

CHAPTER 5

ENGINES

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ENGINES Engine Specifications

1985 Models

Machine Model	Engine Model	Cyl. Disp. CC's	Bore MM	Bore Inches	Stroke MM	Stroke Inches	No. of Cyl.	Type of Cooling
Star	EC25PS-06	244	72	2.8346	60	2.362	1	Fan
SS	EC44-2PM-3100	432	67.72	2.6557	60	2.362	2	Fan
Indy Trail	EC44-2PM-2100	432	67.72	2.6557	60	2.362	2	Fan
Indy 400	EC40PL-02	398	65	2.559	60	2.362	2	Liquid
Indy 600	EC60PL-02	597	65	2.559	60	2.362	3	Liquid
Long Track	EC44-2PM-5000	432	67.72	2.6557	60	2.362	2	Fan

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance +.002"	Engine Operating RP +200 RPM	Recommended Idle RPM
EC25PS-06	26.5	23.7	*(2) 2.0 mm Plain	.006	6300	2100
EC44-2PM-3100	22.6	21.0	*(1) 1.5 mm Keystone	.006	6000	2300
EC44-2PM-2100	22.6	21.0	*(1) 1.5 mm Keystone	.006	6800	2300
EC44-2PM-5000	26.1	24.5	*(2) 1.5 mm Keystone	.006	6300	2300
EC40PL-02	19.0	19.0	*(1) 1.2 mm Keystone	.005 +.002 −.001	7800	1900
EC60PL-02	19.2	19.2	*(1) 1.2 mm Keystone	.0055	7800	1900
	Compressed Gasket Thickness 1.45mm			+.002 −.001		

*Piston ring end gap all engines .20 mm - .45 mm (.008" - .018")

ENGINES **Engine Specifications**

1986 Models

Machine Model	Engine Model	Cyl. Disp. CC's	Bore MM	Bore Inches	Stroke MM	Stroke Inches	No. of Cyl.	Type of Cooling
Star, StarTrak	EC25PS-06	244	72	2.8346	60	2.362	1	Fan
Sprint (ES)	EC34-2PM-01/02	339	62	2.4410	55.6	2.1886	2	Fan
SS	EC44-2PM-3100	432	67.72	2.6557	60	2.362	2	Fan
Indy Trail	EC50PM-01	488	72	2.8346	60	2.362	2	Fan
Indy 400	EC40PL-02	398	65	2.559	60	2.362	2	Liquid
Indy 600 (LE)	EC60PL-02	597	65	2.559	60	2.362	3	Liquid
Long Trak	EC44-2PM-5100	432	67.72	2.6557	60	2.362	2	Fan

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance +.002"	Engine Operating RP +200 RPM	Recommended Idle RPM
EC25PS-06	26.5	23.7	*(2) 2.0 mm Plain	.006	6300	2100
EC34-2PM-01/02	21.0	17.2	*(1) 1.5 mm Keystone	.005	6500	2100
EC44-2PM-3100	22.6	21.0	*(1) 1.5 mm Keystone	.006	6000	2300
EC44-2PM-5100	26.1	24.5	*(2) 1.5 mm Keystone	.006	6300	2300
EC50PM-01	26.6	24.0	*(2) 1.5 mm Keystone	.0055	7000	1900
EC40PL-02	19.0	19.0	*(1) 1.2 mm Keystone	.005 +.002 -.001	7800	1900
EC60PL-02	19.2	19.2	*(1) 1.2 mm Keystone	.0055	7800	1900
	Compressed Gasket Thickness 1.45mm			+.002 -.001		

*Piston ring end gap all engines .20 mm - .45 mm (.008" - .018")

ENGINES Engine Specifications

1987 Models

Machine Model	Engine Model	Cyl. Disp. CC's	Bore MM	Bore Inches	Stroke MM	Stroke Inches	No. of Cyl.	Type of Cooling
Star, StarTrak	EC25PS-06	244	72	2.8346	60	2.362	1	Fan
Sprint (ES)	EC34-2PM-01/02	339	62	2.4410	55.6	2.1886	2	Fan
Indy Sport	EC34-2PM-03	339	62	2.4410	55.6	2.1886	2	Fan
Indy Trail (All)	EC50PM-01/02	488	72	2.8346	60	2.362	2	Fan
Indy 400	EC40PL-02	398	65	2.559	60	2.362	2	Liquid
Indy 600	EC60PL-02	597	65	2.559	60	2.362	3	Liquid
Long Trak (RLR)	EC44-2PM-5100	432	67.72	2.6557	60	2.362	2	Fan

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance +.002"	Engine Operating RP +200 RPM	Recommended Idle RPM
EC25PS-06	26.5	23.7	*(2) 2.0 mm Plain	.006	6300	2100
EC34-2PM-01/02	21.0	17.2	*(1) 1.5 mm Keystone	.005	6500	2100
EC34-2PM-03	21.0	17.2	*(1) 1.5 mm Keystone	.005	6500	2100
EC44-2PM-5100	26.1	24.5	*(2) 1.5 mm Keystone	.006	6300	2300
EC50PM-01/02	26.6	24.0	*(2) 1.5 mm Keystone	.0055	7000	1900
EC40PL-02	20.85	22.05	*(1) 1.2 mm Keystone	.005 +.002 −.001	7800	1900
EC60PL-02	19.5	19.5	*(2) 1.2 mm Keystone	.0055	7800	1900
	Compressed Gasket Thickness 1.45mm			+.002 −.001		

*Piston ring end gap all engines .20 mm - .45 mm (.008" - .018")

ENGINES **Engine Specifications**

1988 Models

Machine Model	Engine Model	Cyl. Disp. CC's	Bore MM	Bore Inches	Stroke MM	Stroke Inches	No. of Cyl.	Type of Cooling
Star, StarTrak	EC25PS-06	244	72	2.8346	60	2.362	1	Fan
Sprint (ES)	EC34-2PM-02	339	62.3	2.4546	55.6	2.1886	2	Fan
Indy Sport	EC34-2PM-03	339	62.3	2.4546	55.6	2.1886	2	Fan
Indy Trail (All)	EC50PM-01/02	488	72	2.8346	60	2.362	2	Fan
Indy 400 (All)	EC40PL-02/03	398	65	2.559	60	2.362	2	Liquid
Indy 650 (All)	EC65PL-01	648	67.72	2.668	60	2.362	3	Liquid
Long Trak (RLR)	EC44-2PM-4100	432	67.72	2.6557	60	2.362	2	Fan

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance +.002"	Engine Operating RP +200 RPM	Recommended Idle RPM
EC25PS-06	26.5	23.7	*(2) 2.0 mm Plain	.006	6300	2100
EC34-2PM-02	21.0	17.2	*(1) 1.5 mm Keystone	.005	6500	2100
EC34-2PM-03	21.0	17.2	*(1) 1.5 mm Keystone	.005	6500	2100
EC44-2PM-4100	22.6	21.8	*(2) 1.5 mm Keystone	.006	6300	2300
EC50PM-01/02	26.6	24.0	*(2) 1.5 mm Keystone	.0055	7000	1900
EC40PL-02/03	19.5	20.7	*(1) 1.2 mm Keystone	.0050 +.002 −.001	8000	1900
EC65PL-01	21.5	21.0	*(2) 1.2 mm Keystone	.0055	7800	1900
	Compressed Gasket Thickness 1.45mm			+.002 −.001		

*Piston ring end gap all engines .20 mm - .45 mm (.008" - .018")

ENGINES Engine Specifications

1989 Models

Machine Model	Engine Model	Cyl. Disp. CC's	Bore MM	Bore Inches	Stroke MM	Stroke Inches	No. of Cyl.	Type of Cooling
Star, StarTrak	EC25PS-06	244	72	2.8346	60	2.362	1	Fan
Sprint (ES)	EC34-2PM-02	339	62.3	2.4546	55.6	2.1886	2	Fan
Indy Sport	EC34-2PM-03	339	62.3	2.4546	55.6	2.1886	2	Fan
Indy Trail (All)	EC50PM-01/02/03	488	72	2.8346	60	2.362	2	Fan
Indy 400 (All)	EC40PL-02	398	65	2.559	60	2.362	2	Liquid
Indy 500 (All)	EC50PL-01/02	488	72	2.8346	60	2.362	2	Liquid
Indy 650 (All)	EC65PL-01	648	67.72	2.668	60	2.362	3	Liquid
Long Trak (RLR)	EC44-2PM-4100	432	67.72	2.6557	60	2.362	2	Fan

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance +.002"	Engine Operating RP +200 RPM	Recommended Idle RPM
EC25PS-06	26.5	23.7	*(2) 2.0 mm Plain	.006	6300	2100
EC34-2PM-02	21.0	17.2	*(1) 1.5 mm Keystone	.005	6500	2100
EC34-2PM-03	21.0	17.2	*(1) 1.5 mm Keystone	.005	6500	2100
EC44-2PM-4100	22.6	21.8	*(2) 1.5 mm Keystone	.005	6300	2300
EC50PM-01/02	26.6	24.0	*(2) 1.5 mm Keystone	.0055	7000	1600
EC50PM-03	31.2	28.6	*(2) 1.5 mm Keystone	.0055	6600	1600
EC40PL-02	19.5	20.7	*(1) 1.2 mm Keystone	.0050 +.002 -.001	8000	1900
EC50PL-01/02	23.4	23.5	*(2) 1.5 mm Keystone	.0042	7800 7000	1900
EC65PL-01	21.5	21.0	*(2) 1.2 mm Keystone	.0055	7800	1900

*Piston ring end gap all engines .20 mm - .45 mm (.008" - .018")

ENGINES **Engine Specifications**

1990 Models

Machine Model	Engine Model	Cyl. Disp. CC's	Bore MM	Bore Inches	Stroke MM	Stroke Inches	No. of Cyl.	Type of Cooling
Star, StarTrak	EC25PS-06	244	72	2.8346	60	2.362	1	Fan
Sprint (ES)	EC34-2PM-02	339	62.3	2.4546	55.6	2.1886	2	Fan
Indy Sport	EC34-2PM-03	339	62.3	2.4546	55.6	2.1886	2	Fan
Indy Trail (All)	EC50PM-01/02/03	488	72	2.8346	60	2.362	2	Fan
Indy 400 (All)	EC40PL-02	398	65	2.559	60	2.362	2	Liquid
Indy 500 (All)	EC50PL-01/02/03	488	72	2.8346	60	2.362	2	Liquid
Indy 650 (All)	EC65PL-01	648	67.72	2.668	60	2.362	3	Liquid

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance +.002"	Engine Operating RP +200 RPM	Recommended Idle RPM
EC25PS-06	26.5	23.7	*(2) 2.0 mm Plain	.0040-.0065	6300	2100
EC34-2PM-02	21.0	17.2	*(1) 1.5 mm Keystone	.0035-.0055	6500	2100
EC44-2PM-03	21.0	17.2	*(1) 1.5 mm Keystone	.0035-.0055	6500	2100
EC50PM-01/02	26.6	24.0	*(2) 1.5 mm Keystone	.0040-.0065	7000	1600
EC50PM-03	31.2	28.6	*(2) 1.5 mm Keystone	.0040-.0065	6600	1600
EC40PL-02	19.5	20.7	*(1) 1.2 mm Keystone	.0050-.0055	8000	1900
EC50PL-01/02 EC50PL-03	23.4	23.5	*(2) 1.5 mm Keystone	.0025-.0045	7800 7000	1900
EC65PL-01	21.5	21.0	*(2) 1.2 mm Keystone	.0035-.0060	7800	1900

*Piston ring end gap all engines .20 mm - .45 mm (.008" - .018")

ENGINES Engine Specifications

1991 Models

Machine Model	Engine Model	Cyl. Disp. CC's	Bore MM	Bore Inches	Stroke MM	Stroke Inches	No. of Cyl.	Type of Cooling
StarLite	EC25PS-07	244	72	2.8346	60	2.362	1	Fan
Indy Lite	EC34-2PM-03	339	62.3	2.4546	55.6	2.1886	2	Fan
Indy Sport/GT	EC44-3PM-01	432	67.72	2.668	60	2.362	2	Fan
Indy Trail (All)	EC50PM-01/02/03	488	72	2.8346	60	2.362	2	Fan
Indy 400 (All)	EC40PL-02	398	65	2.559	60	2.362	2	Liquid
Indy 500 (All)	EC50PL-01/02/03	488	72	2.8346	60	2.362	2	Liquid
Indy 650 (All)	EC65PL-02/03	648	67.72	2.668	60	2.362	3	Liquid

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance +.002"	Engine Operating RP +200 RPM	Recommended Idle RPM
EC25PS-07	26.5	23.7	*(2) 2.0 mm Plain	.0040-.0065	6300	1200
EC34-2PM-03	21.0	17.2	*(1) 1.5 mm Keystone	.0035-.0055	6500	2100
EC44-3PM-01	28.6	23.0	*(2) 1.5 mm Keystone	.0035-.0055	6500	2100
EC50PM-01/02	26.6	24.0	*(2) 1.5 mm Keystone	.0040-.0065	7000	1600
EC50PM-03	31.2	28.6	*(2) 1.5 mm Keystone	.0040-.0065	6600	1600
EC40PL-02	19.5	20.7	*(1) 1.2 mm Keystone	.005-.0055	8000	1900
EC50PL-01/02 EC50PL-03	23.4	23.5	*(2) 1.5 mm Keystone	.0025-.0045	7800 7000	1900
EC65PL-01/03	21.5	21	*(2) 1.2 mm Keystone	.0035-.0060	7800	1900

*Piston ring end gap all engines .20 mm - .45 mm (.008" - .018")

ENGINES

Engine Specifications

1992 Models

Machine Model	Engine Model	Cyl. Disp. CC's	Bore MM	Bore Inches	Stroke MM	Stroke Inches	No. of Cyl.	Type of Cooling
StarLite	EC25PS-07	244	72	2.8346	60	2.362	1	Fan
Indy Lite/GT/ Deluxe	EC34-2PM-02/03/04	339	62.3	2.4546	55.6	2.1886	2	Fan
Indy Sport/GT	EC44-3PM-01	432	67.72	2.668	60	2.362	2	Fan
Indy Trail (All)	EC50PM-01/02/03	488	72	2.8346	60	2.362	2	Fan
Indy 440 XCR/440	EC45PL-01/02	432	67.72	2.668	60	2.362	2	Liquid
Indy 500 (All)	EC50PL-04/05/06/07	488	72	2.8346	60	2.362	2	Liquid
Indy 650 (All)	EC65PL-02/03	648	67.72	2.668	60	2.362	3	Liquid

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance +.002"	Engine Operating RP +200 RPM	Recommended Idle RPM
EC25PS-07	26.5	23.7	*(2) 2.0 mm Plain	.0040-.0065	6300	1200
EC34-2PM-02/03/04	21.1	17.3	*(1) 1.5 mm Keystone	.0035-.0055	6500	2100
EC44-3PM-01	28.6	23.0	*(2) 1.5 mm Keystone	.0035-.0055	6500	2100
EC50PM-01/02	26.6	24.0	*(2) 1.5 mm Keystone	.0040-.0065	7000	1600
EC50PM-03	31.2	28.6	*(2) 1.5 mm Keystone	.0040-.0065	6600	1600
EC45PL-01/02	26.4	21.0	*(1) 1.2 mm Keystone	.0035-.0055	8000	1900
EC50PL-04/05/07 EC50PL-06	23.5	23.5	*(2) 1.2 mm *(2) 1.5 mm Keystone	.0035-.005 .0025-.004	7800 7000	1900
EC65PL-01/03	21.4	20.4	*(2) 1.2 mm Keystone	.0050-.0070	7800	1900

*Piston ring end gap all engines .20 mm - .45 mm (.008" - .018")

ENGINES Engine Specifications

1993 Models

Machine Model	Engine Model	Cyl. Disp. CC's	Bore MM	Bore Inches	Stroke MM	Stroke Inches	No. of Cyl.	Type of Cooling
StarLite	EC25PS-07	244	72	2.8346	60	2.362	1	Fan
Indy Lite/GT/ Deluxe	EC34-2PM-02/04	339	62.3	2.4546	55.6	2.1886	2	Fan
Indy Sport/Trail Deluxe	EC44-3PM-01	432	67.72	2.668	60	2.362	2	Fan
Indy Trail (All)/WideTrak	EC50PM-01/03	488	72	2.8346	60	2.362	2	Fan
Indy 440 XCR/440	EC45PL-01/02	432	67.72	2.668	60	2.362	2	Liquid
Indy 500 (All)	EC50PL-04/05/06/07	488	72	2.8346	60	2.362	2	Liquid
Indy XLT (All)	EC58-PL-01	579	64	2.519	60	2.362	3	Liquid
Indy 650 (All)	EC65PL-05	648	67.72	2.668	60	2.362	3	Liquid
Indy Storm	EC75PL-01	744	69.72	2.744	65	2.559	3	Liquid

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance +.002"	Engine Operating RP ± 200 RPM	Recommended Idle RPM
EC25PS-07	26.5	23.7	*(2) 2.0 mm Plain	.0040-.0065	6300	1200
EC34-2PM-02/04	21.1	17.3	*(1) 1.5 mm Keystone	.0035-.0055	6500	2100
EC44-3PM-01	28.6	23.0	*(2) 1.5 mm Keystone	.0035-.0055	6500	2100
EC50PM-01/03	31.2	28.6	*(2) 1.5 mm Keystone	.0040-.0065	6600	1600
EC45PL-01/02	26.4	21.0	*(2) 1.2 mm Keystone	.0035-.0055	8000	1900
EC50PL-04/05/07 EC50PL-06	23.5	23.5	*(2) 1.2 mm *(2) 1.5 mm Keystone	.0035-.005 .0025-.004	7800 7000	1900
EC58PL-01	23.5	25.4	*(2) 1.2 mm Keystone	.0035-.0055	8000	1900
EC65PL-05	21.4	20.4	*(2) 1.2 mm Keystone	.0050-.0070	7800	1900
EC75PL-01	30.5	24.8	*(2) 1.2 mm Keystone	.0045-.0055		1900

*Piston ring end gap all engines .20 mm - .45 mm (.008" - .018")

ENGINES **Engine Specifications**

1994 Models

Machine Model	Engine Model	Cyl. Disp. CC's	Bore MM	Bore Inches	Stroke MM	Stroke Inches	No. Of Cyl.	Type of Cooling
StarLite/GT	EC25PS-07	244	72	2.8346	60	2.362	1	Fan
Indy Lite/GT/ Deluxe	EC342PM-02/04	339	62.3	2.4546	55.6	2.1886	2	Fan
Indy Super Sport Indy Sport/SKS	EC44-3PM-01/02	432	67.72	2.668	60	2.362	2	Fan
Indy Trail (All)/WideTrak	EC50PM-01/02/03	488	72	2.8346	60	2.362	2	Fan
Indy 440/SKS XCR/440	EC45PL-01/02	432	67.72	2.668	60	2.362	2	Liquid
Indy 500 (All)	EC50PL-05/06/07/08	488	72	2.8346	60	2.362	2	Liquid
Indy XLT/SP/SKS	EC58PL-01	579	64	2.521	60	2.362	3	Liquid
Indy RXL/Touring	EC65PL-05/06	648	67.72	2.668	60	2.362	3	Liquid
Indy Storm/SKS	EC80PL-01	794	72	2.8346	65	2.561	3	Liquid

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance +.002"	Engine Operating RPM ± 200 RPM	Recommended Idle RPM
EC25PS-07	26.5	23.7	(2) 2.0 mm Keystone	.0040-.0065	6300	1200
EC34-2PM-02/04	21.1	17.3	(2) 1.5 mm Keystone	.0035-.0055	7000	2100
EC44-3PM-01/02	28.6	23.0	(2) 1.5 mm Keystone	.0035-.0055	6800	2100
EC50PM-01/02/03	31.2 (02) 26.7(01/03)	28.6 (02) 24.1(01/03)	(2) 1.5 mm Keystone	.0040-.0065	6600	1600
EC45PL-01/02	26.4	21.0	(2) 1.2 mm Keystone	.0035-.0055	8000	1900
EC50PL-05/06/07/08	23.6	23.6	(2) 1.2/1.5 mm Keystone	.0035-.005 *.0025-.004	8000/07 7750/05/08 7000/06	1900
EC58PL-01	23.5	25.4	(2) 1.2 mm Keystone	.0035-.0055	8000	1900
EC65PL-05	21.4	20.4	(2) 1.2 mm Keystone	.0050-.0070	8000	1900
EC80PL-01	28.1	26.6	(2) 1.2 mm Keystone	.0045-.0065	8250	1900

Piston ring end gap all engines except EC80PL-01 .20 mm - .5 mm (.008" - .020")

Piston ring end gap EC80PL-01 engines .36 mm - .62 mm

ENGINES Engine Specifications

1995 Models

Machine Model	Engine Model	Cyl. Disp. CC's	Bore MM	Bore Inches	Stroke MM	Stroke Inches	No. Of Cyl.	Type of Cooling
StarLite	EC25PS07	244	72	2.8346	60	2.362	1	Fan
Indy Lite/GT/ Deluxe	EC34-2PM02/E02	339	62.3	2.4546	55.6	2.1886	2	Fan
Indy Super Sport Indy Sport/SKS	EC44-3PM01/02	432	67.72	2.668	60	2.362	2	Fan
Indy Trail (All)/WideTrak	EC50PM03/04/E04	488	72	2.8346	60	2.362	2	Fan
Indy 440/SKS XCR/440	EC45PL02 03	432 439	67.72 68.25	2.668 2.689	60	2.362	2	Liquid
Indy 500 (All)	EC50PL04/E04/06/07	488	72	2.8346	60	2.362	2	Liquid
Indy XLT/SP/SKS	EC58PL02/03/04	596	65	2.561	60	2.362	3	Liquid
Indy RXL/Touring	EC65PL05/E05	648	67.72	2.668	60	2.362	3	Liquid
Indy Storm/SKS	EC80PL	794	72	2.8346	65	2.561	3	Liquid

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance +.002"	Engine Operating RPM ± 200 RPM	Recommended Idle RPM
EC25PS07	26.5	23.7	(2) 2.0 mm Keystone	.0040-.0065	6300	1200
EC34-2PM02E02	21.1	17.3	(2) 1.5 mm Keystone	.0035-.0055	7000	1600
EC44-3PM01/02	28.6	23.0	(2) 1.5 mm Keystone	.0035-.0055	6800/01 7000/02	1600
EC50PM03/04E04	31.2 (03) 26.7(04)	28.6 (03) 24.1(04)	(2) 1.5 mm Keystone	.0040-.0065	6600/03 7000/04	1600
EC45PL02/ 03	25.8	21.1 19.0	(2) 1.2 mm Keystone	.0035-.0055	8000	1900
EC50PL04E04/07 06	23.6	23.6	(2) 1.2 mm (2) 1.5 mm Keystone	.0035-.005 .0025-.004	8000/07 7750/04 7000/06	1600
EC58PL02 03/04		17.1 19.1	(2) 1.2 mm Keystone	.0035-.0055	8500 8250	1900
EC65PL05	21.4	20.4	(2) 1.2 mm Keystone	.0050-.0070	8000	1900
EC80PL02	28.1	24.9 26.6 mag	(2) 1.2 mm Keystone	.0045-.0065	8250	1900

Piston ring end gap all engines except EC80PL-01 .20 mm - .45 mm (.008" - .020")

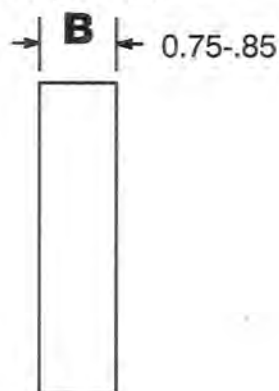
Piston ring end gap EC80PL01 engines .36 mm - .62 mm

ENGINES **Engine Specifications**

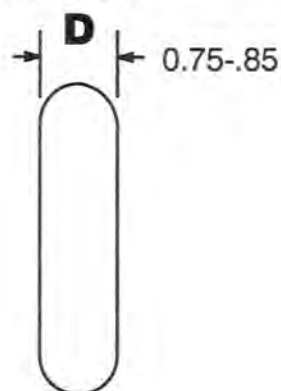
Piston Identification

Piston Retainer Groove (Dimensions MM)

Spiral Clip Groove MM



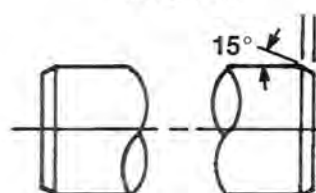
C-Clip Groove MM



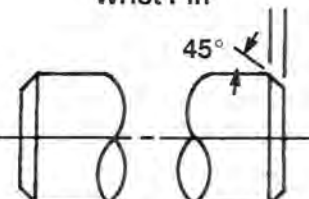
Usage Clarification

Model	1984/85	1985/86	1986/87	1987-Current
EC44-2PM	B	B	D	D
EC44-3PM	—	—	—	D
EC50PM	B	B	B,D	D
EC40PL	B	B	B,D	D
EC45/50PL	—	—	—	D
EC60PL	B	B	B,D	D
EC58/65/75/80PL	—	—	—	D

Spiral Style
Wrist Pin



C-Clip Style
Wrist Pin



CAUTION: Do not use C-clip retainers in spiral clip style pistons, or spiral clip retainers in C-clip style pistons. Severe cylinder damage will result.

CAUTION: Do not use C-clip style wrist pins (with 45° chamfer) with spiral style piston retainer groove. Severe cylinder damage will result. Spiral style wrist pin may be used in either style piston.

Spiral Clip Pistons

Motor Model	Standard	Piston Mark	.010" Oversize	Piston Mark	.020" Oversize	Piston Mark
EC44-2PM 1100,2100,4100 Piston Height=68 mm	3083090	M1	N/A	—	3083173	50M1
EC44-2PM 3100,5000,5100 Piston Height=70 mm	3083159	M2	N/A	—	3083174	50M2
EC50PM	3083545	M	N/A	—	3083716	50M
EC40PL	3083681	4L	3083303	4L25	3083720	4L5
EC60PL	3083348	6L	3083292	6L25	3083293	6L5

C-clip Pistons

Motor Model	Standard	Piston Mark	.010" Oversize	Piston Mark	.020" Oversize	Piston Mark	C Clip
EC44-2PM 1100,2100,4100 Piston Height=68 mm	3083882 3083880	M3,M1 M5	N/A N/A	— —	3083881 3083895	50M3,50M1 50M5	3083839
EC44-2PM 3100,5000,5100 Piston Height=70 mm	3083789	M4,M2	N/A	—	3083791	50M4,50M2	3083839
EC44-3PM-01	3084239	M6	3084240	25M6	3084241	50M6	3083839
EC50PM-01-02	3083841	M1,M	3083902	4W25	3083842	50M1,50M	3083839
EC50PM-03	3083954	M2	3083943	5W25	3083975	50M2	3083839
EC40PL	3083848	4A,4L	3083877	4A25, 4L25	3083878	4A5,4L5	3083839
EC45PL01/02/03	3084326	45A	3084327	45A25	3084328	45A50	3083839
EC45PL05	TBA	455A	TBA	455A25	TBA	455A50	3084167
EC50PL-01-02	3083901	1.5" 4W	3083902	1.5" 4W25	3083903	1.5" 4W50	3083839
EC50PL-04-05-07	3084339	1.2" 5A/5B	3084340	1.2" 5A/B25	3084341	1.2" 5A/B50	3083839
EC50PL-03-06	3083942	5W	3083943	5W25	3083944	5W50	3083839
EC60PL	3083883	6A,6L	3083884	6A25, 6L25	3083885	6A5,6L5	3083839
EC58PL-01	3084449	58B	3084450	58B25	3084451	58B50	3084456
EC58PL-02 EC58PL-03	3085018	58E 58E	3085019	58E25 58E25	3085020	58E50 58E50	3084456
EC65PL	3083857	65E	3083875	65E25	3083876	65EC50	3083839
EC75PL-01	3084575	75PL	3084576	75PL25	3084577	75PL50	3083839
EC80PL-01	3085030	80B	3085027	80B25	3085028	80B50	3084167

*Ring face width in mm.

CAUTION: Be sure to install the proper piston C Clip in the engine.

There are two types of 18mm C Clips. Some engines use an 18mm C Clip with a 1.2mm wire diameter (PN 3084167). Two examples are the EC80PL01 and the EC45PL05.

The majority of others use 18mm C Clip PN 3083839. This C Clip has a wire diameter of 1.4mm and *must not* be installed in engines requiring the 1.2mm clip. Always refer to the appropriate parts manual or microfiche when ordering C Clips and verify the proper diameter before installation.

ENGINES **Metric Conversion Factors**

Metric - English Conversion

MM	INCHES			MM	INCHES			MM	INCHES			MM	INCHES		
1	0.0394	1/32	+	26	1.0236	1 1/32	-	51	2.0079	2	+	76	2.9921	3	-
2	0.0787	3/32	-	27	1.0630	1 1/16	+	52	2.0472	2 1/16	-	77	3.0315	3 1/32	+
3	0.1181	1/8	-	28	1.1024	1 3/32	+	53	2.0866	2 3/32	-	78	3.0709	3 1/16	+
4	0.1575	5/32	+	29	1.1417	1 5/32	-	54	2.1260	2 1/8	+	79	3.1102	3 1/8	-
5	0.1969	3/16	+	30	1.1811	1 3/16	-	55	2.1654	2 5/32	+	80	3.1496	3 5/32	-
6	0.2362	1/4	-	31	1.2205	1 7/32	+	56	2.2047	2 7/32	-	81	3.1890	3 3/16	+
7	0.2756	9/32	-	32	1.2598	1 1/4	+	57	2.2441	2 1/4	-	82	3.2283	3 7/32	+
8	0.3150	5/16	+	33	1.2992	1 5/16	-	58	2.2835	2 9/32	+	83	3.2677	3 9/32	-
9	0.3543	11/32	+	34	1.3386	1 11/32	-	59	2.3228	2 5/16	+	84	3.3071	3 5/16	-
10	0.3937	13/32	-	35	1.3780	1 3/8	+	60	2.3622	2 3/8	-	85	3.3465	3 11/32	+
11	0.4331	7/16	-	36	1.4173	1 13/32	+	61	2.4016	2 13/32	-	86	3.3858	3 3/8	+
12	0.4724	15/32	+	37	1.4567	1 15/32	-	62	2.4409	2 7/16	+	87	3.4252	3 7/16	-
13	0.5118	1/2	+	38	1.4961	1 1/2	-	63	2.4803	2 15/32	+	88	3.4646	3 15/32	-
14	0.5512	9/16	-	39	1.5354	1 17/32	+	64	2.5197	2 17/32	-	89	3.5039	3 1/2	+
15	0.5906	18/32	-	40	1.5748	1 9/16	+	65	2.5591	2 9/16	-	90	3.5433	3 17/32	+
16	0.6299	5/8	+	41	1.6142	1 5/8	-	66	2.5984	2 19/32	+	91	3.5827	3 19/32	-
17	0.6693	21/32	+	42	1.6335	1 21/32	-	67	2.6378	2 5/8	+	92	3.6220	3 5/8	-
18	0.7087	23/32	-	43	1.6929	1 11/16	+	68	2.6772	2 11/16	-	93	3.6614	3 21/32	+
19	0.7480	3/4	-	44	1.7323	1 23/32	+	69	2.7165	2 23/32	-	94	3.7008	3 11/16	+
20	0.7874	25/32	+	45	1.7717	1 25/32	-	70	2.7559	2 3/4	+	95	3.7402	3 3/4	-
21	0.8268	13/16	+	46	1.8110	1 13/16	-	71	2.7953	2 25/32	+	96	3.7795	3 25/32	-
22	0.8661	7/8	-	47	1.8504	1 27/32	+	72	2.8346	2 27/32	-	97	3.8189	3 13/16	+
23	0.9055	29/32	-	48	1.8898	1 7/8	+	73	2.8740	2 7/8	-	98	3.8583	3 27/32	+
24	0.9449	15/16	+	49	1.9291	1 15/16	-	74	2.9134	2 29/32	+	99	3.8976	3 29/32	-
25	0.9843	31/32	+	50	1.9685	1 31/32	-	75	2.9528	2 15/16	+	100	3.9370	3 15/16	-

Comparing The Most Common Measurement Units

Approximate conversions from Customary to metric and vice versa			
	When you know:	You can find:	If you multiply by:
LENGTH	inches	millimeters	25
	feet	centimeters	30
	yards	meters	0.9
	miles	kilometers	1.6
	millimeters	inches	0.04
	centimeters	inches	0.4
	meters	yards	1.1
	kilometers	miles	0.6
AREA	square inches	square centimeters	6.5
	square feet	square meters	0.09
	square yards	square meters	0.8
	square mile	square kilometers	2.6
	acres	square hectometers (hectares)	0.4
	square centimeters	square inches	0.16
	square meters	square yards	1.2
	square kilometers	square miles	0.4
	square hectometers (hectares)	acres	2.5
MASS	ounces	grams	28
	pounds	kilograms	0.45
	short tons	megagrams (metric tons)	0.9
	grams	ounces	0.035
	kilograms	pounds	2.2
	megagrams (metric tons)	short tons	1.1
LIQUID VOLUME	ounces	milliliters	30
	pints	liters	0.47
	quarts	liters	0.95
	gallons	liters	3.8
	milliliters	ounces	0.034
	liters	pints	2.1
	liters	quart	1.06
	liters	gallons	0.26
TEMP	degrees Fahrenheit	degrees Celsius	5/9 (after subtracting 32)
	degrees Celsius	degrees Fahrenheit	9/5 (then add 32)

To Determine Metric Displacement

$$\begin{aligned} \text{mm Bore} \div 2 &= \\ \times \text{itself, or } \pi &\text{ squared} = \\ \times \pi 3.1416 &= \\ \times \text{mm stroke} &= \\ \div 1000 &= \\ \text{displacement} & \\ \text{of one cylinder} & \\ \text{in cc} & \end{aligned}$$

To Determine Compression Ratio

$$\begin{aligned} \text{Compression Ratio} &= \\ \text{Piston Displacement} + & \\ \text{Installed Head Volume} &\div \\ \text{Installed Head Volume} &= \\ \text{_____} &: 1 \text{ Ratio} \end{aligned}$$

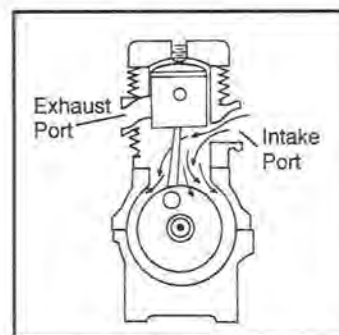
ENGINES

Two Cycle Operation

Polaris snowmobiles are equipped with dependable, high-performance two cycle engines. The first step in proper care of the two cycle engine is to have a basic understanding of how it works.

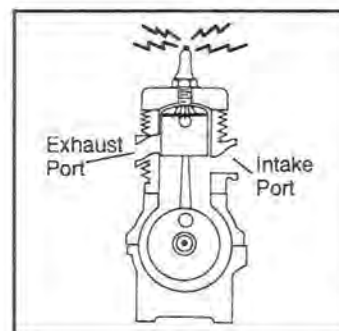
Intake

The piston in a two-cycle engine acts as a valve. When the piston moves upward in the cylinder (first stroke), the exhaust port is closed and the intake port is opened. Air and fuel are drawn into the crankcase and the air/fuel mixture is compressed in the combustion chamber. The spark plug ignites the air/fuel mixture, which expands and forces the piston downward.



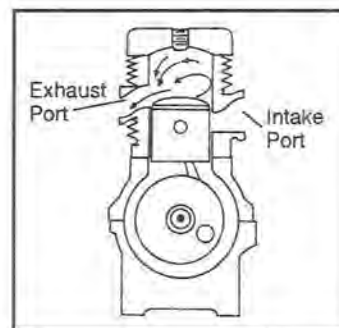
Power

After the piston starts downward, high pressure from the burning gases is applied against the piston, driving it downward with maximum force. This vertical motion is transmitted through the connecting rod into radial motion by the crankshaft. The force of combustion continues until the piston is further down in the cylinder when the exhaust port is opened.



Exhaust

Several functions take place simultaneously during the exhaust phase. When the piston moves downward far enough to open the exhaust port, most of the burned exhaust gases are expelled from the cylinder. Complete exhaust takes place after the piston drops low enough to expose the transfer ports.



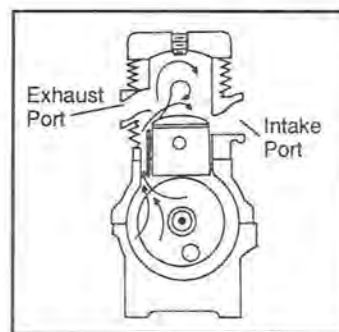
Fuel Transfer

The transfer port connects the crankcase to the combustion chamber. The air/fuel mixture pulled into the crankcase earlier during the intake phase is now transferred into the combustion chamber. This fresh charge helps to push out the remaining exhaust gases. The piston then moves upward and the intake phase begins.

When you realize that at 6000 RPM this happens 100 times a second, you can appreciate the importance of proper lubrication, fuel mixture, and carburetor adjustments.

Oil provides the only lubrication the engine receives. Keep in mind the manufacturer's recommendations:

- Use a good grade of both oil and gasoline.
- Always mix them in proper proportions, thoroughly, and in a clean container.
- Keep surplus fuel tightly capped to prevent evaporation, loss of volatility and power.



Too little oil means inadequate lubrication; too much oil means spark plug fouling, rapid carbonization, and overheated pistons, all of which may lead to engine damage and costly repairs.

The carburetor feeds the gas/oil mixture to the engine, mixing fuel and air to obtain the correct volatile mixture, thus providing fuel for combustion, lubrication, and as a coolant for internal surfaces.

ENGINES

Troubleshooting

PROBLEM	PROBABLE CAUSE
Will not start	-Check ignition switch for run position -Check auxiliary shut-off switch -Check fuel supply -Check wiring from engine to coil(s) or spark plug(s) -Check spark plug(s) -Disconnect engine connector to eliminate any shorts that might be in the system -If starter won't work (electric models), check wires from starter solenoid and battery or check battery and battery cables -Open or broken reed valves
No spark	-Spark plug fouled -Secondary coil bad or wires disconnected -Primary coil shorted or open -Ignition points pitted or dirty -Ignition switch shorted -Auxiliary switch
No compression	-Crankcase plug is out -Head gasket is blown -Bad rings or piston
Engine idles but no acceleration	-Restricted fuel flow -Clogged main jet -Timing -Clutching
Engine runs but fails to reach maximum RPM	-Clogged fuel filter -Incorrect track tension -Incorrect main jet -Throttle slides not fully open -Chain too tight -Clutching
Engine runs but fails to idle	-Incorrect air mixture setting -Throttle stop screw incorrectly adjusted -Dirt in pilot jet
Engine runs, but overloads with fuel	-Chokes are not seating -Fuel pump diaphragm is ruptured (caused by engine backfiring) -Carburetor slides are not synchronized -Too large main jet -Needle and seat not seating properly -Incorrect float level -Check reed valve condition
Carburetion and plug fouling	-If a lot of riding is on trails, and plugs foul and get black when doing so, lower jet needle by placing E clip in 2nd notch from top of needle. Float arms should be level when holding carburetor upside down. Also, air set screw setting should be checked, and slide valves must be synchronized again to raise and lower evenly. Maintain a .017 to .020 spark plug gap.
Engine runs but overheats	-Coolant level -Incorrect main jet -Incorrect timing -Incorrect spark plug
Battery will not charge (electric models only)	-Check for bad connections -Check alternator output -Check diodes
Lights don't work	-Engine must be running -Check wiring harness connector -Check for burned out bulbs -Check wiring for shorts or loose connections -Disconnect taillight if headlight works, short is in taillight wiring or taillight
Unit fails to propel itself	-Check belt (center distance) -Check torque-o-matic unit -Check chain -Check drive sprocket assembly
Track wears unevenly	-Check tension -Check for proper alignment
Chaincase gets hot	-Check oil level -Check chain tension -Check track assembly
Unit hard to steer	-Check lubrication on spindles -Check ski alignment -Check spindle bearings

ENGINES

Spark Plug Information

The spark plug and its condition is indicative of engine operation. The spark plug firing end condition should be read after the engine is warmed up and the vehicle is driven at higher speeds. Immediately check the spark plug for correct color.

Normal

The insulator tip is gray, tan, or light brown. There will be a few combustion deposits. The electrodes are not burned or eroded. This indicates the proper type and heat range for the engine and the service.

NOTE: The tip should not be white. A white insulator tip indicates overheating, caused by use of an improper spark plug or incorrect carburetion adjustments.



Worn Out

Corrosive gases formed by combustion and the high voltage spark have eroded the electrodes. Spark plugs in this condition require more voltage to fire, often more than the ignition system can produce.



Wet Fouled

The insulator tip is black. A damp oily film covers the firing end. There may be a carbon layer over the entire nose. Generally, the electrodes are not worn. General causes are excessive oil, use of non-recommended injection oil, excessive idling, idle too low or too rich, or weak ignition output.



ENGINES

Spark Plug Information/Lubricants

Gap Bridging

Gap bridging: This is usually a "whisker" or filament of lead-carbon compounds which completely short-circuits the spark, making the spark plug inoperative.

Original equipment parts, or their equivalent, should always be used. The heat range of spark plugs is of utmost importance. A spark plug with a heat range which is too high will **always** cause engine damage if the engine is operated in conditions more severe than that for which the spark plug was intended. A spark plug with a heat range which is too low will cause excessive fouling and malfunction. It is extremely important when replacing the spark plugs to install only those which are factory tested and recommended. The correct plug for the engine will improve both starting and all-around performance.



CAUTION: Spark plug failure may be the result of contributing factors such as wrong fuel-air mixture, available ignition voltage, carburetion adjustment, etc. Do not experiment with different heat ranges of spark plugs.

Lubricants

A good two-cycle lubricant must provide anti-friction protection to pistons, cylinder walls and bearings, but with no flushing action. The oil must therefore contain, or be provided with, an affinity for metal. It must burn cleanly with a minimum of smoke. It must mix easily with gasoline and remain in suspension. It must inhibit the formation of varnish, rust, or other engine deposits.

Base oils vary in their ability to meet these requirements. Most good two-cycle oils are blends with carefully selected additives to provide the necessary operating characteristics.

Polaris snowmobile oil has been subjected to a series of severe tests covering a broad range of operating conditions. It meets all requirements. Polaris has a TC-W3 premium oil available for use in all of our products. We highly recommend its use. The only oil recommended for this fuel system is Polaris brand oil. **Engine warranty coverage may become void if other brands are substituted.**

CAUTION: Excess oil will cause carbonization of pistons, spark plugs, ports and exhaust systems, causing loss of power. Too little oil will cause a lean condition and may cause piston seizure, over heating and rod end bearing failure. If oil brands are changed, it is advisable to clean excess carbon from pistons, heads and exhaust ports.

Blue Premium 2-cycle Lubricant - TC-W3 Certified, TC Certified

Polaris Premium 2-Cycle Lubricant is the most advanced formulation of oil available for today's 2-cycle engines. Over twenty months of lab and field tests have resulted in a new generation of 2-cycle lubricant. Polaris Premium 2-Cycle Lubricant addresses the problem of lower quality fuel; keeping ring grooves cleaner with less ring sticking and providing improved overall engine cleanliness. With new generation lubricity technology, it excels in meeting the lubricity demands of today's faster, more precisely engineered 2-cycle engines. It is the optimum oil recommended for liquid cooled 2-cycle engines and performs well in all air cooled 2-cycle engines. TC-W3 is the recommended oil for today's 2-cycle outboard engines. We believe this oil is the best product available in the market today, and strongly recommend its use in our products.

Red Injector Oil - TC-WII Equivalent

Polaris Injector Oil is designed for 2-cycle liquid cooled engines and fan cooled engines operated in cool ambient temperatures. This formulation of 2-cycle oil is recommended for injection or pre-mix application. It is a TC-WII equivalent, -40° C pour point oil and is a proven performer in Polaris liquid cooled and fan cooled engines. For those who chose not to use Polaris Premium Lubricant, we recommend the use of this high quality product.

Green Extreme Temp Oil - TC Equivalent

Polaris Extreme Temp Oil is a 2-cycle engine lubricant designed for air cooled, high ambient temperature operation. This low ash formulation reduces deposits created by high internal engine temperature and high engine RPM. Polaris Extreme Temp Oil is formulated to maintain lubricity required by high RPM operation under high internal engine temperatures. It is specifically designed for Polaris ATV and snowmobile air cooled 2-cycle engines, but also works well in Polaris liquid cooled engines. It is an excellent oil for chain saws, weed eater, lawn mowers and any other 2-cycle air cooled engine.

Oxygenated Fuels

Due to the increased emphasis on reducing auto emissions, some areas of the U.S. are required to use oxygenated fuels. Oxygenated fuels have oxygen carrying additives which improve the engine's combustion process by providing additional oxygen. The improved combustion results in lower tailpipe emissions. The additional oxygen results in a "leaner" air/fuel ratio which four-cycle automotive engines easily tolerate, but the two-cycle engines used in our products do not.

Polaris fully supports any efforts to reduce emissions, and we feel that oxygenated fuels are certainly an effective method to reduce emissions. However, our engines are designed for maximum performance and durability, which requires us to operate with a richer air/fuel ratio. It is very important that the proper air/fuel ratio is maintained to ensure the engine's durability. **THIS SNOWMOBILE'S ENGINE IS NOT CALIBRATED TO USE OXYGENATED FUELS.** If the customer must use oxygenated fuel, you should make the necessary adjustments to ensure that they can use these fuels without risking engine damage. These changes will cause some loss in performance if they do not use oxygenated fuels. If they use oxygenated fuels with the engine modifications, they will notice little or no performance loss.

Break-in Fuel/Oil Ratios

Oil Injection Models:

Models equipped with oil injection are required to have the first tank of fuel pre-mixed at a 40:1 ratio in addition to the normal lubrication received from the injector system.

Pre-Mix Models:

The break-in fuel/oil ratio for all pre-mix engines is 20:1 for the first tank of fuel.

After Break-in

All pre-mix engines are designed to operate at a 40:1 fuel mixture ratio after break-in.

Fuel System Deicers

If the customer is using non-oxygenated fuel, Polaris recommends the regular use of Isopropyl base fuel system deicer (PN 2870505) at the rate of 1 to 2 ounces per gallon (8-16 ml per liter) of gasoline to prevent engine damage resulting from fuel system icing and lean mixtures.

If the oxygenated fuel contains an alcohol blend (ethanol), they should not use additional alcohol deicers or water absorbing additives. If water is present in the fuel tank prior to fueling, they should not use alcohol blended gasoline until the water has been removed. In both cases, the additives and alcohol blended fuels will cause any water present to separate from the fuel, resulting in poor engine performance and or engine damage.

⚠ CAUTION: Never add fuel while snowmobile is running.
Never pour oil or gasoline into fuel tank unless mixed.
Never use low grade multi-viscosity oil.

ENGINES

Torque Specifications

When tightening bolts, nuts, or screws, a torque pattern should be followed to insure uniform equal tension is applied to all fasteners. Proper torque application prevents fasteners from loosening or breaking in critical service. It also minimizes wear and eliminates premature or needless repair costs. Following uniform torque application sequence patterns assures optimum performance from precision machined, close tolerance assemblies. On vital engine parts, torquing negligence could be costly.

Torque is a force which tends to produce rotation. The measurement of this force is expressed in units of force and length. There are at present two basic systems of units used to express torque, English and Metric. In the English system, the units of force are the pound or ounce, and the length is the foot or inch.

In the Metric system, the unit of force is expressed in grams (gm) or kilograms (kg), and length as centimeters (cm) or meters (m). The most common units of torque in the English system are ft. lb. and in. lb. In the Metric system, torque is commonly expressed in units of kg/m.

Multiply	By	To Obtain
in. lbs.	.0834 1150 .01150	ft. lbs. gm/cm kg/m
ft. lbs.	12 13,800 .138	in. lbs. gm/cm kg/m
kg/m	86.8 7.24	in. lbs. ft. lbs.

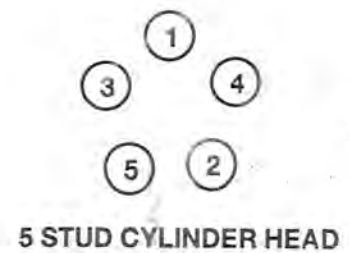
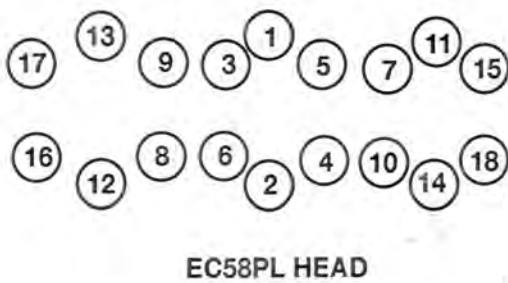
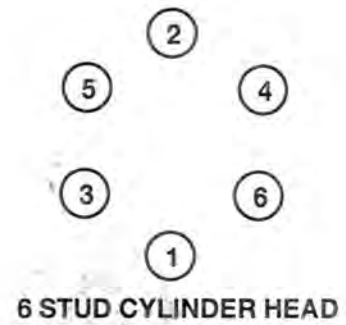
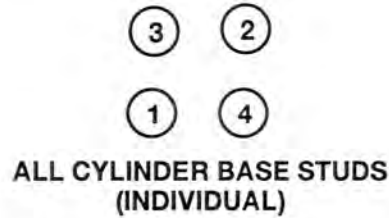
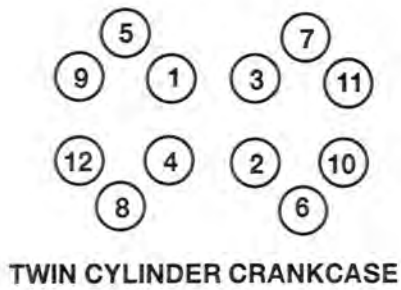
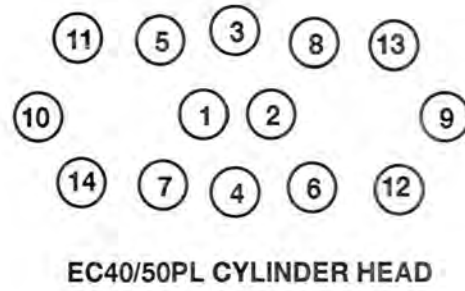
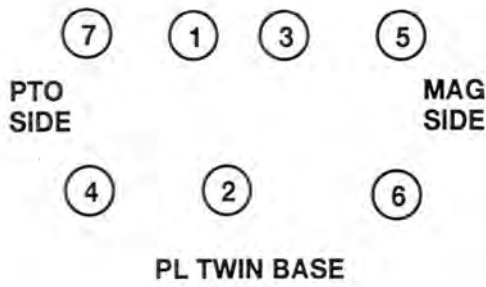
Engine	Cylinder Head	Crankcase 8 mm	Crankcase 10 mm	Flywheel	Cylinder Base Studs
EC25PS	17-18 ft. lbs. 2.3-2.5 kg/m	17-18 ft. lbs. 2.2-2.3 kg/m	23-25 ft. lbs. 3.2-3.5 kg/m	60-65 ft. lbs. 8.3-9.0 kg/m	24-28 ft. lbs. 3.3-3.9 kg/m
Air Cooled Twin Cylinder	17-18 ft. lbs. 2.3-2.5 kg/m	17-18 ft. lbs. 2.2-2.3 kg/m	23-25 ft. lbs. 3.2-3.5 kg/m	60-65 ft. lbs. 8.3-9.0 kg/m	24-28 ft. lbs. 3.3-3.9 kg/m
EC34-2PM	18.5-19.5 ft. lbs. 2.6-2.7 kg/m				
EC34PL EC40PL EC45PL EC50PL EC51PL EC58PL EC60PL EC65PL EC75PL EC80PL	8 mm 17-18 ft. lbs. 2.2-2.3 kg/m 10 mm 24-26 ft. lbs. 3.6-4.0 kg/m	17-18 ft. lbs. 2.2-2.3 kg/m	23-25 ft. lbs. 3.2-3.5 kg/m	60-65 ft. lbs. 8.3-9.0 kg/m	24-28 ft. lbs. 3.3-3.9 kg/m

WARNING

Gasoline is extremely flammable and explosive under certain conditions.

-  Always stop the engine and refuel outdoors or in a well ventilated area.
-  Do not smoke or allow open flames or sparks in or near the area where refueling is performed or where gasoline is stored or used.
-  Do not overfill the tank. Do not fill the tank neck.
-  If you get gasoline in your eyes or if you swallow gasoline, see your doctor immediately.
-  If you spill gasoline on your skin or clothing, immediately wash it off with soap and water and change clothing.
-  Never start the engine or let it run in an enclosed area. Gasoline powered engine exhaust fumes are poisonous and can cause loss of consciousness and death in a short time.

ENGINES **Torque Specifications**



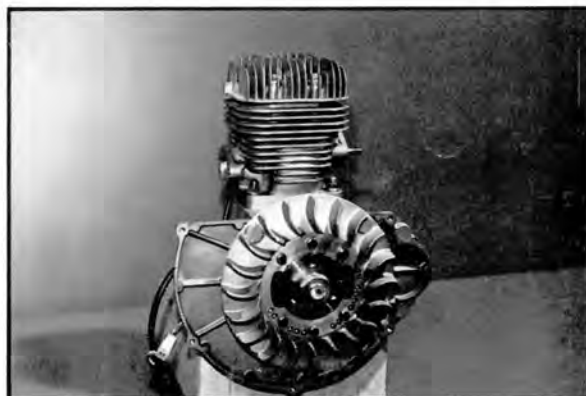
ENGINES

Disassembly and Reassembly Procedures - PS - Single Cylinder Series

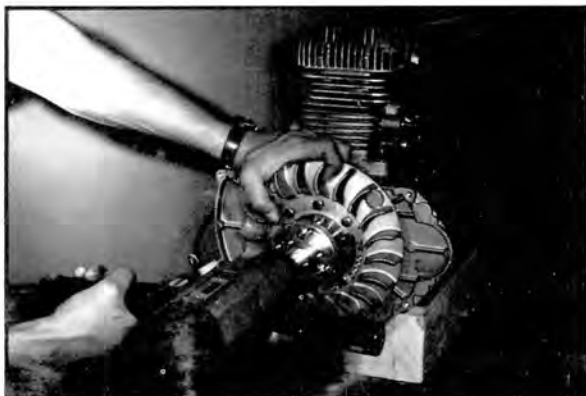
1. The photo at right shows a complete EC25PS engine removed from chassis.



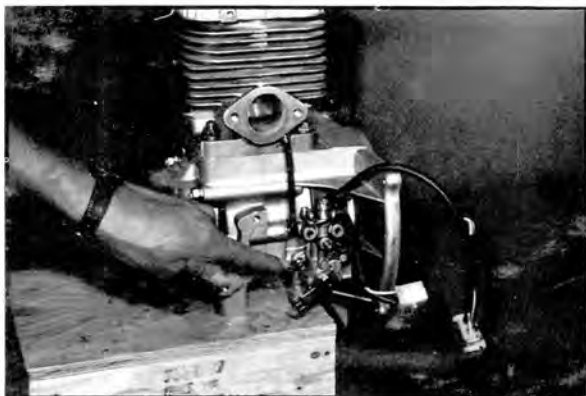
2. Remove carburetor intake rubber boot, fan housing with recoil, fan shrouding and exhaust manifold.
3. Unhook CDI coil pack from stator plate connector plug.
4. Remove recoil rope starter cup.



5. Remove flywheel nut.
6. Install flywheel puller (PN 2870159) on flywheel. Hold with your hand or an appropriate approved strap wrench while pulling the flywheel.

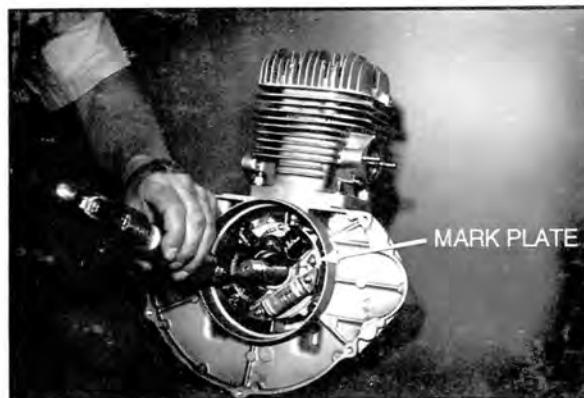


7. Remove oil pump and oil pump drive gear. **NOTE:** Make sure the small end bearing washer comes with the gear assembly.

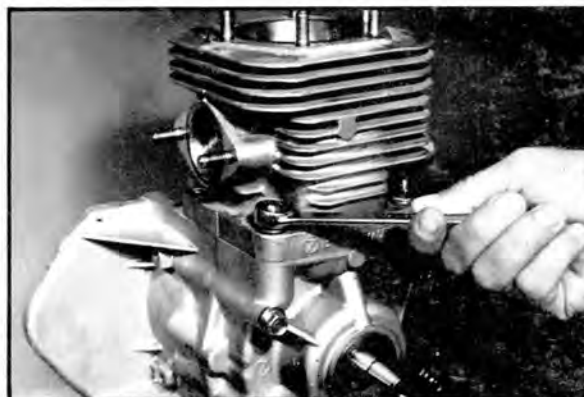


Disassembly and Reassembly Procedures - PS - Single Cylinder Series

8. Mark stator plate before removing hold down screws. Using an impact screwdriver, remove stator plate hold down screws and remove stator plate.

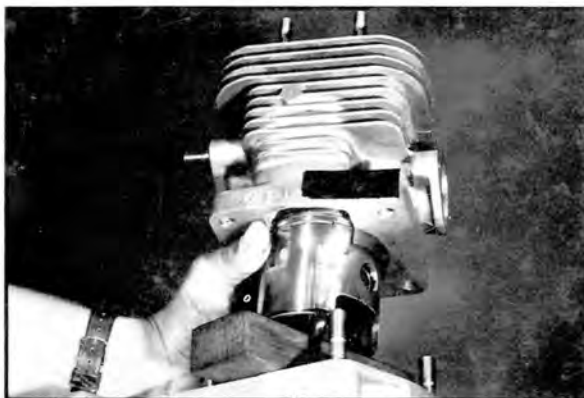


9. Remove head, head gasket, and cylinder base nuts.



10. Remove cylinder. Secure piston with piston support block.

11. Remove C-clip retainers.



12. Use piston pin puller to remove wrist pin. Remove piston.



ENGINES

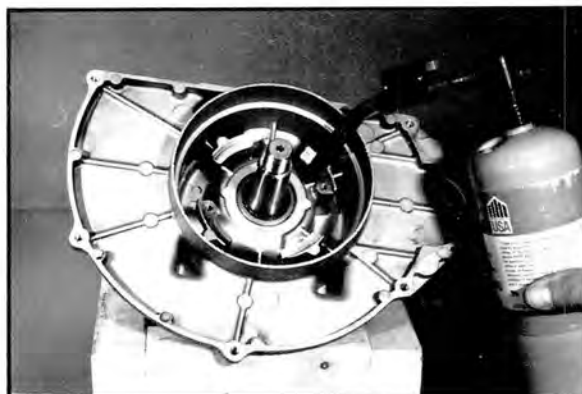
Disassembly and Reassembly Procedures - PS - Single Cylinder Series

13. Remove crankcase bolts.



14. With a propane torch, apply heat to the mag end of the crankcase. Heat enough to see small tailings of smoke.

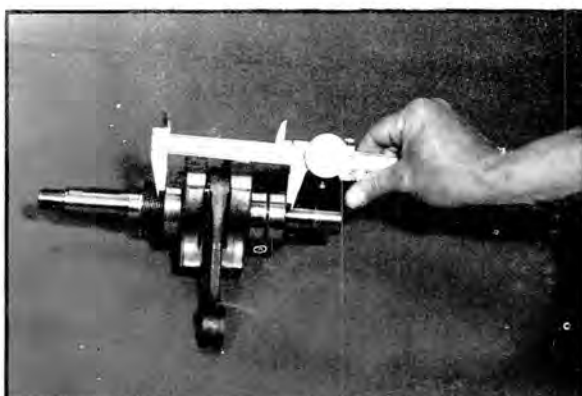
15. Wearing gloves, hold mag end of case and strike end of crankshaft with a plastic hammer.
CAUTION: The case will be hot! Protect hands to avoid serious burns.



16. Heat PTO end of crankcase until smoke tailings appear again, then strike the PTO end of the shaft.
CAUTION: The case will be hot! Protect hands to avoid serious burns.

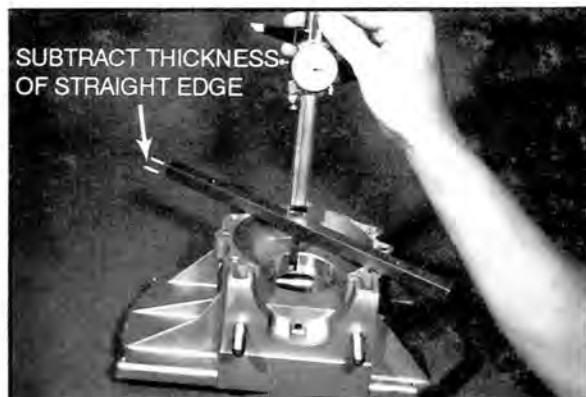


17. Before reassembly, check crank end play. Proper endplay is .008 - .016". **NOTE:** The bearing on the PTO end may move when disassembled. Make sure bearings are properly positioned on shaft. Also, check crankshaft runout and adjust if necessary.

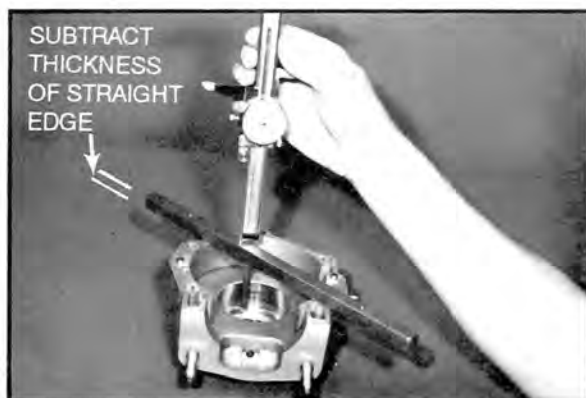


Disassembly and Reassembly Procedures - PS - Single Cylinder Series

18. Measure and record mag side of crankcase.
Remember to subtract depth of straight edge.



19. Measure and record PTO side of crankcase.
Remember to subtract depth of straight edge.



Example: Crankshaft = 4.130
 Mag side minus thickness of straight edge = 2.550
 PTO side minus thickness of straight edge = 1.565
 Add mag side measurement and PTO side measurement = 4.115
 Subtract from Crankshaft measurement = .015 (end play)

To control end play, use the following shims behind PTO bearings:

PN 3083630 = .004" (.1mm)
 PN 3083629 = .008" (.2mm)

20. Check trueness of crankshaft. See page 5.33.

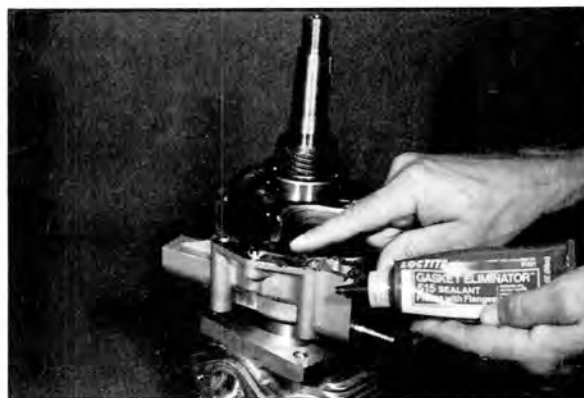
ENGINES

Disassembly and Reassembly Procedures - PS - Single Cylinder Series

21. Heat crankcase as shown, PTO end first.



22. Let case half cool. Add Loctite 515.



23. Heat mag side of case and install over crankcase.

24. Install crankcase bolts and torque in a criss cross pattern.

25. Grease and install crank end seals.



26. Align stator plate with marks and secure to case.

27. Check oil pump end play.



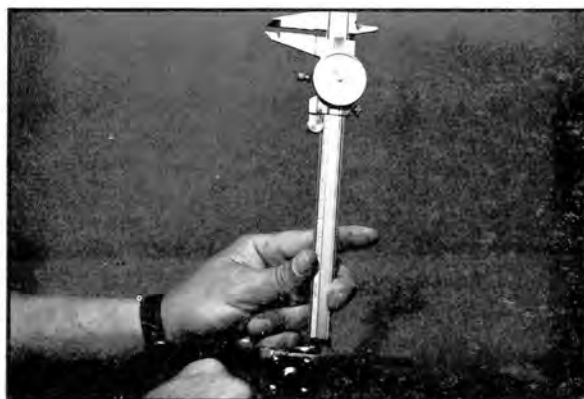
Disassembly and Reassembly Procedures - PS - Single Cylinder Series

28. Measure crankcase surface to gear drive bushing and record measurement (A).



29. Measure from case mating surface to end of pump body as shown and record (B).

30. Subtract measurement B from measurement A.
The difference is the end play.



31. The photo at right shows oil pump drive assembly sequence for EC25PS only.

Optional shims:

PN 3083671 = .006" (.15mm)

PN 3083672 = .012" (.3mm)

PN 3083673 = .024" (.6mm)

End play should be .008 to .016".



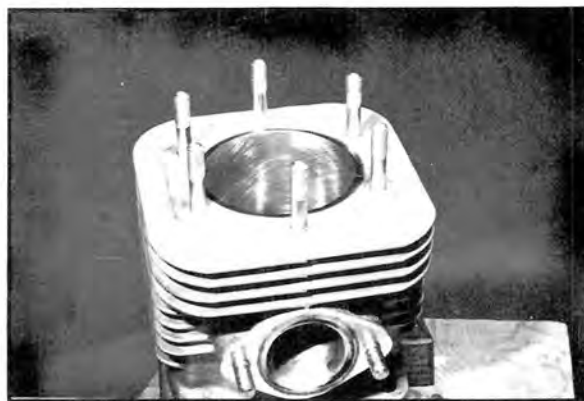
ENGINES

Disassembly and Reassembly Procedures - PS - Single Cylinder Series

32. Hone cylinder until a cross hatch pattern is achieved.

33. Chamfer ports so they are not sharp.

34. Check piston skirt to cylinder clearance and ring end gap prior to assembly. See pages 5.60-5.61.



35. Install piston with "F" or arrow toward flywheel. Always install new rod end bearings, C-clips and new rings when rebuilding the motor.



36. Lightly oil the cylinder. Compress rings with a ring compressor or with fingers.

37. Install cylinder. Torque base nuts to 24 - 28 ft. lbs. (3.3 - 3.86 kg/m).

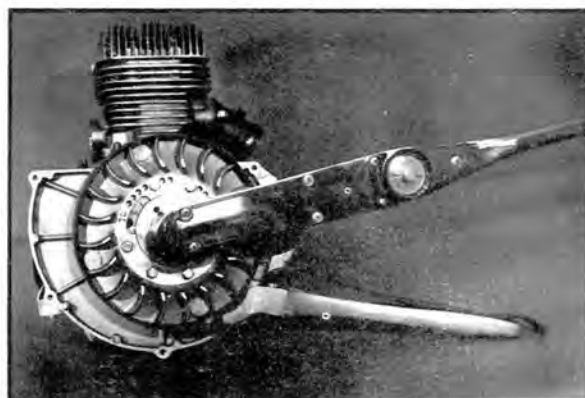


38. Install head gasket with large diameter of fire ring toward cylinder.



Disassembly and Reassembly Procedures - PS - Single Cylinder Series

39. Install head with exhaust side marking toward exhaust port.
40. Torque head nuts to 17 - 18 ft. lbs. (2.34 - 2.48 kg/m).
41. Install and torque flywheel nut to 60 - 65 ft. lbs. (8.28 - 8.97 kg/m). Hold flywheel with a strap wrench while torquing.



42. Reinstall recoil cup, recoil fan housing, fan shroud, rubber carburetor mount, carburetor and exhaust manifold. Connect stator and CDI wire connector.

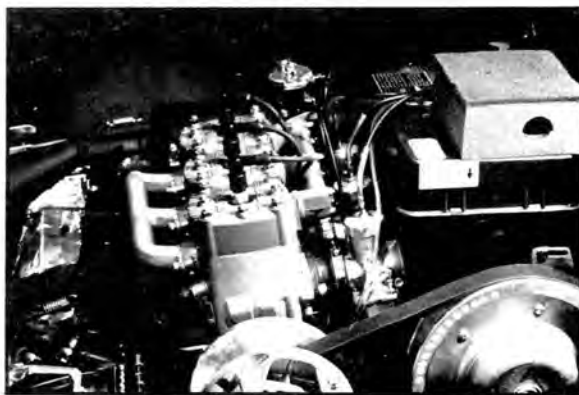


ENGINES

Disassembly and Reassembly Procedures - PL - Three Cylinder Series

Take care to insure all parts are kept extremely clean.

1. Drain coolant from unit.
2. Disconnect necessary cooling system and electrical components.
3. Remove drive clutch and exhaust system.

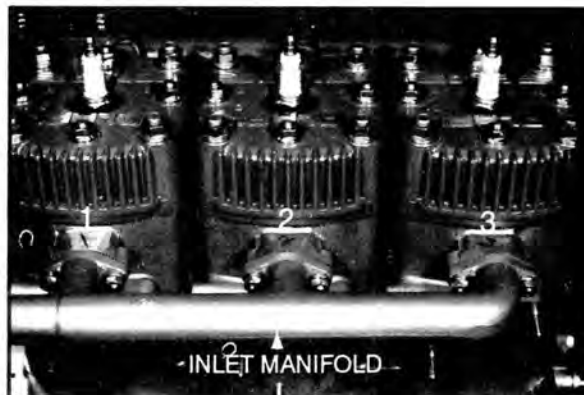


4. Remove carburetors and recoil.

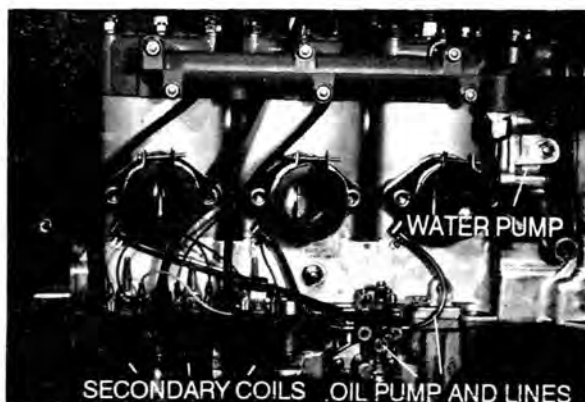


5. Mark cylinders #1 mag side, #2 center, #3 PTO side.

6. Remove inlet water manifold.



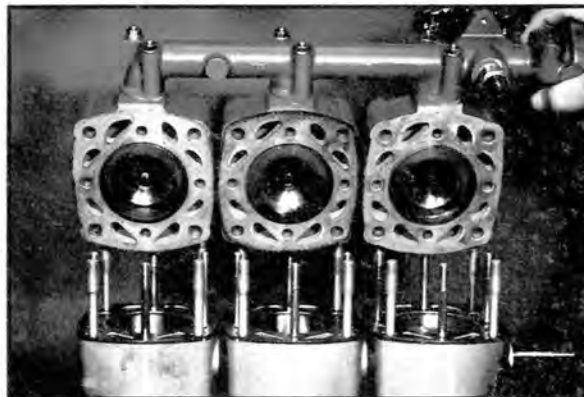
7. Remove oil pump lines and secondary coils.
8. Remove oil pump and drive gear.
9. Remove water pump.



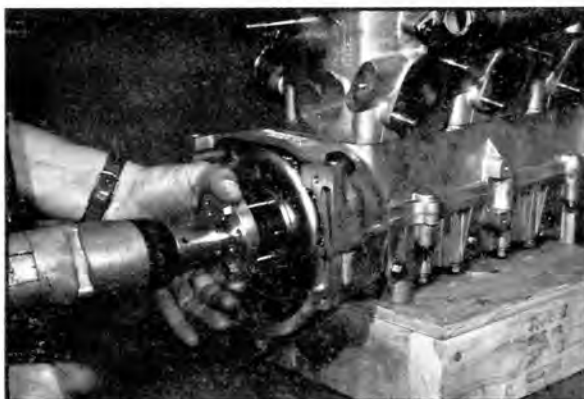
ENGINES

Disassembly and Reassembly Procedures - PL - Three Cylinder Series

10. Remove outlet manifold.
11. Remove heads either as a unit or individually.



12. Remove recoil starter cup and flywheel nut.
13. Using flywheel puller PN 2870384, remove flywheel. Hold puller with your hand or a strap/chain wrench.



14. Mark stator plate and case and remove attaching screws.



15. Mark cylinders - mag, center, PTO.



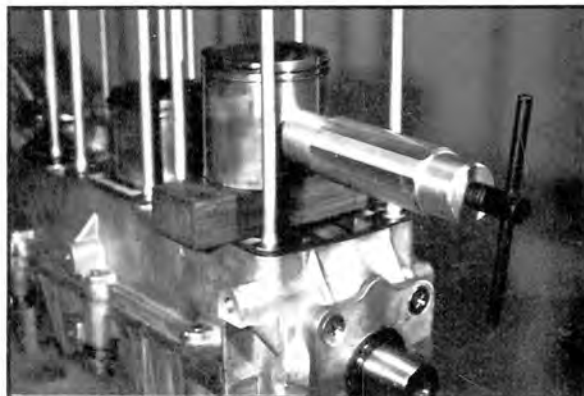
ENGINES

Disassembly and Reassembly Procedures - PL - Three Cylinder Series

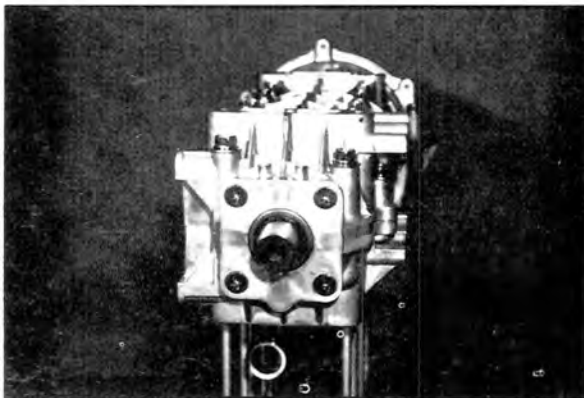
16. Remove piston C-clips as shown.



17. Using wrist pin puller, remove piston wrist pin and mark pistons mag, center and PTO.

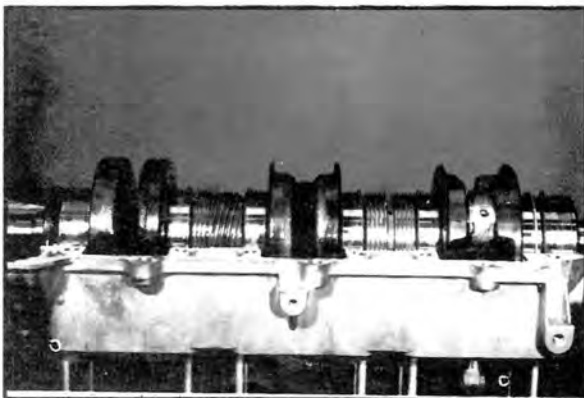


18. Remove seal plate and crankcase bolts.



19. Remove crankshaft from case.

20. Clean and check runout.

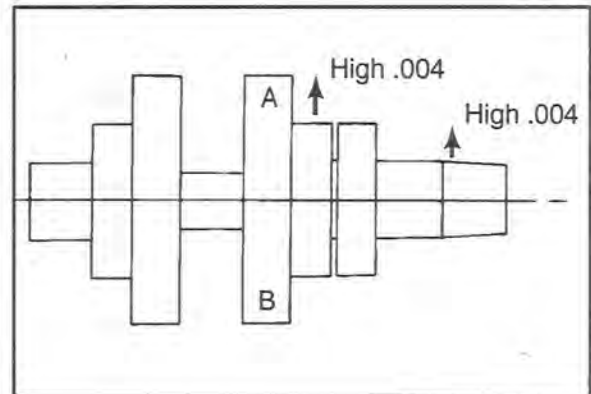


ENGINES

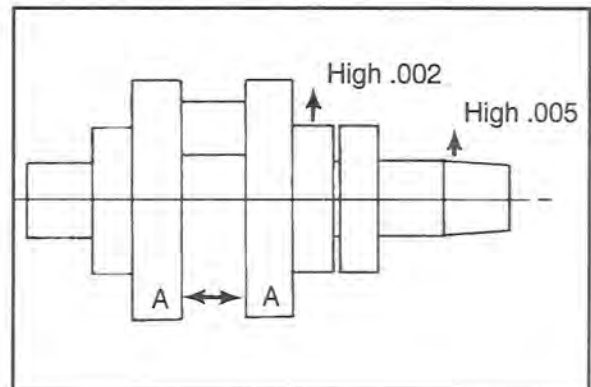
Disassembly and Reassembly Procedures - PL - Three Cylinder Series

Crankshaft Truing

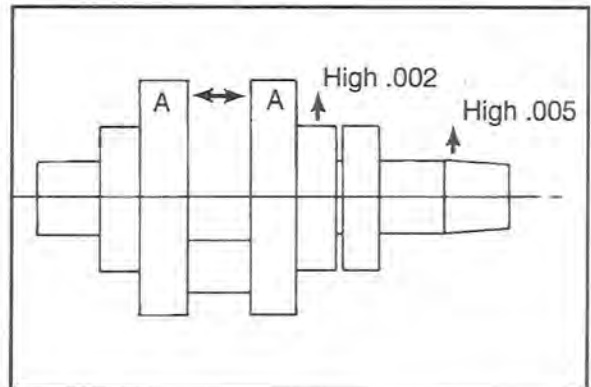
21. To correct a situation like that shown in Ill. 1, hit crankshaft at point A. **NOTE:** The rod pin position in relation to the dial indicator position tells you what action is required to straighten the shaft.



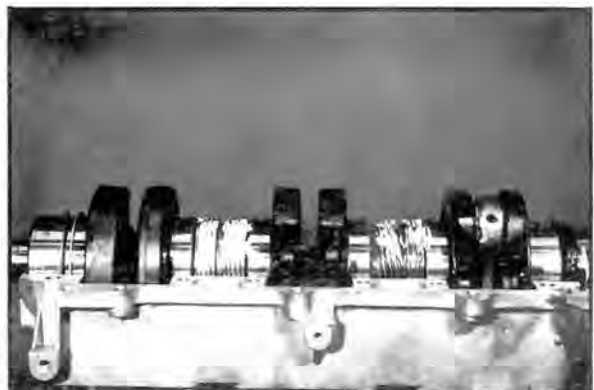
22. To correct a situation like that shown in Ill. 2, squeeze crankshaft at point A. **NOTE:** The rod pin position in relation to the dial indicator position tells you what action is required to straighten the shaft.



23. If the crank rod pin location is opposite the position shown in Ill. 2, or at 180° from the dial indicator it will be necessary to spread the crankshaft at point A as shown. When rebuilding and straightening a crankshaft, straightness is most important. As close to zero runout as possible is also required.



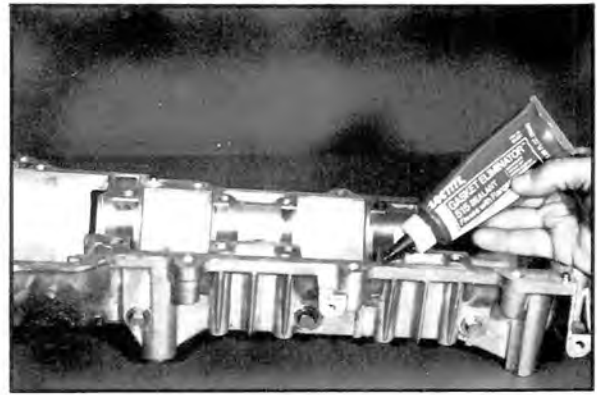
24. Remove old crankcase sealer from case halves.
25. Grease mag end seal with new grease.
26. Grease labyrinth seal area.
27. Make sure bearing alignment anti-rotation pins are in the straight up position.



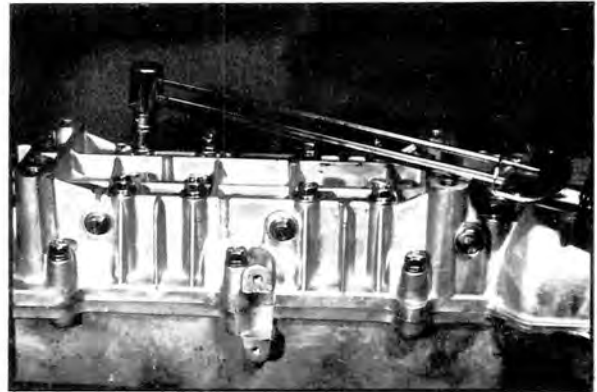
ENGINES

Disassembly and Reassembly Procedures - PL - Three Cylinder Series

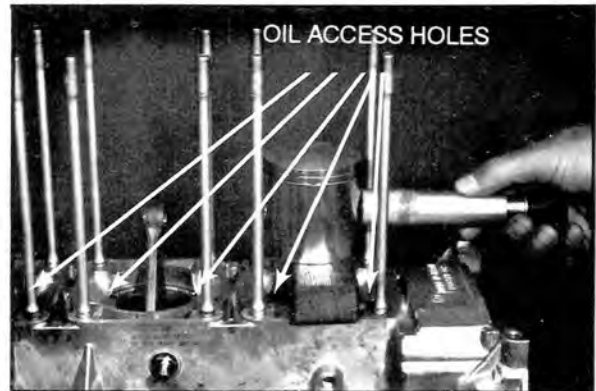
28. Apply Loctite 515 Sealer to the bottom crankcase half as shown.



29. Torque crankcase bolts as shown. Refer to torquing pattern, page 5.21.



30. Install pistons with arrow toward flywheel side of crankcase.
31. Install piston C-clips with C-clip installation tool.
32. Oil crankshaft bearings through access holes in the case.
33. Install keystone rings onto piston with beveled side up and flat side of ring down.



34. Secure wrist pin into piston with C-clip tool, making sure open end of C-clip is toward down side of bevel.



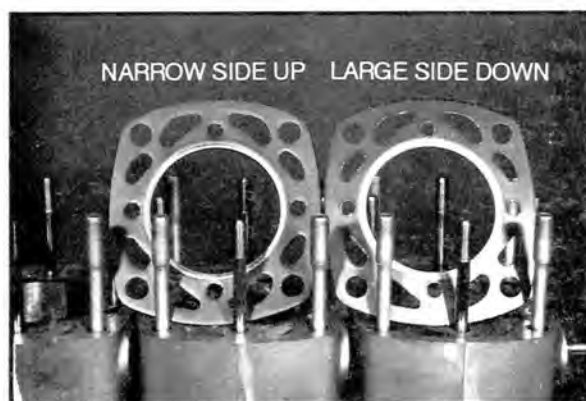
Disassembly and Reassembly Procedures - PL - Three Cylinder Series

35. Before install cylinder, refer to honing procedure on pages 5.62-5.63 of this section.

36. Depress rings in alignment with anti-rotation pins on piston using either a ring compressor or your fingers. Carefully install the cylinder.



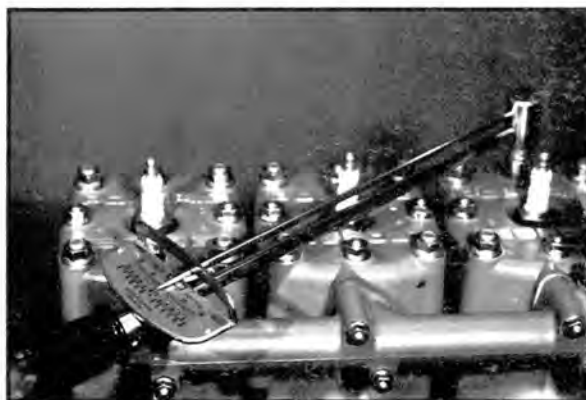
37. Oil gasket sides or paint using high temperature aluminum paint. The large diameter side of the fire ring should be installed toward the cylinder.



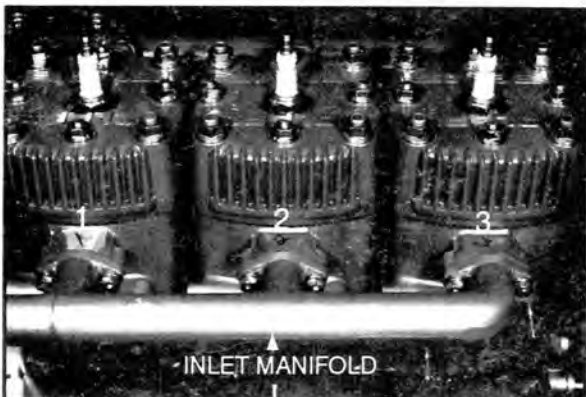
38. Install cylinder heads onto cylinder either as a unit or individually.

39. Torque 10mm nuts to 24-26 ft. lbs. (3.3-3.59 kg/m).

40. Torque 8mm nuts to 17-18 ft. lbs. (2.35-2.48 kg/m).



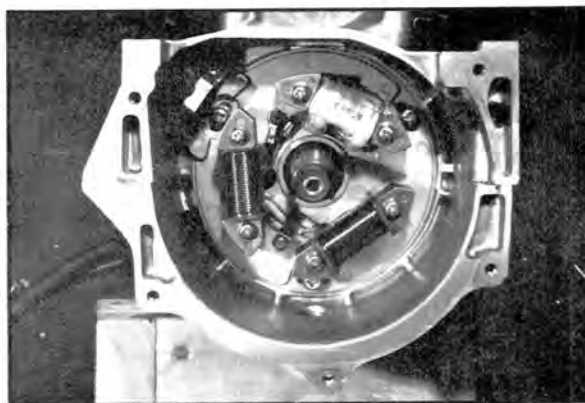
41. Install exhaust manifold gaskets and water manifold. Torque nuts to 6 ft. lbs. (2.28 kg/m). Use caution when torquing nuts so as not to damage gasket.



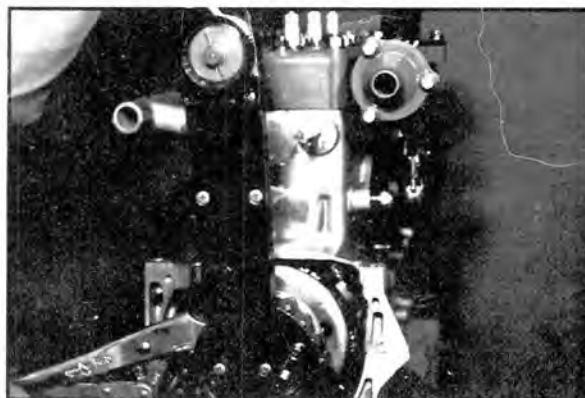
ENGINES

Disassembly and Reassembly Procedures - PL - Three Cylinder Series

42. Install and align stator plate with previous marks.



43. Install flywheel and flywheel nut. Using a strap or chain wrench to hold the flywheel, torque flywheel nut to 60 ft. lbs. (8.28 kg/m).



44. Install water pump and pump belt. Adjust belt tension.

45. Install oil pump and connect feed lines to cylinder.

46. Install secondary coils.

47. Install carburetors, recoil housing and water pump belt guard.

48. Install exhaust manifold gaskets and exhaust manifold.

49. Measure crankcase surface to gear drive bushing and record measurement (A).

50. Measure from case mating surface to end of pump body as shown and record (B).

51. Subtract measurement B from measurement A.
The difference is the end play.

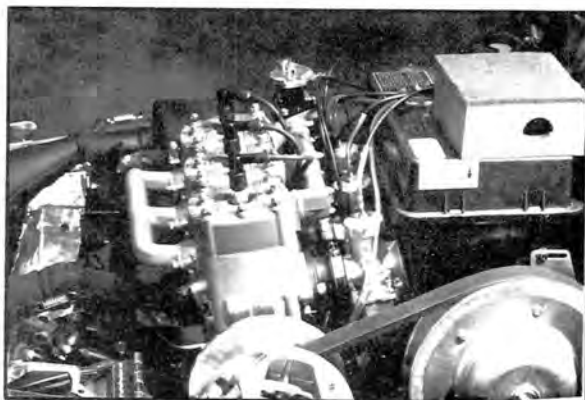
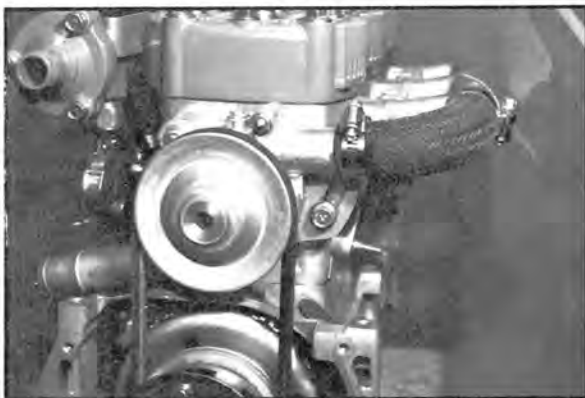
Optional shims:

PN 3083671 = .006" (.15mm)

PN 3083672 = .012" (.3mm)

PN 3083673 = .024" (.6mm)

End play should be .008 to .016".



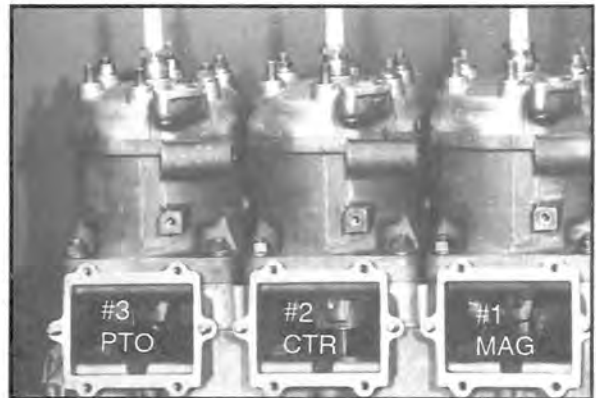
ENGINES

Disassembly and Reassembly - PL Series Reed Valve

1. Disconnect electrical connectors, fuel lines, throttle cable/oil pump cable.
2. Remove air box and exhaust system.
3. Remove drive clutch.
4. Unhook recoil handle. **NOTE:** Do not allow recoil rope to retract into recoil housing.
5. Drain coolant from engine.



6. Remove carburetors, water outlet manifold, secondary coils, oil pump and reed valve cage assemblies. **NOTE:** Mark each components mag, center, and PTO so they will be in the correct sequence when reassembling.



7. Remove recoil housing, water pump belt guard, water pump and flywheel nut.
8. Install flywheel puller and remove flywheel. **CAUTION:** Do not turn puller bolts too deeply into flywheel or coil damage will occur.



9. Mark stator plate at case parting line and remove plate.

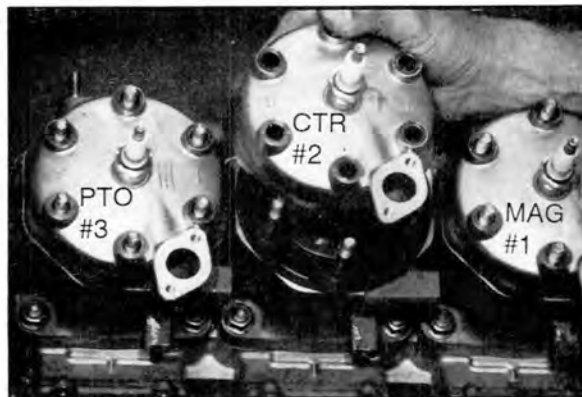


ENGINES

Disassembly and Reassembly - PL Series Reed Valve

10. Remove remainder of head nuts and cylinder base nuts.

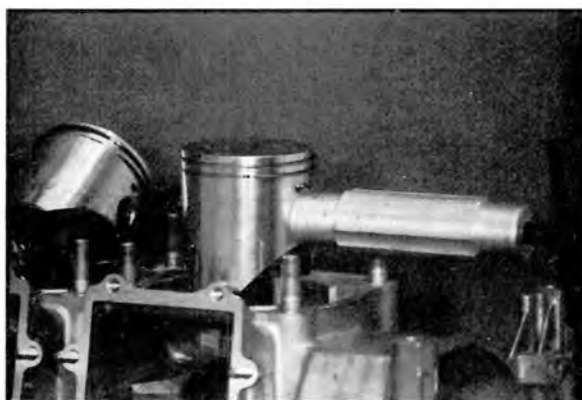
11. Carefully remove cylinders.



12. Remove C-clip retainers.

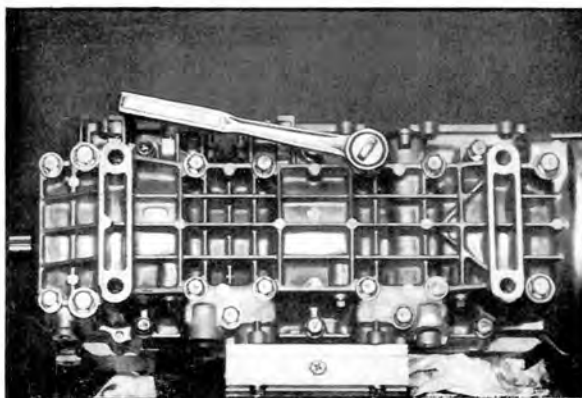


13. Use piston pin puller to remove wrist pins.



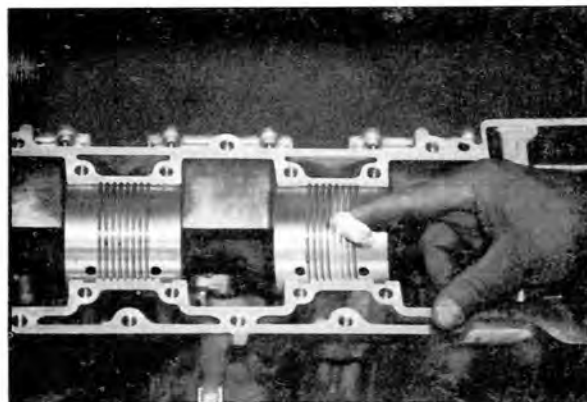
14. Remove crankcase bolts and split case.

15. Inspect crankshaft for trueness. See page 5.33.

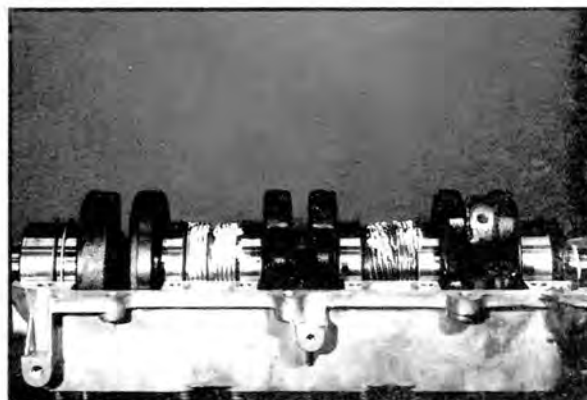


ENGINES
Disassembly and Reassembly - PL Series Reed Valve

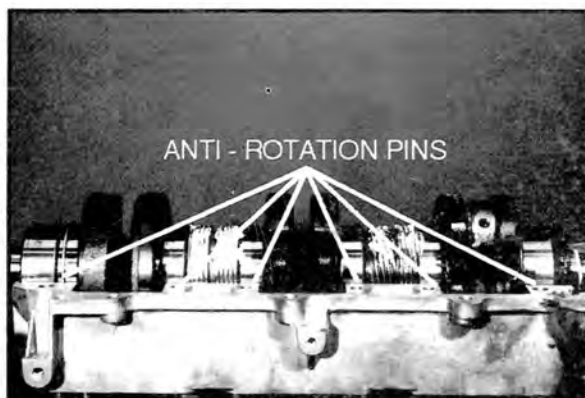
16. Grease labyrinth.



17. Grease end seals and oil pump drive gear.



18. Position anti-rotation pins with divot in case.



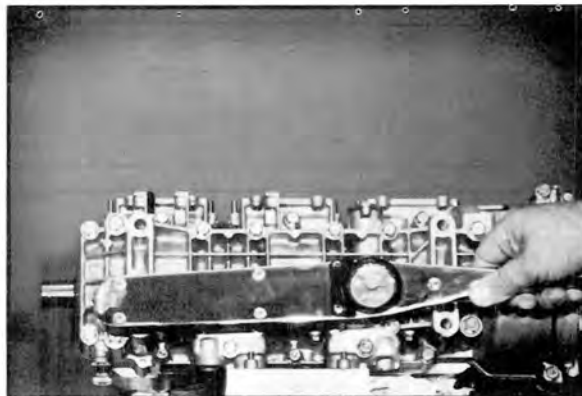
19. Apply a light film of Loctite 515 gasket eliminator to crankcase and reassemble halves.



ENGINES

Disassembly and Reassembly - PL Series Reed Valve

20. Install bolt and torque following torque pattern.
Torque 8mm bolts to 18 ft. lbs. (2.48 kg/m). Torque
10mm bolts to 26 ft. lbs. (3.59 kg/m).



21. Install wrist pin bearings.

22. Install piston with arrow (➤) toward flywheel.



23. Install C-clip retainers using tool PN 2870773.
NOTE: The C-clip opening should be in the up or
down position.



24. Lightly oil rings and cylinder. **NOTE:** Keystone ring
bevel must be up.

25. Carefully compress rings and install cylinder over
piston. Torque cylinder base nuts to 28 ft. lbs. (3.86
kg/m).



ENGINES

Disassembly and Reassembly - PL Series Reed Valve

26. Position head gasket shoulder over outlet on head.

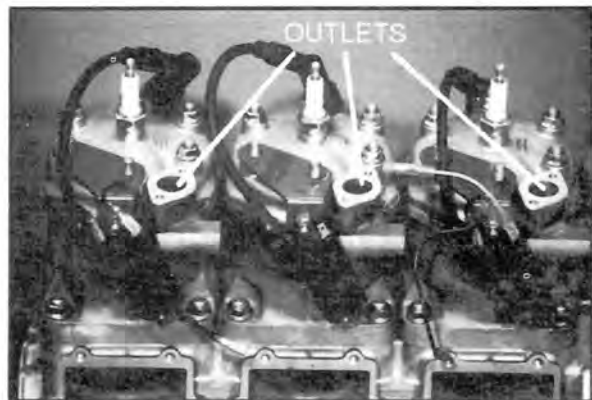
- 750 Storm head gasket should be installed with tab (shoulder) located directly above left exhaust stud, as viewed from intake side.
- 800 Storm head gasket should be positioned with the words "Up" and "80" directly over center of intake port. Raised side of head gasket should face up (toward head).



27. Install heads, positioning outlets as shown. Make sure coils are in correct position and torque head nuts to 18 ft. lbs. (2.48 kg/m).

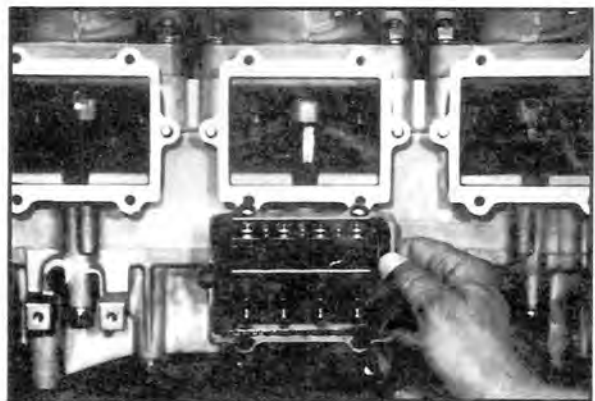
- 800 Storm coolant outlet restrictor plates must be positioned as follows:

PTO	11 mm
Center	12 mm
Mag	13 mm



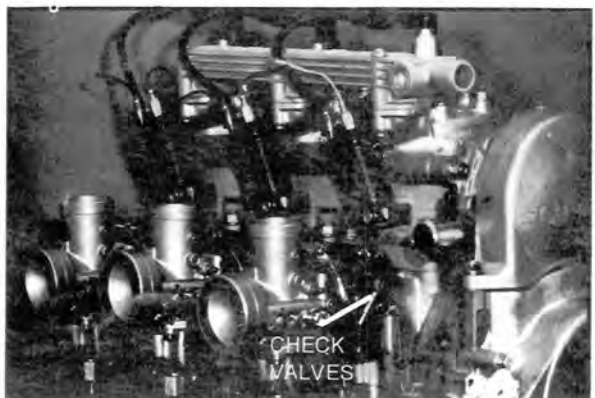
28. Inspect reed pedals.

29. Install reed cages.



30. Install rubber mounts.

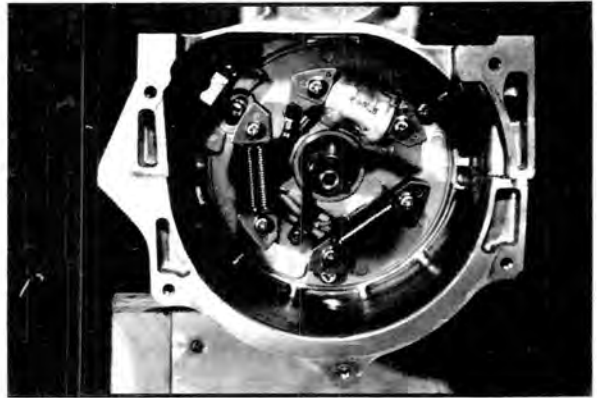
31. Position oil check valve as shown.



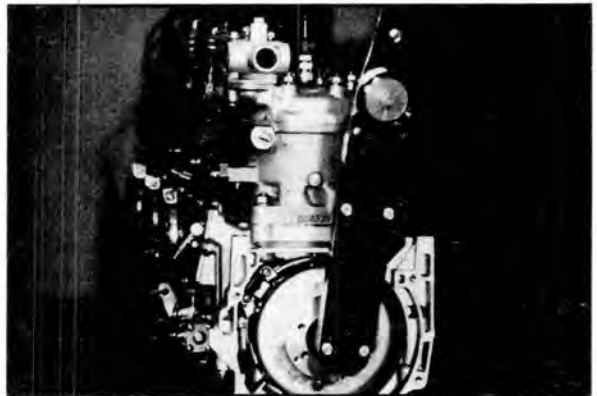
ENGINES

Disassembly and Reassembly - PL Series Reed Valve

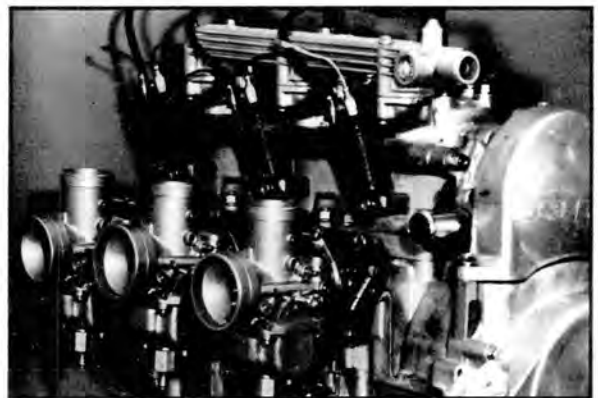
32. Install oil pump drive gear in correct sequence.
33. Install oil pump.
34. Position stator plate at previously marked position and secure in place.



35. Torque flywheel nut to 65 ft. lbs. (8.97 kg/m).



36. Install water pump, recoil cup, and belt. Adjust belt tension.
37. Install recoil housing and belt guard.

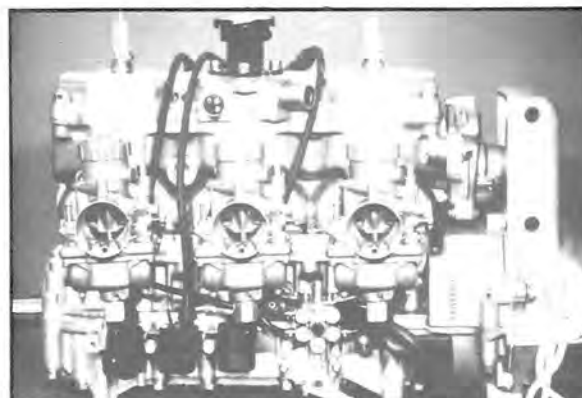


ENGINES

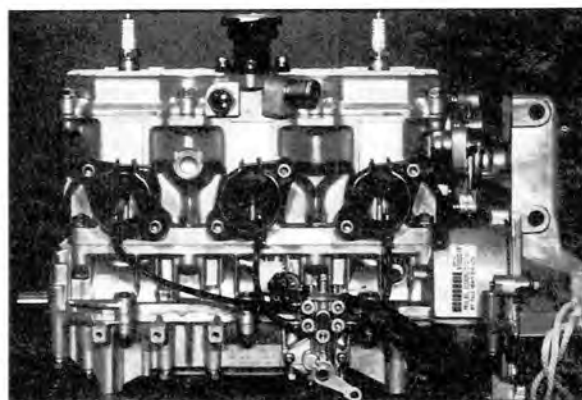
Disassembly and Reassembly - Monoblock

EC58PL Engine

1. Disconnect electrical connectors, fuel lines, throttle cable/oil pump cable.
2. Remove air box and exhaust system.
3. Remove drive clutch.
4. Unhook recoil handle. **NOTE:** Do not allow recoil rope to retract into recoil housing.
5. Drain coolant from engine.



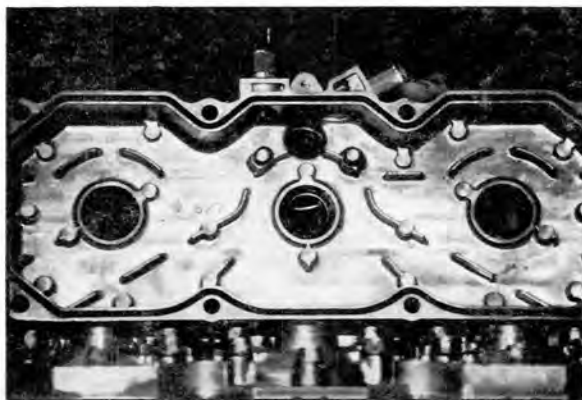
6. Remove carburetors and secondary coils.



7. Remove recoil housing water pump and belt.



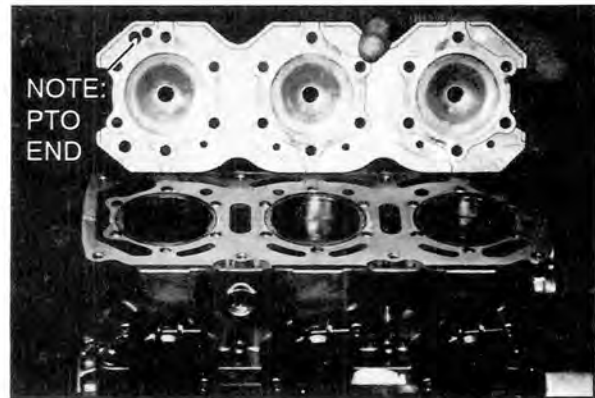
8. Remove water jacket cover.



ENGINES

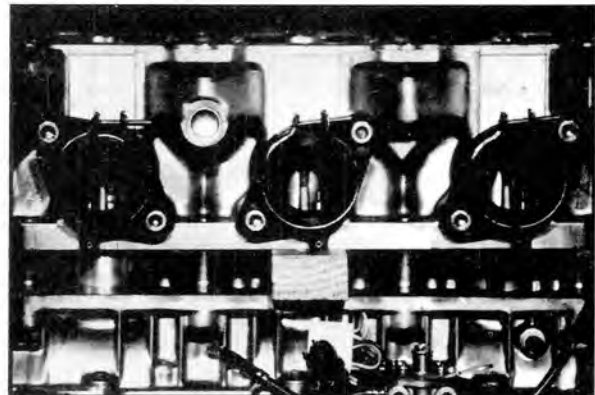
Disassembly and Reassembly - Monoblock

9. Remove head. Mark PTO end of head to assure correct reassembly.

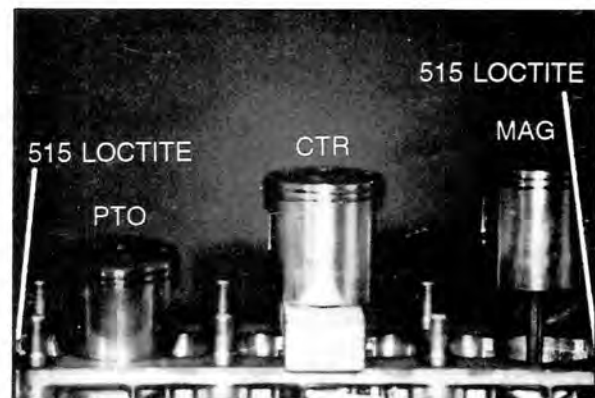


10. Remove cylinder.

11. Refer to PL series three cylinder disassembly beginning on page 5.30 for remainder of disassembly and reassembly instructions.

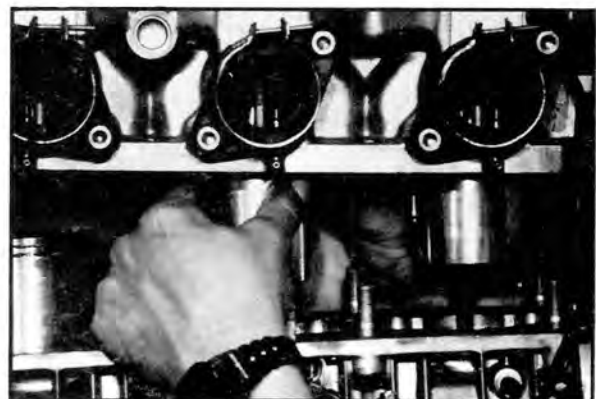


12. Use piston support block on center piston as shown. Apply a small amount of Loctite 515 gasket eliminator to gasket ends.



13. Install pistons in the following order:

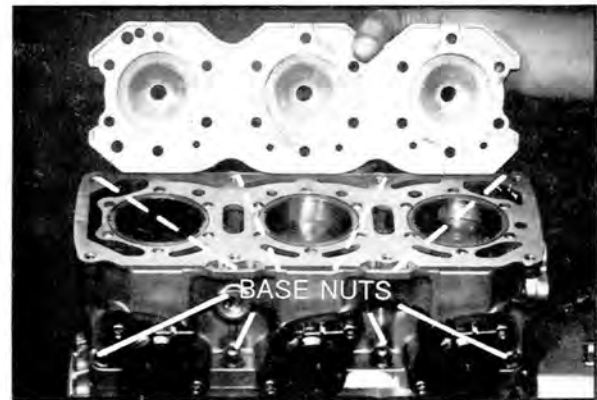
- mag
- center
- PTO



ENGINES

Disassembly and Reassembly - Monoblock

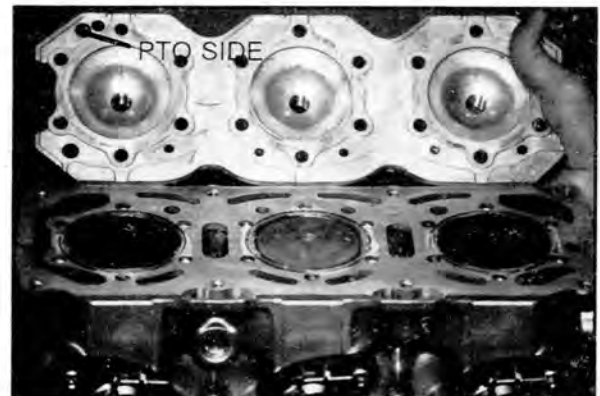
14. Torque base bolts, starting in the middle, alternate intake to exhaust side, moving from PTO end to mag end.



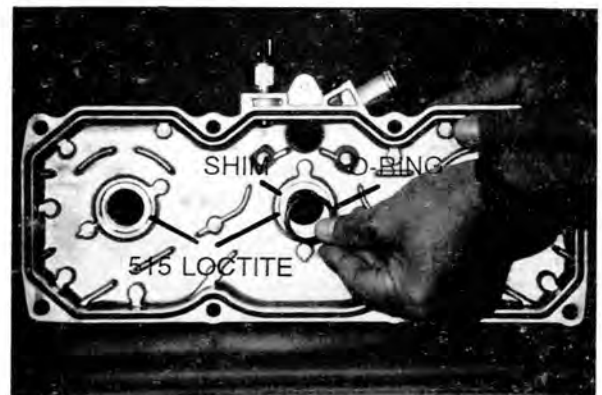
15. Apply Loctite 515 around compression O-Ring in cylinder. **NOTE:** Some models also use a monotype gasket (single, one piece) for all three cylinders.



16. Install head, making sure it is in the correct position.



17. Inspect outer O-Ring seal.
18. Apply Loctite 515 to cover as shown.
19. Position shim and O-Ring as shown.

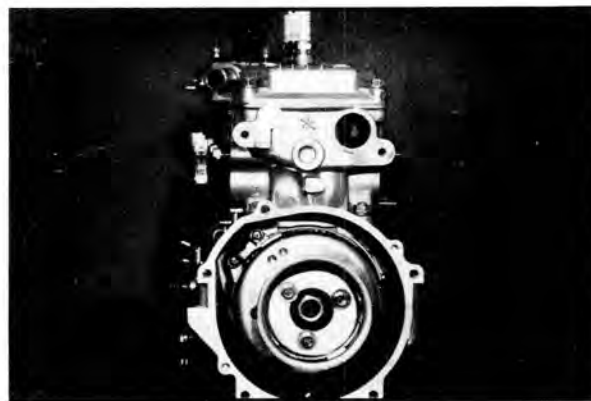


ENGINES

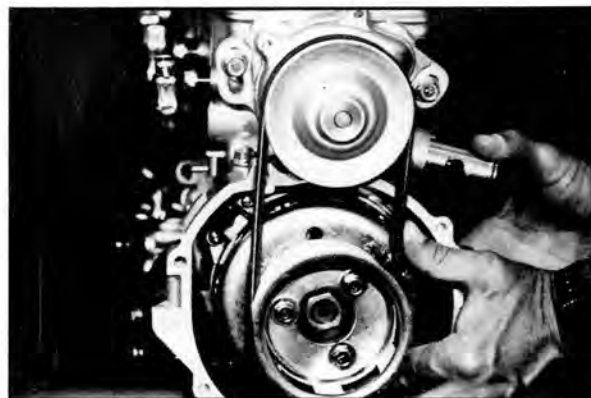
Disassembly and Reassembly - Monoblock

20. Install stator in the previously marked position and secure.

21. Install and torque flywheel nut.

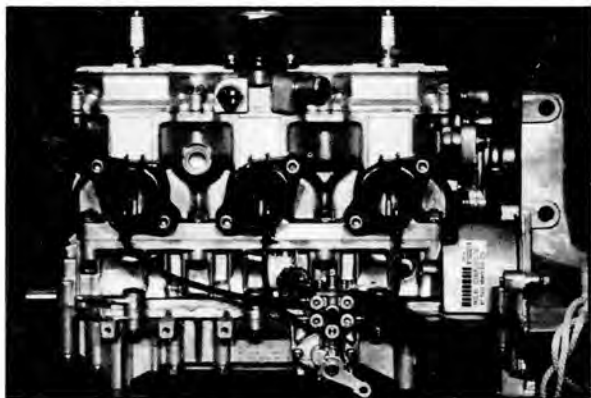


22. Install water pump and belt. Tighten belt.



23. Install oil pump and connect feed lines to rubber mount.

24. Install recoil housing.



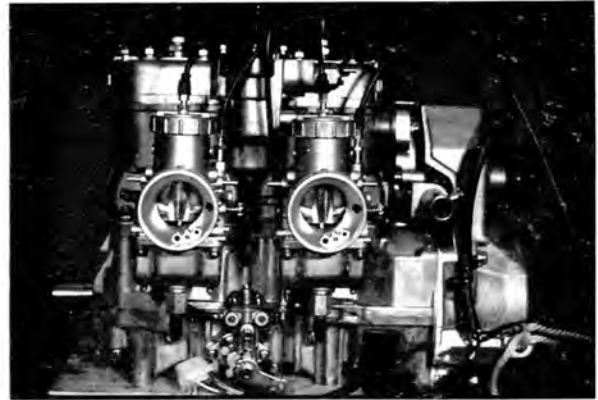
25. Install secondary coils and secure carburetors to rubber mounts.



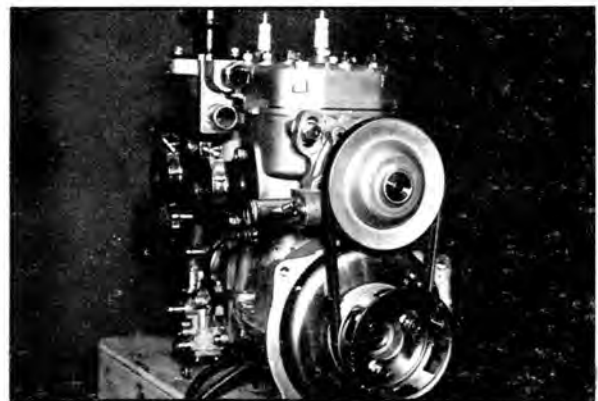
ENGINES

Disassembly and Reassembly - PL Twin Cylinder Series

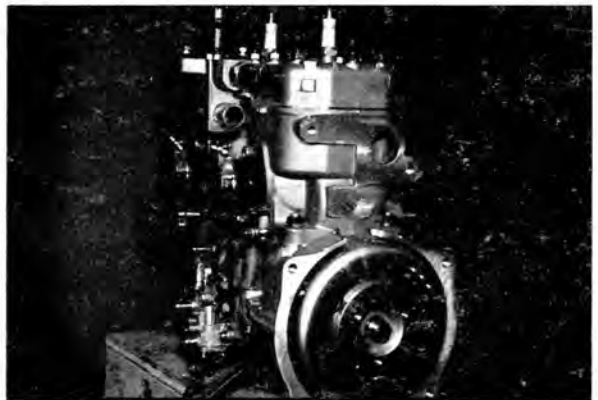
The photo at right shows a complete PL series twin cylinder engine.



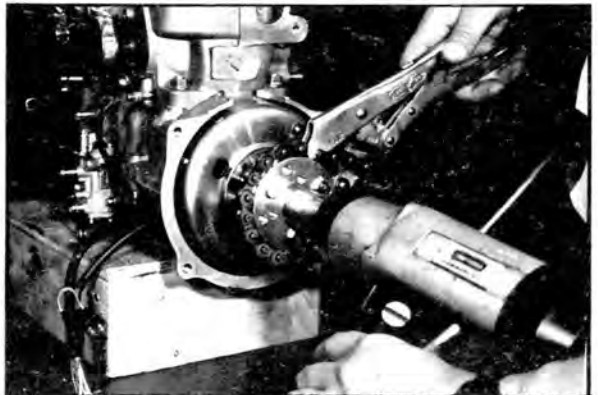
1. Remove carburetors or throttle bodies.
2. Remove recoil housing and exhaust manifold.



3. Remove water pump, starter recoil cup with water pump drive pulley and flywheel nut.



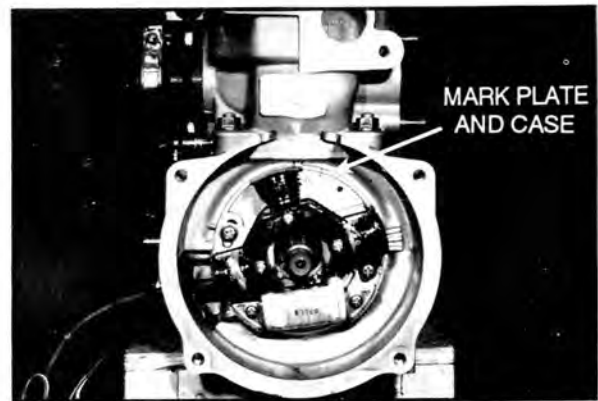
4. Install flywheel puller. Secure puller with a holding fixture tool, strap wrench, or chain wrench while pulling flywheel.



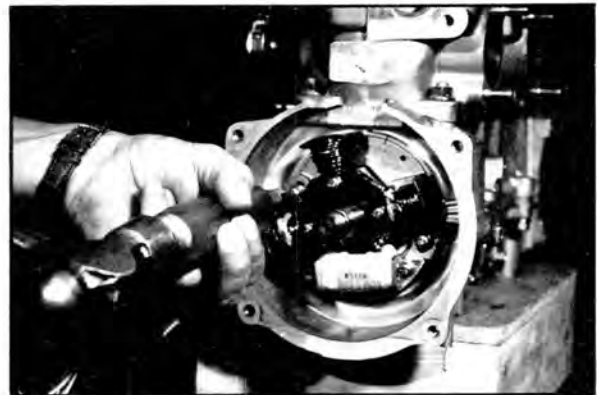
ENGINES

Disassembly and Reassembly - PL Twin Cylinder Series

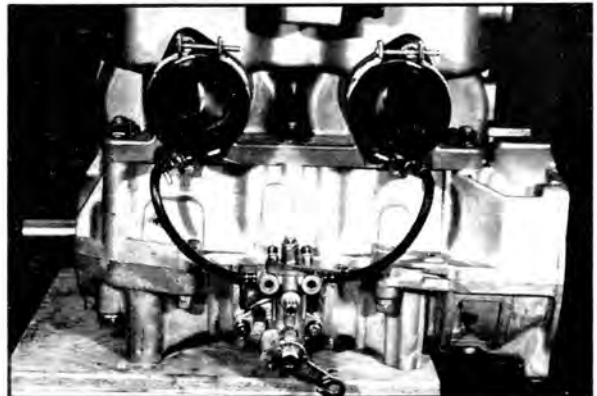
5. Mark stator plate for reference when reassembling the engine.



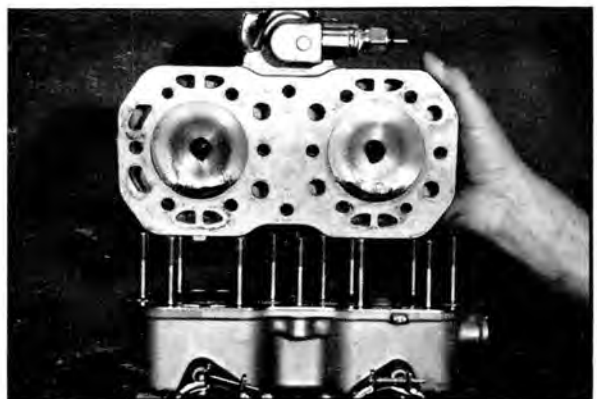
6. Using an impact screwdriver, remove stator screws.



7. Remove oil pump and oil pump feed lines from cylinder banjo bolts.



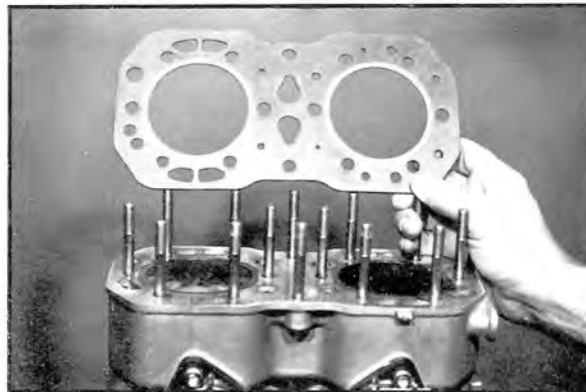
8. Remove cylinder head.



ENGINES

Disassembly and Reassembly - PL Twin Cylinder Series

9. Remove head gasket. Note position of head gasket inlet and outlet hole sizes for reference during reassembly.



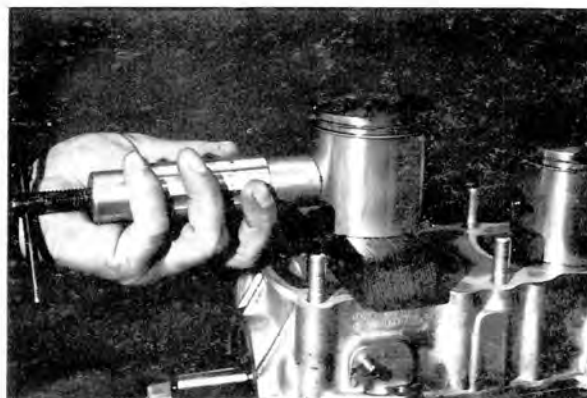
10. Remove cylinder.



11. Remove C-clip retainer clips from piston as shown.



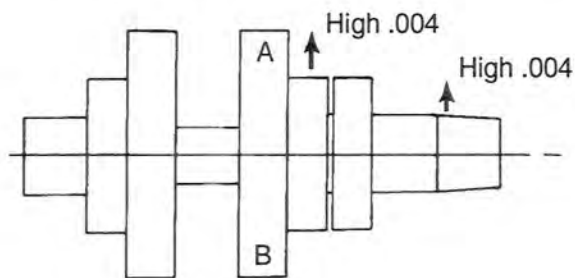
12. Using wrist pin tool, remove wrist pin from piston as shown.



ENGINES

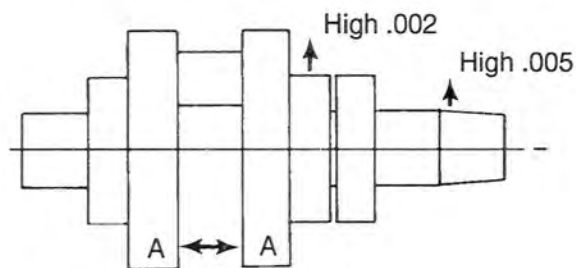
Disassembly and Reassembly - PL Twin Cylinder Series

13. Using the cylinder as a holding fixture, remove crankcase bolts.



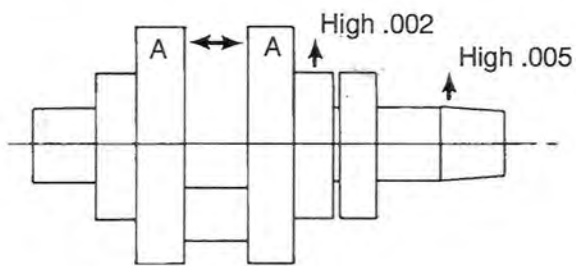
III. 1

14. To correct a situation like that shown in III. 1, hit crankshaft at point A. **NOTE:** The rod pin position in relation to the dial indicator position tells you what action is required to straighten the shaft.



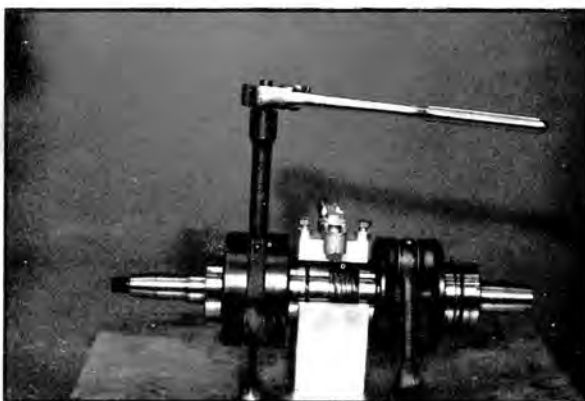
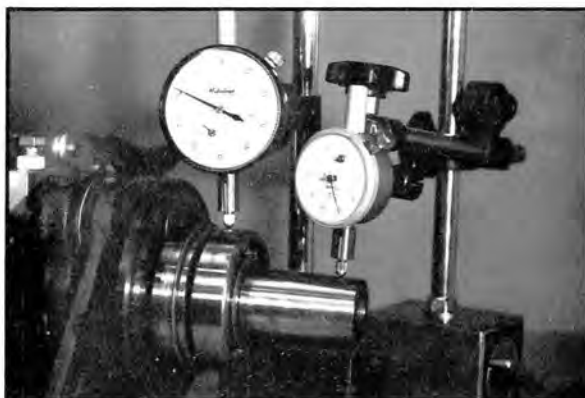
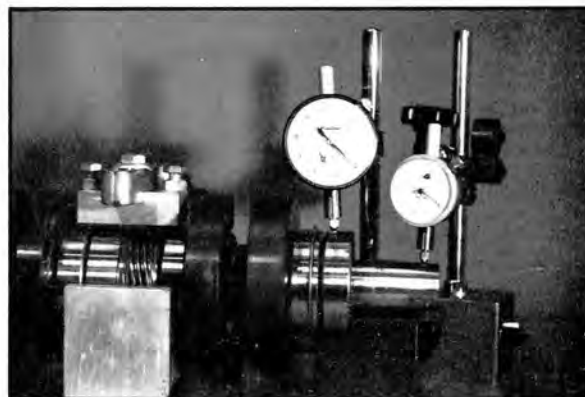
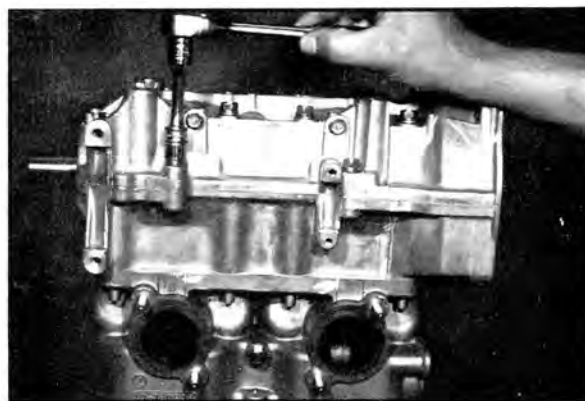
III. 2

15. To correct a situation like that shown in III. 2, squeeze crankshaft at point A. **NOTE:** The rod pin position in relation to the dial indicator position tells you what action is required to straighten the shaft.



III. 3

16. If the crank rod pin location is opposite the position in the second illustration, or at 180° from the dial indicator it will be necessary to spread the crankshaft at point A as shown.
17. Clean case halves and check crankshaft runout before reassembly.

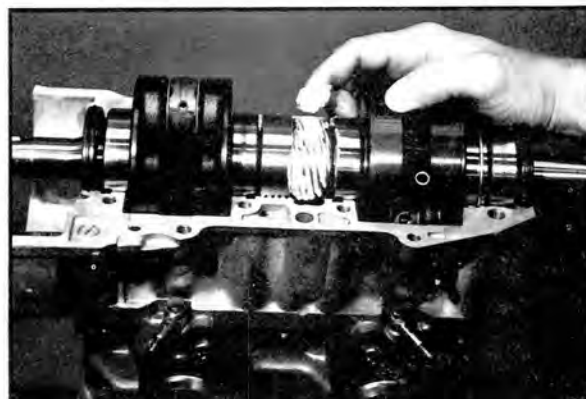


ENGINES

Disassembly and Reassembly - PL Twin Cylinder Series

Prior to reassembly, refer to page 5.60 and check ring end gap and piston skirt to cylinder clearance.

18. When reassembling, grease crankshaft end seals and labyrinth seal area as shown.

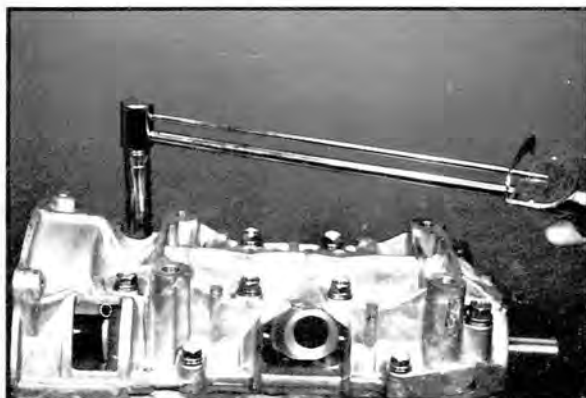


19. Turn bearing so anti-rotation pins are in the proper groove.

20. Apply Loctite 515 to crankcase halves.



21. Torque crankcase following torquing specs and sequence outlined on pages 5.20 and 5.21.



22. Install pistons with "F" mark or arrow (➤) toward flywheel.

23. Install C-clip using installation tool PN 2870773.

24. Install base gasket.

25. Install keystone rings with beveled side up and flat side down.

26. Oil crank bearings through access holes as indicated.



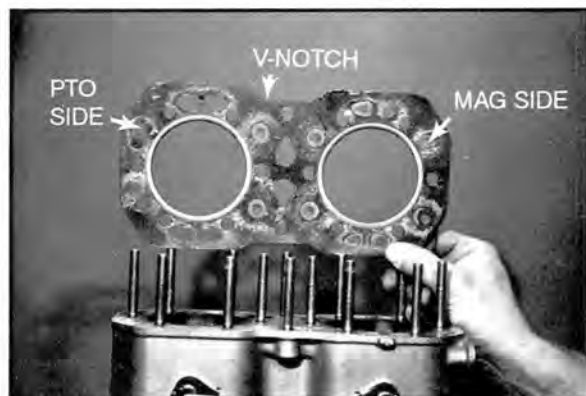
ENGINES

Disassembly and Reassembly - PL Twin Cylinder Series

27. Install cylinder, being careful not to damage rings.



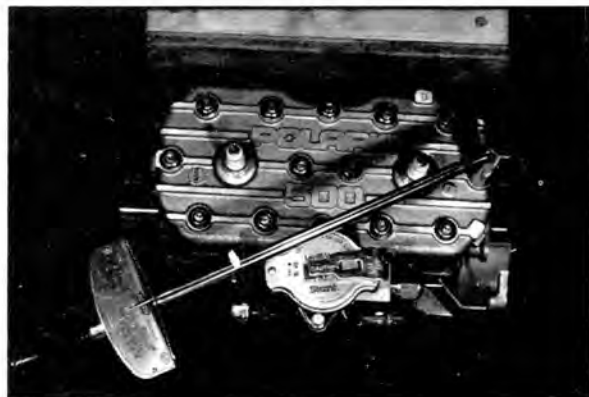
28. Install head gasket. Note proper position of gasket, "V" notch forward, small intake hole on right (mag) side, large hole on left (PTO) side.



29. Install cylinder head and torque cylinder head nuts following torque specs and pattern sequence on pages 5.20 and 5.21.

NOTE: Engine coolant may seep from the cylinder head cover bolts on the 1994 XCR SP EC45PL-03 engine. Apply Loctite 515/518 or 3 Bond Thread Sealer on the bolt threads when reinstalling the cylinder head cover bolts. Also, if the optional head gasket is installed for use with poor grade gasoline, a thinner .4mm spacer (PN 3084687) must be used in place of the original .8mm spacer under the rubber O-Ring.

30. Install oil pump in the sequence shown in the lower right photo.



31. Measure crankcase surface to gear drive bushing and record measurement (A).

32. Measure from case mating surface to end of pump body as shown and record (B).

33. Subtract measurement B from measurement A. The difference is the end play.

Optional shims:

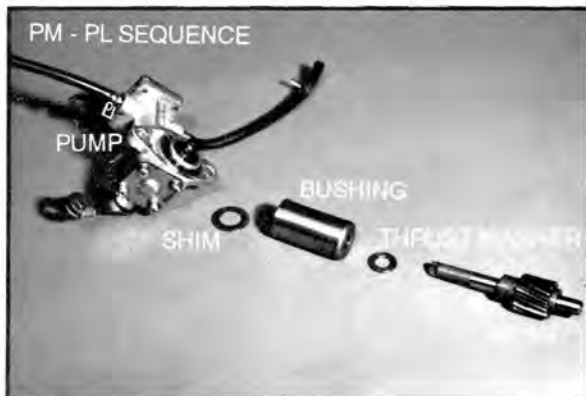
PN 3083671 = .006" (.15mm)

PN 3083672 = .012" (.3mm)

PN 3083673 = .024" (.6mm)

End play should be .008 to .016".

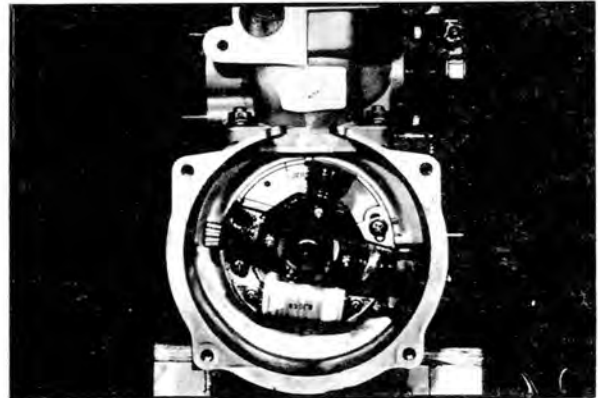
34. Connect feed lines to cylinder.



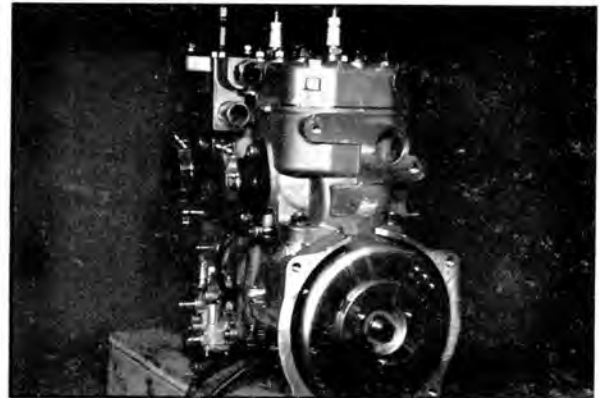
ENGINES

Disassembly and Reassembly - PL Twin Cylinder Series

35. Align stator screws as previously marked on stator plate and secure with hold down screws.

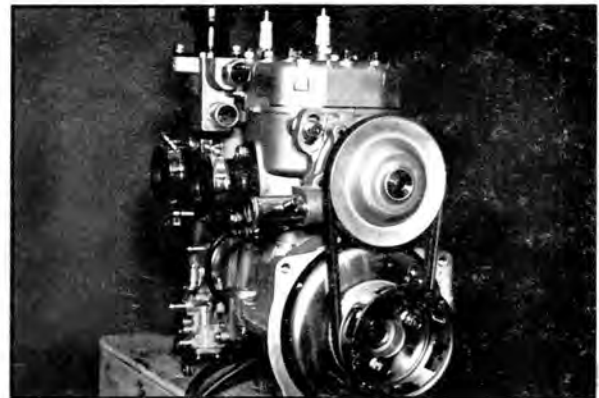


36. Install flywheel and torque flywheel nut to 60-65 ft. lbs. (8.28-8.97 kg/m).



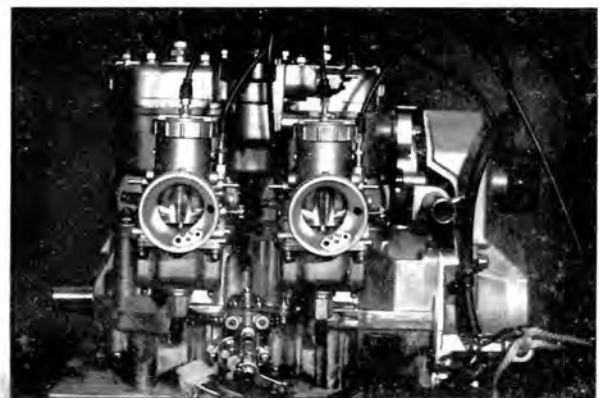
37. Install water pump and recoil starter cup.

38. Adjust tension on pump belt. Deflection should be 1/8"-3/16" (.3-.4 cm).



39. Install recoil housing, carburetors, and oil pump cable.

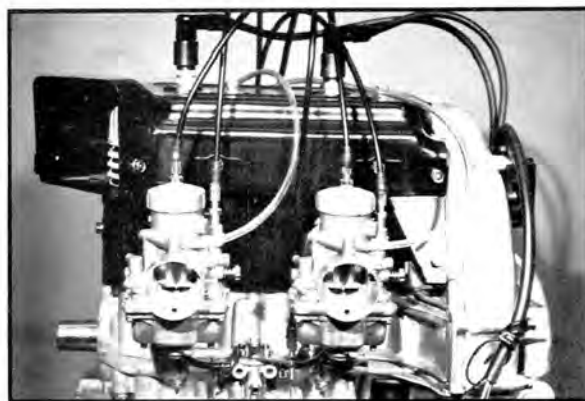
40. Connect CDI to stator plug connector.



ENGINES

Disassembly and Reassembly - PM Twin Cylinder Series

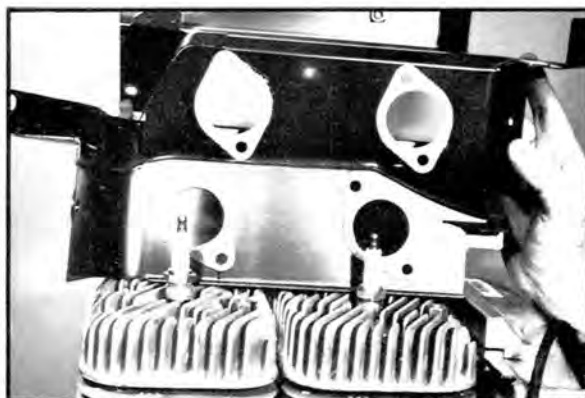
The photo at right shows a complete PM series twin cylinder engine.



1. Remove carburetors.
2. Unhook oil pump feed lines and remove oil pump.



3. Remove air shrouds. **NOTE:** There are gaskets between shroud and cylinder.



4. Note position of shroud retainer mounts on cylinder heads. These must be in the same position for reassembly.



ENGINES

Disassembly and Reassembly - PM Twin Cylinder Series

5. Remove recoil fan housing, recoil starter cup and flywheel nut.
6. Using flywheel puller, remove flywheel.
7. Refer to PL series instructions beginning on page 5.47 for remainder of disassembly and reassembly.
8. Measure crankcase surface to gear drive bushing and record measurement (A).
9. Measure from case mating surface to end of pump body as shown and record (B).
10. Subtract measurement B from measurement A. The difference is the end play.



Optional shims:

PN 3083671 = .006" (.15mm)

PN 3083672 = .012" (.3mm)

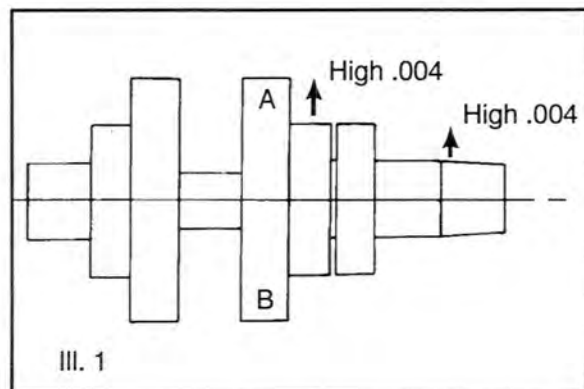
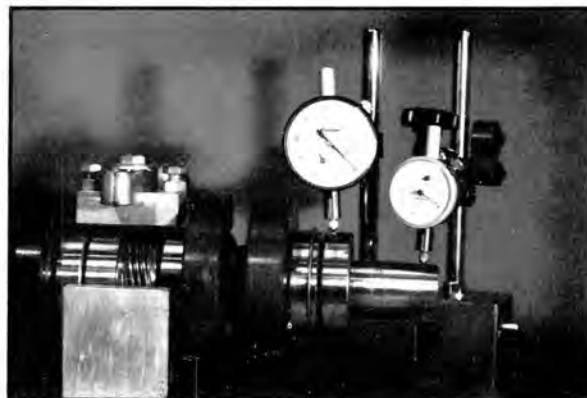
PN 3083673 = .024" (.6mm)

End play should be .008 to .016".

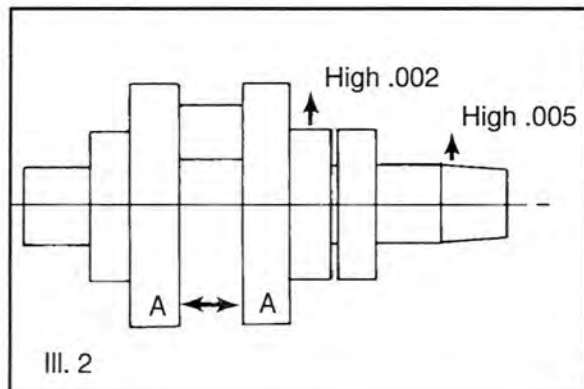
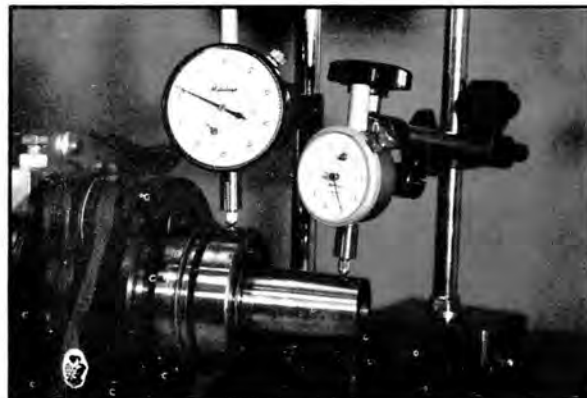
ENGINES

Crankcase Truing

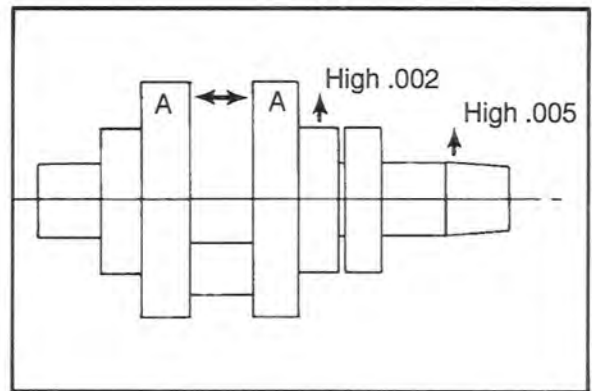
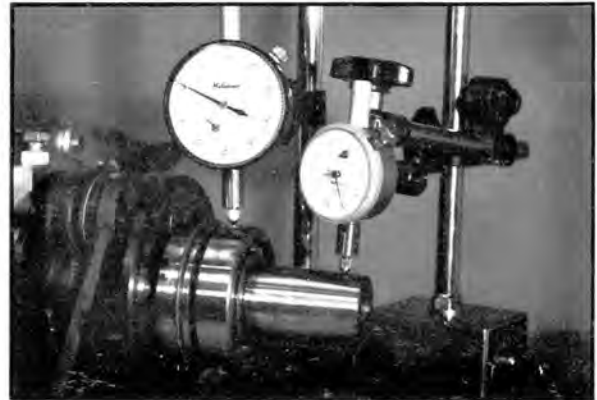
1. To correct a situation like that shown in Ill. 1, hit crankshaft at point A. **NOTE:** The rod pin position in relation to the dial indicator position tells you what action is required to straighten the shaft.



2. To correct a situation like that shown in Ill. 2, squeeze crankshaft at point A. **NOTE:** The rod pin position in relation to the dial indicator position tells you what action is required to straighten the shaft.



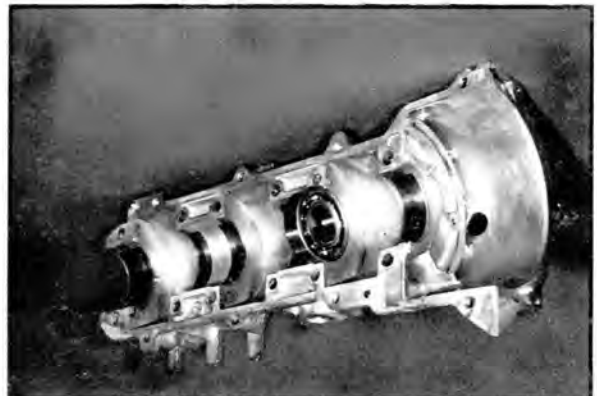
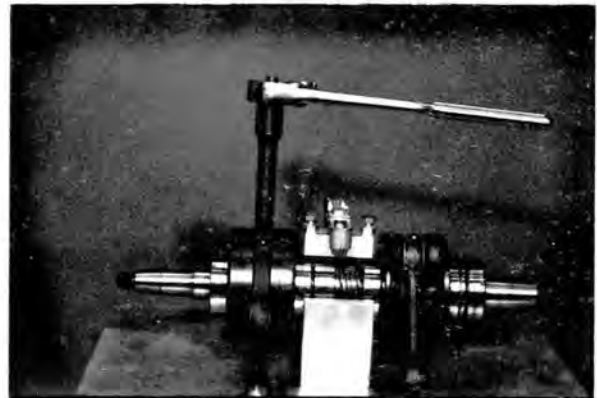
3. If the crank rod pin location is opposite the position shown in Ill. 2, page 5.56, or at 180° from the dial indicator it will be necessary to spread the crankshaft at point A as shown. When rebuilding and straightening a crankshaft, straightness is most important. As close to zero runout as possible is also required.



Crankcase Bearing Fit

Any time crankshaft bearing failure occurs and the case is to be reused, Polaris recommends checking the bearing fit into the case halves using the following procedure.

1. With case halves cleaned, take a replacement bearing and press it into each of the main bearing journals to determine a basic amount of press fit.
NOTE: Do a comparison check of all journals by manually forcing the bearing into the bearing seats noting if any are noticeably loose or tight. Normal hand installation will indicate the recommended interference fit of .0006" (.015 mm) for C-3 bearing, .001" (.025mm) for C-4 bearing. If the bearing falls out of the case when the case is inverted, the case should be replaced.



ENGINES

Cylinder Service

Maximum engine performance and easy starting are directly related to the compression of the fuel and air mixture in the combustion chamber. It is important that the cylinder walls are concentric, smooth and perpendicular to the crankshaft center line. All new engines have these characteristics built into them, however, the stresses and heat of operation may cause the bore to distort or score, resulting in loss of compression and power.

Inspection

A simple way of checking cylinder/piston condition is to remove the exhaust manifold and look into the exhaust port. If there is a considerable amount of blow by (brown or black carbon deposit) under the piston rings, the cylinder should be removed and honed. The piston rings should be replaced also.

The cylinder should always be inspected whenever an engine has been disassembled for repair or any time a loss of power or cylinder cranking compression is noted. A visual inspection after the cylinder head is removed will reveal if the cylinder should be removed for honing. Inspect for any scratches or signs of scoring or brown areas which indicate ring leakage and distortion.

The cylinder shown at right has been damaged by the engine overheating to the point of piston seizure. Honing this cylinder would restore it to service. Damage such as this may be the result of improper fuel/oil mixture, incorrect carburetor jetting, or ignition timing which is too far advanced.



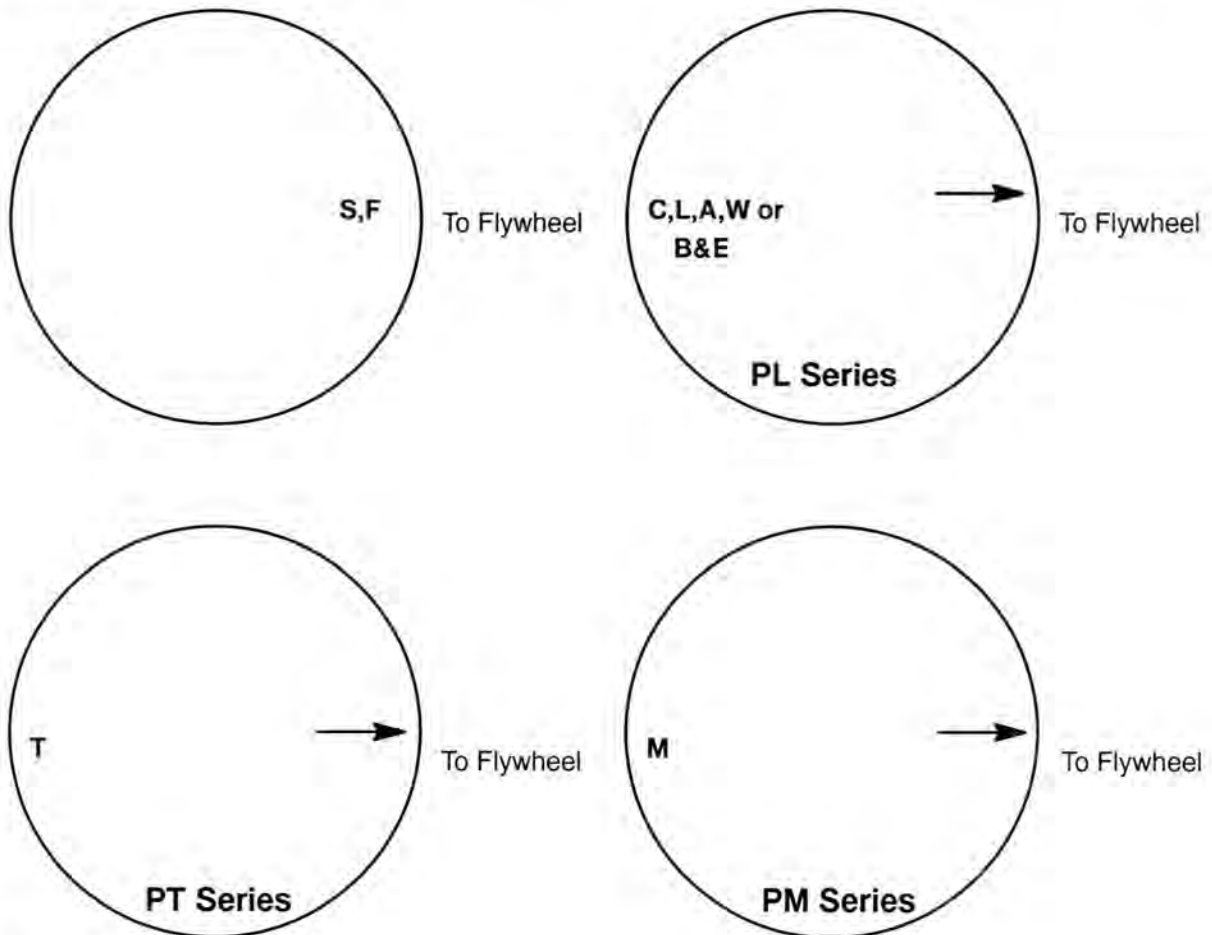
ENGINES

Cylinder Service - Piston Identification / Engine Designation

Correct installation of pistons into cylinders during reassembly is important. Incorrect installation will result in ring breakage and seizure due to ring ends passing over open ports.

Viewing pistons from the top, note directional and engine model series identification marks.

The letter "F", "→" or "➤" must always be toward flywheel side of engine. Pistons may carry a letter such as "L", "A", "T", "W", "M", "M1", or "M2" to indicate their engine series designation. Oversize pistons and rings will have an additional marking of "25" indicating .010" (.025 cm) oversize or "50" indicating .020" (.050 cm) oversize. Piston identifications are shown below.



Engine Designation

M1 designates 44-2PM-1100/2100 - EC50PM-01/02

M2 designates 44-2PM-3100/3300/5000/5100 - EC50PM-03

M6 designates 44-3PM-01

W designates 50PL06

4L designates 40PL

6L designates 60PL

L designates 34/51PL

A designates 50PL/45PL/75PL/80PL

C designates 65PL

B&E designates 58PL

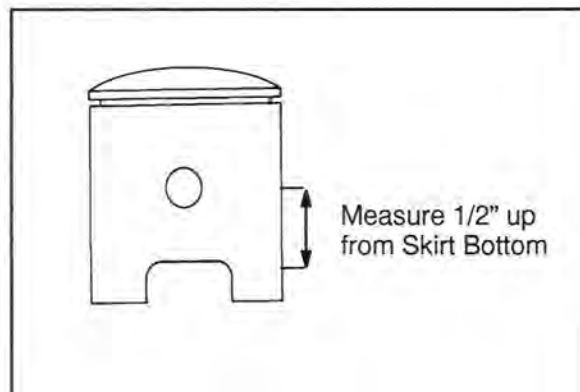
ENGINES

Cylinder Service - Piston/Cylinder Clearance

Piston Measurement

Whenever cylinders are honed or bore clearance is checked, it is important to measure the piston diameter to arrive at its major dimension. The pistons used in Polaris engines should be measured at right angles to the pin as shown. Determine the largest diameter within this area and refer to the chart below for clearance specifications.

The cylinder bore must be straight and concentric. Refer to the honing information outlined in this section for specific procedures. The chart below indicates engine model bore size and recommended rebuild clearances.



Engine Model	Standard Bore		**Rebuild Piston/Cylinder Clearance Inches	**Maximum Service Limits Inches
	Inches	MM		
EC17PM	2.4409	62	.005 - .008	.009
EC25PS	2.8346	72	.004 - .0065	.009
EC29PF	2.283	58	.004 - .0065	.009
EC25PT06/07	2.1017	53.4	Chrome*	---
EC25PT	2.1063	53.5	.004 - .0065	.008
EC25PC	2.1063	53.5	.005 - .007	.009
EC25PM	2.082	52.9	.004 - .0065	.008
EC34PC/PS	2.4409	62	.005 - .007	.008
EC34PM	2.432	61.78	.0045 - .007	.008
EC34-2PM02/03/04	2.4546	62.3	.0035 - .0055	.008
EC34PQ	2.3622	60	.005 - .0075	.010
EC34PT	2.441	62	Chrome*	—
EC34PL	2.432	61.78	.0035 - .0065	.008
EC40/60PL	2.559	65	.0050 - .0065	.0085
EC40PL02	2.559	65	.004 - .006	.008
EC40PM	2.556	65	.005 - .0075	.010
EC44PM	2.6557	67.72	.0045 - .007	.010
EC44-2PM	2.6557	67.72	.0035 - .0060	.008
EC44-3PM	2.668	67.72	.0035 - .0055	.008
EC44PQ	2.6673	67.75	.005 - .0075	.010
EC44PT	2.6673	67.75	Chrome*	—
EC45PL01/02	2.656	67.7	.004 - .006	.009
EC50PL All	2.8346	72	.0035 - .005	.0082
EC50PM	2.8346	72	.004 - .0065	.008
EC51PL	2.432	61.78	.0035 - .0065	.008
EC54PM	2.952	75	.0055 - .0075	.010
EC58PL03/02 - 579 cc	2.521	64	.004 - .006	.008
EC58PL02/03/04 - 596 cc	2.561	65	.0035 - .0055	.008
EC65PL01/02/03/05	2.668	67.72	.005 - .007	.009
EC75PL01	2.747	69.72	.0045 - .0055	.008
EC80PL01	2.834	72	.0043 - .0063	.008

*Chrome cylinders may be de-glazed and refinished using fine stones.

** These numbers represent total piston to cylinder clearances. The clearance with the piston installed will be one-half of the specified dimension.

ENGINES

Cylinder Service - Oversize Pistons and Rings

.020 Oversize Piston And Ring Chart To Fit All Engines As Designated Below

Part Number	Description	ENGINE																						
		PT. PC 250	PM 175	PS 244	PM 250	PM 294	PF 294	PS 294	PM 335	PF 335	PS. PC 335	34- 2 PM	PM 398	PS 398	PS 432	PM 440	44-2PM 3100/3300/ 5000/5100	44-2PM 1100/2100	44-3 PM	PM 50	PM 530	PF 530	PM 50 -03	
3081721	Piston		X																					
3081722	Ring		X						X	X														
3081723	Ring												X											
3081724	Ring			X																				
3081725	Piston												X											
3081726	Piston						X	X																
3081727	Ring					X	X																	
3081728	Ring							X																
3081729	Ring										X													
3081730	Piston								X	X														
3083716	Piston																			X			X	
3081732	Piston			X																				
3083717	Ring																			X			X	X
3081731	Piston																						X	
3081733	Ring																						X	
3081734	Piston							X																
3081735	Piston										X													
3081736	Ring							X																
3081737	Ring										X													
3081738	Piston																							
3081739	Ring														X							X		
3081740	Ring																					X		
3081741	Ring																					X		
3081742	Piston													X										
3081743	Piston														X									
3081744	Ring													X										
3081745	Ring													X										
3081746	Ring														X									
3082273	Piston	X																						
3082274	Top Ring	X																						
3082275	2nd Ring	X																						
3082701	Piston				X																			
3082702	Ring				X																			
3083718	Piston											X												
3083719	Ring											X												
3084241	Piston																			X				
3084243	Ring																			X				
3082845	Piston															X								
3082846	Ring															X	X	X						
3083173	Piston																	X						
3083174	Piston																X							
3083975	Piston																							X

Liquid Cooled Engines

NOTE:

Before discarding any cylinder we recommend honing it. If the cylinder is damaged so it cannot be cleared without exceeding the maximum standard piston-cylinder clearance recommendations, it may be oversized. Refer to honing information outlined in this section for specific procedures.

When ordering oversize cylinders and pistons, refer to the engine model tag located on the engine crankcase or fan housing for correct ordering information.

Part Number	.020 Oversize Description	Engine	Part Number	.010 Oversize Description	Engine
3082705	Piston	34-51PL	3082849	Piston	34-51PL
3082706	Ring	34-51PL	3082559	Ring	34-51PL
3083262	Piston	60PL01	3083260	Piston	60PL01
3083263	Ring	60PL01	3083261	Ring	60PL01
3083293	Piston	60PL02	3083292	Piston	60PL02
3083359	Ring	40PL/60PL02	3083358	Ring	40PL/60PL02
3083720	Piston	40PL	3083303	Piston	40PL
3083903	Piston 1.5	50PL01/02	3083902	Piston 1.5	50PL01/02
3083944	Piston 1.5	50PL03	3083943	Piston 1.5	50PL03
3083971	Ring 1.5	50PL06	3083970	Ring 1.5	50PL
3083876	Piston	65PL	3083875	Piston	65PL
3083874	Ring	65PL/45PL	3083873	Ring	65PL/45PL
3084328	Piston	45PL	3084327	Piston	45PL
3084341	Piston 1.2	50PL04/05	3084340	Piston 1.2	50PL04/05
3084344	Ring 1.2	50PL04/05	3084343	Ring 1.2	50PL04/05
3084451	Piston	58PL01	3084450	Piston	58 PL01
3084454	Ring	58PL01	3084453	Ring	58PL01
3085020	Piston	58PL02	3085019	Piston	58PL02
3083350	Ring	58PL03	3083358	Ring	58PL03
3084577	Piston	75PL01	3084576	Piston	75PL01
3084549	Ring	75PL01	3084548	Ring	75PL01
3085028	Piston	80PL01/02	3085027	Piston	80PL01/02
3084344	Ring	80PL01/02	3084343	Ring	80PL01/02

ENGINES

Cylinder Honing

Cylinder Hone Selection

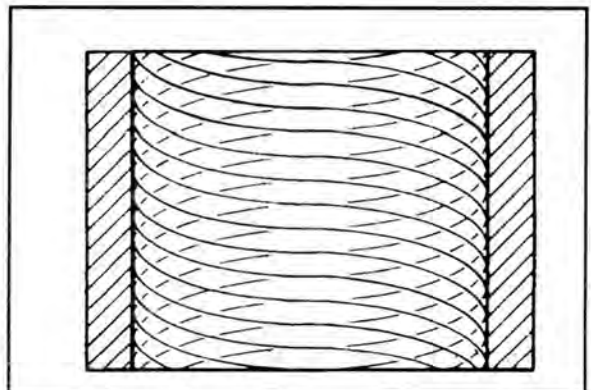
Selecting a hone which will straighten as well as remove material from the cylinder is very important. Honing a cylinder with a common spring loaded finger-type glaze breaker is *never advised*. Polaris recommends using a rigid type hone which also has the capability of oversizing. Such hones are manufactured by Sunnen Products Company of St. Louis, Missouri; Ammco Tools, Inc., of North Chicago, Illinois, among others.

The photo at right shows an Ammco #3950 hone which has roughing and finishing stone sets available for large 75mm bore engines.

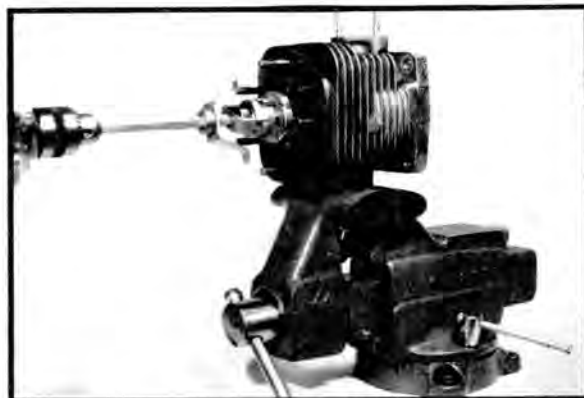
Cylinders may be wet or dry honed, depending upon the hone manufacturer's recommendations.. Wet honing removes more material faster and leaves a more distinct pattern in the bore.

Honing

2. Wash cylinder with solvent and clamp in a vise around exhaust port studs. **NOTE:** Use brass stock, wood or cardboard to protect studs from vise jaw serrations.
3. Place hone in cylinder. Tighten stone adjusting knob until stone contacts cylinder walls. **CAUTION:** Do not over tighten.
4. A finished cylinder should have a cross hatch pattern. This aids in the retention of fuel/oil mixture in initial break in.



4. Using a 1/2" (1.3 cm) drill motor with a speed of 300-500 RPM, run hone in and out of cylinder rapidly until cutting tension decreases. **NOTE:** Remember to keep hone drive shaft centered and to bring stone approximately 1/2" (1.3 cm) beyond bore at end of each stroke. Release hone at regular intervals. Inspect bore to determine if it has been cleared. Check piston fit.



5. With cylinder thoroughly cleaned, install a new piston into bore as shown. Slip a feeler thickness gauge alongside skirt at right angles to pin. Starting with a thinner gauge, progressively work up to the thickest gauge which may be inserted between piston and wall with a sliding fit. This will be the total cylinder-piston clearance. **NOTE:** Refer to the engine specification chart in this section to determine if the clearance is within tolerance for that engine.



6. Position ring 1/2" (1.3 cm) from top of cylinder. Center ring in cylinder bore. Ring end gap should be .006"-.018" (.015-.046 cm) for all models.

Honing To Oversize

If the piston-cylinder clearance measures greater than that given in the chart for a standard bore, it will be necessary to oversize the cylinder to .020" (.050 cm) using a new .020 oversize piston and rings. This may be done either by boring or honing.

For oversize honing, always wet hone using honing oil and a coarse roughing stone. Hone until a check with a new piston indicates you are within .003" (.007 cm) of the clearance recommended. Complete sizing with fine grit stones to provide proper cross-hatch finish and clearance.

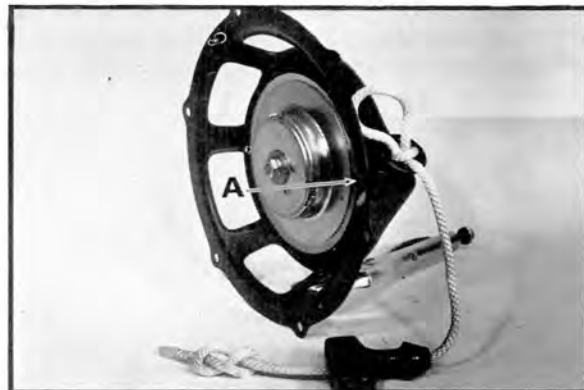
CAUTION: It is very important that the cylinder be thoroughly cleaned after honing to remove all grindings which could cause cylinder and piston wear or damage. Wash cylinder in a solvent, then in hot soapy water; rinse, blow dry and oil lightly.



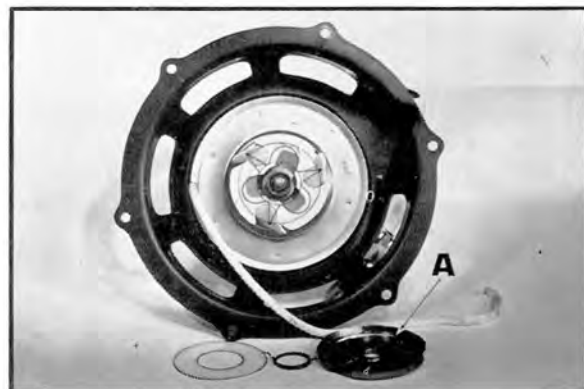
ENGINES

Recoil Starter Rope Replacement

5. Tie rope in a slip knot. Pull rope out of handle.
6. Untie knot and remove handle.



7. Pull rope into notch (A) on reel and slowly unwind spring.
8. Remove retaining nut.
9. Remove ratchet retainer (A), spring, and retainer disc.



10. Remove three ratchet return springs and smaller plastic disc.



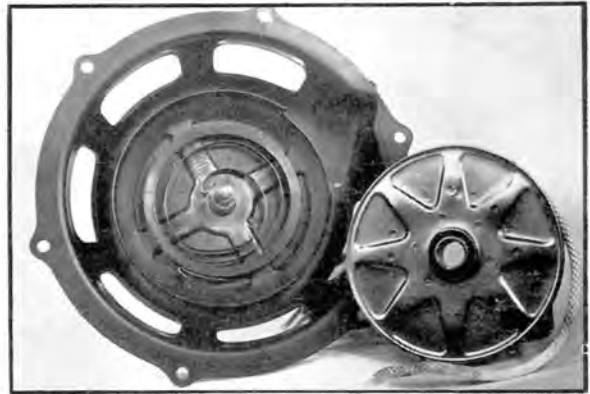
11. Remove three ratchets (A), small spring (B), and washer (C).



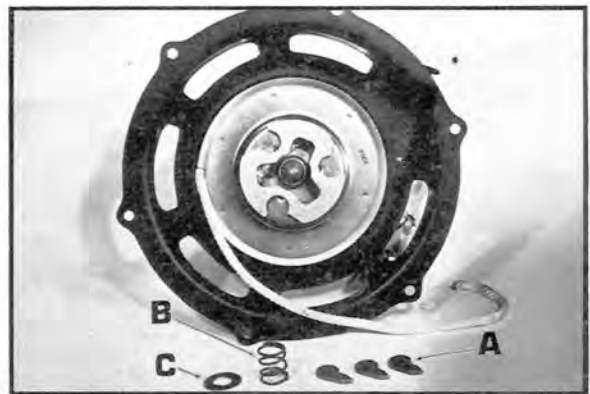
ENGINES

Recoil Starter Rope Replacement

12. Lift reel from housing, making sure that the reel is free of the recoil spring.
13. Install a new rope and replace the reel.



14. Install ratchets (A), spring (B) and washer (C).



15. Install small plastic disc and three ratchet return springs.
16. Install large plastic disc, return spring, and ratchet retainer (A).



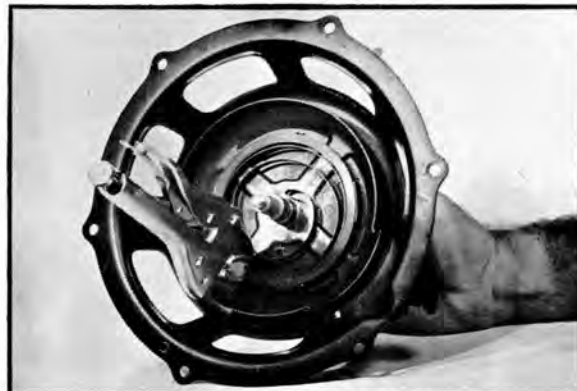
17. Install retaining nut. Tighten recoil spring by putting rope in notch (A). Three to four turns should give sufficient spring tension.
18. Tie a slip knot in rope to prevent it from rewinding.
19. Attach handle and tie a figure eight knot on the rope end and push into the handle.
20. Loosen slip knot and reinstall.



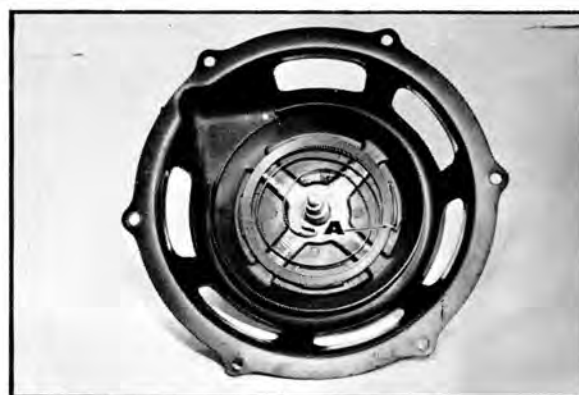
ENGINES

Recoil Starter Spring Replacement

21. Follow disassembly procedures outlined on page 5.64.
22. Clamp defective spring with a small vise grip. Use caution when removing spring.



23. Rewind spring and install in housing, hooking end of spring (A) as shown.
24. Follow reassembly procedures outlined on page 5.65.



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Recoil Starter Spring Replacement, Late Model

Disassembly

1. Remove recoil handle and allow rope to retract and spring to totally unwind.
2. Remove retaining nut, ratchet friction plate and ratchet pawl from reel face.
3. Lift reel assembly straight up, out of housing. **NOTE:** If the spring tension is relieved and the reel is lifted straight out, the spring will remain in the housing.

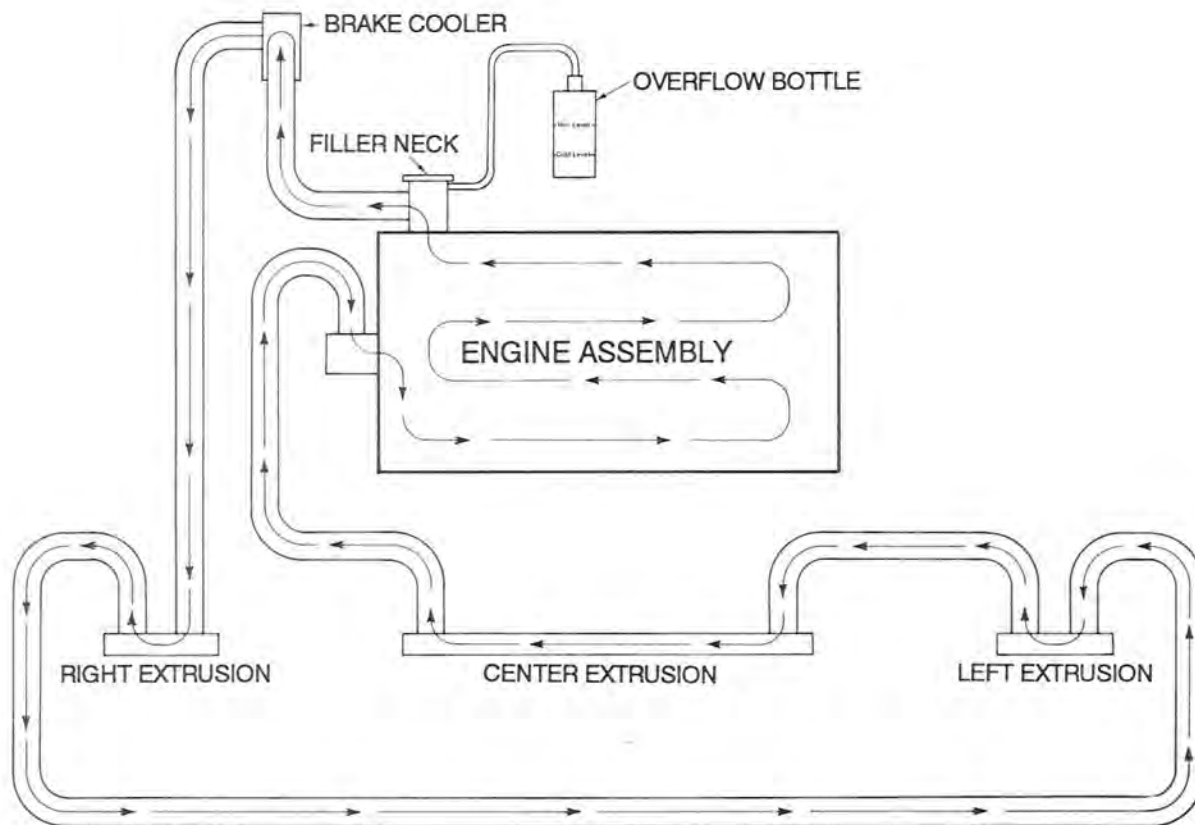
Reassembly

1. If the spring was removed, reinstall it by spiraling counterclockwise toward the center.
2. Lubricate center shaft and spring with Polaris low temperature grease.
3. Wind rope in a counterclockwise direction around outside of reel, as viewed from ratchet side of reel.
4. Pass end of rope through rope guide and slide reel down onto shaft and spring. **NOTE:** Make sure reel tab engages hook on end of spring.
5. Install rope handle.
6. Reinstall ratchet pawl onto reel face. **NOTE:** Ratchet spring holds ratchet in.
7. Reinstall friction plate with one end of friction spring in hole on end of ratchet pawl.
8. Reinstall flange nut and torque to 5 ft. lbs. (.69 kg/m).
9. Pull recoil rope to full extension and align notch on outside edge of reel with housing rope guide hole.
10. Using a needle nose pliers or hooked wire, pull a loop of rope through the notch into center of housing.
11. Holding side of rope loop attached to reel, wind reel counterclockwise until coil bind is felt. Then unwind reel between one and two turns.
12. Pull loop to outside of housing by pulling on rope handle.
13. Allow rope to fully retract and check for normal recoil and ratchet operation.



ENGINES

Cooling System - EC60PL With Recovery System



COOLANT FLOW SCHEMATIC

Filling and Bleeding Procedure

1. Elevate front end of machine approximately 10" (25.4 cm).
2. Loosen special bleeder plug (A) at water pump.
3. Remove pressure cap and pour coolant into engine until it flows from bleed plug.
4. Tighten bleed plug and continue filling until coolant level is at pressure cap fitting neck.
5. Start engine and let idle.
6. Observe coolant in filler neck. It must be circulating. If no circulation is evident, shut engine down and re-bleed pump.
7. Repeat bleeding and filling procedure until circulation and coolant level remains constant for a period of three to five minutes during idling.
8. Fill coolant expansion reservoir bottle to indicated hot level.
9. Field test machine.

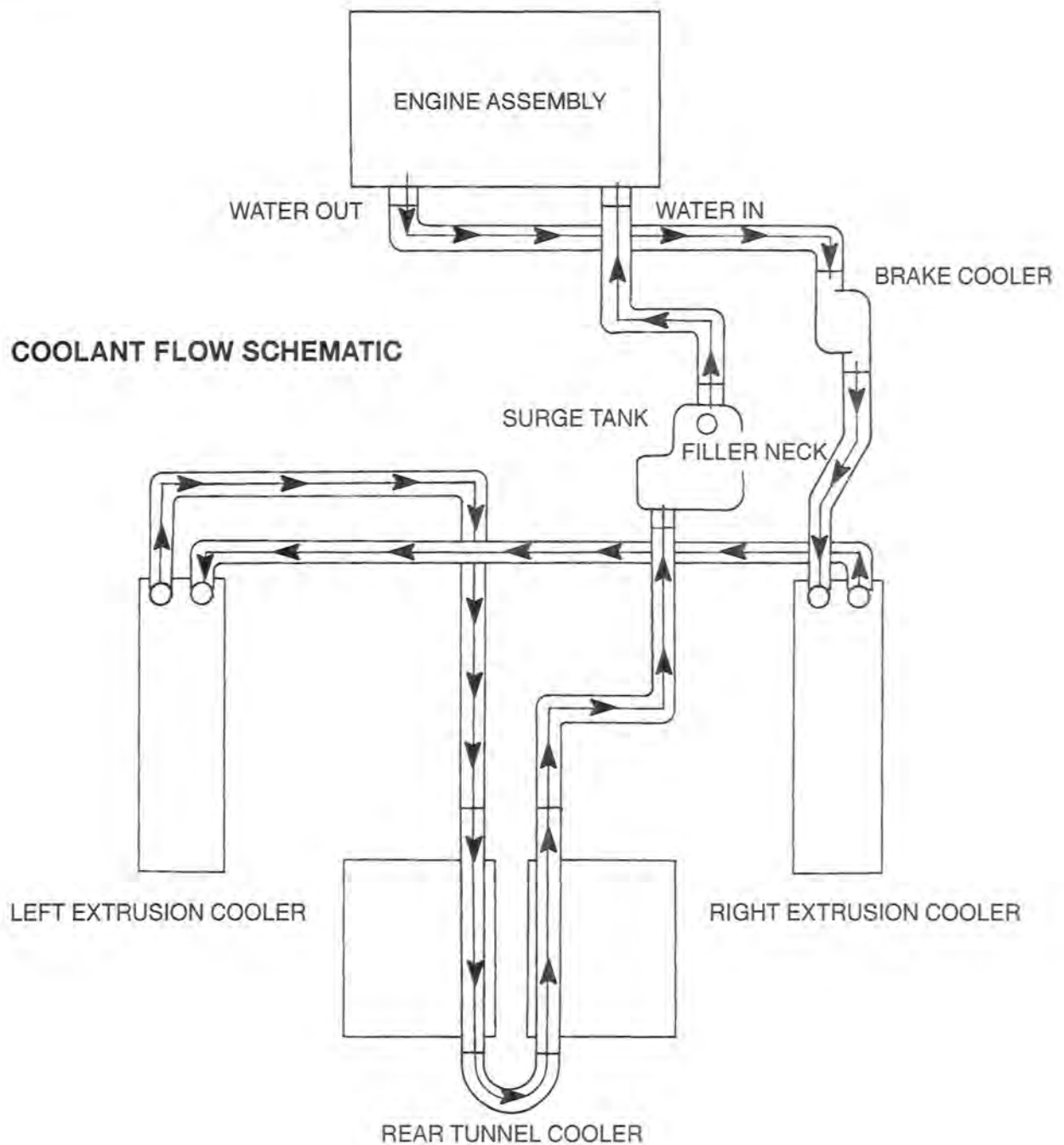


Coolant level and circulation must always be re-checked during the first five to ten minutes of field operation to ensure all systems function. This is especially important after refilling and bleeding following complete draining of the coolant for system repair.

10. Clean, inspect, and, if necessary, repair or replace all parts.

Filling And Bleeding Procedure

1. Fill system with a 50/50 mixture of antifreeze and water.
2. With engine running, crack bleed screws on water pump and head.
3. Continue adding antifreeze mixture until system is purged of air.
4. Close bleed screws.
5. Add antifreeze mixture up to fill line.



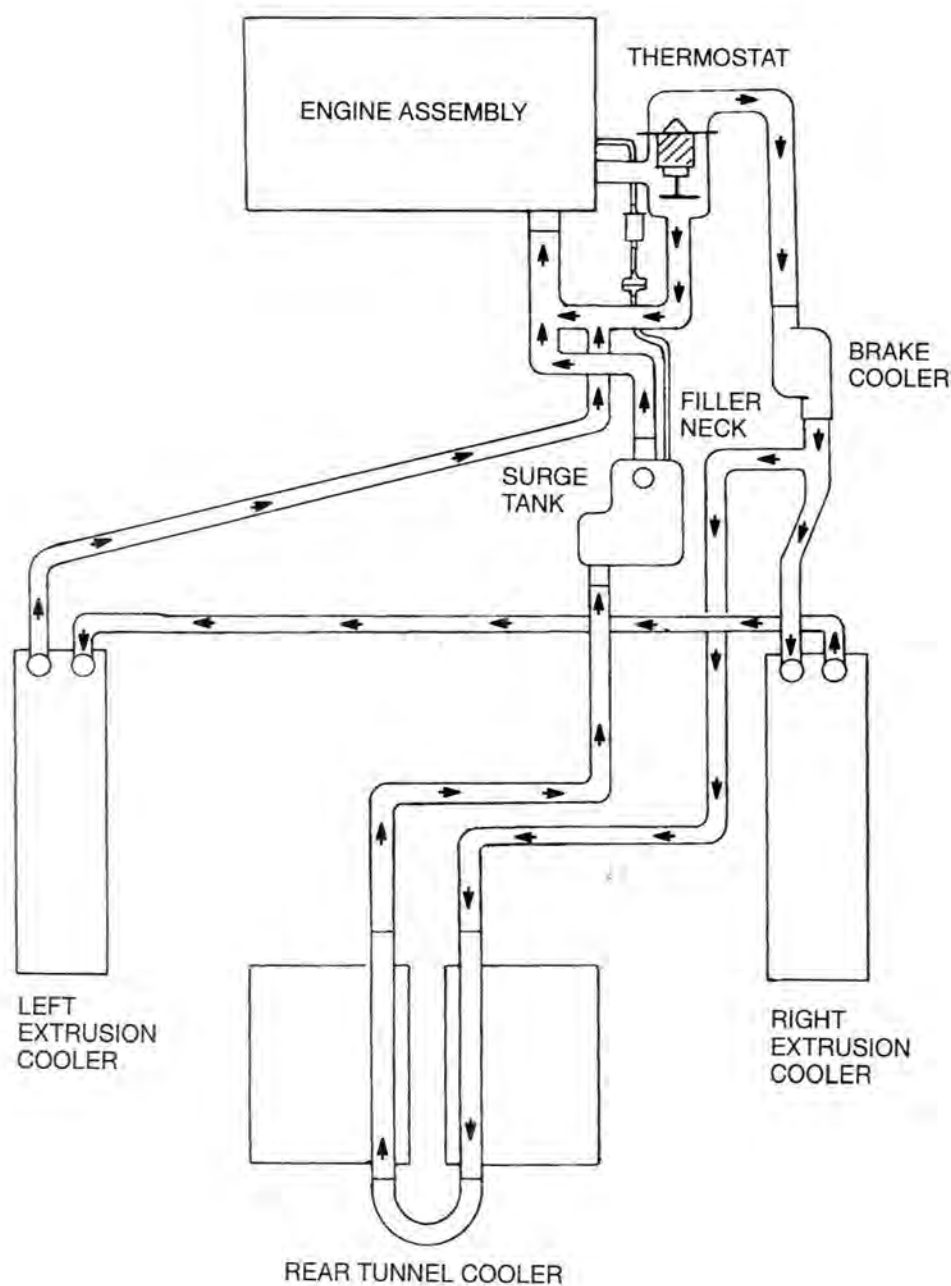
ENGINES

Cooling System - EC75PL-01/EC80PL-01

Filling And Bleeding Procedure

1. Fill system with a 50/50 mixture of antifreeze and water.
2. With engine running, crack bleed screws on water pump and head.
3. Continue adding antifreeze mixture until system is purged of air.
4. Close bleed screws.
5. Add antifreeze mixture up to fill line.

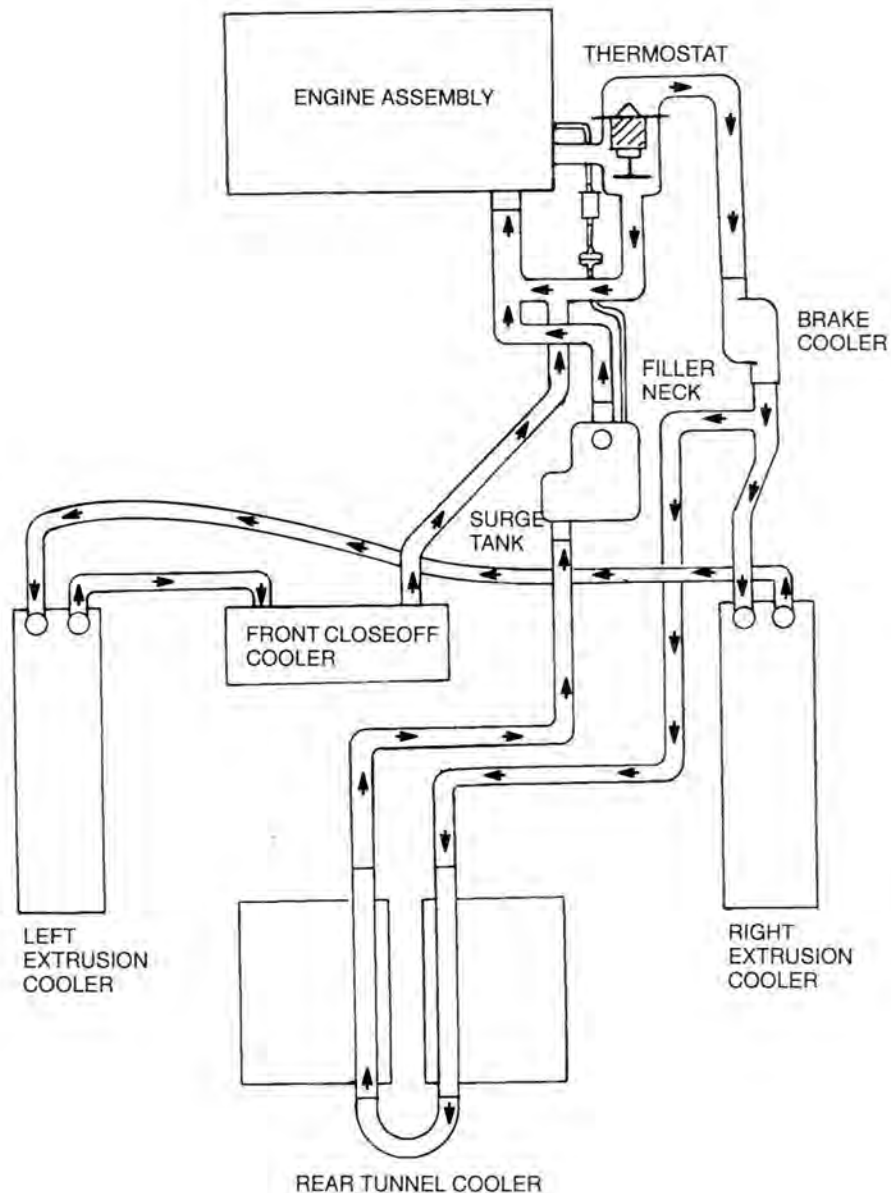
COOLANT FLOW SCHEMATIC



Filling And Bleeding Procedure

1. Fill system with a 50/50 mixture of antifreeze and water.
2. With engine running, crack bleed screws on water pump and head.
3. Continue adding antifreeze mixture until system is purged of air.
4. Close bleed screws.
5. Add antifreeze mixture up to fill line.

COOLANT FLOW SCHEMATIC

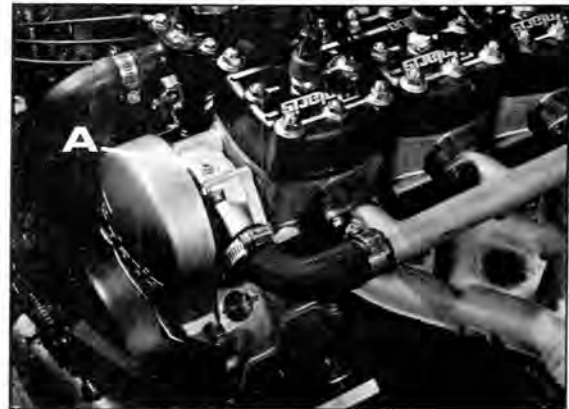


ENGINES

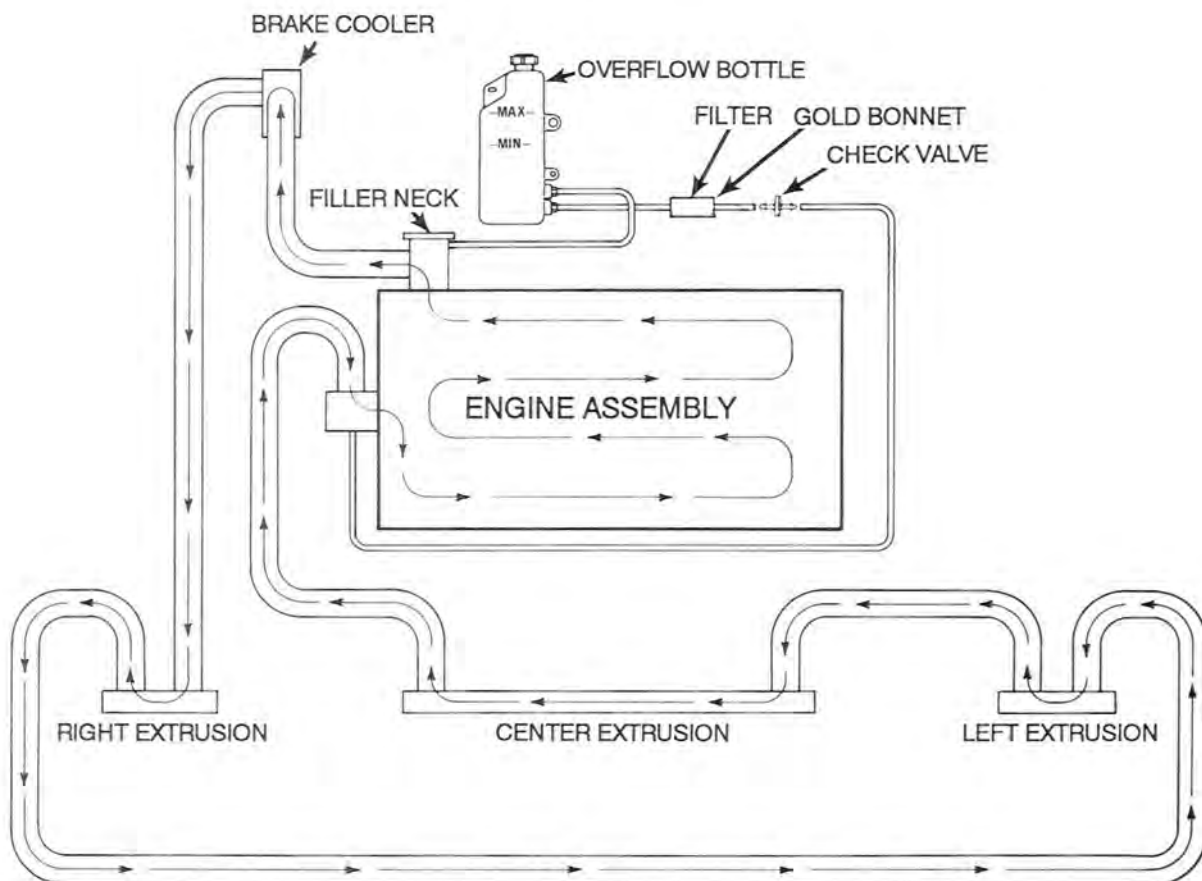
Cooling System - EC40/45/50/60/65PL With Positive Bleed Recovery System

Filling and Bleeding Procedure

1. Elevate front end of machine approximately 10" (25 cm).
2. Loosen special bleeder plug (A) at water pump.
3. Remove pressure cap and pour coolant into engine until it flows from bleed plug.
4. Tighten bleed plug and continue filling until the coolant level is at the pressure cap fitting neck.
5. Fill coolant expansion reservoir to indicated maximum level line.



COOLANT FLOW SCHEMATIC

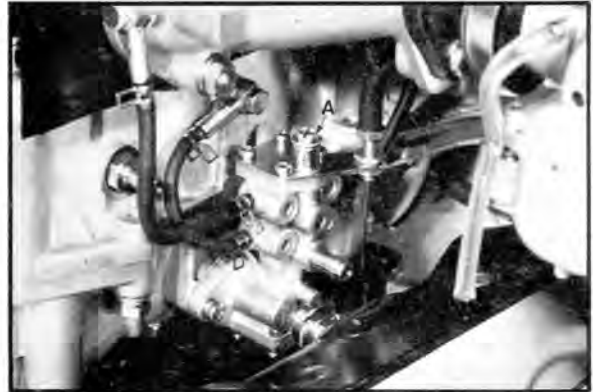


ENGINES

Oil Pump Bleeding - All Models

The oil pump must always be bled following any service to the injector system or engine which allows the loss of oil and subsequent entrapped air during reassembly.

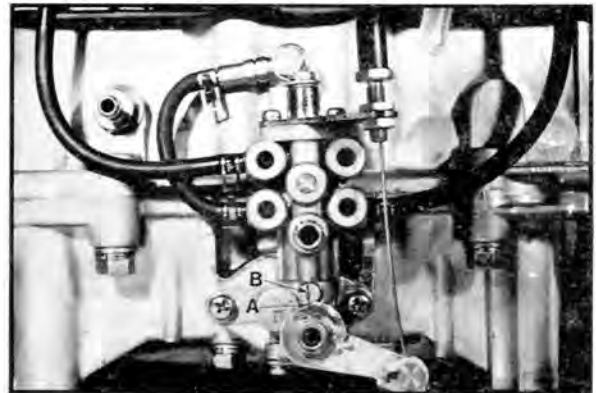
1. Fill oil reservoir with Polaris injector oil.
2. Loosen brass hex head screw (A). After a short time oil should flow from beneath the screw head to indicate the pump is free of air.
3. Tighten bleed screw.



Oil Pump Adjustment - All Models

After the engine RPM and carburetor adjustments have been made, the oil pump must also be adjusted.

1. With engine shut off and throttle in its idle position, the pump lever index mark (A) must align with the pump housing boss index mark (B).
2. Loosen lock nuts on cable housing sleeve and vary cable housing length as required. **NOTE:** Verify that pump lever is actuated upon initial throttle opening.



ENGINES

Oil Pump Operation and Troubleshooting

Any time the engine is disassembled or repaired, it is important that the oil supply from the pump to the engine be checked.

NOTE: Banjo type or pressed in valves should open with 3 to 5 lbs. of pressure.

1. With engine in chassis, oil reservoir full, and pump bled, remove two oil feed line banjo bolts (A) from their location on the manifold or carburetors. **NOTE:** Use care not to lose the two washers on either side of the banjo check valve.
2. Blow through the banjo bolts to make sure they are not plugged or restricted.
3. Loosely thread only the banjo bolts back into the manifold or carburetors.
4. Place oil feed lines with their check valves away from the clutch area. Start the engine and let it idle at normal idle RPM.
5. Lift oil pump control lever up to its maximum flow position.
6. Drops of oil should be visible from the banjo check valves after the engine is idled one to two minutes, with a drop occurring approximately every few seconds.
7. If oil does not flow from one of the check valves, remove oil line from check valve and again idle engine. If oil then flows, the check valve is defective and must be replaced.
8. If oil does not flow with check valves removed from their feed lines, the malfunction is one of the following:
 - Inline filter blocked;
 - Feed lines leaking; or
 - Defective pump.

