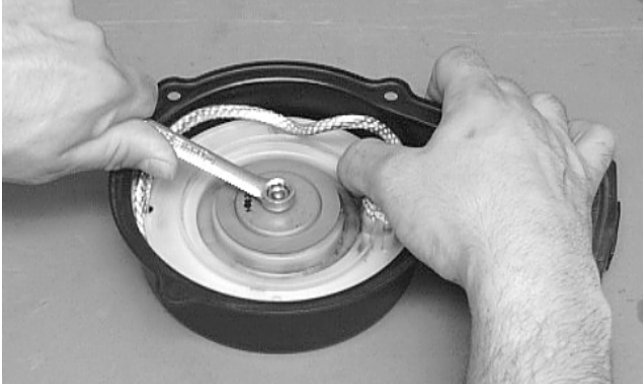
B603D

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



B602D

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



B601D

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

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

13. Place the gasket and recoil starter assembly into position on the left-side cover noting the location of the single washer; then tighten the cap screws to specifications.



CC412D

MEASURING SHIFT FORK (Thickness)

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

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



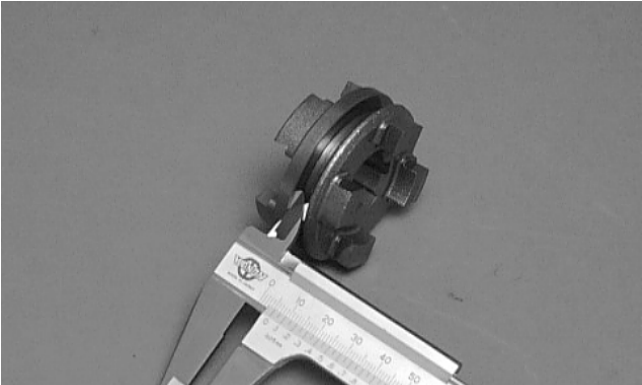
CC296D

- 2. Shift fork thickness must be within specifications.

3

MEASURING SHIFT FORK GROOVE (Width)

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



CC288D

- 2. Shift fork groove width must be within specifications.

MEASURING SHIFT FORK TO GROOVE (Side Clearance)

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



CC292D

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

Servicing Right-Side Components

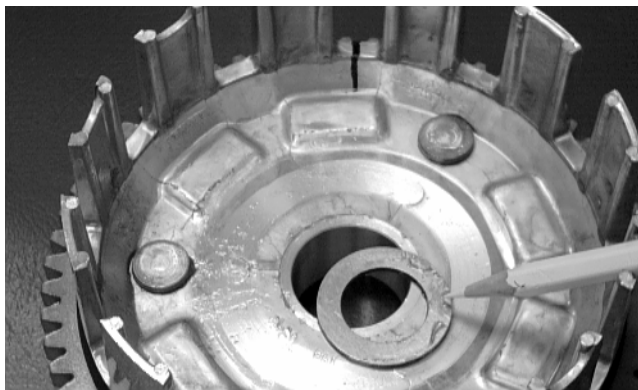
■ **NOTE:** Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.

PRIMARY CLUTCH ASSEMBLY (Inspecting/Measuring/Assembling)

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

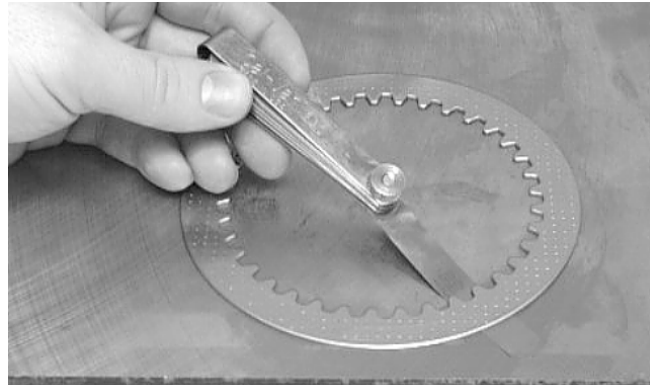
Inspecting/Measuring Clutch Driven Plate Warpage

■ **NOTE:** After removing the clutch hub and clutch plates, account for the washer beneath the clutch hub.



CC444D

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

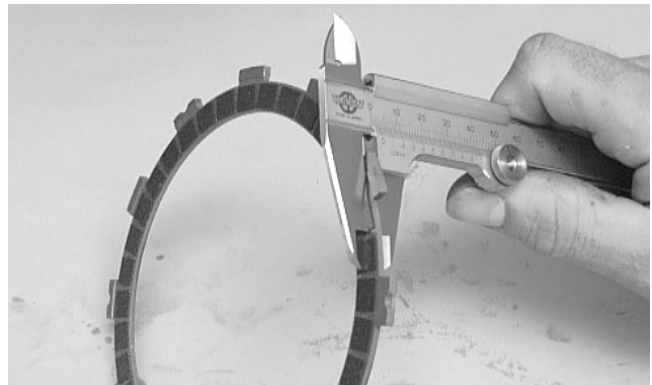


CC245D

3. Maximum driven plate warpage must not exceed specifications.

Measuring Clutch Drive Plate (Fiber) Thickness

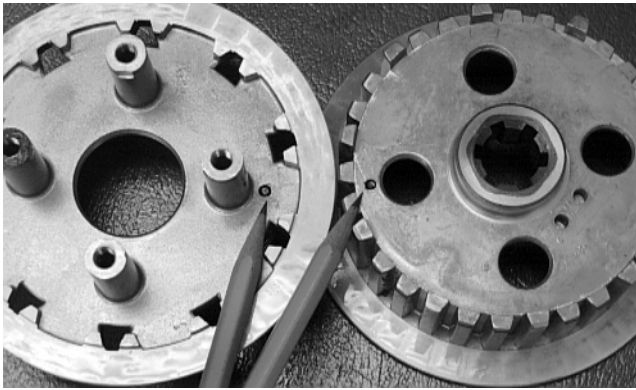
1. Using a calipers, in turn measure the thickness of each drive plate in several locations.



CC243D

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

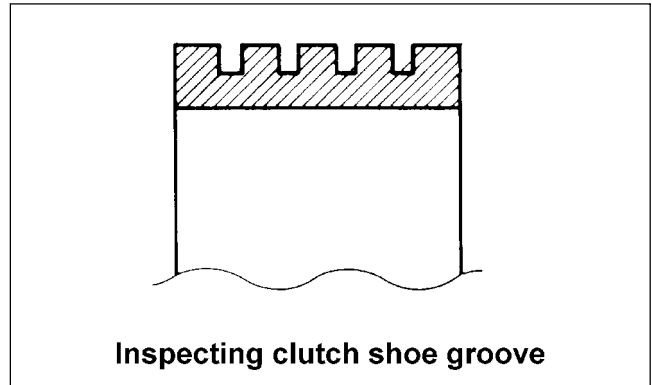
■ **NOTE:** Note the location of the timing mark on the hub for assembly purposes.



CC448D

Inspecting Starter Clutch Shoe

1. Inspect the starter clutch shoe for uneven wear, chips, cracks, or burns.
2. Inspect the groove on the shoe for wear or damage.
3. If any damage to the shoe or any groove wear is noted, the shoe must be replaced.



ATV1014

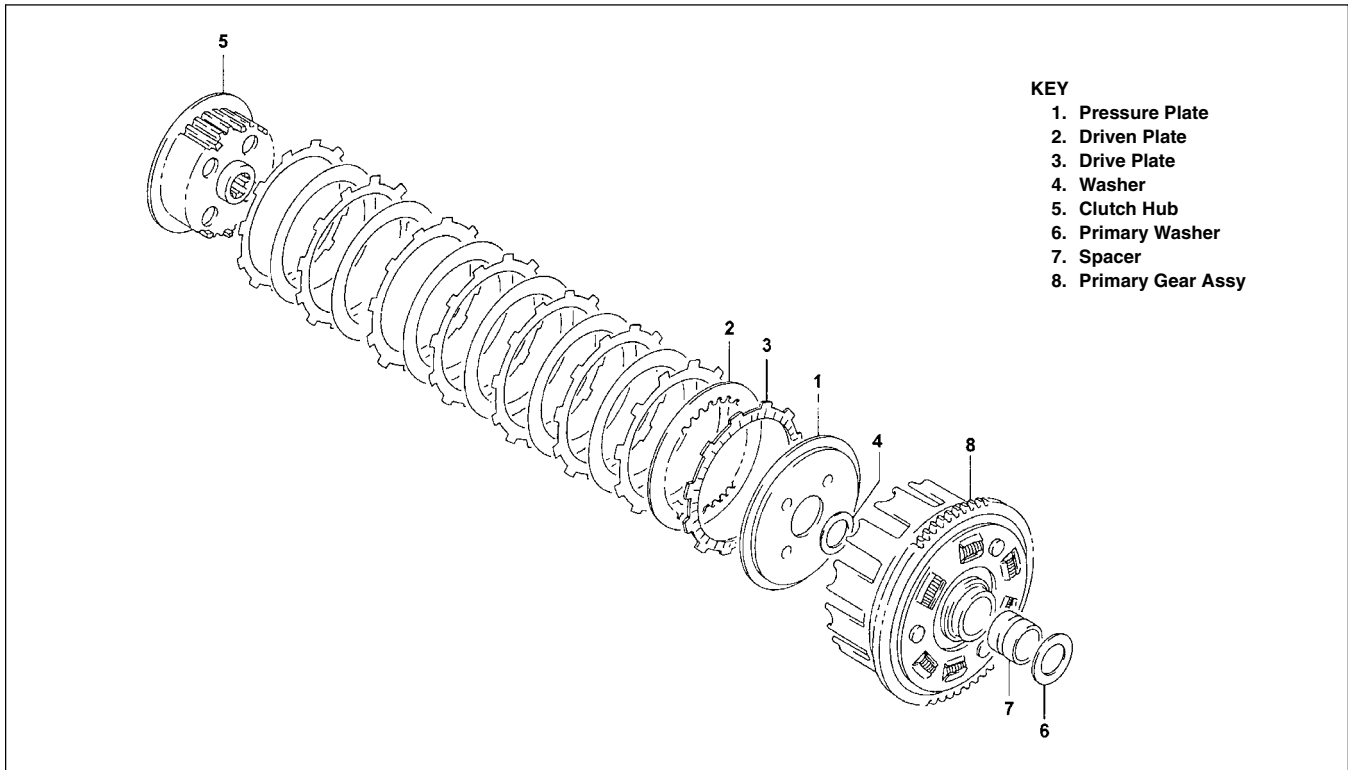
Inspecting Starter Clutch Housing

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

Inspecting Primary One-Way Drive

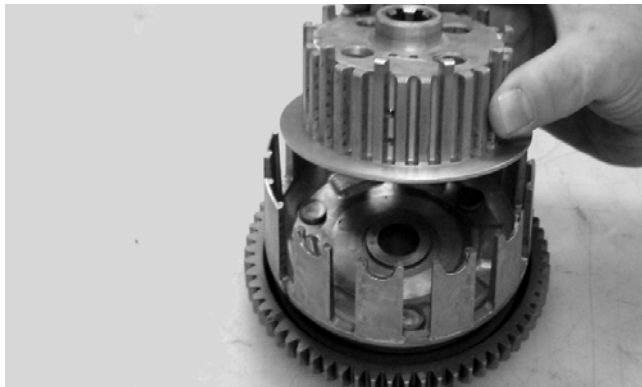
1. Insert the drive into the clutch housing.
2. Rotate the inner race by hand and verify the inner race rotates only one direction.
3. If the inner race is locked in place or rotates both directions, the drive assembly must be replaced.

Assembling Primary Clutch



733-753A

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



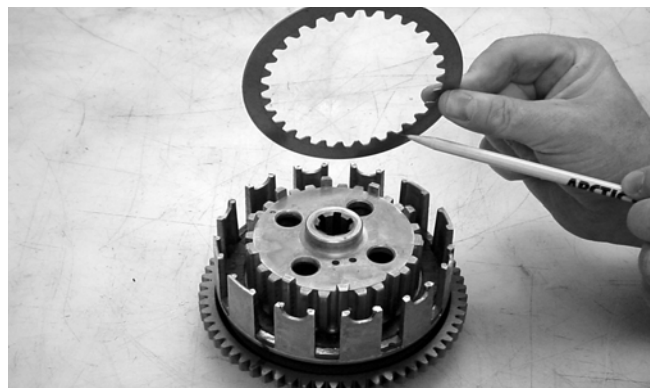
CC920



CC921

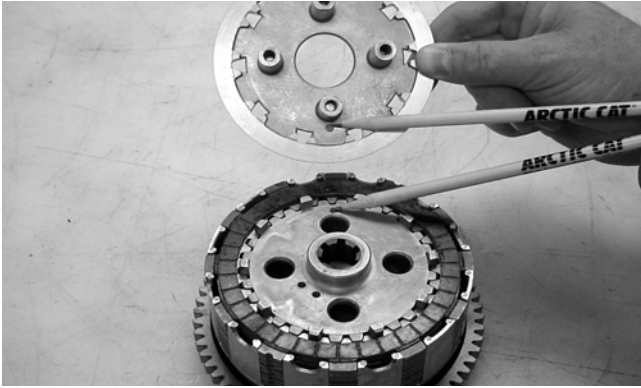
■ **NOTE:** When installing the driven plates for ease of installation, make sure they are placed onto the hub with the rounded side of the plates directed down.

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



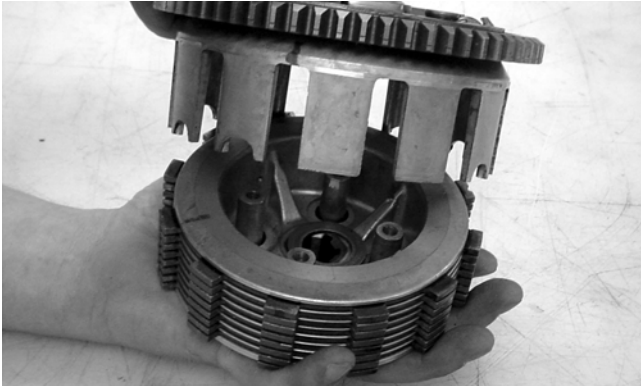
CC922

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



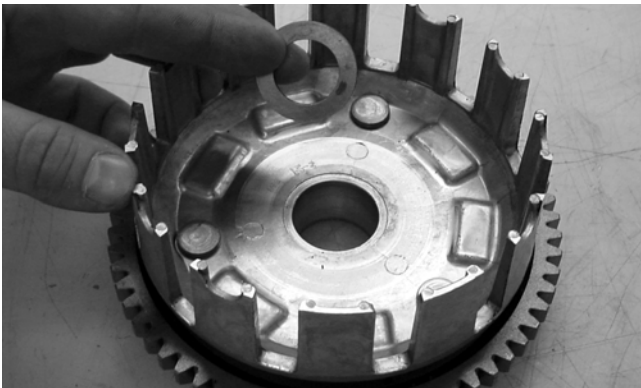
CC923

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



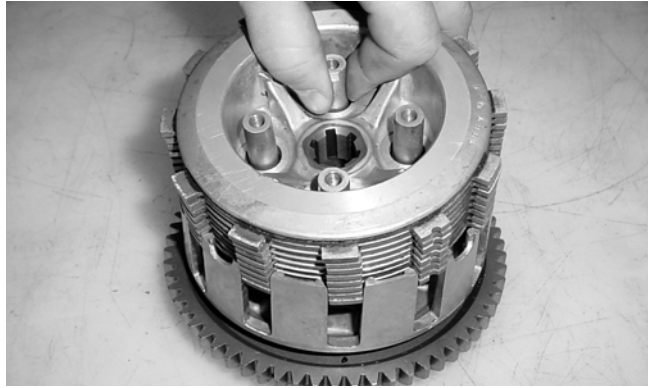
CC924

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



CC925

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



CC926

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

3

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

INSPECTING OIL PUMP

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



CC446D

Servicing Center Crankcase Components

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

SECONDARY GEARS

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

Checking Backlash

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

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

Correcting Backlash

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

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

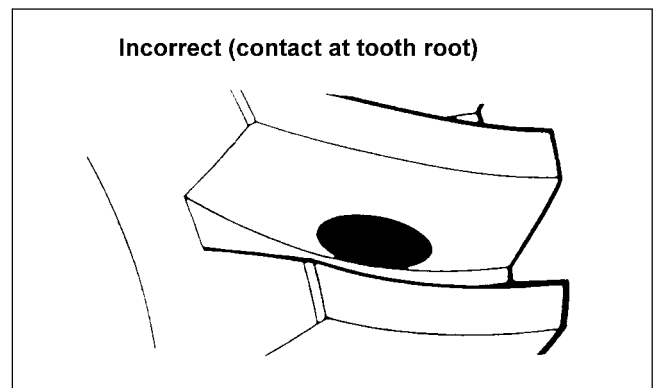
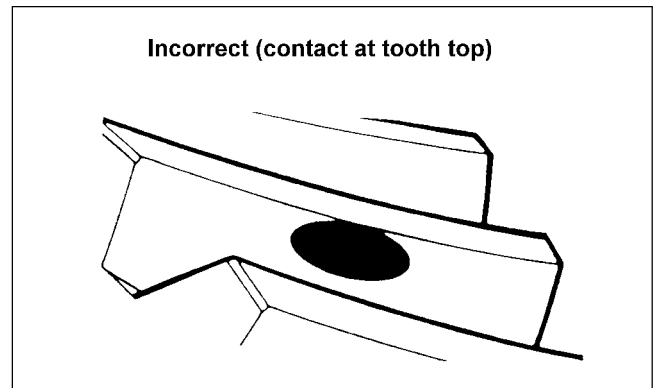
■ **NOTE:** Continue to remove, measure, and install until backlash measurement is within tolerance. Note the following chart.

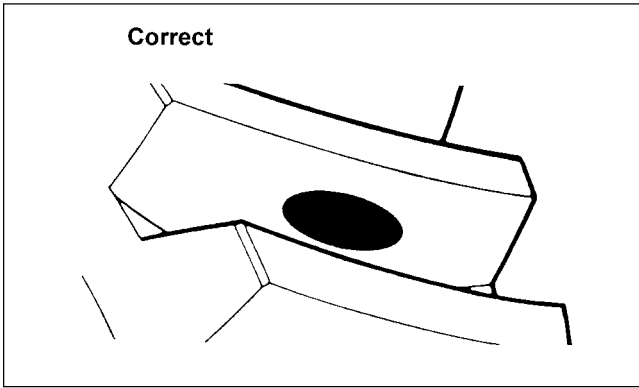
Backlash Measurement	Shim Correction
Under 0.05 mm (0.002 in.)	Decrease Shim Thickness
At 0.05-0.33 mm (0.002-0.013 in.)	No Correction Required
Over 0.33 mm (0.013 in.)	Increase Shim Thickness

Checking Tooth Contact

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

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





ATV-0104

Correcting Tooth Contact

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

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

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

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

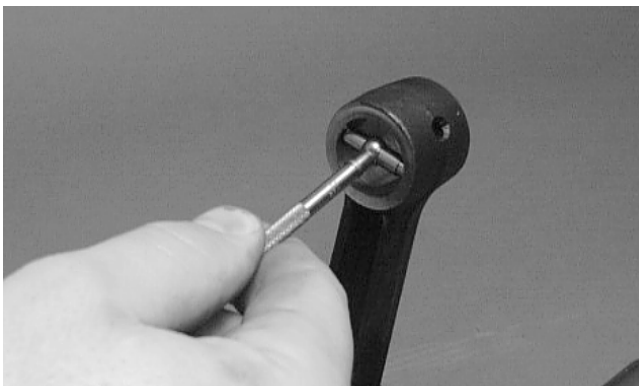
CAUTION

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

CRANKSHAFT ASSEMBLY

Measuring Connecting Rod (Small End Inside Diameter)

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



CC290D

2. Maximum diameter must not exceed specifications.

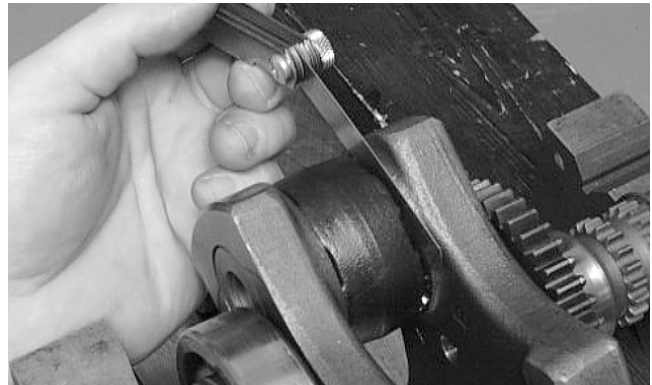
Measuring Connecting Rod (Small End Deflection)

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

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

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

3



CC289D

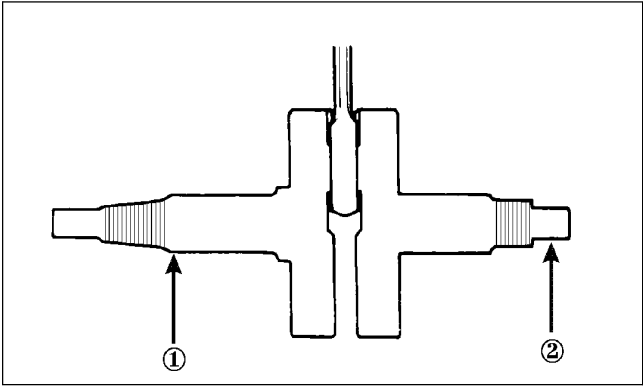
3. Acceptable gap range must be within specifications.

Measuring Connecting Rod (Big End Width)

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

Measuring Crankshaft (Runout)

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



ATV-1074

3. Zero the indicator and rotate the crankshaft slowly.

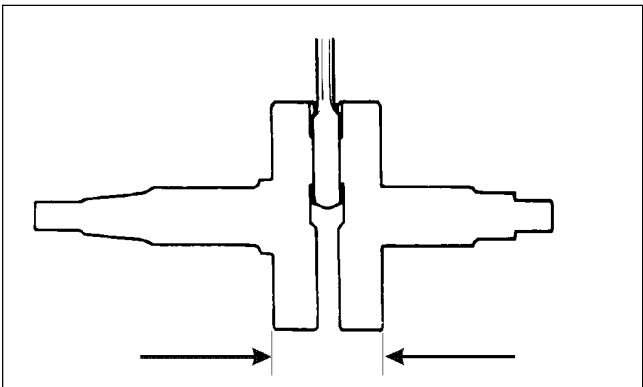
CAUTION
Care should be taken to support the connecting rod when rotating the crankshaft.

4. Maximum runout must not exceed specifications.

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

Measuring Crankshaft (Web-to-Web)

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



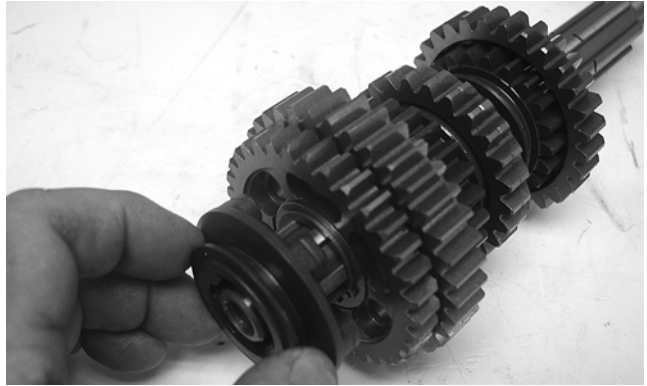
ATV-1017

2. Acceptable width range must be within specifications.

DRIVESHAFT

Disassembling

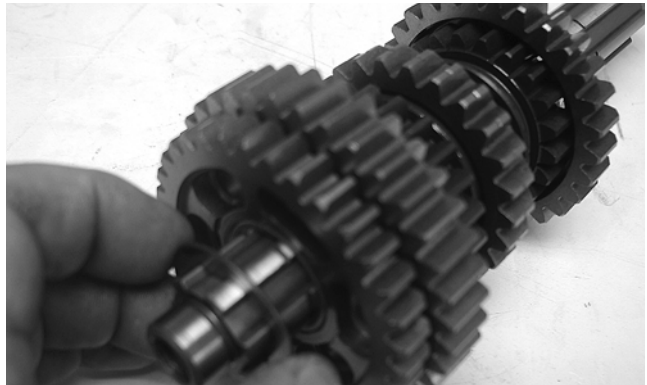
1. In order, remove the reverse dog, circlip, washer, reverse driven gear, and bushing from the driveshaft.



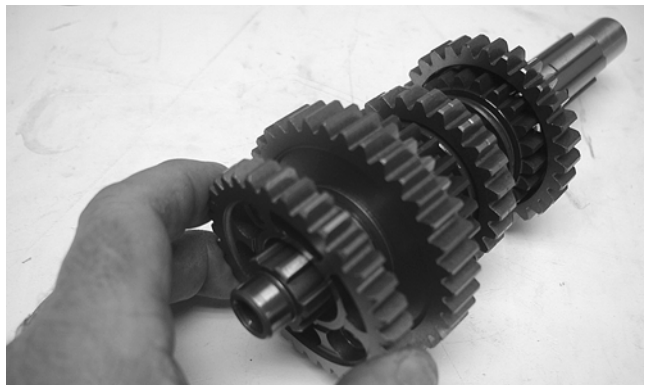
CD331



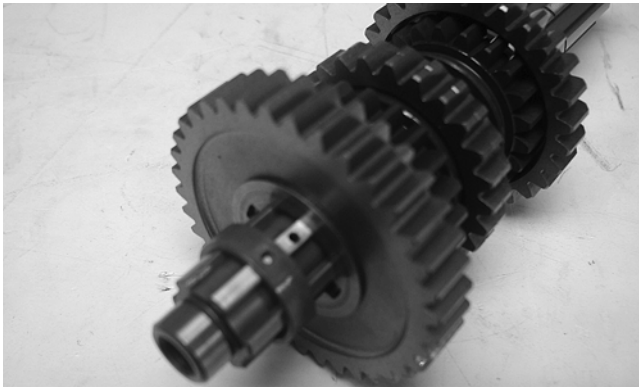
CD332



CD335



CD336



CD338

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

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

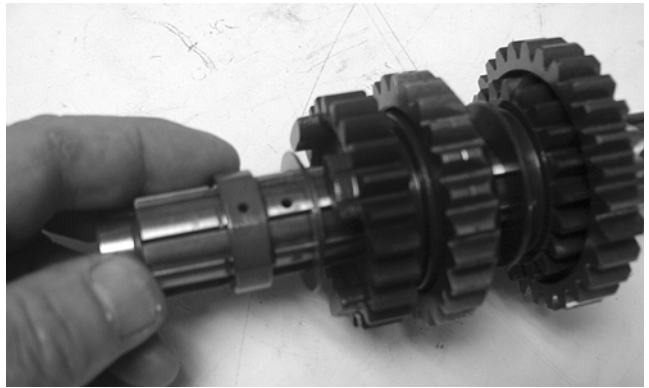


CD340



CD341

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



CD342



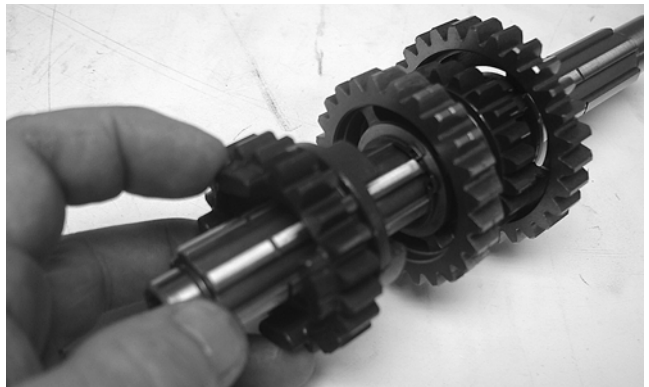
CD343

■ **NOTE:** Remove the 4th driven circlip.



CD344

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

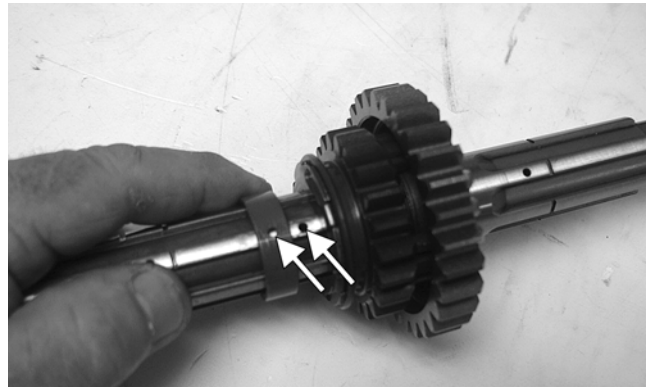


CD345

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



CD346

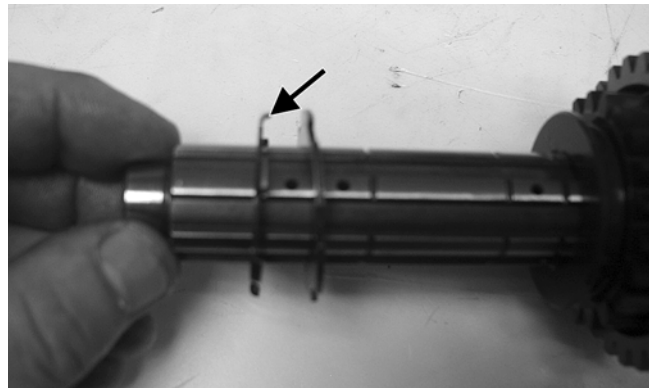


CD351A

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



CD347



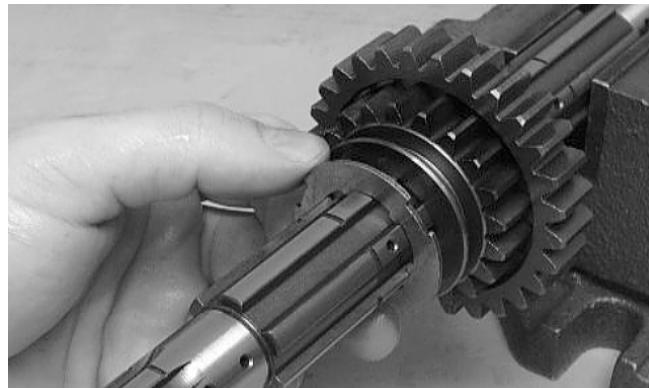
CD354A

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

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



CD349



CC211D

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

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

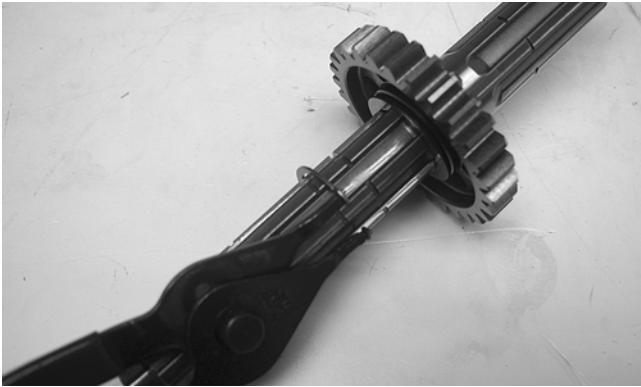


CD355



CD358

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



CD356



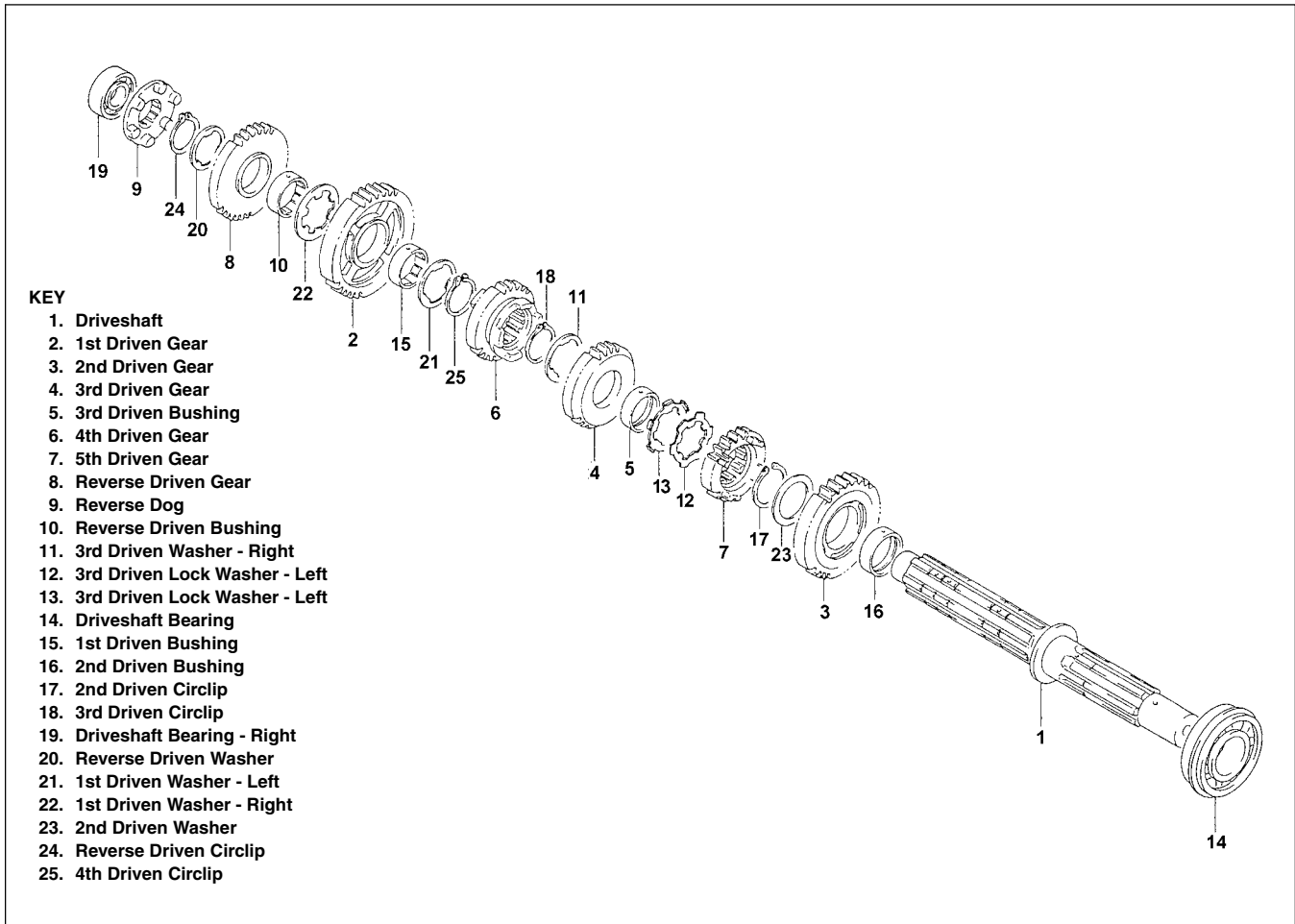
CD359

3

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



CD357



733-754B

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



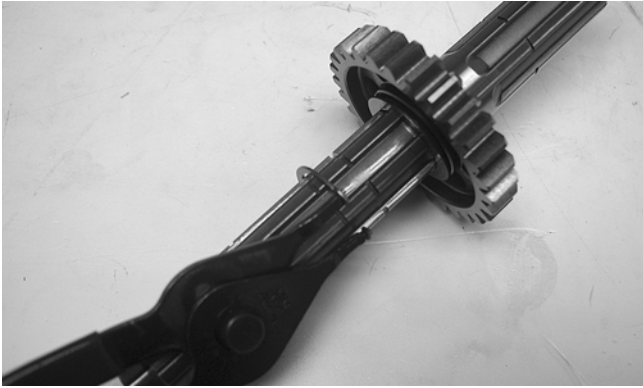
CD359



CD358

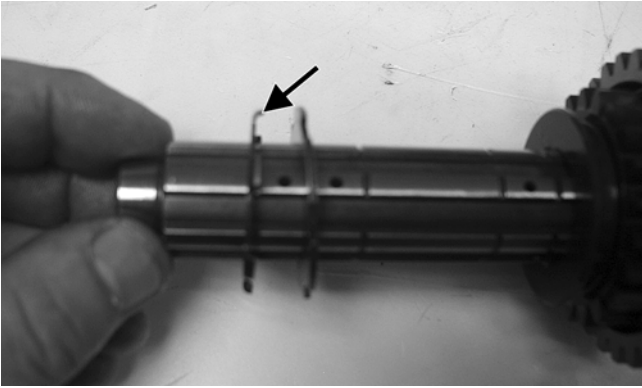


CD357



CD356

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



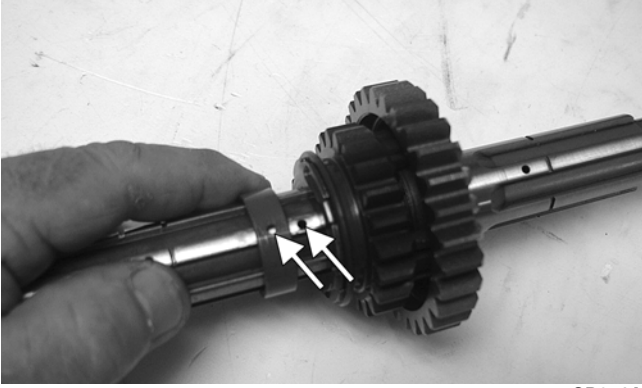
CD354A

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



CD355

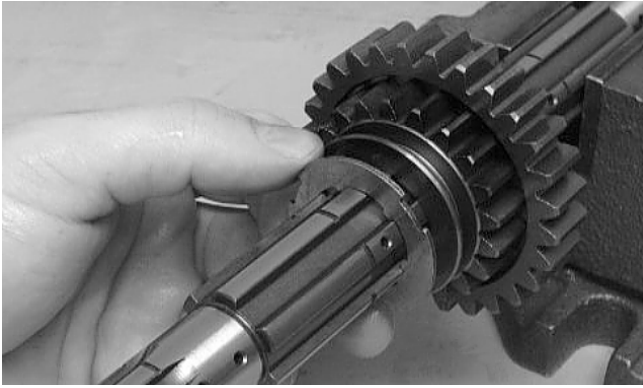
3. Install the second 3rd driven lock washer. Lock it into the groove closest to the 5th driven gear (as noted in disassembling) by rotating it when it is in the groove.



CD351A

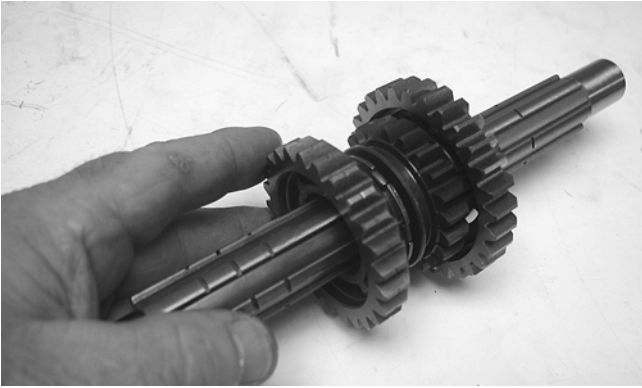
3

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



CC211D

4. Install the first 3rd driven lock washer onto the driveshaft making sure the tabs are facing toward the 5th driven gear.



CD349

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



CD348



CD346

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



CD345

■ **NOTE:** Secure with the circlip.

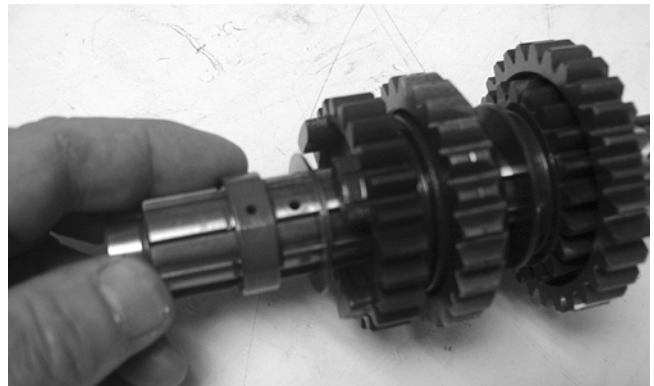


CD344

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



CD343



CD342



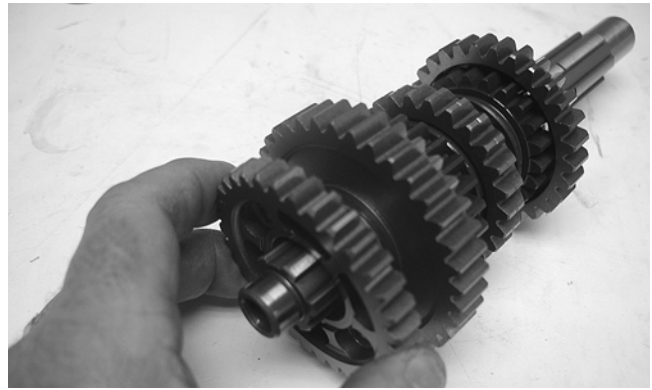
CD341

9. Install the washer on the shaft making sure it lines up with the groove in the shaft; then turn the washer locking it on the shaft.



CD340

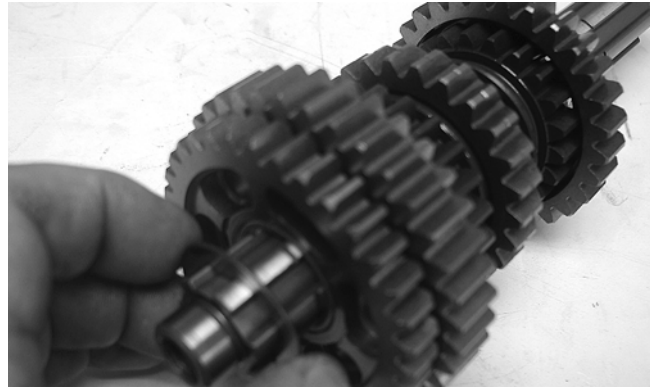
10. Slide the reverse driven gear bushing onto the shaft making sure the oil port in the bushing aligns with the oil port on the shaft.



CD336



CD338

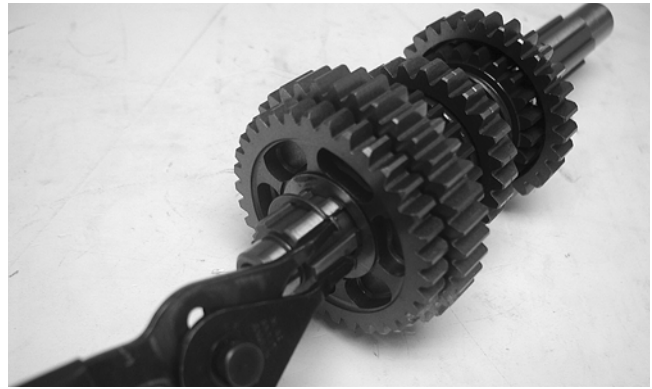


CD335

3

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

11. Move the washer in the shaft groove until the notches in the washer align with the tabs on the bushing; then slide the bushing up tight against the washer.

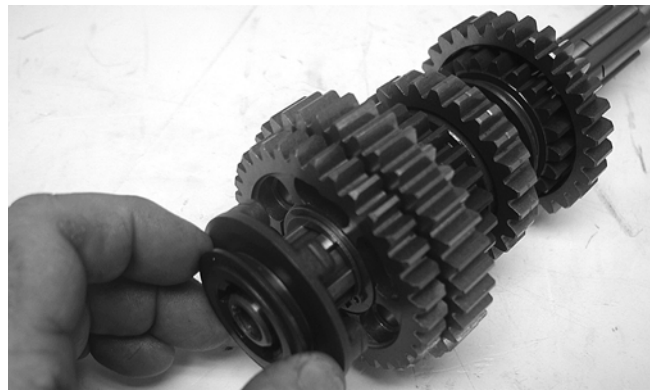


CD334



CD370

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



CD331

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

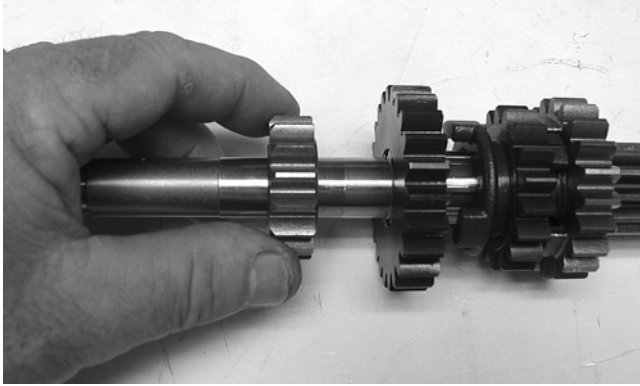
COUNTERSHAFT

Disassembling

1. Remove the 2nd drive gear from the countershaft using a bearing separator and hydraulic press.

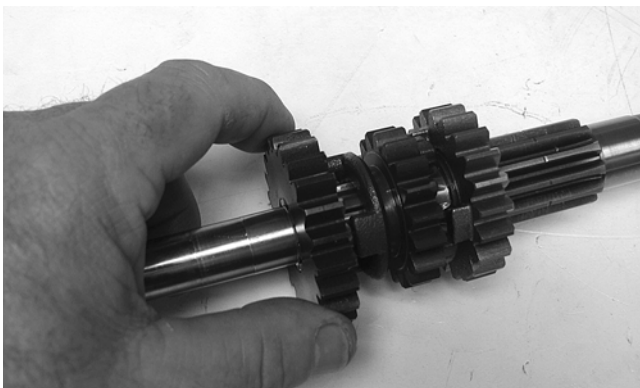
⚠ CAUTION

Pressing the 2nd drive gear off may be done twice before shaft replacement is necessary.



CD395

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

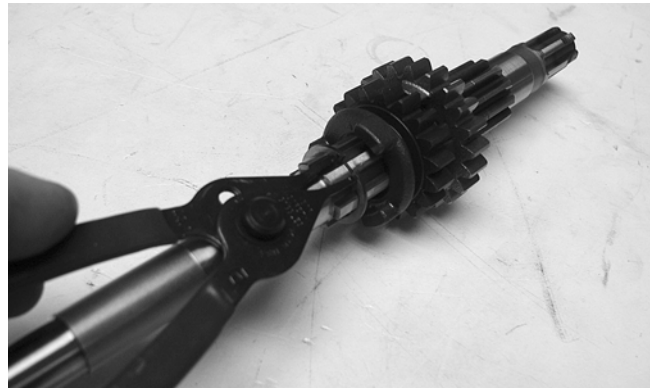


CD396

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

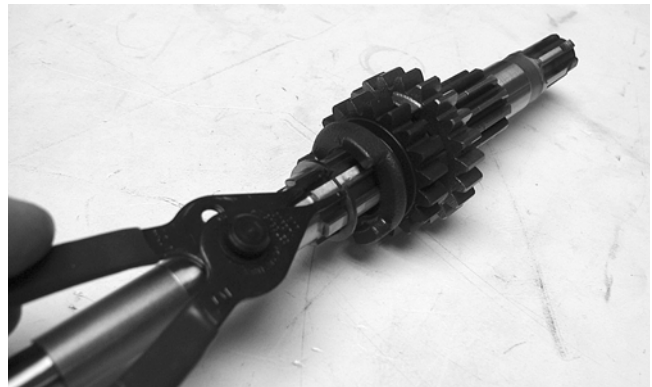


CD397



CD398

4. Remove the 3rd drive gear from the countershaft.
5. Remove the circlip securing the 4th drive gear on the countershaft; then remove the washer and 4th drive gear.



CD399

■ **NOTE:** Account for the bushing in front of the gear.



CD407

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

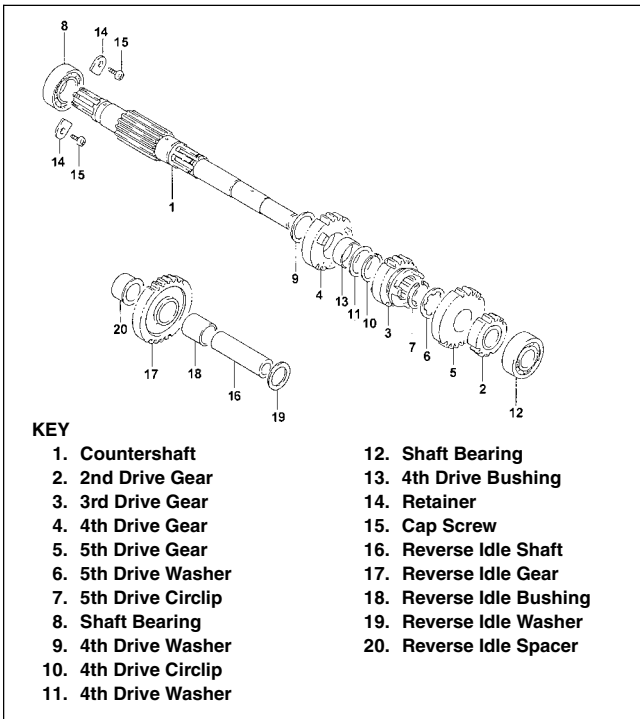


CD408



CD411

Assembling



733-754C

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

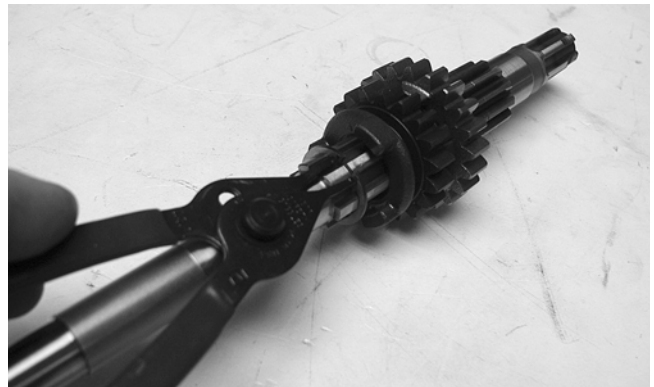
3. Install the 3rd drive gear; then install the 5th drive circlip onto the countershaft.



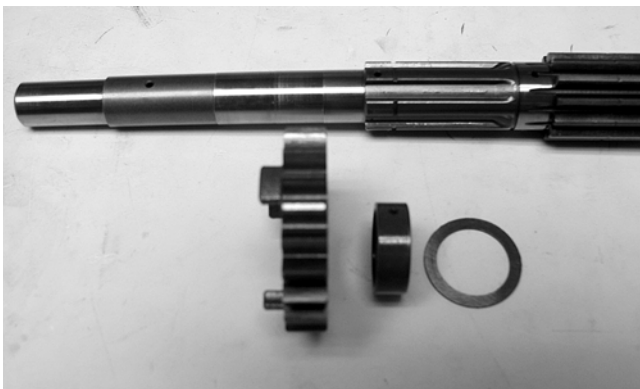
CD412

4. Install the 5th drive washer and 5th drive gear onto the countershaft making sure the oil holes align.

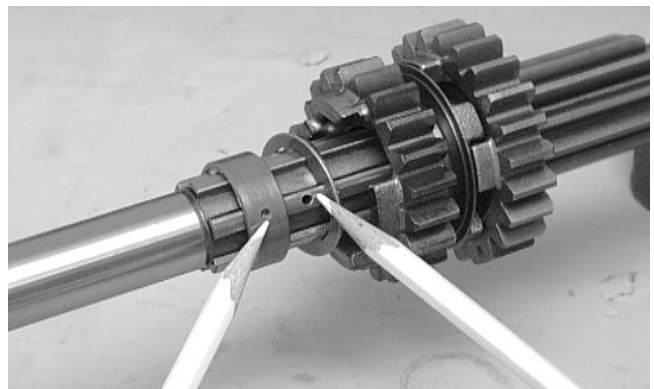
3



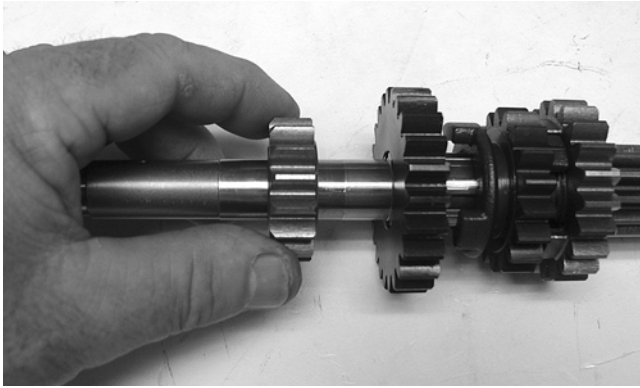
CD398



CD410



CC202D



CD395

5. Press the 2nd drive gear onto the countershaft leaving an 0.25 mm (0.010 in.) gap between the 2nd and 5th drive gears.

■ **NOTE:** When pressing the 2nd drive gear onto the countershaft, the inside of the gear must be oil free; then apply a thin, even coat of green Loctite #620 being careful not to get Loctite on the other gears.

CAUTION

Pressing the 2nd drive gear off may be done twice before shaft replacement is necessary.

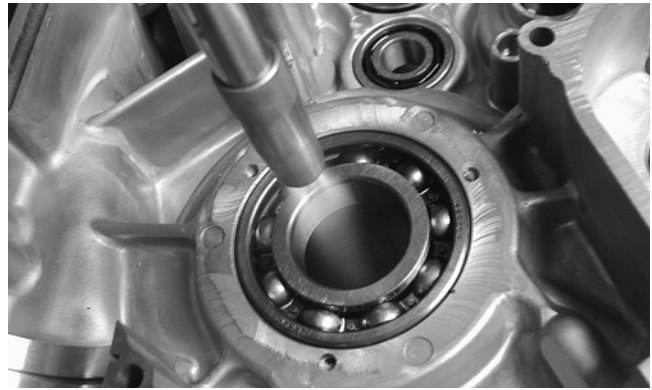
■ **NOTE:** The countershaft is now completely assembled for installation.

Assembling Crankcase Half

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

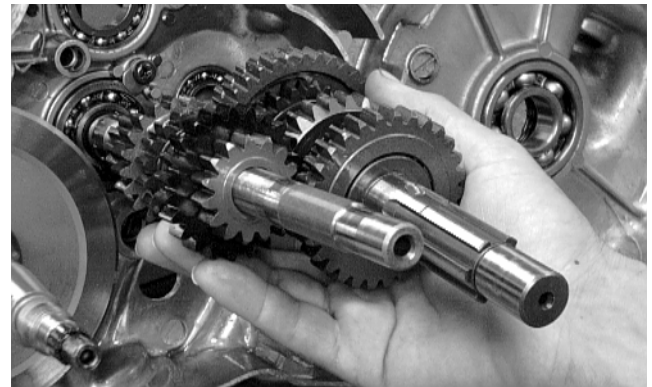
■ **NOTE:** If the output shaft was removed, make sure that the proper shim is installed.

1. Place the oil pipe in position and secure to the crankcase with the Phillips-head screws coated with red Loctite #271.
2. Apply a liberal amount of engine oil to the right-side crankshaft bearing. Using a propane torch, heat the bearing until the oil begins to smoke; then slide the crankshaft assembly into place.



CD416

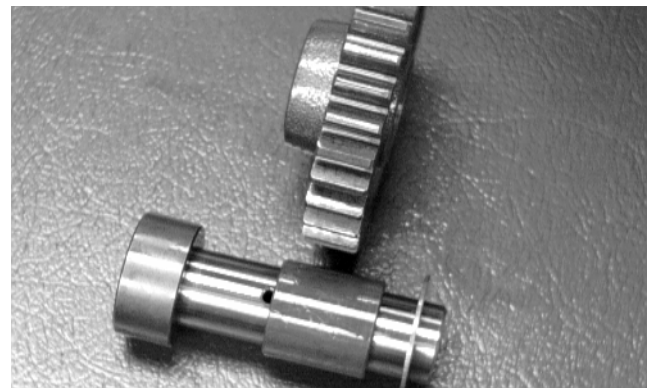
3. Simultaneously, install the driveshaft and countershaft assemblies into the crankcase.



CC505D

4. Install the reverse idler shaft; then install a washer, bushing, reverse idler gear, and a spacer.

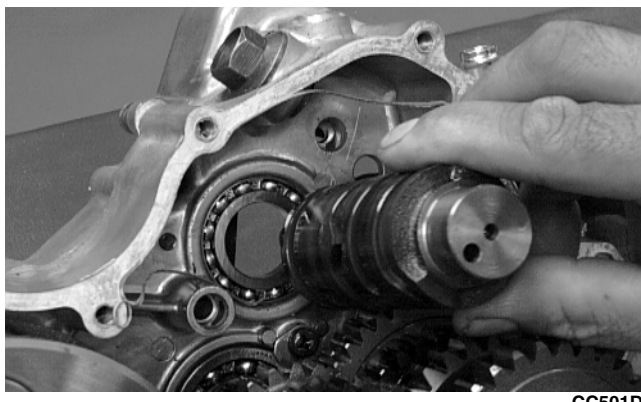
■ **NOTE:** The shoulder of the reverse idler gear should be directed away from the crankcase.



CC504D

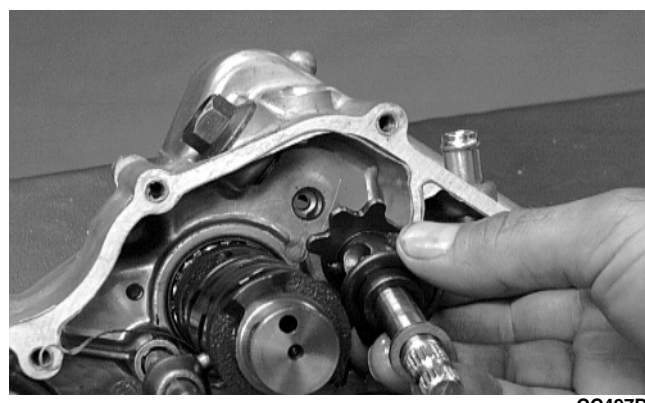
5. Install the gear shifting cam.

9. Install the reverse shifting cam and washer.

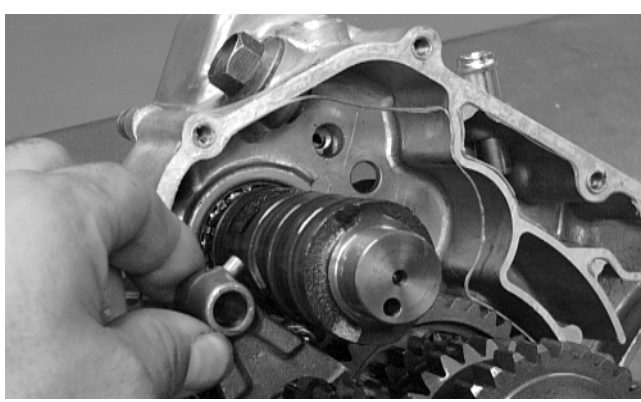


CC501D

6. Install the front gear shifting fork.

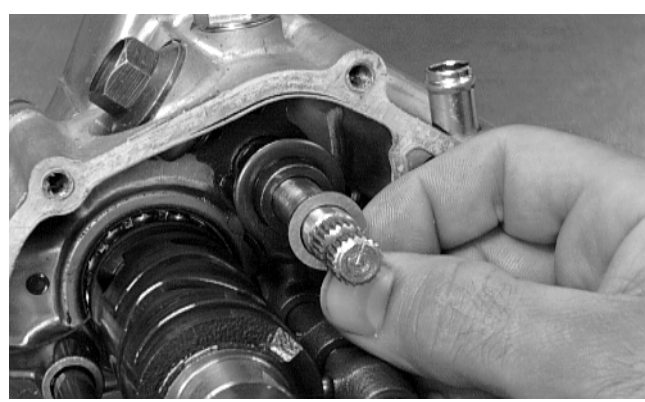


CC497D



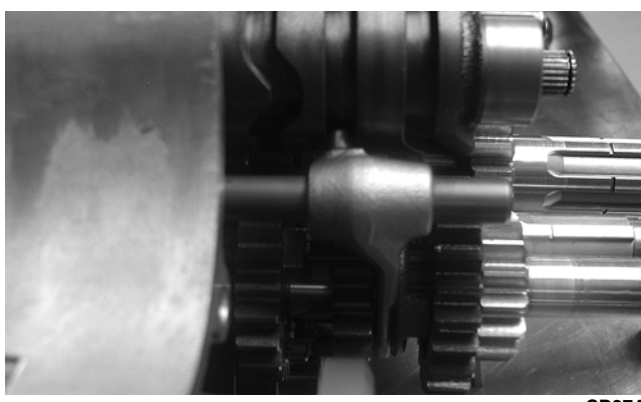
CC500D

7. Install the front gear shifting fork shaft.



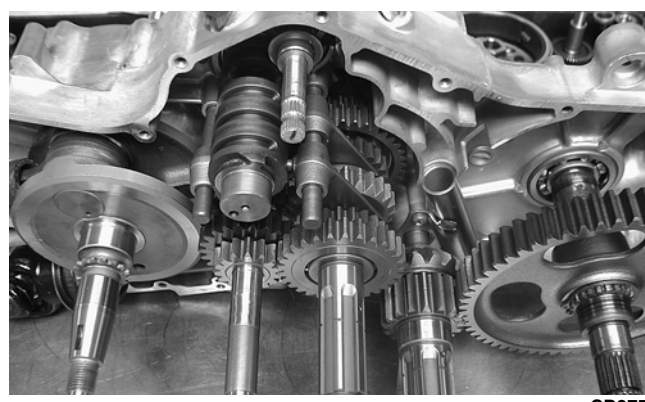
CC486D

10. Install the center and outer shifting forks.



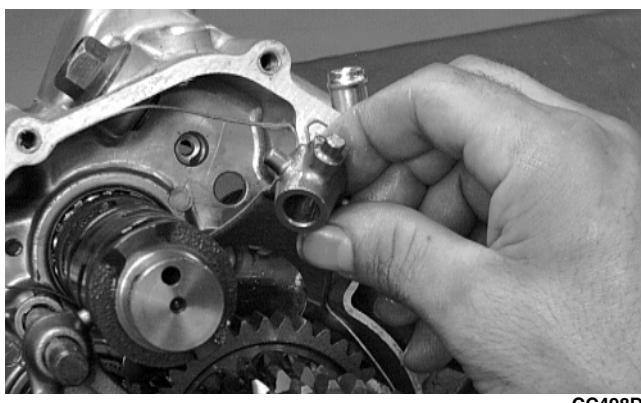
CD374

8. Install the reverse shifting fork.

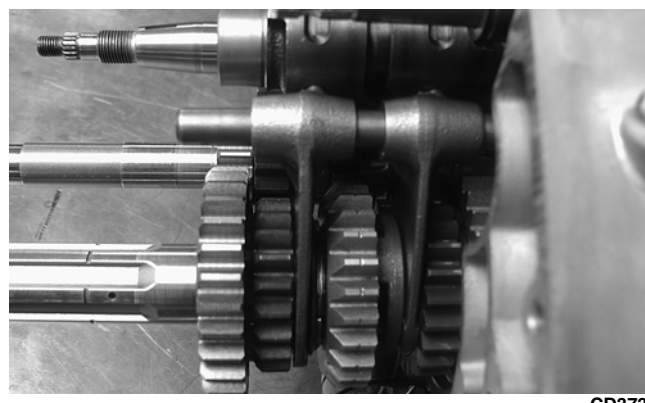


CD375

11. Install the long shifting fork shaft.

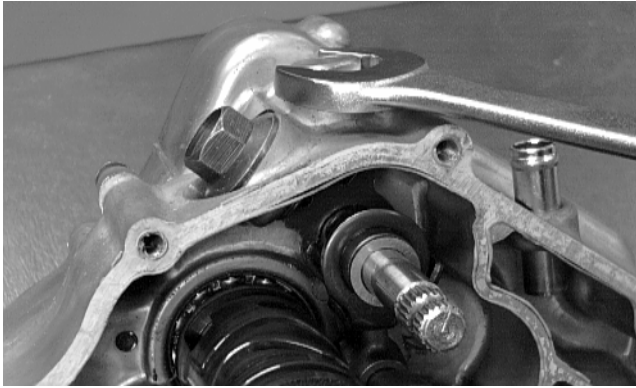


CC498D



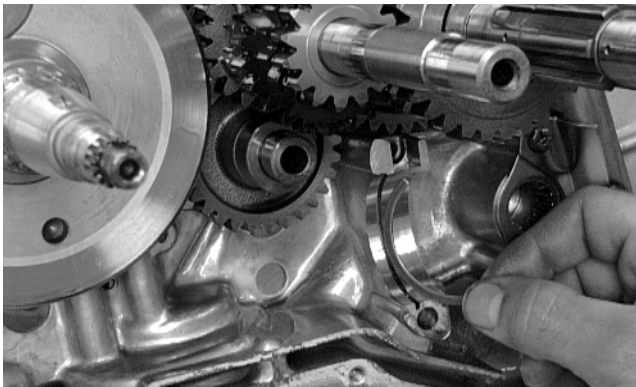
CD373

12. Install the cam stopper detent with gasket onto the crankcase.

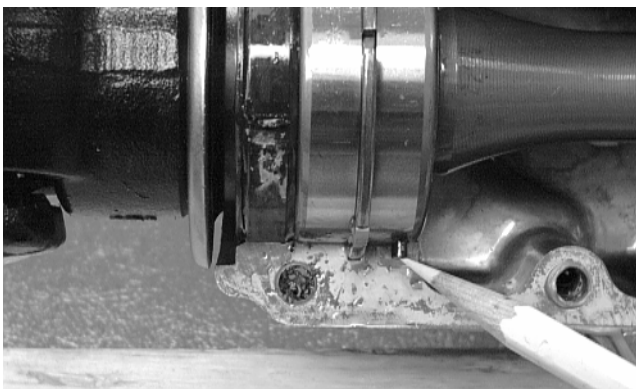


CC493D

13. On the 4x4, place the C-ring into position; then install the secondary output shaft noting the location of the bearing alignment pin from disassembly.



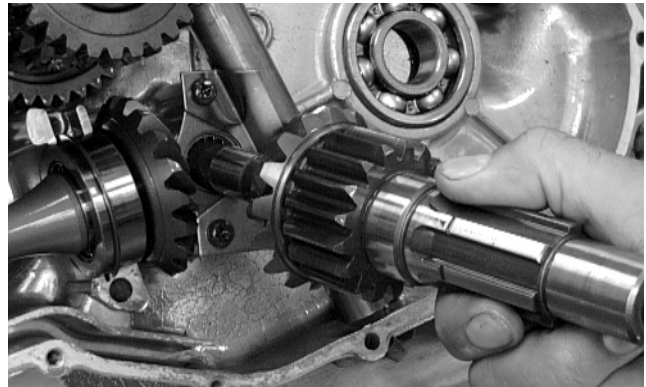
CC492D



CC490D

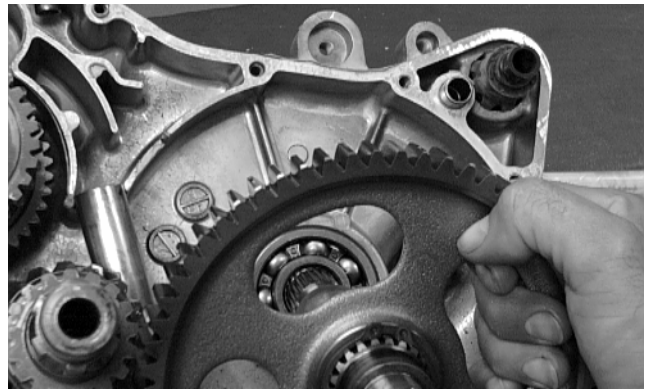
14. Install the sub-transmission shaft assembly.

CAUTION
 Make sure the speedometer drive slot lines up with the groove in the sub-transmission shaft.



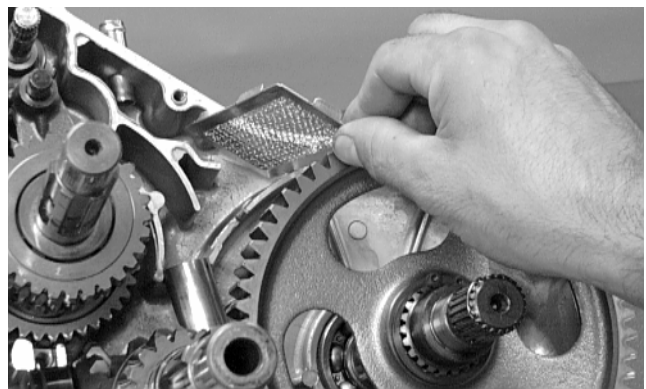
CC489D

15. Install the final driven shaft and gear.



CC488D

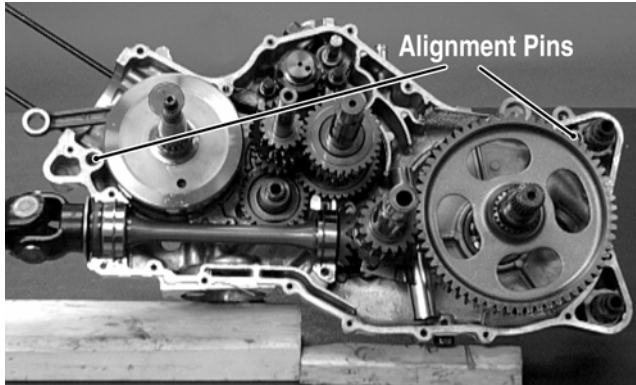
16. On the 300, install the oil breather screen noting the direction of the tabs from disassembly.



CC487D

Joining Crankcase Halves

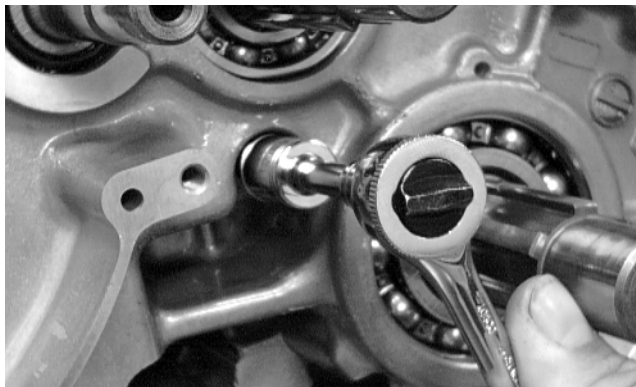
1. Verify that the alignment pins are in place and that both case halves are clean and grease free. Apply Three Bond Sealant (p/n 0636-070) to the mating surfaces. Place the right-side half onto the left-side half.



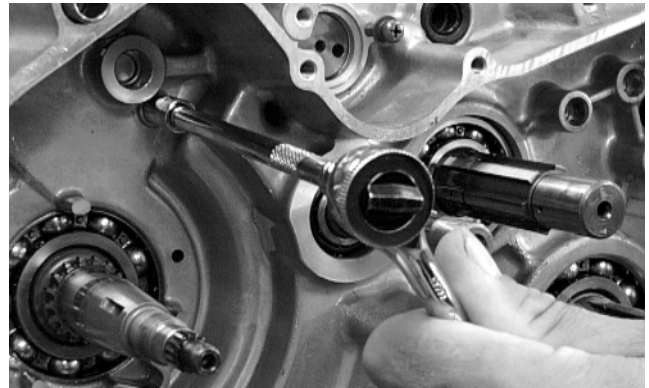
CC485DA

2. Using a plastic mallet, lightly tap the case halves together until cap screws can be installed.
3. From the left side, install the shift cable bracket and the crankcase cap screws noting the location of the different-lengthed 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.



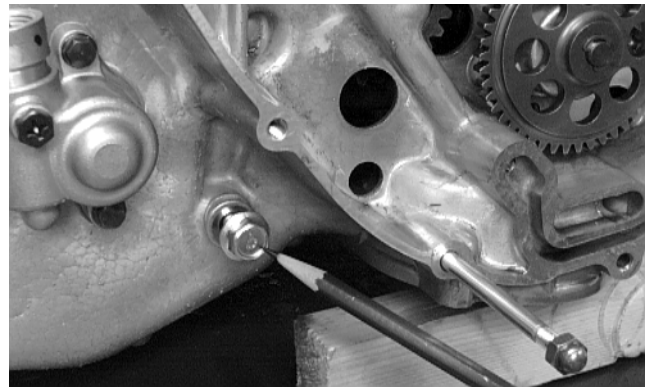
CC483D



CC482D

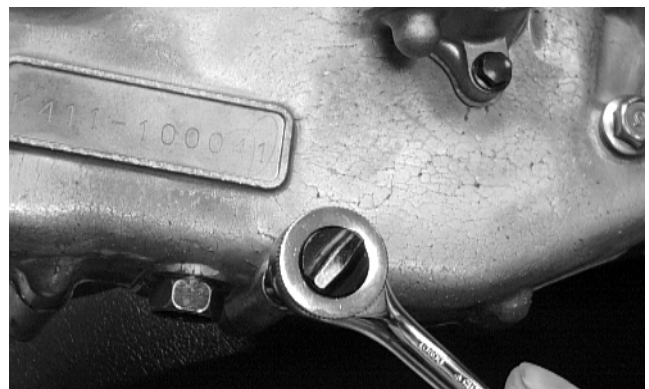
4. From the right side, install the cap screws noting the location of the cap screw with the copper washer; then tighten only until snug.

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



CC481D

3



CC480D

5. In a crisscross/case-to-case pattern, tighten the 8 mm cap screws until the halves are correctly joined; then tighten to specifications.

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

6. In a crisscross/case-to-case pattern, tighten the 6 mm cap screws to specifications.

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

- Apply a small amount of grease to the O-ring seal on the starter; then install the starter into the crankcase. Secure with two cap screws and wiring forms.

👉 AT THIS POINT

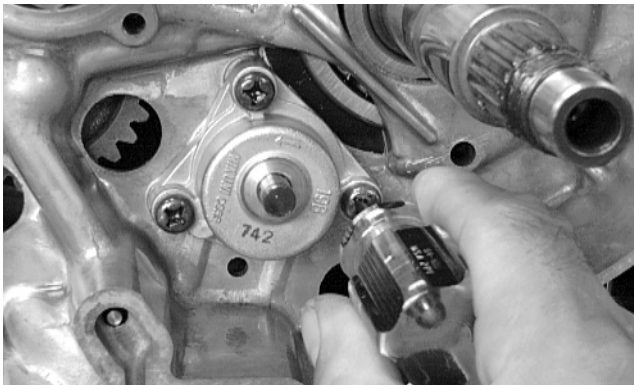
After completing center crankcase components, proceed to **Installing Right-Side Components**, to **Installing Left-Side Components**, and to **Installing Top-Side Components**.

Installing Right-Side Components

- A. Oil Strainer/Oil Pump**
- B. Gear Shifting Arm**

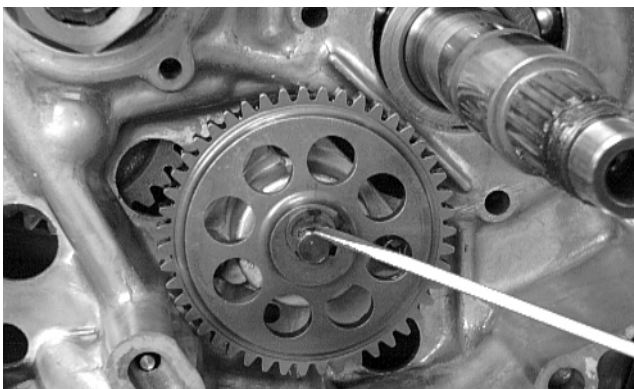
■ **NOTE:** If the oil pump was serviced, follow steps 1-2.

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



CC440D

- Place the pin into position on the oil pump shaft, install the oil pump driven gear making sure the recessed side of the gear is directed inward, and secure with a new circlip.



CC439D

- Place the oil strainer into position beneath the crankcase and tighten with the Phillips-head cap screws (coated with red Loctite #271) securely.

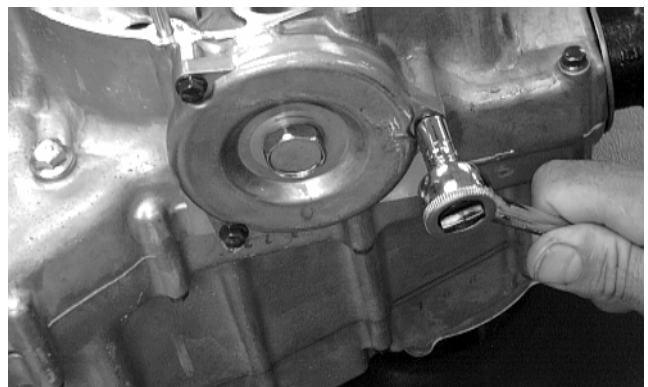
⚠ CAUTION

The legs of the strainer must be directed out.



CC443D

- Noting the arrow from disassembly, place the strainer cap into position on the crankcase making sure the O-ring is properly installed and secure with the cap screws; then tighten the oil drain plug to specifications.



CC442D

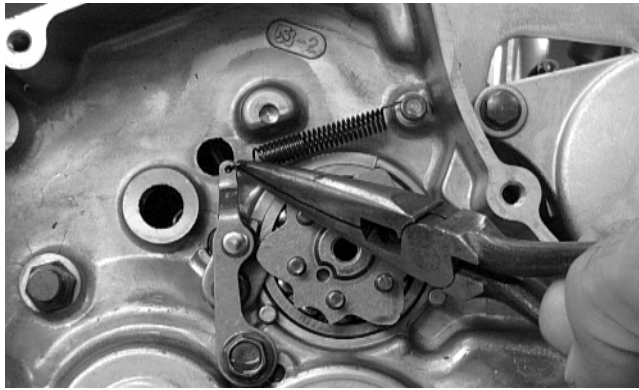
- Place the stopper plate pins into position noting that the alignment pin properly engages into the shifter cam.



CC438D

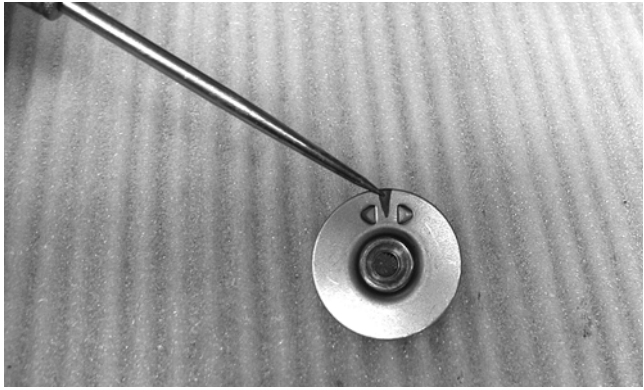
- Install the spring onto the cam stopper.

■ NOTE: The detent in the pin retainer must be straddling a pin.

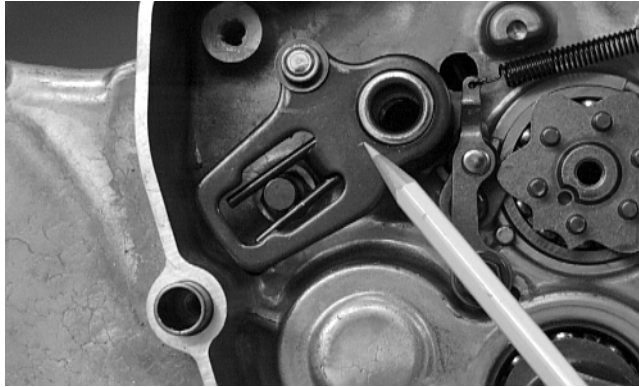


CC437D

7. Install the link arm making sure the spring and roller are in position.



CD379



CC436D

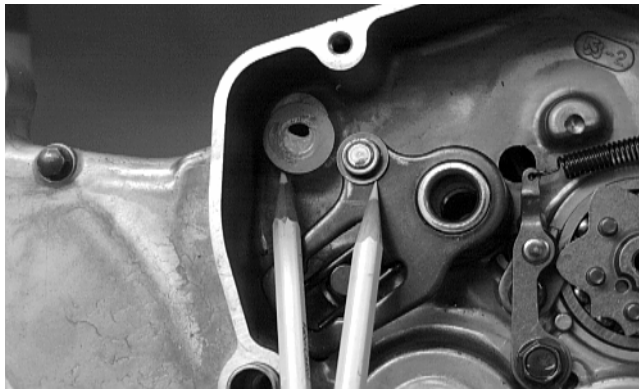
8. Install the gear shifting arm assembly making sure the washer and roller are properly positioned; then install the pin retainer plate and secure with the cap screw coated with red Loctite #271.

■ NOTE: When installing the arm assembly, make sure to lift the spring loaded portion to install between the pin retainer and stopper plate. Also, make sure the link arm roller is in its hole.



CC449D

3



CC435D



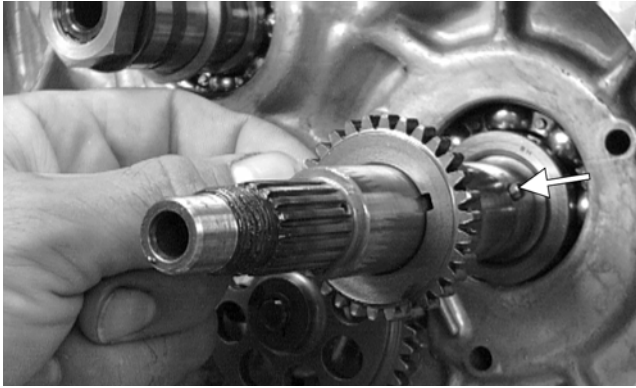
CC451D

C. Primary Clutch
D. Starter Clutch Shoe

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

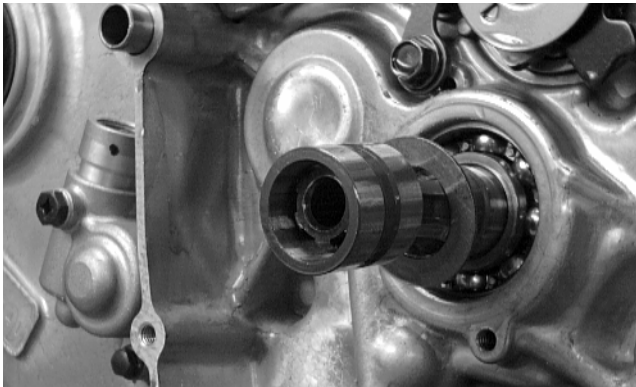
9. Install the oil pump drive gear onto the crankshaft making sure the pin is properly positioned.

■ NOTE: The shoulder of the gear must be directed inward.



CC432DA

10. Install the primary driven washer and sleeve onto the countershaft.



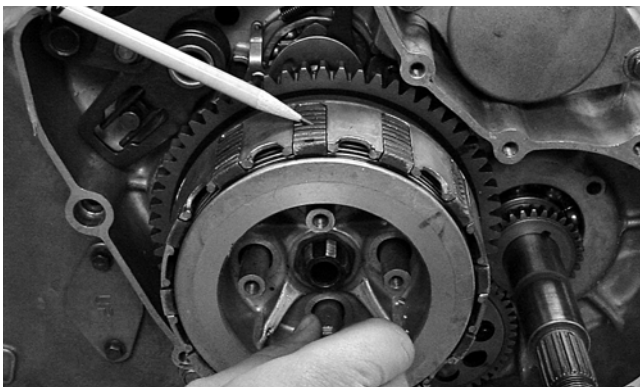
CC431D

CAUTION

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

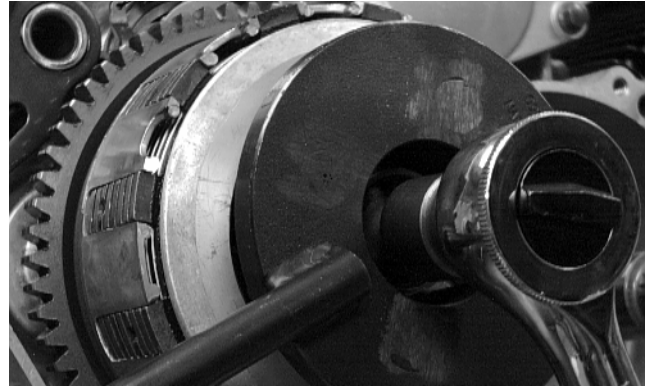
11. Place the primary clutch assembly onto the countershaft.

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



CC914

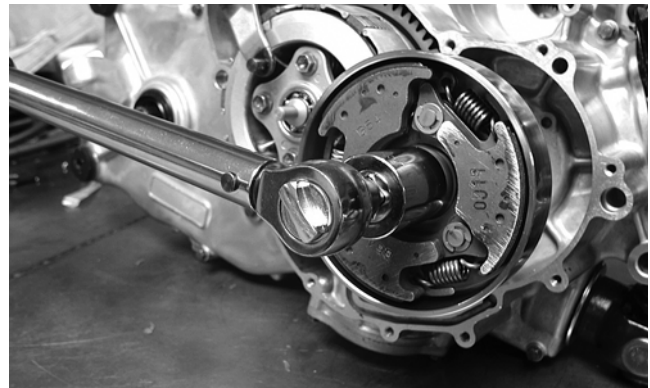
12. Using a clutch sleeve hub holder, install the nut and washer. Tighten to specifications.



CC428D

13. Place the primary drive one-way clutch housing onto the crankshaft.

14. Install the primary clutch shoe and washer; then secure with the starter clutch-shoe nut (left-hand threads). Tighten to specifications.



CD440

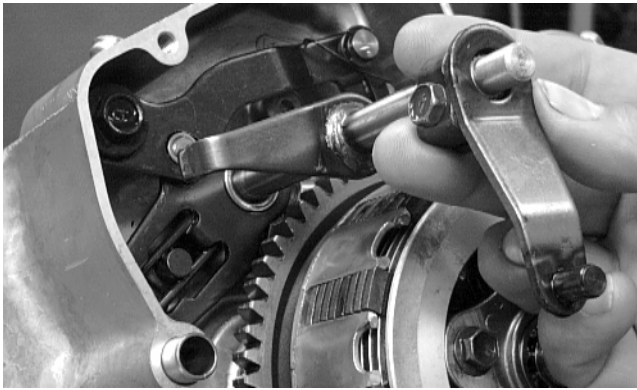
15. Install the release roller assembly making sure the four springs are in position; then using a crisscross pattern, tighten the four cap screws securely.

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



CC425D

16. Slide the clutch release arm and gear shift shaft into the crankcase.

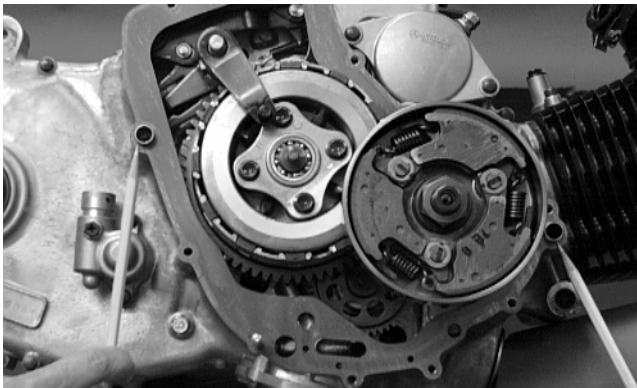


CC424D

E. Release Roller Guide
F. Cover

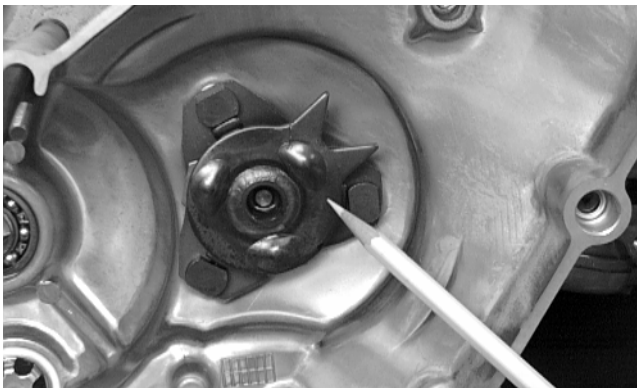
■ **NOTE:** Steps 1-16 of the preceding sub-sections must precede this procedure.

■ **NOTE:** At this time, care should be taken that the alignment pins are installed in the crankcase and the gasket is in position.

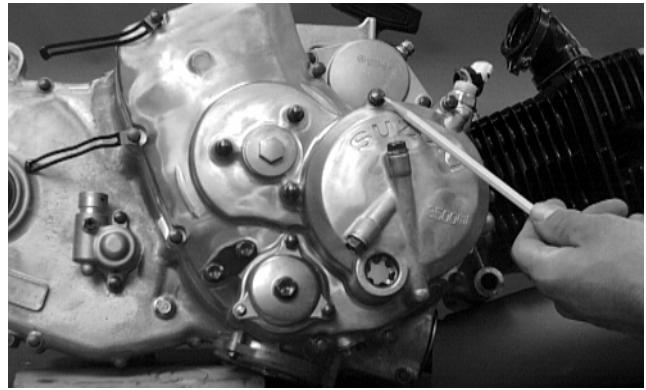


CC423D

17. Install the right-side cover onto the right side crankcase half making sure the release roller guide remains correctly positioned; then install the cap screws. Note the proper locations of the long cap screw with rubber washer and the two wire forms.



CC422D



CC421D

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

Installing Left-Side Components

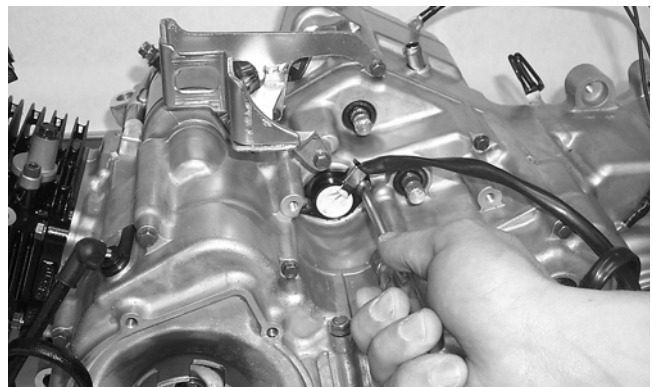
3

A. Idle Gear Assembly
B. Magneto Rotor

1. Place the shift-indicator sending unit into position making sure the neutral contact and spring are inside the case and a well-oiled O-ring is properly positioned. Secure with Phillips-head screws.

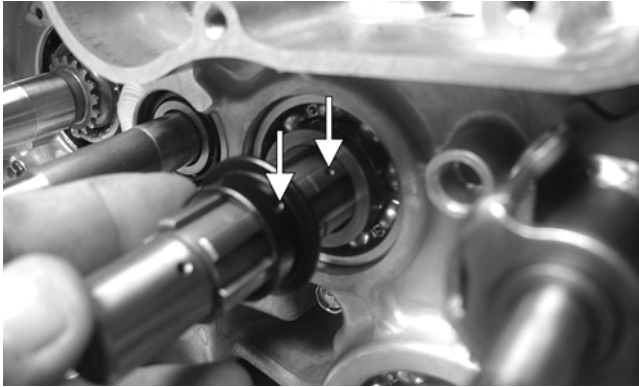


CC479D

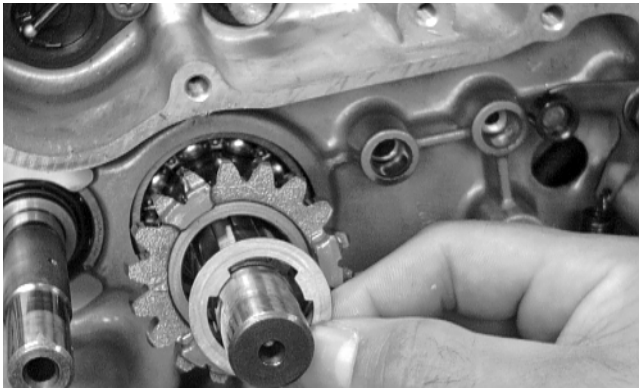


CC478D

2. Place the spacer and bushing (noting the location of the oil hole) onto the driveshaft and place the gear and washer onto the driveshaft; then secure with the circlip.



CD389A



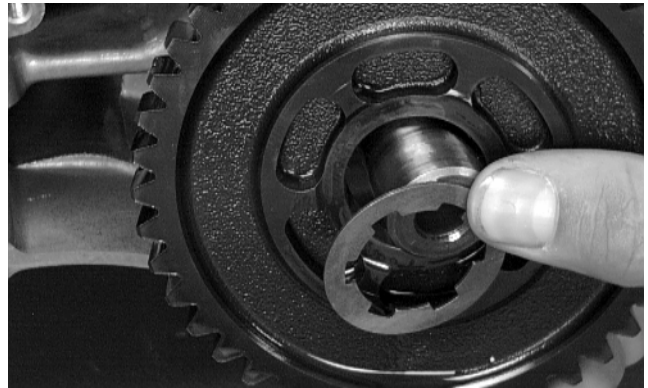
CC474D



CC473D

3. Place a round washer (4x4) onto the sub-transmission shaft; then install the driven gear and notched washer. Secure with a circlip.

■ **NOTE:** On the 4x4, the slots in the gear must face towards the left-side cover when installed.

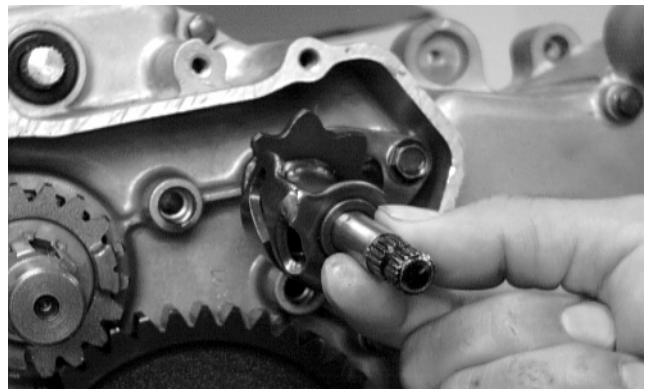


CC471D



CC470D

4. Install the sub-transmission gear cam.



CC469D

5. Install the idler gear and washers noting the thick washer on the inside from disassembly.

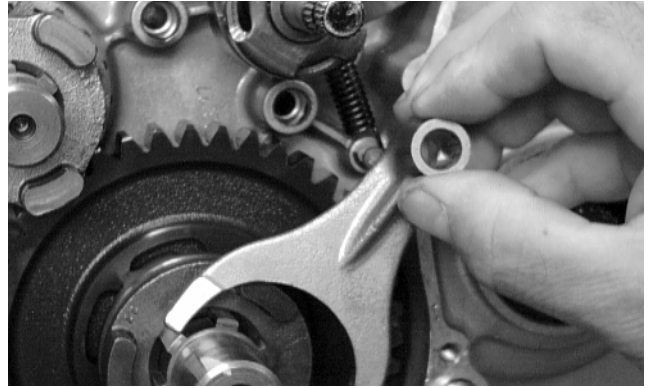


CC477DA



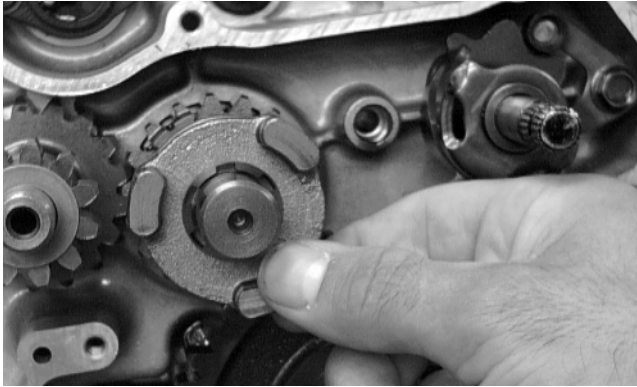
CC468D

6. Install the drive gear dog onto the driveshaft.



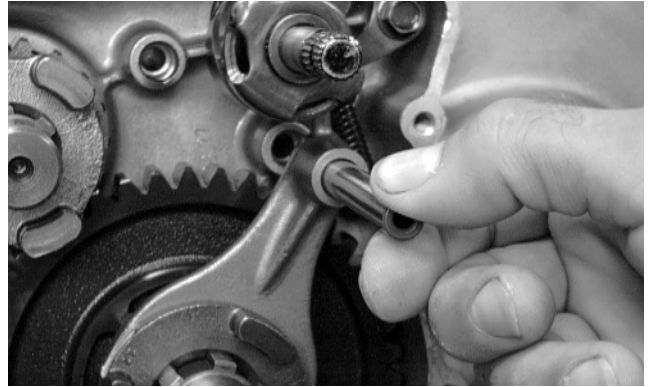
CC465D

9. Install the long shift fork shaft (4x4).



CC467D

7. Place the driven gear dog onto the sub-transmission shaft (4x4).



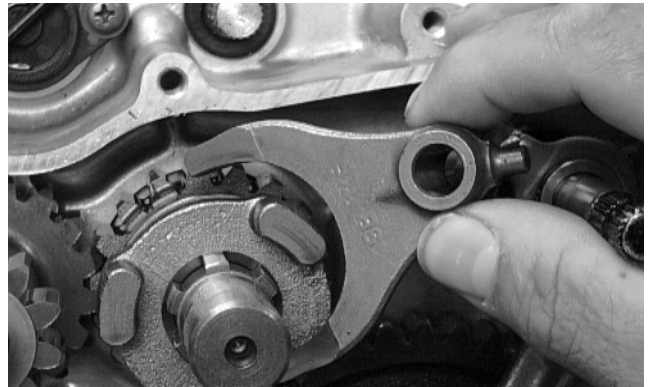
CC464D

10. Install the short shift fork.



CC466D

8. Install the long shift fork (4x4).



CC463D

11. Install the short shift fork shaft.



CC462D

12. Place the drive gear and washer on the driveshaft.
13. Install the driven gear and washer (4x4).



CC460D

14. Install the cam chain; then install the starter clutch gear assembly.



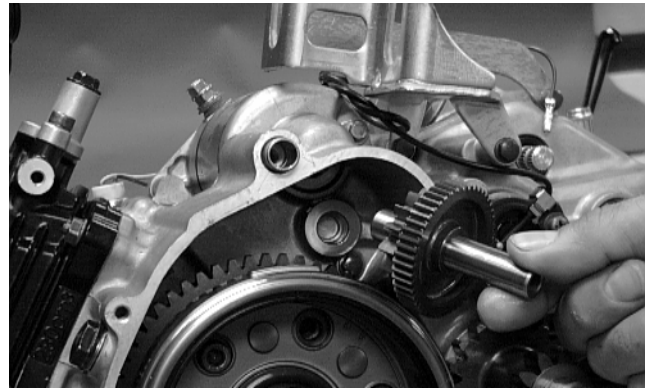
CC459D

15. Place the magneto rotor into position on the crankshaft making sure the key is in place.

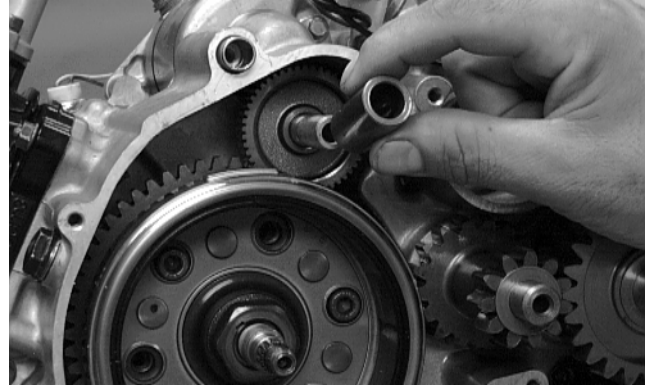


CC458D

16. Install the starter idler gear and shaft; then install the spacer.



CC455D



CC454D

C. Stator Assembly/Cover
D. Starter Cup
E. Recoil Starter

■ **NOTE:** Steps 1-16 in the preceding sub-section must precede this procedure.

17. Install the magneto rotor nut on the crankshaft and tighten until the rotor is properly seated; then tighten to specifications.



CD427

18. Place the gasket and left-side cover into position on the crankcase making sure the alignment pins are in place.

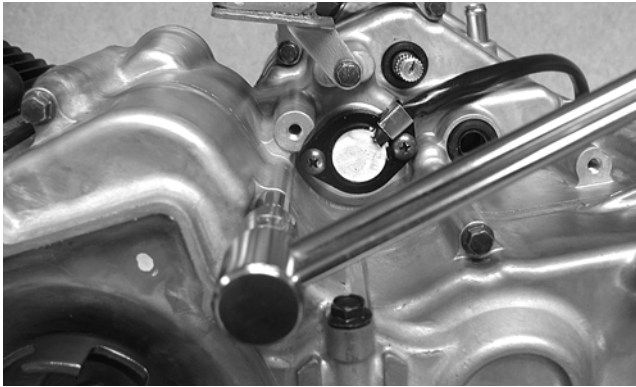
19. Install the cap screws to secure the left-side cover noting the location of the different-sized cap screws; then only finger-tighten at this time.

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



CC413D

21. Tighten the left-side cover caps screws (from step 19) to specifications.



CD428

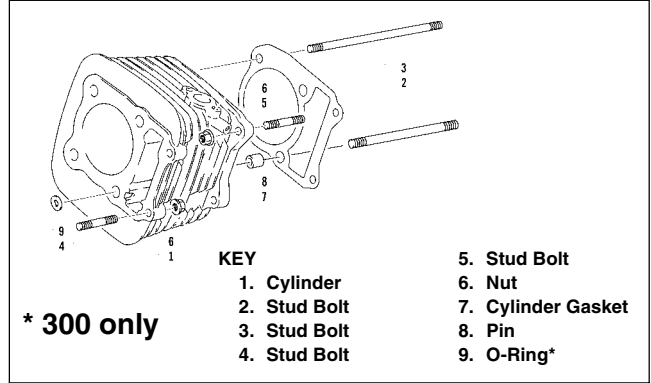
22. Place the gasket and recoil starter assembly into position on the left-side cover noting the location of the single washer; then tighten the cap screws to specifications.



CC412D

Installing Top-Side Components

A. Piston B. Cylinder

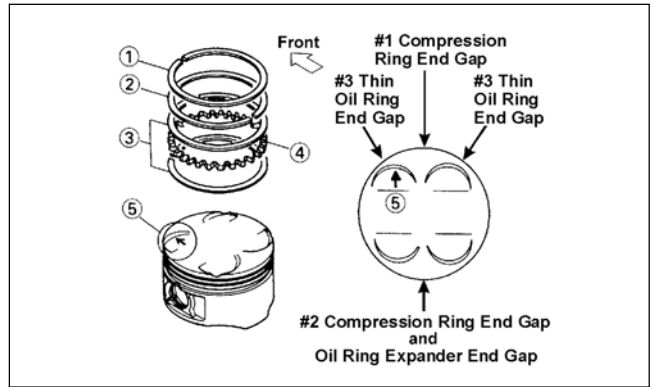


0733-744

3

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

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

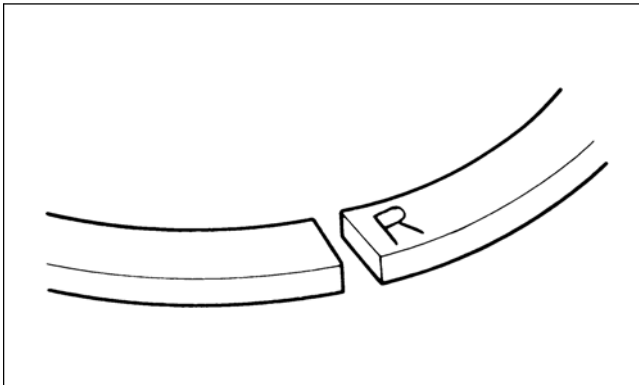


ATV-1085B

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

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

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



ATV-1024

⚠ CAUTION

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

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

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



CC383D



CC382D

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.

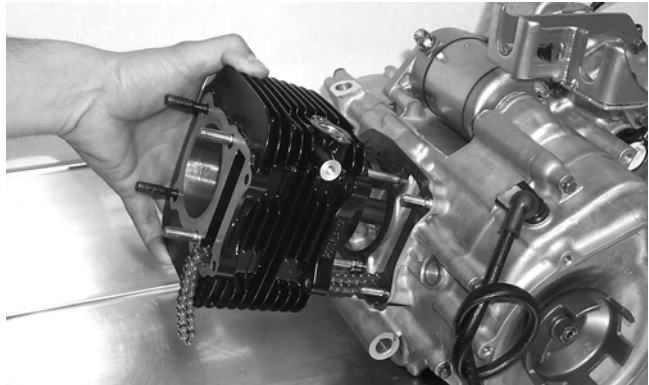


CC381D

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

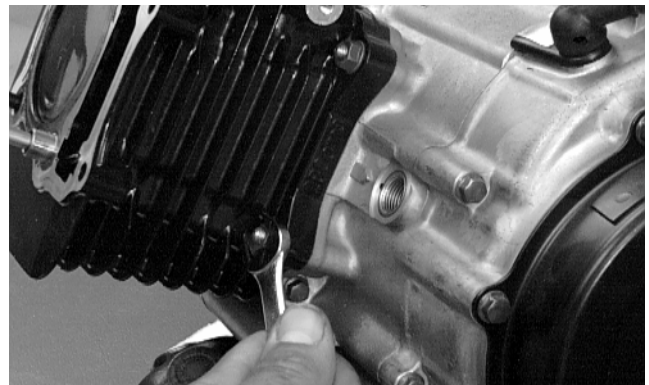
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



CC525D

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

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

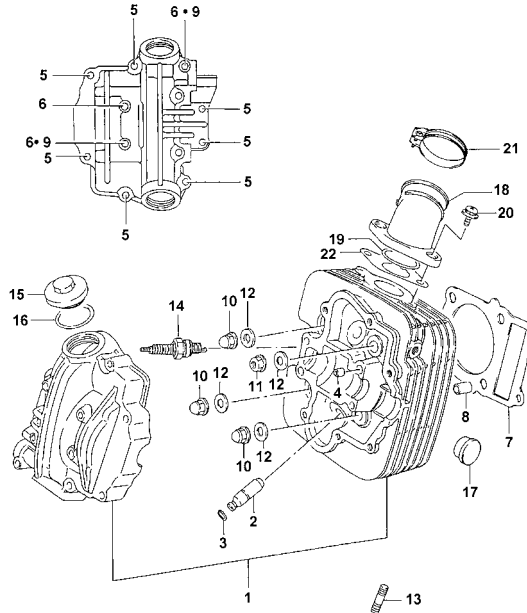


CC380D

C. Cylinder Head
D. Valve Cover

KEY

- 1. Cylinder Head Assy
- 2. Valve Guide
- 3. O-Ring
- 4. Dowel Pin
- 5. Cap Screw
- 6. Cap Screw
- 7. Cylinder Head Gasket
- 8. Dowel Pin
- 9. Gasket
- 10. Nut
- 11. Nut
- 12. Gasket
- 13. Stud Bolt
- 14. Spark Plug
- 15. Inspection Cap
- 16. O-Ring
- 17. Cylinder Head Plug
- 18. Intake Pipe
- 19. O-Ring
- 20. Screw
- 21. Clamp
- 22. Gasket



0733-743

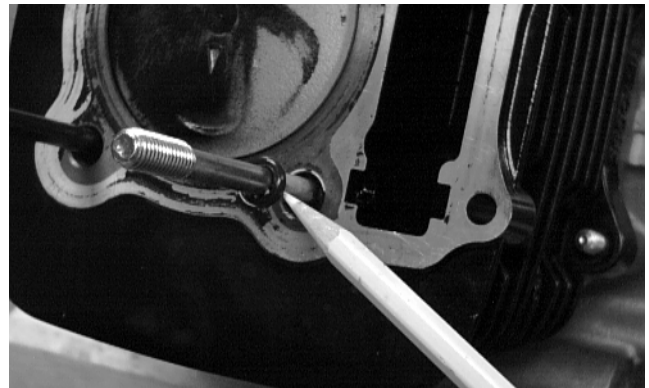
3

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

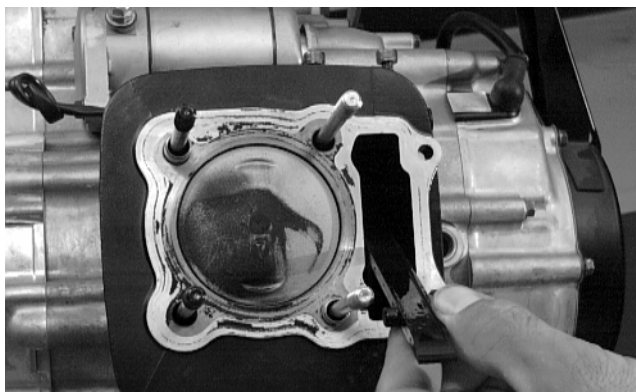
5. Place the chain guide into the cylinder.

CAUTION

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



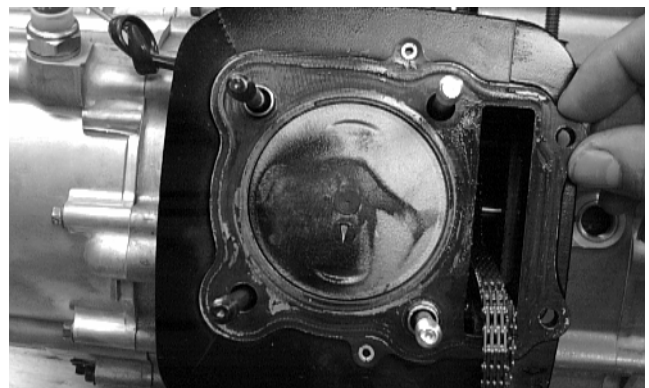
CC384D



CC379D

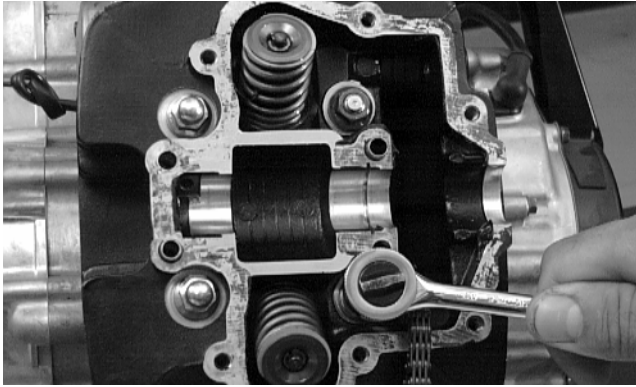
6. On the 300, install the O-ring onto the front left-side stud.

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



CC378D

8. Install the three cylinder head cap nuts and one nut with copper washers (note the locations of the cap nuts and nut). Tighten only until snug.



CC377D

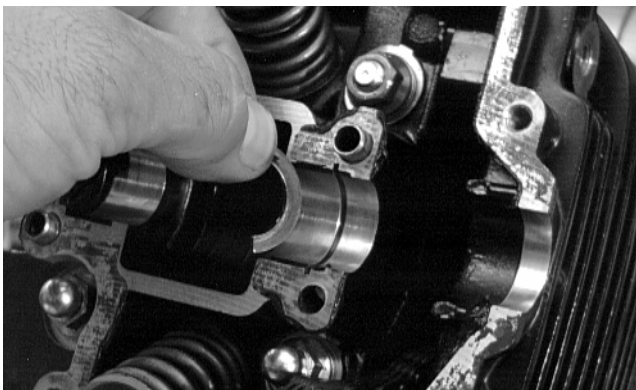
9. Loosely install the remaining cylinder head nuts.



CC376D

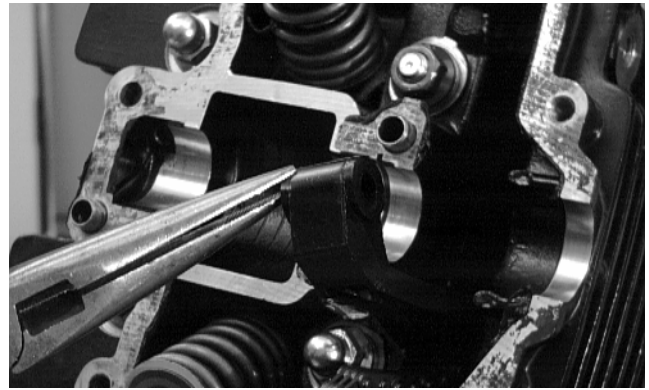
10. In a crisscross pattern, tighten the three cylinder head cap nuts and one nut (from step 8) to specifications. Tighten the remaining head nuts (from step 8) and the cylinder-to-crankcase nuts (from step 4) to specifications.

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



CC374D

12. Install the chain tensioner pad into the cylinder head.



CC375D

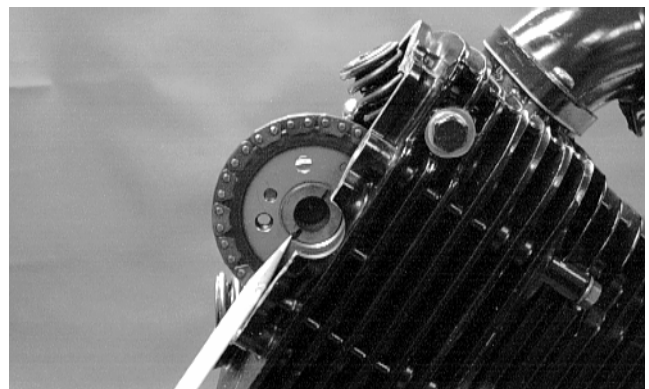
■ **NOTE:** At this point, oil the camshaft bearings, cam lobes, and the three seating journals on the cylinder.

13. With the alignment pin installed in the camshaft and the cam lobes directed down (toward the piston), place the camshaft in its seating position; then loop the chain over the sprocket and install the sprocket onto the camshaft.



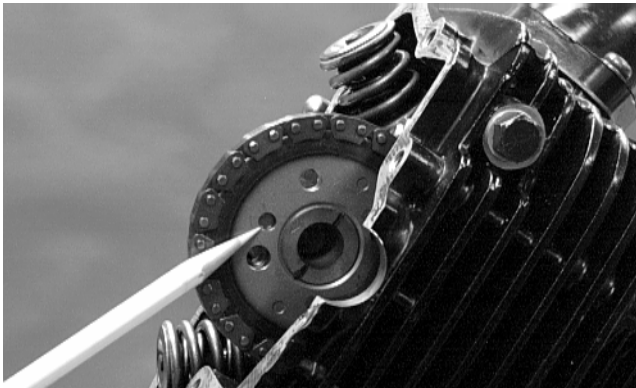
CC373D

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



CC401D

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



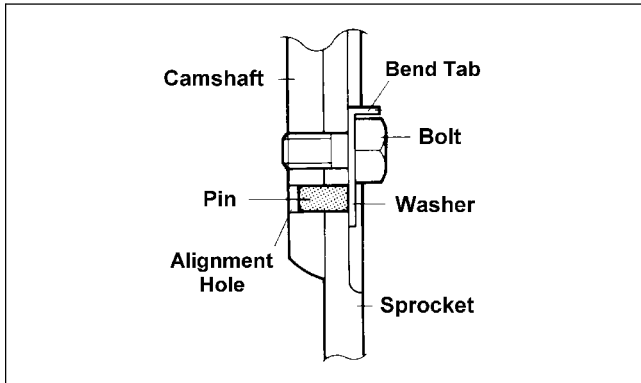
CC402D

14. 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.

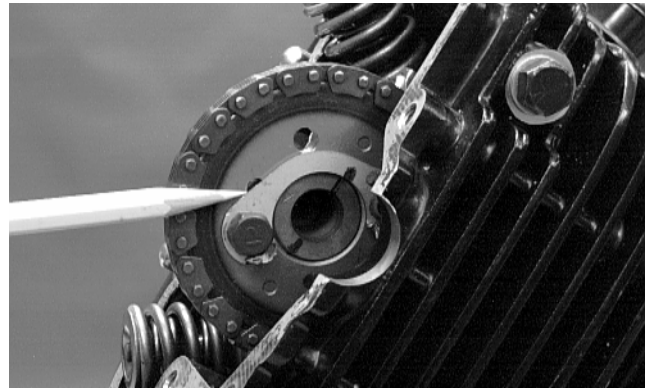
15. Place the tab washer onto the sprocket making sure it covers the pin in the alignment hole.



ATV-1027

⚠ CAUTION

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



CC403D

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.

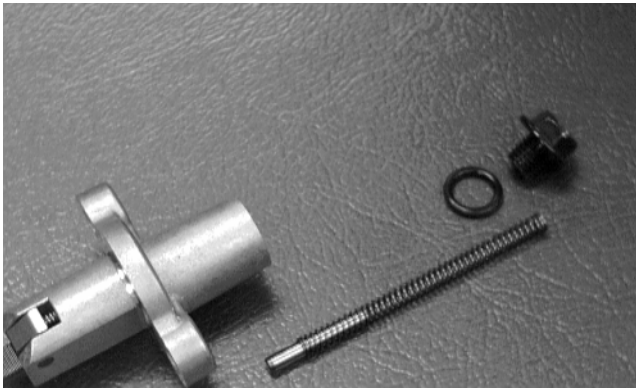


CC404D

17. Rotate the crankshaft until the second cap screw (from step 16) securing the sprocket to the camshaft can be installed; then install the cap screw (threads coated with red Loctite #271) and tighten to specifications. Bend the tab to secure the cap screw.
18. Rotate the crankshaft until the first cap screw (from step 16) securing the sprocket to the camshaft can be addressed; then tighten to specifications. Bend the tab to secure the cap screw.

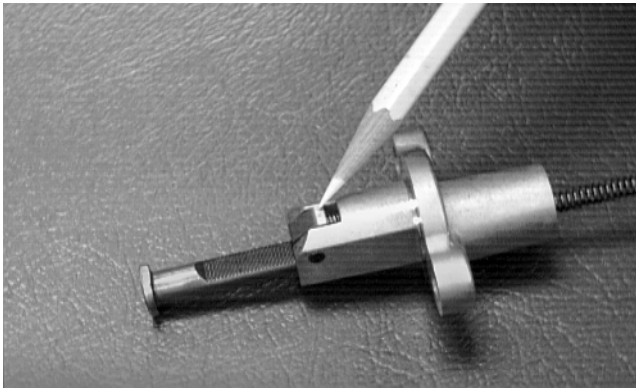
■ NOTE: Make sure to return the timing mark to TDC on the compression stroke.

19. Install the cylinder head plug in the cylinder head.
20. Remove the cap screw from the end of the chain tensioner. Account for the plunger, spring, and O-ring.



CC405D

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



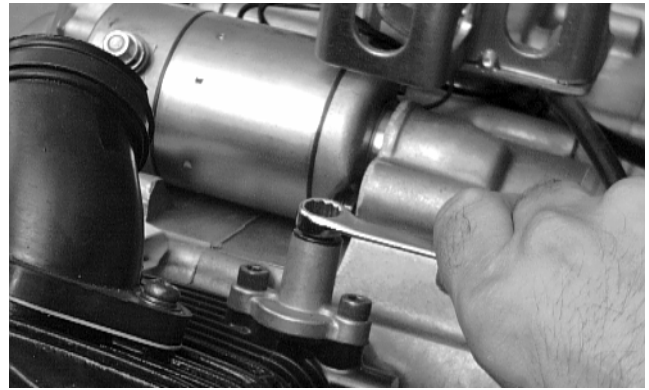
CC406D

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



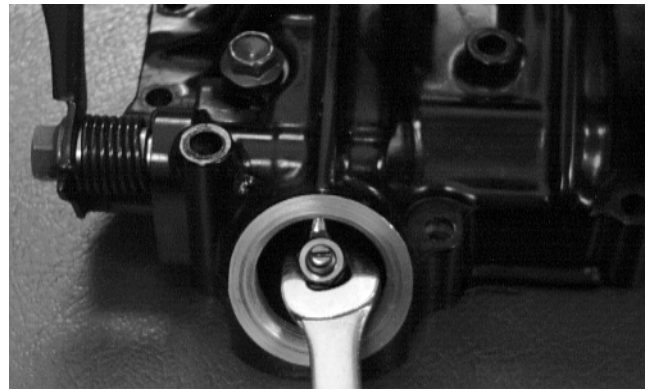
CC370D

23. Install the cap screw into the end of the chain tensioner.



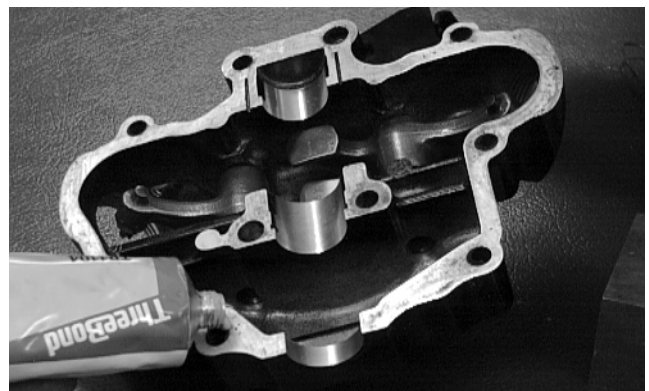
CC369D

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



CC407D

25. Apply a thin coat of Three Bond Sealant (p/n 0636-070) to the mating surface of the valve cover.

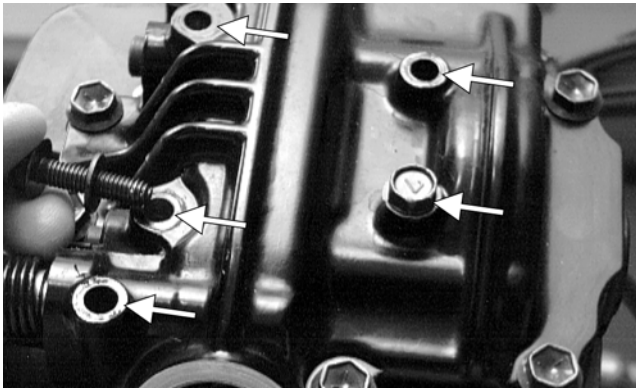


CC408D

26. Place the valve cover into position.

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

27. Install the valve cover cap screws into the head noting the locations of any with rubber washers; then install the remaining cap screws. Tighten only until snug.

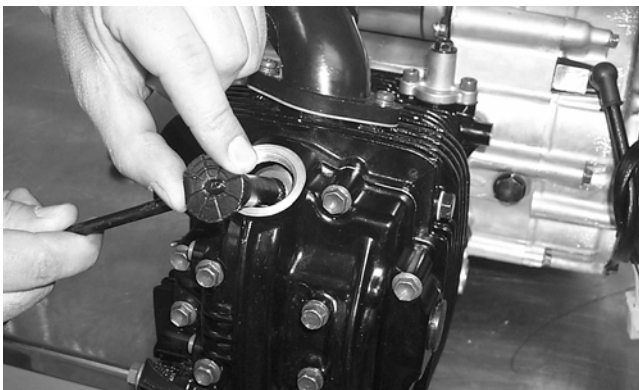


CC367DA

28. In a crisscross pattern starting from the center and working outward, tighten the cap screws to specifications.
29. Adjust valve/tappet clearance using the following procedure.

■ **NOTE: Use Valve Gap Adjuster (p/n 0444-092) for this procedure.**

- A. Turn the engine over until the piston reaches top dead center on the compression stroke.
- B. Place the valve adjuster onto the jam nut securing the tappet adjuster screw; then rotate the valve adjuster dial clockwise until the end is seated in the tappet adjuster screw.
- C. While holding the valve adjuster dial in place, use the valve adjuster handle and loosen the jam nut; then rotate the tappet adjuster screw clockwise until resistance is felt.



CC522D

- D. Align the valve adjuster handle with one of the marks on the valve adjuster dial.
- E. While holding the valve adjuster handle in place, rotate the valve adjuster dial counterclockwise until specified valve/tappet clearance is attained.

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

F. While holding the adjuster dial at the proper clearance setting, tighten the jam nut securely with the valve adjuster handle; then repeat steps B-F on the remaining valve.

30. Place the two tappet covers with O-rings into position; then tighten the covers securely.



CC366D

31. Install the spark plug and tighten to specifications; then install the timing inspection plug.

3



CC411D

Installing Engine/Transmission

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

1. Install the engine into the sub-frame assembly.
2. Connect each drive axle to the engine output shafts.
3. Secure the upper A-arms with cap screws. Tighten to specifications.
4. Secure the rear of the engine to the sub-frame with cap screws and flat washers. Tighten to specifications.

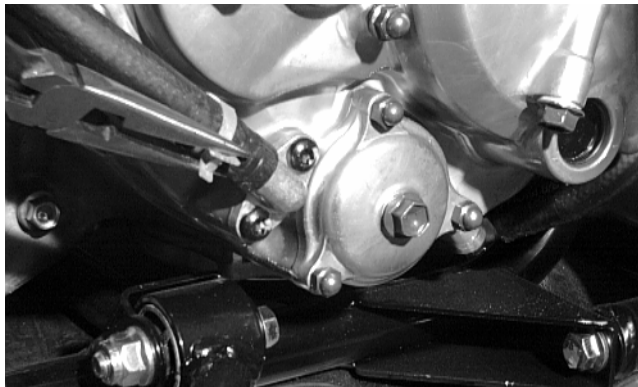
■ **NOTE:** The washers must be located next to the head of the cap screw.

5. Secure the upper shock mount to the sub-frame. Tighten to specifications.
6. Secure the front of the engine to the sub-frame using a cap screw and spacers. Tighten to specifications.
7. Secure the rear wheels to the hubs. Tighten to specifications.
8. Place the engine/sub-frame assembly onto a large floor/transmission jack and place the sub-frame assembly up and into position; then loosely start all six mounting cap screws.

⚠ WARNING

Support the ATV so it doesn't fall off the support stand when the engine/sub-frame assembly is installed into the frame or severe damage, injury, or death may result.

9. Tighten the four upper sub-frame mounting cap screws in a crisscross pattern to specifications.
10. Tighten the two lower sub-frame mounting cap screws to specifications.
11. Secure the skid plate to the rear end assembly. Tighten securely.
12. Secure the two oil cooler hoses to the engine.

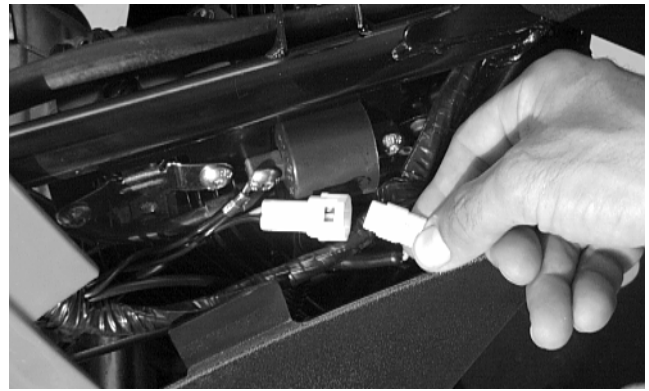


CH070D

13. Secure the brake hose holder to the upper suspension arm with a torx-head screw. Tighten securely.
14. Tighten the rear hydraulic brake caliper to specifications.

15. Tighten the auxiliary brake caliper to specifications.

16. Secure the oil light switch to its connector.



CH067D

17. Install the rear fenders, rear rack, and side panels.



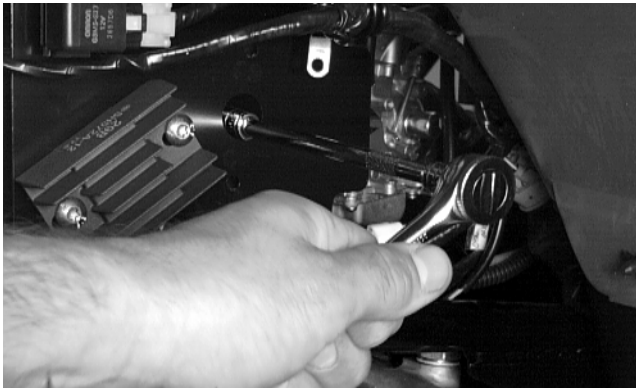
CH066D

18. Secure the remaining connectors to the main wiring harness.



CH065D

19. Install the air-cleaner assembly into the frame and connect the crankcase breather hoses; then secure the air-cleaner assembly to the frame. Tighten securely.

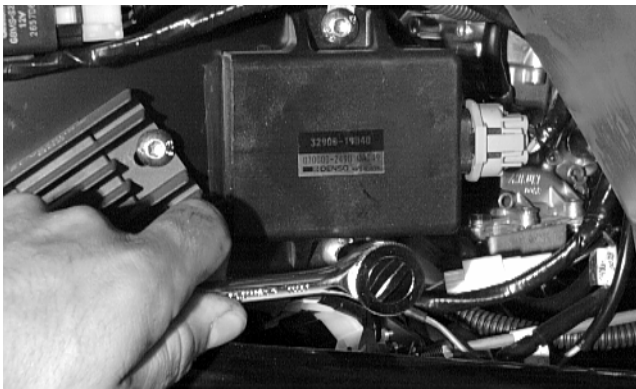


CH048D



CH047D

20. Secure the CDI unit to the frame. Tighten securely.



AF882D

21. Install the carburetor into the air-intake boots; then tighten the clamps. Route the vent hoses in the seat stop holes.

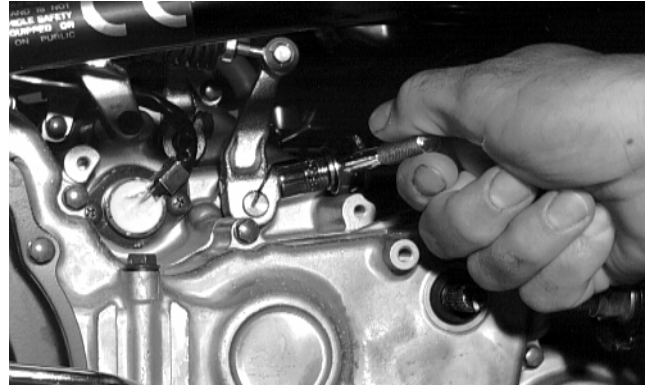


CH043D

22. Secure the air-intake snorkel to the air-cleaner assembly and frame.

23. Secure the reverse gear shaft arm to the reverse shift shaft making sure that the alignment marks made during removing align. Tighten securely.

24. Secure the gear shifter arm to the shifter arm shaft making sure that the alignment marks made during removing align. Tighten securely.



CH060D

3

25. Secure the hi/lo range shifter arm to the shifter arm shaft making sure that the alignment marks made during removing align. Tighten securely.



CH058D

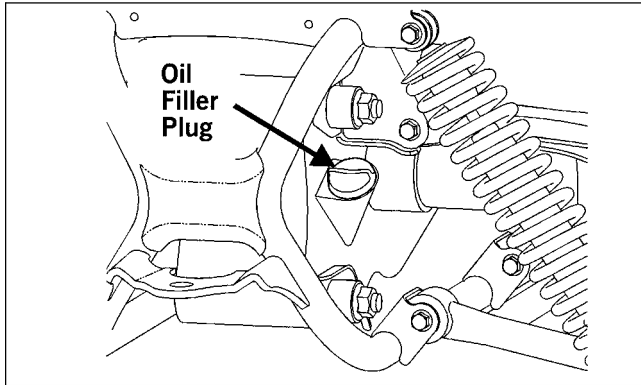
26. Place the exhaust header pipe up to the engine with the existing grafoil gaskets and springs.

27. Secure the muffler and exhaust pipe. Tighten securely.



CH056D

28. Connect the positive cable to the starter motor; then connect the ground (negative) cable to the crankcase.
29. Fill the engine with the correct engine oil (viscosity and quantity).



733-714A

30. Install the battery and the battery hold-down bracket.
31. Connect the positive cable to the battery first; then the negative cable. Connect the high tension lead to the spark plug.
32. Install the seat.
33. Adjust the auxiliary brake to within specifications.
34. Remove the tie-down straps; then remove the ATV from the support stand.
35. Turn the gas tank valve to the ON position.

⚠ CAUTION

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

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Removing Engine/Transmission

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

AT THIS POINT

If the technician's objective is to service/replace left-side cover oil seals (3), front output joint oil seal (1), rear output joint oil seal (1), and/or the oil strainer (from beneath the engine/transmission), the engine/transmission does not have to be removed from the frame.

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

WARNING

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

1. Remove the seat.
2. Remove the negative cable from the battery; then remove the positive cable. Remove the battery hold-down strap and the battery vent hose; then remove the battery.

CAUTION

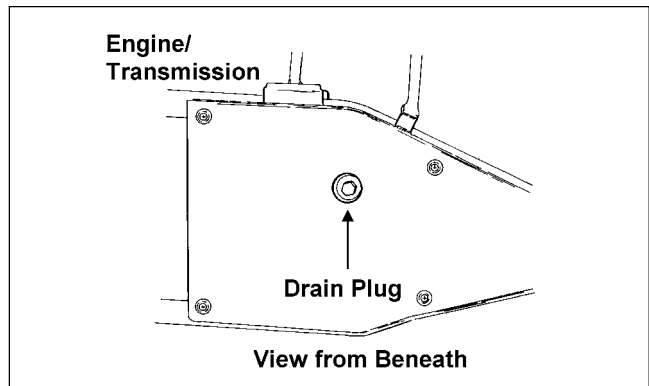
Battery acid is harmful if it contacts eyes, skin, or clothing. Care must be taken whenever handling a battery.

3. Near the battery tray, remove the two screws securing the fuse block; then carefully remove all the wiring from the block.

CAUTION

It is critical that all wiring be marked when removing from the fuse block. This will aid in installing correctly.

4. Carefully guide the battery cables and fuse block wiring down through the access hole into the engine compartment for future removing.
5. Drain the oil from beneath the engine/transmission.



ATV-0109

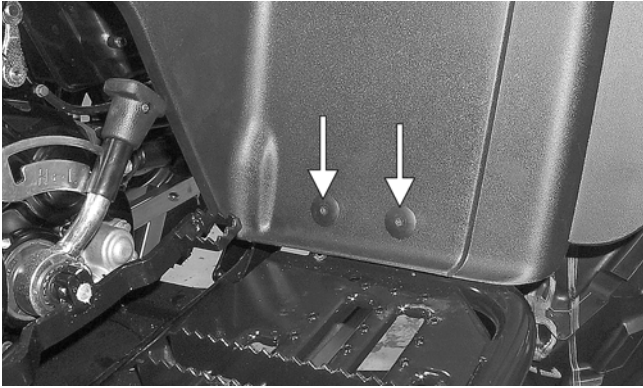
3

6. Remove the hardware securing the right-side and left-side panels; then remove the panels.
7. Turn the gas tank valve to the OFF position; then remove the fuel hose and vent hose.
8. Remove the gas tank.



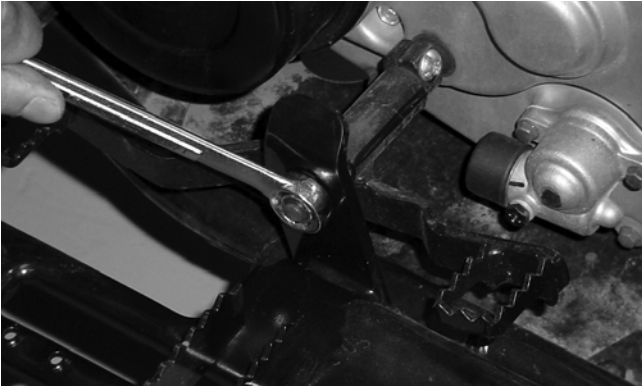
CC933

9. Remove the rear fenders and the rear rack (see Section 8).
10. Remove the hardware securing both footrests to the frame and front fender.

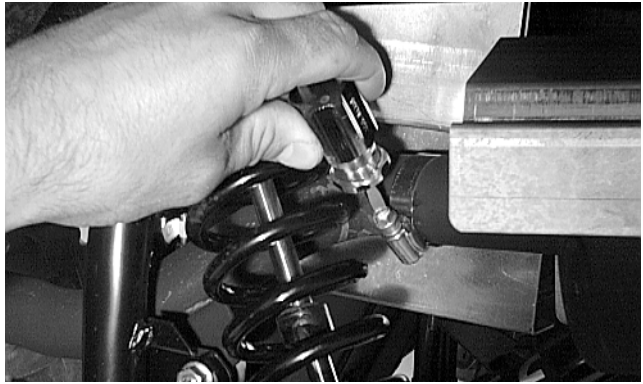


CC861A

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



CD003



AF775D

12. Remove the exhaust pipe and account for the grafoil gasket.



CC934

14. Remove the E-clip securing the reverse shift linkage; then remove the linkage. Account for the bushing and washer.



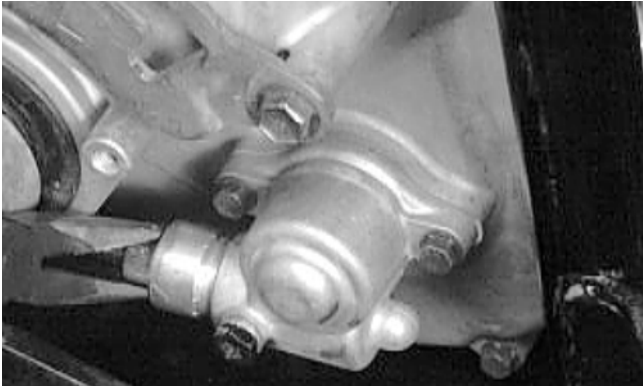
CC941

13. Remove the pinch screw and lock nut securing the gear shift lever; then remove the gear shift lever from the shaft on the engine.



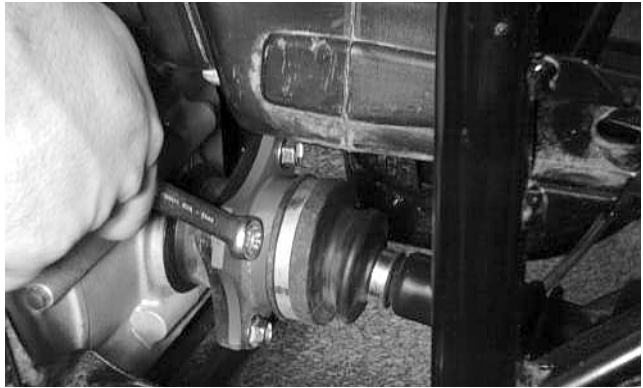
CC935

15. On the ACT/TBX models, detach the speedometer cable by loosening the knurled nut and routing the cable away from the engine/transmission. On the FIS models, disconnect the speed sensor from the housing.



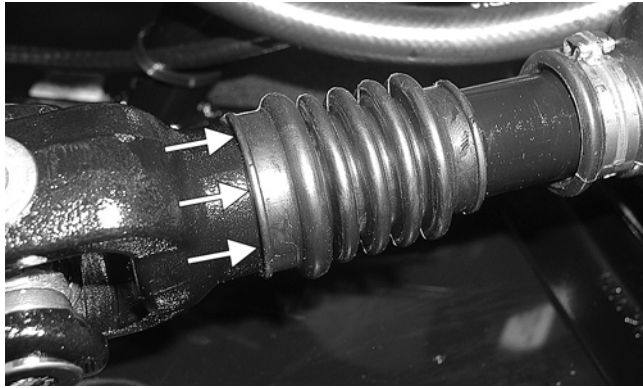
AF667D

16. Remove the four cap screws securing the rear output joint to the transmission and push the shaft away from the transmission.



CC119D

17. Dislodge the rear of the shaft boot from the groove in the propeller shaft yoke; then slide it forward and clear of the yoke.



CD520A

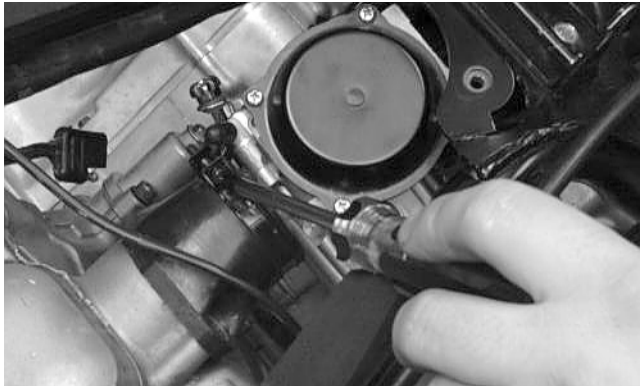
18. Detach the carburetor using the following procedure.

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



CC536

B. Loosen the clamps securing the carburetor boot and the air inlet boot.



CC120D

C. Route the carburetor assembly up and away from the engine.



CC936

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

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

3

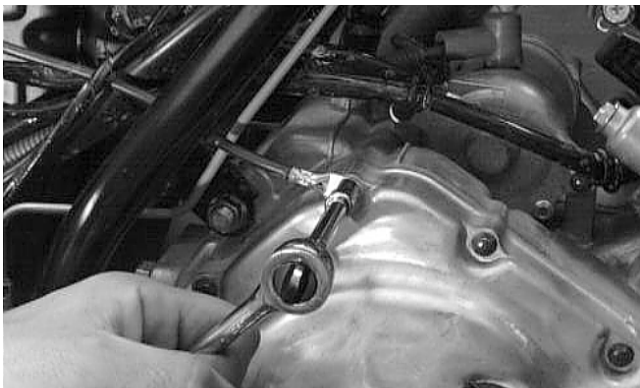


CC937

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

20. Disconnect the high tension lead from the spark plug. At the ignition coil, remove the cap screw, nut, and the two wire leads; then remove the coil.

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



AR600D

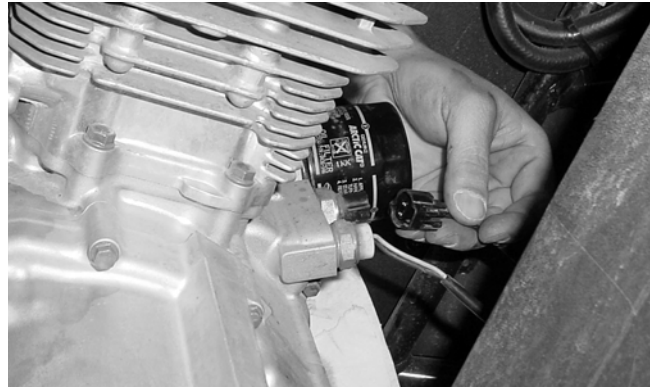


AR604D

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



CC938



CC939

23. Loosen the clamp on the crankcase breather vent hose; then disconnect the hose and route it away from the engine.

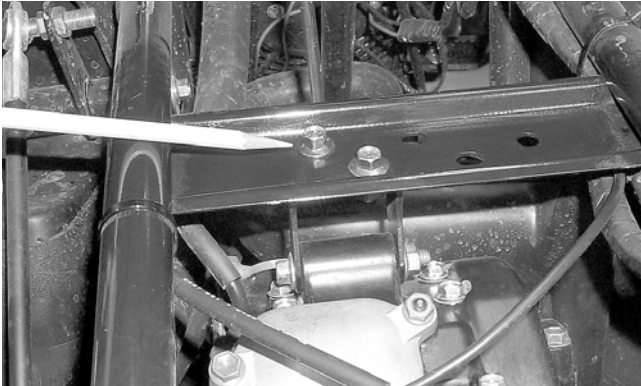


CC122DA

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

A. Upper front: Two cap screws (inside the bracket) and one cap screw and nut (topside of the engine).

■ **NOTE:** It will be necessary to remove the upper front bracket to remove the engine.



AF939

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



CC126D

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



CC123D

C. Upper rear: One cap screw and nut with flat washer; then two left-side engine mount-to-frame cap screws.



CC940



CC125D

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

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.

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

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

Removing Top-Side Components

- A. Valve Cover
- B. Cylinder Head

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

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

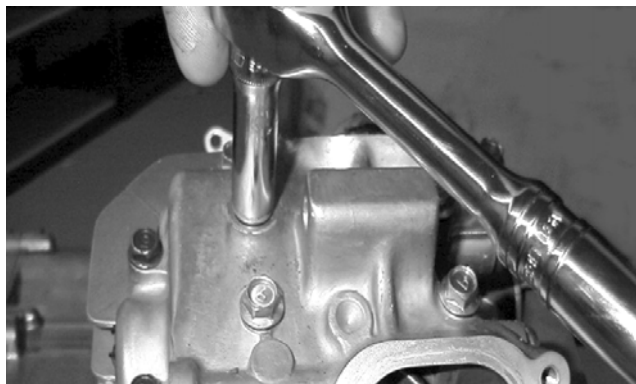
1. Remove the cap screws securing the two tappet covers. Remove the two tappet covers. Account for the O-rings.



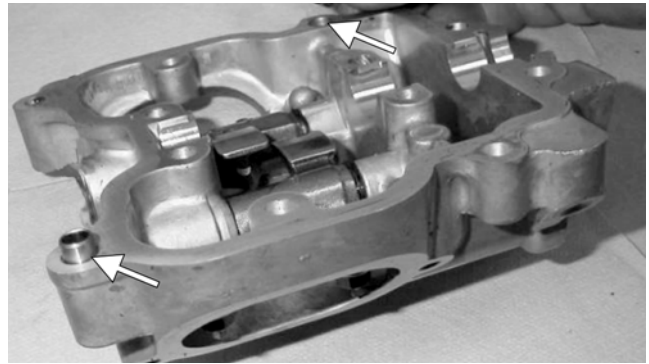
MD1264

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

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



MD1261

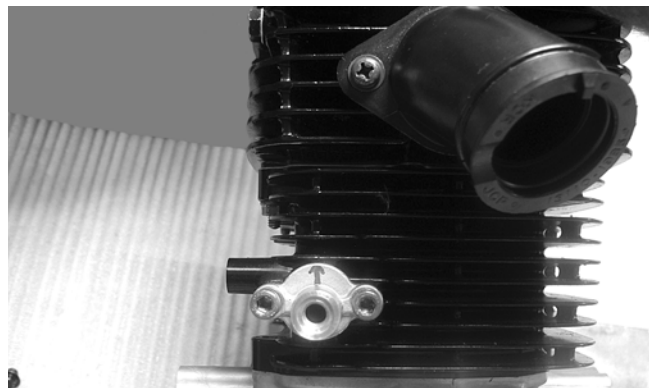


MD1354A

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

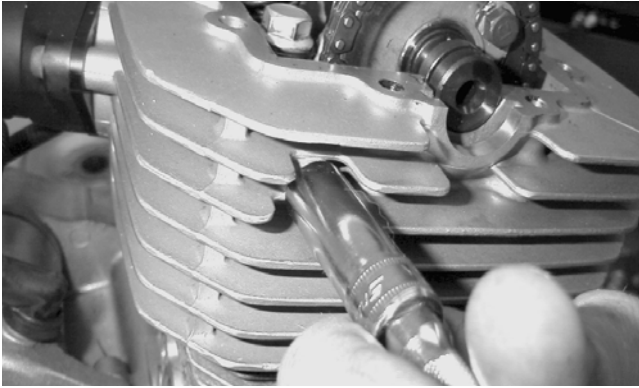


MD1245



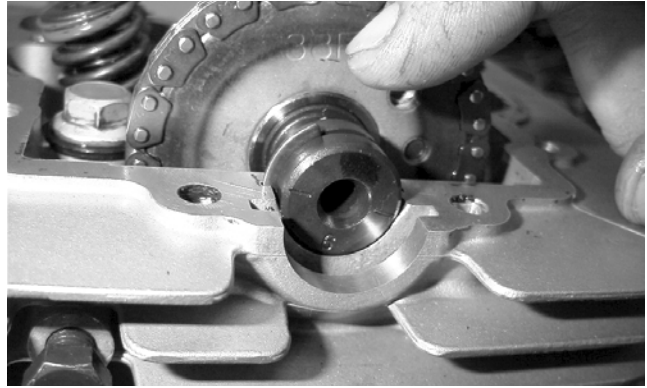
CD382

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



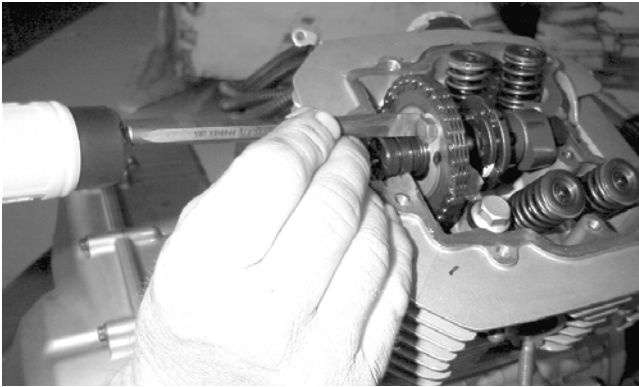
MD1251

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

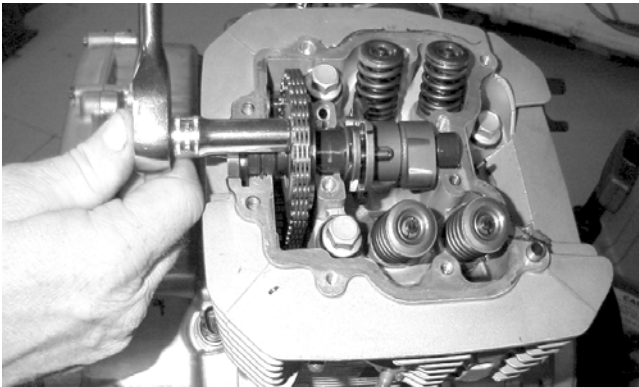


MD1131

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



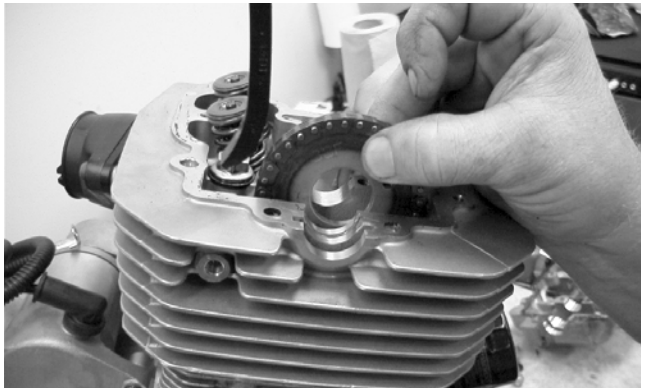
MD1136



MD1137

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

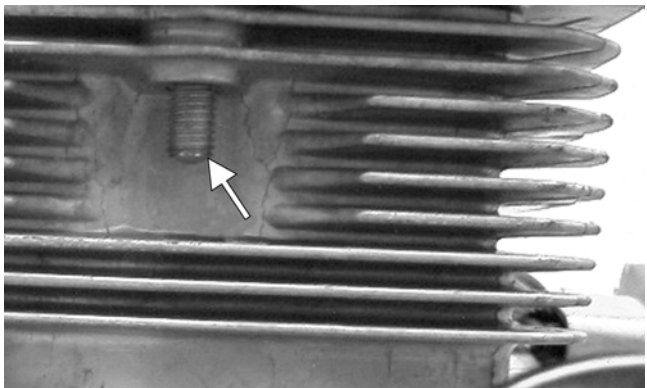
■NOTE: Care should be taken not to drop the C-ring down into the crankcase.



MD1132

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

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



MC1192

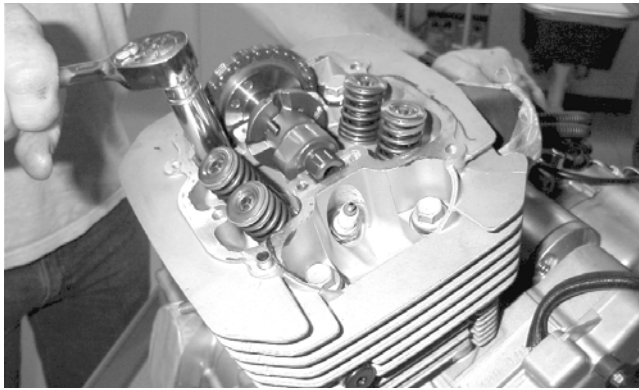
9. Remove the four cylinder head cap screws and washers. Note that the two cap screws on the right side of the cylinder head nearest the cam sprocket are longer than the two cap screws on the left (spark plug) side.

3

C. Cylinder
D. Piston

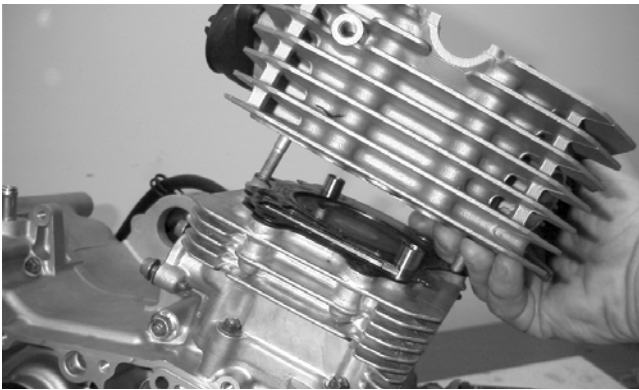
■ **NOTE:** Steps 1-11 in the preceding sub-section must precede this procedure.

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



MD1167

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



MD1163

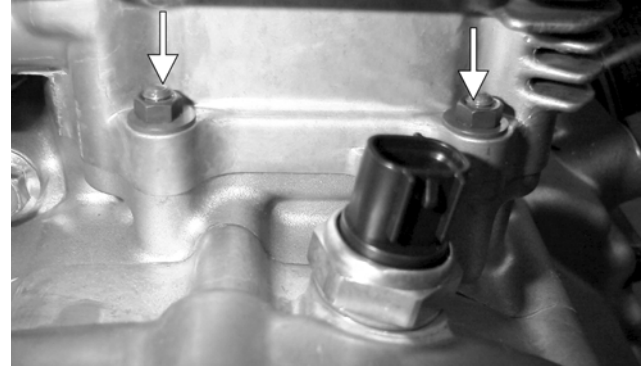
👉 AT THIS POINT
To service valves and cylinder head, see Servicing Top-Side Components sub-section.

- Remove the cam chain guide.

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

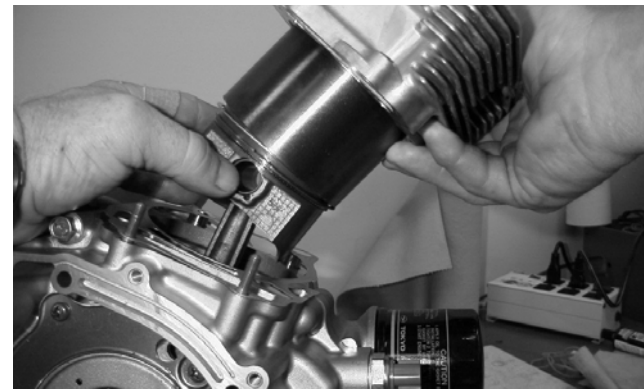


MD1173



MD1226A

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

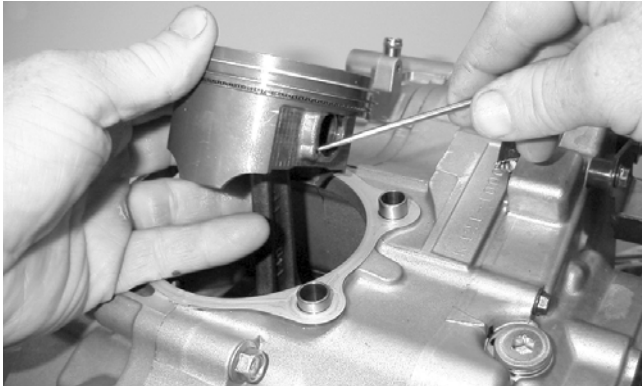


MD1214

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

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

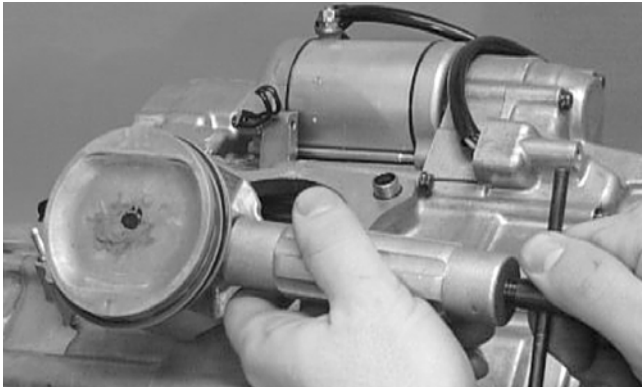
- Using an awl, remove one piston-pin circlip. Take care not to drop it into the crankcase.



MD1213

15. Using the Piston-Pin Puller (p/n 0644-328), remove the piston pin. Account for the opposite-side circlip. Remove the piston.

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



MD1219

■NOTE: Support the connecting rod with rubber bands to avoid damaging the rod or install the Connecting Rod Holder (p/n 0444-006).

CAUTION
<p>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.</p>

■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
<p>To service piston, see Servicing Top-Side Components sub-section.</p>

AT THIS POINT
<p>To service center crankcase components only, proceed to Removing Left-Side Components.</p>

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

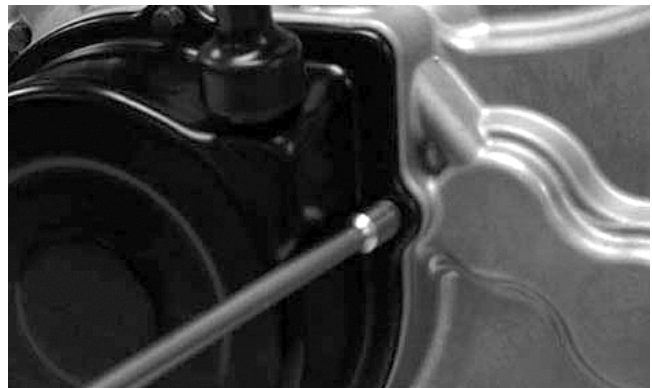
■NOTE: The engine/transmission does not have to be removed from the frame for this procedure.

3

Removing Left-Side Components

A. Cover/Stator Assembly

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



CC942

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



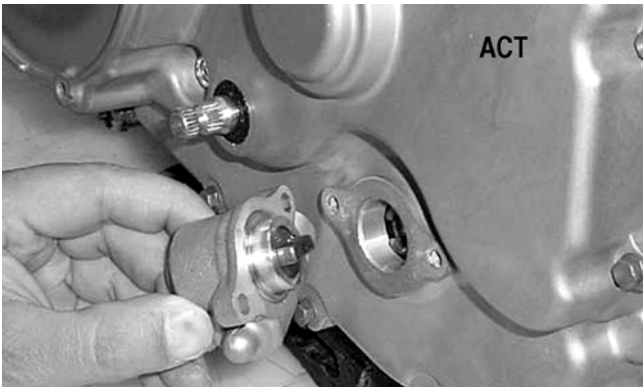
CC943

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

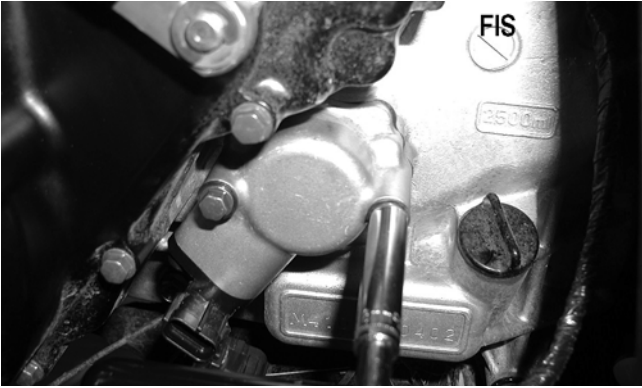


CC944

■ **NOTE:** On the ACT/TBX models, remove the cap screws securing the speedometer drive housing; then remove the housing. On the FIS models, remove the two cap screws securing the speed sensor housing; then remove the housing. Account for the gasket.

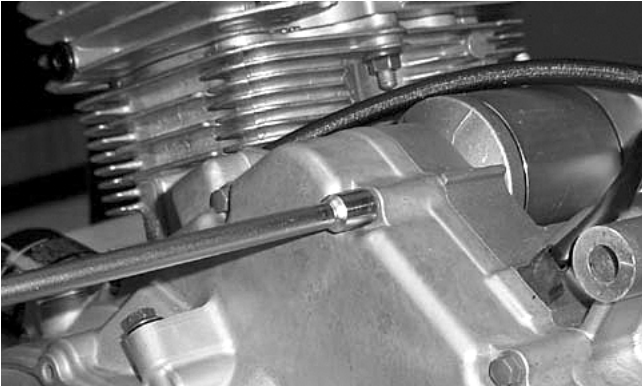


CC947



CD069

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



CC945



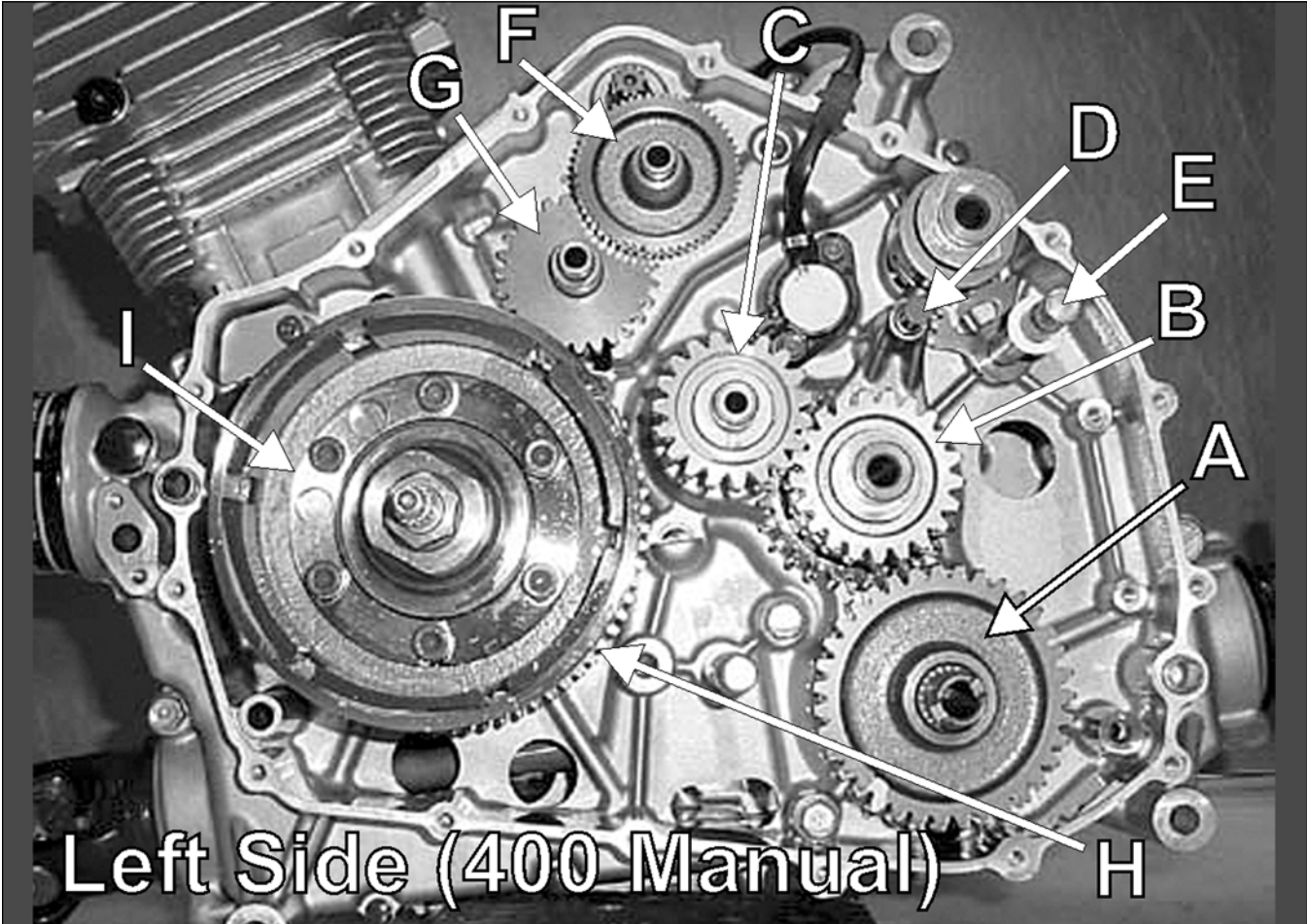
CC946

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

B. Rotor/Flywheel
C. Idle Gear Assembly

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

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



3

Left Side (400 Manual)

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

CC948B

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

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

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

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

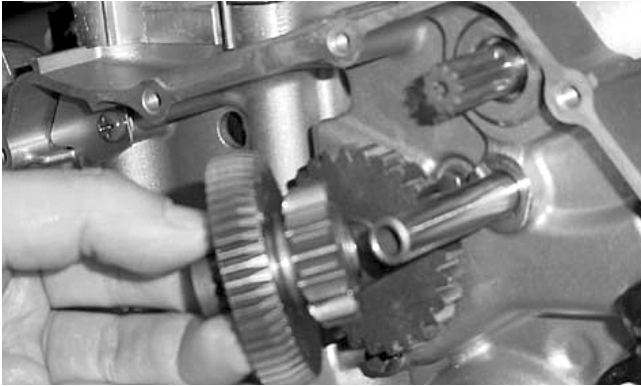


CC514D

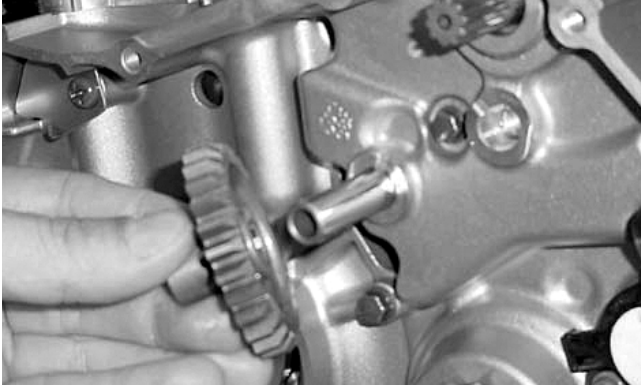


CC949

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

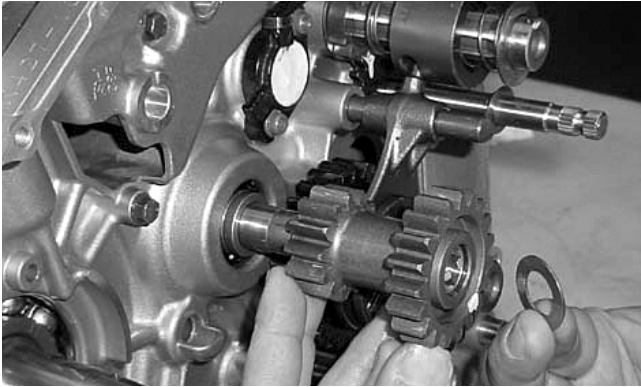


CC950



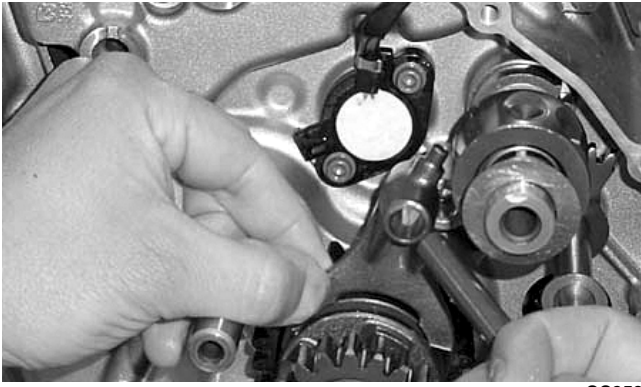
CC951

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



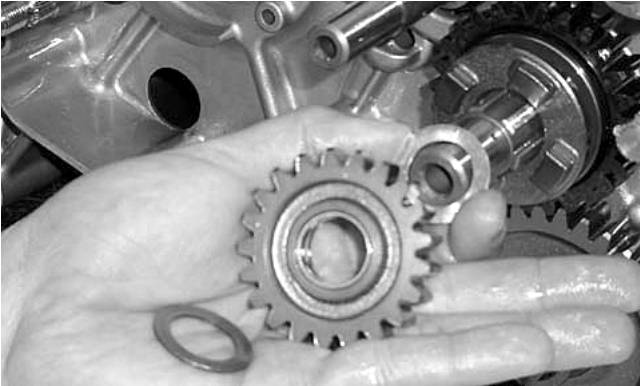
CC952

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



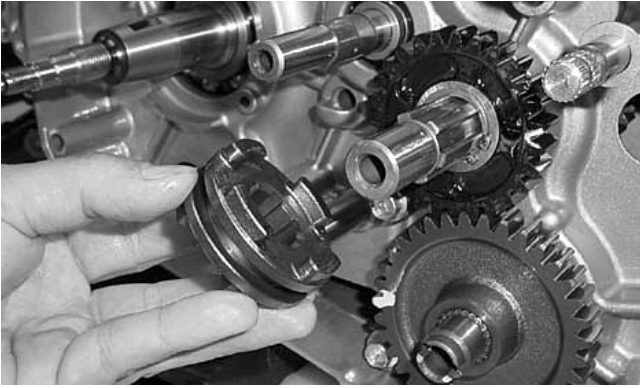
CC953

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



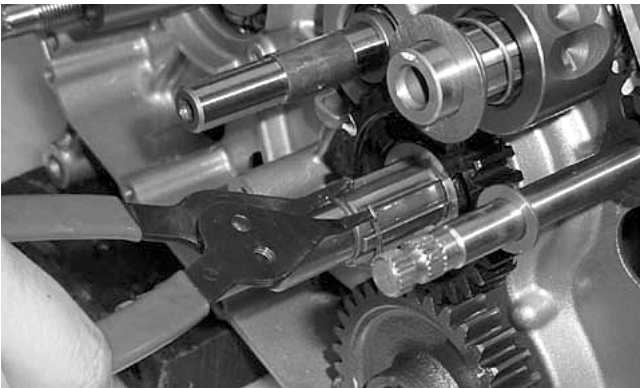
CC954

12. Remove the sliding dog from the driveshaft.

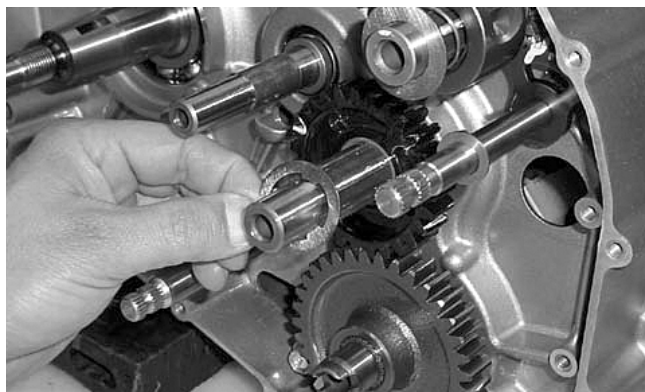


CC966

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



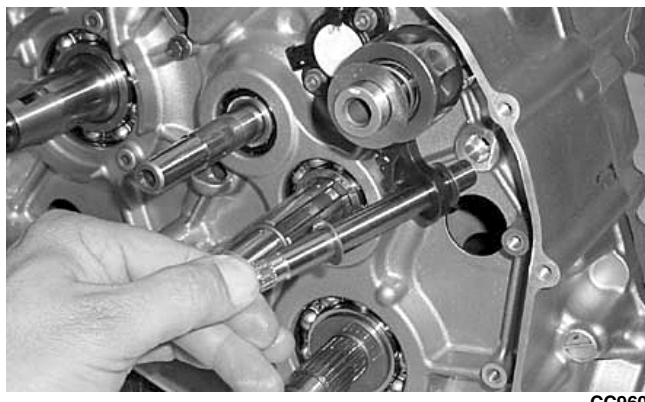
CC955



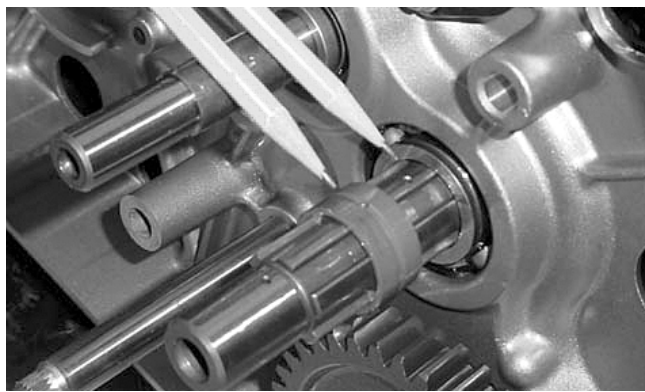
CC956

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

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



CC960

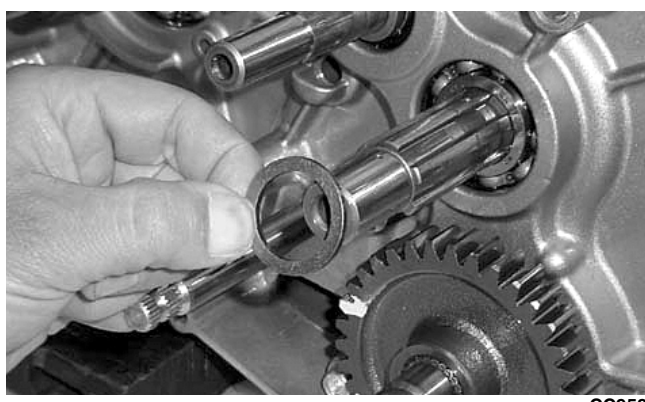


CC957



CC961

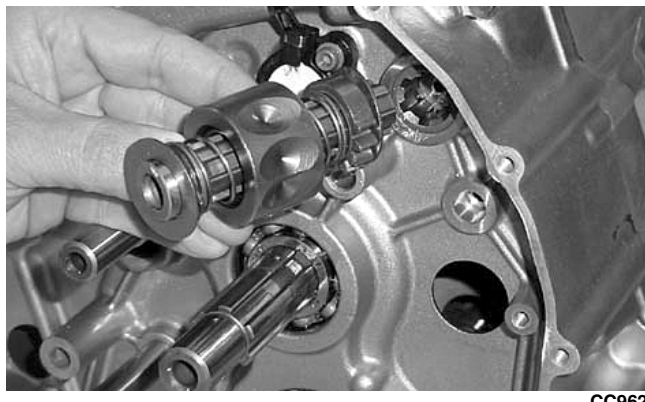
3



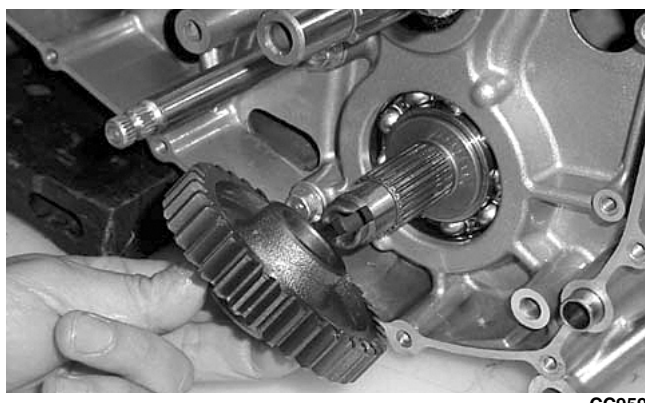
CC958

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

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

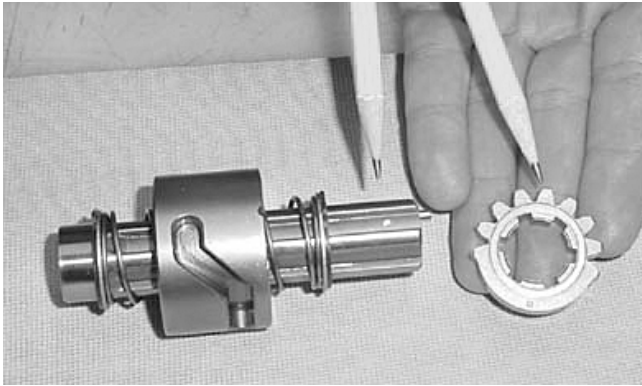


CC962



CC959

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

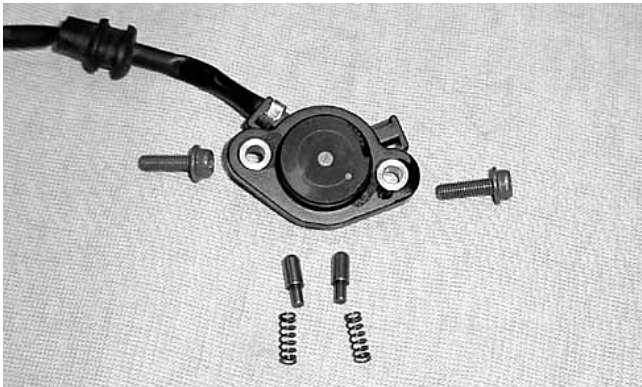


CC963

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



CC964



CC965

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

Right-Side Components

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

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

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

Removing Right-Side Components

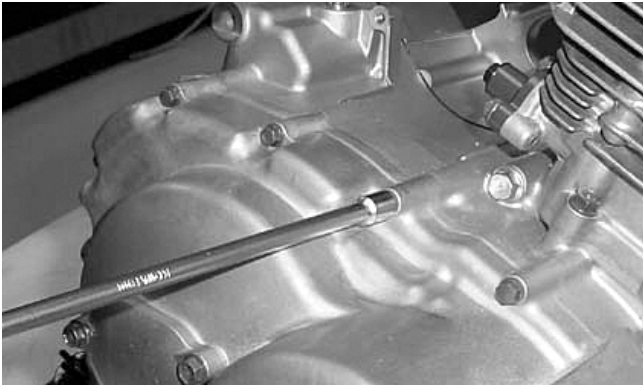
A. Oil Filter

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



CC967

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



CC968

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



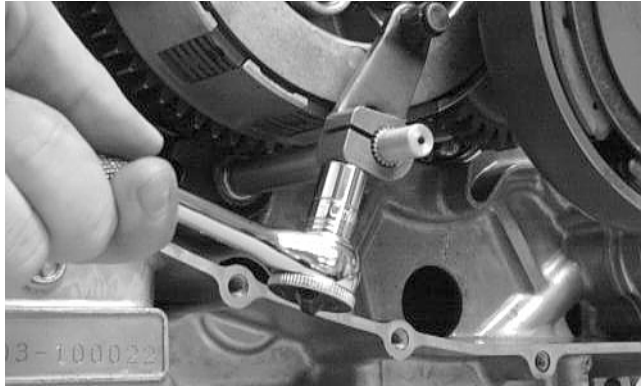
CC070D

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

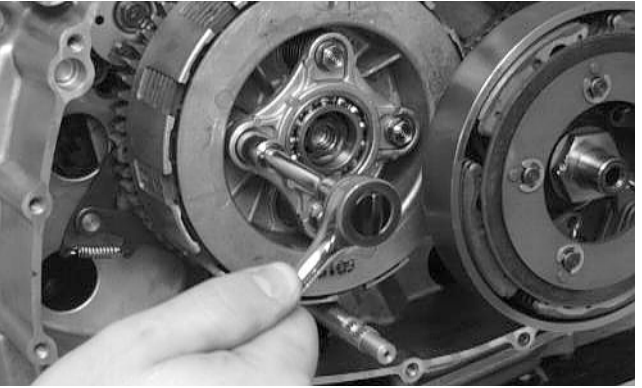
■ **NOTE:** Steps 1-2 in the preceding sub-section must precede this procedure.

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

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



CC073D



CC074D

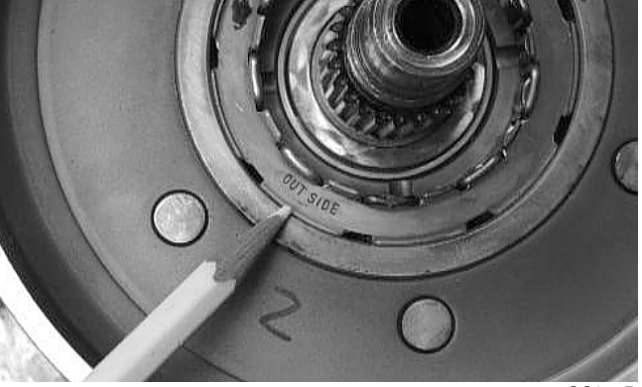
4. Remove the release roller assembly. Account for four springs.
5. Remove the starter clutch-shoe nut (left-hand threads) and washer from the driveshaft; then using a primary clutch shoe remover, remove the clutch shoe.

⚠ CAUTION

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

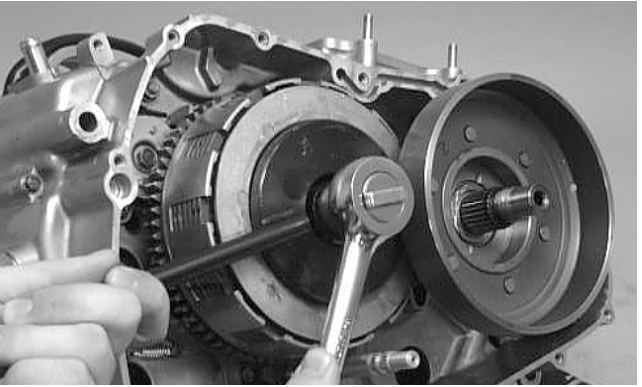
3

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



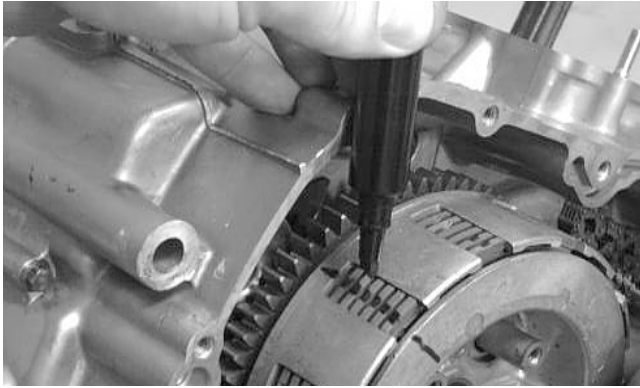
CC075D

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



CC076D

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

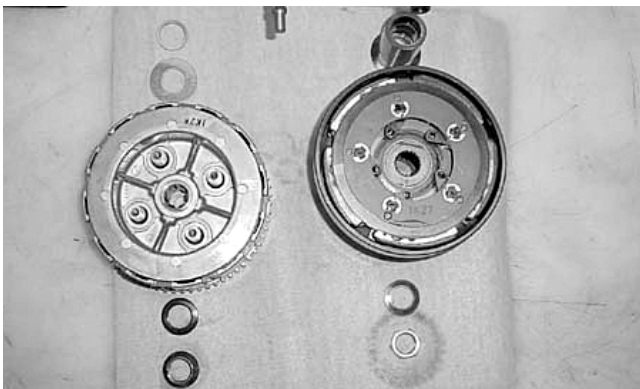


CC077D

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



CC078D



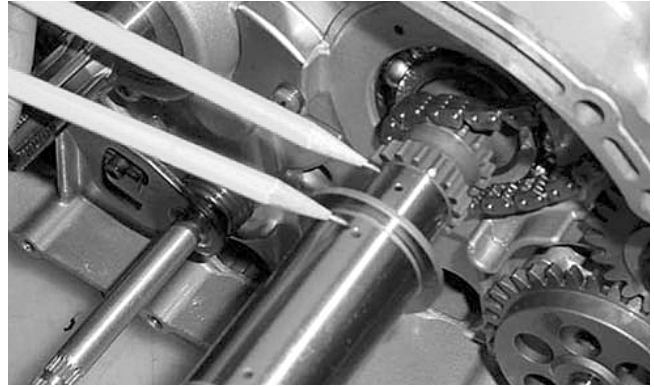
CC969

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

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

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

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



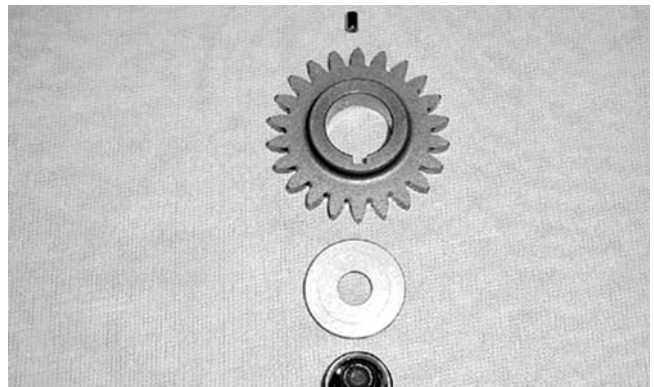
CC970

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

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

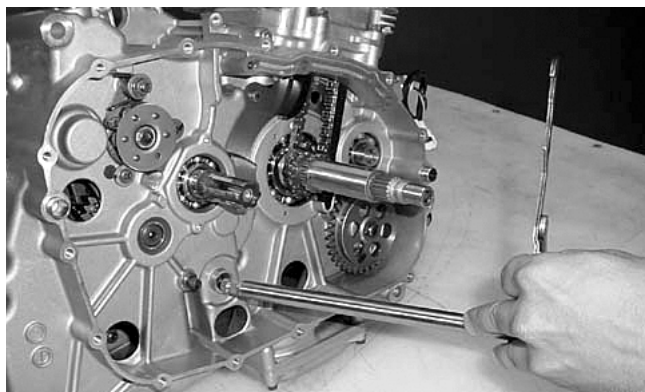


CC971



CC972

11. Remove the gear shift shaft from the crankcase.



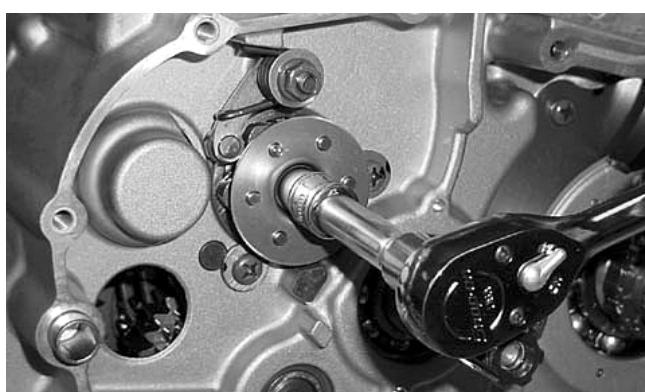
CC973

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



CC974

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



CC975

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

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

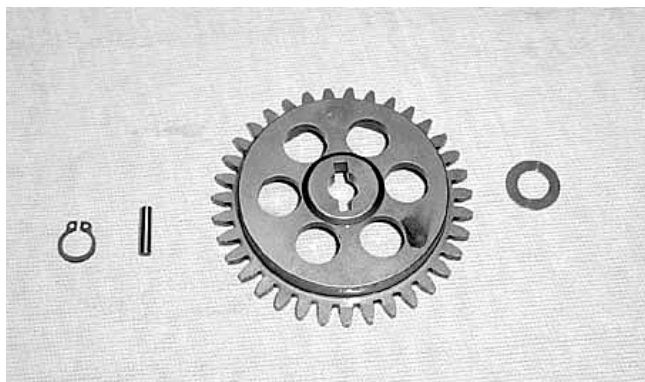
14. Remove the circlip securing the oil pump driven gear; then remove the gear. Account for the pin and the washer.

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



CC976

3



CC977

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



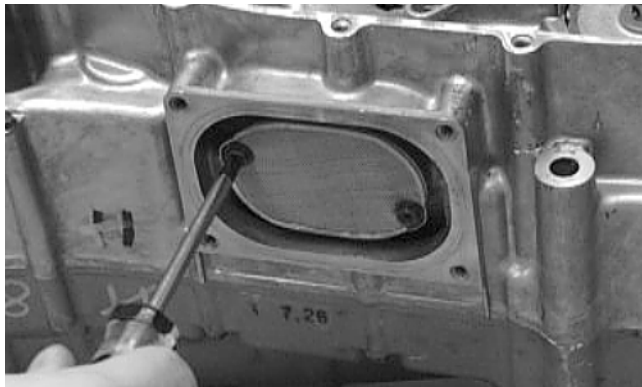
CC978

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



CC091D

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



CC163D

👉 AT THIS POINT

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

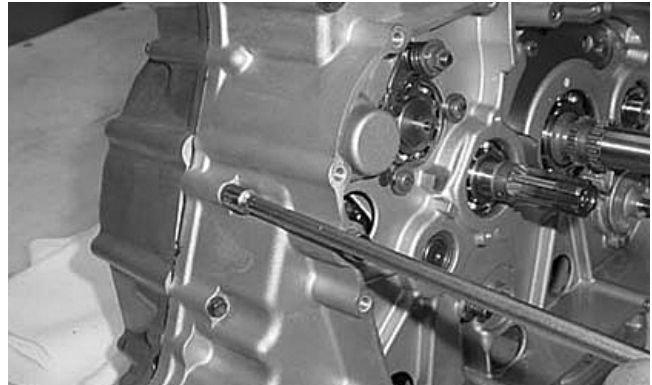
Center Crankcase Components

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

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

Separating Crankcase Halves

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



CC979



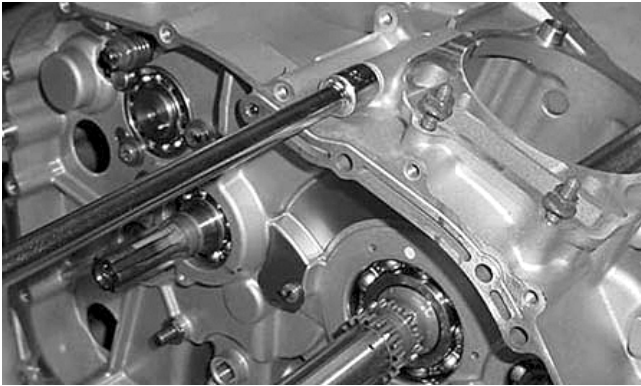
CC980

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

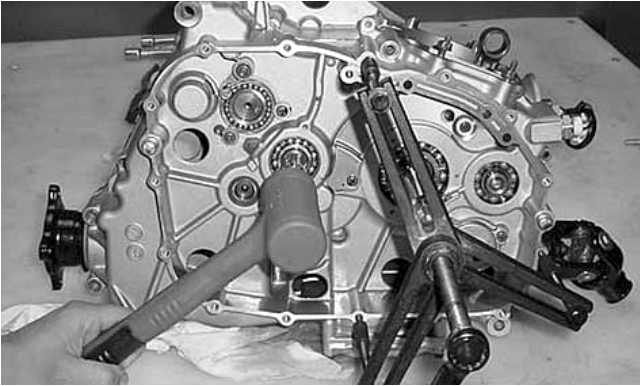


CC981

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



CC982



CC983

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

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

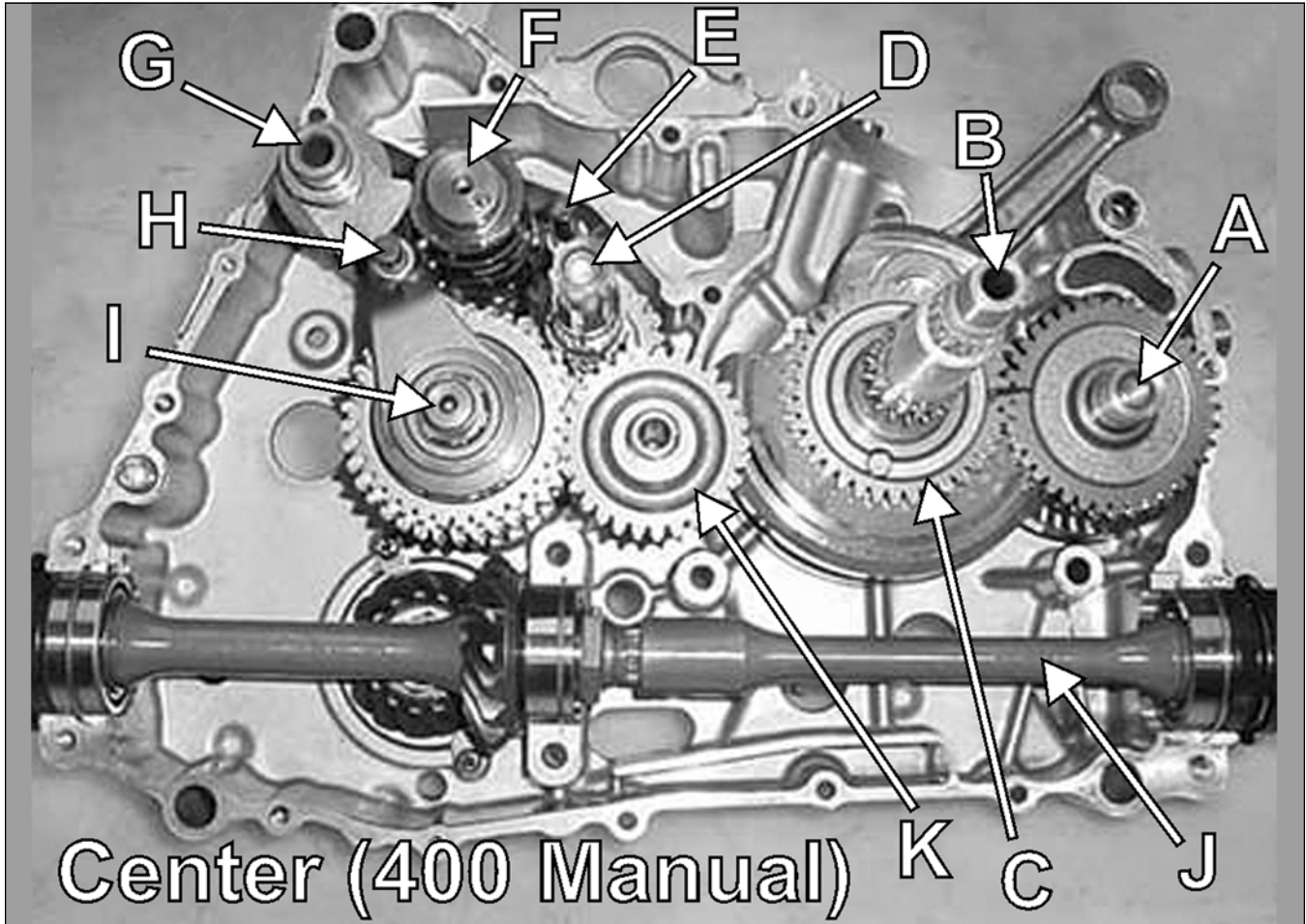


CC984

3

Disassembling Crankcase Half

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



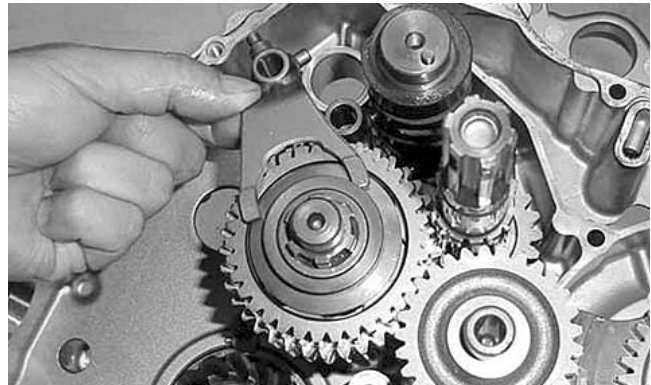
KEY

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

CC985B

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

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



CC986

5. Remove the gear shift cam (F).



CC987

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

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

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

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

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

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



CC166D

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



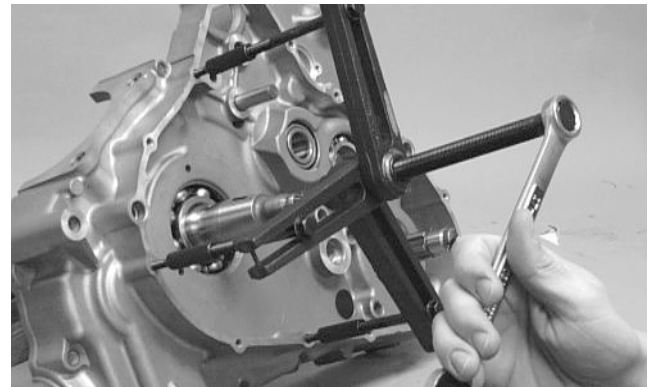
CC165D

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

10. Remove the crank balancer assembly (A).

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

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

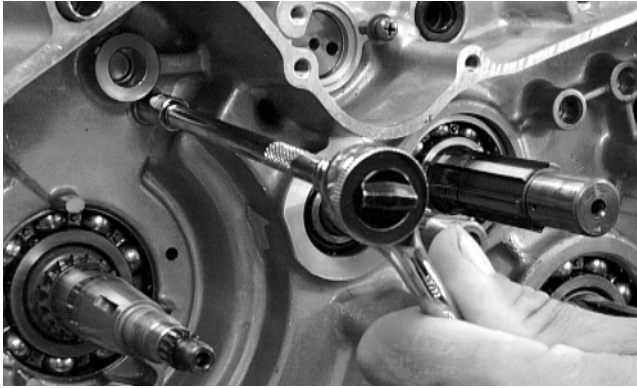


CC115D

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

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

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



CC482D

Table of Contents (Servicing Components)

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

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Servicing Top-Side Components

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

VALVE ASSEMBLY

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

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

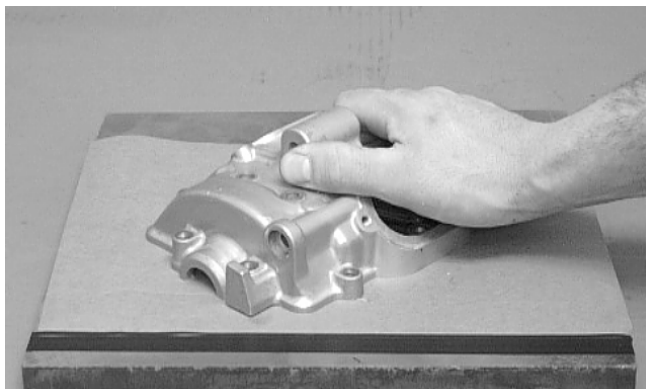
Cleaning/Inspecting Valve Cover

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

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

⚠ CAUTION

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



CC130D

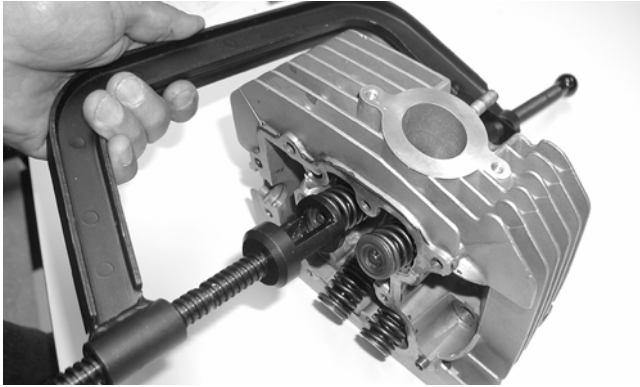
⚠ CAUTION

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

Removing Valves

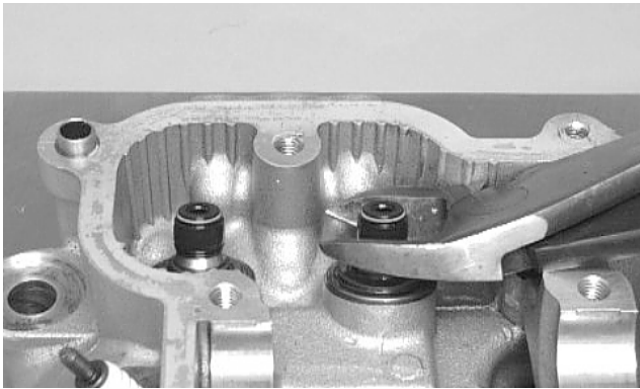
■ **NOTE:** Keep all valves and valve components as a set. Note the original location of each valve set for use during installation. Return each valve set to its original location during installation.

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

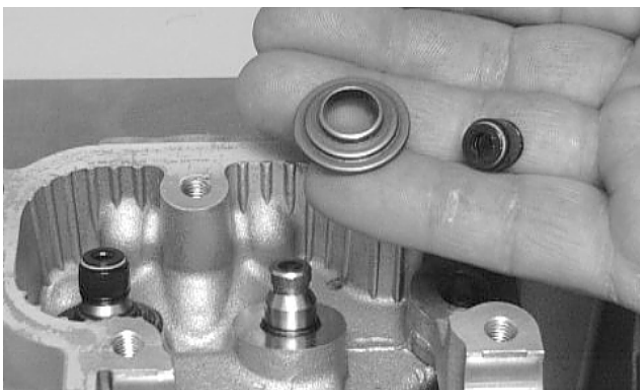


CC994

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



CC134D



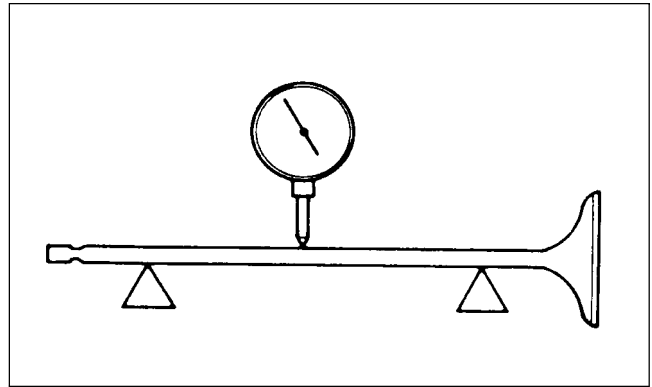
CC136D

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

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

Measuring Valve Stem Runout

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



ATV-1082

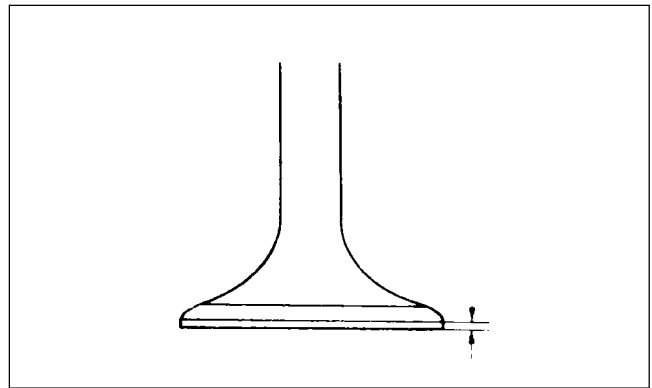
2. Maximum runout must not exceed specifications.

Measuring Valve Stem Outside Diameter

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

Measuring Valve Face/Seat Width

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

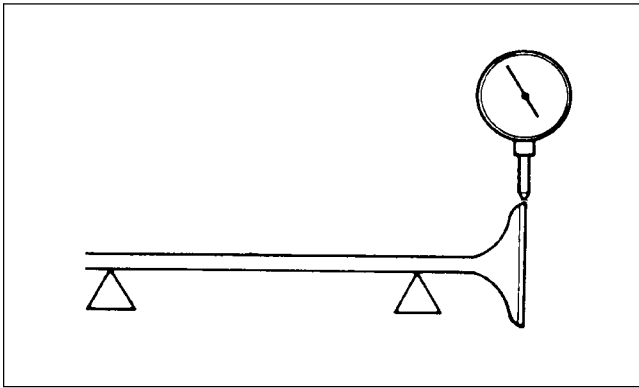


ATV-1004

2. Acceptable width range must be within specifications.

Measuring Valve Face Radial Runout

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

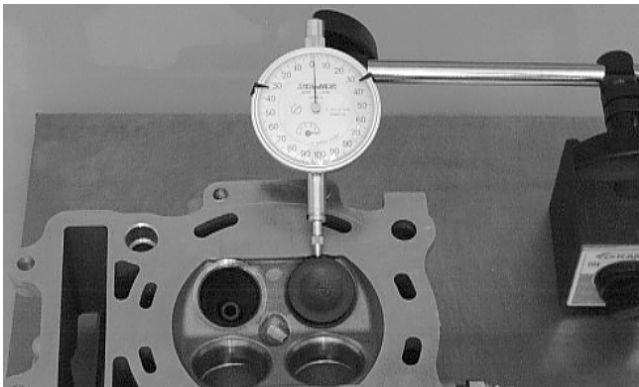


ATV1082A

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

Measuring Valve Guide/Valve Stem Deflection (Wobble Method)

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



CC131D

3. Push the valve from side to side; then from top to bottom.
4. Maximum “wobble” deflection must not exceed specifications.

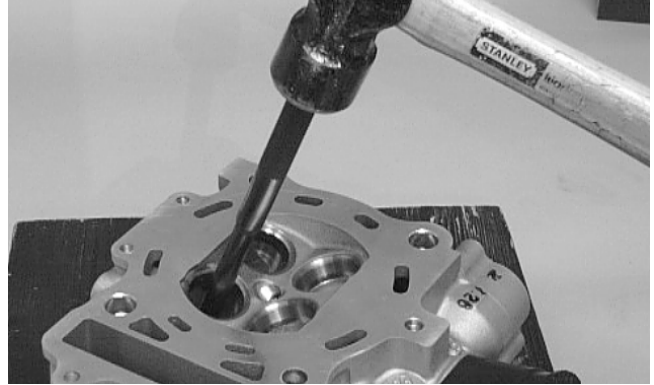
Measuring Valve Guide (Inside Diameter)

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

Replacing Valve Guide

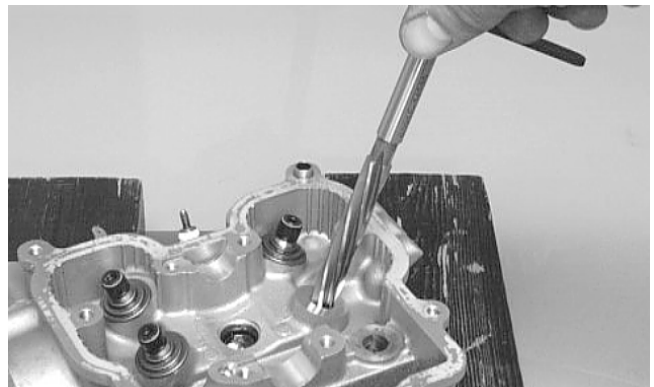
■ **NOTE:** If a valve guide is worn or damaged, it must be replaced.

1. If a valve guide needs replacing, insert a valve guide remover into the valve seat side of the valve guide. Using a hammer, gently drive the valve guide out of the cylinder head.



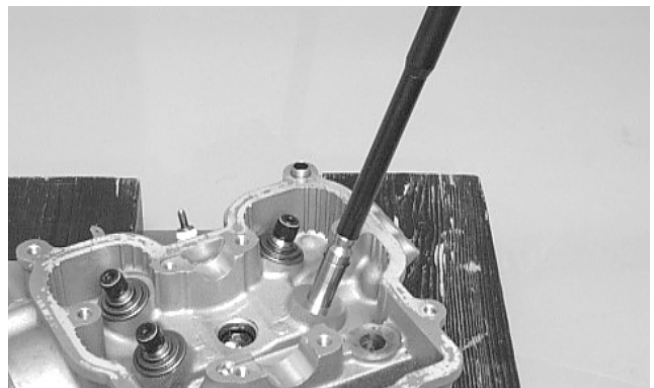
CC137D

2. Using the Standard Valve Guide Reamer (p/n 0444-017), remove any burrs or tight areas from the valve guide journals.



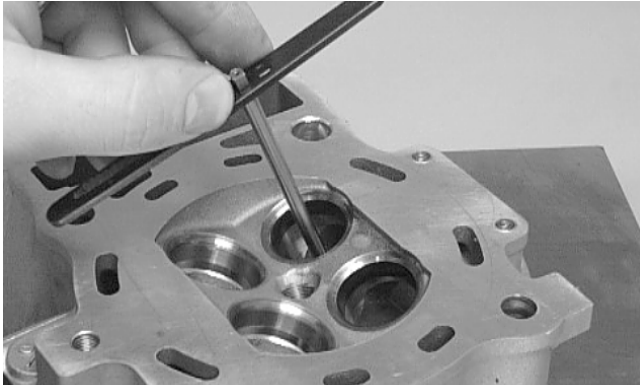
CC142D

3. To install a valve guide, use a valve guide installer and gently drive a valve guide with a retaining clip into the bore from the valve spring side until the retaining clip just contacts the cylinder head.



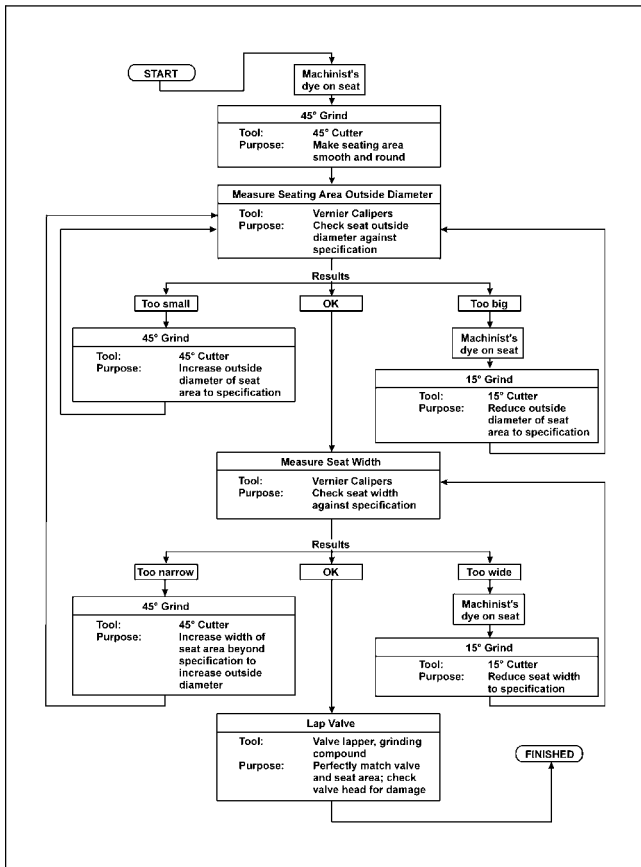
CC143D

4. After installing the guide, use the standard valve guide reamer to remove all burrs and tight areas that may remain in each valve guide.



CC138D

Valve Seat/Guide Servicing Flow Chart



ATV-0107

Grinding Valve Seats

■ **NOTE:** If the valve seat is beyond servicing, the cylinder head must be replaced.

1. Insert an exhaust valve seat pilot shaft into an exhaust valve guide. Slide an exhaust valve seat grinding tool onto the pilot shaft; then using light pressure on a driver handle and a deep socket, grind the exhaust valve seat until within specifications.

■ **NOTE:** Repeat procedure on the remaining exhaust valve.



CC139D

2. Insert an intake valve seat pilot shaft into one of the intake valve guides. Slide the intake valve seat grinding tool onto the pilot shaft; then using light pressure on a driver handle and a deep socket, grind the intake valve seat until within specifications.

3

■ **NOTE:** Repeat procedure on the remaining intake valve.



CC140D

Lapping Valves

■ **NOTE:** Do not grind the valves. If a valve is damaged, it must be replaced.

1. Remove all carbon from the valves.
2. Lubricate each valve stem with light oil; then apply a small amount of valve lapping compound to the entire seating face of each valve.
3. Attach the suction cup of a valve lapping tool to the head of the valve.
4. Rotate the valve until the valve and seat are evenly polished.
5. Clean all compound residue from the valve and seat.

Measuring Rocker Arm (Inside Diameter)

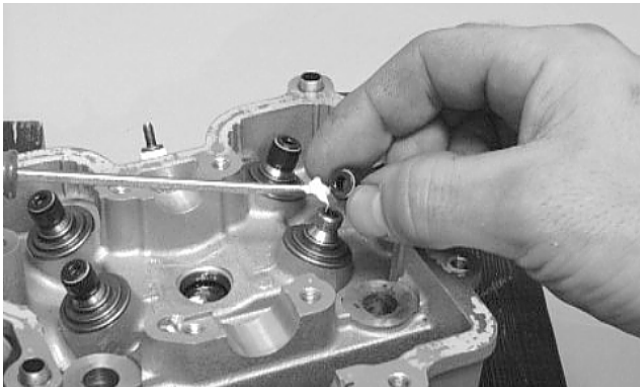
1. Using a dial calipers, measure the inside diameter of the rocker arm.
2. Acceptable inside diameter range must be within specifications.

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

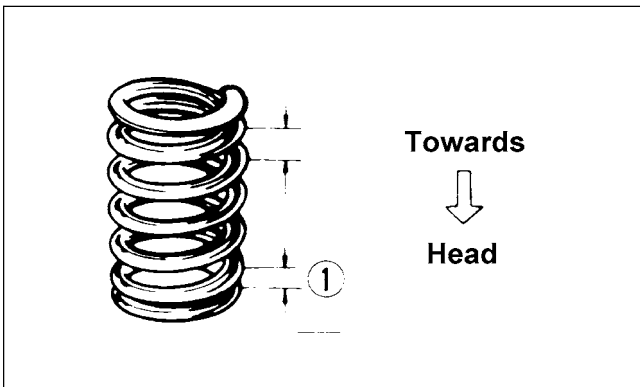
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



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 painted end is not visible, install the ends of the springs with the closest coils toward the head.



ATV-1011A

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



CC994

PISTON ASSEMBLY

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

Cleaning/Inspecting Piston

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the dome of the piston.
2. Inspect the piston for cracks in the piston pin, dome, and skirt areas.
3. Inspect the piston for seizure marks or scuffing. Repair with #400 grit wet-or-dry sandpaper and water or honing oil.



AN135

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

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

Removing Piston Rings

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



CC400D

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

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

Cleaning/Inspecting Piston Rings

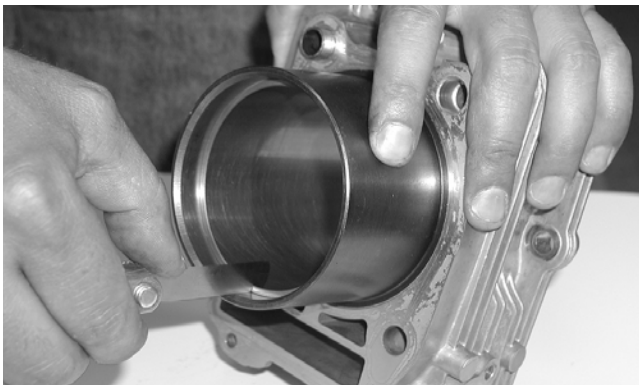
1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

CAUTION

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

Measuring Piston-Ring End Gap (Installed)

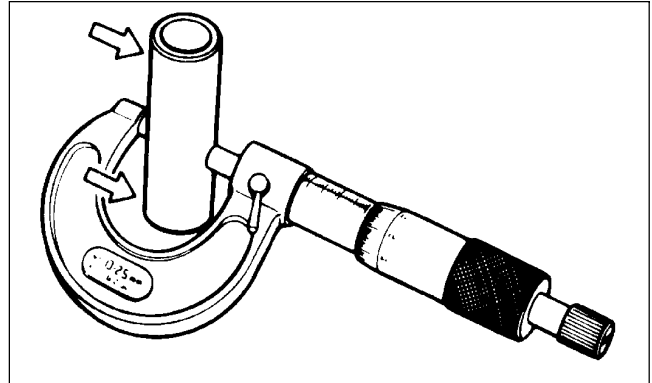
1. Place each piston ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must be within specifications.



CC995

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

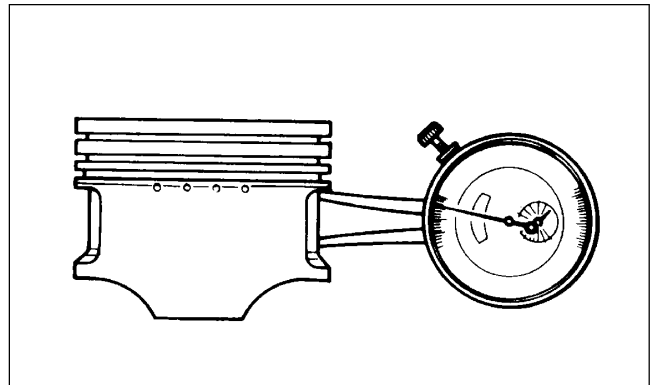
1. Measure the piston pin outside diameter at each end and in the center. If measurement is not within specifications, the piston pin must be replaced.



ATV-1070

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

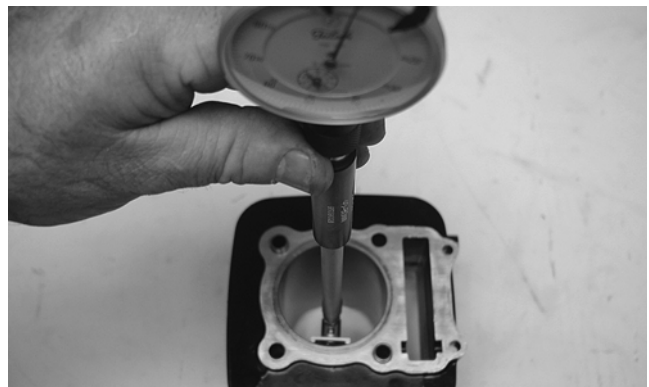
3



ATV-1069

Measuring Piston Skirt/ Cylinder Clearance

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



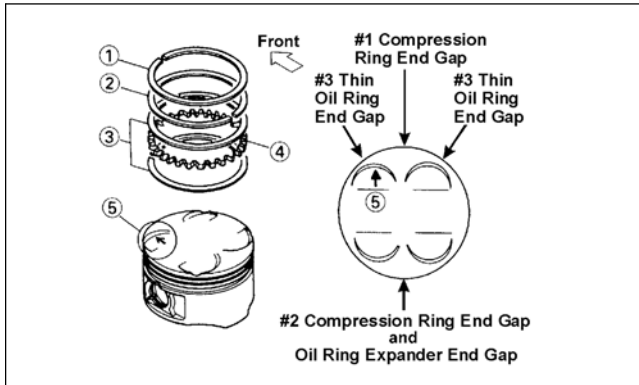
CD325

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

Installing Piston Rings

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

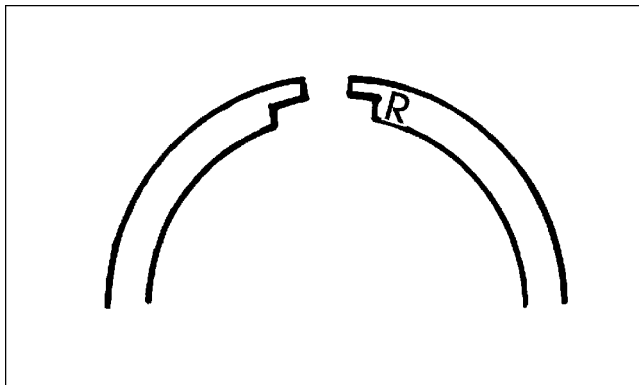
■ **NOTE:** Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.



ATV-1085B

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

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



726-306A

CAUTION

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

CYLINDER/CYLINDER HEAD ASSEMBLY

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

Cleaning/Inspecting Cylinder Head

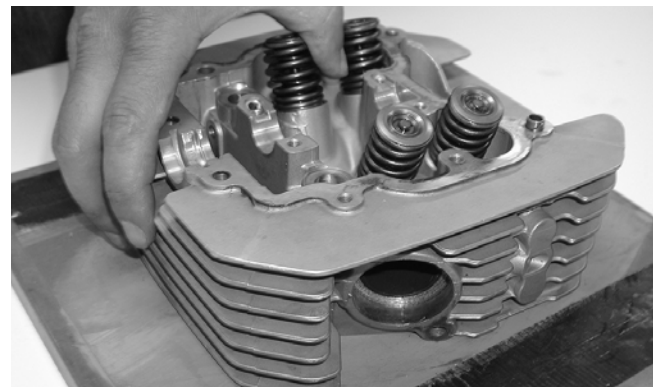
CAUTION

The cylinder head studs must be removed for this procedure.

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

CAUTION

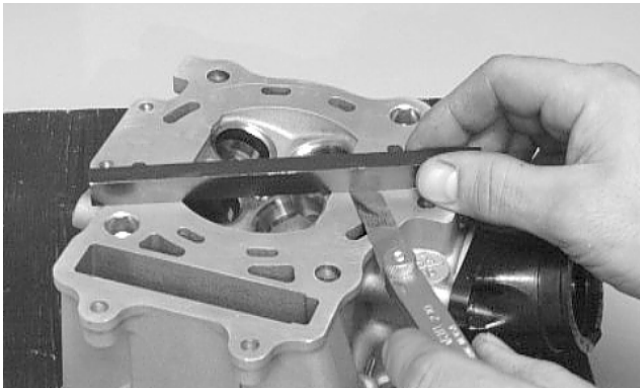
Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.



CC996

Measuring Cylinder Head Distortion

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



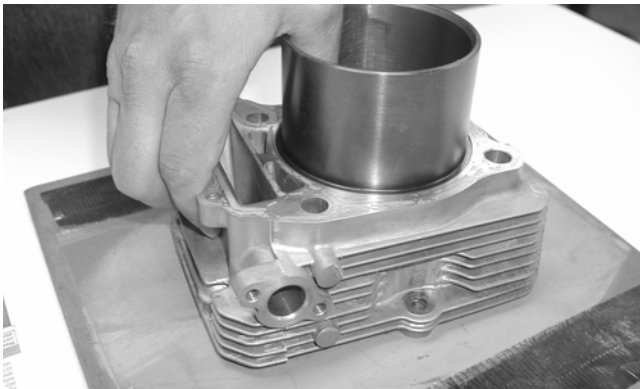
CC141D

Cleaning/Inspecting Cylinder

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

CAUTION

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



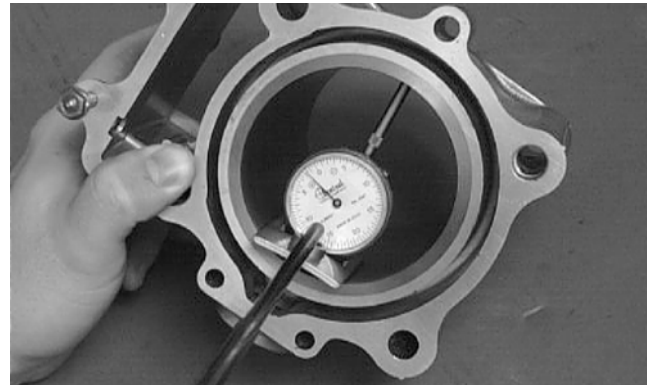
CC997

Inspecting Cam Chain Guide

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

Honing Cylinder

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

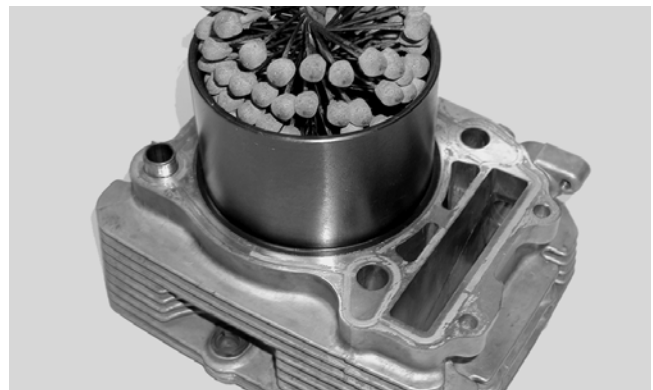


CC127D

3

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

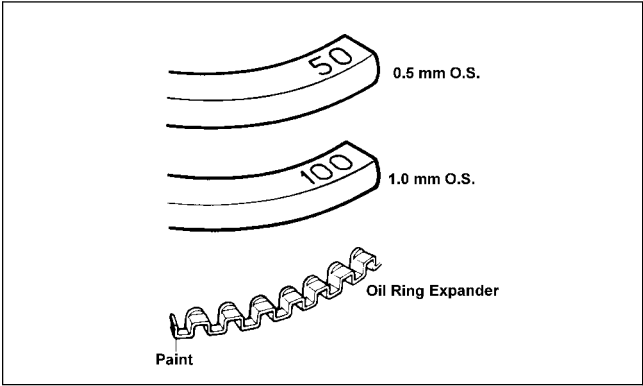
■ **NOTE:** To produce the proper 60° cross-hatch pattern, use a low RPM drill (600 RPM) at the rate of 30 strokes per minute. If honing oil is not available, use a lightweight petroleum-based oil. Thoroughly clean cylinder after honing using soap and hot water. Dry with compressed air; then immediately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



CC998

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

■ **NOTE:** Oversized piston and rings are available. The oversized piston and rings are marked for identification.

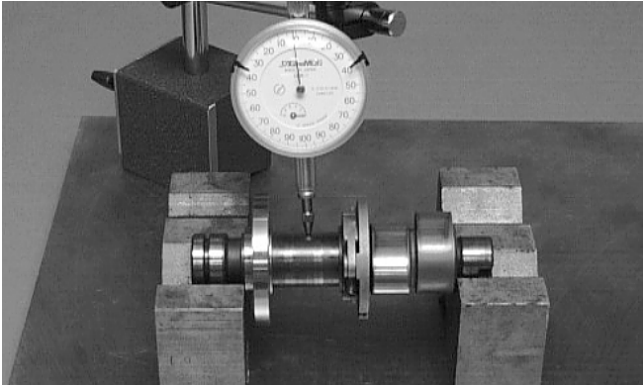


ATV-1068

Measuring Camshaft Runout

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

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

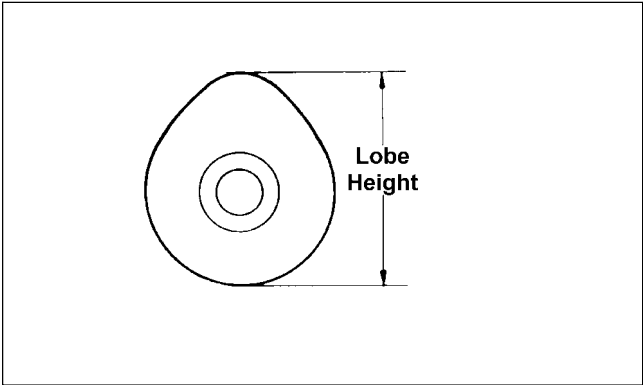


CC283D

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

Measuring Camshaft Lobe Height

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



ATV1013A

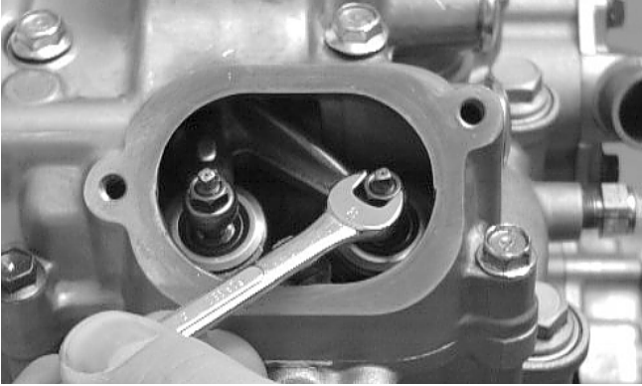
2. The lobe heights must not exceed minimum specifications.

Inspecting Camshaft Bearing Journal

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

Measuring Camshaft to Cylinder Head Clearance

1. Remove the adjuster screws and jam nuts.



CC005D

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

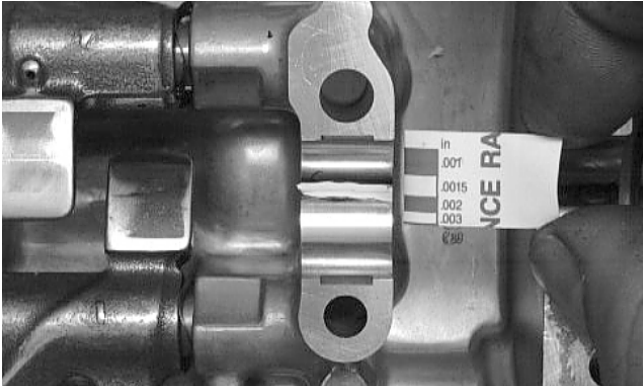
■ **NOTE:** Do not rotate the camshaft when measuring clearance.

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



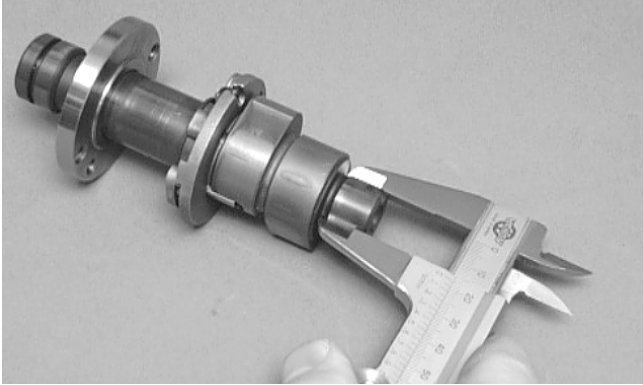
MD1261

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



CC145D

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

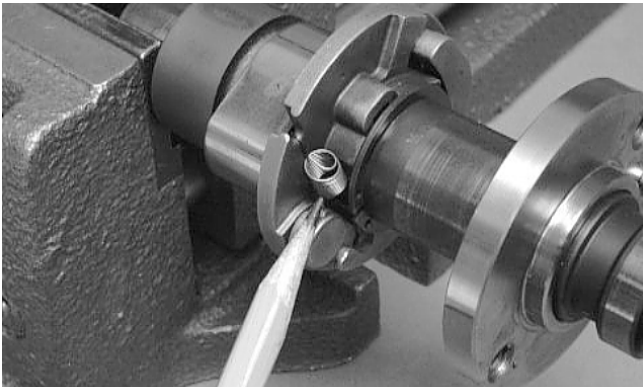


CC287D

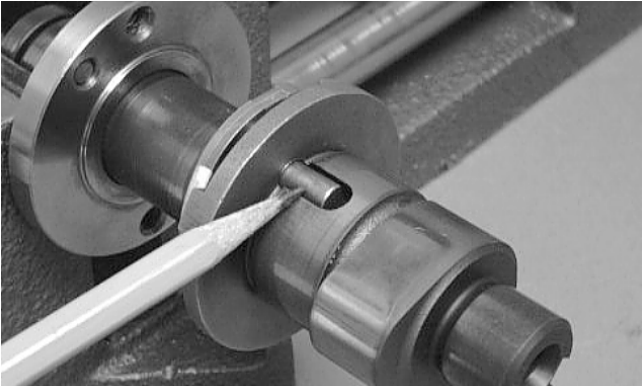
■ **NOTE:** If the journals are worn, replace the camshaft; then measure the clearance again. If it is still out of tolerance, replace the cylinder head.

Inspecting Camshaft Spring/Drive Pin

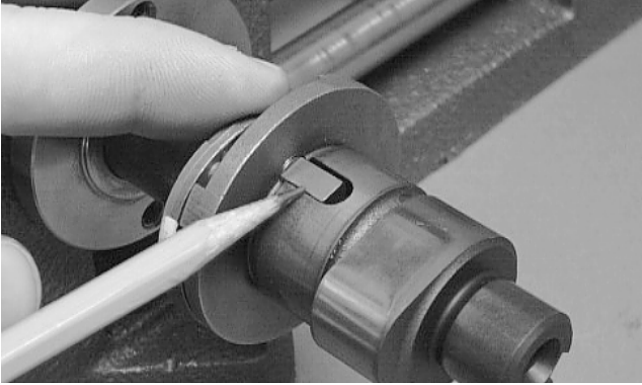
1. Inspect the spring and drive pin for damage.



CC304D



CC306D



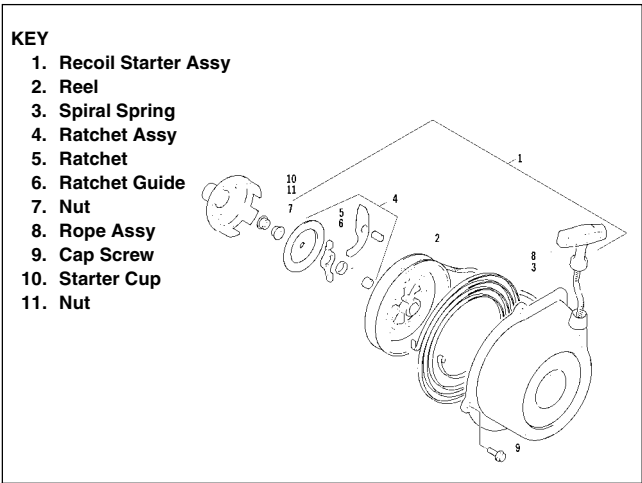
CC308D

2. If damaged, the camshaft must be replaced.

3

Servicing Left-Side Components

RECOIL STARTER



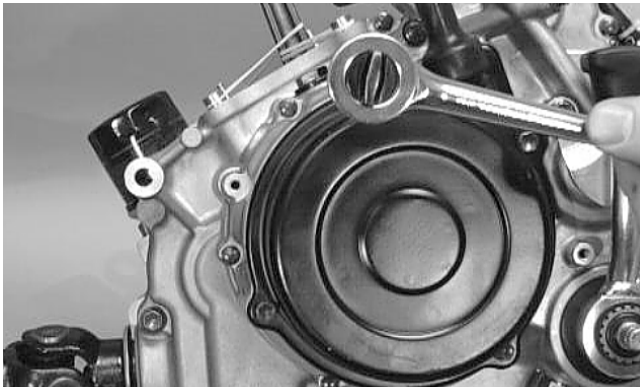
- KEY**
- 1. Recoil Starter Assy
 - 2. Reel
 - 3. Spiral Spring
 - 4. Ratchet Assy
 - 5. Ratchet
 - 6. Ratchet Guide
 - 7. Nut
 - 8. Rope Assy
 - 9. Cap Screw
 - 10. Starter Cup
 - 11. Nut

0737-034

⚠ WARNING
Always wear safety glasses when servicing the recoil starter.

Removing/Disassembling

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

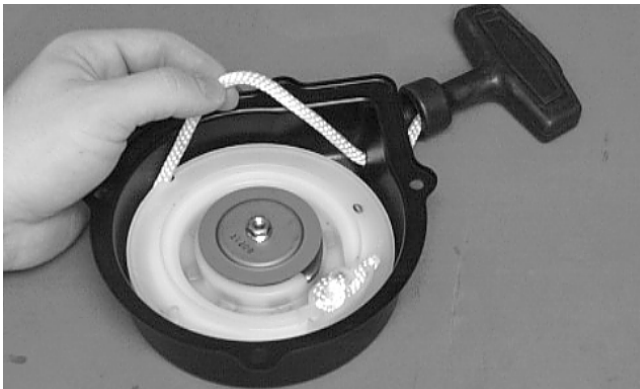


CC039D

WARNING

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

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

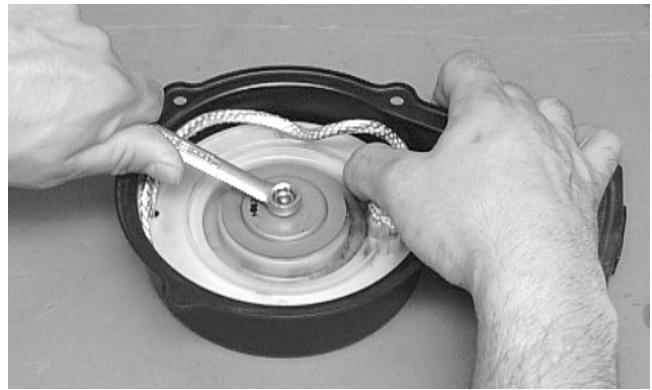


B600D

CAUTION

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

3. Remove the nut.



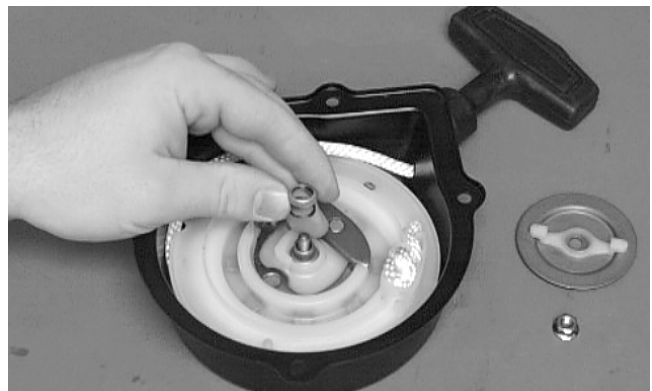
B601D

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



B602D

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



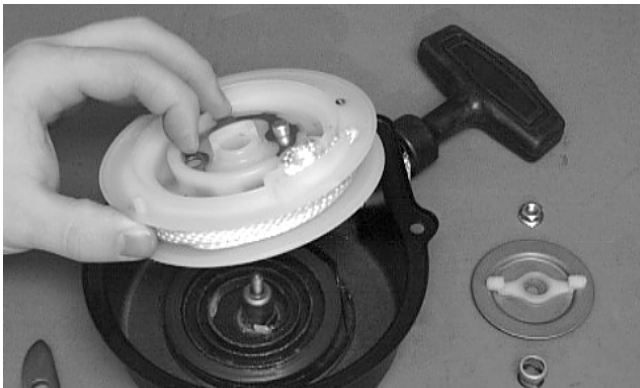
B603D

6. Remove the ratchet and account for the pin.



B604D

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



B605D

⚠ WARNING

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

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

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

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

Cleaning and Inspecting

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

- Clean all components.
- Inspect the springs and ratchet for wear or damage.
- Inspect the reel and case for cracks or damage.
- Inspect the shaft for wear, cracks, or damage.
- Inspect the rope for breaks or fraying.
- Inspect the spiral spring for cracks, crystallization, or abnormal bends.
- Inspect the handle for damage, cracks, or deterioration.

Assembling/Installing

3

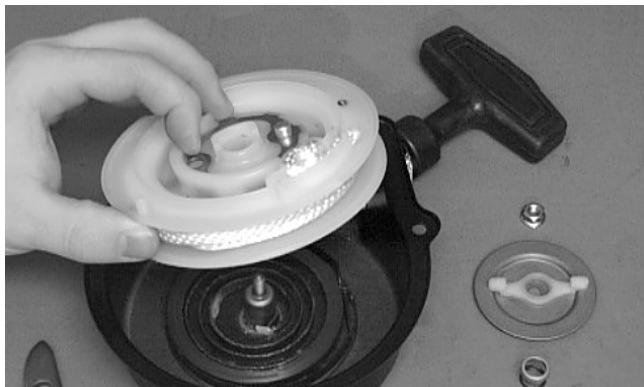
- If removed, insert the spiral spring into the case with the outer end of the spring around the mounting lug in the case; then wind it in a counterclockwise direction until the complete spring is installed.

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



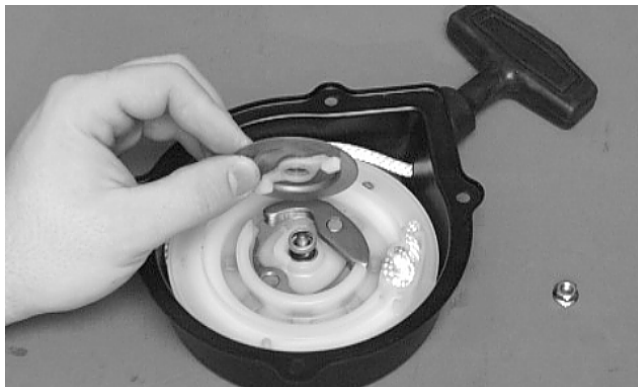
B606D

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



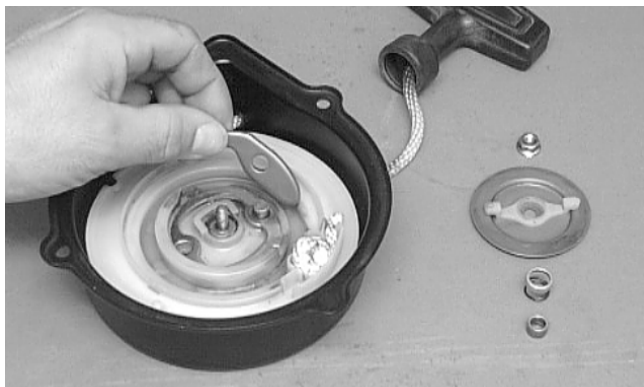
B605D

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



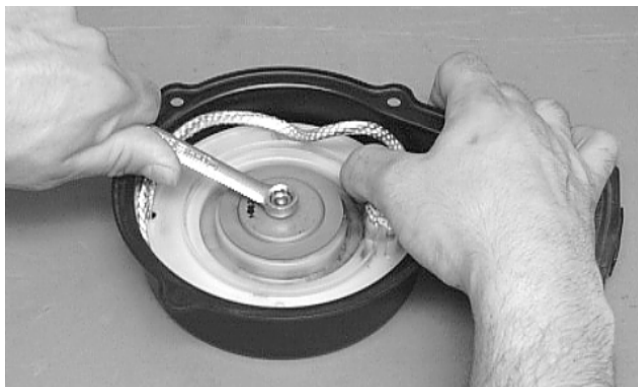
B602D

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



B604D

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



B601D

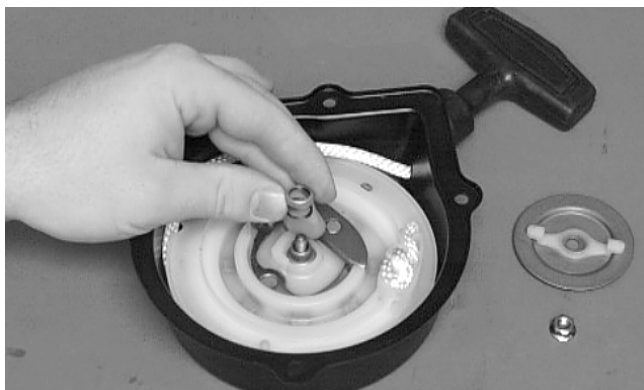
10. With the 50 cm (20 in.) of rope exposed, hook the rope in the notch of the reel.

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

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

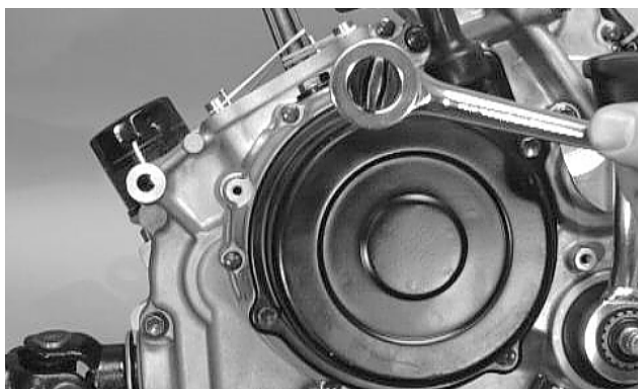
■ **NOTE:** Increasing the rotations in step 11 will increase spring tension.

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



B603D

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



CC039D

MEASURING SHIFT FORK (Thickness)

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

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

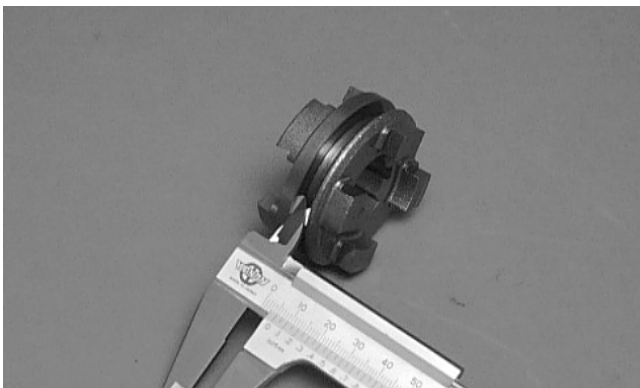


CC296D

2. Shift fork thickness must be within specifications.

MEASURING SHIFT FORK GROOVE (Width)

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



CC288D

2. Shift fork groove width must be within specifications.

MEASURING SHIFT FORK TO GROOVE (Side Clearance)

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



CC292D

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

Servicing Right-Side Components

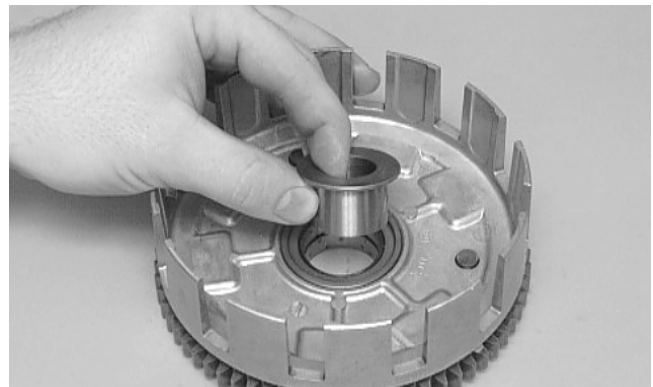
3

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

PRIMARY CLUTCH ASSEMBLY (Inspecting/Measuring/Assembling)

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

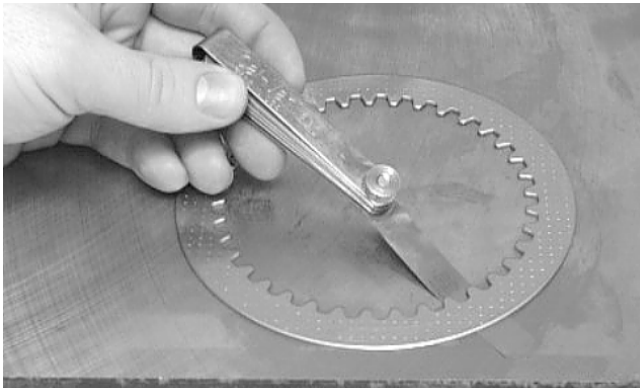
■ **NOTE:** When removing components from the primary gear assembly, account for the bushing that fits into the primary gear.



CC239D

Inspecting/Measuring Clutch Driven Plate Warpage

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

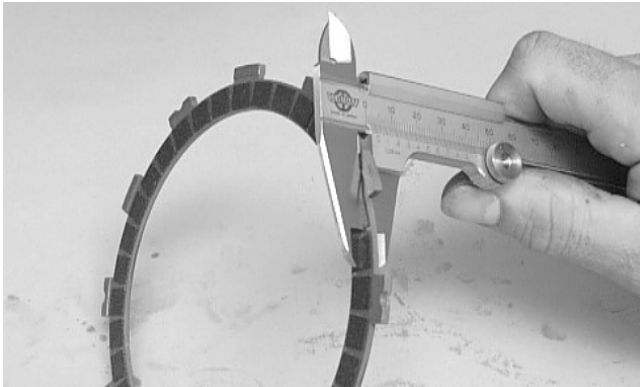


CC245D

3. Maximum driven plate warpage must not exceed specifications.

Measuring Clutch Drive Plate (Fiber) Thickness

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



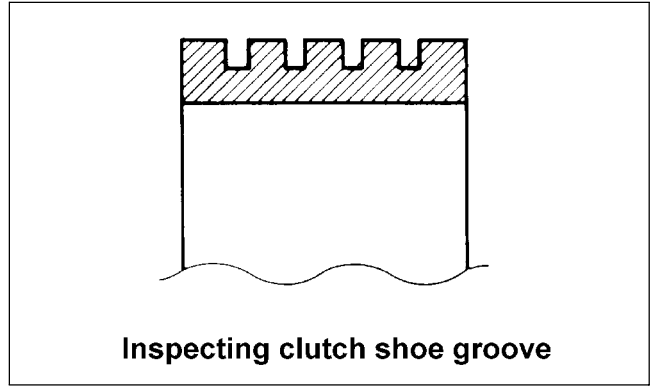
CC243D

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

Inspecting Starter Clutch Shoe

1. Inspect the starter clutch shoe for uneven wear, chips, cracks, or burns.
2. Inspect the groove on the shoe for wear or damage.

3. If any damage to the shoe or any groove wear is noted, the shoe must be replaced.



Inspecting clutch shoe groove

ATV1014

Inspecting Starter Clutch Housing

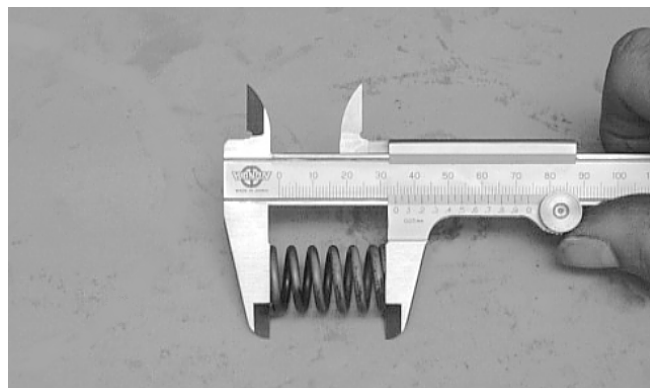
1. Inspect the starter clutch housing for burns, marks, scuffs, cracks, scratches, or uneven wear.
2. If the housing is damaged in any way, the housing must be replaced.

Inspecting Primary One-Way Drive

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

Measuring Clutch Spring Length

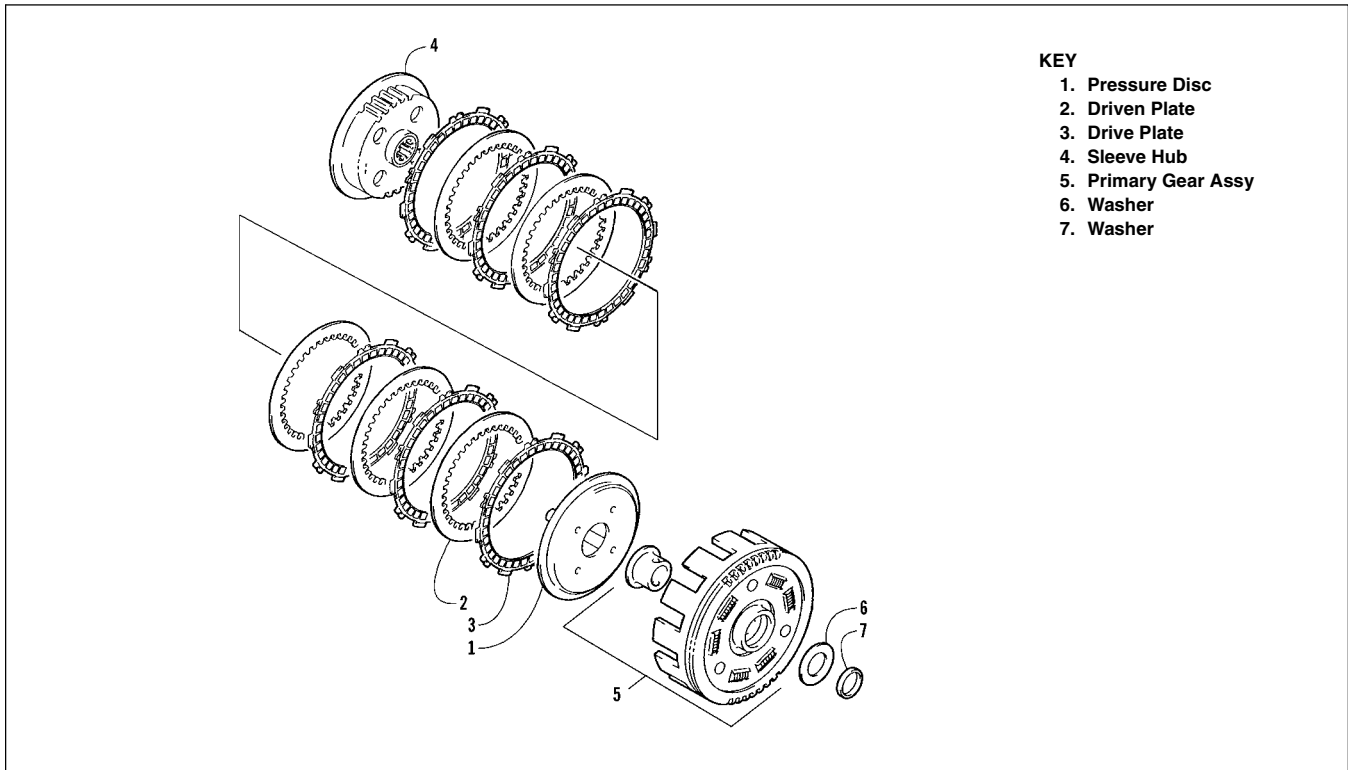
1. Using a calipers, measure the overall free length of the clutch spring.



CC247D

2. Overall length must not exceed minimum specifications.

Assembling Primary Clutch

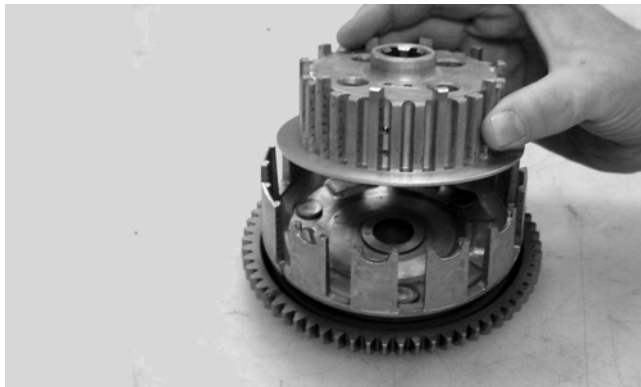


- KEY**
- 1. Pressure Disc
 - 2. Driven Plate
 - 3. Drive Plate
 - 4. Sleeve Hub
 - 5. Primary Gear Assy
 - 6. Washer
 - 7. Washer

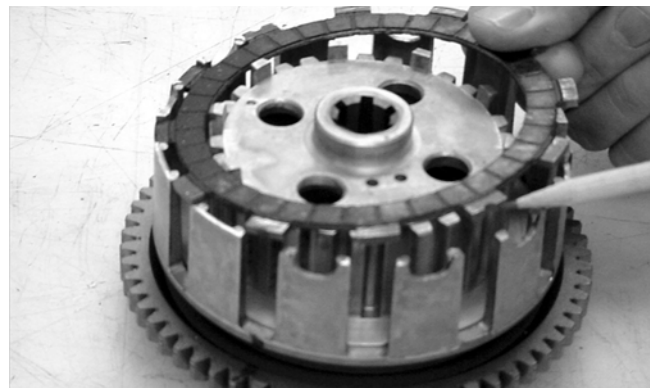
3

737-731A

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



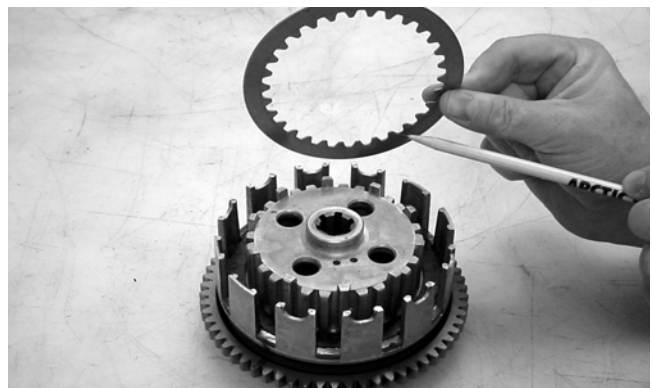
CC920



CC921

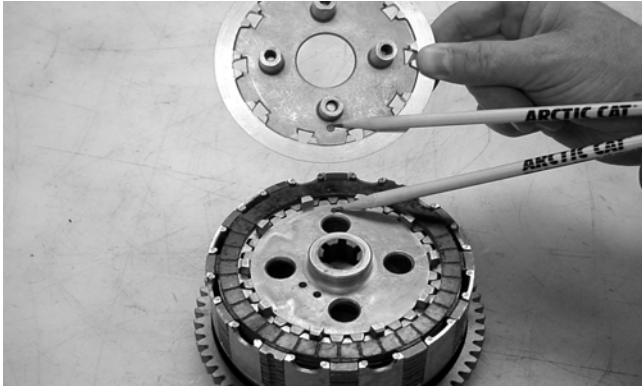
■ **NOTE:** When installing the driven plates for ease of installation, make sure they are placed onto the hub with the rounded side of the plates directed down.

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



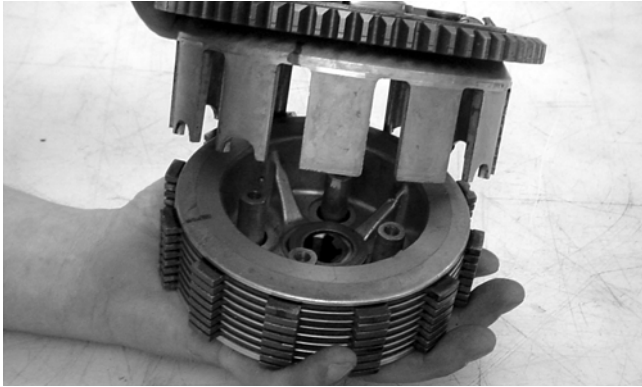
CC922

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



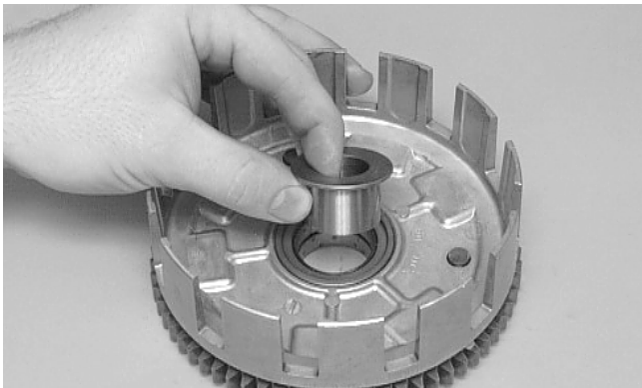
CC923

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



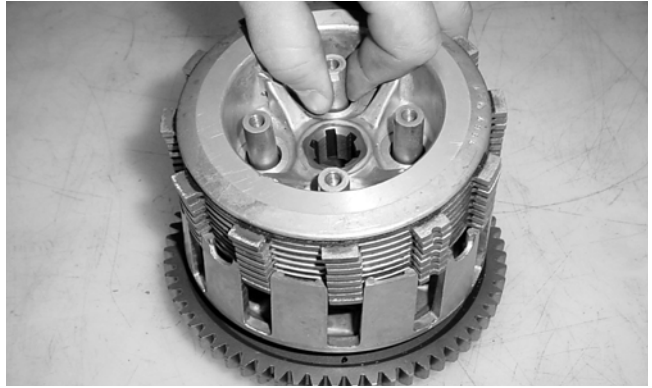
CC924

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



CC239D

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



CC926

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

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

INSPECTING OIL PUMP

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



CC446D

Servicing Center Crankcase Components

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

SECONDARY GEARS

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

Checking Backlash

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

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

Correcting Backlash

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

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

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

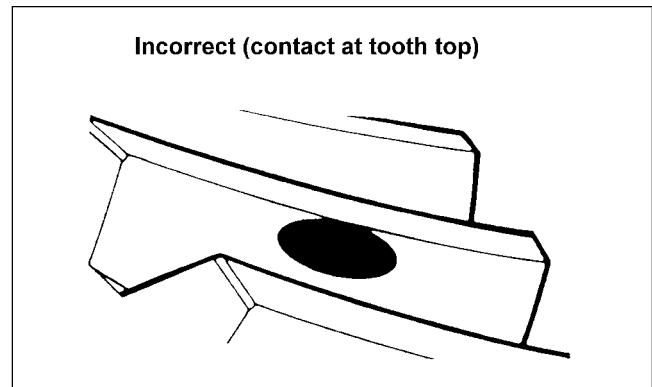
Backlash Measurement	Shim Correction
Under 0.05 mm (0.002 in.)	Decrease Shim Thickness
At 0.05-0.33 mm (0.002-0.013 in.)	No Correction Required
Over 0.33 mm (0.013 in.)	Increase Shim Thickness

Checking Tooth Contact

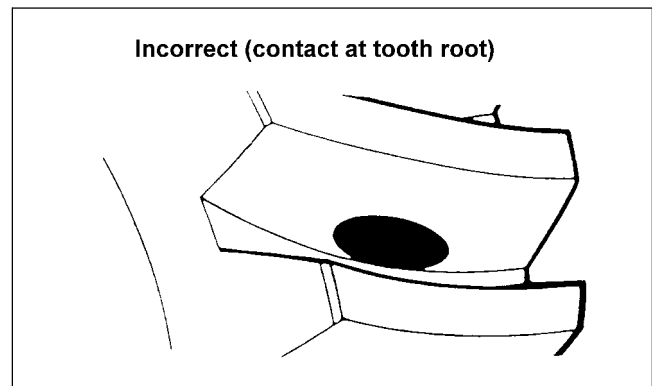
■ **NOTE:** After correcting backlash of the secondary driven bevel gear, it is necessary to check tooth contact.

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

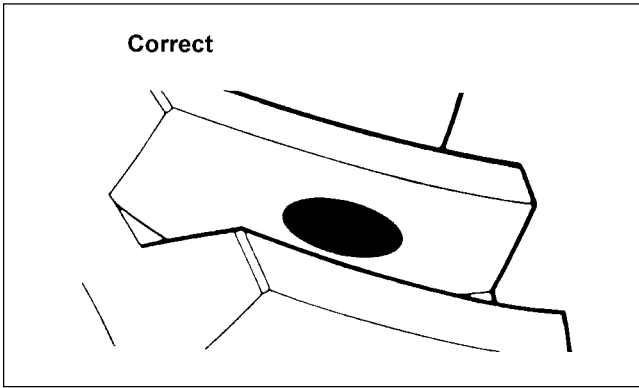
3



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.

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

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

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

CAUTION

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

CRANKSHAFT ASSEMBLY

Measuring Connecting Rod (Small End Inside Diameter)

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



CC290D

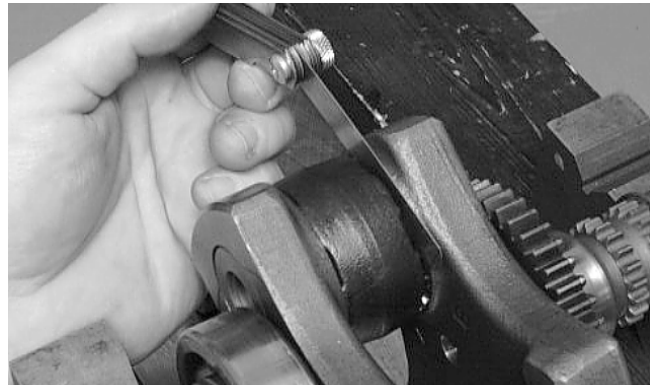
2. Maximum diameter must not exceed specifications.

Measuring Connecting Rod (Small End Deflection)

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

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

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



CC289D

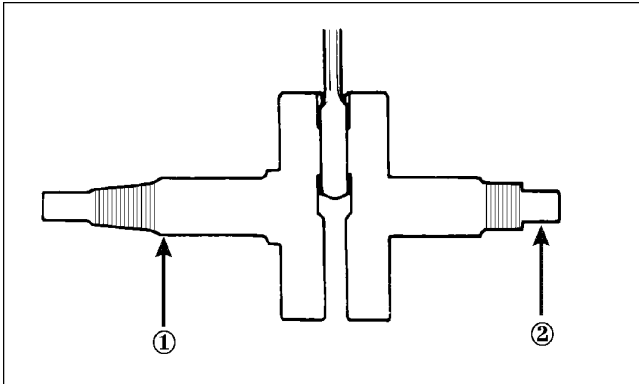
3. Acceptable gap range must be within specifications.

Measuring Connecting Rod (Big End Width)

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

Measuring Crankshaft (Runout)

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



ATV-1074

3. Zero the indicator and rotate the crankshaft slowly.

CAUTION

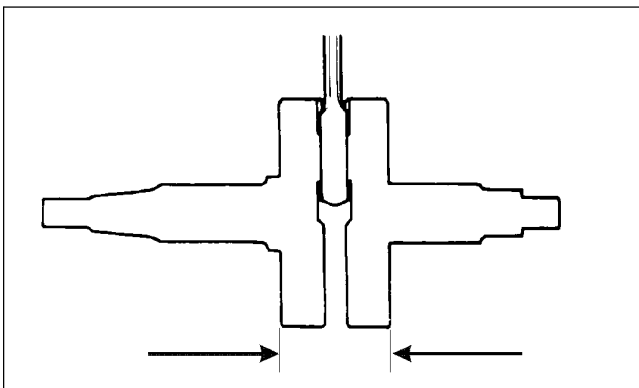
Care should be taken to support the connecting rod when rotating the crankshaft.

4. Maximum runout must not exceed specifications.

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

Measuring Crankshaft (Web-to-Web)

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



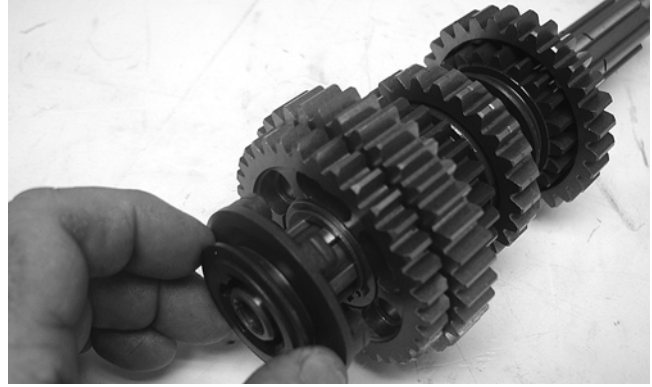
ATV-1017

2. Acceptable width range must be within specifications.

DRIVESHAFT

Disassembling

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

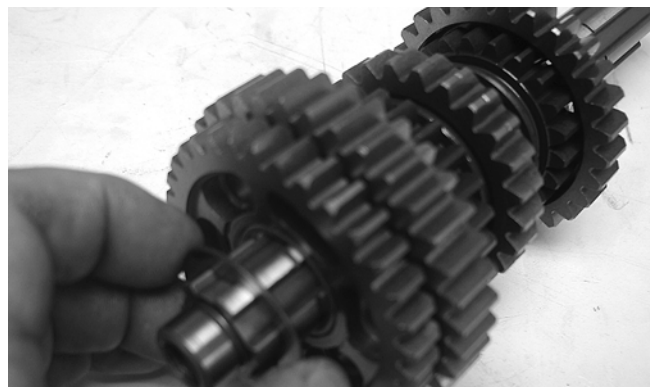


CD331

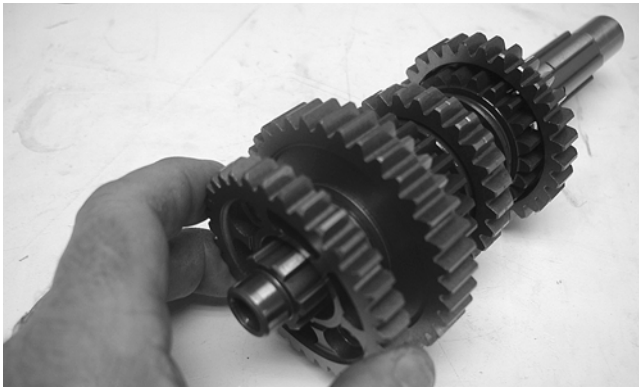
3



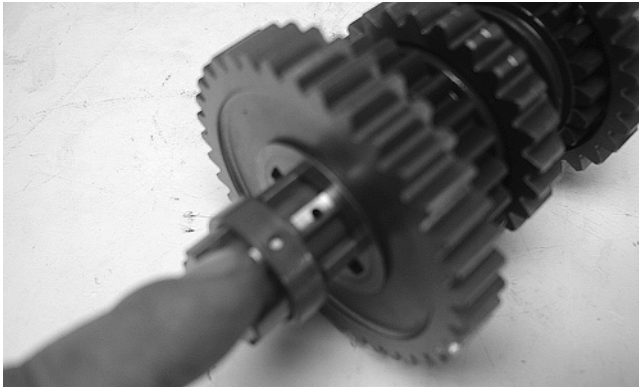
CD333



CD335



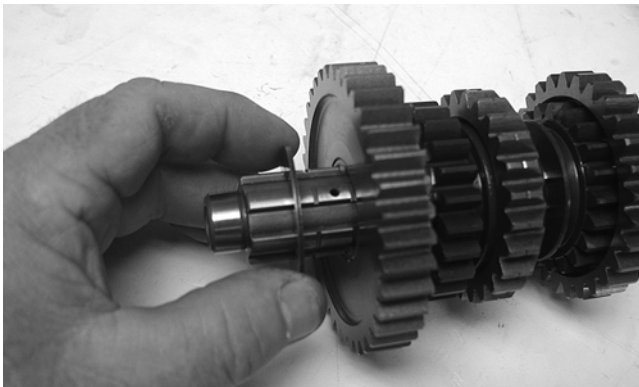
CD336



CD337

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

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

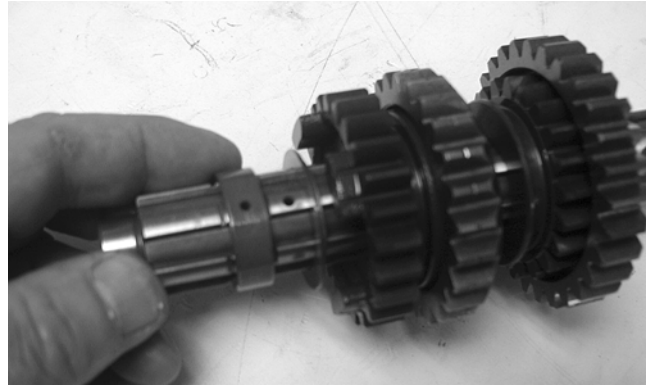


CD339



CD341

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



CD342

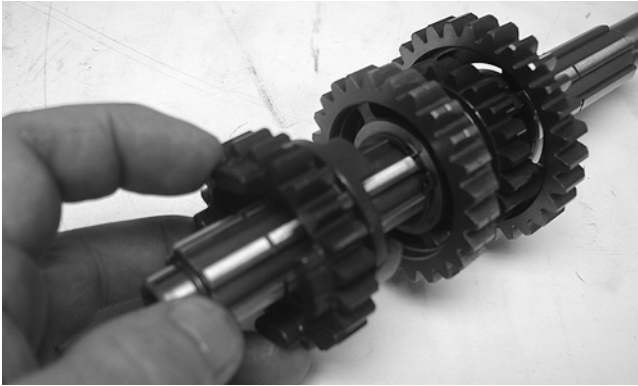


CD343



CD344

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



CD345

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

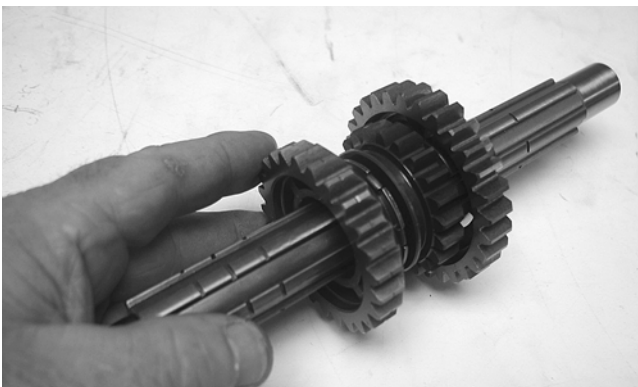


CD346



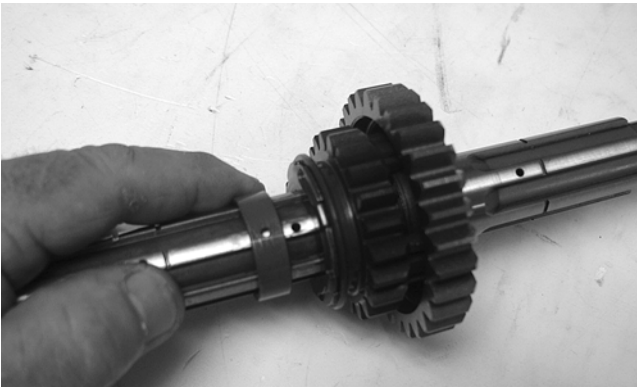
CD348

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



CD349

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



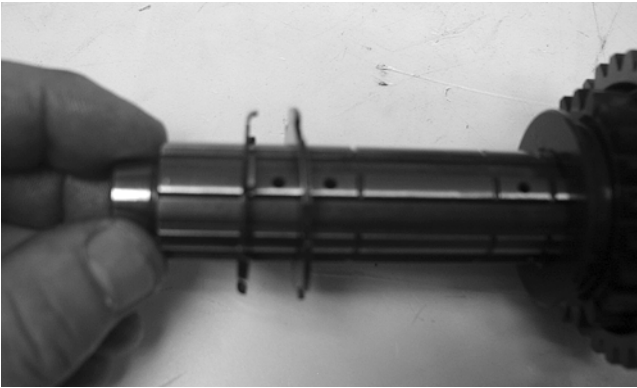
CD351

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



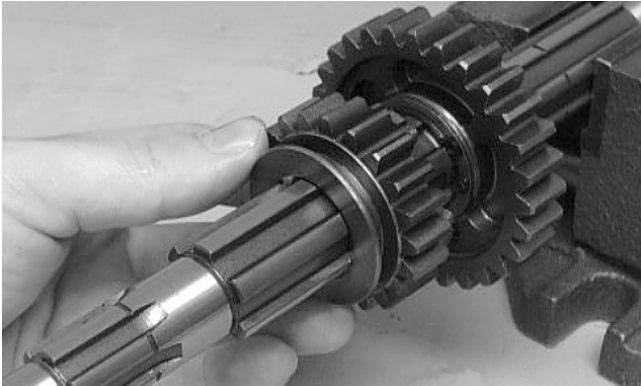
CD352

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



CD354

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



CC210D



CD358

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



CD356

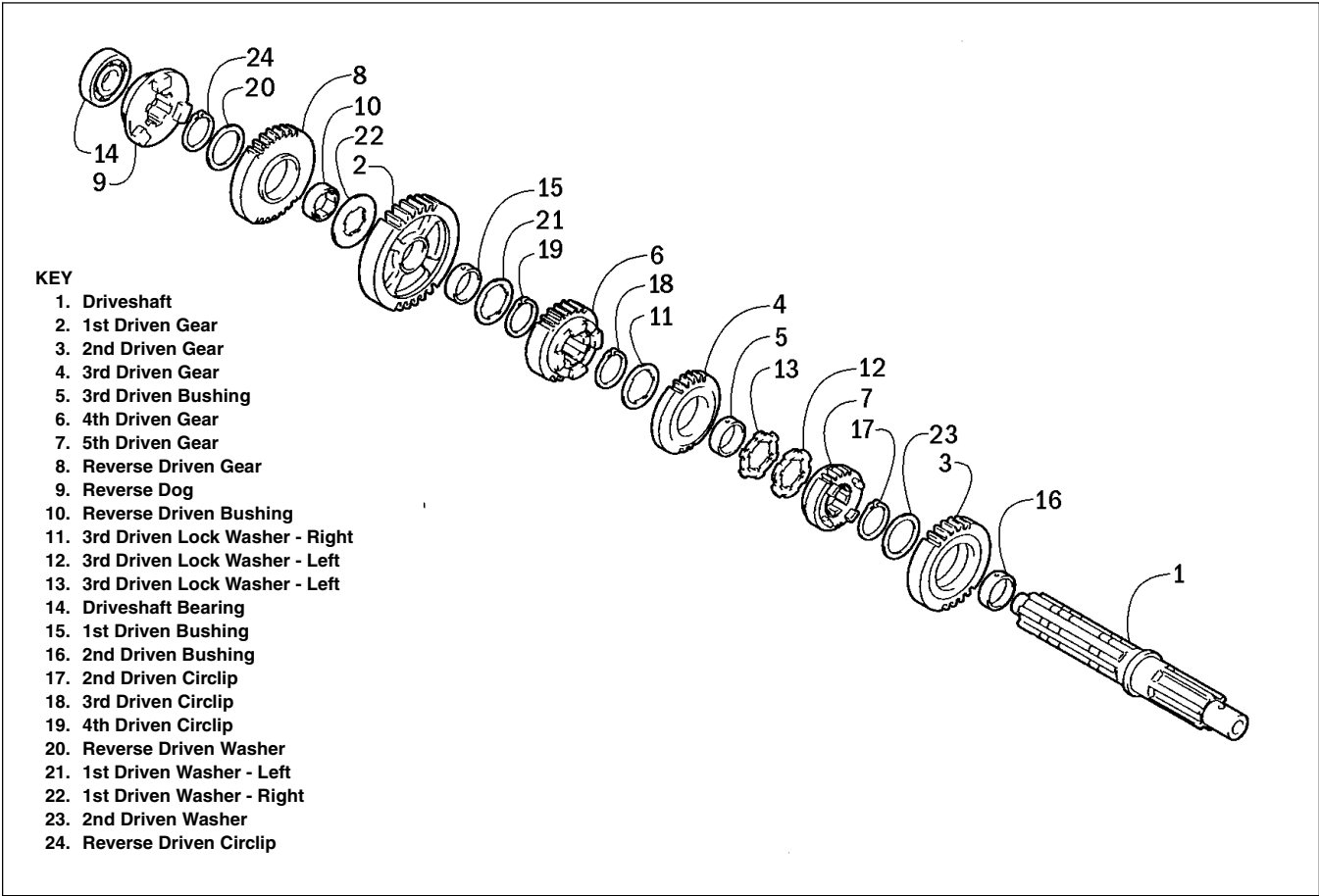


CD359

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



CD357



3

737-733A

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



CD359



CD358



CD357



CD356

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



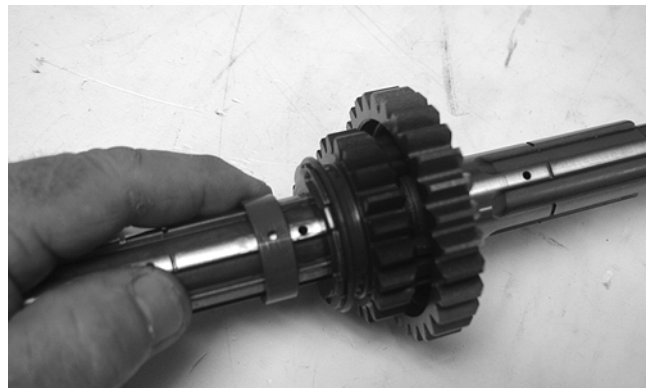
CD352

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



CD355

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



CD351



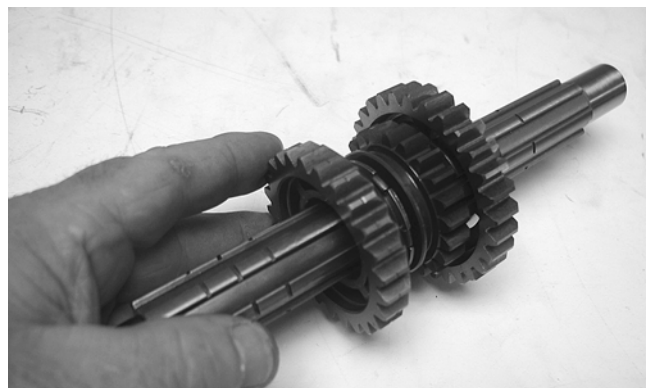
CD354

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

CAUTION

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

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



CD349



CD348



CD346

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



CD345

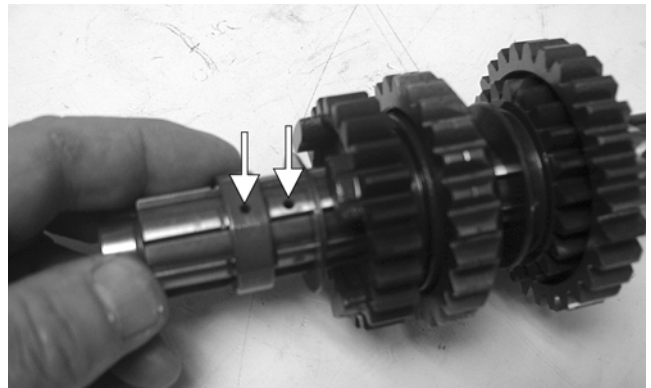


CD344

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



CD343



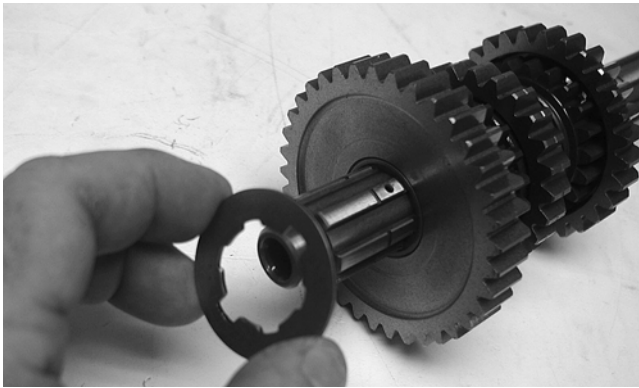
CD342A



CD341

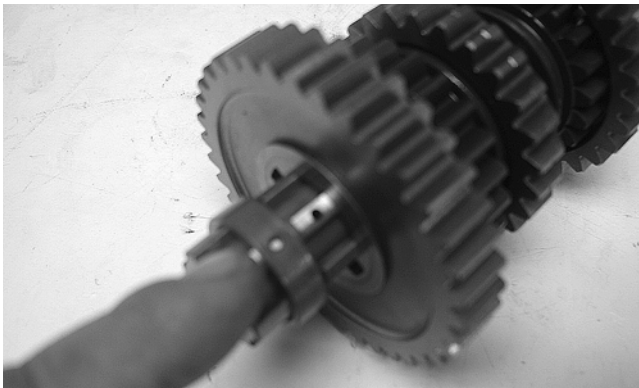
9. Install the 1st driven washer (right side) on the shaft making sure it lines up with the groove in the shaft; then turn the washer locking it on the shaft.

3



CD340

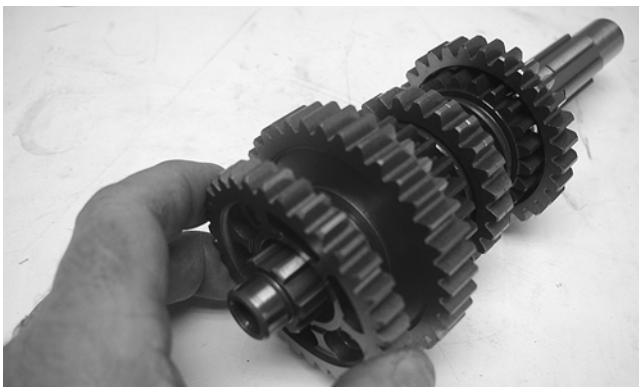
10. Slide the reverse driven bushing onto the shaft making sure the oil port in the bushing aligns with the oil port on the shaft.



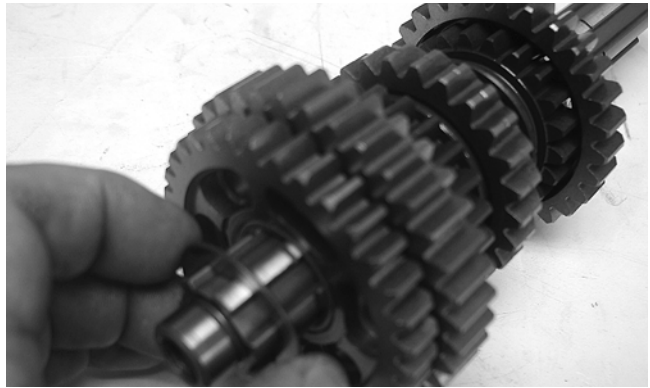
CD337

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

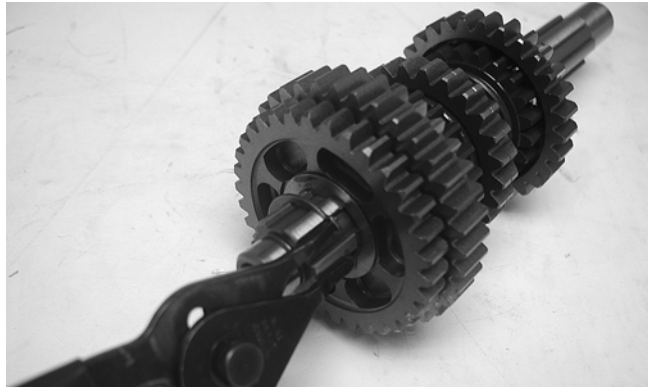
11. In order, install the reverse driven gear, washer, circlip, and reverse dog onto the driveshaft.



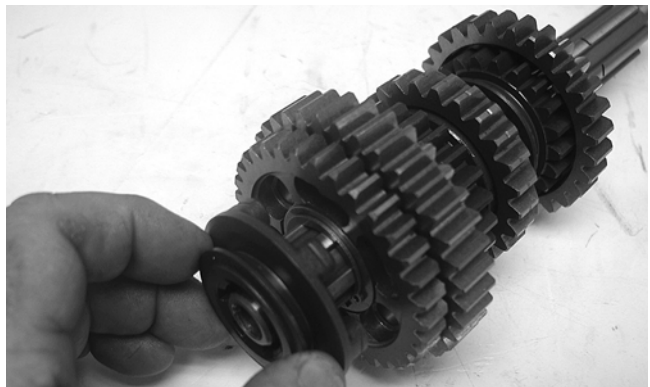
CD336



CD335



CD334



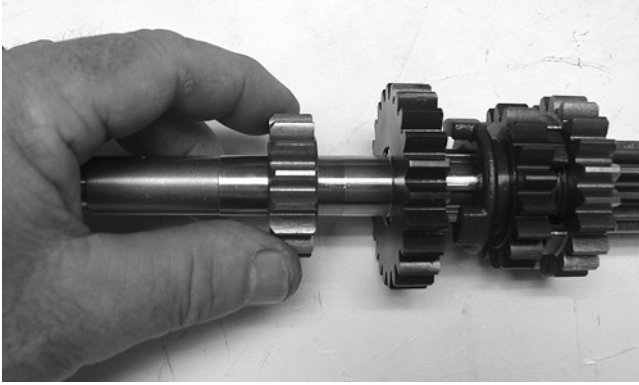
CD331

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

COUNTERSHAFT

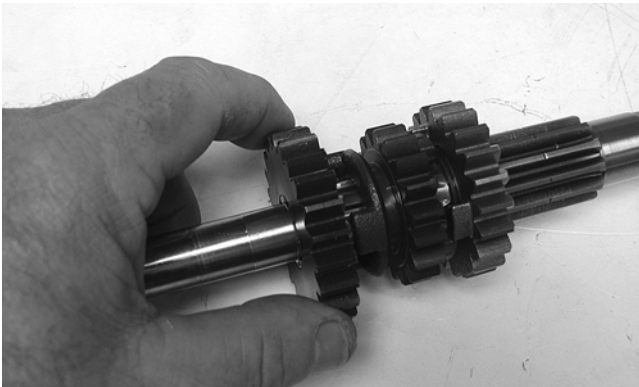
Disassembling

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



CD395

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

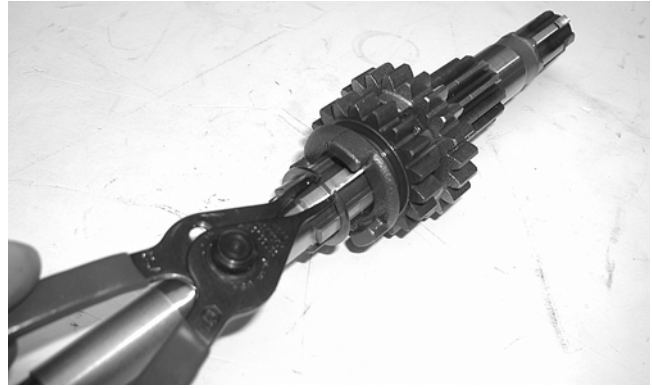


CD396

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



CD397



CD400

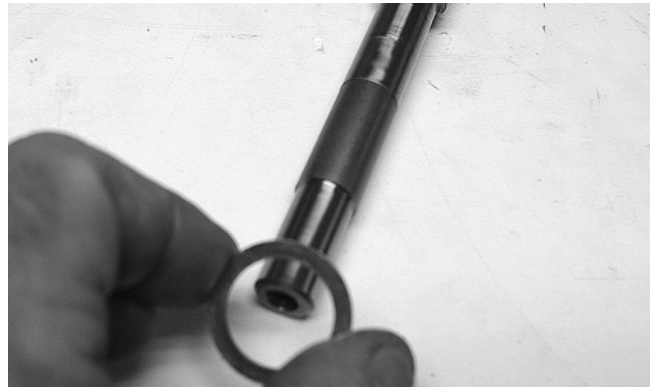
4. Remove the 3rd drive gear from the countershaft.

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



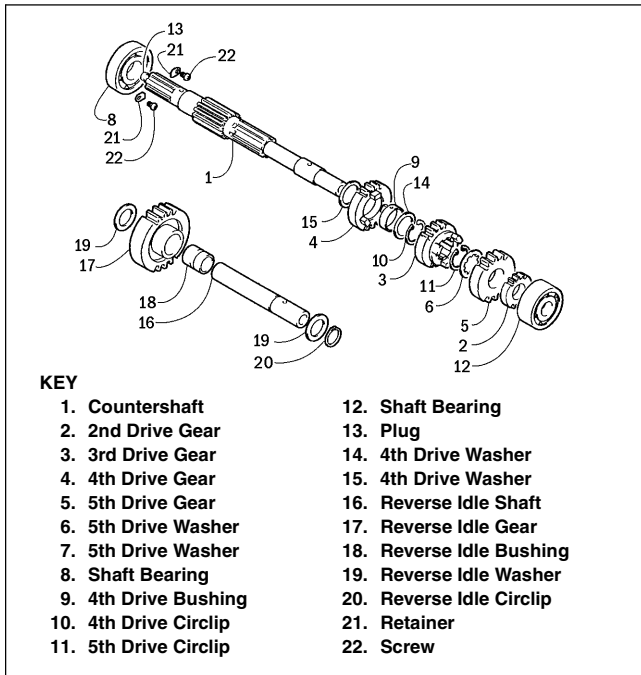
CD405

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



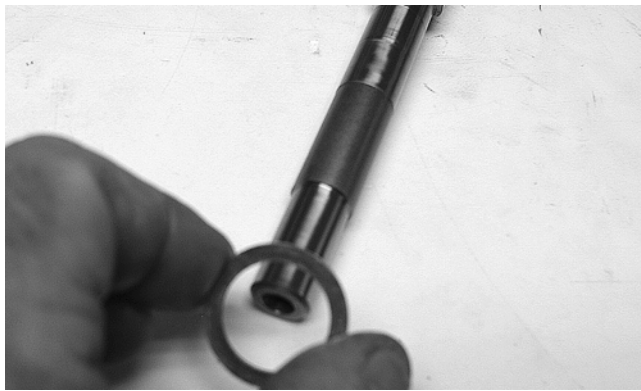
CD408

3



737-733B

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



CD408

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

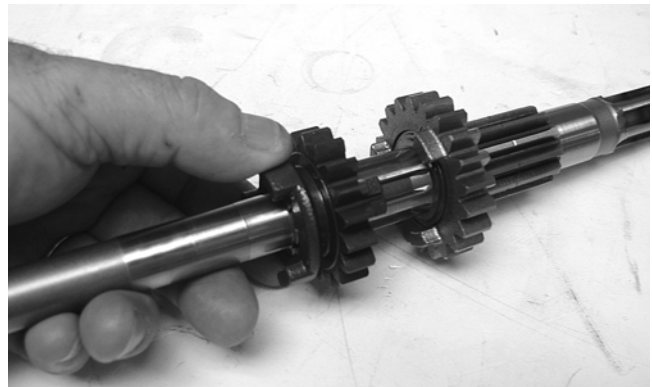


CD405

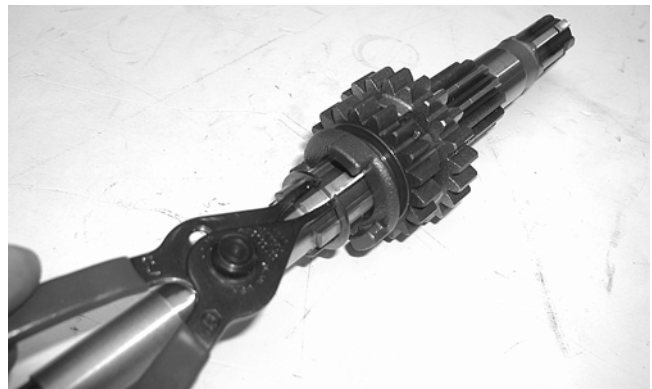


CD406

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

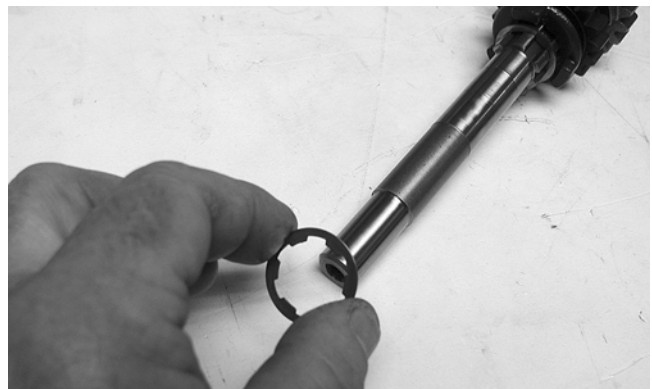


CD401

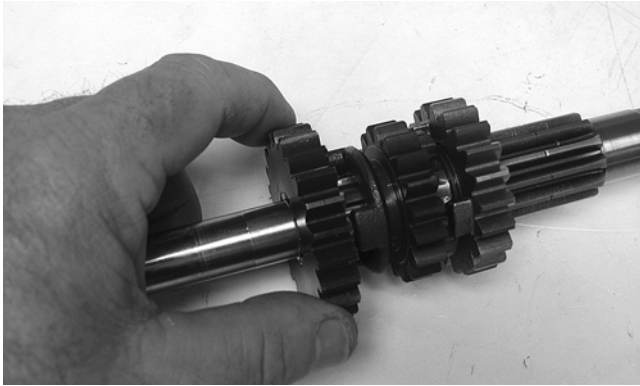


CD400

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

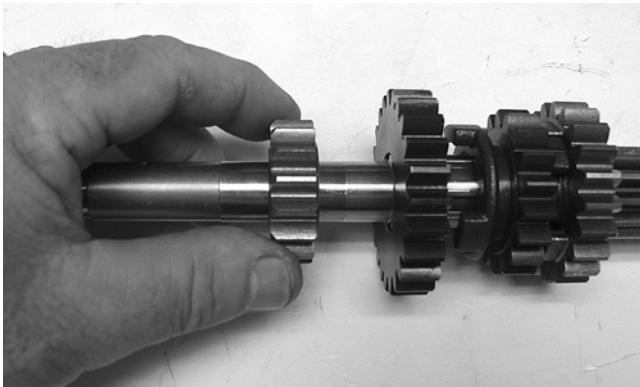


CD397



CD396

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



CD395

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

Assembling Crankcase Half

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

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

1. To install the output shaft and gear, place the shaft into position with proper shims, slide the gear onto the shaft, and secure with a new nut tightened to specifications.

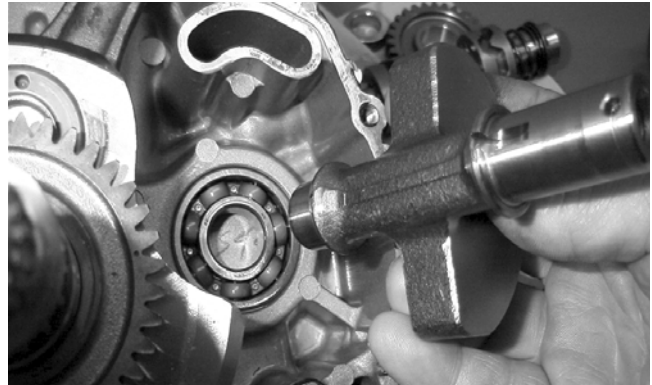
2. Apply a liberal amount of engine oil to the crankshaft bearing. Using a propane torch, heat the bearing until the oil begins to smoke; then slide the crankshaft assembly into place. Install the crank balancer.



MD1334

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

3

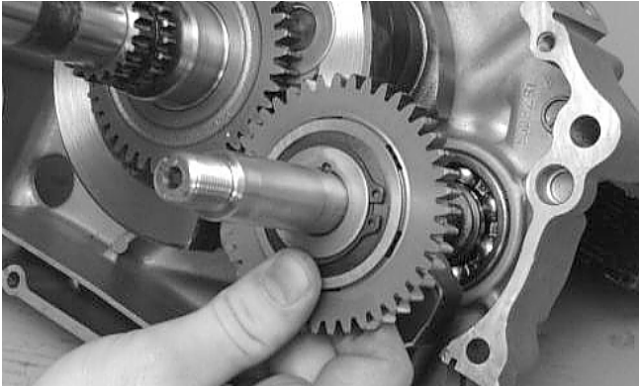


MD1024

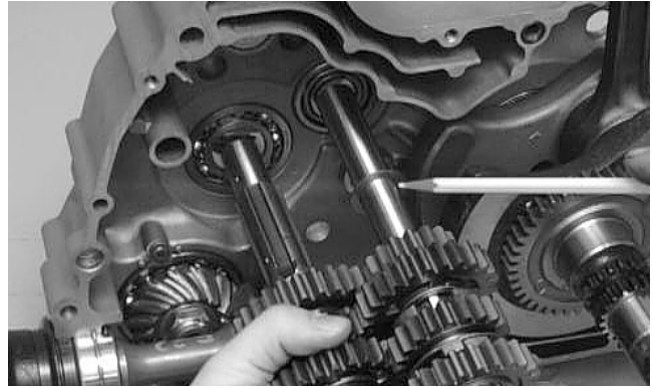
3. With the key in position, slide the driven gear onto the crank balancer making sure the timing marks are aligned.



CC165D



CC167D



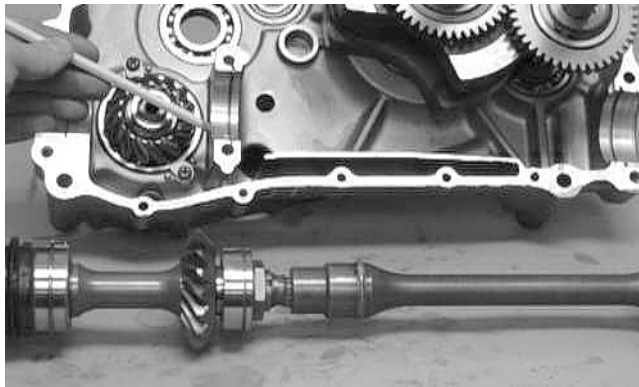
CC197D



CC166D

4. Place the bearing C-ring into position in the crankcase; then install the front shaft (4x4) and rear shaft assemblies.

⚠ CAUTION
The bearing pins must be positioned into the crankcase.

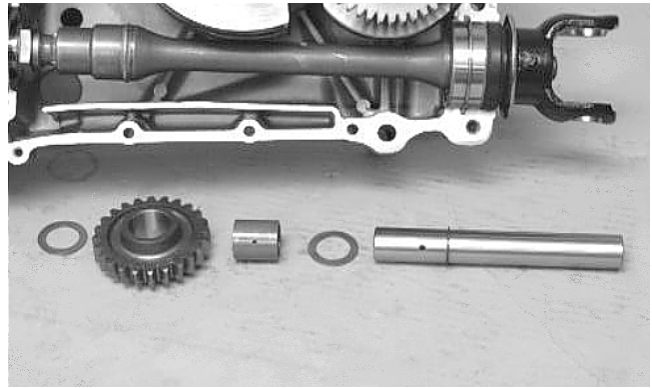


CC110D

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

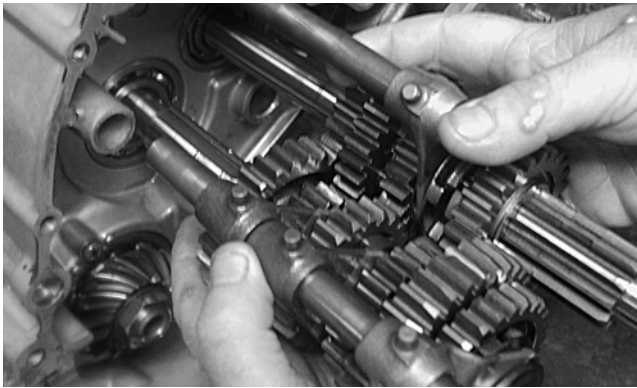


CC229D



CC231D

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

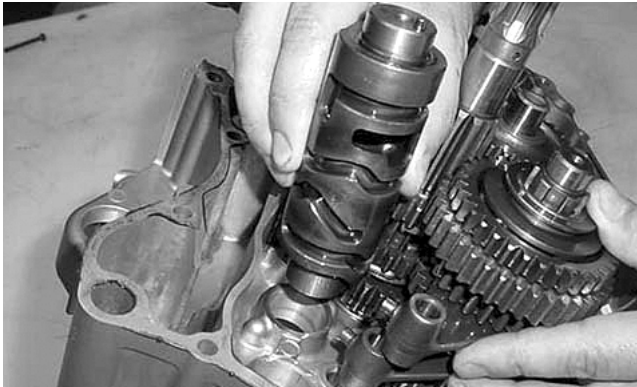


CD232

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

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

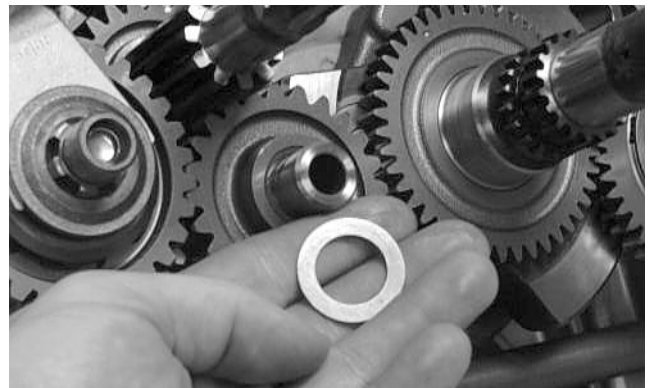
Joining Crankcase Halves



CC987

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

1. Verify that the shim washer is on the idler shaft; then apply Three Bond Sealant (p/n 0636-070) to the mating surfaces. Place the right-side half onto the left-side half.



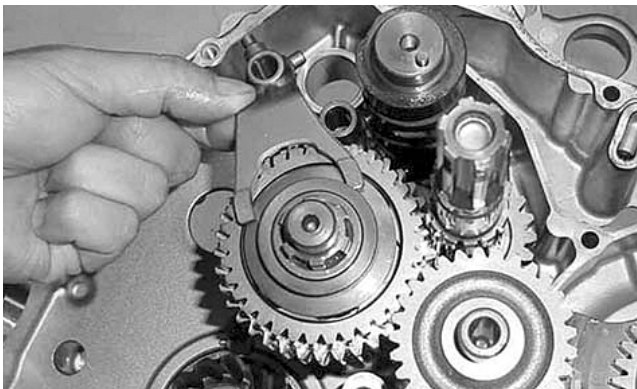
CC102D

3

2. Using a plastic mallet, lightly tap the case halves together until cap screws can be installed.

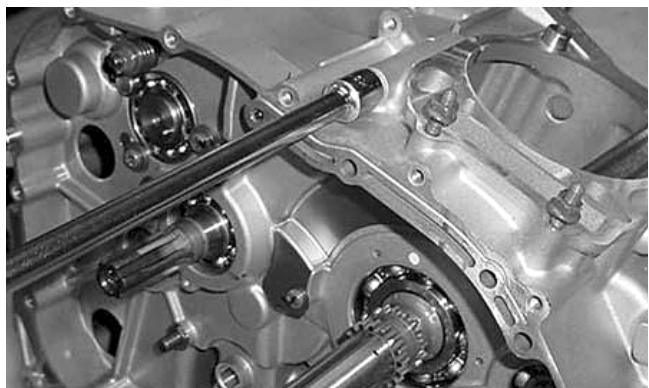
3. From the right side, install the four case half 8 mm cap screws; then tighten only until snug.

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



CC986

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



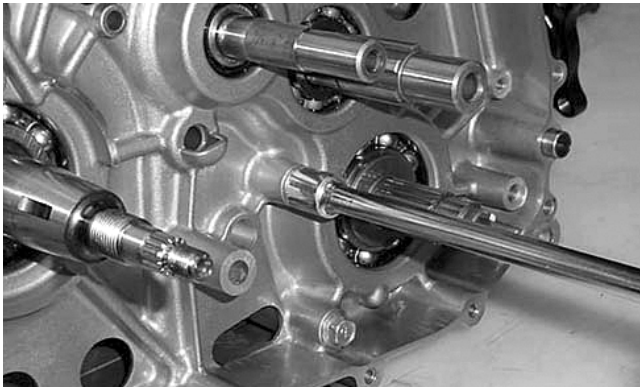
CC982

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

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



CC988



CC981

5. From the left side, install the seven case half 6 mm cap screws; then tighten only until snug.

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

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

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

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

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

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

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

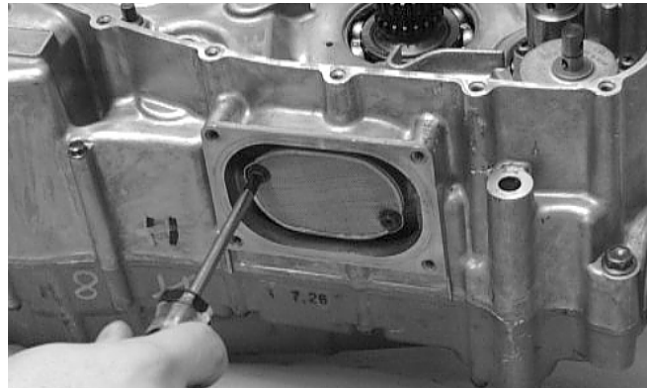
CAUTION

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

Installing Right-Side Components

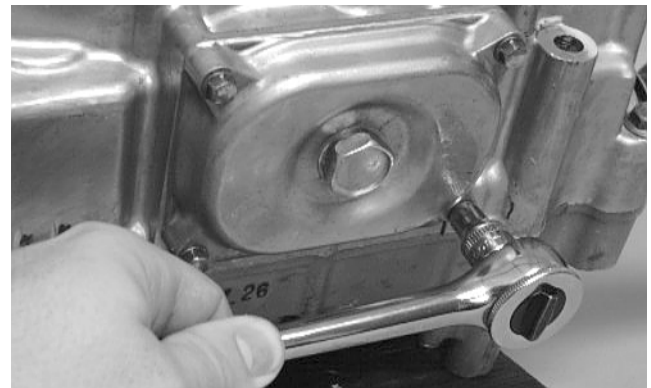
- A. Oil Strainer/Oil Pump**
- B. Gear Shift Shaft**

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



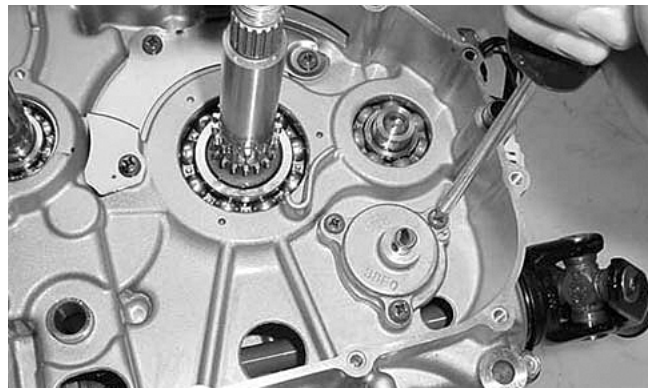
CC163D

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



CC091D

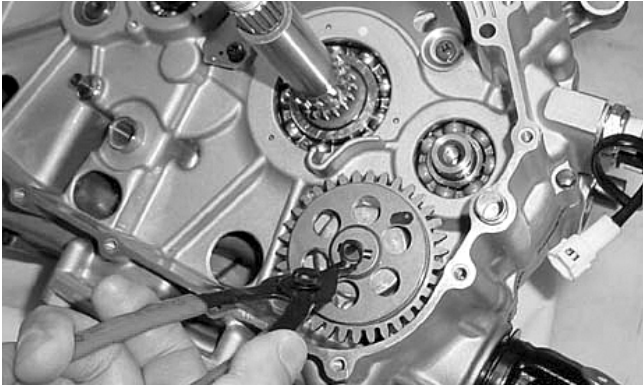
3. Place the oil pump into position in the crankcase and secure with the three Phillips-head screws coated with blue Loctite #243. Tighten to specifications.



CC978

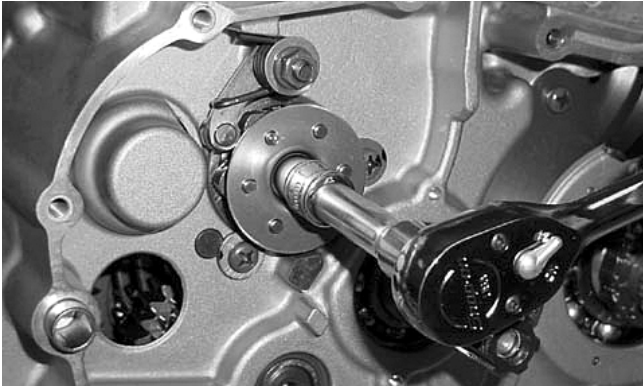
4. Place the washer and pin into position on the oil pump shaft, install the oil pump driven gear, and secure with the circlip.

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



CC976

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



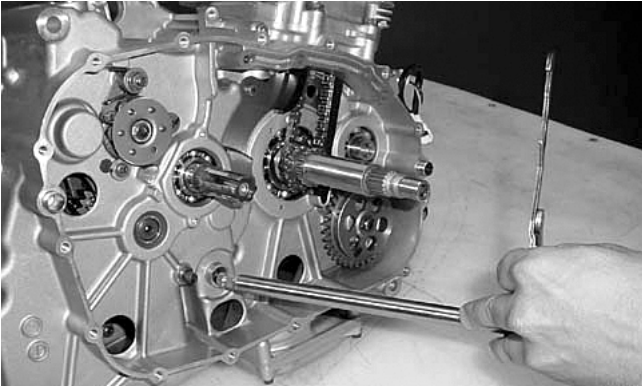
CC975

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



CC974

7. Install the gear shift shaft.



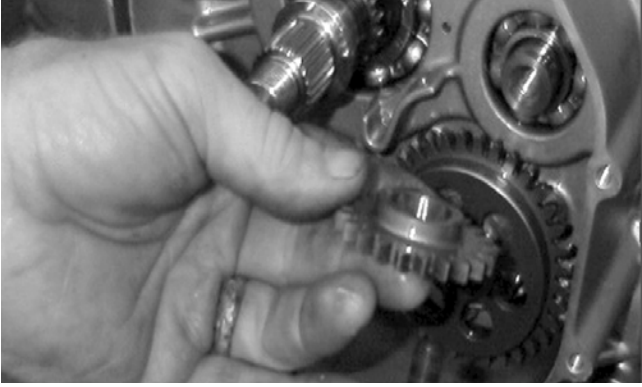
CC973

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

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

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

3

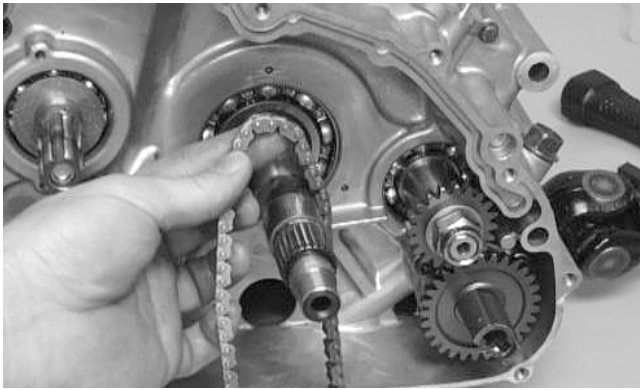


MD1017



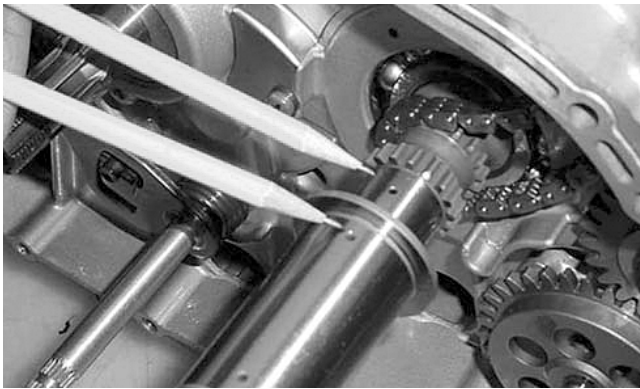
GD447

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



CC079D

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



CC970

⚠ CAUTION

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

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



CC078D

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

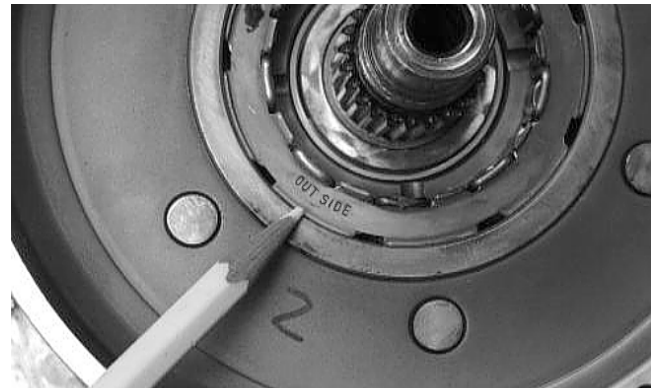
12. Using a clutch sleeve hub holder, install the nut and washer. Tighten to specifications.

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



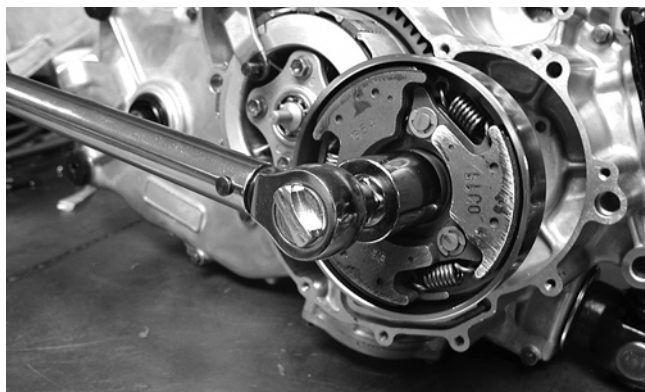
CD448

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



CC075D

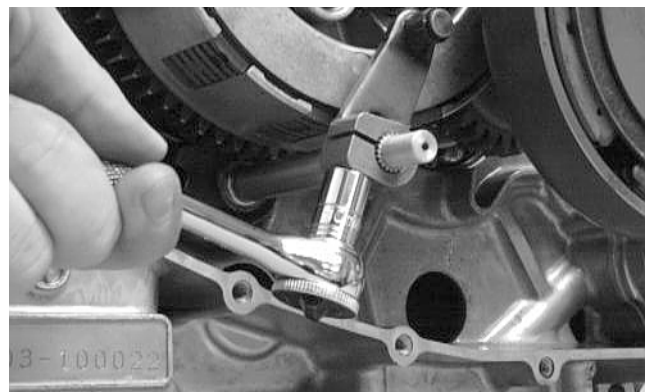
14. Install the starter clutch shoe and washer; then secure with the starter clutch-shoe nut (left-hand threads). Tighten to specifications; then using a center punch, stake the nut.



CD440

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

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



CC073D

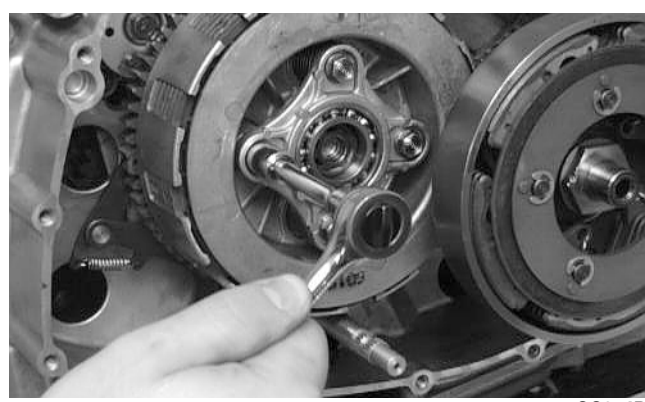
F. Oil Filter

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

■NOTE: Lubricate all internal components with 10W-40 oil prior to installing the right-side cover.

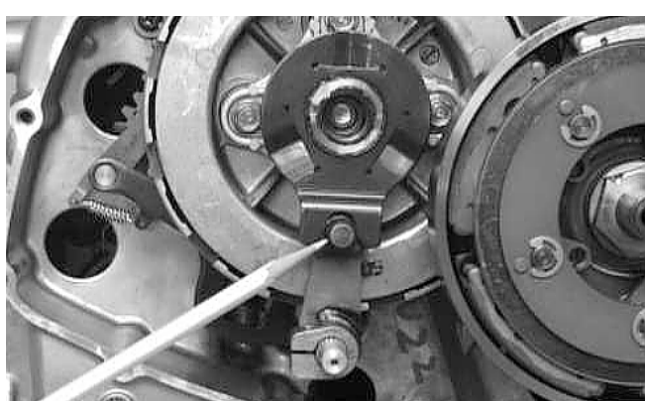
■NOTE: Care should be taken that the alignment pins are installed in the right-side cover.

3



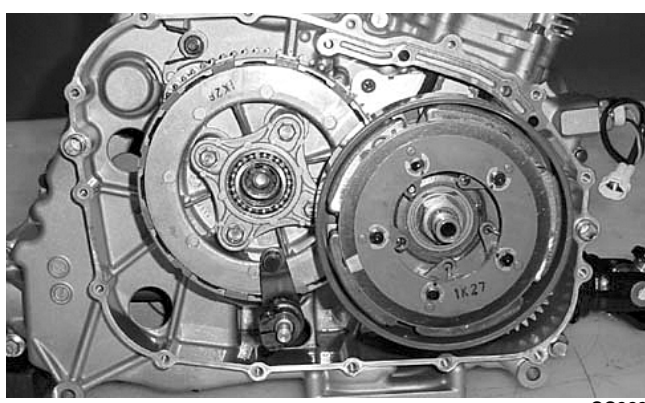
CC074D

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



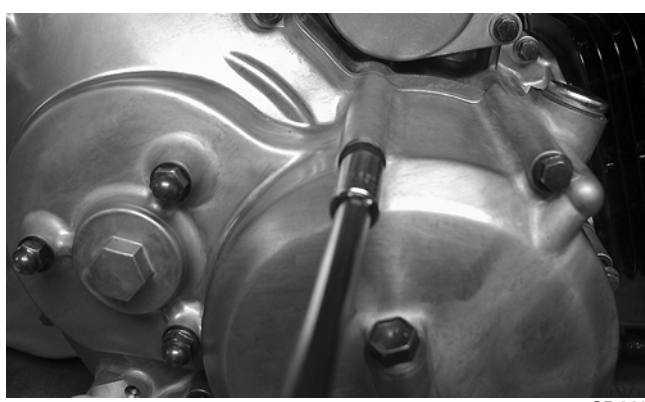
CC162D

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



CC989

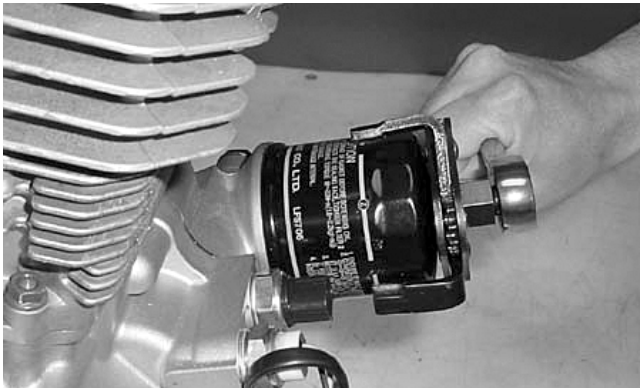
18. Place the gasket and right-side cover into position making sure the release roller guide remains correctly positioned; then install the fifteen cap screws.



CD441

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

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

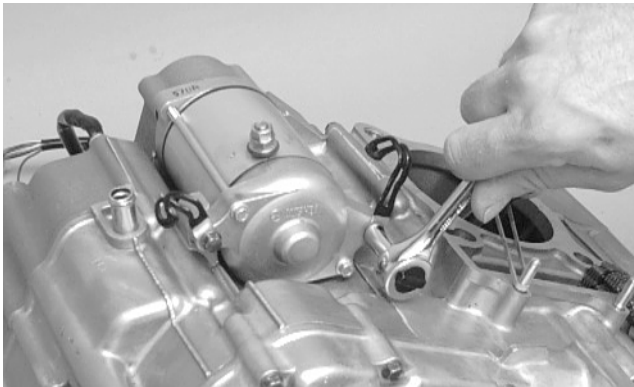


CC967

Installing Left-Side Components

A. Idle Gear Assembly B. Magneto Rotor

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



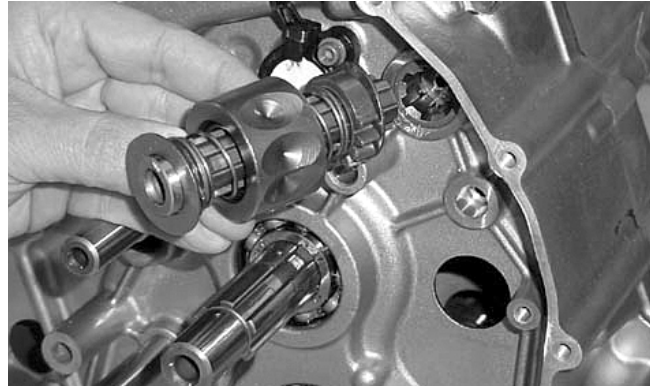
CC065D

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



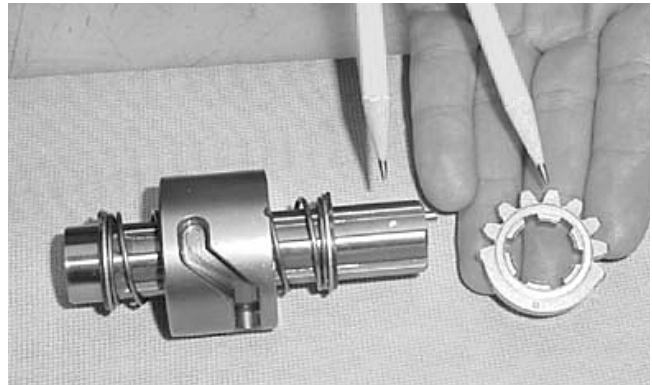
CC964

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



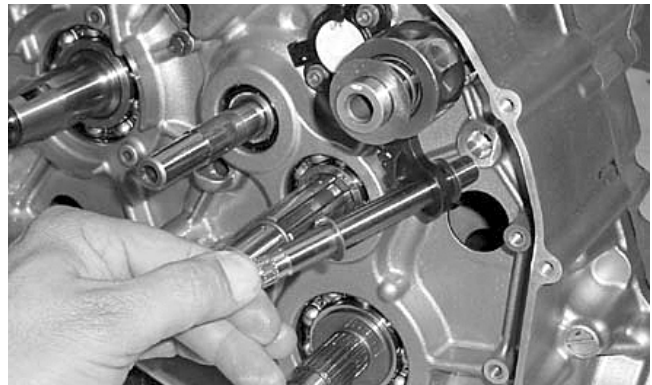
CC962

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



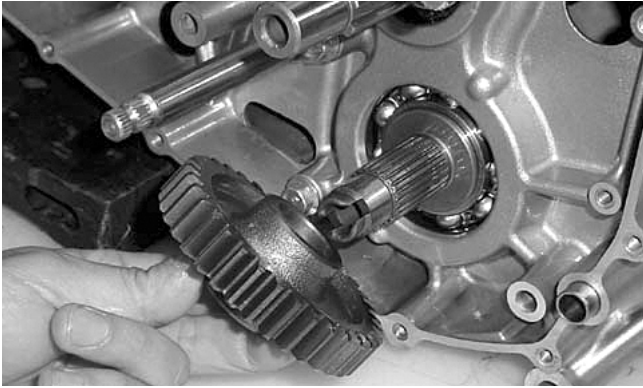
CC963

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



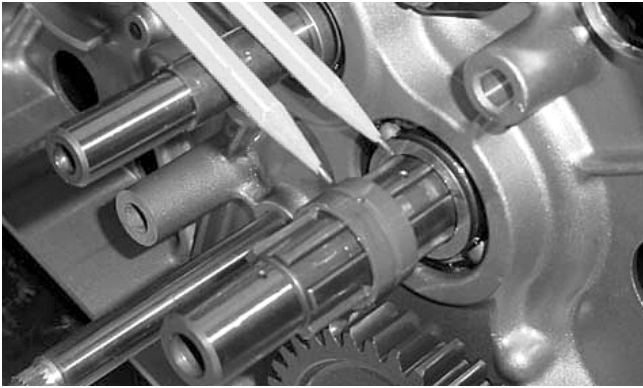
CC960

5. Install the driven gear onto the output shaft.



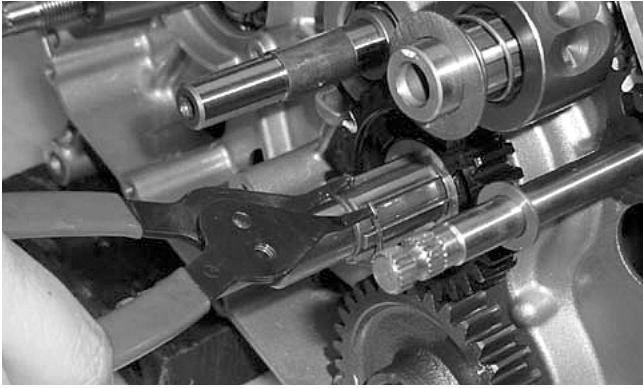
CC959

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



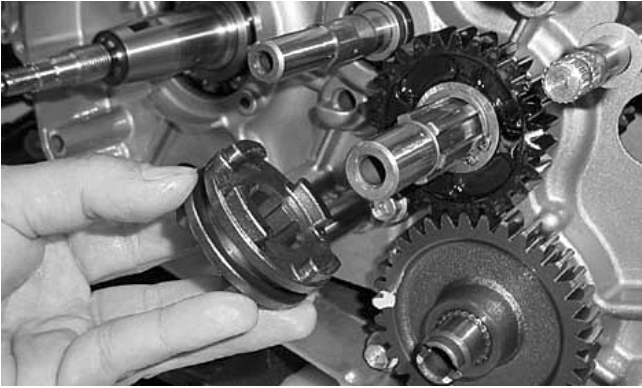
CC957

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

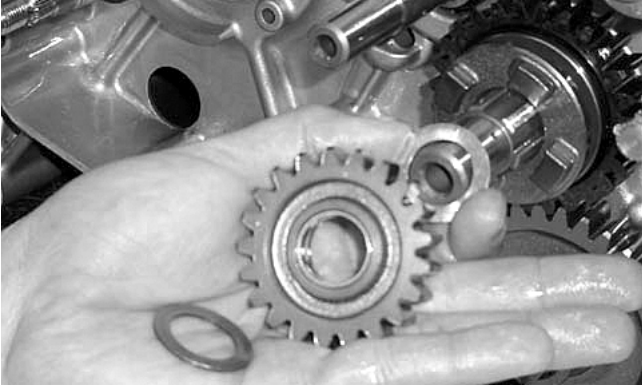


CC955

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

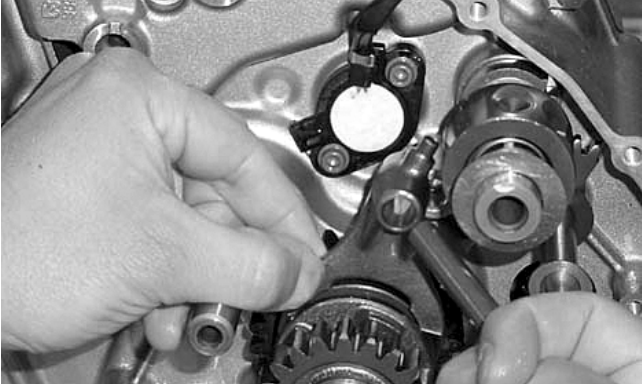


CC966



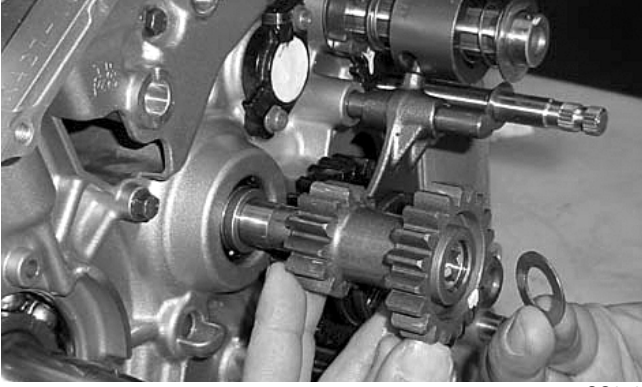
CC954

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



CC953

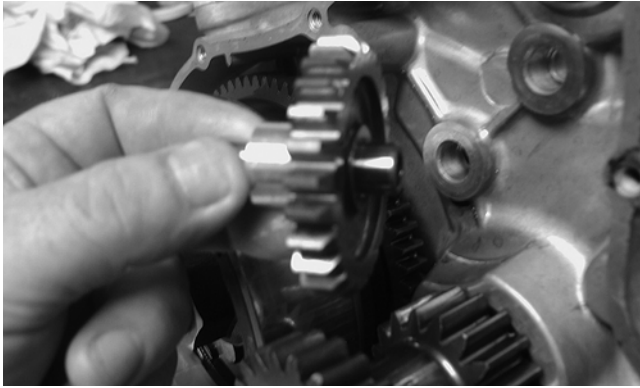
10. Install the drive idler gear with one spacer and one washer.



CC952

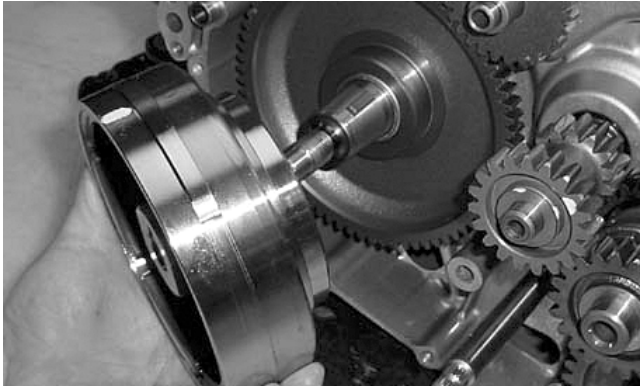
3

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



CD140

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



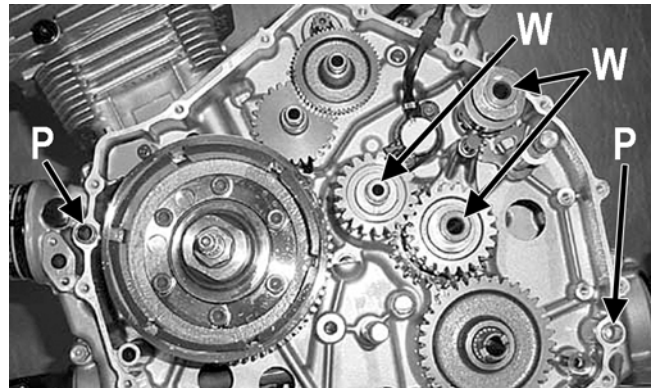
CC991



CC990

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

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



CC948A

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

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

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

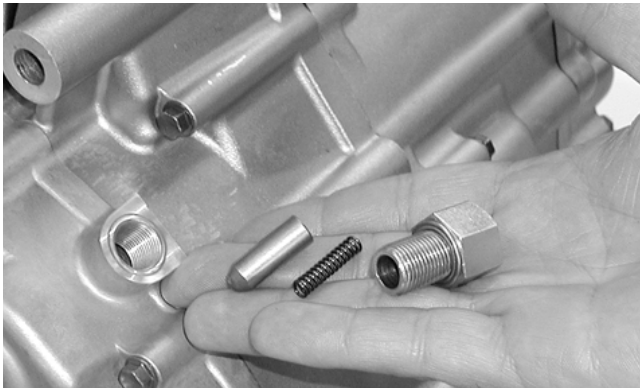
- **NOTE:** It may be necessary to push or pull the splined Hi/Low range shift shaft to establish cover/crankcase mating.

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



CC945

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



CC993

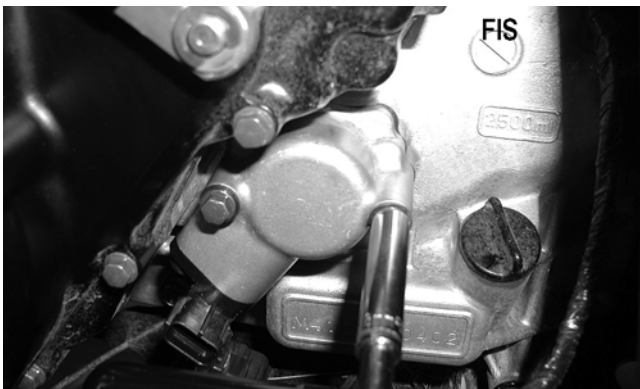
17. On the ACT model, place the speedometer drive adapter and gasket into position and secure with the two cap screws. Tighten securely. On the FIS models, place the speed sensor into position and secure with the two cap screws. Tighten securely.

CAUTION

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



CC947



CD069

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



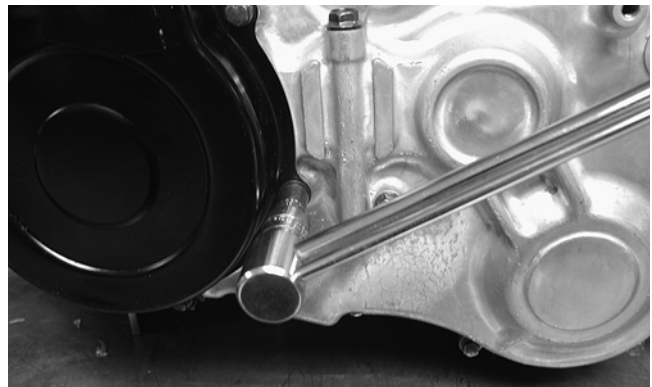
CC943

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



CD429

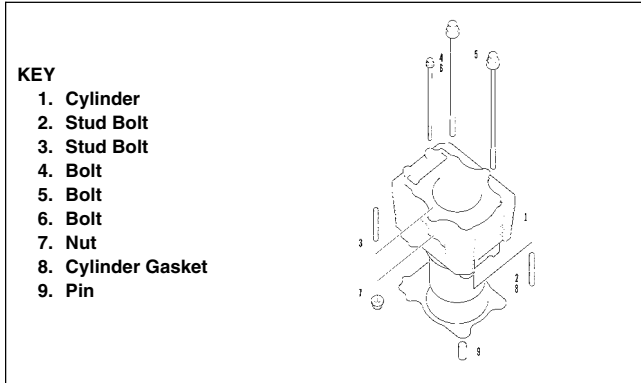
20. Place the recoil starter assembly into position on the left-side cover; then tighten four cap screws to specifications.



CD431

Installing Top-Side Components

A. Piston B. Cylinder

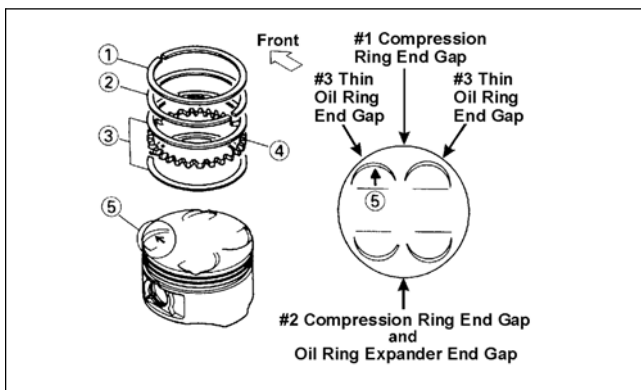


0737-039

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

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

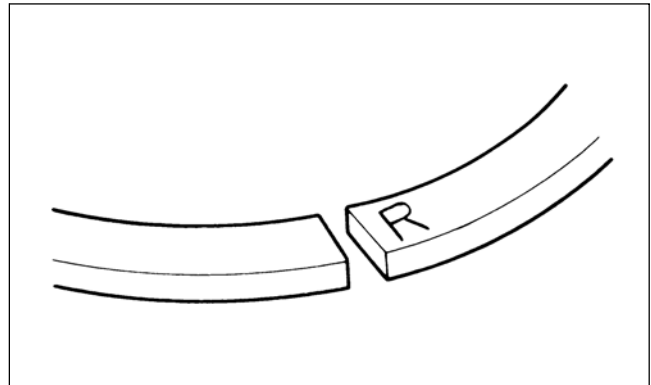
■ **NOTE:** Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.



ATV-1085B

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

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



ATV-1024

⚠ CAUTION

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

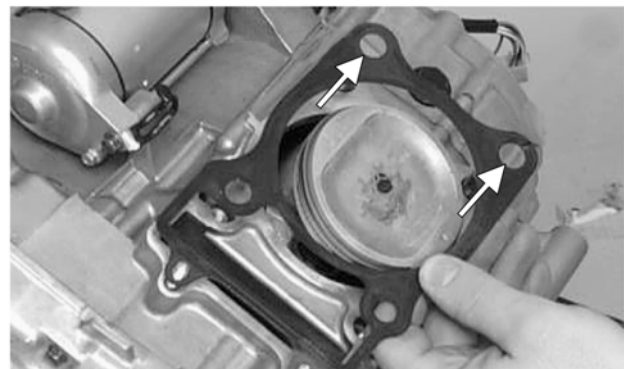
1. Install the piston on the connecting rod making sure there is a circlip on each side and the open end of the circlip is directed upwards or downwards.

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



MD1213

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

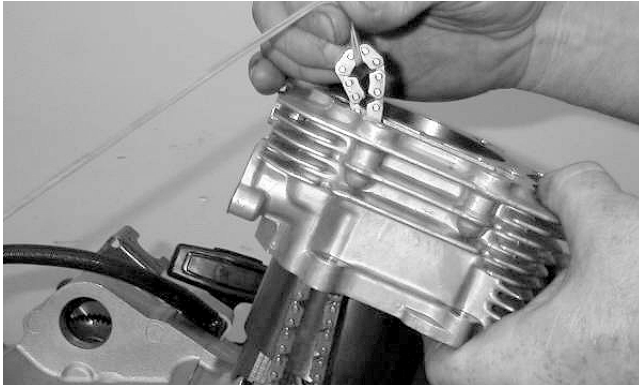


MD1344

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

CAUTION

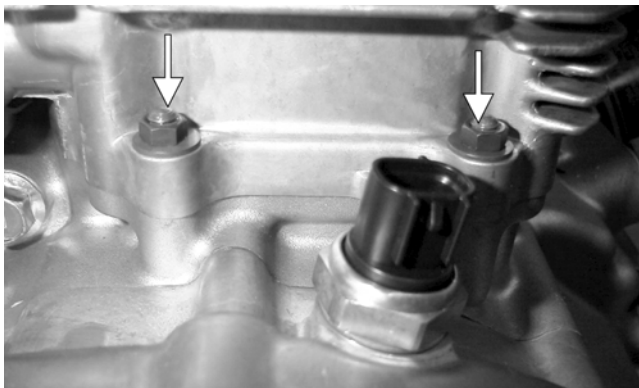
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



MD1345

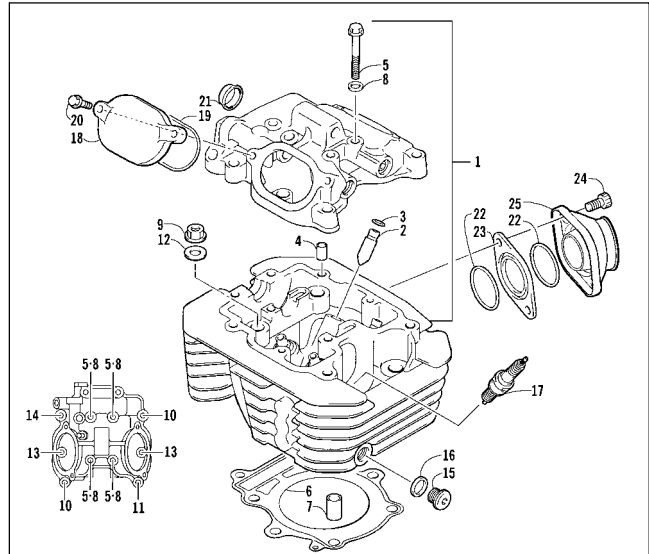
- Loosely install the two nuts with washers which secure the right-side of the cylinder to the right-side crankcase half.

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



MD1226A

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



KEY

- | | |
|-------------------------|---------------------|
| 1. Cylinder Head Assy | 14. Cap Screw |
| 2. Valve Guide | 15. Plug |
| 3. Ring | 16. Gasket |
| 4. Pin | 17. Spark Plug |
| 5. Cap Screw | 18. Inspection Cap |
| 6. Cylinder Head Gasket | 19. O-Ring |
| 7. Pin | 20. Cap Screw |
| 8. Gasket | 21. Plug |
| 9. Nut | 22. O-Ring |
| 10. Cap Screw | 23. Insulator |
| 11. Cap Screw | 24. Screw |
| 12. Washer | 25. Intake Manifold |
| 13. Cap Screw | |

0737-038

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

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

CAUTION

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

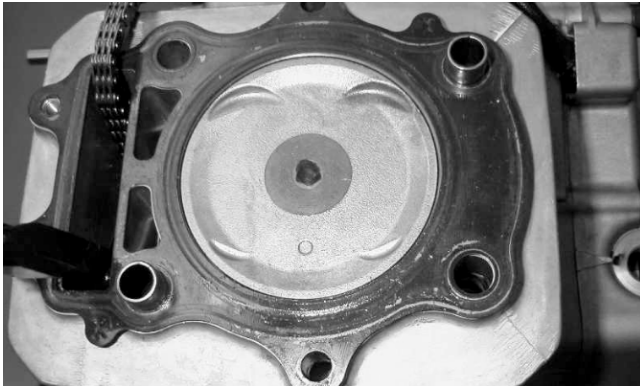


MD1349

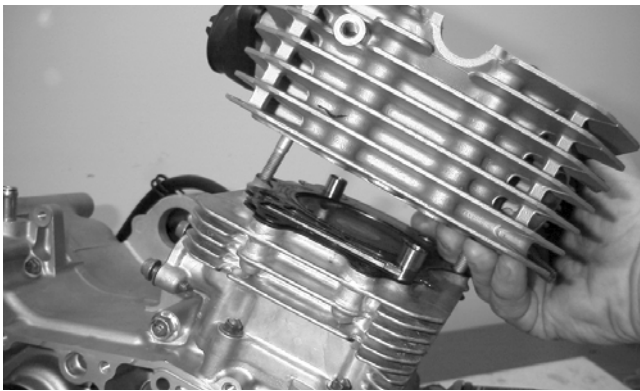
- Place the head gasket into position on the cylinder. Place the alignment pins into position; then place the head assembly into position on the cylinder making sure the cam chain is routed through the chain cavity.

⚠ CAUTION

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

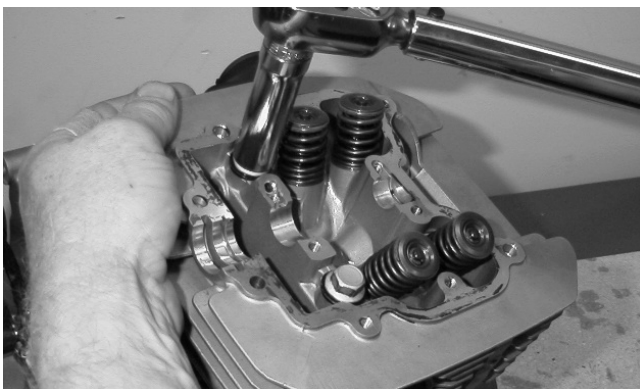


MD1347



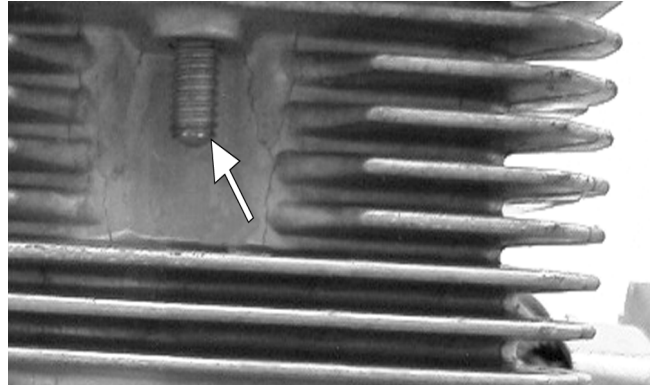
MD1163

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



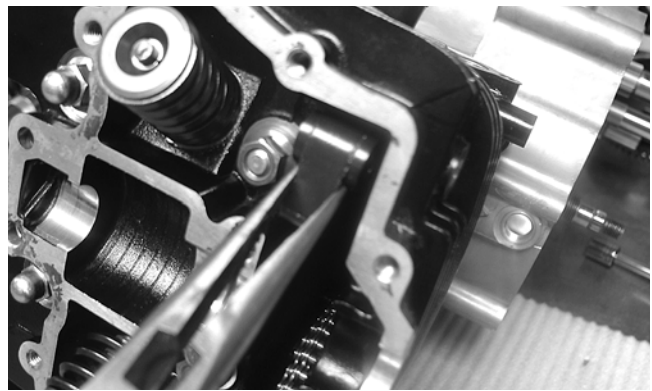
MD1270

- Install the two lower nuts securing the cylinder head to the cylinder, one in front and one in rear. Tighten only until snug.



MD1192

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

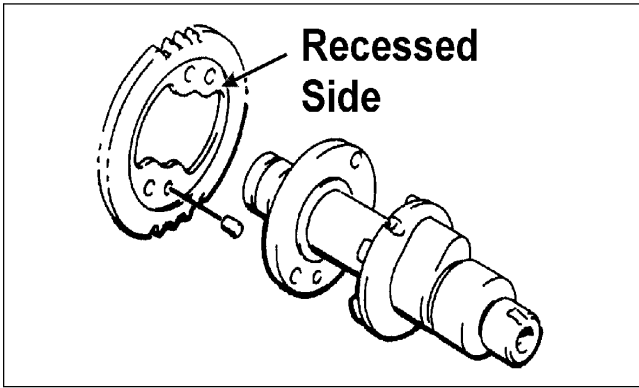


CD383

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

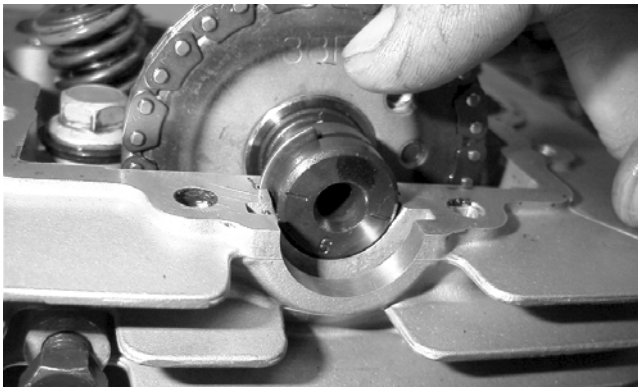
■ **NOTE:** When the camshaft assembly is seated, make sure the alignment pin in the camshaft aligns with the smallest hole in the sprocket.

- Loosely place the cam sprocket (with the recessed side facing the camshaft lobes) onto the camshaft and place it into position with the cam chain over the sprocket.



732-307B

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



MD1131

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

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

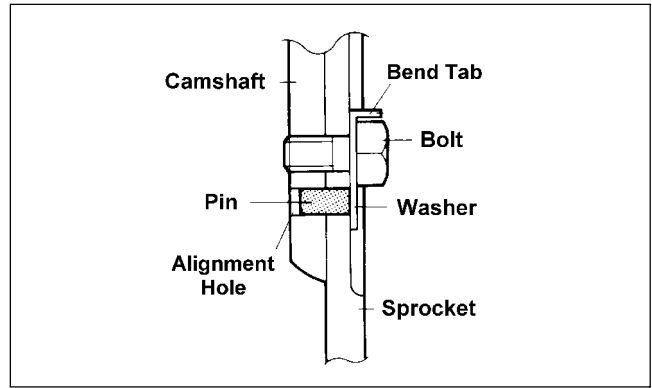
15. When the camshaft assembly is seated, ensure the following.

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

CAUTION

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

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



ATV-1027



MD1362

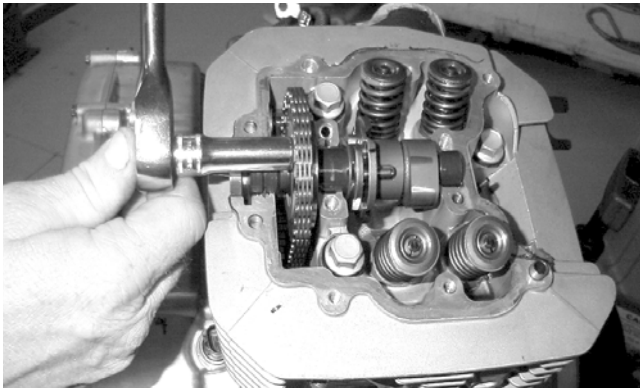
CAUTION

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

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

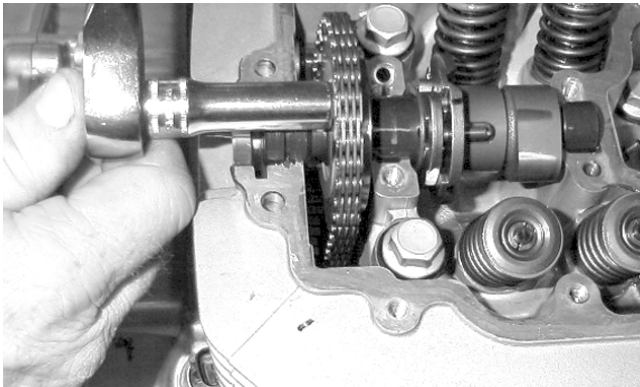


CC404D



MD1137

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

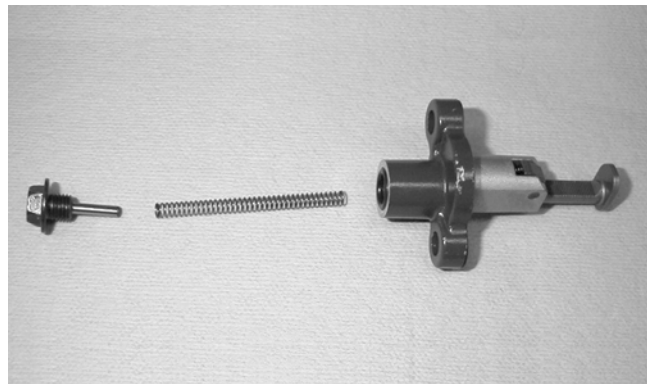


MD1137

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

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

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



MD1248

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



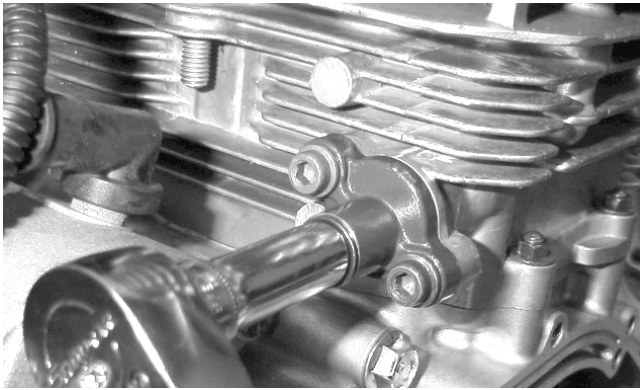
MD1146

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

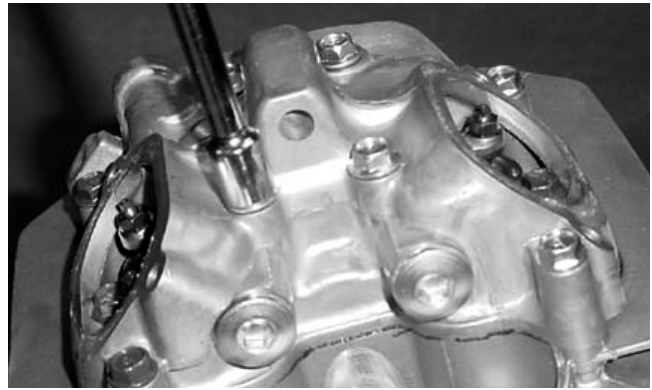


MD1254

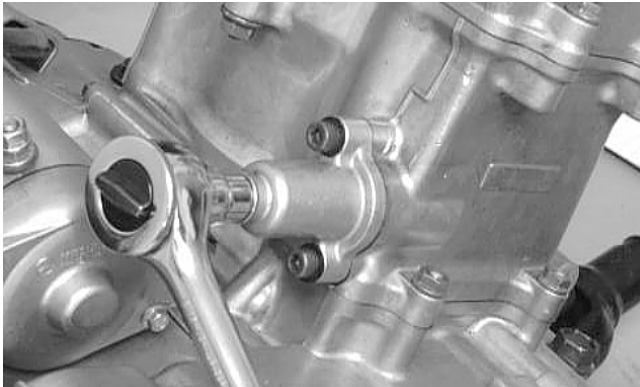
24. Install the cap screw and spring into the end of the chain tensioner. Tighten securely.



MD1245



CC999



CC009D

25. Loosen the adjuster screw jam nuts; then loosen the adjuster screws on the rocker arms in the valve cover.
 26. Apply a thin coat of Three Bond Sealant (p/n 0636-070) to the mating surface of the valve cover. Place the valve cover into position making sure the two alignment pins are properly positioned.
- **NOTE:** At this point, the rocker arms and adjuster screws must not have pressure on them.
27. Install the four top-side cap screws with rubber washers; then install the remaining cap screws. Tighten only until snug.

28. In a crisscross pattern starting from the center and working outward, tighten the cap screws (from step 27) to specifications.
29. Adjust valve/tappet clearance using the following procedure.

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

- A. Turn the engine over until the piston reaches top dead center on the compression stroke.
- B. Place the valve adjuster onto the jam nut securing the tappet adjuster screw; then rotate the valve adjuster dial clockwise until the end is seated in the tappet adjuster screw.



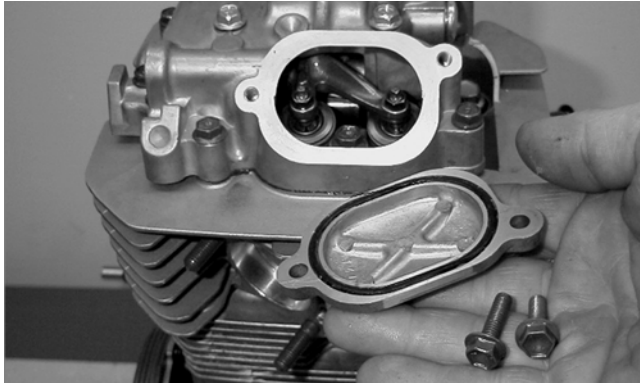
CD001

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

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

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

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



MD1264

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

Installing Engine/Transmission

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

1. From the left side, place the engine/transmission into the frame making sure the driveshaft engages with the splines in the front output yoke.
2. Install the mounting fasteners securing the engine/transmission in the following sequence.

A. Lower rear: One cap screw and nut with flat washer. Tighten only until snug.



CD002

B. Upper rear: Loosely fasten the left-side engine mount-to-frame cap screws; then install the cap screw w/nut and flat washer. Tighten only until snug.



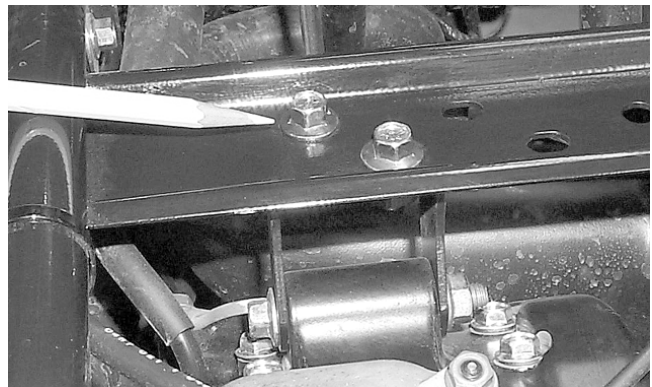
CC125D

C. Lower front: One cap screw, nut, spacer, and washer. Tighten only until snug.



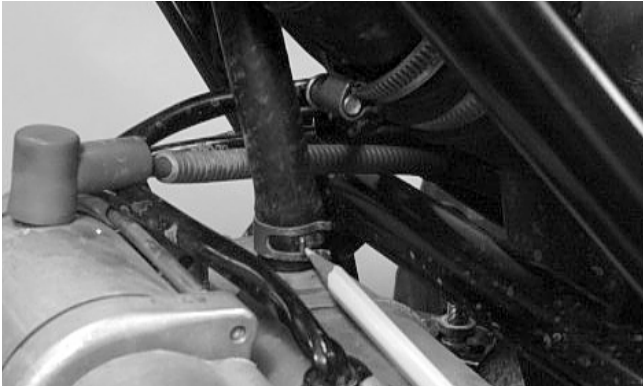
CC123D

D. Upper front: Two cap screws (inside the bracket) and one cap screw and nut (topside of engine). Tighten only until snug.



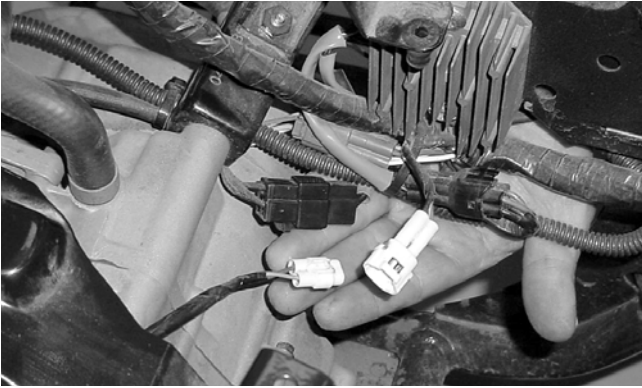
AF939

3. Tighten the engine mounting fasteners to specifications.
4. Connect the crankcase breather vent hose and secure with the clamp.



CC122D

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



CC938

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



CC937

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



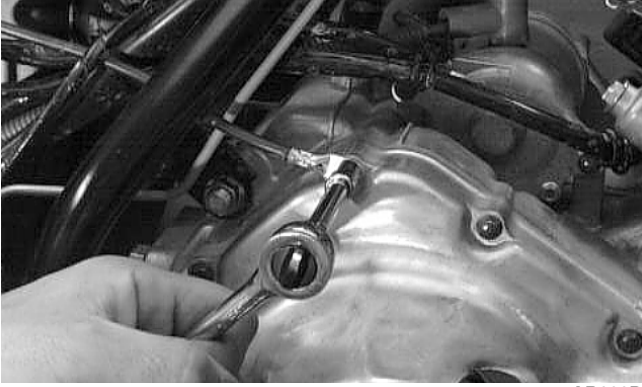
AR604D

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



CC939

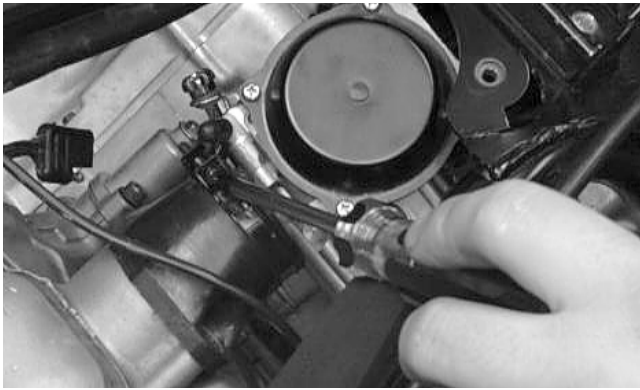
9. Install the high tension lead on the spark plug.



AR600D

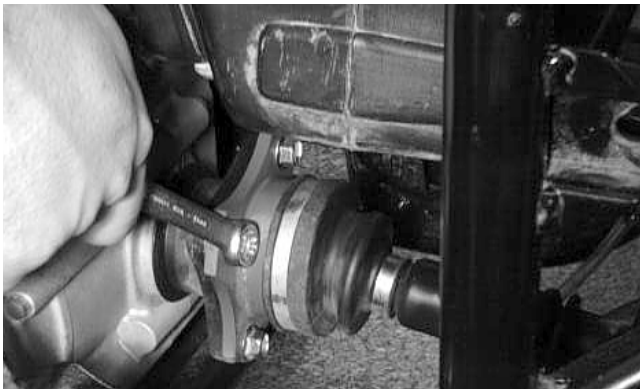
10. Install the carburetor assembly and secure the intake manifold and air inlet boot.

3



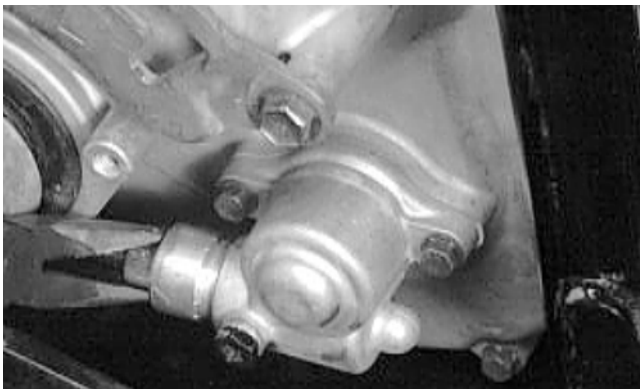
CC120D

11. Route the two vent hoses through the slots in the frame.
12. Place the rear output shaft into position on the rear output joint; then install the four cap screws and tighten to specifications.



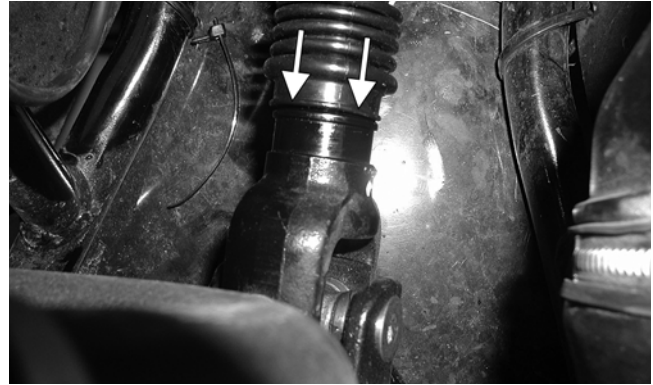
CC119D

13. On the ACT/TBX models, place the speedometer cable into position and tighten the knurled nut. On the FIS models, connect the speed sensor connector to its housing.



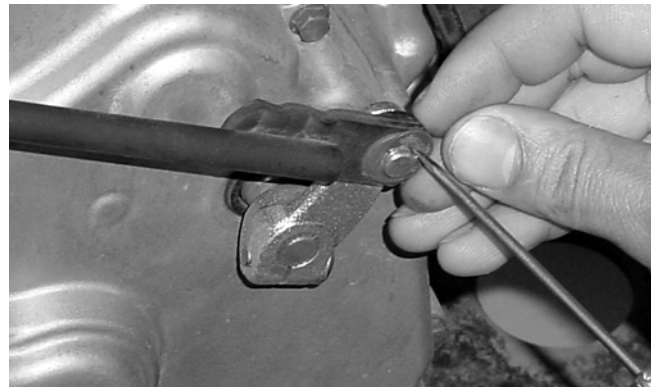
AF667D

14. Slide the front driveshaft boot over the front propeller yoke until it seats in the groove; then install and secure the boot clamp.



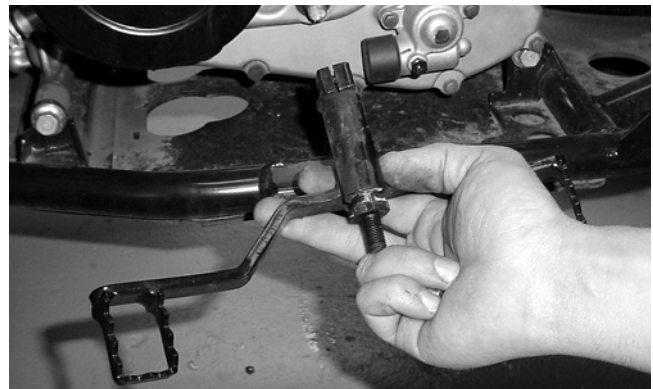
CD097A

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

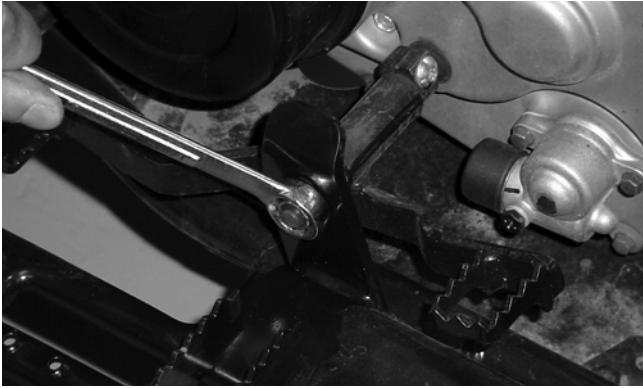


CC935

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



CC934



CD003

17. Place the footrests into position on the frame. Tighten the 10 mm cap screws to specifications and the 8 mm cap screws to specifications; then secure the fender extensions to the footrests with existing hardware.

18. Place the exhaust pipe into position inside the frame and connect to the muffler at the juncture. Do not tighten the clamp at this time.

■ **NOTE:** If the muffler was removed, see Section 8.

19. Place the exhaust pipe with new grafoil gasket into position on the engine; install and tighten the cap screws to specifications; then tighten the clamp (from step 18) to specifications.

20. Install the rear fenders and the rear rack (see Section 8).

21. Install the gas tank (see Section 4).

22. Place the right-side and left-side panels into position; then install the existing hardware and tighten securely.

23. Carefully guide the battery cables and fuse block wiring up through the access hole into the battery tray.

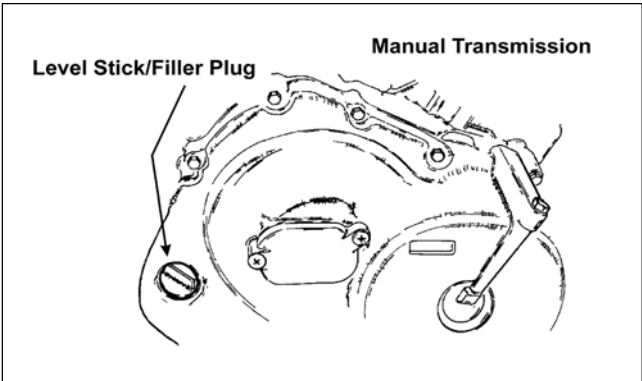
24. Connect all fuse block wiring according to the marking made in removing; then place the fuse block into position and secure with two screws (see wiring diagram in Section 5).

⚠ CAUTION

It is critical that all wiring be installed correctly to ensure electrical components will function properly.

■ **NOTE:** If the mounting screw holes have elongated, it will be necessary to install larger diameter screws.

- 25. Install the battery in the tray, install the vent hose, and secure the battery with the hold-down strap. Connect the positive battery cable; then connect the negative cable.
- 26. Install the seat.
- 27. Pour the correct amount of recommended oil into the engine/transmission filler hole; install the filler plug.



ATV-0075

⚠ CAUTION

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

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Removing Engine/ Transmission

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

AT THIS POINT

If the technician's objective is to service/replace left-side cover oil seals (3), front output joint oil seal (1), rear output joint oil seal (1), and/or the oil strainer (from beneath the engine/transmission), the engine/transmission does not have to be removed from the frame.

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

WARNING

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

1. Remove the seat.
2. Remove the negative cable from the battery; then remove the positive cable. Remove the battery hold-down strap and the battery vent hose; then remove the battery.

CAUTION

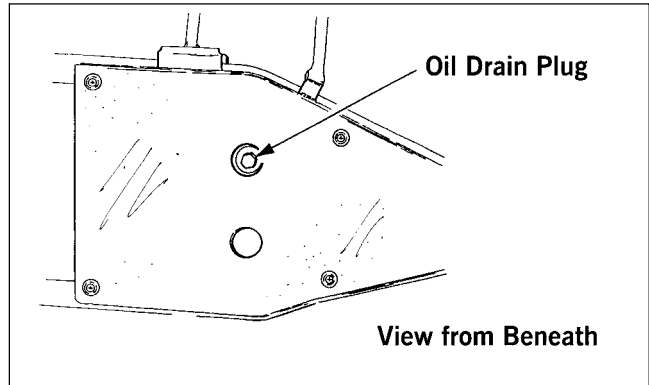
Battery acid is harmful if it contacts eyes, skin, or clothing. Care must be taken whenever handling a battery.

3. Near the battery tray, remove the two screws securing the fuse block; then carefully remove all the wiring from the block.

CAUTION

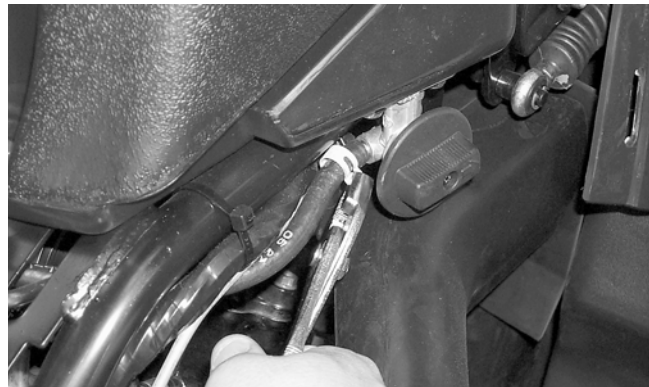
It is critical that all wiring be marked when removing from the fuse block. This will aid in installing correctly.

4. Carefully guide the battery cables and fuse block wiring down through the access hole into the engine compartment for future removing.
5. Drain the oil from beneath the engine/transmission.



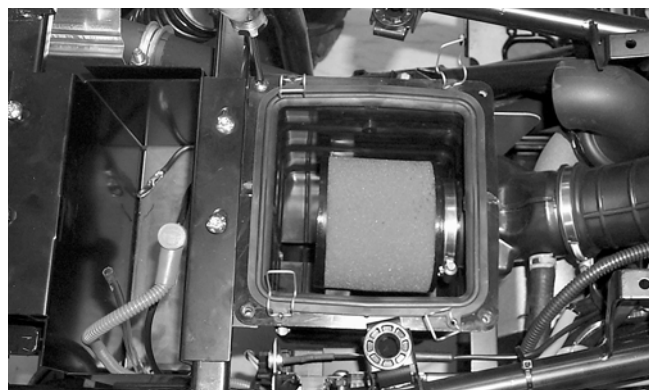
733-441A

6. Remove the hardware securing the right-side and left-side panels; then remove the panels.
7. Turn the gas tank valve to the OFF position; then remove the fuel hose and vent hose.



CC533

8. Remove the gas tank.
9. Remove the rear fenders and the rear rack assembly (see Section 8).
10. Remove the hardware securing the air cleaner housing to the frame.



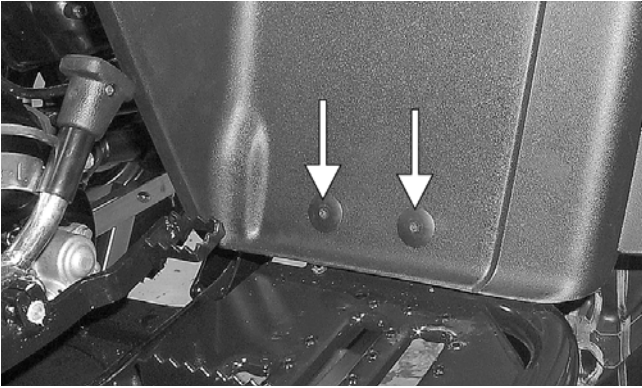
CC535

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



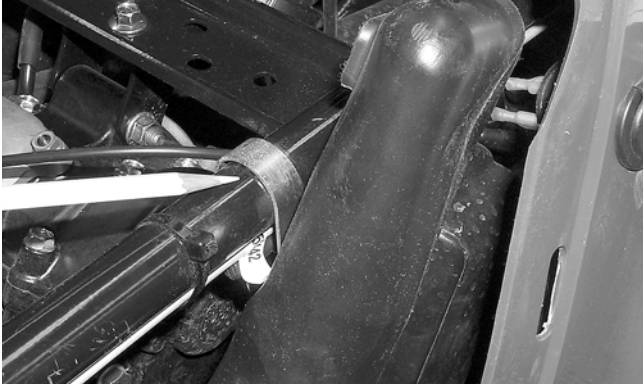
CC536

12. Remove the hardware securing the cooling duct assembly to the frame.



CC861A

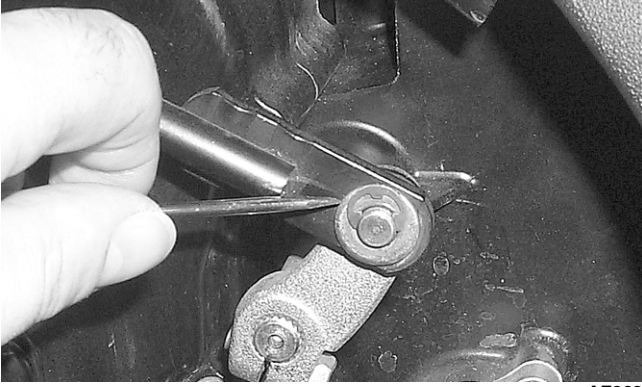
15. Loosen the clamp securing the carburetor to the intake; then route the carburetor assembly up and away from the engine.



AF938

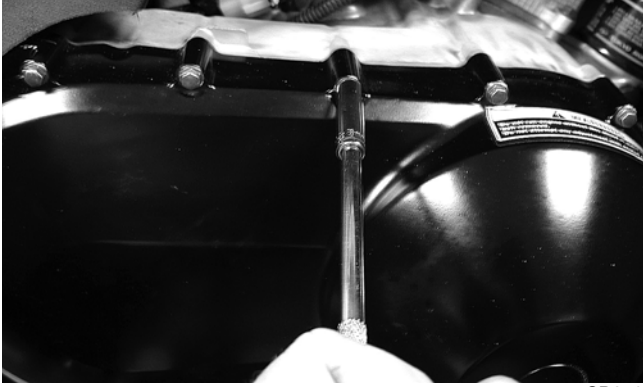
13. Remove the cooling duct shroud from the V-belt cover.

16. Remove the E-clip securing the shift rod to the engine shift arm.



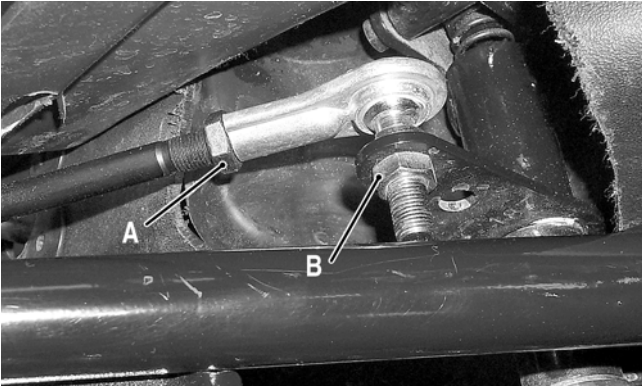
AF962

17. Remove the lock nut (B) securing the shift rod to the shift lever arm; then remove the shift rod.



CD078

14. Remove the hardware securing both footrests to the frame and front fender.



AF941A

18. Remove the torx-head screws securing the exhaust pipe shroud; then remove the shroud.

19. Remove the four (two on each side) torx-head screws securing the inner front fenders to the frame and footrests.

3

■ **NOTE:** It is not necessary to remove the front fender to remove the engine; however, removing the screws securing the inner front fenders will allow the fender to be moved to accommodate the removing of the exhaust pipe and engine.

20. Remove the hardware securing the exhaust pipe to the muffler, frame, and engine; then remove the exhaust pipe.

21. Remove the two oil hoses from the engine. Route the hoses out of the way.

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

22. Remove the hardware securing the rear driveshaft.



CD085

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

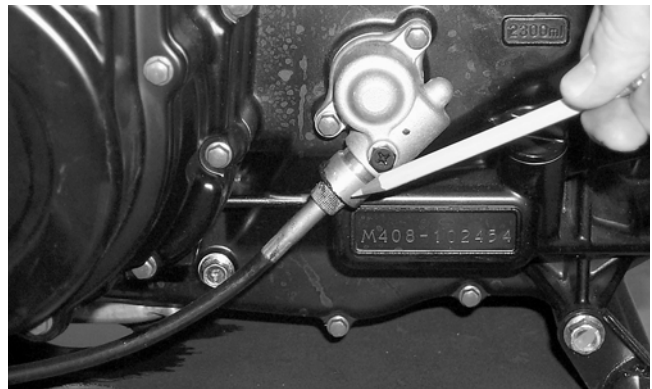
23. On the right side, cut the cable ties securing the wiring harness to the frame.



CC567

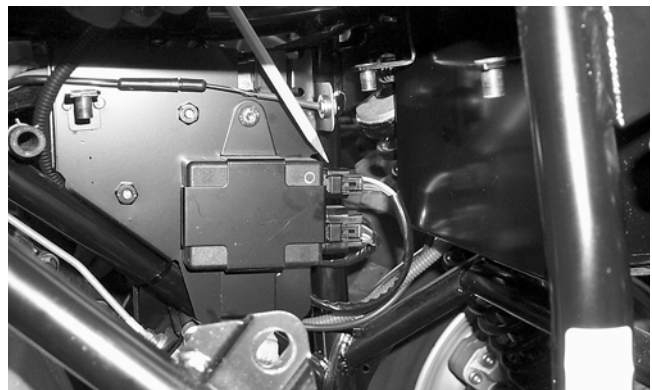
24. Remove the positive cable from the starter motor and route it out of the way.

25. On the ACT/TBX models, remove the speedometer cable from the speedometer gear housing. On FIS models, disconnect the speed sensor connector from the housing.



CC568

26. Disconnect the top connector at the CDI unit.



CC569

27. Disconnect the stator-to-rectifier/regulator connector.

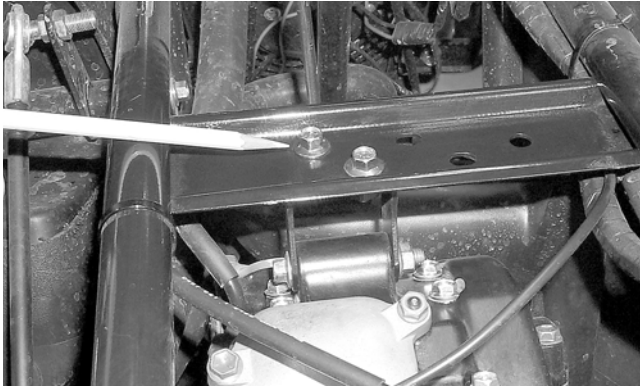
28. Remove the temperature sensor wires from the engine.

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



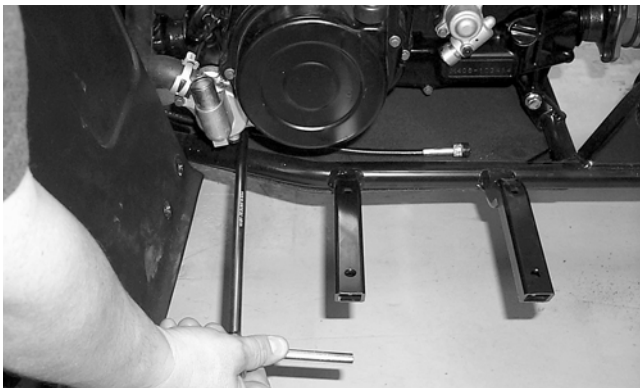
AF964B

29. Remove the two cap screws securing the front upper engine mount to the frame.



AF939

30. Remove the cap screw and flange nut securing the upper engine bracket to the engine; then remove the bracket.
31. Remove the spark plug wire from the spark plug.
32. Remove the shift indicator connector from the main wiring harness.
33. Remove the cap screw securing the engine ground wire to the engine.
34. Remove the three engine mounting through-bolts. Account for a washer on the upper bolt and a spacer on the lower front bolt.



CC577

35. Remove the caps screws securing the two upper rear engine mounts to the frame.
36. Slightly raise the front of the engine to disengage the front driveshaft from the front output yoke.



CD096

37. Loosen the hose clamps securing the front and rear duct boots to the engine; then remove the boots.



CD504



CD515

38. Remove the engine from the right side by moving the engine forward while raising the engine in the rear and rotating the engine counterclockwise. The engine will come out the right side of the frame.

3

Top-Side Components

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

AT THIS POINT

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

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

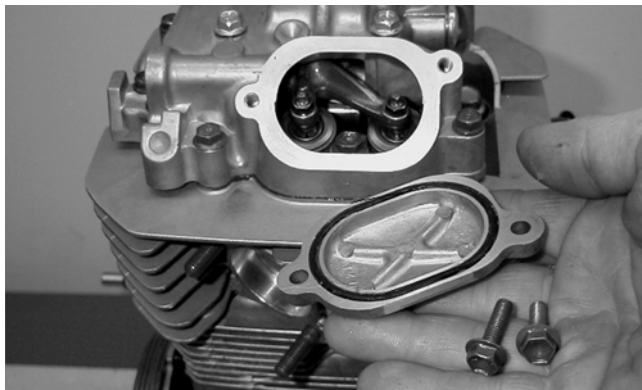
Removing Top-Side Components

- A. Valve Cover
- B. Cylinder Head

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

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

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



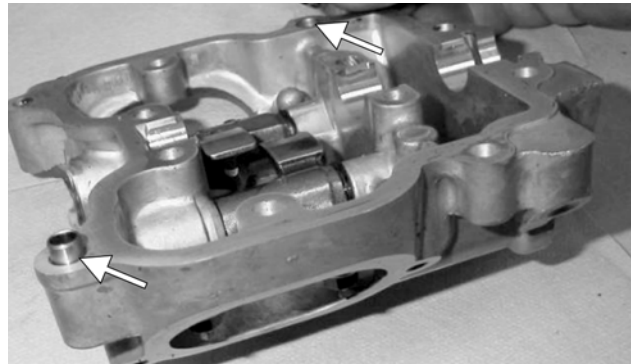
MD1264

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

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

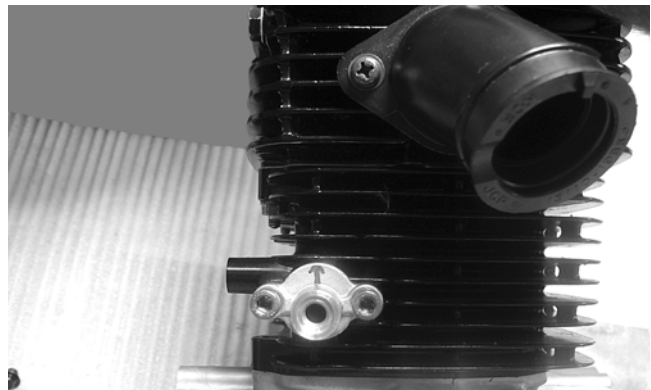


MD1261



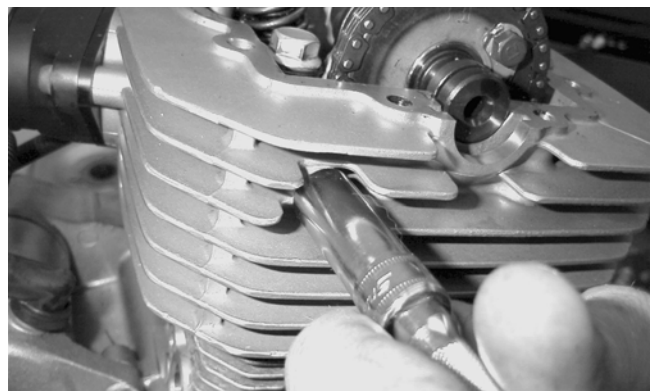
MD1354A

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



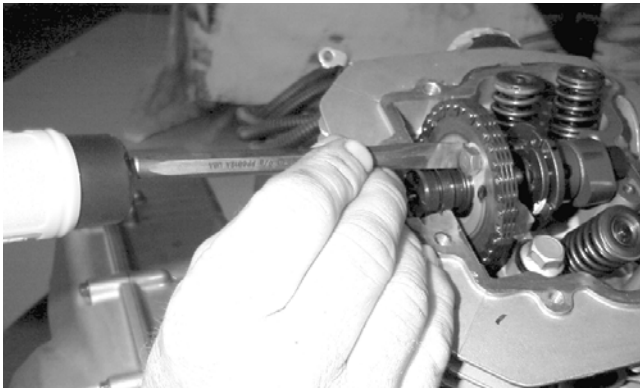
CD382

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

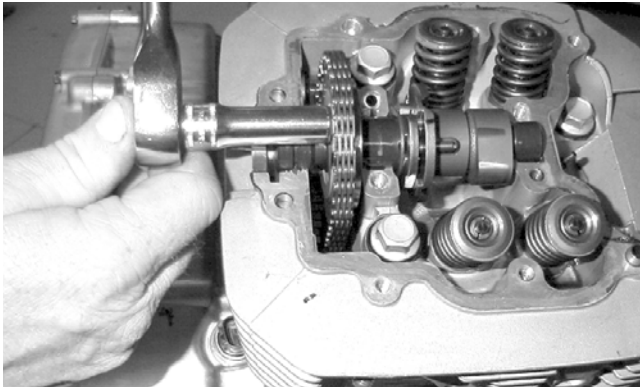


MD1251

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



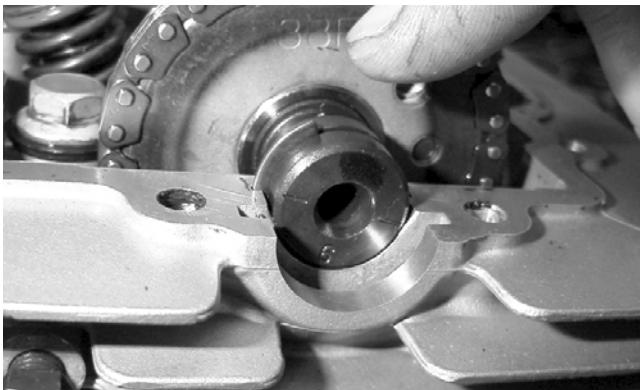
MD1136



MD1137

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

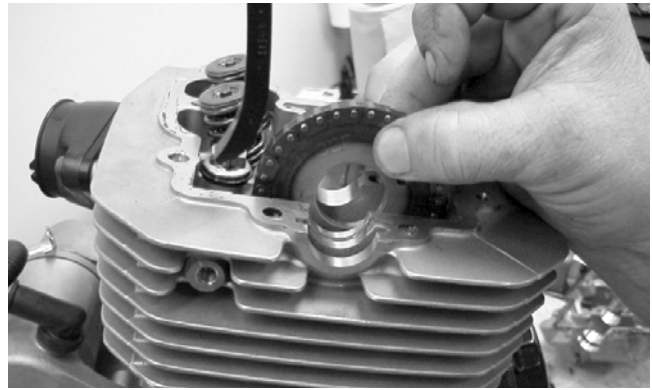
■ **NOTE:** Care should be taken not to drop the C-ring down into the crankcase.



MD1131

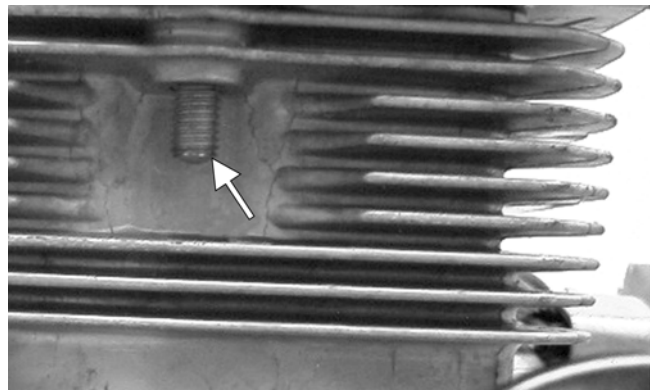
- Noting the timing marks for installing purposes, drop the sprocket off the camshaft. While holding the cam chain, slide the sprocket and camshaft out of the cylinder head. Account for an alignment pin.

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



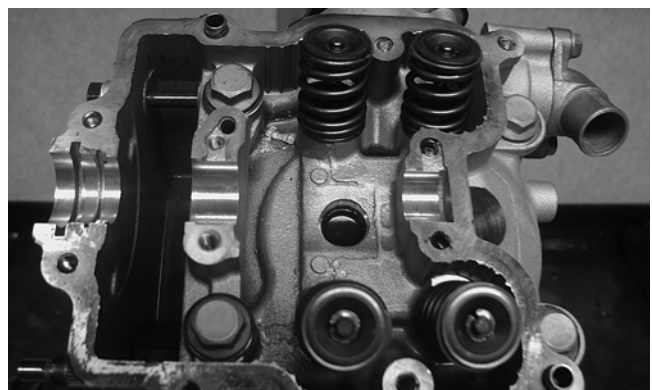
MD1132

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



MD1192

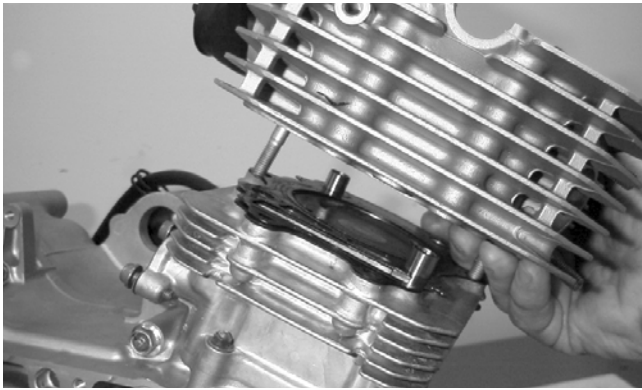
- Remove the four cylinder head cap screws and washers. Note that the two cap screws on the right side of the cylinder head nearest the cam sprocket are longer than the two cap screws on the left (spark plug) side.



CD211

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

3

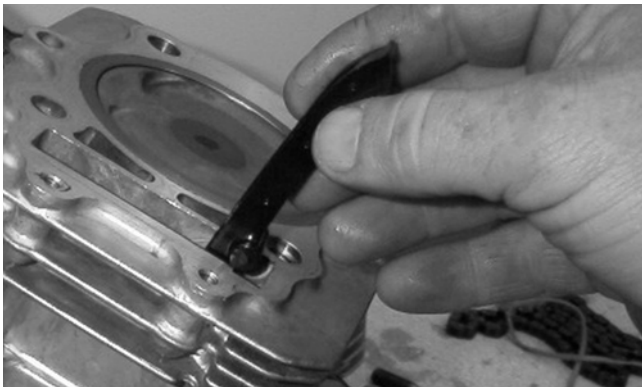


MD1163

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

11. Remove the cam chain guide.

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

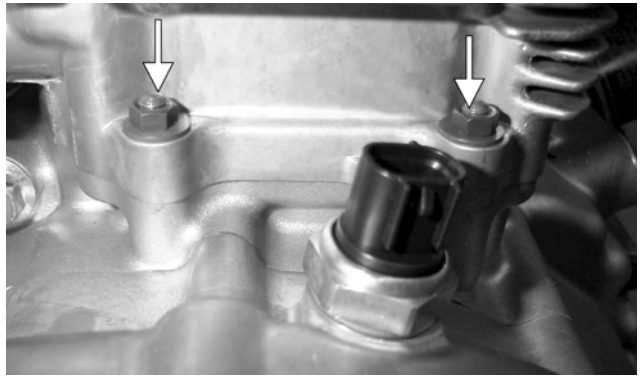


MD1173

C. Cylinder
D. Piston

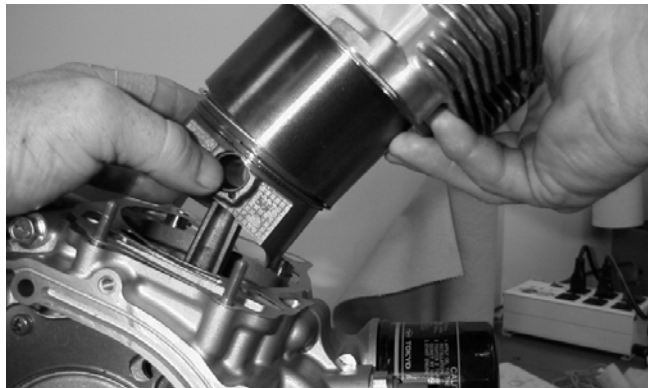
■NOTE: Steps 1-11 in the preceding sub-section must precede this procedure.

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



MD1226A

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



MD1214

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

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

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



MD1213

15. Using Piston-Pin Puller (p/n 0644-328), remove the piston pin. Account for the opposite-side circlip. Remove the piston.

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

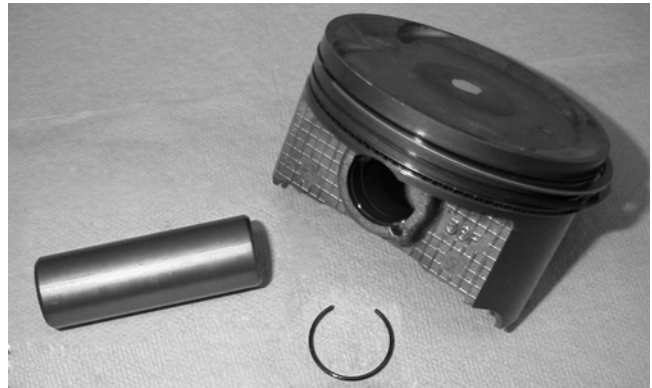


MD1219

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

CAUTION
<p>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.</p>

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



MD1211

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

AT THIS POINT
<p>To service piston, see Servicing Top-Side Components sub-section.</p>

3

AT THIS POINT
<p>To service center crankcase components only, proceed to Removing Left-Side Components.</p>

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

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

Removing Left-Side Components

- A. Recoil Starter
- B. Starter Cup
- C. Cover/Stator Assembly

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

👉 AT THIS POINT

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

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

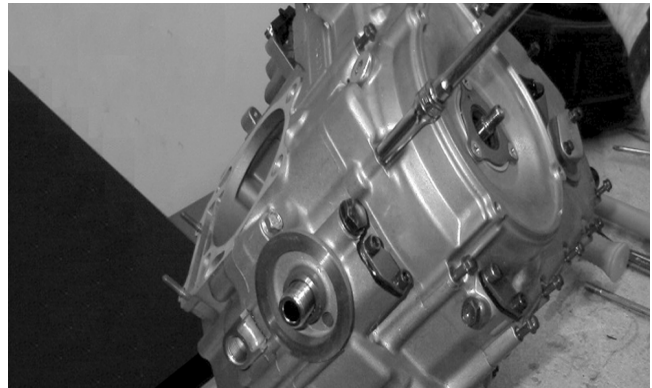


MD1303



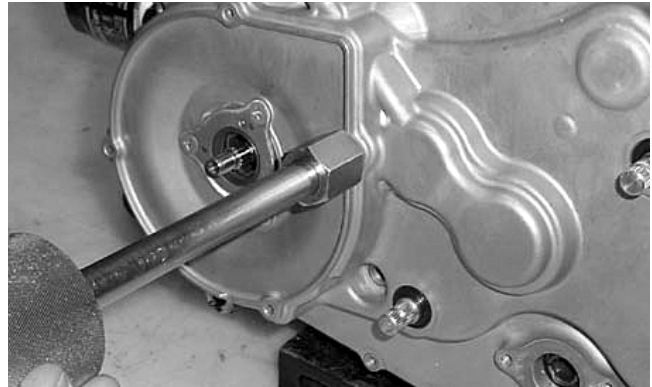
MD1304

3. Lay the engine/transmission on its right side. Remove the 14 left-side cover-to-crankcase mounting cap screws noting the location of the long cap screw with the washer near the middle of the left-side cover. Keep the different-lengthed 6 mm cap screws in order for installing purposes.



MD1186

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



CC946



MD1188

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

- D. Rotor/Flywheel
- E. Starter Motor

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

5. Remove the rotor/flywheel nut.



MD1194

6. Install the crankshaft protector.



MD1365

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

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



MD1368

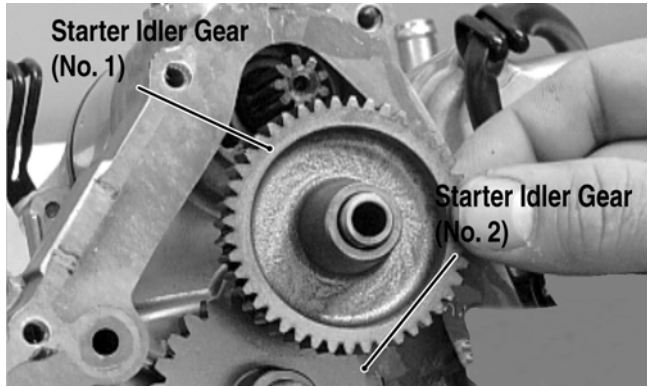


MD1369



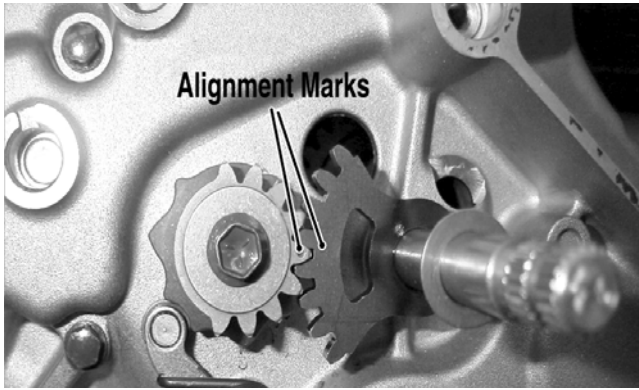
MD1370

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



MD1305

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



MD1239

10. Remove the shift detent cam. Note position of spacer for installing purposes.
11. Remove the cam stopper assembly.
12. Remove the spacer from the driveshaft noting the direction of the stepped side for installing purposes.



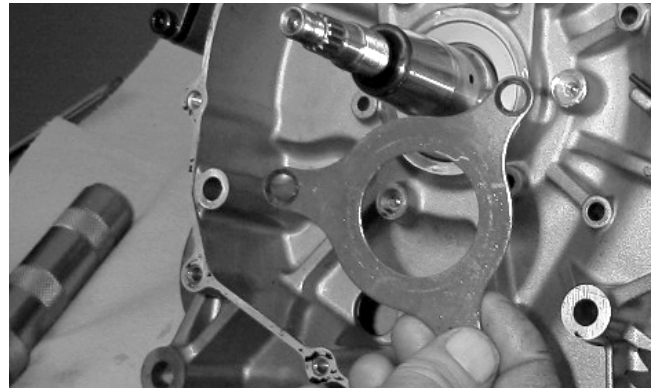
MD1224

13. Remove two starter motor cap screws.



MD1078

14. Remove starter motor by tapping lightly with a mallet.
15. Using an impact screwdriver, remove the three Phillips-head screws holding the crankshaft bearing retainer. Remove the crankshaft bearing retainer.



MD1122

Right-Side Components

AT THIS POINT

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

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

AT THIS POINT

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

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

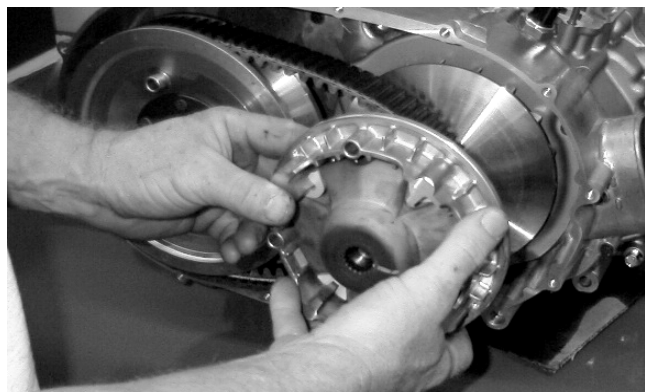
Removing Right-Side Components

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

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



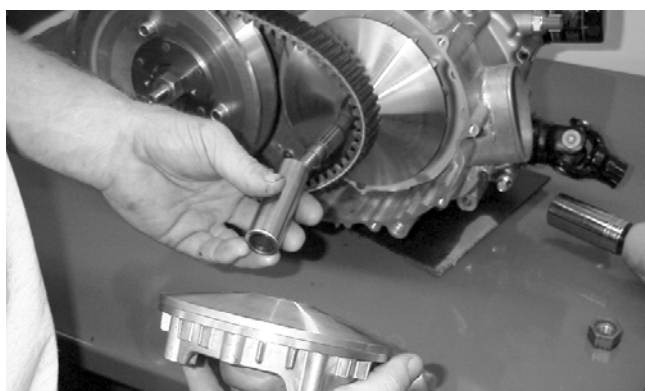
MD1306



MD1035



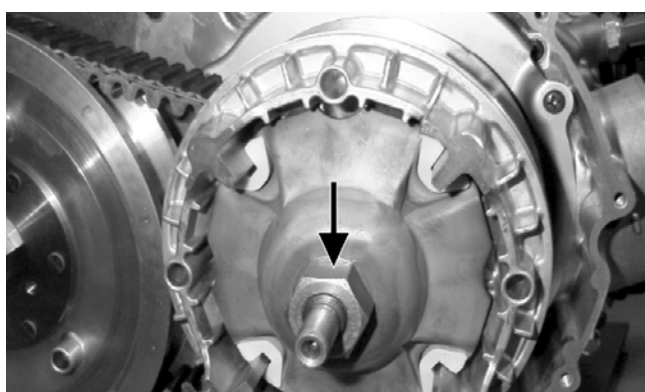
MD1307



MD1034

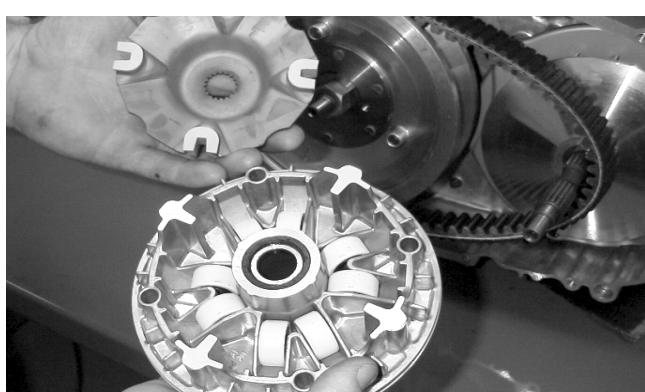
3

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



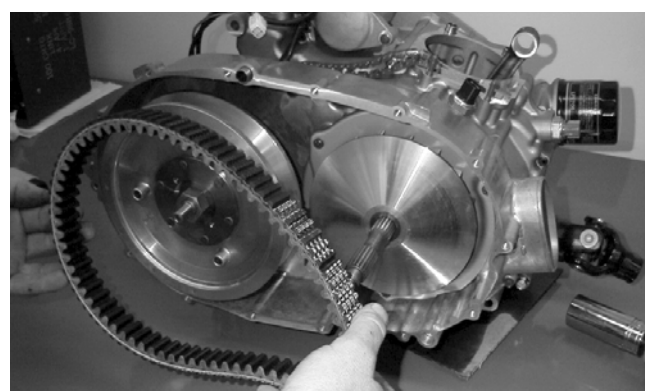
MD1033

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



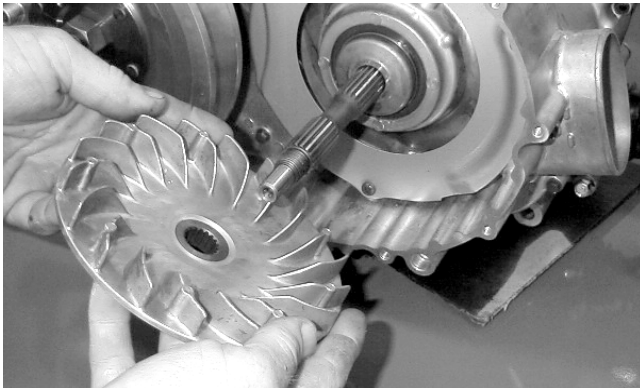
MD1036

4. Remove the V-belt.



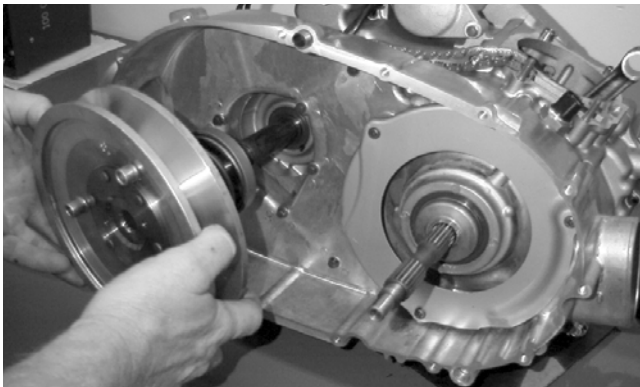
MD1118

5. Remove the fixed drive face.



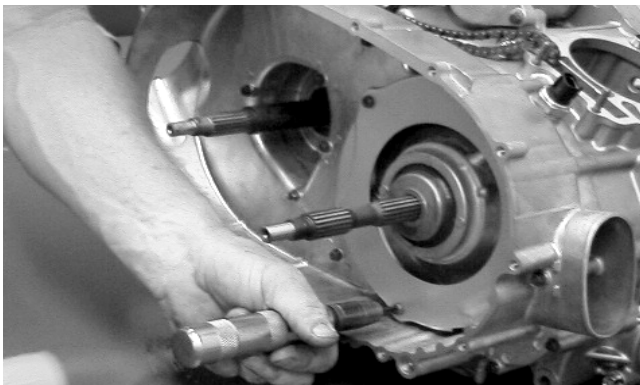
MD1094

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



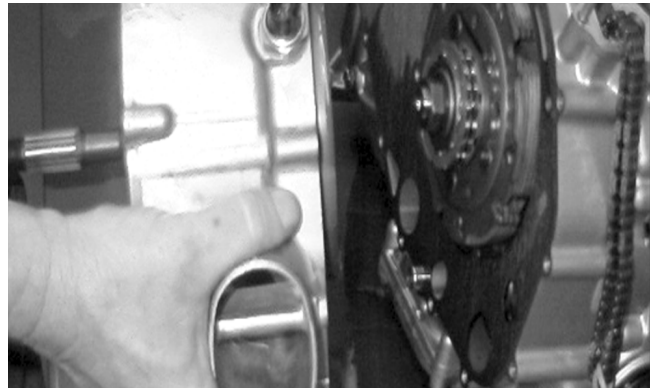
MD1068

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



MD1092

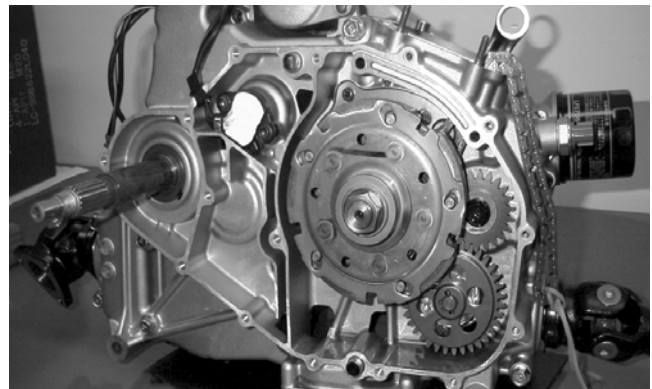
8. Remove the cap screws holding the clutch cover onto the right-side crankcase half. Note the positions of the different-lengthed cap screws for installing purposes.
9. Using a rubber mallet, loosen the clutch cover; then pull it away from the right-side crankcase half. Account for two alignment pins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



MD1115

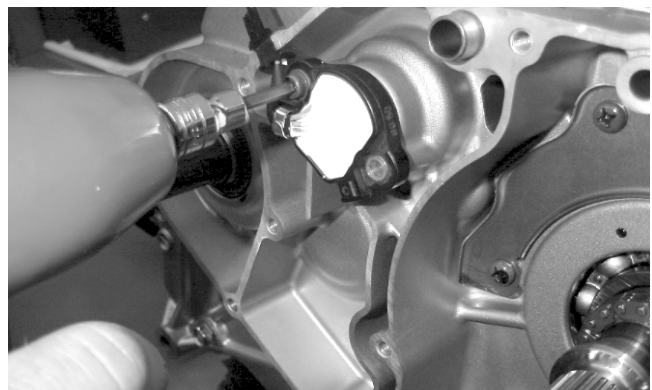
**D. Gear Position Switch
E. Centrifugal Clutch Assembly
F. Oil Pump Drive Gear
G. Oil Pump Driven Gear**

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



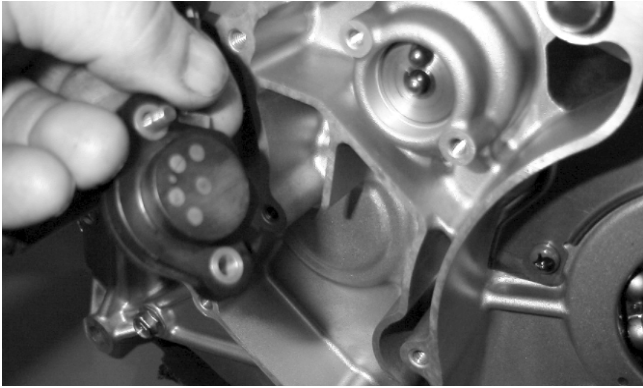
MD1072

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

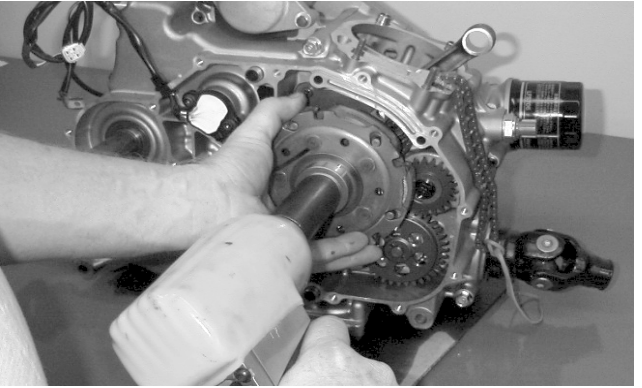


MD1041

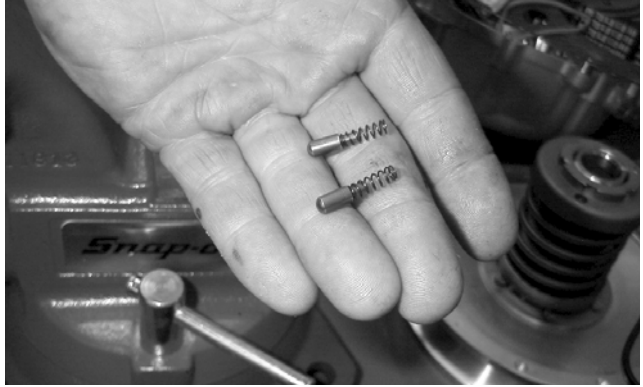
11. Remove the gear position indicator switch. Account for two contact pins and two springs.



MD1040



MD1014



MD1043



MD1016

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

14. Remove the cam chain.



MD1286

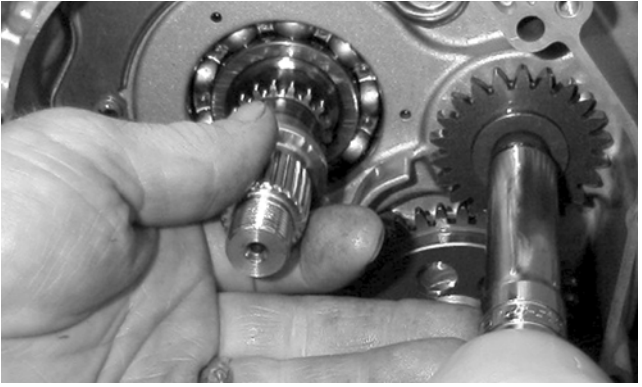


MD1335

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

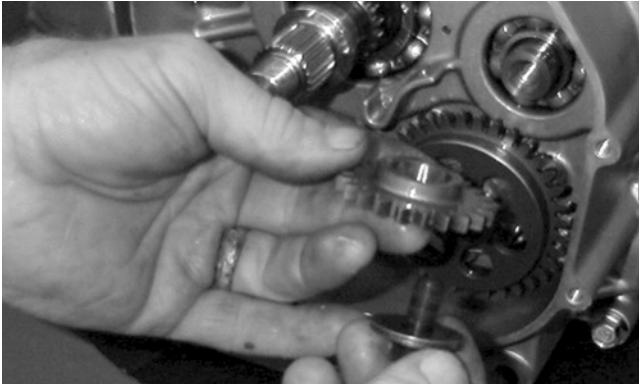
15. Remove the oil pump drive gear cap screw.

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



MD1018

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



MD1017

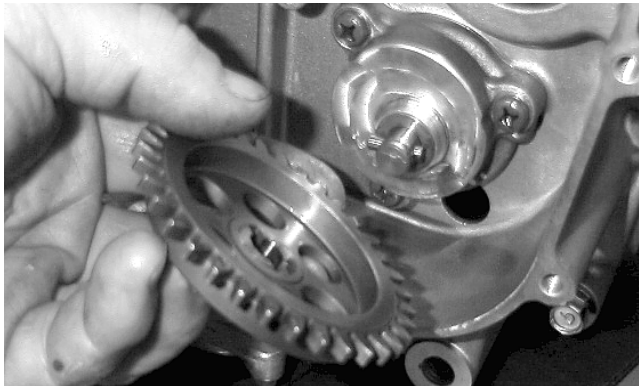
17. Remove the snap ring holding the oil pump driven gear.



MD1019

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

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

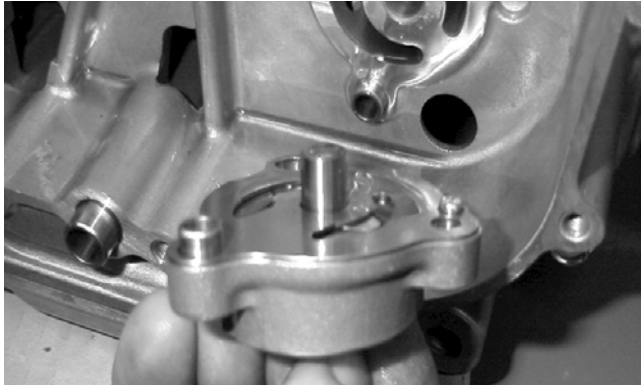


MD1020

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

H. Oil Pump/Oil Strainer

■ **NOTE:** Steps 1-18 in the preceding sub-sections must precede this procedure.



MD1060

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

■ **NOTE:** Note the directional arrow for installing purposes.



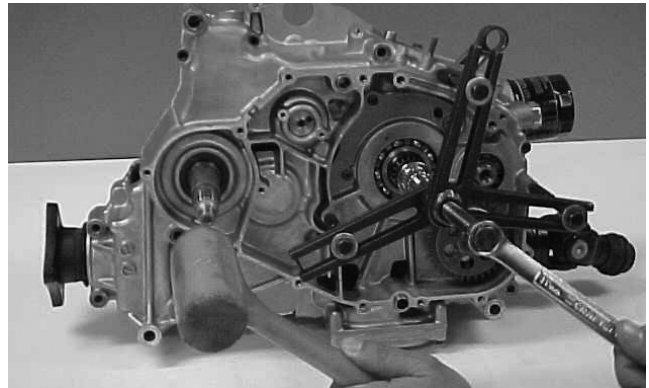
MD1207

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

Center Crankcase Components

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

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

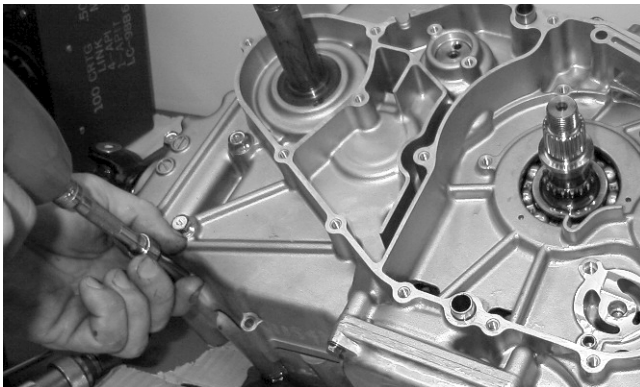


CC869

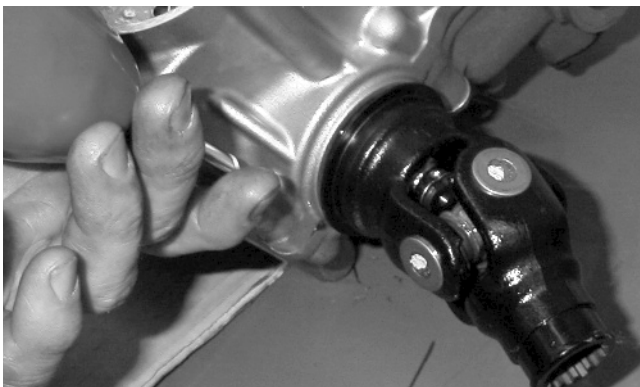
■ **NOTE:** To keep the shaft/gear assemblies intact for identification, tap the shafts toward the left-side crankcase half when separating the halves.

Separating Crankcase Halves

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

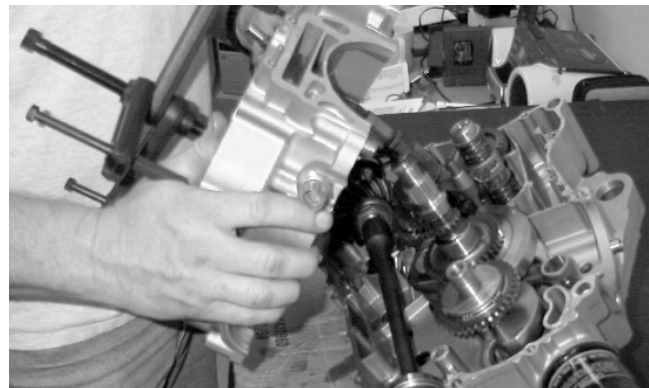


MD1006



MD1012

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

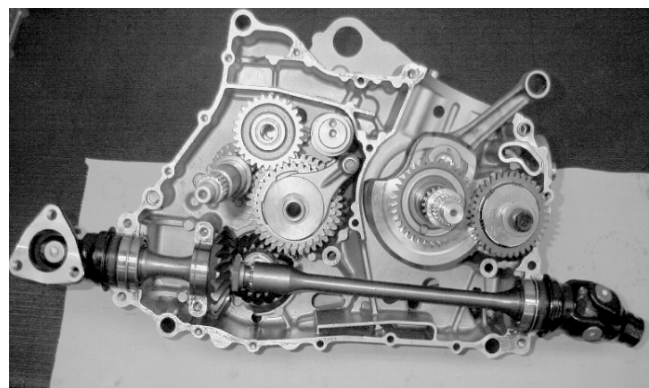


MD1313

3

Disassembling Crankcase Half

1. Remove the secondary and primary driveshaft assemblies. Account for the bearing alignment C-ring on the bearing boss next to the pinion gear.



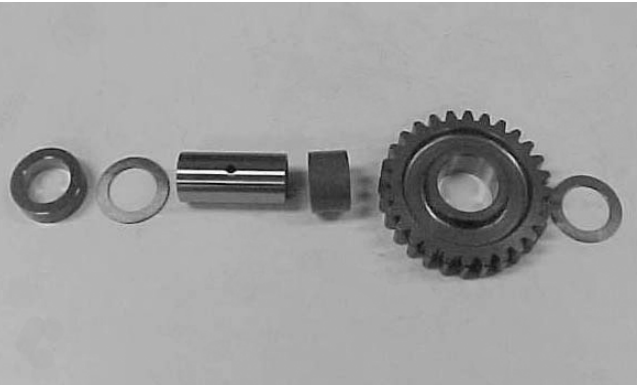
MD1317

■ **NOTE:** Note the location of the bearing alignment pin on the secondary output shaft.

2. Remove the reverse idler gear, spacer, and sleeve. Account for the washers.



MD1325



CC870

3. Remove the driveshaft.



MD1326

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



MD1327

5. Remove snap ring and gear from the output side of the gear cluster. Remove the gear cluster and the inner shift fork together. Account for snap ring, gear, and washer.



MD1328

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



MD1329

7. Remove the counterbalance gear. Account for the key and inner and outer thrust washers.

8. Remove the counterbalance shaft.



MD1024

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

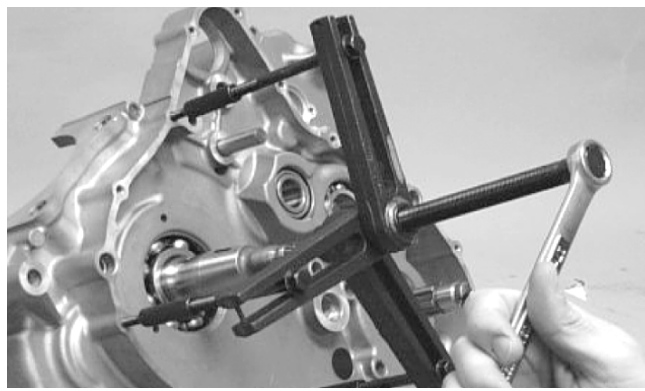


MD1331



MD1100

9. Using Crankcase Separator/Crankshaft Remover (p/n 0444-009), remove the crankshaft.



MD1330

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

👉 AT THIS POINT
To service crankshaft assembly, see Servicing Center Crankcase Components sub-section.

**Table of Contents
(Servicing Components)**

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

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Servicing Top-Side Components

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

VALVE ASSEMBLY

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

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

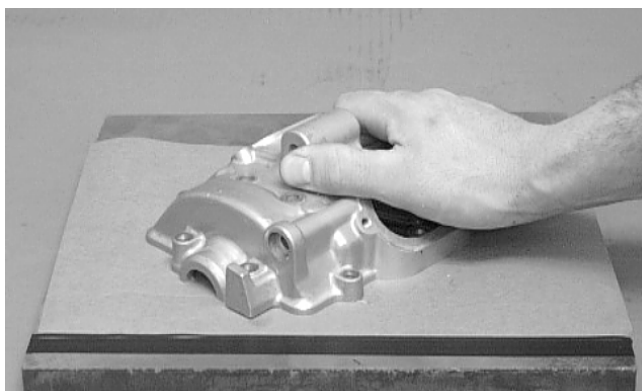
Cleaning/Inspecting Valve Cover

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

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

CAUTION

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



CC130D

CAUTION

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

Removing Valves

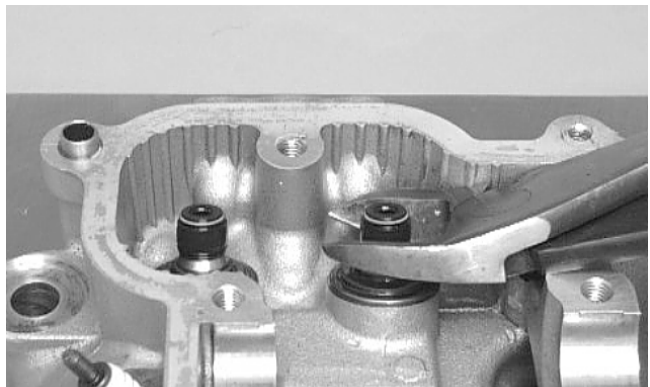
■ **NOTE:** Keep all valves and valve components as a set. Note the original location of each valve set for use during installation. Return each valve set to its original location during installation.

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

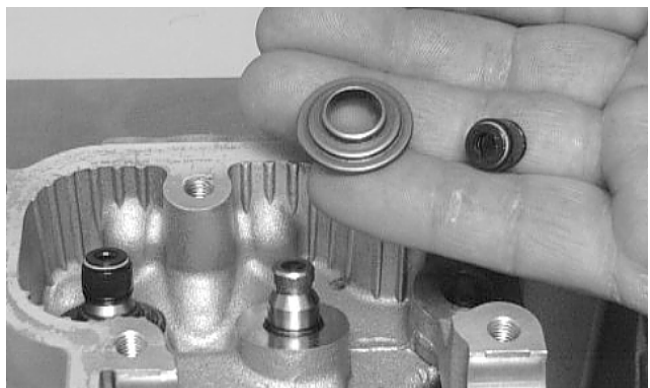


CC994

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



CC134D



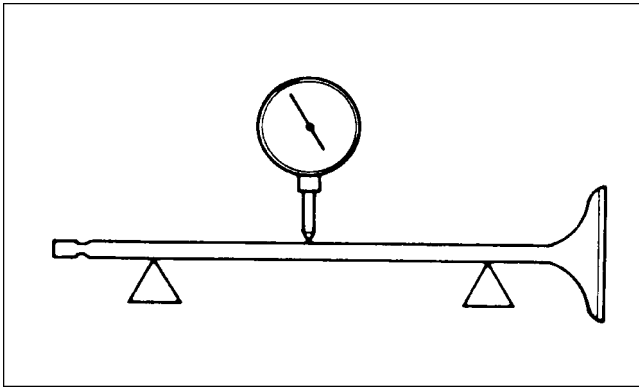
CC136D

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

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

Measuring Valve Stem Runout

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



ATV-1082

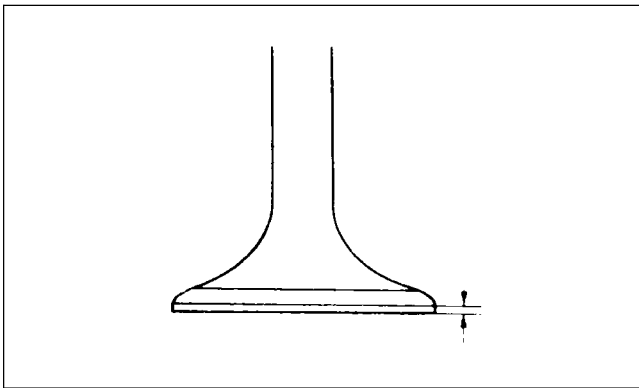
2. Maximum runout must not exceed specifications.

Measuring Valve Stem Outside Diameter

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

Measuring Valve Face/Seat Width

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

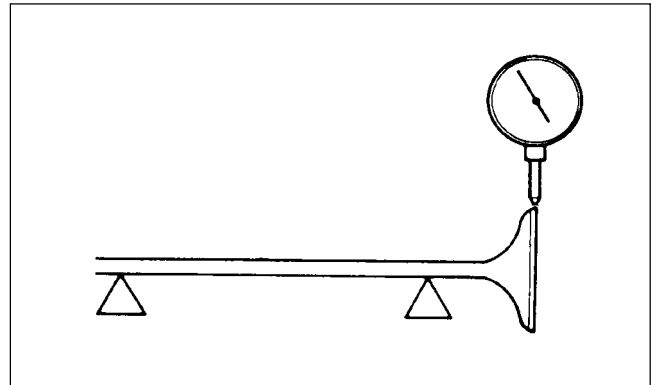


ATV-1004

2. Acceptable width range must be within specifications.

Measuring Valve Face Radial Runout

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



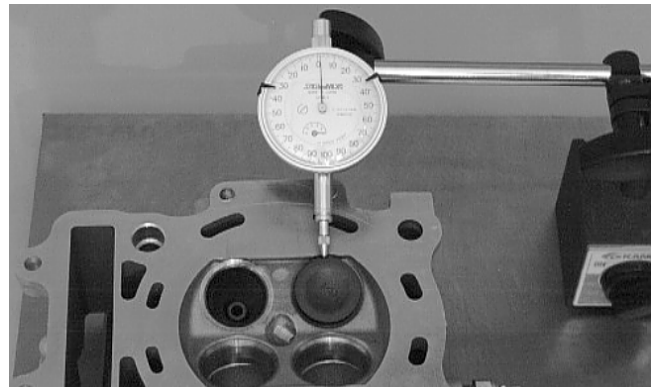
ATV1082A

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

Measuring Valve Guide/Valve Stem Deflection (Wobble Method)

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

3



CC131D

3. Push the valve from side to side; then from top to bottom.
4. Maximum “wobble” deflection must not exceed specifications.

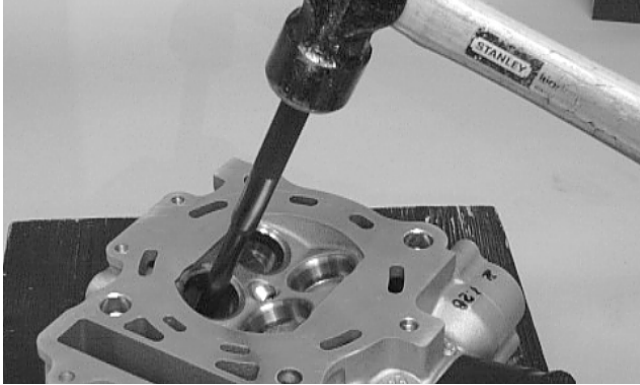
Measuring Valve Guide (Inside Diameter)

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.

Replacing Valve Guide

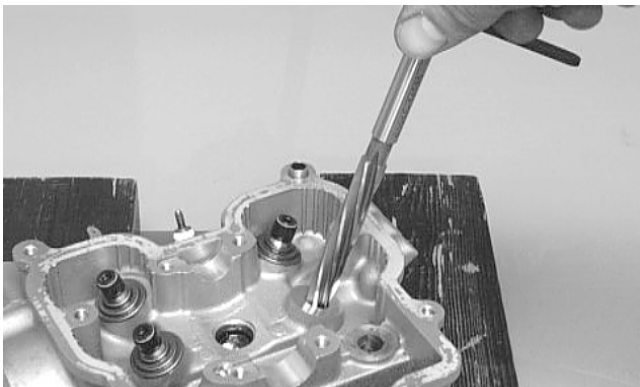
■ **NOTE:** If a valve guide is worn or damaged, it must be replaced.

1. If a valve guide needs replacing, insert a valve guide remover into the valve seat side of the valve guide. Using a hammer, gently drive the valve guide out of the cylinder head.



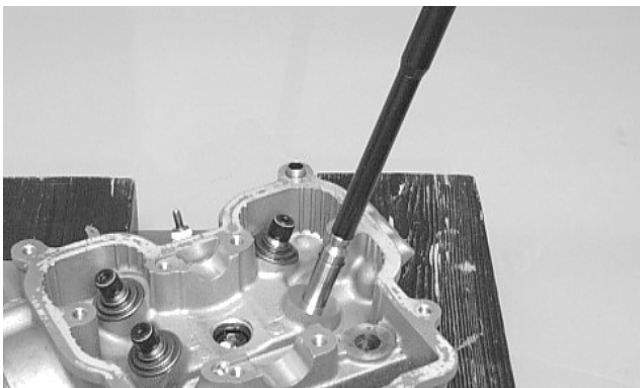
CC137D

2. Using the Standard Valve Guide Reamer (p/n 0444-017), remove any burrs or tight areas from the valve guide journals.



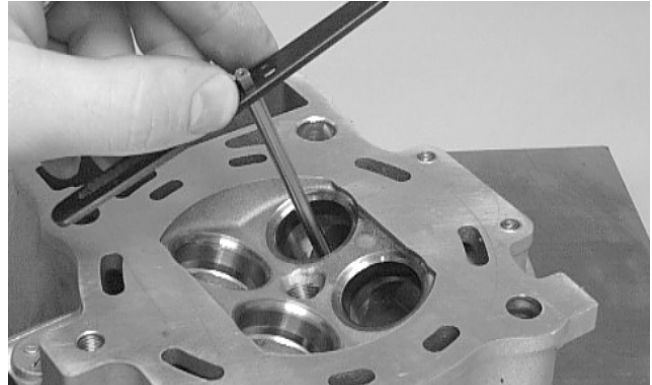
CC142D

3. To install a valve guide, use a valve guide installer and gently drive a valve guide with a retaining clip into the bore from the valve spring side until the retaining clip just contacts the cylinder head.



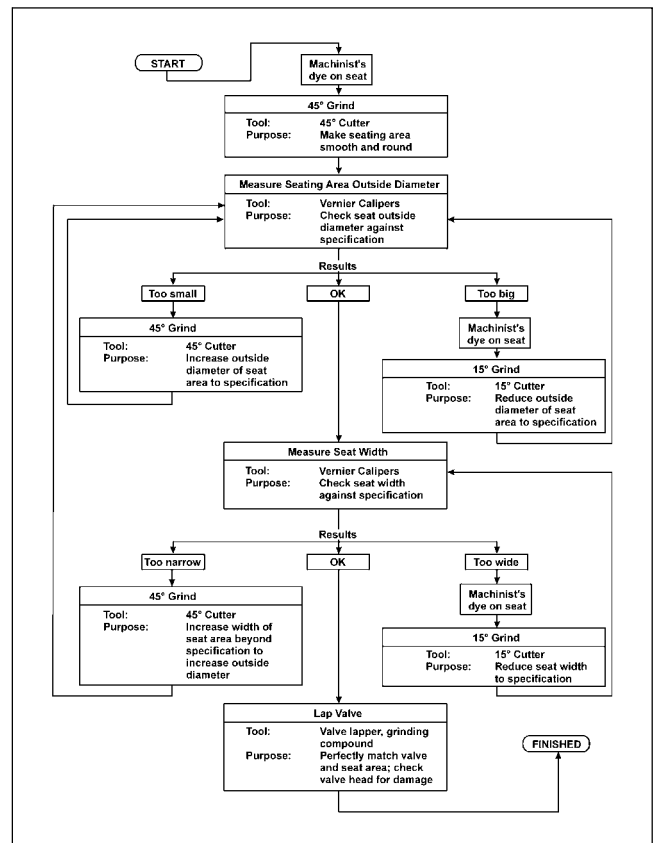
CC143D

4. After installing the guide, use the standard valve guide reamer to remove all burrs and tight areas that may remain in each valve guide.



CC138D

Valve Seat/Guide Servicing Flow Chart



ATV-0107

Grinding Valve Seats

■ **NOTE:** If the valve seat is beyond servicing, the cylinder head must be replaced.

1. Insert an exhaust valve seat pilot shaft into an exhaust valve guide. Slide an exhaust valve seat grinding tool onto the pilot shaft; then using light pressure on a driver handle and a deep socket, grind the exhaust valve seat until within specifications.

■ **NOTE:** Repeat procedure on the remaining exhaust valve.



CC139D

2. Insert an intake valve seat pilot shaft into one of the intake valve guides. Slide the intake valve seat grinding tool onto the pilot shaft; then using light pressure on a driver handle and a deep socket, grind the intake valve seat until within specifications.

■ **NOTE:** Repeat procedure on the remaining intake valve.



CC140D

Lapping Valves

■ **NOTE:** Do not grind the valves. If a valve is damaged, it must be replaced.

1. Remove all carbon from the valves.
2. Lubricate each valve stem with light oil; then apply a small amount of valve lapping compound to the entire seating face of each valve.
3. Attach the suction cup of a valve lapping tool to the head of the valve.
4. Rotate the valve until the valve and seat are evenly polished.
5. Clean all compound residue from the valve and seat.

Measuring Rocker Arm (Inside Diameter)

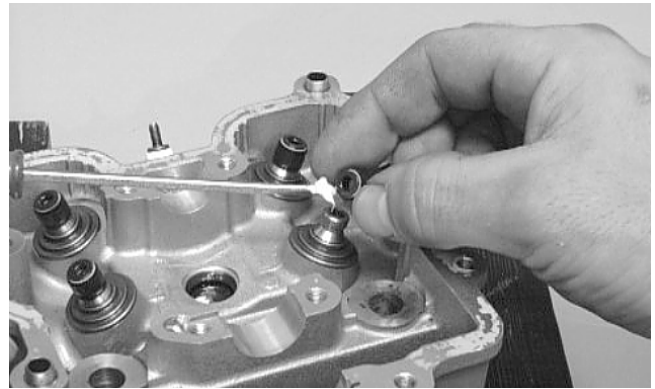
1. Using a dial calipers, measure the inside diameter of the rocker arm.
2. Acceptable inside diameter range must be within specifications.

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

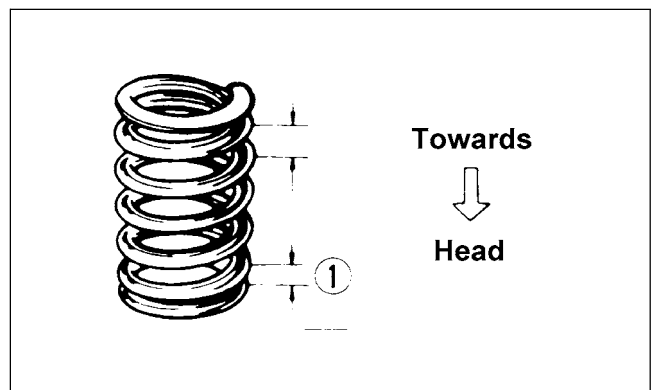
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



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 painted end is not visible, install the ends of the springs with the closest coils toward the head.



ATV-1011A

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



CC994

PISTON ASSEMBLY

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

Cleaning/Inspecting Piston

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the dome of the piston.
2. Inspect the piston for cracks in the piston pin, dome, and skirt areas.
3. Inspect the piston for seizure marks or scuffing. Repair with #400 grit wet-or-dry sandpaper and water or honing oil.



AN135

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

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

Removing Piston Rings

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



CC400D

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

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

Cleaning/Inspecting Piston Rings

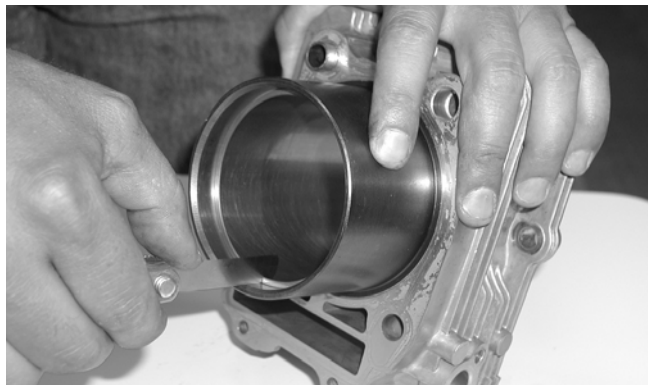
1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

⚠ CAUTION

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

Measuring Piston-Ring End Gap (Installed)

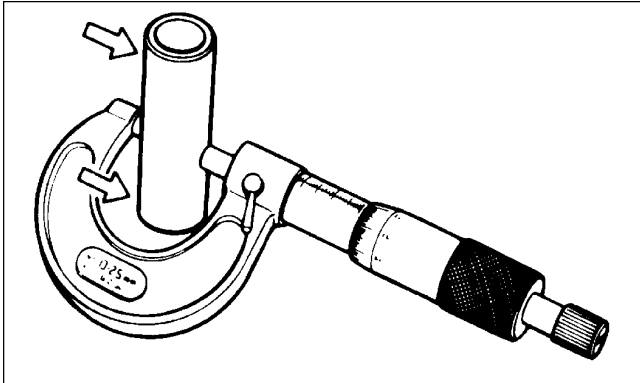
1. Place each piston ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must not exceed specifications.



CC995

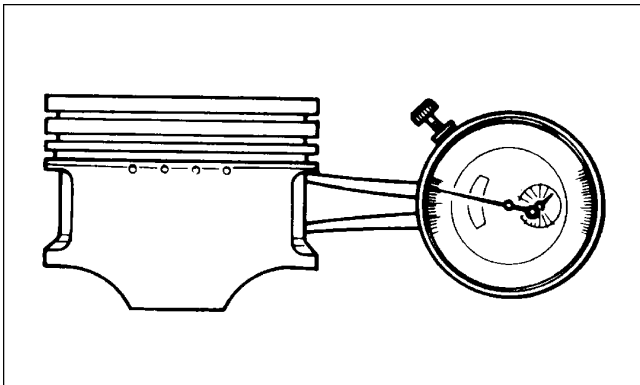
Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

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



ATV-1070

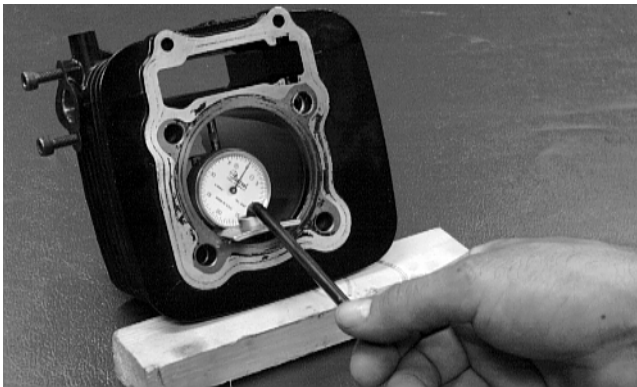
2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



ATV-1069

Measuring Piston Skirt/ Cylinder Clearance

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



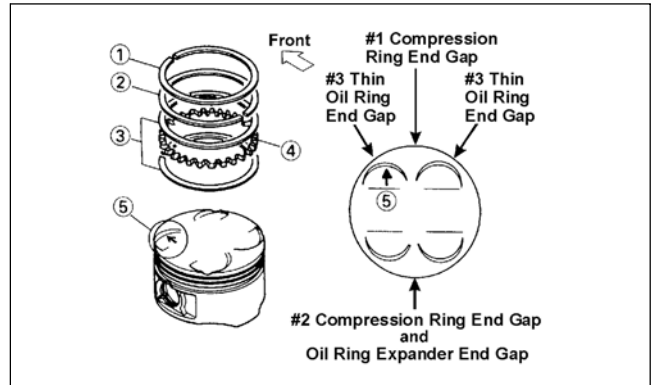
CC397D

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

Installing Piston Rings

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

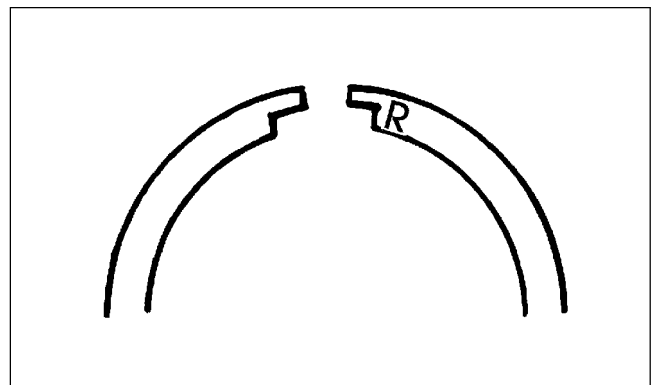
■ **NOTE:** Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.



ATV-1085B

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

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



726-306A

CAUTION

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

CYLINDER/CYLINDER HEAD ASSEMBLY

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

Cleaning/Inspecting Cylinder Head

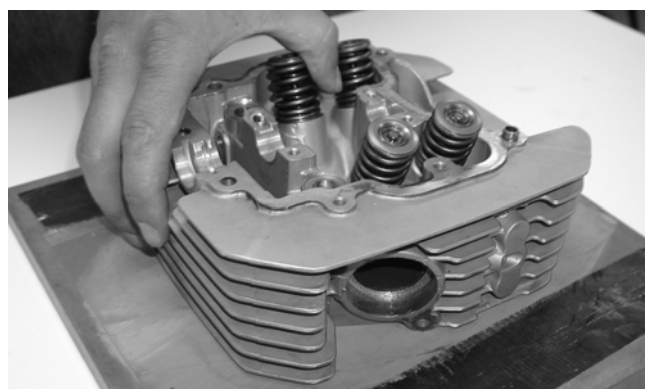
⚠ CAUTION

The cylinder head studs must be removed for this procedure.

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

⚠ CAUTION

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



CC996

Measuring Cylinder Head Distortion

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



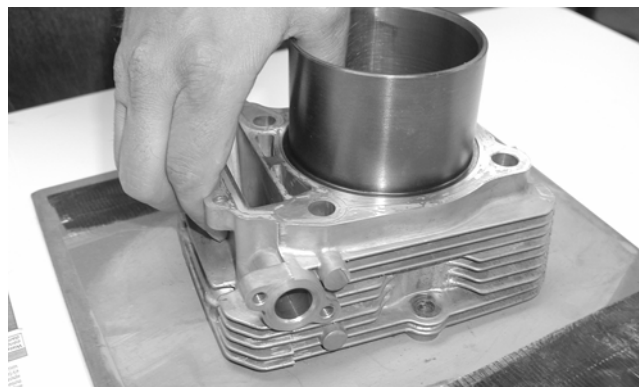
CC141D

Cleaning/Inspecting Cylinder

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

⚠ CAUTION

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



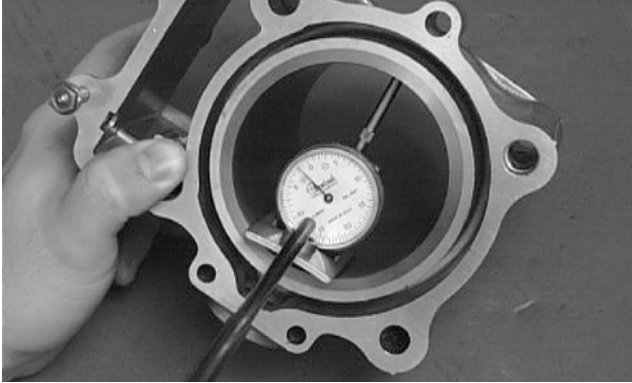
CC997

Inspecting Cam Chain Guide

1. Inspect cam chain guide for cuts, tears, breaks, or chips.
2. If the chain guide is damaged, it must be replaced.

Honing Cylinder

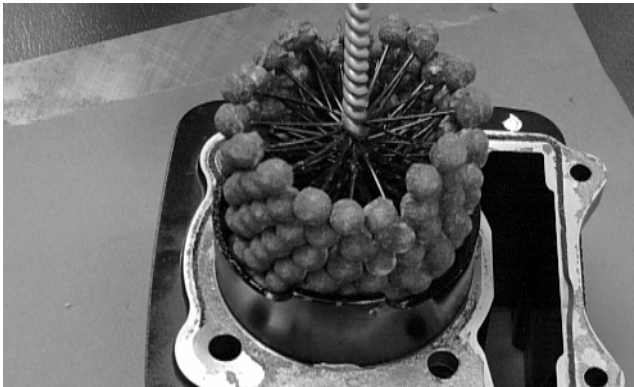
- Using a slide gauge and a dial indicator or a snap gauge, measure the cylinder bore diameter in three locations from top to bottom and again from top to bottom at 90° from the first measurements for a total of six measurements. The trueness (out-of-roundness) is the difference between the highest and lowest reading. Maximum trueness (out-of-roundness) must not exceed specifications.



CC127D

- Wash the cylinder in parts-cleaning solvent.
- Inspect the cylinder for pitting, scoring, scuffing, and corrosion. If marks are found, repair the surface using a ball hone.

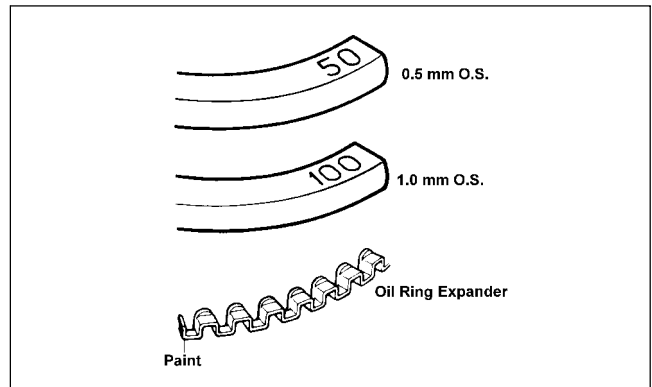
■ **NOTE:** To produce the proper 60° cross-hatch pattern, use a low RPM drill (600 RPM) at the rate of 30 strokes per minute. If honing oil is not available, use a lightweight petroleum-based oil. Thoroughly clean cylinder after honing using soap and hot water. Dry with compressed air; then immediately apply oil to the cylinder bore. If the bore is severely damaged or gouged, replace the cylinder.



CC390D

- If any measurement exceeds the limit, hone the cylinder and install an oversized piston or replace the cylinder.

■ **NOTE:** Oversized piston and rings are available. The oversized piston and rings are marked for identification.

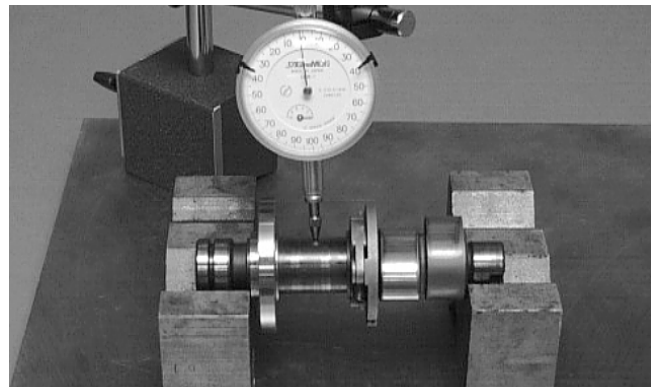


ATV-1068

Measuring Camshaft Runout

■ **NOTE:** If the camshaft is out of tolerance, it must be replaced.

- Place the camshaft on a set of V blocks; then position the dial indicator contact point against the shaft and zero the indicator.

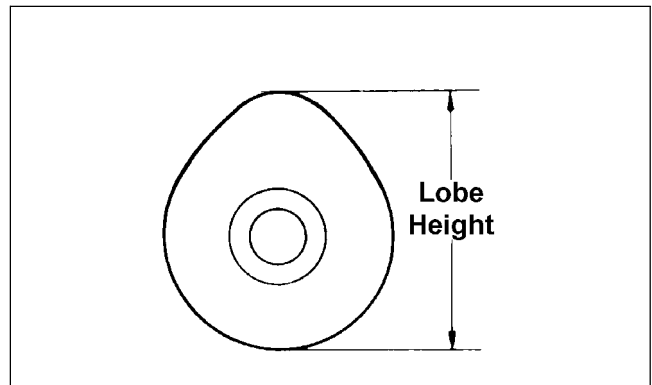


CC283D

- Rotate the camshaft and note runout; maximum tolerance must not exceed specifications.

Measuring Camshaft Lobe Height

- Using a calipers, measure each cam lobe height.



ATV1013A

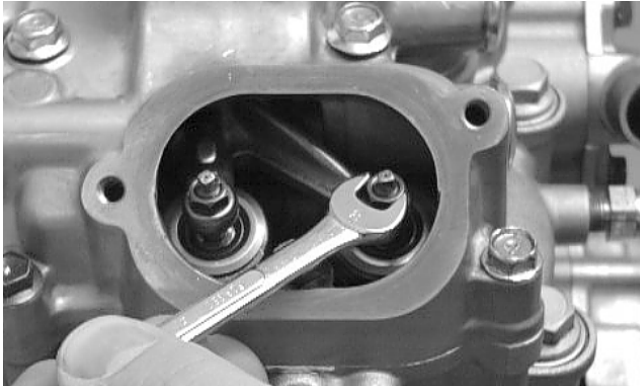
- The lobe heights must not exceed minimum specifications.

Inspecting Camshaft Bearing Journal

1. Inspect the bearing journal for scoring, seizure marks, or pitting.
2. If excessive scoring, seizure marks, or pitting is found, the cylinder head assembly must be replaced.

Measuring Camshaft to Cylinder Head Clearance

1. Remove the adjuster screws and jam nuts.

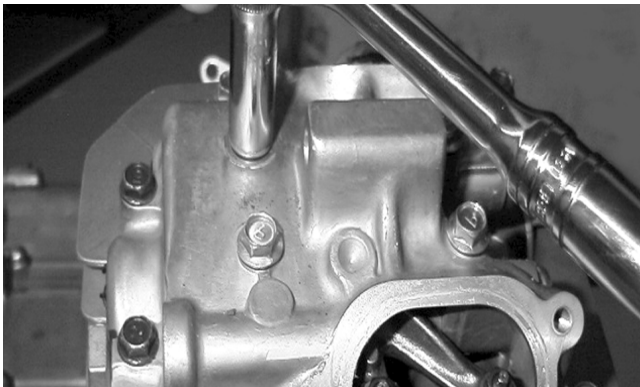


CC005D

2. Place a strip of plasti-gauge in each of the camshaft lands in the cylinder head.
3. Place the valve cover on the cylinder head and secure with the valve cover cap screws. Tighten securely.

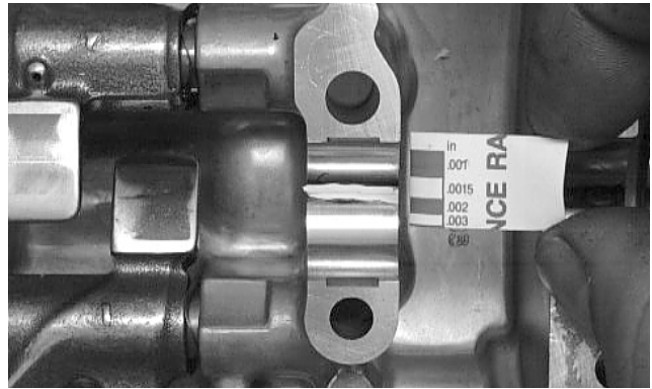
■ **NOTE:** Do not rotate the camshaft when measuring clearance.

4. Remove the cap screws securing the valve cover to the cylinder; then remove the valve cover and camshaft.



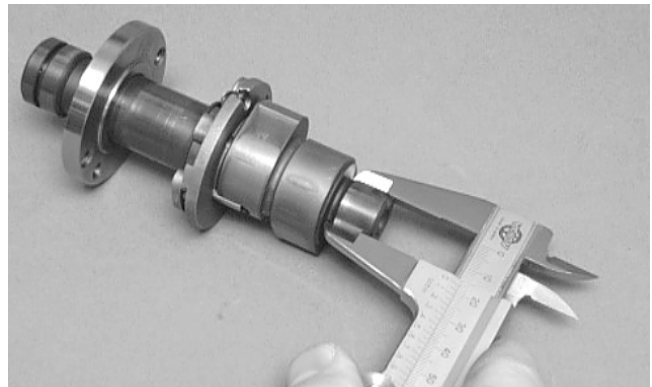
MD1261

5. Match the width of the plasti-gauge with the chart found on the plasti-gauge packaging to determine camshaft to cylinder head and valve cover clearance.



CC145D

6. If clearance is excessive, measure the journals of the camshaft.

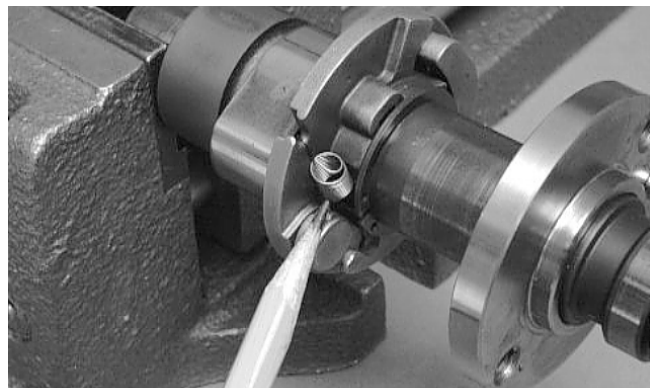


CC287D

■ **NOTE:** If the journals are worn, replace the camshaft; then measure the clearance again. If it is still out of tolerance, replace the cylinder head.

Inspecting Camshaft Spring/Drive Pin

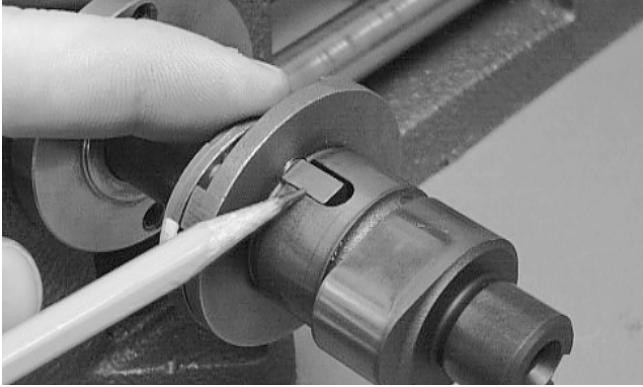
1. Inspect the spring and drive pin for damage.



CC304D



CC306D

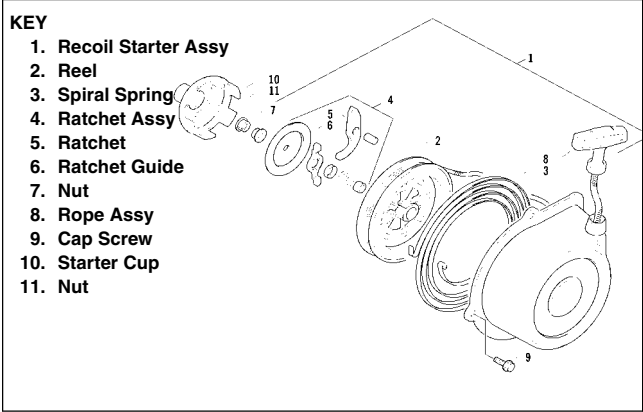


CC308D

2. If damaged, the camshaft must be replaced.

Servicing Left-Side Components

RECOIL STARTER

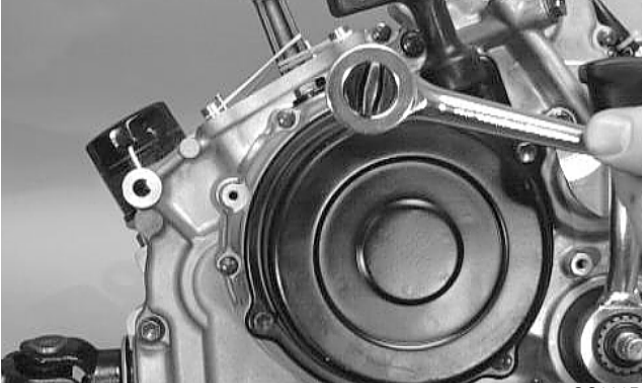


0737-034

⚠ WARNING
Always wear safety glasses when servicing the recoil starter.

Removing/Disassembling

1. Remove the cap screws securing the recoil starter assembly to the left-side cover; then remove the starter.

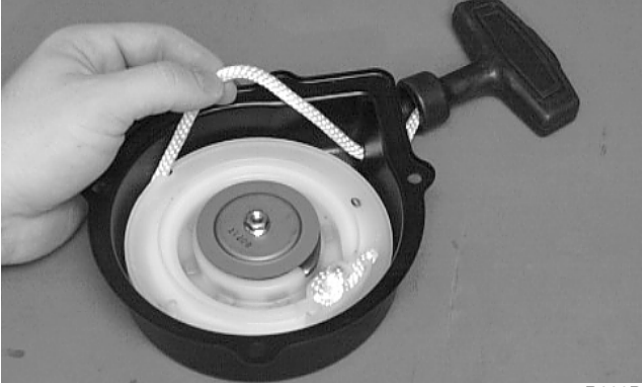


CC039D

⚠ WARNING
During the disassembly procedure, continuous downward pressure must be exerted on the reel so it does not accidentally disengage and cause injury.

3

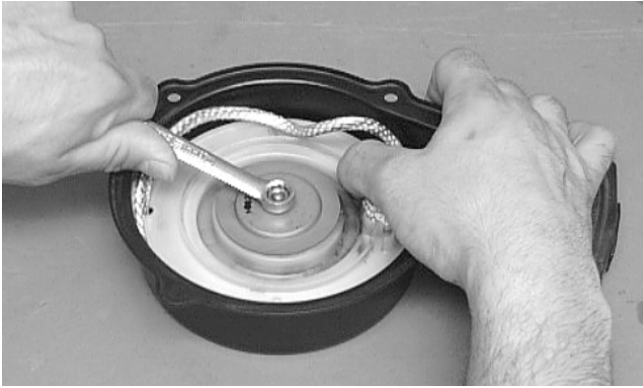
2. Rotate the reel counterclockwise until the notch of the reel is near the rope guide in the case. Guide the rope into the notch and slowly allow the reel to retract until all spiral spring tension is released.



B600D

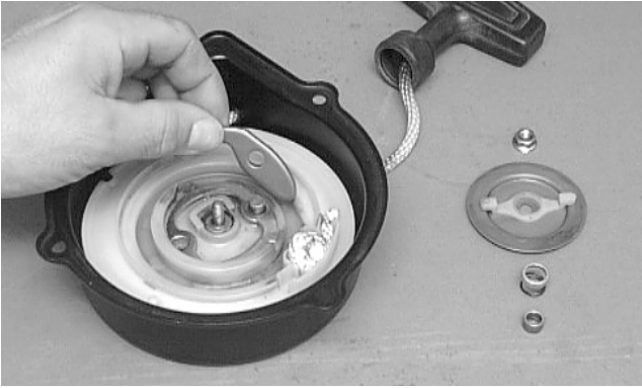
⚠ CAUTION
During the disassembly procedure, make sure all spring tension is released before continuing.

3. Remove the nut.



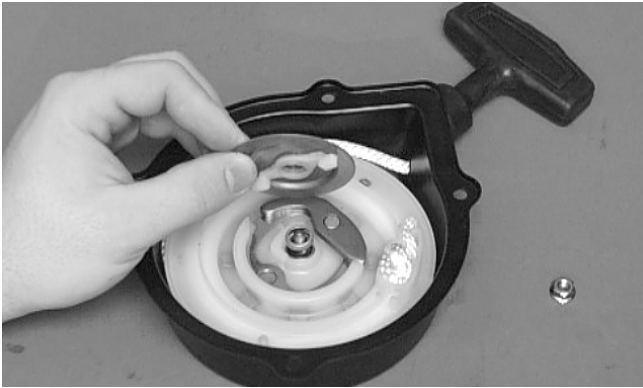
B601D

4. Slowly release the friction plate and lift the plate with ratchet guide free of the recoil case; then remove the ratchet guide from the friction plate.



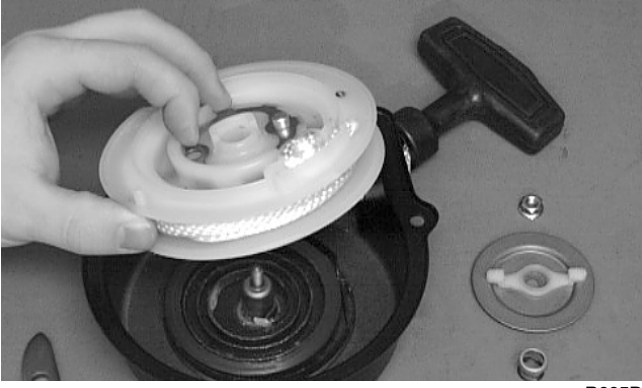
B604D

7. Carefully lift the reel free of the case making sure the spiral spring does not accidentally disengage from the case.



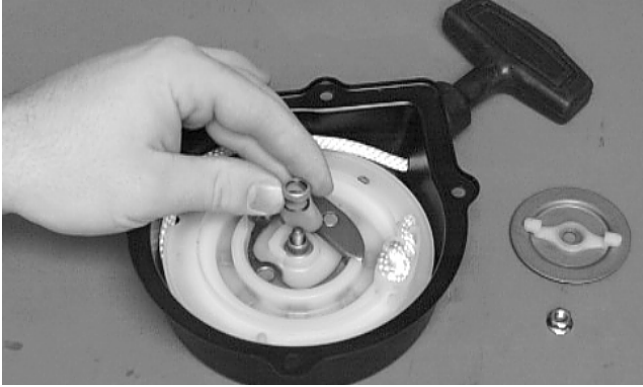
B602D

5. Remove the spring cover, spring, and shaft.



B605D

6. Remove the ratchet and account for the pin.



B603D

⚠ WARNING
Care must be taken when lifting the reel free of the case. Wear safety glasses to avoid injury.

8. Remove the protective cover from the starter handle and pull the rope out of the handle; then untie the knot in the rope and remove the handle.

■ **NOTE: Do not remove the spiral spring unless replacement is necessary. It should be visually inspected in place to save time. If replacement is necessary, follow steps 9-10.**

9. Remove the spiral spring from the case by lifting the spring end up and out. Hold the remainder of the spring with thumbs and alternately release each thumb to allow the spring to gradually release from the case.

10. Unwind the rope from the reel and remove the rope.

Cleaning and Inspecting

■ **NOTE: Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.**

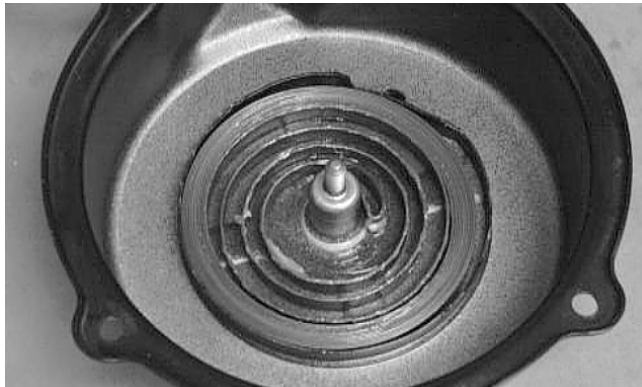
1. Clean all components.

2. Inspect the springs and ratchet for wear or damage.
3. Inspect the reel and case for cracks or damage.
4. Inspect the shaft for wear, cracks, or damage.
5. Inspect the rope for breaks or fraying.
6. Inspect the spiral spring for cracks, crystallization, or abnormal bends.
7. Inspect the handle for damage, cracks, or deterioration.

Assembling/Installing

1. If removed, insert the spiral spring into the case with the outer end of the spring around the mounting lug in the case; then wind it in a counterclockwise direction until the complete spring is installed.

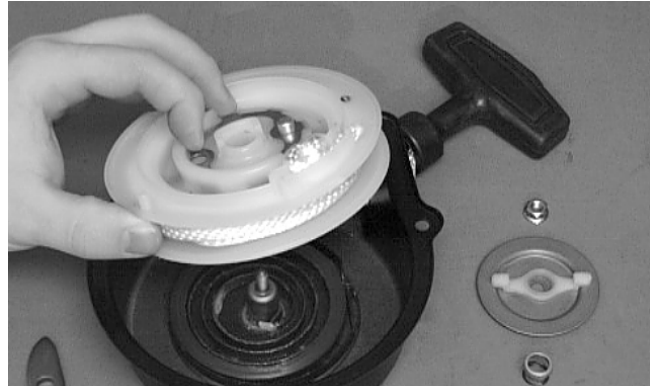
■ **NOTE:** The spiral spring must seat evenly in the recoil case.



B606D

2. Insert the rope through the hole in the reel and tie a knot in the end; then wrap the rope counterclockwise around the reel leaving approximately 50 cm (20 in.) of rope free of the reel.
3. Apply low-temperature grease to the spring and hub.
4. Thread the end of the rope through the guide hole of the case; then thread the rope through the handle and secure it with a double knot. Install the protective cover into the handle.

5. Align the inner hook of the spiral spring with the notch in the reel.



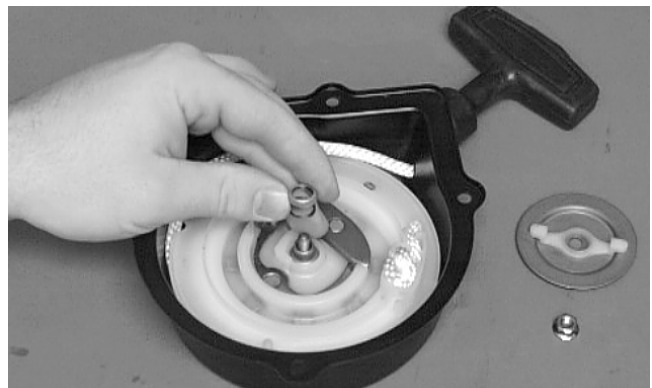
B605D

6. Install the ratchet onto its pin making sure the end is properly installed on the reel.



B604D

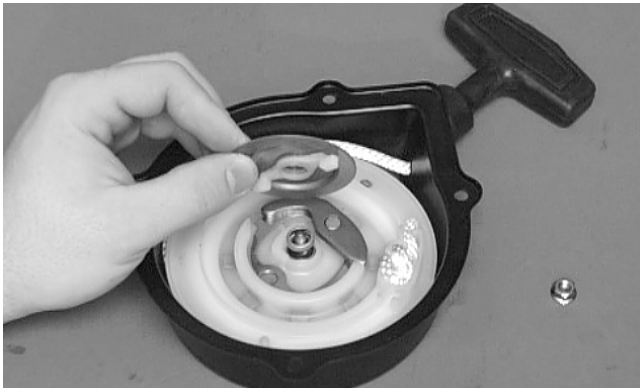
7. Install the shaft, spring, and the spring cover.



B603D

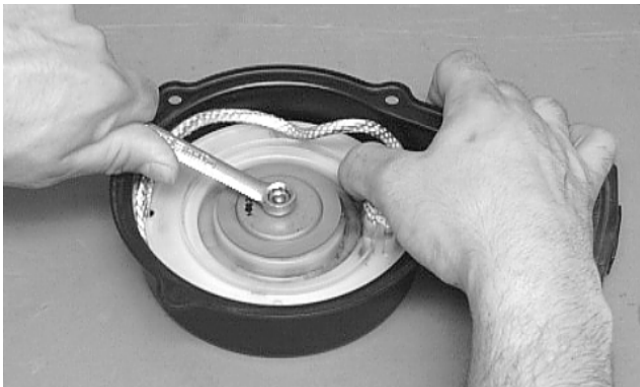
8. Install the friction plate with the ratchet guide fitting into the ratchet.

3



B602D

9. While pushing down on the reel, install the nut. Tighten securely.



B601D

10. With the 50 cm (20 in.) of rope exposed, hook the rope in the notch of the reel.
11. Rotate the reel four turns counterclockwise; then release the rope from the notch and allow the rope to retract.
12. Pull the rope out two or three times to check for correct tension.

■ **NOTE:** Increasing the rotations in step 11 will increase spring tension.

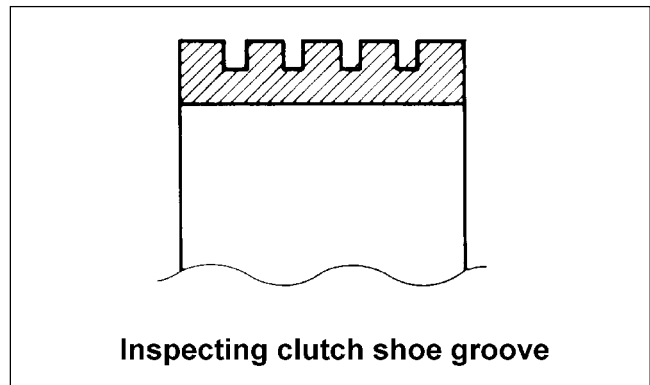
13. Place the recoil starter assembly into position on the left-side cover; then tighten the cap screws to specifications.

Servicing Right-Side Components

■ **NOTE:** Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.

INSPECTING STARTER CLUTCH SHOE

1. Inspect the starter clutch shoe for uneven wear, chips, cracks, or burns.
2. Inspect the groove on the shoe for wear or damage.
3. If any damage to the shoe or any groove wear is noted, the shoe must be replaced.



ATV1014

INSPECTING STARTER CLUTCH HOUSING

1. Inspect the starter clutch housing for burns, marks, scuffs, cracks, scratches, or uneven wear.
2. If the housing is damaged in any way, the housing must be replaced.

INSPECTING PRIMARY ONE-WAY DRIVE

1. Insert the drive into the clutch housing.
2. Rotate the inner race by hand and verify the inner race rotates only one direction.
3. If the inner race is locked in place or rotates both directions, the drive assembly must be replaced.

INSPECTING OIL PUMP

1. Inspect the pump for damage.
2. It is inadvisable to remove the screw securing the pump halves. If the oil pump is damaged, it must be replaced.



CC46D

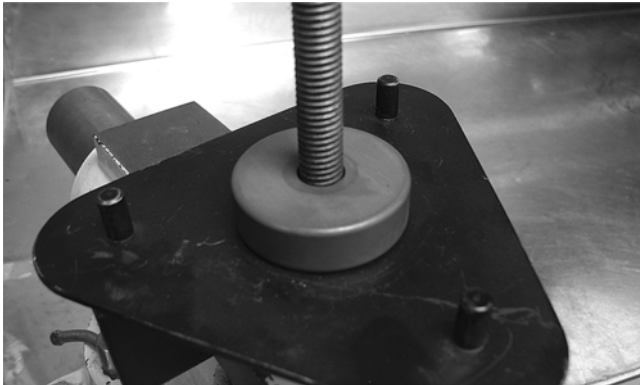
DRIVEN PULLEY ASSEMBLY

Disassembling

WARNING

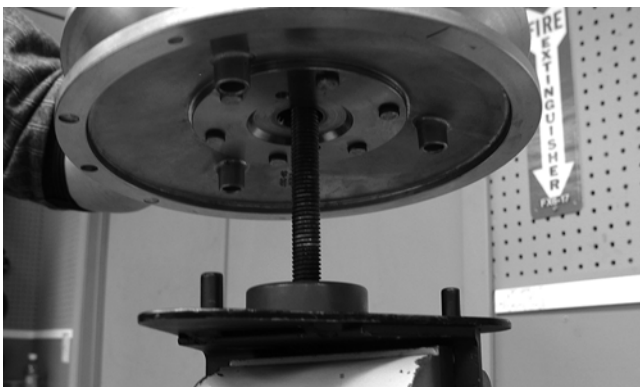
This procedure involves relaxing a compressed spring assembly. **DO NOT** attempt disassembling without the proper tools.

1. Secure Driven Pulley Compressor (p/n 0444-140) in a suitable holding fixture such as a bench vise; then remove the wing nut, holding handle, flat washer, and pilot bushing leaving the large spacer on the compressor tool base.



CD047

2. Place the driven pulley assembly onto the compressor tool base engaging the dowel pins into appropriate holes in the fixed face of the assembly.



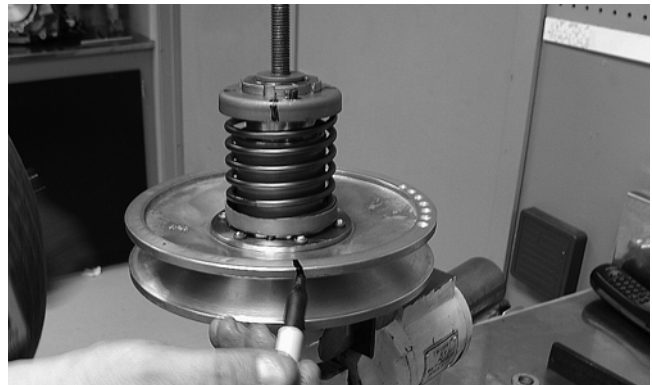
CD048

3. Install the pilot bushing with the machined end directed down; then fit the bushing into the pulley hub.



CD067

4. Using a suitable marking pen, make alignment marks on the fixed face spring holder and both pulley faces.



CD049

5. Place the holding handle on the spring holder fitting the two dowel pins into the spring holder face; then install a flat washer and the wing nut. Turn the wing nut down until resistance is felt.

■ **NOTE:** Do not use the wing nut to compress the spring further.



CD050

3

⚠ WARNING

The spring assembly is under pressure. Extreme care must be taken when relaxing the spring. Always wear safety glasses. Use proper tools only.

- Using a spanner and suitable breaker bar, loosen the notched-ring nut; then spin the nut free of the hub.



CD051

- Firmly hold the handle and slowly turn the wing nut counterclockwise to relax the spring.

■ **NOTE:** There will be a tendency for the handle to rotate clockwise approximately $\frac{1}{4}$ turn as the spring holder clears the flats or hub. This is due to a slight counterclockwise preload on the spring.



CD052

- Release the preload slowly; then continue to relax the spring until the wing nut is flush with the end of the threads.

- Firmly holding the spring and spring holder, remove the wing nut; then remove the spring.



CD053

- Using a thin pry-bar or screwdriver, work the movable face sleeve upward and free of the O-rings; then remove the sleeve.

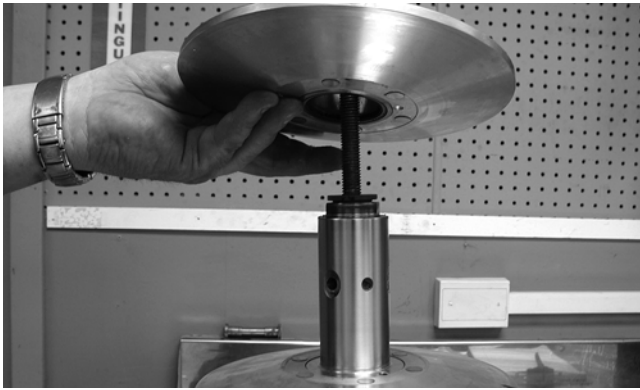


CD054

- Remove the three pins and spacers from the cam slots in the movable face; then remove the movable face.



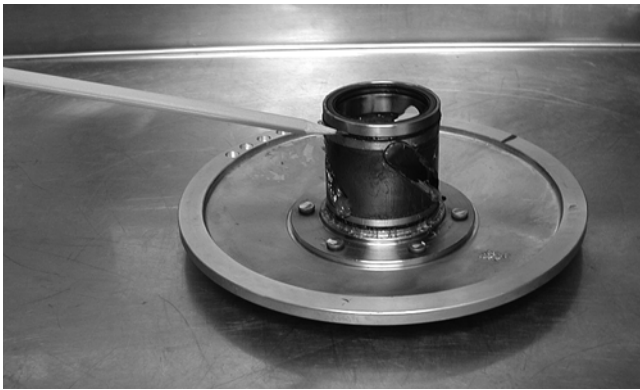
CD055



CD056

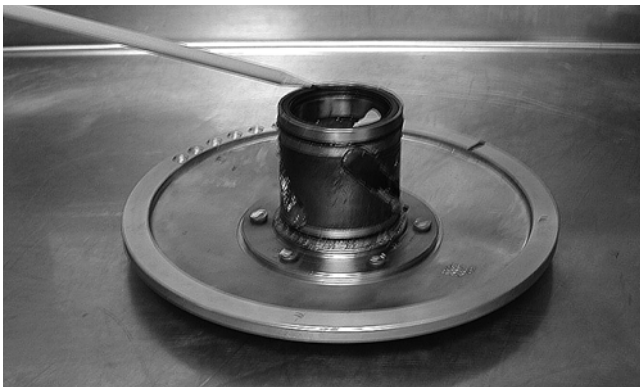
Inspecting

1. Inspect the pulley faces for wear, galling, or grooving.
2. Inspect the O-rings on the movable face for nicks, tears, or swelling.



CD057

3. Inspect two grease seals in the movable face for nicks, cuts, or damage.



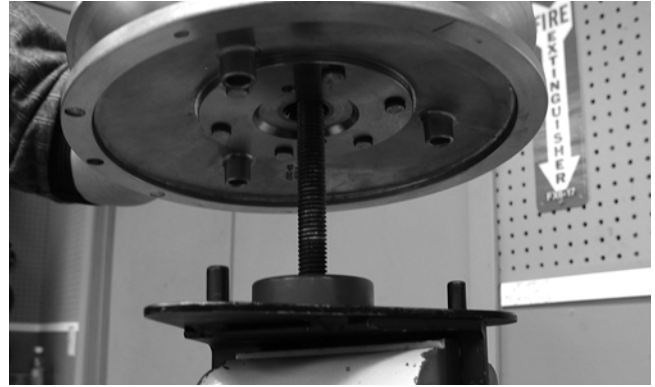
CD058

4. Inspect the pins and bushings for wear, flat spots, looseness, or cracking.

Assembling

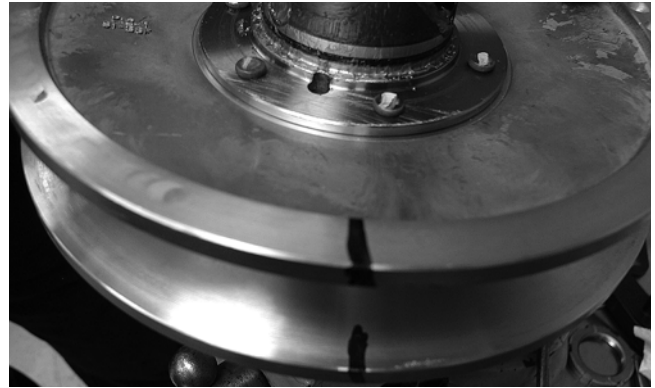
1. Place the fixed face of the driven pulley on the pulley compressor base making sure the dowel pins are engaged in the appropriate holes in the pulley face.

■ **NOTE:** Make sure the spacer is on the base or damage to the fixed face will occur when the spring is compressed.



CD048

2. Apply multi-purpose grease to the O-rings and grease seals on the movable face; then install on the fixed face making sure the alignment marks are properly aligned.



CD060

3. Install the three pins and spacers into the fixed face hub; then pack the cam slots in the movable face with multi-purpose grease.



CD061

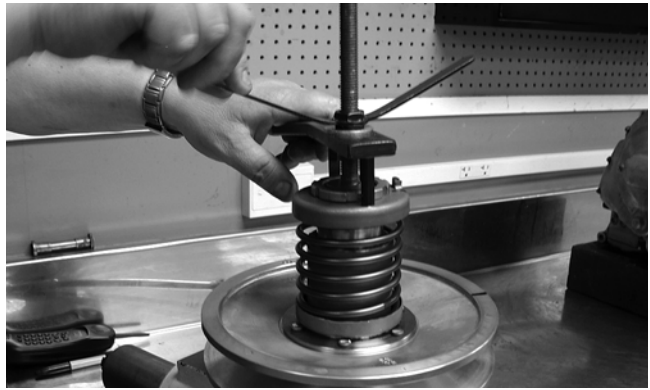
4. Install the movable face sleeve aligning the hole in the spring seat with the spring anchor hole in the movable face.

3



CD062

5. Install the spring over the hub and movable face sleeve; then insert the end of the spring through the sleeve and into the spring anchor hole in the movable face.



CD052

8. Compress the spring until the spring holder nears the threads on the fixed face hub; then using the handle, wind the spring holder counterclockwise to align the flats of the spring holder and hub.



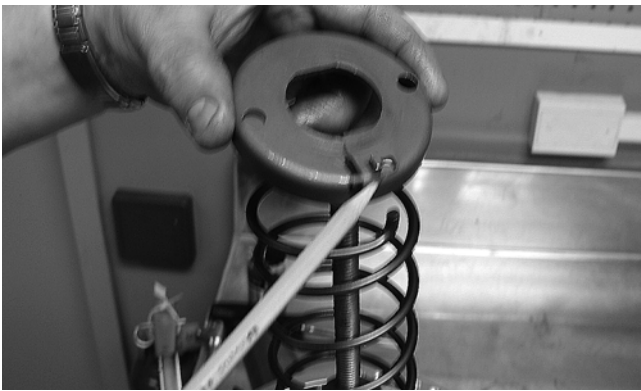
CD063

6. Place the spring holder on the spring engaging the spring end with the appropriate anchor hole.



CD065

9. Continue compressing the spring while guiding the spring holder onto the hub. When a slight resistance is felt, stop turning the wing nut.



CD064

7. Assemble the notched-ring nut, spring holding handle, one flat washer, and the wing nut in order on the pulley compressor bolt; then thread the wing nut onto the bolt.



CD066

11. Remove the wing nut, washer, and holding handle; then remove the driven pulley from the pulley compressor.

Servicing Center Crankcase Components

■ **NOTE:** Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.

SECONDARY GEARS

■ **NOTE:** When checking and correcting secondary gear backlash and tooth contact, the universal joint must be secured to the front shaft or false measurements will occur.

Checking Backlash

■ **NOTE:** The rear shaft and bevel gear must be removed for this procedure. Also, always start with the original shims on the rear shaft.

1. Place the left-side crankcase cover onto the left-side crankcase half to prevent runout of the secondary transmission output shaft.
2. Install the secondary driven output shaft assembly onto the crankcase.
3. Mount the indicator tip of the dial indicator on the secondary driven bevel gear.
4. While rocking the driven bevel gear back and forth, note the maximum backlash reading on the gauge.
5. Acceptable backlash range is 0.05-0.33 mm (0.002-0.013 in.).

Correcting Backlash

■ **NOTE:** If backlash measurement is within the acceptable range, no correction is necessary.

1. If backlash measurement is less than specified, remove an existing shim, measure it, and install a new thinner shim.
2. If backlash measurement is more than specified, remove an existing shim, measure it, and install a thicker shim.

■ **NOTE:** Continue to remove, measure, and install until backlash measurement is within tolerance. Note the following chart.

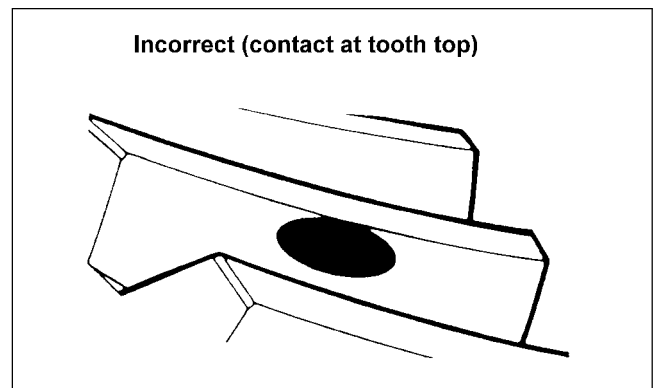
Backlash Measurement	Shim Correction
Under 0.05 mm (0.002 in.)	Decrease Shim Thickness
At 0.05-0.33 mm (0.002-0.013 in.)	No Correction Required
Over 0.33 mm (0.013 in.)	Increase Shim Thickness

Checking Tooth Contact

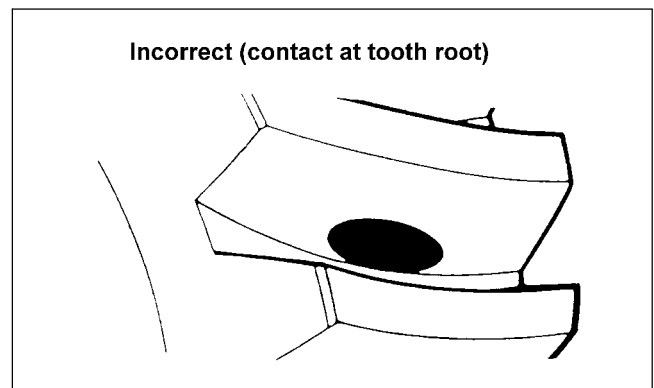
■ **NOTE:** After correcting backlash of the secondary driven bevel gear, it is necessary to check tooth contact.

1. Remove the secondary driven output shaft assembly from the left-side crankcase half.
2. Clean the secondary driven bevel gear teeth of old oil and grease residue.
3. Apply a thin, even coat of a machinist-layout dye to several teeth of the gear.
4. Install the secondary driven output shaft assembly.
5. Rotate the secondary driven bevel gear several revolutions in both directions.
6. Examine the tooth contact pattern in the dye and compare the pattern to the illustrations.

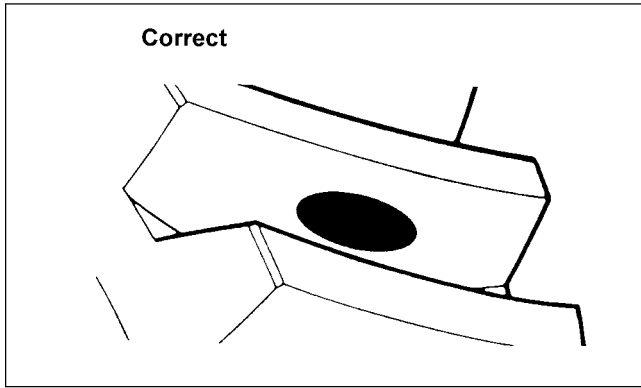
3



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.

1. If tooth contact pattern is comparable to an incorrect pattern, correct tooth contact according to the following chart.

Tooth Contact	Shim Correction
Contacts at Top	Decrease Shim Thickness
Contacts at Root	Increase Shim Thickness

■ **NOTE:** To correct tooth contact, steps 1 and 2 (with NOTE) of “Correcting Backlash” must be followed and the above “Tooth Contact/Shim Correction” chart must be consulted.

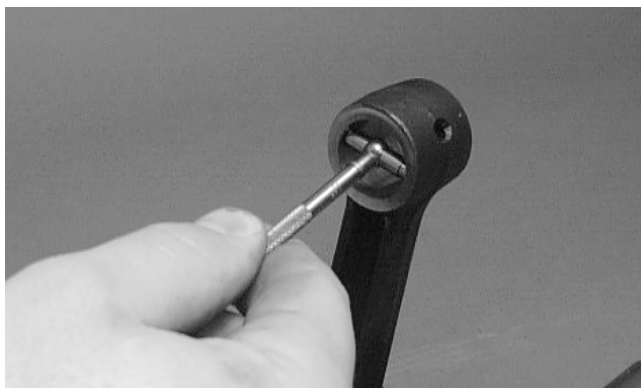
CAUTION

After correcting tooth contact, backlash must again be checked and corrected (if necessary). Continue the correcting backlash/correcting tooth contact procedures until they are both within tolerance values.

CRANKSHAFT ASSEMBLY

Measuring Connecting Rod (Small End Inside Diameter)

1. Insert a snap gauge into the upper connecting rod small end bore; then remove the gauge and measure it with micrometer.



CC290D

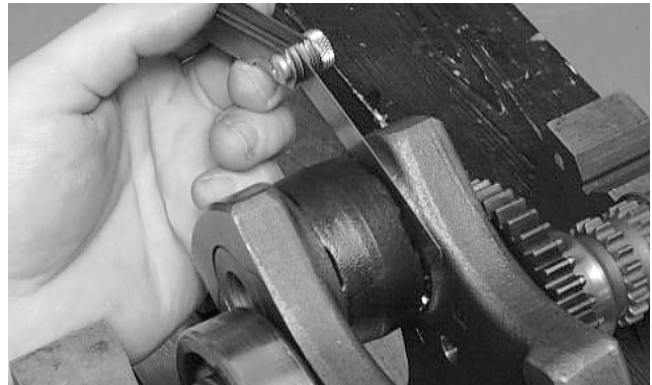
2. Maximum diameter must not exceed specifications.

Measuring Connecting Rod (Small End Deflection)

1. Place the crankshaft on a set of V-blocks and mount a dial indicator and base on the surface plate. Position the indicator contact point against the center of the connecting rod small end journal.
2. Zero the indicator and push the small end of the connecting rod away from the dial indicator.
3. Maximum deflection must not exceed specifications.

Measuring Connecting Rod (Big End Side-to-Side)

1. Push the lower end of the connecting rod to one side of the crankshaft journal.
2. Using a feeler gauge, measure the gap between the connecting rod and crankshaft journal.



CC289D

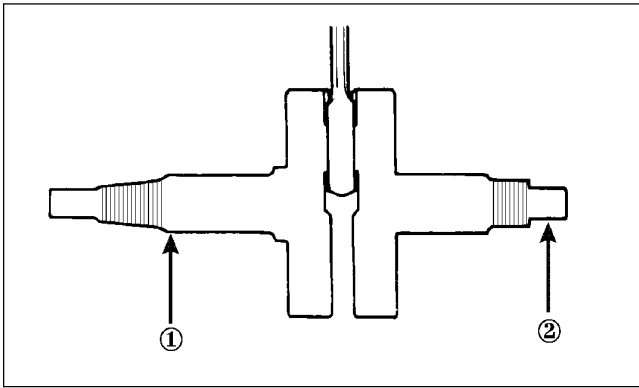
3. Acceptable gap range must be within specifications.

Measuring Connecting Rod (Big End Width)

1. Using a calipers, measure the width of the connecting rod at the big-end bearing.
2. Acceptable width range must be within specifications.

Measuring Crankshaft (Runout)

1. Place the crankshaft on a set of V blocks.
2. Mount a dial indicator and base on the surface plate. Position the indicator contact at point 1 of the crankshaft.



ATV-1074

3. Zero the indicator and rotate the crankshaft slowly.

CAUTION

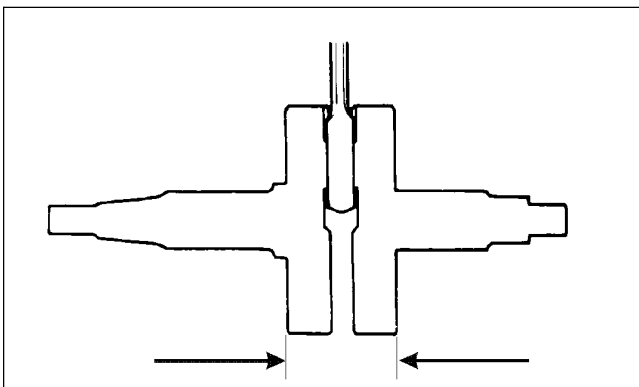
Care should be taken to support the connecting rod when rotating the crankshaft.

4. Maximum runout must not exceed specifications.

■ **NOTE:** Proceed to check runout on the other end of the crankshaft by positioning the indicator contact at point 2 and following steps 2-4.

Measuring Crankshaft (Web-to-Web)

1. Using a calipers, measure the distance from the outside edge of one web to the outside edge of the other web.



ATV-1017

2. Acceptable width range must be within specifications.

COUNTERSHAFT

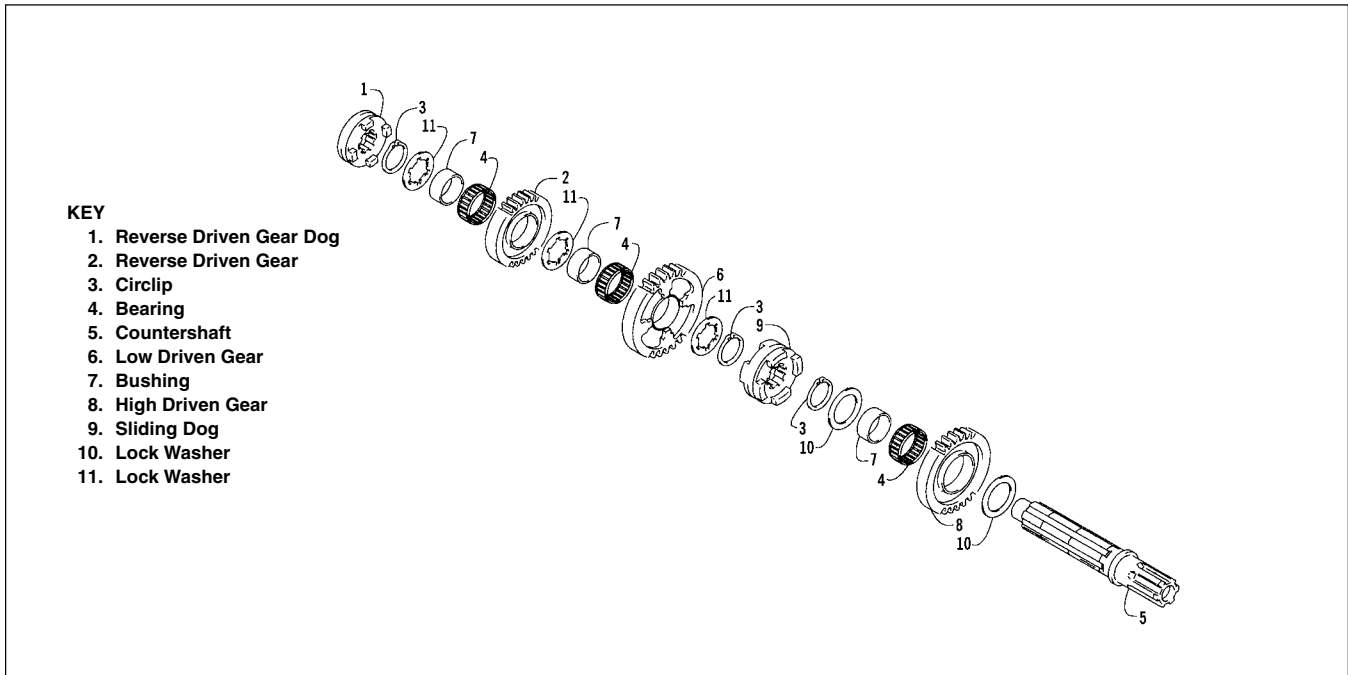
CAUTION

When disassembling the countershaft, care must be taken to note the direction each major component (dog, gear) faces. If a major component is installed facing the wrong direction, transmission damage may occur and/or the transmission will malfunction. In either case, complete disassembly and assembly will be required.

Disassembling

1. Remove the reverse driven gear dog; then remove the circlip securing the reverse driven gear.
2. Remove the reverse driven gear and account for the washer, bushing, and bearing.
3. Remove the low driven gear washer; then remove the low driven gear. Account for the bushing and bearing.
4. Remove the washer; then remove the circlip securing the sliding dog. Remove the sliding dog.
5. Remove the high driven gear circlip; then remove the high driven gear. Account for the washer, bushing, and bearing.

3

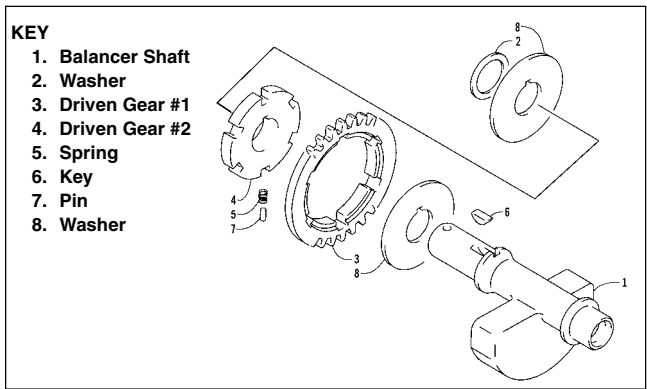


737-053A

1. Place the high driven gear onto the countershaft making sure the bearing, bushing, and washer are properly positioned. Secure with the circlip.
2. Place the sliding dog onto the countershaft; then secure with the circlip. Place the washer next to the circlip.
3. Place the low driven gear onto the countershaft making sure the bearing and bushing are properly positioned; then place the washer onto the shaft.
4. Place the reverse driven gear onto the countershaft making sure the bearing, bushing, and washer are properly positioned; then secure with the circlip.
5. Place the reverse driven gear dog onto the countershaft; then secure with the circlip.

NOTE: The countershaft is now completely assembled for installation.

CRANK BALANCER DRIVEN GEAR



737-050A

Disassembling

1. Remove the small and large washers from the balancer shaft.
2. Note the position of the alignment marks for assembling purposes; then remove driven gear #1 with driven gear #2. Account for pins and springs.
3. Remove driven gear #2 from gear #1; then account for a large washer and a key.

Inspecting

1. Inspect the gear, pins, and keyway for wear.
2. Inspect the springs for damage or fatigue.

Assembling

1. Place driven gear #2 into driven gear #1; then align the alignment marks of driven gear #1 and driven gear #2.
2. Using a pair of needle-nose pliers, insert each spring part way into the slot; then install a pin and push the spring/pin assembly into the slot.
3. Place the key and the large washer into position on the balancer shaft.
4. Place the driven gear #1 assembly onto the balancer shaft; then place the large and small washers onto the shaft.

NOTE: The crank balancer/driven gear assembly is now completely assembled for installation.

Assembling Crankcase Half

■ **NOTE:** For ease of assembly, install components on the right-side crankcase half.

■ **NOTE:** If the output shaft was removed, make sure that the proper shim is installed.

1. Install the output shaft into the crankcase making sure the two gears, shim, washer, and nut are in the correct order.



MD1199



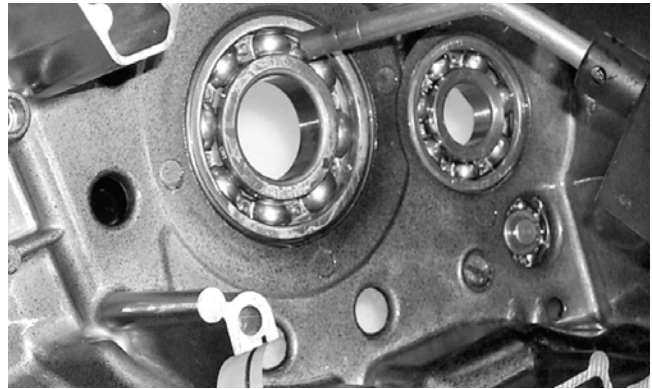
MD1079

2. Apply red Loctite #271 to the threads of the output shaft. Install and tighten the nut specifications. Using a punch, peen the nut.



MD1333

3. Apply a liberal amount of oil to the crankshaft bearing. Using a propane torch, heat the bearing until the oil begins to smoke; then slide the crankshaft assembly into place.



MD1334

■ **NOTE:** If heating the bearing is not possible, the crankshaft can be installed using a crankshaft installer.

4. Rotate the crankshaft so the counterweight is toward the rear of the engine. Install the counterbalance shaft.



MD1024

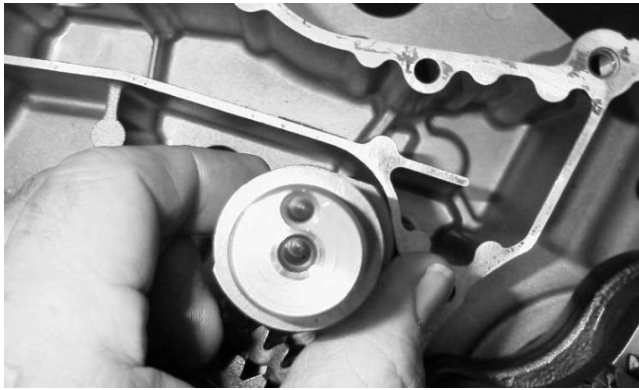
5. Keeping the counterbalance gear timing mark aligned with the the one on the crankshaft gear, install the large thrust washer, key, counterbalance gear, and second large thrust washer.



MD1102

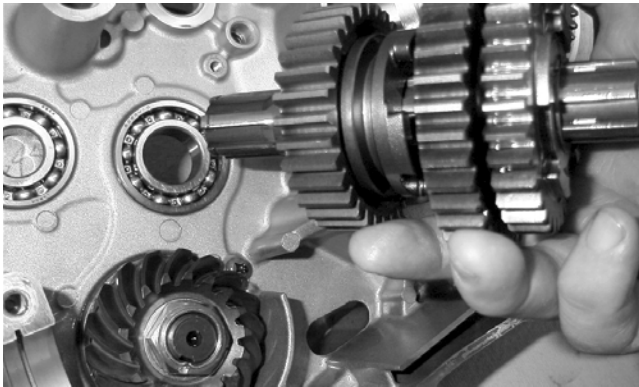
6. Keeping the two holes facing up, install the shift cam and inner and outer washers.

3

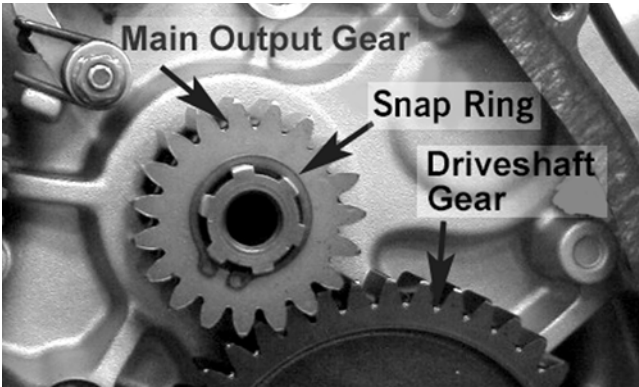


MD1329

7. Align the inner shift fork with the gear cluster and with the inner washer in place, install the gear cluster and inner shift fork. While holding the gear cluster in place, install the washer, gear, and snap ring.

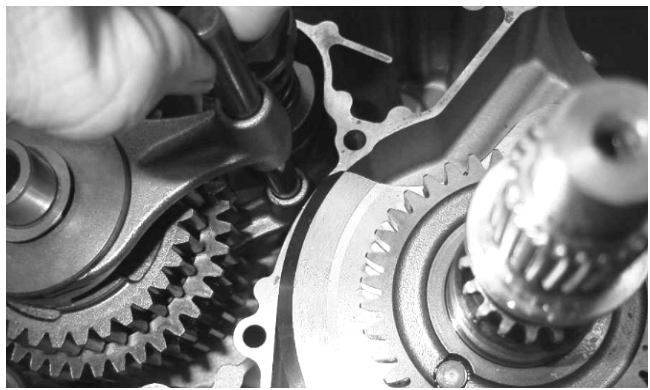


MD1032



MD1198

8. Install the outer shift fork and the shift fork shaft.

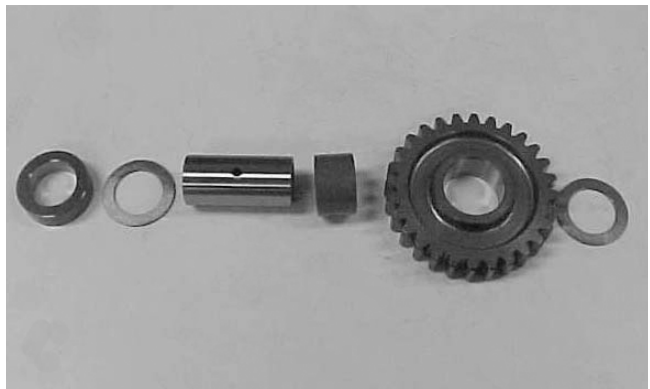


MD1327

9. Install the input driveshaft.



MD1326



CC870

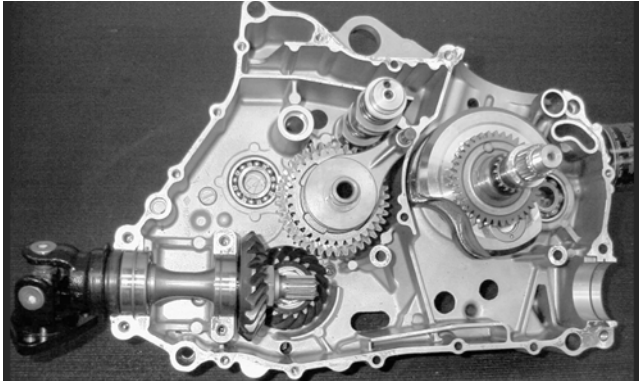
10. Install the washer, spacer, sleeve, reverse idler gear, and washer.



MD1357

11. Install the secondary and primary driveshaft assemblies. Account for the bearing alignment C-ring on the bearing boss next to the pinion gear.

■ **NOTE:** Align the bearing alignment pin on the secondary output shaft.



MD1316

■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs while tightening the cap screws.



MD1008

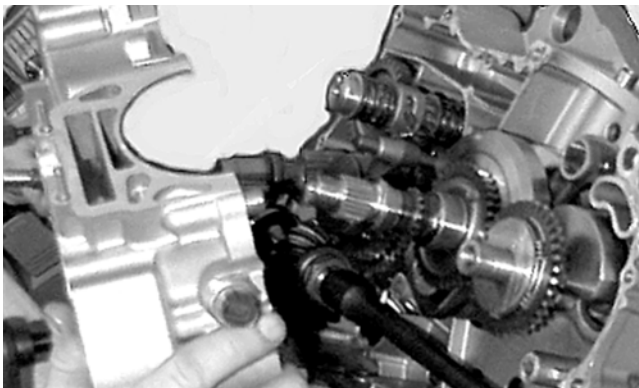
4. From the left side, install the remaining crankcase cap screws; then tighten only until snug.

■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs while tightening the cap screws.

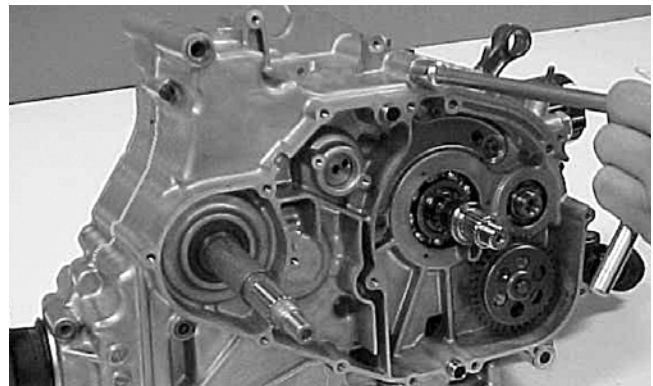
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Joining Crankcase Halves

1. Verify that the two alignment pins are in place and that both case halves are clean and grease free. Apply Three Bond Sealant (p/n 0636-070) to the mating surfaces. Place the right-side half onto the left-side half.



MD1336



CC871

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.

5. In a crisscross/case-to-case pattern, tighten the 8 mm cap screws until the halves are correctly joined; then tighten to specifications.

■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

6. In a crisscross/case-to-case pattern, tighten the 6 mm cap screws to specifications.

■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

AT THIS POINT

After completing center crankcase components, proceed to installing Right-Side Components, to installing Left-Side Components, and to installing Top-Side Components.

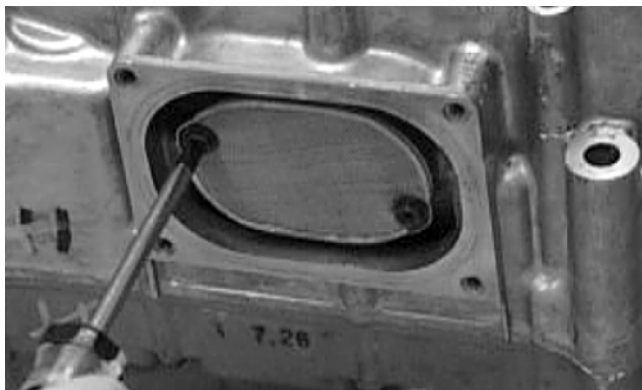
Installing Right-Side Components

A. Oil Strainer/Oil Pump

1. Place the oil strainer and new O-ring into position beneath the crankcase. Tighten the Phillips-head screws (coated with red Loctite #271) securely.

⚠ CAUTION

The legs of the strainer must be directed out.



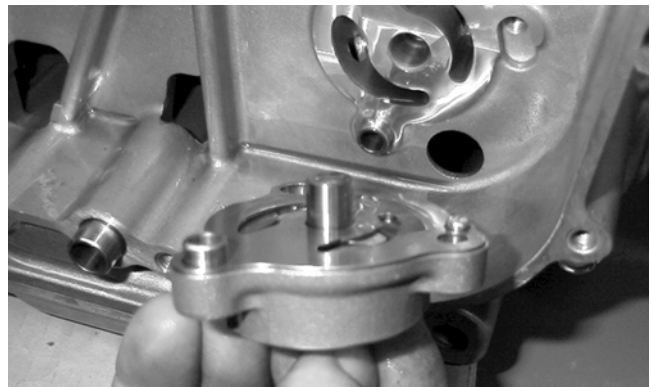
MD1337

2. Noting the directional arrow from removing, place the strainer cover into position on the crankcase making sure the O-ring is properly installed and secure with the four cap screws; then tighten the oil drain plug to specifications.



MD1208

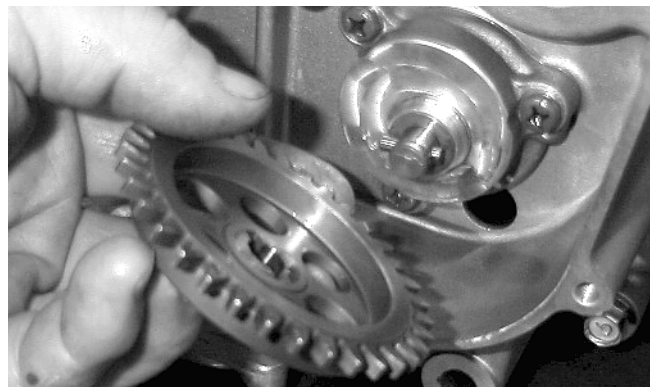
3. Place two alignment pins and the oil pump into position on the crankcase and secure with the Phillips-head screws coated with blue Loctite #243. Tighten to specifications.



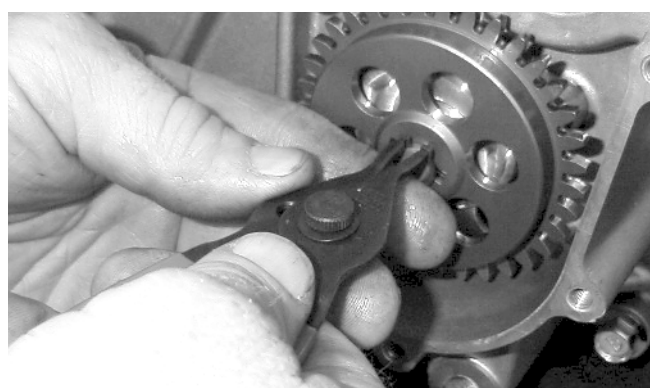
MD1060

4. Place the pin into position on the oil pump shaft, install the oil pump driven gear making sure the recessed side of the gear is directed inward, and secure with a new snap ring.

■ **NOTE:** Always use a new snap ring when installing the oil pump driven gear.



MD1020

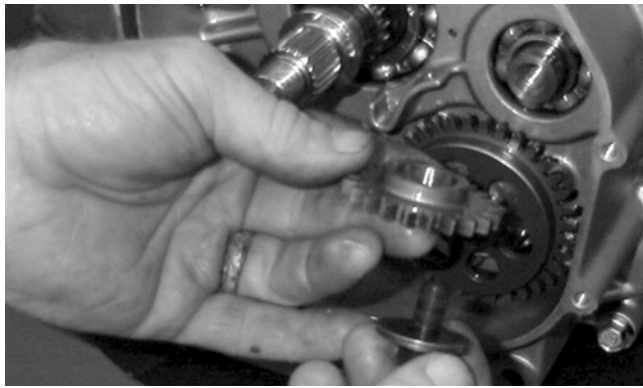


MD1019

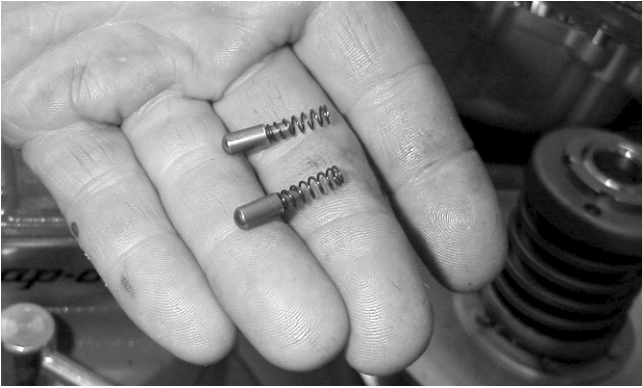
5. Install the cam chain.

■ **NOTE:** Keep tension on the cam chain to avoid damaging the crankcase boss.

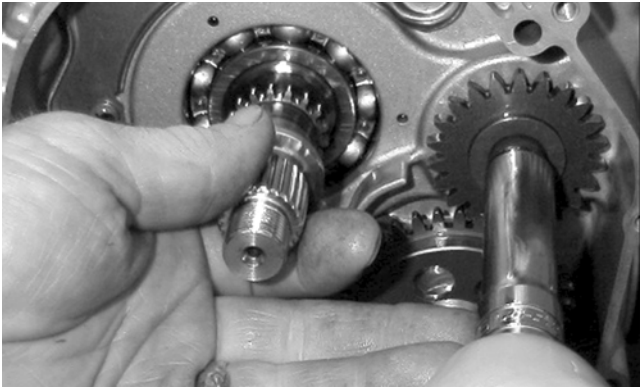
6. Place the pin into position, install the oil pump drive gear, and tighten the cap screw (coated with red Loctite #271) securely.



MD1017



MD1043



MD1018

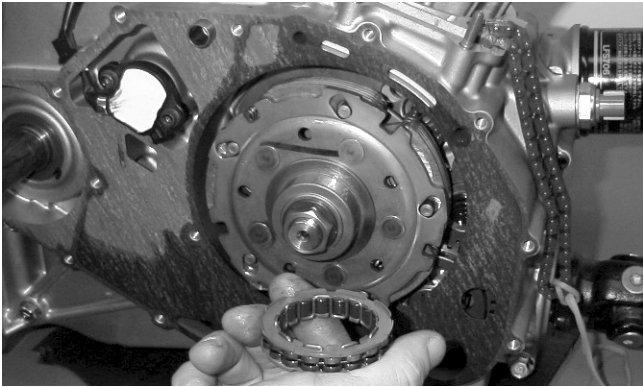
7. Install the clutch shoe assembly on the crankshaft; then install the flange nut (left-hand thread). Tighten to specifications.

■ **NOTE:** The flat side of the flange nut should be directed towards the clutch shoe.

⚠ CAUTION

Care must be taken when installing the flange nut; it has "left-hand" threads.

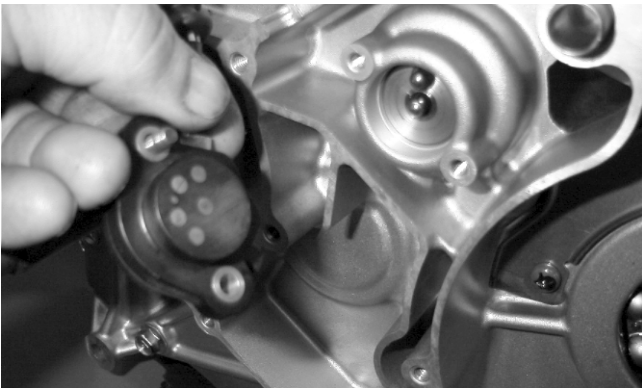
8. Install the one-way sprag clutch making sure that the green dot or the stamp tag **OUTSIDE** is directed away from the crankcase.



MD1286

9. Install gear position indicator switch contact pins and springs into the end of the shift shaft.

10. Install gear position indicator switch making sure the O-ring is well-oiled and properly positioned. Tighten cap screws securely.

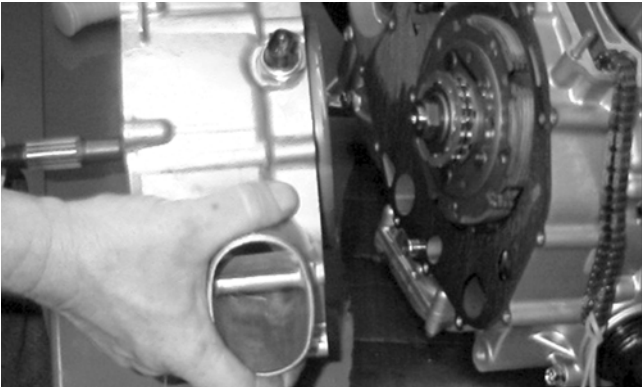


MD1040

B. Clutch Cover
C. Fixed Drive Face
D. Movable Drive Face

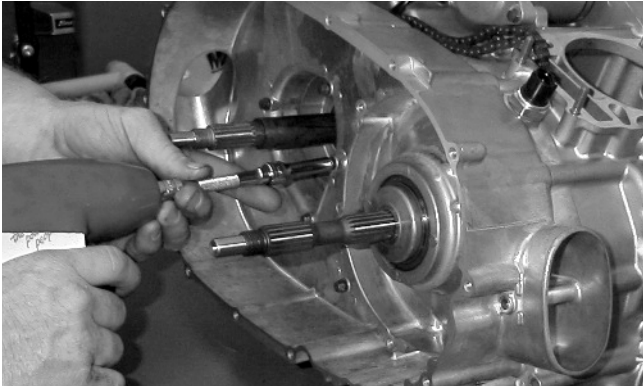
■ **NOTE:** Steps 1-10 in the preceding sub-section must precede this procedure.

11. Install two alignment pins and place the clutch cover gasket into position. Install the clutch cover.



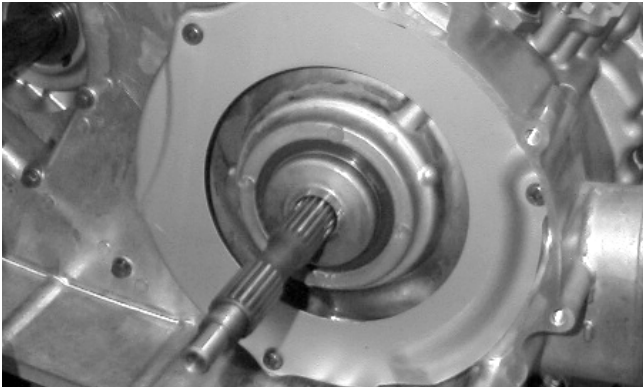
MD1115

12. Tighten the clutch cover cap screws to specifications.



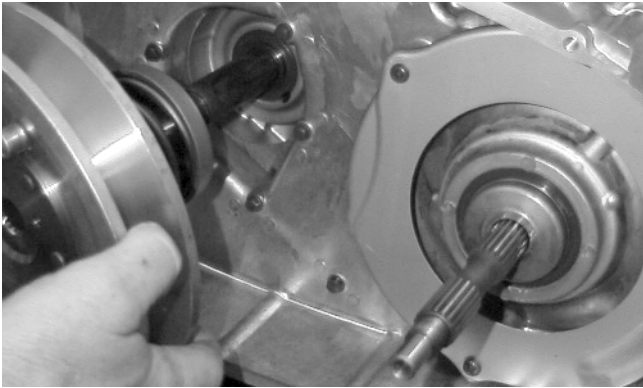
MD1117

13. Install the air intake plate. Apply red Loctite #271 to the threads of the three Phillips-head cap screws; then install and tighten securely.

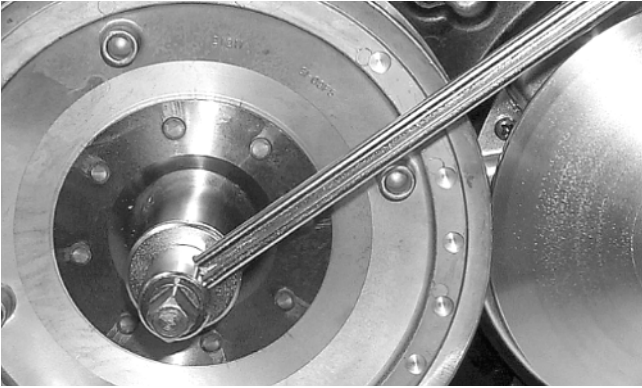


MD1342

14. Place the driven pulley assembly into position and secure with the nut (threads coated with red Loctite #271). Tighten to specifications.



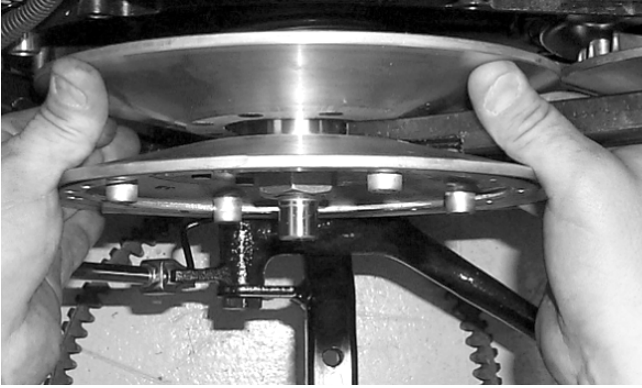
MD1068



MD1339

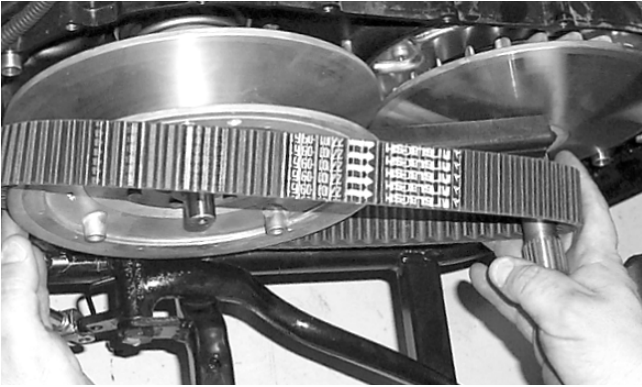
15. Slide the fixed drive face assembly onto the front shaft.

16. Spread the faces of the driven pulley by pushing the inner face toward the engine while turning it counterclockwise; then when the faces are separated, insert a wedge (approximately 3/8 in. thick) between the faces. Release the inner face.



MD1340

17. Place the V-belt into position on the driven pulley and over the front shaft.



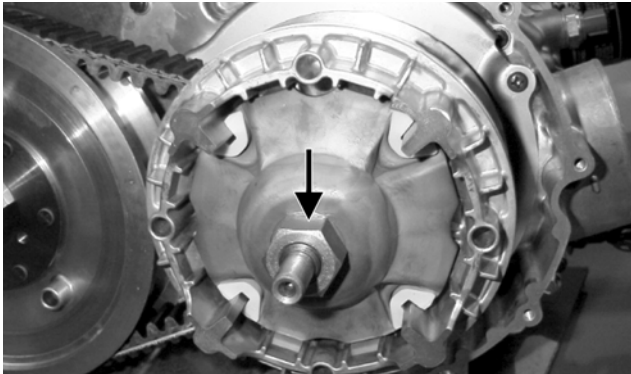
MD1341

■ **NOTE:** The arrows on the V-belt should point forward.

18. Making sure the eight movable drive face rollers are in position, pinch the V-belt together near its center and slide the spacer and movable drive face onto the shaft. Coat the threads of the nut with red Loctite #271 and secure the movable drive face. Tighten the nut to specifications.



MD1338



MD1033

■ **NOTE:** At this point, the wedge can be removed from between the driven pulley faces.

19. Rotate the V-belt and drive/driven assemblies until the V-belt is flush with the top of the driven pulley.
20. Install two alignment pins and place the V-belt cover gasket into position on the clutch cover. Install the V-belt cover noting the position of the long cap screws and rubber washer and two wire forms. In a crisscross pattern, tighten cap screws to specifications.



MD1306

Installing Left-Side Components

A. Starter Idler Gears B. Rotor/Flywheel

1. Place the crankshaft bearing retainer into position. Apply red Loctite #271 to the three Phillips-head screws. Install and tighten the three Phillips-head screws securely.



MD1122

2. Install the starter motor and tighten the two cap screws securely.
3. Install the driveshaft spacer making sure the stepped side is to the inside.



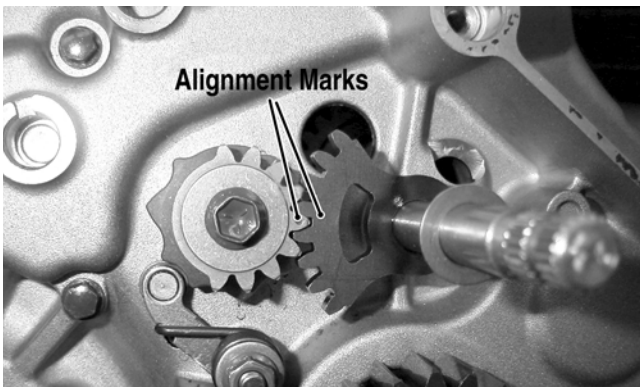
MD1224

4. Install the shift detent cam making sure the spacer is properly positioned.



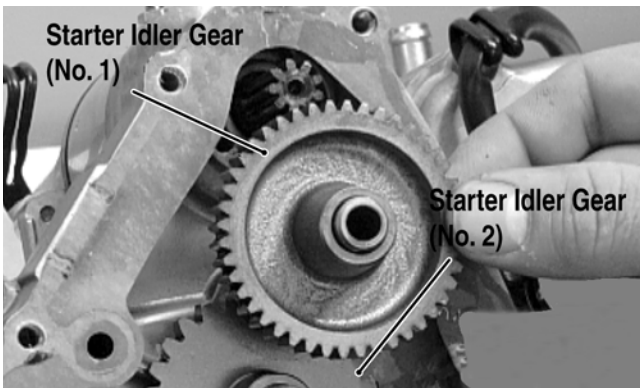
MD1086

5. Install the cam stopper assembly.
6. Install the gear shift shaft assembly and washer making sure to align the alignment marks.



MD1239

7. Install starter idler gear (No. 1) and starter idler gear (No. 2).



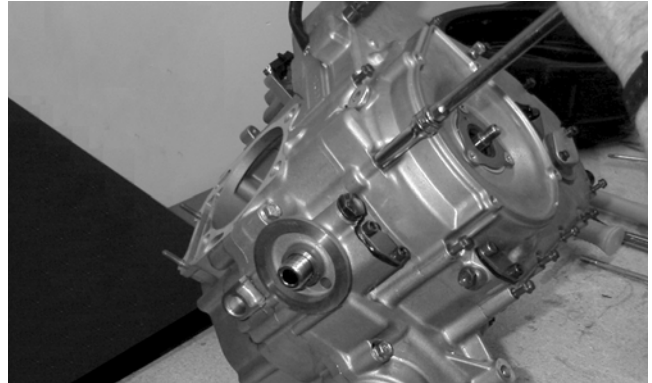
MD1305

8. Place the key into its notch; then slide the rotor/flywheel (with the ring gear in place) over the crankshaft. Tighten the nut to specifications.

C. Cover
D. Recoil Starter

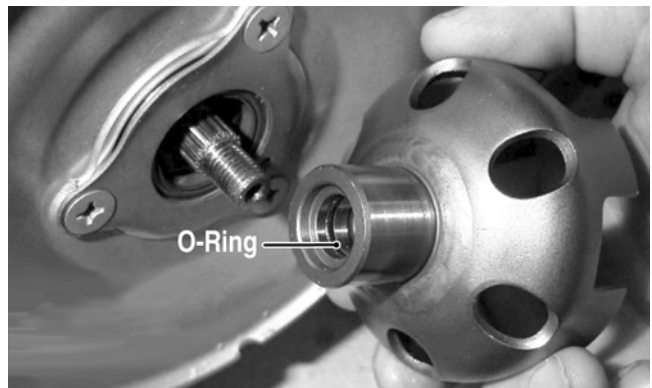
■ **NOTE:** Steps 1-8 in the preceding sub-section must precede this procedure.

9. Install two alignment pins and place the left-side cover gasket into position. Install the left-side cover. Noting the different-lengthed 6 mm cap screws, the position of the shifter bracket, and the location of the long cap screw with the washer, tighten cap screws only until snug.



MD1186

10. Install the starter cup making sure that the O-ring is in place inside the starter cup. Tighten the nut w/lock washer to specifications.



MD1304



MD1303

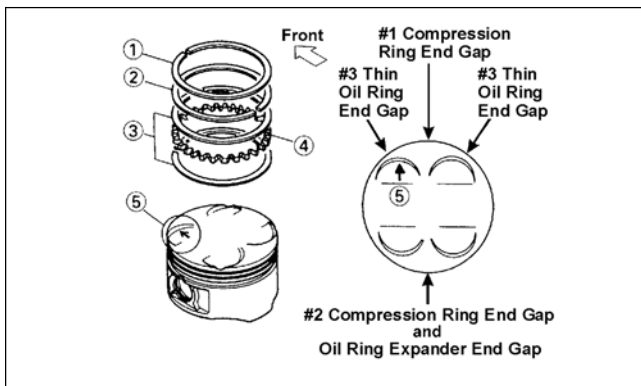
11. Tighten the cap screws (from step 9) in a crisscross pattern to specifications.
12. Place the gasket, recoil starter assembly, and cover into position on the left-side cover making sure the single washer is properly positioned; then install and tighten the four cap screws to specifications.

Installing Top-Side Components

A. Piston B. Cylinder

■ **NOTE:** If the piston rings were removed, install them in this sequence.

- A. Install ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap. Stagger the end gaps of the upper and lower thin oil rings according to the illustration.

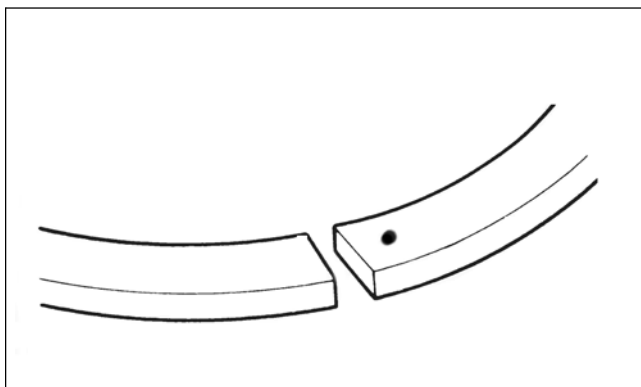


ATV-1085B

■ **NOTE:** Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.

- B. Install the compression rings (1 and 2) so the letter on the top surface of each ring faces the dome of the piston. Rotate the rings until the ring end gaps are on directly opposite sides of the piston according to the illustration.

■ **NOTE:** The chrome (silver) ring should be installed in the top position.



MD1343

CAUTION

Incorrect installation of the piston rings will result in engine damage.

1. Install the piston on the connecting rod making sure there is a circlip on each side and the open end of the circlip is directed upwards or downwards.

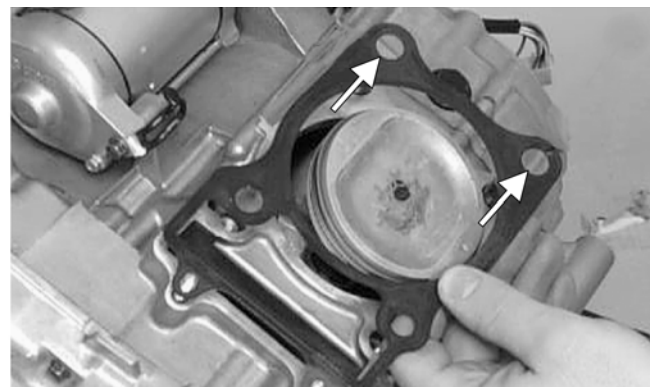
■ **NOTE:** The piston should be installed so the arrow points towards the exhaust.



MD1213

2. Place the two alignment pins into position. Place the cylinder gasket into position; then place a piston holder (or suitable substitute) beneath the piston skirt and square the piston in respect to the crankcase.

3

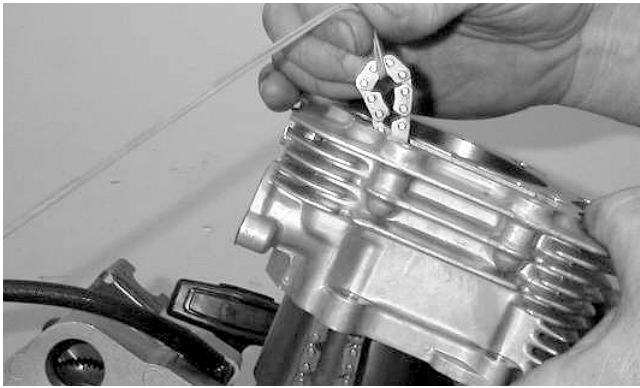


MD1344

3. Lubricate the inside wall of the cylinder; then using a ring compressor or the fingers, compress the rings and slide the cylinder over the piston. Route the cam chain up through the cylinder cam chain housing; then remove the piston holder and seat the cylinder firmly on the crankcase.

CAUTION

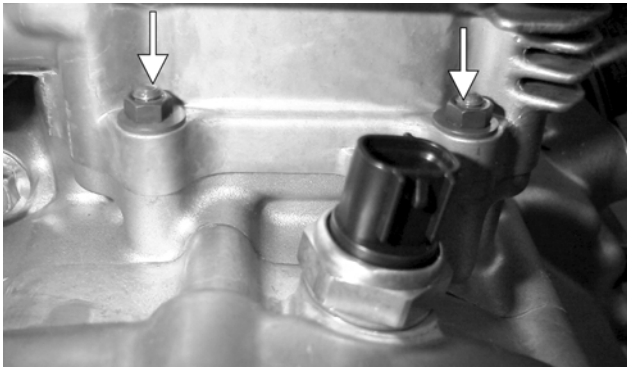
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



MD1345

- Loosely install the two nuts with washers which secure the cylinder to the right-side crankcase half.

■ **NOTE:** The two cylinder-to-crankcase nuts will be tightened in step 9.



MD1226A

**C. Cylinder Head
D. Valve Cover**

■ **NOTE:** Steps 1-4 in the preceding sub-section must precede this procedure.

- While keeping tension on the cam chain, place the front cam chain guide into the cylinder.

⚠ CAUTION

Care should be taken that the bottom of the chain guide is secured in the crankcase boss.

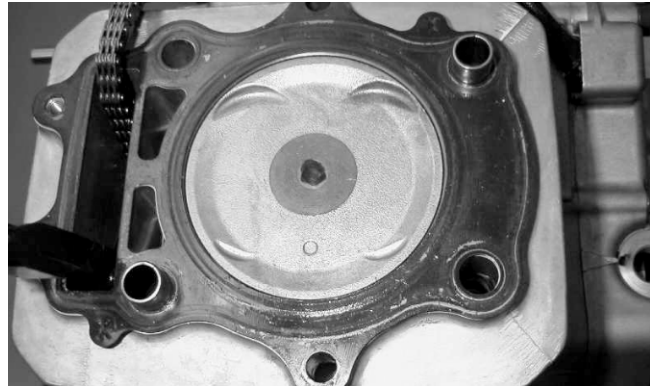


MD1349

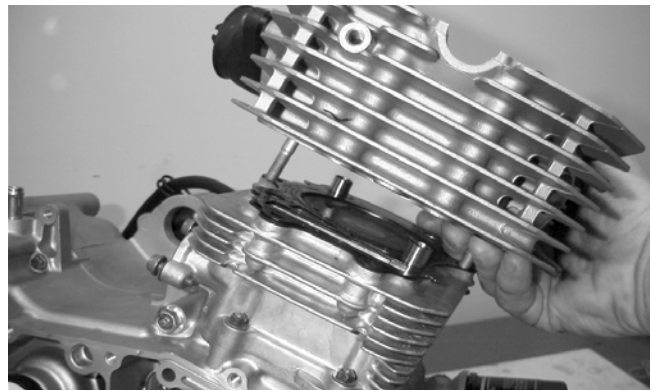
- Place the head gasket into position on the cylinder. Place the alignment pins into position; then place the head assembly into position on the cylinder making sure the cam chain is routed through the chain cavity.

⚠ CAUTION

Keep tension on the cam chain to avoid damaging the crankcase boss.

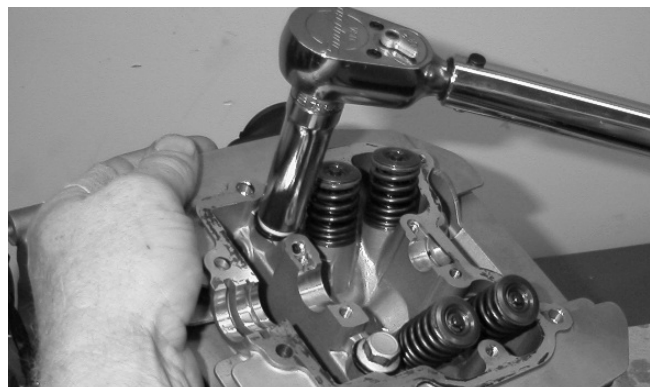


MD1347



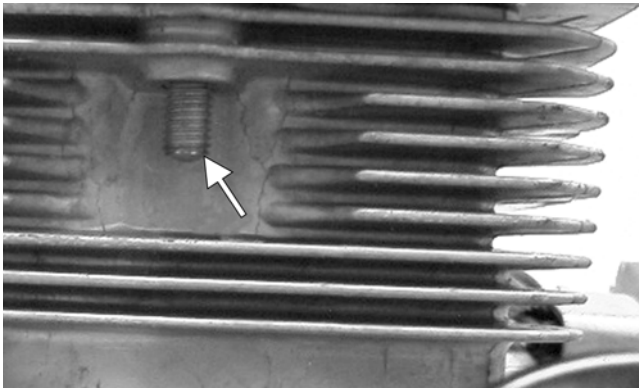
MD1163

- Install the four cylinder head cap screws with washers. Note that the two cap screws on the right side of the cylinder head nearest the cam sprocket are longer than the two cap screws on the left (spark plug) side. Tighten only until snug.

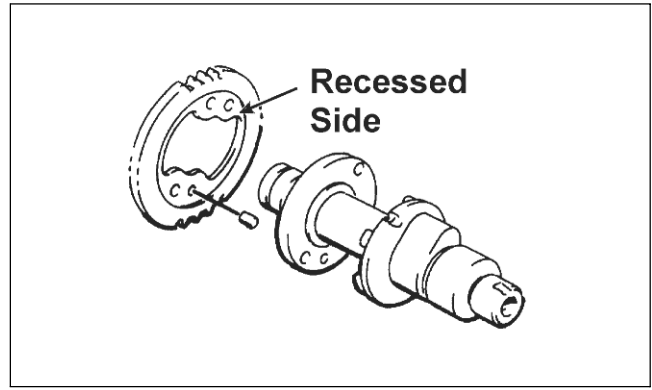


MD1270

- Install the two lower nuts securing the cylinder head to the cylinder, one in front and one in rear.



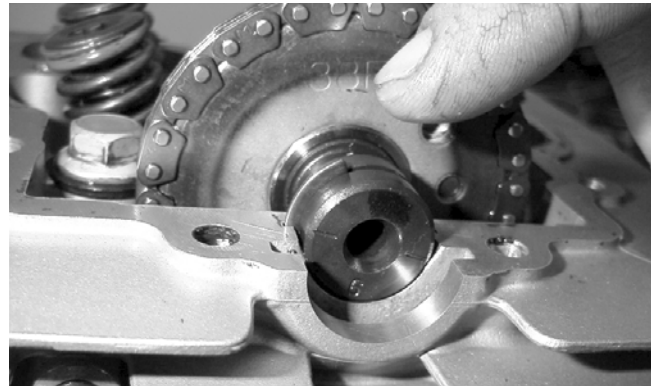
MD1192



MD1359

9. In a crisscross pattern, tighten the four cylinder head cap screws (from step 7) to specifications. Tighten the two lower cylinder head nuts (from step 8) to specifications and the cylinder-to-crankcase nuts (from step 4) to specifications.
10. With the timing inspection plug removed and the cam chain held tight, rotate the crankshaft until the piston is at top-dead-center.
11. While holding the cam chain sprocket to the side, install the rear cam chain tensioner guide into the cylinder head. Install the pivot cap screw and washer.

14. Place the C-ring into position in its groove in the cylinder head.



MD1131



CD383

12. With the alignment pin installed in the camshaft and the cam lobes directed down (toward the piston), place the camshaft in position and verify that the timing mark on the magneto is visible through the inspection plug and that the timing marks on the camshaft sprocket are parallel with the valve cover mating surface.

■ **NOTE:** When the camshaft assembly is seated, make sure the alignment pin in the camshaft aligns with the smallest hole in the sprocket.

13. With the alignment pin installed in the camshaft, loosely place the cam sprocket (with the recessed side facing the camshaft lobes) onto the camshaft and place it into position with the cam chain over the sprocket.

■ **NOTE:** At this point, oil the camshaft bearings, cam lobes, and the three seating journals on the cylinder.

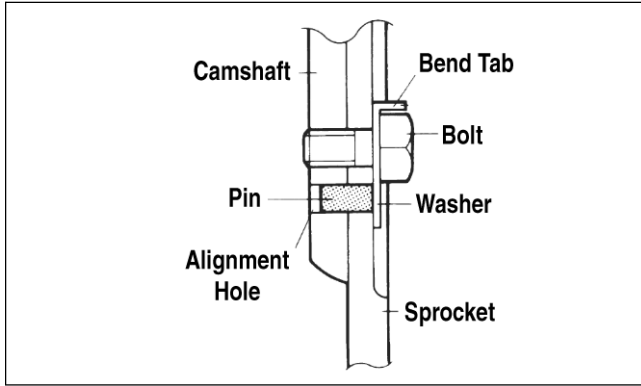
■ **NOTE:** Note the position of the alignment marks on the end of the camshaft. They must be parallel with the valve cover mating surface. If rotating the camshaft is necessary for alignment, do not allow the chain and sprocket to rotate and be sure the cam lobes end up in the down position.

15. When the camshaft assembly is seated, ensure the following.
 - A. Piston still at top-dead-center.
 - B. Camshaft lobes directed down (toward the piston).
 - C. Camshaft alignment marks parallel to the valve cover mating surface.
 - D. Recessed side of the sprocket directed toward the cam lobes.
 - E. Camshaft alignment pin and sprocket alignment hole (smallest) are aligned.

⚠ CAUTION

If any of the above factors are not as stated, go back to step 13 and carefully proceed.

- Place the tab washer onto the sprocket making sure it covers the pin in the alignment hole.



MD1363

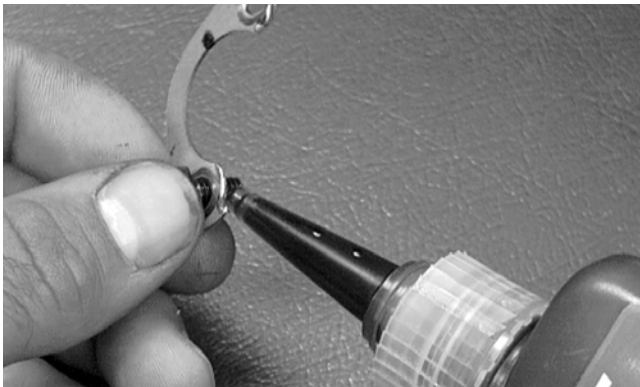
CAUTION

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.

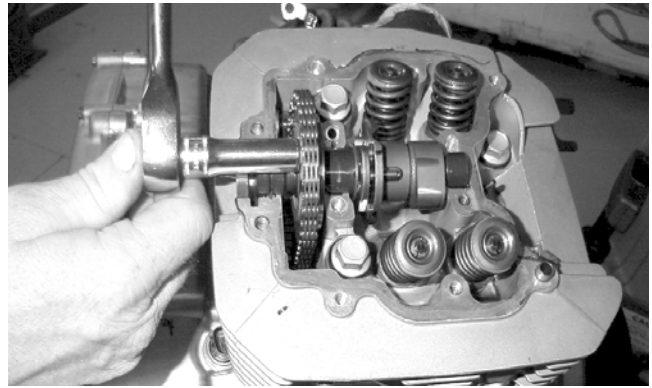


MD1362

- Apply red Loctite #271 to the first cap screw securing the sprocket and tab washer to the camshaft; then install the cap screw and tab washer. Tighten cap screw only until snug.

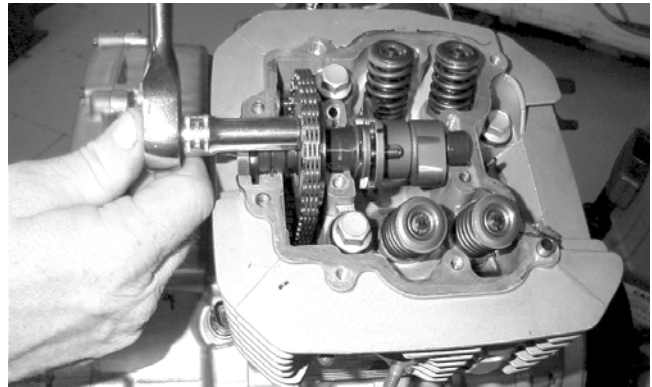


CC404D



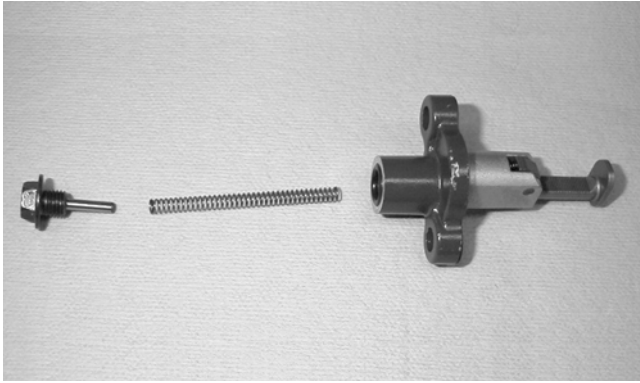
MD1137

- Rotate the crankshaft until the second cap screw securing the sprocket to the camshaft can be installed; then install the cap screw (threads coated with red Loctite #271). Tighten to specifications; then bend the tab to secure the cap screw.



MD1137

- Rotate the crankshaft until the first cap screw (from step 17) securing the sprocket to the camshaft can be addressed; then tighten to specifications. Bend the tab to secure the cap screw.
- Install the cylinder head plug with the cupped end facing the camshaft and the opening directed downwards.
- Remove the cap screw from the end of the chain tensioner. Account for the plunger, spring, and O-ring.



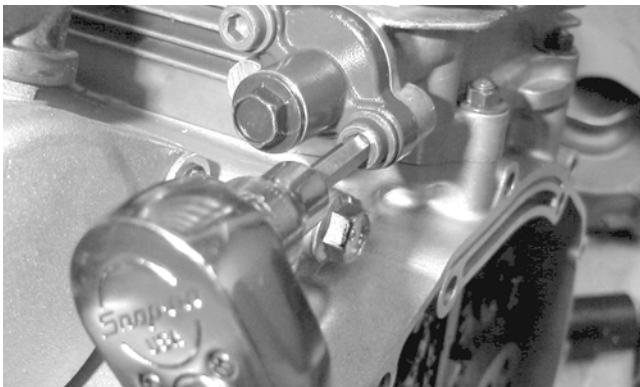
MD1248

22. Depress the spring-loaded lock and push the plunger into the tensioner.



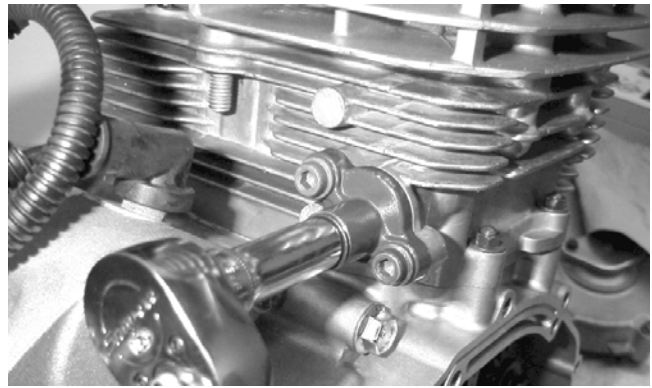
MD1146

23. Place the cam chain tensioner assembly and gasket into the cylinder making sure the ratchet side is facing toward the top of the cylinder and secure with the two Allen-head screws.



MD1254

24. Install the cap screw and spring into the end of the cam chain tensioner. Tighten securely.



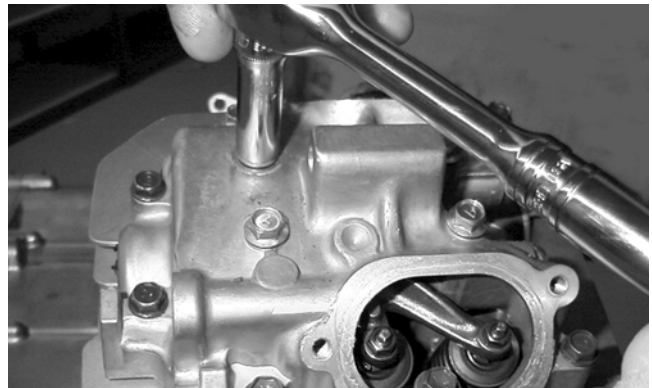
MD1245

25. Loosen the adjuster screw jam nuts; then loosen the adjuster screws on the rocker arms in the valve cover.

26. Apply a thin coat of Three Bond Sealant (p/n 0636-070) to the mating surface of the valve cover; then place the valve cover into position. Note that the two alignment pins are properly positioned.

■ **NOTE:** At this point, the rocker arms and adjuster screws must not have pressure on them.

27. Install the four top-side cap screws with rubber washers; then install the remaining cap screws. Tighten only until snug.



MD1261

28. In a crisscross pattern starting from the center and working outward, tighten the cap screws (from step 27) to specifications.

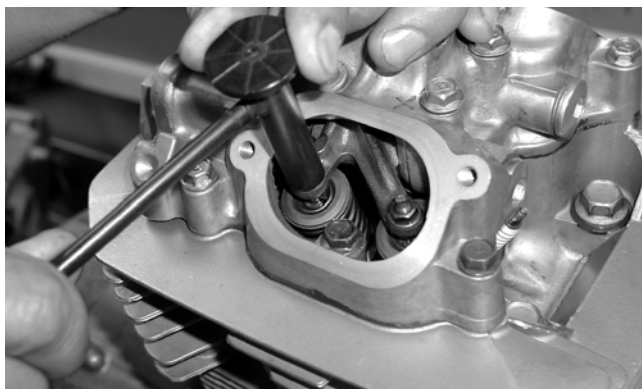
29. Adjust valve/tappet clearance using the following procedure.

■ **NOTE:** Use Valve Clearance Adjuster (p/n 0444-078) for this procedure.

A. Turn the engine over until the piston reaches top-dead-center on the compression stroke.

B. Place the valve adjuster onto the jam nut securing the tappet adjuster screw; then rotate the valve adjuster dial clockwise until the end is seated in the tappet adjuster screw.

- C. While holding the valve adjuster dial in place, use the valve adjuster handle and loosen the jam nut; then rotate the tappet adjuster screw clockwise until friction is felt.

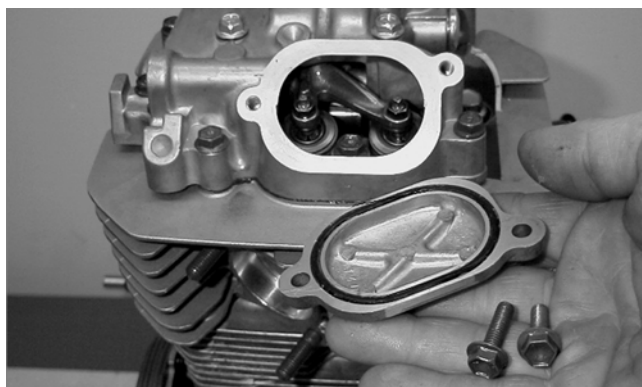


CD001

- D. Align the valve adjuster handle with one of the marks on the valve adjuster dial.
- E. While holding the valve adjuster handle in place, rotate the valve adjuster dial counterclockwise until specified valve/tappet clearance is attained.

■ **NOTE: Rotating the valve adjuster dial counterclockwise will open the valve/tappet clearance by 0.05 mm (0.002 in.) per mark.**

- F. While holding the adjuster dial at the proper clearance setting, tighten the jam nut securely with the valve adjuster handle.
30. Place the two tappet covers with O-rings into position; then install and tighten the cap screws securely.



MD1264

31. Install the spark plug and tighten to specifications; then install the timing inspection plug.

Installing Engine/Transmission

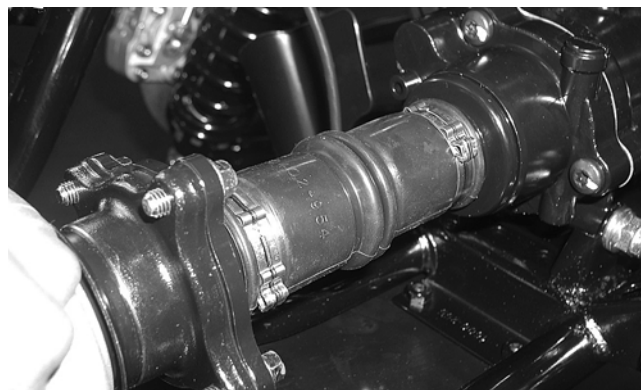
■ **NOTE: Arctic Cat recommends that new gaskets and O-rings be installed whenever servicing the ATV.**

1. From the right side, place the engine/transmission into the frame making sure it is properly positioned in the frame with the front and rear driveshafts properly aligned.
2. Slightly raise the front of the engine and engage the front driveshaft splines with the splines of the front output yoke.



CD817

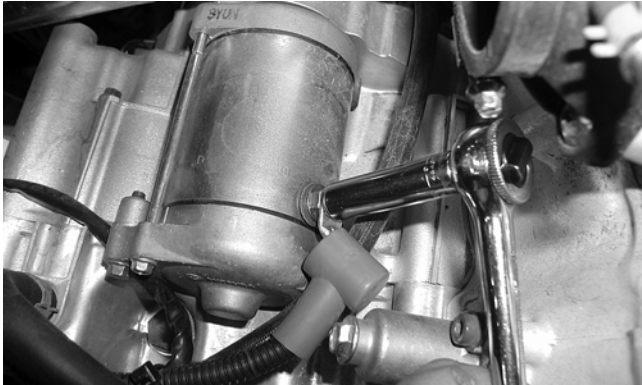
3. Position the two upper rear engine mounts in place on the frame and loosely secure with existing hardware; then install the three engine mounting through-bolts making sure to account for a washer on the upper bolt and a spacer on the lower front bolt. Tighten only until snug.
4. Align the front and rear driveshafts and secure with existing hardware. Tighten only until snug.



CD519

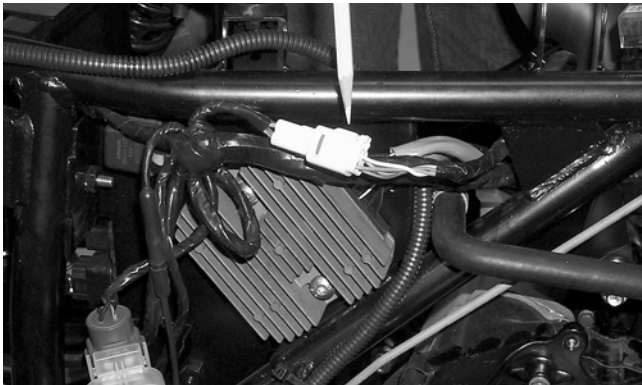
5. Secure the front upper engine mount to the frame with the cap screws. Tighten to specifications.
6. Secure the upper engine bracket to the engine with the existing cap screw and flange nut. Tighten to specifications.

7. Tighten all engine mounting through-bolts and brackets to specifications.
8. Secure the exhaust pipe to the engine, frame, and muffler using existing hardware. The cap screws securing the exhaust pipe to the engine and to the frame should be tightened to specifications.
9. Install the starter cable with existing hardware. Tighten securely.



CD798

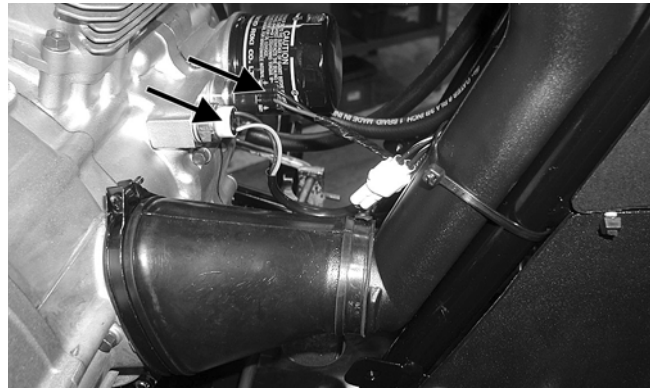
10. Secure the engine ground wire to the engine with a cap screw. Tighten to specifications.
11. Install the shift indicator connector to the main wiring harness.



CC573

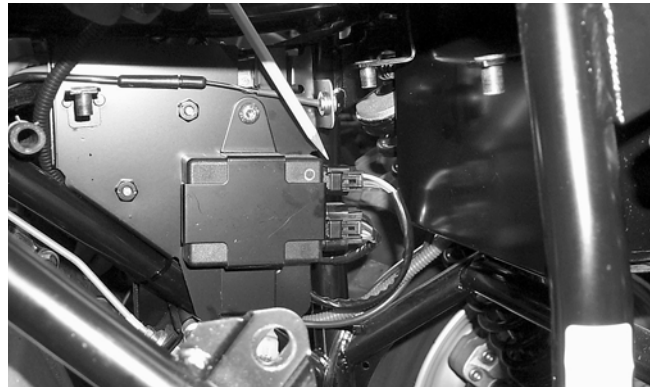
12. Connect the temperature sensor wires to the engine.

■ **NOTE:** There are two temperature sensors.



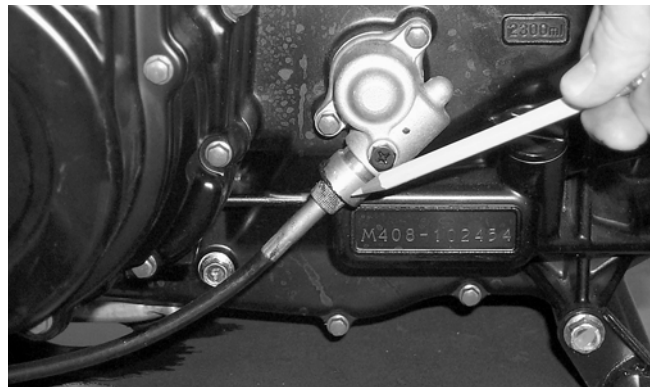
CD517B

13. Secure the stator wires to the CDI unit.

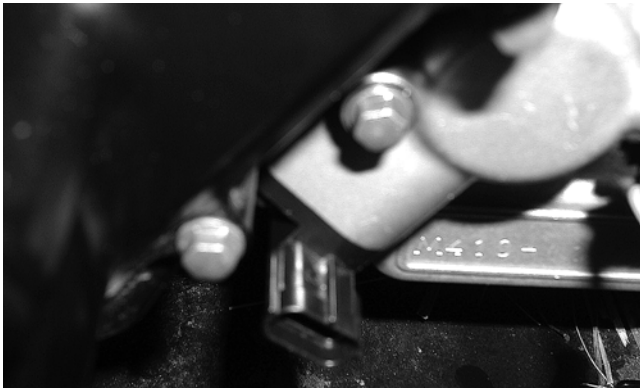


CC569

14. On the ACT/TBX models, secure the speedometer cable to the speedometer gear housing. On the FIS models, connect the speed sensor connector to the housing.

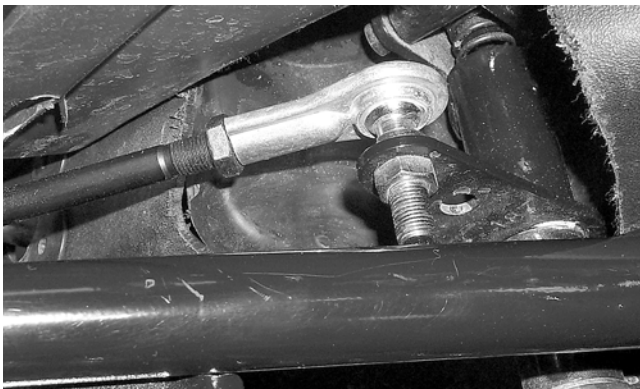


CC568



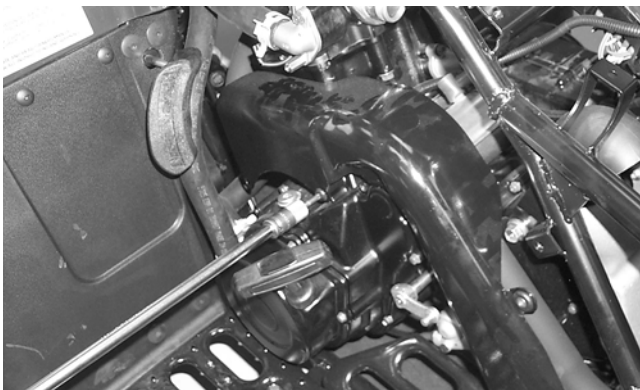
CD095

15. Secure the positive cable to the starter motor.
16. Secure all wiring to the frame and upper engine bracket with cable ties.
17. Secure the two oil hoses to the engine.
18. Secure the crankcase vent hose to the air cleaner housing.
19. Secure the shift rod to the engine with a new E-clip; then secure the shift rod to the shift lever arm with a new lock nut. Tighten securely.



AF941

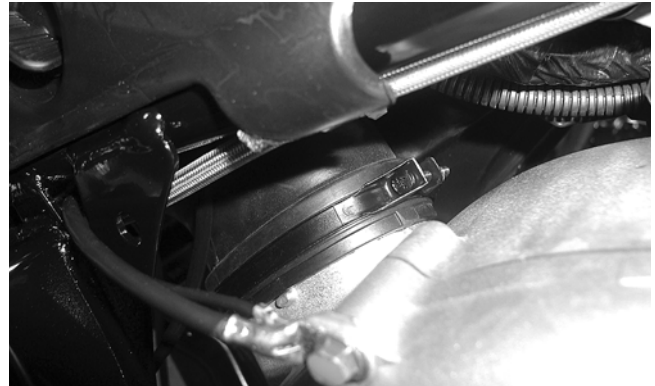
20. Install the exhaust pipe shroud and secure with the existing torx-head screws. Tighten securely.



CC560

21. Install the carburetor into the intake hose. Tighten the hose clamp.

22. Place the footrests in position on the frame; then secure with existing hardware. Tighten the 10 mm cap screws to specifications and the 8 mm cap screws to specifications.
23. Install the cooling duct boots and clamps; then secure the cooling duct assembly to the frame.



CD515



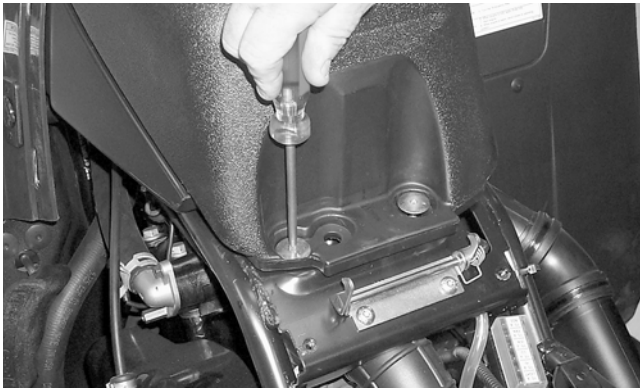
CD517

24. Install the air cleaner housing and secure the air intake hose to the carburetor; then secure the crankcase vent hose to the air cleaner housing.



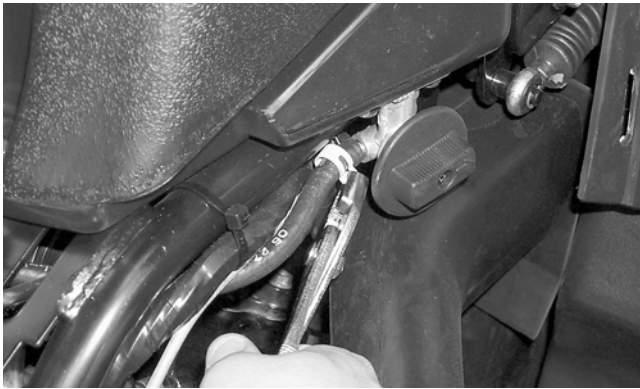
CC536

25. Install the rear rack and rear fenders with existing hardware. Tighten securely.
26. Secure the wiring harness to the frame with cable ties.
27. Install the gas tank; then connect the vent hose.



CC534

28. Connect the fuel hose to the gas tank valve.



CC533

29. Install the left-side and right-side panels. Secure with existing hardware.

30. Carefully guide the battery cables and fuse block wiring up through the access hole near the battery tray.
31. Carefully connect all fuse block wiring correctly according to the marking made during removing.

⚠ CAUTION

It is critical that all wiring be connected correctly to ensure all components function properly.

32. Place the fuse block into position and secure with existing screws.

NOTE: If the mounting screw holes have elongated, it will be necessary to install larger diameter screws.

33. Place the battery into position in the battery compartment; then install the battery cables and vent hose. Secure with the hold-down strap.

⚠ CAUTION

Battery acid is harmful if it contacts eyes, skin, or clothing. Care must be taken whenever handling a battery.

34. Connect the spark plug wire to the spark plug.
35. Add proper amount of engine/transmission oil.
36. Install the seat.

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Removing Engine/ Transmission

Many service procedures can be performed without removing the engine/transmission from the frame. Closely observe the note introducing each sub-section for this important information.

AT THIS POINT

If the technician's objective is to service/replace left-side cover oil seals (3), front output joint oil seal (1), rear output joint oil seal (1), and/or the oil strainer (from beneath the engine/transmission), the engine/transmission does not have to be removed from the frame.

Secure the ATV on a support stand to elevate the wheels.

WARNING

Make sure the ATV is solidly supported on the support stand to avoid injury.

1. Remove the seat.
2. Remove the negative cable from the battery; then remove the positive cable. Remove the battery and the battery vent hose; then remove the battery.

CAUTION

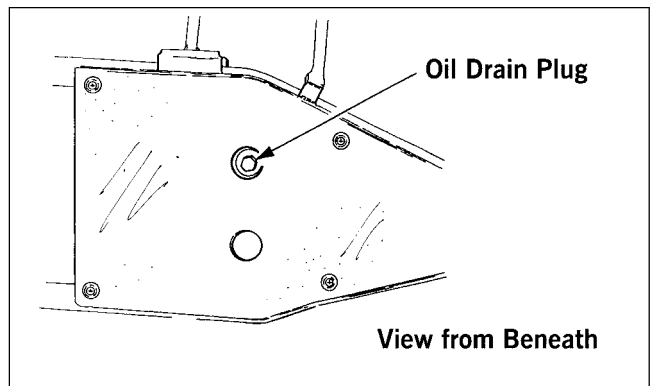
Battery acid is harmful if it contacts eyes, skin, or clothing. Care must be taken whenever handling a battery.

3. Remove the radiator access cover, steering post cover, and storage compartment cover assembly; then remove the storage compartment box.
4. Remove the reinstallable rivets securing the side panels; then remove the panels.

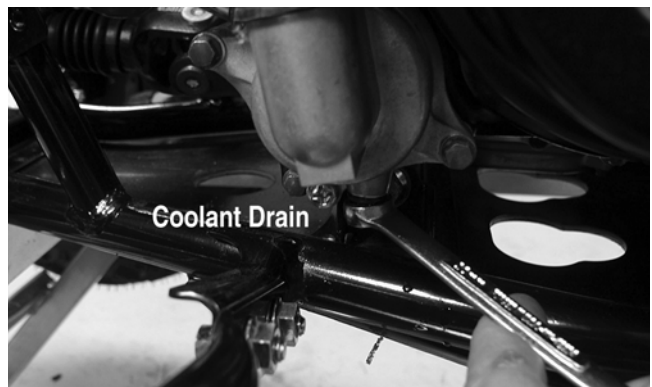


CD683A

5. Remove the instrument pod; then remove the front rack and front body panel (see Section 8).
6. Drain the oil from beneath the engine/transmission; then drain the coolant.

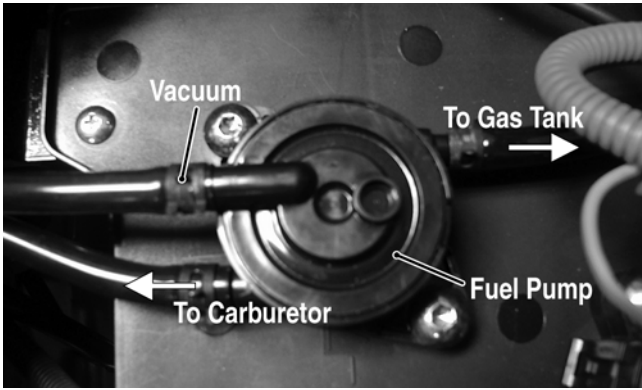


733-441A



CD799A

7. Remove the air filter (see Section 2).
8. Remove the vacuum hose and the fuel-pump-to-carburetor hose.



CD766A

9. Loosen the clamp securing the air intake duct to the air filter housing.

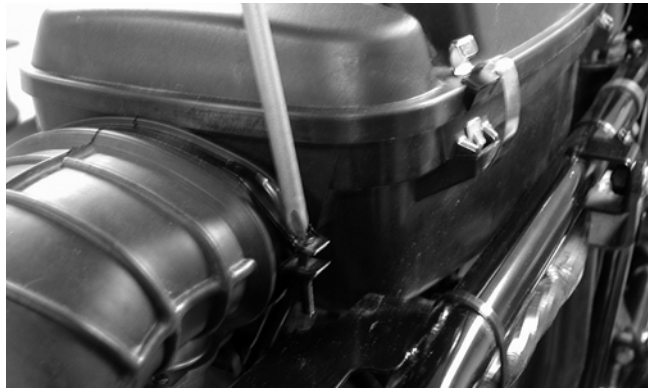


CD785

10. Disconnect the crankcase vent hose from the air filter housing. Remove the clamp securing the carburetor intake duct to the air filter housing; then remove the air filter housing.

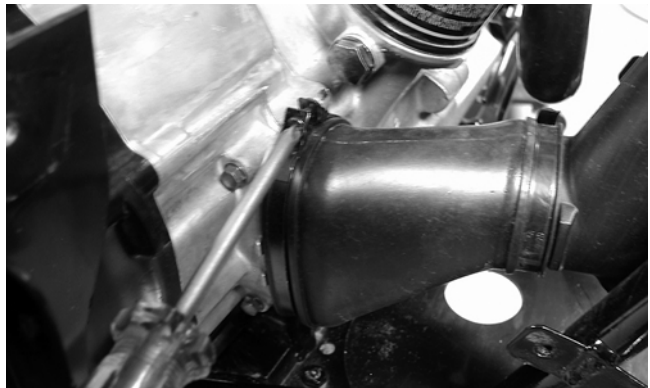


CD787



CD786

11. Remove the clamp securing the cooling duct boot to the V-belt housing; then remove the cooling duct boot from the V-belt housing outlet.



CD793

3



CD515A

12. Remove the left-side foot peg and footwell (see Section 8).



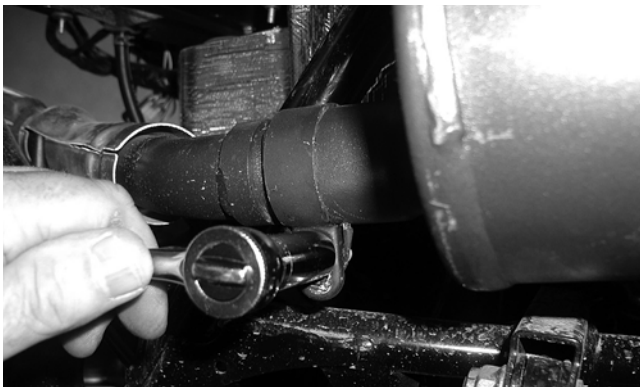
CD782

13. Secure the carburetor assembly up and away from the engine.
14. Remove the E-clip securing the shift rod to the engine shift arm; then allow the shift rod to swing forward and hang straight down from the shift lever.



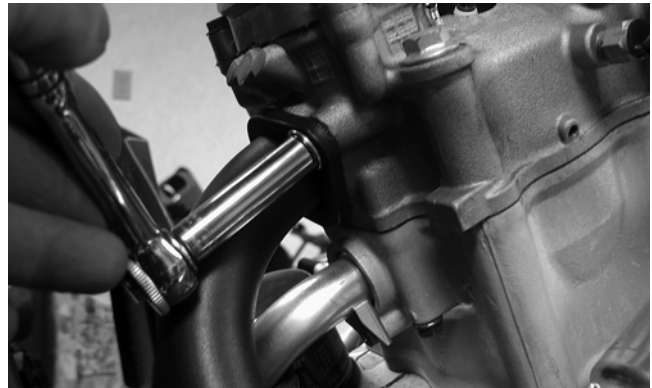
CD774

15. Remove the mounting bolts securing the muffler to the frame; then remove the muffler. Account for the graphite bushing.



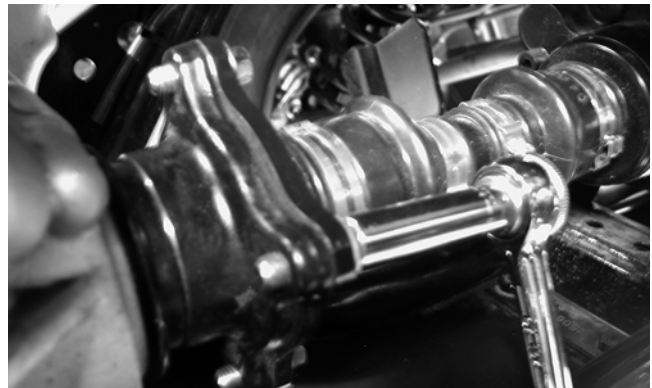
CD802

16. Remove the two cap screws securing the exhaust pipe to the cylinder head; then remove the pipe.



CD803

17. Remove the two coolant hoses from the engine; then route the hoses out of the way.
18. Remove the cap screws securing the rear driveshaft/output flange to the rear output joint flange.



CD805

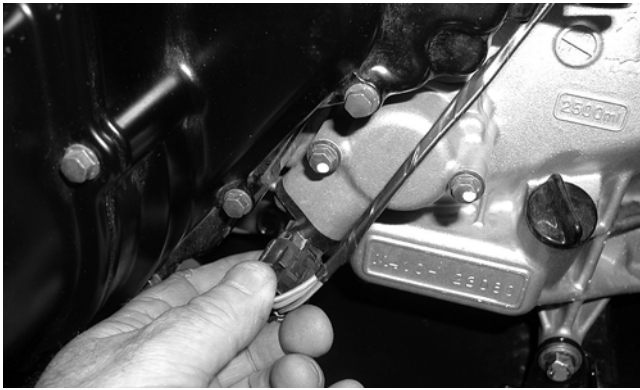
■ **NOTE:** It is advisable to lock the brake when loosening the cap screws securing the rear driveshaft.

19. Remove the positive cable from the starter motor and route it out of the way.



CD796

20. Disconnect the speed sensor connector from the sensor housing.



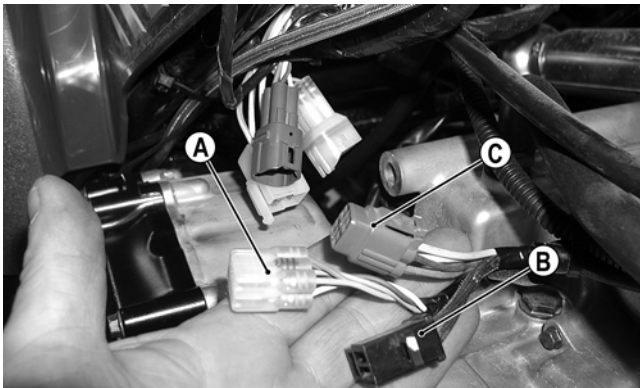
CD794

21. On the right-side, disconnect the gear position indicator connector (A), stator connector (B), and the CDI connector (C).



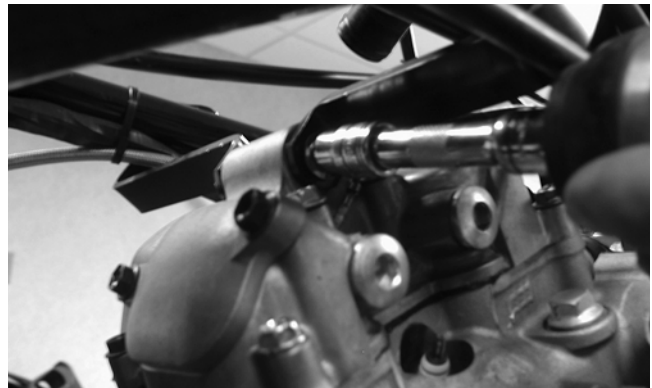
CD806

24. Remove the cap screw and flange nut securing the upper engine bracket to the engine; then remove the bracket.



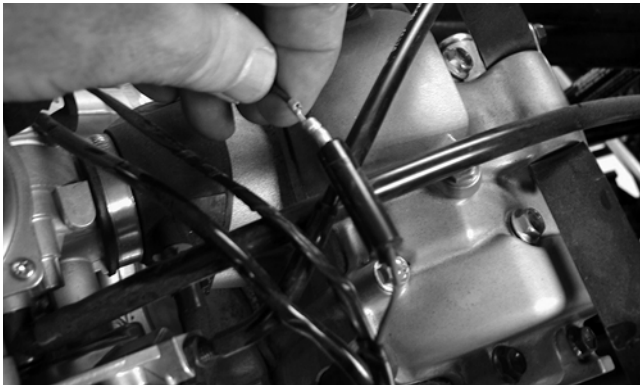
CD797A

22. Disconnect the temperature sensor lead from the wiring harness.



CD807

25. Remove the spark plug wire from the spark plug; then remove the coil from the frame.



CD788

23. Remove the two cap screws securing the upper engine mount to the frame.



CD814

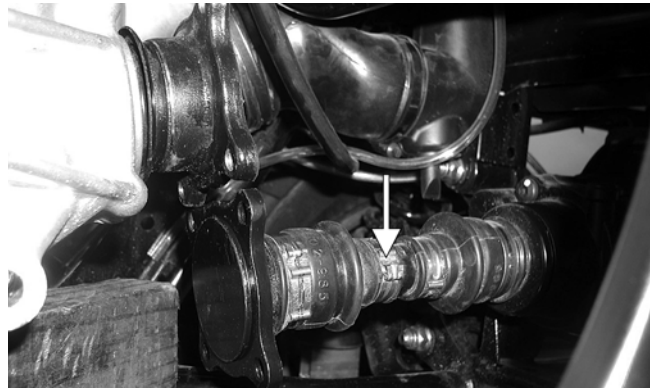
26. Remove the cap screw securing the engine ground wire to the engine.

3

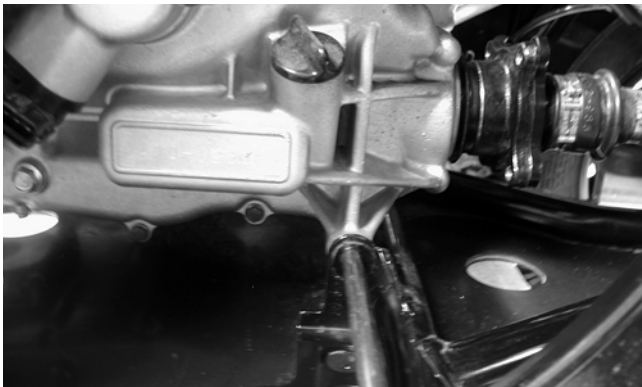


CD810

27. Remove the two engine mounting through-bolts. Account for a washer and a spacer on the bolts.

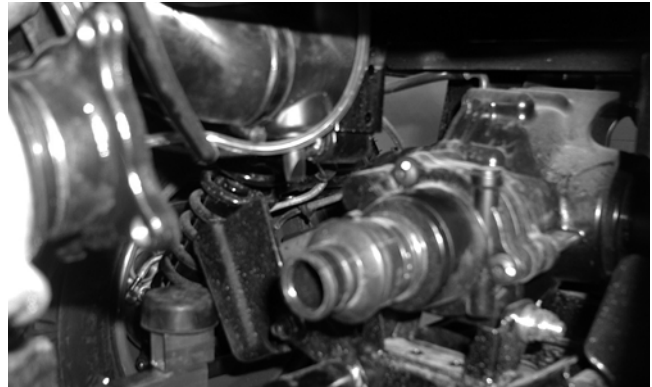


CD812A



CD809

28. Raise the rear of the engine enough to allow the rear output flange to clear the output flange joint. Block the engine up in this position.



CD813

30. Remove the block from under the engine and lower the engine; then remove the boot clamp from the front output drive yoke.



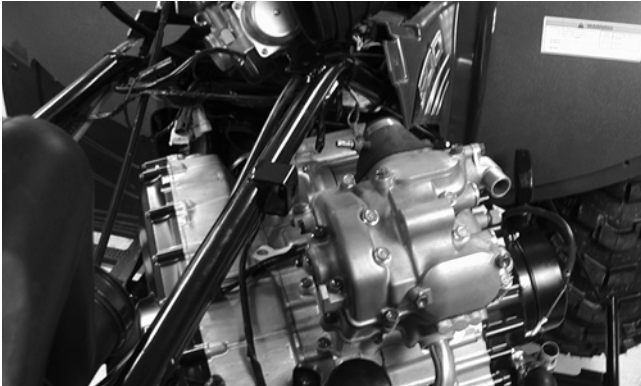
CD811

29. Remove the first small boot clamp; then remove the output flange and driveshaft from the rear drive coupler.



CD818

31. Move the engine to the rear enough to allow the front driveshaft to clear the front output yoke; then move the engine forward and to the left. The engine will come out the left side of the frame.



CD773



CC001D

■NOTE: Keep the mounting hardware with the covers for assembly purposes or thread them back into the head to keep them separated.

2. Remove the 12 cap screws securing the valve cover to the head; account for the four rubber washers on the top side cap screws. Remove the valve cover. Account for and note the orientation of the cylinder head plug. Note the location of two alignment pins.

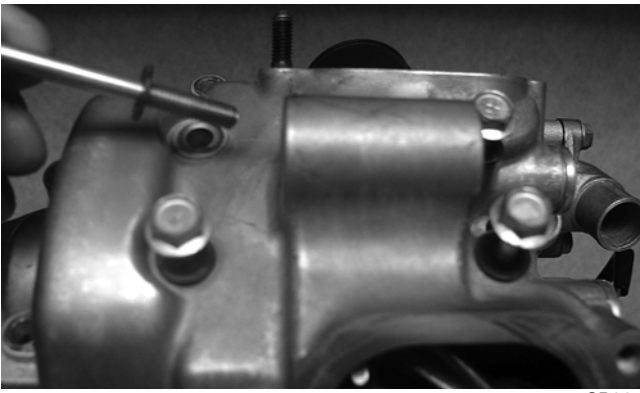
3

Top-Side Components

■NOTE: For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

👉 AT THIS POINT
To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■NOTE: The engine/transmission does not have to be removed from the frame for this procedure.



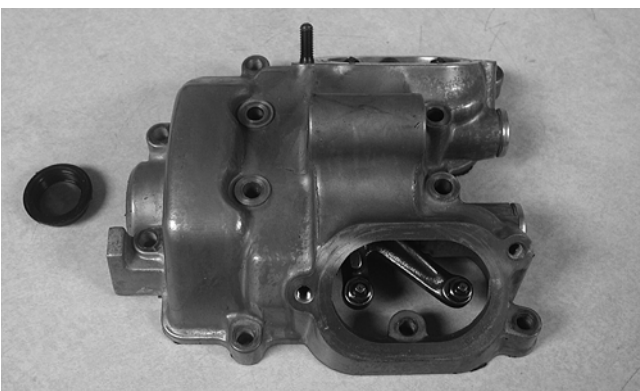
CD205

Removing Top-Side Components

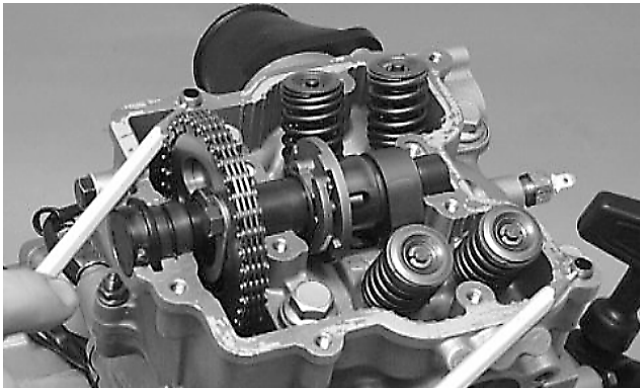
- A. Valve Cover
- B. Cylinder Head

■NOTE: Remove the spark plug and timing inspection plug; then using the recoil starter, rotate the crankshaft to top-dead-center of the compression stroke.

1. Remove the two tappet covers.

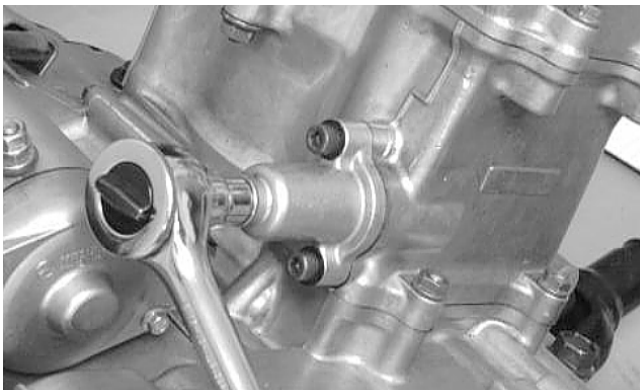


CD206



CC273D

- Loosen the cap screw on the end of the tensioner; then remove the two Allen-head cap screws securing the tensioner adjuster assembly and remove the assembly. Account for a gasket.



CC009D

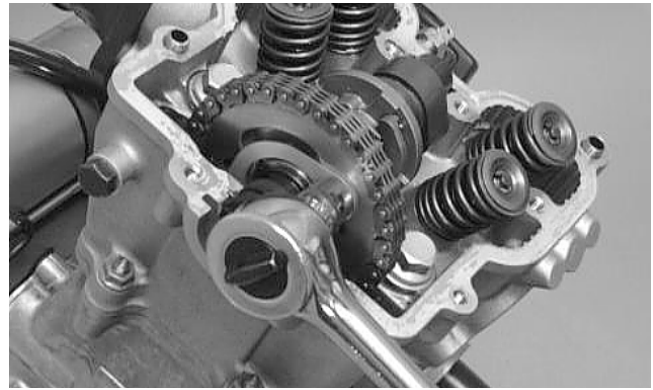
- Using an awl, rotate the C-ring in its groove until it is out of the cylinder head; then remove the C-ring.

■ **NOTE:** Care should be taken not to drop the C-ring down into the crankcase.



CC012D

- Bend the washer tabs down and remove the two cap screws securing the sprocket to the camshaft; then drop the sprocket off the camshaft.



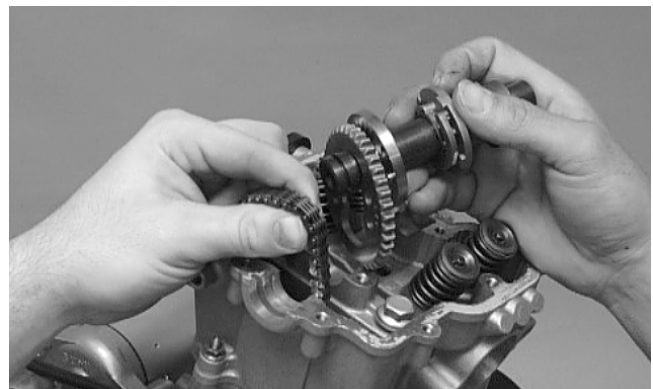
CC013D

- Remove the cap screw securing the chain tensioner (account for a washer); then remove the tensioner.



CC014D

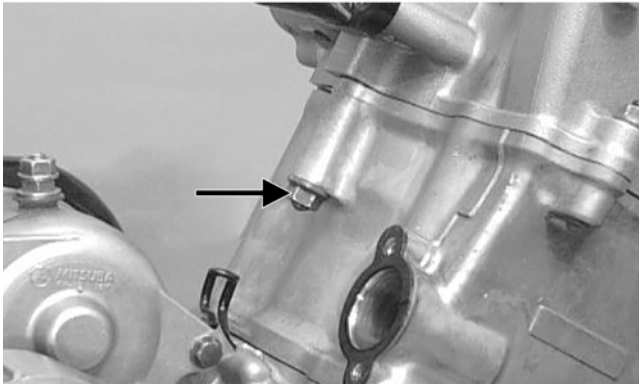
- While holding the chain, slide the sprocket and camshaft out of the cylinder head.



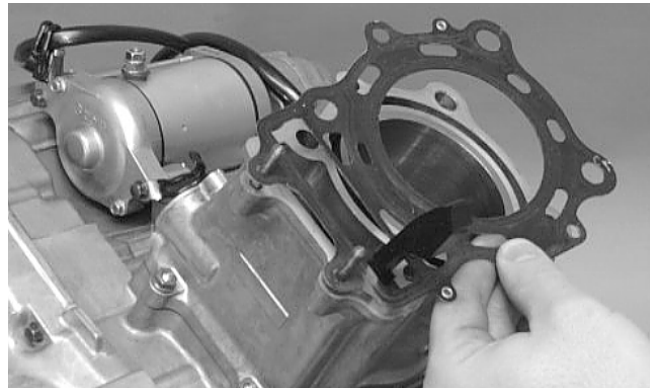
CC266D

■ **NOTE:** Loop the chain over the cylinder and secure it to keep it from falling into the crankcase.

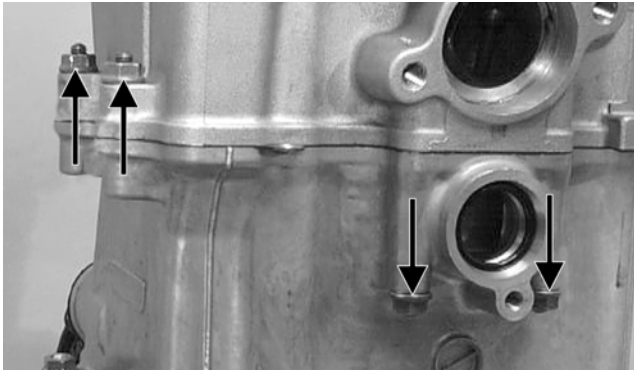
- Remove the five nuts securing the cylinder head to the cylinder; then remove the four cylinder head cap screws with copper washers (note location of the different-sized cap screws and nuts).



CC017D



CC020D

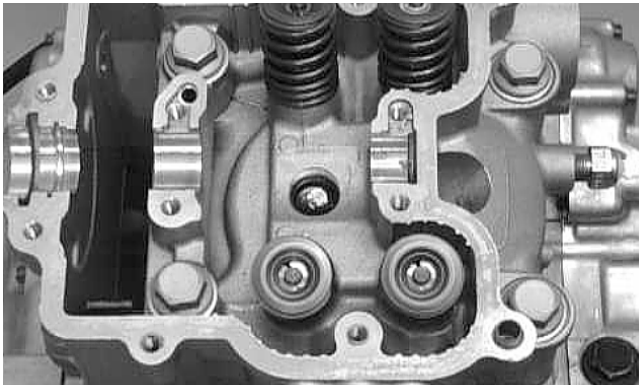


CC018D

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.

3



CC016D



CC022D

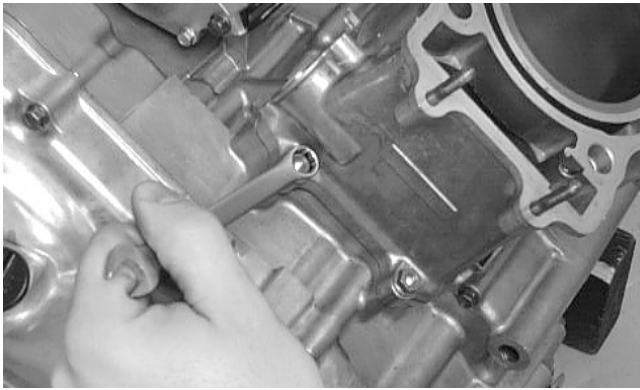
**C. Cylinder
 D. Piston**

■ **NOTE:** Steps 1-9 in the preceding sub-section must precede this procedure.

9. Remove the cylinder head from the cylinder, remove the gasket, and account for two alignment pins; then remove the cam chain guide.

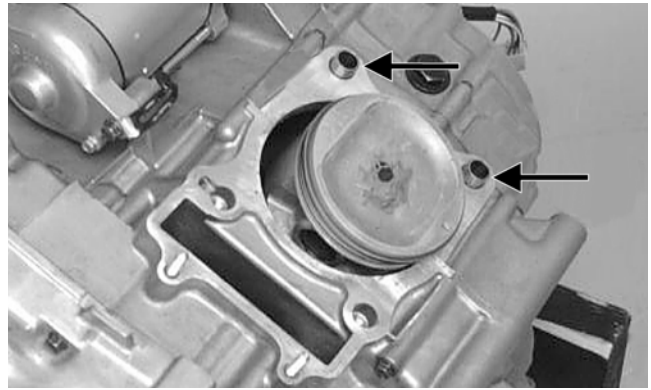
10. Loosen the clamp securing the coolant hose to the union; then detach the hose.

11. Remove the two nuts securing the cylinder to the crankcase.



CC023D

12. Lift the cylinder off the crankcase taking care not to allow the piston to drop against the crankcase. Account for the gasket and two alignment pins.



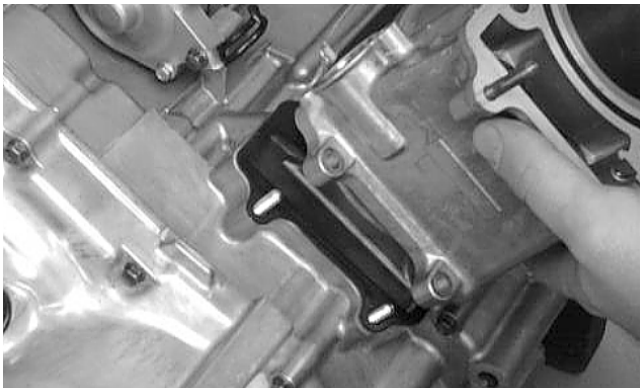
CC026D

AT THIS POINT

To service cylinder, see Servicing Top-Side Components sub-section.

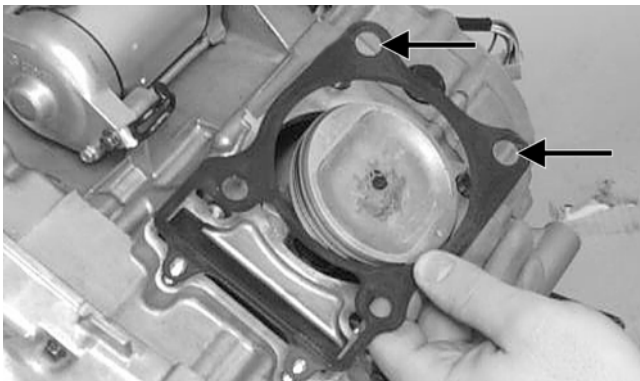
CAUTION

When removing the cylinder, be sure to support the piston to prevent damage to the crankcase and piston.

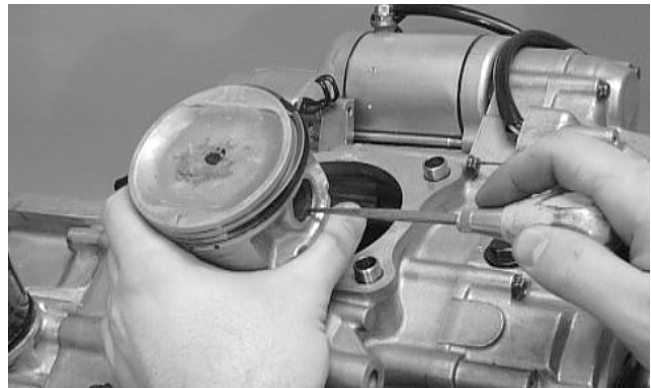


CC024D

13. Using an awl, remove one piston-pin circlip.



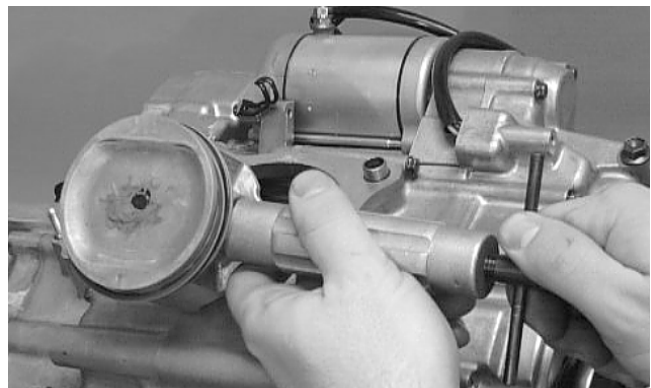
CC025D



CC032D

14. Using the Piston-Pin Puller (p/n 0644-328), remove the piston pin. Account for the opposite-side circlip. Remove the piston.

■ **NOTE:** It is advisable to remove the opposite-side circlip prior to using the puller.



CC033D

■ **NOTE:** Support the connecting rod with rubber bands to avoid damaging the rod or install the Connecting Rod Holder (p/n 0444-006).

⚠ CAUTION

Do not allow the connecting rod to go down inside the crankcase. If the rod is down inside the crankcase and the crankshaft is rotated, severe damage will result.

■ **NOTE:** If the existing rings will not be replaced with new rings, note the location of each ring for proper installation. When replacing with new rings, replace as a complete set only. If the piston rings must be removed, remove them in this sequence.

- A. Starting with the top ring, slide one end of the ring out of the ring-groove.
- B. Remove each ring by working it toward the dome of the piston while rotating it out of the groove.

👉 AT THIS POINT

To service piston, see Servicing Top-Side Components sub-section.

👉 AT THIS POINT

To service center crankcase components only, proceed to Removing Left-Side Components.

Left-Side Components

■ **NOTE:** For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

👉 AT THIS POINT

To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■ **NOTE:** The engine/transmission does not have to be removed from the frame for this procedure.

Removing Left-Side Components

- A. Recoil Starter**
- B. Water Pump**
- C. Cover**
- D. Rotor/Flywheel**

1. Remove the four cap screws securing the recoil starter assembly to the left-side cover; then remove the recoil starter. Account for the gasket.

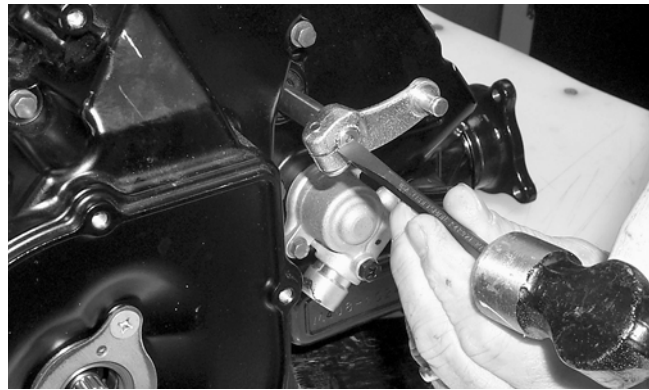
👉 AT THIS POINT

To service the recoil starter, see Servicing Left-Side Components sub-section.



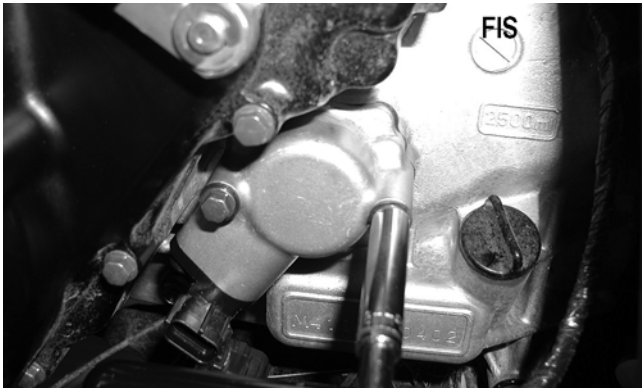
CC615

2. Remove the flange nut securing the starter cup to the crankshaft; then remove the starter cup. Account for the O-ring inside the cup.
3. Using a cold chisel, scribe a mark showing the relative position of the shift arm to the shift arm shaft to aid in installing; then remove the shift arm.



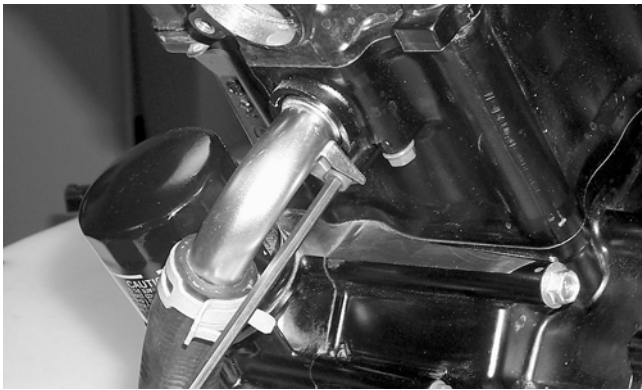
CC621

4. Remove the two cap screws securing the speed sensor housing; then remove the housing. Account for the gasket.



CD069

5. Loosen the clamps securing the coolant hose to the water pump; then remove the crossover tube from the cylinder head. Account for an O-ring.



CC620

6. Remove the two cap screws securing the water pump to the engine; then remove the water pump.



CC623

👉 AT THIS POINT
To service the water pump, see Section 4.

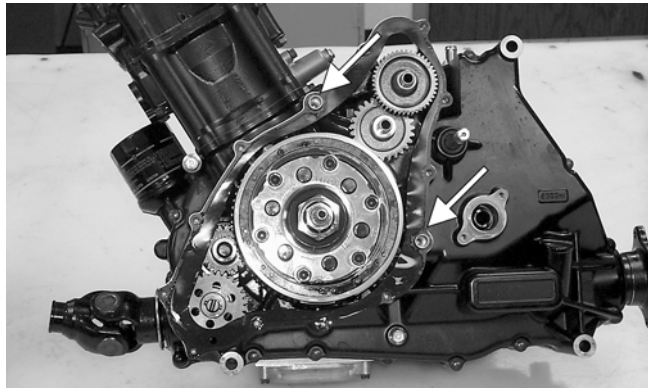
7. Remove the 13 cap screws securing the left-side cover to the crankcase noting the location of the different-sized cap screws for installing purposes.



CC626

8. Using Side Case Puller (p/n 0644-262), remove the side cover. Account for a gasket and two alignment pins.

■ **NOTE:** Inspect the inside of the left-side cover for any shaft washers that may have come off with the cover. Make sure they are returned to their respective shafts and that the starter idler gear spacer is on the shaft or in the cover.

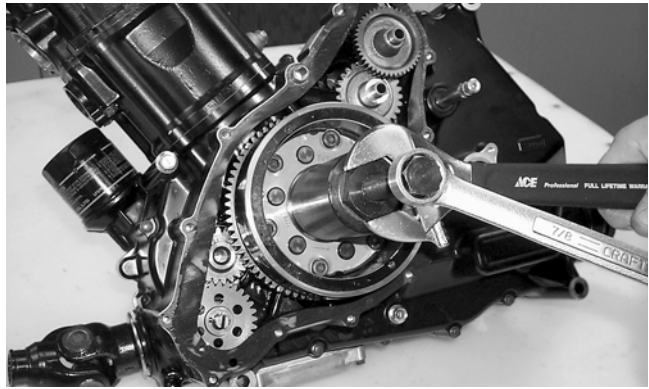


CC629A

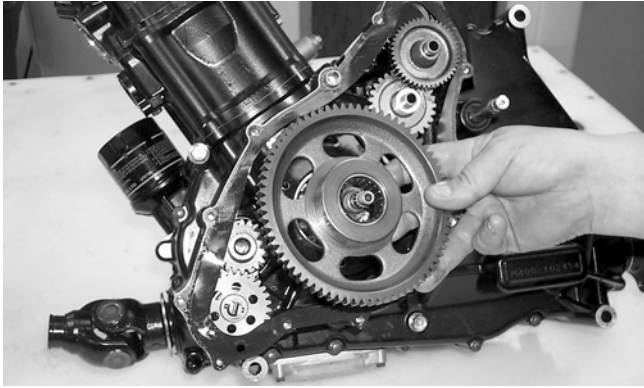
9. Remove the nut securing the magneto rotor to the crankshaft; then install the magneto rotor puller adapter.

■ **NOTE:** The puller has left-hand threads.

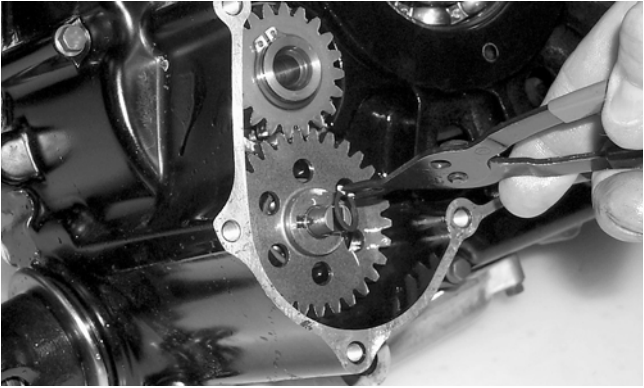
10. Using Magneto Rotor Remover Set (p/n 0444-075), remove the rotor/flywheel assembly from the crankshaft. Account for the key; then remove the starter clutch gear assembly and washer.



CC632



CC634

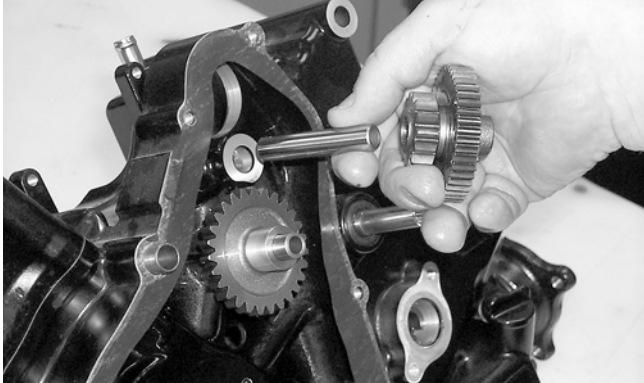


CC638

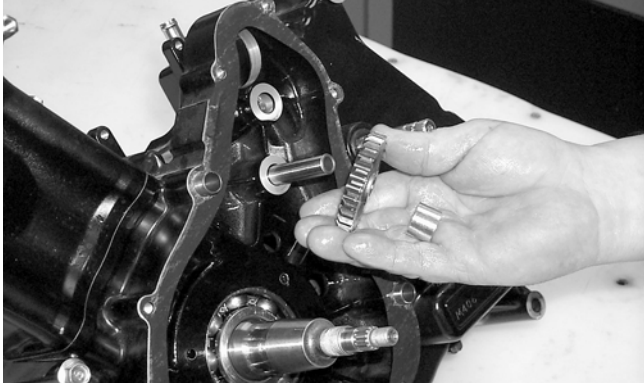
AT THIS POINT

To service the magneto assembly, see Section 5.

11. Remove the two starter gears from the crankcase noting the direction of the beveled side of the gears for installing purposes; then remove the two starter gear shafts.



CC636



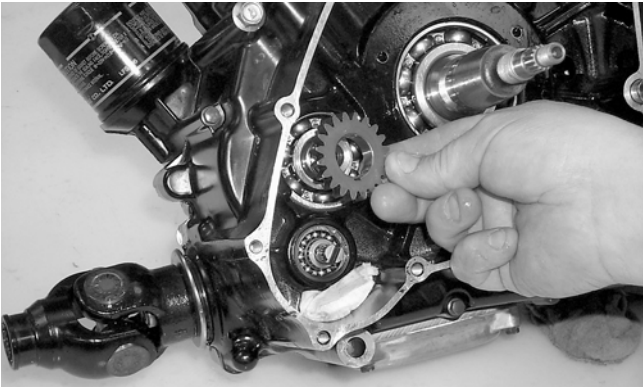
CC637

12. Remove the snap ring securing the water pump driven gear; then remove the gear noting the direction of the sides of the gear for installing purposes. Account for the driven gear alignment pin.

■NOTE: There is an oil passage beneath the driven gear/drive gear assembly. This passage should be plugged prior to removing the driven gear and drive gear. Failure to do so could result in the loss of an alignment pin into the crankcase.

13. Remove the snap ring securing the water pump drive gear; then remove the gear noting the direction of the sides of the gear for installing purposes. Account for the drive gear alignment pin.

3



CC641

Right-Side Components

■NOTE: For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

AT THIS POINT

To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■NOTE: The engine/transmission does not have to be removed from the frame for this procedure.

Removing Right-Side Components

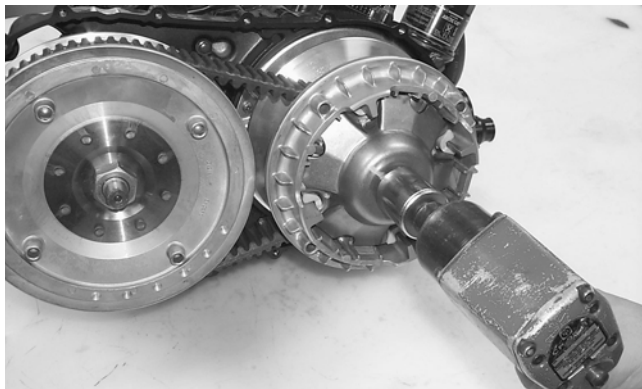
- A. V-Belt Cover
- B. Driven Pulley
- C. Clutch Cover

1. Remove the cap screws securing the V-belt cover noting the location of the different-lengthed cap screws for installing purposes; then using a rubber mallet, gently tap on the cover tabs to loosen the cover.

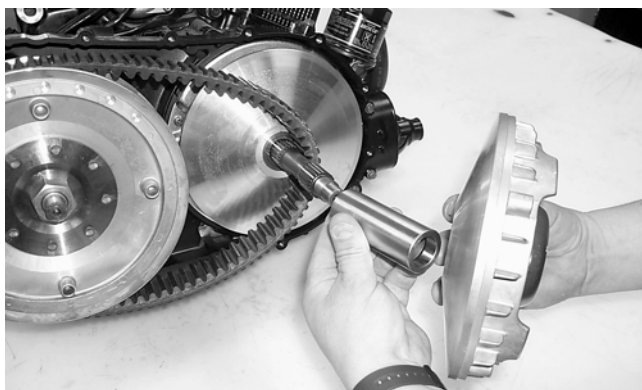


CD079

2. Remove the nut securing the movable drive face; then remove the face. Account for a spacer.



CC581



CC582

3. Remove the V-belt.

4. Remove the nut securing the fixed driven assembly; then remove the assembly.



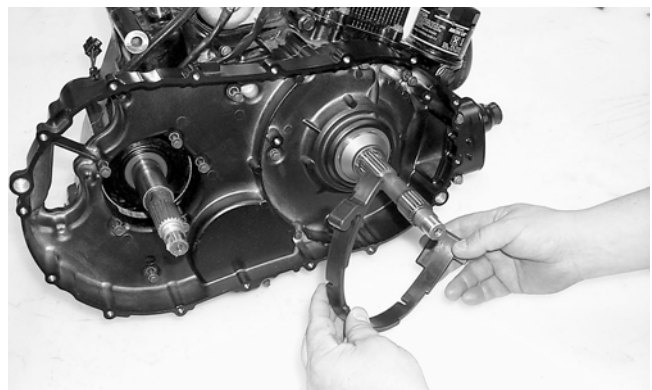
CC585

5. Remove the fixed drive face.

6. Using an impact driver, remove the Phillips-head screws securing the air intake plate; then remove the plate cushion.

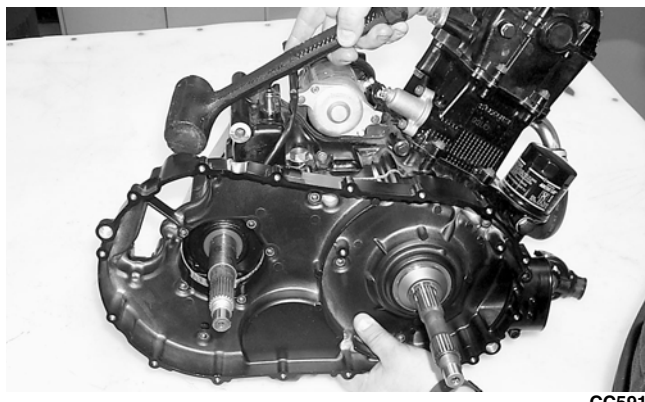


CC587

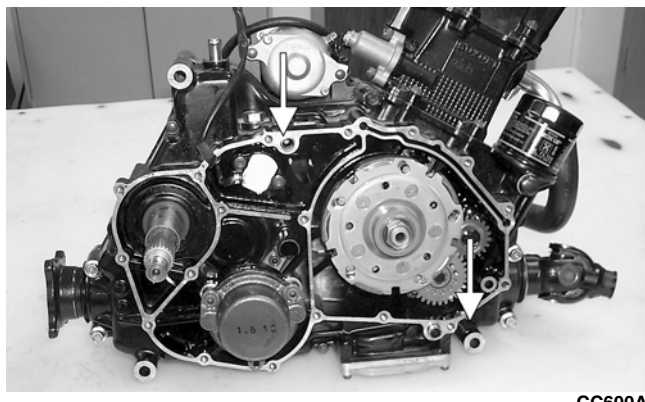


CC590

7. Remove the cap screws securing the clutch cover. Note the location of the different-lengthed cap screws for installing purposes. Using a rubber mallet, carefully remove the cover. Account for two alignment pins.



CC591

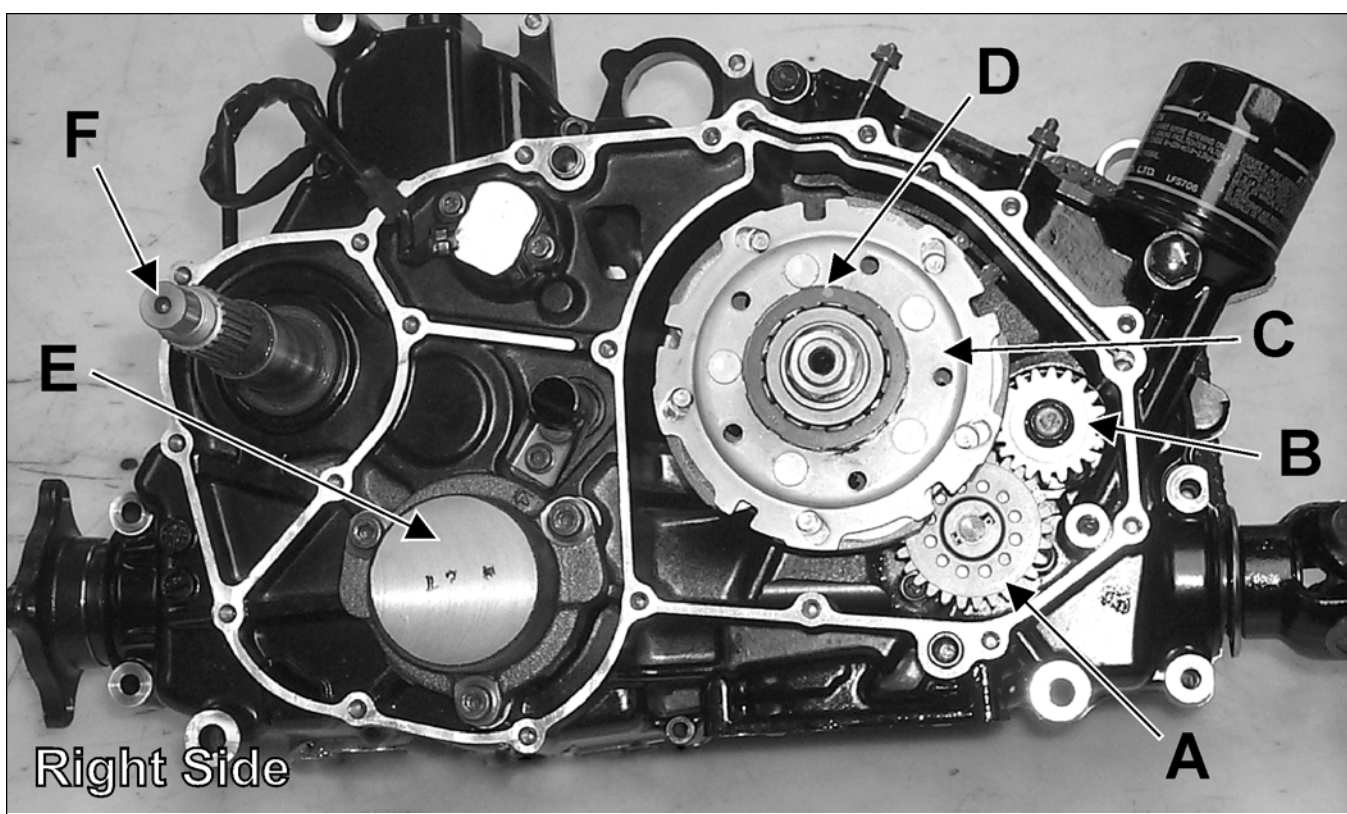


CC600A

⚠ CAUTION
 Care must be taken when removing the cover so the cover gasket is not damaged.

■ **NOTE:** For steps 8-14, refer to illustration CC829B.

3



Right Side

- KEY**
- A. Oil Pump Driven Gear
 - B. Oil Pump Drive Gear
 - C. Clutch Shoe Assembly
 - D. One-Way Clutch (Green Dot MUST Show)

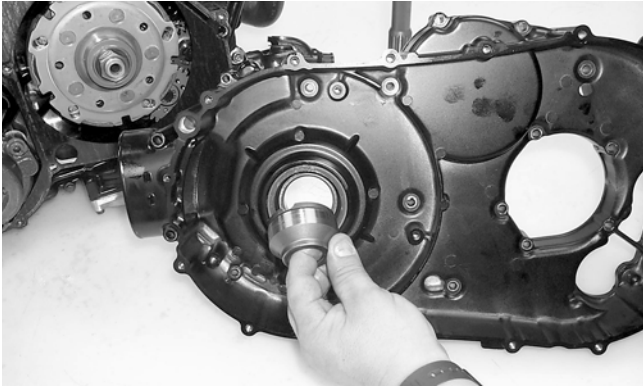
- E. Final Drive Carrier Bearing Housing
- F. Input Shaft

CC829B

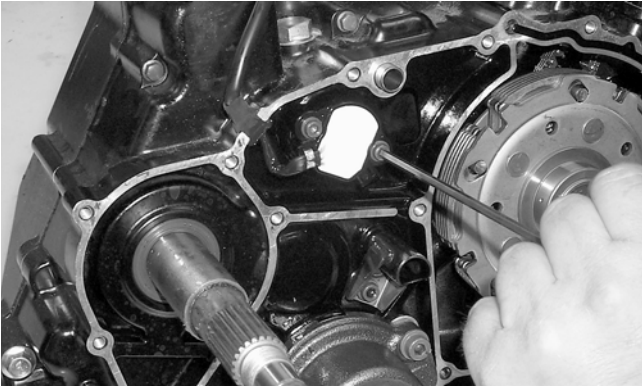
■ **NOTE:** To aid in installing, it is recommended that the assemblies are kept together and **IN ORDER**.

8. Remove the one-way clutch (D) from the clutch housing. Note the location of the green alignment dot (or the word **OUTSIDE**) for installing purposes.

9. Using a hydraulic press, remove the clutch housing assembly from the clutch cover. Account for the left fixed drive spacer and an O-ring inside the fixed drive spacer.



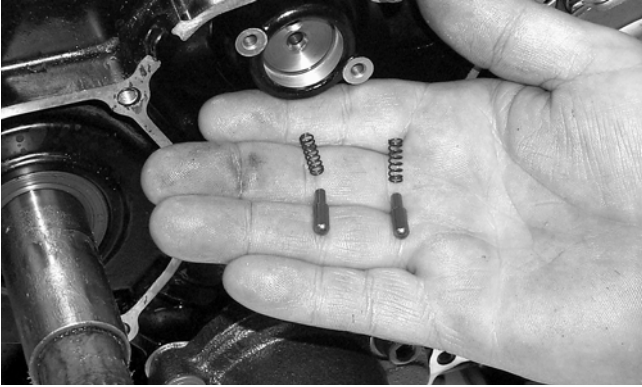
CC595



CC602



CC596



CC603

■ **NOTE:** Account for and inspect the clutch housing seal.

11. Remove the nut (left-hand threads) securing the clutch shoe assembly (C). Account for a washer.

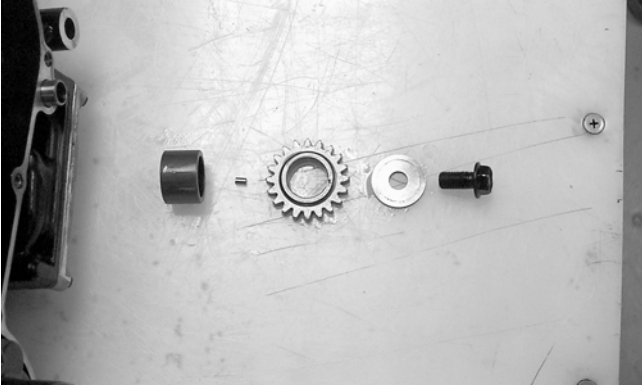


CC597

■ **NOTE:** The washer is also directional. The flat side of the washer must face toward the clutch assembly when installing.

12. Remove the cap screw securing the oil pump drive gear (B). Account for a cap screw, washer, pin, and spacer.

10. Remove the two Allen-head screws securing the shift indicator sending unit; then remove the unit. Account for two neutral contact pins and two springs.

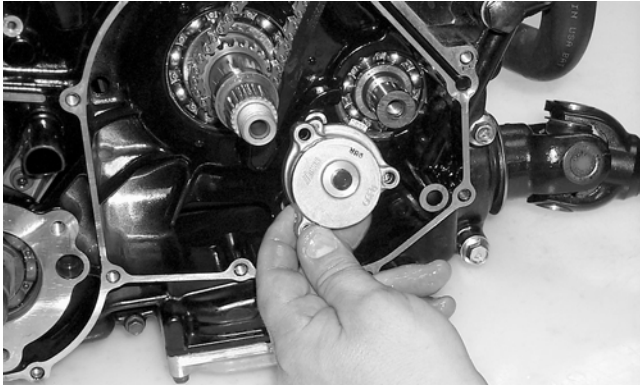


CC606

13. Using an impact driver, remove the Allen-head screws securing the final drive carrier bearing housing (E); then remove the housing and account for two alignment pins.

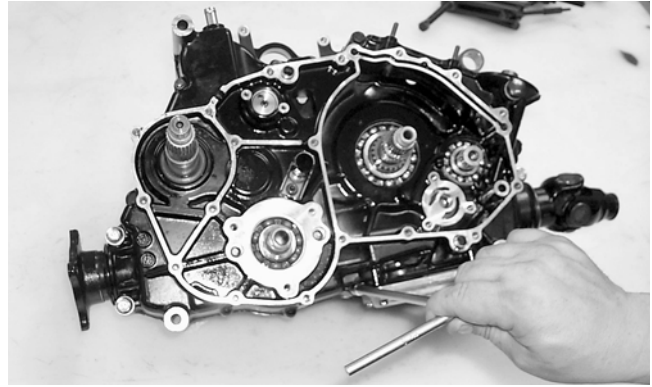
14. Remove the snap ring securing the oil pump driven gear (A); then remove the gear noting the direction of the sides of the gear for installing purposes. Account for a pin and a washer.

- Using an impact driver, remove the three Phillips-head screws securing the oil pump; then remove the pump.



CC613

- Remove the right-side cap screws securing the crankcase halves. Note the location of the different-lengthed cap screws.



CC664

- Remove the left-side cap screws securing the crankcase halves. Note the location of the different-lengthed cap screws.



CC663

Center Crankcase Components

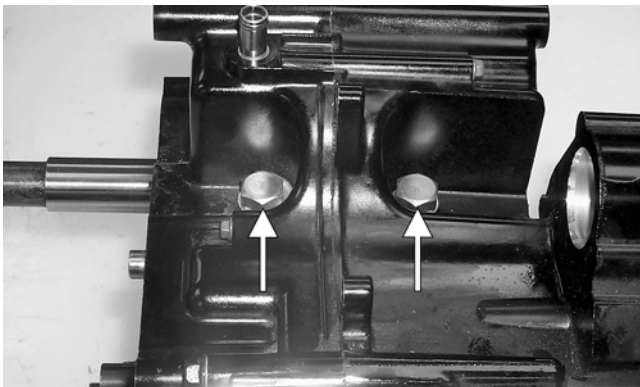
■ **NOTE:** This procedure cannot be done with the engine/transmission in the frame. Complete Removing procedures for Top-Side, Left-Side, and Right-Side must precede this procedure.

■ **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.

3

Separating Crankcase Halves

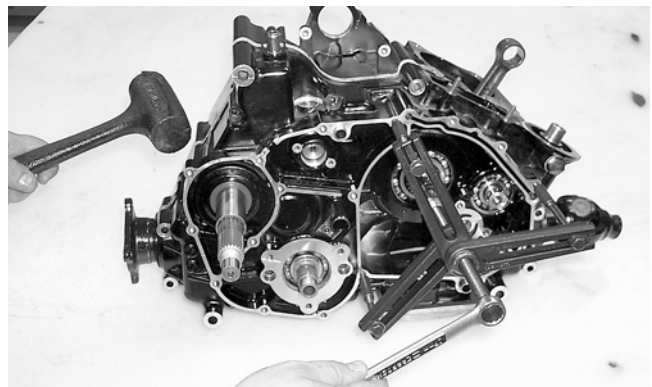
- Remove the two shift cam stoppers from the top of the crankcase.



CC661A

- Using the Crankcase Separator/Crankshaft Remover (p/n 0444-009) and tapping lightly with a rubber mallet, separate the crankcase halves. Account for two alignment pins.

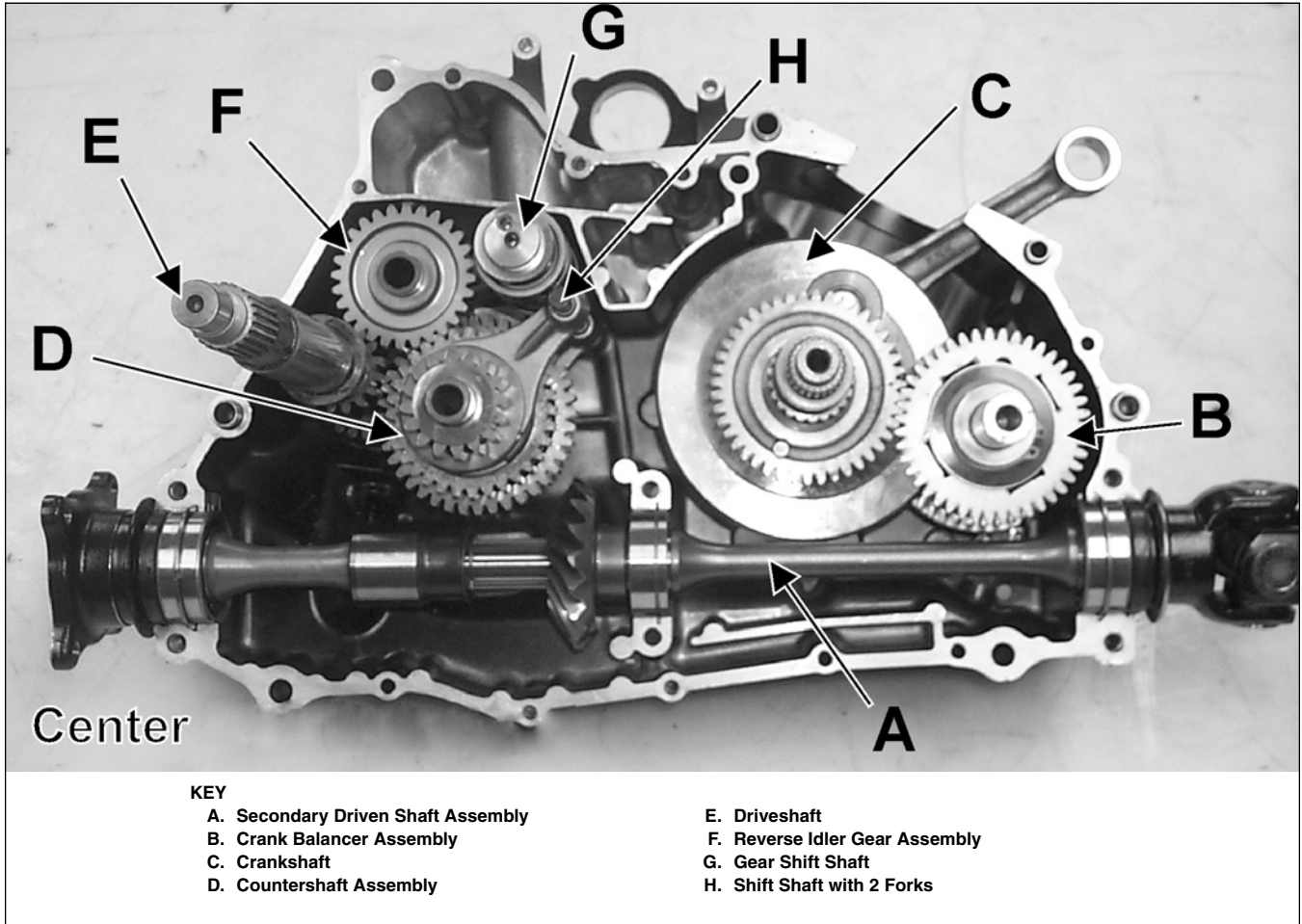
■ **NOTE:** To keep the shaft/gear assemblies intact for identification, tap the shafts toward the left-side crankcase half when separating the halves.



CC665

Disassembling Crankcase Half

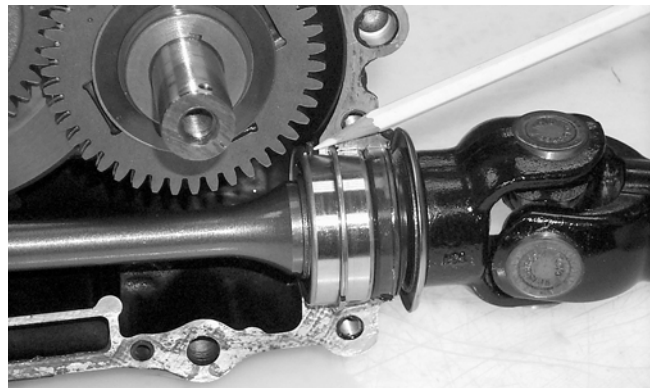
■ NOTE: For steps 1-7, refer to illustration CC821B.



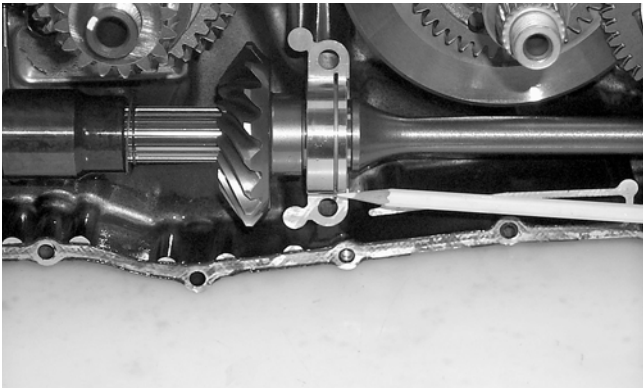
CC821B

■ NOTE: To aid in installing, it is recommended that the assemblies are kept together and IN ORDER.

1. Remove the secondary driven shaft assembly (A) noting the location of the bearing locating pins. Account for the bearing C-ring.

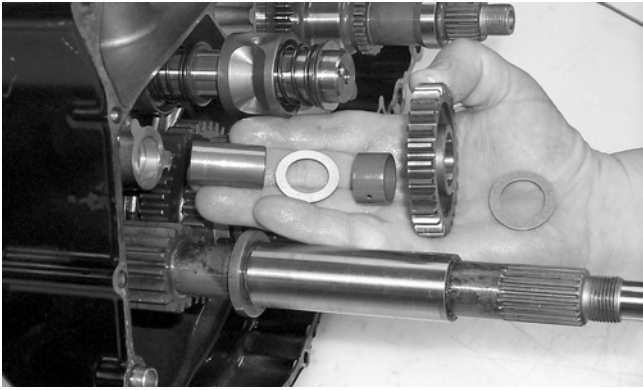


CC666



CC667

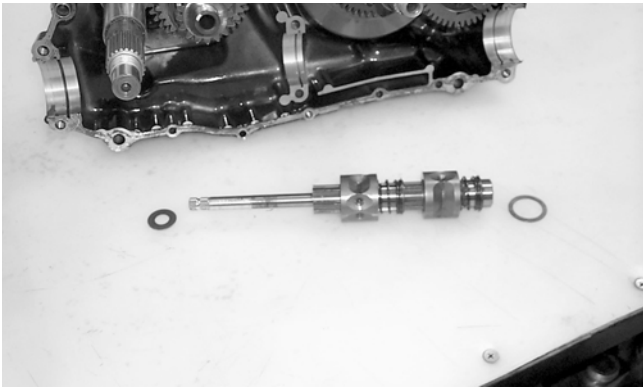
2. Remove the reverse idler gear assembly (F). Account for all washers, shaft, bushing, and the gear.



CC668

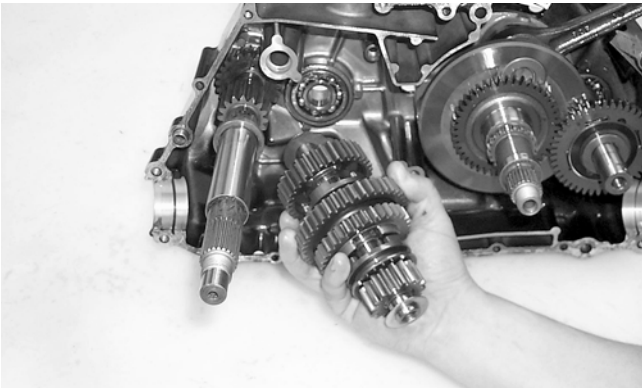
3. Remove the shift shaft (H); then remove the two forks taking note of the direction of the tabs on the forks for assembling purposes.

4. Remove the gear shift shaft (G) noting the location of the two holes on the end of the shaft. Account for two washers.



CC672

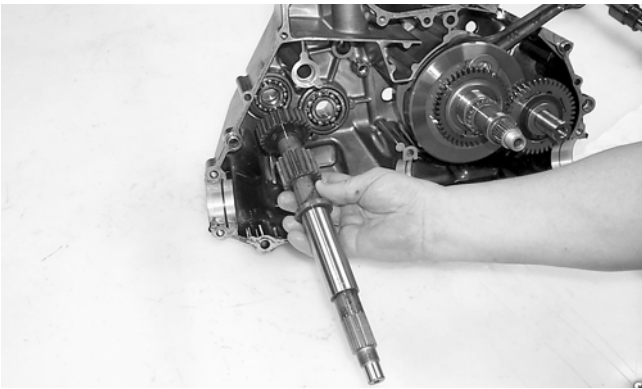
5. Remove the countershaft assembly (D). Account for a washer on each end of the countershaft.



CC674

■ **NOTE:** Do not disassemble the countershaft assembly unless necessary. If necessary, see Servicing Center Crankcase Components sub-section.

6. Using a rubber mallet, tap on the crankcase to remove the driveshaft.



CC675

7. Note the alignment dots on the crank balancer assembly (B) gear and crankshaft (C) gear for assembling purposes; then slide the crank balancer gear off the crank balancer. Account for the key in the keyway.

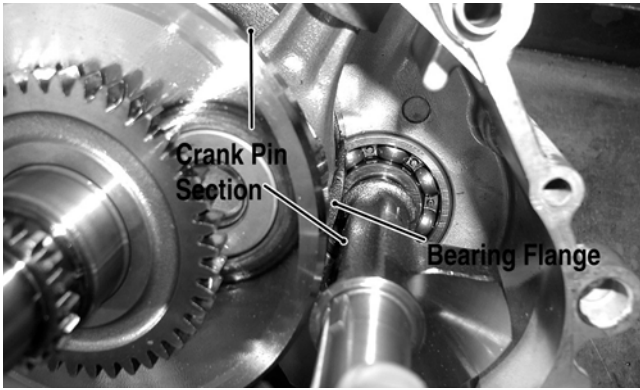


CD826

8. Remove the crank balancer.

■ **NOTE:** There is a flat spot on the crank balancer bearing flange to allow clearance past the crankshaft.

3



CD832B

9. Remove the snap ring securing the water pump driven gear shaft.



CC681

12. Remove the two cap screws securing the oil strainer; then remove the strainer.



CC679

10. Using a hydraulic press, remove the crankshaft assembly.

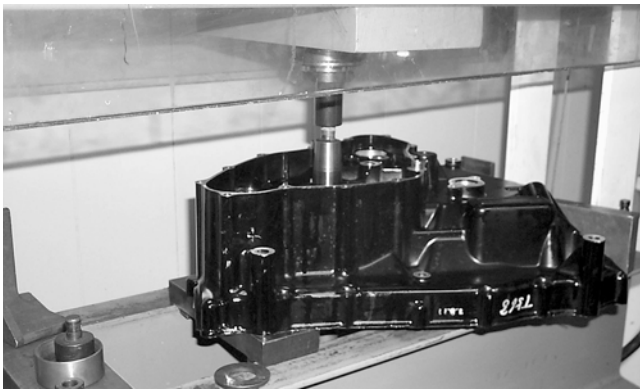
■ **NOTE:** Use a protective end cap to prevent damage to the crankshaft threads.



CC682

	<p>CAUTION</p>
<p>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.</p>	

13. To remove the assembly, remove the nut securing the secondary drive gear and secondary driven gear; then from the inside of the crankcase using a rubber mallet, remove the output shaft assembly. Account for the output shaft, two gears, a shim, a washer, and the nut.



CC680

11. Remove the cap screws securing the oil strainer cap; then remove the cap. Account for the cap O-ring.



CC683



CC686

■ **NOTE:** Whenever a valve is out of tolerance, it must be replaced.

Cleaning/Inspecting Valve Cover

■ **NOTE:** If the valve cover cannot be trued, the cylinder head assembly must be replaced.

1. Wash the valve cover in parts-cleaning solvent.
2. Place the valve cover on the Surface Plate (p/n 0644-016) covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the valve cover in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the valve cover in a figure eight motion until a uniform bright metallic finish is attained.

**Table of Contents
(Servicing Components)**

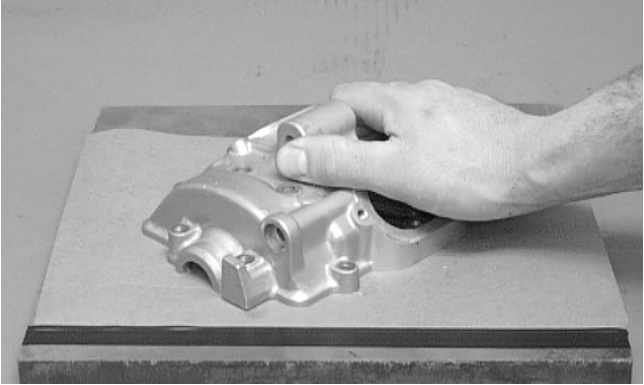
■ **NOTE:** Critical engine/transmission specifications are located at the beginning of this section.

- Servicing Top-Side Components 3-225
 - Valve Assembly 3-225
 - Piston Assembly 3-229
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⚠ 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.

3



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.

Servicing Top-Side Components

■ **NOTE:** Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

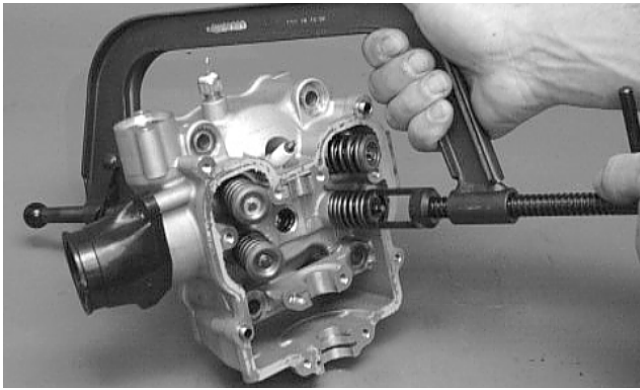
VALVE ASSEMBLY

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.

Removing Valves

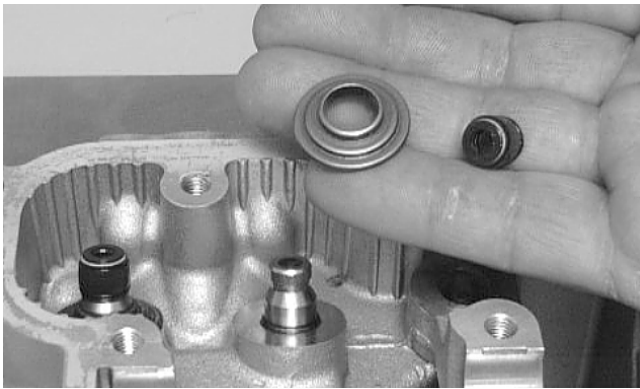
■ **NOTE:** Keep all valves and valve components as a set. Note the original location of each valve set for use during installation. Return each valve set to its original location during installation.

1. Using a valve spring compressor, compress the valve springs and remove the valve cotters. Account for an upper spring retainer.



CC132D

2. Remove the valve seal and the lower remaining spring seat. Discard the valve seal.



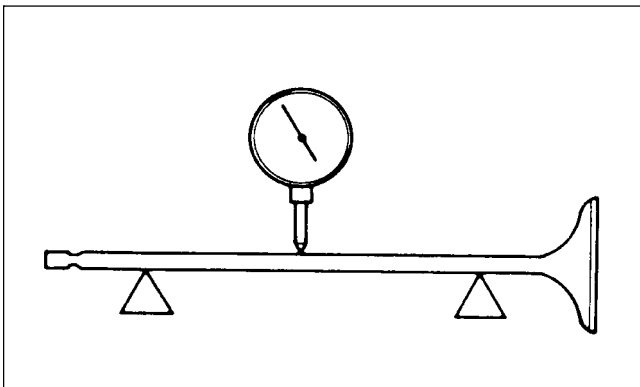
CC136D

■ **NOTE:** The valve seals must be replaced.

3. Remove the valve springs; then invert the cylinder head and remove the valves.

Measuring Valve Stem Runout

1. Support each valve stem end with the V Blocks (p/n 0644-022); then check the valve stem runout using a dial indicator.



ATV-1082

2. Maximum runout must not exceed specifications.

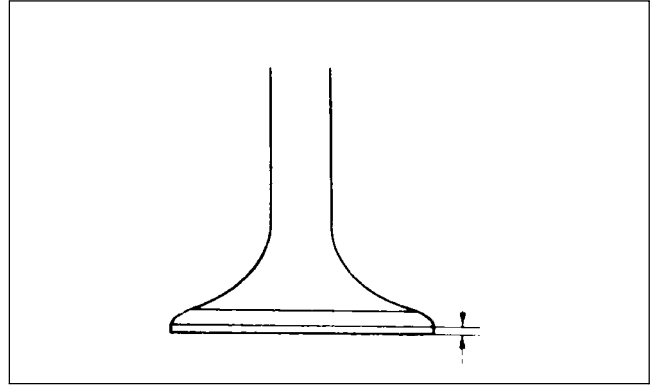
Measuring Valve Stem Outside Diameter

1. Using a micrometer, measure the valve stem outside diameter.

2. Acceptable diameter range (intake valve) must be within specifications.
3. Acceptable diameter range (exhaust valve) must be within specifications.

Measuring Valve Face/Seat Width

1. Using a micrometer, measure the width of the valve face.

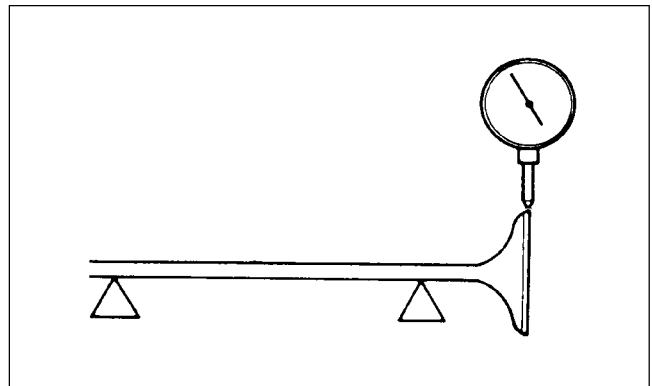


ATV-1004

2. Acceptable width range must be within specifications.

Measuring Valve Face Radial Runout

1. Mount a dial indicator on the surface plate; then place the valve stem on a set of V blocks.
2. Position the dial indicator contact point on the outside edge of the valve face; then zero the indicator.

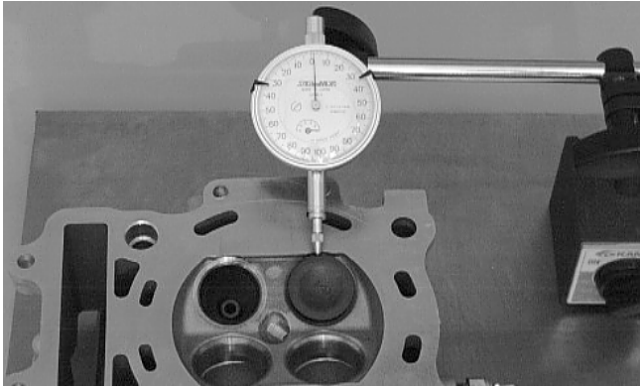


ATV1082A

3. Rotate the valve in the V blocks.
4. Maximum runout must not exceed specifications.

Measuring Valve Guide/Valve Stem Deflection (Wobble Method)

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.

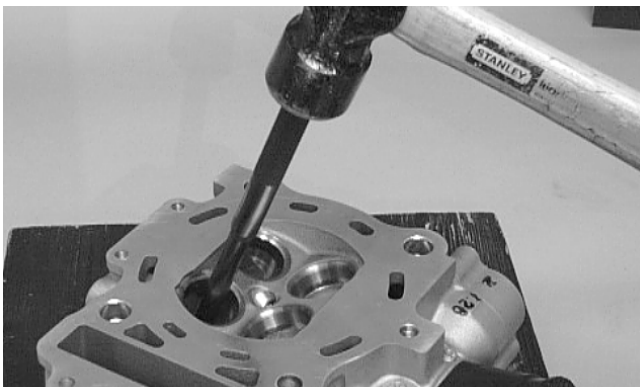
Measuring Valve Guide (Inside Diameter)

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.

Replacing Valve Guide

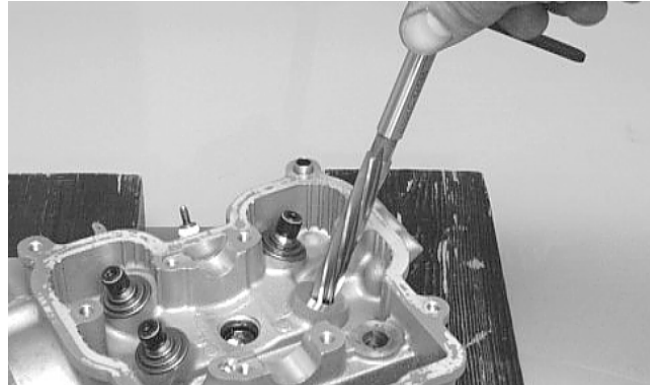
■ **NOTE:** If a valve guide is worn or damaged, it must be replaced.

1. If a valve guide needs replacing, insert a valve guide remover into the valve seat side of the valve guide. Using a hammer, gently drive the valve guide out of the cylinder head.



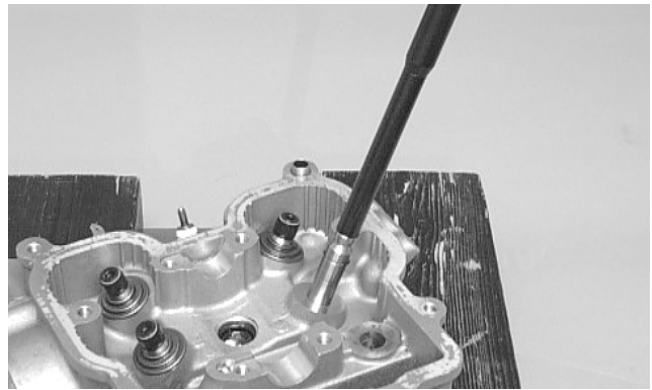
CC137D

2. Using the Standard Valve Guide Reamer (p/n 0444-017), remove any burrs or tight areas from the valve guide journals.



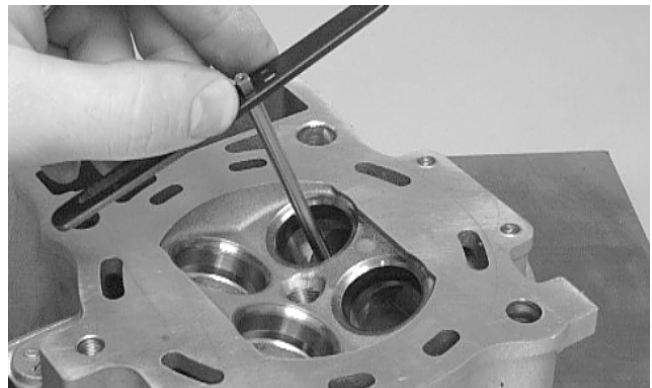
CC142D

3. To install a valve guide, use a valve guide installer and gently drive a valve guide with a retaining clip into the bore from the valve spring side until the retaining clip just contacts the cylinder head.



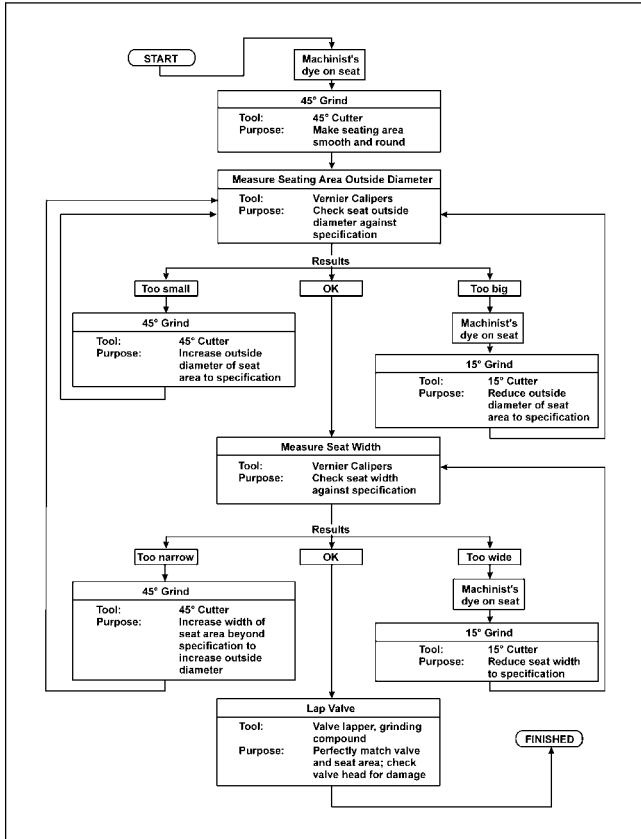
CC143D

4. After installing the guide, use the standard valve guide reamer to remove all burrs and tight areas that may remain in each valve guide.



CC138D

Valve Seat/Guide Servicing Flow Chart



ATV-0107

Grinding Valve Seats

■ **NOTE:** If the valve seat is beyond servicing, the cylinder head must be replaced.

1. Insert an exhaust valve seat pilot shaft into an exhaust valve guide. Slide an exhaust valve seat grinding tool onto the pilot shaft; then using light pressure on a driver handle and a deep socket, grind the exhaust valve seat until within specifications.

■ **NOTE:** Repeat procedure on the remaining exhaust valve seat.



CC139D

2. Insert an intake valve seat pilot shaft into one of the intake valve guides. Slide the intake valve seat grinding tool onto the pilot shaft; then using light pressure on a driver handle and a deep socket, grind the intake valve seat until within specifications.

■ **NOTE:** Repeat procedure on the remaining intake valve seat.



CC140D

Lapping Valves

■ **NOTE:** Do not grind the valves. If a valve is damaged, it must be replaced.

1. Remove all carbon from the valves.
2. Lubricate each valve stem with light oil; then apply a small amount of valve lapping compound to the entire seating face of each valve.
3. Attach the suction cup of a valve lapping tool to the head of the valve.
4. Rotate the valve until the valve and seat are evenly polished.
5. Clean all compound residue from the valve and seat.

Measuring Rocker Arm (Inside Diameter)

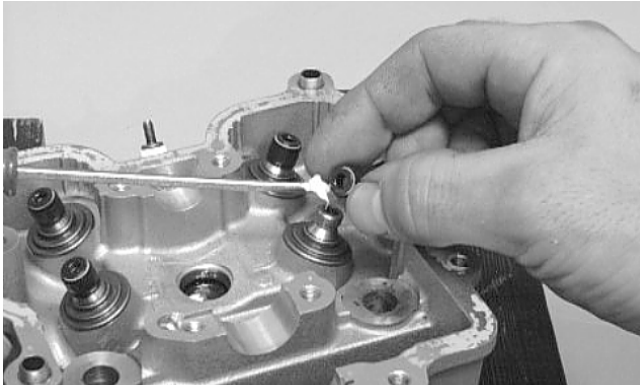
1. Using a dial calipers, measure the inside diameter of the rocker arm.
2. Acceptable inside diameter range must be within specifications.

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

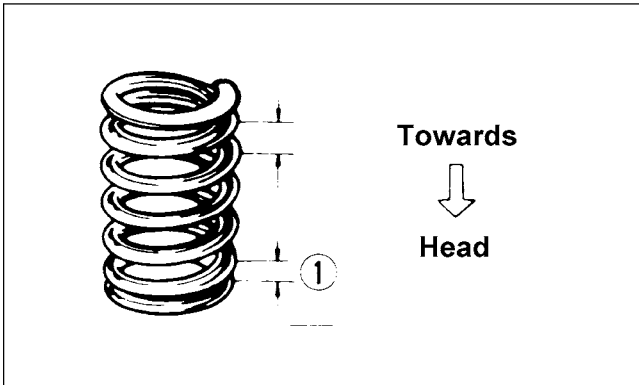
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



CC144D

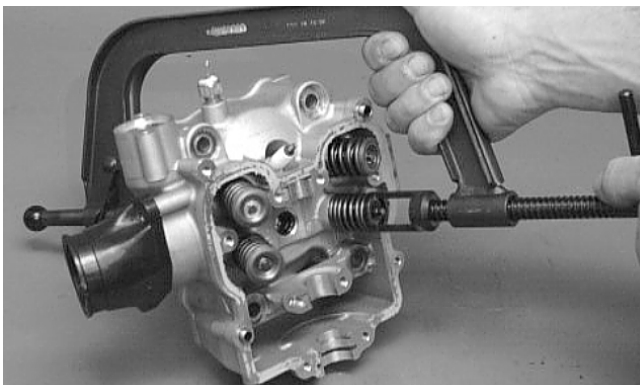
2. Insert each valve into its original valve location.
3. Install the valve springs with the painted end of the spring facing away from the cylinder head.

■ **NOTE:** If the painted end is not visible, install the ends of the springs with the closest coils toward the head.



ATV-1011A

4. Place a spring retainer over the valve springs; then using the valve spring compressor, compress the valve springs and install the valve cotters.



CC132D

PISTON ASSEMBLY

■ **NOTE:** Whenever a piston, rings, or pin are out of tolerance, they must be replaced.

Cleaning/Inspecting Piston

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the dome of the piston.
2. Inspect the piston for cracks in the piston pin, dome, and skirt areas.
3. Inspect the piston for seizure marks or scuffing. Repair with #400 grit wet-or-dry sandpaper and water or honing oil.



AN135

■ **NOTE:** If scuffing or seizure marks are too deep to correct with the sandpaper, replace the piston.

4. Inspect the perimeter of each piston for signs of excessive "blowby." Excessive "blowby" indicates worn piston rings or an out-of-round cylinder.

Removing Piston Rings

1. Starting with the top ring, slide one end of the ring out of the ring-groove.



CC400D

2. Remove each ring by working it toward the dome of the piston while rotating it out of the groove.

■ **NOTE:** If the existing rings will not be replaced with new ones, note the location of each ring for proper installation. When installing new rings, install as a complete set only.

Cleaning/Inspecting Piston Rings

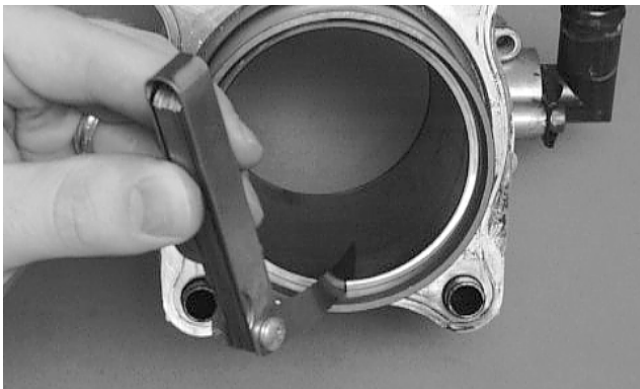
1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

CAUTION

Improper cleaning of the ring-grooves by the use of the wrong type of ring-groove cleaner will result in severe damage to the piston.

Measuring Piston-Ring End Gap (Installed)

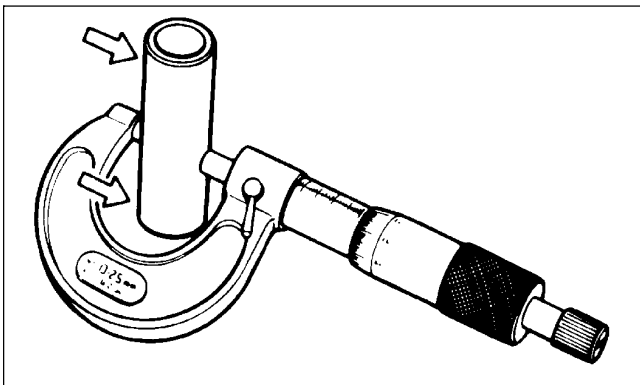
1. Place each compression ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must be within specifications.



CC280D

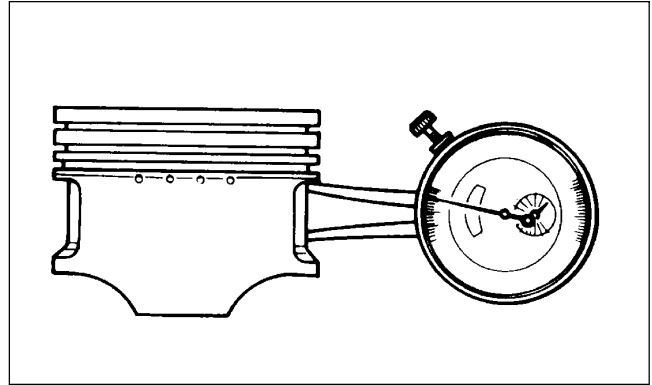
Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

1. Measure the piston pin outside diameter at each end and in the center. If measurement is not within specifications, the piston pin must be replaced.



ATV-1070

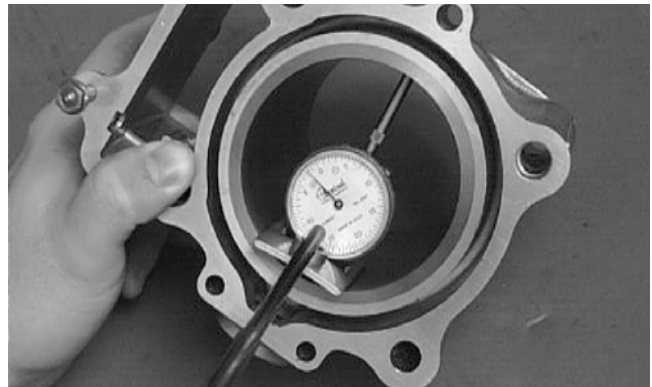
2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



ATV-1069

Measuring Piston Skirt/ Cylinder Clearance

1. Measure the cylinder front to back in six places.

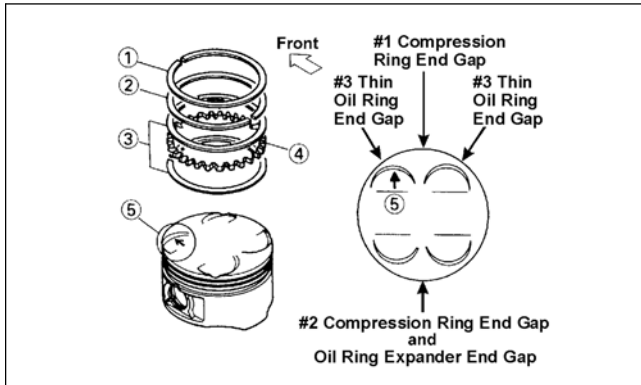


CC127D

2. Measure the corresponding piston diameter at a point 15 mm (0.6 in.) above the piston skirt at a right angle to the piston-pin bore. Subtract this measurement from the measurement in step 1. The difference (clearance) must be within specifications.

Installing Piston Rings

1. Install ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap. Stagger the end gaps of the upper and lower thin oil rings according to the illustration.

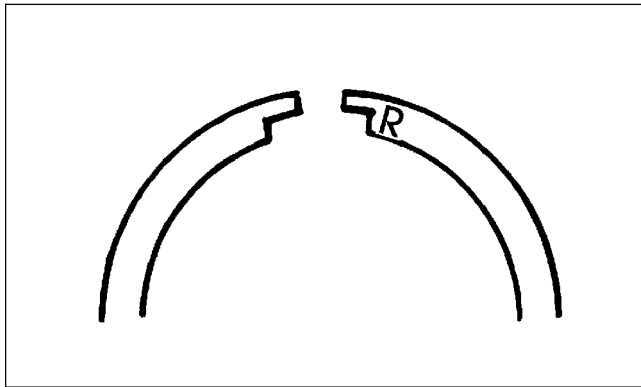


ATV-1085B

■ **NOTE:** Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.

2. Install the compression rings (1 and 2) so the letter on the top surface of each ring faces the dome of the piston. Rotate the rings until the ring end gaps are on directly opposite sides of the piston (see illustration).

■ **NOTE:** The chrome (silver) ring should be installed in the top position.



726-306A

CAUTION

Incorrect installation of the piston rings will result in engine damage.

CYLINDER/CYLINDER HEAD ASSEMBLY

■ **NOTE:** If the cylinder/cylinder head assembly cannot be trued, they must be replaced.

Cleaning/Inspecting Cylinder Head

CAUTION

The cylinder head studs must be removed for this procedure.

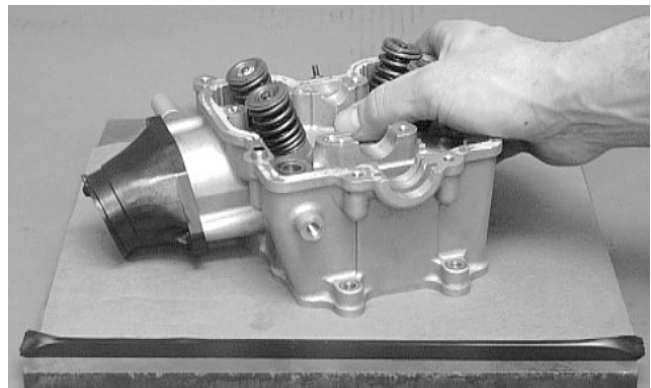
1. Using a non-metallic carbon removal tool, remove any carbon buildup from the combustion chamber being careful not to nick, scrape, or damage the combustion chamber or the sealing surface.

2. Inspect the spark plug hole for any damaged threads. Repair damaged threads using a “heli-coil” insert.

3. Place the cylinder head on the surface plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the cylinder head in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the cylinder head in a figure eight motion until a uniform bright metallic finish is attained.

CAUTION

Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.

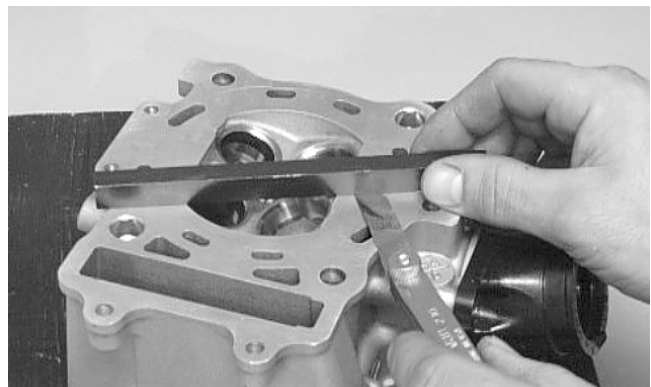


CC128D

3

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.

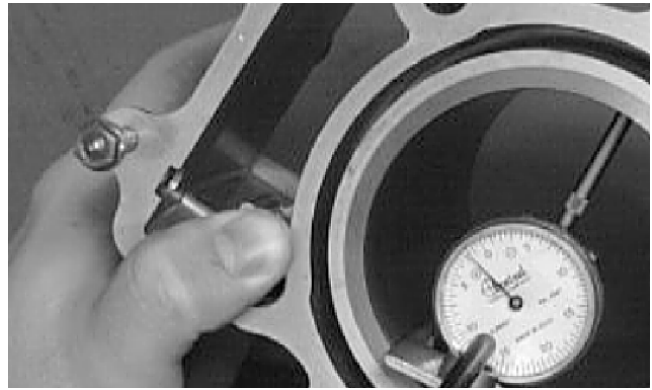


CC141D

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.



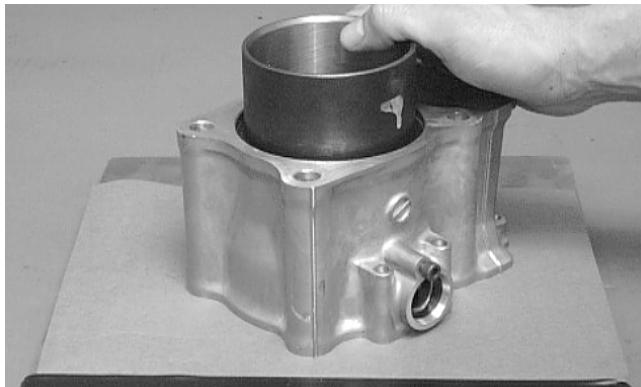
CC127D

⚠ 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.

2. Wash the cylinder in parts-cleaning solvent.
3. Inspect the cylinder for pitting, scoring, scuffing, and corrosion. If marks are found, repair the surface using a ball hone.

■ **NOTE:** To produce the proper 60° cross-hatch pattern, use a low RPM drill (600 RPM) at the rate of 30 strokes per minute. If honing oil is not available, use a lightweight petroleum-based oil. Thoroughly clean cylinder after honing using soap and hot water. Dry with compressed air; then immediately apply oil to the cylinder bore. If the bore is severely damaged or gouged, replace the cylinder.



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

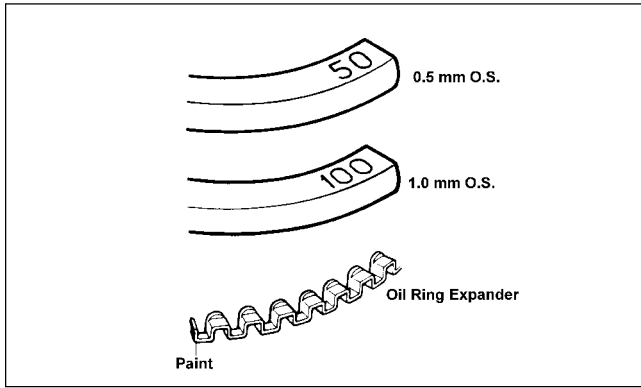
1. Using a slide gauge and a dial indicator or a snap gauge, measure the cylinder bore diameter in three locations from top to bottom and again from top to bottom at 90° from the first measurements for a total of six measurements. The trueness (out-of-roundness) is the difference between the highest and lowest reading. Maximum trueness (out-of-roundness) must not exceed specifications.



CC390D

4. If any measurement exceeds the limit, hone the cylinder and install an oversized piston or replace the cylinder.

■ **NOTE:** Oversized piston and rings are available. The oversized piston and rings are marked for identification.

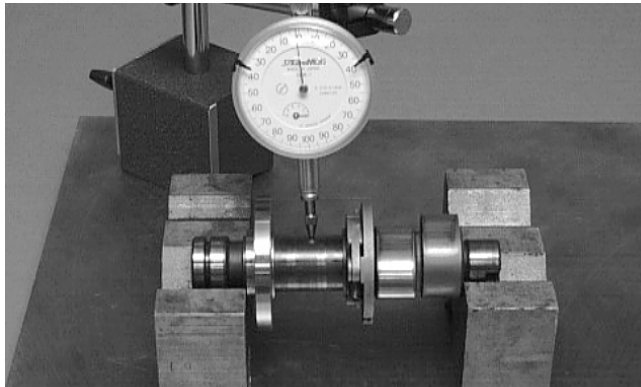


ATV-1068

Measuring Camshaft Runout

■ **NOTE:** If the camshaft is out of tolerance, it must be replaced.

1. Place the camshaft on a set of V blocks; then position the dial indicator contact point against the shaft and zero the indicator.

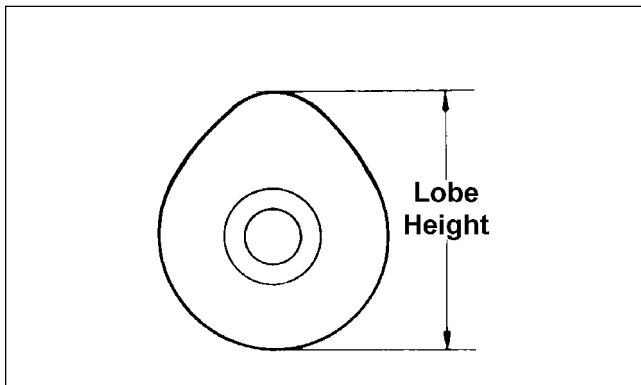


CC283D

2. Rotate the camshaft and note runout; maximum tolerance must not exceed specifications.

Measuring Camshaft Lobe Height

1. Using a calipers, measure each cam lobe height.



ATV1013A

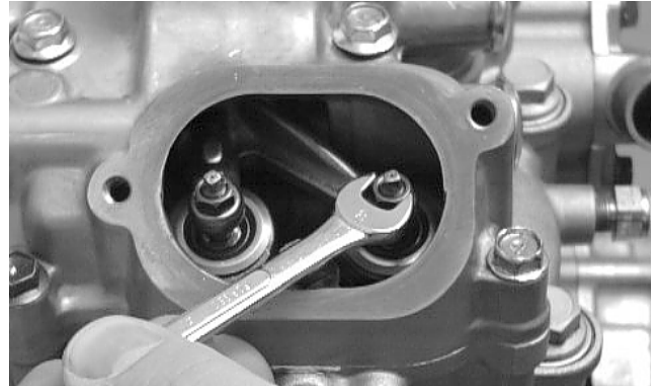
2. The lobe heights must not exceed minimum specifications.

Inspecting Camshaft Bearing Journal

1. Inspect the bearing journal for scoring, seizure marks, or pitting.
2. If excessive scoring, seizure marks, or pitting is found, the cylinder head assembly must be replaced.

Measuring Camshaft to Cylinder Head Clearance

1. Remove the adjuster screws and jam nuts.

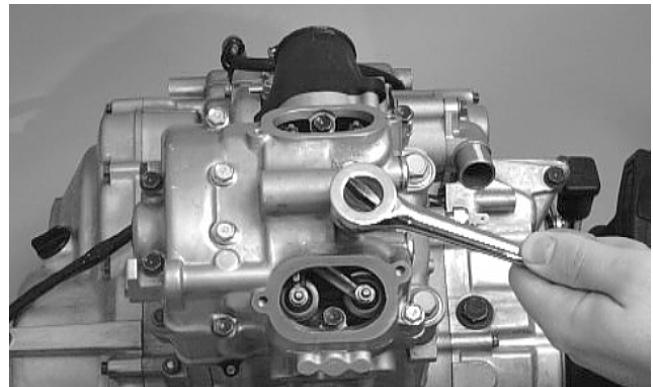


CC005D

2. Place a strip of plasti-gauge in each of the camshaft lands in the cylinder head.
3. Place the valve cover on the cylinder head and secure with the valve cover cap screws. Tighten securely.

■ **NOTE:** Do not rotate the camshaft when measuring clearance.

4. Remove the cap screws securing the valve cover to the cylinder; then remove the valve cover and camshaft.



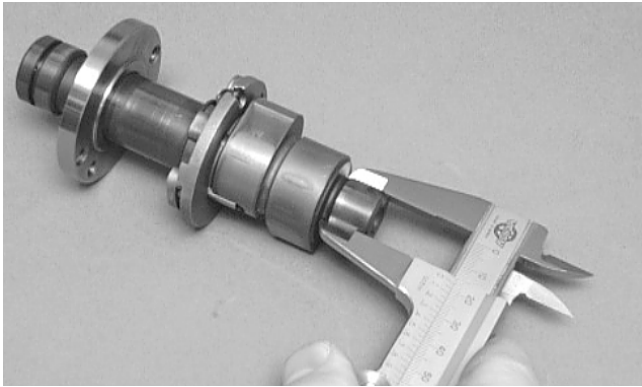
CC003D

5. Match the width of the plasti-gauge with the chart found on the plasti-gauge packaging to determine camshaft to cylinder head and valve cover clearance.



CC145D

6. If clearance is excessive, measure the journals of the camshaft.

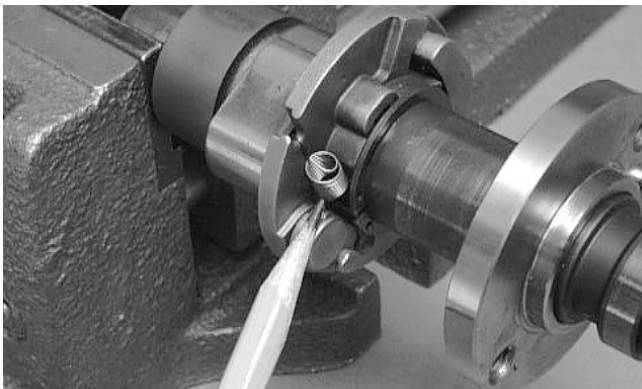


CC287D

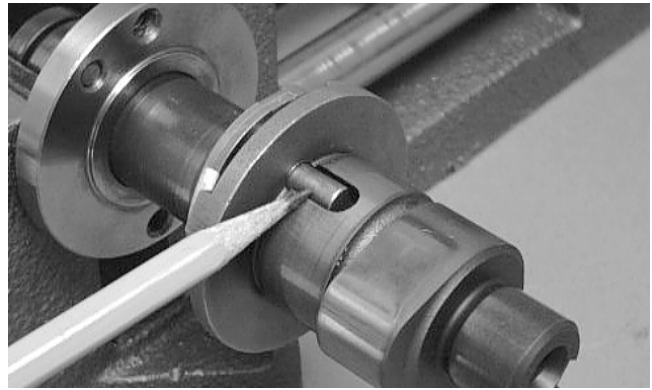
■ **NOTE:** If the journals are worn, replace the camshaft; then measure the clearance again. If it is still out of tolerance, replace the cylinder head.

Inspecting Camshaft Spring/Drive Pin

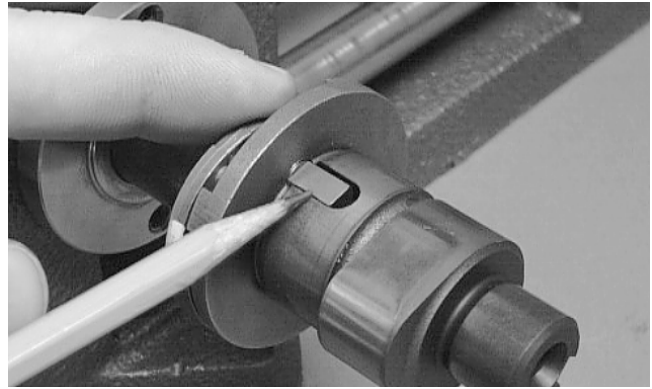
1. Inspect the spring and drive pin for damage.



CC304D



CC306D



CC308D

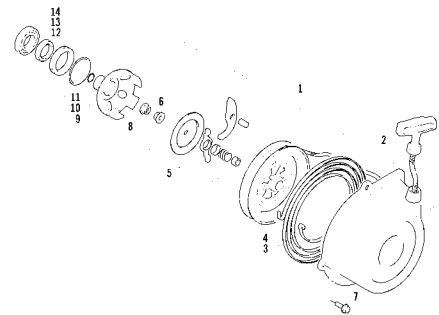
2. If damaged, the camshaft must be replaced.

Servicing Left-Side Components

RECOIL STARTER

KEY

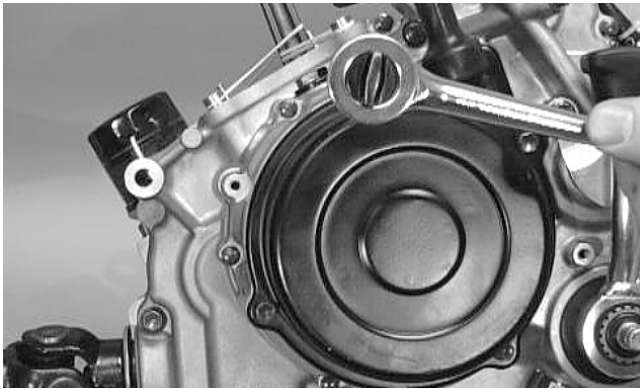
- 1. Recoil Starter Assy
- 2. Rope Assy
- 3. Spiral Spring
- 4. Reel
- 5. Ratchet Assy
- 6. Nut
- 7. Cap Screw
- 8. Nut
- 9. Starter Cup
- 10. O-Ring
- 11. O-Ring
- 12. Spacer
- 13. Oil Seal
- 14. Bearing



0737-764

Removing/Disassembling

1. Remove the cap screws securing the recoil starter assembly to the left-side cover; then remove the starter.

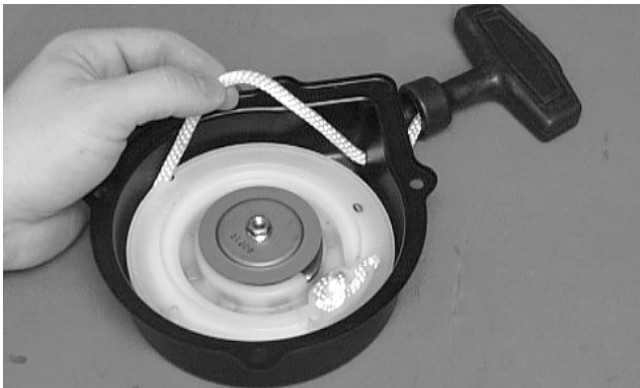


CC039D

⚠ WARNING

During the disassembly procedure, continuous downward pressure must be exerted on the reel so it does not accidentally disengage and cause injury.

2. Rotate the reel counterclockwise until the notch of the reel is near the rope guide in the case. Guide the rope into the notch and slowly allow the reel to retract until all spiral spring tension is released.

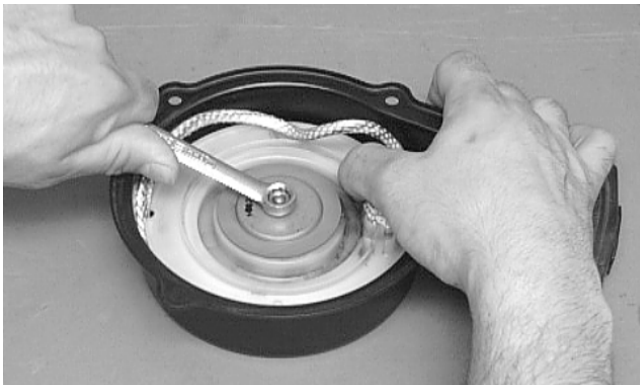


B600D

⚠ CAUTION

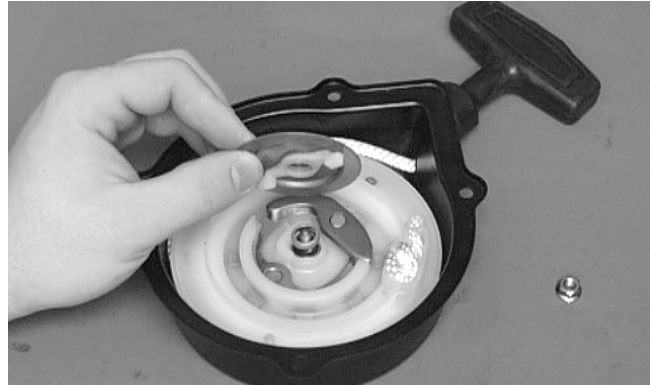
During the disassembly procedure, make sure all spring tension is released before continuing.

3. Remove the nut.



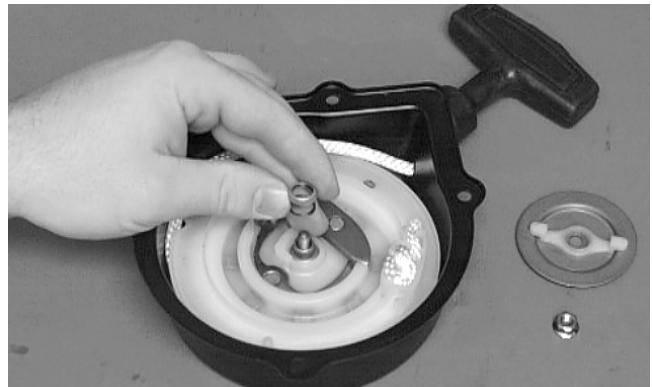
B601D

4. Slowly release the friction plate and lift the plate with ratchet guide free of the recoil case; then remove the ratchet guide from the friction plate.



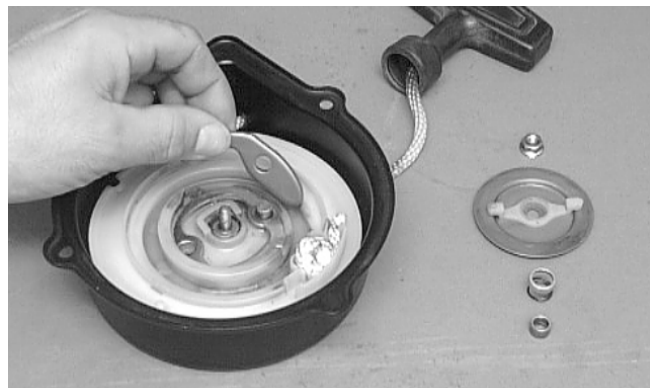
B602D

5. Remove the spring, collar, and friction spring.



B603D

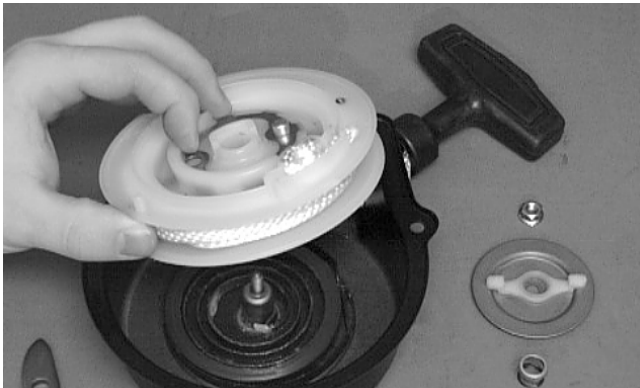
6. Remove the ratchet and account for the pin.



B604D

7. Carefully lift the reel from the case making sure the spiral spring does not accidentally disengage from the case.

3



B605D

⚠ WARNING

Care must be taken when lifting the reel free of the case. Wear safety glasses to avoid injury.

8. Remove the protective cover from the starter handle and pull the rope out of the handle; then untie the knot in the rope and remove the handle.

■ **NOTE:** Do not remove the spiral spring unless replacement is necessary. It should be visually inspected in place to save time. If replacement is necessary, follow steps 9-10.

9. Remove the spring from the case by lifting the spring end up and out. Hold the remainder of the spring with thumbs and alternately release each thumb to allow the spring to gradually release from the case.
10. Unwind the rope from the reel and remove the rope.

Cleaning and Inspecting

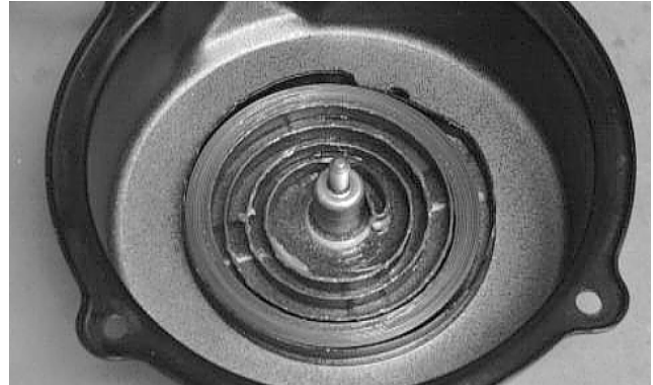
■ **NOTE:** Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

1. Clean all components.
2. Inspect the springs and ratchet for wear or damage.
3. Inspect the reel and case for cracks or damage.
4. Inspect the shaft for wear, cracks, or damage.
5. Inspect the rope for breaks or fraying.
6. Inspect the spiral spring for cracks, crystallization, or abnormal bends.
7. Inspect the handle for damage, cracks, or deterioration.

Assembling/Installing

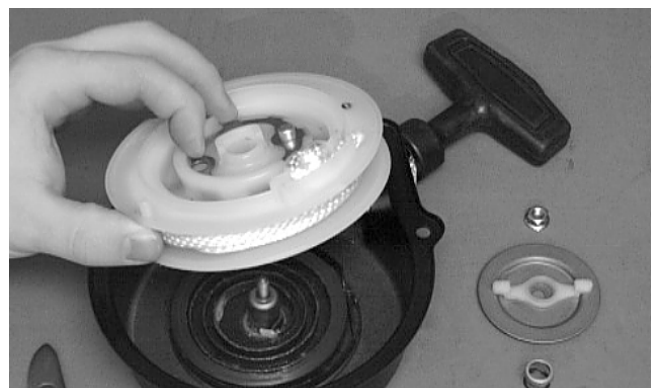
1. If removed, insert the spiral spring into the case with the outer end of the spring around the mounting lug in the case; then wind it in a counterclockwise direction until the complete spring is installed.

■ **NOTE:** The spiral spring must seat evenly in the recoil case.



B606D

2. Insert the rope through the hole in the reel and tie a knot in the end; then wrap the rope counterclockwise around the reel leaving approximately 50 cm (20 in.) of rope free of the reel.
3. Apply low-temperature grease to the spring and hub.
4. Thread the end of the rope through the guide hole of the case; then thread the rope through the handle and secure it with a double knot. Install the protective cover into the handle.
5. Align the inner hook of the spiral spring with the notch in the reel.



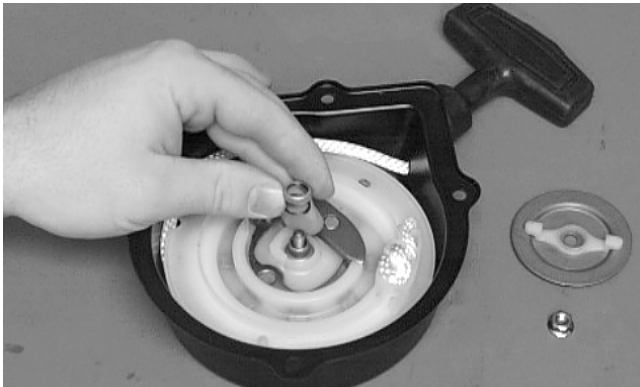
B605D

6. Install the ratchet making sure the end is properly installed on the reel.



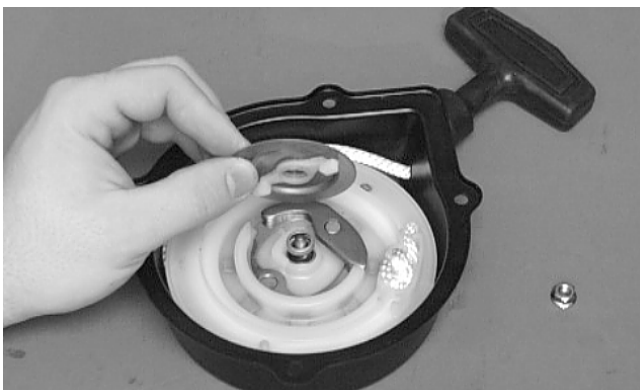
B604D

7. Install the friction spring and the spring cover.



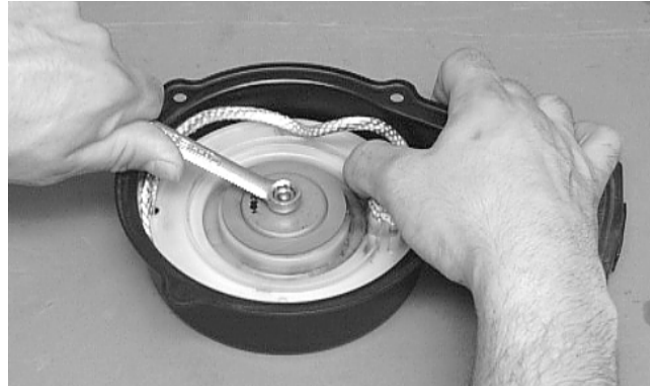
B603D

8. Install the friction plate with the ratchet guide fitting into the ratchet.



B602D

9. While pushing down on the reel, install the nut. Tighten securely.



B601D

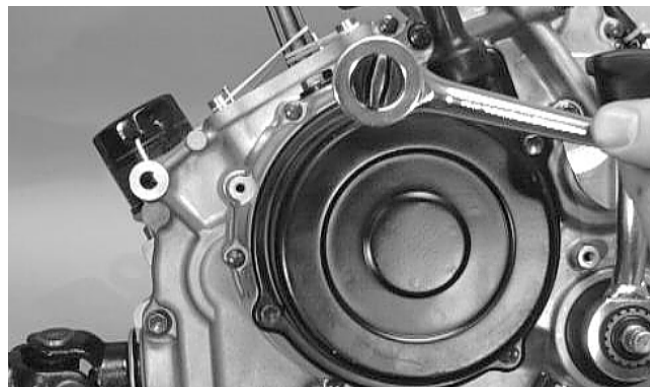
10. With the 50 cm (20 in.) of rope exposed, hook the rope in the notch of the reel.

11. Rotate the reel four turns counterclockwise; then release the rope from the notch and allow the rope to retract.

12. Pull the rope out two or three times to check for correct tension.

■ **NOTE:** Increasing the rotations in step 11 will increase spring tension.

13. Place the recoil starter assembly into position on the left-side cover; then tighten the cap screws to specifications.



CC039D

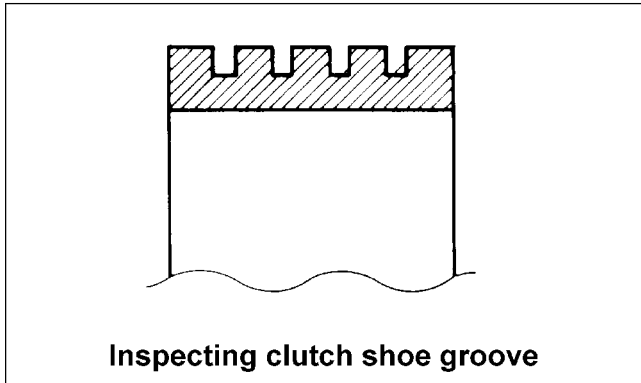
3

Servicing Right-Side Components

■ **NOTE:** Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.

INSPECTING CLUTCH SHOE

1. Inspect the clutch shoe for uneven wear, chips, cracks, or burns.
2. Inspect the groove on the shoe for wear or damage.
3. If any damage to the shoe or any groove wear is noted, the shoe must be replaced.



ATV1014

INSPECTING CLUTCH HOUSING

1. Inspect the clutch housing for burns, marks, scuffs, cracks, scratches, or uneven wear.
2. If the housing is damaged in any way, the housing must be replaced.

INSPECTING PRIMARY ONE-WAY DRIVE

1. Insert the drive into the clutch housing.
2. Rotate the inner race by hand and verify the inner race rotates only one direction.
3. If the inner race is locked in place or rotates both directions, the drive assembly must be replaced.

INSPECTING OIL PUMP

1. Inspect the pump for damage.
2. It is inadvisable to remove the screw securing the pump halves. If the oil pump is damaged, it must be replaced.



CC446D

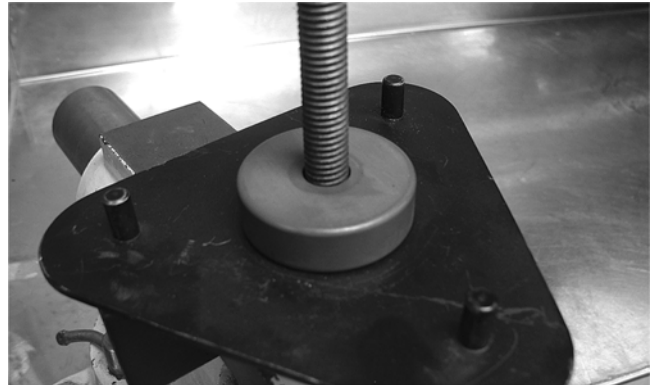
DRIVEN PULLEY ASSEMBLY

Disassembling

WARNING

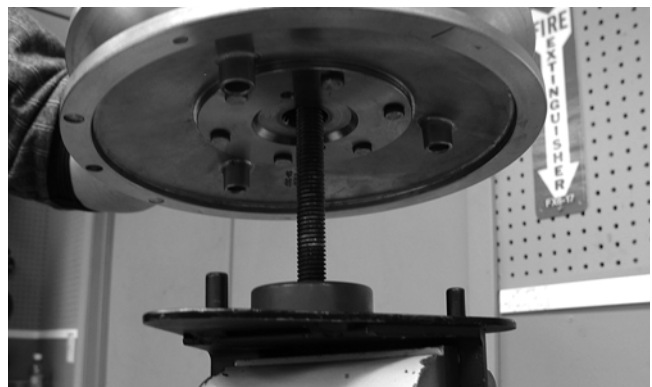
This procedure involves relaxing a compressed spring assembly. **DO NOT** attempt disassembling without the proper tools.

1. Secure Driven Pulley Compressor (p/n 0444-121) in a suitable holding fixture such as a bench vise; then remove the wing nut, holding handle, flat washer, and pilot bushing leaving the large spacer on the compressor tool base.



CD047

2. Place the driven pulley assembly onto the compressor tool base engaging the dowel pins into appropriate holes in the fixed face of the assembly.



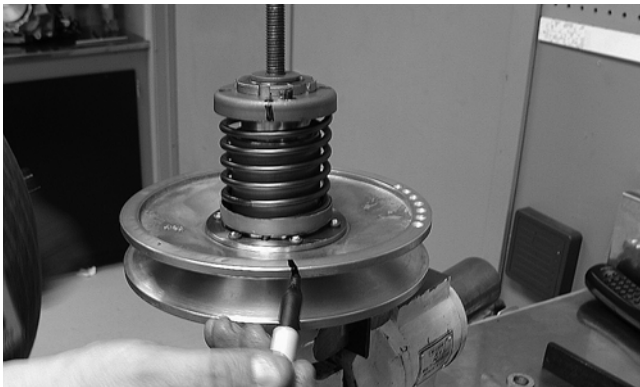
CD048

3. Install the pilot bushing with the machined end directed down; then fit the bushing into the pulley hub.



CD067

4. Using a suitable marking pen, make alignment marks on the fixed face spring holder and both pulley faces.



CD049

5. Place the holding handle on the spring holder fitting the two dowel pins into the spring holder face; then install a flat washer and the wing nut. Turn the wing nut down until resistance is felt.

■ **NOTE:** Do not use the wing nut to compress the spring further.



CD050

WARNING

The spring assembly is under pressure. Extreme care must be taken when relaxing the spring. Always wear safety glasses. Use proper tools only.

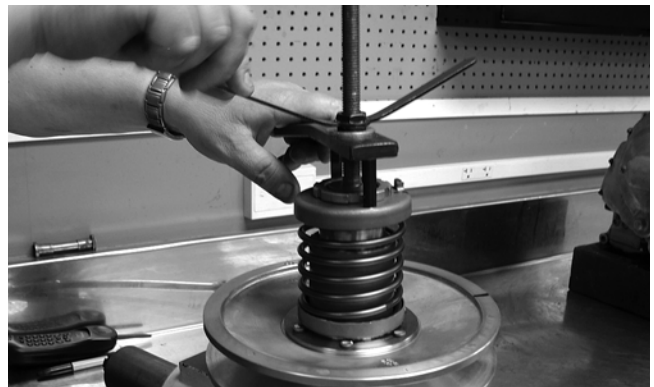
6. Using a spanner and suitable breaker bar, loosen the notched-ring nut; then spin the nut free of the hub.



CD051

7. Firmly hold the handle and slowly turn the wing nut counterclockwise to relax the spring.

■ **NOTE:** There will be a tendency for the handle to rotate clockwise approximately $\frac{1}{4}$ turn as the spring holder clears the flats or hub. This is due to a slight counterclockwise preload on the spring.



CD052

8. Release the preload slowly; then continue to relax the spring until the wing nut is flush with the end of the threads.

9. Firmly holding the spring and spring holder, remove the wing nut; then remove the spring.

3



CD053

10. Using a thin pry-bar or screwdriver, work the movable face sleeve upward and free of the O-rings; then remove the sleeve.

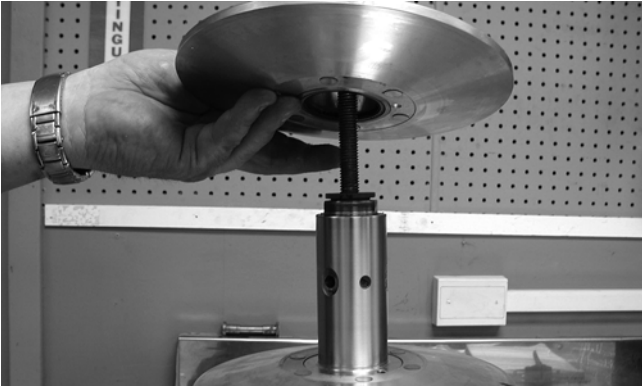


CD054

11. Remove the four pins and spacers from the cam slots in the movable face; then remove the movable face.



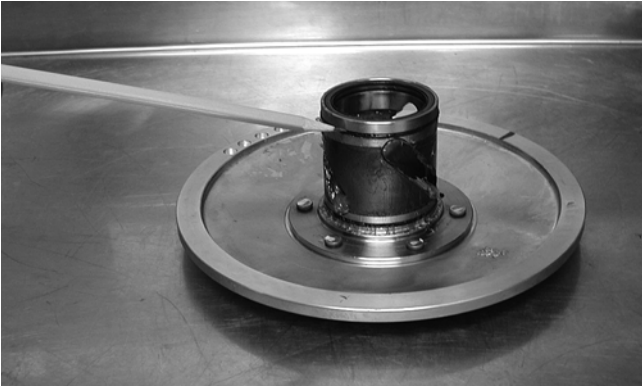
CD055



CD056

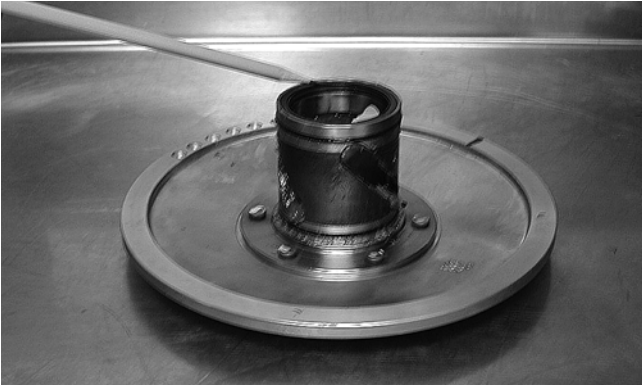
Inspecting

1. Inspect the pulley faces for wear, galling, or grooving.
2. Inspect the O-rings on the movable face for nicks, tears, or swelling.



CD057

3. Inspect two grease seals in the movable face for nicks, cuts, or damage.



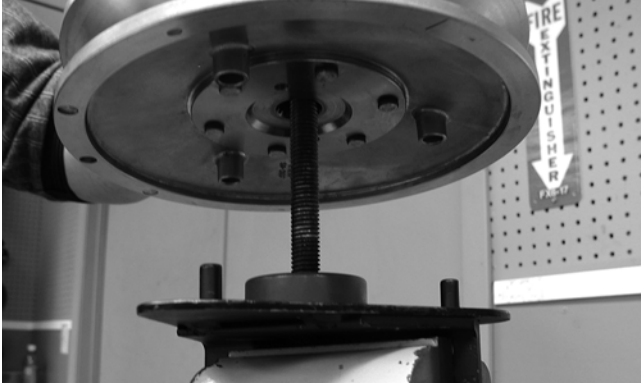
CD058

4. Inspect the pins and bushings for wear, flat spots, looseness, or cracking.

Assembling

1. Place the fixed face of the driven pulley on the pulley compressor base making sure the dowel pins are engaged in the appropriate holes in the pulley face.

■ **NOTE:** Make sure the spacer is on the base or damage to the fixed face will occur when the spring is compressed.



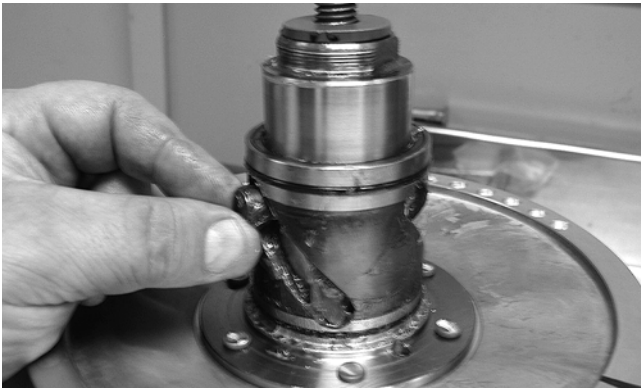
CD048

2. Apply multi-purpose grease to the O-rings and grease seals on the movable face; then install on the fixed face making sure the alignment marks are properly aligned.



CD060

3. Install the four pins and spacers into the fixed face hub; then pack the cam slots in the movable face with multi-purpose grease.



CD061

4. Install the movable face sleeve aligning the hole in the spring seat with the spring anchor hole in the movable face.



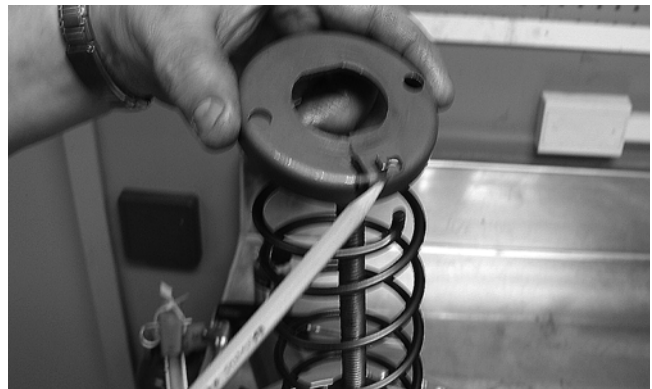
CD062

5. Install the spring over the hub and movable face sleeve; then insert the end of the spring through the sleeve and into the spring anchor hole in the movable face.



CD063

6. Place the spring holder on the spring engaging the spring end with the appropriate anchor hole.

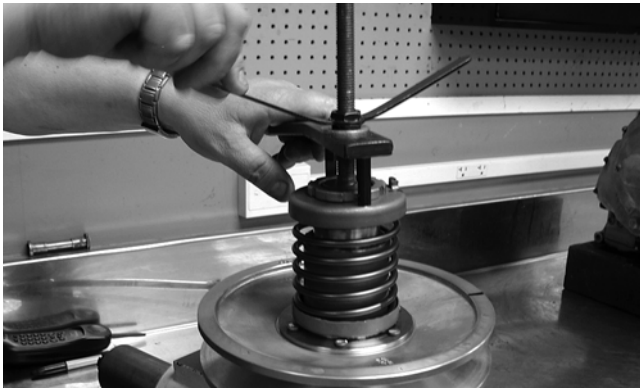


CD064

7. Assemble the notched-ring nut, spring holding handle, one flat washer, and the wing nut in order on the pulley compressor bolt; then thread the wing nut onto the bolt.

3

Servicing Center Crankcase Components



CD052

8. Compress the spring until the spring holder nears the threads on the fixed face hub; then using the handle, wind the spring holder counterclockwise to align the flats of the spring holder and hub.



CD065

9. Continue compressing the spring while guiding the spring holder onto the hub. When a slight resistance is felt, stop turning the wing nut.
10. Install the nut (threads coated with red Loctite #271); then tighten the nut to specification using the spanner and a torque wrench.



CD066

11. Remove the wing nut, washer, and holding handle; then remove the driven pulley from the pulley compressor.

■ **NOTE:** Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.

SECONDARY GEARS

■ **NOTE:** When checking and correcting secondary gear backlash and tooth contact, the universal joint must be secured to the front shaft or false measurements will occur.

Checking Backlash

■ **NOTE:** The rear shaft and bevel gear must be removed for this procedure. Also, always start with the original shims on the rear shaft.

1. Place the left-side crankcase cover onto the left-side crankcase half to prevent runout of the secondary transmission output shaft.
2. Install the secondary driven output shaft assembly onto the crankcase.
3. Mount the dial indicator so the tip is contacting a tooth on the secondary driven bevel gear.
4. While rocking the driven bevel gear back and forth, note the maximum backlash reading on the gauge.
5. Acceptable backlash range is 0.05-0.33 mm (0.002-0.013 in.).

Correcting Backlash

■ **NOTE:** If backlash measurement is within the acceptable range, no correction is necessary.

1. If backlash measurement is less than specified, remove an existing shim, measure it, and install a new thinner shim.
2. If backlash measurement is more than specified, remove an existing shim, measure it, and install a thicker shim.

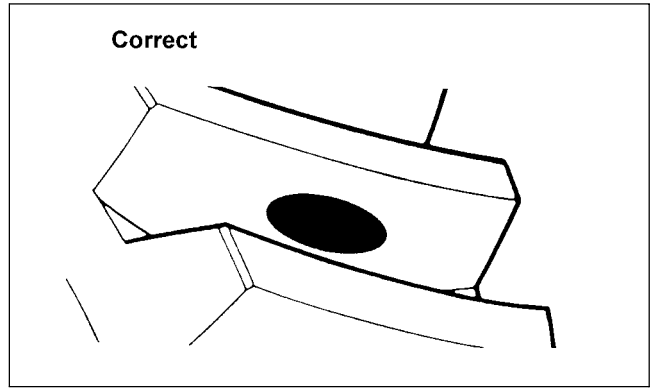
■ **NOTE:** Continue to remove, measure, and install until backlash measurement is within tolerance. Note the following chart.

Backlash Measurement	Shim Correction
Under 0.05 mm (0.002 in.)	Decrease Shim Thickness
At 0.05-0.33 mm (0.002-0.013 in.)	No Correction Required
Over 0.33 mm (0.013 in.)	Increase Shim Thickness

Checking Tooth Contact

■ **NOTE:** After correcting backlash of the secondary driven bevel gear, it is necessary to check tooth contact.

1. Remove the secondary driven output shaft assembly from the left-side crankcase half.
2. Clean the secondary driven bevel gear teeth of old oil and grease residue.
3. Apply a thin, even coat of a machinist-layout dye to several teeth of the gear.
4. Install the secondary driven output shaft assembly.
5. Rotate the secondary driven bevel gear several revolutions in both directions.
6. Examine the tooth contact pattern in the dye and compare the pattern to the illustrations.



ATV-0104

Correcting Tooth Contact

■ **NOTE:** If tooth contact pattern is comparable to the correct pattern illustration, no correction is necessary.

1. If tooth contact pattern is comparable to an incorrect pattern, correct tooth contact according to the following chart.

Tooth Contact	Shim Correction
Contacts at Top	Decrease Shim Thickness
Contacts at Root	Increase Shim Thickness

■ **NOTE:** To correct tooth contact, steps 1 and 2 (with NOTE) of “Correcting Backlash” must be followed and the above “Tooth Contact/Shim Correction” chart must be consulted.

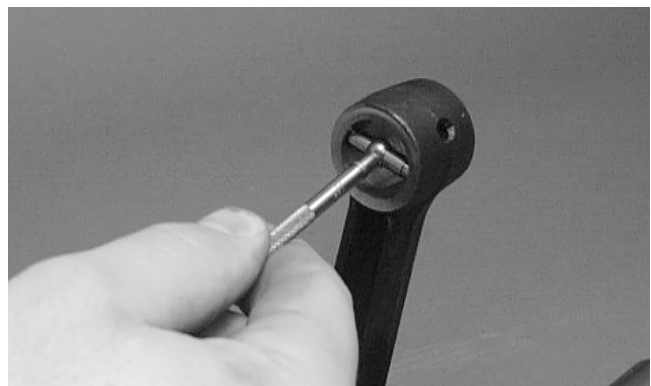
CAUTION

After correcting tooth contact, backlash must again be checked and corrected (if necessary). Continue the correcting backlash/correcting tooth contact procedures until they are both within tolerance values.

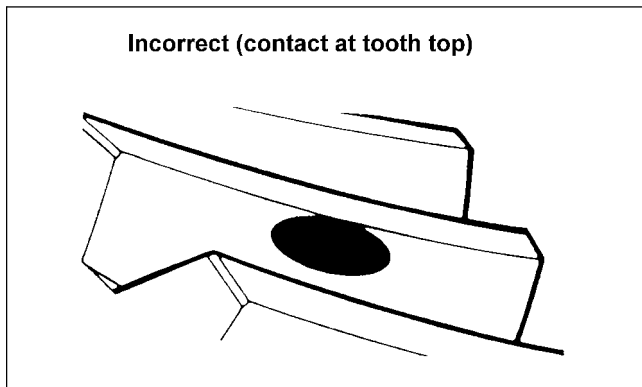
CRANKSHAFT ASSEMBLY

Measuring Connecting Rod (Small End Inside Diameter)

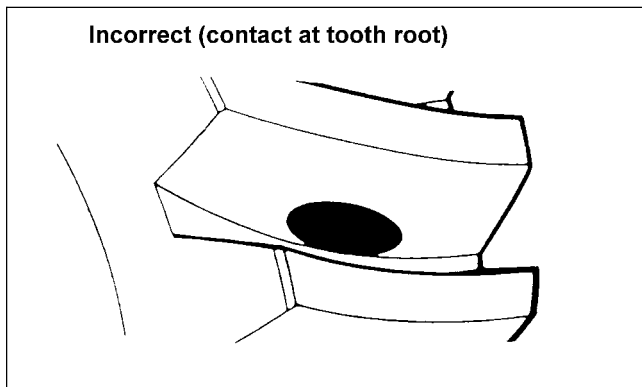
1. Insert a snap gauge into the upper connecting rod small end bore; then remove the gauge and measure it with micrometer.



CC290D



ATV-0103



ATV-0105

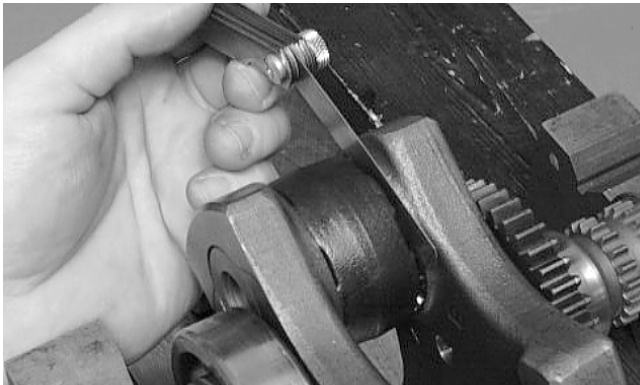
2. Maximum diameter must not exceed specifications.

Measuring Connecting Rod (Small End Deflection)

1. Place the crankshaft on a set of V-blocks and mount a dial indicator and base on the surface plate. Position the indicator contact point against the center of the connecting rod small end journal.
2. Zero the indicator and push the small end of the connecting rod away from the dial indicator.
3. Maximum deflection must not exceed specifications.

Measuring Connecting Rod (Big End Side-to-Side)

1. Push the lower end of the connecting rod to one side of the crankshaft journal.
2. Using a feeler gauge, measure the gap between the connecting rod and crankshaft journal.



CC289D

3. Acceptable gap range must be within specifications.

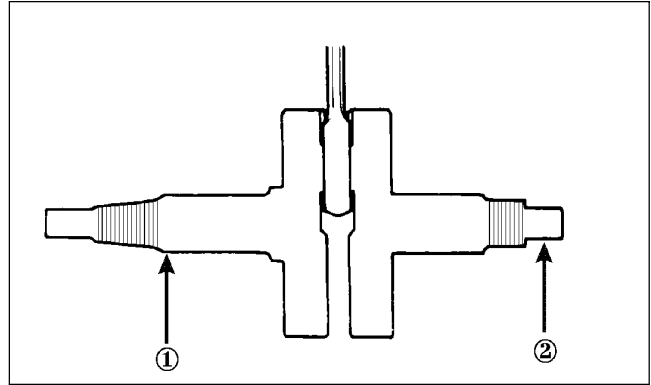
Measuring Connecting Rod (Big End Width)

1. Using a calipers, measure the width of the connecting rod at the big-end bearing.
2. Acceptable width range must be within specifications.

Measuring Crankshaft (Runout)

1. Place the crankshaft on a set of V blocks.

2. Mount a dial indicator and base on the surface plate. Position the indicator contact at point 1 of the crankshaft.



ATV-1074

3. Zero the indicator and rotate the crankshaft slowly.

CAUTION

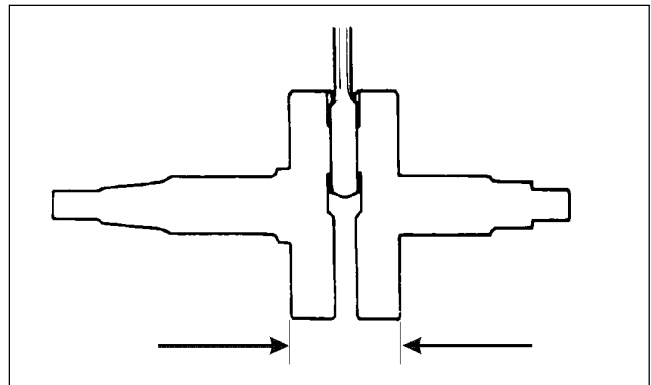
Care should be taken to support the connecting rod when rotating the crankshaft.

4. Maximum runout must not exceed specifications.

■ **NOTE:** Proceed to check runout on the other end of the crankshaft by positioning the indicator contact at point 2 and following steps 2-4.

Measuring Crankshaft (Web-to-Web)

1. Using a calipers, measure the distance from the outside edge of one web to the outside edge of the other web.



ATV-1017

2. Acceptable width range must be within specifications.

COUNTERSHAFT

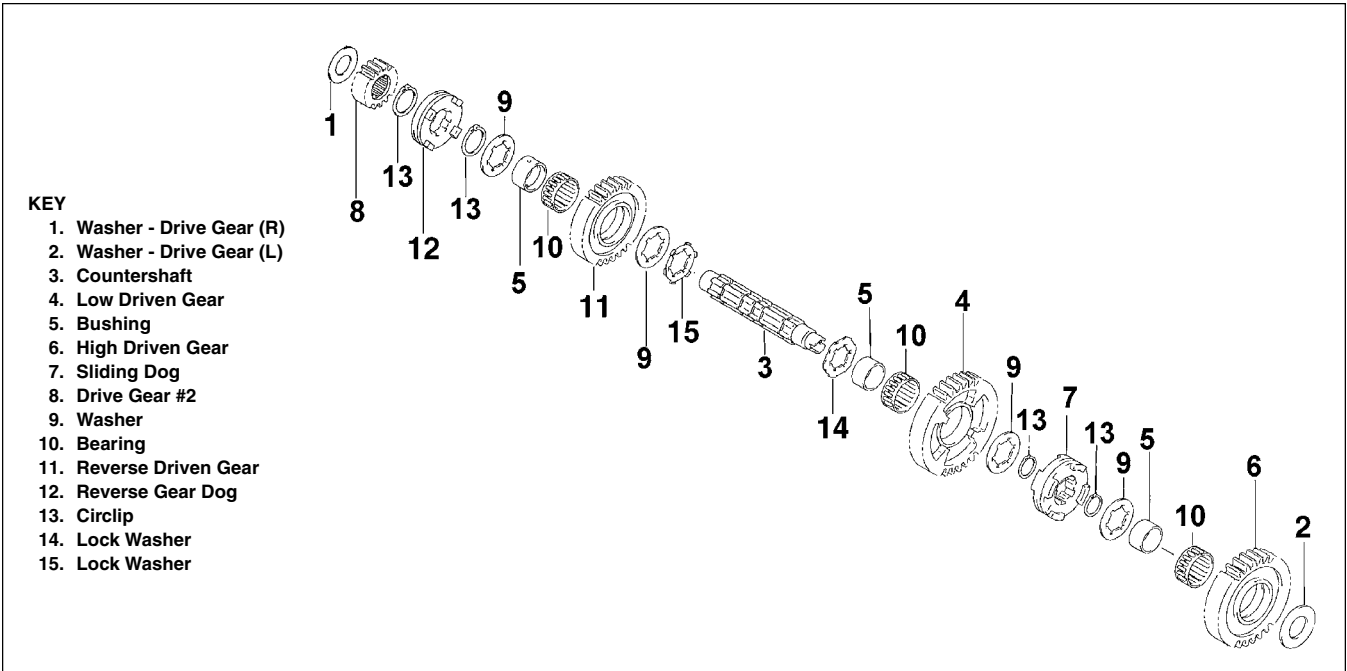
CAUTION

When disassembling the countershaft, care must be taken to note the direction each major component (dog, gear) faces. If a major component is installed facing the wrong direction, transmission damage may occur and/or the transmission will malfunction. In either case, complete disassembly and assembly will be required.

Disassembling

1. Remove drive gear #2; then remove the circlip securing the reverse gear dog.

Assembling



735-618A

3

1. Place the high driven gear onto the countershaft making sure the bearing, bushing, and washer are properly positioned. Secure with the circlip.
2. Place the sliding dog onto the countershaft; then secure with the circlip. Place the washer next to the circlip.
3. Place the low driven gear onto the countershaft making sure the bearing and bushing are properly positioned; then place the lock washers and washer onto the shaft.

2. Remove the reverse gear dog; then remove the circlip securing the reverse driven gear.
3. Remove the reverse driven gear and account for the washer, bushing, and bearing.
4. Remove the low driven gear washer and lock washers; then remove the low driven gear. Account for the bushing and bearing.
5. Remove the washer; then remove the circlip securing the sliding dog. Remove the sliding dog.
6. Remove the high driven gear circlip; then remove the high driven gear. Account for the washer, bushing, and bearing.

4. Place the reverse driven gear onto the countershaft making sure the bearing, bushing, and washer are properly positioned; then secure with the circlip.
5. Place the reverse gear dog onto the countershaft; then secure with the circlip.
6. Place drive gear #2 onto the countershaft.

NOTE: When installing the countershaft assembly, account for the washer on each end of the shaft.

Assembling Crankcase Half

1. Install the output shaft assembly into the crankcase making sure the two gears, shim, washer, and nut are properly sequenced.



CC686

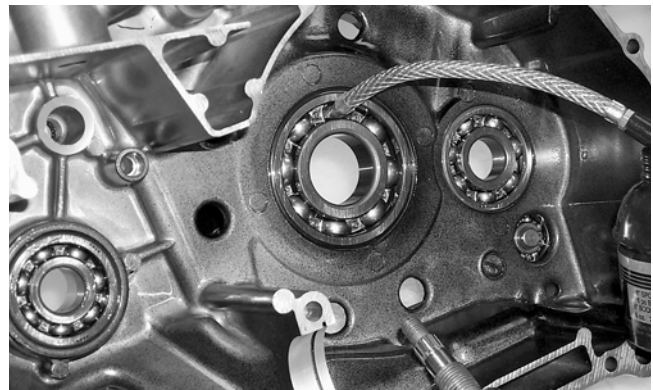
■ **NOTE:** The beveled side of the secondary drive gear must face upward.

2. Apply red Loctite #271 to the threads of the output shaft; then secure with the nut. Tighten nut to specifications; then using a punch, peen the nut.



CC687

3. Apply a liberal amount of engine oil to the crankshaft bearing. Using a propane torch, heat the bearing until the oil begins to smoke; then slide the crankshaft assembly into place.



CC688



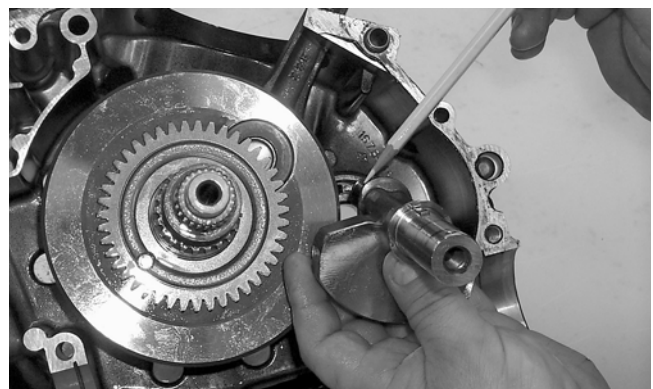
CC689

■ **NOTE:** If heating the bearing is not possible, the crankshaft can be installed using a crankshaft installing tool.



CC690

4. Install the crank balancer.



CC678

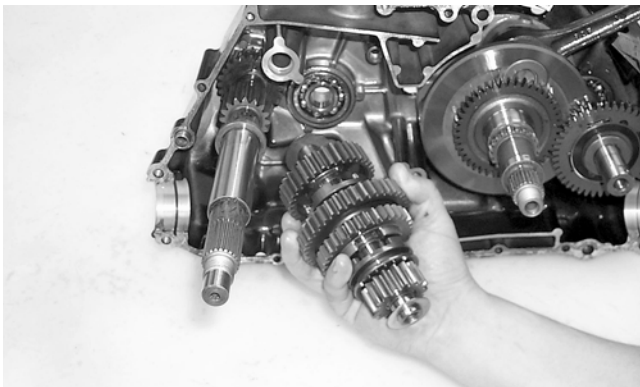
■ **NOTE:** It will be necessary to rotate the crank balancer until the counterweight is facing away from the crankshaft; then rotate the crankshaft clockwise into the journal area to allow the crank balancer to be fully seated.

- Place the key into the crank balancer keyway; then install the crank balancer gear making sure the alignment dots on the crank balancer gear and the crankshaft gear align.



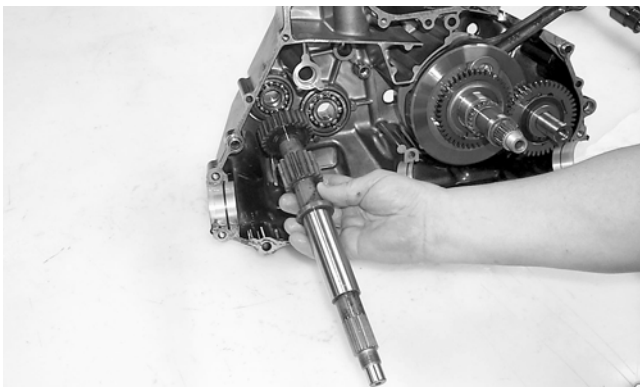
CC676

- Place a washer on each end of the countershaft assembly; then install the assembly.



CC674

- Install the driveshaft.



CC675

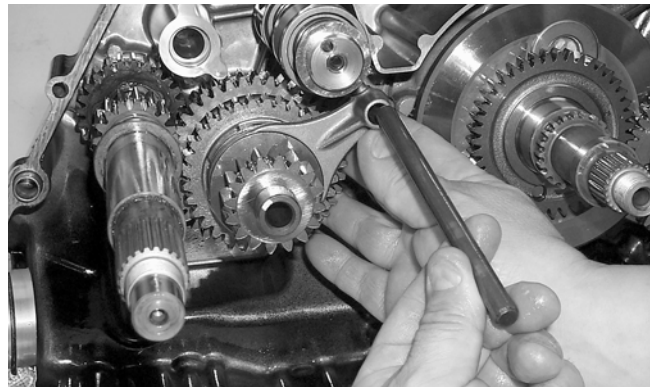
- Place a washer on each end of the gear shift shaft; then install the shaft assembly making sure the two holes on the end of the shaft are positioned vertically.



CC671

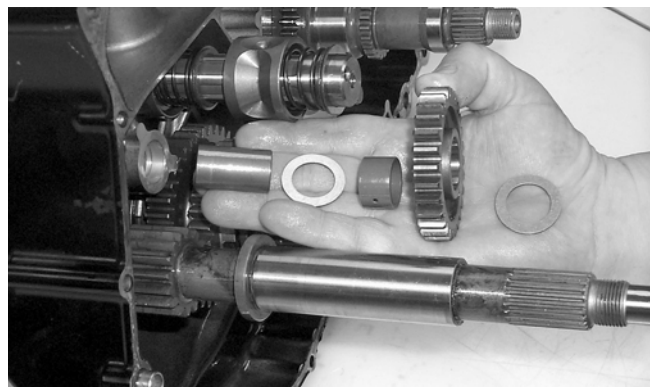
- Insert the two shift forks into the sliding dogs noting the direction of the tabs from disassembling; then install the shift fork shaft.

■ **NOTE:** Make sure the shift fork tabs face upward and that they are properly seated into the shift cams.



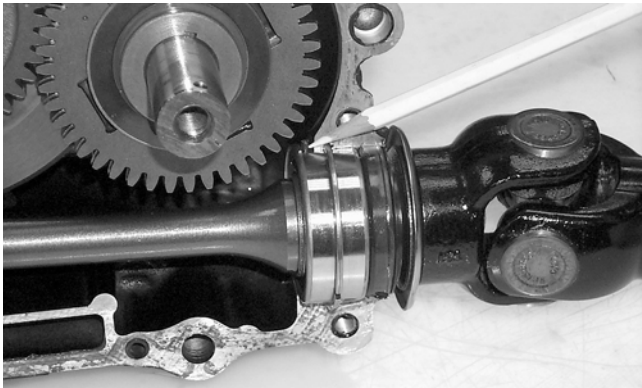
CC669

- Install the reverse idler gear assembly noting the positioning of the two washers, gear, bushing, and shaft.



CC668

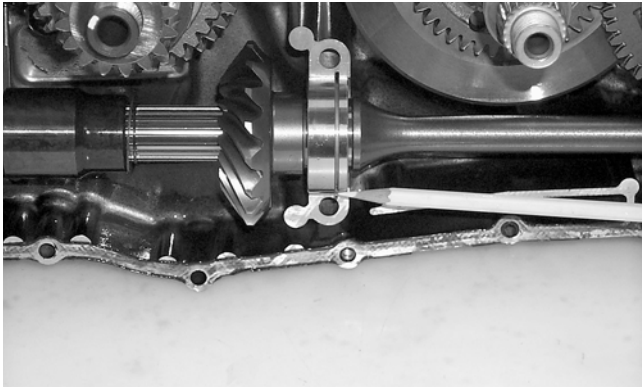
- Install the front and rear secondary driven shaft assemblies into the left side of the crankcase making sure the bearing locating pins are facing upward and the bearing C-ring is fully seated in the crankcase.



CC666



CC681



CC667

12. Place the oil strainer into position; then secure with the two screws.

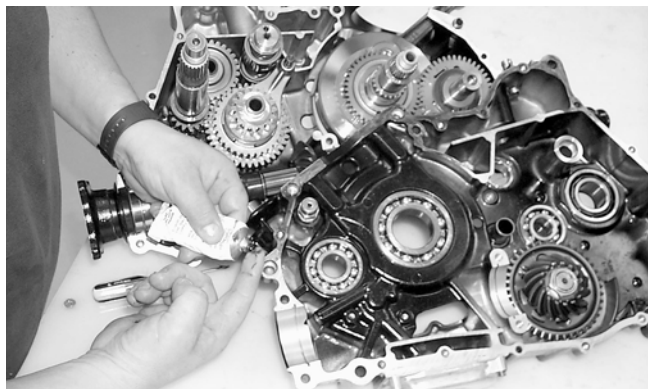


CC682

13. Place the oil strainer cap into position making sure the O-ring is in position; then secure the cap with cap screws. Tighten securely.

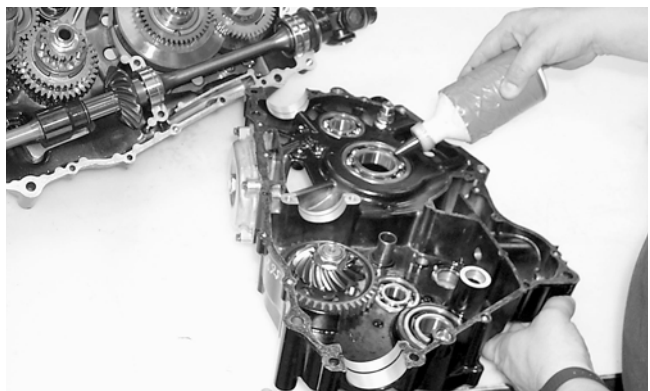
Joining Crankcase Halves

1. Apply High-Temp Sealant (p/n 0636-069) to the left-side mating surface.

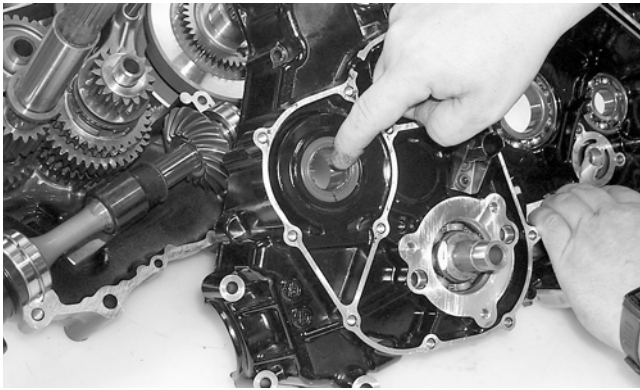


CC693

2. Lightly oil all bearings and grease all shafts in the right-side crankcase.



CC694



CC696

- Using a propane torch, heat the right-side crankshaft bearing until the oil begins to smoke; then join the two crankcase halves.



CC695

- Using a plastic mallet, lightly tap the case halves together until cap screws can be installed.
- From the right side, install the 8 mm cap screws; then tighten only until snug.

■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

- From the left side, install the remaining 8 mm cap screws (two inside the case); then tighten only until snug.

■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

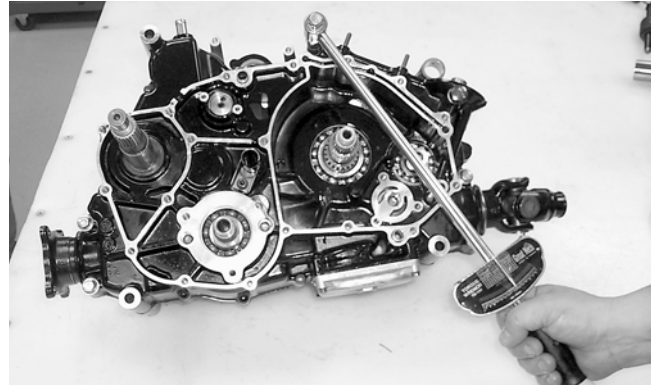
- From the left side, install the eight case half 6 mm cap screws; then tighten only until snug.

■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

- From the right side, install the 6 mm cap screws; then tighten only until snug.

■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

- In a crisscross/case-to-case pattern, tighten the 8 mm cap screws (from steps 5-6) until the halves are correctly joined; then tighten to specifications.



CC697

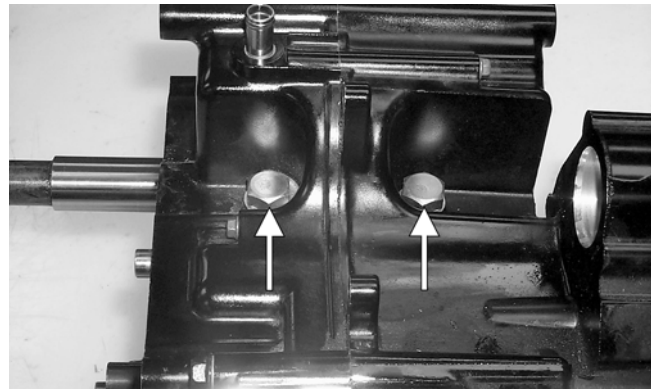
■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

- In a crisscross/case-to-case pattern, tighten the 6 mm cap screws (from steps 7-8) to specifications.

■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

- Using a liberal amount of grease, assemble the shift cam stoppers; then install them into the top of the engine.

■ **NOTE:** The grease will hold the springs and cam stoppers in position while installing the assemblies into the engine.



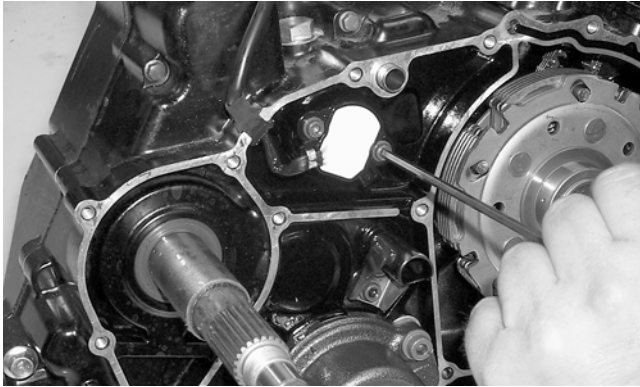
CC661A

AT THIS POINT

After completing center crankcase components, proceed to installing Right-Side Components, to installing Left-Side Components, and to installing Top-Side Components.

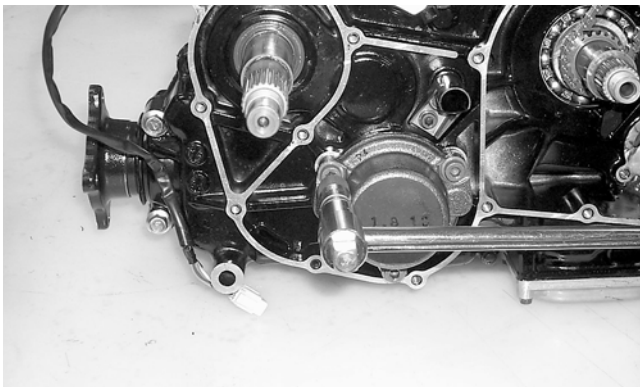
Installing Right-Side Components

1. Install the shift indicator sending unit making sure the two neutral contact pins and the two springs are properly positioned. Tighten the Allen-head screws securely.



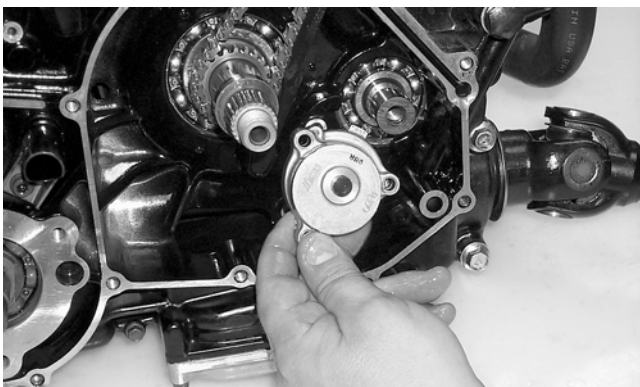
CC602

2. Install the secondary shaft bearing housing making sure the two alignment pins are properly positioned. Tighten the Allen-head screws securely.



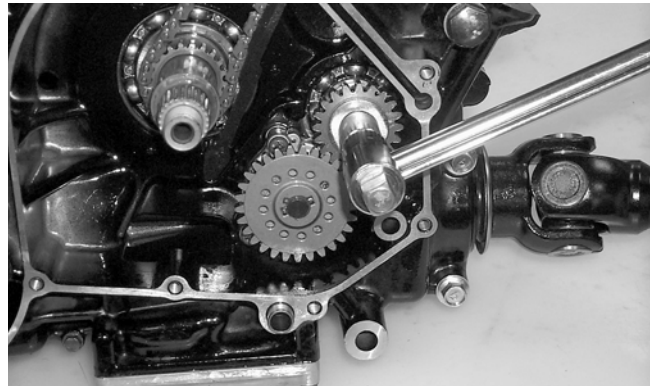
CC711

3. Install the oil pump onto the engine; then tighten the Phillips-head screws securely.



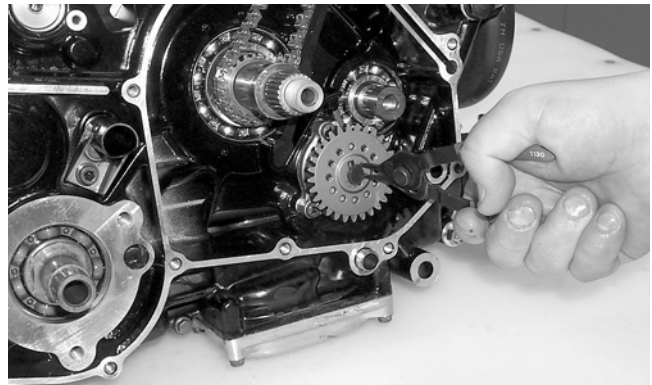
CC613

4. Install the oil pump drive gear spacer onto the crank balancer shaft. Grease the pin and insert it into the shaft; then install the drive gear making sure the raised side of the gear is facing toward the inside. Secure the gear with the cap screw (threads coated with red Loctite #271) and the washer. Tighten the cap screw to specifications.



CC712

5. Grease the driven gear pin and insert it into the oil pump shaft; then install the driven gear (noting the direction of the sides of the gear from removing). Secure with a snap ring.



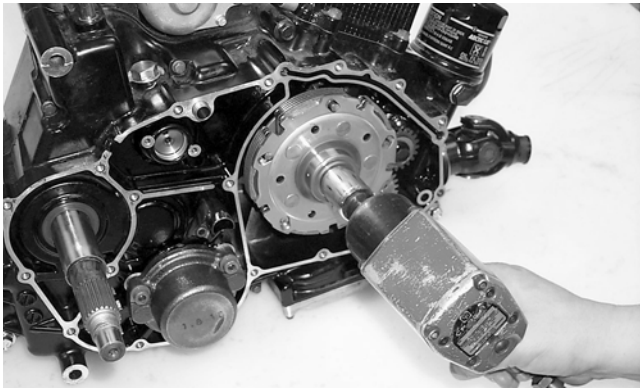
CC609

■ **NOTE:** When installed correctly, the sides of the drive and driven gears will be flush with each other.

6. Install the clutch shoe assembly and secure with the washer (with the flat side facing the assembly as noted in removing) and the nut (threads coated with red Loctite #271). Tighten to specifications.

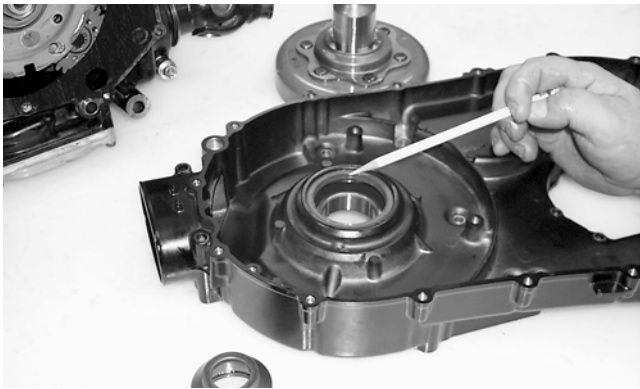
CAUTION

Care must be taken that the directional washer be installed correctly and note that the nut has left-hand threads.

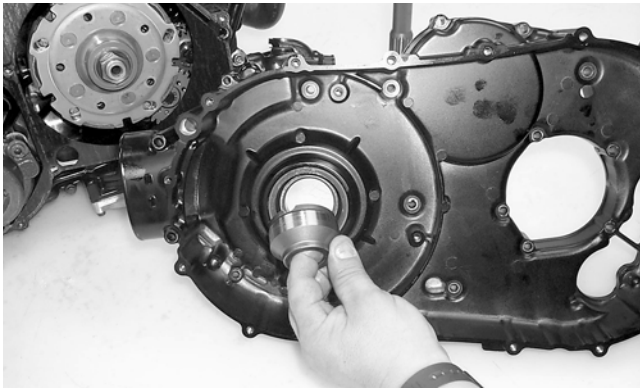


CC604

7. Lightly grease the clutch housing seal; then insert the left fixed drive spacer.

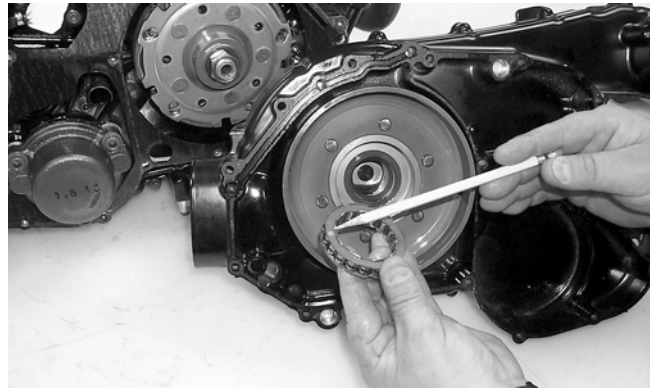


CC597



CC595

8. Install the clutch cover alignment pins into the crankcase, apply oil to the cover gasket, and install the gasket onto the crankcase.
9. Apply grease to the outer edges of the clutch housing; then from inside the clutch cover, install the clutch housing into the cover using a rubber mallet.
10. Install the one-way clutch onto the clutch shoe assembly.



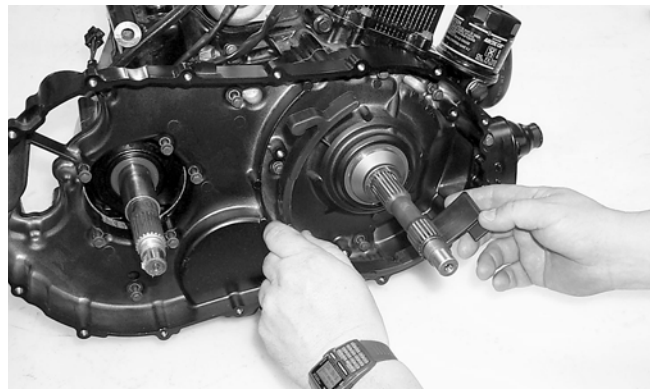
CC592

⚠ CAUTION

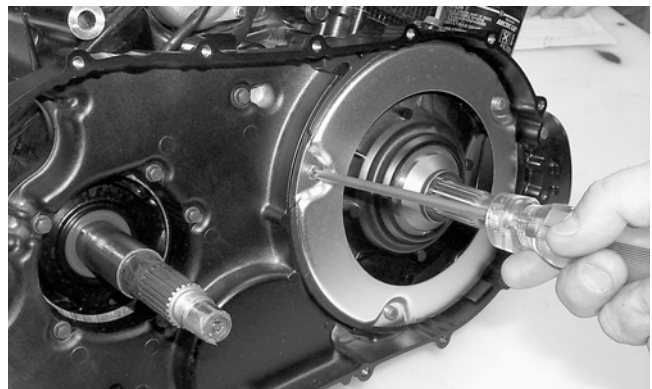
When installed correctly, the green alignment dot (or the word OUTSIDE) on the one-way clutch DOES NOT SHOW.

11. Place the clutch cover/clutch housing assembly into position on the crankcase; then secure with the cap screws making sure the different-lengthed cap screws are in their proper location. Tighten to specifications.
12. Place the air intake plate cushion into position; then install the air intake plate. Tighten the Phillips-head screws (threads treated with a small amount of red Loctite #271) securely.

3

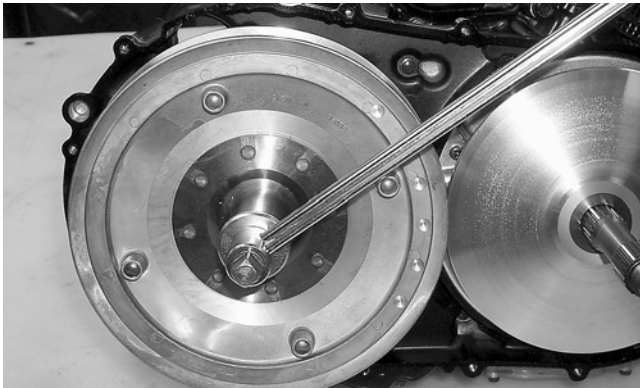


CC589



CC586

13. Place the driven pulley assembly into position and secure with the nut. Tighten to specifications.



CC726

14. Slide the fixed drive face onto the shaft.
15. Spread the faces of the driven pulley by pushing the inner face toward the engine while turning it counterclockwise; then when the faces are separated, insert a wedge (approximately 3/8 in. thick) between the faces. Release the inner face.



CC549

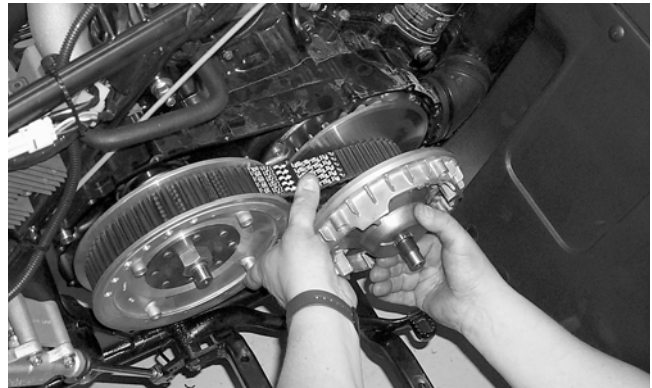
16. Place the V-belt into position on the driven pulley and over the front shaft.



CC550

■ **NOTE:** The arrows on the V-belt should point forward.

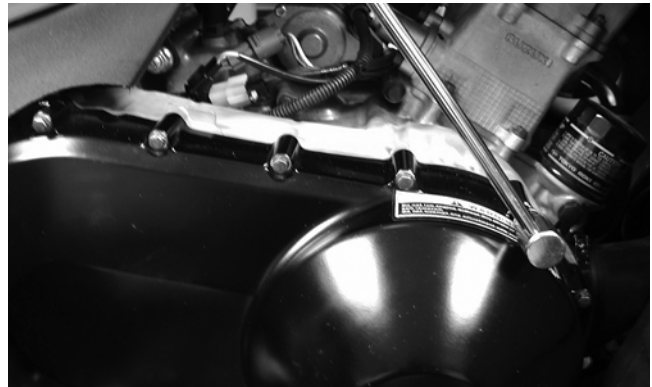
17. Pinch the V-belt together near its center and slide the spacer and movable drive face onto the shaft. Secure the drive face with a nut (threads coated with red Loctite #271). Tighten the nut to specifications.



CC552

■ **NOTE:** At this point, the wedge can be removed from between the driven pulley faces.

18. Rotate the V-belt and drive/driven assemblies until the V-belt is flush with the top of the driven pulley.
19. Place the V-belt cover gasket into position; then install the cover and secure with the cap screws making sure the different-lengthed cap screws are in their proper location. Tighten the cap screws to specifications.

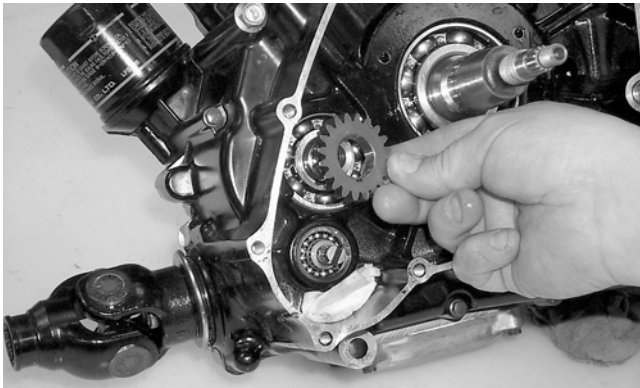


CD083

Installing Left-Side Components

■ **NOTE:** Plug the oil passage in the crankcase housing prior to installing the drive gear/driven gear assembly to prevent loss of an alignment pin.

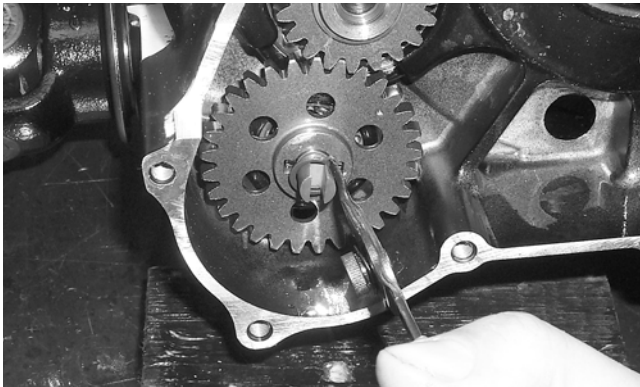
1. Install the water pump drive gear alignment pin and the drive gear (with the flat side of the gear facing outward as noted in removing); then secure with the snap ring.



CC641

■ **NOTE:** The sharp side of the snap ring should be facing outward.

2. Install the water pump driven gear alignment pin and the driven gear (with the beveled side of the gear facing outward as noted in removing); then secure with the snap ring.



CC845

■ **NOTE:** The sharp side of the snap ring should be facing outward.

■ **NOTE:** Once the gears are secured, remove the oil passage plug from the crankcase.

3. Install the two starter gear shafts; then install the two starter gears (with the beveled side of the intermediate gear facing inward as noted in removing).



CC636

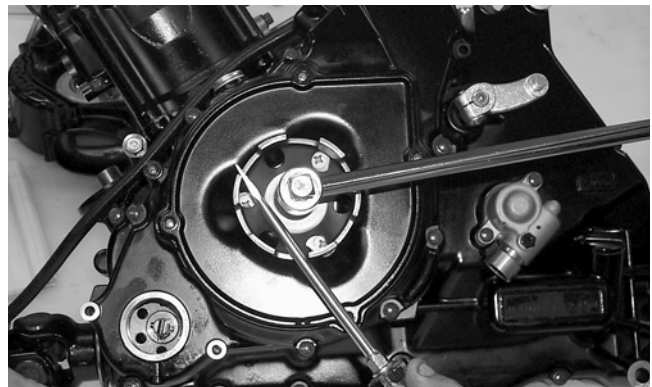
4. In order on the crankshaft, install a washer, ring gear, key, and the magneto rotor. Secure with the nut (threads coated with red Loctite #271). Tighten to specifications.
5. Lubricate the magneto cover gasket with fresh engine oil; then place it into position on the two dowel pins.



CC629

6. Install the magneto cover and secure with the cap screws. Tighten only until snug.

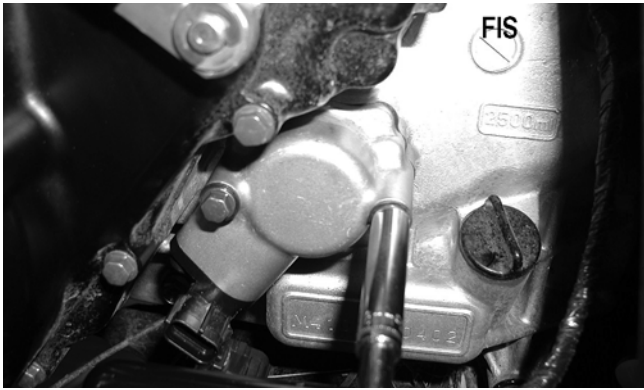
7. Place the starter cup into position on the crankshaft making sure a new, lubricated O-ring is inside the cup. Tighten the flange nut to specifications.



CC710

8. Tighten the cap screws (from step 6) to specifications.

9. Place the speed sensor housing and gasket into position and secure with the two cap screws. Tighten securely.



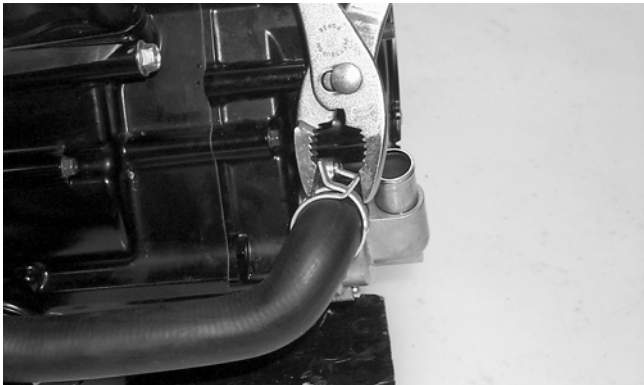
CD069

10. Place the water pump into position and secure with two cap screws. Tighten securely.

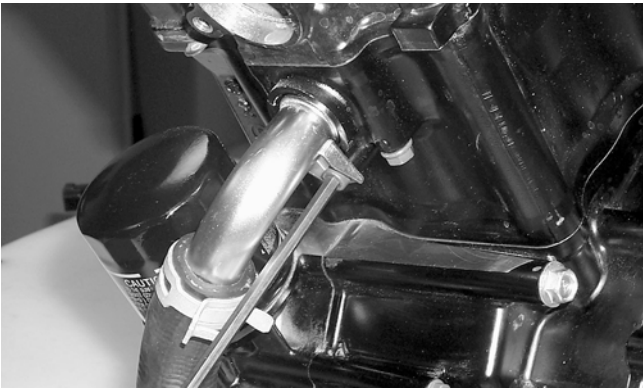


CC623

11. Install the crossover tube on the water pump and cylinder head making sure the O-ring is properly positioned.



CC619



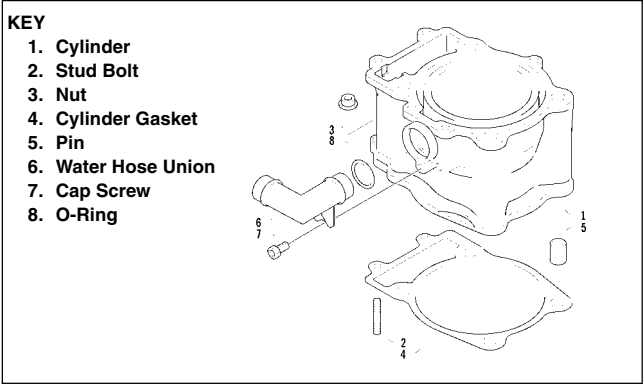
CC620

12. Install the shift arm on the shift arm shaft making sure the scribed marks (from removing) are aligned. Tighten securely.

13. Place the gasket and recoil starter assembly into position on the left-side cover; then tighten four cap screws to specifications.

Installing Top-Side Components

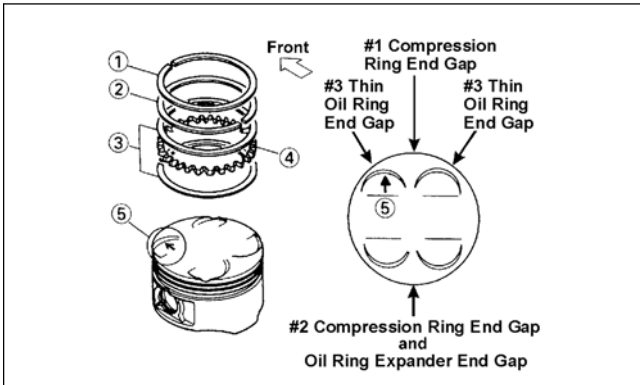
- A. Piston
- B. Cylinder



0732-301

■ **NOTE:** If the piston rings were removed, install them in this sequence.

A. Install ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap. Stagger the end gaps of the upper and lower thin oil rings according to the illustration.

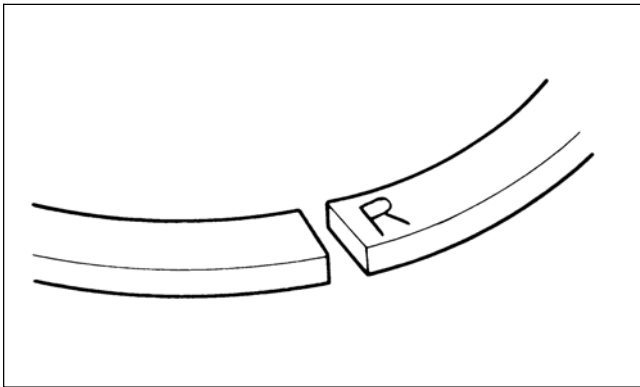


ATV-1085B

■ **NOTE:** Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.

B. Install the compression rings (1 and 2) so the letter on the top surface of each ring faces the dome of the piston. Rotate the rings until the ring end gaps are on directly opposite sides of the piston (see illustration).

■ **NOTE:** The chrome (silver) ring should be installed in the top position.



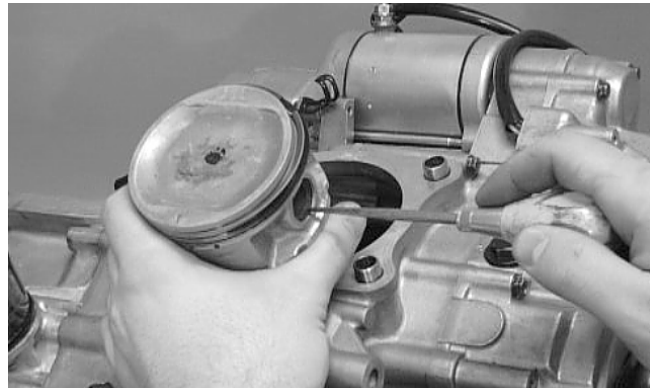
ATV-1024

⚠ CAUTION

Incorrect installation of the piston rings will result in engine damage.

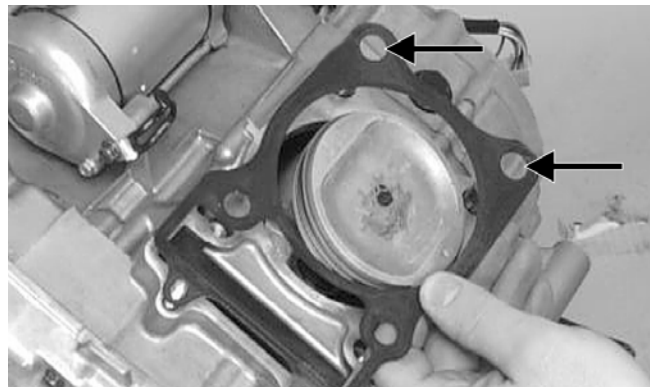
1. Install the piston on the connecting rod making sure there is a circlip on each side and the open end of the circlip faces upwards.

■ **NOTE:** The piston should be installed so the arrow points toward the exhaust.



CC032D

2. Place the two alignment pins into position. Place the cylinder gasket into position; then place a piston holder (or suitable substitute) beneath the piston skirt and square the piston in respect to the crankcase.



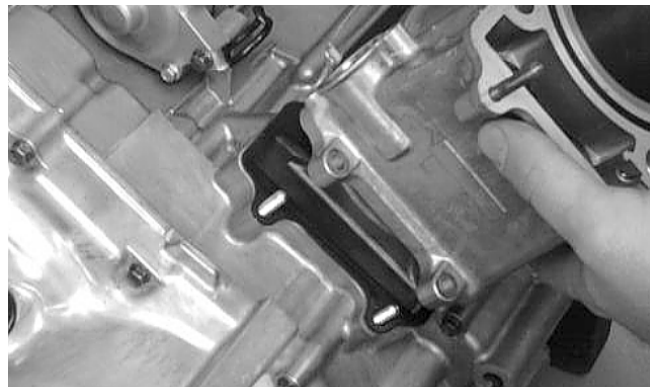
3

CC025D

3. Lubricate the inside wall of the cylinder; then using a ring compressor or the fingers, compress the rings and slide the cylinder over the piston. Route the cam chain up through the cylinder cam chain housing; then remove the piston holder and seat the cylinder firmly on the crankcase.

⚠ CAUTION

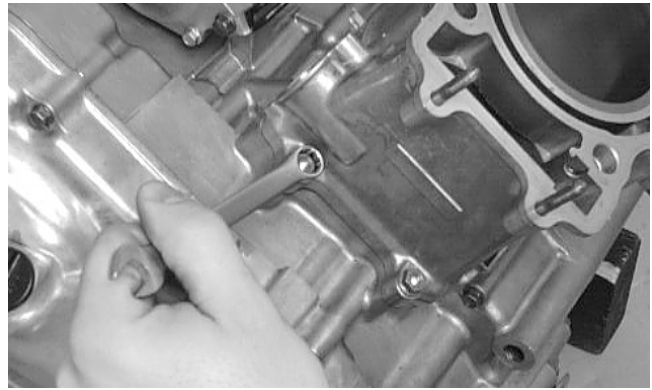
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



CC024D

4. Loosely install the two nuts which secure the cylinder to the crankcase.

■ **NOTE:** The two cylinder-to-crankcase nuts will be tightened in step 10.



CC023D

5. Install the coolant hose onto the crankcase union and tighten the clamp.

C. Cylinder Head
D. Valve Cover

KEY	
1. Cylinder Head Assy	21. O-Ring
2. Valve Guide	22. Cap Screw
3. Pin	23. Stud Bolt
4. Cap Screw	24. Cylinder Head Plug
5. Cap Screw	25. Intake Pipe Assy
6. Cylinder Head Gasket	26. O-Ring
7. Pin	27. Cap Screw
8. Cap Screw	28. Clamp
9. Cap Screw	29. Temperature Switch Assy
10. Stud Bolt	30. Thermostat Cover
11. Stud Bolt	31. Thermostat
12. Stud Bolt	*Frost Plug
13. Cap Screw	
14. Cap Screw	
15. Nut	
16. Nut	
17. Gasket	
18. Gasket	
19. Spark Plug	
20. Inspection Cap	

*Not Illustrated

0737-755

■ **NOTE:** Steps 1-5 in the preceding sub-section must precede this procedure.

6. Place the chain guide into the cylinder.

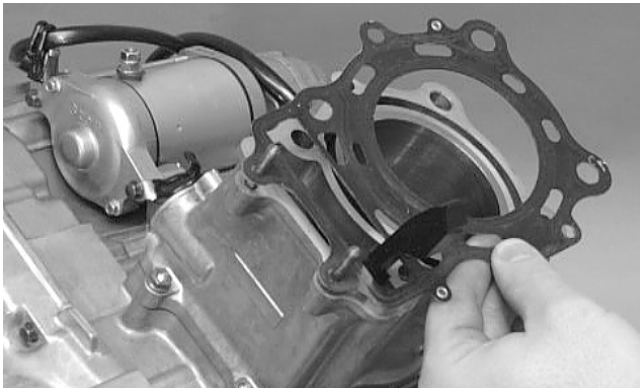
⚠ CAUTION

Care should be taken that the bottom of the chain guide is secured in the crankcase boss.

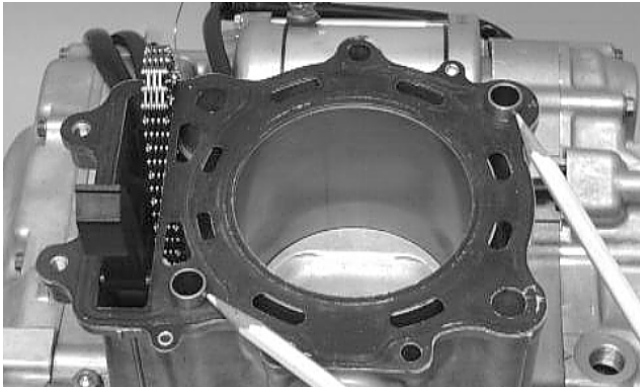


CC022D

7. Place the head gasket into position on the cylinder. Place the alignment pins into position; then place the head assembly into position on the cylinder.

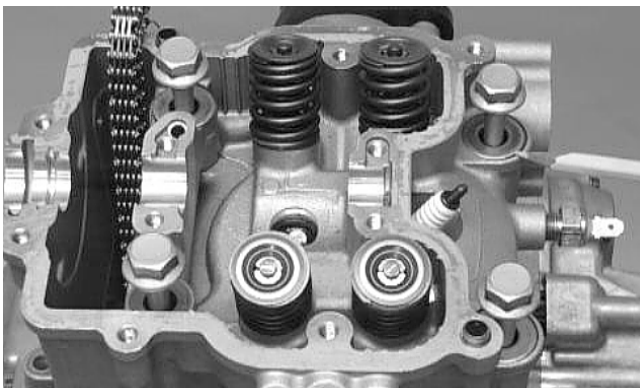


CC020D



CC265D

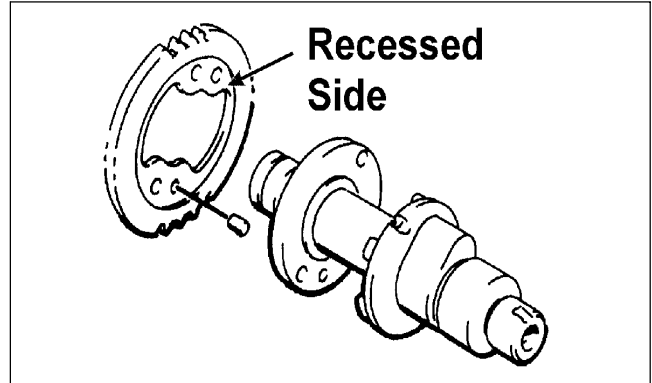
8. Install the four cylinder head cap screws with copper washers (note the locations of the different-lengthed cap screws). Tighten only until snug.



CC272D

9. Loosely install the five cylinder head nuts.
10. In a crisscross pattern, tighten the four cylinder head cap screws (from step 8) to 3.8 kg-m (27.5 ft-lb); then tighten the 8 mm nut (from step 9) to 2.5 kg-m (18 ft-lb). Using a crisscross pattern, tighten the 6 mm nuts (from step 9) to 1.1 kg-m (8 ft-lb). Tighten the two cylinder-to- crankcase nuts (from step 4) securely.

11. With the timing inspection plug removed and the chain held tight, rotate the crankshaft until the piston is at top-dead-center.
12. With the alignment pin installed in the camshaft, loosely place the cam sprocket (with the recessed side facing the cam shaft lobes) onto the camshaft. At this point, do not “seat” the sprocket onto the shaft.

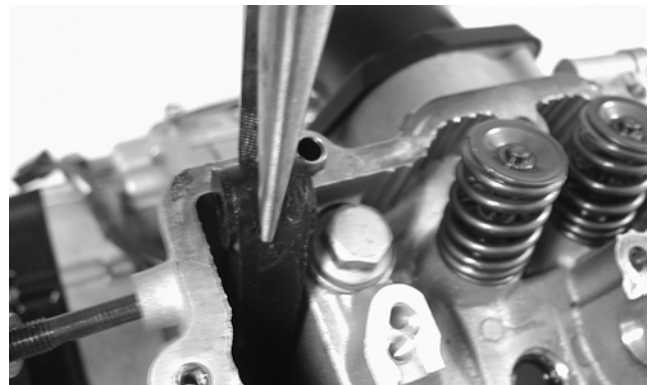


732-307B

3

■ **NOTE:** At this point, oil the camshaft bearings, cam lobes, and the three seating journals on the cylinder.

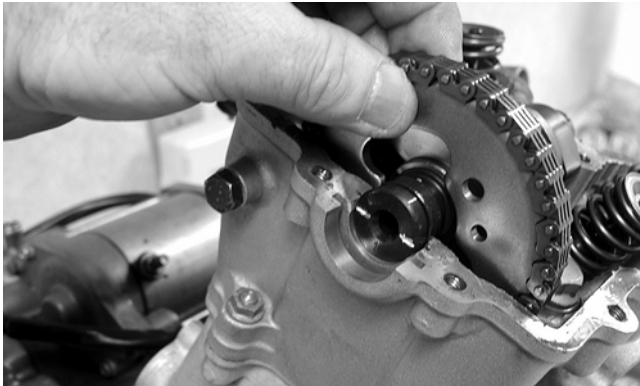
13. While holding the cam chain sprocket to the side, install the rear cam chain tensioner guide into the cylinder head. Install the pivot cap screw and washer.



CD461

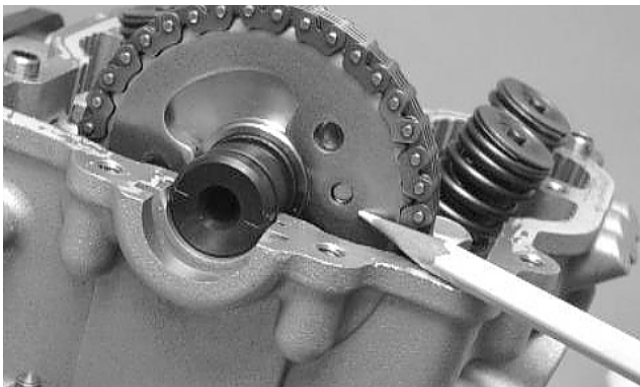
14. With the cam lobes directed down (toward the piston), maneuver the camshaft/sprocket assembly through the chain and towards its seating position; then loop the chain over the sprocket.

■ **NOTE:** Note the position of the alignment marks on the end of the camshaft. They must be parallel with the valve cover mating surface. If rotating the camshaft is necessary for alignment, do not allow the chain and sprocket to rotate and be sure the cam lobes end up in the down position.



CD463

15. Seat the cam sprocket onto the camshaft making sure the alignment pin in the camshaft aligns with the smallest hole in the sprocket; then place the camshaft/sprocket assembly onto the cylinder ensuring the following.



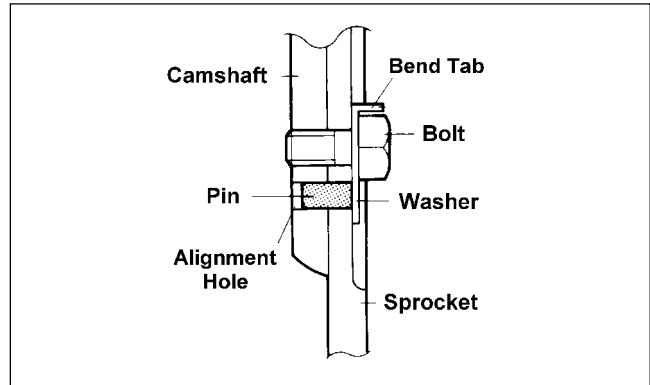
CC268D

- A. Piston still at top-dead-center.
- B. Camshaft lobes directed down (toward the piston).
- C. Camshaft alignment marks parallel to the valve cover mating surface.
- D. Recessed side of the sprocket directed toward the cam lobes.
- E. Camshaft alignment pin and sprocket alignment hole (smallest) are aligned.

CAUTION

If any of the above factors are not as stated, go back to step 11 and carefully proceed.

16. Place the tab-washer onto the sprocket making sure it covers the pin in the alignment hole.

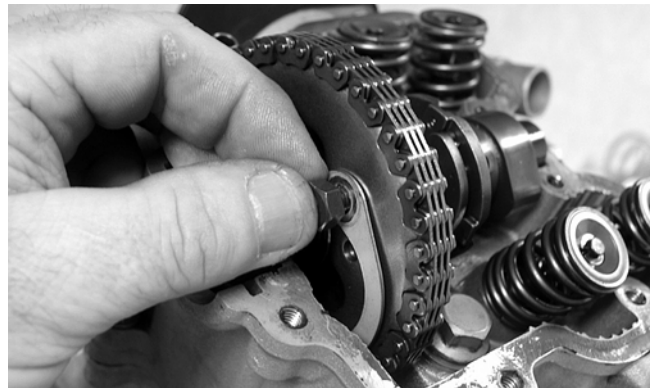


ATV1027

CAUTION

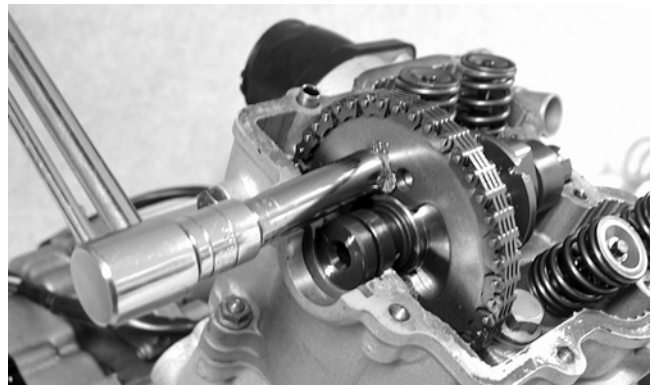
Care must be taken that the tab-washer is installed correctly to cover the alignment hole on the sprocket. If the alignment pin falls out, severe engine damage will result.

17. Install the first cap screw (threads coated with red Loctite #271) securing the sprocket and tab-washer to the camshaft. Tighten only until snug.



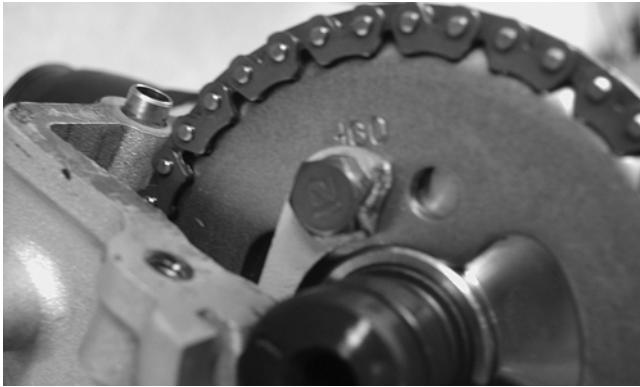
CD464

18. Rotate the crankshaft until the second cap screw securing the sprocket to the camshaft can be installed; then install the cap screw (threads coated with red Loctite #271) and tighten to specifications. Bend the tab to secure the cap screw.



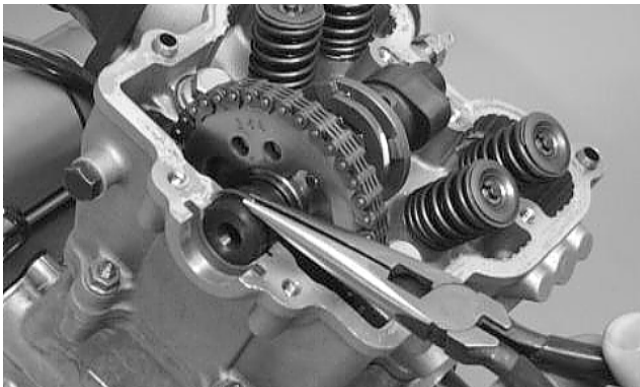
CD465

19. Rotate the crankshaft until the first cap screw (from step 17) can be addressed; then tighten to specifications. Bend the tab to secure the cap screw.



CD466

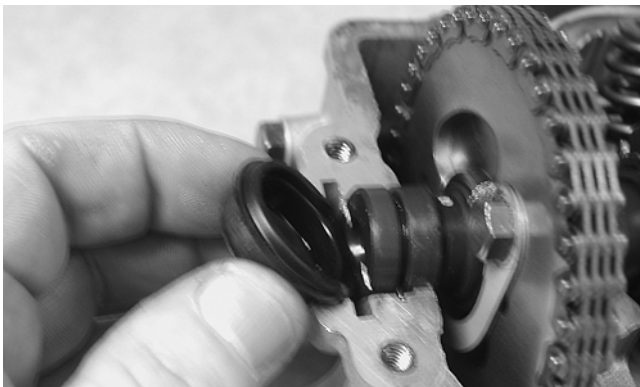
20. Place the C-ring into position in its groove in the cylinder head.



CC012D

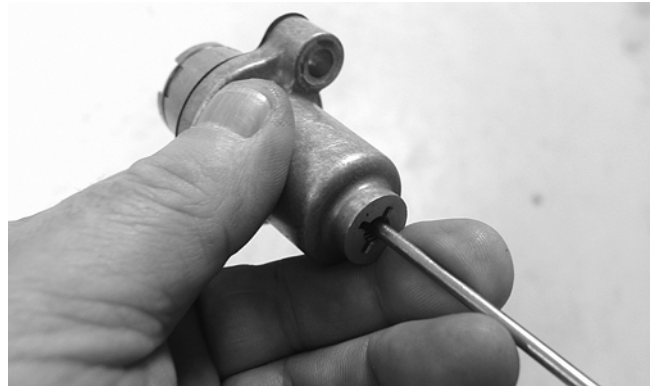
21. Install the cylinder head plug in the cylinder head with the open end facing downward and toward the inside.

CAUTION
The open end of the plug must be positioned downward.



CD468

22. Remove the cap screw from the end of the chain tensioner; then using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner clockwise until the screw bottoms.

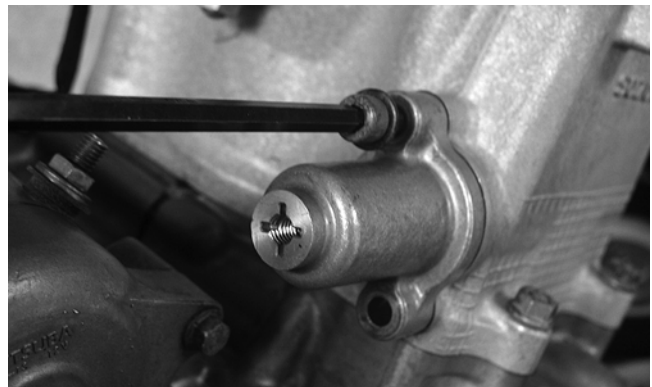


CD501

- **NOTE:** The adjuster shaft will be drawn into the tensioner as the adjuster screw is rotated clockwise. The adjuster shaft tension will be released in step 24.

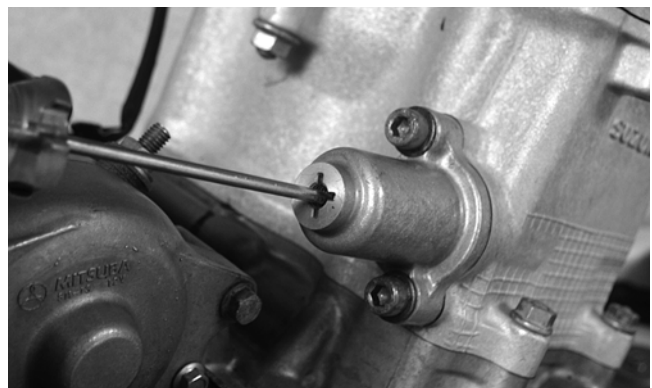
3

23. Place the chain tensioner adjuster assembly and gasket into position on the cylinder and secure with the two Allen-head cap screws.

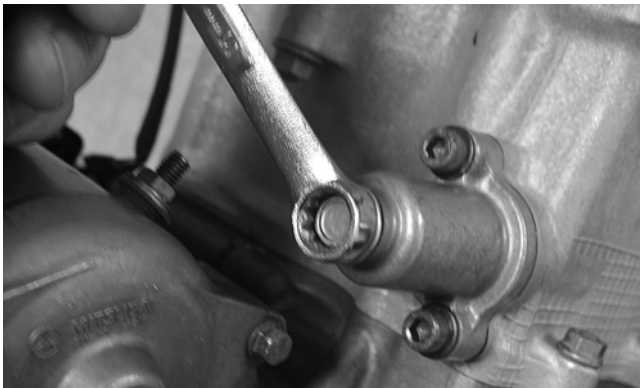


CD469

24. Using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner counterclockwise until all tension is released; then install the cap screw into the end of the chain tensioner.

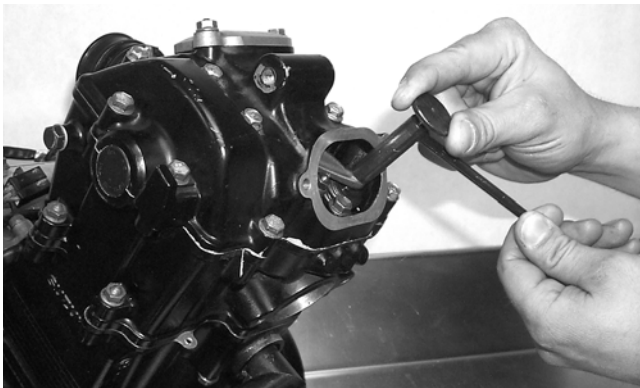


CD470



CD471

25. Loosen the four adjuster screw jam nuts; then loosen the four adjuster screws on the rocker arms in the valve cover.



CC528D

26. Apply a thin coat of Three Bond Sealant (p/n 0636-070) to the mating surfaces of the cylinder head and valve cover.

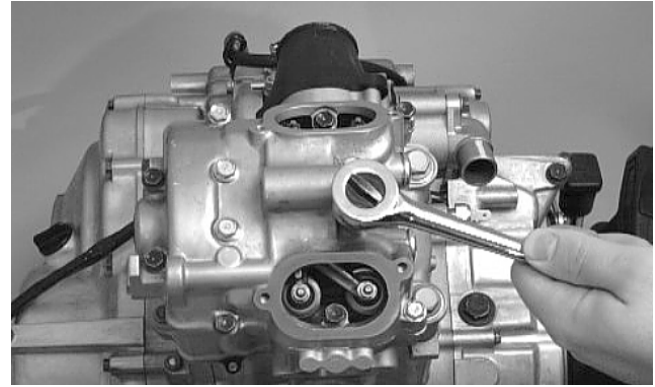


CC275D

27. Place the valve cover into position.

■ **NOTE:** At this point, the rocker arms and adjuster screws must not have pressure on them.

28. Install the four top side cap screws with rubber washers; then install the remaining cap screws. Tighten only until snug.



CC003D

29. In a crisscross pattern starting from the center and working outward, tighten the cap screws securely.

30. Adjust valve/tappet clearance using the following procedure.

■ **NOTE:** Use Valve Clearance Adjuster (p/n 0444-078) for this procedure.

A. Turn the engine over until the piston reaches top dead center on the compression stroke.

B. Place the valve adjuster onto the jam nut securing the tappet adjuster screw; then rotate the valve adjuster dial clockwise until the end is seated in the tappet adjuster screw.

C. While holding the valve adjuster dial in place, use the valve adjuster handle and loosen the jam nut; then rotate the tappet adjuster screw clockwise until friction is felt.

D. Align the valve adjuster handle with one of the marks on the valve adjuster dial.

E. While holding the valve adjuster handle in place, rotate the valve adjuster dial counterclockwise until specified valve/tappet clearance is attained.

■ **NOTE:** Rotating the valve adjuster dial counterclockwise will open the valve/tappet clearance by 0.05 mm (0.002 in.) per mark.

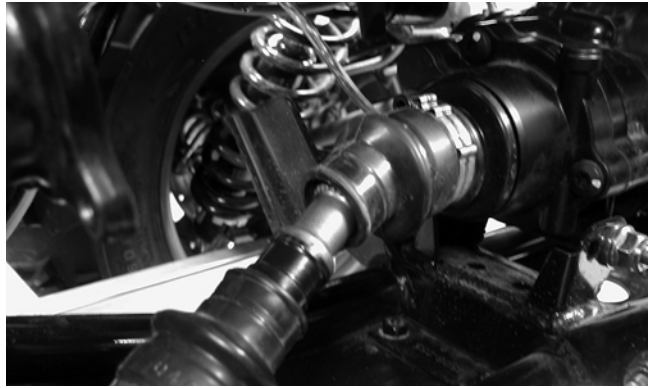
F. While holding the adjuster dial at the proper clearance setting, tighten the jam nut securely with the valve adjuster handle.

31. Place the two tappet covers into position making sure the proper cap screws are with the proper cover. Tighten the cap screws securely.



CC001D

32. If removed, install the spark plug. Tighten to specifications.



CD821

4. Remove the block from beneath the engine; then align the rear drive flanges and secure with four cap screws. Tighten to specifications.

Installing Engine/Transmission

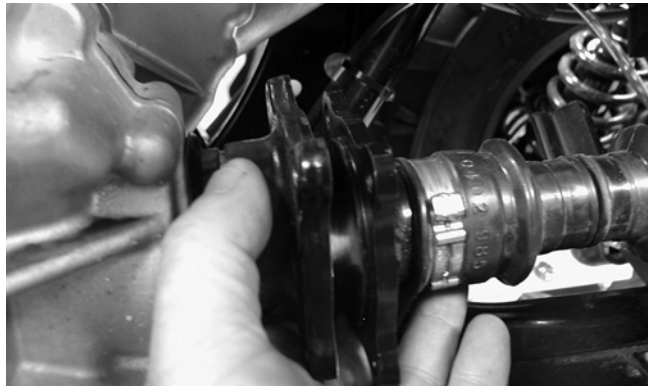
■ **NOTE:** Arctic Cat recommends that new gaskets and O-rings be installed whenever servicing the ATV.

1. From the left side, place the engine/transmission into the frame; then slide the engine rearward as far as possible.
2. Slightly raise the rear of the engine and engage the front drive coupler into the splines of the front drive output yoke; then slide the engine forward as far as possible.



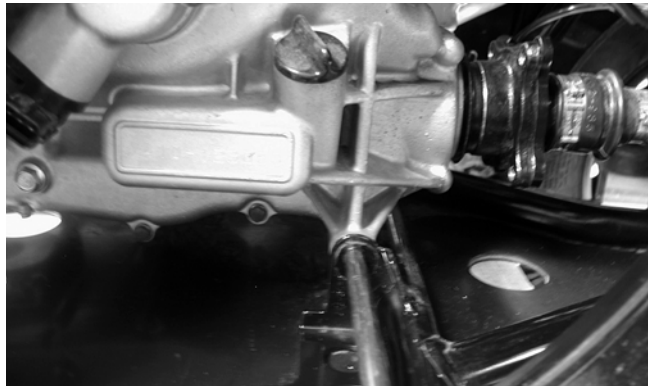
CD818

3. Raise the rear of the engine and place a block beneath it; then install the propeller shaft and output flange into the rear drive coupler.



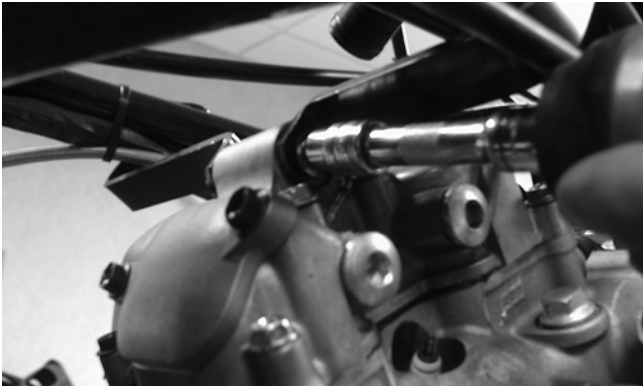
CD824

5. Secure the upper engine mounts to the frame with the cap screws. Tighten only until snug.
6. Install two engine mounting through-bolts, two bushings, and two washers; then tighten the through-bolt flange nuts to specifications. Tighten the upper engine mount cap screws (from step 5) to specifications.



CD809

7. Secure the upper engine bracket to the engine with the existing cap screw and flange nut. Tighten to specifications.

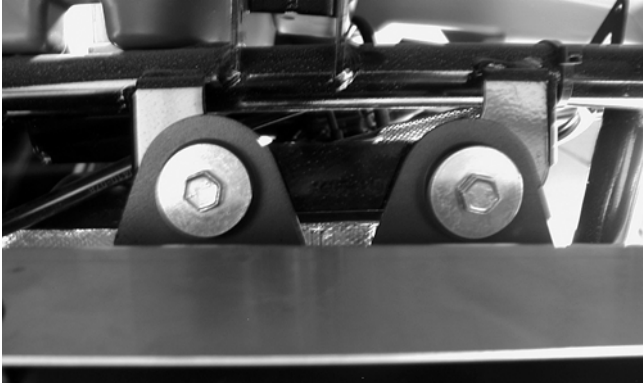


CD807

8. Secure the exhaust pipe to the engine with two cap screws making sure the mounting brackets engage the frame grommets; then install the muffler and tighten all mounting hardware to specifications.

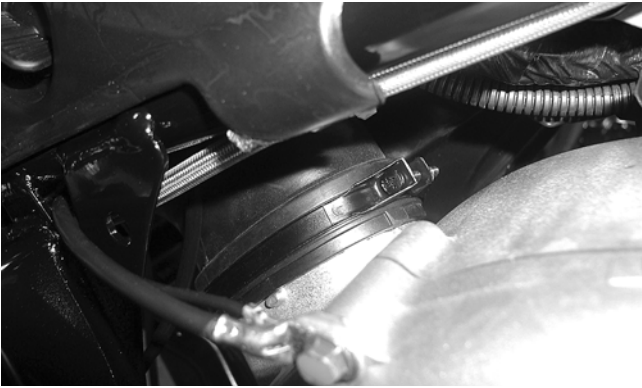


CD803

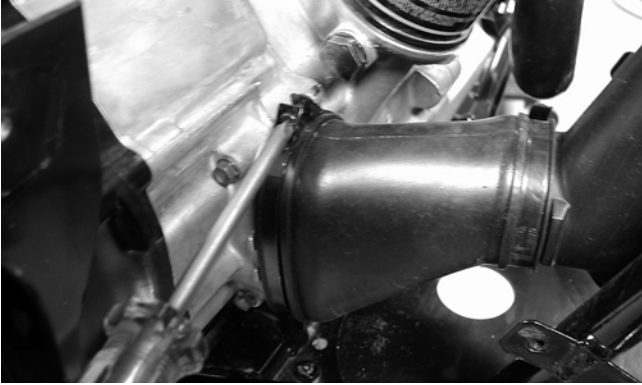


CD804

9. Install the cooling ducts with clamps and tighten the clamps securely.



CD515



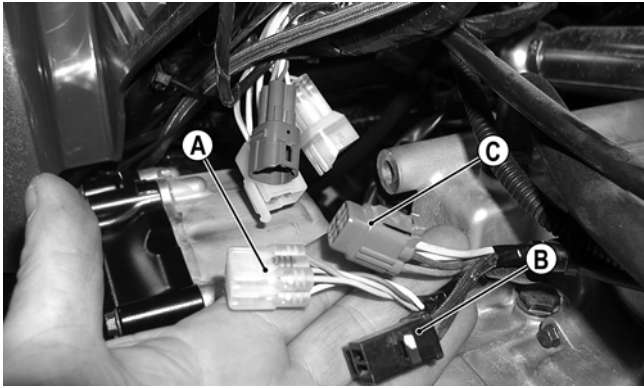
CD793

10. Secure the engine ground wire to the engine with a cap screw. Tighten to specifications.



CD810

11. Connect the gear position indicator connector (A), stator connector (B), and the CDI connector (C) to the main wiring harness.



CD797A

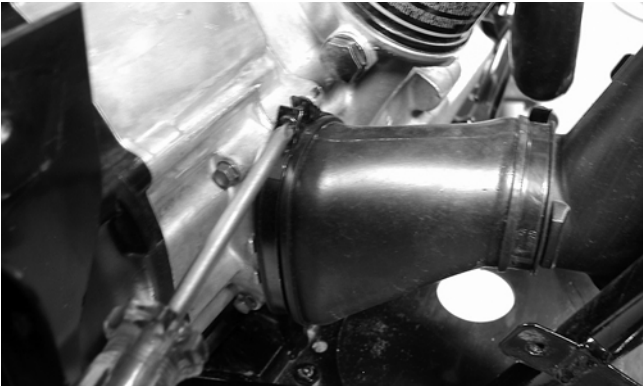
- 12. Connect the temperature sensor wire to the main wiring harness.
- 13. Secure the wires to the frame with nylon ties.
- 14. Connect the speed sensor connector to the housing.
- 15. Secure the positive cable to the starter motor.
- 16. Secure all wiring to the frame and upper engine bracket with cable ties.
- 17. Secure the two coolant/oil hoses to the engine.
- 18. Secure the crankcase vent hose to the air cleaner housing; then secure the inlet boot and carburetor to the air cleaner housing.



CD787



CD785



CD793

- 19. Secure the shift rod to the engine with a new E-clip.



CD774

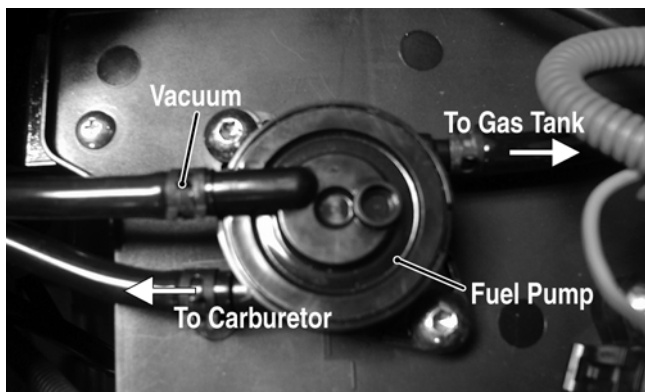
- 20. Place the left-side footwell and foot peg in position on the frame; then secure with existing hardware. Tighten to specifications.



CD782

- 21. Install the front body panel with existing hardware (see Section 8).
- 22. Connect the hose to the fuel pump; then connect the vacuum hose and secure with hose clamps.

3



CD766A

- 23. Place the side panels into position; then install the reinstallable rivets.
- 24. Place the battery into position in the battery compartment; then install the battery cables and vent hose. Secure with the battery cover.

⚠ CAUTION

Battery acid is harmful if it contacts eyes, skin, or clothing. Care must be taken whenever handling a battery.

- 25. Add proper amounts of engine/transmission oil and coolant.
- 26. Install the seat.

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Removing Engine/ Transmission

Many service procedures can be performed without removing the engine/transmission from the frame. Closely observe the note introducing each sub-section for this important information.

👉 AT THIS POINT

If the technician's objective is to service/replace left-side cover oil seals (3), front output joint oil seal (1), rear output joint oil seal (1), and/or the oil strainer (from beneath the engine/transmission), the engine/transmission does not have to be removed from the frame.

Secure the ATV on a support stand to elevate the wheels.

⚠ WARNING

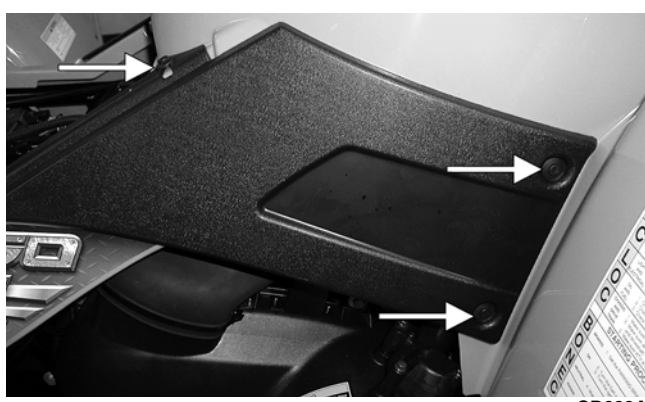
Make sure the ATV is solidly supported on the support stand to avoid injury.

1. Remove the seat.
2. Remove the negative cable from the battery; then remove the positive cable. Remove the battery vent hose; then remove the battery.

⚠ CAUTION

Battery acid is harmful if it contacts eyes, skin, or clothing. Care must be taken whenever handling a battery.

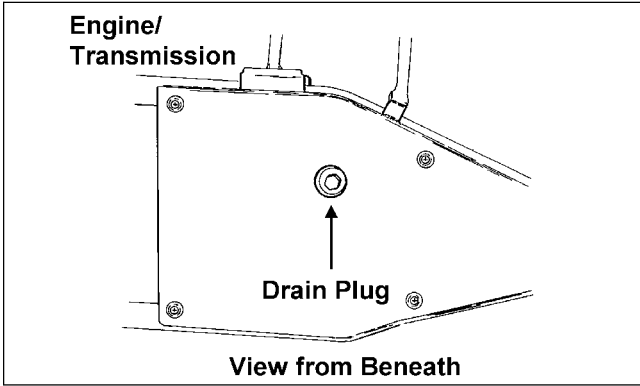
3. Remove the radiator access cover, steering post cover, and storage compartment cover assembly; then remove the storage compartment box.
4. Remove the reinstallable rivets securing the side panels; then remove the panels.



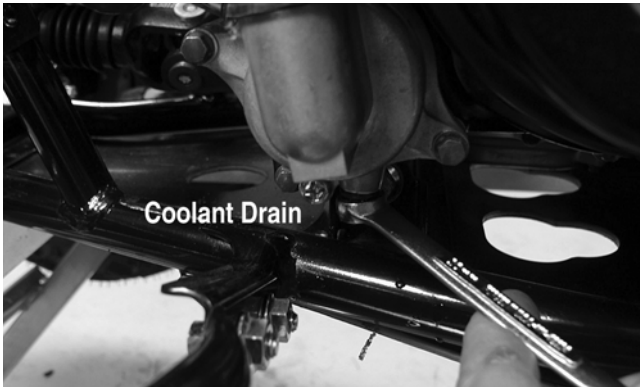
CD683A

5. Remove the instrument pod; then remove the front rack and front body panel (see Section 8).

6. Drain the oil from beneath the engine/transmission; then drain the cooling system.



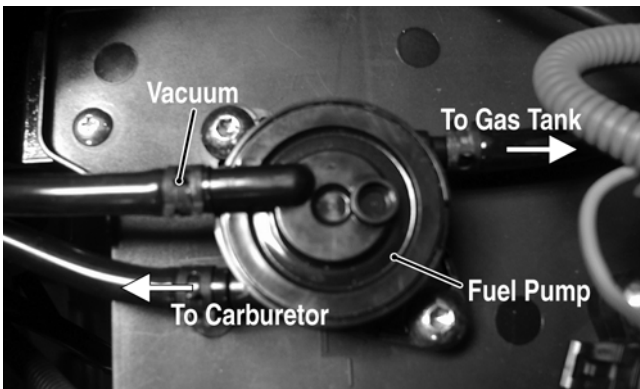
ATV-0109



CD799A

7. Remove the air filter (see Section 2).

8. Remove the vacuum hose and the fuel-pump-to-carburetor hose.



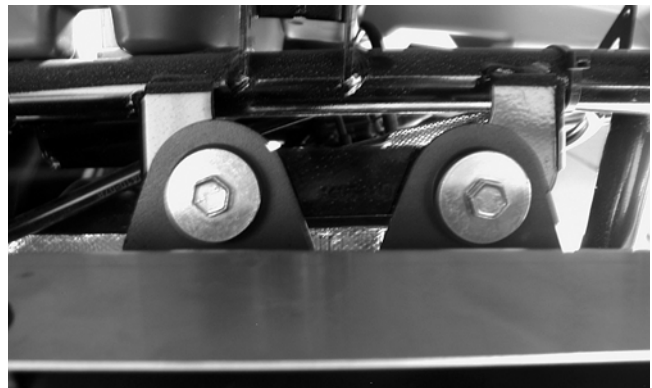
CD766A

9. Remove the cap screws securing the left-side foot peg and footwell to the footrest; then remove the footwell.



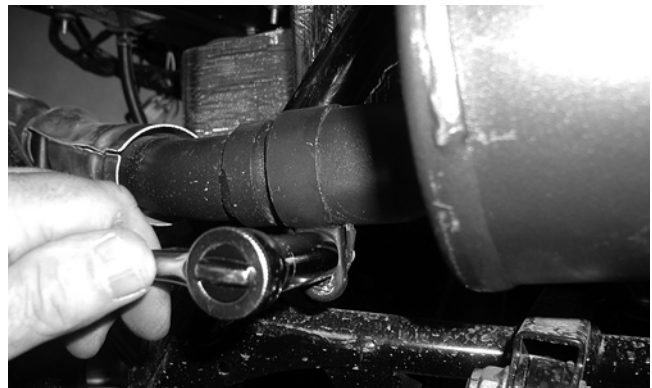
CD782

10. Remove the mounting bolts securing the muffler to the frame; then loosen the muffler clamp and remove the muffler. Account for a graphite bushing.



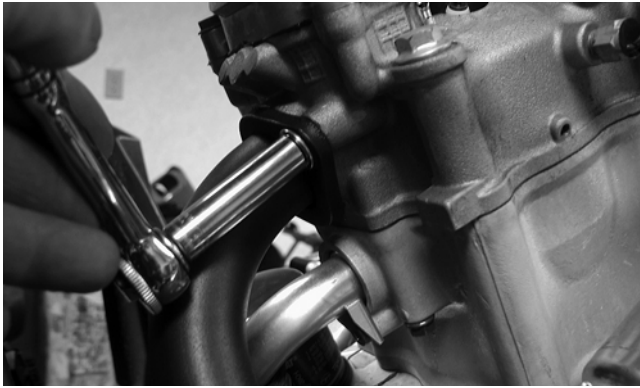
CD804

3



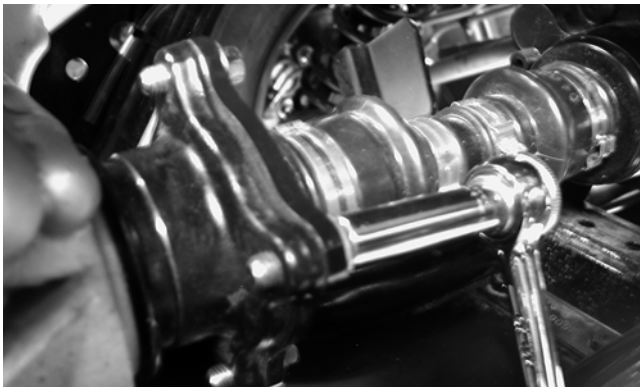
CD802

11. Remove the cap screws securing the exhaust pipe to the head; then remove the exhaust pipe.



CD803

12. Remove the E-clip securing the shift rod to the engine shift arm; then allow the shift rod to swing forward and hang straight down from the shift lever.
13. Disconnect the speed sensor connector from the sensor housing.
14. Remove the four cap screws securing the rear output joint to the transmission and push the shaft away from the transmission.



CD805

15. Loosen the clamp securing the air intake duct to the air filter housing.



CD785

16. Disconnect the crankcase vent hose from the air filter housing. Loosen the clamp securing the carburetor intake duct to the air filter housing; then remove the housing.



CD787



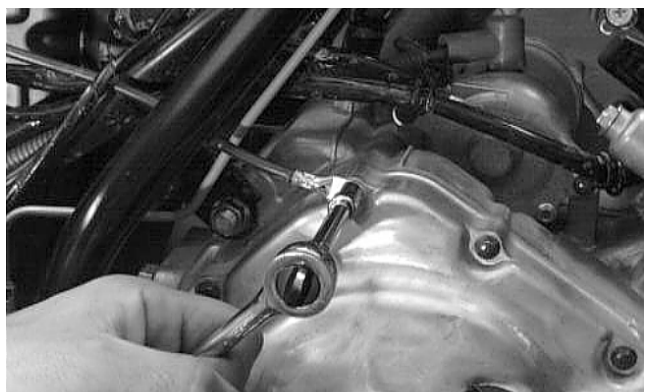
CD786

17. Remove the clamp securing the upper coolant hose to the thermostat housing; then disconnect the hose.



CC335D

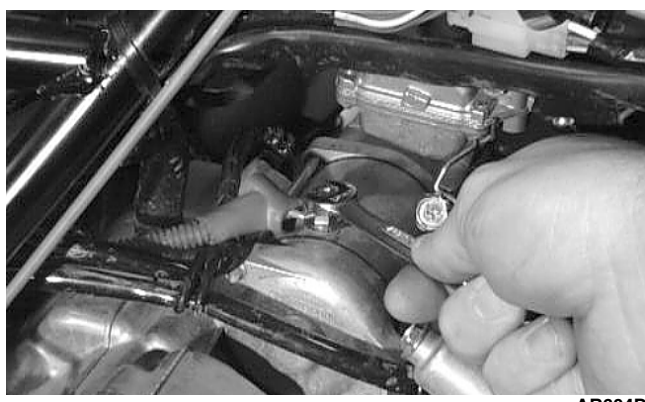
18. Disconnect the high tension lead from the spark plug; then remove the coil.
19. Disconnect the battery ground (negative) cable from the crankcase cover; then disconnect the positive cable from the starter motor.



AR600D

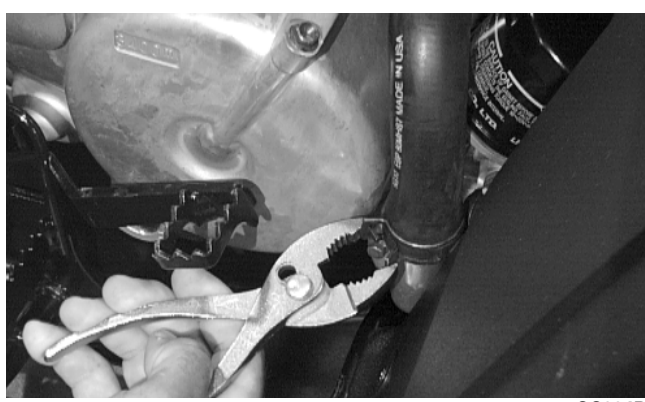


CC122D



AR604D

20. Remove the clamp securing the lower coolant hose to the water pump housing; then disconnect the hose.



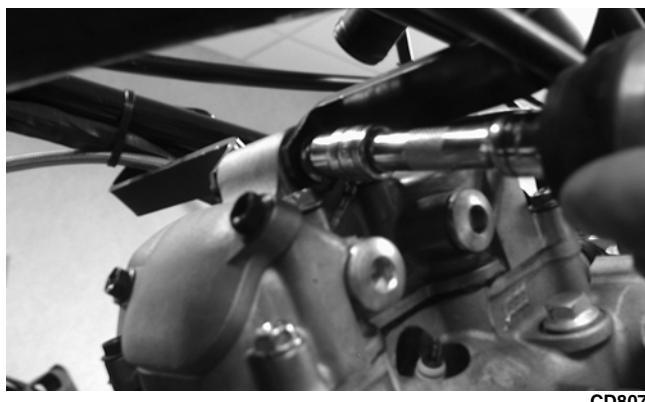
CC334D

21. Loosen the clamp on the crankcase breather vent hose; then disconnect the hose and route it away from the engine.

22. Remove the engine/transmission mounting fasteners in the following sequence:
A. Upper: Two cap screws (bracket to frame) and one cap screw and nut (topside of the engine).



CD806



CD807

B. Lower front: One cap screw, nut, spacer, and washer.

3



CC123D

C. Lower rear: One cap screw, nut, spacer, and washer.



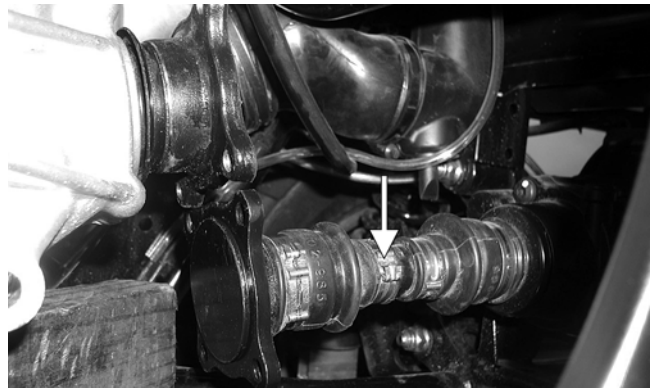
CC126D

23. Raise the rear of the engine enough to allow the rear output flange to clear the output flange joint. Place a block beneath the engine in this position.

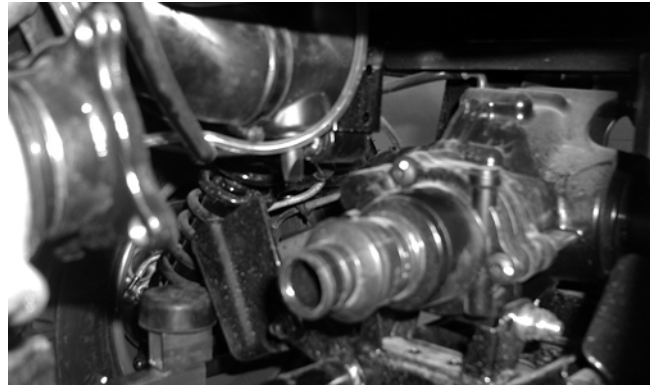


CD811

24. Remove the first small boot clamp; then slide the output flange and driveshaft out of the rear coupler.



CD812A



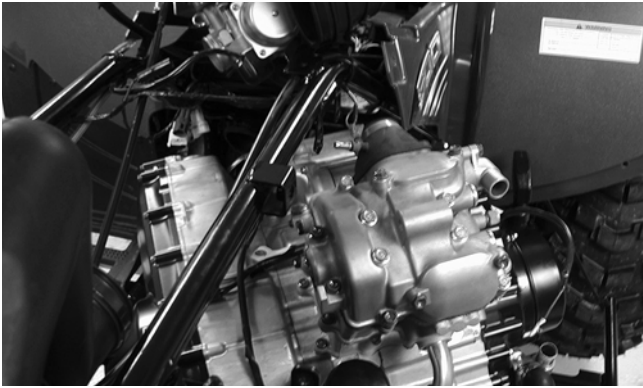
CD813

25. Remove the block and lower the rear of the engine; then remove the boot clamp on the front output drive yoke.

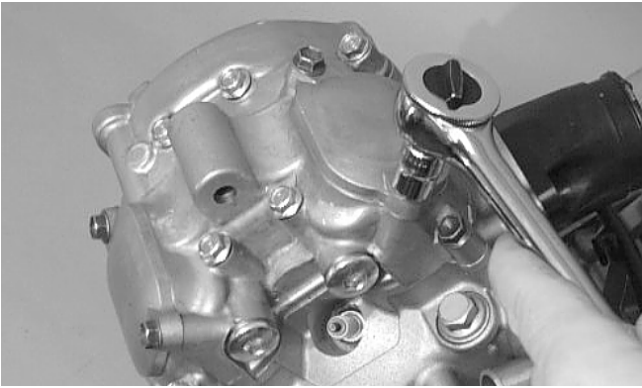


CD817

26. Move the engine to the rear enough to allow the front drive coupler to clear the front output yoke; then move the engine forward and to the left. Remove the engine from the left-side of the frame.



CD773



CC001D

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
<p>To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.</p>

■ **NOTE:** The engine/transmission does not have to be removed from the frame for this procedure.

Removing Top-Side Components

- A. Valve Cover
- B. Cylinder Head

■ **NOTE:** Remove the spark plug and timing inspection plug; then using the recoil starter, rotate the crankshaft to top-dead-center of the compression stroke.

1. Remove the two tappet covers.

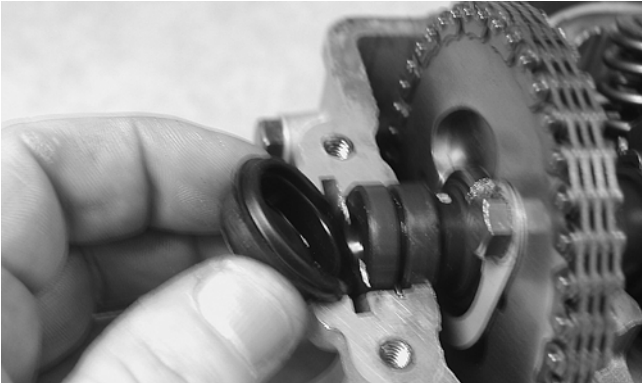
■ **NOTE:** Keep the mounting hardware with the covers for assembly purposes or thread them back into the head to keep them separated.

2. Remove the 12 cap screws securing the valve cover to the head; account for the four rubber washers on the top side cap screws. Remove the valve cover. Account for and note the orientation of the cylinder head plug. Note the location of two alignment pins.

3



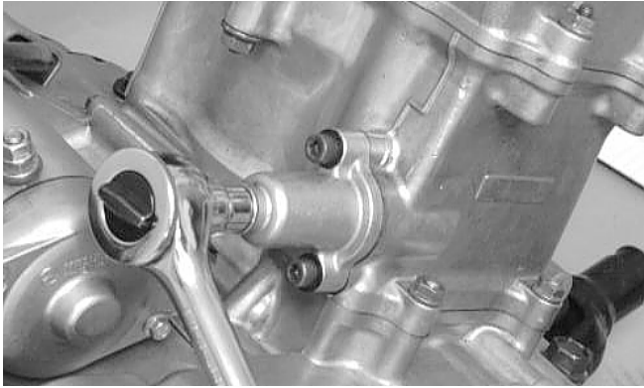
CD205



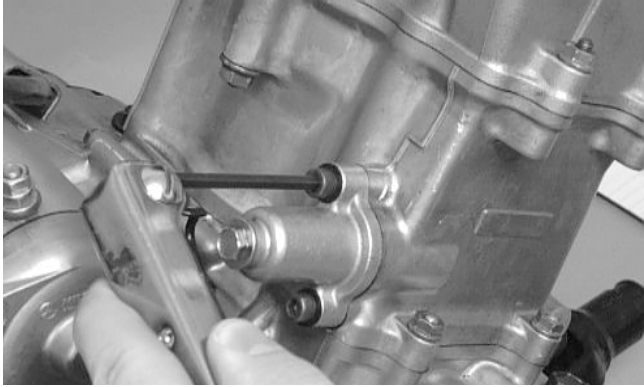
CD468

■ **NOTE:** Note that the opening of the head plug must be directed to the 6 o'clock position.

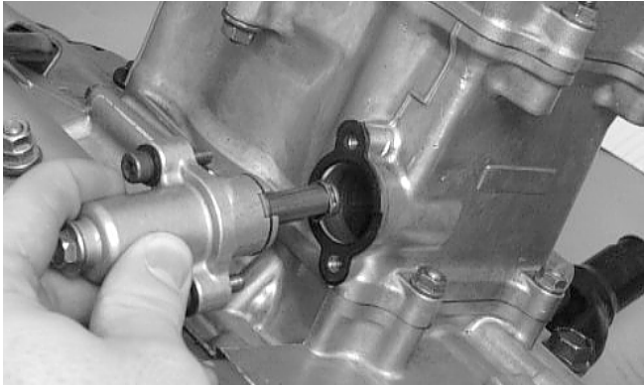
3. Loosen the cap screw on the end of the tensioner; then remove the two Allen-head cap screws securing the tensioner adjuster assembly and remove the assembly. Account for a gasket.



CC009D



CC010D



CC011D

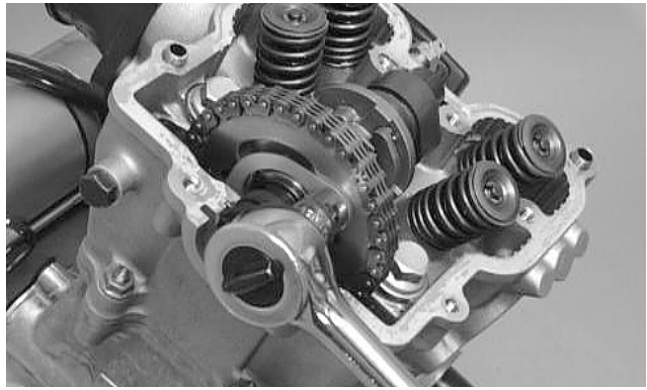
4. Using an awl, rotate the C-ring in its groove until it is out of the cylinder head; then remove the C-ring.

■NOTE: Care should be taken not to drop the C-ring down into the crankcase.

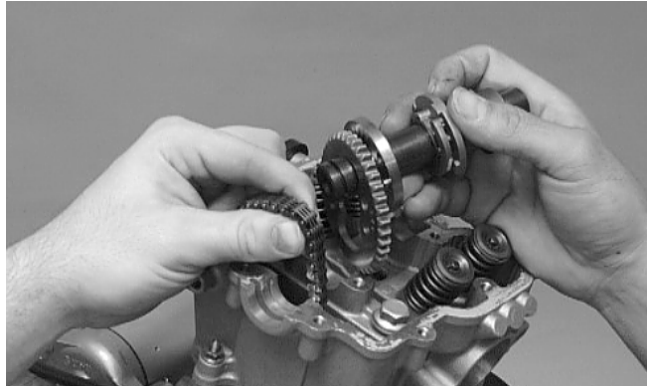


CC012D

5. Bend the washer tabs and remove the two cap screws securing the sprocket to the camshaft; then drop the sprocket off the camshaft. While holding the chain, slide the sprocket and camshaft out of the cylinder head.



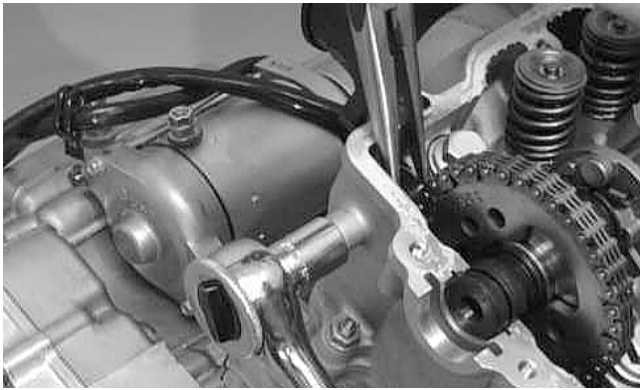
CC013D



CC266D

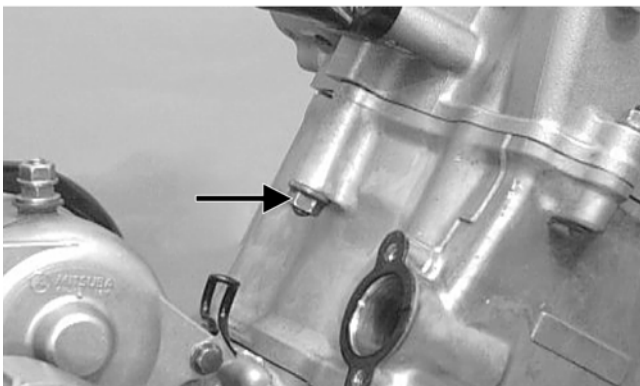
■NOTE: Loop the chain over the cylinder and secure it to keep it from falling into the crankcase.

6. Remove the cap screw securing the chain tensioner (account for a washer); then remove the tensioner.

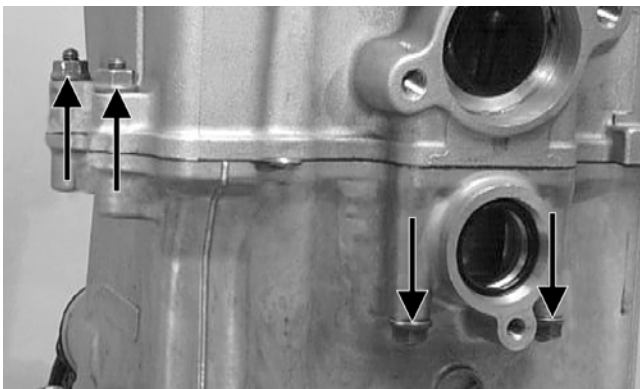


CC014D

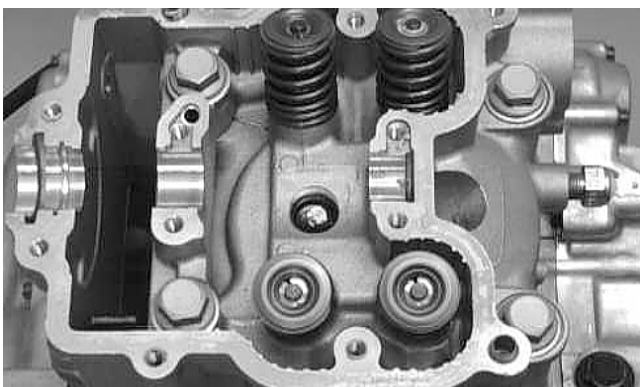
7. Remove the five nuts securing the cylinder head to the cylinder; then remove the four cylinder head cap screws with copper washers (note location of the different-sized cap screws and nuts).



CC017D

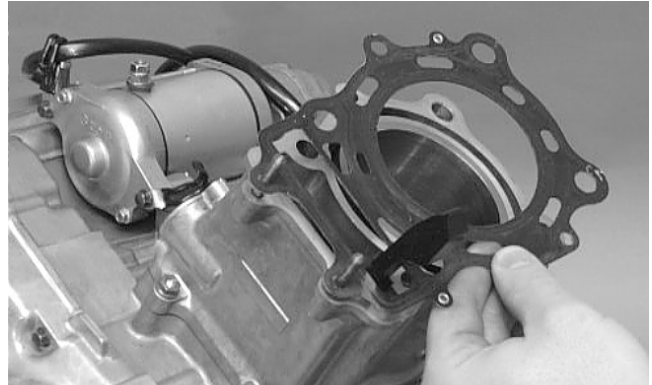


CC018D



CC016D

8. Remove the cylinder head from the cylinder, remove the gasket, and account for two alignment pins.



CC020D

AT THIS POINT

To service valves and cylinder head, see Servicing Top-Side Components sub-section.

3

9. Remove the cam chain guide.

AT THIS POINT

To inspect cam chain guide, see Servicing Top-Side Components sub-section.

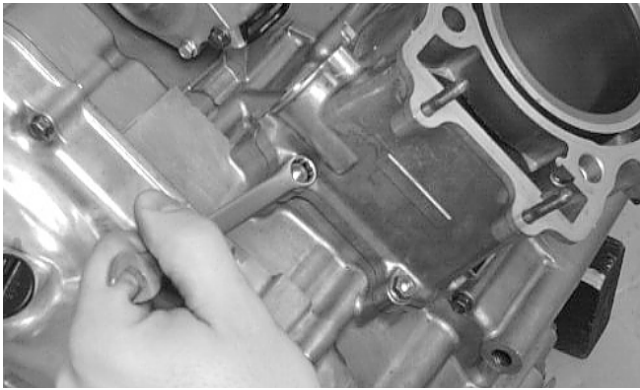


CC022D

**C. Cylinder
D. Piston**

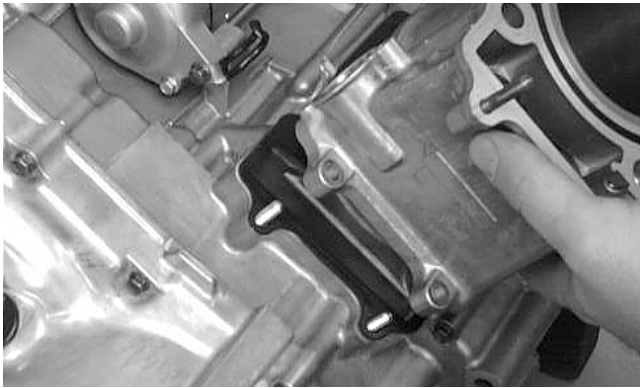
■ **NOTE:** Steps 1-9 in the preceding sub-section must precede this procedure.

- 10. Loosen the clamp securing the coolant hose to the union; then detach the hose.
- 11. Remove the two nuts securing the cylinder to the crankcase.

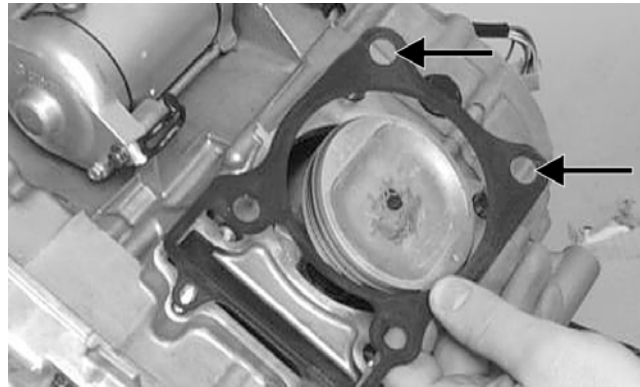


CC023D

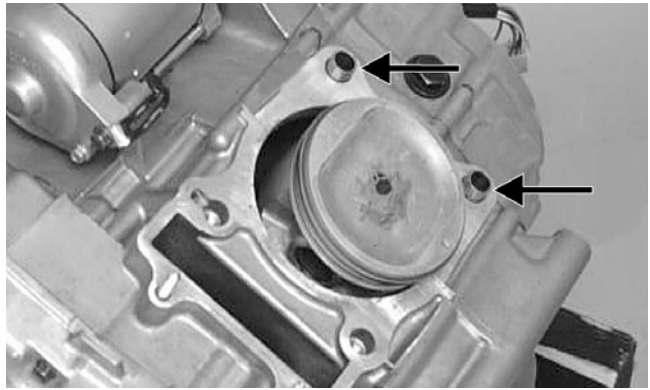
12. Lift the cylinder off the crankcase taking care not to allow the piston to drop against the crankcase. Account for the gasket and two alignment pins.



CC024D



CC025D

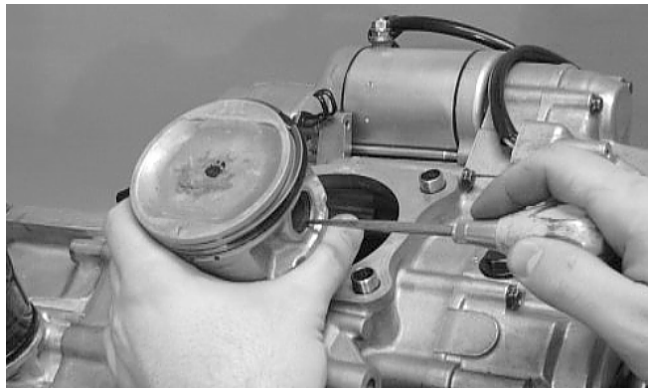


CC026D

AT THIS POINT
 To service cylinder, see Servicing Top-Side Components sub-section.

CAUTION
 When removing the cylinder, be sure to support the piston to prevent damage to the crankcase and piston.

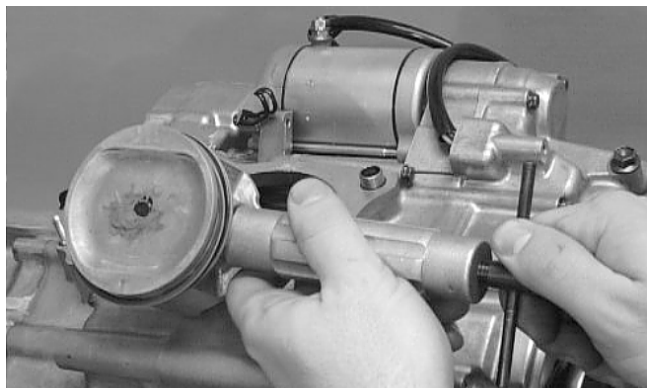
13. Using an awl, remove one piston-pin circlip.



CC032D

14. Using the Piston-Pin Puller (p/n 0644-328), remove the piston pin. Account for the opposite-side circlip. Remove the piston.

■ **NOTE:** It is advisable to remove the opposite-side circlip prior to using the puller.



CC033D

■ **NOTE:** Support the connecting rod with rubber bands to avoid damaging the rod or install the Connecting Rod Holder (p/n 0444-006).

⚠ CAUTION

Do not allow the connecting rod to go down inside the crankcase. If the rod is down inside the crankcase and the crankshaft is rotated, severe damage will result.

■ **NOTE:** If the existing rings will not be replaced with new rings, note the location of each ring for proper installation. When replacing with new rings, replace as a complete set only. If the piston rings must be removed, remove them in this sequence.

- A. Starting with the top ring, slide one end of the ring out of the ring-groove.
- B. Remove each ring by working it toward the dome of the piston while rotating it out of the groove.

👉 AT THIS POINT

To service piston, see Servicing Top-Side Components sub-section.

👉 AT THIS POINT

To service center crankcase components only, proceed to Removing Left-Side Components.

Left-Side Components

■ **NOTE:** For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

👉 AT THIS POINT

To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■ **NOTE:** The engine/transmission does not have to be removed from the frame for this procedure.

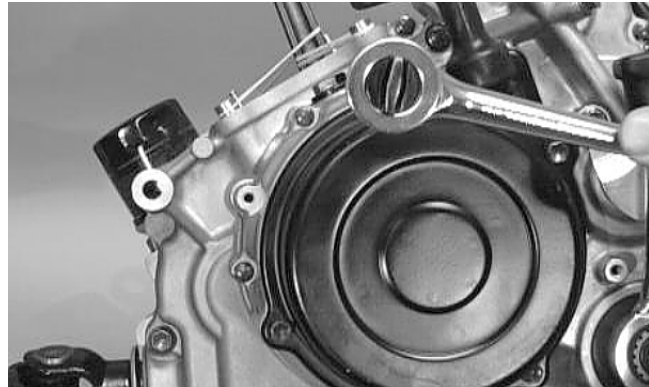
Removing Left-Side Components

- A. Recoil Starter**
- B. Hi/Low Shifter Assembly**
- C. Speed Sensor Housing**
- D. Cover**

1. Remove the cap screws securing the recoil starter assembly to the left-side cover; then remove the recoil starter.

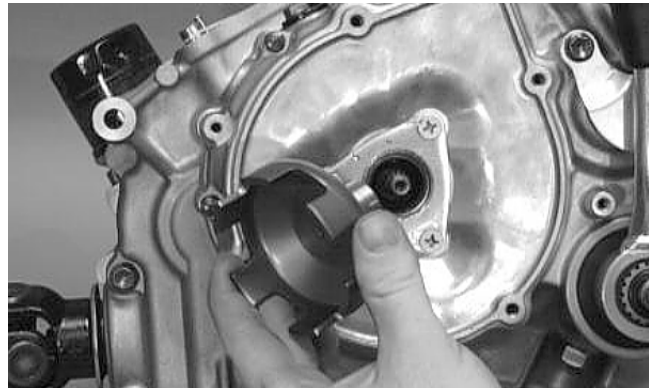
👉 AT THIS POINT

To service the recoil starter, see Servicing Left-Side Components sub-section.



CC039D

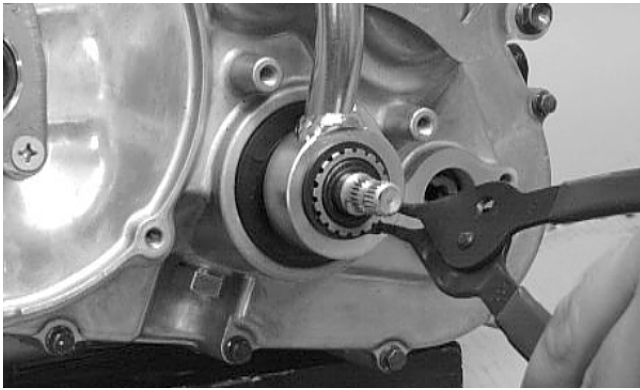
2. Remove the flange nut securing the starter cup to the crankshaft; then remove the starter cup. Account for the O-ring inside the cup.



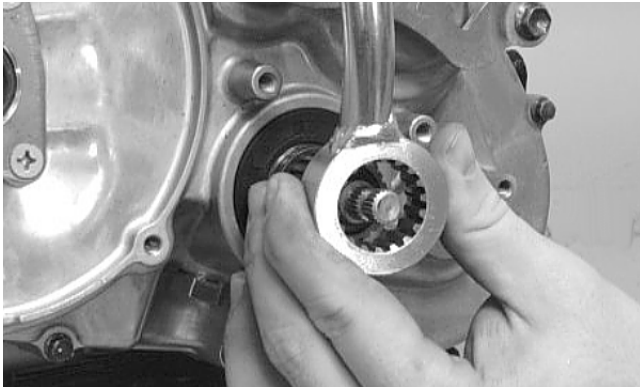
CC041D

3. Put the shift lever into the hi-range position and remove the circlip from the hi/low range shift shaft; then remove the shift lever.

■ **NOTE:** It will be necessary to lift slightly on the shift lever to remove it from the shaft and plate.

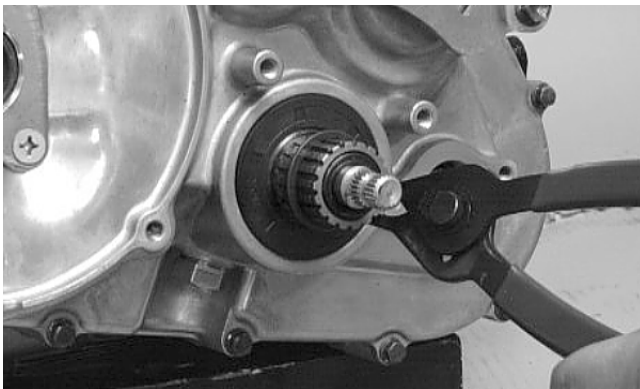


CC044D



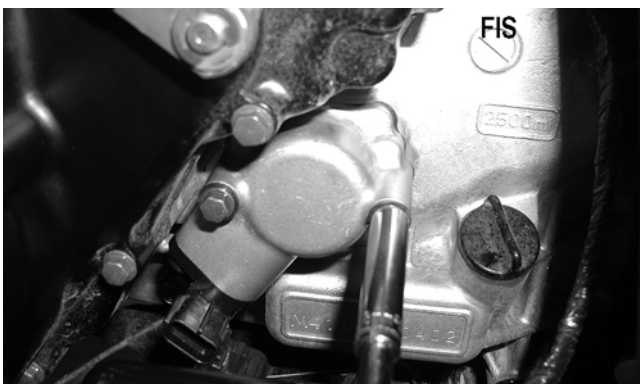
CC045D

4. Remove the inside circlip.



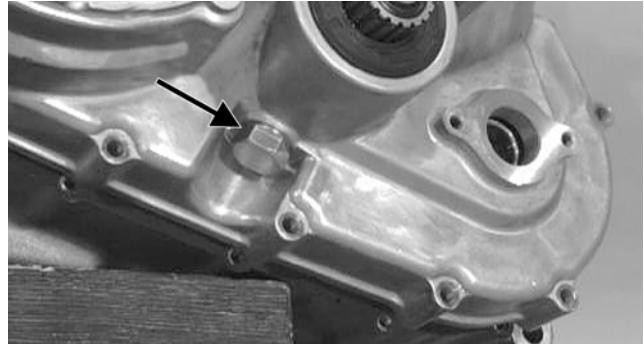
CC046D

5. Remove the two cap screws securing the speed sensor housing; then remove the housing. Account for the gasket.



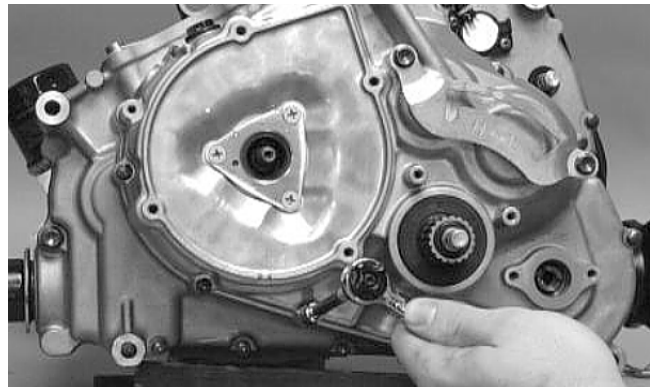
CD069

6. Remove the shift stop housing assembly from beneath the shift shaft housing. Account for the stopper and spring.



CC054D

7. Remove the fourteen cap screws securing the left-side cover to the crankcase and note the location of the long cap screw with rubber washer.



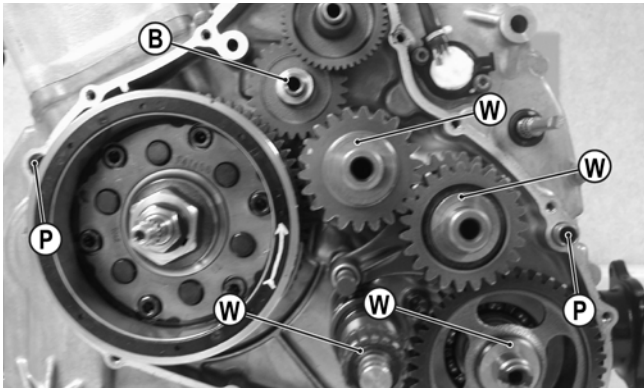
CC047D



CC055D

8. Using Side Case Puller (p/n 0644-262), remove the side cover. Account for a gasket, two alignment pins, and an idle gear limiter bushing.

■ **NOTE:** Inspect the inside of the left-side cover for the four shaft washers that may have come off with the cover. The three gear shaft washers are identical and interchangeable. The shift shaft washer is a larger diameter. Keep the washers with their respective shafts for installing purposes.



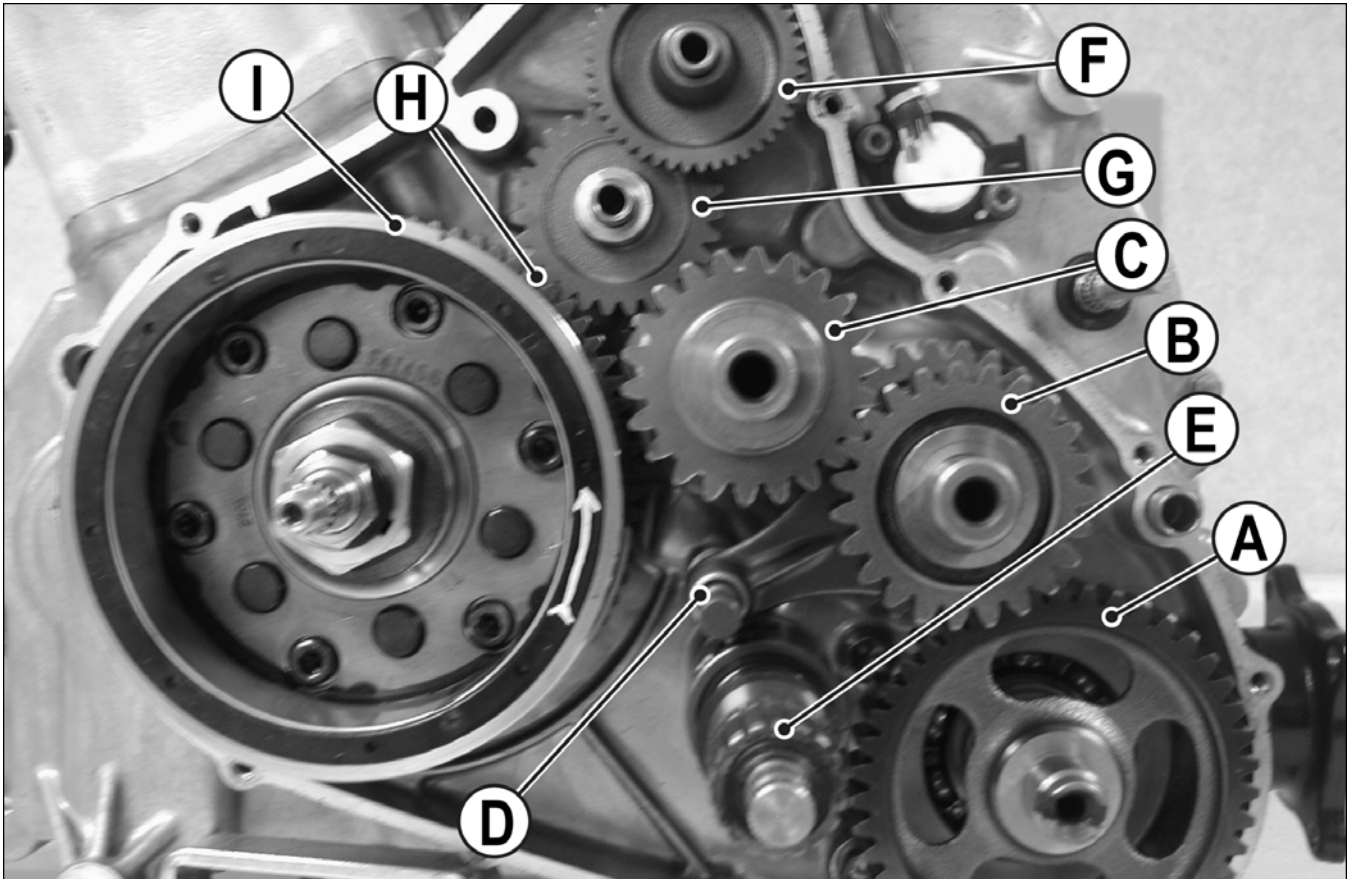
CD134A

E. Rotor/Flywheel
F. Idle Gear Assembly

■ **NOTE:** Steps 1-8 in the preceding sub-section must precede this procedure.

■ **NOTE:** For steps 9-18, refer to illustration CD134B.

3



KEY

- A. Output Shaft with Driven Gear
- B. Drive Gears #1 & #2
- C. Idle Gear

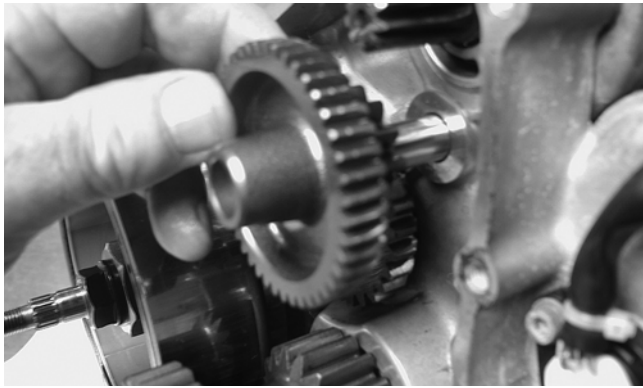
- D. Shift Fork with Shaft
- E. Shift Shaft Assembly
- F. Starter Gear Assembly

- G. Starter Idler Gear
- H. Starter Clutch Gear Assembly
- I. Rotor/Flywheel

CD134B

■ **NOTE:** To aid in installing, it is recommended that the assemblies are kept together and **IN ORDER.**

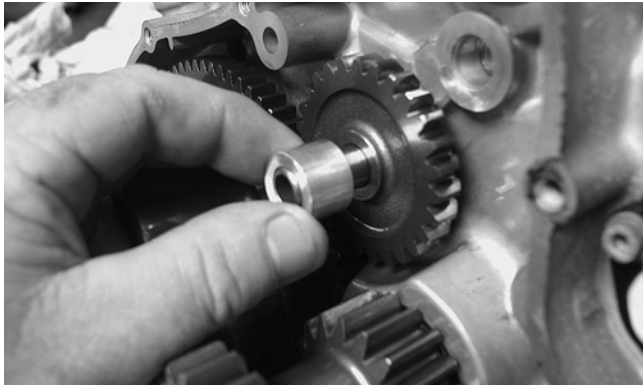
9. Remove the starter gear assembly (F) from the crankcase; then remove the starter idler gear (G) and spacer.



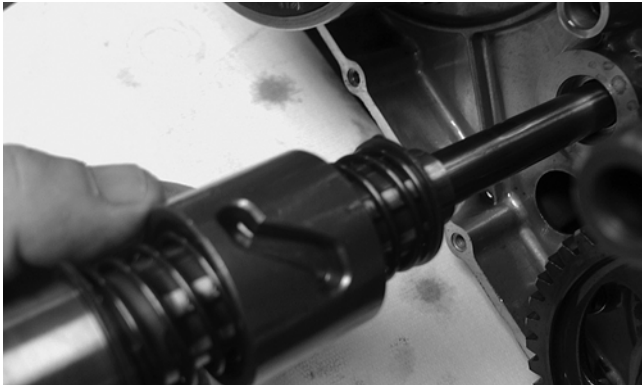
CD136



CD146

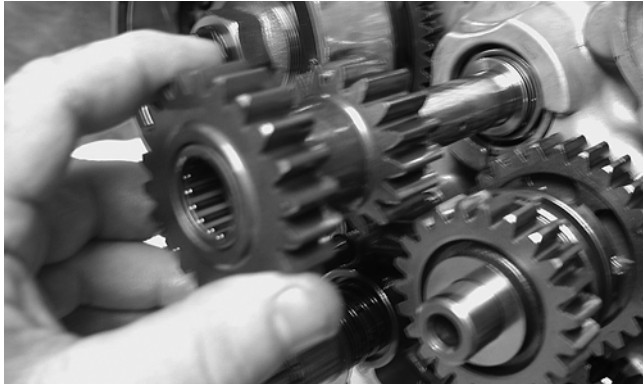


CD138



CD147

10. Remove the idle gear (C), washer, and spacer from the countershaft.



CD141



CD152

13. Remove the circlip and washer from the driveshaft; then remove the #1 drive gear (B). Account for a splined bushing and a spacer.

11. Remove the #2 drive gear (B), washer, and the select sliding dog gear from the driveshaft. Account for a bushing and a washer.

👉 AT THIS POINT
To service shift fork, see Servicing Left-Side Components sub-section.

12. Remove the shift fork shaft (D) from the crankcase boss; then remove the shift fork from the shaft. Remove the shift shaft assembly (E) from the fixed shaft. Account for the left shaft washer.



CC059D



CC062D

14. Remove the washer and driven gear (A) from the output shaft; then account for the bushing.

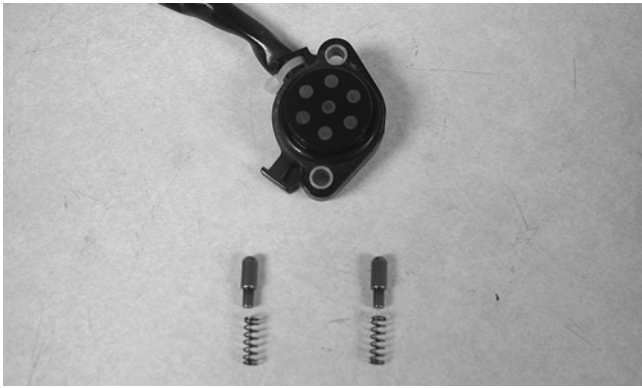


CD149



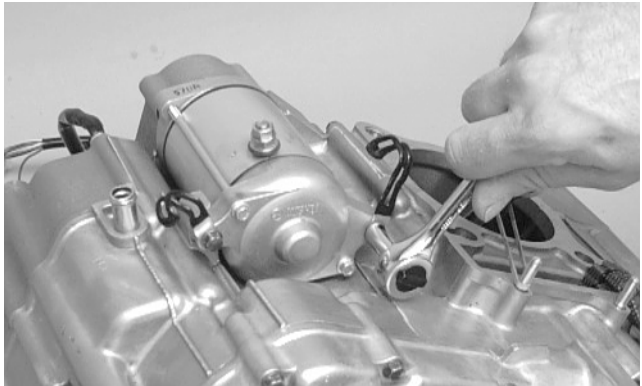
CD150

15. Remove the Allen-head screws securing the shift-indicator sending unit; then remove the sending unit. Account for an O-ring, two contacts, and two springs.



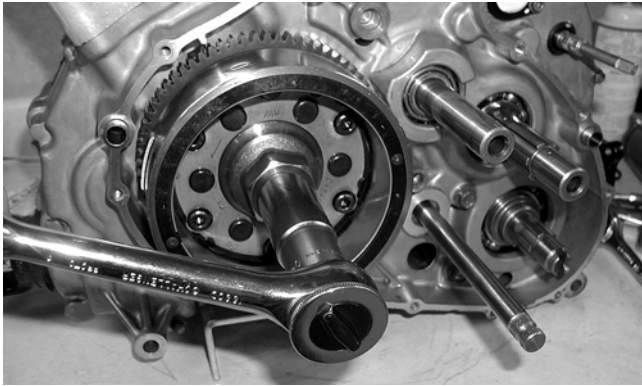
CD159

16. Remove the two cap screws securing the starter to the crankcase; then remove the starter. Account for the wiring forms.



CC065D

17. Remove the nut securing the rotor/flywheel (I) to the crankshaft; then install the magneto rotor remover adapter.



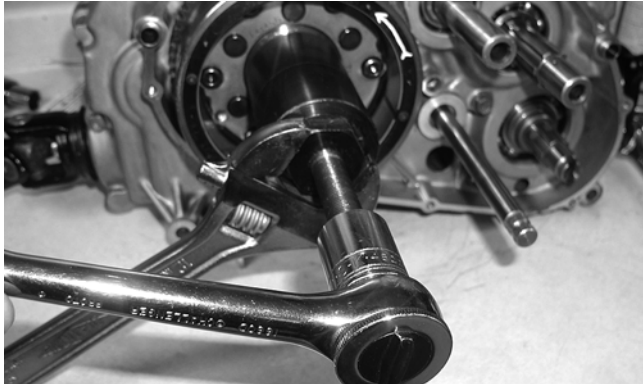
CD562

3



CD549

18. Using Magneto Rotor Remover (p/n 0444-075), remove the rotor/flywheel assembly from the crankshaft. Account for the key; then remove the starter clutch gear assembly (H) and thrust washer.



CD550



CD155

👉 AT THIS POINT
 To service center crankcase components only, proceed to Removing Right-Side Components.

Right-Side Components

■ **NOTE:** For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

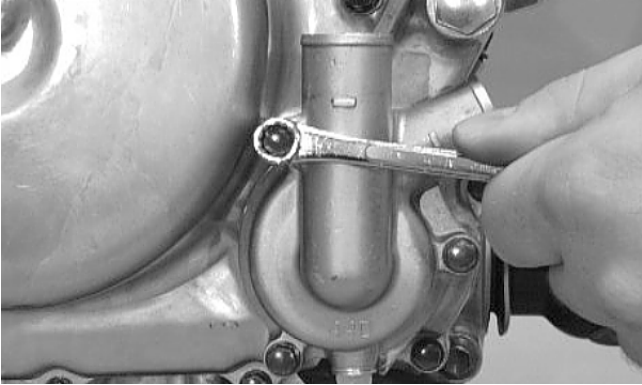
👉 AT THIS POINT
 To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■ **NOTE:** The engine/transmission does not have to be removed from the frame for this procedure.

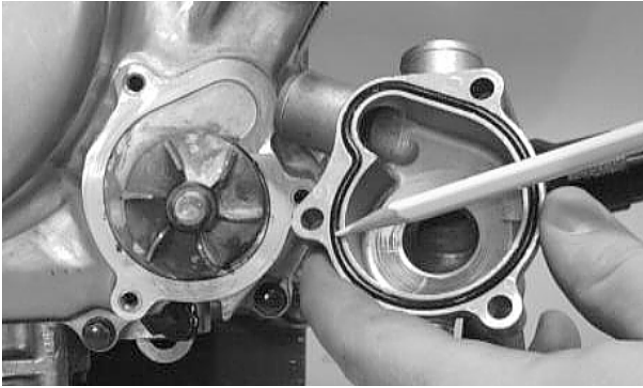
Removing Right-Side Components

- A. Oil Filter**
- B. Water Pump**

1. Remove the clamp securing the coolant hose to the water pump; then remove the hose.
2. Using the Oil Filter Wrench (p/n 0644-389), remove the oil filter.
3. Remove the three cap screws securing the water pump cover to the right-side cover; then remove the water pump cover. Account for the O-ring.

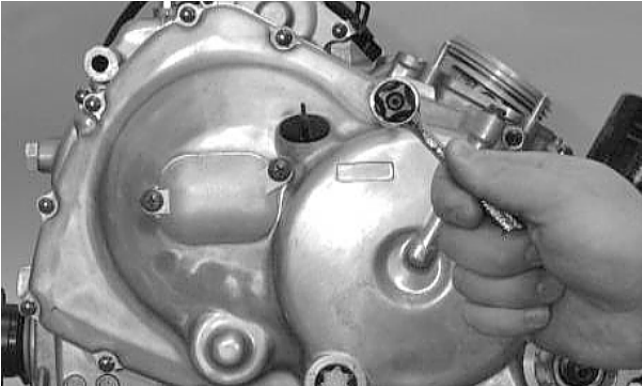


CC027D



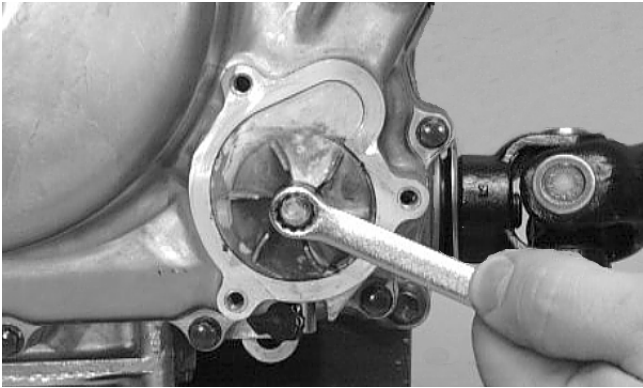
CC028D

4. Remove the cap screw securing the impeller to the impeller shaft; then remove the impeller. Account for the rubber retainer and porcelain seal.

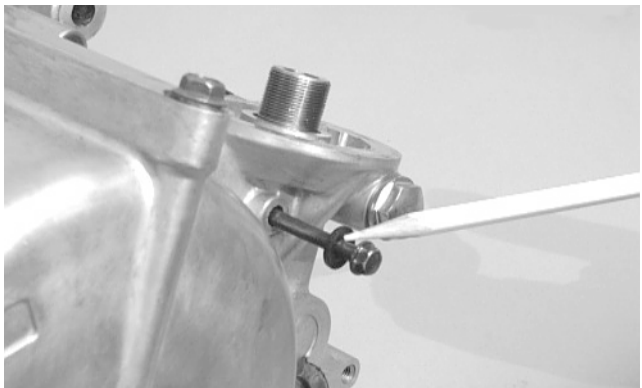


CC034D

■ **NOTE:** The water pump housing does not have to be removed when removing the right-side cover.



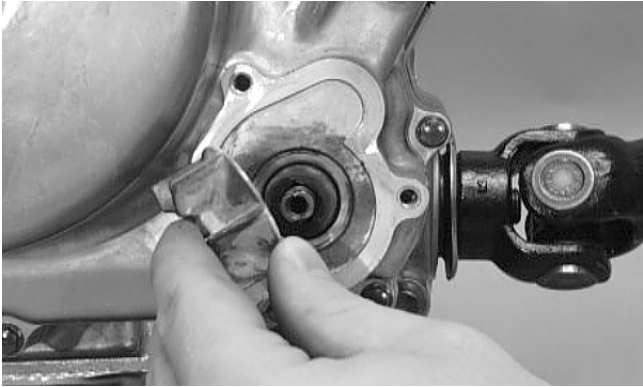
CC029D



CC068D

3

■ **NOTE:** When removing the right-side cover, account for the release roller guide that it does not fall and cause damage.



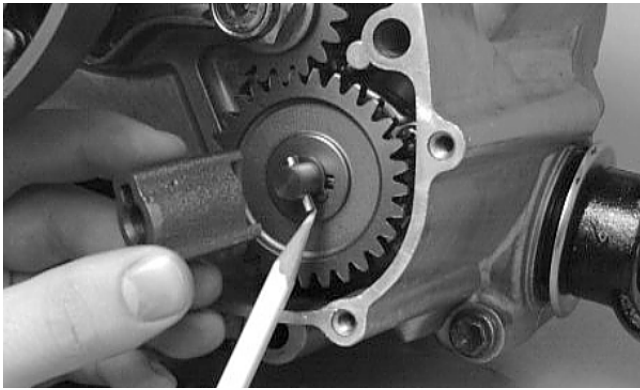
CC030D

5. Remove the fifteen cap screws securing the right-side cover to the crankcase. Remove the cover. Note the location of the long cap screw and rubber washer. Account for the gasket and for two alignment pins.



CC070D

6. Remove the water pump drive joint from the water pump shaft. Account for the pin.



CC082D

C. Primary Drive Clutch Shoe
D. Primary Driven Clutch
E. Primary Drive Clutch Housing

■ **NOTE:** Steps 1-6 in the preceding sub-section must precede this procedure.

7. Remove the reverse cam stopper housing and gasket and account for a stopper and spring.

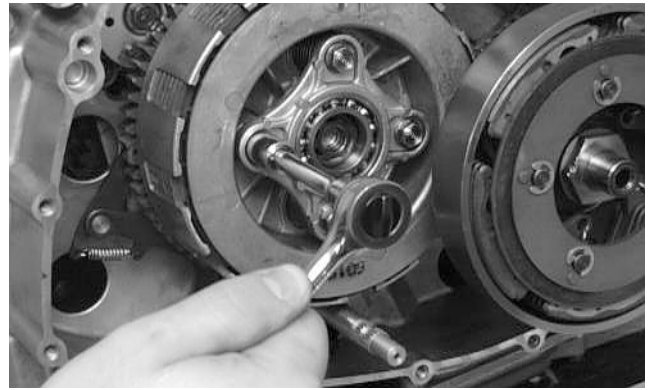


CC069D

8. Remove the clutch release arm and washer; then in a crisscross pattern, remove the four cap screws securing the clutch release roller assembly.



CD171

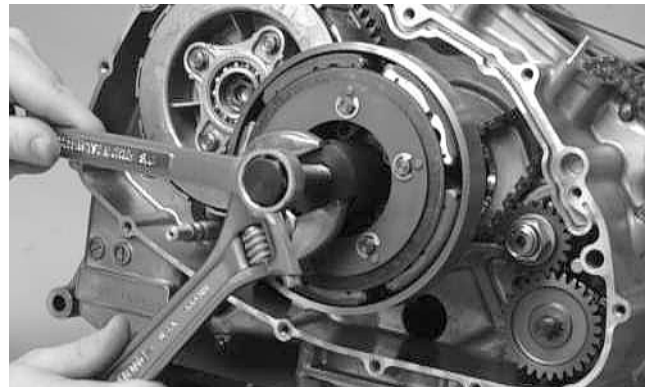


CC074D

9. Remove the release plate. Account for four springs.
10. Remove the primary drive clutch-shoe nut (left-hand threads) and washer from the driveshaft; then using a primary clutch shoe remover, remove the clutch shoe.

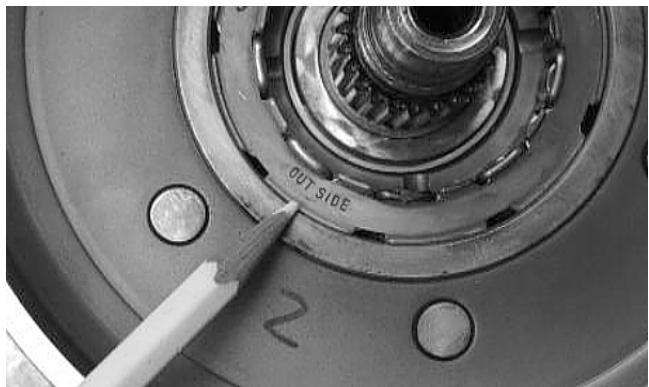
⚠ CAUTION

Care must be taken when removing the nut; it has "left-hand" threads.



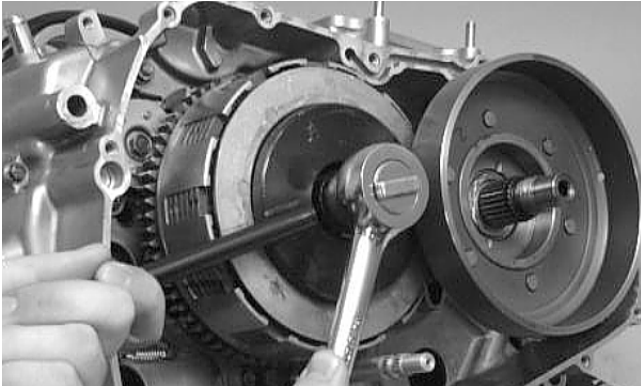
CC072D

11. Remove the primary drive one-way clutch from the primary drive clutch housing. Note the word **OUTSIDE** stamped on the clutch for installing purposes.



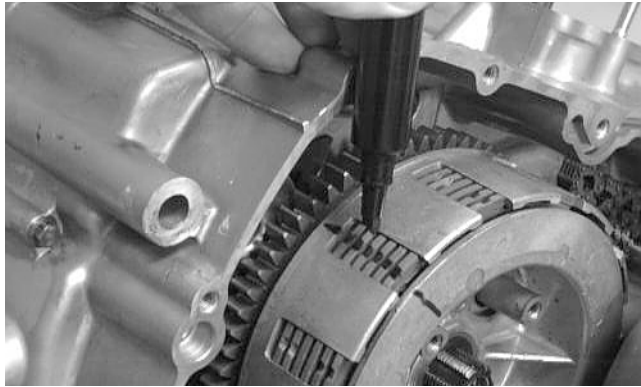
CC075D

12. Using the Clutch Sleeve Hub Holder (p/n 0444-007) to hold the clutch sleeve hub, remove the nut and washer.



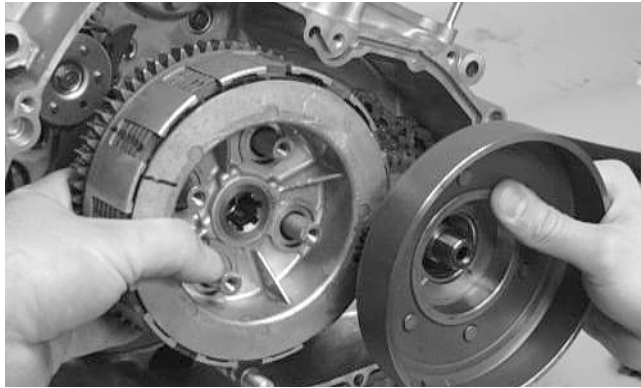
CC076D

13. Scribe a line across the primary driven clutch assembly to aid in assembling.



CC077D

14. Simultaneously, remove the primary driven clutch assembly and primary drive clutch housing from their respective shafts. Account for the sleeve and washers.



CC078D

👉 AT THIS POINT
 To service clutch components, see Servicing Right-Side Components sub-section.

F. Gear Shift Cam Plate/Guide
G. Oil Pump/Oil Strainer

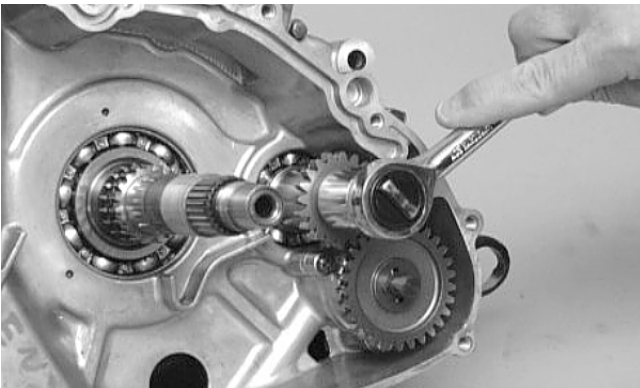
■ **NOTE:** Steps 1-14 in the preceding sub-sections must precede this procedure.

15. Remove the cam chain from the crankcase.



CC079D

16. Remove the nut and washer securing the oil pump drive gear to the crank balancer shaft; then remove the gear and account for the pin and the spacer.



CC080D



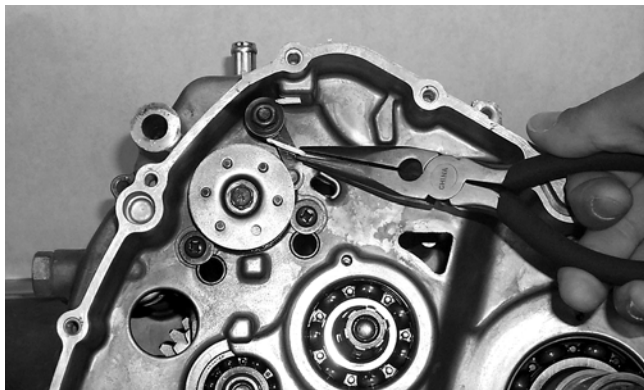
CC081D

17. Remove the gear shift shaft from the crankcase.



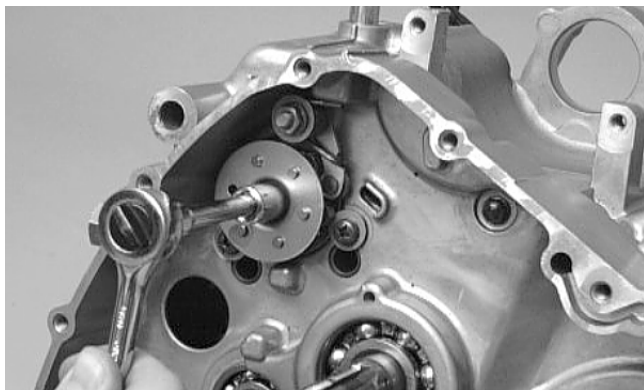
CC085D

18. Release the tension from the gear shift cam stopper arm spring.



CC086D

19. Remove the cap screw securing the gear shift cam plate and guide to the gear shift cam; then remove the cam plate and guide.



CC164D

CAUTION

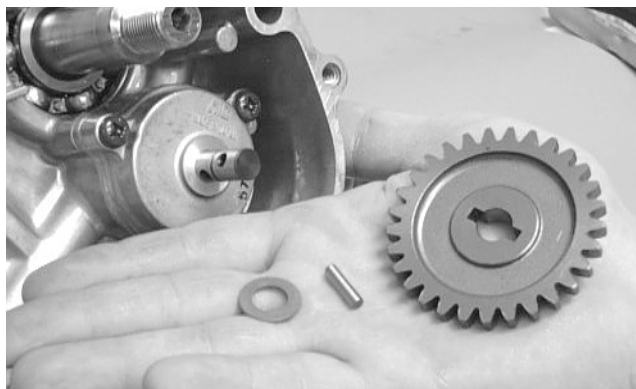
If servicing of the engine/transmission is due to a lubrication-related problem, replace the oil pump.

■ **NOTE:** For general servicing, it is advisable to disassemble, clean, and inspect the oil pump. If any wear or damage is suspected, replace the oil pump.

20. Remove the circlip securing the oil pump driven gear; then remove the gear. Account for the pin and the washer.



CC088D



CC089D

21. Remove the three Phillips-head screws securing the oil pump; then remove the oil pump.

■ **NOTE:** It may be necessary to use an impact driver to loosen the screws.



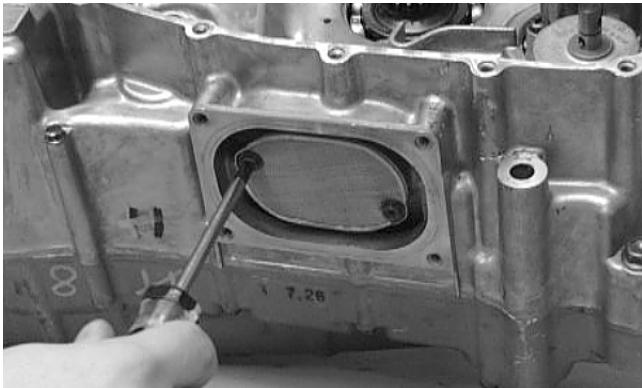
CD190

22. Remove the cap screws securing the oil strainer cap; then remove the cap. Account for the O-ring.

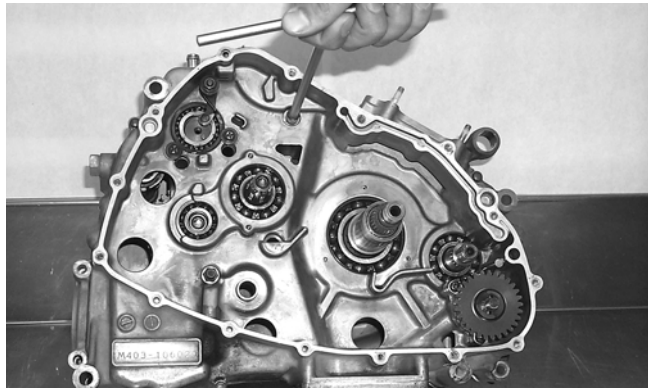


CC091D

23. Remove the two Phillips-head cap screws securing the strainer.



CC163D



CC530D

👉 AT THIS POINT
To service center crankcase components only, proceed to Separating Crankcase Halves.

Center Crankcase Components

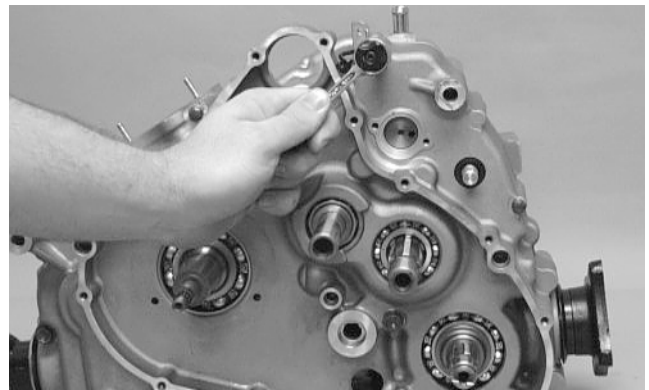
■ **NOTE:** This procedure cannot be done with the engine/transmission in the frame. Complete Removing procedures for Top-Side, Left-Side, and Right-Side must precede this procedure.

■ **NOTE:** For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

Separating Crankcase Halves

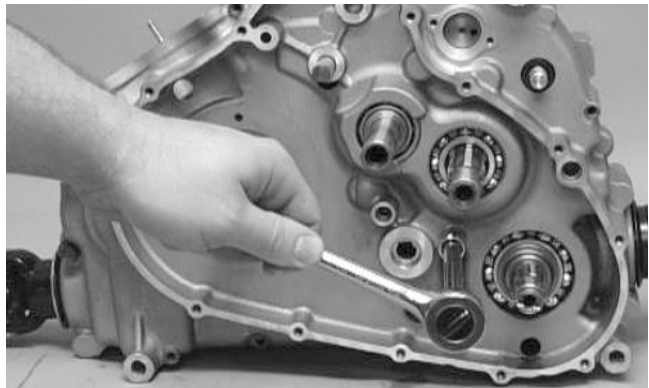
1. Remove the five right-side 6 mm cap screws (one from inside the case) securing the crankcase halves. Note the location of the different-lengthed cap screws.

2. Remove the seven left-side 6 mm cap screws securing the crankcase halves. Note the location of the wiring form. Note the location of the different-lengthed cap screws.



CC096D

3. Remove the three left-side 8 mm cap screws (two from inside the case) securing the crankcase halves. Note the location of the different-lengthed cap screws.



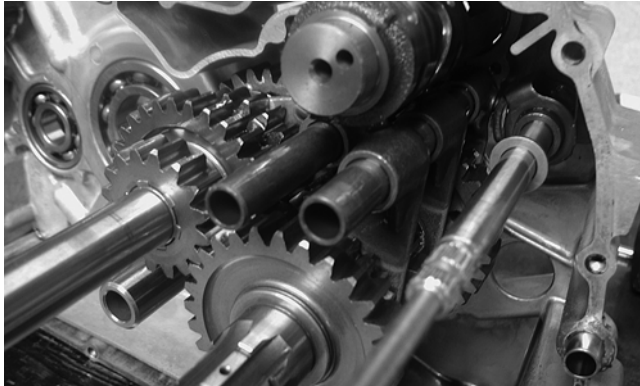
CC097D

4. Remove the three right-side 8 mm cap screws securing the crankcase halves.

3



CC098D



CD227

5. Using the Crankcase Separator/Crankshaft Remover (p/n 0444-009) and tapping lightly with a rubber mallet, separate the crankcase halves. Account for two alignment pins, an O-ring, and a washer.

■ **NOTE:** To keep the shaft/gear assemblies intact for identification, tap the shafts toward the left-side crankcase half when separating the halves.



CC101D



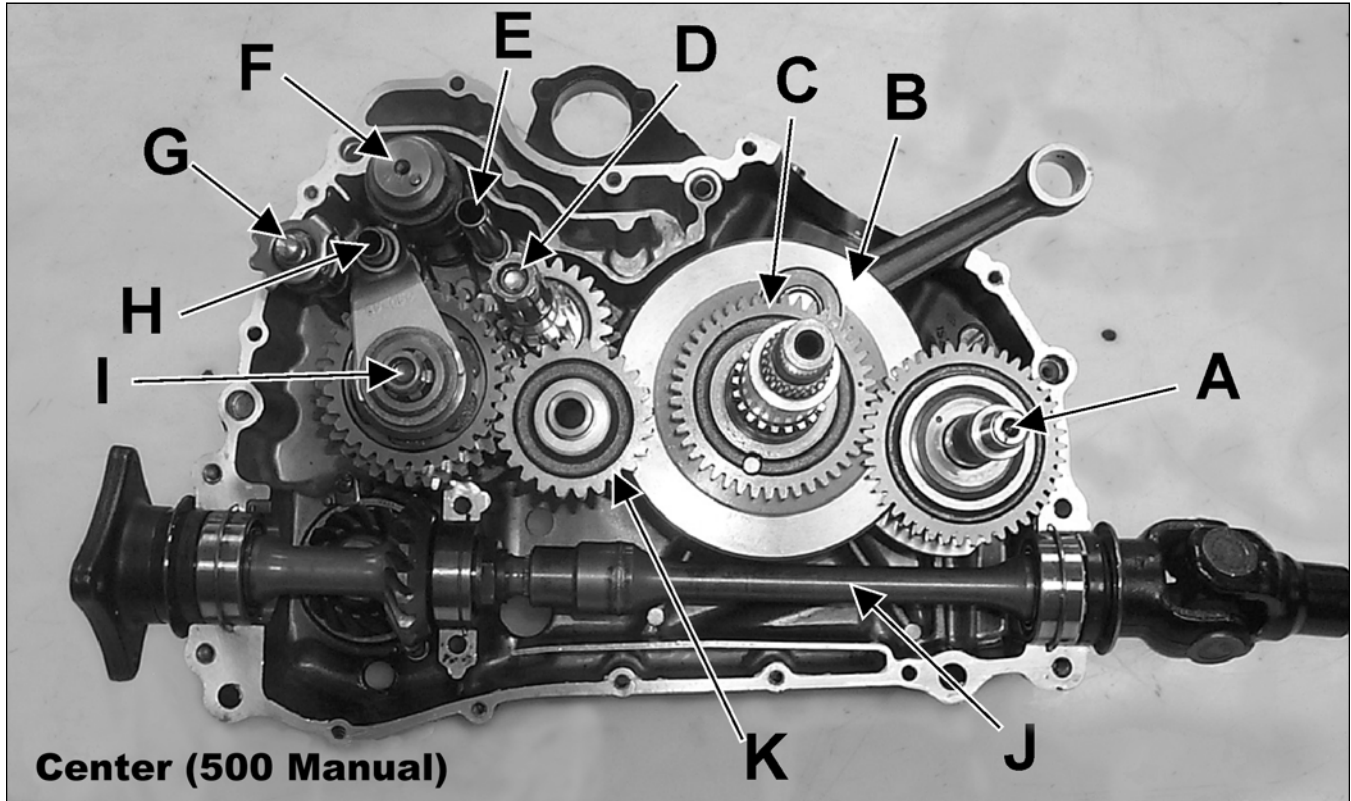
CC099D



CC102D

Disassembling Crankcase Half

■ NOTE: For steps 1-10, refer to illustration CC803C.



3

Center (500 Manual)

KEY

- | | | |
|---------------------------------|-----------------------------|------------------------|
| A. Crank Balancer Assembly | E. Shift Shaft with Fork | I. Driveshaft Assembly |
| B. Crankshaft | F. Gear Shift Cam | J. Output Shaft |
| C. Balancer Drive Gear with Pin | G. Reverse Shift Cam | K. Reverse Idle Gear |
| D. Countershaft Assembly | H. Shift Shaft with 3 Forks | |

CC803C

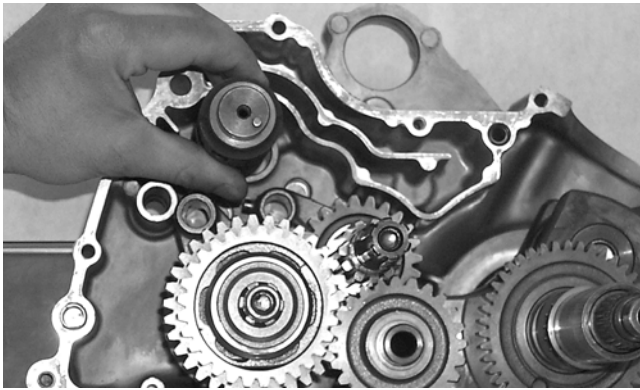
■ NOTE: To aid in assembling, it is recommended that the assemblies are kept together and IN ORDER.

1. Remove the two shift shafts (E and H).
2. Remove the reverse shift cam (G) and spacer.
3. Disengage four forks from the gear shift cam (F); then remove the reverse shifter fork.



CC105D

4. Remove the gear shift cam (F).



CC106D

5. Remove the three remaining forks noting their positions for assembling purposes.

👉 AT THIS POINT

To service gear shift forks, see Servicing Center Crankcase Components sub-section.

6. Remove the reverse idle gear (K) w/shaft. Account for the bushing, two washers, and the circlip.

7. Simultaneously, remove the driveshaft assembly (I) and countershaft assembly (D). Account for the washer on the countershaft.

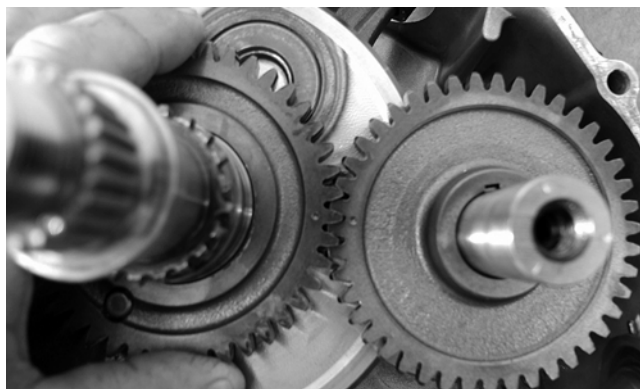
👉 AT THIS POINT

To service the driveshaft and/or countershaft, see Servicing Center Crankcase Components sub-section.

■ **NOTE:** For efficiency, if the driveshaft and/or countershaft are not being serviced, it is preferable to leave them assembled. The technician should use discretion and sound judgment.

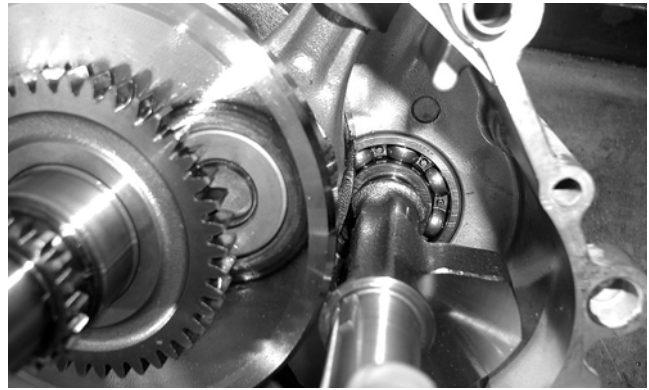
8. Remove the front output shaft (J) and rear shaft assemblies. Account for the bearing C-ring.

■ **NOTE:** Note the alignment marks on the crank balancer driven gear and balancer drive gear to aid in assembly.



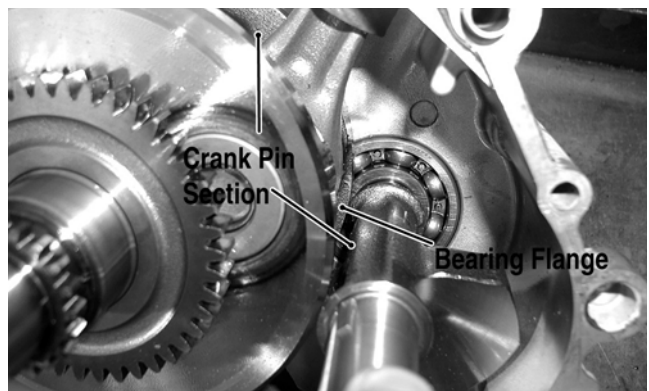
CD826

9. Remove the driven gear from the crank balancer assembly (A). Account for a key.



CD832

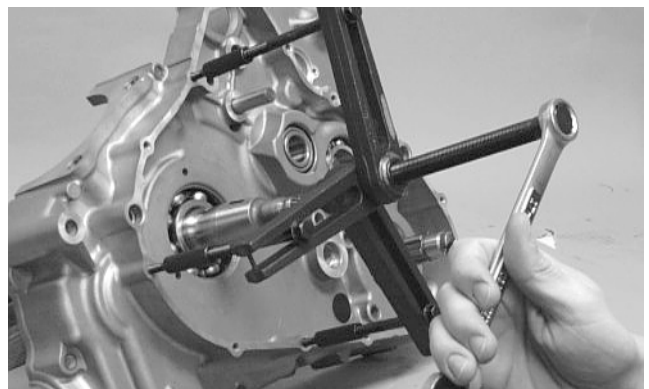
10. Remove the crank balancer assembly (A).



CD832B

■ **NOTE:** There is a flat spot on the crank balancer to allow clearance past the crankshaft.

11. Using the Crankcase Separator/Crankshaft Remover (p/n 0444-009), push the crankshaft assembly out of the crankcase.



CC115D

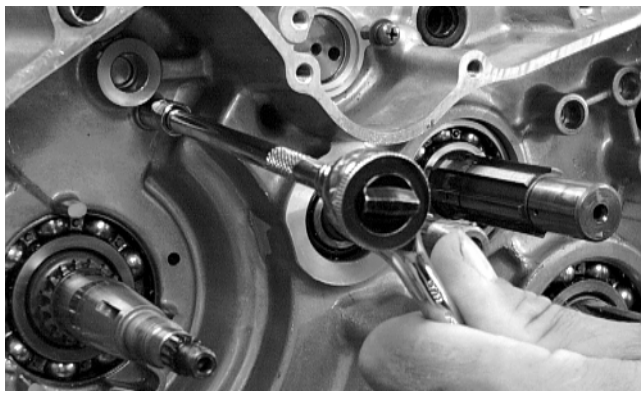
👉 AT THIS POINT

To service crankshaft assembly, see Servicing Center Crankcase Components sub-section.

CAUTION

Do not remove the remaining output shaft assembly unless absolutely necessary. If the shaft is removed, the shaft nut must be replaced with a new one and the shaft must be re-shimmed.

- To remove the output shaft and gear, remove the nut, slide the gear off the shaft (account for a shim or shims), and drive the shaft out with a plastic mallet (account for a shim or shims).



CC482D

Table of Contents (Servicing Components)

NOTE: Critical engine/transmission specifications are located at the beginning of this section.

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 - Driveshaft 3-305
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Servicing Top-Side Components

NOTE: Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

VALVE ASSEMBLY

When servicing valve assembly, inspect valve seats, valve stems, valve faces, and valve stem ends for pits, burn marks, or other signs of abnormal wear.

NOTE: Whenever a valve is out of tolerance, it must be replaced.

Cleaning/Inspecting Valve Cover

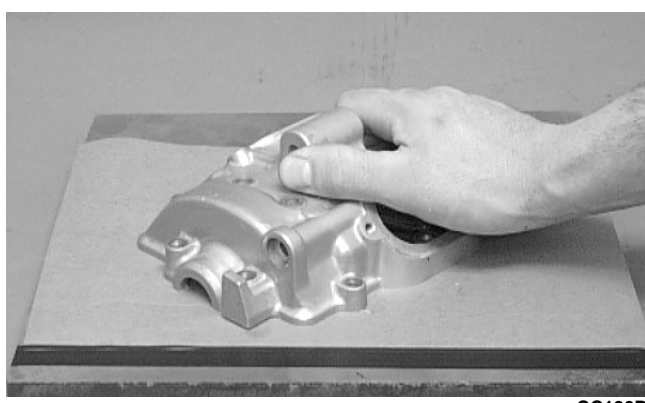
NOTE: If the valve cover cannot be trued, the cylinder head assembly must be replaced.

- Wash the valve cover in parts-cleaning solvent.
- Place the valve cover on the Surface Plate (p/n 0644-016) covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the valve cover in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the valve cover in a figure eight motion until a uniform bright metallic finish is attained.

3

CAUTION

Do not remove an excessive amount of the sealing surface or damage to the camshaft will result. Always check camshaft clearance when resurfacing the valve cover.



CC130D

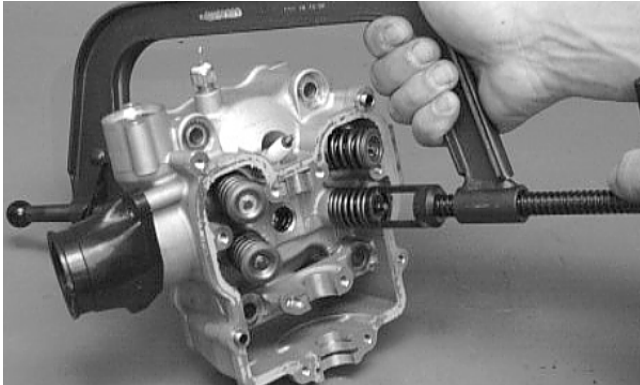
CAUTION

Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.

Removing Valves

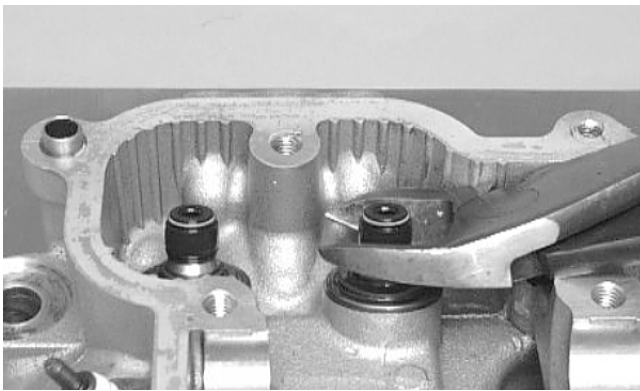
■ **NOTE:** Keep all valves and valve components as a set. Note the original location of each valve set for use during installation. Return each valve set to its original location during installation.

1. Using a valve spring compressor, compress the valve springs and remove the valve cotters. Account for an upper spring retainer.

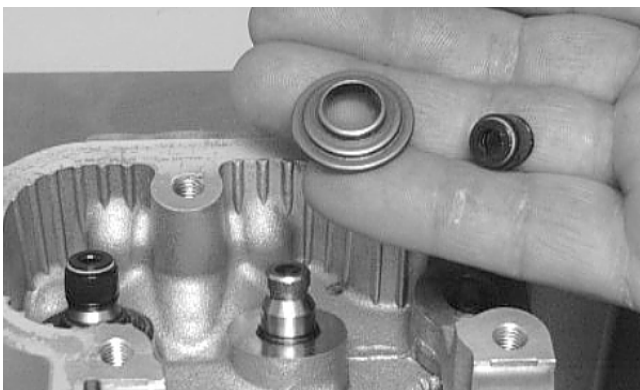


CC132D

2. Remove the valve seal and the lower remaining spring seat. Discard the valve seal.



CC134D



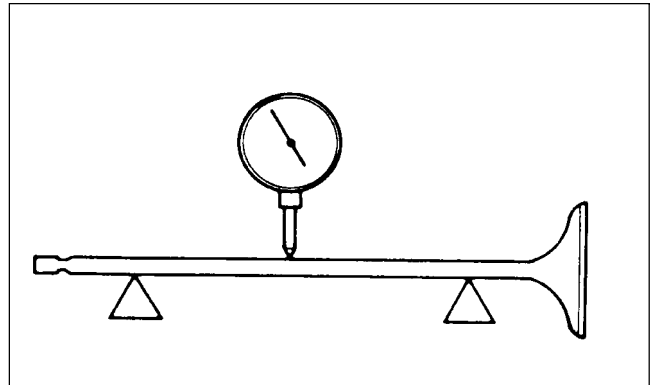
CC136D

■ **NOTE:** The valve seals must be replaced.

3. Remove the valve springs; then invert the cylinder head and remove the valves.

Measuring Valve Stem Runout

1. Support each valve stem end with the V Blocks (p/n 0644-022); then check the valve stem runout using a dial indicator.



ATV-1082

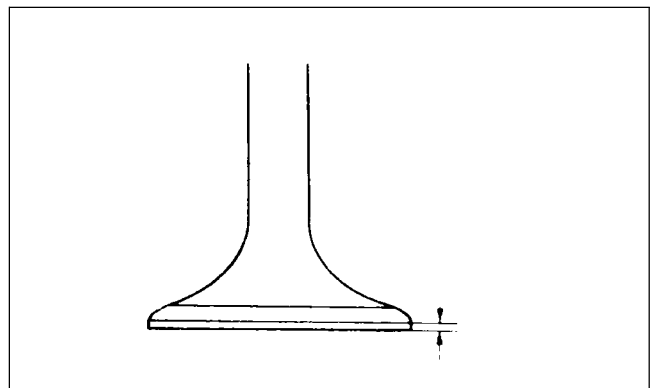
2. Maximum runout must not exceed specifications.

Measuring Valve Stem Outside Diameter

1. Using a micrometer, measure the valve stem outside diameter.
2. Acceptable diameter range (intake valve) must be within specifications.
3. Acceptable diameter range (exhaust valve) must be within specifications.

Measuring Valve Face/Seat Width

1. Using a micrometer, measure the width of the valve face.

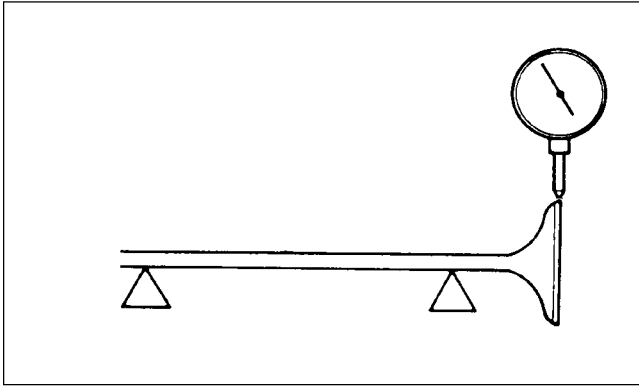


ATV-1004

2. Acceptable width range must be within specifications.

Measuring Valve Face Radial Runout

1. Mount a dial indicator on the surface plate; then place the valve stem on a set of V blocks.
2. Position the dial indicator contact point on the outside edge of the valve face; then zero the indicator.

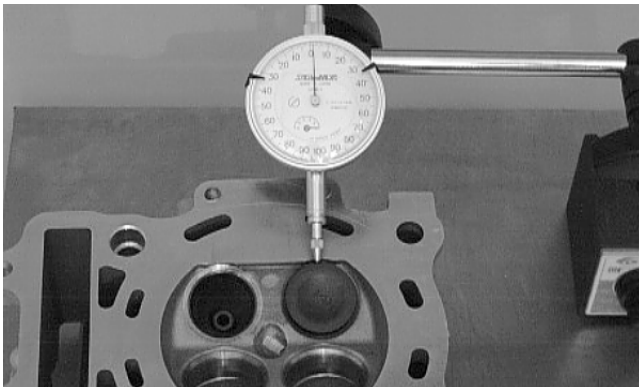


ATV1082A

3. Rotate the valve in the V blocks.
4. Maximum runout must not exceed specifications.

Measuring Valve Guide/Valve Stem Deflection (Wobble Method)

1. Mount a dial indicator and base on the surface plate; then place the cylinder head on the surface plate.
2. Install the valve into the cylinder head; then position the dial indicator contact point against the outside edge of the valve face. Zero the indicator.



CC131D

3. Push the valve from side to side; then from top to bottom.
4. Maximum “wobble” deflection must not exceed specifications.

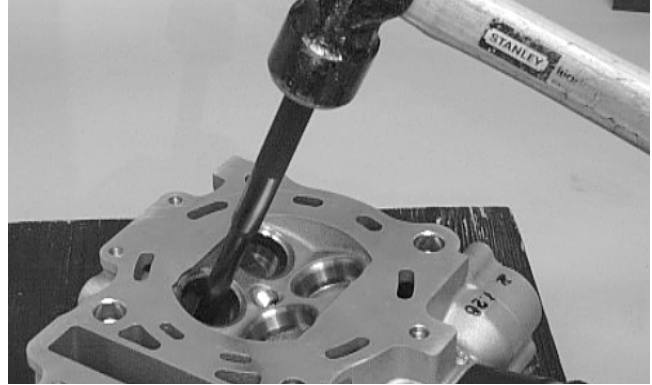
Measuring Valve Guide (Inside Diameter)

1. Insert a snap gauge 1/2 way down into each valve guide bore; then remove the gauge and measure it with a micrometer.
2. Acceptable inside diameter range must be within specifications.
3. If a valve guide is out of tolerance, it must be replaced.

Replacing Valve Guide

■ **NOTE:** If a valve guide is worn or damaged, it must be replaced.

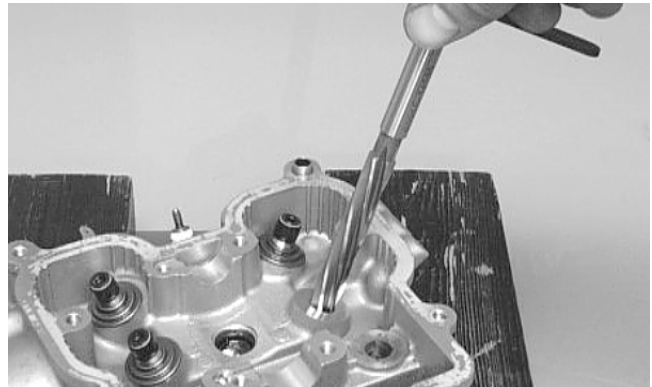
1. If a valve guide needs replacing, insert a valve guide remover into the valve seat side of the valve guide. Using a hammer, gently drive the valve guide out of the cylinder head.



CC137D

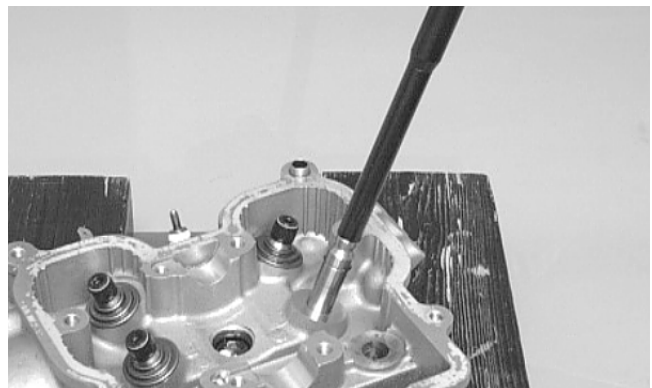
3

2. Using the Standard Valve Guide Reamer (p/n 0444-017), remove any burrs or tight areas from the valve guide journals.



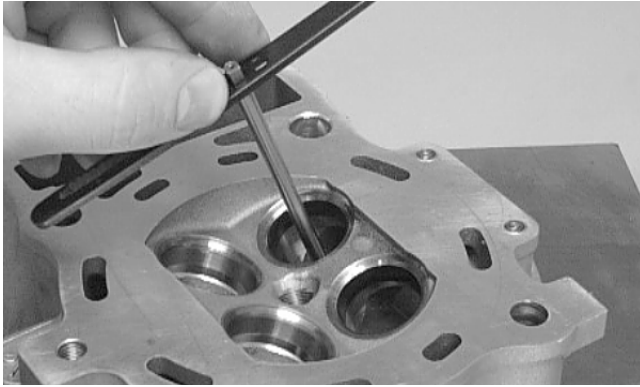
CC142D

3. To install a valve guide, use a valve guide installer and gently drive a valve guide with a retaining clip into the bore from the valve spring side until the retaining clip just contacts the cylinder head.



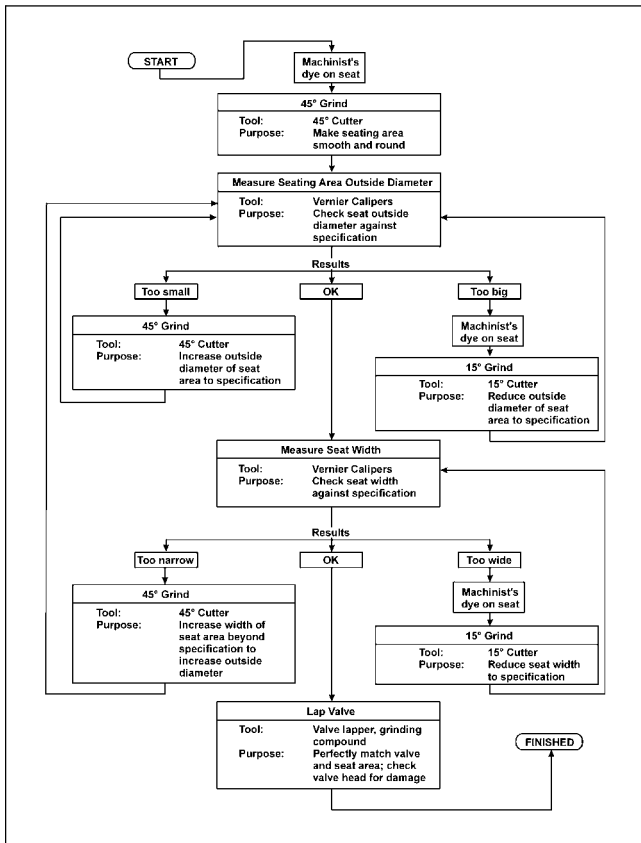
CC143D

4. After installing the guide, use the standard valve guide reamer to remove all burrs and tight areas that may remain in each valve guide.



CC138D

Valve Seat/Guide Servicing Flow Chart



ATV-0107

Grinding Valve Seats

■ **NOTE:** If the valve seat is beyond servicing, the cylinder head must be replaced.

1. Insert an exhaust valve seat pilot shaft into an exhaust valve guide. Slide an exhaust valve seat grinding tool onto the pilot shaft; then using light pressure on a driver handle and a deep socket, grind the exhaust valve seat until within specifications.

■ **NOTE:** Repeat procedure on the remaining exhaust valve.



CC139D

2. Insert an intake valve seat pilot shaft into one of the intake valve guides. Slide the intake valve seat grinding tool onto the pilot shaft; then using light pressure on a driver handle and a deep socket, grind the intake valve seat until within specifications.

■ **NOTE:** Repeat procedure on the remaining intake valve.



CC140D

Lapping Valves

■ **NOTE:** Do not grind the valves. If a valve is damaged, it must be replaced.

1. Remove all carbon from the valves.
2. Lubricate each valve stem with light oil; then apply a small amount of valve lapping compound to the entire seating face of each valve.
3. Attach the suction cup of a valve lapping tool to the head of the valve.
4. Rotate the valve until the valve and seat are evenly polished.
5. Clean all compound residue from the valve and seat.

Measuring Rocker Arm (Inside Diameter)

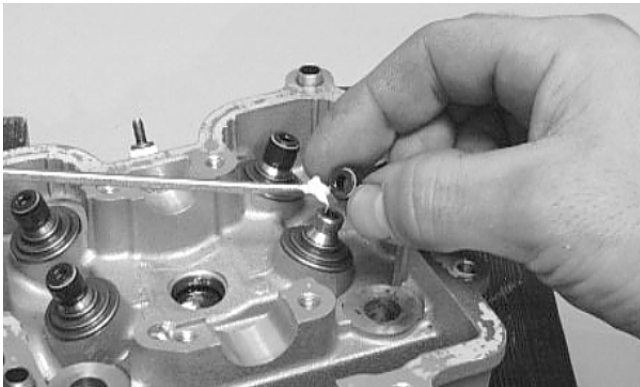
1. Using a dial calipers, measure the inside diameter of the rocker arm.
2. Acceptable inside diameter range must be within specifications.

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

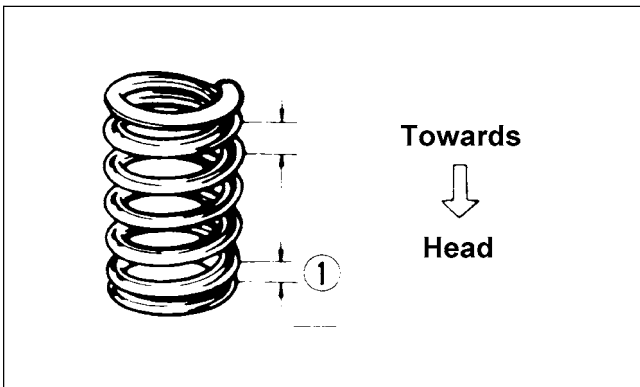
1. Apply grease to the inside surface of the valve seals; then place a lower spring seat and valve guide seal over each valve guide.



CC144D

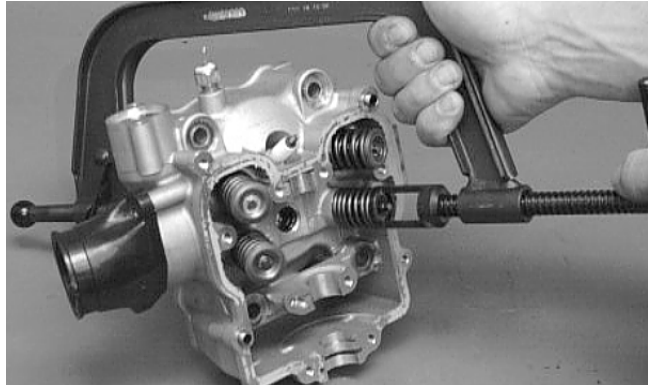
2. Insert each valve into its original valve location.
3. Install the valve springs with the painted end of the spring facing away from the cylinder head.

■ **NOTE:** If the painted end is not visible, install the ends of the springs with the closest coils toward the head.



ATV-1011A

4. Place a spring retainer over the valve springs; then using the valve spring compressor, compress the valve springs and install the valve cotters.



CC132D

PISTON ASSEMBLY

■ **NOTE:** Whenever a piston, rings, or pin are out of tolerance, they must be replaced.

Cleaning/Inspecting Piston

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the dome of the piston.
2. Inspect the piston for cracks in the piston pin, dome, and skirt areas.
3. Inspect the piston for seizure marks or scuffing. Repair with #400 grit wet-or-dry sandpaper and water or honing oil.



AN135

■ **NOTE:** If scuffing or seizure marks are too deep to correct with the sandpaper, replace the piston.

4. Inspect the perimeter of each piston for signs of excessive “blowby.” Excessive “blowby” indicates worn piston rings or an out-of-round cylinder.

Removing Piston Rings

1. Starting with the top ring, slide one end of the ring out of the ring-groove.



CC400D

2. Remove each ring by working it toward the dome of the piston while rotating it out of the groove.

■ **NOTE:** If the existing rings will not be replaced with new ones, note the location of each ring for proper installation. When installing new rings, install as a complete set only.

Cleaning/Inspecting Piston Rings

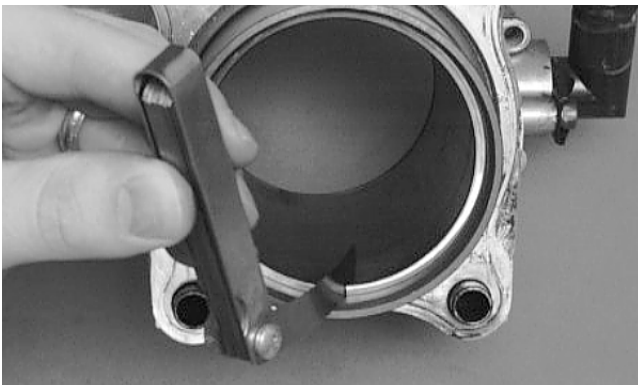
1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

CAUTION

Improper cleaning of the ring-grooves by the use of the wrong type of ring-groove cleaner will result in severe damage to the piston.

Measuring Piston-Ring End Gap (Installed)

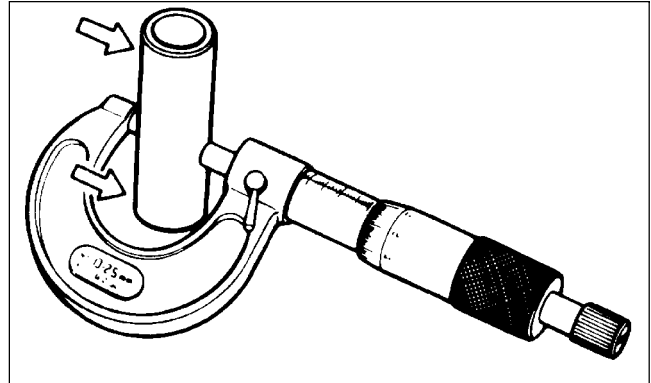
1. Place each piston ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must be within specifications.



CC280D

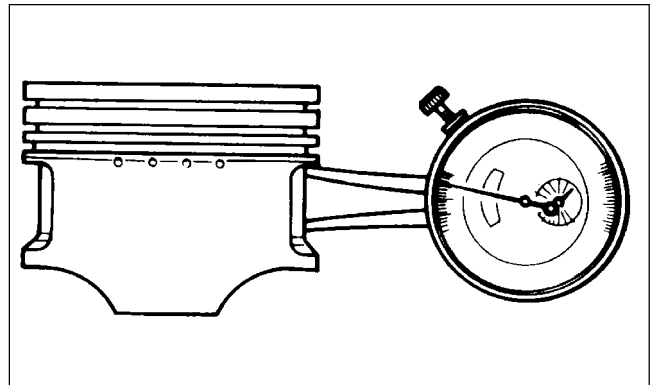
Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

1. Measure the piston pin outside diameter at each end and in the center. If measurement is not within specifications, the piston pin must be replaced.



ATV-1070

2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.



ATV-1069

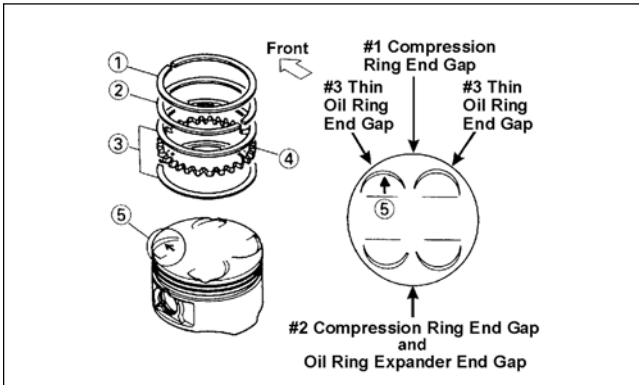
Measuring Piston Skirt/Cylinder Clearance

1. Measure the cylinder front to back in six places.
2. Measure the corresponding piston diameter at a point 15 mm (0.6 in.) above the piston skirt at a right angle to the piston-pin bore. Subtract this measurement from the measurement in step 1. The difference (clearance) must be within specifications.

Installing Piston Rings

1. Install ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap. Stagger the end gaps of the upper and lower thin oil rings according to the illustration.

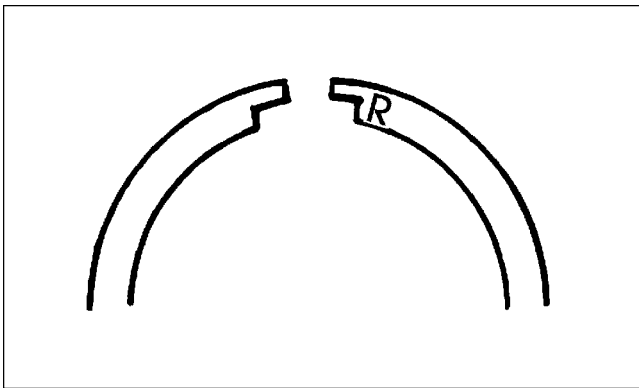
■ **NOTE:** Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.



ATV-1085B

2. Install the compression rings (1 and 2) so the letter on the top surface of each ring faces the dome of the piston. Rotate the rings until the ring end gaps are on directly opposite sides of the piston (see illustration).

■ **NOTE:** The chrome (silver) ring should be installed in the top position.



726-306A

CAUTION

Incorrect installation of the piston rings will result in engine damage.

CYLINDER/CYLINDER HEAD ASSEMBLY

■ **NOTE:** If the cylinder/cylinder head assembly cannot be trued, they must be replaced.

Cleaning/Inspecting Cylinder Head

CAUTION

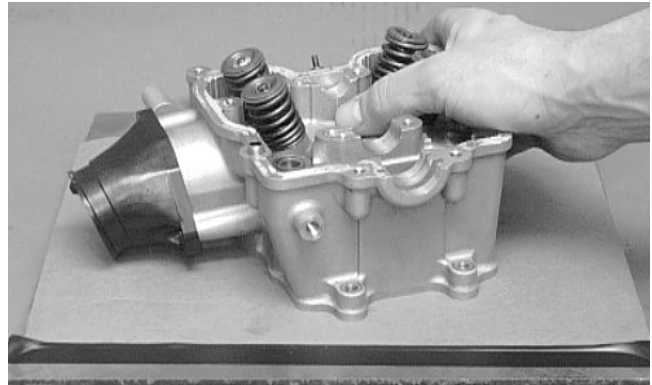
The cylinder head studs must be removed for this procedure.

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the combustion chamber being careful not to nick, scrape, or damage the combustion chamber or the sealing surface.
2. Inspect the spark plug hole for any damaged threads. Repair damaged threads using a "heli-coil" insert.

3. Place the cylinder head on the surface plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the cylinder head in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the cylinder head in a figure eight motion until a uniform bright metallic finish is attained.

CAUTION

Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.



CC128D

Measuring Cylinder Head Distortion

1. Remove any carbon buildup in the combustion chamber.
2. Lay a straightedge across the cylinder head; then using a feeler gauge, check the distortion factor between the head and the straightedge.
3. Maximum distortion must not exceed specifications.



CC141D

Cleaning/Inspecting Cylinder

1. Wash the cylinder in parts-cleaning solvent.
2. Inspect the cylinder for pitting, scoring, scuffing, warpage, and corrosion. If marks are found, repair the surface using a cylinder hone (see Honing Cylinder in this sub-section).

- Place the cylinder on the surface plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the cylinder in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the cylinder in a figure eight motion until a uniform bright metallic finish is attained.

CAUTION

Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.



CC129D

Inspecting Cam Chain Guide

- Inspect cam chain guide for cuts, tears, breaks, or chips.
- If the chain guide is damaged, it must be replaced.

Honing Cylinder

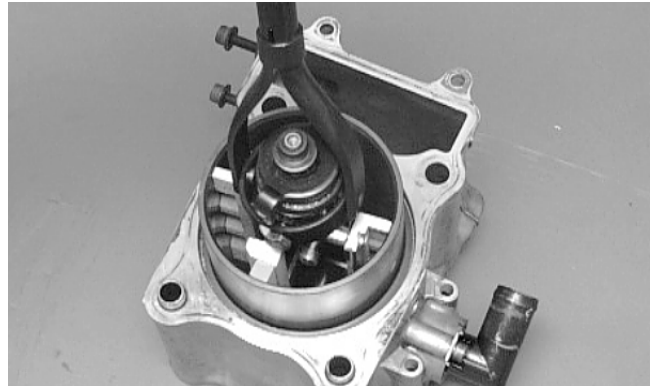
- Using a slide gauge and a dial indicator or a snap gauge, measure the cylinder bore diameter in three locations from top to bottom and again from top to bottom at 90° from the first measurements for a total of six measurements. The trueness (out-of-roundness) is the difference between the highest and lowest reading. Maximum trueness (out-of-roundness) must not exceed specifications.



CC127D

- Wash the cylinder in parts-cleaning solvent.
- Inspect the cylinder for pitting, scoring, scuffing, and corrosion. If marks are found, repair the surface using a rigid cylinder 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.

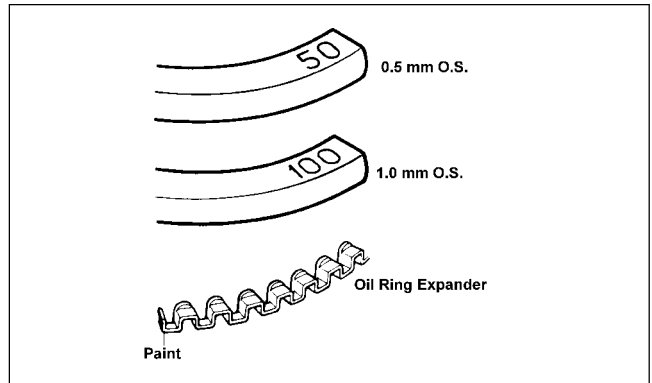


CC321D

■ **NOTE:** Nिकासil-plated cylinder cannot be honed.

- If any measurement exceeds the limit, hone the cylinder and install an oversized piston or replace the cylinder.

■ **NOTE:** Oversized piston and rings are available. The oversized piston and rings are marked for identification.

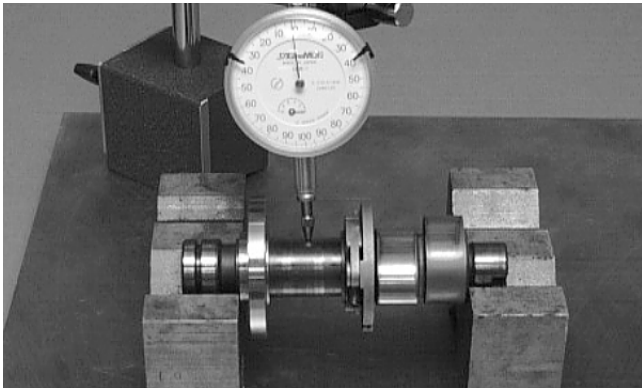


ATV-1068

Measuring Camshaft Runout

■ **NOTE:** If the camshaft is out of tolerance, it must be replaced.

- Place the camshaft on a set of V blocks; then position the dial indicator contact point against the shaft and zero the indicator.

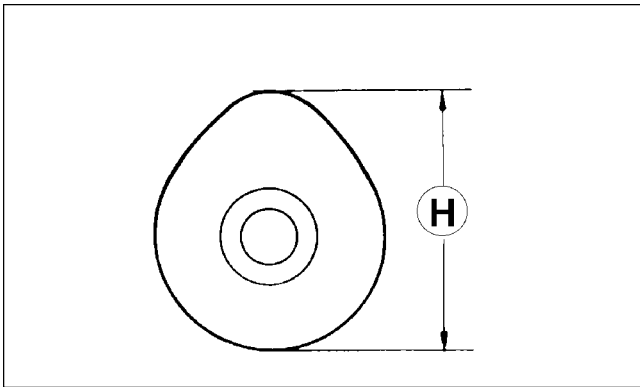


CC283D

2. Rotate the camshaft and note runout; maximum tolerance must not exceed specifications.

Measuring Camshaft Lobe Height

1. Using a calipers, measure each cam lobe height.



ATV1013A

2. The lobe heights must not exceed minimum specifications.

Inspecting Camshaft Bearing Journal

1. Inspect the bearing journal for scoring, seizure marks, or pitting.
2. If excessive scoring, seizure marks, or pitting is found, the cylinder head assembly must be replaced.

Measuring Camshaft to Cylinder Head Clearance

1. Remove the adjuster screws and jam nuts.



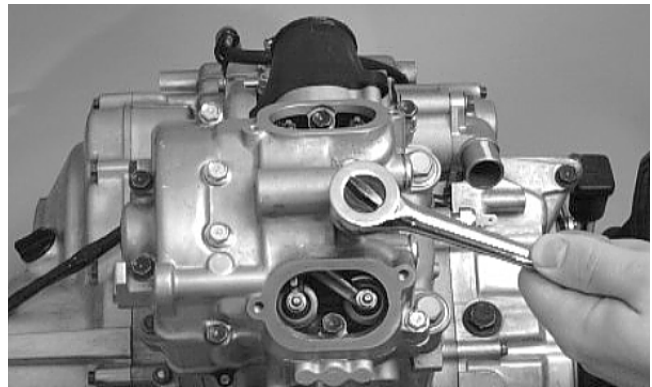
CC005D

2. Place a strip of plasti-gauge in each of the camshaft lands in the cylinder head.
3. Place the valve cover on the cylinder head and secure with the valve cover cap screws. Tighten securely.

■ **NOTE:** Do not rotate the camshaft when measuring clearance.

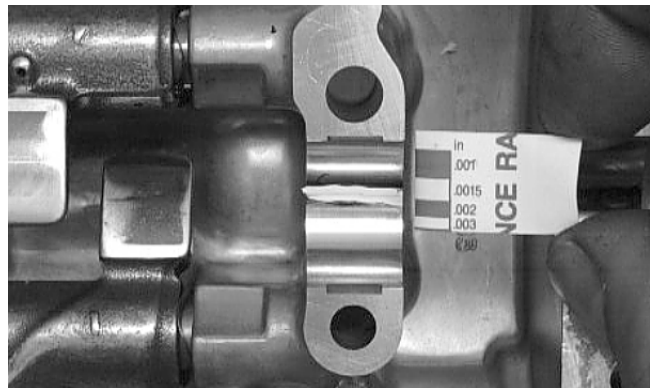
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4. Remove the cap screws securing the valve cover to the cylinder; then remove the valve cover and camshaft.



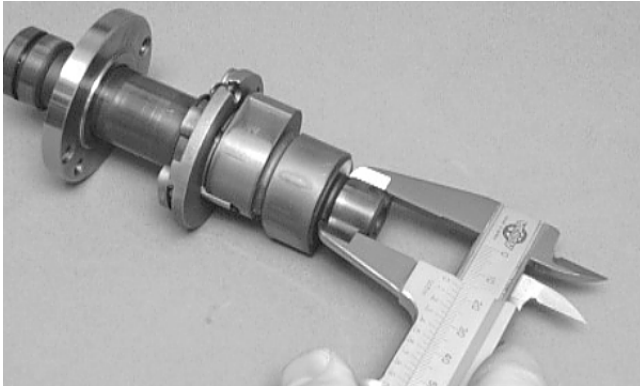
CC003D

5. Match the width of the plasti-gauge with the chart found on the plasti-gauge packaging to determine camshaft to cylinder head and valve cover clearance.



CC145D

6. If clearance is excessive, measure the journals of the camshaft.

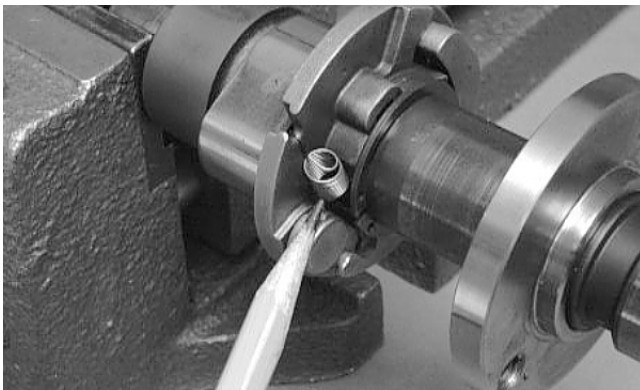


CC287D

■ **NOTE:** If the journals are worn, replace the camshaft; then measure the clearance again. If it is still out of tolerance, replace the cylinder head.

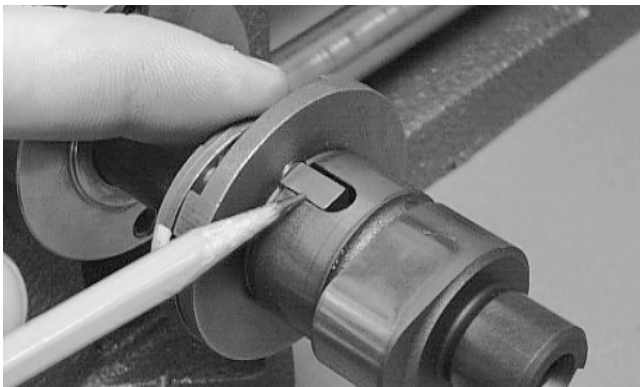
Inspecting Camshaft Automatic Decompression Spring/Unloader Assembly

1. Inspect the spring, weights, and unloader for damage and freedom of movement.



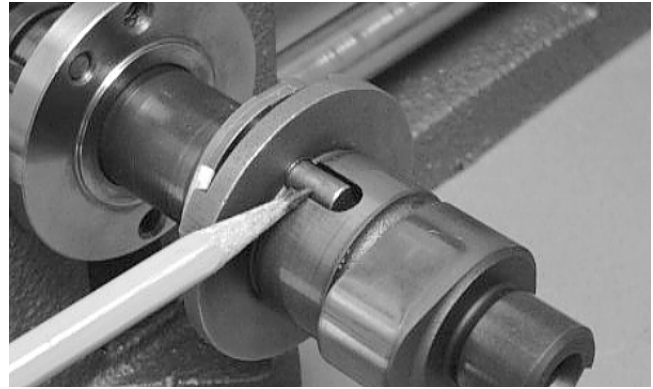
CC304D

■ **NOTE:** With the weight extended the unloader flat should be even with the camshaft journal.



CC308D

■ **NOTE:** When the weight is released, the spring should return the assembly to the “unload” position with the unloader extending above the camshaft journal.



CC306D

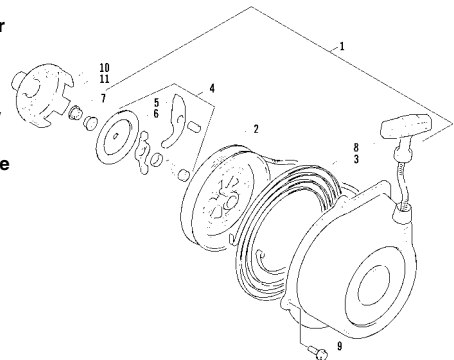
2. If damaged, the camshaft must be replaced.

Servicing Left-Side Components

RECOIL STARTER

KEY

1. Recoil Starter Assy
2. Reel
3. Spiral Spring
4. Ratchet Assy
5. Ratchet
6. Ratchet Guide
7. Nut
8. Rope Assy
9. Cap Screw
10. Starter Cup
11. Nut



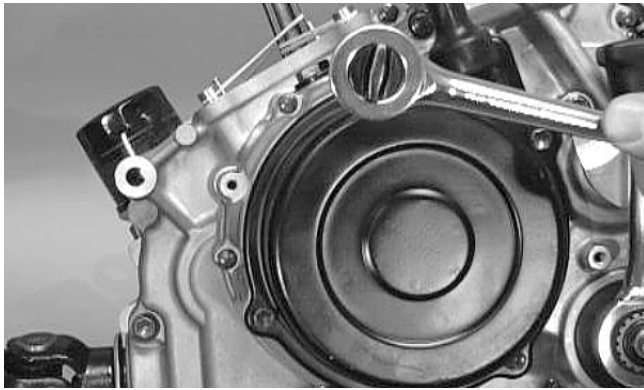
0737-034

WARNING

Always wear safety glasses when servicing the recoil starter.

Removing/Disassembling

1. Remove the cap screws securing the recoil starter assembly to the left-side cover; then remove the starter.

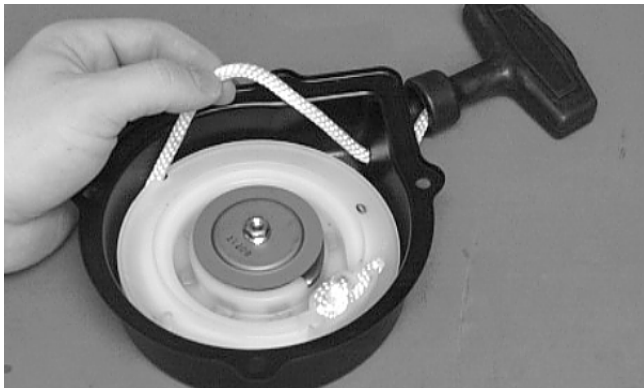


CC039D

⚠ WARNING

During the disassembly procedure, continuous downward pressure must be exerted on the reel so it does not accidentally disengage and cause injury.

2. Rotate the reel counterclockwise until the notch of the reel is near the rope guide in the case. Guide the rope into the notch and slowly allow the reel to retract until all spiral spring tension is released.

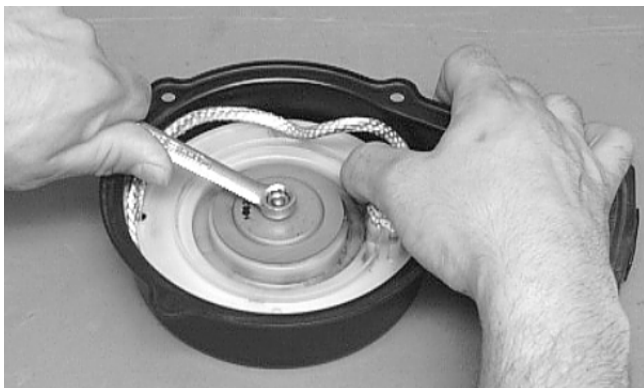


B600D

⚠ CAUTION

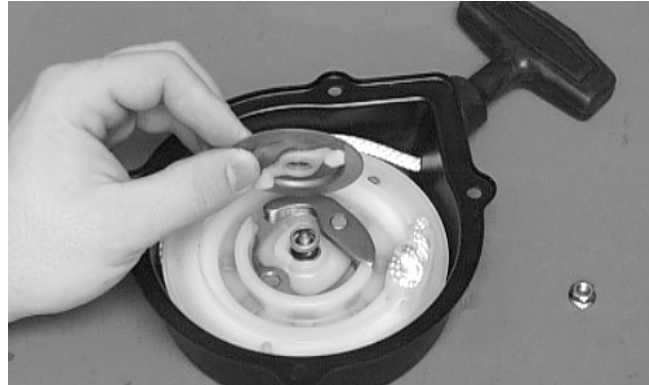
During the disassembly procedure, make sure all spring tension is released before continuing.

3. Remove the nut.



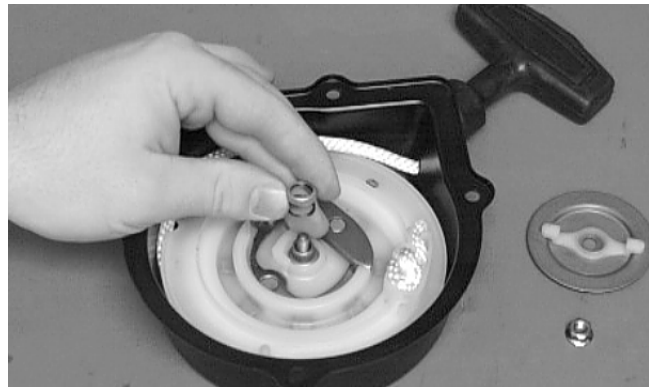
B601D

4. Slowly release the friction plate and lift the plate with ratchet guide free of the recoil case; then remove the ratchet guide from the friction plate.



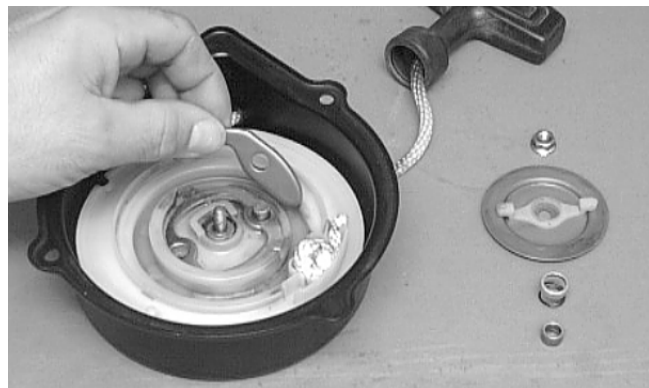
B602D

5. Remove the spring cover, spring, and shaft.



B603D

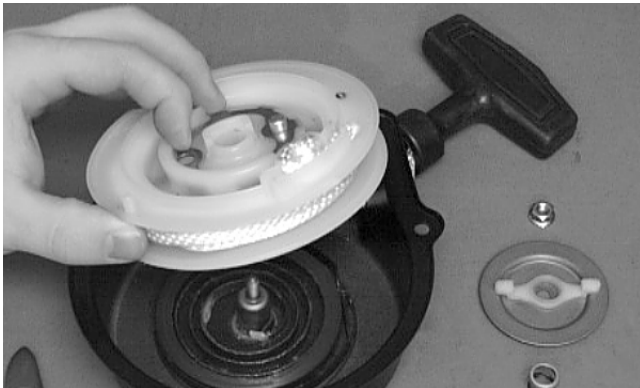
6. Remove the ratchet and account for the pin.



B604D

7. Carefully lift the reel from the case making sure the spring does not accidentally disengage from the case.

3



B605D

WARNING

Care must be taken when lifting the recoil free of the case. Wear safety glasses to avoid injury.

- Remove the protective cover from the starter handle and pull the rope out of the handle; then untie the knot in the rope and remove the handle.

■ **NOTE:** Do not remove the spiral spring unless replacement is necessary. It should be visually inspected in place to save time. If replacement is necessary, follow steps 9-10.

- Remove the spiral spring from the case by lifting the spring end up and out. Hold the remainder of the spring with thumbs and alternately release each thumb to allow the spring to gradually release from the case.
- Unwind the rope from the reel and remove the rope.

Cleaning and Inspecting

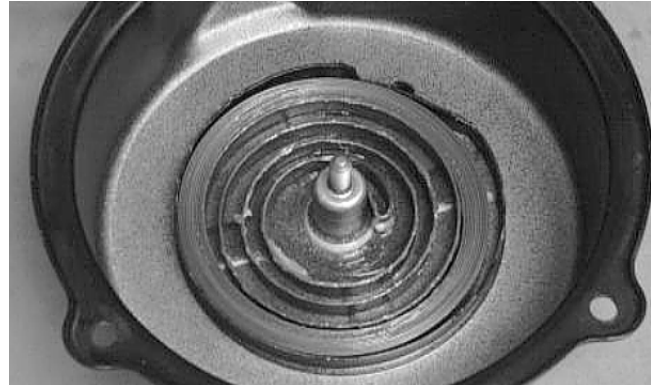
■ **NOTE:** Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

- Clean all components.
- Inspect the springs and ratchet for wear or damage.
- Inspect the reel and case for cracks or damage.
- Inspect the shaft for wear, cracks, or damage.
- Inspect the rope for breaks or fraying.
- Inspect the spiral spring for cracks, crystallization, or abnormal bends.
- Inspect the handle for damage, cracks, or deterioration.

Assembling/Installing

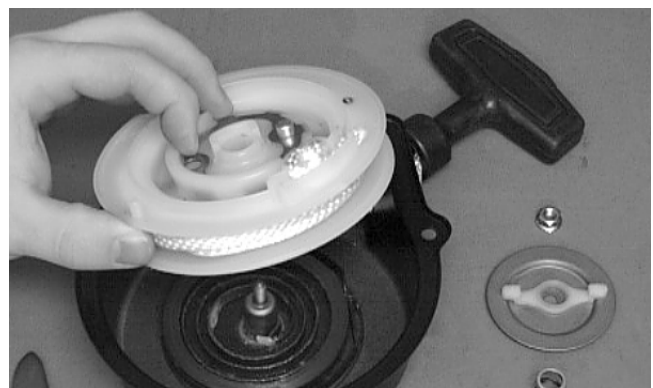
- If removed, insert the spiral spring into the case with the outer end of the spring around the mounting lug in the case; then wind it in a counterclockwise direction until the complete spring is installed.

■ **NOTE:** The spiral spring must seat evenly in the recoil case.



B606D

- Insert the rope through the hole in the reel and tie a knot in the end; then wrap the rope counterclockwise around the reel leaving approximately 50 cm (20 in.) of rope free of the reel.
- Apply low-temperature grease to the spring and hub.
- Thread the end of the rope through the guide hole of the case; then thread the rope through the handle and secure it with a double knot. Install the protective cover into the handle.
- Align the inner hook of the spiral spring with the notch in the reel.



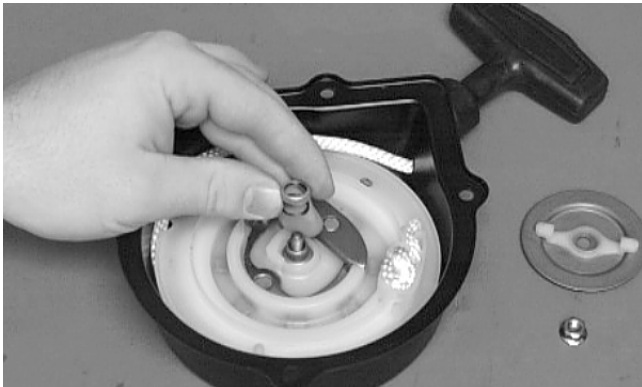
B605D

- Install the ratchet onto its spring making sure the end is properly installed on the reel.



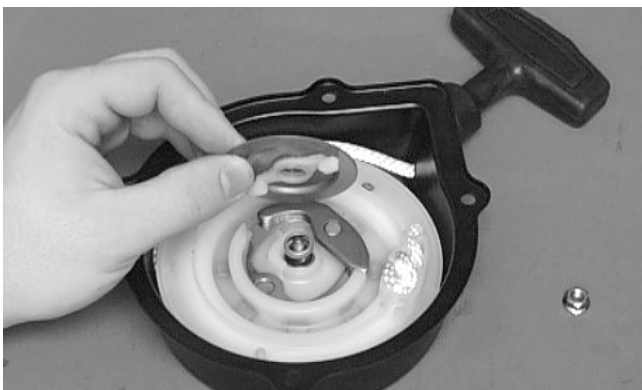
B604D

7. Install the shaft, spring, and the spring cover.



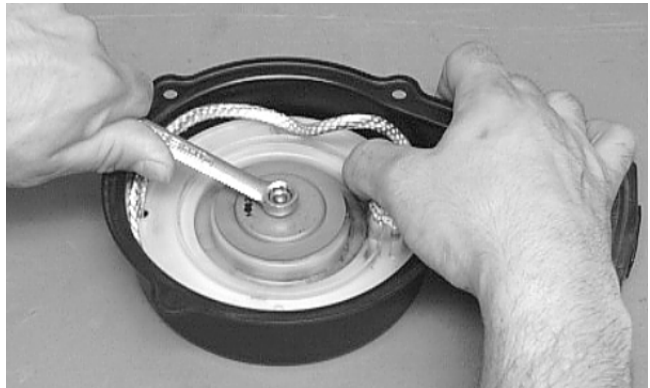
B603D

8. Install the friction plate with the ratchet guide fitting into the ratchet.



B602D

9. While pushing down on the reel, install the nut. Tighten securely.



B601D

10. With the 50 cm (20 in.) of rope exposed, hook the rope in the notch of the reel.

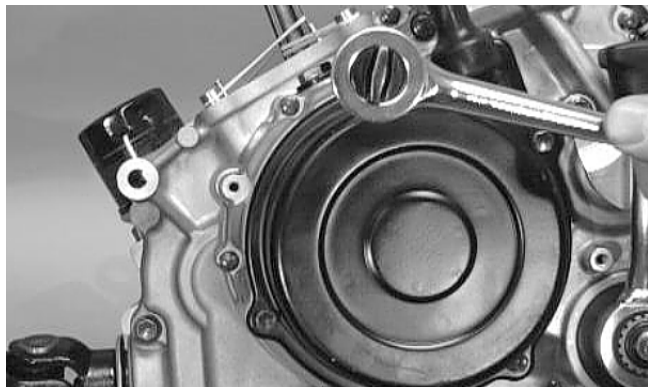
11. Rotate the reel four turns counterclockwise; then release the rope from the notch and allow the rope to retract.

12. Pull the rope out two or three times to check for correct tension.

■ **NOTE:** Increasing the rotations in step 11 will increase spring tension.

13. Place the recoil starter assembly into position on the left-side cover; then tighten the cap screws to specifications.

3

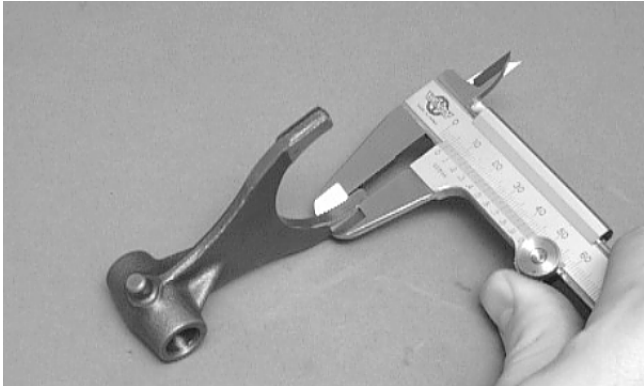


CC039D

MEASURING SHIFT FORK (Thickness)

■ **NOTE:** Whenever a shift fork is out of tolerance, replacement is necessary.

1. Using a calipers, in turn measure the thickness of the machined tip of each shift fork.

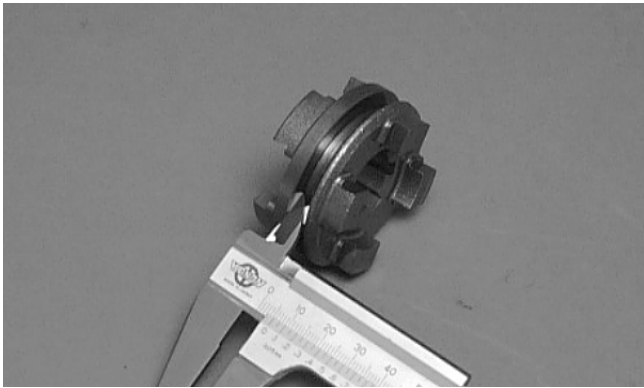


CC296D

2. Shift fork thickness must be within specifications.

MEASURING SHIFT FORK GROOVE (Width)

1. Using a calipers, in turn measure the width of each shift fork groove.



CC288D

2. Shift fork groove width must be within specifications.

MEASURING SHIFT FORK TO GROOVE (Side Clearance)

1. In turn, insert each shift fork into its groove.
2. Using a feeler gauge, measure the clearance between the shift fork and the groove.



CC292D

3. Shift fork to groove side clearance must be within specifications.

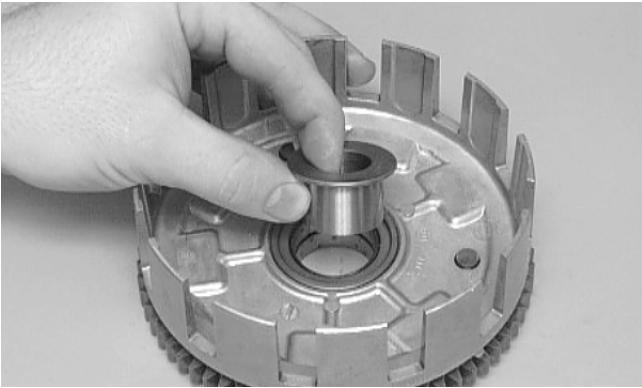
Servicing Right-Side Components

■ **NOTE:** Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.

PRIMARY CLUTCH ASSEMBLY (Inspecting/Measuring/Assembling)

■ **NOTE:** Prior to inspecting and measuring components, it is recommended that all components be removed from the primary gear assembly and be cleaned.

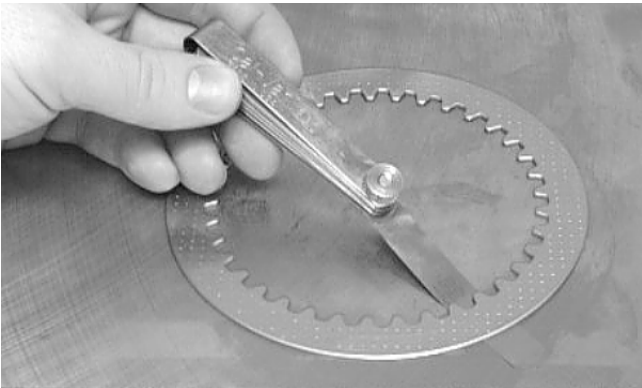
■ **NOTE:** When removing components from the primary gear assembly, account for the bushing that fits into the primary gear.



CC239D

Inspecting/Measuring Clutch Driven Plate Warpage

1. Inspect each driven plate for warpage and burn marks.
2. In turn place each driven plate on the surface plate; then using a feeler gauge, measure warpage in several locations.

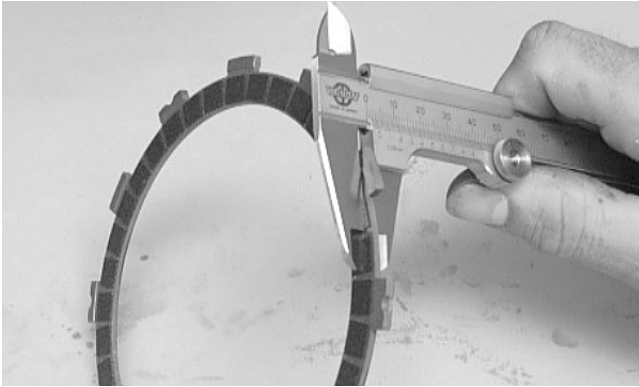


CC245D

3. Maximum driven plate warpage must not exceed specifications.

Measuring Clutch Drive Plate (Fiber) Thickness

1. Using a calipers, in turn measure the thickness of each drive plate in several locations.

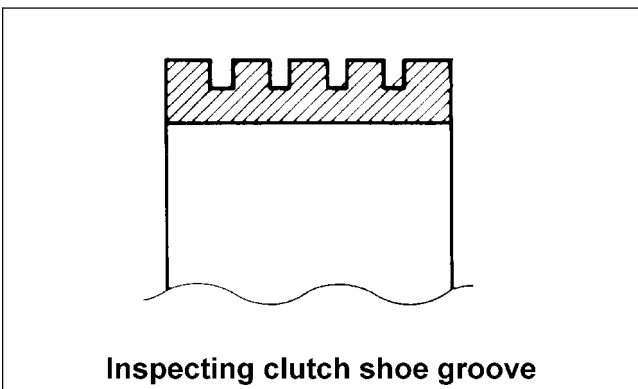


CC243D

2. Drive plate thickness must be within minimum specifications.
3. If the fiber plate tabs are damaged, the plate must be replaced.
4. Inspect the clutch sleeve hub for grooves or notches. If grooves or notches are present, replace the hub.

Inspecting Starter Clutch Shoe

1. Inspect the starter clutch shoe for uneven wear, chips, cracks, or burns.
2. Inspect the groove on the shoe for wear or damage.
3. If any damage to the shoe or any groove wear is noted, the shoe must be replaced.



Inspecting clutch shoe groove

ATV1014

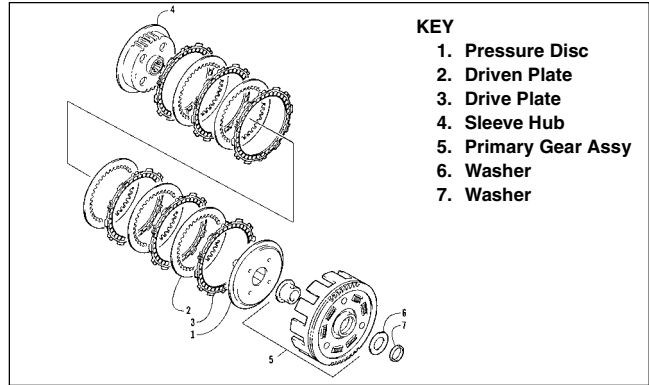
Inspecting Starter Clutch Housing

1. Inspect the starter clutch housing for burns, marks, scuffs, cracks, scratches, or uneven wear.
2. If the housing is damaged in any way, the housing must be replaced.

Inspecting Primary One-Way Drive

1. Insert the drive into the clutch housing.
2. Rotate the inner race by hand and verify the inner race rotates only one direction.
3. If the inner race is locked in place or rotates both directions, the drive assembly must be replaced.

Assembling Primary Clutch

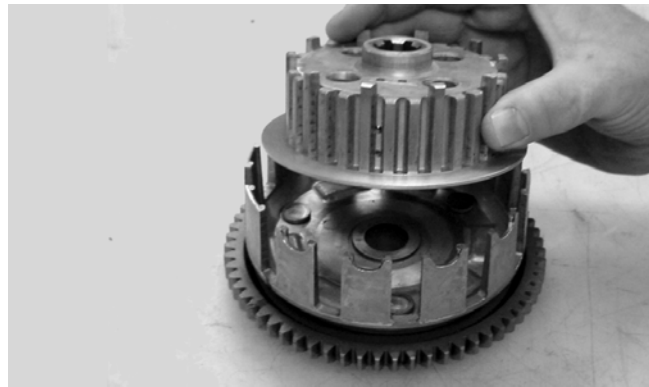


KEY

1. Pressure Disc
2. Driven Plate
3. Drive Plate
4. Sleeve Hub
5. Primary Gear Assy
6. Washer
7. Washer

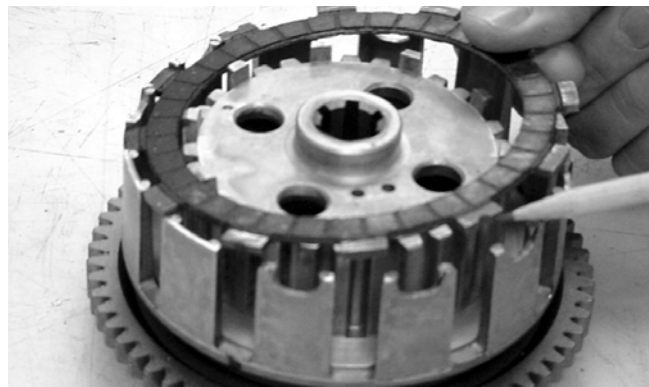
737-731A

1. Place the clutch hub upside down into the primary gear assembly.



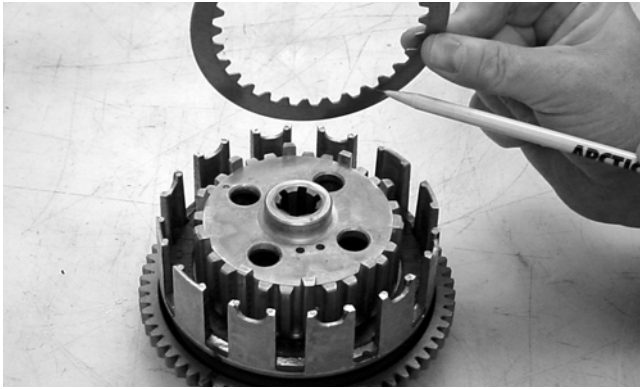
CC920

2. Alternately install the drive plates and driven plates onto the hub (starting with and ending with a drive plate) making sure the tabs with the notches are all in line with each other.



CC921

■ **NOTE:** When installing the driven plates for ease of installation, make sure they are placed onto the hub with the rounded side of the plates directed down.



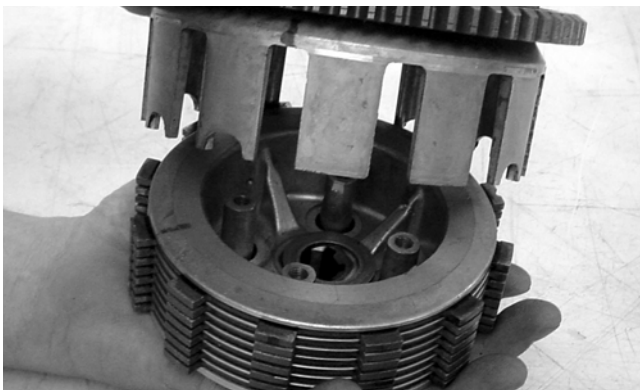
CC922

3. Install the pressure plate onto the hub making sure the alignment dots are correctly positioned.



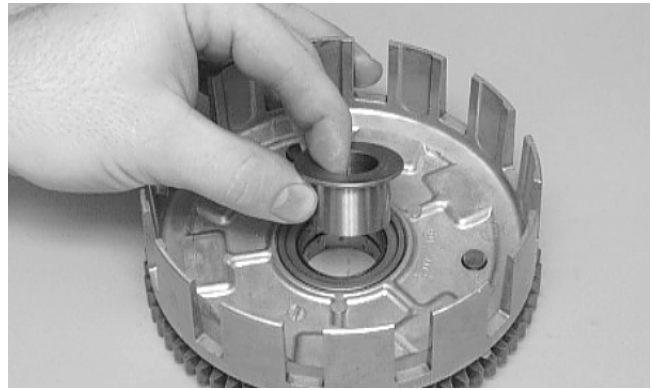
CC923

4. Place the primary gear assembly w/clutch hub assembly in one hand, place the other hand on top of the clutch hub assembly, and flip the assembly over; then lift the primary gear assembly off the clutch hub assembly being careful not to disturb the drive plate notched tab orientation.



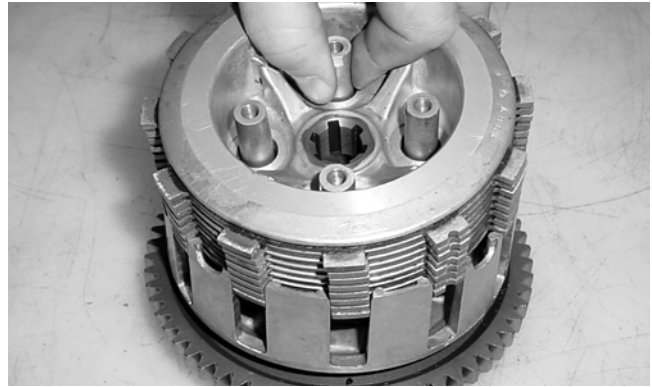
CC924

5. Place the primary gear assembly on a clean, flat surface; then install the primary washer into the assembly.



CC239D

6. Place the clutch hub assembly into the primary gear assembly.



CC926

CAUTION

The clutch hub and the pressure plate must be seated in the proper position. If any of the incorrect positions are used, the hub and plate will have clearance between them and they will not operate properly.

■ **NOTE:** The primary clutch assembly is now completely assembled for installation.

INSPECTING OIL PUMP

1. Inspect the pump for damage.
2. It is inadvisable to remove the screw securing the pump halves. If the oil pump is damaged, it must be replaced.



CC446D

Servicing Center Crankcase Components

■ **NOTE:** Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.

SECONDARY GEARS

■ **NOTE:** When checking and correcting secondary gear backlash and tooth contact, the universal joint must be secured to the front shaft or false measurements will occur.

Checking Backlash

■ **NOTE:** The rear shaft and bevel gear must be removed for this procedure. Also, always start with the original shims on the rear shaft.

1. Place the left-side crankcase cover onto the left-side crankcase half to prevent runout of the secondary transmission output shaft.
2. Install the secondary driven output shaft assembly onto the crankcase.
3. Mount the indicator tip of the dial indicator on the secondary driven bevel gear.
4. While rocking the driven bevel gear back and forth, note the maximum backlash reading on the gauge.
5. Acceptable backlash range is 0.05-0.33 mm (0.002-0.013 in.).

Correcting Backlash

■ **NOTE:** If backlash measurement is within the acceptable range, no correction is necessary.

1. If backlash measurement is less than specified, remove an existing shim, measure it, and install a new thinner shim.
2. If backlash measurement is more than specified, remove an existing shim, measure it, and install a thicker shim.

■ **NOTE:** Continue to remove, measure, and install until backlash measurement is within tolerance. Note the following chart.

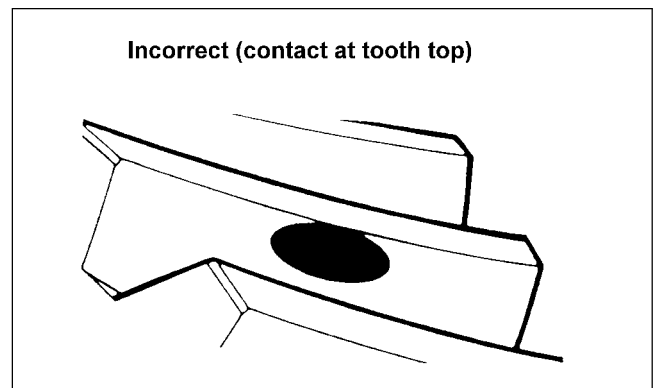
Backlash Measurement	Shim Correction
Under 0.05 mm (0.002 in.)	Decrease Shim Thickness
At 0.05-0.33 mm (0.002-0.013 in.)	No Correction Required
Over 0.33 mm (0.013 in.)	Increase Shim Thickness

Checking Tooth Contact

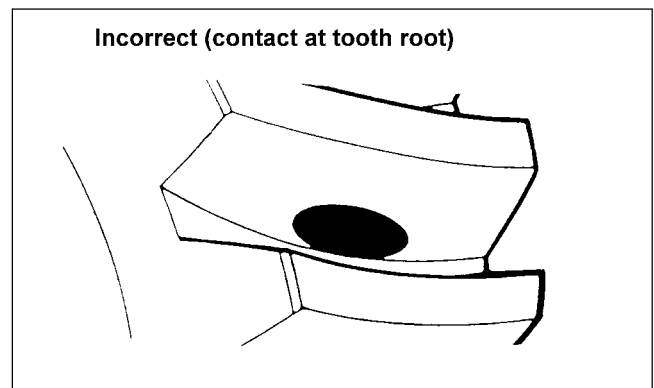
■ **NOTE:** After correcting backlash of the secondary driven bevel gear, it is necessary to check tooth contact.

1. Remove the secondary driven output shaft assembly from the left-side crankcase half.
2. Clean the secondary driven bevel gear teeth of old oil and grease residue.
3. Apply a thin, even coat of a machinist-layout dye to several teeth of the gear.
4. Install the secondary driven output shaft assembly.
5. Rotate the secondary driven bevel gear several revolutions in both directions.
6. Examine the tooth contact pattern in the dye and compare the pattern to the illustrations.

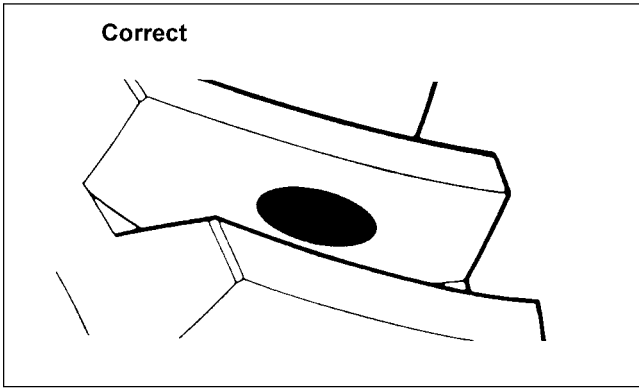
3



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.

1. If tooth contact pattern is comparable to an incorrect pattern, correct tooth contact according to the following chart.

Tooth Contact	Shim Correction
Contacts at Top	Decrease Shim Thickness
Contacts at Root	Increase Shim Thickness

■ **NOTE:** To correct tooth contact, steps 1 and 2 (with NOTE) of “Correcting Backlash” must be followed and the above “Tooth Contact/Shim Correction” chart must be consulted.

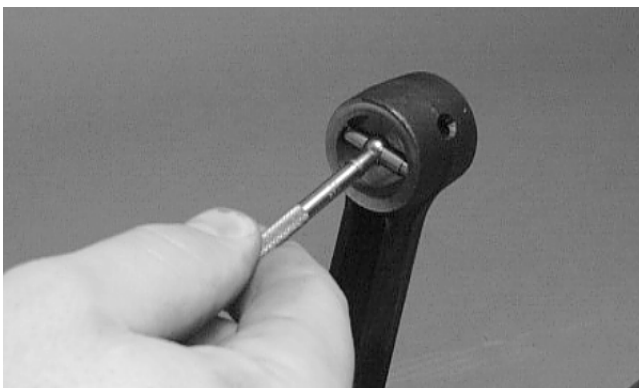
CAUTION

After correcting tooth contact, backlash must again be checked and corrected (if necessary). Continue the correcting backlash/correcting tooth contact procedures until they are both within tolerance values.

CRANKSHAFT ASSEMBLY

Measuring Connecting Rod (Small End Inside Diameter)

1. Insert a snap gauge into the upper connecting rod small end bore; then remove the gauge and measure it with micrometer.



CC290D

2. Maximum diameter must not exceed specifications.

Measuring Connecting Rod (Small End Deflection)

1. Place the crankshaft on a set of V-blocks and mount a dial indicator and base on the surface plate. Position the indicator contact point against the center of the connecting rod small end journal.
2. Zero the indicator and push the small end of the connecting rod away from the dial indicator.
3. Maximum deflection must not exceed specifications.

Measuring Connecting Rod (Big End Side-to-Side)

1. Push the lower end of the connecting rod to one side of the crankshaft journal.
2. Using a feeler gauge, measure the gap between the connecting rod and crankshaft journal.



CC289D

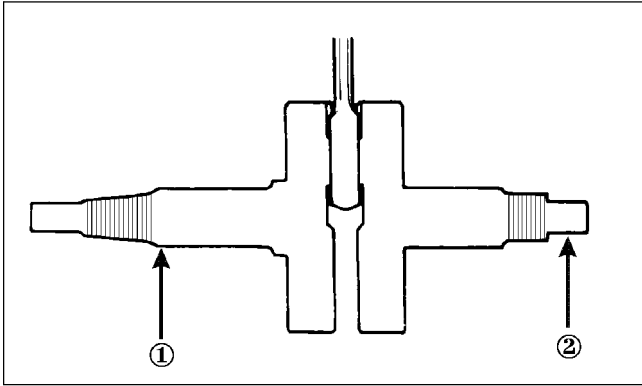
3. Acceptable gap range must be within specifications.

Measuring Connecting Rod (Big End Width)

1. Using a calipers, measure the width of the connecting rod at the big-end bearing.
2. Acceptable width range must be within specifications.

Measuring Crankshaft (Runout)

1. Place the crankshaft on a set of V blocks.
2. Mount a dial indicator and base on the surface plate. Position the indicator contact at point 1 of the crankshaft.



ATV-1074

3. Zero the indicator and rotate the crankshaft slowly.

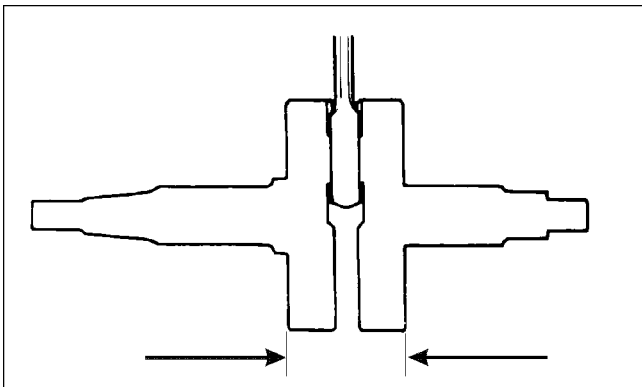
CAUTION
Care should be taken to support the connecting rod when rotating the crankshaft.

4. Maximum runout must not exceed specifications.

■ **NOTE:** Proceed to check runout on the other end of the crankshaft by positioning the indicator contact at point 2 and following steps 2-4.

Measuring Crankshaft (Web-to-Web)

1. Using a calipers, measure the distance from the outside edge of one web to the outside edge of the other web.



ATV-1017

2. Acceptable width range must be within specifications.

DRIVESHAFT

Disassembling

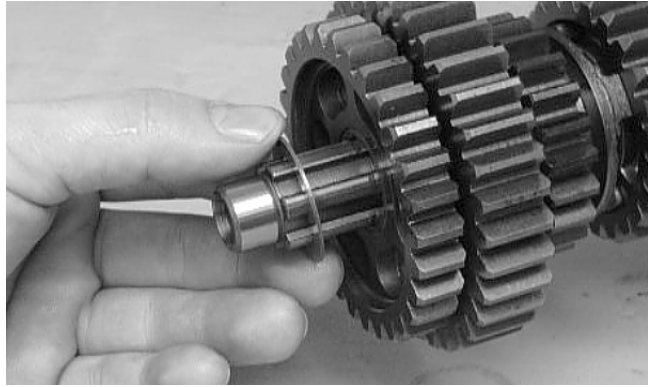
1. In order, remove the reverse dog, circlip, washer, reverse driven gear, and bushing from the driveshaft.



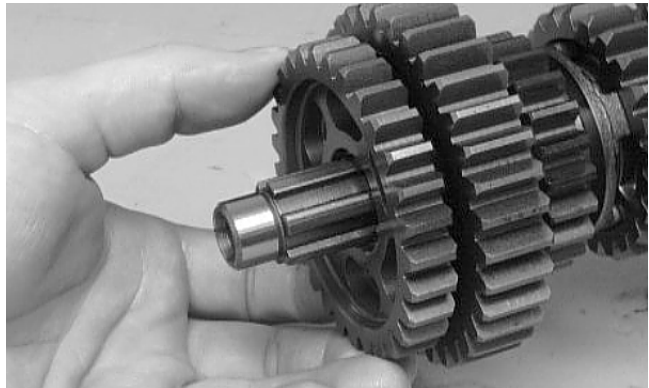
CC228D



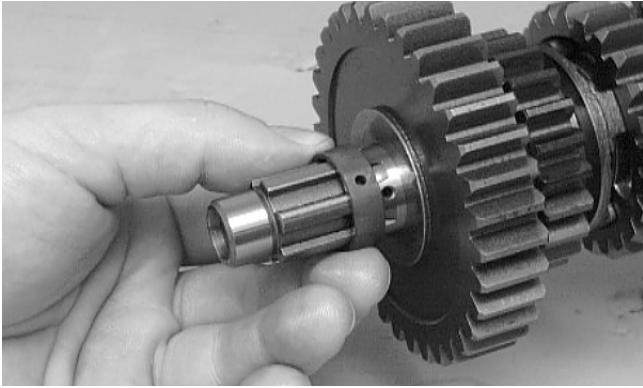
CC227D



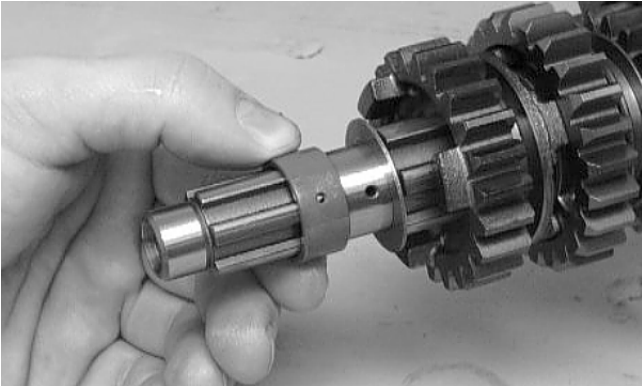
CC226D



CC225D



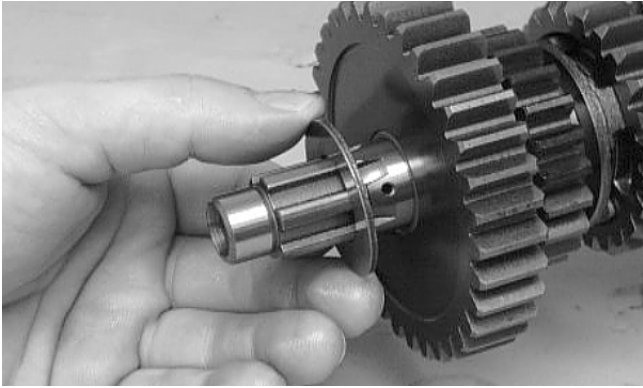
CC224D



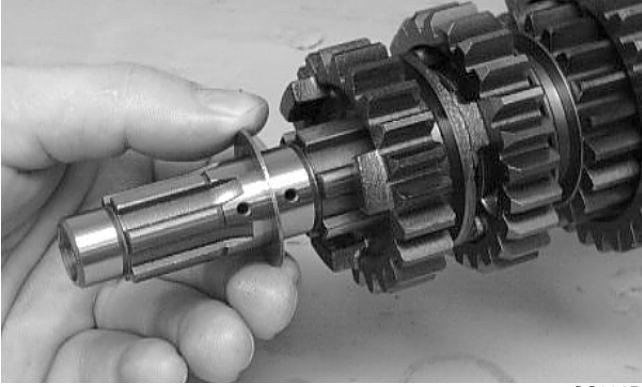
CC221D

■ **NOTE:** The teeth on the bushing must face the 1st driven gear.

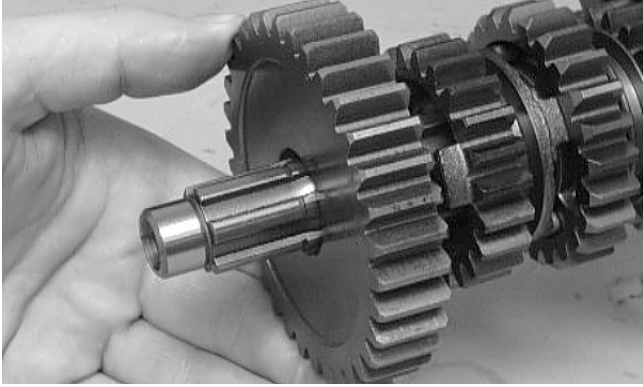
2. Remove the 1st driven washer (right side); then remove the 1st driven gear from the driveshaft.



CC223D



CC220D



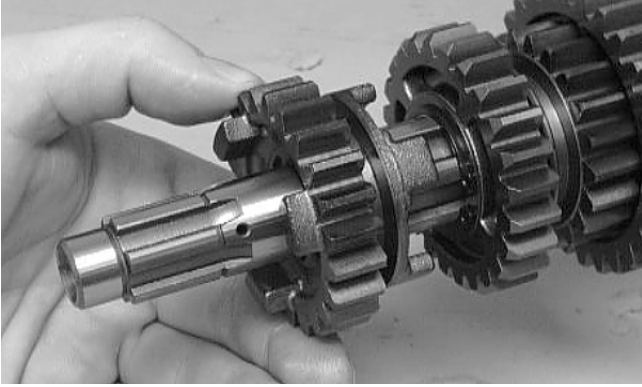
CC222D

3. Remove the 1st driven bushing; then remove the 1st driven washer (left side) from the shoulder of the splined shaft. Remove the 4th driven circlip.



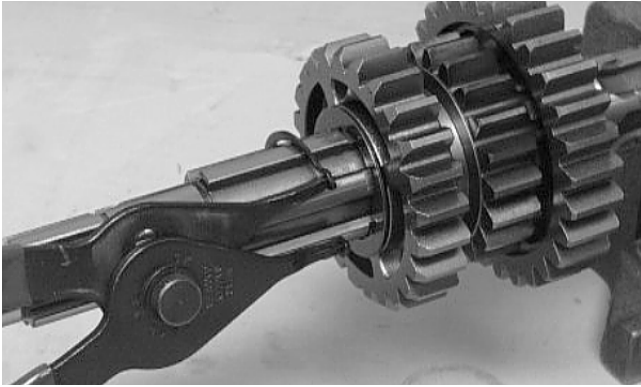
CC508D

4. Remove the 4th driven gear from the driveshaft. Note the four small dogs facing toward the 3rd driven gear for assembling purposes.

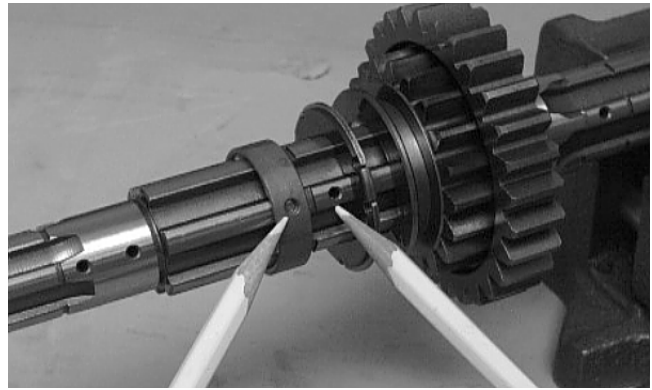


CC219D

5. Remove the 3rd driven circlip; then remove the 3rd driven lock washer (right side) from the driveshaft.

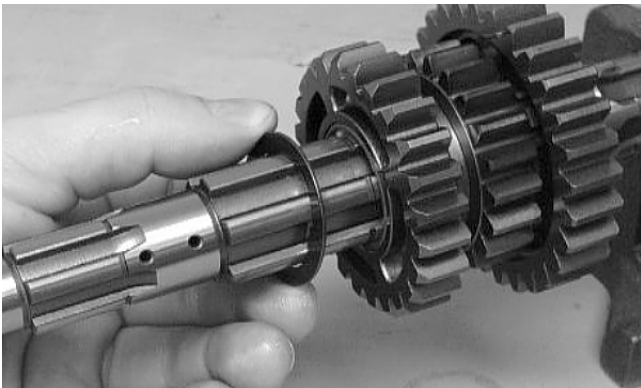


CC216D

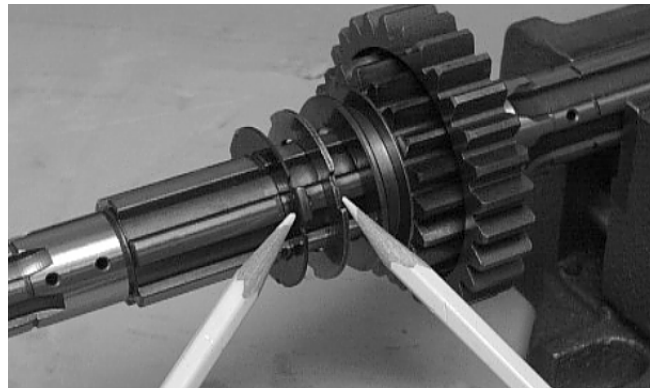


CC213D

8. Remove the 3rd driven lock washer (left side) from the driveshaft. Note the tabs facing toward the 5th driven gear for assembling purposes.

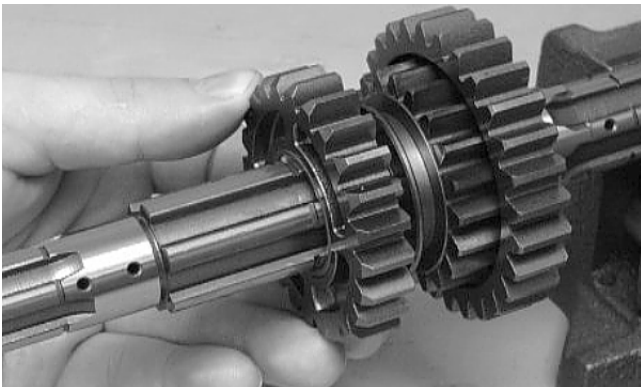


CC215D



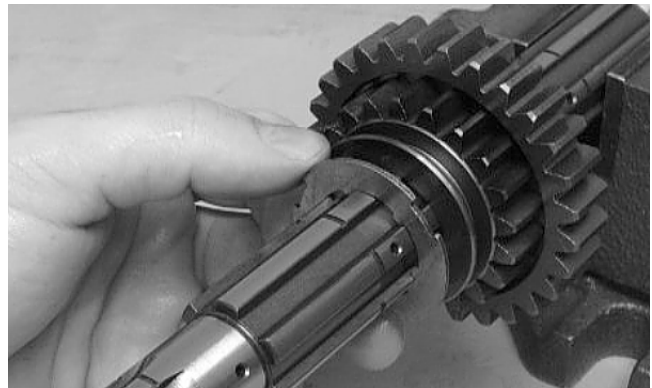
CC212D

6. Remove the 3rd driven gear from the driveshaft.



CC214D

9. Remove the next 3rd driven lock washer (left side) by rotating it out of the groove. Note the groove closest to the 5th driven gear for assembling purposes.

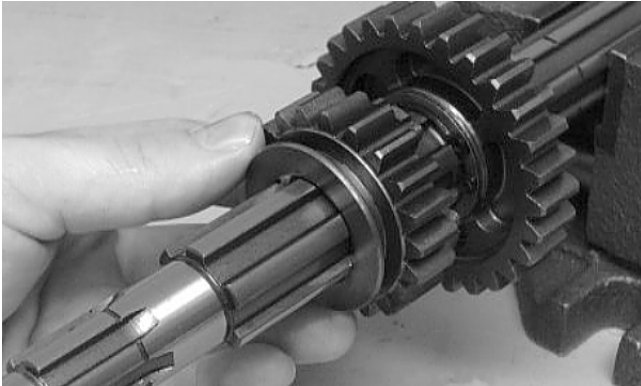


CC211D

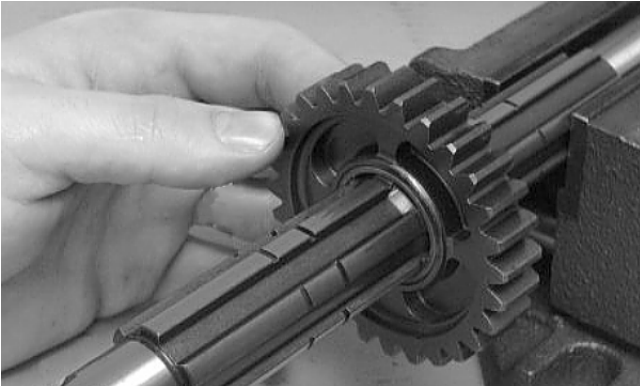
7. Remove the 3rd driven bushing from the driveshaft. Note the location of the oil feed hole in the bushing and the matching oil supply hole in the driveshaft for assembling purposes.

10. Remove the 5th driven gear from the driveshaft.

3

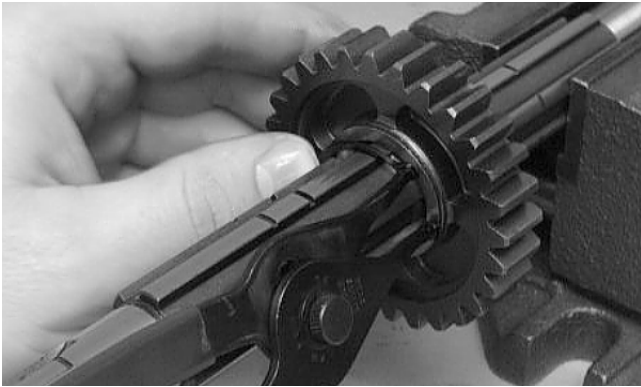


CC210D

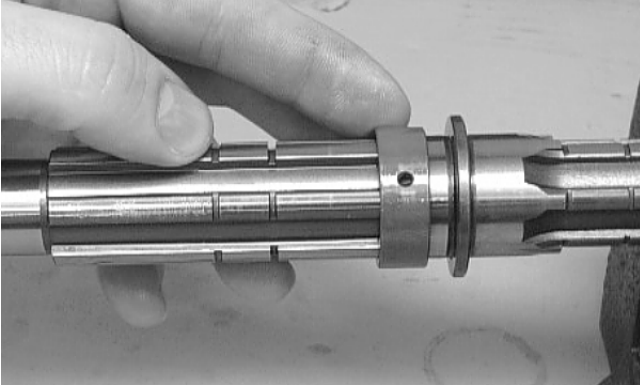


CC207D

11. In order, remove the 2nd driven circlip, washer, gear, and bushing from the driveshaft.

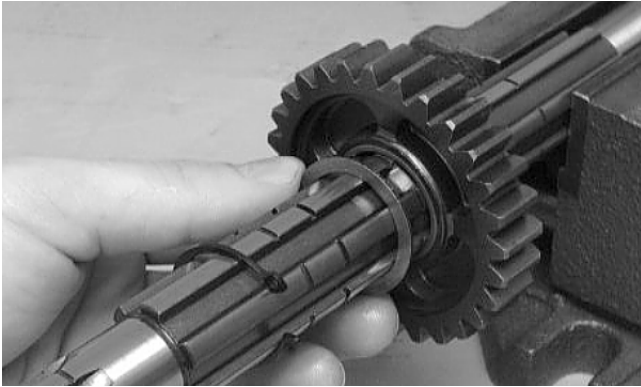


CC209D

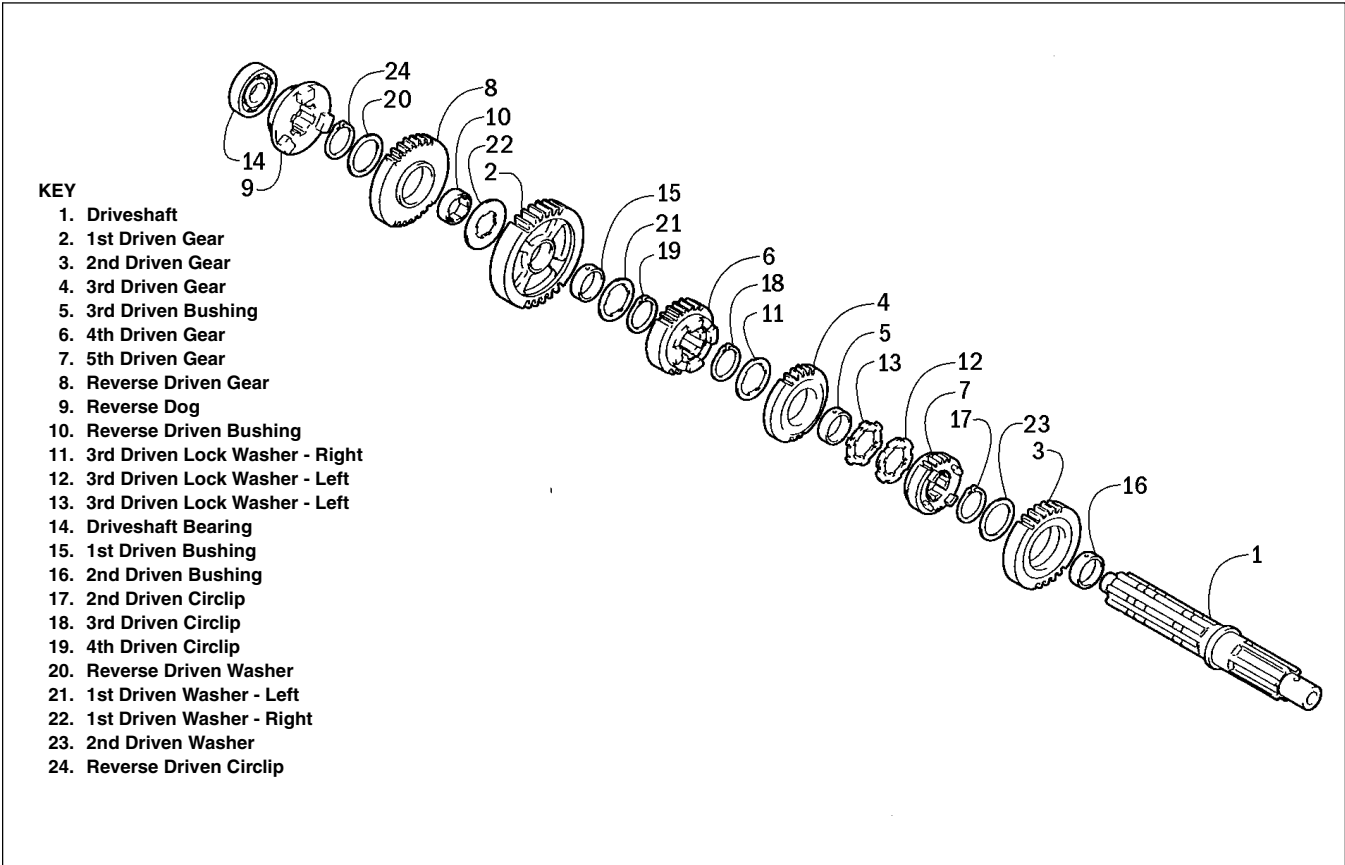


CC206D

<p>👉 AT THIS POINT</p> <p>To service secondary gears, see Servicing Center Crankcase Components in this sub-section.</p>



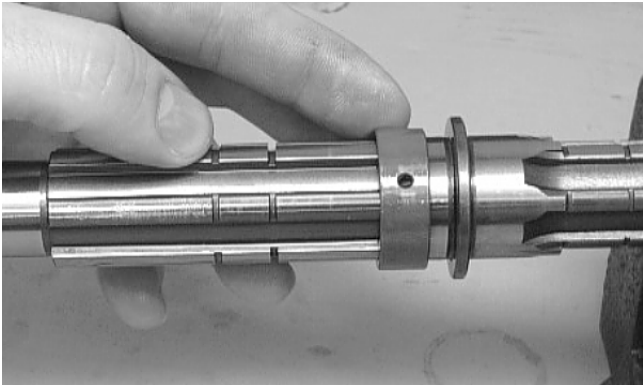
CC208D



3

737-733A

1. In order, install the 2nd driven bushing, gear, washer, and circlip onto the driveshaft.



CC206D



CC208D

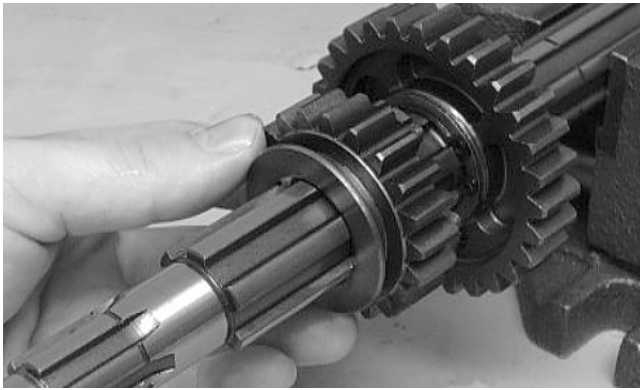


CC207D



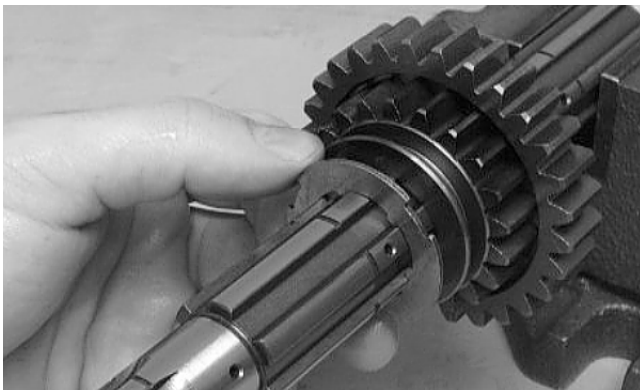
CC209D

2. Install the 5th driven gear onto the driveshaft.



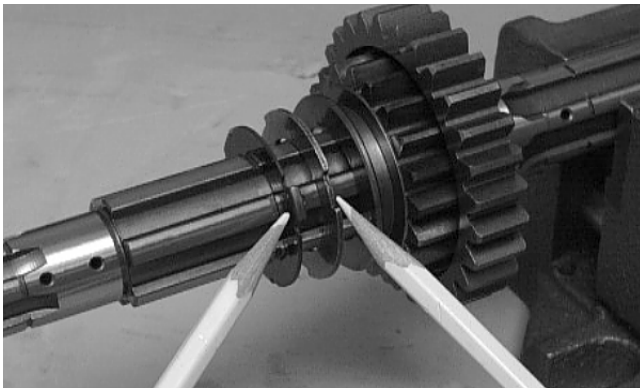
CC210D

3. Install the 3rd driven lock washer (left side). Lock it into the groove closest to the 5th driven gear (as noted in disassembling) by rotating it when it is in the groove.



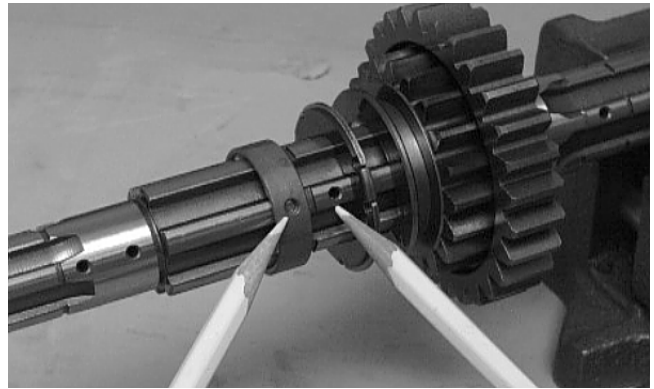
CC211D

4. Install the next 3rd driven lock washer (left side) onto the driveshaft making sure the tabs are facing toward the 5th driven gear. Make sure the tabs intertwine with the 3rd driven lock washer.



CC212D

5. Install the 3rd driven bushing onto the driveshaft making sure the oil feed hole in the bushing aligns with the appropriate oil supply hole in the driveshaft (as noted in disassembling).

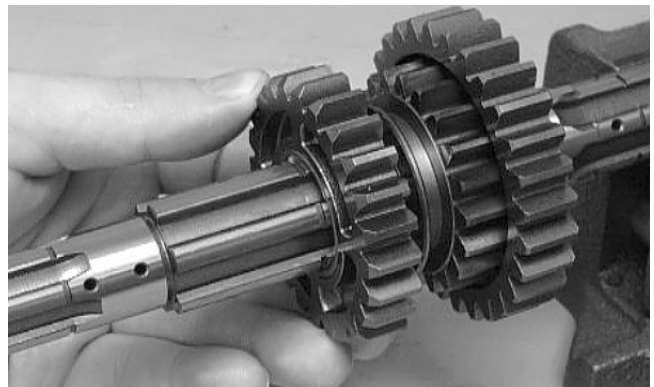


CC213D

CAUTION

It is very important to assure the oil feed hole in the bushing and oil supply hole in the driveshaft align. If not aligned, engine damage will result.

6. In order, install the 3rd driven gear, lock washer (right side), and circlip onto the driveshaft.



CC214D

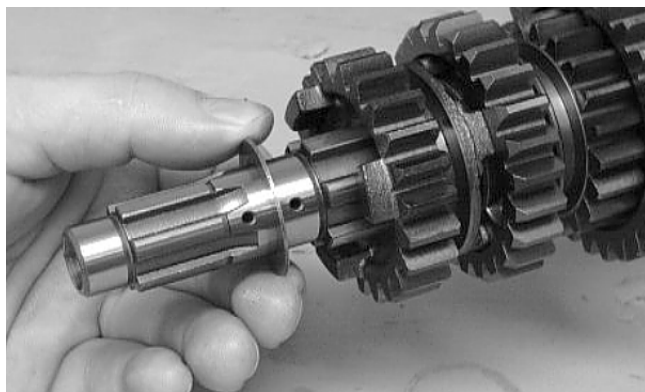


CC215D

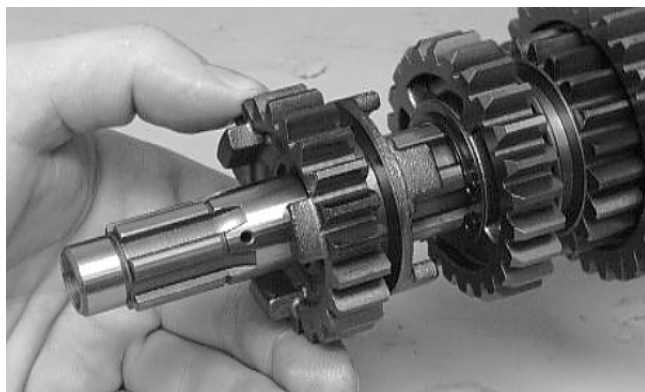


CC216D

7. Install the 4th driven gear onto the driveshaft making sure the four small dogs are facing toward the 3rd driven gear as noted in disassembling; then secure with the circlip.



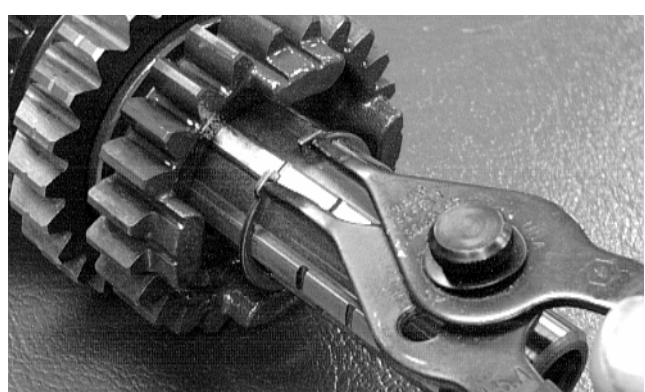
CC220D



CC219D

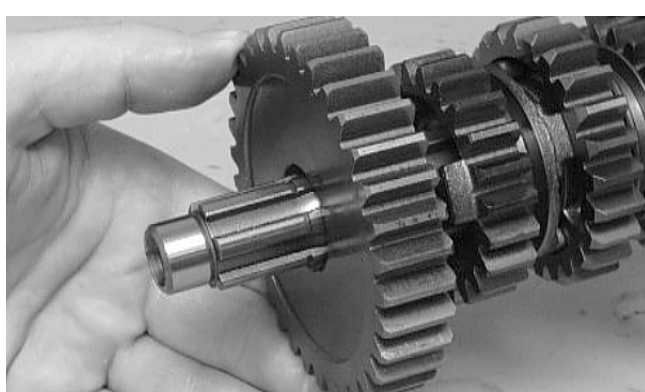


CC221D



CC508D

8. Install the 1st driven washer (left side) onto the shoulder of the splined shaft; then install the 1st driven bushing and gear.



CC222D

9. Install the 1st driven washer (right side) on the shaft making sure it lines up with the groove in the shaft; then turn the washer locking it on the shaft.



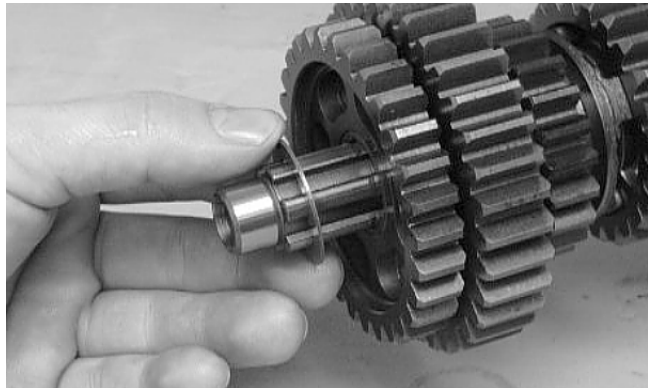
CC223D

3

10. Slide the reverse driven gear bushing onto the shaft making sure the oil port in the bushing aligns with the oil port on the shaft.



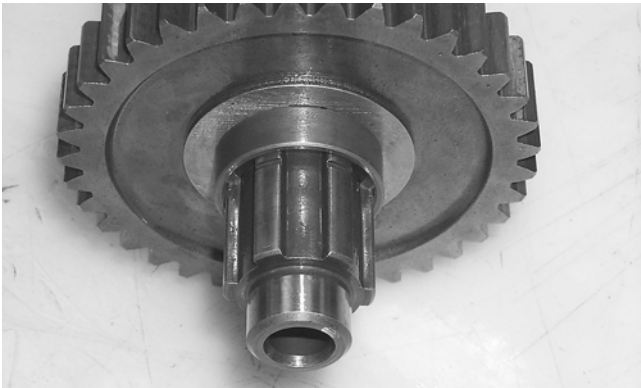
CC842



CC226D

CAUTION
Failure to align the oil ports will result in serious engine damage.

11. Move the washer in the shaft groove until the notches in the washer align with the tabs on the bushing; then slide the bushing up tight against the washer.

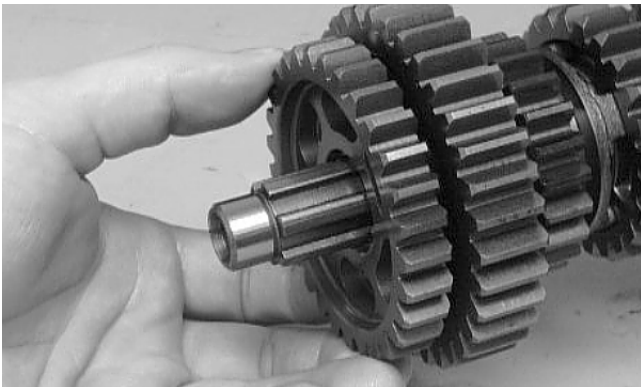


CC843



CC227D

12. In order, install the reverse driven gear, washer, circlip, and reverse dog onto the driveshaft.



CC225D



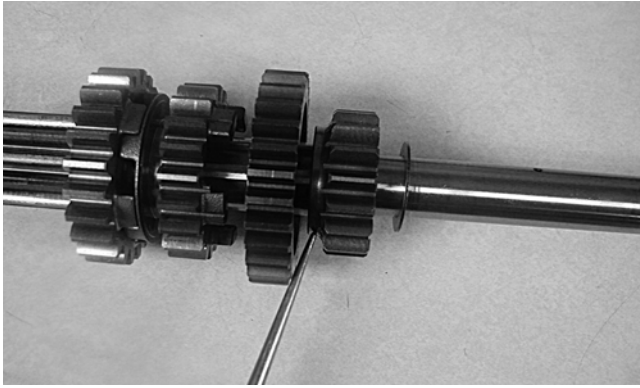
CC228D

■ **NOTE:** The driveshaft is now completely assembled for installation.

COUNTERSHAFT

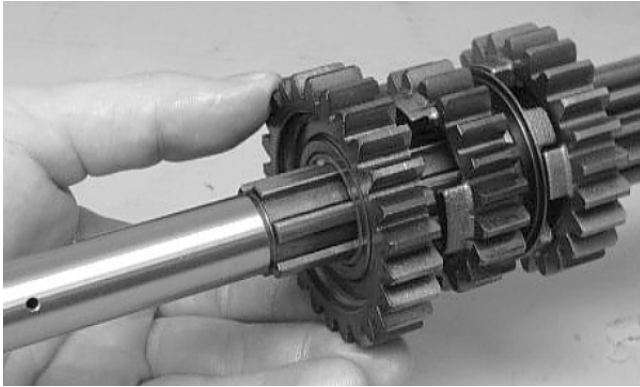
Disassembling

1. Remove the 2nd drive gear and washer from the countershaft.



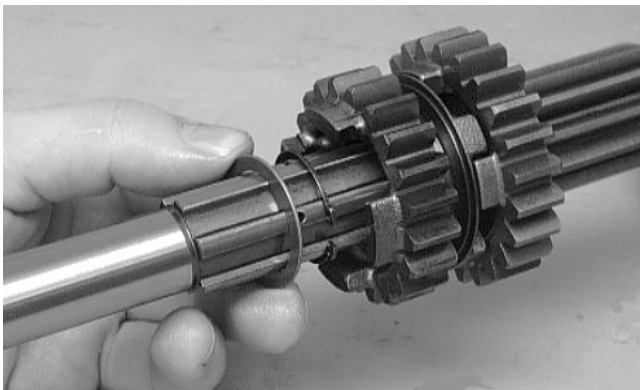
CD242

2. Remove the 5th drive gear from the countershaft.



CC203D

3. Remove the 5th drive washer and 5th drive circlip from the countershaft.



CC201D



CC200D

4. Remove the 3rd drive gear from the countershaft.
5. Remove the 4th drive circlip securing the 4th drive gear on the countershaft; then remove the first 4th drive washer and 4th drive gear. Account for the bushing.

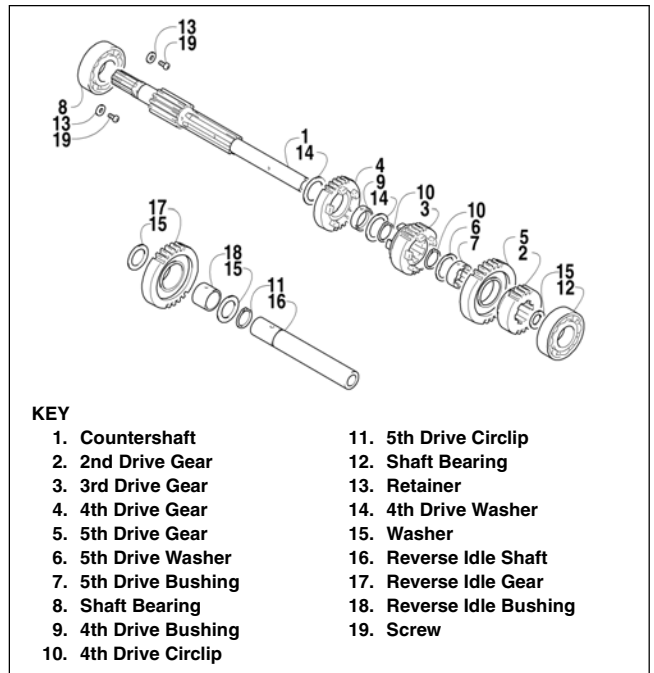


CC199D

6. Remove the other 4th drive washer from the countershaft.

3

Assembling



738-294A

1. Install the 4th drive washer onto the countershaft.
2. Install the 4th drive gear making sure the bushing is in position; then install the other 4th drive washer onto the countershaft. Secure with the circlip.



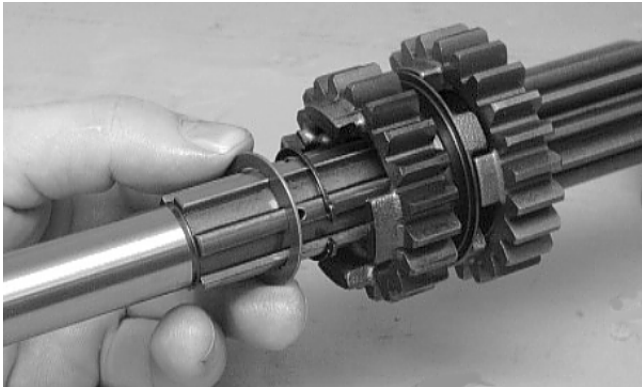
CC199D

3. Install the 3rd drive gear; then install the 5th drive circlip onto the countershaft.



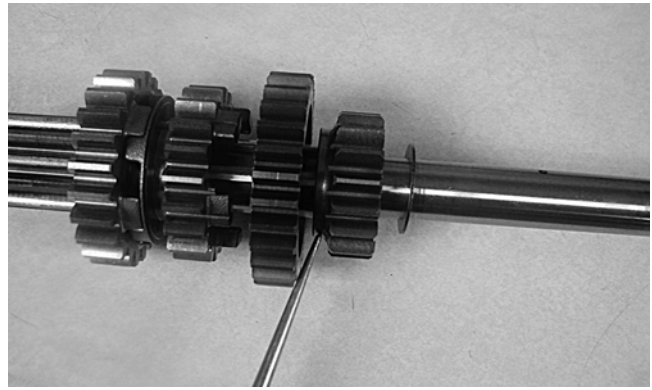
CC200D

4. Install the 5th drive washer and 5th drive gear onto the countershaft.



CC201D

5. Install the 2nd drive gear and washer onto the countershaft.



CD242

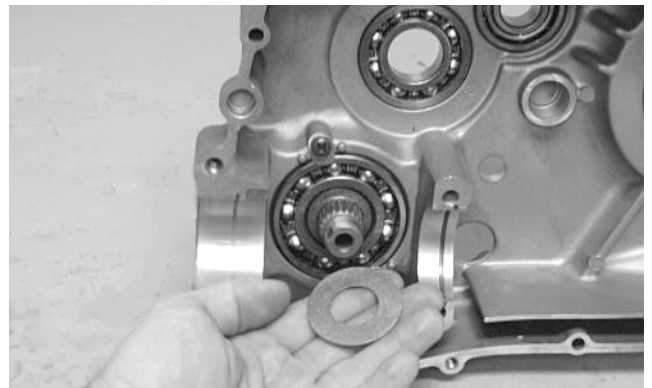
■ **NOTE:** The countershaft is now completely assembled for installation.

Assembling Crankcase Half

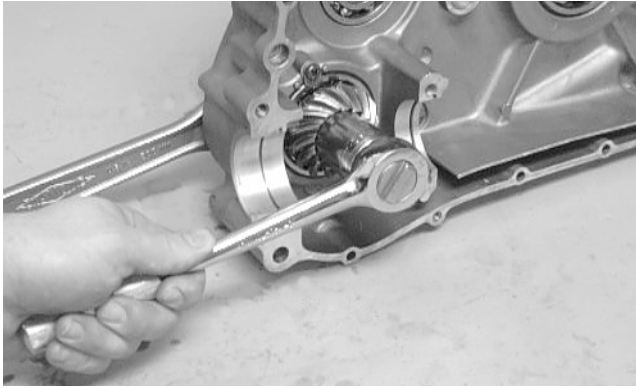
■ **NOTE:** For ease of assembly, install components on the left-side crankcase half.

■ **NOTE:** If the output shaft and gear were removed, make sure that the proper shim is installed.

1. To install the output shaft and gear, place the shaft into position with proper shims, slide the gear onto the shaft, and secure with a new nut tightened to specifications.

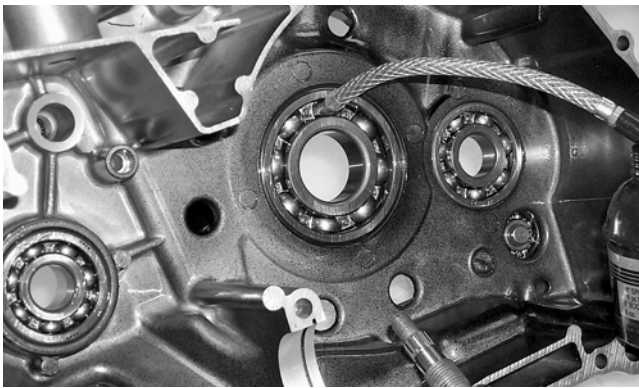


CC117D



CC116D

2. Apply a liberal amount of engine oil to the crankshaft bearing. Using a propane torch, heat the bearing until the oil begins to smoke; then slide the crankshaft assembly into place.



CC688

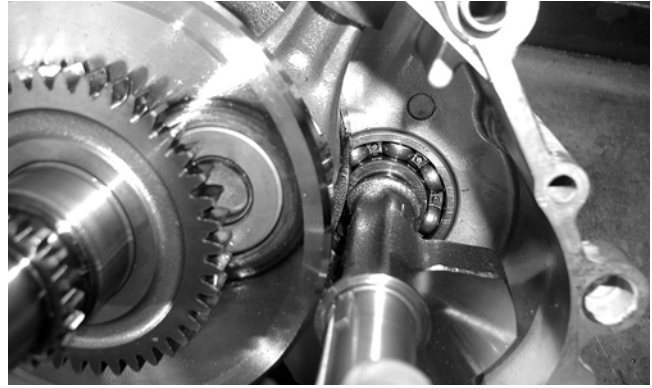


CC689

■ **NOTE:** If heating the bearing is not possible, the crankshaft can be installed using a crankshaft installing tool.

3. Install the crank balancer.

■ **NOTE:** It will be necessary to rotate the crank balancer until the counterweight is directed away from the crankshaft; then rotate the crankshaft clockwise into the journal area to allow the balancer to be fully seated.



CD832A

4. With the key in position, slide the driven gear onto the crank balancer making sure the timing marks are aligned.

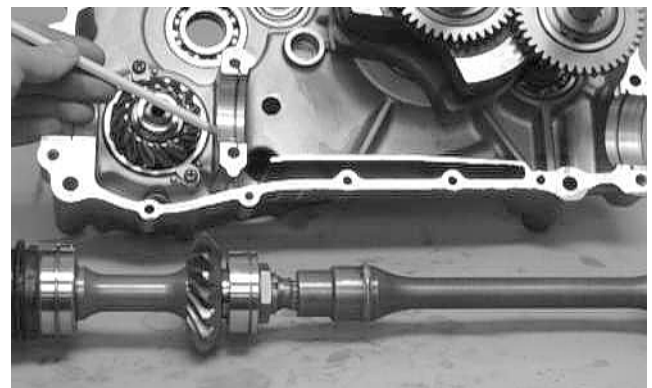


CD826

5. Place the bearing C-ring into position in the crankcase; then install the front output shaft and rear shaft assemblies.

⚠ CAUTION

The bearing pins must be positioned into the crankcase correctly or damage to the crankcase may occur.



CC110D

6. Simultaneously, install the driveshaft and countershaft assemblies making sure the washer is on the countershaft.

3

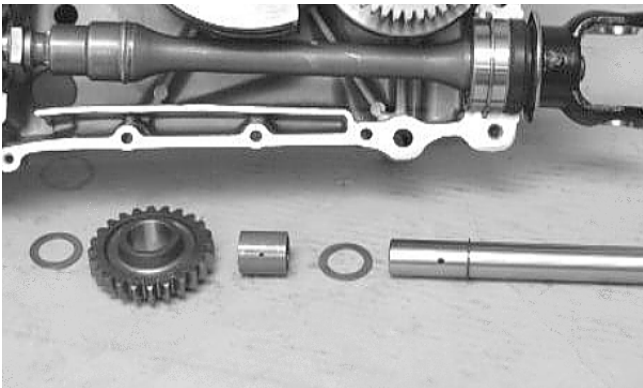


CC197D

7. Install the reverse idle shaft with circlip making sure the oil hole in the shaft is facing downward; then install a washer, bushing, reverse idle gear, and a washer.

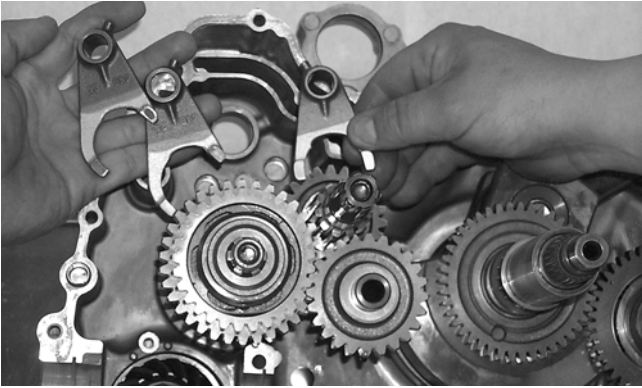


CC229D



CC231D

8. Place each of the four shift forks into its respective gear or dog as noted during disassembling; then install the gear shift cam.



CC107D

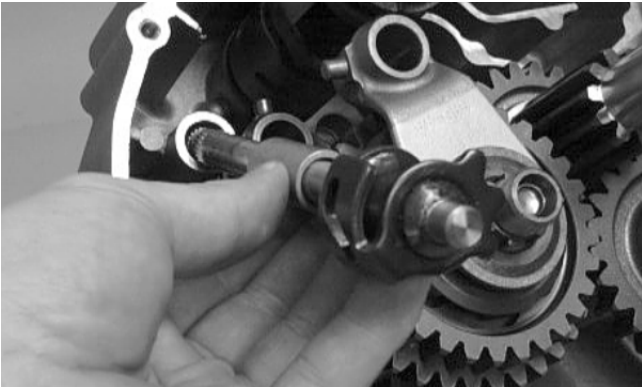


CC106D

9. Engage the four forks to the gear shift cam; then install the reverse shift cam and spacer.

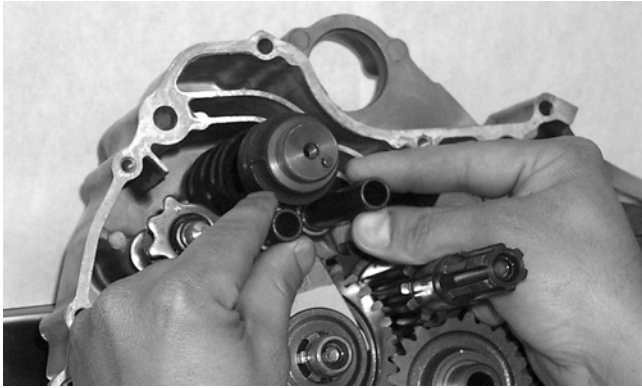


CC105D



CC103D

10. Install the two gear shift shafts; then verify that the two crankcase half alignment pins are in place.



CC104D

■ **NOTE:** Prior to joining crankcase halves, turn the shift cam to ensure all gears shift properly.



CC234D

2. Using a plastic mallet, lightly tap the case halves together until cap screws can be installed.
3. From the left side, install the three case half 8 mm cap screws (two inside the case); then tighten only until snug.

■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

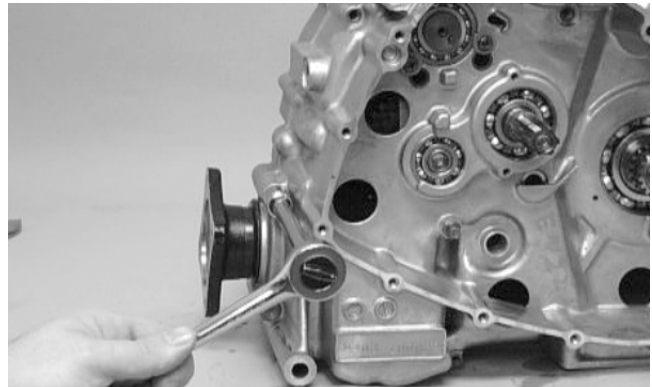
3

Joining Crankcase Halves

1. Place the O-ring in the left-side crankcase half and verify that the washer is on the idler shaft; then apply Three Bond Sealant (p/n 0636-070) to the mating surfaces. Place the right-side half onto the left-side half.



CC101D



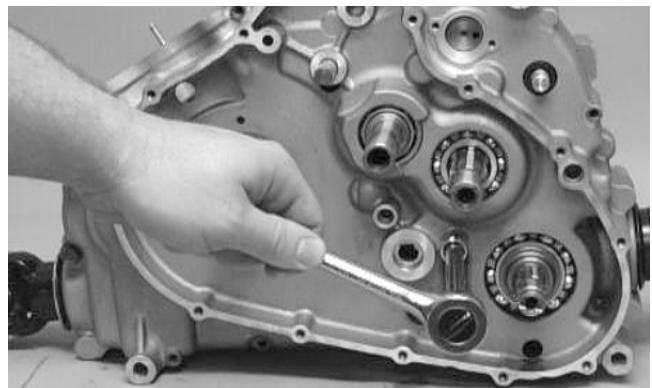
CC098D

4. From the right side, install the three case half 8 mm cap screws; then tighten only until snug.

■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.



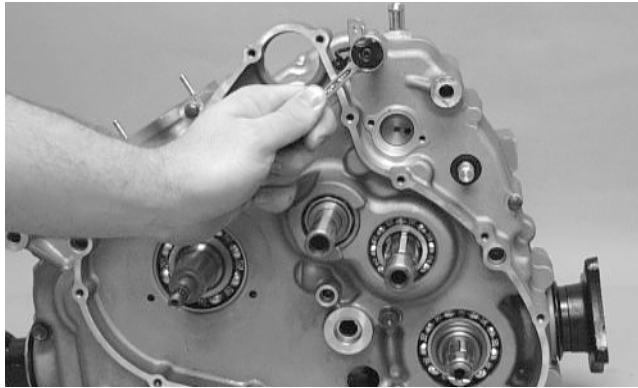
CC102D



CC097D

5. From the left side, install the seven case half 6 mm cap screws noting the location of the wiring form; then tighten only until snug.

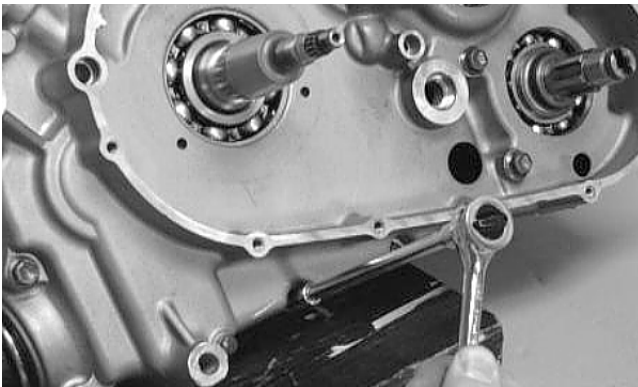
■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.



CC096D

6. From the right side, install the five case half 6 mm cap screws (one inside the case); then tighten only until snug.

■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.



CC095D

7. In a crisscross/case-to-case pattern, tighten the 8 mm cap screws (from steps 3-4) until the halves are correctly joined; then tighten to specifications.

■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

8. In a crisscross/case-to-case pattern, tighten the 6 mm cap screws (from steps 5-6) to specifications.

■ **NOTE:** Rotate the shafts back and forth to ensure no binding or sticking occurs.

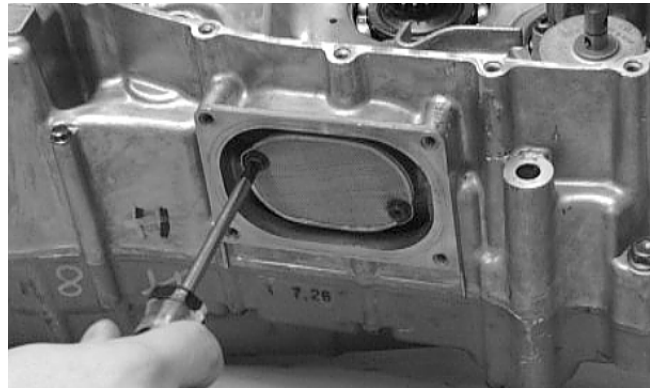
⚠ CAUTION

After completing center crankcase components, proceed to Installing Right-Side Components, to Installing Left-Side Components, and to Installing Top-Side Components.

Installing Right-Side Components

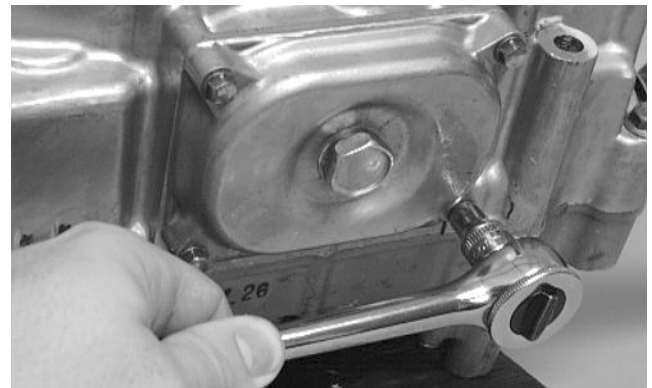
A. Oil Strainer/Oil Pump B. Gear Shift Shaft

1. Place the oil strainer into position beneath the crankcase and tighten securely with the Phillips-head cap screws.



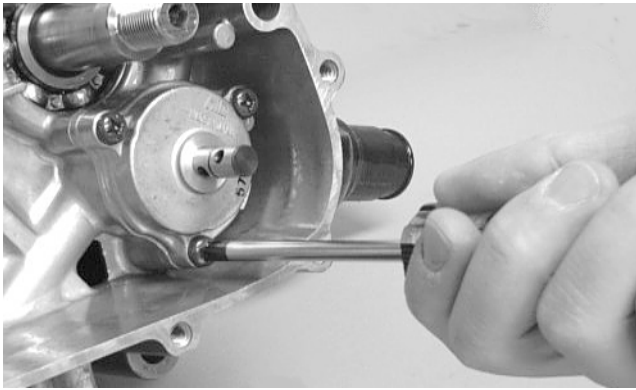
CC163D

2. Place the strainer cap into position on the strainer making sure a new O-ring is properly installed and secure with the cap screws; then install and tighten the oil drain plug to specifications.



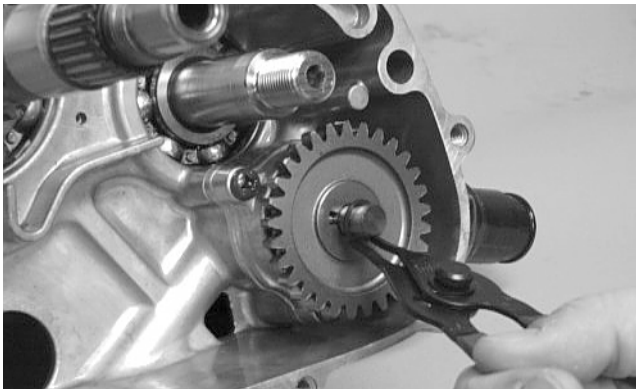
CC091D

3. Place the oil pump into position in the crankcase and secure with the three Phillips-head screws coated with blue Loctite #243. Tighten to specifications.



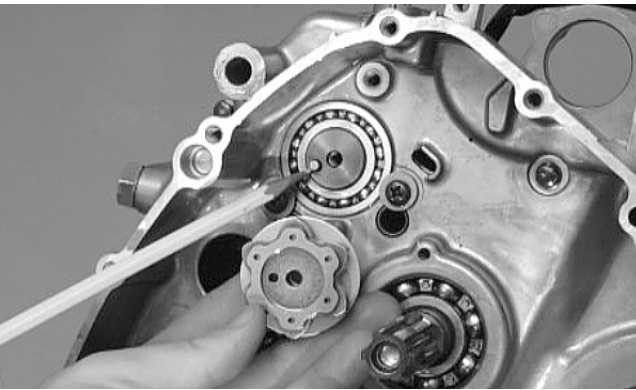
CC090D

4. Place the pin and washer into position on the oil pump shaft, install the oil pump driven gear, and secure with the circlip.

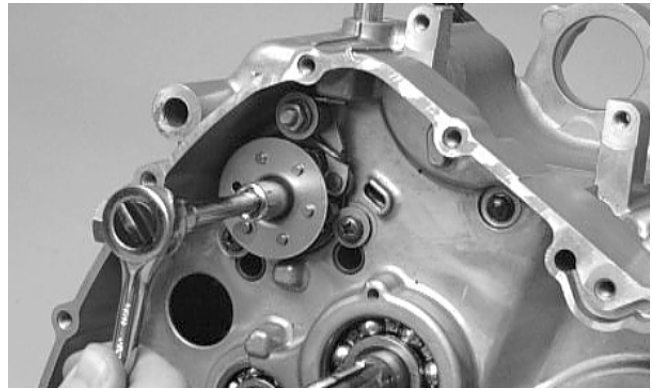


CC088D

5. Place the gear shift cam plate and guide onto the gear shift cam making sure the alignment pin was installed. Secure assembly with the cap screw coated with blue Loctite #243. Tighten securely.

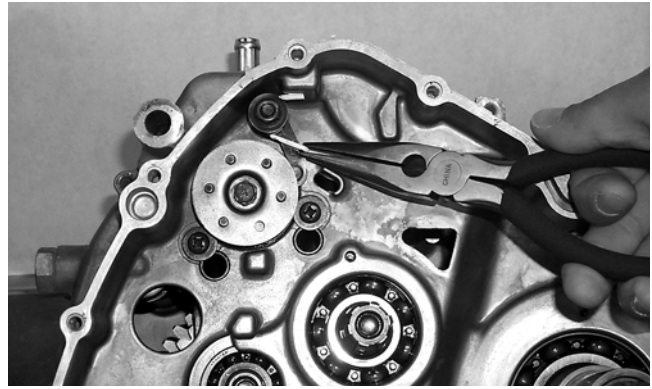


CC087D

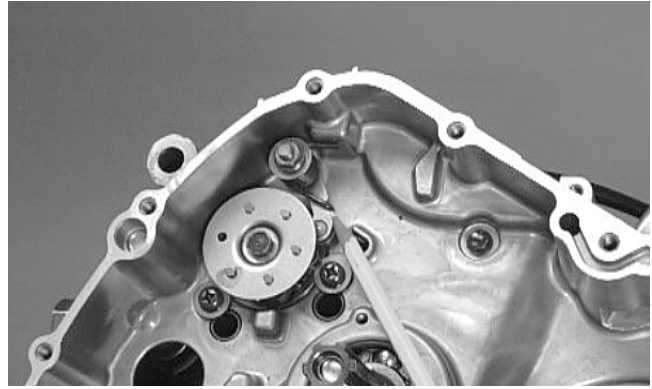


CC164D

6. Attach the spring to the gear shift cam stopper arm.

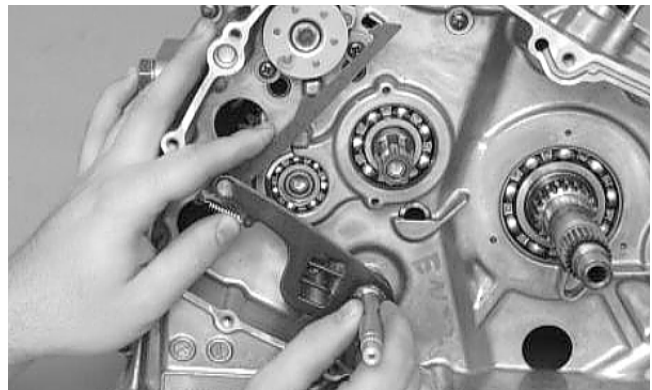


CC086D



CC153D

7. Install the gear shift shaft.



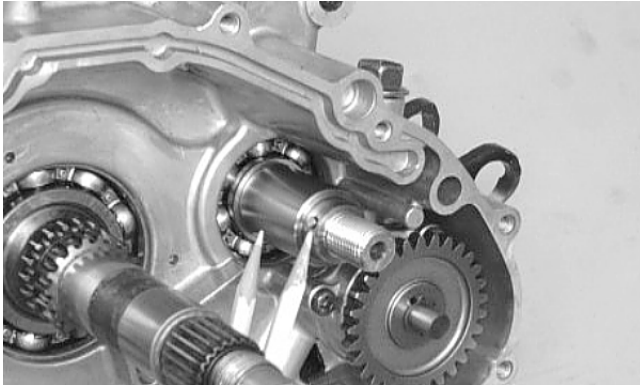
CC085D

3

C. Primary Driven Gear
D. Primary Driven Clutch
E. Primary Drive Clutch Shoe

■ **NOTE:** Steps 1-7 in the preceding sub-section must precede this procedure.

8. Install the spacer, pin, and oil pump drive gear onto the crank balancer shaft making sure the shoulder of the drive gear is facing inward toward the crankcase; then secure with the washer and nut tightened to specifications.



CD081D



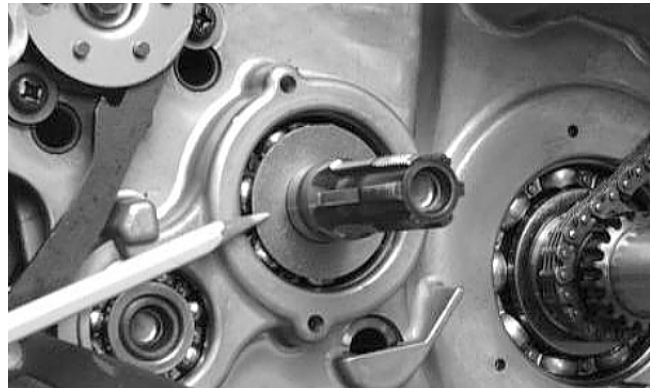
CD481

9. Place the chain into the crankcase; then secure it from the top side with a wire for ease of assembling.



CC079D

10. Install the primary driven washers onto the driveshaft and crankshaft.

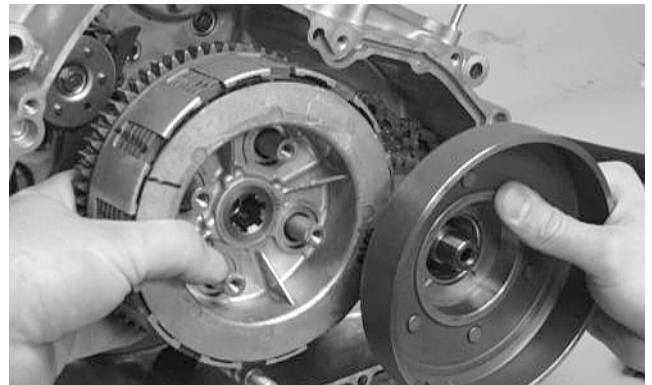


CC232D

⚠ CAUTION

The clutch sleeve hub and the pressure plate must be seated in the proper position. If any of the incorrect positions are used, the hub and plate will have clearance between them and they will not operate properly.

11. Simultaneously, place the primary clutch assembly and the starter clutch housing on their respective shafts making sure the sleeve is properly positioned in the primary assembly.



CC078D

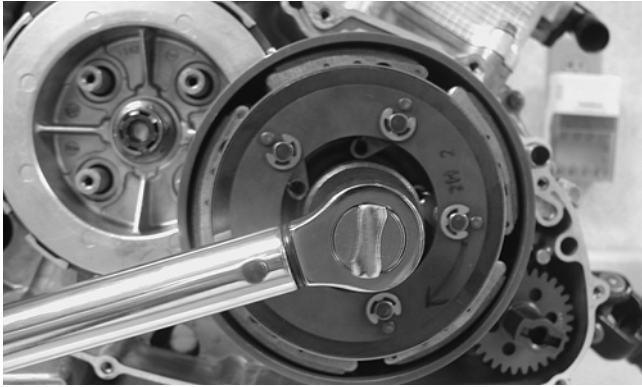
■ **NOTE:** Note the alignment mark scribed on the primary driven gear assembly during disassembly.

12. Using the Clutch Sleeve Hub Holder (p/n 0444-007), install the nut and washer. Tighten to specifications.



CD479

13. Place the primary drive one-way clutch into the starter clutch housing noting the word OUTSIDE for proper placement.

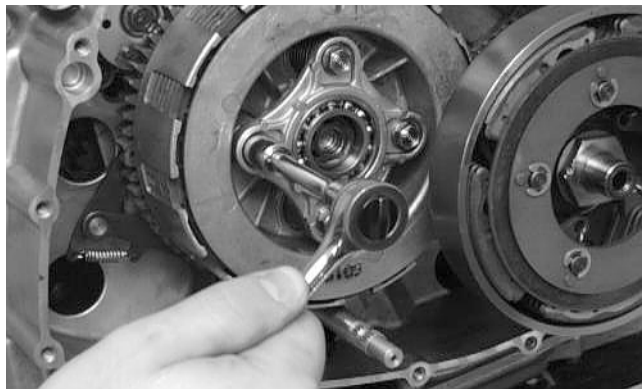


CD482

14. Install the clutch shoe and washer; then secure with the starter clutch shoe nut (left-hand threads). Tighten to specifications; then using a center punch, stake the nut.

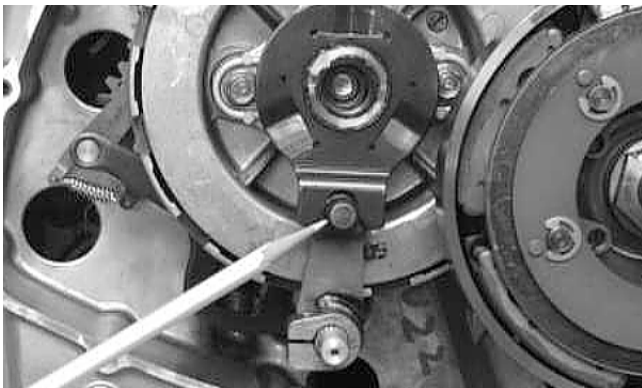
15. Install the release roller assembly making sure the four springs are in position; then using a crisscross pattern, tighten the four cap screws securely.

■ **NOTE:** Tighten the four roller assembly cap screws in a crisscross pattern making sure there is no clearance between the clutch plates when secured.



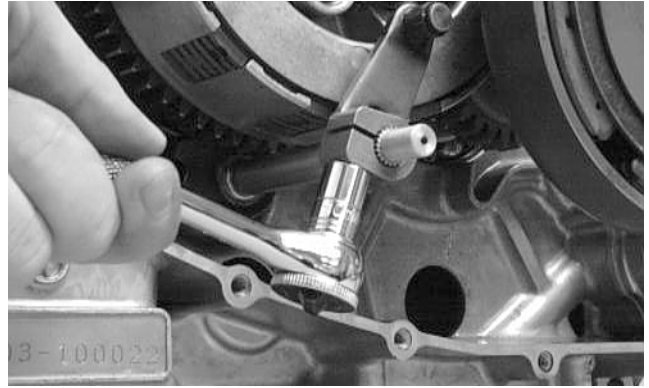
CC074D

16. Install the clutch release arm and release roller guide making sure the release roller and guide are aligned.



CC162D

17. Secure the clutch release arm with the cap screw coated with blue Loctite #243. Tighten securely.



CC073D

18. Install the reverse cam stopper housing and gasket making sure the stopper and spring are correctly positioned. Tighten to specifications.



CD494

**F. Water Pump
G. Oil Filter**

■ **NOTE:** Steps 1-18 of the preceding sub-sections must precede this procedure.

■ **NOTE:** Lubricate all internal components with 10W-40 oil prior to installing the right-side cover.

19. Place the water pump drive joint into position on the water pump shaft making sure the pin is properly positioned.



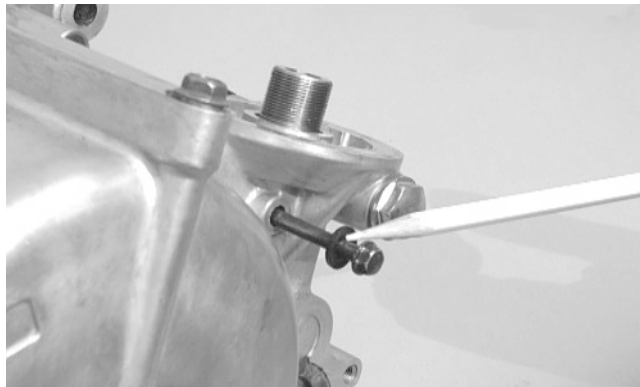
CC082D

■ **NOTE:** Care should be taken that the alignment pins are installed in the right-side cover.



CC256D

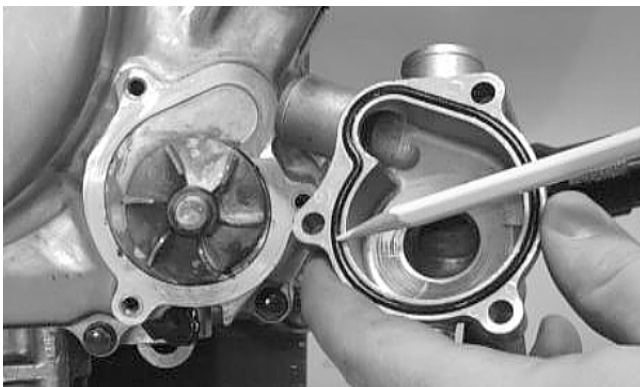
20. Place the gasket and right-side cover into position making sure the release roller guide remains correctly positioned and that the water pump drive adapter aligns; then install the fifteen cap screws. Note the proper location of the long cap screw with rubber washer.



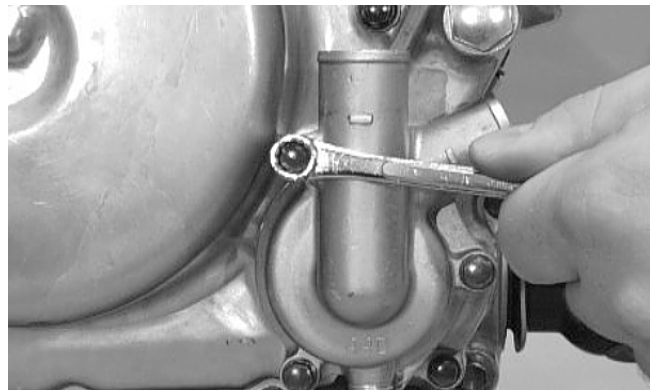
CC068D

21. Tighten the cap screws in a crisscross pattern to specifications.

22. Place the water pump cover onto the right-side cover making sure the new O-ring is properly positioned. Tighten securely with the three cap screws.



CC028D



CC027D

23. Using the oil filter wrench, install a new oil filter.



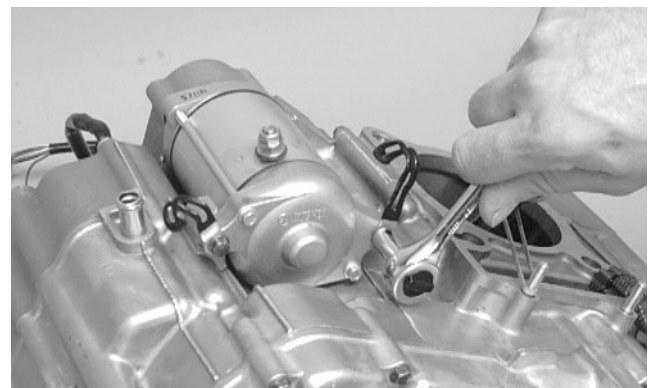
CC067D

24. Install the coolant hose on the water pump and secure with the clamp.

Installing Left-Side Components

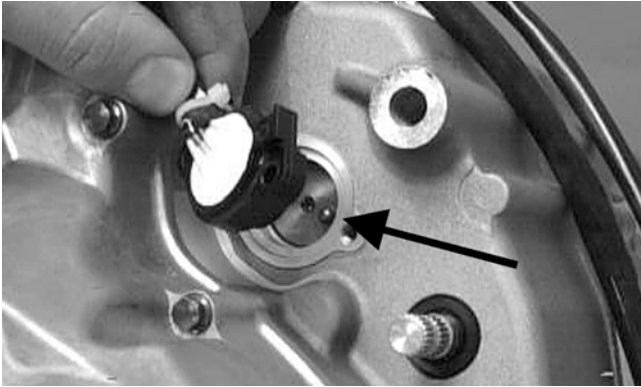
A. Idle Gear Assembly B. Magneto Rotor

1. Place the starter into position on the crankcase and secure with the cap screws. Note the position of the wiring form.

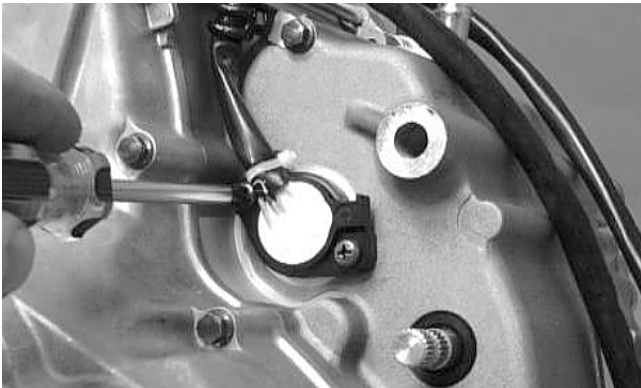


CC065D

2. Place the shift-indicator sending unit into position making sure the contacts and springs are inside the case and a well-oiled O-ring is properly positioned. Secure with Phillips-head screws.

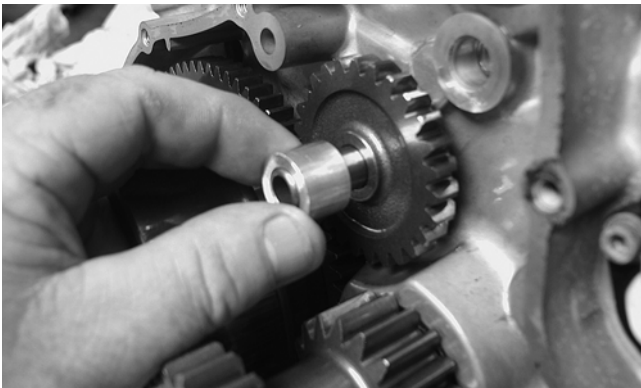


CC049D



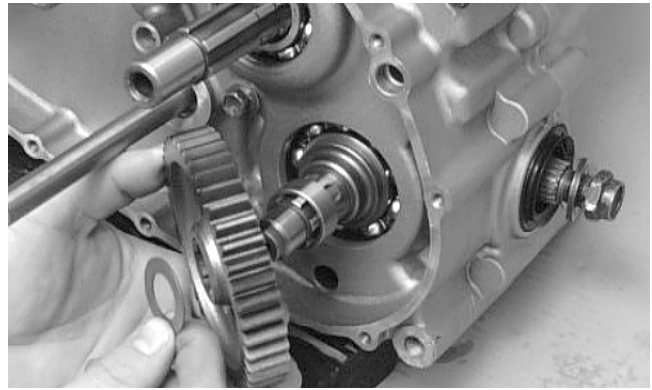
CC048D

3. Install the starter idle gear pin into the crankcase; then with the beveled side of the idle gear facing the crankcase, install the idle gear and spacer.



CD138

4. Place the bushing onto the output shaft; then install the driven gear and washer.



CC063D

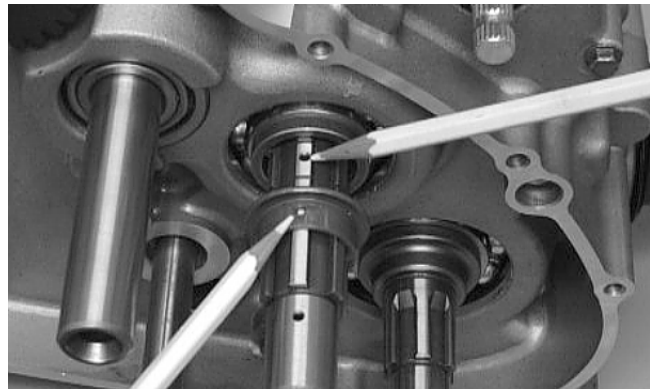
5. Install the spacer onto the driveshaft.



CC258D

6. Place the splined bushing onto the driveshaft making sure the oil hole of the splined bushing aligns with the oil hole of the driveshaft.

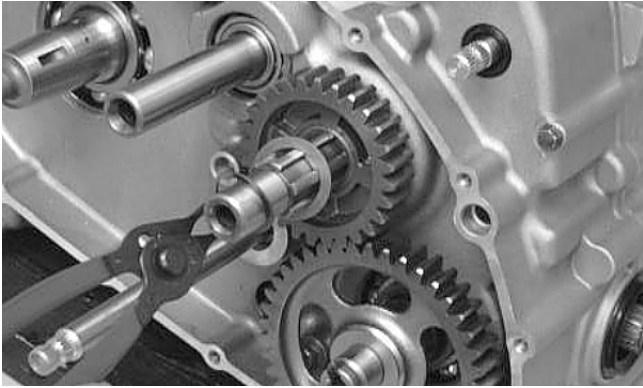
CAUTION
<p>It is important that the oil holes in the splined bushing and driveshaft align. If they are not aligned, major damage will occur from lack of lubrication.</p>



CC259D

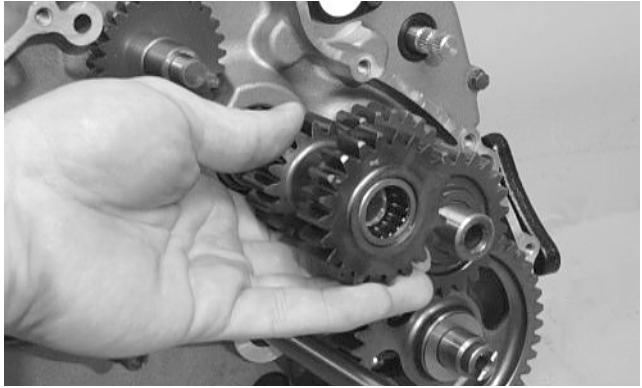
7. In turn on the driveshaft, install the #1 drive gear and washer; then secure with the circlip.

3



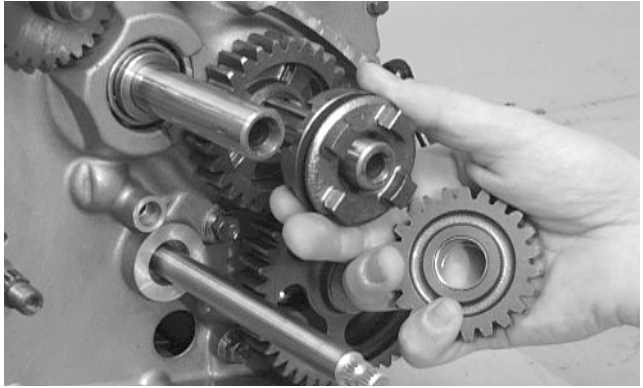
CC059D

8. Place the select sliding dog gear and washer onto the driveshaft; then place the #2 drive gear onto the driveshaft making sure the bushing and washer follow on the driveshaft.



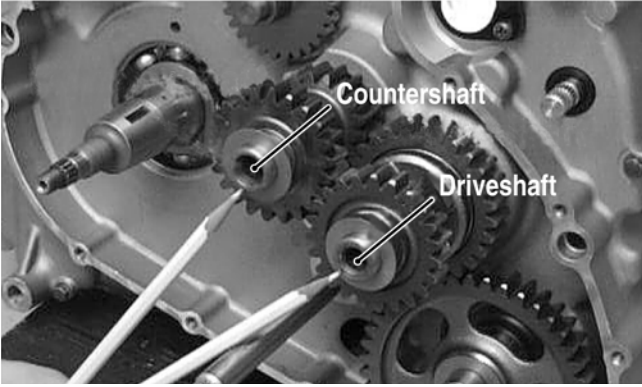
CC060D

10. Place a washer on both the driveshaft and the countershaft.



CC061D

9. Place the idle gear spacer and idle gear onto the countershaft.



CC058DA

11. With the slot in the shift shaft assembly facing upward, place the assembly on the fixed shaft.



CC262D



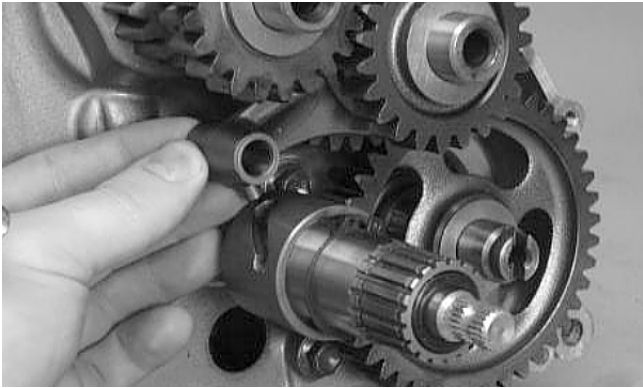
CD147

12. Place the left shaft washer on the shift shaft.



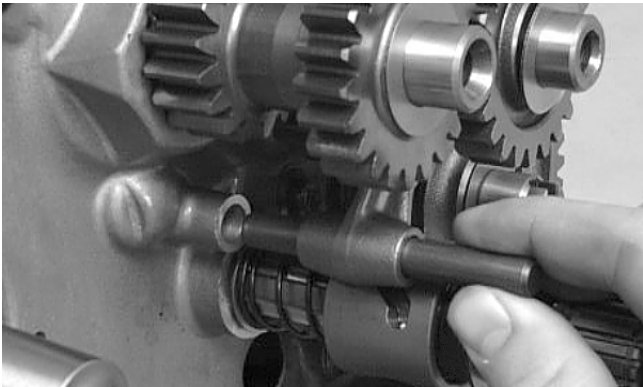
CC333D

13. With the shift fork peg positioned in the shift shaft assembly slot, install the shift fork in the select sliding dog gear.



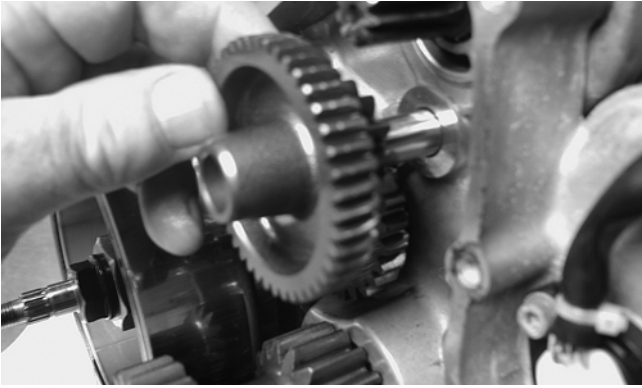
CC329D

14. Slide the shift fork shaft through the shift fork and into the crankcase boss.



CC330D

15. Insert the pin into the starter gear assembly boss in the crankcase; then install starter idler gear #1.



CD136

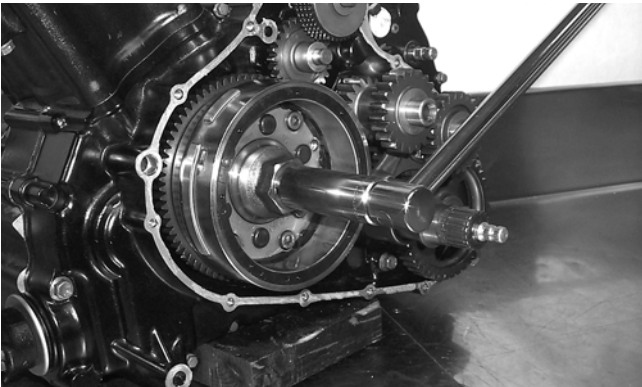
16. Place a washer on each end of the starter gear assembly and install in the crankcase.

17. Place a thrust washer onto the crankshaft; then install the starter clutch gear assembly onto the crankshaft. Place the key into its notch.



CD155

18. Place the rotor/flywheel into position on the crankshaft; then install the nut on the crankshaft and tighten until the rotor/flywheel is properly seated. Tighten to specifications.

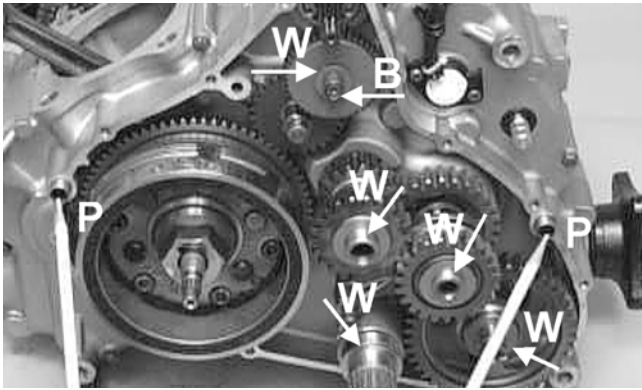


CC147D

19. Install the two alignment pins into the left crankcase half.

■ **NOTE:** Make sure that five washers, one bushing, and two alignment pins are in place.

3



CC326D

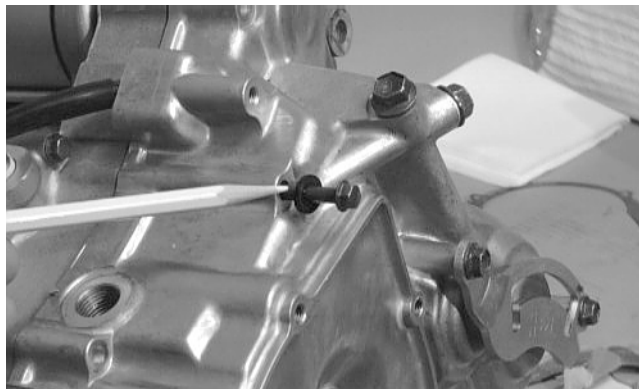
- C. Cover
- D. Speed Sensor Housing
- E. Hi/Low Shifter Assembly
- F. Recoil Starter

■ **NOTE:** Steps 1-19 in the preceding sub-section must precede this procedure.

20. Place the gasket and left-side cover into position on the crankcase.

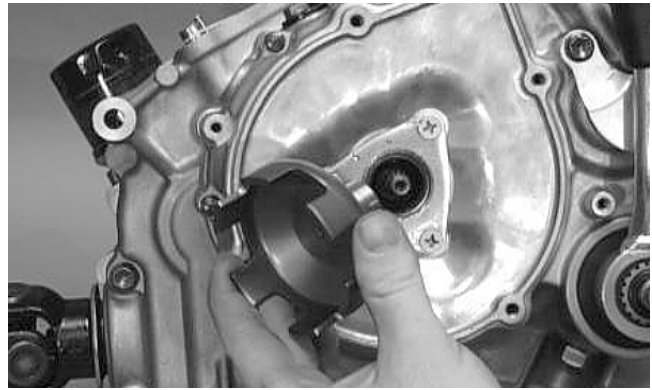
■ **NOTE:** It may be necessary to push or pull the splined Hi/Low range shift shaft to establish cover/crankcase mating.

21. Install the fourteen cap screws to secure the left-side cover. Do not tighten at this time. Note the location of the long cap screw with rubber washer.



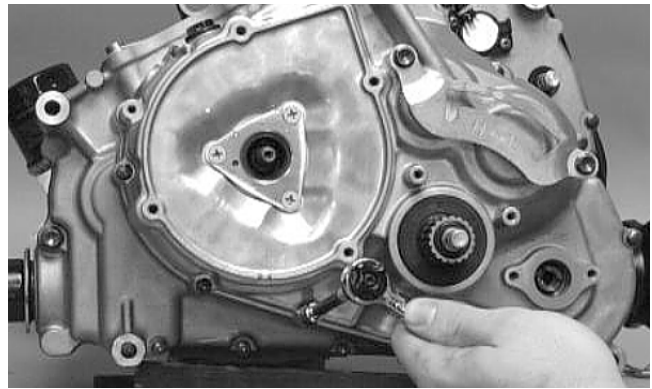
CC055D

22. Place the starter cup into position on the crankshaft making sure a new, lubricated O-ring is inside the cup. Tighten the flange nut to specifications.



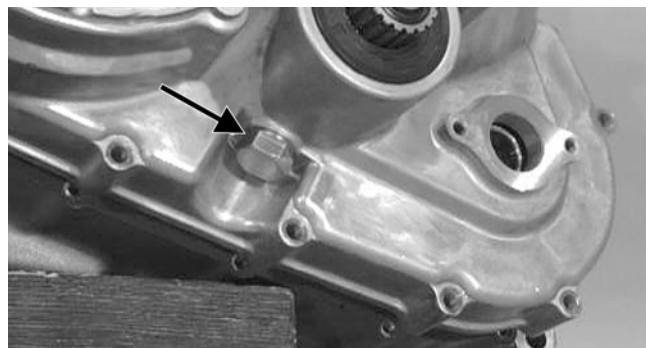
CC041D

23. In a crisscross pattern, tighten the cap screws (from step 21) to specifications.



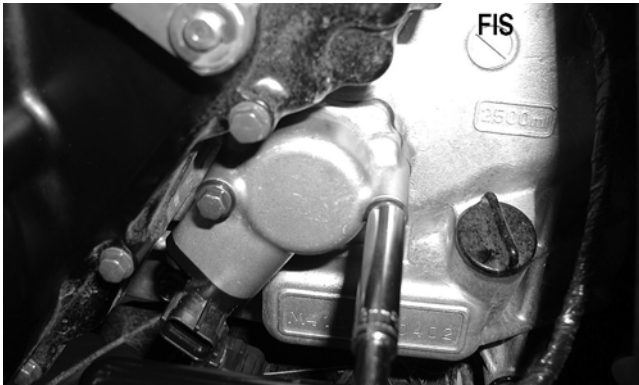
CC047D

24. Place the shift stop housing assembly into position beneath the shift shaft housing making sure the spring and stopper are correctly positioned. Tighten to specifications.



CC054D

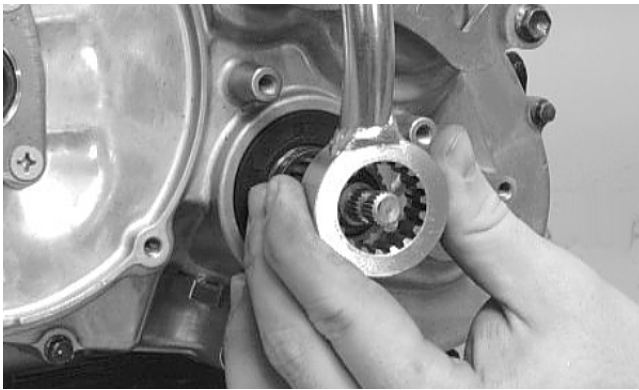
25. Place the speed sensor housing and gasket into position and secure with the two cap screws. Tighten securely.



CD069

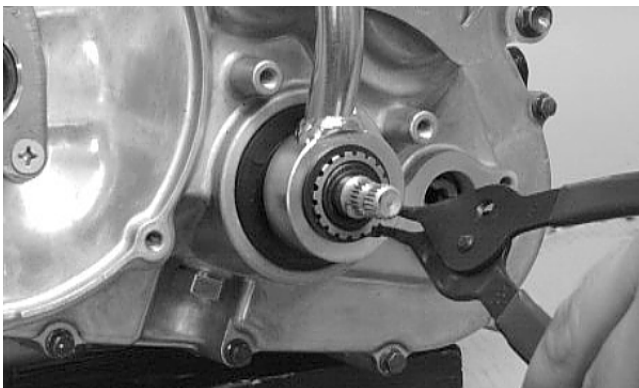
26. Install the inside circlip onto the hi/low range shift shaft with the sharp side of the circlip facing the engine; then place the shift lever assembly part way onto the shaft.

■ **NOTE:** Position the shift lever part way onto the splines and verify the subtransmission is in hi range. If not, shift into hi range.



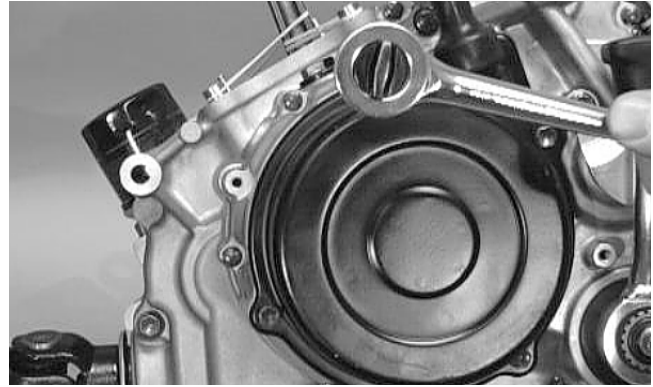
CC045D

27. Pull up on the hi/low shift T-handle and guide the T-handle stop pin into the hi range lever stop plate slot; then slide the shift lever assembly the rest of the way onto the shift shaft. Secure with the outer circlip making sure the sharp side of the circlip faces away from the hi/low-range lever.



CC044D

28. Place the recoil starter assembly into position on the left-side cover; then tighten four cap screws to specifications.

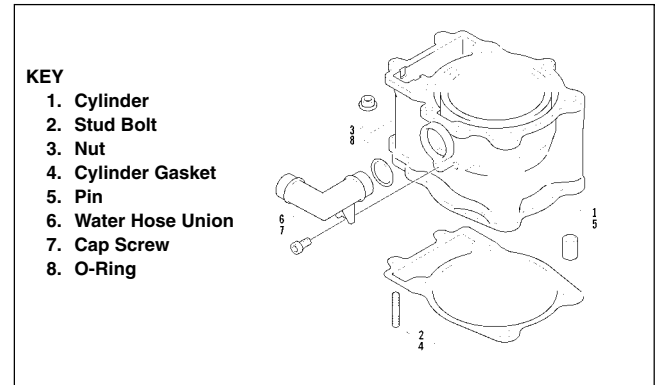


CC039D

Installing Top-Side Components

3

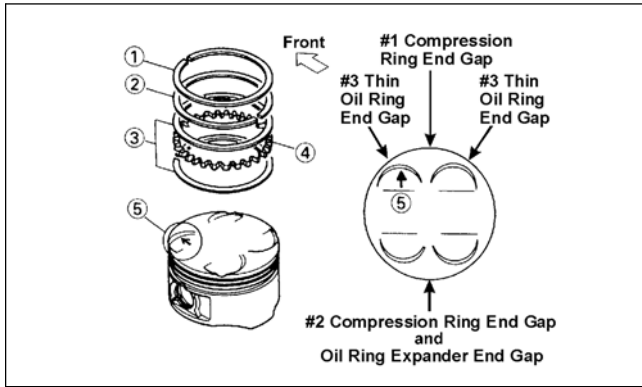
- A. Piston
- B. Cylinder



0732-301

■ **NOTE:** If the piston rings were removed, install them in this sequence.

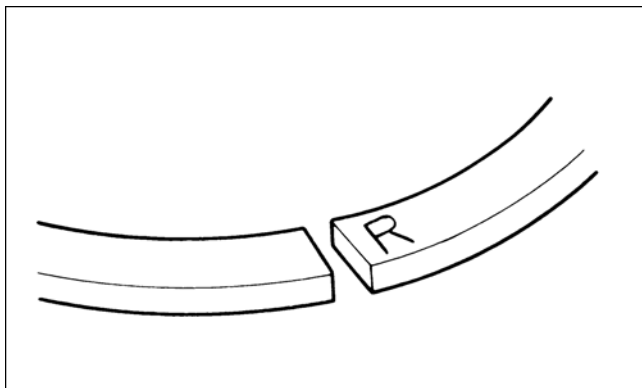
A. Install ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap.



ATV-1085B

B. Stagger the end gaps of the upper and lower thin oil rings according to the illustration.

■ **NOTE:** Note the direction of the exhaust side of the piston (5) for correct ring end gap orientation.



ATV-1024

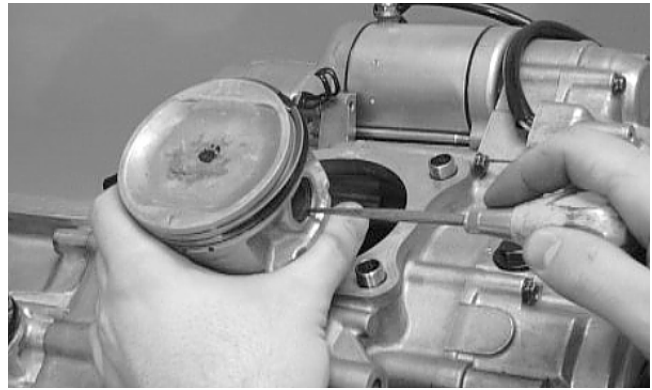
C. Install the compression rings (1 and 2) so the letter on the top surface of each ring faces the dome of the piston. Rotate the rings until the ring end gaps are on directly opposite sides of the piston (see illustration).

■ **NOTE:** The chrome (silver) ring should be installed in the top position.

CAUTION
Incorrect installation of the piston rings will result in engine damage.

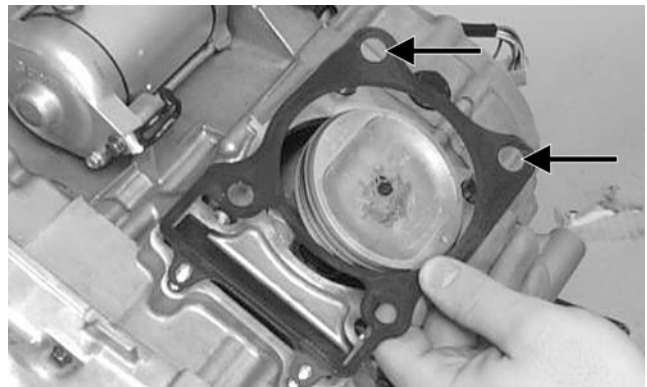
1. Install the piston on the connecting rod making sure there is a circlip on each side and the open end of the circlip faces upwards.

■ **NOTE:** The piston should be installed so the arrow points toward the exhaust.



CC032D

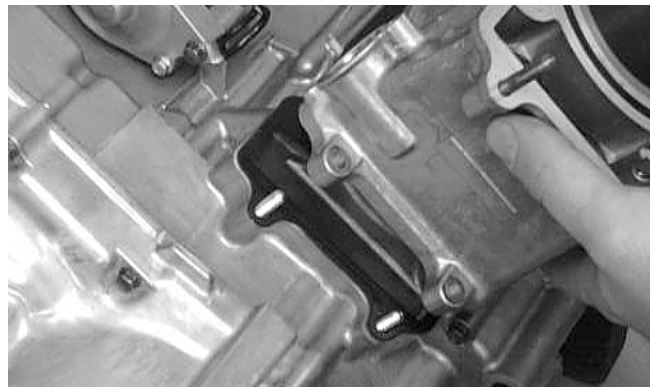
2. Place the two alignment pins into position. Place the cylinder gasket into position; then place a piston holder (or suitable substitute) beneath the piston skirt and square the piston in respect to the crankcase.



CC025D

3. Lubricate the inside wall of the cylinder; then using a ring compressor or the fingers, compress the rings and slide the cylinder over the piston. Route the cam chain up through the cylinder cam chain housing; then remove the piston holder and seat the cylinder firmly on the crankcase.

CAUTION
The cylinder should slide on easily. Do not force the cylinder or damage to the piston, rings, cylinder, or crankshaft assembly may occur.



CC024D

4. Loosely install the two nuts which secure the cylinder to the crankcase.

■ **NOTE:** The two cylinder-to-crankcase nuts will be tightened in step 10.

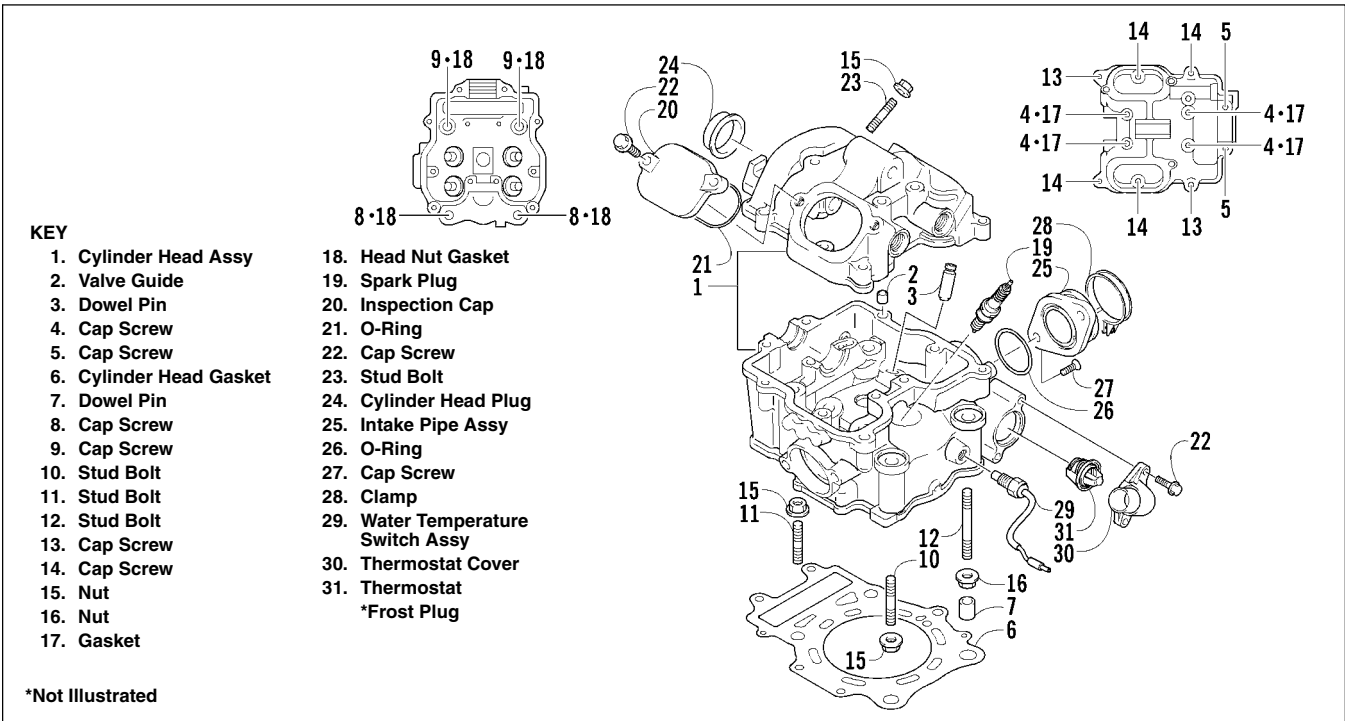
5. Install the coolant hose onto the crankcase union and tighten the clamp.



CC023D

C. Cylinder Head
D. Valve Cover

3



0737-755

■ **NOTE:** Steps 1-5 in the preceding sub-section must precede this procedure.

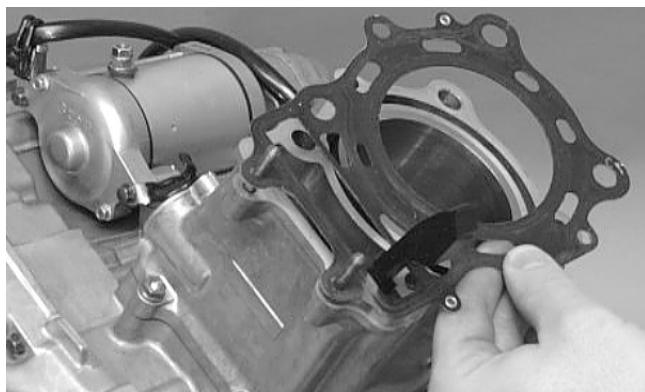
6. Place the chain guide into the cylinder.

CAUTION
Care should be taken that the bottom of the chain guide is secured in the crankcase boss.

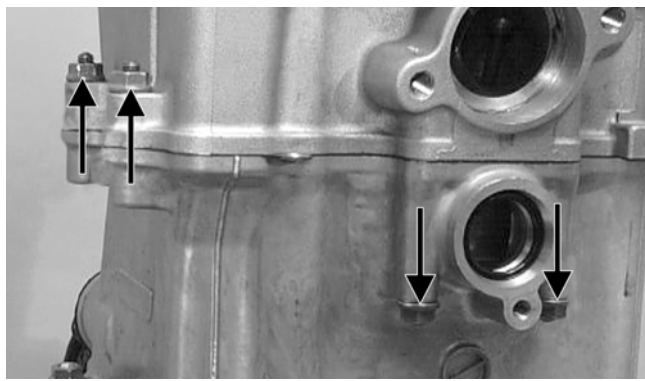


CC022D

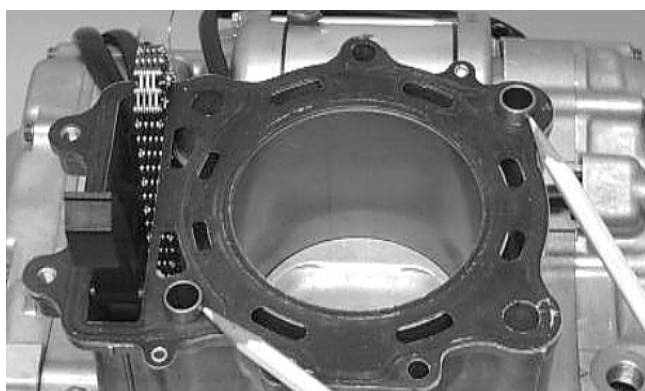
7. Place the head gasket into position on the cylinder. Place the alignment pins into position; then place the head assembly into position on the cylinder.



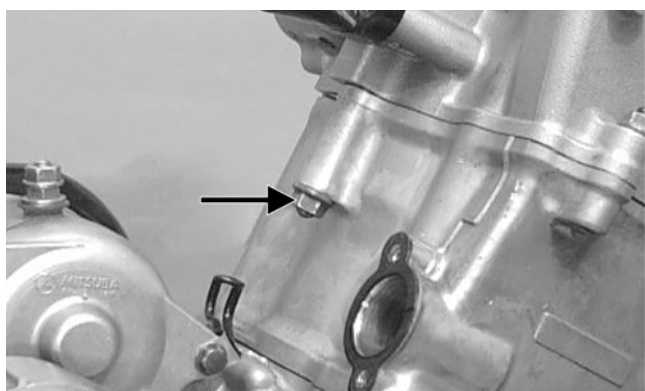
CC020D



CC018D



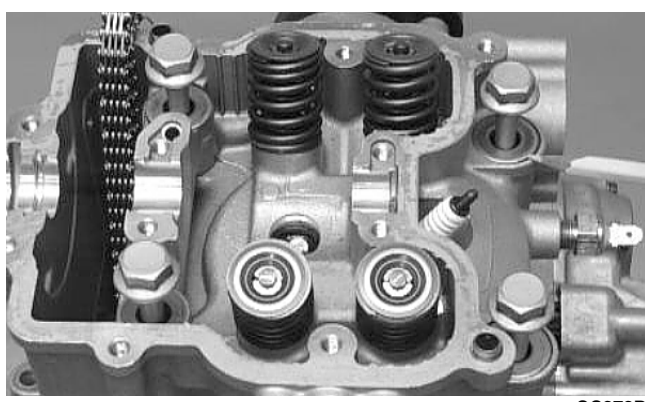
CC265D



CC017D

8. Install the four cylinder head cap screws with copper washers (note the locations of the different-lengthed cap screws). Tighten only until snug.

10. In a crisscross pattern, tighten the four cylinder head cap screws (from step 8) to 3.8 kg-m (27.5 ft-lb); then tighten the 8 mm nut (from step 9) to 2.5 kg-m (18 ft-lb). Using a crisscross pattern, tighten the four 6 mm nuts (from step 9) to 1.1 kg-m (8 ft-lb). Tighten the two cylinder-to-crankcase nuts (from step 4) securely.

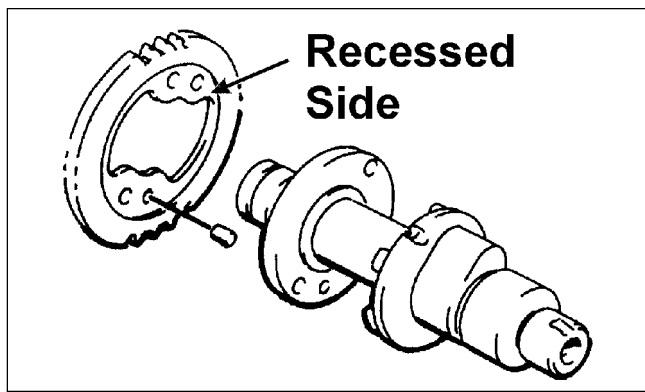


CC272D

11. With the timing inspection plug removed and the chain held tight, rotate the crankshaft until the piston is at top-dead-center.

12. With the alignment pin installed in the camshaft, loosely place the cam sprocket (with the recessed side facing the cam shaft lobes) onto the camshaft. At this point, do not "seat" the sprocket onto the shaft.

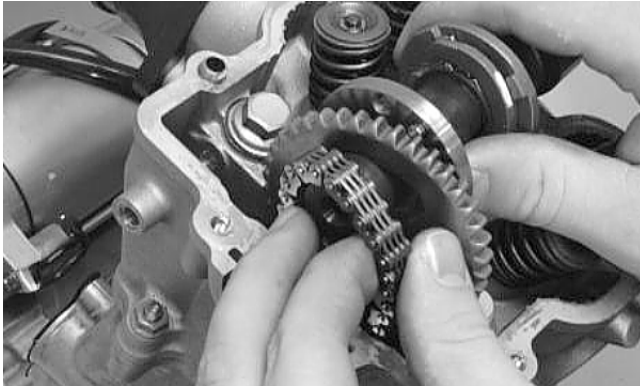
9. Loosely install the five cylinder head nuts.



732-307B

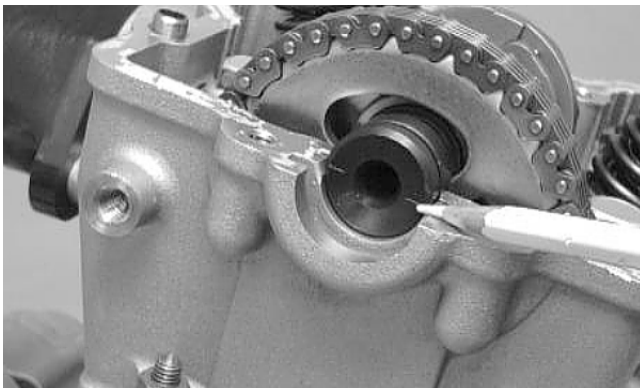
■ **NOTE:** At this point, oil the camshaft bearings, cam lobes, and the three seating journals on the cylinder.

13. With the cam lobes directed down (toward the piston), maneuver the camshaft/sprocket assembly through the chain and towards its seating position; then loop the chain over the sprocket.



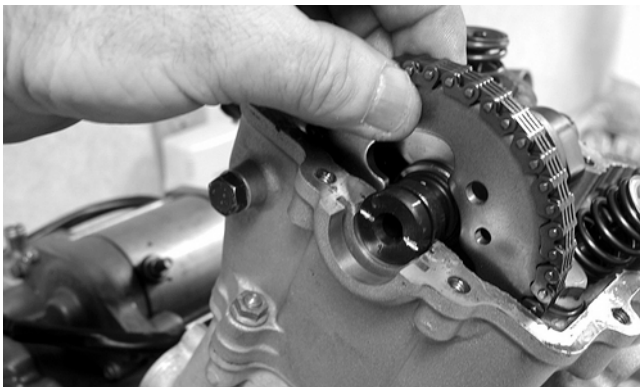
CC015D

■ **NOTE:** Note the position of the alignment marks on the end of the camshaft. They must be parallel with the valve cover mating surface. If rotating the camshaft is necessary for alignment, do not allow the chain and sprocket to rotate and be sure the cam lobes end up in the down position.



CC267D

14. Seat the cam sprocket onto the camshaft making sure the alignment pin in the camshaft aligns with the smallest hole in the sprocket; then place the camshaft/sprocket assembly onto the cylinder ensuring the following.



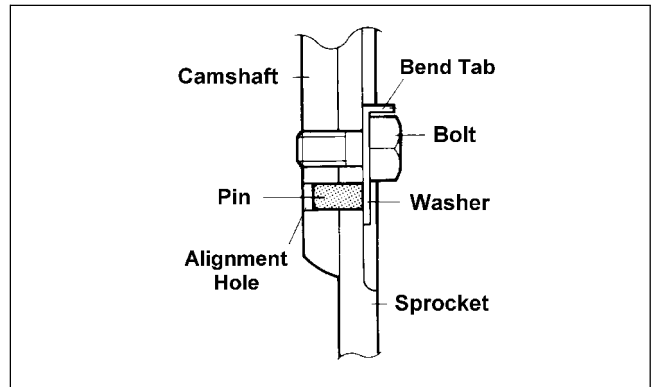
CD463

- A. Piston still at top-dead-center.
- B. Camshaft lobes directed down (toward the piston).
- C. Camshaft alignment marks parallel to the valve cover mating surface.
- D. Recessed side of the sprocket directed toward the cam lobes.
- E. Camshaft alignment pin and sprocket alignment hole (smallest) are aligned.

⚠ CAUTION

If any of the above factors are not as stated, go back to step 11 and carefully proceed.

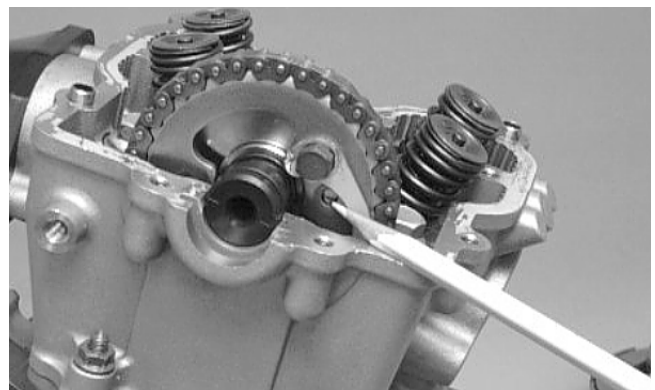
15. Place the tab-washer onto the sprocket making sure it covers the pin in the alignment hole.



ATV-1027

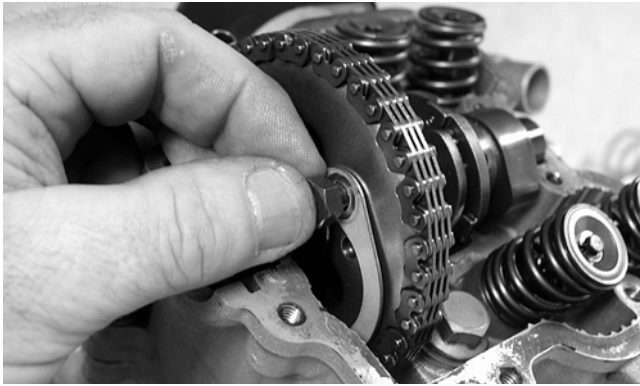
⚠ CAUTION

Care must be taken that the tab-washer is installed correctly to cover the alignment hole on the sprocket. If the alignment pin falls out, severe engine damage will result.



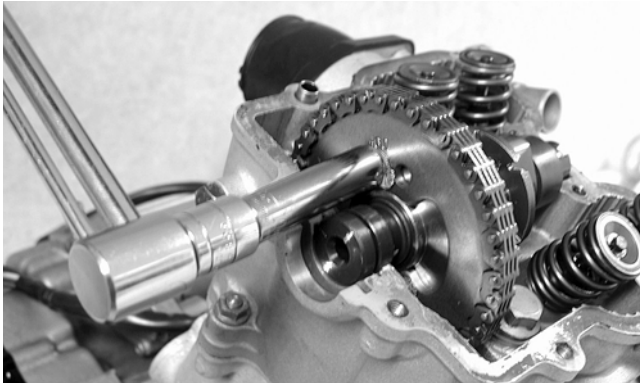
CC270D

16. Install the first cap screw (threads coated with red Loctite #271) securing the sprocket and tab-washer to the camshaft. Tighten only until snug.



CD464

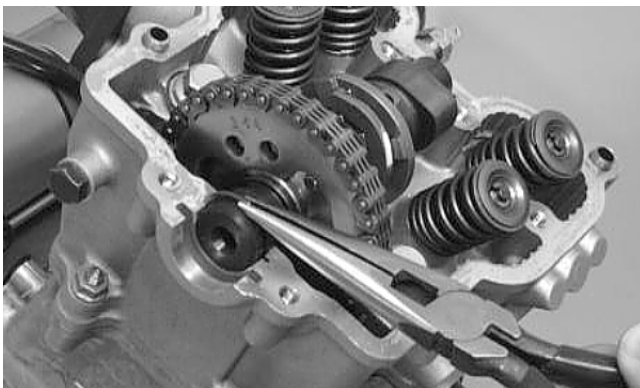
17. Rotate the crankshaft until the second cap screw securing the sprocket to the camshaft can be installed; then install the cap screw (threads coated with red Loctite #271) and tighten to specifications. Bend the tab to secure the cap screw.



CD465

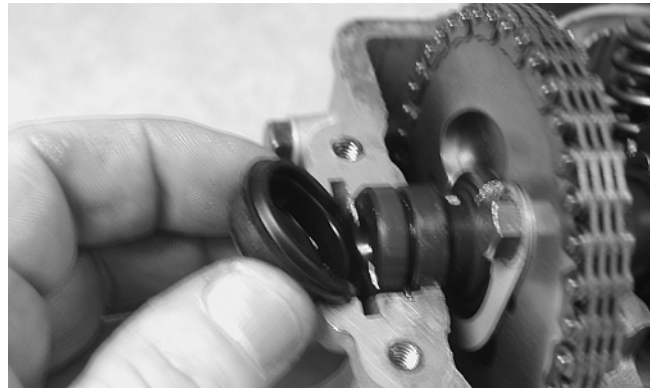
18. Rotate the crankshaft until the first cap screw (from step 16) securing the sprocket to the camshaft can be addressed; then tighten to specifications. Bend the tab to secure the cap screw.

19. Place the C-ring into position in its groove in the cylinder.



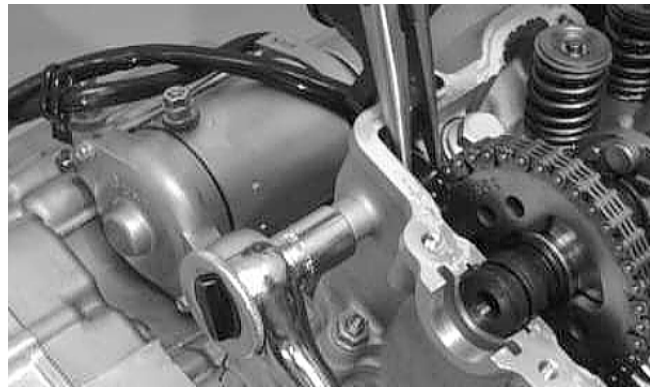
CC012D

20. Install the cylinder head plug in the cylinder head with the opening of the plug directed downward and toward the inside.



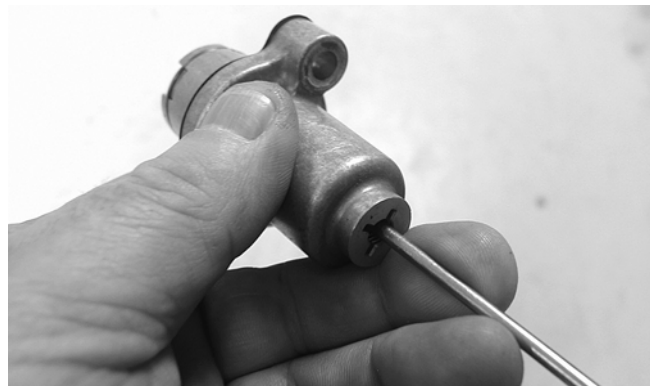
CD468

21. Place the cam chain tensioner guide into position and secure with the cap screw and washer.



CC014D

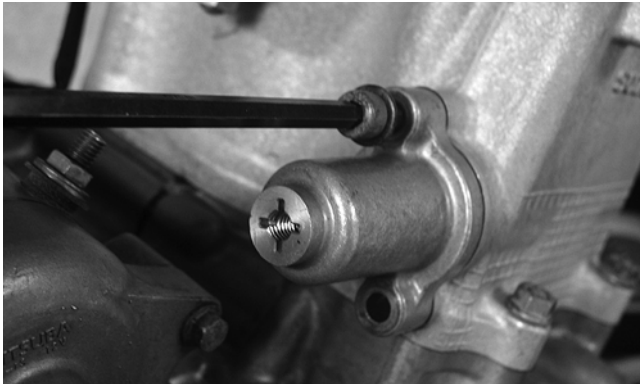
22. Remove the cap screw from the end of the chain tensioner; then using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner clockwise until the screw bottoms.



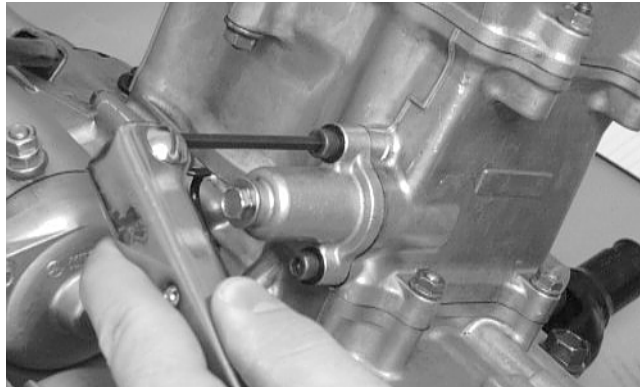
CD501

■ **NOTE:** The adjuster shaft will be drawn into the tensioner as the adjuster screw is rotated clockwise. The adjuster shaft tension will be released in step 24.

23. Place the chain tensioner adjuster assembly and gasket into position on the cylinder and secure with the two Allen-head cap screws.

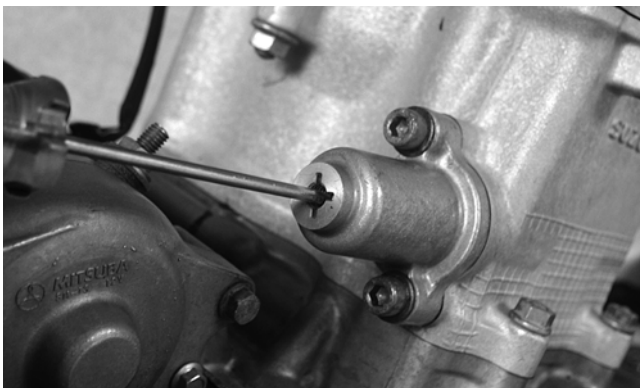


CD469

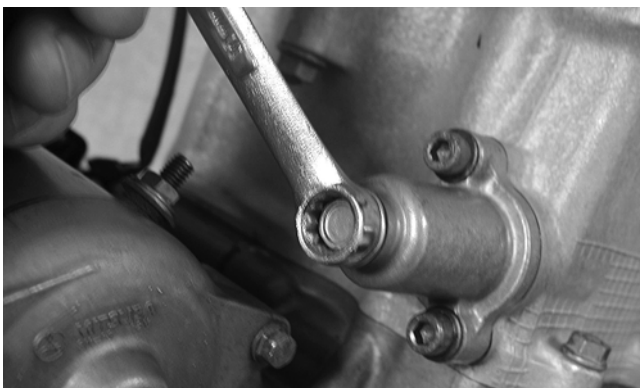


CC010D

24. Using a flat-blade screwdriver, rotate the adjuster screw inside the tensioner counterclockwise until all tension is released; then install the cap screw into the end of the chain tensioner.



CD470



CD471

25. Loosen the four adjuster screw jam nuts; then loosen the four adjuster screws on the rocker arms in the valve cover.
26. Apply a thin coat of Three Bond Sealant (p/n 0636-070) to the mating surfaces of the cylinder head and valve cover.

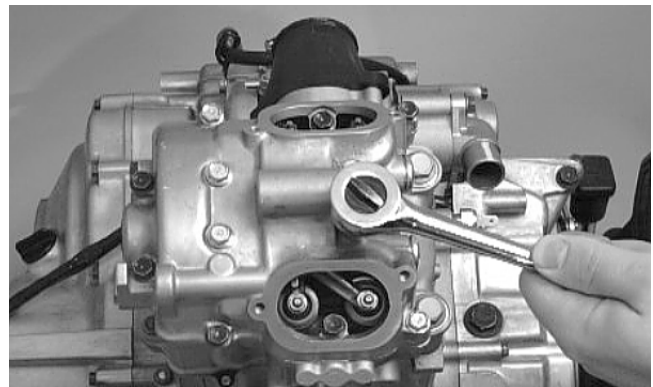


CC275D

27. Place the valve cover into position.

■ **NOTE:** At this point, the rocker arms and adjuster screws must not have pressure on them.

28. Install the four top side valve cover cap screws with rubber washers; then install the remaining cap screws. Tighten only until snug.



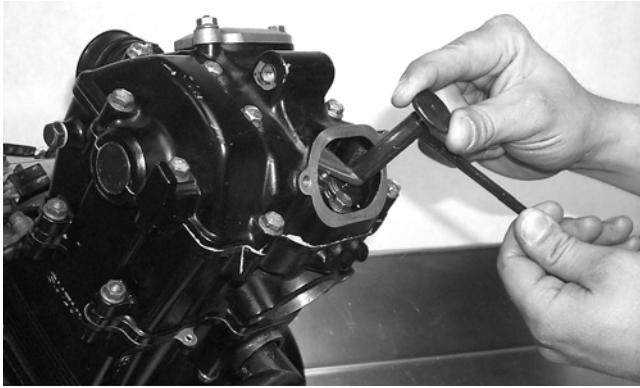
CC003D

29. In a crisscross pattern starting from the center and working outward, tighten the cap screws (from step 28) securely.

30. Adjust valve/tappet clearance using the following procedure.

■ **NOTE:** Use Valve Clearance Adjuster (p/n 0444-078) for this procedure.

- A. Turn the engine over until the piston reaches top dead center on the compression stroke.
- B. Place the valve adjuster onto the jam nut securing the tappet adjuster screw; then rotate the valve adjuster dial clockwise until the end is seated in the tappet adjuster screw.



CC528D

- C. While holding the valve adjuster dial in place, use the valve adjuster handle and loosen the jam nut; then rotate the tappet adjuster screw clockwise until friction is felt.
- D. Align the valve adjuster handle with one of the marks on the valve adjuster dial.
- E. While holding the valve adjuster handle in place, rotate the valve adjuster dial counterclockwise until specified valve/tappet clearance is attained.

■ **NOTE:** Rotating the valve adjuster dial counterclockwise will open the valve/tappet clearance by 0.05 mm (0.002 in.) per mark.

- F. While holding the adjuster dial at the proper clearance setting, tighten the jam nut securely with the valve adjuster handle.
31. Place the two tappet covers into position making sure the proper cap screws are with the proper cover. Tighten the cap screws securely.



CC001D

32. If removed, install the spark plug and tighten to specifications.

Installing Engine/Transmission

■ **NOTE:** Arctic Cat recommends that new gaskets and O-rings be installed whenever servicing the ATV.

1. From the left side, place the engine/transmission into the frame; then move it rearward as far as possible.
2. Raise the rear of the engine enough to engage the front driveshaft into the splines of the front drive output yoke; then slide the engine forward as far as possible.



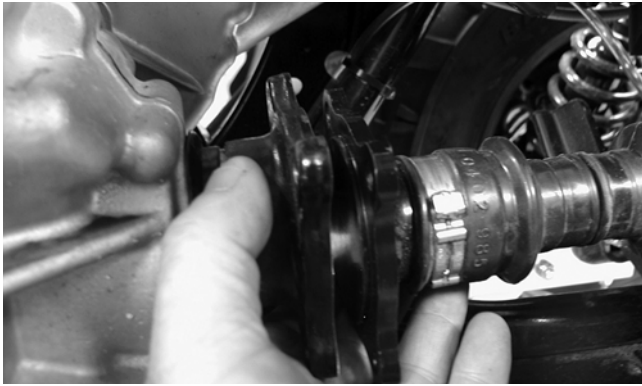
CD818

3. Raise the rear of the engine and place a block under it; then install the propeller shaft and output flange into the rear drive coupler.



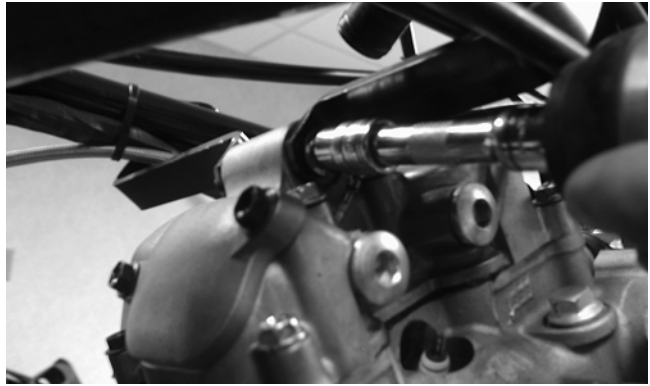
CD821

4. Remove the block from beneath the engine; then align the rear drive flanges and secure with four cap screws. Tighten to specifications.



CD824

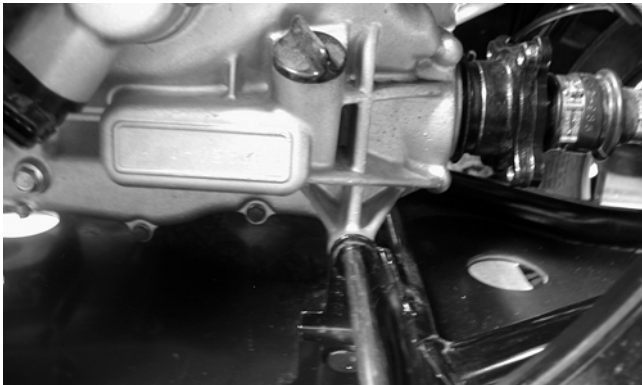
5. Install the lower rear engine mounting through-bolt, spacer, and washer; then install the lower front engine mounting through-bolt, spacer, and washer. Secure with the flange nuts. Tighten to specifications.



CD807

7. Connect the crankcase breather vent hose and secure with the clamp.

8. Connect the lower coolant hose to the water pump housing and secure with the clamp.



CD809

6. Install the upper engine mounting brackets to the frame with two cap screws; then install the through-bolt and flange nut. Tighten all hardware to specifications.



CC124D

9. Connect the positive cable to the starter motor and install the protective boot.



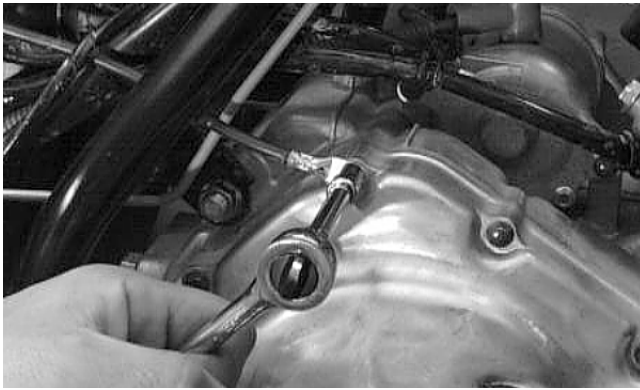
CD806



AR604D

10. Connect the battery ground (negative) cable to the crankcase cover.

3



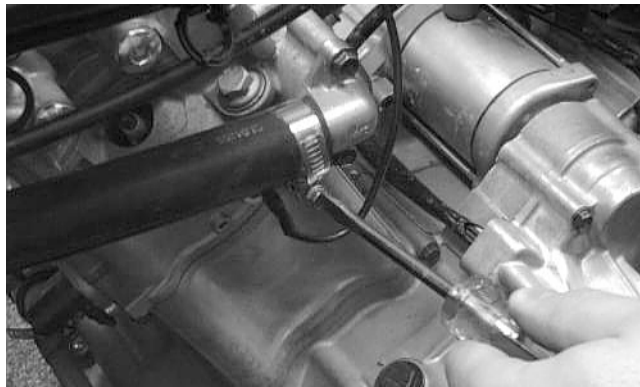
AR600D

11. Install the coil and secure with two cap screws; then install the high tension lead on the spark plug.



CD814

12. Connect the upper coolant hose to the thermostat housing and secure with the clamp.



CC121D

13. Install the air filter housing; then connect the crankcase breather and the inlet air duct. Secure with the clamps.



CD785



CD787

14. Position the carburetor into the intake pipe and secure with the clamp; then connect the carburetor boot to the air filter housing. Secure with the clamp.

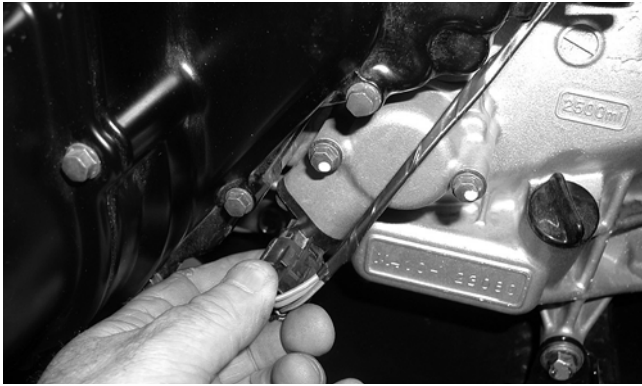


CD790



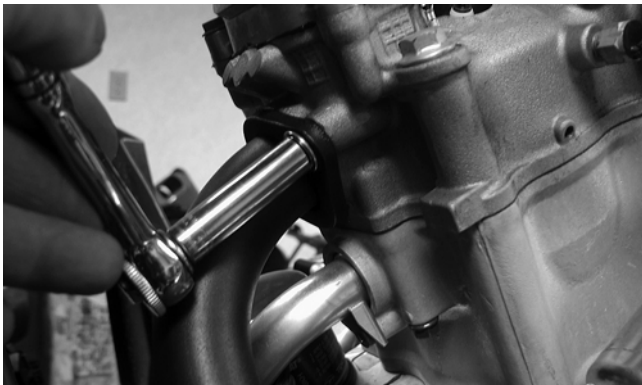
CD786

15. Connect the speed sensor connector to the sensor housing.

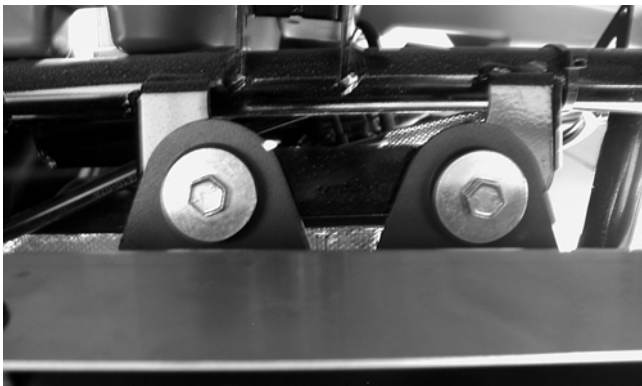


CD794

16. Install the exhaust pipe and secure with two cap screws making sure the mounting brackets engage the frame grommets; then install the muffler. Tighten all hardware to specifications.



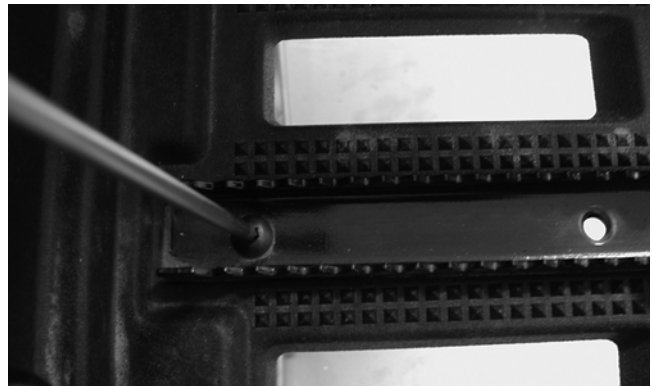
CD803



CD804

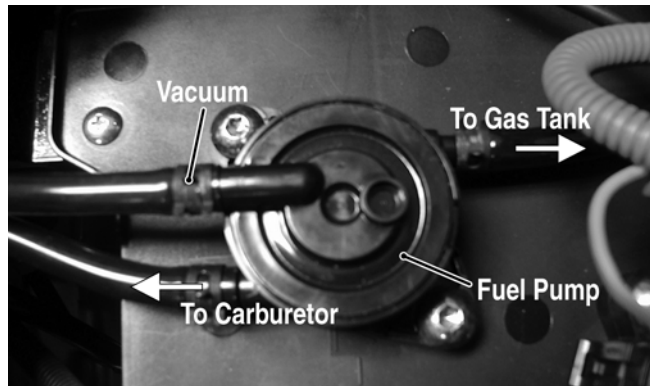
17. Swing the shift rod back into position on the engine shift arm; then secure with the E-clip.

18. Place the left-side footwell and foot peg into position on the footrest. Secure with two cap screws. Tighten to specifications.



CD782

19. Connect the gas hose to the fuel pump; then connect the vacuum hose. Secure with hose clamps.



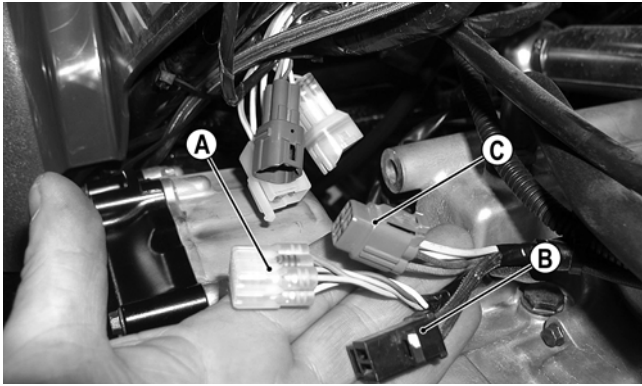
CD766A

20. Connect the temperature sensor wire to the main harness.



CD788

21. Connect the gear position indicator connector (A), stator connector (B), and the CDI connector (C) to the main harness.



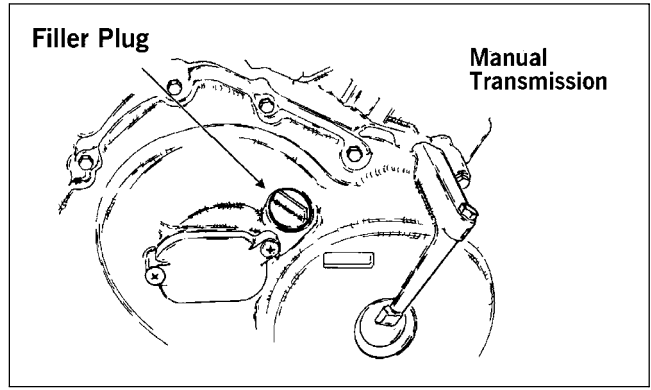
CD797A

- 22. Install the front body panel and the front rack (see Section 8).
- 23. Place the side panels into position; then install the reinstallable rivets.



CD683A

- 24. Install the battery connecting the positive cable first; then the negative cable.
- 25. Pour the correct amount of recommended oil into the engine/transmission filler hole; install the filler plug.



ATV-0108

- 26. Pour 2.9 L (3 U.S. qt) of premixed Arctic Cat Antifreeze (p/n 0638-395) into the cooling system. Allow coolant to settle and then fill to the bottom of the stand pipe in the radiator neck.



AN604D

- 27. Install the seat making sure it “locks” into position.

CAUTION
<p>If the engine had a major overhaul or if any major part was replaced, proper engine break-in procedures must be followed (see Section 1). If the proper engine break-in procedures are not followed, severe engine damage may result.</p>

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(650 V-Twin)

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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.

NOTE: For ease of removal of components, it is advisable to remove front and rear racks, fenders, and side panels prior to engine removal.

AT THIS POINT

If the technician's objective is to service/replace recoil starter, alternator/rotor flywheel, stator, pick-up coil, starter torque limiter, primary cam chain, water pump impeller/seal, starter clutch, and starter clutch gear, the engine/transmission does not have to be removed from the frame.

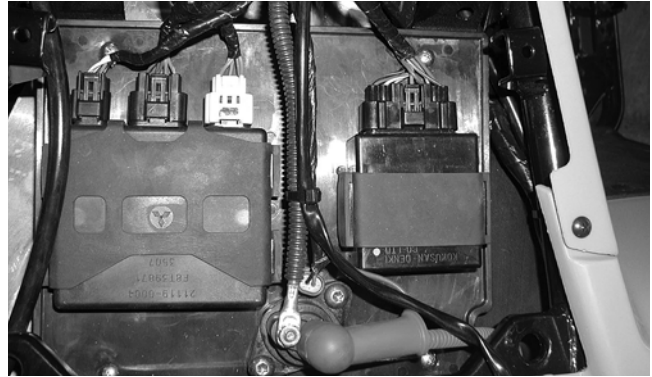
Secure the ATV on a support stand to elevate the wheels.

WARNING

Make sure the ATV is solidly supported on the support stand to avoid injury.

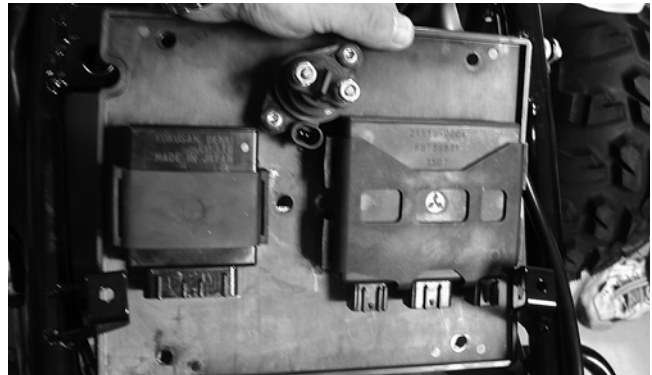
1. Remove the seat.
2. Remove the negative cable from the battery; then remove the positive cable. Remove the battery cover and the battery vent hose; then remove the battery.

3. Disconnect the wiring on the starter relay; then disconnect the CDI unit and the engine brake actuator control connectors.



KX074

4. Remove the four screws securing the electronics mounting tray; then remove the entire assembly.



KX130

5. Drain the coolant from the cooling system; then drain the oil from the engine/transmission.



KX036A

6. Remove the reinstallable rivets securing the right-side and left-side panels; then remove the panels.
7. Remove the radiator access cover, steering post cover, and storage compartment cover assembly; then remove the storage compartment box.
8. Remove the instrument pod; then remove the front rack and front body panel (see Section 8).

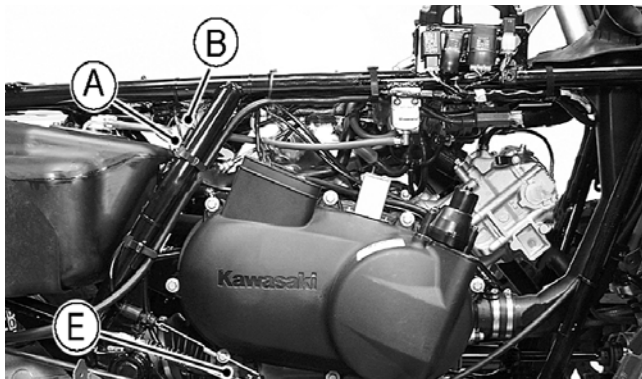
3

9. Remove the front V-belt cooling snorkel; then remove the rear V-belt cooling boot.



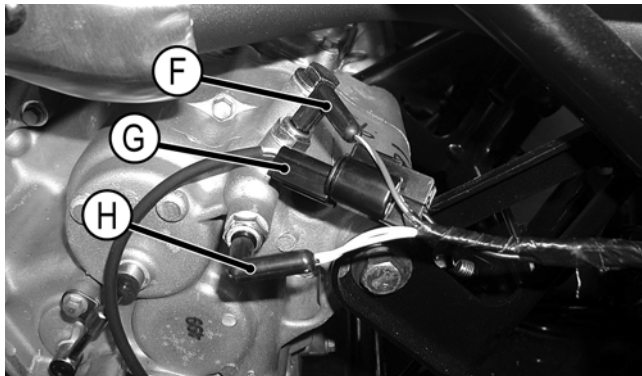
KX101A

10. Disconnect the alternator lead connector (A); then disconnect the pick-up coil lead (B) and the speed sensor connector (E).



KX234B

11. Remove the neutral position connector (F) and reverse position connector (H); then disconnect the forward and reverse detection sensor lead (G).



KX075A

12. Remove the front and rear spark plug caps; then remove the oil pressure sending unit lead (I).



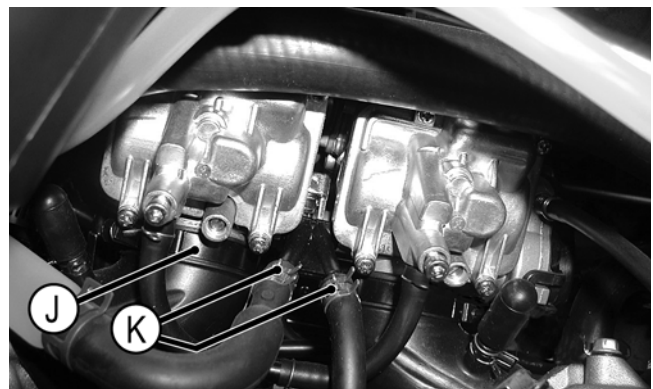
KX046A

13. Remove the left-side foot peg and footwell.



KX104

14. Loosen the carburetor intake boot clamp (J); then remove the two coolant hoses (K).



KX025D

15. Remove the throttle cover from the front carburetor; then disconnect the throttle cable.



KX136

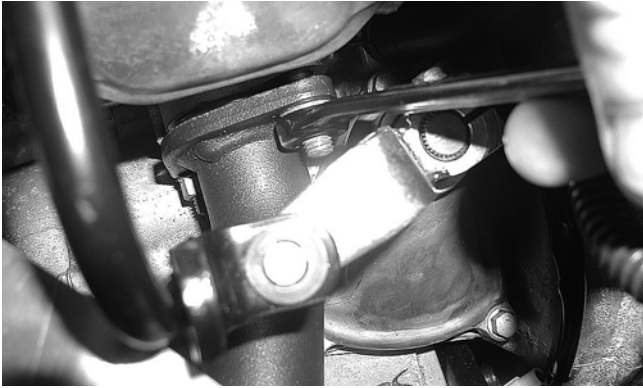
16. Lift the carburetors above the frame and tie to the handlebar; then cover the carburetor openings with duct tape or other suitable material.



KX121

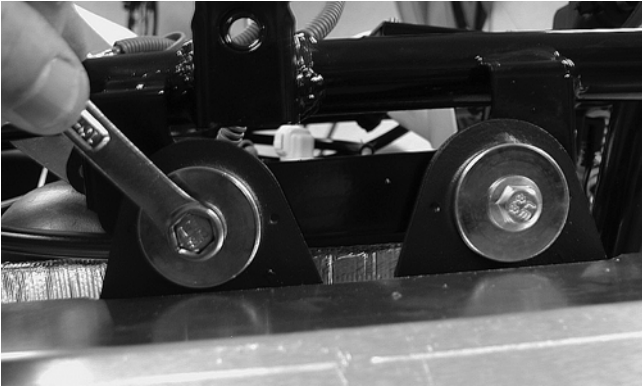
CAUTION
If hardware items or other foreign objects are ingested by the engine on start-up, severe engine damage will occur.

17. Remove the cap screws securing the rear exhaust pipe to the head; then remove the three bolts securing the heat shield to the frame.



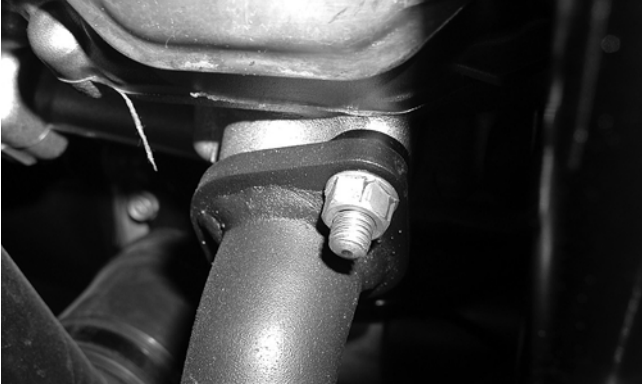
KX141

18. Loosen the muffler clamp; then remove two mounting bolts securing the muffler to the frame. Remove the muffler assembly accounting for one ring gasket and one exhaust pipe bushing seal.



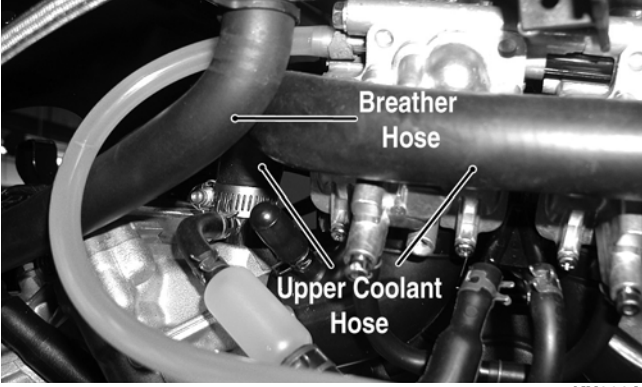
KX126

19. Remove the front exhaust pipe accounting for the ring gasket.



KX067

20. Remove the two upper coolant hoses and the breather hose; then remove the lower coolant hose.



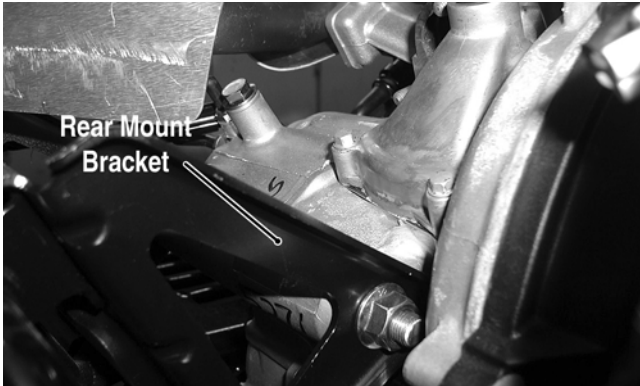
KX086A



KX117A

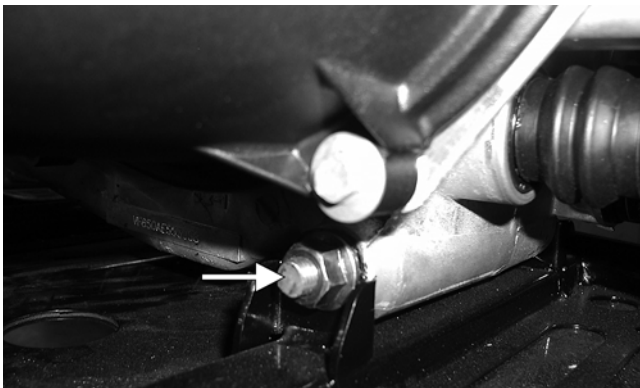
21. Remove the rear engine mount through-bolt; then remove the rear engine mount brackets from the frame.

■NOTE: Removing the brackets will allow the engine to be moved rearward enough to release the front drive coupler.



KX090A

22. Remove the front lower engine mount through-bolt.



KX089A

23. Raise the rear of the engine and maneuver forward to release the rear drive coupler; then lower the rear and shift the engine to the rear to release the front drive coupler.

■NOTE: This will require an assistant to hold cables and lines clear and to assist in maneuvering the engine/transmission assembly out of the frame.

24. Remove the engine/transmission assembly from the left side of the frame.

■NOTE: Tape over or cap all open hoses, lines, and vents to prevent contamination. Make sure that the gas tank valve is in the OFF position and the tank cap is securely tightened.

Left-Side Components

■NOTE: For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

AT THIS POINT

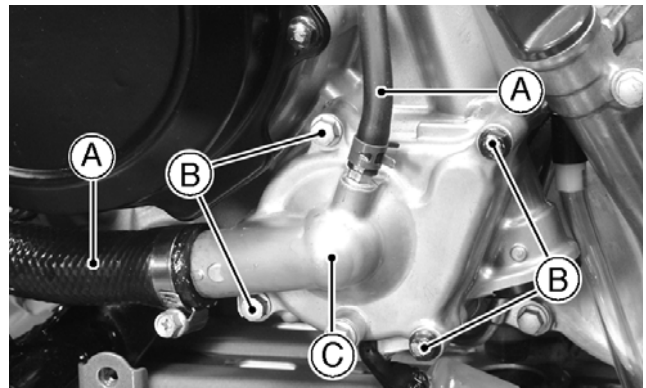
To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.

■NOTE: The engine/transmission does not have to be removed from the frame for this procedure.

Removing Left-Side Components

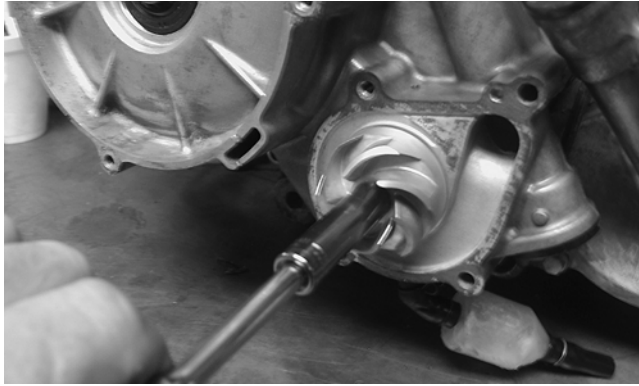
- A. Recoil Starter
- B. Water Pump
- C. Cover
- D. Rotor/Flywheel
- E. Stator
- F. Starter Torque Limiter
- G. Starter Clutch/Clutch Gear
- H. Oil Pump

1. Remove the four cap screws securing the recoil starter assembly to the left-side cover; then remove the recoil starter. Account for the gasket.
2. Drain the cooling system including the coolant reserve tank; then remove the coolant hoses (A), four cap screws (B), and the water pump cover (C). Account for the gasket.



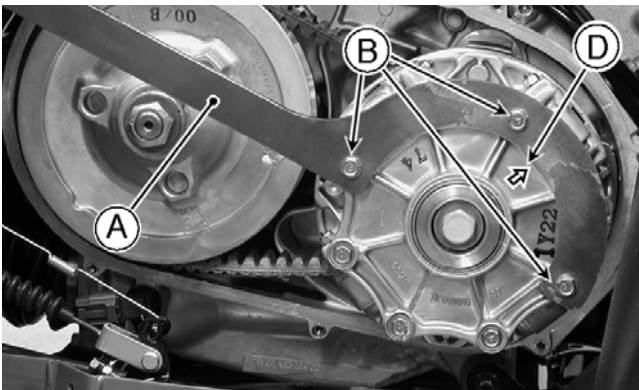
KX235

3. Remove the water pump impeller.



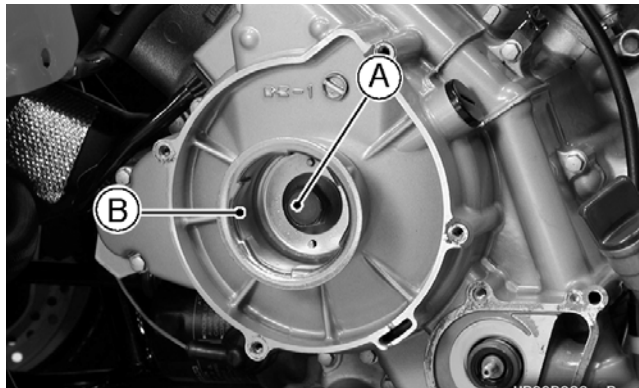
KX40D

- Remove the V-belt cover (See Removing Right-Side Components); then remove the three clutch cover bolts (B) noting the arrow (D) and attach the clutch holding tool (A).



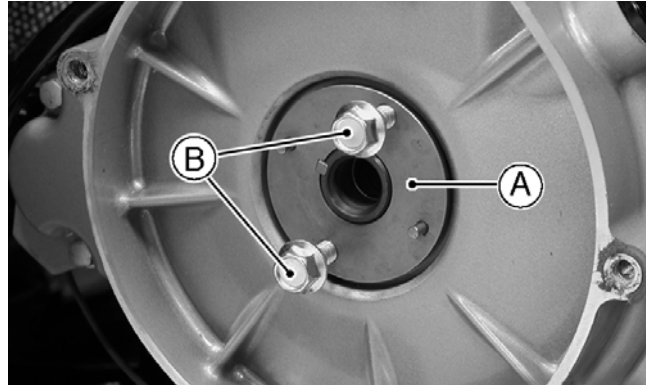
KX236A

- Hold the clutch stationary while (from the opposite side) loosening the rotor/flywheel cap screw (A); then remove the cap screw and the starter cup (B). Account for the O-ring.

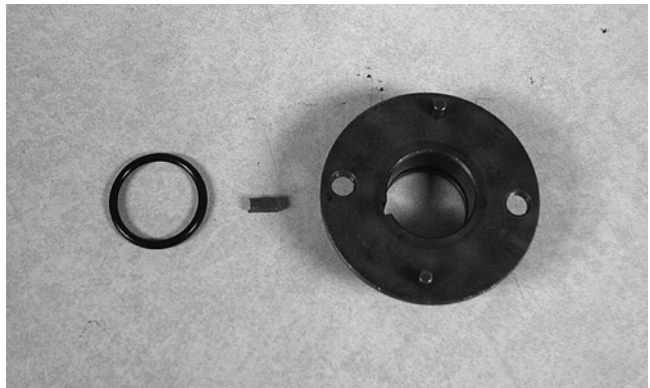


KX237

- Place an oil pan under the left side of the engine; then install two 6 mm cap screws (B) into the collar (A) and remove the collar.

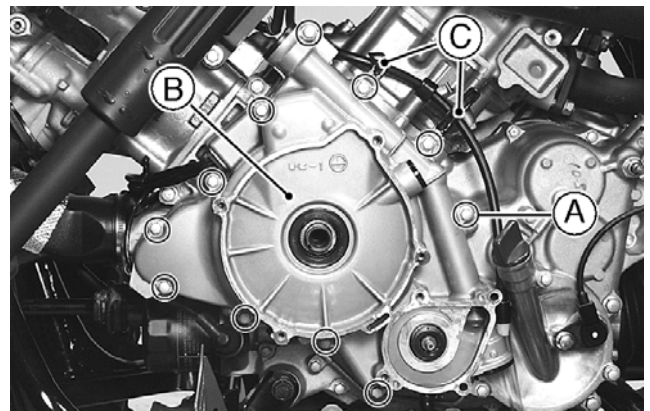


KX238



KX409

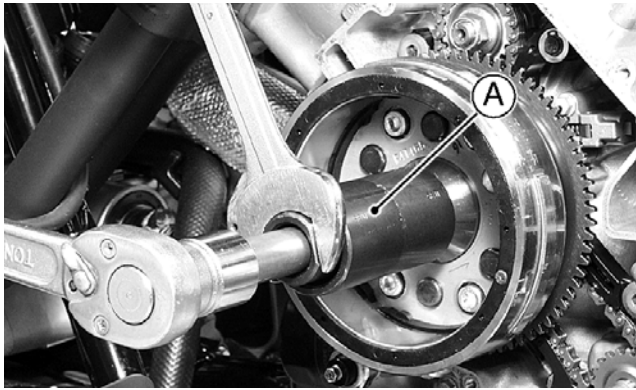
- Disconnect the alternator and pick-up coil lead connectors; then remove the alternator cover cap screws (A), alternator cover (B), and the two clamps (C). Account for two alignment pins and a gasket.



KX239

- Remove the ball bearing; then thread the flywheel puller (A) into the rotor/flywheel.

3



KX240

9. Hold the puller with a suitable wrench and turn the puller screw in to remove the rotor/flywheel. Account for the key.

CAUTION

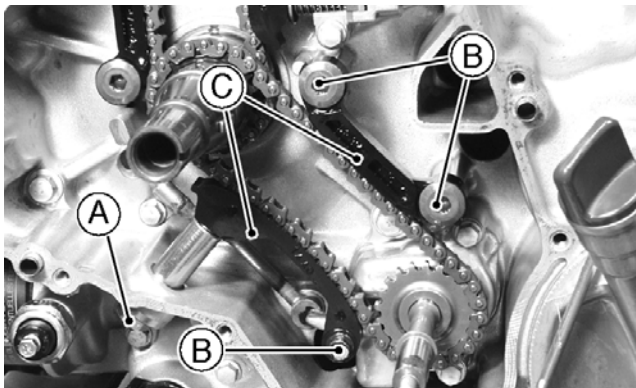
If the rotor is difficult to remove, turn the screw while tapping on the end of the puller screw. Do not strike the rotor/flywheel as a sharp blow can cause magnets to lose strength.

10. Remove the starter torque limiter; then remove the starter gear.

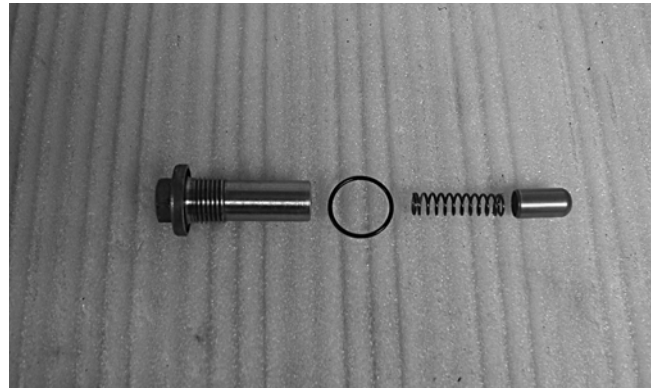


KX412

11. Remove the oil pump drive chain tensioner bolt (A); then remove the chain guide bolts (B) and collar and the chain guides (C). Account for a pin, spring, and O-ring with the chain tensioner bolt.

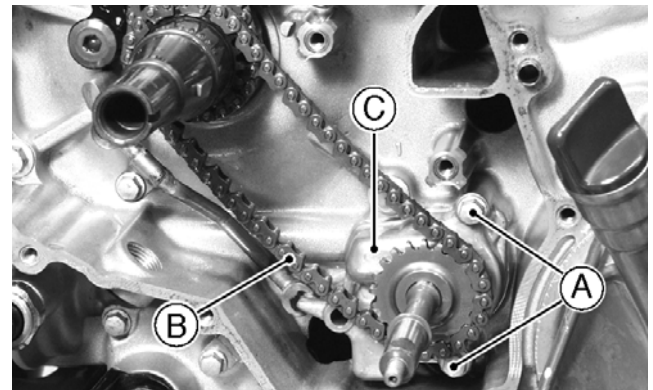


KX242



KX413

12. Remove the cap screws securing the oil pump (A); then remove the oil pump drive chain (B) and oil pump assembly (C). Account for the chain tensioner, chain, and two alignment pins.



KX243

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 Assembly

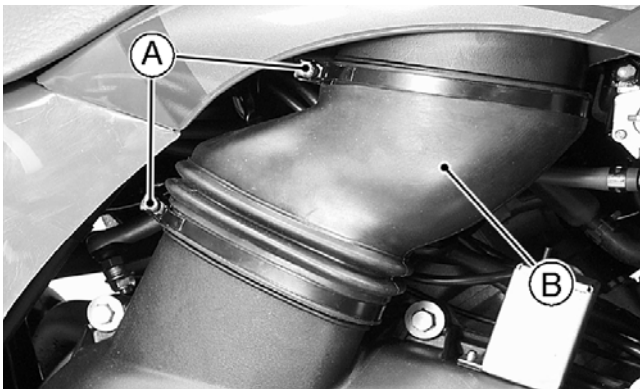
⚠ WARNING

Imbalance of clutch or driven pulley or excessive RPM could cause component failure resulting in severe injury or death. These components are precision balanced and designed to operate within certain RPM limits. Disassembling, assembling, and servicing procedures of clutch and driven pulley must be followed closely. Any modifications that increase RPM may cause failure.

⚠ CAUTION

Do not turn the ignition switch ON while the V-belt cover is removed. This will cause the learning control of the engine brake control to operate and the engine brake actuator may be damaged.

1. Turn the ignition switch to the OFF position and remove the ignition key.
2. Loosen the two clamps (A) securing the air duct boot (B); then remove the boot.



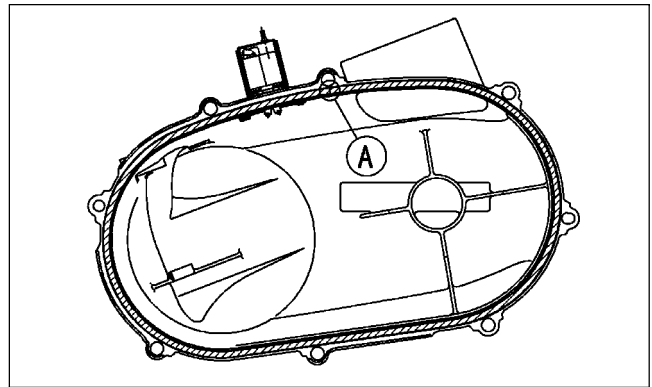
KX244

3. Disconnect the belt failure detection connector and the engine brake actuator lead; then remove the cap screws securing the V-belt cover to the crankcase.



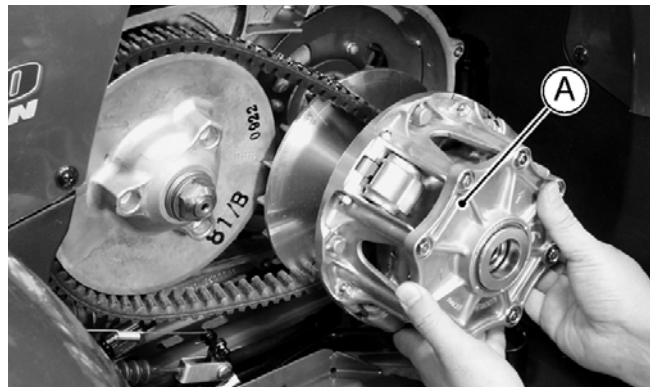
KX138A

4. Remove the V-belt cover accounting for the seal. Note the position of the glue joint (A).

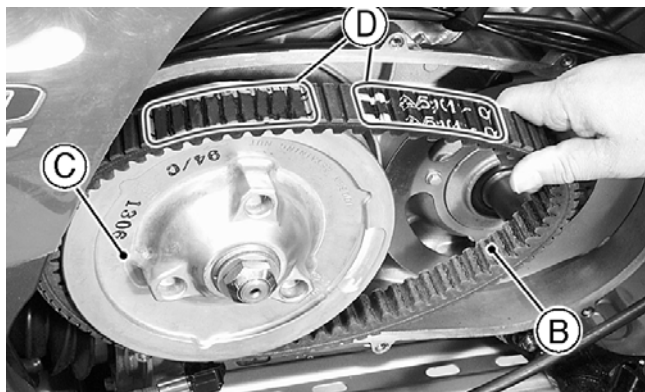


ATV2064

5. Remove the cap screw (left-hand threads) securing the clutch assembly.
6. Using an appropriate clutch puller, remove the clutch assembly (A); then lift the V-belt (B) off the driven pulley (C). Note the direction of the printed information (D) on the belt or mark the belt for correct installation. See Section 2 for procedure.



KX245



KX232A

7. Hold the driven pulley with an appropriate holder; then remove the driven pulley nut and the driven pulley.

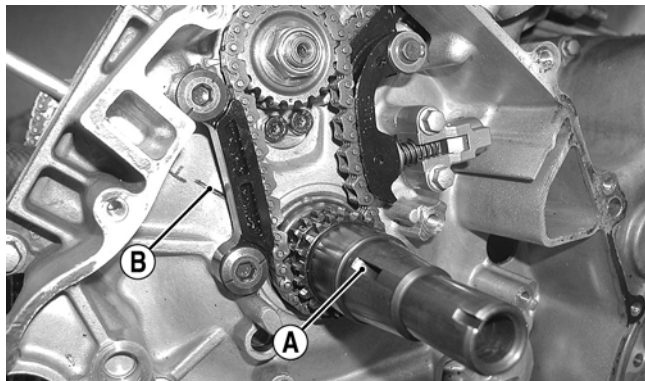


KX246A

Removing Top-Side Components

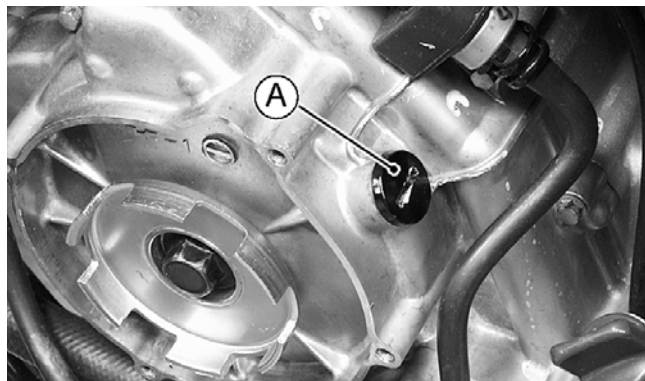
- A. Valve Covers
- B. Cylinder Heads

■ NOTE: If the left-side components have been removed, align the keyway (A) in the crankshaft with the embossed line (B) on the crankcase.



KX530A

■ NOTE: If the left-side components have not been removed, remove the spark plugs and timing inspection plug (A); then using the recoil starter, rotate the crankshaft to top-dead-center (TDC) of the compression stroke of the front cylinder. TF is top-dead-center front.



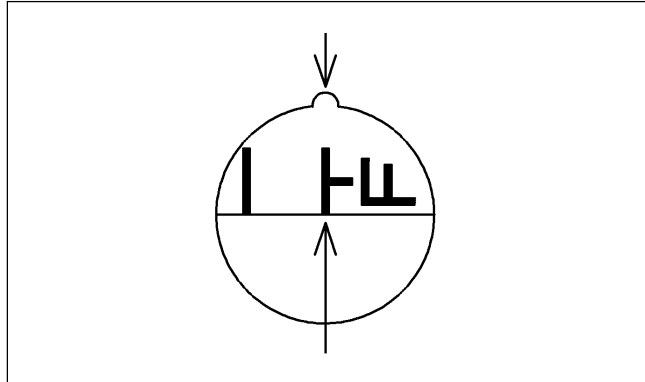
KX247

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.

<p>👉 AT THIS POINT</p>
<p>To service any one specific component, only limited disassembly of components may be necessary. Note the AT THIS POINT information in each sub-section.</p>

■ NOTE: The engine/transmission does not have to be removed from the frame for this procedure.



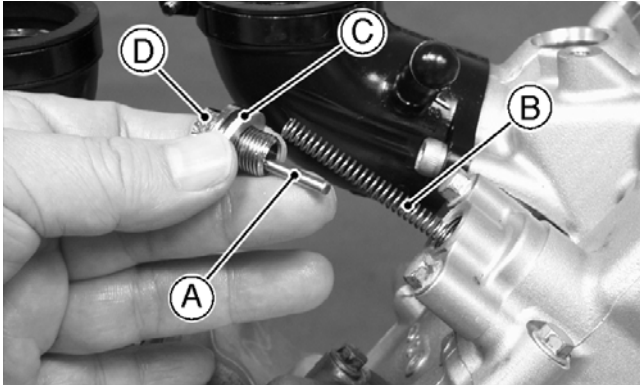
ATV2057A

1. Remove the two tappet covers. Account for two gasket rings.

CAUTION

Be sure the crankshaft is on TDC of the compression stroke of the front cylinder or valve damage could occur.

2. Remove front and rear camshaft chain tensioners by first removing the spring cap (D). Account for one washer (C), one spring (B), and one guide rod (A) for each tensioner.

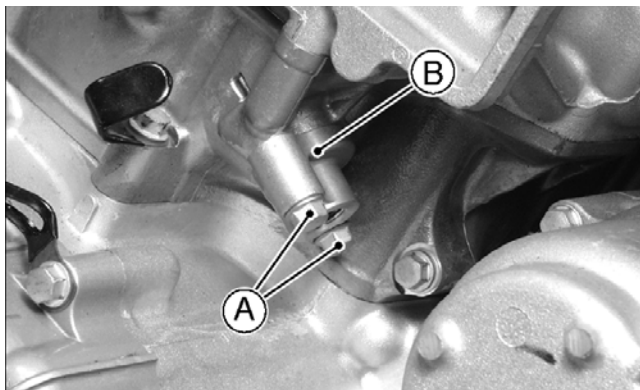


KX248

CAUTION

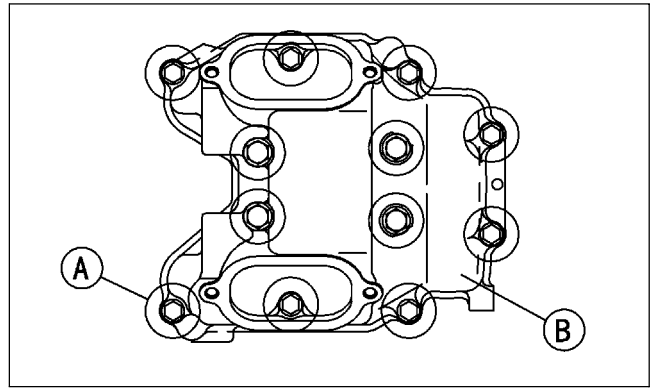
This is a ratchet-type chain tensioner and must be completely removed and reset if the mounting bolts are loosened. Retightening the mounting bolts after loosening will cause damage to the tensioner and camshaft chain.

3. Remove the cap screws (A); then remove the cam chain tensioner (B). Repeat for the second cylinder.



KX249

4. Remove the cap screws (A) securing the front rocker case to the head; then remove the front rocker case (B).

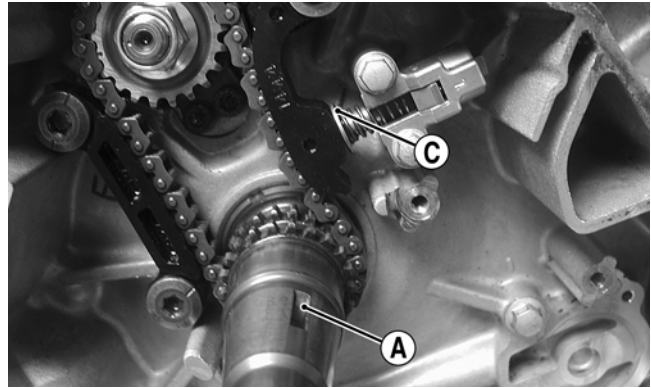


ATV2065

■ **NOTE:** Leave the camshaft and camshaft chain installed until the rear rocker case is removed or the cam chain will have to be supported while rotating the crankshaft.

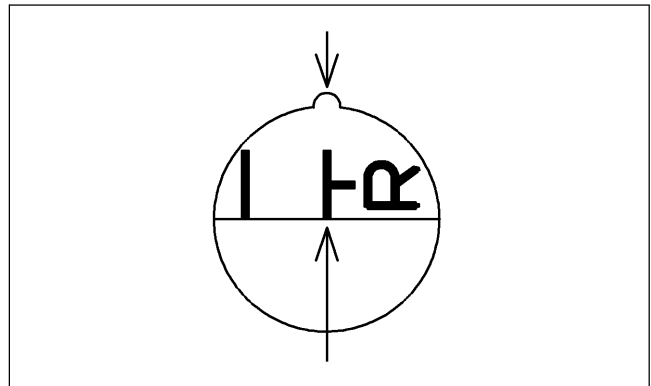
■ **NOTE:** If the left-side components have been removed, align the keyway (A) in the crankshaft with the embossed line (C) on the crankcase.

3



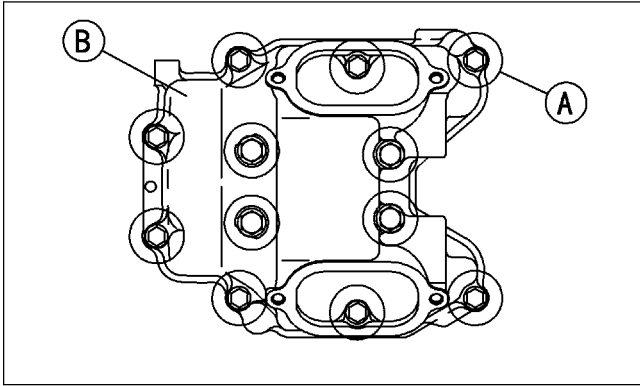
KX528A

5. If the left-side components have not been removed, rotate the crankshaft counterclockwise to position the rear cylinder at TDC on the compression stroke; then remove the two tappet covers. Account for two gasket rings. TR is top-dead-center rear.



ATV2058A

6. Remove the cap screws (A) securing the rear rocker case to the head; then remove the rear rocker case (B).



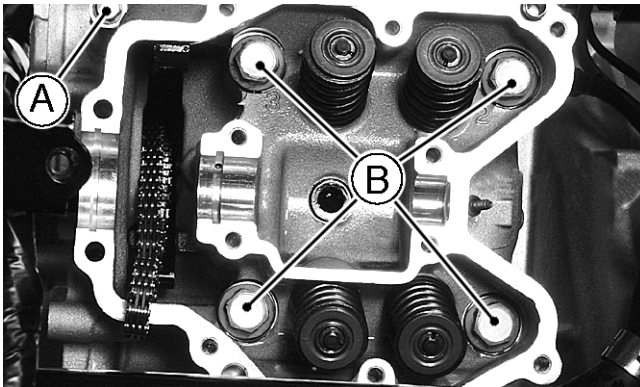
ATV2066

7. Remove the front camshaft and support the cam chain; then remove the rear camshaft and support the rear cam chain.

CAUTION

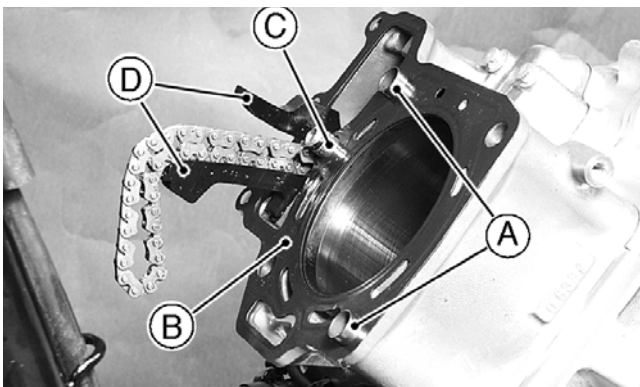
Do not rotate the crankshaft without keeping tension on the camshaft chains or engine damage could occur.

8. Remove the 6 mm cylinder head cap screw (A); then remove front 10 mm cap screws (B) and washers.



KX250A

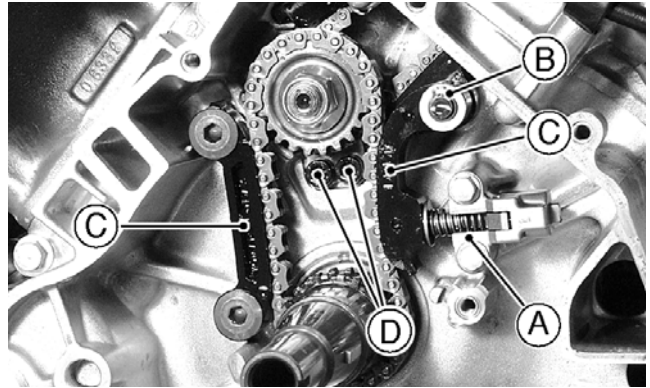
9. Remove the front cylinder head assembly and account for two alignment pins (A), cylinder head gasket (B), oil pipe (C), and camshaft chain guides (D). Repeat steps 8 and 9 for the rear cylinder head.



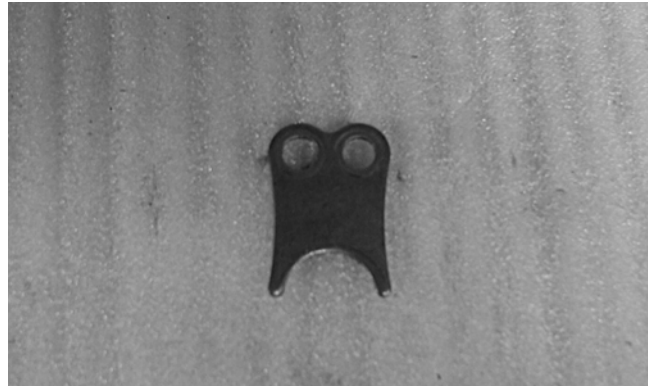
KX255

10. Remove the intermediate shaft chain tensioner (A); then remove the circlip (B) and washer.

11. Remove the intermediate shaft chain guides (C); then remove the two Allen-head cap screws (D). Account for the intermediate cam drive position plate.

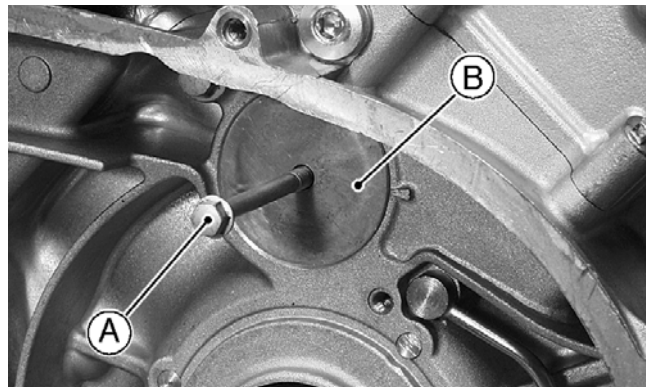


KX251



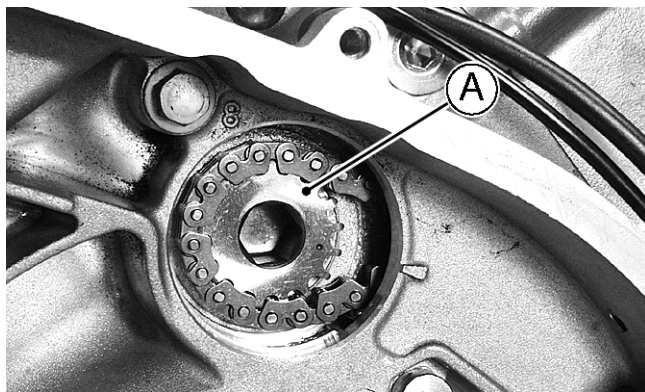
KX452

12. Install a 6 mm cap screw (A) in the tapped hole of the front camshaft drive gear cover (B) and remove the cover. Account for one O-ring.



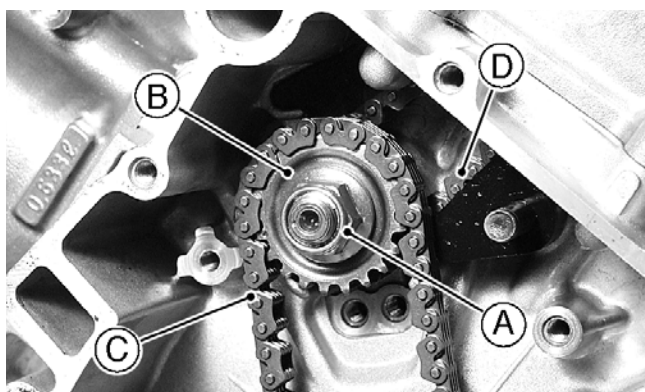
KX252

13. Hold the intermediate shaft (A) with an Allen wrench.



KX253

14. Remove the intermediate shaft sprocket nut (A); then remove the sprocket (B), drive chain (C), and the rear camshaft drive chain (D).

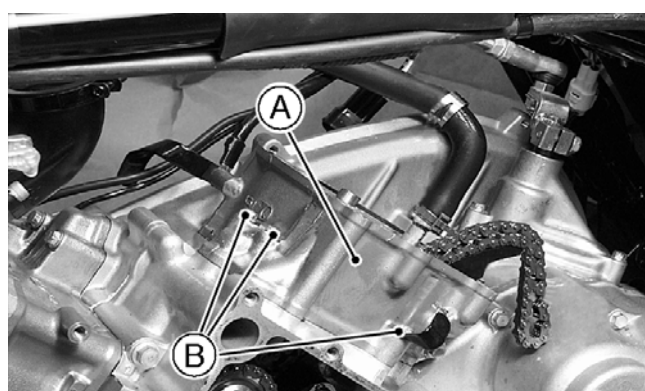


KX254

15. Remove the front camshaft drive chain from the intermediate sprocket (A) on the right side; then remove the shaft from the engine.



KX253

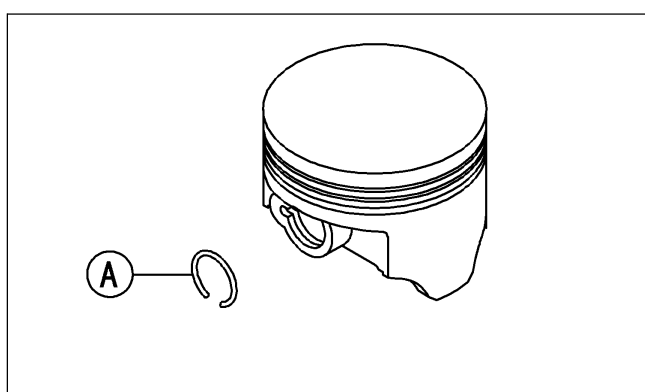


KX256A



KX257A

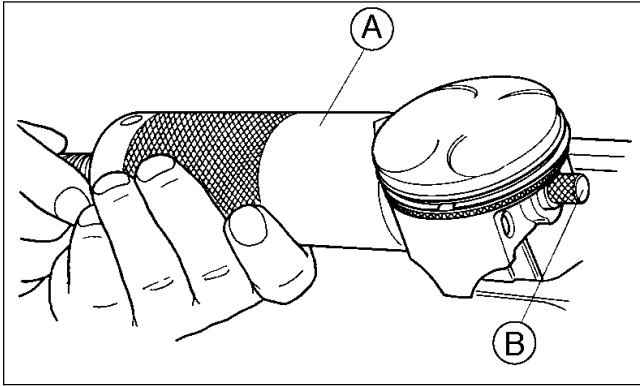
17. Place a clean, lint-free cloth under the piston; then remove the piston pin retainer rings (A).



ATV2067

18. Using a piston pin puller (A), remove the piston pins (B); then remove the pistons from the connecting rods.

3



ATV2068

CAUTION
 The connecting rods must be wrapped or suspended to avoid metal-to-metal contact with the crankcase. If the rods or crankcase are nicked or chipped, severe engine damage will occur.



KX456

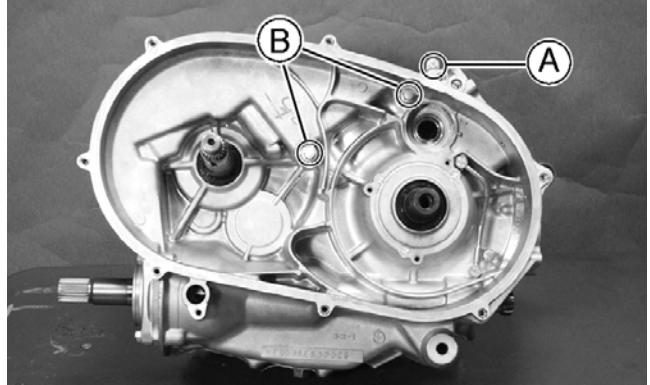
Center Crankcase Components

■ **NOTE:** This procedure cannot be done with the engine/transmission in the frame. Complete Removing procedures for Left-Side, Right-Side, and Top-Side must precede this procedure.

■ **NOTE:** For efficiency, it is preferable to remove and disassemble only those components which need to be addressed and to service only those components. The technician should use discretion and sound judgment.

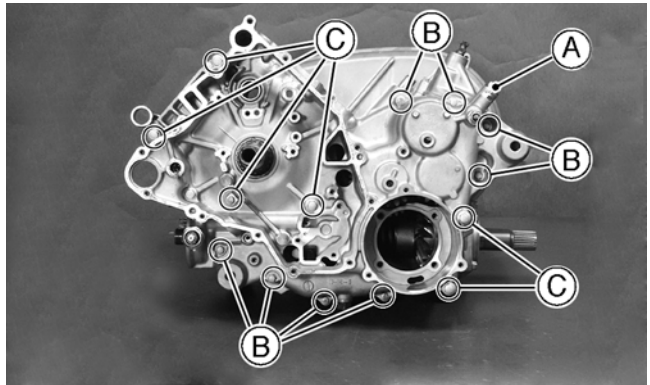
Separating Crankcase Halves

1. Remove the right crankcase bolts (A = 6 mm) (B = 8 mm).



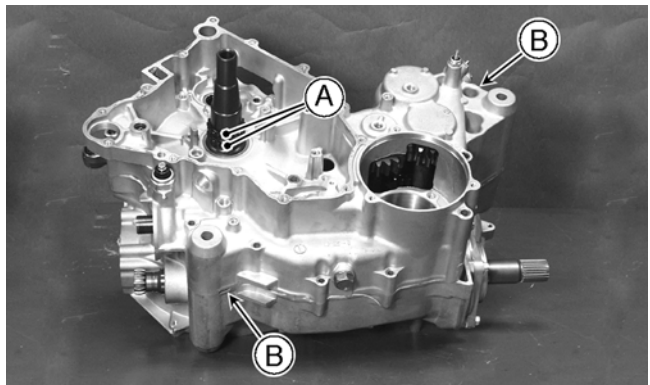
KX258

2. Remove the shift shaft positioning bolt (A) accounting for a washer, spring, and ball; then remove the left crankcase bolts (B = 6 mm) (C = 8 mm).



KX259

3. Wrap tape on the sprockets (A) to protect the crankshaft bushing in the case; then using pry points (B), separate the crankcase and lift off the left side.



KX260

■ **NOTE:** The right and left crankcase halves are machined as an assembled set; therefore, they must be replaced as a set.

■ **NOTE:** Connecting rod cap should be immediately installed on its connecting rod to prevent a mismatch.

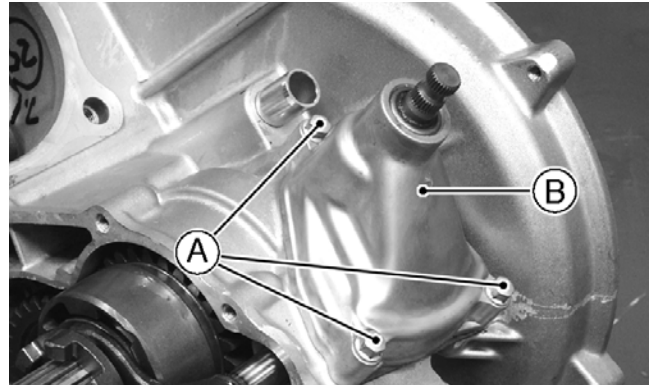
Disassembling Crankcase Half

- Using a press, remove the crankshaft from the right case; then mark matching marks on the connecting rods and end caps.

AT THIS POINT

Connecting rod side clearance (A) should be measured with a feeler gauge (B) before disassembling as connecting rods have to be installed for this measurement. Maximum serviceable side clearance is 0.7 mm (0.028 in.). Connecting rods or crankshaft will have to be replaced if measurement exceeds specification.

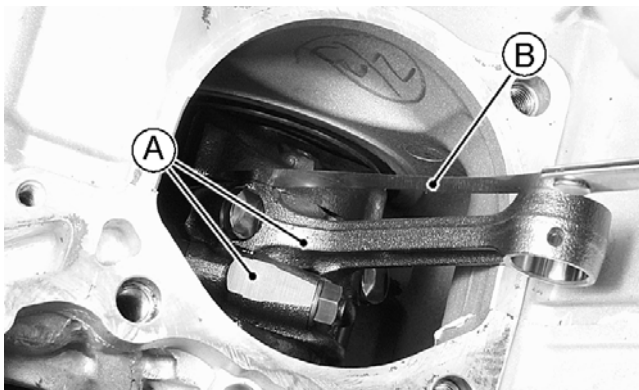
- Remove the three cap screws (A); then remove the shift shaft cover (B).



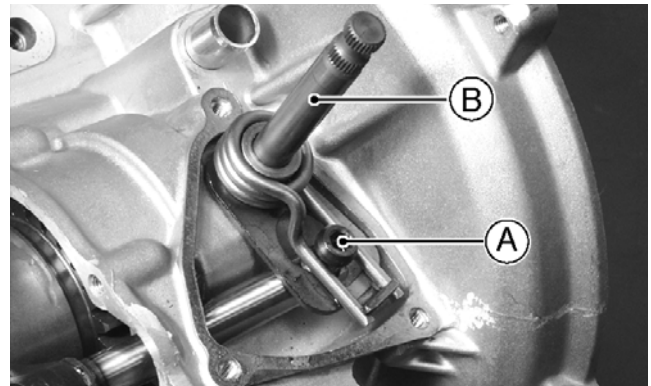
KX263

- Remove the shift shaft spring anchor (A); then remove the shift shaft (B).

3



KX261



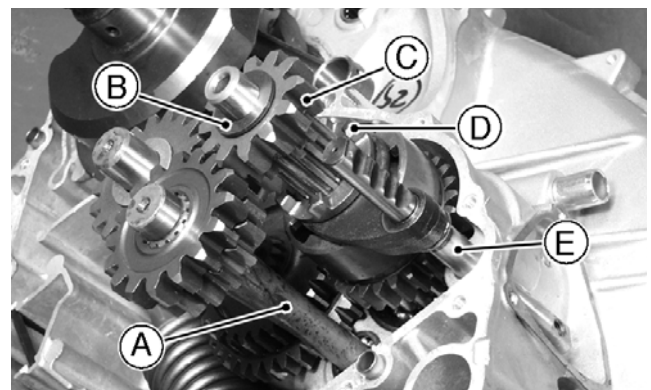
KX264

CAUTION

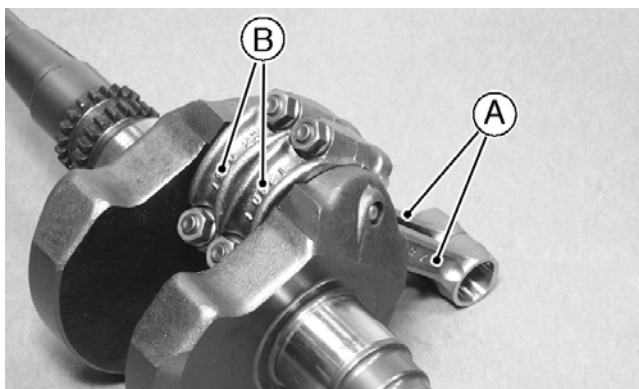
Connecting rods are machined with the big end caps installed. Severe engine damage will result if the caps are not installed on their respective rods.

- Remove the spacer (B) and reverse drive gear (C) accounting for a needle bearing and spacer; then remove the reverse idler shaft (A), shifter (D), and shift rod (E).

- Remove the connecting rod nuts; then remove the connecting rods (A) and caps (B).

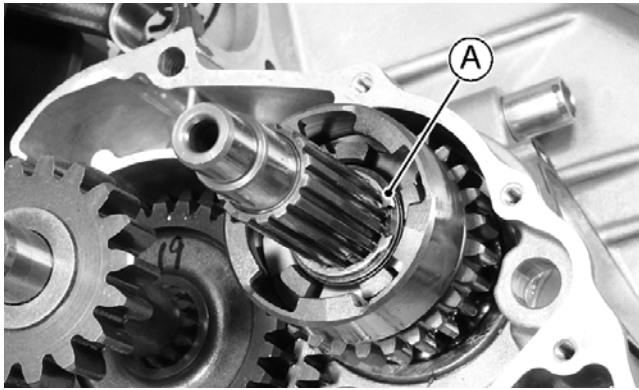


KX265



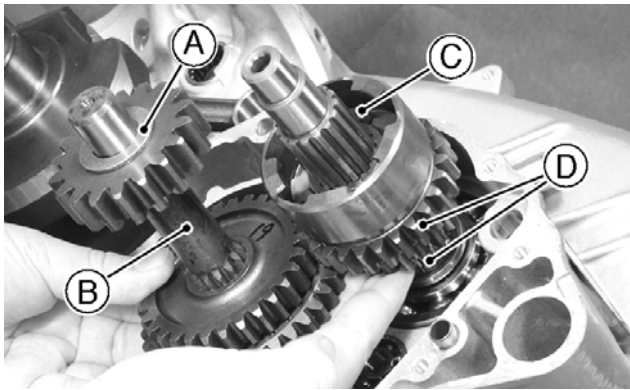
KX262

- Remove the circlip (A).



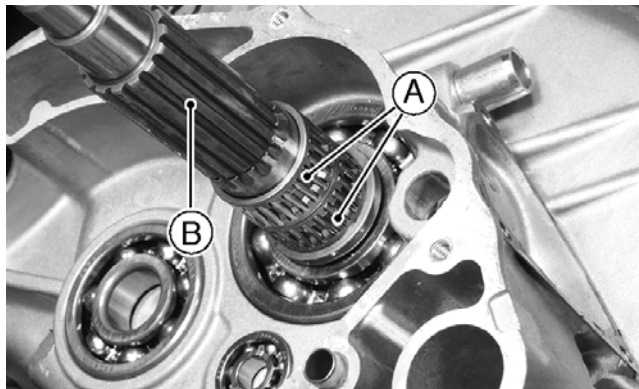
KX266

7. Remove the spacer (A), idler gear assembly (B), and washers and spacer (C); then remove low and high range gears (D).



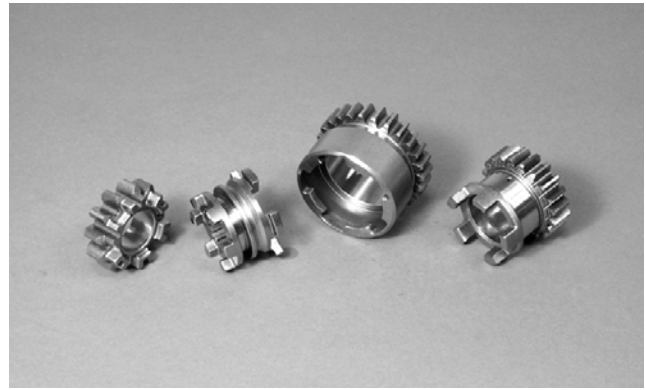
KX267

8. Remove the two needle bearings (A); then using a press, remove the driven shaft (B).



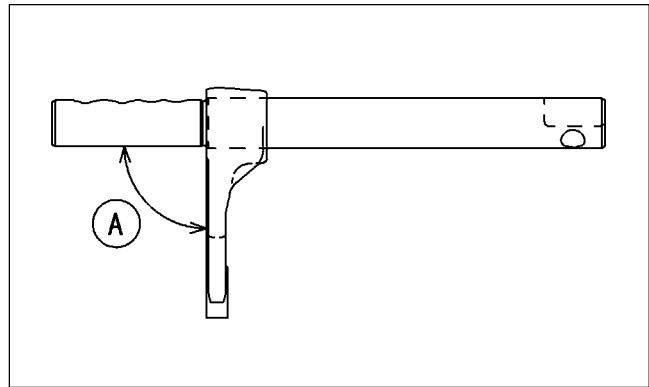
KX268

■ **NOTE:** Check all parts including gears, shifter, gear dogs, and splines. Replace chipped, damaged, or worn parts.



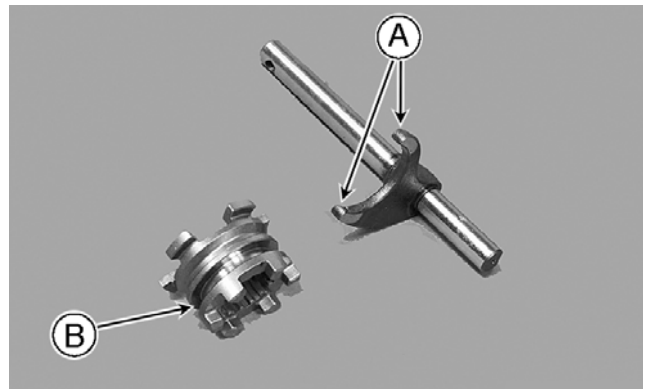
KX269

9. Check angle (A) for shift fork bending. It must be 90° .



ATV2069

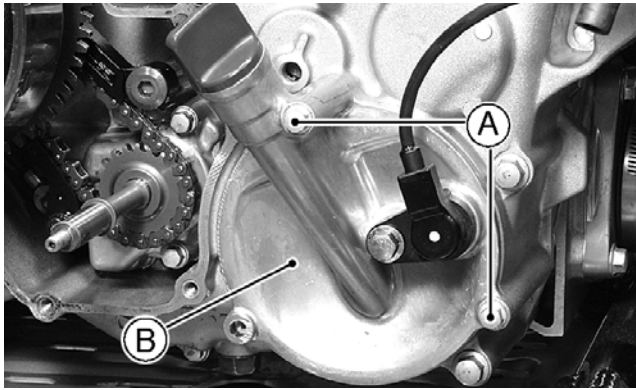
10. Measure the thickness of the shift fork at (A); then measure the shifter groove width (B). If they are out of specification, they must be replaced.



KX270

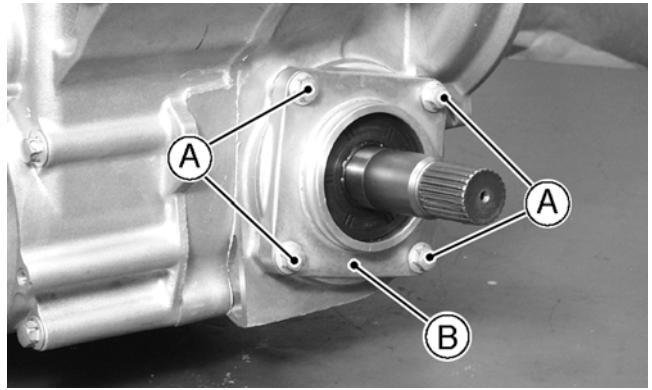
REMOVING OUTPUT DRIVE/DRIVEN BEVEL GEAR ASSEMBLY

1. Remove the oil pipe, cap screws (A), and the output drive bevel gear cover (B).

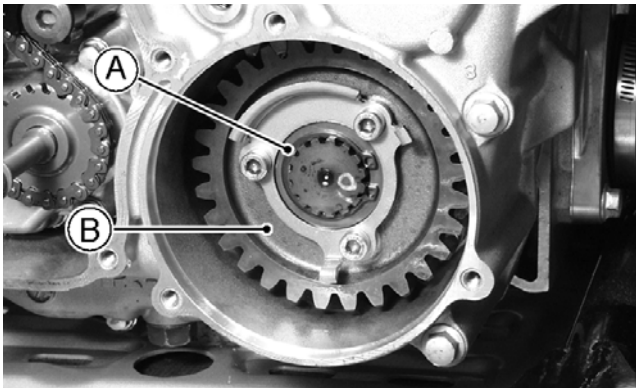


KX271

2. Remove circlip (A); then remove the output drive idler gear (B).

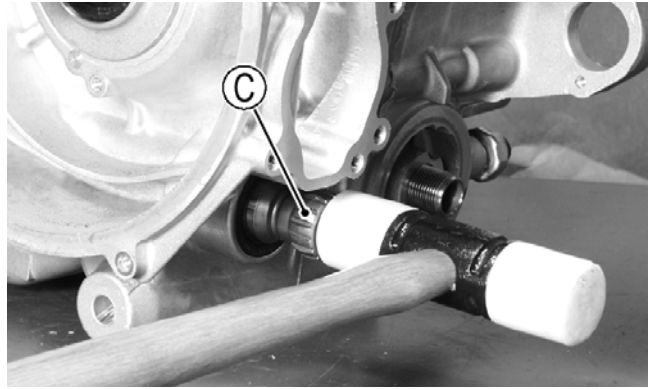


KX274



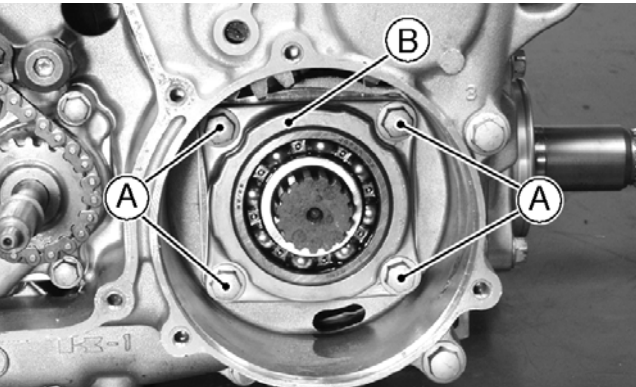
KX272

3. Remove the cap screws (A) securing the output drive bevel gear housing; then remove the housing (B).



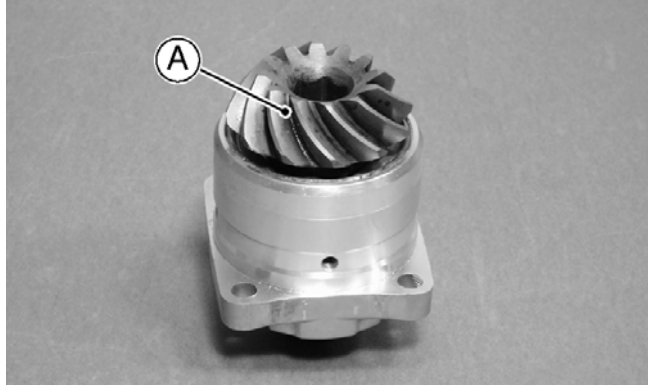
KX275A

■ **NOTE:** Check the bevel gears (A) for scoring, chipping, or abnormal gear patterns; then check the bearings by rotating the drive and driven gears. If no abnormalities are detected, set the assemblies aside for installation. Do not remove from housings.



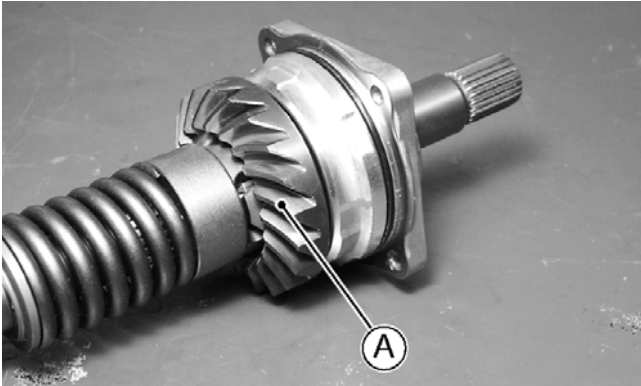
KX273

4. Remove four cap screws (A) securing the output driven bevel gear housing (B); then tap lightly on the front of the output driven bevel gear shaft (C) using a plastic mallet. The output driven bevel gear and housing come off with the shaft assembly.



KX276

3



KX277

■ **NOTE:** For disassembling and servicing, refer to Servicing Center Crankcase Components, this section.

■ **NOTE:** Whenever a valve is out of tolerance, it must be replaced.

Cleaning/Inspecting Rocker Case

■ **NOTE:** If the rocker case cannot be trued, the cylinder head assembly must be replaced.

1. Wash the rocker case in parts-cleaning solvent.
2. Place the rocker case on the Surface Plate (p/n 0644-016) covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the rocker case 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 rocker case in a figure eight motion until a uniform bright metallic finish is attained.

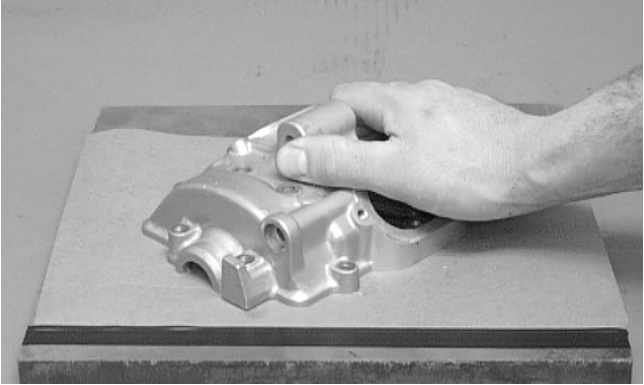
**Table of Contents
(Servicing Components)**

■ **NOTE:** Critical engine/transmission specifications are located at the beginning of this section.

- Servicing Top-Side Components 3-354
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 - Cylinder/Cylinder Head Assembly 3-360
- Servicing Left-Side Components 3-363
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 - Driven Pulley Assembly 3-363
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 - Crankshaft Assembly 3-368
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 - Disassembling Output Driven Bevel Gear Assembly 3-371

⚠ 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 rocker case.



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.

Servicing Top-Side Components

■ **NOTE:** Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

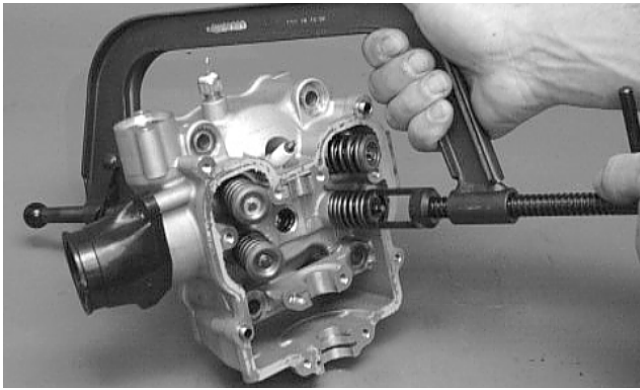
VALVE ASSEMBLY

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.

Removing Valves

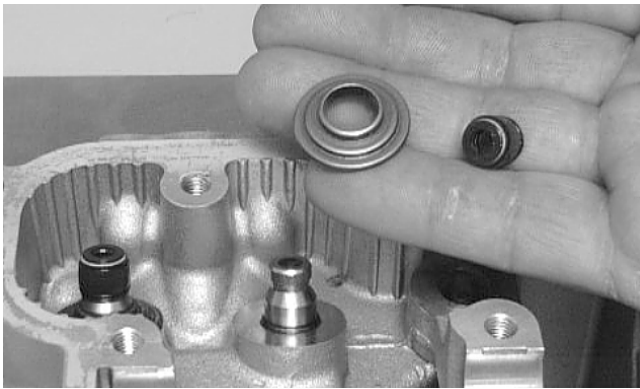
■ **NOTE:** Keep all valves and valve components as a set. Note the original location of each valve set for use during installation. Return each valve set to its original location during installation.

1. Using a valve spring compressor, compress the valve springs and remove the valve cotters. Account for an upper spring retainer.



CC132D

2. Remove the valve seal and the lower remaining spring seat. Discard the valve seal.



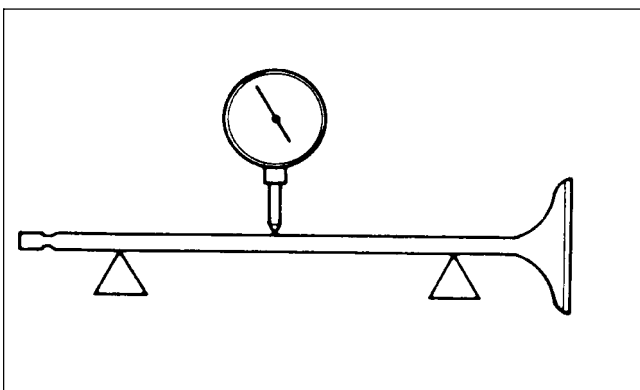
CC136D

■ **NOTE:** The valve seals must be replaced.

3. Remove the valve springs; then invert the cylinder head and remove the valves.

Measuring Valve Stem Runout

1. Support each valve stem end with the V Blocks (p/n 0644-022); then check the valve stem runout using a dial indicator.



ATV-1082

2. Maximum runout must not exceed specifications.

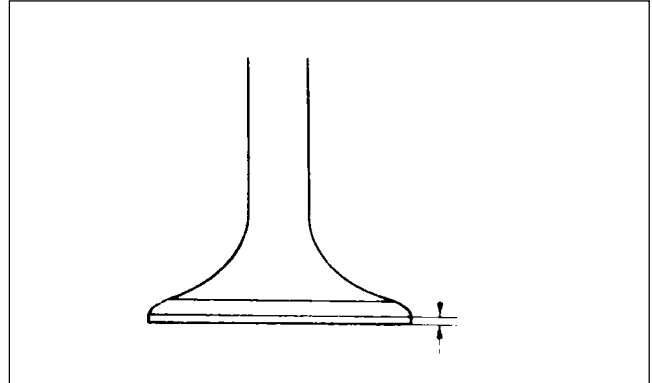
Measuring Valve Stem Outside Diameter

1. Using a micrometer, measure the valve stem outside diameter.

2. Acceptable diameter range (intake valve) must be within specifications.
3. Acceptable diameter range (exhaust valve) must be within specifications.

Measuring Valve Face/Seat Width

1. Using a micrometer, measure the width of the valve face.

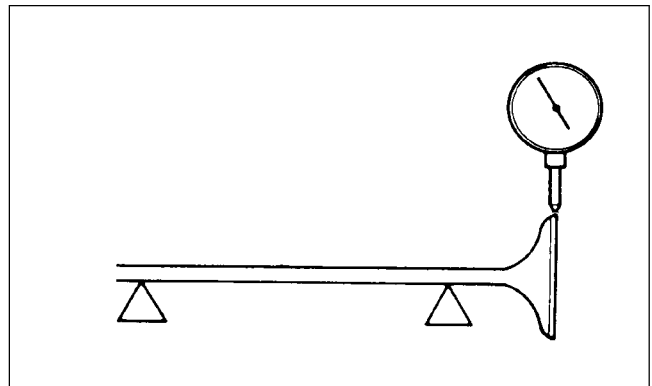


ATV-1004

2. Acceptable width range must be within specifications.

Measuring Valve Face Radial Runout

1. Mount a dial indicator on the surface plate; then place the valve stem on a set of V blocks.
2. Position the dial indicator contact point on the outside edge of the valve face; then zero the indicator.

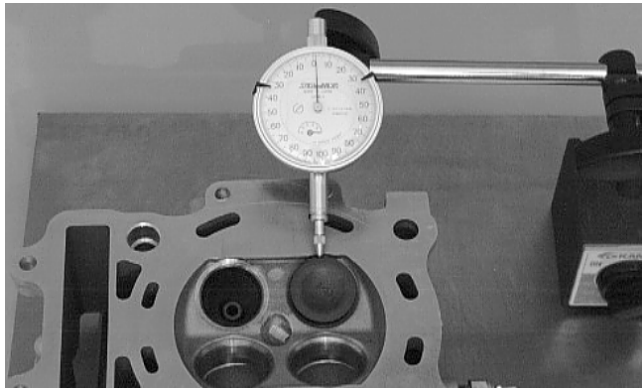


ATV1082A

3. Rotate the valve in the V blocks.
4. Maximum runout must not exceed specifications.

Measuring Valve Guide/Valve Stem Deflection (Wobble Method)

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.

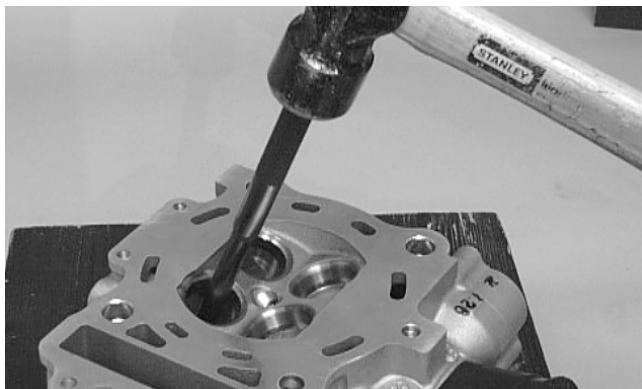
Measuring Valve Guide (Inside Diameter)

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.

Replacing Valve Guide

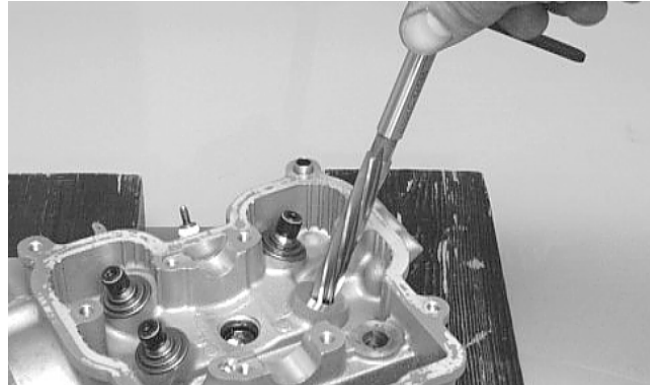
■ **NOTE:** If a valve guide is worn or damaged, it must be replaced.

1. If a valve guide needs replacing, insert a valve guide remover into the valve seat side of the valve guide. Using a hammer, gently drive the valve guide out of the cylinder head.



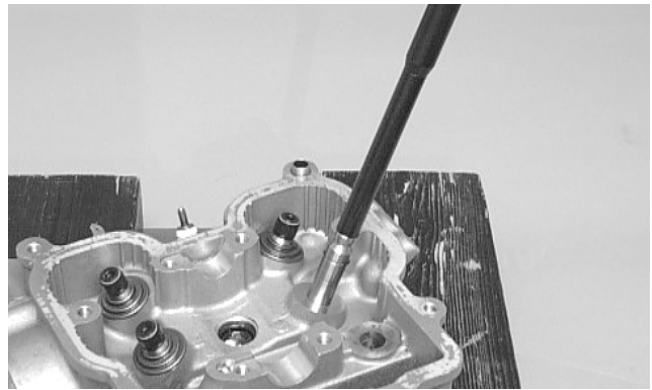
CC137D

2. Using the Standard Valve Guide Reamer (p/n 0444-017), remove any burrs or tight areas from the valve guide journals.



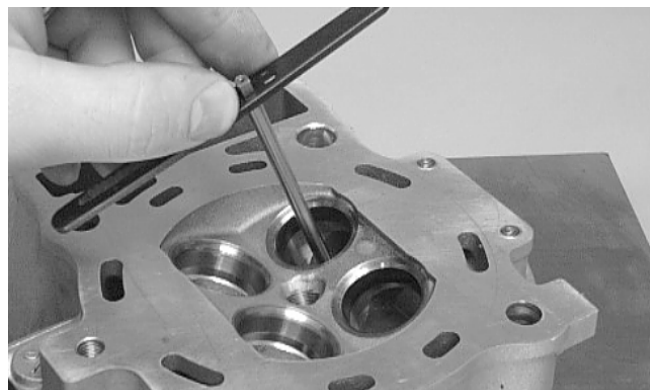
CC142D

3. To install a valve guide, use a valve guide installer and gently drive a valve guide with a retaining clip into the bore from the valve spring side until the retaining clip just contacts the cylinder head.



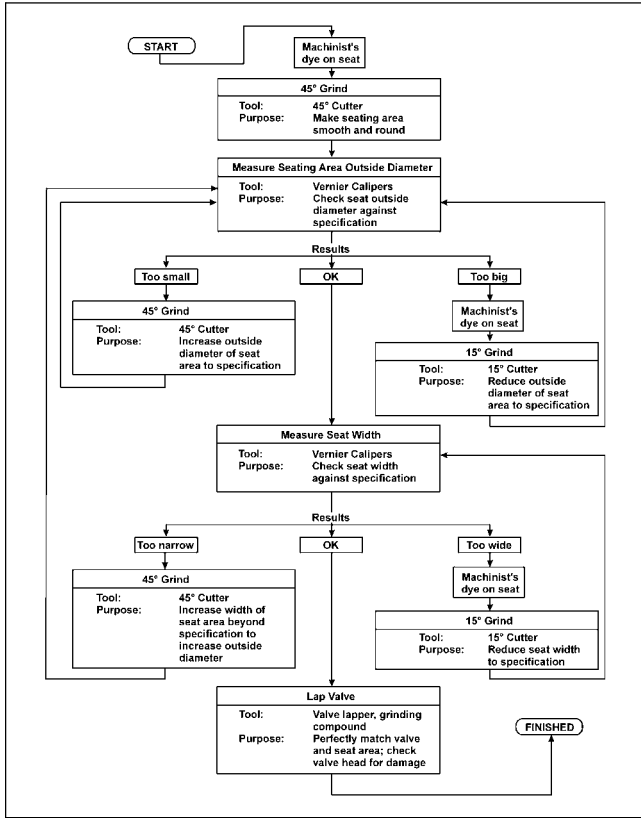
CC143D

4. After installing the guide, use the standard valve guide reamer to remove all burrs and tight areas that may remain in each valve guide.



CC138D

Valve Seat/Guide Servicing Flow Chart



ATV-0107

Grinding Valve Seats

■ **NOTE:** If the valve seat is beyond servicing, the cylinder head must be replaced.

1. Insert an exhaust valve seat pilot shaft into an exhaust valve guide. Slide an exhaust valve seat grinding tool onto the pilot shaft; then using light pressure on a driver handle and a deep socket, grind the exhaust valve seat until within specifications.

■ **NOTE:** Repeat procedure on the remaining exhaust valve.



CC139D

2. Insert an intake valve seat pilot shaft into one of the intake valve guides. Slide the intake valve seat grinding tool onto the pilot shaft; then using light pressure on a driver handle and a deep socket, grind the intake valve seat until within specifications.

■ **NOTE:** Repeat procedure on the remaining intake valve.



CC140D

3

Lapping Valves

■ **NOTE:** Do not grind the valves. If a valve is damaged, it must be replaced.

1. Remove all carbon from the valves.
2. Lubricate each valve stem with light oil; then apply a small amount of valve lapping compound to the entire seating face of each valve.
3. Attach the suction cup of a valve lapping tool to the head of the valve.
4. Rotate the valve until the valve and seat are evenly polished.
5. Clean all compound residue from the valve and seat.

Measuring Rocker Arm (Inside Diameter)

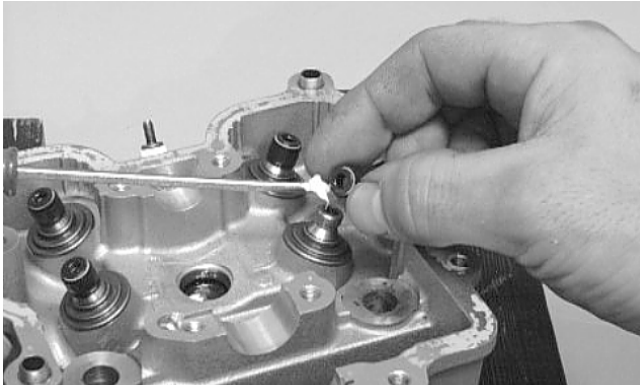
1. Using a dial calipers, measure the inside diameter of the rocker arm.
2. Acceptable inside diameter range must be within specifications.

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.

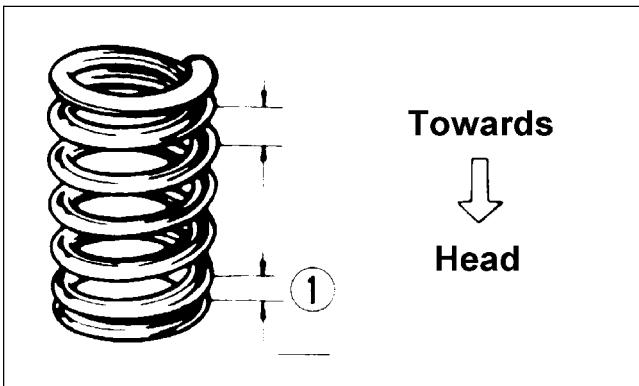
Installing Valves

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.



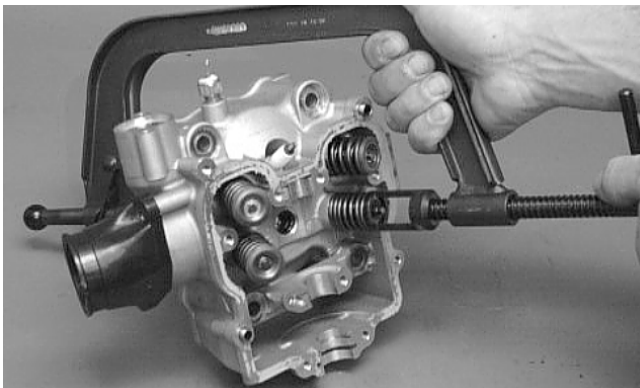
CC144D

2. Insert each valve into its original valve location.
3. Install the valve spring with closest coils (1) toward the head.



ATV-1011A

4. Place a spring retainer over the valve springs; then using the valve spring compressor, compress the valve springs and install the valve cotters.



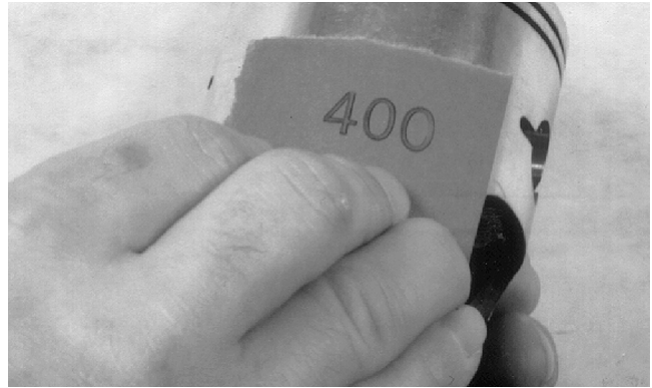
CC132D

PISTON ASSEMBLY

■ **NOTE:** Whenever a piston, rings, or pin is out of tolerance, it 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.



AN135

■ **NOTE:** If scuffing or seizure marks are too deep to correct with the sandpaper, replace the piston.

4. Inspect the perimeter of each piston for signs of excessive “blowby.” Excessive “blowby” indicates worn piston rings or an out-of-round cylinder.

Removing Piston Rings

1. Starting with the top ring, slide one end of the ring out of the ring-groove.



CC400D

2. Remove each ring by working it toward the dome of the piston while rotating it out of the groove.

■ **NOTE:** If the existing rings will not be replaced with new ones, note the location of each ring for proper installation. When installing new rings, install as a complete set only.

Cleaning/Inspecting Piston Rings

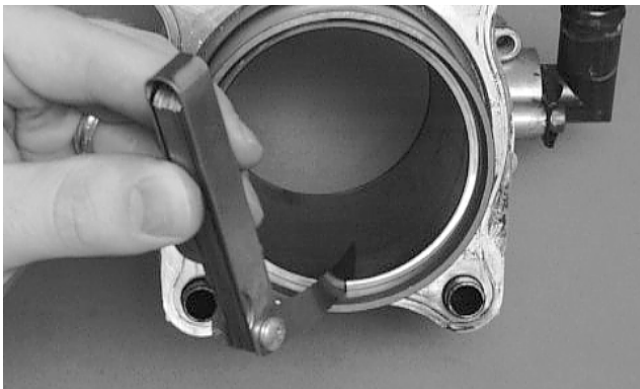
1. Take an old piston ring and snap it into two pieces; then grind the end of the old ring to a 45° angle and to a sharp edge.
2. Using the sharpened ring as a tool, clean carbon from the ring-grooves. Be sure to position the ring with its tapered side up.

CAUTION

Improper cleaning of the ring-grooves by the use of the wrong type of ring-groove cleaner will result in severe damage to the piston.

Measuring Piston-Ring End Gap (Installed)

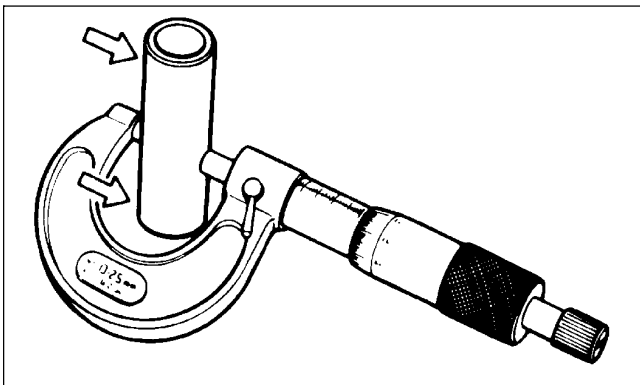
1. Place each piston ring in the wear portion of the cylinder. Use the piston to position each ring squarely in the cylinder.
2. Using a feeler gauge, measure each piston-ring end gap. Acceptable ring end gap must be within specifications.



CC280D

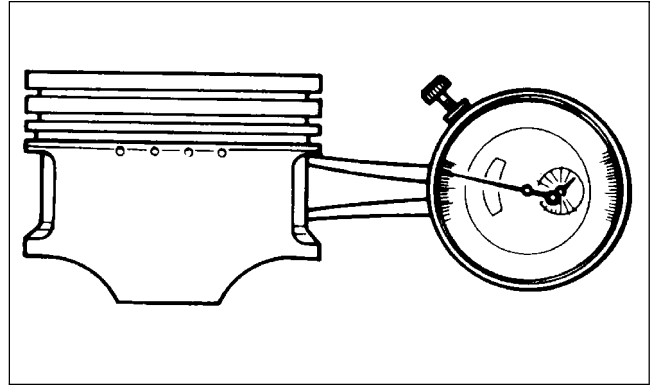
Measuring Piston Pin (Outside Diameter) and Piston-Pin Bore

1. Measure the piston pin outside diameter at each end and in the center. If measurement is not within specifications, the piston pin must be replaced.



ATV-1070

2. Insert an inside dial indicator into the piston-pin bore. The diameter must not exceed specifications. Take two measurements to ensure accuracy.

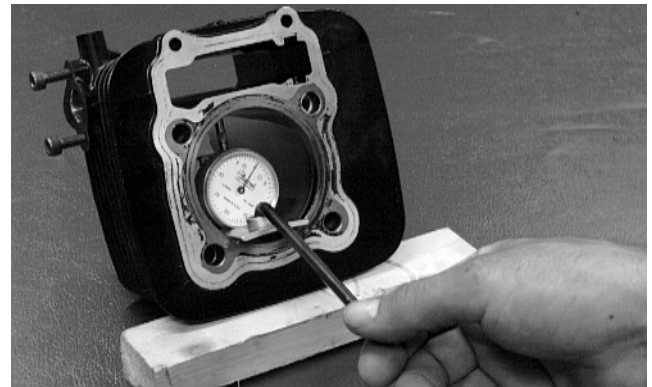


ATV-1069

Measuring Piston Skirt/ Cylinder Clearance

1. Measure the cylinder front to back in six places.

3

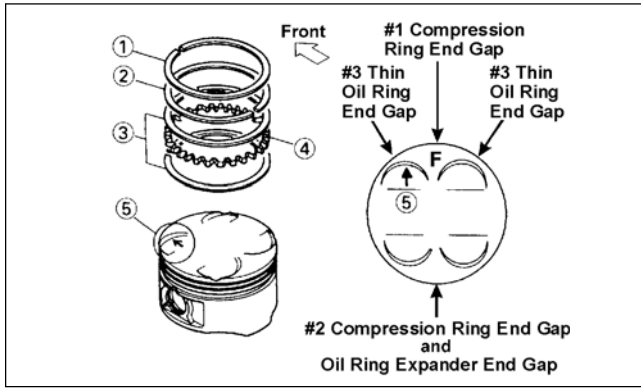


CC397D

2. Measure the corresponding piston diameter at a point 15 mm (0.6 in.) above the piston skirt at a right angle to the piston-pin bore. Subtract this measurement from the measurement in step 1. The difference (clearance) must be within specifications.

Installing Piston Rings

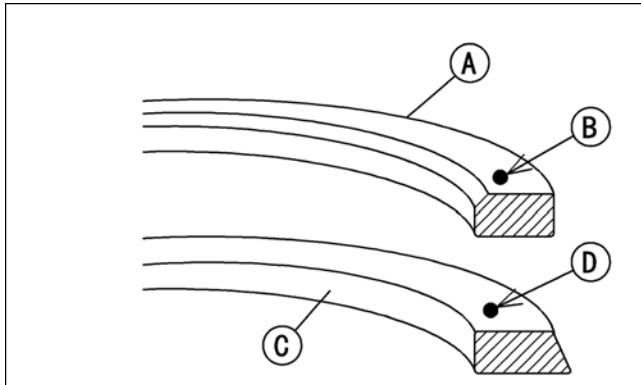
1. Install ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap. Stagger the end gaps of the upper and lower thin oil rings according to the illustration. An F is stamped on the piston to indicate front.



ATV-1085C

■ **NOTE:** Note the direction of the front (F) of the piston (5) for correct ring end gap orientation.

2. Install compression ring #2 (C) so the “RN” mark (D) is up; then install the top compression ring #1 (A) so the “R” mark (B) is up (see illustration).



ATV2098

CAUTION

Incorrect installation of the piston rings will result in engine damage.

CYLINDER/CYLINDER HEAD ASSEMBLY

■ **NOTE:** If the cylinder/cylinder head assembly cannot be trued, they must be replaced.

Cleaning/Inspecting Cylinder Head

CAUTION

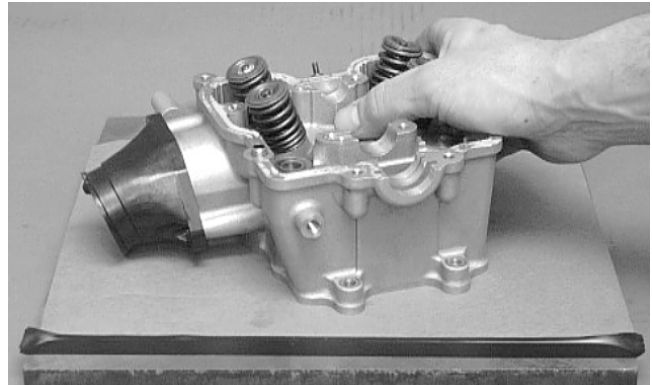
The cylinder head studs must be removed for this procedure.

1. Using a non-metallic carbon removal tool, remove any carbon buildup from the combustion chamber being careful not to nick, scrape, or damage the combustion chamber or the sealing surface.
2. Inspect the spark plug hole for any damaged threads. Repair damaged threads using a “heli-coil” insert.

3. Place the cylinder head on the surface plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the cylinder head in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the cylinder head in a figure eight motion until a uniform bright metallic finish is attained.

CAUTION

Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.



CC128D

Measuring Cylinder Head Distortion

1. Remove any carbon buildup in the combustion chamber.
2. Lay a straightedge across the cylinder head; then using a feeler gauge, check the distortion factor between the head and the straightedge.
3. Maximum distortion must not exceed specifications.



CC141D

Cleaning/Inspecting Cylinder

1. Wash the cylinder in parts-cleaning solvent.
2. Inspect the cylinder for pitting, scoring, scuffing, warpage, and corrosion. If marks are found, repair the surface using a cylinder hone (see Honing Cylinder in this sub-section).

- Place the cylinder on the surface plate covered with #400 grit wet-or-dry sandpaper. Using light pressure, move the cylinder in a figure eight motion. Inspect the sealing surface for any indication of high spots. A high spot can be noted by a bright metallic finish. Correct any high spots before assembly by continuing to move the cylinder in a figure eight motion until a uniform bright metallic finish is attained.

CAUTION

Water or parts-cleaning solvent must be used in conjunction with the wet-or-dry sandpaper or damage to the sealing surface may result.



CC129D

Inspecting Cam Chain Guide

- Inspect cam chain guide for cuts, tears, breaks, or chips.
- If the chain guide is damaged, it must be replaced.

Honing Cylinder

- Using a slide gauge and a dial indicator or a snap gauge, measure the cylinder bore diameter in three locations from top to bottom and again from top to bottom at 90° from the first measurements for a total of six measurements. The trueness (out-of-roundness) is the difference between the highest and lowest reading. Maximum trueness (out-of-roundness) must not exceed specifications.



CC127D

- Wash the cylinder in parts-cleaning solvent.
- Inspect the cylinder for pitting, scoring, scuffing, and corrosion. If marks are found, repair the surface using a ball hone.

■ **NOTE:** To produce the proper 60° cross-hatch pattern, use a low RPM drill (600 RPM) at the rate of 30 strokes per minute. If honing oil is not available, use a lightweight petroleum-based oil. Thoroughly clean cylinder after honing using soap and hot water. Dry with compressed air; then immediately apply oil to the cylinder bore. If the bore is severely damaged or gouged, replace the cylinder.



CC390D

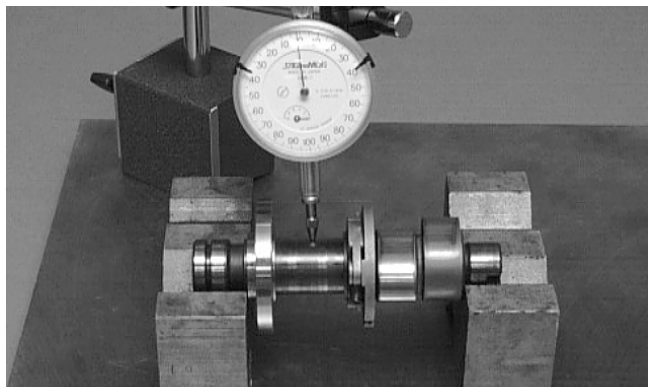
3

- If any measurement exceeds the limit, replace the cylinder.

Measuring Camshaft Runout

■ **NOTE:** If the camshaft is out of tolerance, it must be replaced.

- Place the camshaft on a set of V blocks; then position the dial indicator contact point against the shaft and zero the indicator.

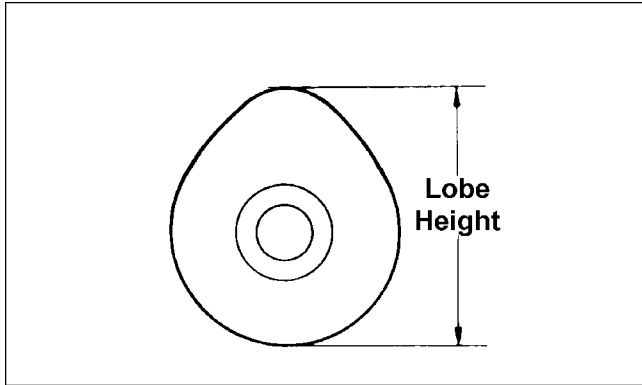


CC283D

- Rotate the camshaft and note runout; maximum tolerance must not exceed specifications.

Measuring Camshaft Lobe Height

- Using a calipers, measure each cam lobe height.



ATV1013A

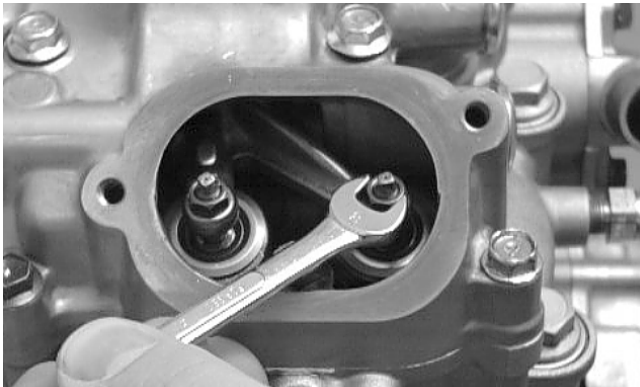
- The lobe heights must not exceed minimum specifications.

Inspecting Camshaft Bearing Journal

- Inspect the bearing journal for scoring, seizure marks, or pitting.
- If excessive scoring, seizure marks, or pitting is found, the cylinder head assembly must be replaced.

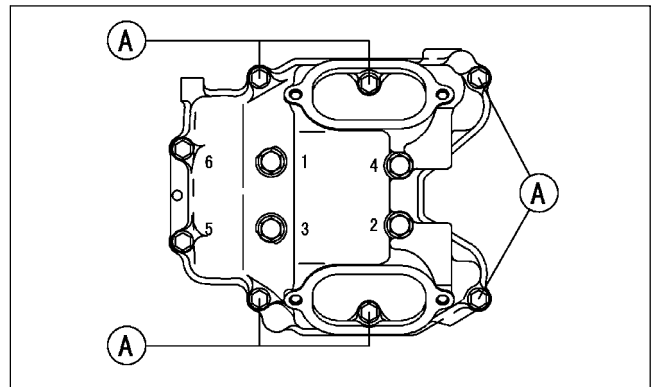
Measuring Camshaft to Cylinder Head Clearance

- Remove the adjuster screws and jam nuts.



CC005D

- Place a strip of plastigauge in each of the camshaft lands in the cylinder head.
- Place the rocker case on the cylinder head and secure with the rocker case cap screws. Tighten in correct sequence to specifications.

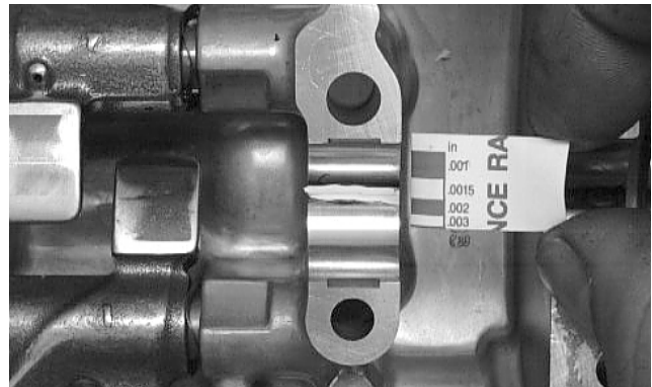


ATV2070

■ **NOTE:** Tighten cap screws 1-4 with washers to 0.9 kg-m (6.5 ft-lb), cap screws 5-6 to 1.0 kg-m (7 ft-lb), and cap screws (A) to 1.0 kg-m (7 ft-lb).

■ **NOTE:** Do not rotate the camshaft when measuring clearance.

- Remove the cap screws securing the rocker case to the cylinder; then remove the rocker case and camshaft.
- Match the width of the plastigauge with the chart found on the plastigauge packaging to determine camshaft to cylinder head and rocker case clearance.



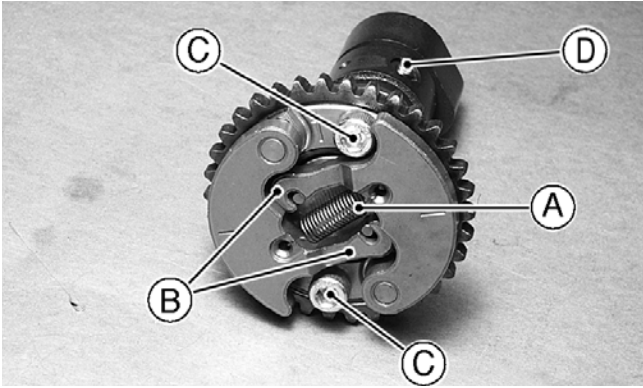
CC145D

- If clearance is excessive, measure the journals of the camshaft.

■ **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 Automatic Compression Release

- Check that the weights (B) are in the retracted position. If the weights are extended, check the spring (A) for distortion or breakage or pivot pins (C) for binding.



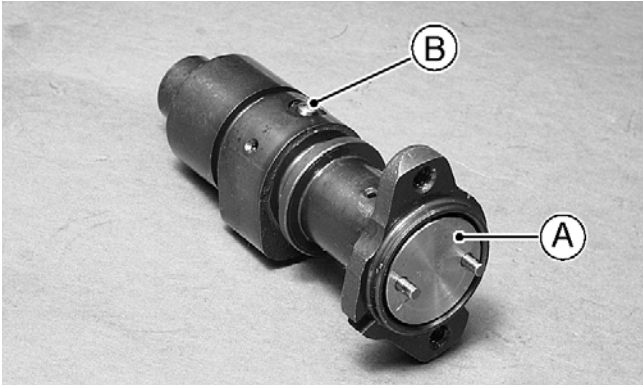
KX278A

2. Manually extend the weights. The pin (D) should retract and the weights should move without binding and return when released. Pin (D) should extend when the weights are released.

■ **NOTE:** If any binding or resistance other than the spring tension is felt, the automatic compression release must be replaced.

3. Check that the shaft (A) rotates and the pin (B) is not broken, chipped, or worn flat.

■ **NOTE:** Do not remove shaft (A) or pin (B) as they are not serviceable and cannot be reassembled. The camshaft assembly must be replaced if any defects are found.



KX279

Servicing Left-Side Components

RECOIL STARTER

■ **NOTE:** The recoil starter is a non-serviceable component. If it is damaged or if it does not function properly, it must be replaced as a complete unit.

Servicing Right-Side Components

■ **NOTE:** Whenever a part is worn excessively, cracked, damaged in any way, or out of tolerance, replacement is necessary.

DRIVEN PULLEY ASSEMBLY

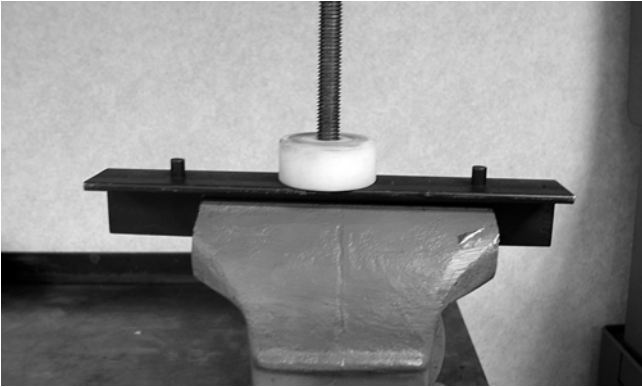
Disassembling

⚠ WARNING

This procedure involves relaxing a compressed spring assembly. DO NOT attempt disassembling without the proper tools.

1. Secure Driven Pulley Compressor (p/n 0444-121) in a suitable holding fixture such as a bench vise.

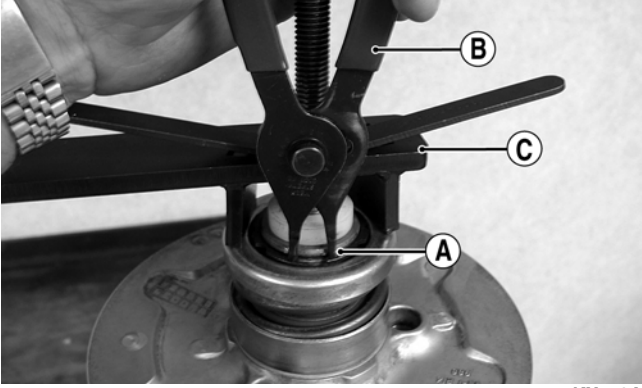
3



KX571

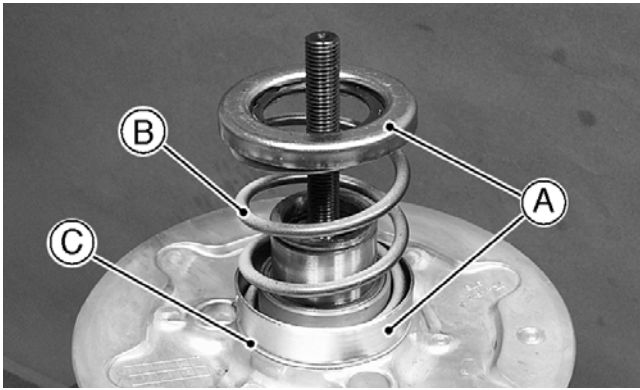
2. Place the driven pulley assembly onto the compressor tool base.

3. Tighten the nut against Spring Holder (p/n 0444-162) (C) to compress the springs; then using a circlip pliers (B), remove the circlip (A).



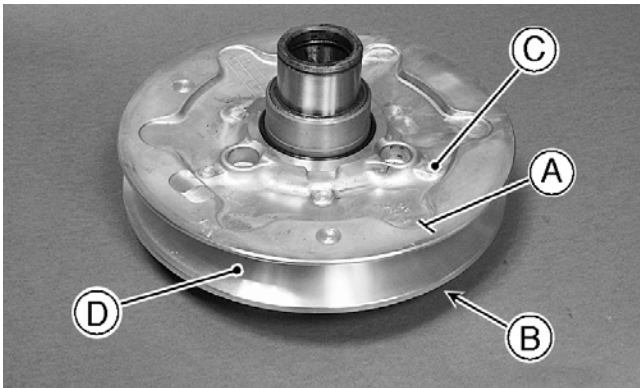
KX573A

4. Relax the spring by removing the nut and spring holder; then remove the spring seats (A), spring (B), and thrust plate (C).



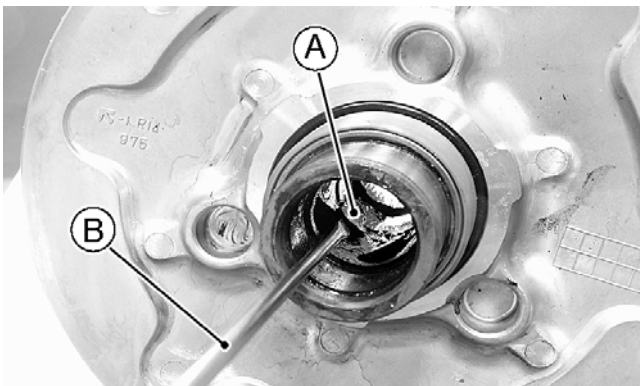
KX281

5. Make matching marks (A) and (B) on the movable sheave (C) and stationary sheave (D) to allow installation in the same position.



KX282

6. Wipe out excessive grease; then using a standard tip screwdriver (B), dislodge the four guide pins (A).



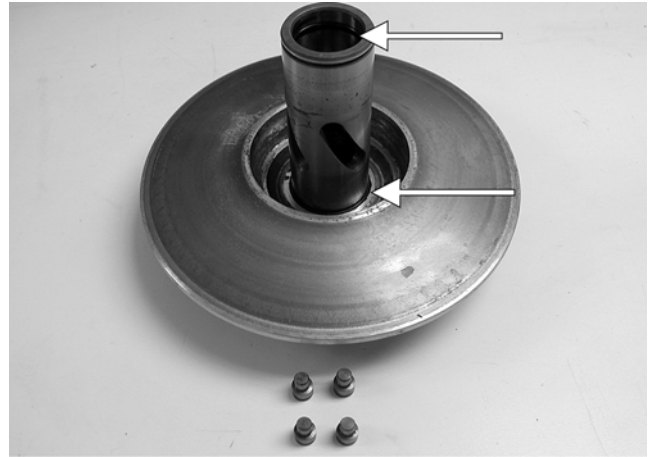
KX283

7. Remove the spacers; then thoroughly clean all parts in a high flash-point solvent.

Inspecting

1. Inspect the pulley faces for wear, galling, or grooving.

2. Inspect the O-rings on the stationary face for nicks, tears, or swelling.



KX577A

3. Inspect two grease seals in the movable face for nicks, cuts, or damage.

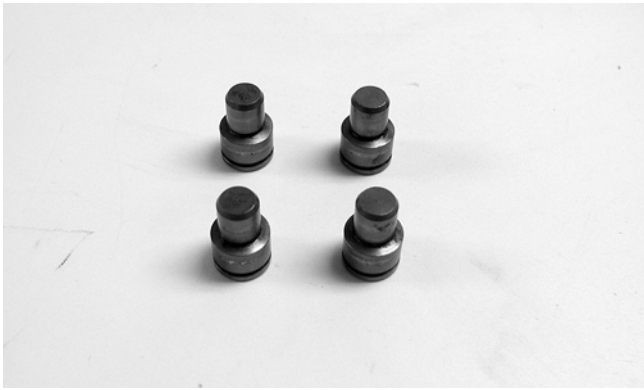


KX575A



KX576A

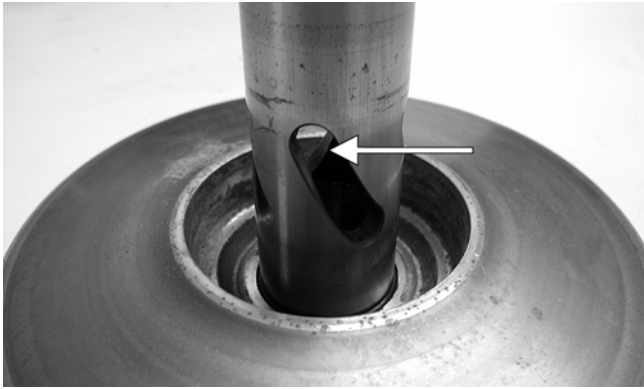
4. Inspect the pins, bushings, and cam slots for wear, flat spots, looseness, or cracking.



KX579



KX581



KX578A

3. Place the assembled faces of the driven pulley on the pulley compressor base.



KX582

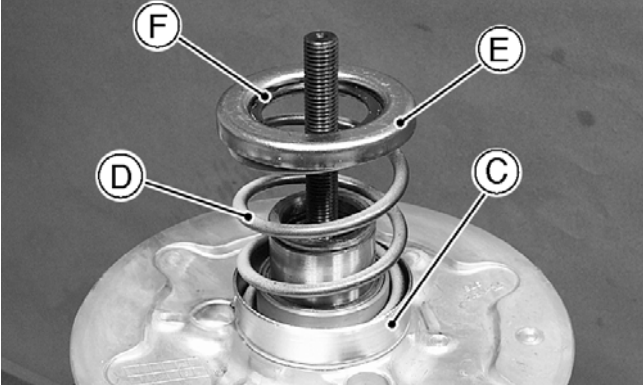
3

Assembling

1. Apply multi-purpose grease to the O-rings and grease seals on the movable face; then install on the fixed face making sure the alignment marks are properly aligned and the spacers are in position.
2. Install the four pins into the fixed face hub; then pack the cam slots in the movable face with multi-purpose grease.

■ **NOTE:** Installation of the pins can be simplified by applying a multi-purpose grease on the blade of a screwdriver, placing the pin onto the grease, and installing the pin into the appropriate slot; then filling the slot with grease to retain the pin in the slot.

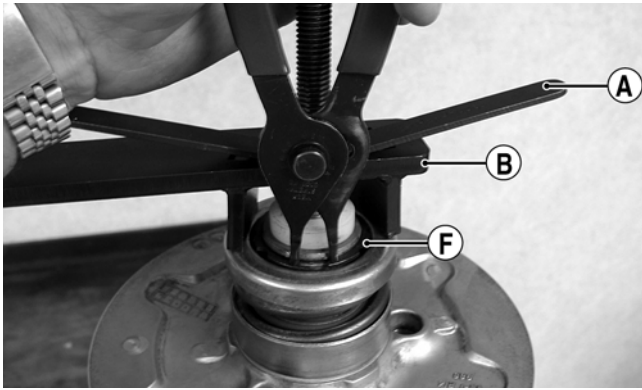
4. Install the spring seat (C), spring (D), spring seat (E), and circlip (F); then attach the spring holder (B) and tighten nut (A) until the circlip (F) can be installed.



KX284A



KX580



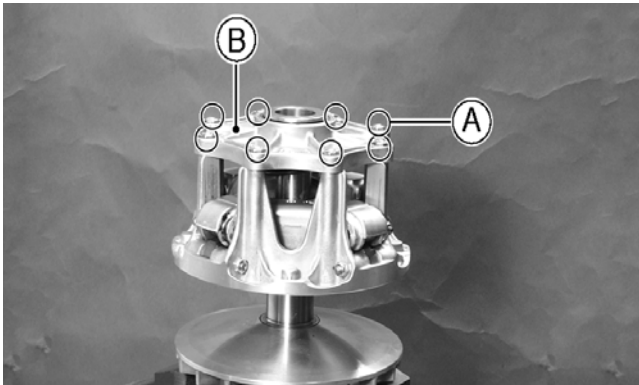
KX573B

- Loosen the nut and remove the spring holder; then remove the driven pulley assembly from the driven pulley compressor.

DRIVE CLUTCH ASSEMBLY

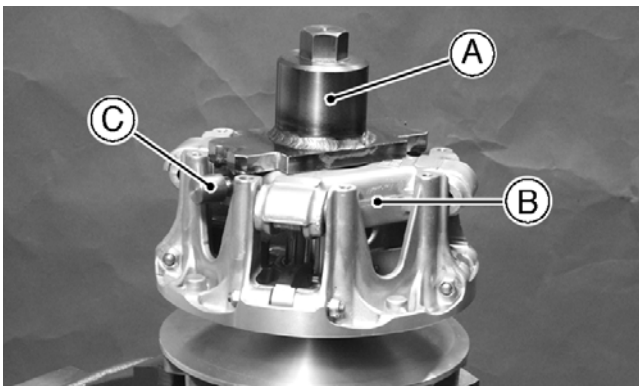
Disassembling

- Hold the drive clutch holder in a suitable vise; then set the clutch on the holder engaging the holding pins with the clutch back.
- Remove the drive clutch cover bolts (A); then remove the clutch cover (B). Account for the spring and spacers.



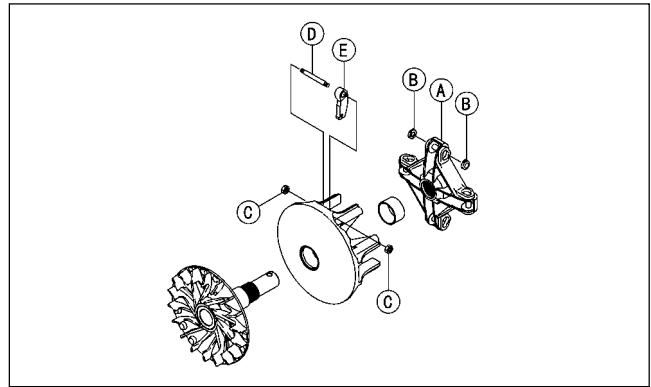
KX286

- Place the spider wrench (A) on the spider (B) and tighten the bolt (C); then turn the wrench clockwise and remove the spider with the movable sheave.



KX287

- Remove the shoes (B), nuts (C), ramp weight pins (D), and ramp weights (E) from the spider (A); then clean all parts thoroughly in a high flash-point solvent.



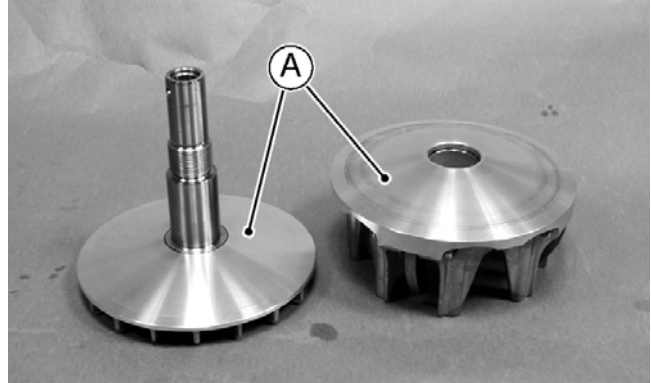
ATV2071A

Inspecting

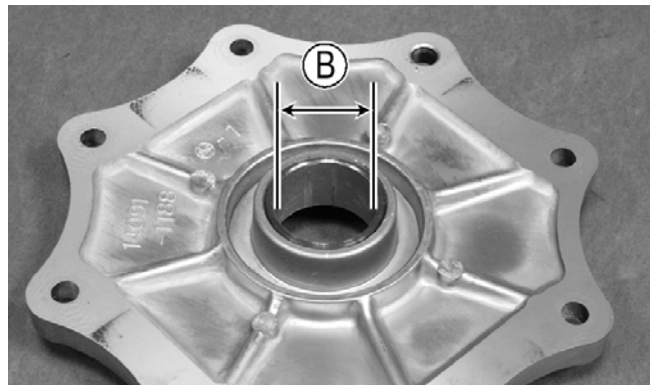
⚠ WARNING

Inspect all rotating parts carefully for cracks, loose bolts, chips, or nicks. Clutches and driven pulleys rotate at high speeds and can break up with explosive force causing severe injury or death.

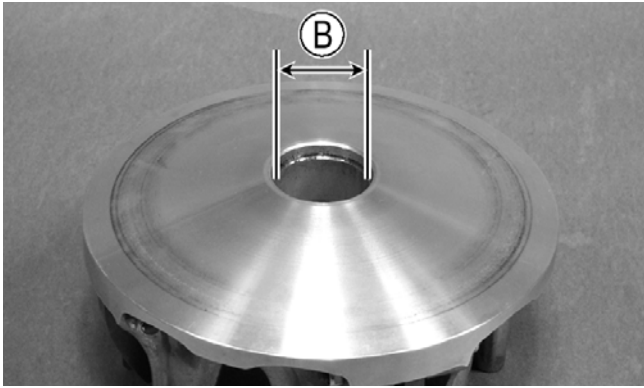
- Inspect the sheave faces (A) for cracks, galling, or hollowing; then check all bushings (B).



KX288

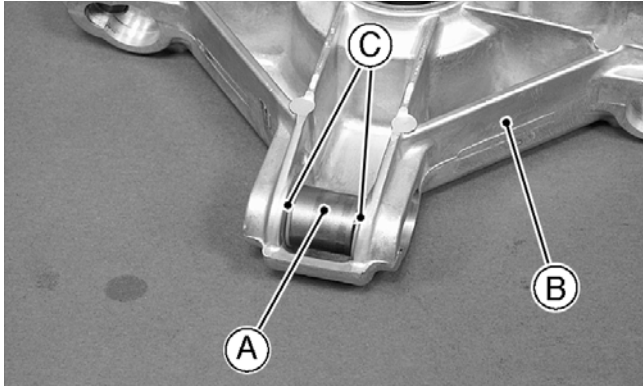


KX289A



KX290A

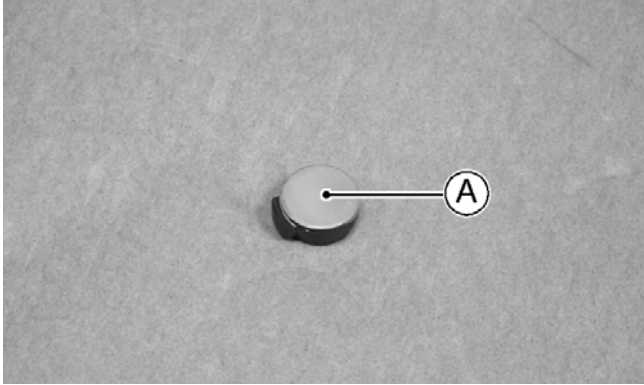
2. Inspect spider shoes (A) for wear or damage. If any are damaged, replace the complete set.



KX293

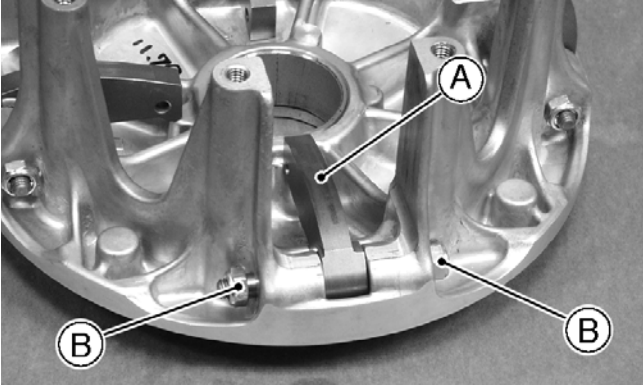
Assembling

1. Install the ramp weights (A) and tighten nuts (B) to specifications; then check that the ramp weights swing freely.



KX291

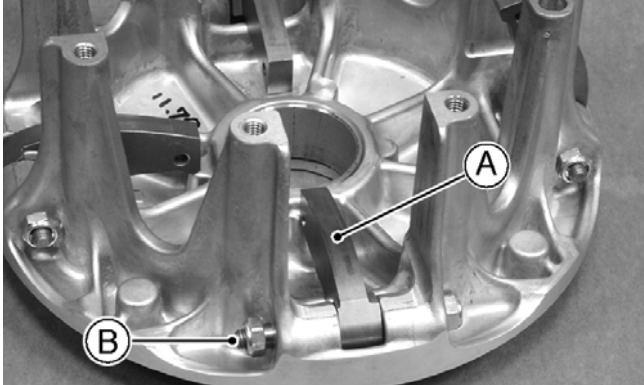
3. Inspect the ramp weights (A) and pins (B) in the movable sheave. Replace any worn parts.



KX294

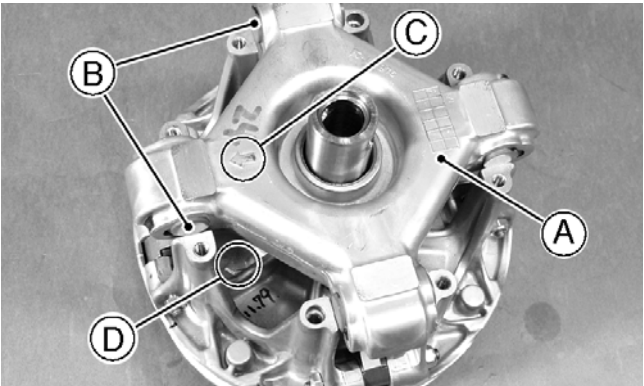
3

2. Place the fixed sheave on the clutch holder; then install the movable sheave, spider (A) and shoes (B) aligning the arrow (C) with the arrow (D) on the movable sheave.



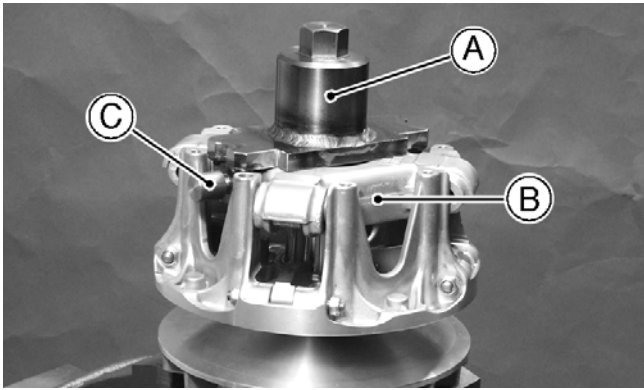
KX292

4. Inspect the rollers (A) and washers (C) in the spider. If they are worn, replace the spider assembly (B).



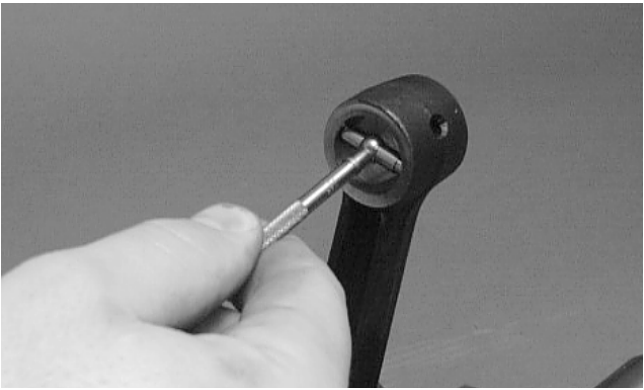
KX295

3. Install the spider wrench (A) on the spider (B) and tighten bolt (C); then tighten spider counterclockwise to specifications.



KX296

4. Install the spring spacer in the spider; then install the spring (A) in the spider groove.
5. Install the alignment pins (C); then install the clutch cover aligning the arrows (B) on the clutch cover and spider. Tighten to specifications.

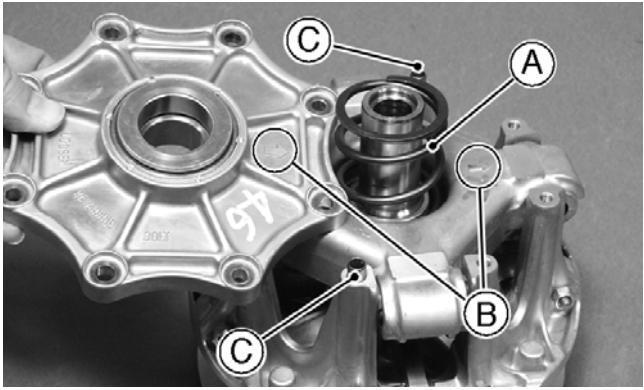


CC290D

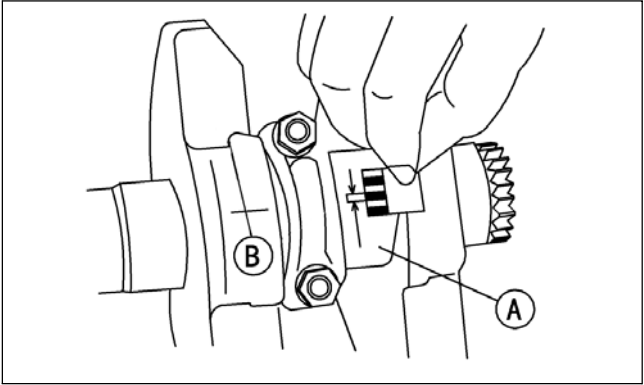
2. Maximum diameter must not exceed specifications.

■ **NOTE: Always tighten connecting rod cap nuts to the specified torque value before making any measurements.**

3. Measure the connecting rod big end insert to crank pin clearance using plastigauge. Check the clearance (A) by reading the width (B) with the gauge provided. Clearance must be within specifications. Do not move the connecting rod with the plastigauge installed.



KX297



ATV2072

4. Measure the crank pin diameter (A) and check the crankshaft marking (B). If no mark is on the crankshaft, the crank pin diameter should be within specifications. If the crankshaft is marked with "O," crank pin diameter should be within specifications.

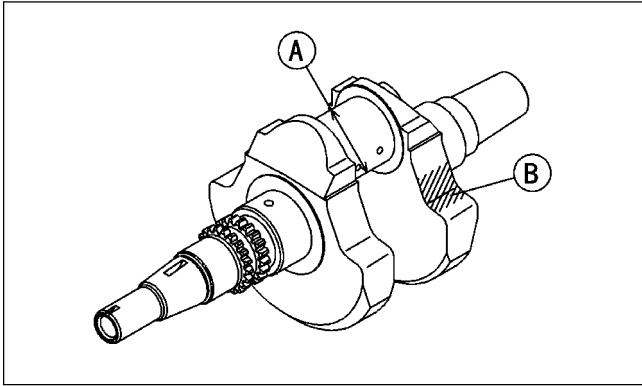
■ **NOTE: If the crank pin diameter does not coincide with the marking, make a new mark that coincides with the measurement.**

Servicing Center Crankcase Components

CRANKSHAFT ASSEMBLY

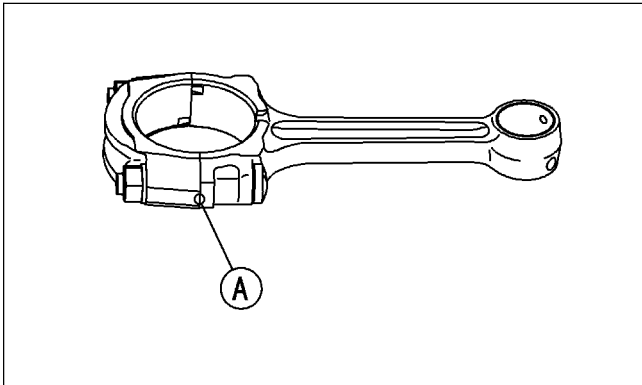
Measuring Connecting Rod (Small End Inside Diameter)

1. Insert a snap gauge into the upper connecting rod small end bore; then remove the gauge and measure it with micrometer.



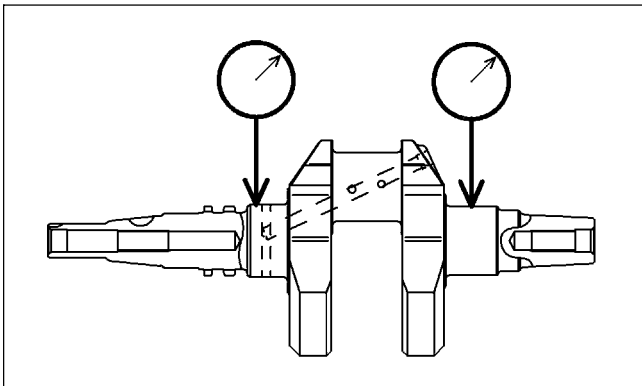
ATV2073

5. Measure the connecting rod big end inside diameter; then check the mark (A) to see if the measurement coincides with the mark. If there is no mark on the connecting rod, the big end inside diameter should be within specifications. If there is an "O," the big end inside diameter should be within specifications.



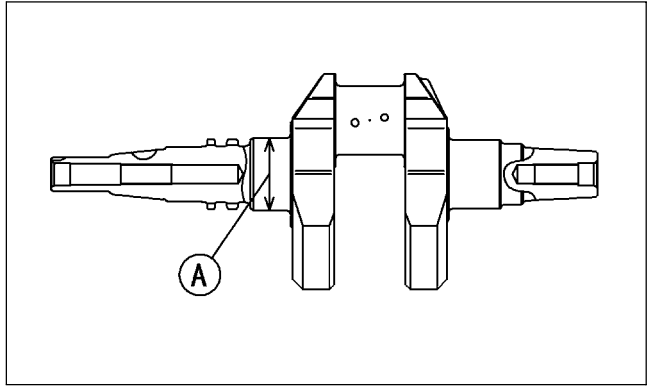
ATV2074

6. Place the crankshaft on a set of V blocks; then mount a dial indicator and base on the surface plate.
7. Slowly turn the crankshaft and note the readings at the points indicated. Crankshaft runout must be less than specifications.



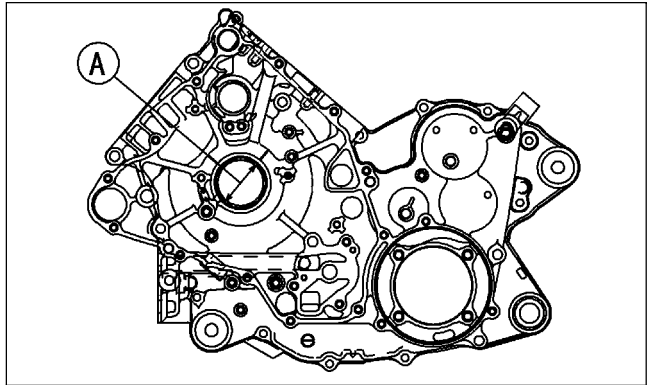
ATV2075

8. Measure the crankshaft main journal (A). It must be greater than specifications.



ATV2076

9. Measure the main bearing bore diameter (A) in the crankcase. It must be less than specifications.

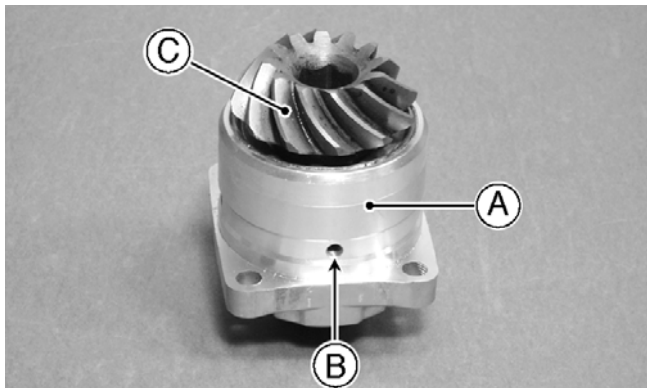


ATV2077

DISASSEMBLING OUTPUT DRIVE BEVEL GEAR ASSEMBLY

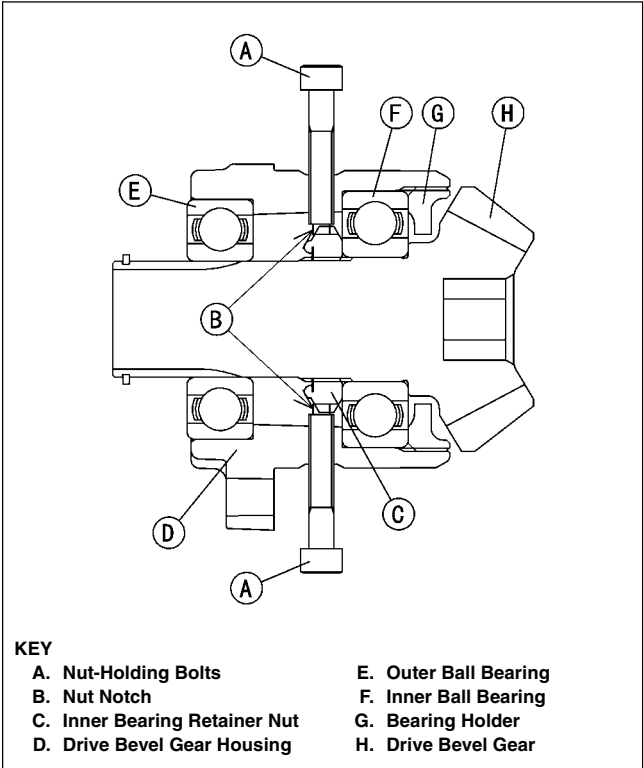
AT THIS POINT
If no abnormal wear, chipping, or bearing roughness is found, proceed to Installing Output Drive/Driven Bevel Gears in this sub-section.

1. Look through the bolt hole (B) in the drive housing (A); then rotate the drive bevel gear (C) until a notch in the inner bearing retainer nut can be seen.



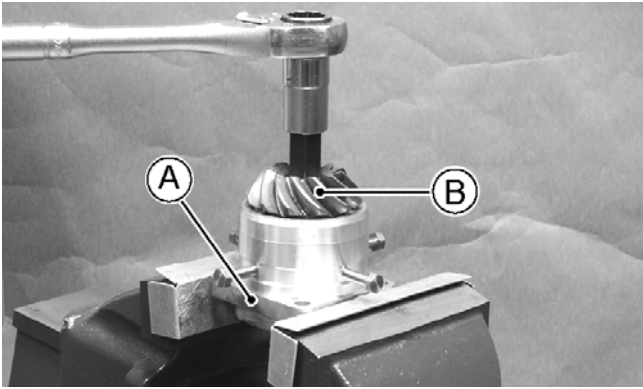
KX298

2. Install and tighten four nut-holding bolts (A) in the four threaded holes. See illustration for location of assembly components.



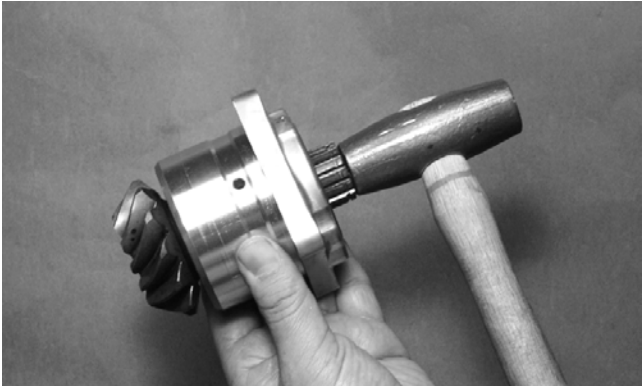
ATV2078

3. Loosen the bevel gear (B) using an Allen wrench while holding the housing (A) in a vise; then continue to turn the bevel gear (about 4-5 turns) until the retainer nut is free of the holding bolts.



KX299

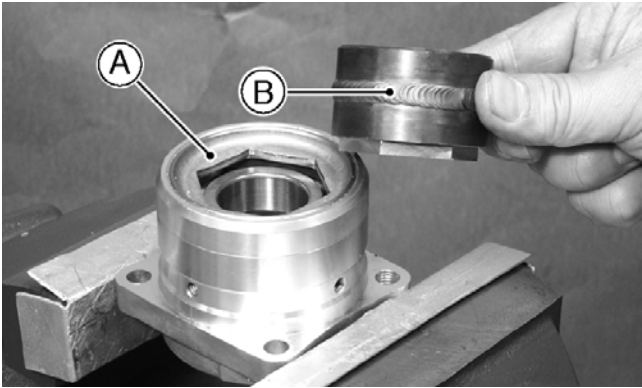
4. Loosen the holding bolts, removing one; then using a brass or copper mallet, drive the shaft out until the notch of the retainer nut can be seen (see step 1).



KX300

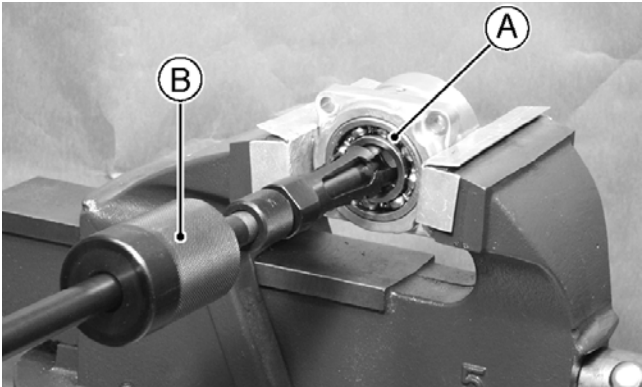
5. Retighten the holding bolts and repeat steps 1 and 3 until the bevel gear can be removed from the housing; then remove the four holding bolts.

6. Remove the bearing holder (A) using a special hex wrench (B). Apply heat to soften the Loctite.



KX301

7. Remove the outer ball bearing (A) using a suitable seal and bearing remover (B); then remove the retainer nut and the inner ball bearing.



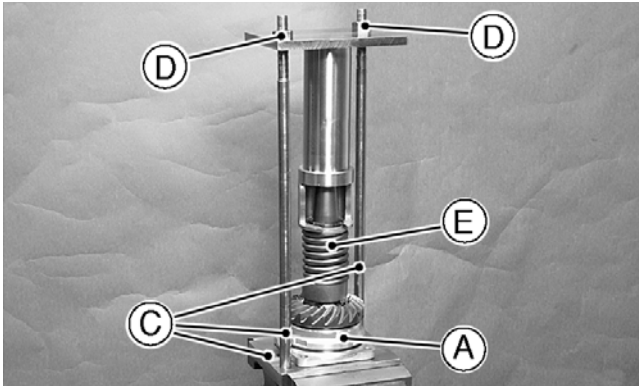
KX302

DISASSEMBLING OUTPUT DRIVEN BEVEL GEAR ASSEMBLY

👉 AT THIS POINT

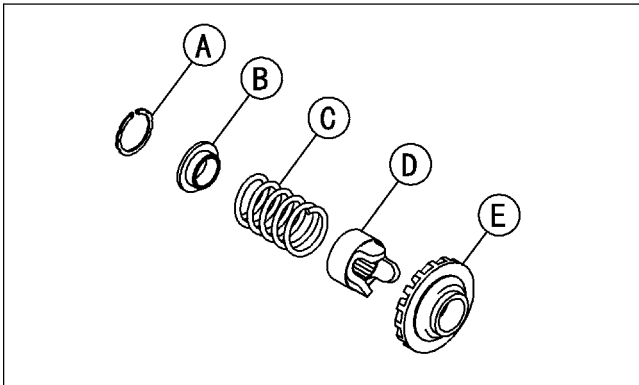
If no abnormal chipping or bearing roughness is found, proceed to Installing Output Drive/Driven Bevel Gears in this sub-section.

1. Secure the driven bevel gear assembly holding/compressing tool (C) in a vise; then set the housing assembly (A) on the holder, tighten holder nuts (D), and compress the damping spring (E).



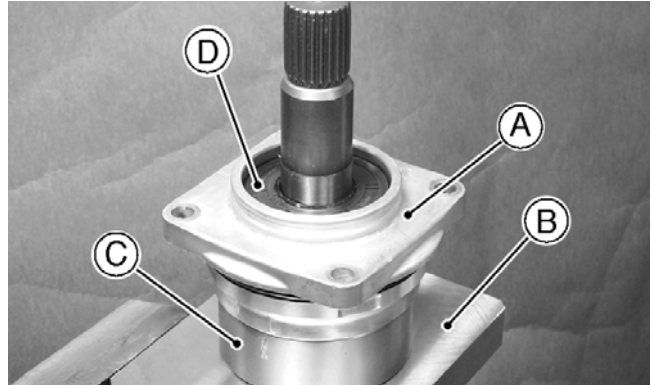
KX304A

2. Remove the circlip (A); then loosen and remove the holder nuts and spring compressor component of the tool.
3. Remove the spring holder (B), spring (C), cam damper (D), and the driven bevel gear (E).



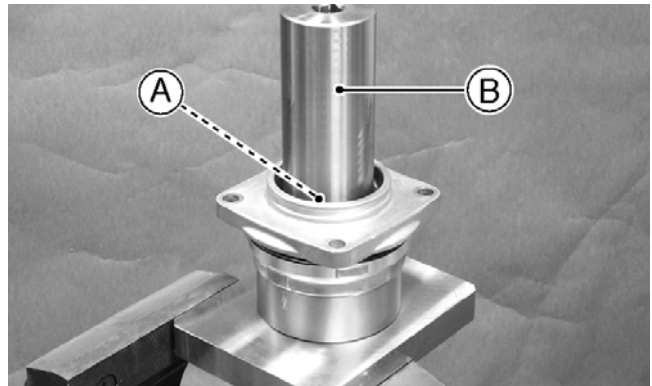
ATV2080

4. Hold the housing assembly (A) with the output shaft holder (B) and spacer (C) in a vise; then remove the oil seal (D).



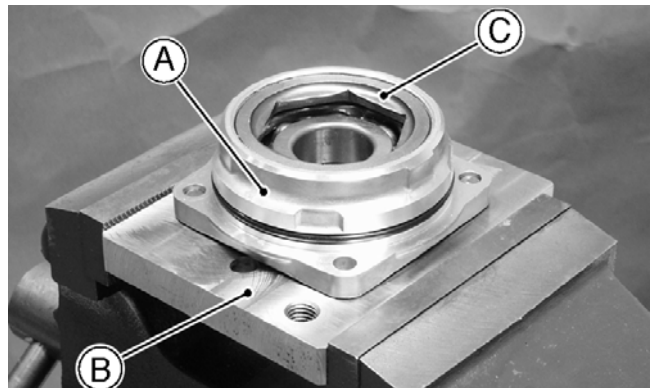
KX306

5. Using a special deep socket (B), remove the output shaft retainer nut (A).



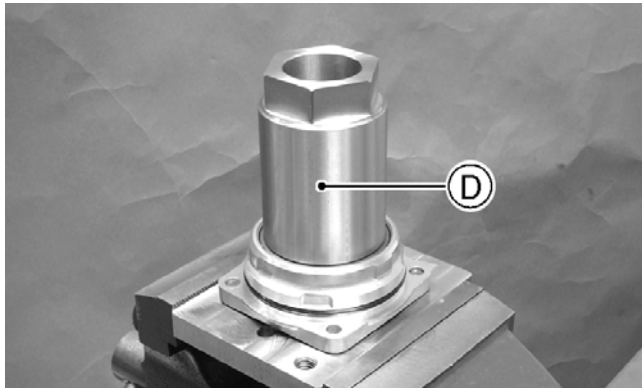
KX307

6. With the housing assembly (A) secured on the holder (B), apply heat to the bearing retainer (C); then using the special hex wrench (D), remove the bearing retainer. Remove the ball bearing from the housing.



KX308

3



KX309

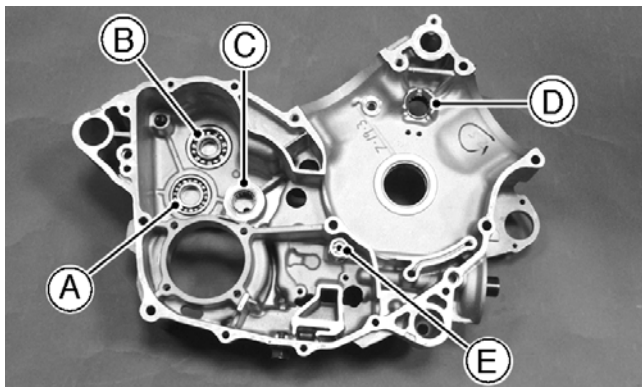
Assembling Crankcase Half

■ **NOTE:** Be sure to clean all parts thoroughly before assembly. Use compressed air to ensure that all oil passages are clear of blockage.

⚠ CAUTION

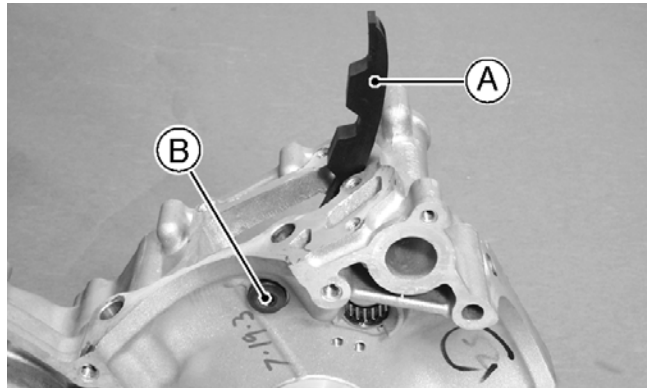
The crankcase halves are machined together; therefore, they are a matched pair. Using unmatched crankcase halves will result in severe engine damage.

1. Using a press, install ball bearings (A) and (B) into the crankcase making sure that the seal on bearing (B) is directed toward the crankcase; then press in needle bearings (C) and (D) until flush with bore (insert bearing (D) from the outside).
2. Install the oil pressure relief valve (E); then coat all bearings with clean engine oil.



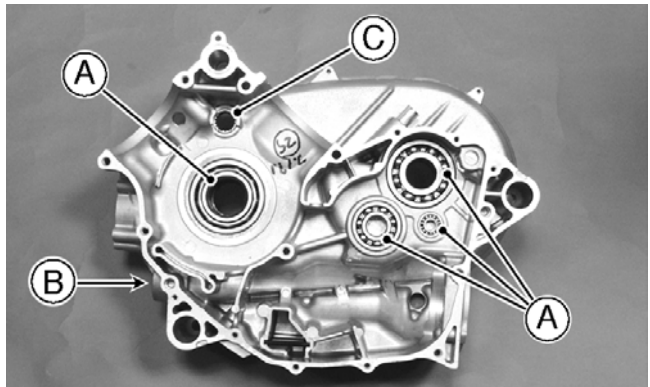
KX310

3. Install the rear cylinder camshaft chain guide (A) and tighten bolt (B) to specifications.



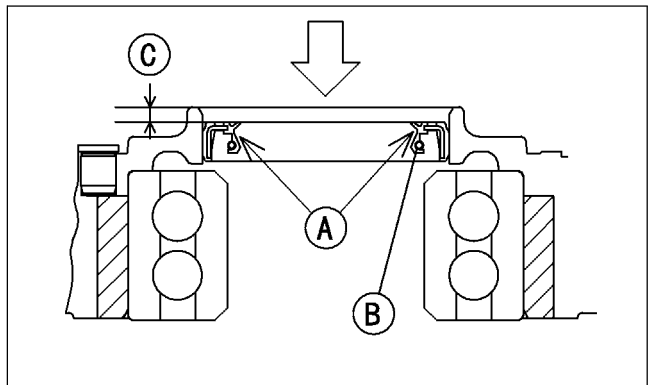
KX311

4. Press ball bearings (A) into the case until they bottom out; then press in needle bearings (B) and (C) until flush with bore (insert bearing (B) from the outside). Coat all bearings with clean engine oil.



KX312

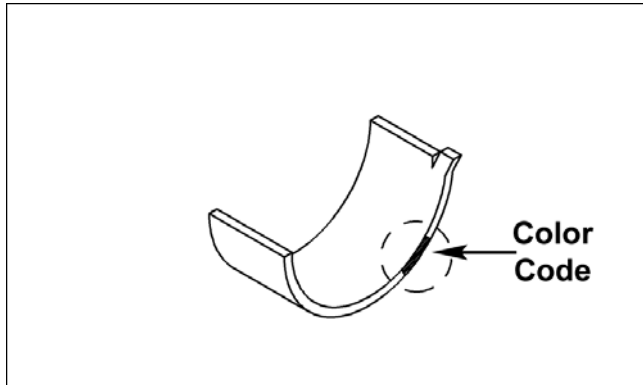
5. Apply grease to the lip (A) of the crankshaft oil seal (B); then press the seal in so that it sits 3 mm (0.12 in.) inward (C) from the end of the housing.



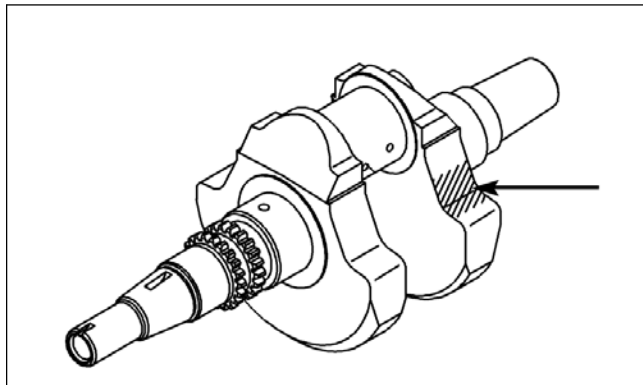
ATV2081

6. Select connecting rod big end inserts using the following chart and the markings on the crankshaft and connecting rod.

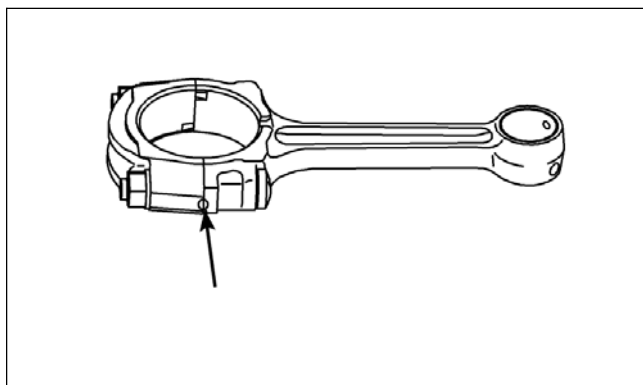
Big End Bearing Insert Selection		
Con-Rod Big End Bore Diameter Marking	Crank Pin Diameter Mark	Bearing Insert
		Size Color
None	○	Brown
None	None	Yellow
○	○	Green
A	None	



ATV2082A



ATV2073A

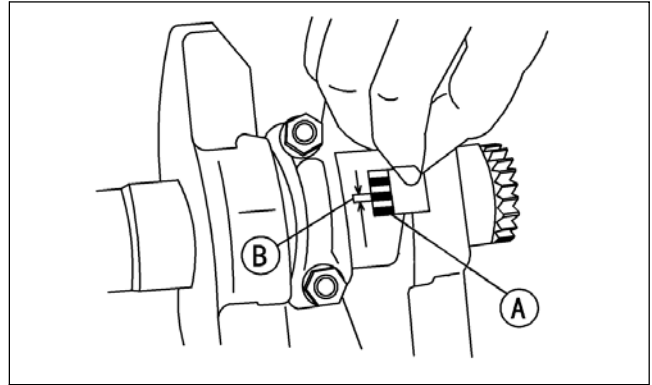


ATV2074A

7. Install the inserts into the connecting rods and caps; then use plastigauge (A) to measure connecting rod/crankshaft clearance (B). Tighten the connecting rod nuts to specifications.

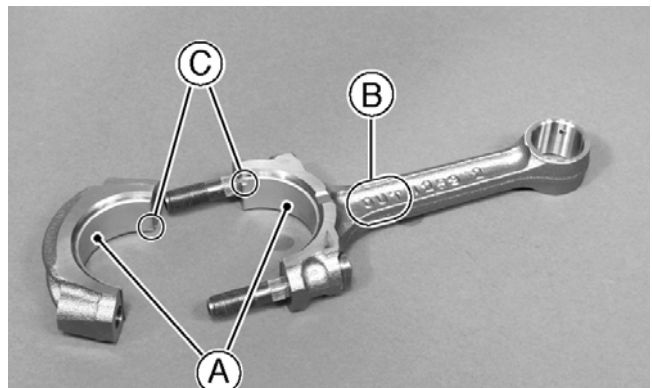
■ **NOTE:** Do not move the connecting rod with plastigauge installed or the reading will be compromised.

8. Remove the connecting rods and read the clearance with the gauge provided. The clearance must be 0.028-0.052 mm (0.0011-0.0020 in.) standard with a maximum service limit of 0.09 mm (0.0035 in.).



ATV2072A

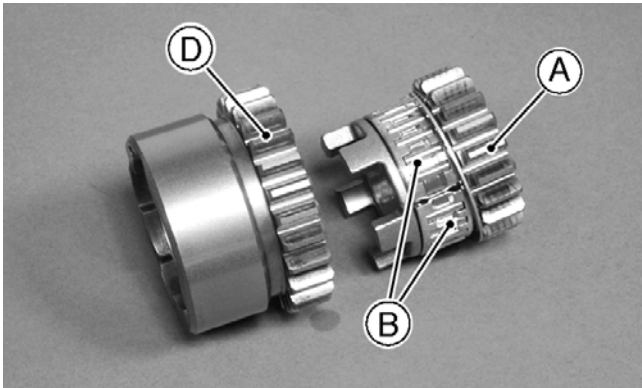
9. Clean off all traces of plastigauge from the crankshaft and inserts; then assemble on the crankshaft using clean, molybdenum disulfide oil on the inserts (A). Make sure that the "OUT" marks (B) on both connecting rods are directed towards the outside of the crankshaft and the grooves (C) of the cap and connecting rod are on the same side.



KX313

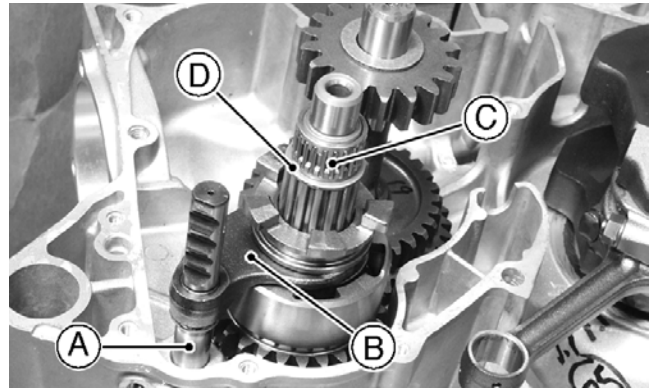
10. Install the crankshaft assembly in the right crankcase half.

11. Using a press, install the driven shaft in the crankcase until it is bottomed; then install the needle bearings (B) on the low gear (A) along with the high gear (D).



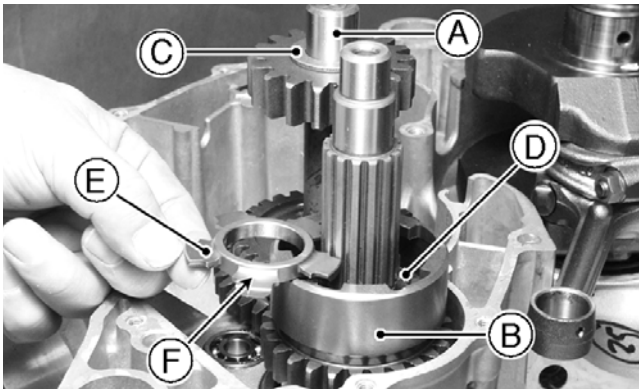
KX314A

12. Install the idler shaft (A) with gear assembly (B), spacer (C), and spacer (D); then install spacer (E) with the stepped side (F) directed outward.



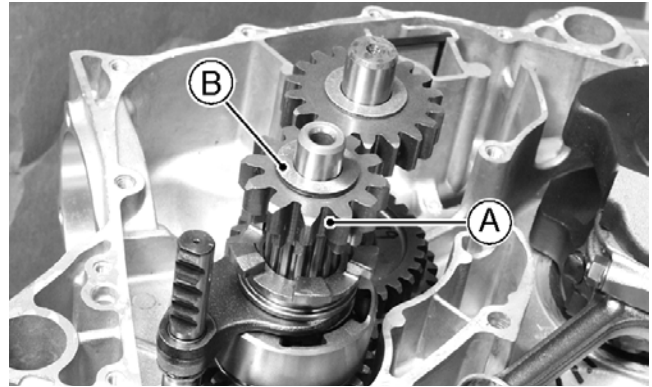
KX317

15. Install reverse idler (C); then install the reverse drive gear (A) and spacer (B).

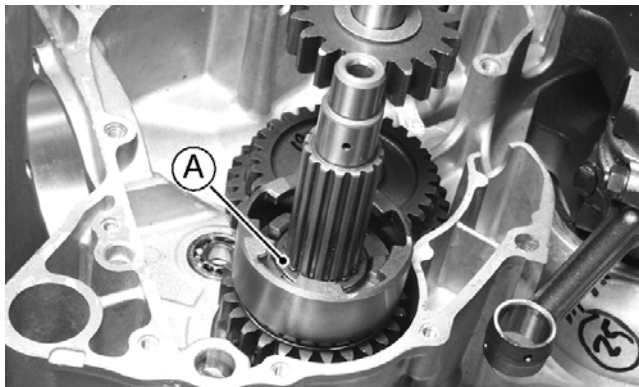


KX315

13. Install a spacer, toothed washer (A), and the circlip on the driven shaft.

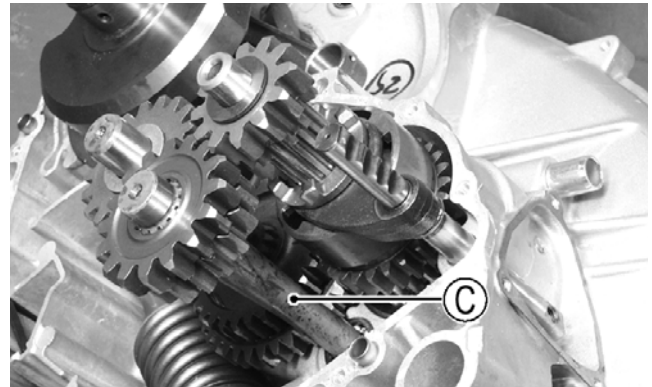


KX318



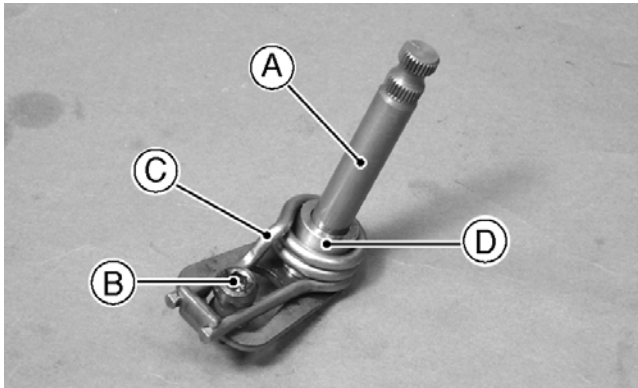
KX316

14. Apply clean engine oil to the shift rod (A), shift fork (B), and needle bearing (C); then install the shift rod with shifter, spacer (D), and needle bearing.

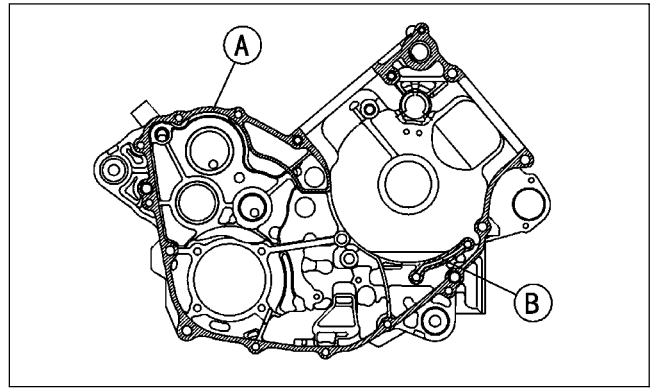


KX319A

16. Apply molybdenum disulfide oil to the shift shaft (A); then install the shift spring (C) and guide (D). Apply red Loctite #271 to the shift shaft spring bolt (B) and tighten to specifications.



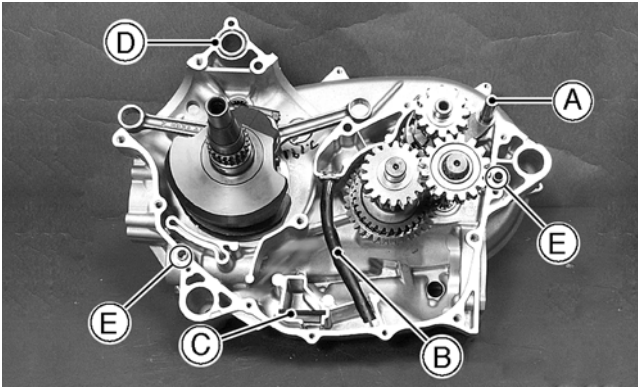
KX320



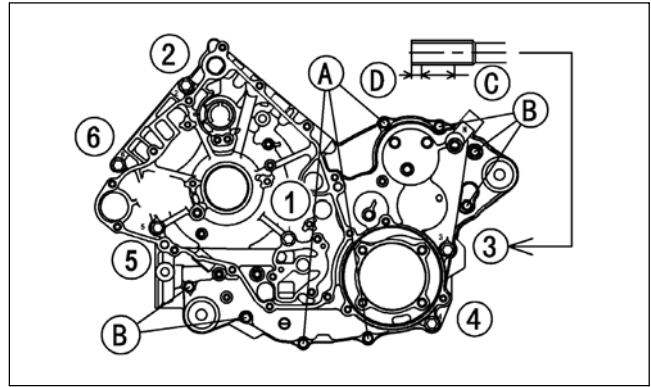
ATV2083

17. Make sure that the crankshaft, transmission shafts and shift shaft (A), oil tube (B), oil screen (C), O-ring (D), and alignment pins (E) are in place in the right crankcase half; then apply clean engine oil to the moving parts and grease to all O-rings and seals.

2. Apply blue Loctite #242 to the thread area (C), except tip (D) of left case cap screw (3); then install and tighten the 8 mm cap screws to 2.0 kg-m (14.5 ft-lb) following the tightening sequence 1-8. Tighten the 6 mm crankcase cap screws (A) and (B) to 1.0 kg-m (7 ft-lb).



KX321



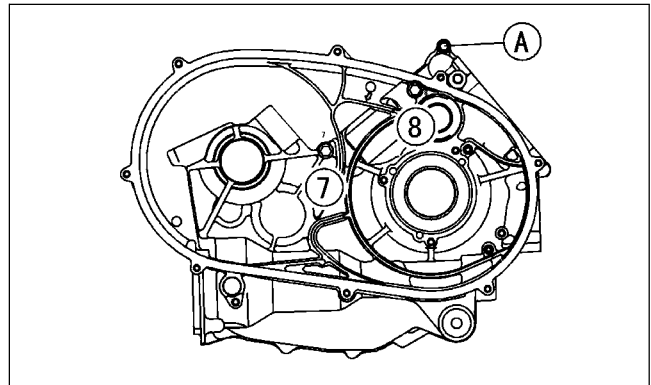
ATV2084A

3

Joining Crankcase Halves

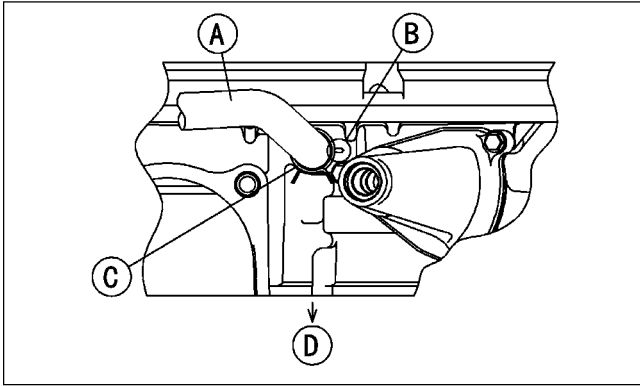
- A. Breather Tube**
- B. Positioning Bolt**
- C. Drive Bevel Gear (Assembling)**
- D. Driven Bevel Gear (Assembling)**
- E. Drive/Driven Bevel Gears (Installing)**
- F. Backlash (Adjusting)**
- G. Tooth Contact (Adjusting)**
- H. Camshaft Drive Chains (Installing)**
- I. Intermediate Shaft**

1. Apply Three Bond Sealant (p/n 0636-070) to the mating surface of the left crankcase half (A) being careful to keep sealant out of the oil passage (B); then join the crankcase halves.



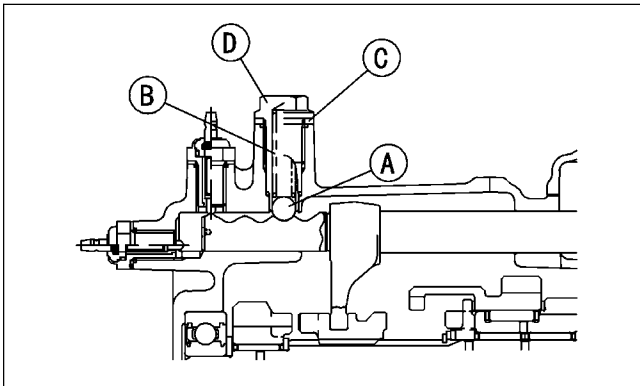
ATV2085

3. Install the breather tube (A) on the crankcase fitting aligning the white line on the tube with the mark (B) on the crankcase; then install the clamp (C) directing the open end toward the left side (D) of the crankcase.



ATV2086

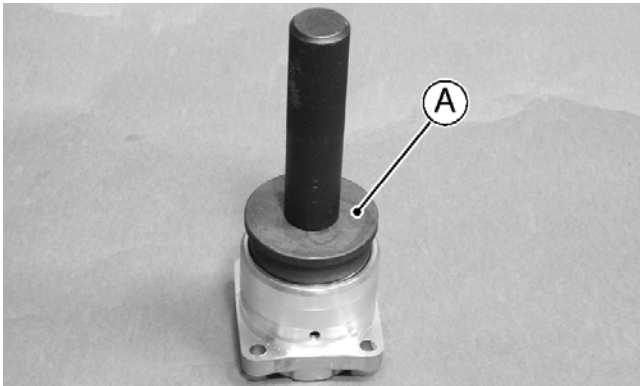
4. Apply grease to the steel ball (A) and spring (B); then install the steel ball, spring, washer (C), and shift shaft positioning bolt (D). Tighten the shift shaft positioning bolt to specifications.



ATV2087

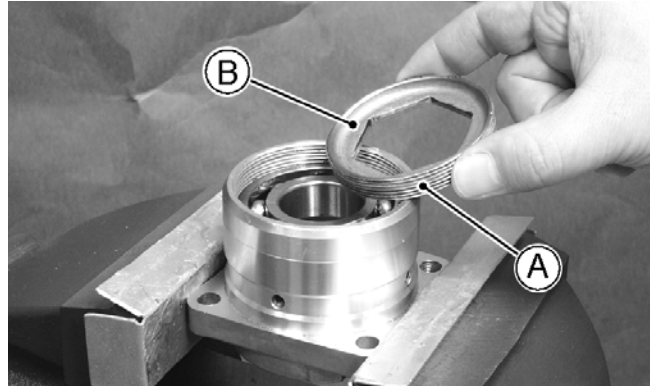
5. Check that the crankshaft and driven shaft turn freely. If any of the shafts don't turn freely, separate the crankcase halves to locate the problem.

6. Using the bearing driver (A), drive the bearing into the housing until it bottoms out.



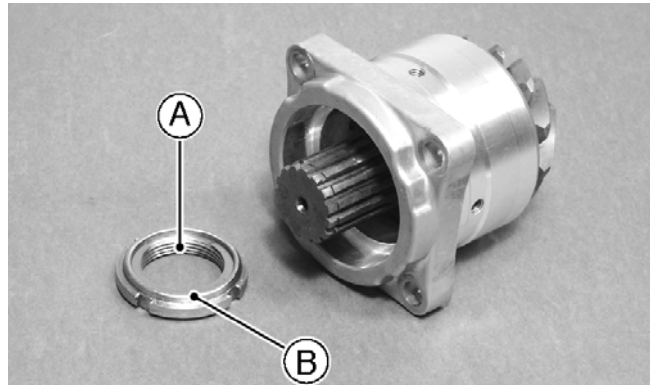
KX322

7. Place the bearing housing into the holding fixture; then apply blue Loctite #242 on the threads of the bearing retainer (A). Install with the dished side (B) directed away from the bearing and tighten to specifications.



KX323

8. Press the drive bevel gear in until it bottoms; then apply blue Loctite #242 to the threads (A) of the bevel gear retainer nut and with the raised side (B) directed away from the bearing, tighten to specifications.



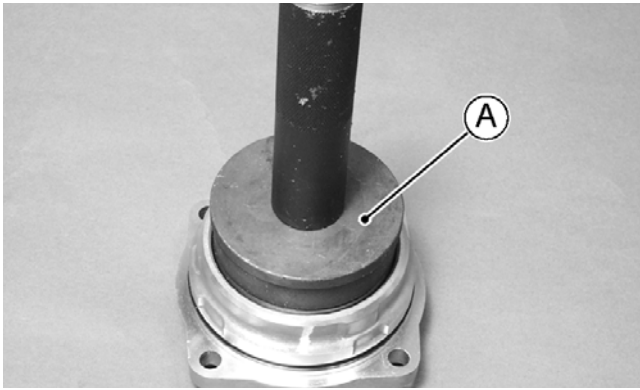
KX324

9. Press the outer ball bearing in until it is bottomed out.



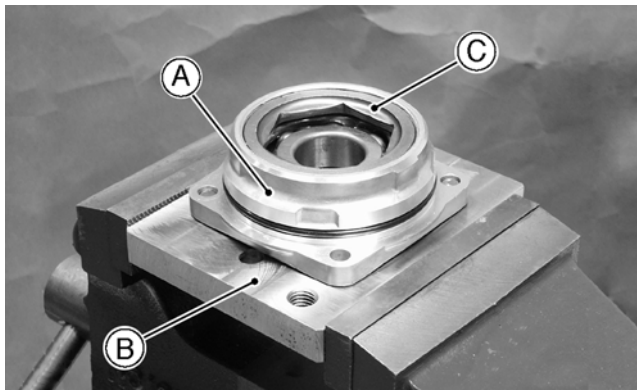
KX325A

10. Using the bearing driver (A), drive the bearing into the output drive bearing housing until it bottoms out.



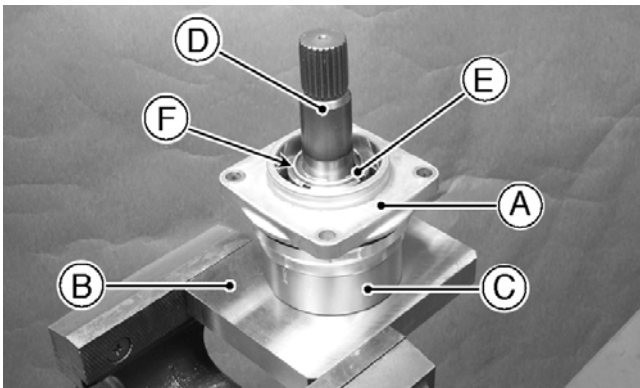
KX326

- Place the output drive bearing housing (A) into the holding fixture (B); then apply blue Loctite #242 to the threads of the bearing retainer (C). Install the bearing retainer and tighten to specifications.



KX327

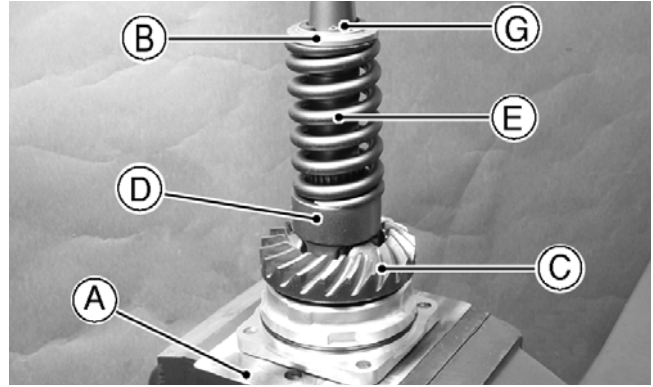
- Secure the output shaft holding fixture (B) and spacer (C) in a vise; then hold the housing assembly (A) and install the output shaft (D) in the housing.
- Apply blue Loctite #242 to the threads of the output shaft retainer nut (E) and with the protruding side (F) directed away from the bearing, tighten to specifications.



KX328

- Apply grease to the output drive oil seal; then install in the housing being careful not to damage the lip of the seal or distort the seal.

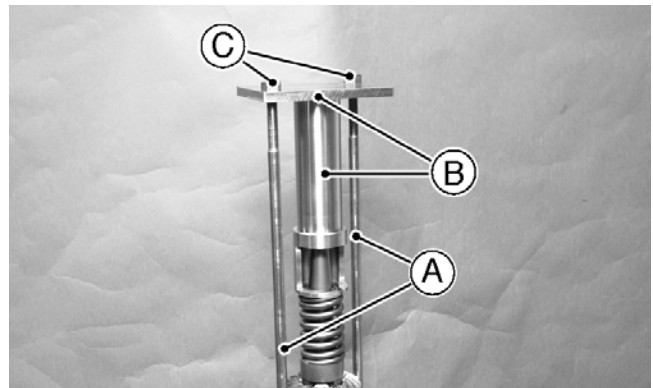
- Secure the holding fixture (A) in a vise; then install the driven bevel gear (C), cam damper (D), spring (E), spring holder (B), and circlip (G).



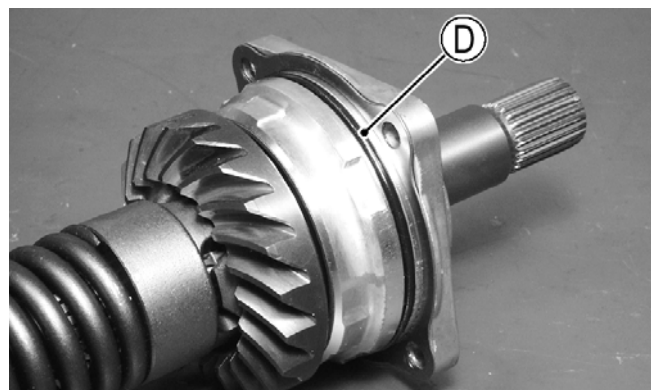
KX329A

- Install the guide bars (A), spring compressor (B), and nuts (C); then tighten the nuts (C) until the circlip (D) can be installed. After seating the circlip, remove the nuts (C), compressor (B), and guide rods (A). Apply grease to the O-ring seal on the housing.

3

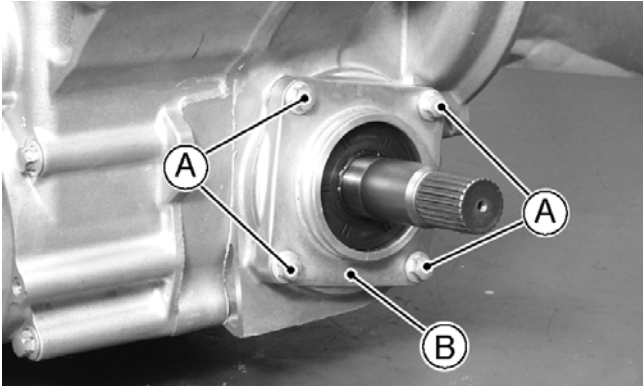


KX330



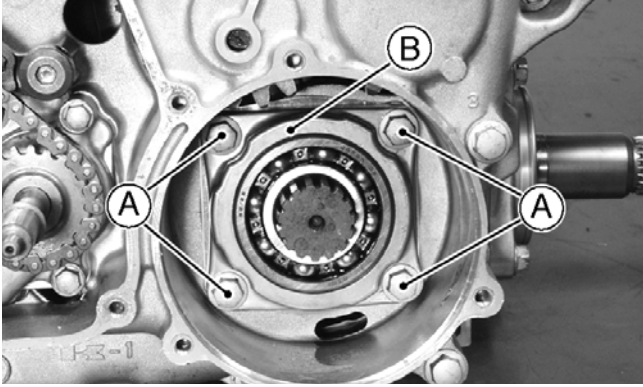
KX331A

- Install the driven gear assembly (B) in the crankcase; then tighten the four cap screws (A) to specifications.



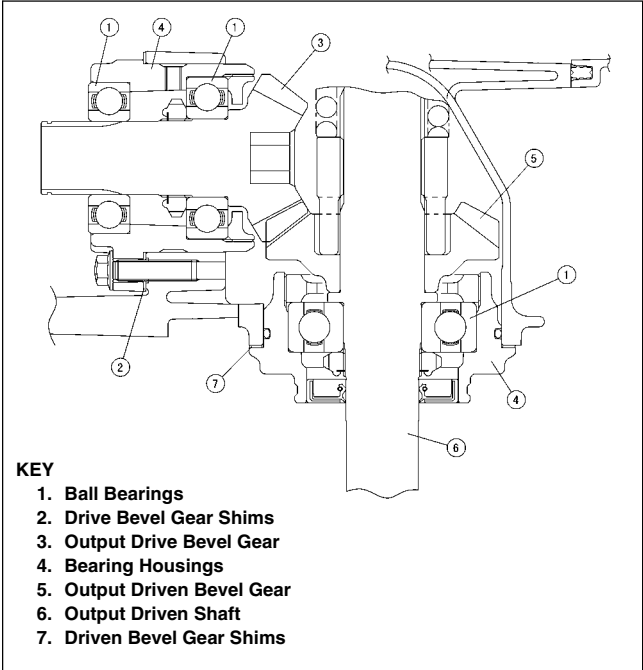
KX332

18. Install the drive bevel gear housing (B); then tighten the four cap screws (A) to specifications.

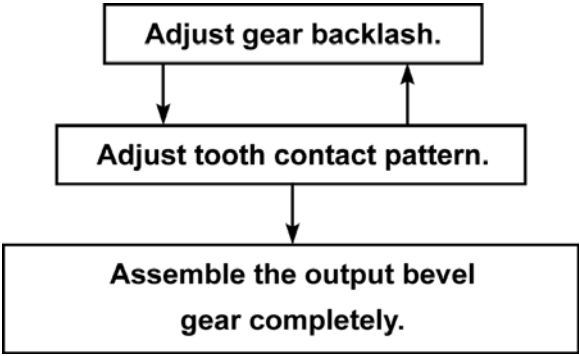


KX333

■ **NOTE:** If any of the output bevel gear (backlash-related) parts have been replaced, the Adjusting Backlash and Adjusting Tooth Contact procedures must be followed.

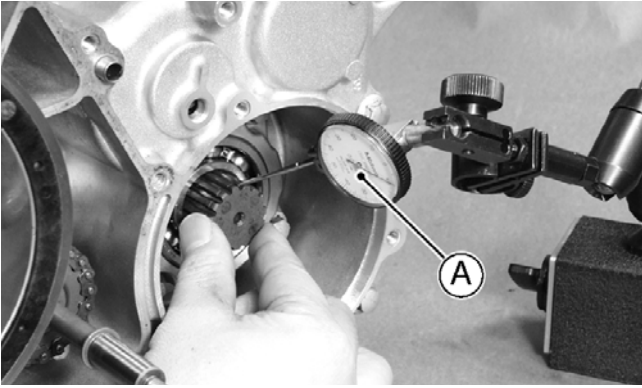


ATV2088



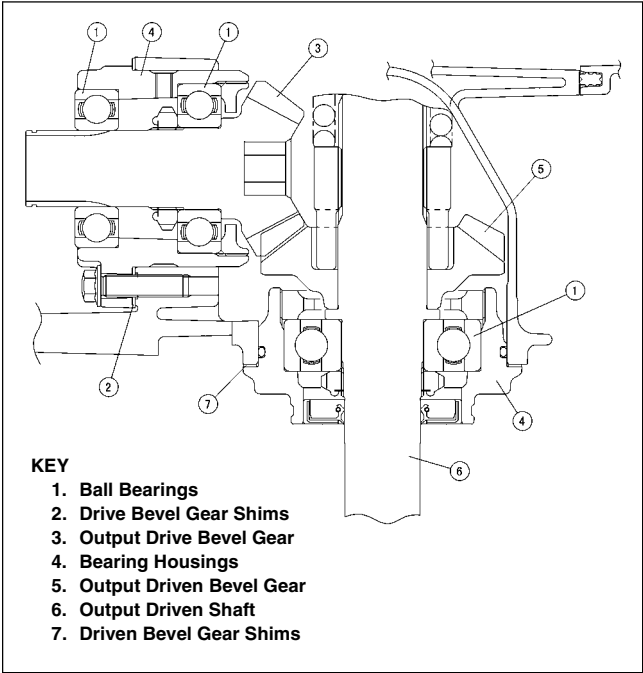
ATV2092

19. Set the dial indicator (A) against the output driveshaft spline groove; then rock the driveshaft slightly until gear lash (play) is taken out in one direction (do not let driven shaft turn). Zero the dial indicator and rock the shaft in the opposite direction until gear contact is made. The new reading is the backlash. It should be between 0.05-0.11 mm (0.0020-0.0043 in.).



KX334

■ **NOTE:** To decrease backlash, decrease the thickness of shims (7). To increase backlash, increase the thickness of shims (7). Make small changes at a time.

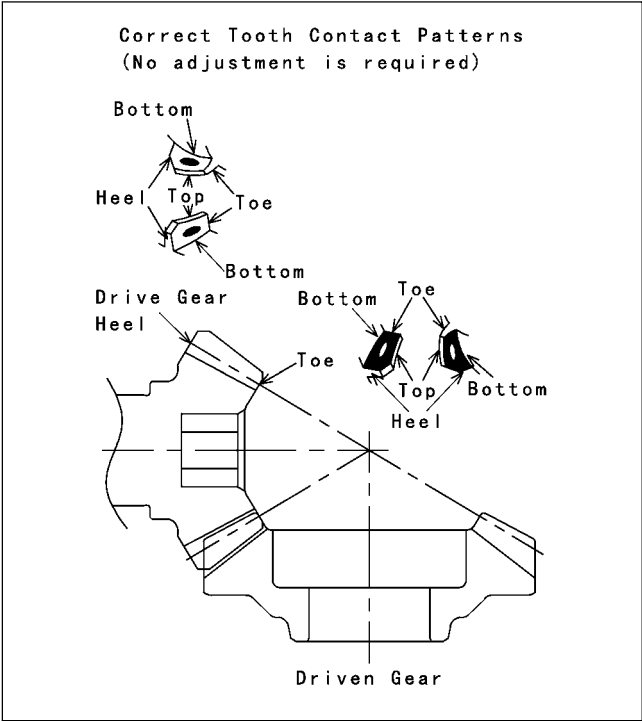


- KEY**
- 1. Ball Bearings
 - 2. Drive Bevel Gear Shims
 - 3. Output Drive Bevel Gear
 - 4. Bearing Housings
 - 5. Output Driven Bevel Gear
 - 6. Output Driven Shaft
 - 7. Driven Bevel Gear Shims

ATV2088

Driven Bevel Gear Shims for Backlash Adjustment	
Thickness	
	0.15 mm (0.006 in.).
	0.2 mm (0.008 in.).
	0.5 mm (0.020 in.).
	0.8 mm (0.031 in.).
	1.0 mm (0.039 in.).
	1.2 mm (0.047 in.).

- 20. Remove the drive bevel gear housing assembly; then clean all oil from the bevel gears. Apply a thin even coat of machinist layout dye on the bevel gears.
- 21. Rotate the driveshaft several revolutions in both directions while applying resistance to the drive gear. Note the drive and coast contact patterns on the bevel gears.



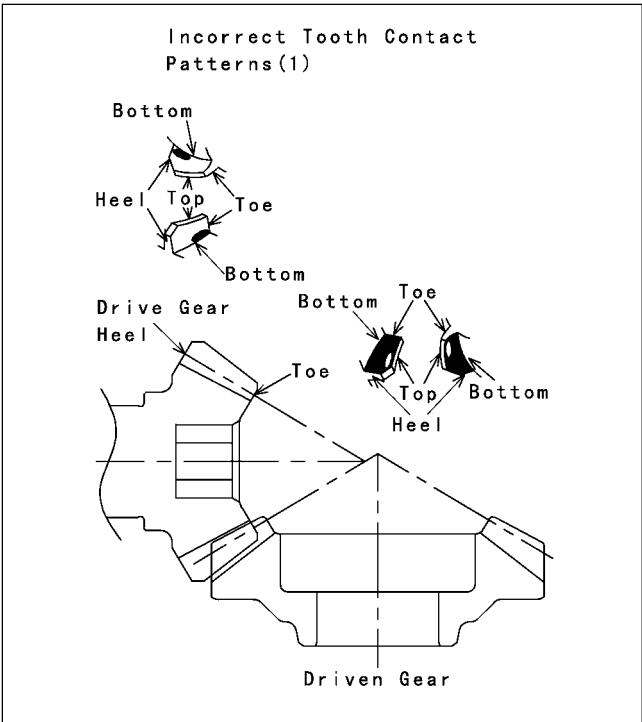
ATV2089

3

- 22. Increase or decrease shim thickness on the drive bevel gear housing until the correct contact pattern is obtained.

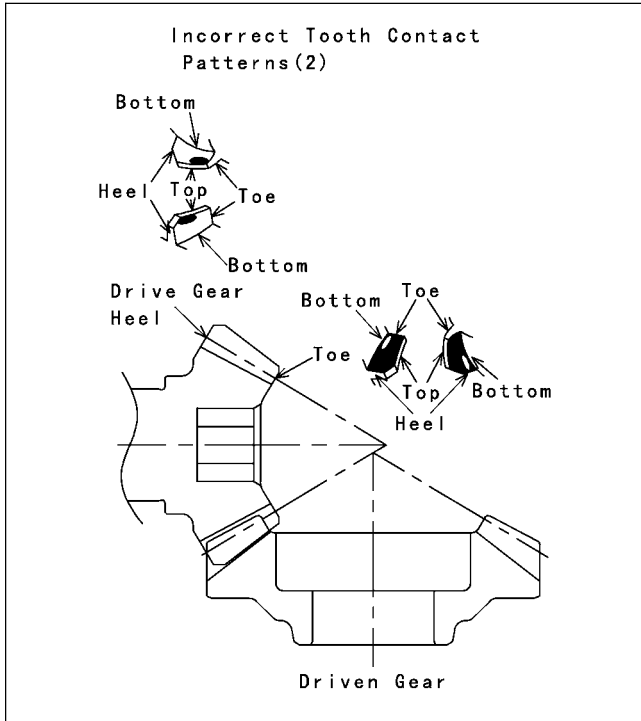
■ **NOTE:** Always check gear backlash after changing any shims.

■ **NOTE:** The following illustration indicates that the drive gear is running too shallow in the set. Decrease drive housing shims and increase driven housing shims.



ATV2090

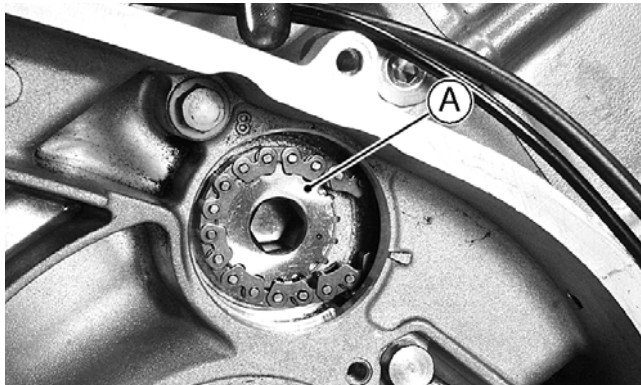
■ **NOTE:** The following illustration indicates that the drive gear is running too deep in the set. Increase drive housing shims and decrease driven housing shims.



ATV2091

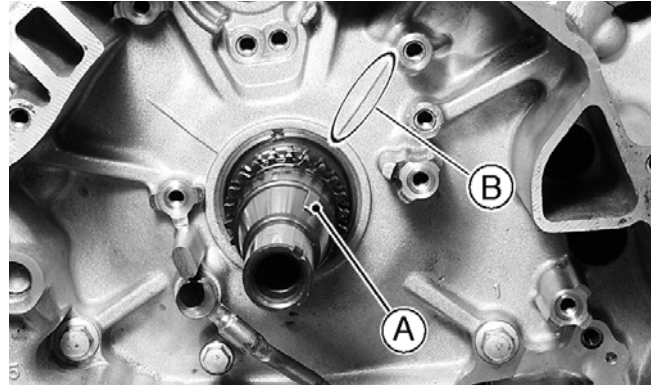
■ **NOTE:** Changing driven housing shims will affect backlash more than contact pattern. Changing drive housing shims will affect contact pattern more than backlash. Always recheck backlash.

23. After backlash and contact patterns are within specifications, install the bevel gear assemblies in accordance with steps 1 and 2 of this sub-section.
24. From the right side, install the intermediate cam driveshaft (A) and front camshaft chain.



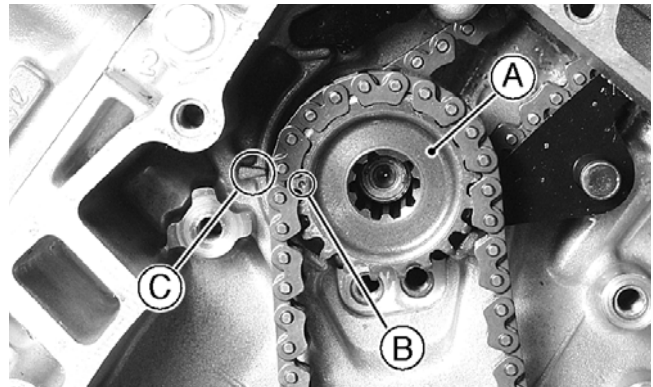
KX335

25. Align the keyway (A) with the index line (B) on the crankcase; then install the timing chain and engage the intermediate shaft sprocket.



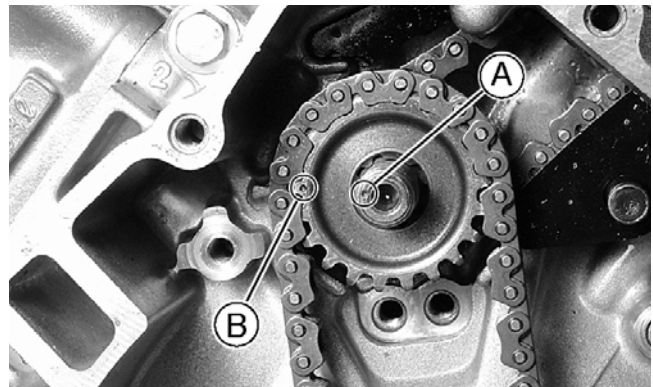
KX336

26. Align the punch mark (B) on the intermediate shaft sprocket (A) with the index mark (C) on the crankcase.



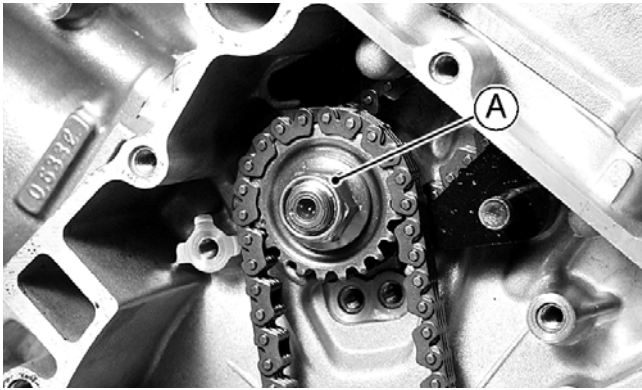
KX337

27. Engage the splines of the intermediate drive sprocket and shaft aligning the punch mark (A) on the shaft with the punch mark (B) on the sprocket.



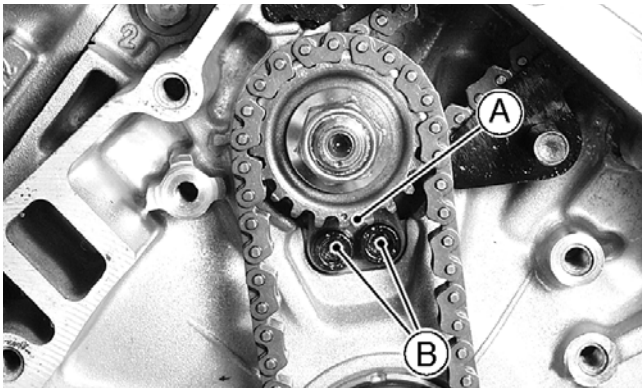
KX338

28. Install the nut (A); then hold the intermediate shaft from the right side with an Allen wrench and tighten to specifications.



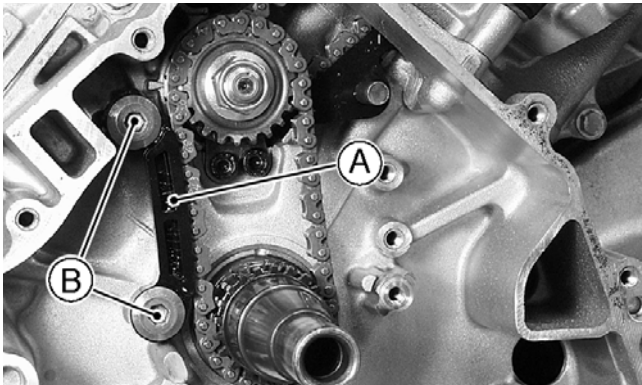
KX339

29. Install the position plate (A); then tighten cap screws (B) to specifications.



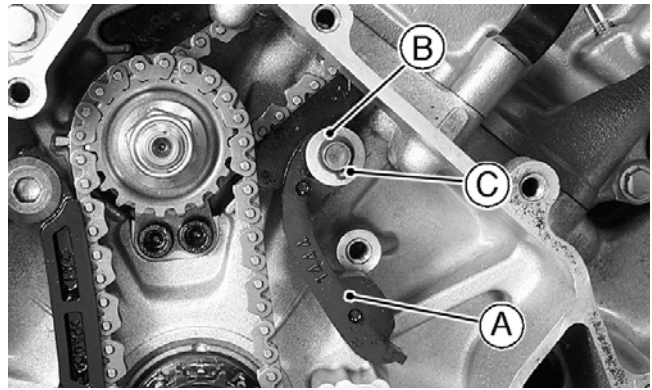
KX340

30. Install the front intermediate shaft chain guide (A); then tighten the mounting cap screws (B) to specifications.



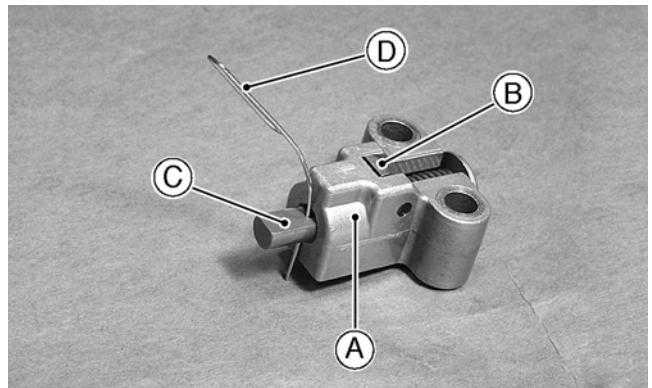
KX341

31. Place the rear intermediate chain guide (A) onto the pivot as shown; then secure with a flat washer (B) and circlip (C).



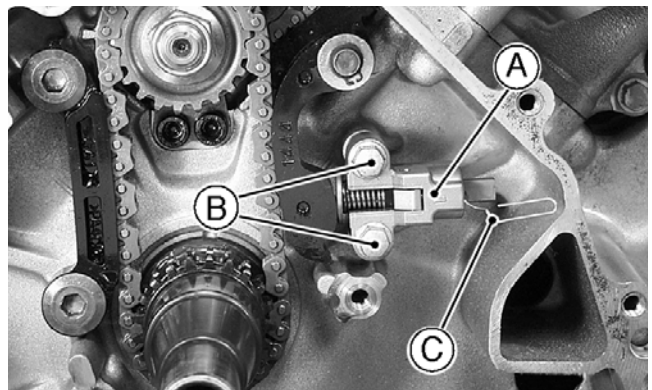
KX342

32. To prepare the intermediate shaft chain tensioner (A) for installation, release the stopper (B); then push the rod (C) into the housing and secure with a piece of wire (D).



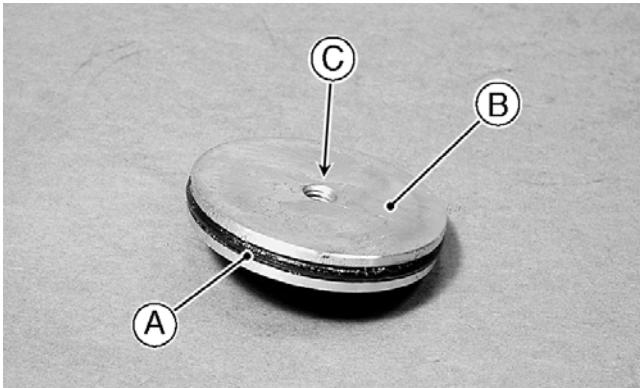
KX343

33. Secure the chain tensioner assembly (A) to the crankcase with cap screws (B); then tighten to specifications and remove the wire (C).



KX344

34. Apply grease to the O-ring (A); then install the cover (B) into the right side of the crankcase with the tapped hole (C) directed outward.



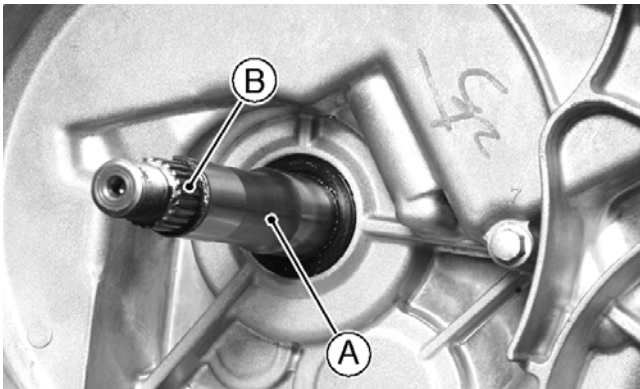
KX345

⚠ CAUTION

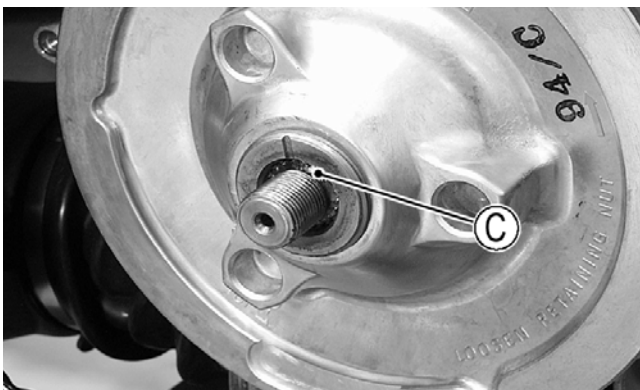
Make sure tension is kept on the front and rear cam chains whenever the crankshaft is rotated. Damage to the crankcase could occur.

Installing Right-Side Components

1. Install the driven pulley on the transmission driven shaft (A) being careful not to jam the splines (B) with the splines in the pulley (C).

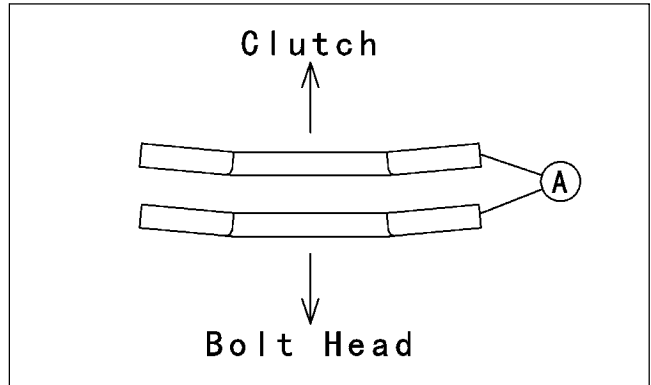


KX346

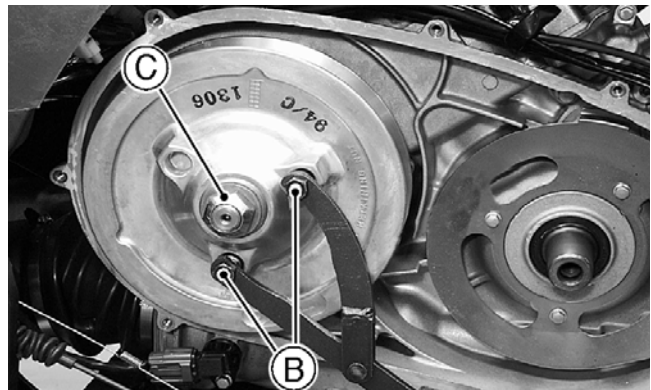


KX347A

2. Install the two bevel washers (A) with the concave side directed towards the driven pulley; then use the pulley holder (B) to hold the driven pulley and tighten the nut (C) to specifications.

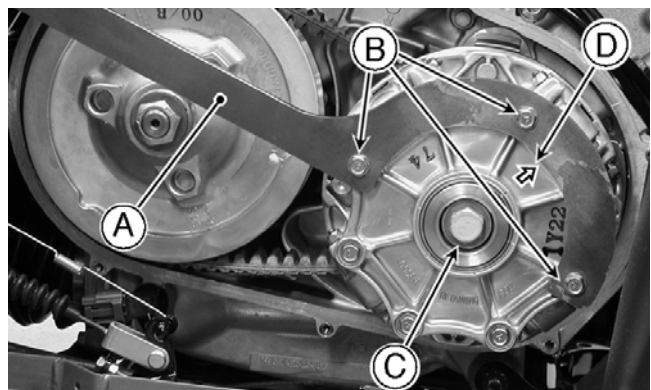


ATV2093



KX348A

3. Loop the belt over the driven pulley; then install the drive clutch with holding tool (A) with cap screws (B) referenced to the arrow (D) and tighten the cap screw (C) (left-hand threads) to specifications.



KX349

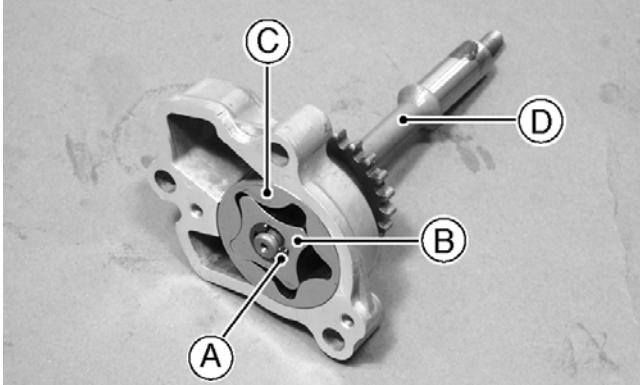
4. Check that drive belt deflection is within specifications (see Section 2).

👉 AT THIS POINT

The drive clutch holder can be left installed to hold the crankshaft for left-side component installation.

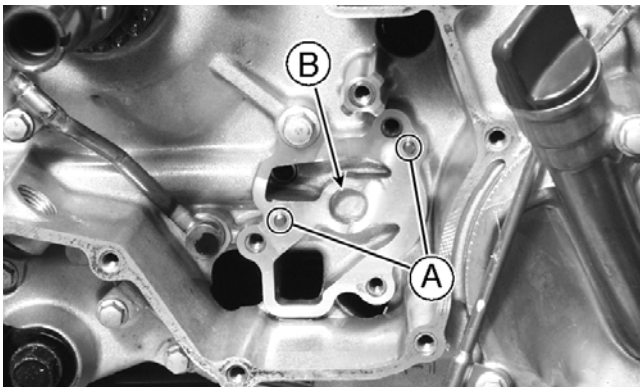
Installing Left-Side Components

1. Install a new circlip (A) securing the oil pump rotor (B) in rotor (C); then apply clean engine oil to the rotors and shaft (D).



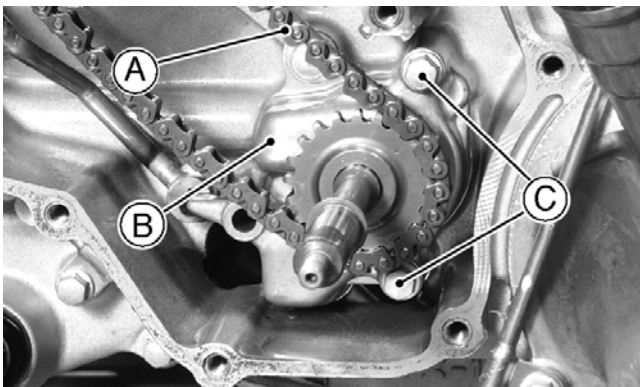
KX350A

2. Make sure that alignment pins (A) are in place and apply clean engine oil to oil port (B).



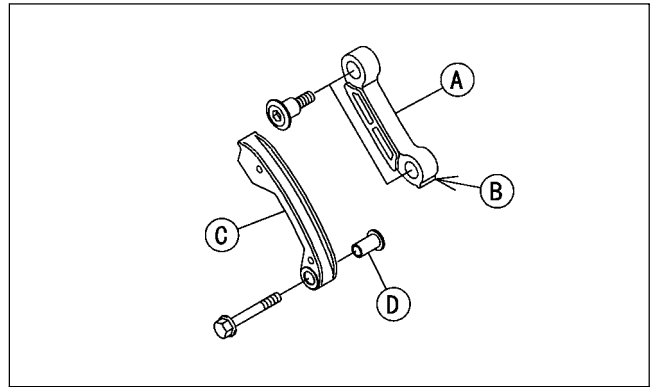
KX351

3. Install the oil pump drive chain (A) with the oil pump assembly (B); then tighten the cap screws (C) to specifications.



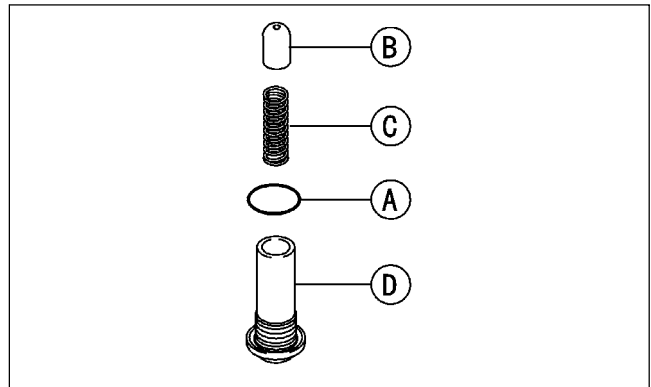
KX352

4. Install the upper chain guide (A) with the tab (B) directed downward; then install the lower chain guide (C) and collar (D). Tighten the chain guide attaching bolts to specifications.



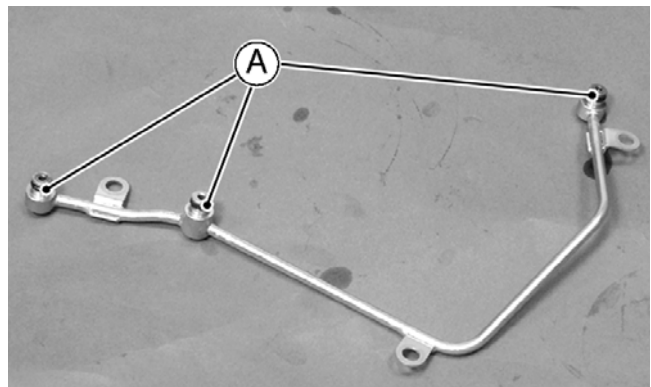
ATV2094

5. Apply grease to the O-ring (A); then install the pin (B), spring (C), and oil pump chain tensioner bolt (D) and tighten to specifications.



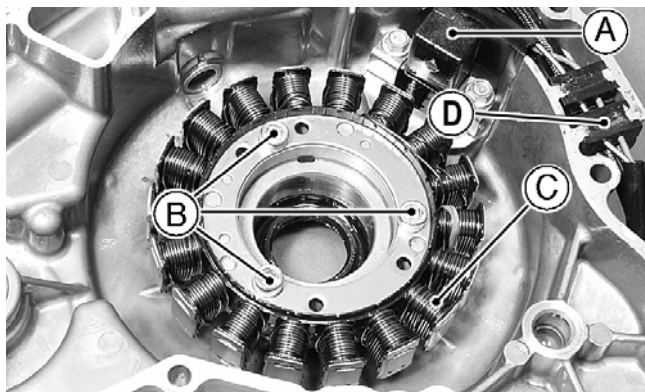
ATV2095

6. Install new O-rings (A) on the oil pipe fittings; then apply clean engine oil and install on the crankcase tightening the oil pipe cap screws to specifications.



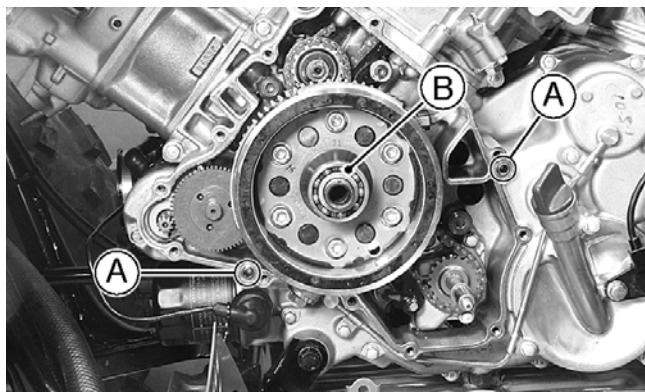
KX353

7. Install the pick-up coil (A) and stator (C) and tighten cap screws (B) to specifications; then install the lead grommets (D) in the alternator cover.



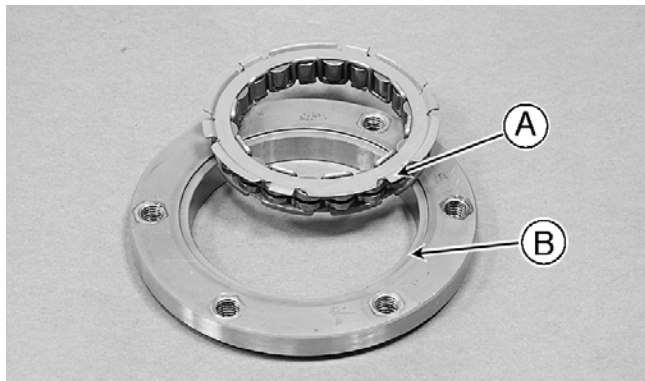
KX354

8. Install the one-way clutch so the flange (A) fits on the recess (B) of the race; then install on the rotor/flywheel and attach with the cap screws. Coat threads with blue Loctite #242 and tighten to specifications.



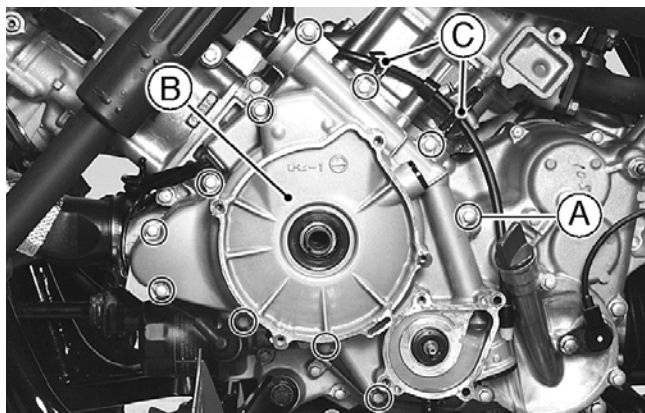
KX357

11. Apply grease to the alternator cover oil seal; then install the cover (B), cover cap screws (A), and clamps (C). Tighten the cap screws to specifications.



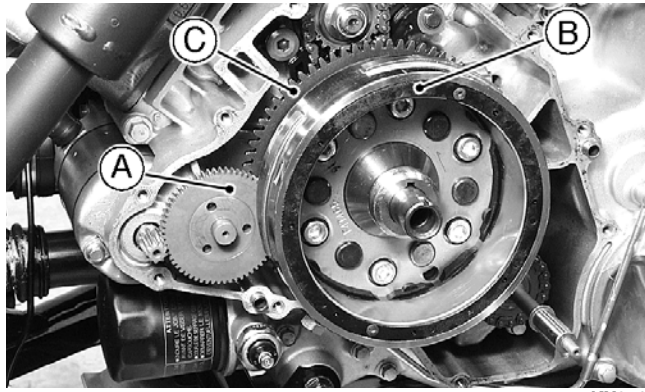
KX355

9. Install the starter clutch gear (C) and torque limiter (A); then wipe the crankshaft and rotor/flywheel mating surfaces clean and install the rotor/flywheel (B) while turning the starter clutch gear.



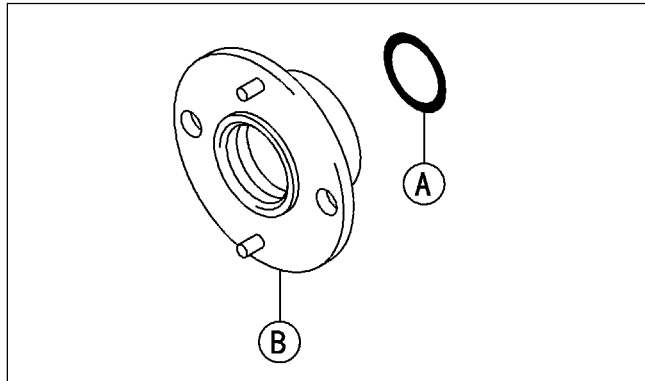
KX358

12. Install a new O-ring (A) in the collar (B); then apply grease to the O-ring and install the collar into the alternator cover.



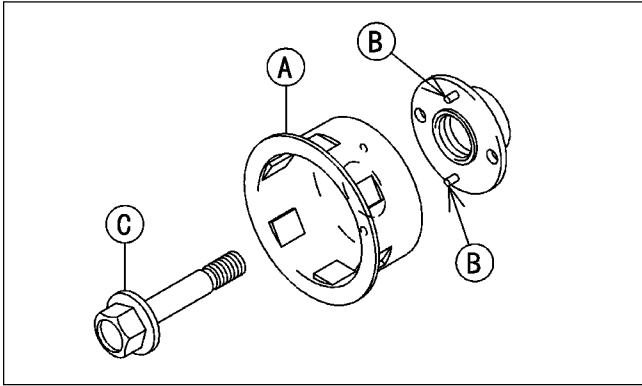
KX356

10. Ensure that the alignment pins (A) are installed; then install the bearing (B).



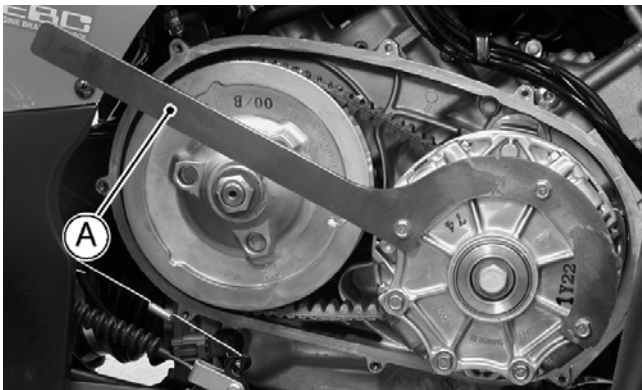
ATV2096

13. Align the holes in the starter cup (A) with the pins (B) in the collar; then hold the drive clutch with the holder and tighten the rotor/flywheel cap screw (C) to specifications.

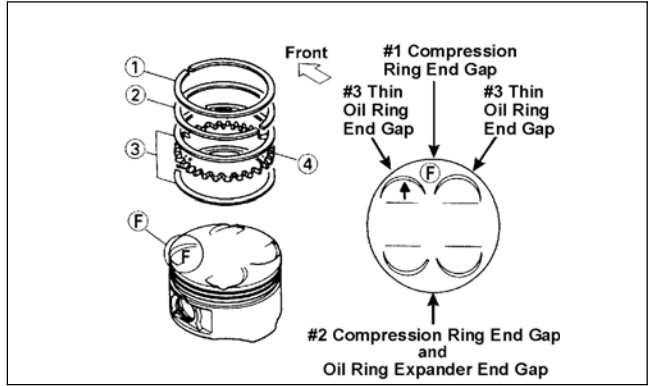


ATV2097

14. Remove the clutch holding tool (A); then reinstall the three cap screws and tighten the drive clutch cover bolts using a crisscross pattern to specifications.

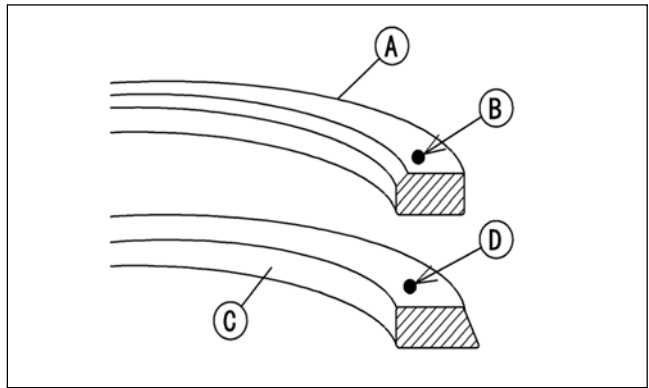


KX359



ATV-1085D

B. Install compression ring #2 (C) so the “RN” mark (D) is up; then install the top compression ring #1 (A) so the “R” mark (B) is up.



ATV2098

Installing Top-Side Components

- A. Piston
- B. Cylinder
- C. Cylinder Heads
- D. Camshafts

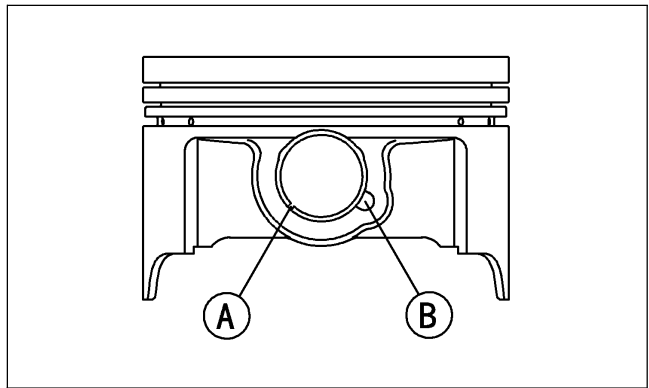
■ **NOTE:** If the piston rings were removed, install them in this sequence.

A. Install ring expander (4) in the bottom groove of the piston; then install the thin oil rings (3) over the expander making sure the expander ends do not overlap. Stagger the end gaps of the upper and lower thin oil rings according to the illustration.

CAUTION
Incorrect installation of the piston rings will result in engine damage.

1. Install the pistons on the connecting rods making sure there is a circlip on each side and the open end of the circlip (A) does not align with the notch (B) in the piston.

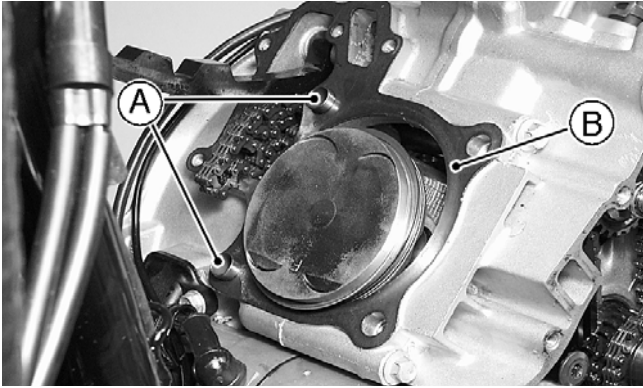
■ **NOTE:** The pistons should be installed so the F is directed toward the front on both front and rear pistons.



ATV2099

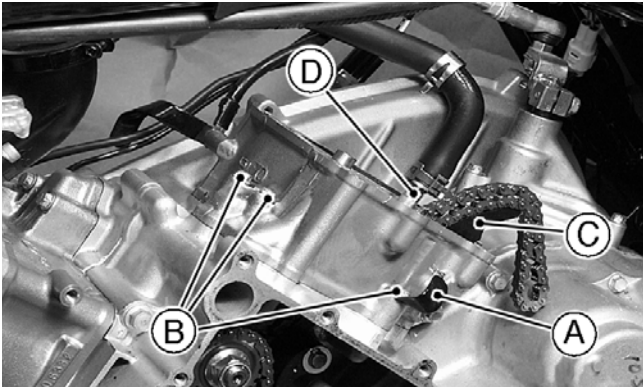
■ **NOTE:** When installing the circlips in the piston, compress them only enough to install. Do not over compress.

2. Install two alignment pins (A) for each cylinder; then position a new base gasket (B) as shown.



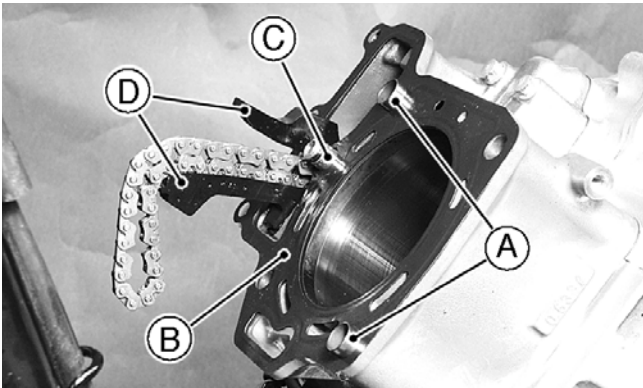
KX360

3. Apply clean engine oil to the piston skirts and cylinder walls; then install the cylinders and clamp (A) (rear only) and tighten the cylinder cap screws (B) to specifications. Install the cam chain guide (C) and the oil pipe (D).



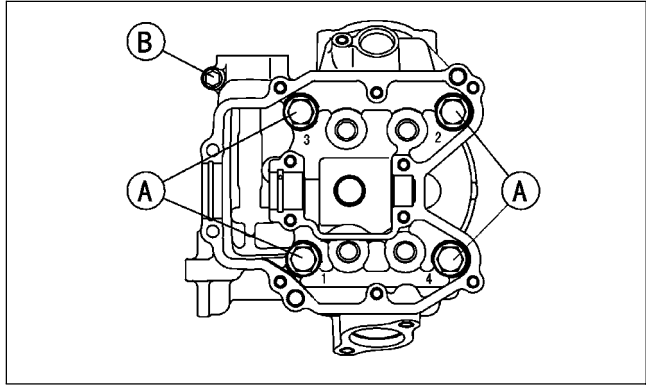
KX361

4. Locate alignment pins (A) as shown; then place a new head gasket (B) into position and install the oil pipe (C) and camshaft chain guides (D).



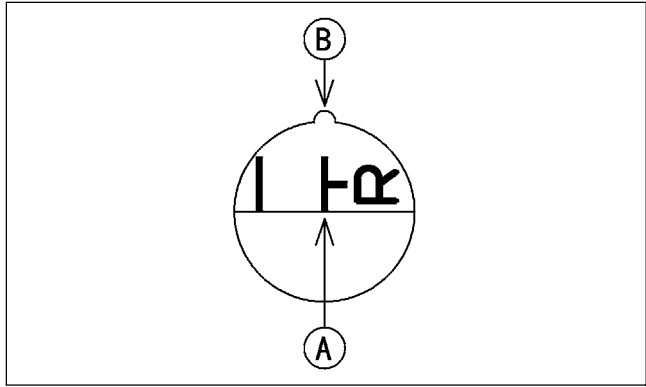
KX362

5. Install the cylinder heads and tighten cap screws (A) in the sequence illustrated to 2.5 kg-m (18 ft-lb); then in the same sequence, tighten to the final value of 5.0 kg-m (36 ft-lb). Tighten cap screw (B) to 1.0 kg-m (7 ft-lb).



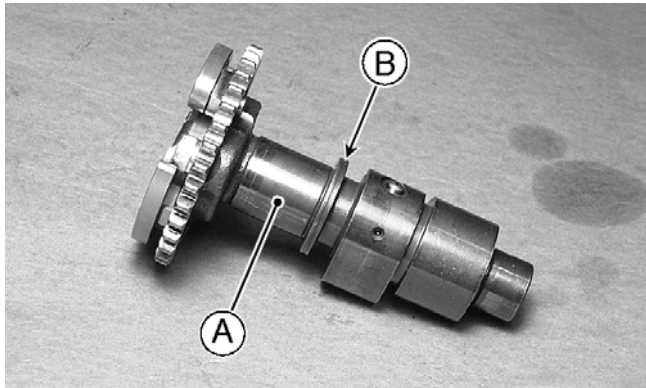
ATV2100

6. Using a wrench on the alternator bolt, turn the crankshaft clockwise to align the "TR" mark (A) with the notch (B) in the inspection window.



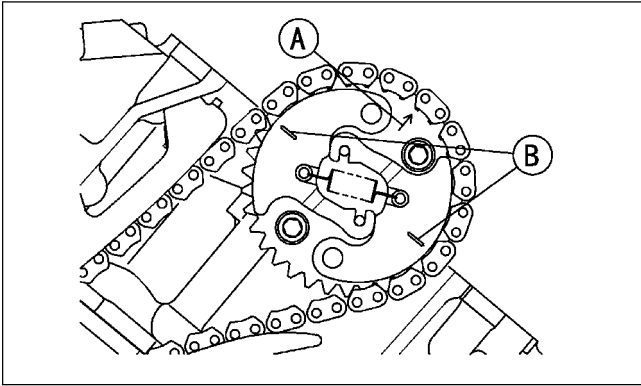
ATV2101

7. Install the rear camshaft (A) identified by the groove (B).



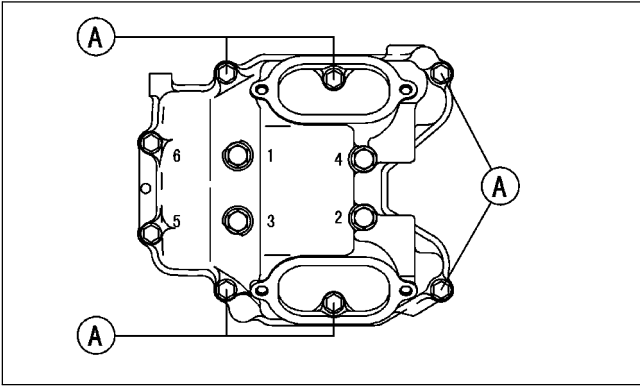
KX363

8. Direct the arrow (A) of the rear camshaft upward (left side view); then engage the rear camshaft sprocket with the chain aligning the index marks (B) with the cylinder head upper surface.



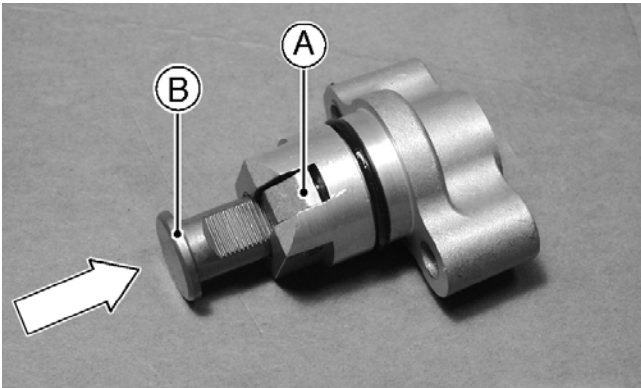
ATV2102

9. Release the ratchet (A) and press the push rod (B) into the camshaft chain tensioner body; then install on the appropriate cylinder and tighten the cap screws to specifications.



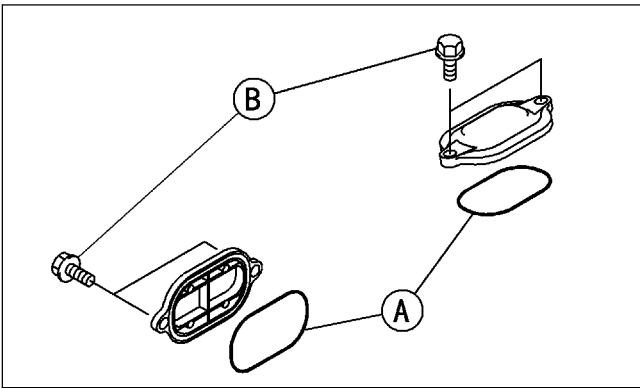
ATV2104

12. Adjust valve clearance (See Section 2); then apply grease to O-rings (A) and install the tappet covers. Tighten the cap screws (B) to specifications.



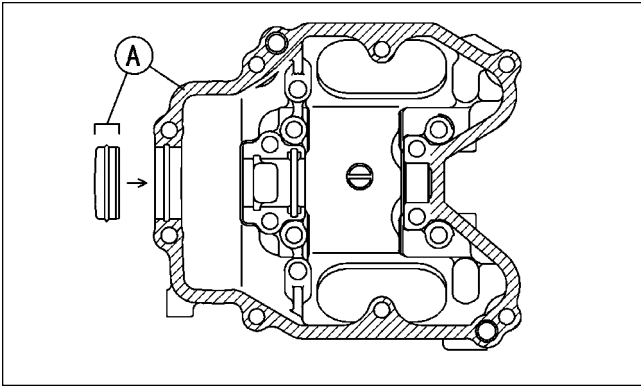
KX364

10. Apply clean engine oil to the camshaft; then apply a thin coat of Three Bond Sealant (p/n 0636-070) (A) to the outer surface of the cap and the upper surface of the cylinder head.



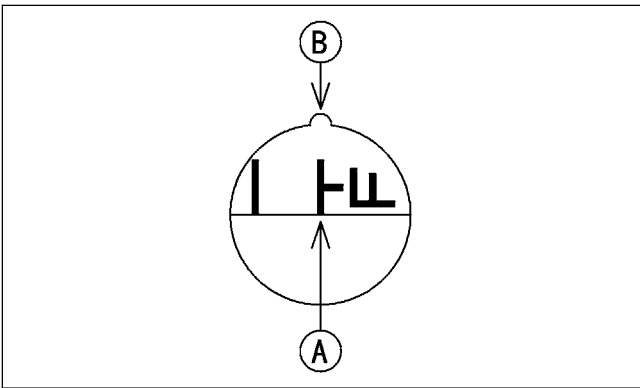
ATV2105

13. Using a wrench on the alternator bolt, turn the crankshaft clockwise 270° and align the "TF" mark (A) with the notch (B) in the inspection window.



ATV2103

11. Install the rocker case making sure that the rocker arms and adjuster screws do not have pressure on them; then tighten the rocker case cap screws as follows: 1-4 with washers, 0.9 kg-m (6.5 ft-lb); 5 and 6, 1.0 kg-m (6.5 ft-lb); (A) 1.0 kg-m (7.0 ft-lb). Use the illustrated tightening sequence for cap screws 1-6.



ATV2106

14. Repeat steps 8-12 for the front camshaft.

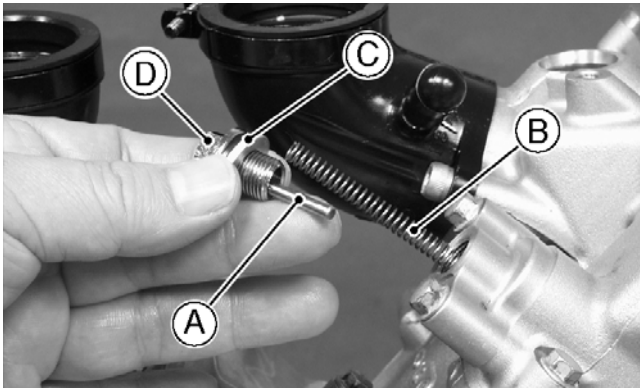
■ **NOTE: All views are from the right side for the front camshaft.**

15. Install pin (A), spring (B), washer (C), and chain tensioner cap bolt (D); then tighten cap bolt to specifications.

Installing Engine/Transmission

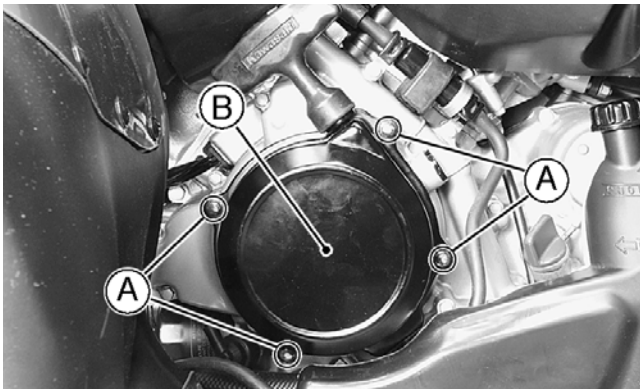
■ **NOTE:** Arctic Cat recommends that new gaskets and O-rings be installed whenever servicing the ATV.

1. Using a suitable lifting device, set the engine/transmission into the frame cradle from the left side; then align the splines of the rear drive shaft coupler and slide the engine/transmission rearward and engage the coupler.



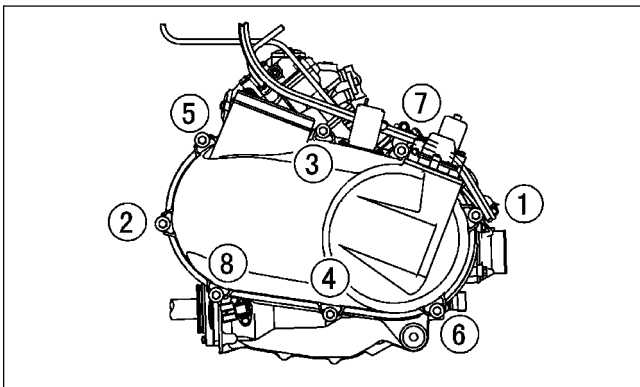
KX365

16. Install the spark plugs (if removed) and tighten to specifications.
17. Install the recoil starter assembly (B) and tighten the cap screws (A) to specifications.

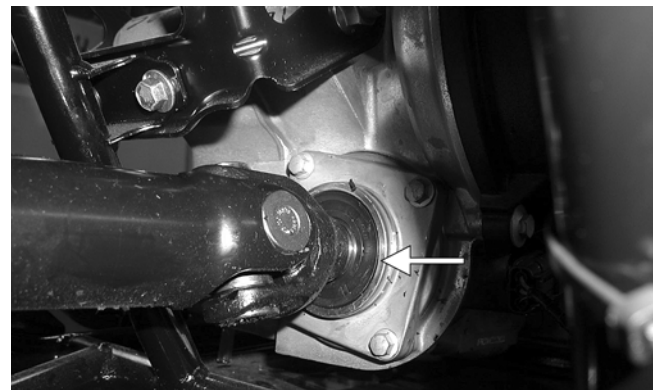


KX366

18. Install the V-belt cover; then tighten the cap screws to specifications in the sequence illustrated.

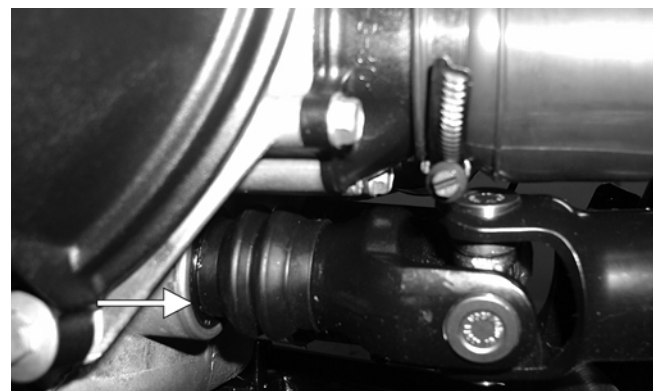


ATV2107



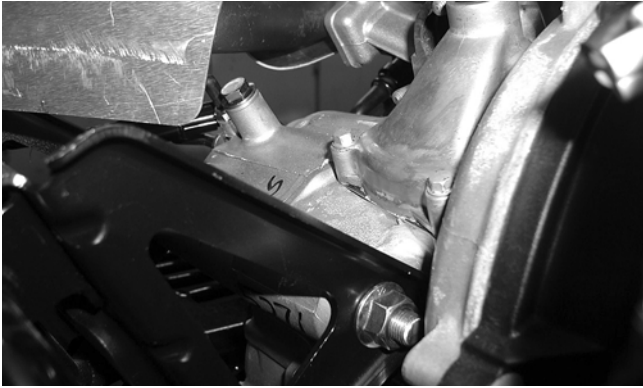
KX078A

2. Raise the front of the engine/transmission sufficiently to enable the front drive coupler to engage the front output shaft; then lower the front of the engine/transmission and engage the coupler. Slide the boot over the yoke.



KX088A

3. Install the rear engine mount bracket to the frame. Do not tighten the bolts at this time.



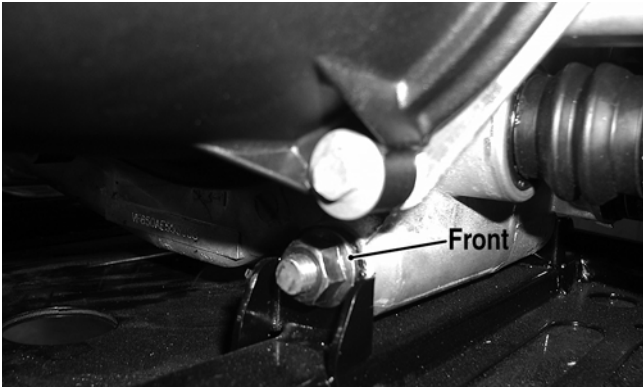
KX090

4. Align the engine with the front mount ears and install the front through-bolt; then install the rear through-bolt.

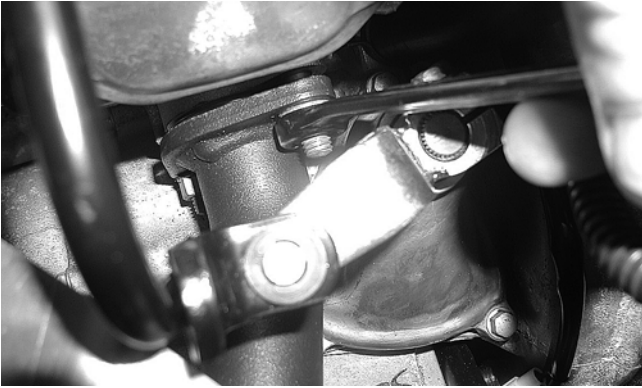


KX076

7. Install the muffler and rear exhaust pipe assembly with a new seal ring and seal bushings; then evenly tighten all the exhaust pipe retainer nuts to specifications.

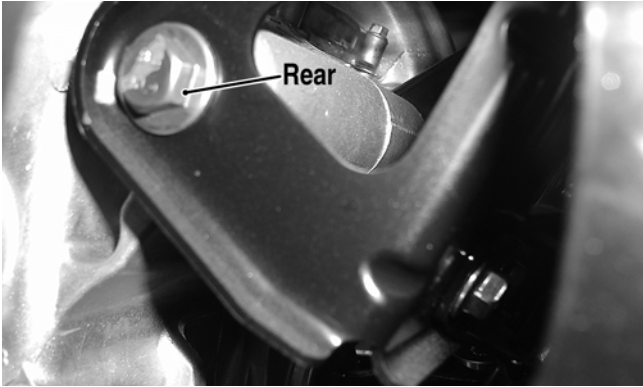


KX089B



KX141

3

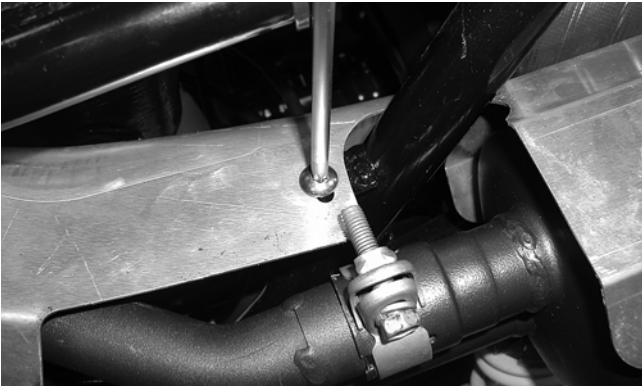


KX069A

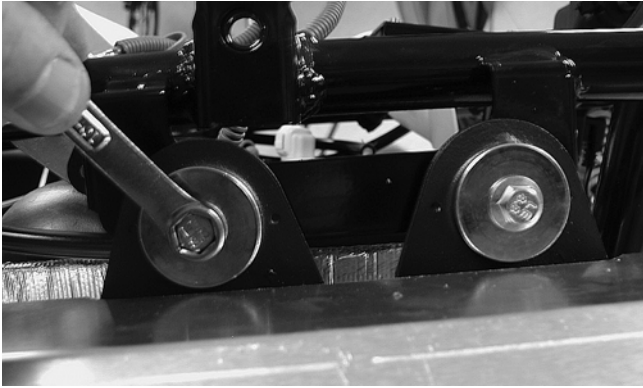
5. Tighten the rear bracket to frame bolts (from step 3) securely; then install the front and rear through-bolt nuts and tighten to specifications.

6. Install the front exhaust pipe with a new seal ring. Do not tighten the retainer nuts at this time.

8. Install all exhaust system heat shields and tighten the mounting screws securely; then install two muffler mounts, hardware, and bolts and tighten securely.

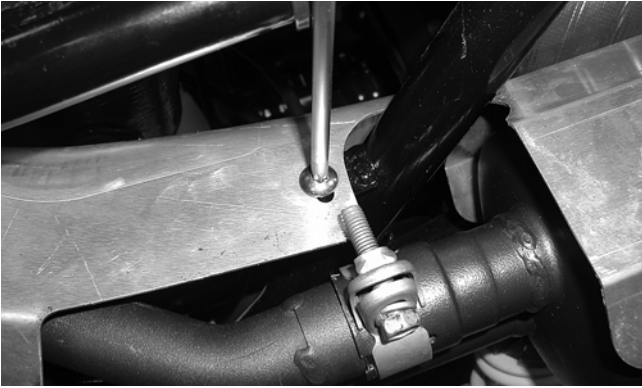


KX123



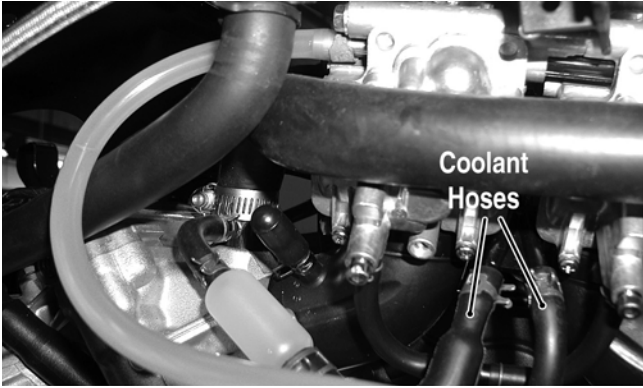
KX126

9. Install the two upper and one lower coolant hoses and tighten the hose clamps securely. Make sure to install the two coolant hoses connected to the carburetors.



KX123

11. Connect the throttle cable and check for proper free-play; then install the cover and tighten the screw securely.



KX086B

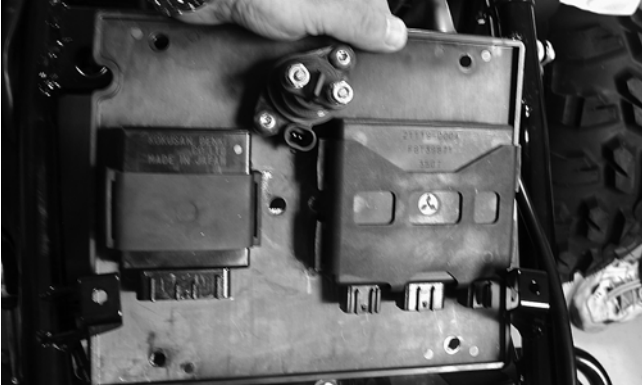
10. Remove the tape or caps from the intake hoses checking for any dirt, hardware items, or liquids; then install the carburetors into the intake hoses and tighten the clamps securely. Make sure the carburetors are securely seated by rocking side to side after installation.



KX136

12. Install the electronics mounting tray with the CDI, starter relay, and EBC module attached; then secure with four mounting screws.

	<p>CAUTION</p>
<p>Make sure to check intake hoses for any foreign matter. Severe engine damage will occur if liquids or hardware items are ingested at start-up.</p>	

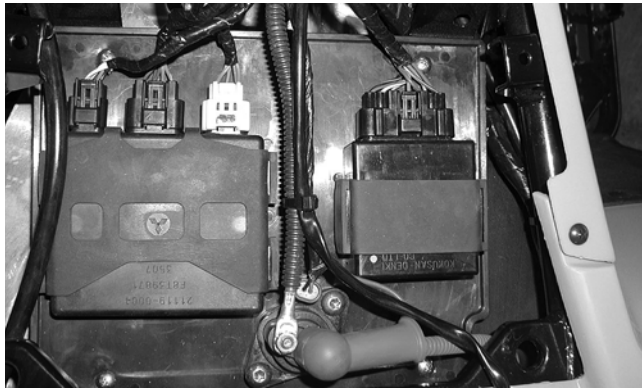


KX130

13. Connect the four disconnect plugs as shown; then connect the battery positive cable and starter lead to the starter relay.

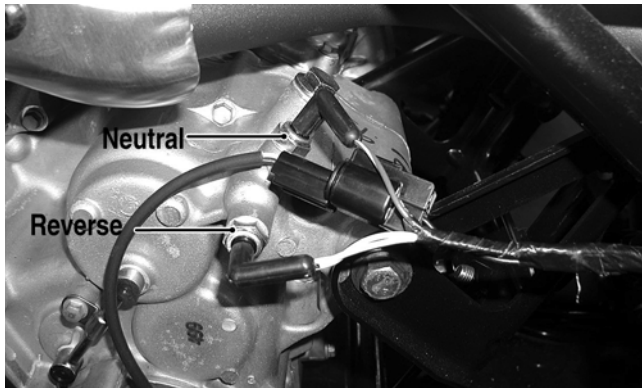


KX122



KX074

14. Connect the starter cable to the starter lug and tighten securely.
15. Connect the alternator and pick-up coil leads; then attach the reverse indicator lead and neutral indicator lead to the switches.



KX075B

16. Connect the speed sensor, forward/reverse sensor lead, and oil pressure warning lead; then connect the drive belt failure detector lead and the engine brake control servo lead to the main harness. Connect the spark plug wires.
17. Remove the tape from the carburetor inlets checking for any foreign material; then using red Loctite #271, install the lower air cleaner housing and tighten the mounting screws securely.

18. Install the air filter and air filter cover.



KX119



KX118

19. Install the left footrest; then tighten the 10 mm cap screws to specifications and the 8 mm cap screws to specifications.
20. Install all fenders, side panels, and racks that were removed; then install the storage compartment cover.
21. Install the battery by connecting the positive cable first; then connecting the negative cable.
22. Install the seat making sure it is properly secured.
23. Fill with recommended oil and coolant. See Section 2.

NOTES



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