

SECTION V

ENGINES

Contents of this Section

Engine Specifications (1972 through 1979)	1 – 7
Metric Conversion Factors	8
Engine Specifications (1980 through 1987)	8a – 8h
Two-Cycle Operation	9
Troubleshooting	10
Spark Plug Information	11 – 12
Fuel Mixtures	13
Torque Specifications	14 – 15
Engine Removal – All Models Except Liquid Cooled	16 – 17
Disassembly Procedures – PM Series	18 – 22
Inspection	23
Reassembly Procedures – PM Series	24 – 27
Disassembly Procedures – 44–2PM Series	27a – 27d
Reassembly Procedures – 44–2PM Series	27d – 27f
Oil Pump Bleeding and Adjustment – All Models	27g
Oil Pump Operation and Troubleshooting	27h
EC34PL	28
EC34PL Cooling System	29 – 30
Cooling System Service – PL Series	31
Engine Removal – PL Twin Cylinder Series	32 – 33

Continued

Disassembly Procedures – PL Twin Cylinder Series	34 – 37
Reassembly Procedures – PL Twin Cylinder Series	38 – 41
Cooling System – PL Three Cylinder Series.	42
Cooling System – EC60PL with Recovery System (1984)	42a – 42b
Cooling System – EC60/40 PL with Positive Bleed Recovery System.	42c – 42d
Disassembly Procedures – PL Three Cylinder Series	43 – 45
Reassembly Procedures – PL Three Cylinder Series	46 – 49
Cylinder Service	50
Cylinder Service – Piston Identification	50a
Cylinder Service – Piston/Cylinder Clearance	50b
Cylinder Service – Oversize Pistons and Rings.	51
Cylinder Hone Selection and Honing	52
Cylinder Honing	53
Recoil Starter Rope Replacement	54 – 55
Recoil Starter Spring Replacement	56

ENGINES

Engine Specifications

1
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7
2

Cyl. Disp. CC's	Engine Model	Model Year	Bore MM	Stroke MM	No. of Cyl.	Comp. Ratio	Bolt Torque		Piston Skirt to Bore	Engine Operating RPM
							Cyl. Hds. ft./lbs.	Crank-case ft./lbs.		
175	EC17P	1969 - 1972	62	58	1	7.5:1	21-23	11-13	.004/.006	5500
244	EC25P	1972	72	60	1	7.6:1	18	21-23	.0055/.0075	6000
294	EC29P	1969 - 1972	58	55.6	2	7.5:1	18	21-23	.0035/.0055	6500
294	EC29PF	1969 - 1972	58	55.6	2	7.5:1	18	21-23	.0035/.0055	6500
335	EC35PS	1970 - 1972	62	55.5	2	7.5:1	18	21-23	.0035/.0055	6000
398	EC40P	1969 - 1972	65	60	2	7.5:1	18	21-23	.0045/.0065	6000
398	EC40PF	1969 - 1972	65	60	2	7.5:1	18	21-23	.0045/.0065	6000
500	EC51PS	1972	62	55.5	3	7.5:1	18	21-23	.0035/.0055	6500
530	EC54P	1972	75	60	2	7.5:1	19	21-23	.0065/.008	6500
530	EC54PF	1972	75	60	2	7.5:1	19	21-23	.0065/.008	6500

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Cyl. Disp. CC's	Engine Model	Bore MM	Stroke MM	No. of Cyl.	Comp. Ratio	Bolt Torque		Piston Skirt to Bore	Engine Operating RPM
						Cyl. Hds. ft./lbs.	Crank-case ft./lbs.		
175	EC17P	62	58	1	7.5:1	21-23	11-13	.004/.006	5500
244	EC25PS	72	60	1	6.8:1	18	21-23	.0055/.0075	6000
294	EC29PM	58	55.6	2	7.5:1	18	21-23	.0035/.0055	6500
294	EC29PF	58	55.6	2	7.5:1	18	21-23	.0035/.0055	6500
294	EC29PS	58	55.6	2	6.8:1	18	21-23	.0035/.0055	7000
335	EC34PF	62	55.6	2	6.8:1	18	21-23	.0035/.0055	6500
335	EC34PS	62	55.6	2	6.8:1	18	21-23	.0035/.0055	7000
398	EC40PM	65	60	2	7.5:1	18	21-23	.0045/.0065	6500
398	EC40PS	65	60	2	6.8:1	18	21-23	.0045/.0065	7000
432	EC44PS	67.75	60	2	6.8:1	18	21-23	.0045/.0065	7000
500	EC51PS	62	55.6	3	6.8:1	18	21-23	.0035/.0055	6500
530	EC54PM	75	60	2	6.8:1	19	21-23	.0065/.008	6500

ENGINES

Engine Specifications

1974

Cyl. Disp. CC's	Engine Model	Bore MM	Stroke MM	No. of Cyl.	Comp. Ratio	Cyl. Head CC's Uninstalled	Piston Rings	Piston Skirt to Bore ± .002"	Ring End Gap Clearance	Engine Operating RPM ± 250 RPM
175	EC17PM	62	58	1	6.7:1	19.5	Standard 2 Ring	.006	↑ .005/.008 ↓	5500
244	EC25PS	72	60	1	6.6:1	26.5	Standard 2 Ring	.006		6000
250	EC25PC	53.5	55.6	2	7.2:1	10.3	Standard L Ring	.006		6000
250	EC25PT	53.5	55.6	2	7.2:1	10.3	L + 1.2mm	.006		6500
294	EC29PF	58	55.6	2	7.0:1	15.5	Standard 2 Ring	.006		6000
335	EC34PC	62	55.6	2	6.7:1	19.5	Standard L Ring	.006		6000
335	EC34PS	62	55.6	2	6.8:1	19.5	Standard L Ring	.006		6500
336	EC34PQ	60	60	2	7.0:1	19.5	Standard L Ring	.006		6000
398	EC40PM	65	60	2	7.5:1	22	Standard 2 Ring	.006		6500
432	EC44PQ	67.75	60	2	7.1:1	21	Standard L Ring	.006		6000
432	EC44PT*	67.75	60	2	6.5:1	20.5	L + 1.2mm	—		7500
500	EC51PT*	62	55.6	3	6.5:1	18.5	L + 1.2mm	—		7500
530	EC54PM	75	60	2	6.8:1	30.5	Standard L Ring	.006		6500

Engine Model Codes

- PM — Standard Fan Cooled
- PF — Standard Free Air
- PS — High Performance
- PC — Free Air Colt Series
- PQ — Fan Cooled Silent Star Single Carb.
- PT — TX Free Air
- * — Chrome Bore

Clearance cannot be changed on the 440PT and 500PT engines; however, chrome cylinders may be de-glazed and refinished using fine stones.

ENGINES
Engine Specifications

1975

Cyl. Disp. CC's	Engine Model	Bore MM	Stroke MM	No. of Cyl.	Cyl. Head CC's Uninstalled	Piston Rings	Piston Skirt to Bore ± .002"	Ring End Gap Clearance	Engine Operating RPM ± 250 RPM
175	EC17PM	62	58	1	19.5	Standard 2 Ring	.006	↑ .005/.008 ↓	5500
244	EC25PS	72	60	1	26.5	Standard 2 Ring	.006		6000
250	EC25PC	53.5	55.6	2	11.0	L + 1.2mm	.006		7000
250	EC25PT	53.5	55.6	2	11.3	L + 1.2mm	.006		7200
336	EC34PC	62	55.6	2	20.0	L + 1mm	.006		7200
335	EC34PT*	62	55.6	2	19.5	1mm Keystone	—		8200
336	EC34PQ	60	60	2	15.5	L + 1.2mm	.006		7500
439	EC44PQ	67.75	60	2	22.9	L + 1mm	.006		7500
432	EC44PT*	67.75	60	2	21.5	1mm Keystone	—		8500
500	EC51PT*	62	55.6	3	19.7	1mm Keystone	—		7500

Engine Model Codes

- PM – Standard Fan Cooled
- PS – High Performance
- PC – Free Air Colt Series
- PQ – Fan Cooled Silent Star Electra
- PT – TX Free Air
- * – Chrome Bore

Clearance cannot be changed on the 340PT, 440PT, and 500PT engines; however, chrome cylinders may be de-glazed and refinished using fine stones.

ENGINES

Engine Specifications

1976

Machine Model	Engine Model	Cyl. Disp. CC's	Bore MM	Stroke MM	No. of Cyl.	Cyl. Head CC's Uninstalled	Piston Rings
Colt	EC17PM	175	62	58	1	19.5	Standard 2 Ring
Colt/Electra	EC25PS	244	72	60	1	26.5	Standard 2 Ring
Colt	EC25PC	250	53.5	55.6	2	11.0	L + 1.0mm Standard
Colt	EC34PC	336	62	55.6	2	20.0 Small Fin 20.0 Large Fin	L + 1.0mm Standard
Electra	EC34PQ	339	60	60	2	15.5	L + 1.0mm Standard
Electra	EC44PQ	433	67.75	60	2	22.9	L + 1.0mm Standard
TX	EC25PT-06*	250	53.4	55.6	2	11.3	1.2mm Keystone
TX	EC34PT-05*	336	62	55.6	2	19.7	1.2mm Keystone
TX	EC44PT-05*	433	67.75	60	2	22.8	1.2mm Keystone
Starfire	EC25PT-05*	250	53.4	55.6	2	11.3	1.2mm Keystone
Starfire	EC34PT-06*	336	62	55.6	2	19.7	1.2mm Keystone

Engine Model	Piston Skirt to Bore ± .002"	Ring End Gap Clearance	Engine Operating RPM ± 250 RPM
EC17PM	.006	↑ .005/.008 ↓	5500
EC25PS	.006		6000
EC25PC	.006		7500
EC34PC	.006		7500
EC34PQ	.006		7500
EC44PQ	.006		7500
EC25PT-06*	—		7500
EC34PT-05*	—		7500
EC44PT-05*	—		7000
EC25PT-05*	—		8500
EC34PT-06*	—		9500

Engine Model Codes

PM – Standard Fan Cooled
 PF – Standard Free Air
 PS – High Performance
 PC – Free Air Colt Series
 PQ – Fan Cooled Silent Star
 25PT-06 — TX Free Air
 34PT-05 — TX Free Air
 44PT-05 — TX Free Air
 25PT-05 — Starfire Free Air
 34PT-06 — Starfire Free Air
 *Chrome Bore

Clearance cannot be changed on TX and Starfire engines; however, de-glazing and refinishing is allowed using fine stones.

ENGINES
Engine Specifications

1977

Machine Model	Engine Model	Cyl. Disp. CC's	Bore		Stroke		No. of Cyl.	Type of Cooling	Cyl. Head CC's Uninstalled
			MM	Inches	MM	Inches			
Colt/Electra	EC25PS	244	72	2.8346	60	2.362	1	Fan	19.5
Colt	EC25PC	250	53.5	2.1063	55.6	2.1886	2	Free Air	11.0
Colt SS	EC25PM-01	244	52.9	2.0824	55.6	2.1886	2	Fan	11.5
TX	EC25PT-07*	249	53.4	2.1017	55.6	2.1886	2	Free Air	11.3
Colt SS	EC34PM-03	333	61.78	2.432	55.6	2.1886	2	Fan	21.0
Electra	EC34PQ	339	60	2.362	60	2.362	2	Fan	15.5
TX	EC34PT-05*	336	62	2.441	55.6	2.1886	2	Free Air	19.7
TXL	EC34PL-01	333	61.78	2.432	55.6	2.1886	2	Liquid	17.5
Electra	EC44PQ	432	67.75	2.6673	60	2.362	2	Fan	22.9
TX	EC44PT-05*	432	67.75	2.6673	60	2.362	2	Free Air	22.8
TX	EC44PT-06*	432	67.75	2.6673	60	2.362	2	Free Air	22.8

Engine Model	Piston Rings	Piston Skirt to Bore ± .002"	Engine Operating RPM ± 250 RPM
EC25PS	(2) 2.0mm Standard	.009	6000
EC25PC	L + 1.5mm Standard	.006	7500
EC25PM-01	(2) 1.5mm Keystone	.005	7000
EC25PT-07*	(1) 1.2mm Keystone	—	8000
EC34PM-03	(2) 1.5mm Keystone	.006	6500
EC34PQ	L + 1.2mm Standard	.0065	7500
EC34PT-05*	(1) 1.2mm Keystone	—	7500
EC34PL-01	(1) 1.2mm Keystone	.005	8000
EC44PQ	L + 1.0mm Standard	.008	7500
EC44PT-05*	(1) 1.2mm Keystone	—	7000
EC44PT-06*	(1) 1.2mm Keystone	—	7000

Engine Model Codes

- PM — Standard Fan Cooled
- PS — High Performance
- PC — Free Air
- PQ — Fan Cooled Silent Star
- PT — TX Series
- PL — Liquid Cooled
- *Chrome Bore

Clearance cannot be changed on chrome cylinders; however, they may be de-glazed and refinished using fine stones.

ENGINES

Engine Specifications

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Machine Model	Engine Model	Cyl. Disp. CC's	Bore		Stroke		No. of Cyl.	Type of Cooling	Cyl. Head CC's Uninstalled
			MM	Inches	MM	Inches			
Colt	EC25PS	244	72	2.8346	60	2.362	1	Fan	19.5
Colt	EC25PC	250	53.5	2.1063	55.6	2.1886	2	Free Air	11.0
TX	EC25PT-07	249	53.4	2.1017	55.6	2.1886	2	Free Air	11.3
S/S 340	EC34PM-03/04N	333	61.78	2.432	55.6	2.1886	2	Fan	21.0
Cobra	EC34PM-04	333	61.78	2.432	55.6	2.1886	2	Fan	21.0
TX	EC34PT-05	336	62	2.441	55.6	2.1886	2	Free Air	19.7
TX-L	EC34PL-02	333	61.78	2.432	55.6	2.1886	2	Liquid	18.5
Cobra	EC44PM-01	432	67.72	2.6557	60	2.362	2	Fan	22.9
TX	EC44PT-05	432	67.75	2.6673	60	2.362	2	Free Air	22.8

Engine Model	Piston Rings	Piston/Cylinder Bore Clearance $\pm .002''$	Engine Operating RPM ± 250 RPM
EC25PS	(2) 2.0mm Standard	.009	6000
EC25PC	L + 1.5mm Standard	.006	7500
EC25PT-07	(1) 1.2mm Keystone	Dress with fine stone only*	8000
EC34PM-03/04N	(2) 1.5mm Keystone	.006	6500
EC34PM-04	(2) 1.5mm Keystone	.006	6750
EC34PT-05	(1) 1.2mm Keystone	Dress with fine stone only*	7500
EC34PL-02	(1) 1.2mm Keystone	.005	8500
EC44PM-01	(2) 1.5mm Keystone	.008	6500
EC44PT-05	(1) 1.2mm Keystone	Dress with fine stone only*	7000

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

ENGINES

Engine Specifications

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Machine Model	Engine Model	Cyl. Disp. CC's	Bore		Stroke		No. of Cyl.	Type of Cooling	Cyl. Head CC's Uninstalled
			MM	Inches	MM	Inches			
Gemini	EC25PS	244	72	2.8346	60	2.362	1	Fan	26.5
Gemini	EC25PM-01	244	52.9	2.0824	55.6	2.1886	2	Fan	11.5
Apollo	EC34PM-03	333	61.78	2.432	55.6	2.1886	2	Fan	21.0
Cobra	EC34PM-04	333	61.78	2.432	55.6	2.1886	2	Fan	21.0
Cobra	EC44PM-01	432	67.72	2.6557	60	2.362	2	Fan	22.9
TX	EC25PT-07	249	53.4	2.1017	55.6	2.1886	2	Free Air	11.8
TX	EC34PT-05	336	62	2.441	55.6	2.1886	2	Free Air	19.7
TX	EC44PT-05	432	67.75	2.6673	60	2.362	2	Free Air	22.8
TX-L	EC34PL-02	333	61.78	2.432	55.6	2.1886	2	Liquid	18.5
Centurion	EC51PL-01	500	61.78	2.432	55.6	2.1886	3	Liquid	19.5

Engine Model	Piston Rings	Piston/Cylinder Bore Clearance ± .002"	Engine Operating RPM ± 250 RPM
EC25PS	(2) 2.0mm Standard	.009	6000
EC25PM-01	(2) 1.5mm Keystone	.005	7000
EC34PM-03	(2) 1.5mm Keystone	.006	6500
EC34PM-04	(2) 1.5mm Keystone	.006	6750
EC44PM-01	(2) 1.5mm Keystone	.008	6500
EC25PT-07	(1) 1.2mm Keystone	Dress with fine stone only*	8000
EC34PT-05	(1) 1.2mm Keystone	Dress with fine stone only*	7500
EC44PT-05	(1) 1.2mm Keystone	Dress with fine stone only*	6750
EC34PL-02	(1) 1.2mm Keystone	.005	8000
EC51PL-01	(1) 1.2mm Keystone	.005	7750

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

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	2.0	+	76	2.9921	3.0	-
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 1/8	+	53	2.0866	2 1/8	-	78	3.0709	3 1/16	+
4	0.1575	5/32	+	29	1.1417	1 3/32	-	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 3/16	+	80	3.1496	3 1/8	-
6	0.2362	1/4	-	31	1.2205	1 1/4	+	56	2.2047	2 3/8	-	81	3.1890	3 1/4	+
7	0.2756	5/16	-	32	1.2598	1 1/4	+	57	2.2441	2 3/8	-	82	3.2283	3 3/16	+
8	0.3150	3/8	+	33	1.2992	1 3/8	-	58	2.2835	2 3/4	+	83	3.2677	3 3/8	-
9	0.3543	1/2	+	34	1.3386	1 1/2	-	59	2.3228	2 3/4	+	84	3.3071	3 3/4	-
10	0.3937	13/32	-	35	1.3780	1 3/4	+	60	2.3622	2 3/4	-	85	3.3465	3 11/32	+
11	0.4331	7/16	-	36	1.4173	1 3/4	+	61	2.4016	2 3/2	-	86	3.3858	3 3/4	+
12	0.4724	1 1/32	+	37	1.4567	1 15/32	-	62	2.4409	2 3/4	+	87	3.4252	3 7/8	-
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	5/8	-	39	1.5354	1 1/2	+	64	2.5197	2 15/32	-	89	3.5039	3 1/2	+
15	0.5906	3/4	-	40	1.5748	1 1/2	+	65	2.5591	2 3/4	-	90	3.5433	3 1/2	+
16	0.6299	5/8	+	41	1.6142	1 3/4	-	66	2.5984	2 3/4	+	91	3.5827	3 1/2	-
17	0.6693	2 1/32	+	42	1.6535	1 3/4	-	67	2.6378	2 3/4	+	92	3.6220	3 3/4	-
18	0.7087	2 1/32	-	43	1.6929	1 11/16	+	68	2.6772	2 11/16	-	93	3.6614	3 11/16	+
19	0.7480	3/4	-	44	1.7323	1 5/8	+	69	2.7165	2 5/8	-	94	3.7008	3 1/4	+
20	0.7874	2 1/2	+	45	1.7717	1 5/8	-	70	2.7559	2 3/4	+	95	3.7402	3 3/4	-
21	0.8268	1 1/4	+	46	1.8110	1 3/4	-	71	2.7953	2 3/4	+	96	3.7795	3 3/4	-
22	0.8661	7/8	-	47	1.8504	1 3/4	+	72	2.8346	2 3/4	-	97	3.8189	3 3/4	+
23	0.9055	2 1/2	-	48	1.8898	1 3/4	+	73	2.8740	2 3/4	-	98	3.8583	3 3/4	+
24	0.9449	1 1/2	+	49	1.9291	1 3/4	-	74	2.9134	2 3/4	+	99	3.8976	3 3/4	-
25	0.9843	2 1/2	+	50	1.9685	1 3/4	-	75	2.9528	2 3/4	+	100	3.9370	3 3/4	-

Comparing the Commonest 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 miles		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	quarts	1.06	
	liters	gallons	0.26	
TEMP	degrees Fahrenheit	degrees Celcius	5/9 (after subtracting 32)	
	degrees Celcius	degrees Fahrenheit	9/5 (then add 32)	

ENGINES
Engine Specifications

1980

Machine Model	Engine Model	Cyl. Disp. CC's	Bore		Stroke		No. of Cyl.	Type of Cooling
			MM	Inches	MM	Inches		
Gemini	EC25PS	244	72	2.8346	60	2.362	1	Fan
Gemini	EC25PM-01	244	52.9	2.0824	55.6	2.1886	2	Fan
Apollo	EC34PM-03	333	61.78	2.432	55.6	2.1886	2	Fan
Galaxy	EC34PM-04	333	61.78	2.432	55.6	2.1886	2	Fan
Galaxy	EC44PM-01/02	432	67.72	2.6557	60	2.362	2	Fan
TX/TX-C	EC34PT-07	336	62	2.441	55.6	2.1886	2	Free Air
TX	EC44PT-05	432	67.75	2.6673	60	2.362	2	Free Air
TX-L/TX-L Indy	EC34PL-02/05	333	61.78	2.432	55.6	2.1886	2	Liquid
Centurion	EC51PL-02	500	61.78	2.432	55.6	2.1886	3	Liquid

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance $\pm .002''$	Engine Operating RPM ± 250 RPM
EC25PS	26.5	23.7	(2) 2.0mm Standard	.009	6000
EC25PM-01	11.5	11.8	(2) 1.5mm Keystone	.005	7000
EC34PM-03	21.0	16.8	(2) 1.5mm Keystone	.006	6500
EC34PM-04	21.0	16.8	(2) 1.5mm Keystone	.006	6750
EC44PM-01/02	22.9	21.4	(2) 1.5mm Keystone	.008	6500
EC34PT-07	19.7	15.5	(1) 1.2mm Keystone	Dress with fine stone only*	7500
EC44PT-05	22.8	21.2	(1) 1.2mm Keystone	Dress with fine stone only*	6750
EC34PL-02/05	18.5	15.1	(1) 1.2mm Keystone	.005	8000
EC51PL-02	19.5	15.5	(1) 1.2mm Keystone	.005	7750

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

ENGINES

Engine Specifications

Machine Model	Engine Model	Cyl. Disp. CC's	Bore		Stroke		No. of Cyl.	Type of Cooling
			MM	Inches	MM	Inches		
Gemini	EC25PS	244	72	2.8346	60	2.362	1	Fan
Galaxy	EC44PM-02	432	67.72	2.6557	60	2.362	2	Fan
Cutlass	EC34PM-03	333	61.78	2.432	55.6	2.1886	2	Fan
Cutlass SS	EC44-2PM-3100/3300	432	67.72	2.6557	60	2.362	2	Fan
TX-C	EC44-2PM-1100	432	67.72	2.6557	60	2.362	2	Fan
TX-L/TX-L Indy	EC34PL-05	333	61.78	2.432	55.6	2.1886	2	Liquid
Centurion Indy	EC51PL-02	500	61.78	2.432	55.6	2.1886	3	Liquid

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance $\pm .002''$	Engine Operating RPM ± 250 RPM	Recommended Idle RPM
EC25PS	26.5	23.7	(2) 2.0mm Standard	.009	6000	600
EC44PM-02	22.9	21.4	(2) 1.5mm Keystone	.008	6500	1800
EC34PM-03	21.0	16.8	(2) 1.5mm Keystone	.006	6500	2200
EC44-2PM-3100/3300	22.6	21.1	(1) 1.5mm Keystone	.006	6250	2300
EC44-2PM-1100	22.6	21.1	(1) 1.5mm Keystone	.006	6750	2300
EC34PL-05	18.5	15.1	(1) 1.2mm Keystone	.005	8250	2500
EC51PL-02	19.5	15.5	(1) 1.2mm Keystone	.005	8000	2200

1981

ENGINES
Engine Specifications

Machine Model	Engine Model	Cyl. Disp. CC's	Bore		Stroke		No. of Cyl.	Type of Cooling
			MM	Inches	MM	Inches		
Cutlass SS	EC44-2PM-3100	432	67.72	2.6557	60	2.362	2	Fan
TX-C	EC44-2PM-1100	432	67.72	2.6557	60	2.362	2	Fan
TX-L/TX-L Indy	EC34PL-05	333	61.78	2.432	55.6	2.1886	2	Liquid
Centurion Indy	EC51PL-02	500	61.78	2.432	55.6	2.1886	3	Liquid

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance $\pm .002''$	Engine Operating RPM ± 250 RPM	Recommended Idle RPM
EC44-2PM-3100	22.6	21.1	(1) 1.5mm Keystone	.006	6250	2300
EC44-2PM-1100	22.6	21.1	(1) 1.5mm Keystone	.006	6750	2300
EC34PL-05	18.5	15.1	(1) 1.2mm Keystone	.005	8250	2500
EC51PL-02	19.5	15.5	(1) 1.2mm Keystone	.005	8000	2200

1982

ENGINES

Engine Specifications

Machine Model	Engine Model	Cyl. Disp. CC's	Bore		Stroke		No. of Cyl.	Type of Cooling
			MM	Inches	MM	Inches		
Gemini/Star	EC25PS	244	72	2.8346	60	2.362	1	Fan
Sport	EC44-2PM 5100	432	67.72	2.6557	60	2.362	2	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 Cross Country	EC34PL-05	333	61.78	2.432	55.6	2.188	2	Liquid
Indy 600	EC60PL-01	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 $\pm .002''$	Engine Operating RPM ± 250 RPM	Recommended Idle RPM
EC25PS	26.5	23.7	(2) 2.0mm Plain	.006	6300	600
EC44-2PM 5000/5100	26.1	24.5	(1) 1.5mm Keystone	.006	6300	2300
EC44-2PM 3100	22.6	21.0	(1) 1.5mm Keystone	.006	6000	2300
EC44-2PM 2100	22.6	21.0	(1) 1.5mm Keystone	.006	6800	2300
EC34PL-05	18.5	15.1	(1) 1.2mm Keystone	.005	8200	2500
EC60PL-01	20.0	19.6	(1) 1.2mm* ¹ Keystone	.0055* ²	7900	2200

*1 Ring end gap .006 — .012

*2 Measure piston 6 — 16 mm from bottom of skirt

1389

ENGINES
Engine Specifications

Machine Model	Engine Model	Cyl. Disp. CC's	Bore		Stroke		No. of Cyl.	Type of Cooling
			MM	Inches	MM	Inches		
Star/Star LT	EC25PS-05	244	72	2.8346	60	2.362	1	Fan
SS	EC44-2PM 3100	432	67.72	2.6557	60	2.362	2	Fan
Trail Indy	EC44-2PM 2100	432	67.72	2.6557	60	2.362	2	Fan
600 Indy	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

1984

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance $\pm .002''$	Engine Operating RPM ± 200 RPM	Recommended Idle RPM
EC25PS-05	26.5	23.7	(2) 2.0mm Plain	.006	6300	600
EC44-2PM 3100	22.6	21.0	(1) 1.5mm Keystone	.006	6000	2300
EC44-2PM 2100	22.6	21.0	(1) 1.5mm Keystone	.006	6800	2300
EC44-2PM 5000	26.1	24.5	(1) 1.5mm Keystone	.006	6300	2300
EC60PL-02	19.2	19.2	(1) 1.2mm Keystone	.0055	7800	2200
	Compressed Gasket Thickness 1.45mm			+ .002 - .001		

ENGINES

Engine Specifications

Machine Model	Engine Model	Cyl. Disp. CC's	Bore		Stroke		No. of Cyl.	Type of Cooling
			MM	Inches	MM	Inches		
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

15895

Engine Model	Cyl. Head CC's Uninstalled	Cyl. Head CC's Installed	Piston Rings	Piston/Cylinder Bore Clearance $\pm .002''$	Engine Operating RPM ± 200 RPM	Recommended Idle RPM
EC25PS-06	26.5	23.7	*(2) 2.0mm Plain	.006''	6300	2100
EC44-2PM 3100	22.6	21.0	*(1) 1.5mm Keystone	.006''	6000	2300
EC44-2PM 2100	22.6	21.0	*(1) 1.5mm Keystone	.006''	6800	2300
EC44-2PM 5000	26.1	24.5	*(1) 1.5mm Keystone	.006''	6300	2300
EC40PL-02	19.0	19.0	*(1) 1.2mm Keystone	.005'' +.002'' -.001''	7800	2200
EC60PL-02	19.2	19.2	*(1) 1.2mm Keystone	.0055'' +.002'' -.001''	7800	2000
Compressed Gasket Thickness 1.45mm						

* Piston ring end gap all engines .15mm - .40mm/.006'' - .016''

ENGINES
Engine Specifications

Machine Model	Engine Model	Cyl. Disp. CC's	Bore		Stroke		No. of Cyl.	Type of Cooling
			MM	Inches	MM	Inches		
Star	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 Track	EC44-2PM 5100	432	67.72	2.6557	60	2.362	2	Fan

16899

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

* Piston ring end gap all engines .15mm – .40mm/.006'' – .016''

ENGINES

Engine Specifications

Machine Model	Engine Model	Cyl. Disp. CC's	Bore		Stroke		No. of Cyl.	Type of Cooling
			MM	Inches	MM	Inches		
Star, Star Trak	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 Track (R.L.R.)	EC44-2PM 5100	432	67.72	2.6557	60	2.362	2	Fan

1987

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

* Piston ring end gap all engines .15mm - .40mm/.006'' - .016''

ENGINES

Two-Cycle Operation

Your Polaris snowmobile is equipped with a dependable, high-performance two-cycle engine. Treat it right; give it reasonable care. The first step is to have a basic comprehension of the mechanics involved in its operation. Understanding your two-cycle engine and how it functions will enable you to better maintain your engine, resulting in longer and better performance and life at less cost to you.

A basic component of the two-cycle engine is the piston. When the piston moves upward in the cylinder (1st stroke), it draws fuel into the crankcase while also compressing fuel in the combustion chamber. The spark plug then ignites the fuel, which expands and forces the piston downward.

The down-stroke provides the power which turns the crankshaft. It also compresses the fuel in the crankcase, clears the transfer ports, and releases a new supply of fuel through the ports and into the combustion chamber. This forces the burned gases out through the exhaust ports. See sketches of 2-cycle principle.

When you realize that at 6,000 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 your engine gets. Keep in mind the manufacturer's recommendations:

1. Use a good grade of both oil and gasoline.
2. Always mix them in proper proportions — thoroughly — and in a clean container.
3. 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 which may lead to engine damage and costly repairs.

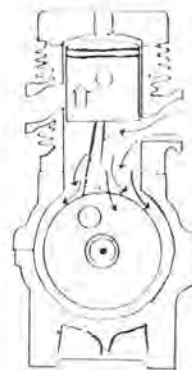
The carburetor feeds the gas-oil mixture to the engine, mixing fuel and air to obtain the correct volatile mixture, thus providing fuel for combustion, a lubricant, and a coolant for internal surfaces.

POWER

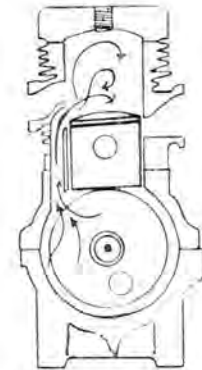
Immediately after the piston starts downward, peak combustion pressure from the burning gases is applied against the piston, driving it downward with maximum force. This inline motion is transmitted thru the connecting rod to radial motion by the crankshaft. The force of combustion continues until the piston is further down in the cylinder when the exhaust port becomes exposed.

EXHAUST

Actually, several functions take place simultaneously during the exhaust phase. When the piston moves downward far enough to expose 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 which completes one cycle.



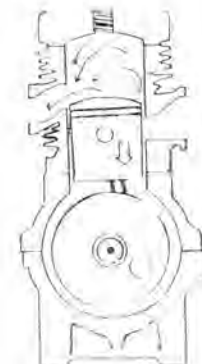
INTAKE



FUEL TRANSFER



POWER



EXHAUST

ENGINES

Troubleshooting

<u>PROBLEM</u>	<u>PROBABLE CAUSE:</u>
1. Will not start	<ol style="list-style-type: none">1. Check ignition switch for run position.2. Check auxiliary shut-off switch.3. Check fuel supply.4. Check wiring from engine to coil(s) or spark plug(s).5. Check spark plug(s).6. Disconnect the engine connector to eliminate any shorts that might be in the system.7. If starter won't work on electric models, check wires from starter solenoid and battery or check battery and battery cables.
2. No spark	<ol style="list-style-type: none">1. Spark plug fouled.2. Secondary coil bad or wires disconnected.3. Primary coil shorted or open.4. Ignition points pitted or dirty.5. Ignition switch shorted.
3. No compression	<ol style="list-style-type: none">1. Crankcase plug is out.2. Head gasket is blown.3. Bad rings or piston.
4. Engine idles but no acceleration	<ol style="list-style-type: none">1. Restricted fuel flow.2. Clogged main jet.
5. Engine runs but fails to reach maximum R.P.M.	<ol style="list-style-type: none">1. Clogged fuel filter.2. Incorrect track tension.3. Incorrect main jet.4. Throttle slides not fully open.5. Chain too tight.
6. Engine runs but fails to idle	<ol style="list-style-type: none">1. Incorrect air mixture setting.2. Throttle stop screw incorrectly adjusted.3. Dirt in pilot jet.
7. Engine runs, but overloads with fuel	<ol style="list-style-type: none">1. Chokes are not seating.2. Fuel pump diaphragm is ruptured (caused by engine backfiring).3. Carburetor slides are not synchronized.4. Too large main jet.5. Needle and seat not seating properly.6. Incorrect float level.
8. Carburetion and plug fouling	<ol style="list-style-type: none">1. If you do a lot of trail riding and your plugs foul and get black when doing so, lower the jet needle by placing the E clip in 2nd notch from top of needle. Float arms should be level when holding the carburetor upside down. Also, the air set screw should be from 3/4 to 1 turn open, and again, slide valves must be synchronized to rise and lower evenly. Maintain a .017 to .020 spark plug gap.
9. Engine runs but overheats	<ol style="list-style-type: none">1. Incorrect main jet.2. Incorrect timing.3. Incorrect spark plug.
10. Battery will not charge (Electric models only)	<ol style="list-style-type: none">1. Check for bad connections.2. Check alternator output.3. Check diodes.
11. Lights don't work	<ol style="list-style-type: none">1. Engine must be running.2. Check wiring harness connector.3. Check for burned out bulbs.4. Check wiring for shorts or loose connections.5. Disconnect taillight if headlight works, short is in taillight wiring or taillight.
12. Unit fails to propel itself	<ol style="list-style-type: none">1. Check belt (check center distance).2. Check torque-o-matic unit.3. Check secondary pulley.4. Check chain.5. Check drive sprocket assembly.
13. Track wears unevenly	<ol style="list-style-type: none">1. Check tension.2. Check for proper alignment.
14. Chaincase gets hot	<ol style="list-style-type: none">1. Check oil level.2. Check chain tension.3. Check track assembly.
15. Unit steers hard	<ol style="list-style-type: none">1. Check lubrication on spindles.2. Check ski alignment.3. Check spindle bearings.

Spark Plug Information

1. **Normal:**
The insulator tip is gray, tan, or light brown. There will be few combustion deposits and the electrodes are not burned or eroded.

This indicates the proper type and heat range for the engine and the service.



2. **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.



3. **Wet Fouled:**
The insulator tip is black. A damp oily film covers the firing end. There also may be a carbon layer over the entire nose. Generally the electrodes are not worn.

General causes are excessive oil or use of a non-recommended oil in the fuel, excessive idling, idle too low or too rich. Weak ignition output can also cause wet fouling.



ENGINES

Spark Plug Information

4. **Gap Bridging:**
This is usually a "whisker" or filament of lead-carbon compounds and completely short-circuits the spark, rendering the plug inoperative.



When replacing spark plugs, original equipment parts, or their equivalent, should always be used. Because of different brands intended for various applications, it is extremely important when replacing the spark plugs to install only those which are factory tested and recommended.

The correct plug for your engine will improve both starting and all-around performance.

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

NOTES:

A good two-cycle lubricant must provide anti-friction protection to pistons, cylinder walls and bearings but no flushing action is involved. 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 and most good two-cycle oils are blends, with carefully selected additives as required 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 and meets all requirements. Because of this Polaris strongly recommends the exclusive use of Polaris Snowmobile Oil in its engines.



FUEL RECOMMENDATION

Use a good grade of regular leaded or premium unleaded gasoline and "Polaris Snowmobile Oil" on all machines. Mix fuel in a clean container. Pour about one-half of the gasoline into a container. Add all of the oil and mix well. Then add remainder of gasoline and mix thoroughly.

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 DEICERS

Polaris recommends the use of its fuel system isopropyl deicer to prevent icing and possible engine damage due to fuel starvation. Mix three ounces deicer to five gallons of gasoline.

CAUTION: Never add fuel while snowmobile is running.



Never pour oil or gasoline into fuel tank unless mixed.

Do not use low grade multi-viscosity oil.

NOTE: 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.

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: the English and the 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 the FT./LB. or the IN./LB. In the Metric System, torque is commonly expressed in units of KG./M.

Multiply	by	To Obtain
IN.-LBS.	.0834	FT.-LBS.
	1150	GM.-CM.
	.01150	KG.-M.
FT.-LBS.	12	IN.-LBS.
	13,800	GM.-CM.
	.138	KG.-M.
KG.-M.	86.8	IN.-LBS.
	7.24	FT.-LBS.

CELSIUS/FAHRENHEIT CONVERSION TABLE

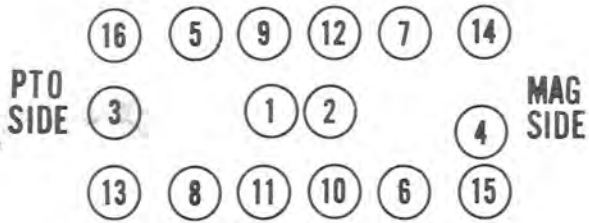
Celsius		Fahrenheit	
C	F	C	F
00	32	40	104
01	33.8	41	105.8
02	35.6	42	107.6
03	37.4	43	109.4
04	39.2	44	111.2
05	41	45	113
06	42.8	46	114.8
07	44.6	47	116.6
08	46.4	48	118.4
09	48.2	49	120.2
10	50	50	122
11	51.8	51	123.8
12	53.6	52	125.6
13	55.4	53	127.4
14	57.2	54	129.2
15	59	55	131
16	60.8	56	132.8
17	62.6	57	134.6
18	64.4	58	136.4
19	66.2	59	138.2
20	68	60	140
21	69.8	61	141.8
22	71.6	62	143.6
23	73.4	63	145.4
24	75.2	64	147.2
25	77	65	149
26	78.8	66	150.8
27	80.6	67	152.6
28	82.4	68	154.4
29	84.2	69	156.2
30	86	70	158
31	87.8	71	159.8
32	89.6	72	161.6
33	91.4	73	163.4
34	93.2	74	165.2
35	95	75	167
36	96.8	76	168.8
37	98.6	77	170.6
38	100.4	78	172.4
39	102.2	79	174.2
40	104	80	176
41	105.8	81	177.8
42	107.6	82	179.6
43	109.4	83	181.4
44	111.2	84	183.2
45	113	85	185
46	114.8	86	186.8
47	116.6	87	188.6
48	118.4	88	190.4
49	120.2	89	192.2
50	122	90	194
51	123.8	91	195.8
52	125.6	92	197.6
53	127.4	93	199.4
54	129.2	94	201.2
55	131	95	203
56	132.8	96	204.8
57	134.6	97	206.6
58	136.4	98	208.4
59	138.2	99	210.2
60	140	100	212

ENGINE BOLT TORQUE – FT./LBS. AND KG.-M-COLD

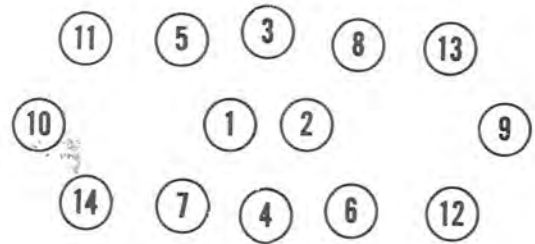
Engine	Cylinder Head	Crankcase		Flywheel	Cylinder Base Studs
		8MM	10MM		
EC25PS	17-18 Ft./Lbs. 2.3-2.5 KG.-M	17-18 Ft./Lbs. 2.2-2.3 KG.-M	23-25 Ft./Lbs. 3.2-3.5KG.-M	60-65 Ft./Lbs. 8.3-9.0-KG.-M	24-28 Ft./Lbs. 3.3-3.9KG.-M
All Air Cooled Twin Cylinder	17-18 Ft./Lbs. 2.3-2.5 KG.-M	17-18 Ft./Lbs. 2.2-2.3 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
EC34PL EC40PL EC51PL EC60PL	8MM 17-18 Ft./Lbs. 2.2-2.3 KG.-M 10MM 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

ENGINES

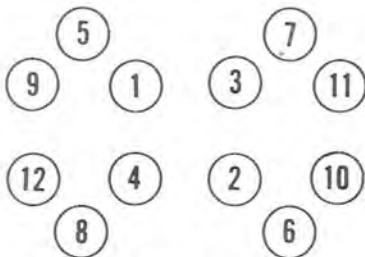
Torque Specifications



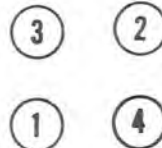
EC34PL Cylinder Head



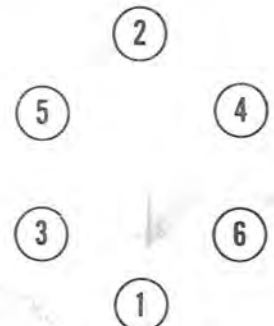
EC40PL Cylinder Head



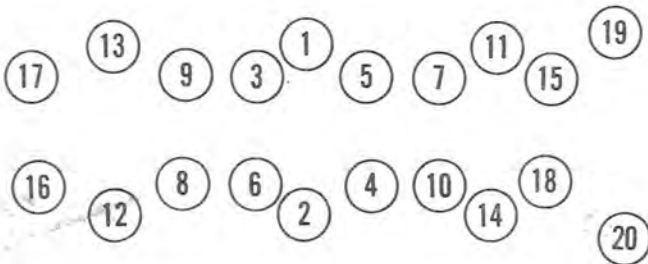
Twin Cylinder Crankcase



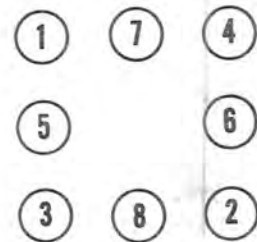
All Cylinder Base Studs



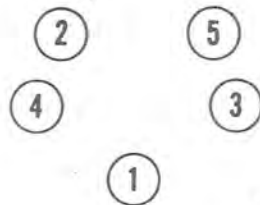
6 Stud Cylinder Head



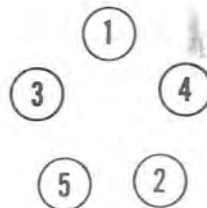
3 Cylinder Crankcase



3 Cylinder Head



244 Crankcase



5 Stud Cylinder Head

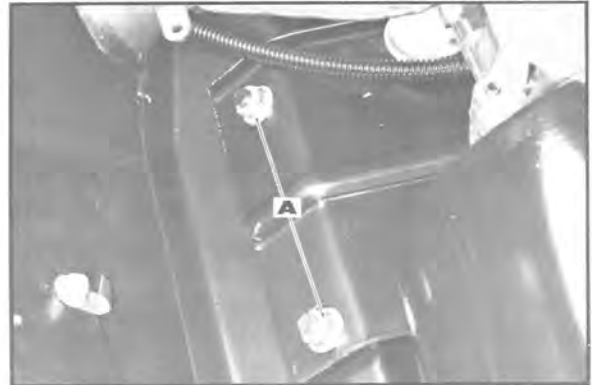
ENGINES

Engine Removal – All Models Except Liquid Cooled

Removal of the engine from the chassis is basically the same on all models. Operations of removal follow a certain pattern, and while minor details may require a variation of technique, the following procedures will establish a guideline for the serviceman which will be valuable in all instances during this operation.

1. Remove the muffler by disconnecting the hold-down springs.

Remove the engine motor mount bolt nuts that secure the engine to the chassis (A).



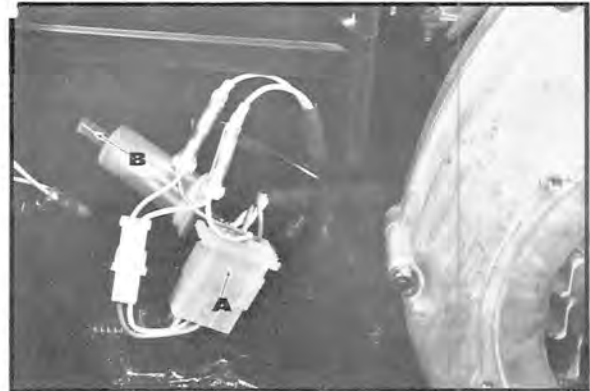
2. Remove the headlight wiring by disconnecting from the headlights (A) and by bending the retaining clips that secure the wiring loom to the hood (B). Next pull the entire wire harness rearward from between the engine and its mount plate placing it out of the way on the machine.



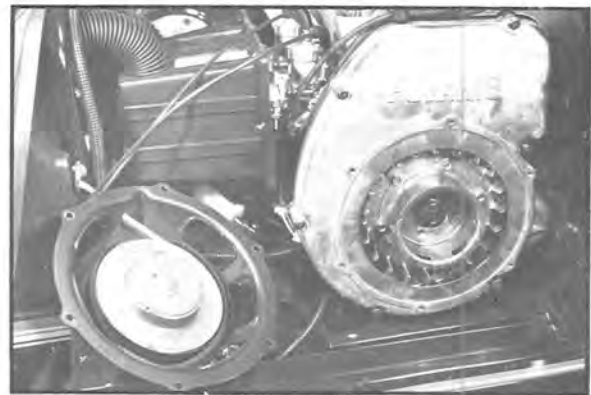
Engine Removal – All Models Except Liquid Cooled

3. The air silencer need not be removed on all models. Disconnect the wire harness receptacle from the engine (A). Disconnect the fuel line from the filter (B), plugging the line to prevent fuel spillage and a fire hazard.

NOTE: CDI units also require the black wire to the CDI box be disconnected from the receptacle. Remove the hood stop cable from the engine.



4. Remove the recoil assembly from the engine and set it aside in the nosepan.



5. Disconnect the choke cable from the instrument panel.

6. Remove the throttle cable retainer. Clip to allow passage of the throttle cable through the block. Remove the throttle cable. Remove the drive belt. The engine is now ready for removal from the chassis.

NOTE: Upon engine reinstallation, the drive clutch must be realigned. Refer to Section VII, Torque-O-Matic Drive, for further information.

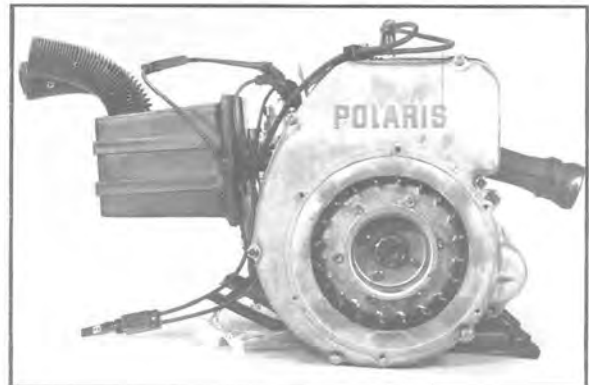


ENGINES

Disassembly Procedures – PM Series

Disassembly of all engines for diagnosis and replacement of parts is basically the same. While engine features may vary; i.e., fan or free air models, the techniques used on crankcases, cylinders, pistons, etc., follow certain guidelines for all. The following will be an aid to the serviceman during diagnosis and repair.

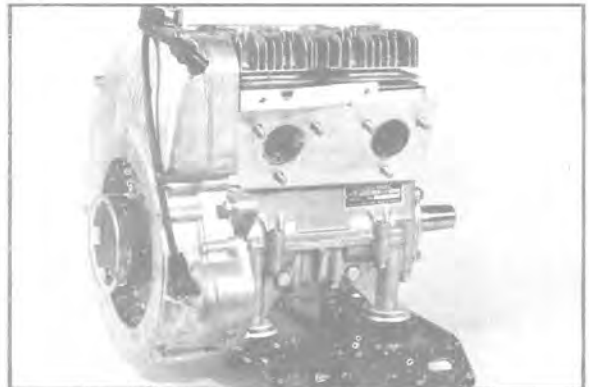
1. A complete EC34PM-03 engine, less recoil starter and muffler.



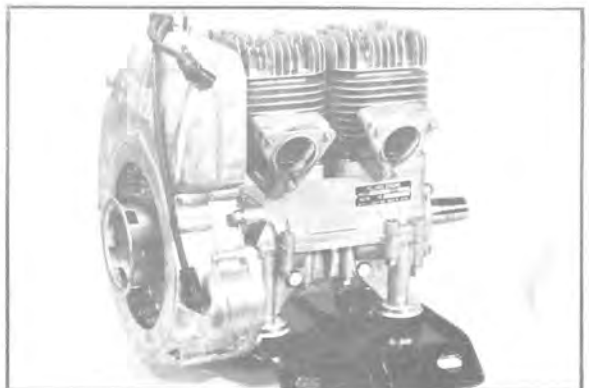
2. Remove the carburetors, intake silencer, and exhaust manifold.



3. Remove the top cooling shroud.



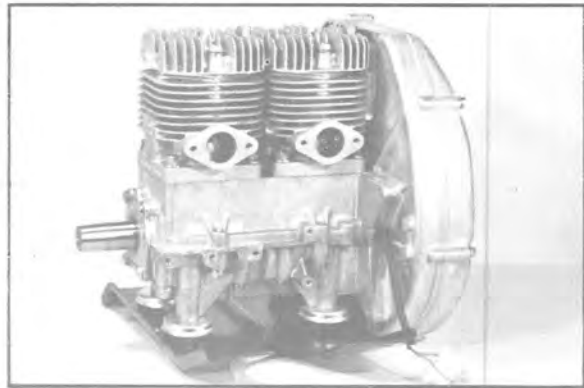
4. Remove the cooling shroud from the front of the engine.



5. Remove the carburetor rubber mounts and the cooling shroud from the rear of the cylinders.



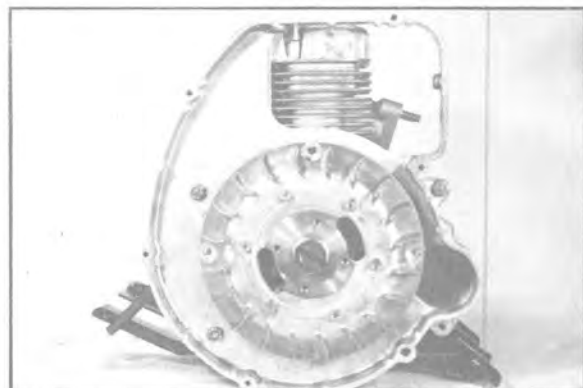
6. Remove the fuel pump and ignition coils.



7. Remove the outer blower housing.



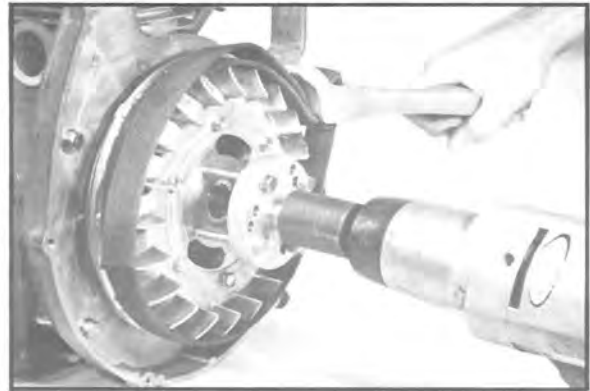
8. Remove the starter cup and the dust shield from the flywheel.



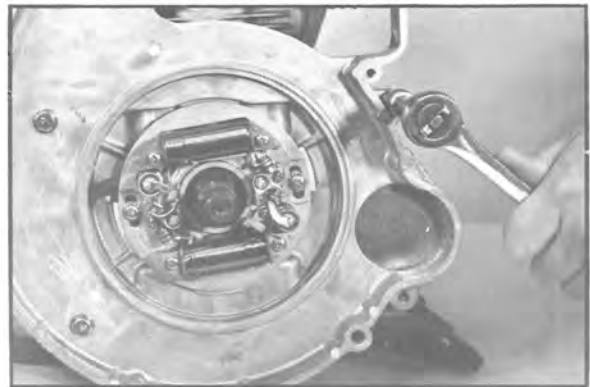
ENGINES

Disassembly Procedures — PM Series

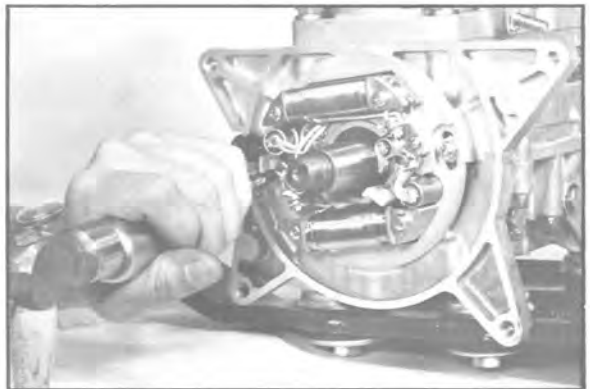
9. Remove the flywheel nut. Install the flywheel puller (PN 2870159) to the flywheel, holding with the strap wrench during removal.



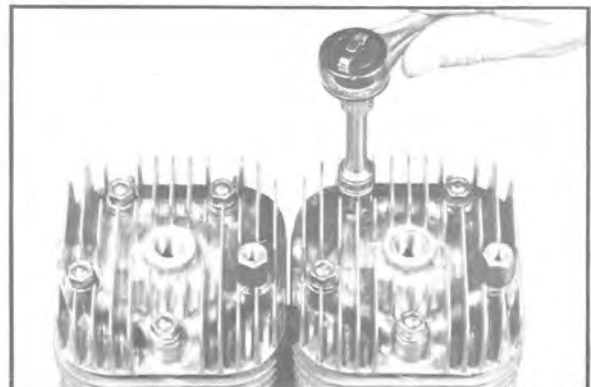
10. Remove the inner half of the blower housing from the crankcase.



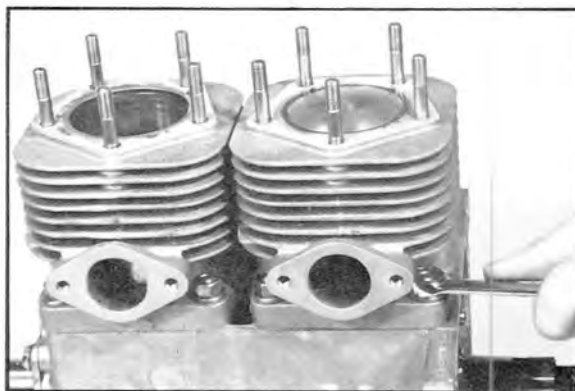
11. Using an impact screwdriver, remove the two stator plate retaining screws and remove the stator plate.



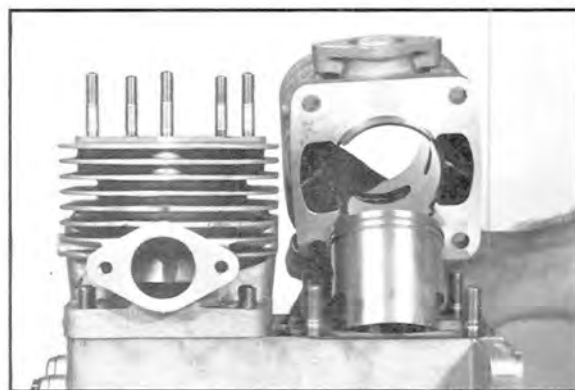
12. Remove the head, noting the location of the two special cooling shroud mounting nuts.



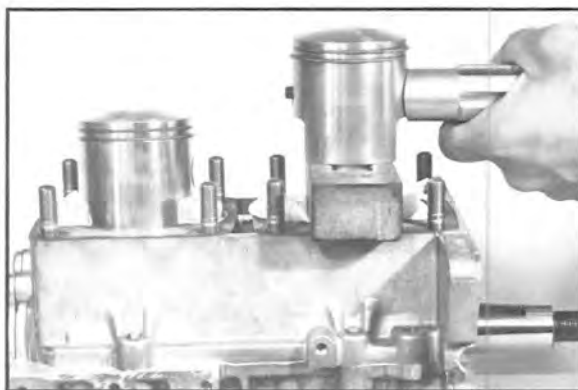
13. Remove the cylinder base nuts.



14. Remove the cylinders.



15. Using the piston support block (PN 2870390) and supporting the piston as shown, remove the piston pin retainers. Then using the piston pin puller (PN 2870386), remove the piston pin.



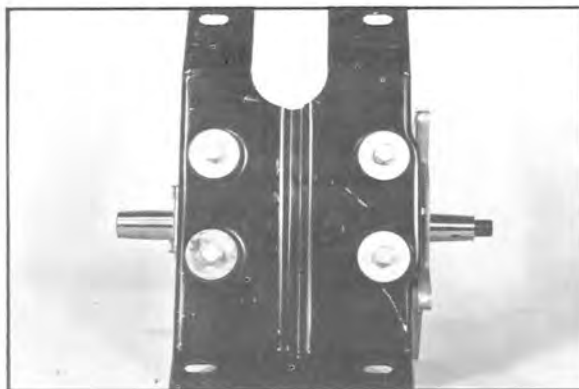
16. Remove the flywheel side crankshaft end seal.



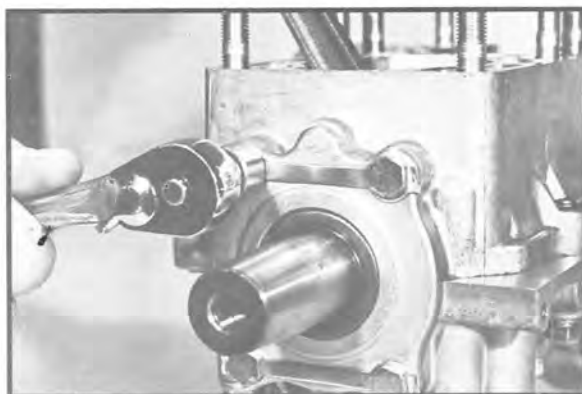
ENGINES

Disassembly Procedures — PM Series

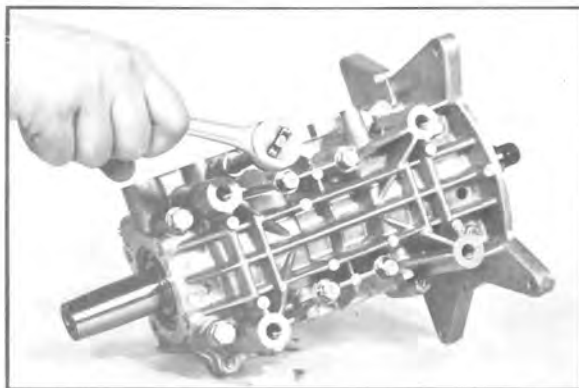
17. Remove the four (4) bolts fastening the engine mount plate and remove the plate.



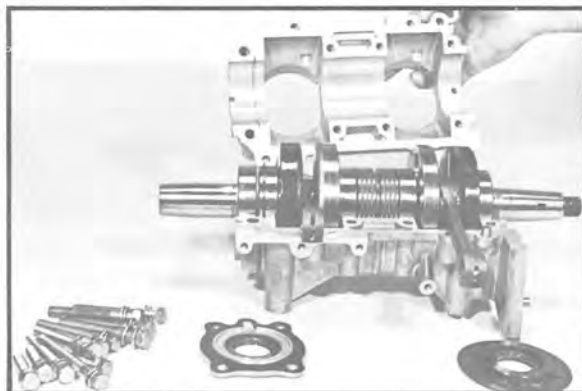
18. Remove the PTO side crankshaft seal by bending the locking tabs and removing the four (4) cap screws.



19. Remove the crankcase bolts, and using a plastic hammer, tap the crankcase at the fan housing bracket to split the case.



20. Crankcase split showing the bearing and center labyrinth seal arrangement.



With the engine disassembled inspect the following items:

ITEM:

PROCEDURE:

1. Crankshaft Bearings

Spin by hand and check for roughness.

2. Crankcase

Check bearing mating surfaces and labyrinth seal area. In some instances the labyrinth seal rings gouge into the case halves and cause a small amount of metal to flare to each side. This condition is not necessarily damaging to the engine. In most instances the rough edges can be sanded by hand with a grit wet sandpaper; however, if the case halves are severely gouged (1/16" or more) the cases should be replaced.

3. Crankshaft Seals

Inspect for hardness or cracking. Always install new seals upon reassembly.

4. Connecting Rod Small End Bearings

Check for roughness.

5. Connecting Rod Large End Bearings

Check by rotating the rod and moving from side to side.

6. Magneto Breaker Points

Inspect for pitting, install new points.

7. Cylinder Bore

Inspect for scoring or distortion. Refer to cylinder service in this section for detailed procedures.

8. Piston and Rings

Check for stuck rings and signs of piston damage from detonation.

9. Cylinder Heads and Gaskets

Check for leakage. Always install new gaskets and torque the heads according to the torque chart in this section.



10. Crankshaft Runout

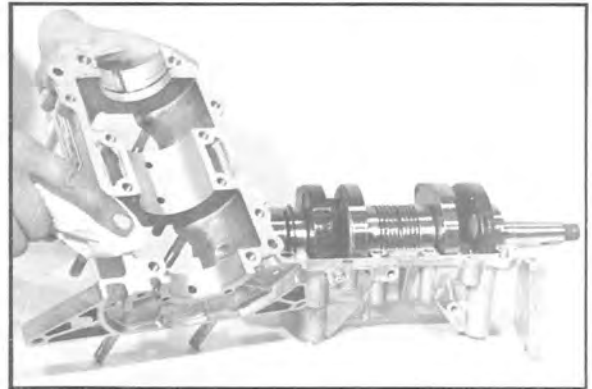
With the crankshaft installed and case halves torqued, polish the PTO end of shaft with fine emery cloth to remove nicks or foreign material which will result in inaccurate readings. Measure indicated crankshaft runout 1/2" from the PTO end as shown.

NOTE: Serviceable shaft total runout reading should not exceed .006" on all models.

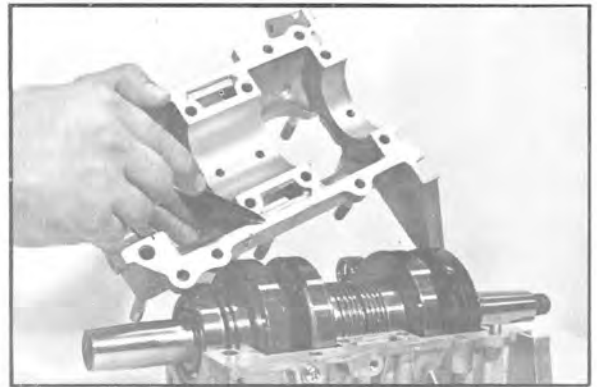
ENGINES

Reassembly Procedures — PM Series

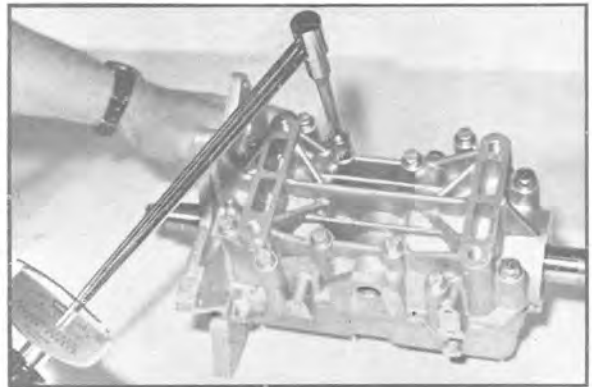
1. Before reassembling the engine, clean all parts with solvent. Remove the old sealer from the crankcase halves.



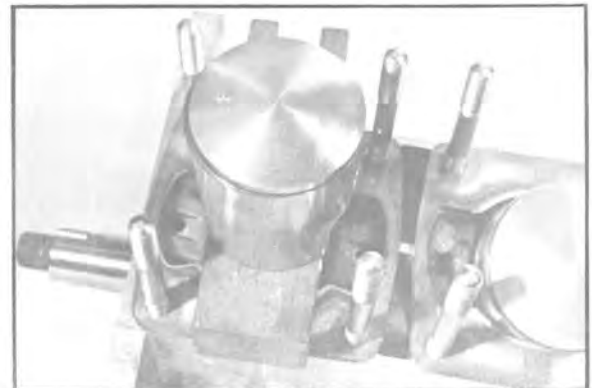
2. Apply a small amount of an appropriate sealer to the crankcase halves. Grease the labyrinth seal and crankshaft end seals.



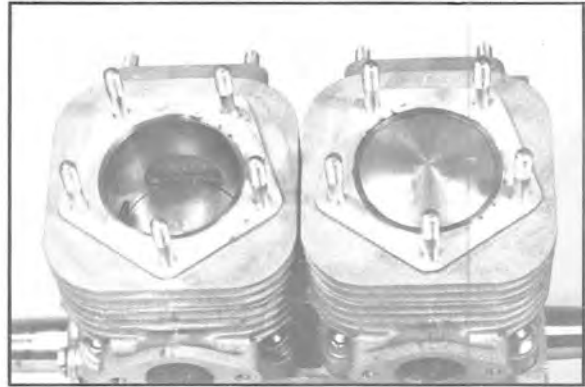
3. Torque the crankcase bolts following the torque patterns in this section.



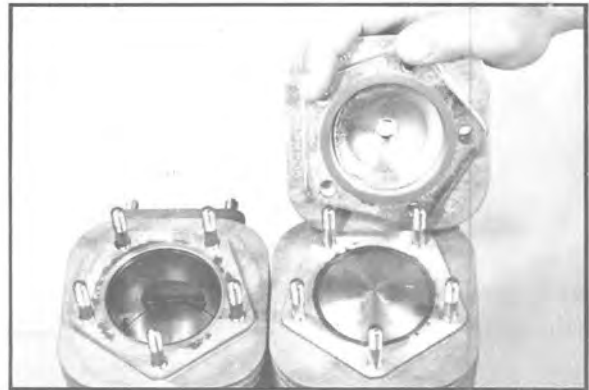
4. Install the piston pin bearings and spacers to the rod and install the pistons with the "F" marking toward the flywheel side. Install new piston pin retainer locks.



5. Oil the pistons and install the cylinders.



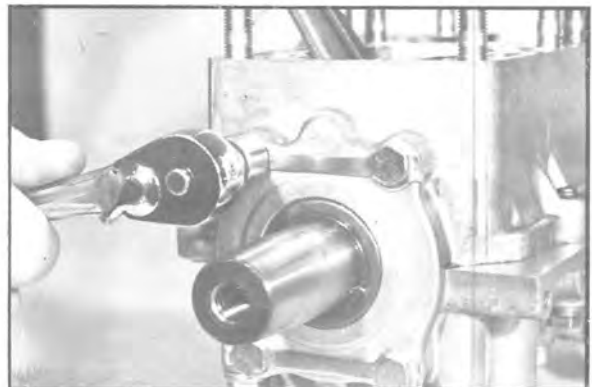
6. Install the cylinder head gaskets with the large diameter metal surface toward the cylinder. Install the cylinder heads. Torque according to the sequence and values given in this section.



7. Grease the flywheel crankshaft end and seal and install.



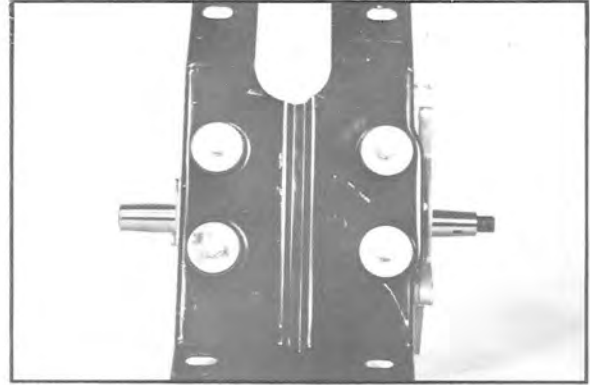
8. Apply grease to the PTO crankshaft seal and install as shown. Bend the cap screw retaining lock tabs.



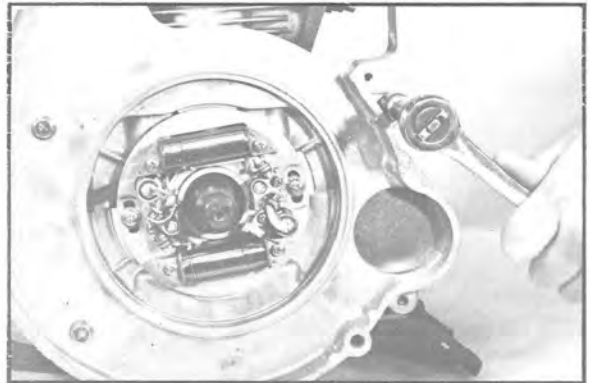
ENGINES

Reassembly Procedures — PM Series

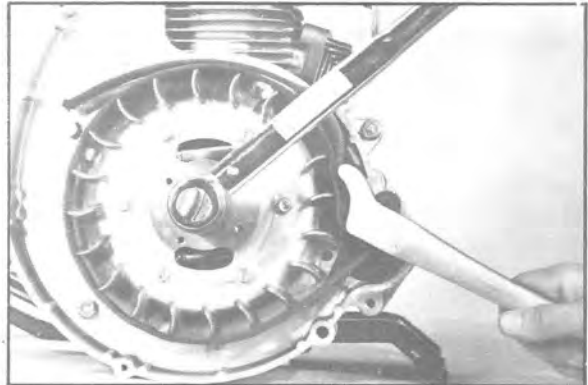
9. Install the engine mounting plate, torquing bolts to 55 - 60 ft./lbs.



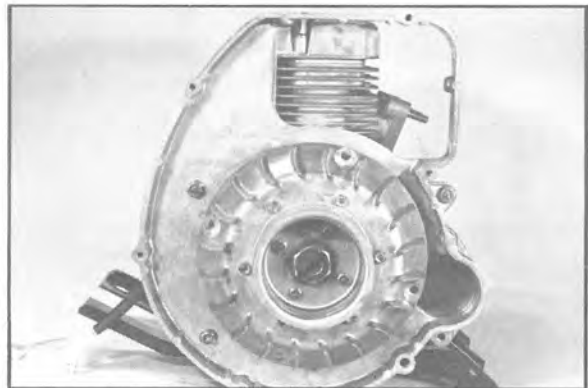
10. Install the stator plate and inside blower housing half to the crankcase.



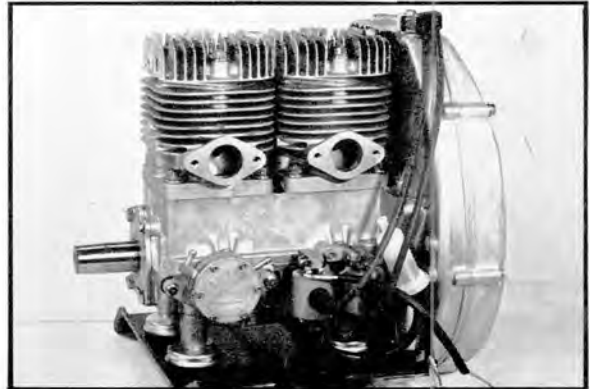
11. Install the flywheel and torque to 60 - 65 ft./lbs. Re-time the ignition system.



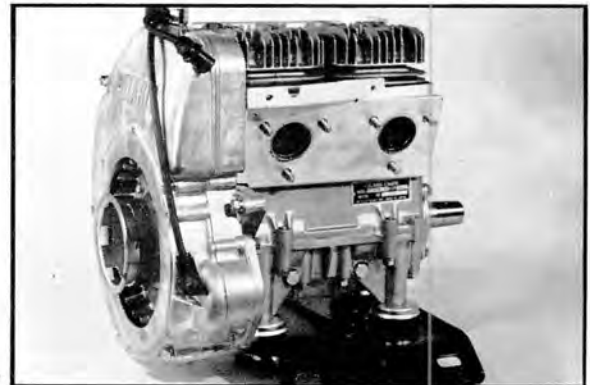
12. Install the recoil starter cup.



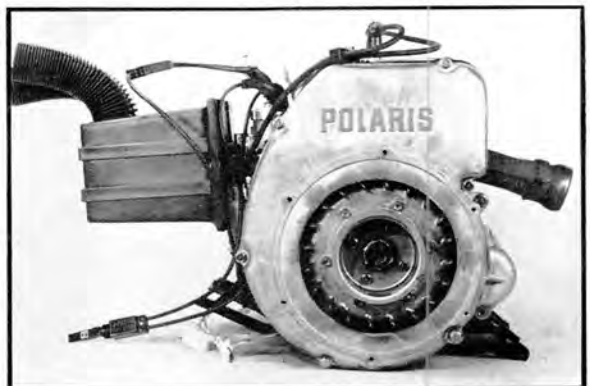
13. Install the outer blower housing half, the secondary coils, and the fuel pump.



14. Install the cooling shrouds.



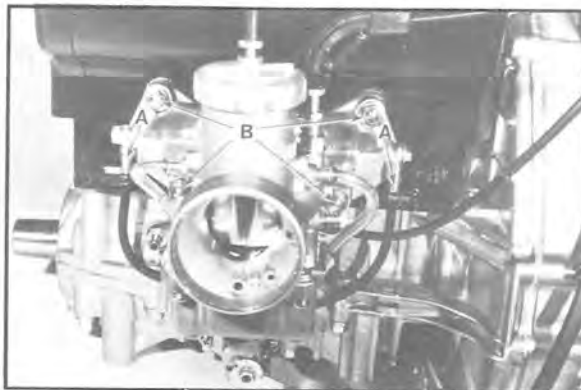
15. Install the carburetors, air silencer, and exhaust manifold. The engine can now be installed in the chassis in the reverse sequence of removal.



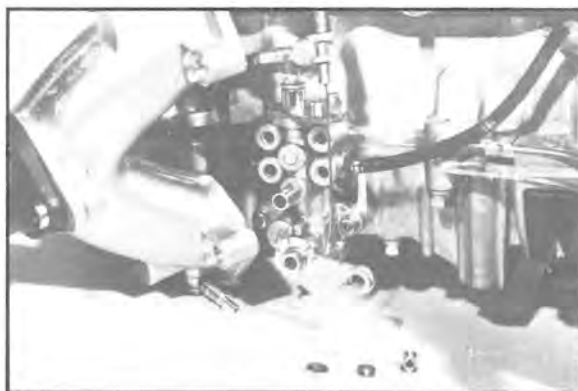
ENGINES

Disassembly Procedures – 44–2PM Series

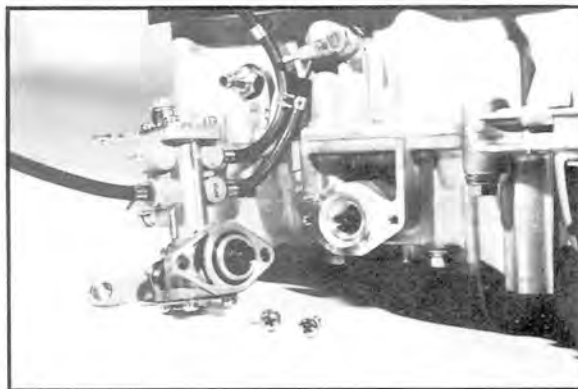
1. Remove the engine mount plate.
2. Disconnect the two oil-injection lines (A) from the manifold. Remove the four nuts and washers (B) securing the manifold to the cylinders and remove the manifold and carburetor.



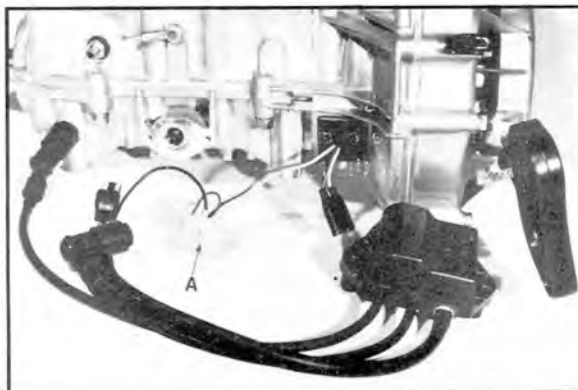
3. Remove the oil pump control cable from its attaching bracket and the pump control lever.



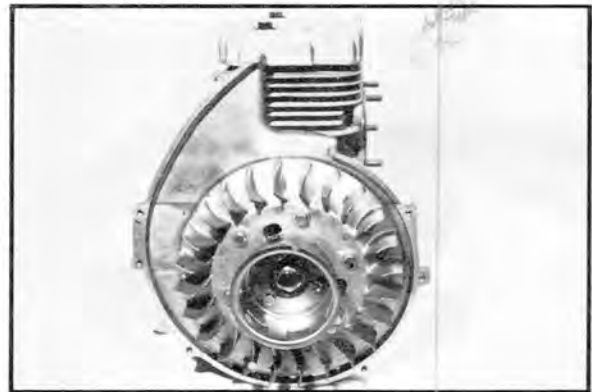
4. Remove the two phillips-head screws holding the oil pump to the crankcase. Disconnect the oil line at the crankcase and remove the pump.



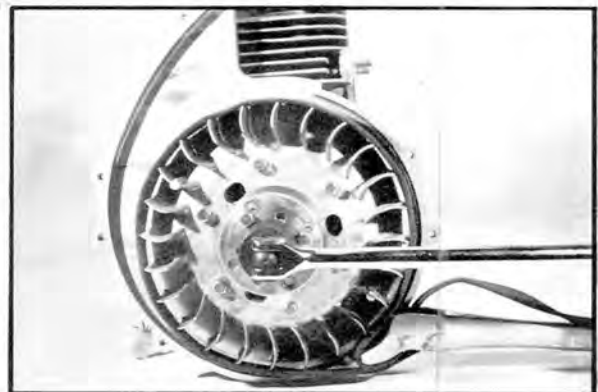
5. Remove the exhaust manifold, cooling shrouds, spark plugs, and CDI control unit. Mark the auxiliary kill wire location (A) at the connector block and remove it so the control unit can be set aside.



6. Remove the seven blower housing attaching bolts and outer blower housing from the engine.



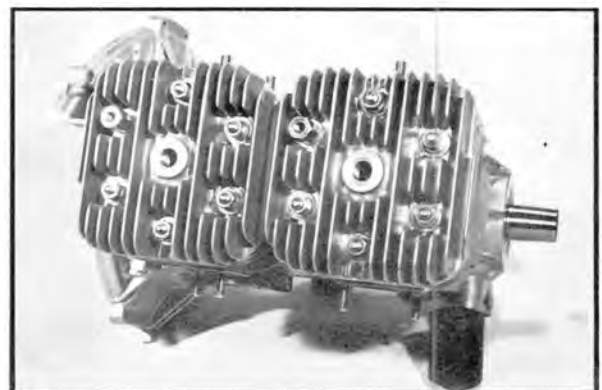
7. Remove the flywheel nut. Install the flywheel puller (PN 2870159) and strap wrench to the flywheel and remove the flywheel as shown. NOTE: Prior to attempting flywheel removal, be sure the three puller bolts are threaded into the flywheel equally to prevent binding.



8. Mark the stator plate to crankcase position for reassembly reference. Remove the two stator plate attaching screws (A), dislodge the dust cover from the crankcase housing, and remove the stator assembly.



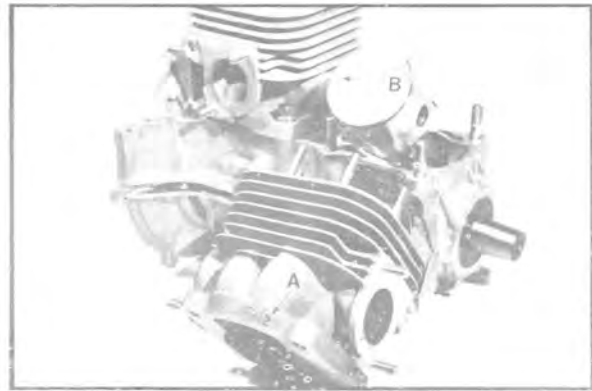
9. Remove the cylinder heads, noting the position of the two deep nuts used for attaching the cooling shroud.



ENGINES

Disassembly Procedures – 44–2PM Series

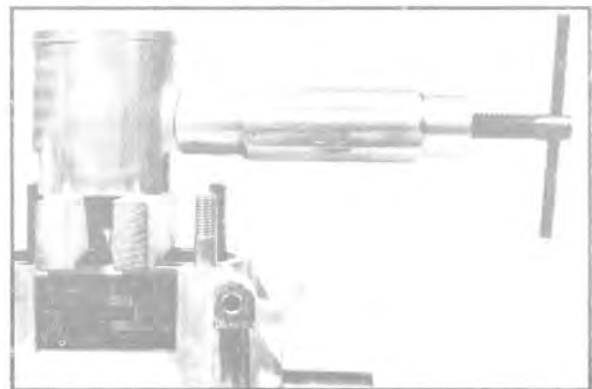
10. Remove the cylinder base nuts and washers. Remove one cylinder and base gasket.
NOTE: The cylinders are numbered at the transfer base (A) with No. 1 being the flywheel side and No. 2 the PTO side. In addition, the identifying mark on the piston head (B) is always positioned toward the flywheel side of the crankshaft.



11. Using a needle-nose pliers, compress and remove the piston pin retainer clips.



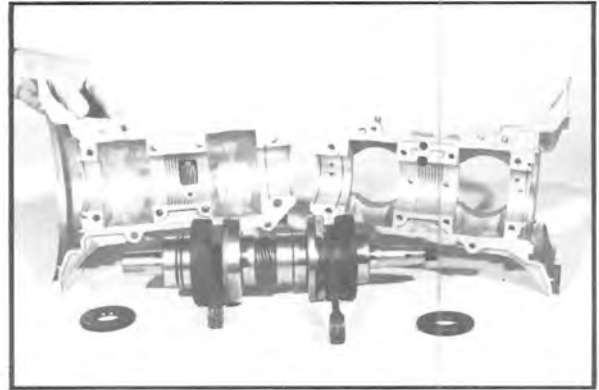
12. Supporting the piston with the support block (PN 2870390), install the piston pin puller (PN 2870386) and remove the piston pin. Remove the remaining cylinder in the same sequence.



13. Remove the 12 bolts located on the bottom of the crankcase. Supporting the case as shown, use a soft hammer to separate the case halves.

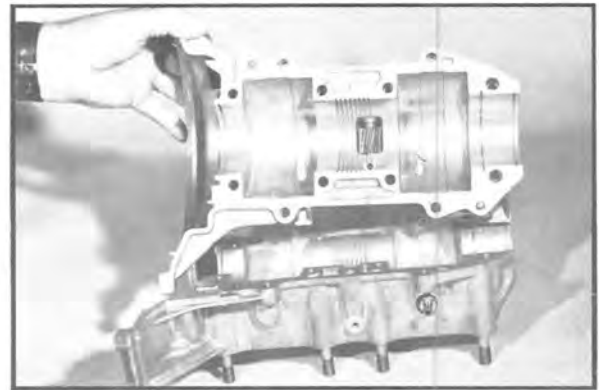


14. Split crankcase and crankshaft.

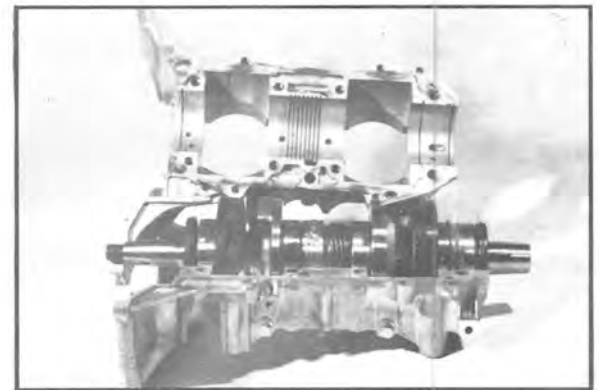


REASSEMBLY PROCEDURES

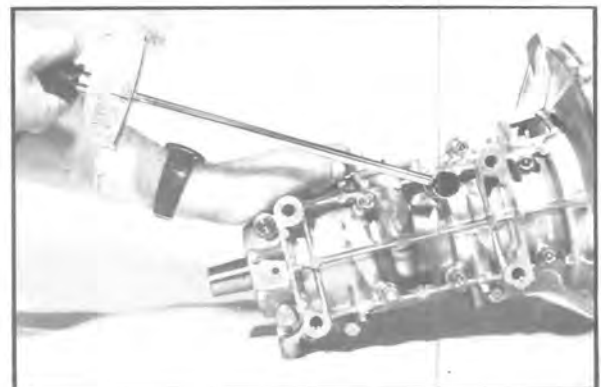
1. Before reassembling, clean all parts with a suitable solvent, taking care to remove all the old crankcase sealer from the crankcase halves.



2. Wipe a small amount of an appropriate sealer (Casite Make-A-Gasket) to the crankcase halves. Grease the labyrinth seal grooves in the case and the crankshaft end seals (use general purpose automotive chassis grease).



3. Torque the crankcase bolts according to the torque patterns in this section.



ENGINES

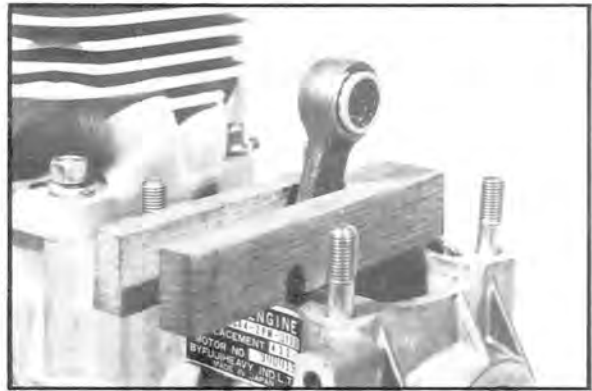
Reassembly Procedures — 44—2PM Series

4. Apply a light coat of grease to the piston pin bearing. Support the rod with the piston block as shown. Install the piston to the rod with the identifying mark toward the flywheel side. Always use new piston pin retainer clips and position their openings down.

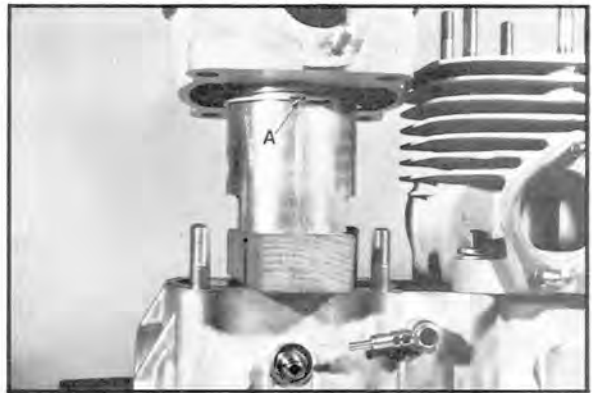
NOTE: The piston pins are a press fit and pre-heating the pistons using a heat lamp or gun to the point where they are hot to the touch will aid in pin installation.



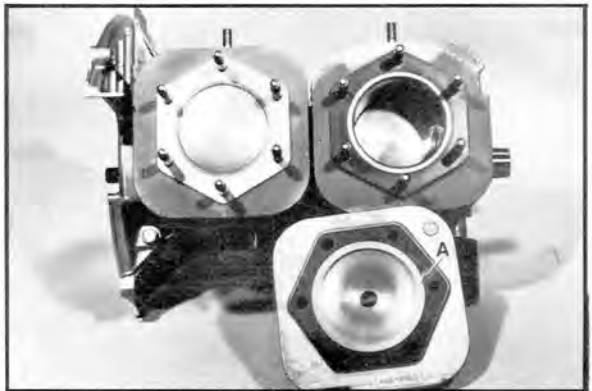
CAUTION: Never drive the pins in as damage to the bearing cage and subsequent failure will result.



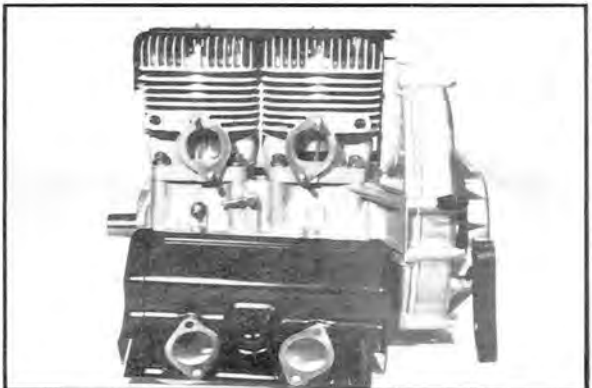
5. Install the rings (beveled side up) and cylinder base gaskets. Oil the pistons and install the cylinders, taking care to position the ring end gap over its pin (A) in the ring groove to prevent breakage. Compress the ring by hand and slide the cylinder straight down over the base studs as shown. Torque cylinder base stud nuts to 24–28 ft./lbs.



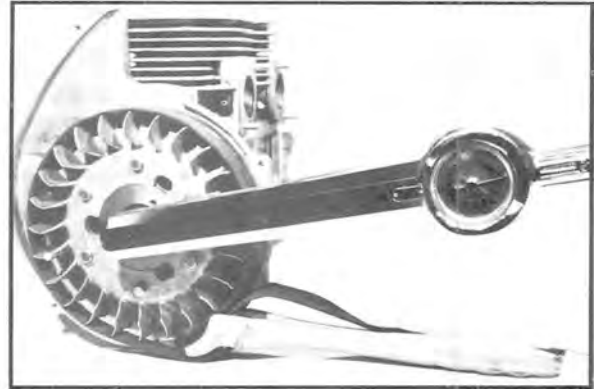
6. Install the cylinder head gaskets with the large diameter metal surface (A) toward the cylinder. Install the cylinder heads. Torque according to the sequence and values given in this section. Observe placement of deep nuts for shroud attachment. Install the spark plugs.



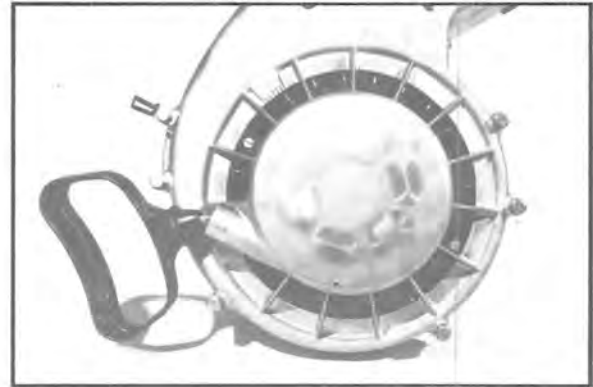
7. Install the cooling shrouds.
NOTE: Intake and exhaust gaskets are installed between cylinders and shrouds as well as between shrouds and manifolds.



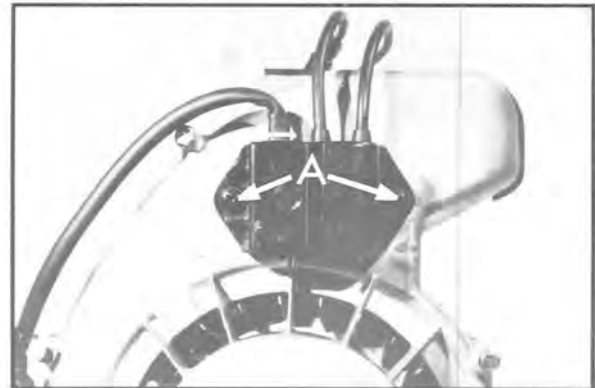
8. Install the stator plate (note reference mark) and flywheel. Torque the flywheel to 65 ft./lbs. as shown.



9. Install the starter cup and outer blower housing.

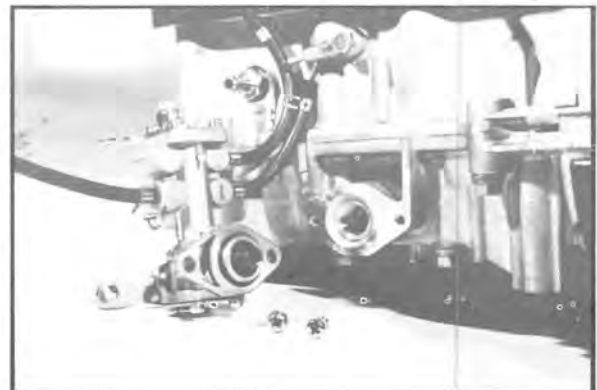


10. Install the CDI control unit to the blower housing. Torque on the well nut screws (A) is 8–10 in./lbs.



11. Install the oil pump, taking care to position the drive tab so it enters properly. Install the intake manifold and oil feed lines. Install the exhaust manifold. Hook up the oil pump control cable.

Install the engine mounting plate. Torque the four bolts to 55–60 ft./lbs. The engine is now ready for installation into the chassis.



ENGINES

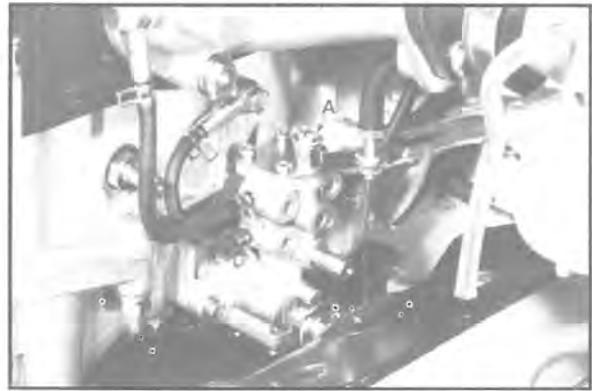
Oil Pump Bleeding and Adjustment — All Models

BLEEDING PROCEDURE

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

Proceed as follows:

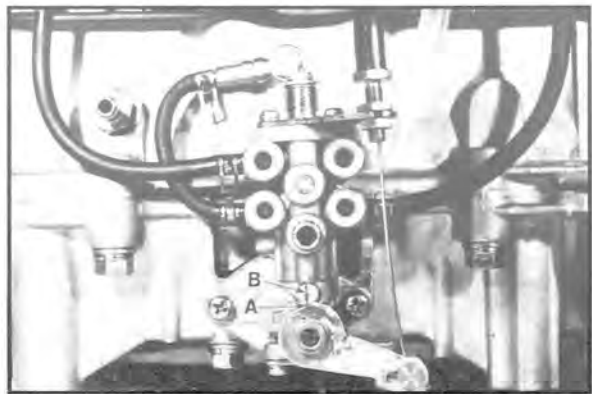
- A. Fill the oil reservoir with Polaris injector oil.
- B. Crack the brass hex head screw (A) loose. After a short period of time oil should flow from beneath the screw head to indicate the pump is free of air.
- C. Retighten the bleed screw.



ADJUSTMENT PROCEDURE

After the engine RPM and carburetor adjustments have been made the oil pump must also be adjusted. With the engine shut off and the throttle in its idle position, the pump lever index mark (A) must align with the pump housing boss index mark (B). Adjustment is accomplished by loosening the lock nuts on the cable housing sleeve and varying the cable housing length as required.

NOTE: Confirm that the pump lever is actuated upon initial throttle opening.

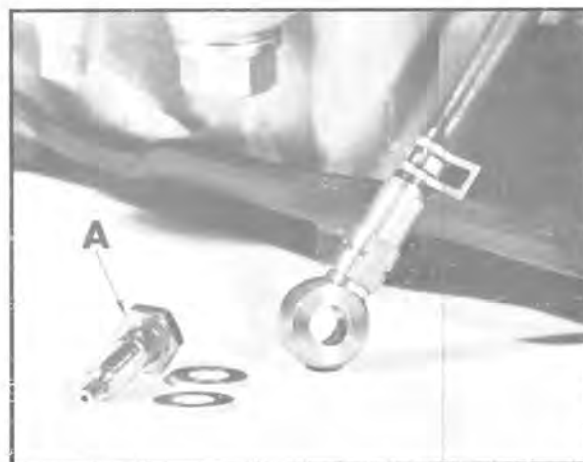


Oil Pump Operation and Troubleshooting

Any time the engine is disassembled or repaired it is important that the oil supply from the pump to the engine be checked. This can be accomplished as follows:

1. With the engine in the chassis, the oil reservoir full, and the pump bled, remove the two oil feed line banjo bolts (A) from their location on the manifold or carburetors.

NOTE: Use care so as not to lose the two washers located on either side of the banjo check valve.



2. Blow through the banjo bolts to determine that they are not plugged or restricted.

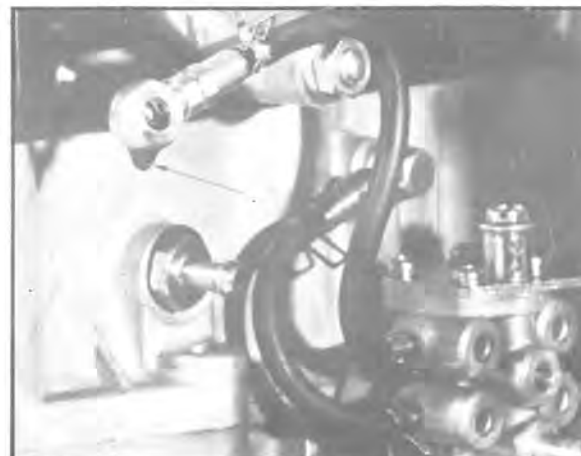
3. Loosely thread only the banjo bolts back into the manifold or carburetors.

4. Place the oil feed lines with their check valves away from the clutch area. Start the engine and let idle at the normal idle RPM.

5. Lift the oil pump control lever up to its maximum flow position.

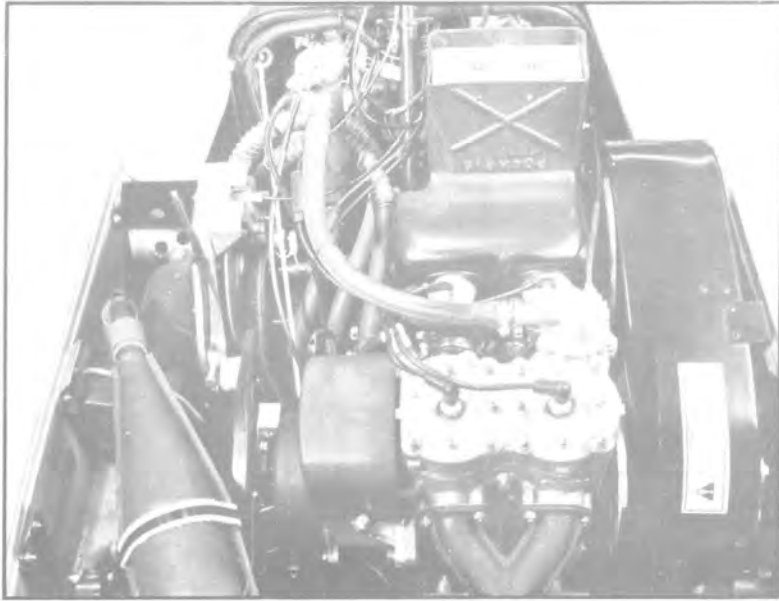
6. Drops of oil should be visible from the banjo check valves after the engine is idled 1–2 minutes, with a drop occurring approximately every few seconds.

7. In the event oil does not flow from one of the check valves, remove the oil line from the check valve and again idle the engine. If oil now flows, the check valve is defective and must be replaced.



8. If oil does not flow with the check valves removed from their feed lines, the malfunction is one of the following:

- A. Inline filter blocked.
- B. Feed lines leaking.
- C. Defective pump.



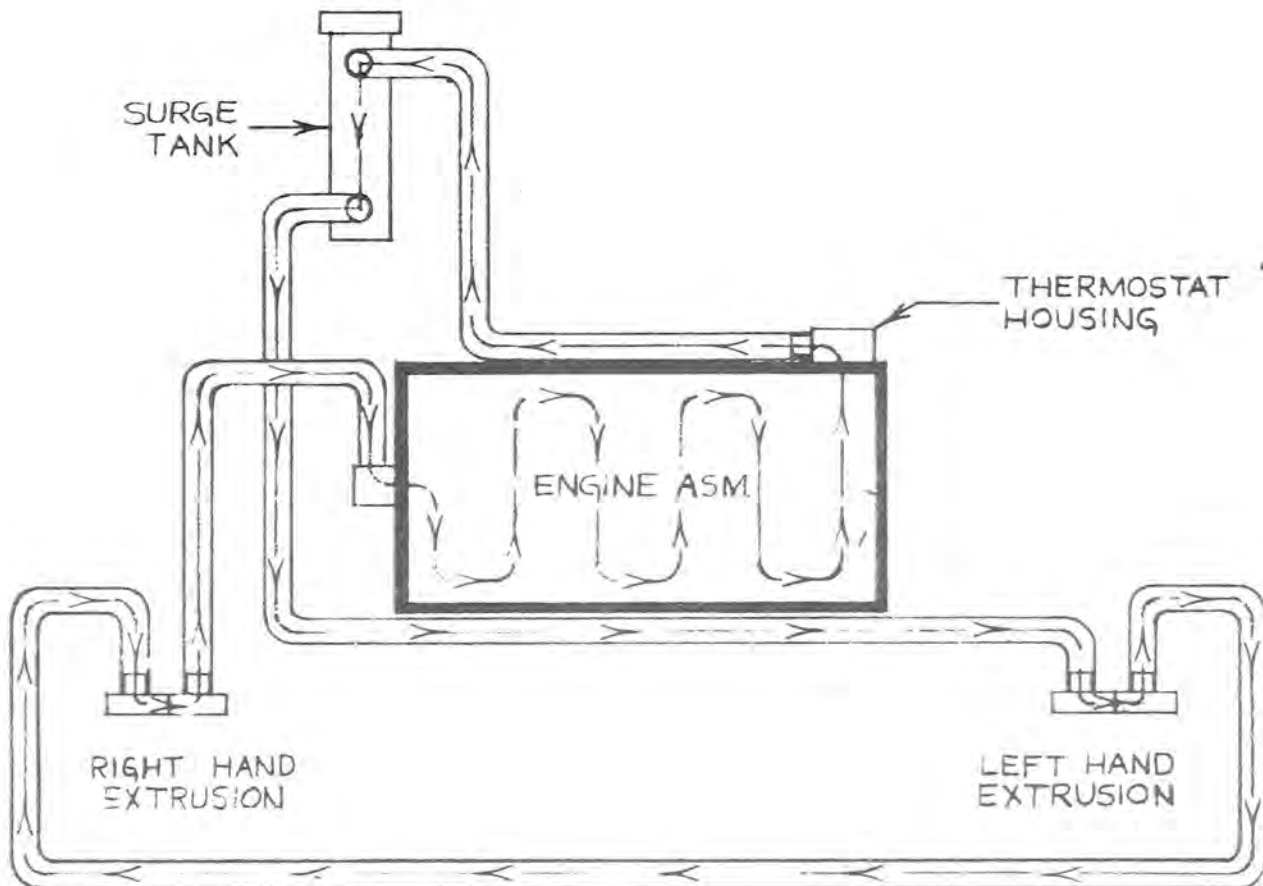
CHASSIS INSTALLATION



Coolant temperature is lowered as the coolant is circulated through heat exchangers fastened under the chassis running boards.

ENGINES
EC34PL Cooling System

The cooling system consists of the following major components: surge tank, water pump, cylinder, cylinder head, thermostat, and heat exchangers. When the engine is started, the thermostat will be closed and coolant will circulate through the pump, cylinder, and by-pass hose. When the coolant temperature warms up to 126° F (52° C), the thermostat will open and coolant will circulate through the heat exchangers where its temperature is lowered before recycling.



Coolant Flow Schematic

ENGINES

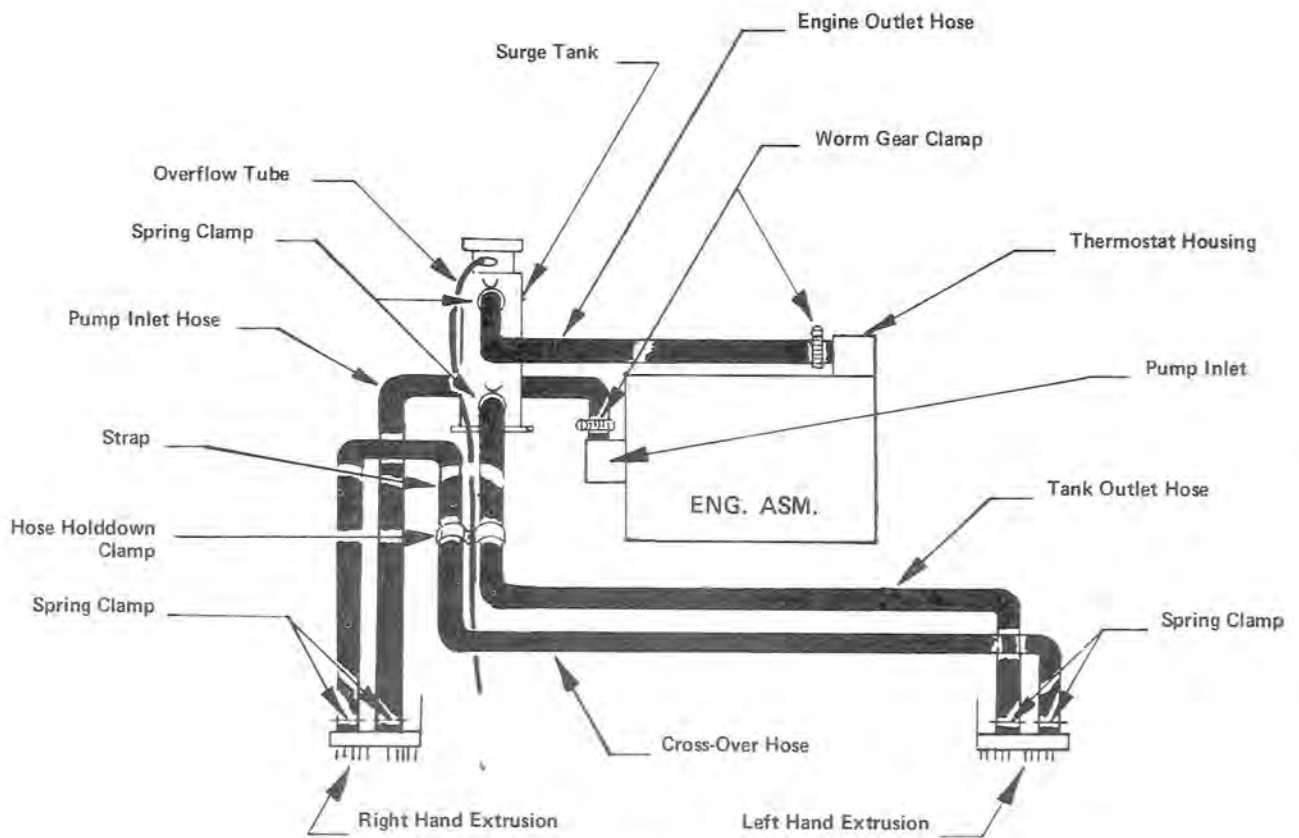
EC34PL Cooling System

COOLANT

The coolant supplied is a 50-50 mixture of tap water and automotive anti-freeze (ethylene glycol). This coolant mixture will provide protection against freezing at temperatures down to -34° F.

The capacity of the cooling system is four quarts. Always pre-mix the water and anti-freeze in the proper proportion before adding to cooling system.

IMPORTANT: Do not exceed a 60 percent concentration of anti-freeze in the coolant mixture.



FRONT VIEW

Coolant Line Schematic

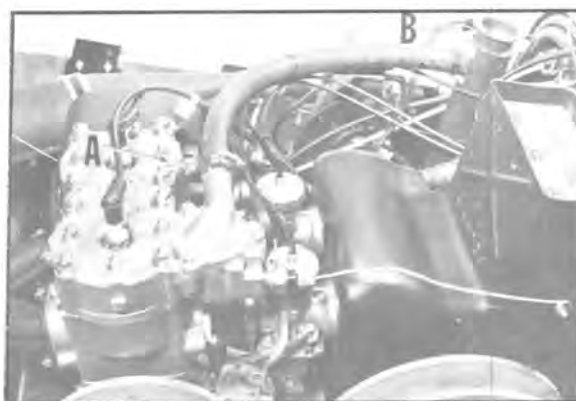
DRAINING THE COOLING SYSTEM

Remove the pressure cap and both rear caps from the heat exchangers (bolted versions). Remove the drain plug from the front of the cylinder block.



FILLING AND BLEEDING PROCEDURE

Remove the bleeder plug (A) from top of cylinder with a 14mm wrench. Remove the pressure cap and fill coolant into surge tank (B). Continue filling until coolant comes out of the bleeder vent. Reinstall the bleeder plug and fill surge tank to filler neck. To avoid leakage, always use a new gasket on the bleeder plug.



Start engine and idle at 4,000 RPM until the thermostat opens. Coolant can be seen flowing into the top of the surge tank when the thermostat opens. If the coolant level drops in the surge tank with continued idling, fill coolant to level indicated on the tank decal. Continue idle and filling procedure until coolant stabilizes at the level specified. The same basic procedure is used on the three cylinder engine, with the exception the bleed vent is located on the water outlet manifold near the thermostat housing.

PRESSURE TESTING THE SYSTEM

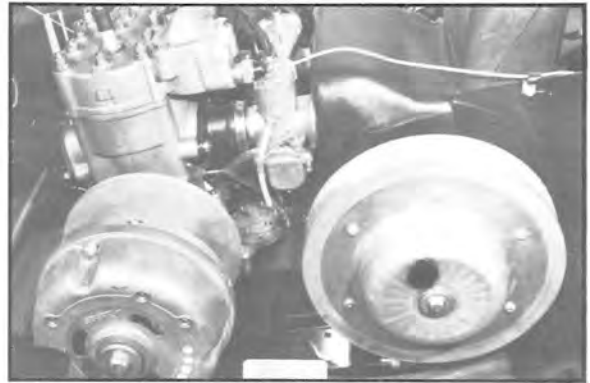
Polaris recommends that a pressure test be performed on all machines during the pre-delivery and maintenance inspections. This procedure calls for pressurizing the system to 14 pounds using an automotive-type pressure tester and holding the pressure at 14 pounds for three to four minutes. The coolant must be at operating temperature while performing the pressure test. During this time visually inspect all connections for any leakage. Tighten all loose hose fittings. Upon completion of this test, run the machine up to operating temperature. Shut the machine off and recheck hose connections for any further leakage.



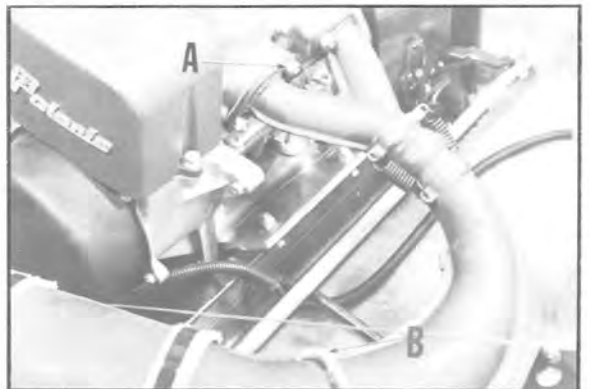
ENGINES

Engine Removal – PL Twin Cylinder Series

1. Open the clutch guard and remove the drive belt.



2. Remove the four (4) exhaust manifold nuts (A). Release the spring clamp (B). The manifold and muffler are removed as a unit. It is not necessary to remove the lower resonator.

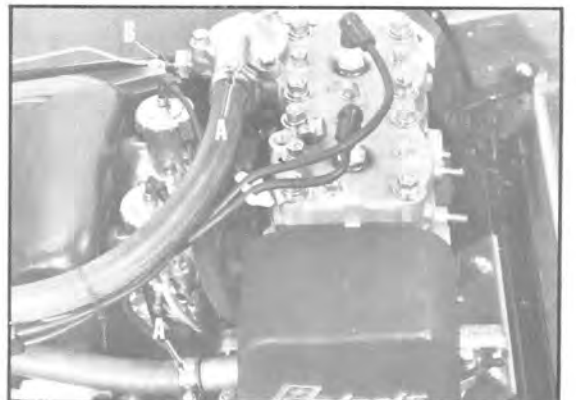


3. Remove the recoil starter and set it aside in the nosepan.



4. Drain the cooling system. Follow draining the cooling system instructions in this section.

5. After proper draining, remove the coolant hoses (A), the temperature warning switch wire (B), spark plug wires, choke and throttle cables.



Engine Removal – PL Twin Cylinder Series

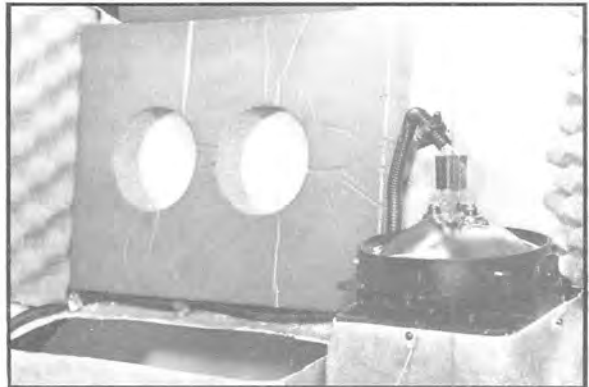
6. Disconnect the engine electrical couplers. Remove and plug the fuel line from the fuel pump.



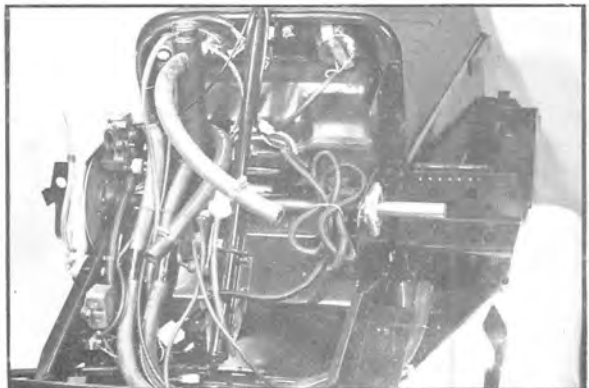
7. Remove the engine mount plate bolts.



8. Disconnect the headlight harness from the headlamps and pull the harness from between the engine and mounting plate.



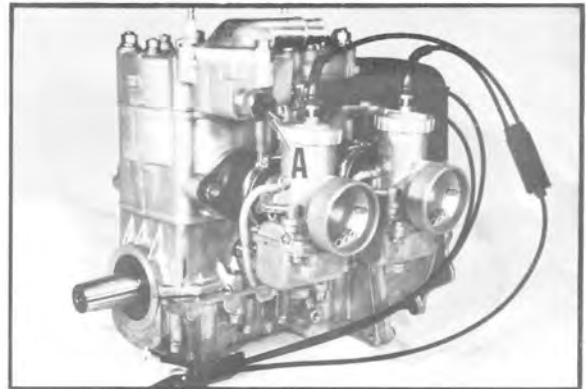
9. The engine can now be removed.



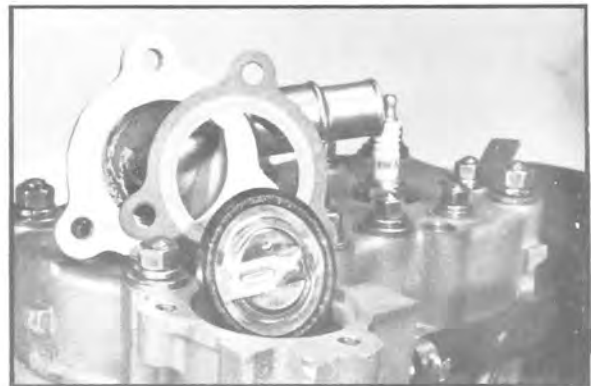
ENGINES

Disassembly Procedures — PL Twin Cylinder Series

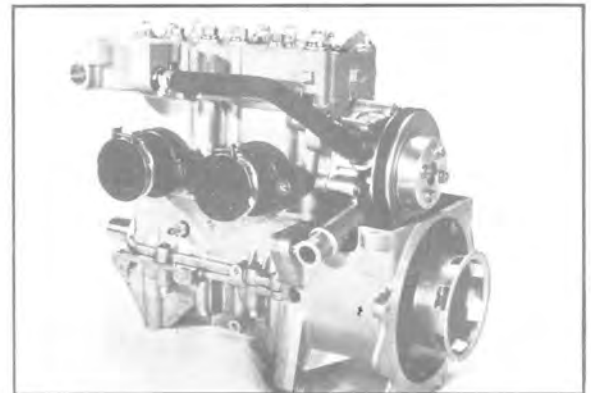
1. EC34PL-02 engine as lifted from chassis. Temperature warning switch (A) should now be removed.



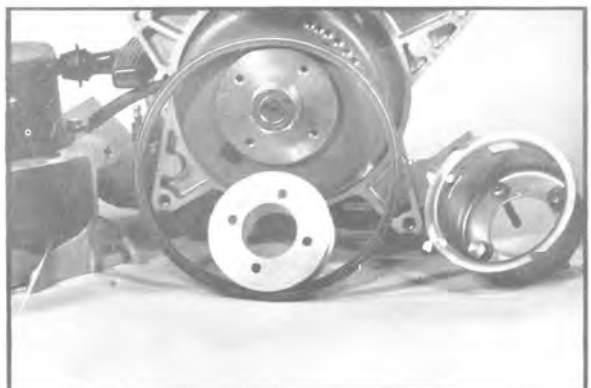
2. Remove the water outlet housing, gasket, and thermostat.



3. Remove the carburetors and the water pump housing.



4. Remove the starter cup, the water pump drive pulley, and the flywheel housing.



Disassembly Procedures — PL Twin Cylinder Series

5. With the strap wrench (PN 2870336) secured to the flywheel, remove the flywheel nut. Install the flywheel puller (PN 2870384) and remove the flywheel.



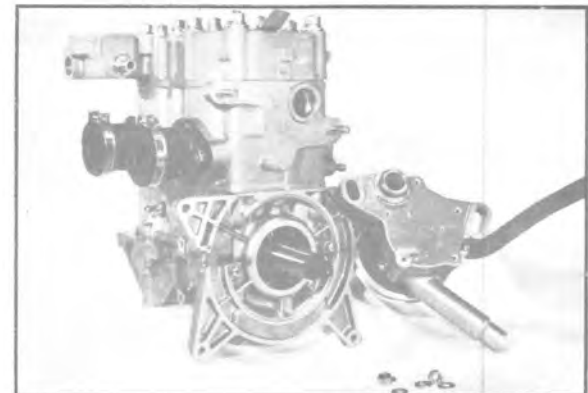
6. With a hammer and a chisel, make a reference mark on the stator plate and housing for future reassembly.



7. Using an impact screwdriver, remove the two (2) stator plate retaining screws as shown. Remove the stator plate.



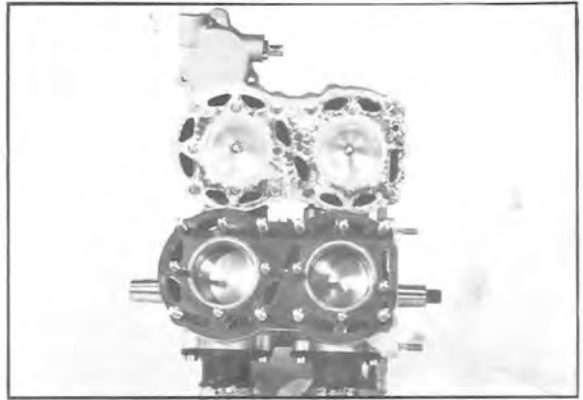
8. Remove the water pump.



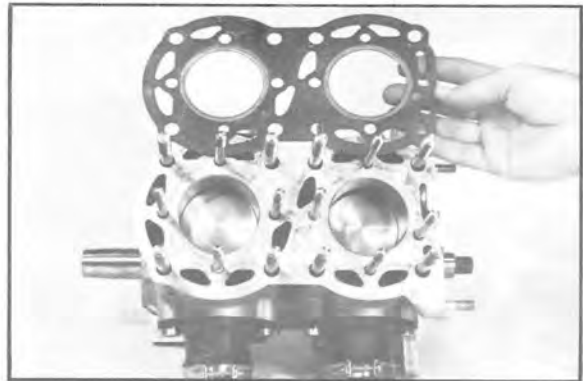
ENGINES

Disassembly Procedures — PL Twin Cylinder Series

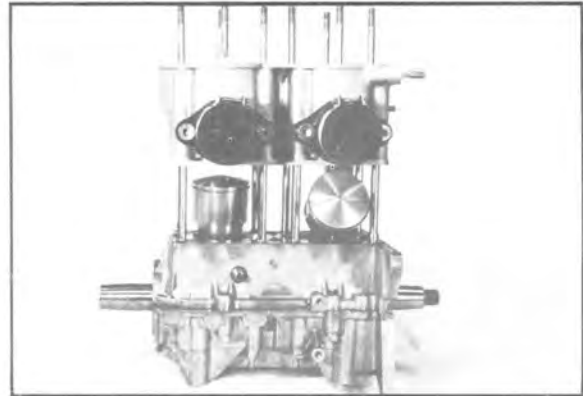
9. Remove the cylinder head.



10. Remove the cylinder head gasket.



11. Lift the cylinder assembly from the crankcase.



12. Place a shop cloth under the piston. Using a knife blade or sharp object, remove the spiral lock piston pin retainers.



Disassembly Procedures – PL Twin Cylinder Series

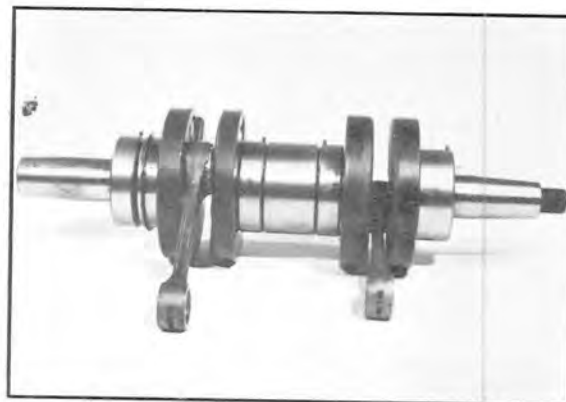
13. Use the piston pin puller (PN 2870386) to remove the piston pin.



14. Remove the crankcase bolts from the bottom of the crankcase. With a soft hammer, tap the case to separate the halves.



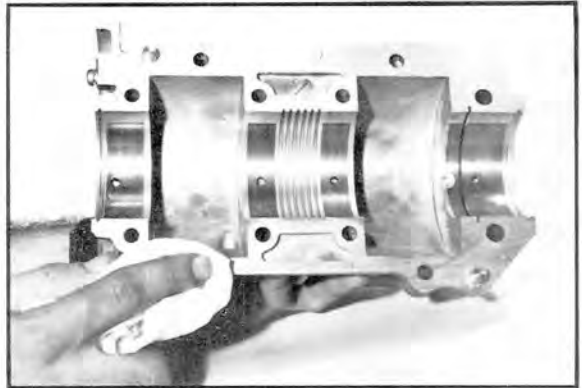
15. TX-L crankshaft. Note the special bearings and anti-rotation pins on the outer bearing race.



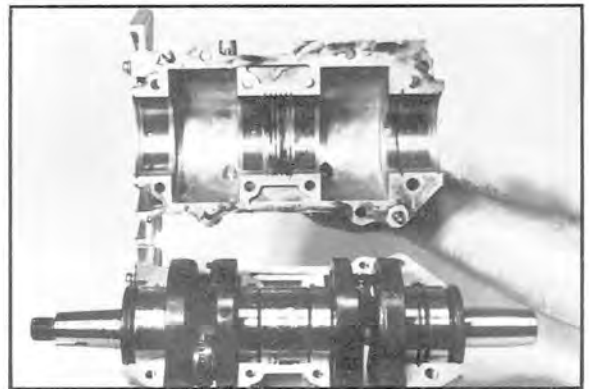
ENGINES

Reassembly Procedures — PL Twin Cylinder Series

1. Before reassembling the engine, clean all parts with solvent. Remove the old sealer from the crankcase halves.



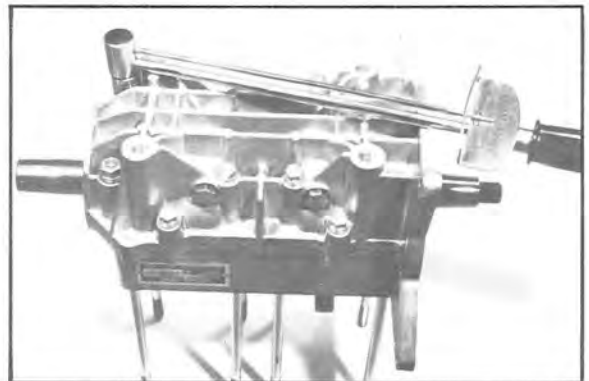
2. Apply a small amount of an appropriate sealer to the crankcase halves. Grease the labyrinth seal and crankshaft end seals.



3. Torque the crankcase bolts following the torque patterns in this section.

8mm bolts: 18 - 20 ft./lbs.
2.5 - 2.8 Kg.-M

10mm bolts: 23 - 25 ft./lbs.
3.2 - 3.5 Kg.-M



4. Install the piston pin bearings and spacers to the rod and install the pistons with the "F" marking toward the flywheel side.



5. Install the piston pin locks and rings.

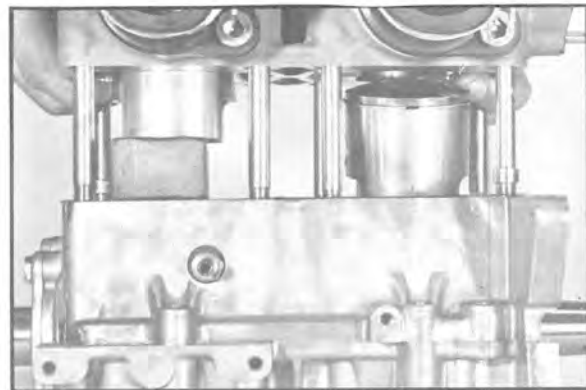


Keystone Ring Installation:

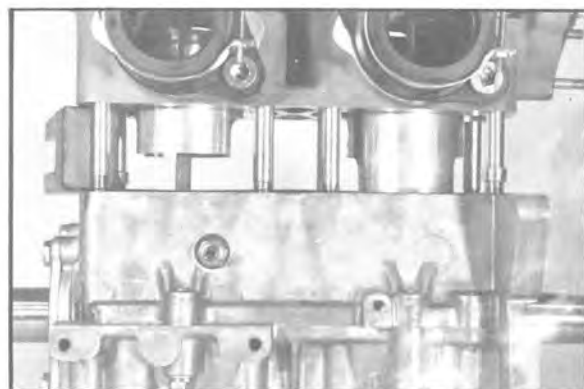
Keystone rings are beveled to the inside. This bevel must be toward the top of the piston. See diagram.



6. Install the cylinder base gasket; oil the pistons. Support one piston as shown. Compress the ring and install the cylinder over the piston.



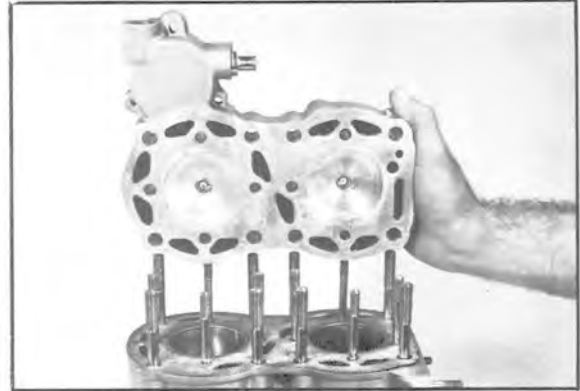
7. Move the support block from under the piston to the cylinder. Compress the ring, and rotating the crankshaft, guide the piston into the cylinder.



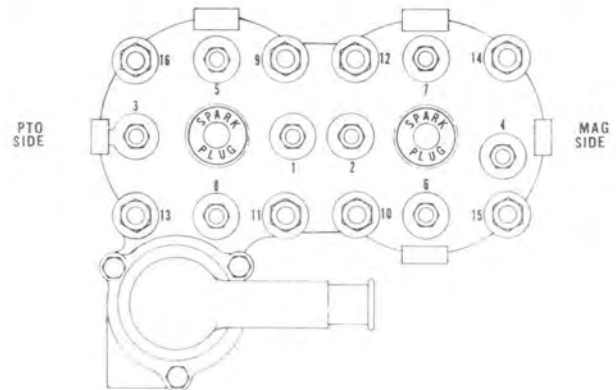
ENGINES

Reassembly Procedures — PL Twin Cylinder Series

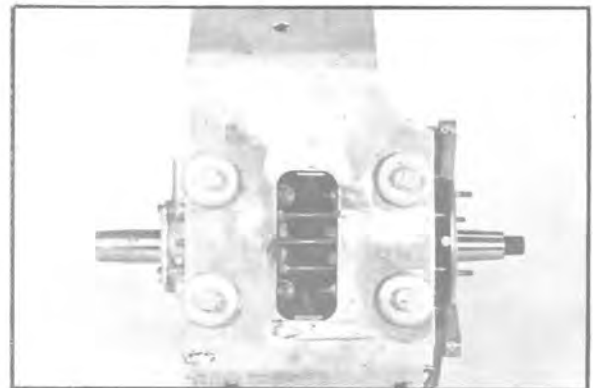
8. Install the cylinder head and gasket.



9. Torque the 8mm nuts to 16-17 ft./lbs. The 10mm nuts are torqued to 26-29 ft./lbs. Re-torque the 8mm nuts. Install the thermostat.



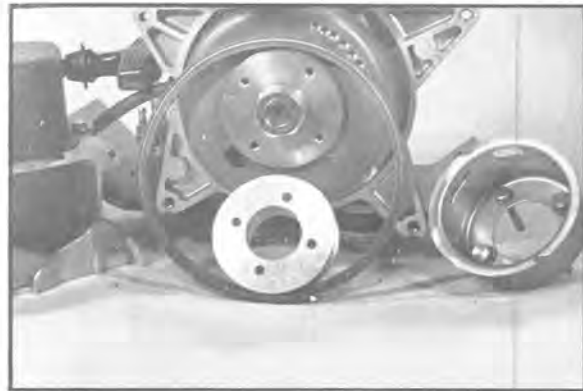
10. Install the engine mount plate, torquing bolts to 55 - 60 ft./lbs.



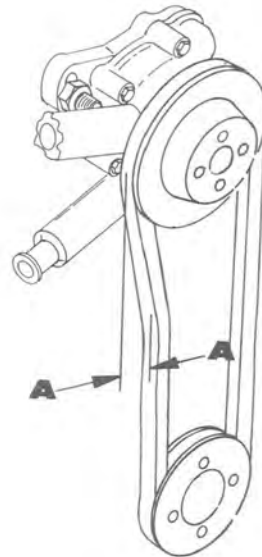
11. Install the stator. Note the chisel marks for timing reference.



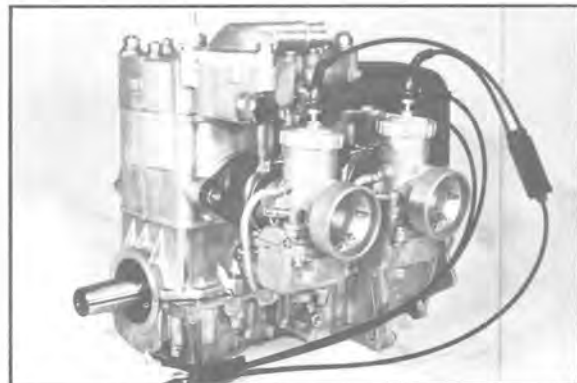
12. Install the flywheel and key. Torque the flywheel nut to 60 ft./lbs. using the strap wrench (PN 2870336) to secure the flywheel. Install the water pump drive pulley, starter cup, and flywheel housing.



13. Install the water pump to the cylinder. Apply a light coat of grease to the O-ring between the cylinder and pump fitting. Install the drive belt and adjust the deflection to 1/4" (A). Torque the 8mm pump retaining stud nuts to 15 ft./lbs.



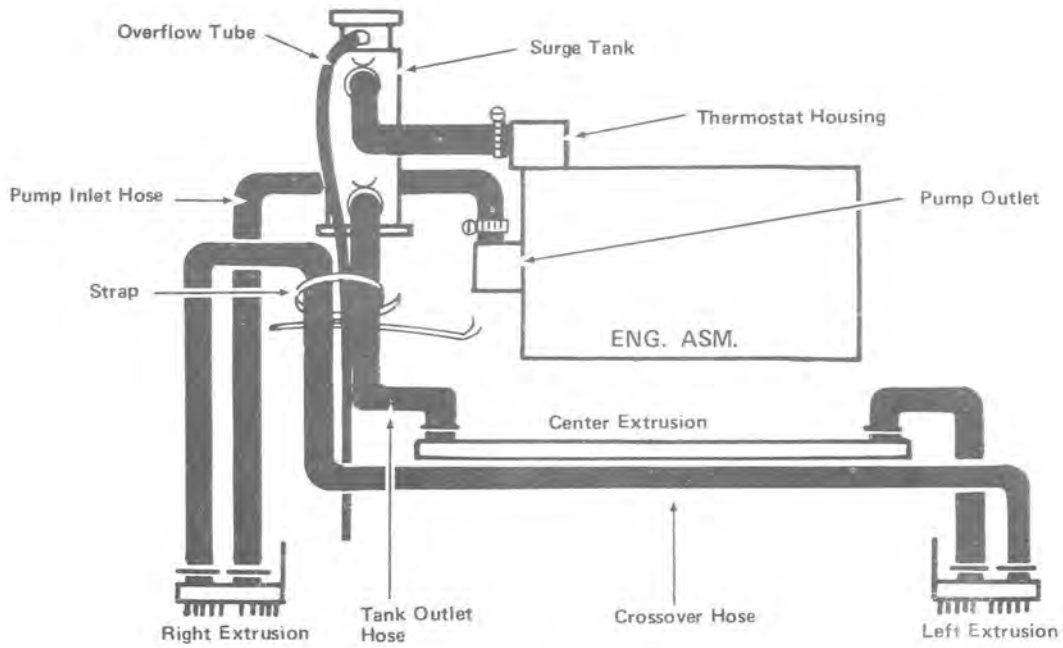
14. Install temperature warning switch, thermostat, and water outlet housing with new gasket. Install carburetors and water pump housing. The engine can now be installed in chassis.



ENGINES

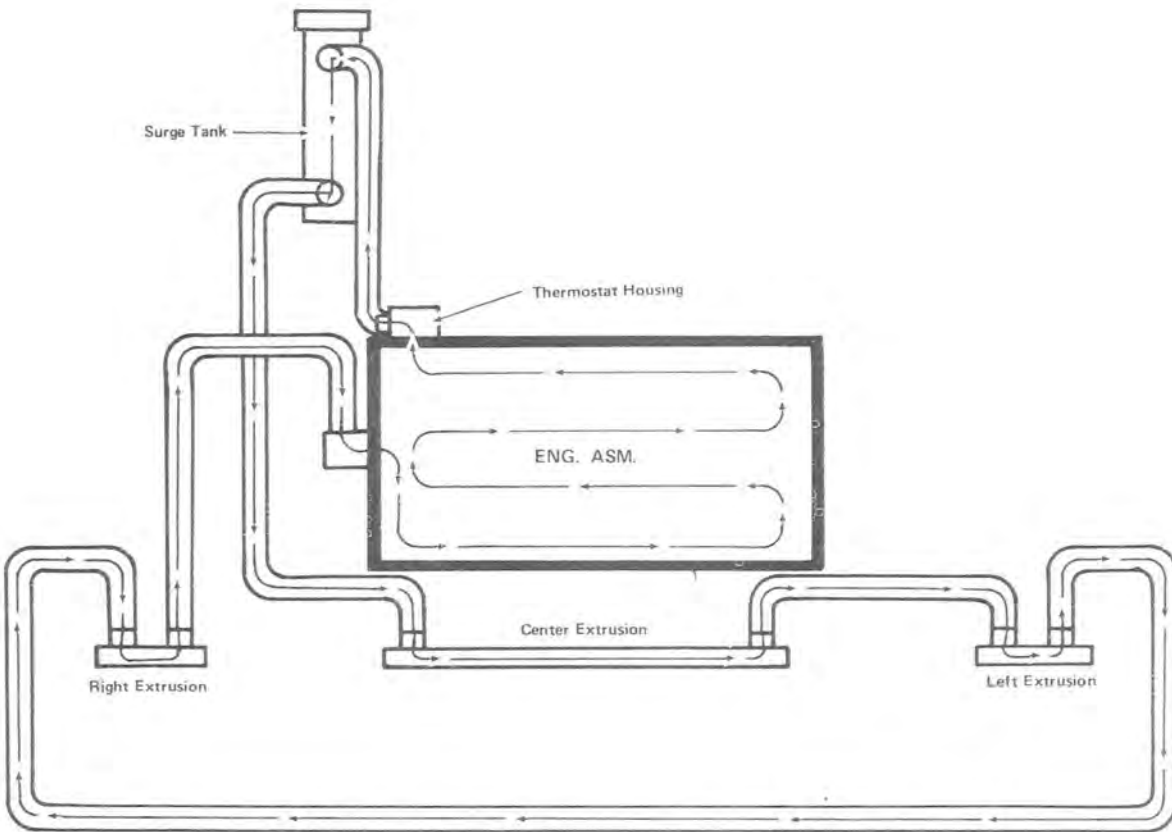
Cooling System – PL Three Cylinder Series

The recommended mixture of anti-freeze (ethylene glycol) and water is 50-50.

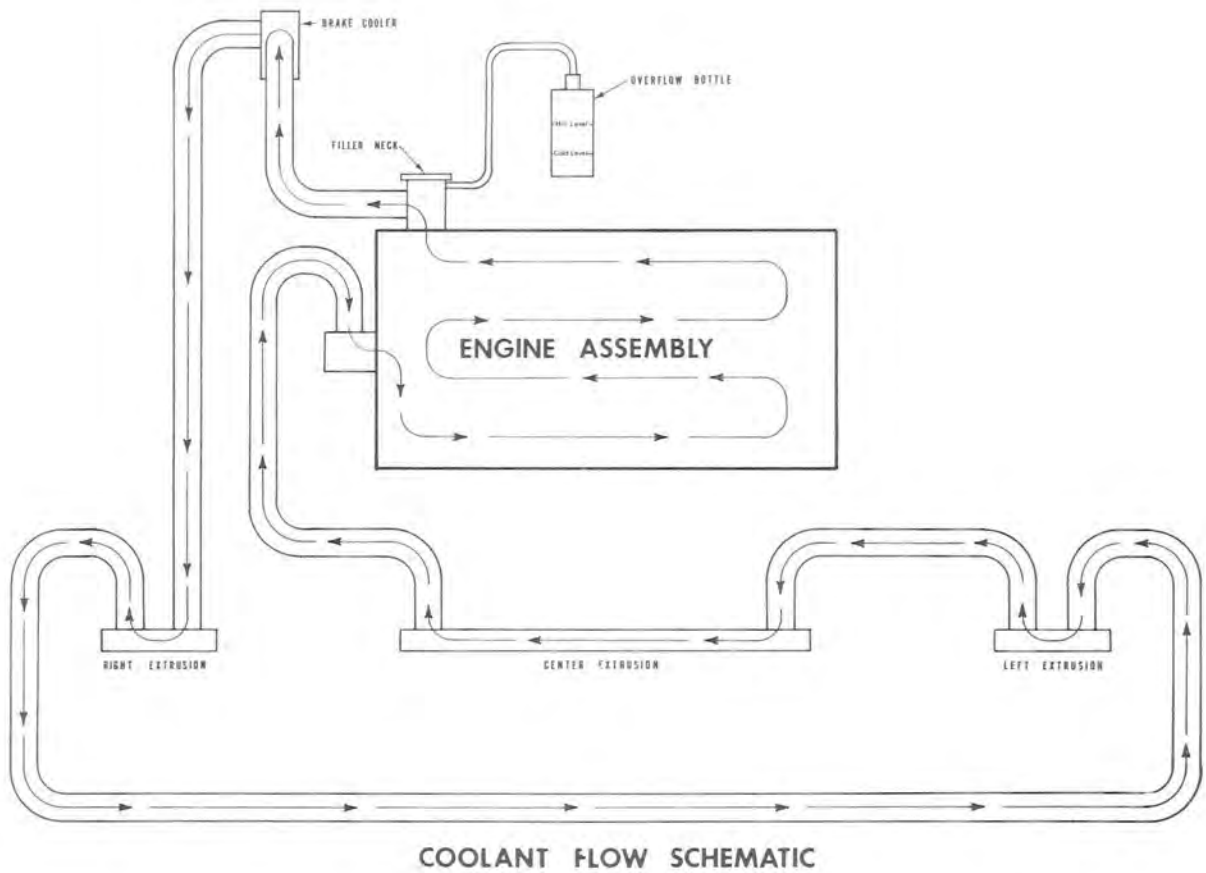


FRONT VIEW

Coolant Line Schematic

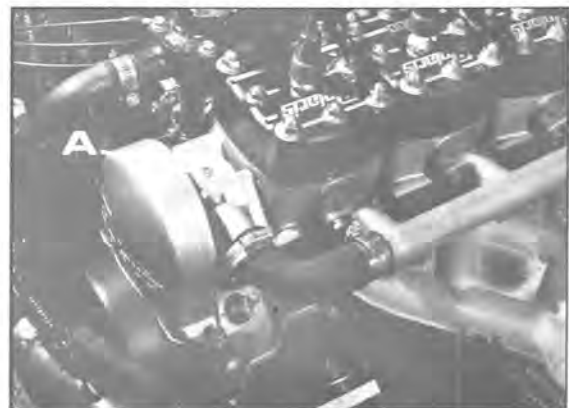


Coolant Flow Schematic



FILLING AND BLEEDING PROCEDURE

1. Elevate the front end of the machine approximately 10": Loosen the special bleeder plug (A) at the water pump. Remove the pressure cap and pour coolant into the engine until it flows from the bleed plug. Tighten the bleed plug and continue filling until the coolant level is at the pressure cap fitting neck.



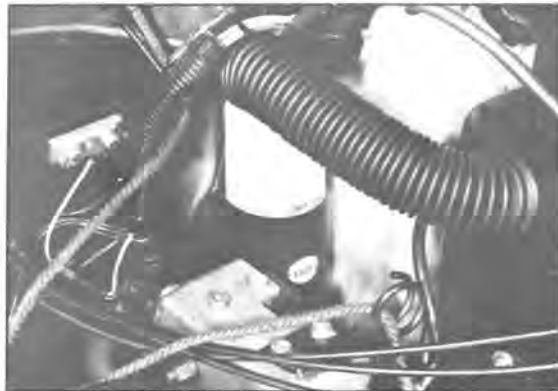
ENGINES

Cooling System – EC60PL With Recovery System

2. Start the engine and let idle. Observe the coolant in the filler neck. It must be circulating. If no circulation is evident, shut the engine down and rebleed the pump. Repeat the bleeding and filling procedure until circulation and coolant level remains constant for a period of 3 - 5 minutes during idling.

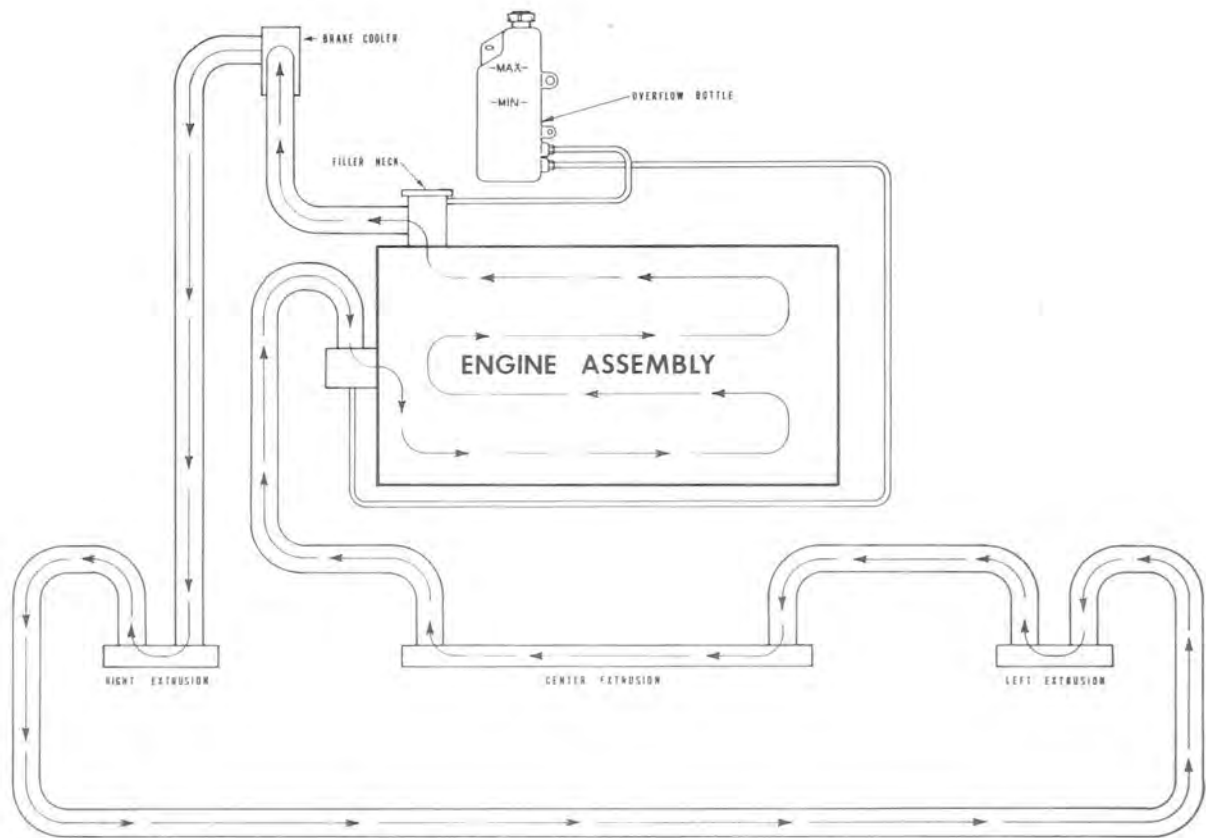


3. Fill the coolant expansion reservoir bottle to the indicated hot level.



4. **Field Test Machine**
Note: Coolant level and circulation must always be rechecked during the first 5 - 10 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.

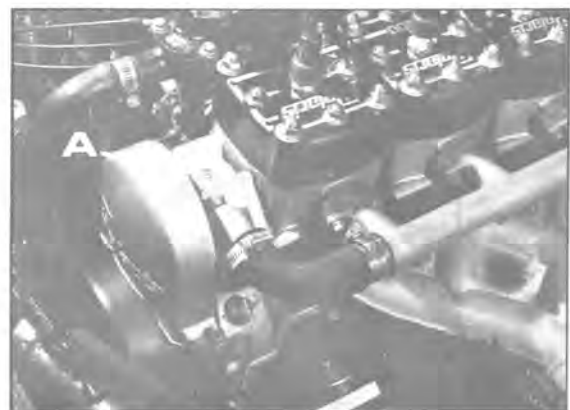
Cooling System – EC60/40PL With Positive Bleed Recovery System



COOLANT FLOW SCHEMATIC

FILLING AND BLEEDING PROCEDURE

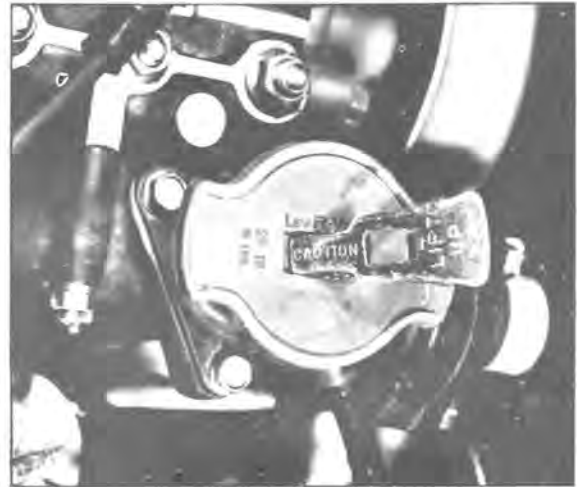
1. Elevate the front end of the machine approximately 10". Loosen the special bleeder plug (A) at the water pump. Remove the pressure cap and pour coolant into the engine until it flows from the bleed plug. Tighten the bleed plug and continue filling until the coolant level is at the pressure cap fitting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



ENGINES

Cooling System – EC60/40PL With Positive Bleed Recovery System

3. Install the pressure cap and with the lever lock up in its released position, run the engine at fast idle for 2–3 minutes. This will purge the system of entrapped air. Close the lever lock and recheck recovery tank level.



COOLANT LEVEL

The engine coolant level is controlled or maintained by the recovery system. The recovery system components are the overflow tank, engine filler neck, pressure cap and connecting hose.

As coolant operating temperature increases the expanding (heated) excess coolant is forced out of the engine past the pressure cap and into the overflow tank. As engine coolant temperature decreases this contracting (cooled) coolant is drawn back up from the tank past the pressure cap and into the engine.

Note: The overflow tank must be maintained between the minimum and maximum levels.

! Never remove the pressure cap when the engine is warm or hot. If the pressure cap is to be removed the engine must be cool.

Note: Use of a non standard pressure cap will not allow the recovery system to function properly. If the cap should need replacement contact your dealer for the correct replacement part.

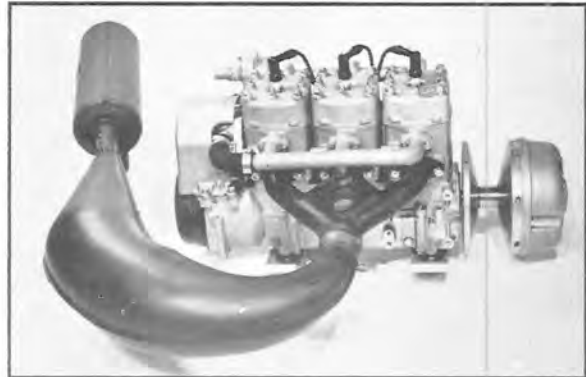
FLUSHING COOLING SYSTEM

To insure that the coolant maintains its ability to protect the engine, it is recommended that the system be completely drained every two years and a fresh 50/50 mixture of anti-freeze and water be added.

Disassembly Procedures — PL Three Cylinder Series

The following sequence of disassembly and reassembly procedures will be an aid to the serviceman during diagnosis and repair. Care should be taken to ensure that internal parts and external parts are kept extremely clean when service work is being completed.

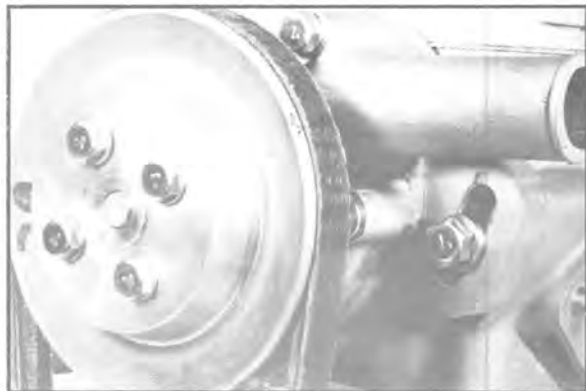
1. Complete EC51PL-01 three cylinder engine, less air silencer.



2. Remove the carburetors, intake silencer, and exhaust manifold.



3. Remove the water pump cover. Remove the water pump by removing one cap screw and one nut.



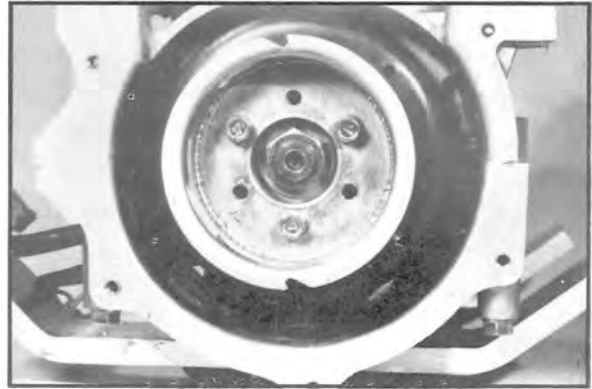
4. Remove the cylinder head nuts.
NOTE: The cylinder heads can be removed separately by removing the water manifold or as a unit as shown in this photo. The heads should be marked to correspond with the same cylinder during reassembly.



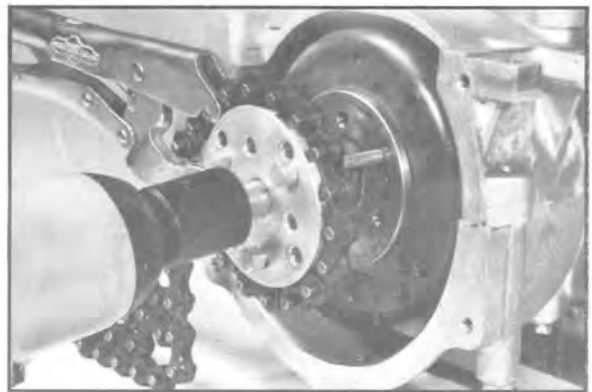
ENGINES

Disassembly Procedures – PL Three Cylinder Series

5. Remove the recoil, starter cup, and flywheel nut.



6. Install flywheel puller (PN 2870384) to the flywheel. Secure the puller with chain wrench (PN 2870203). Use an impact gun or appropriate driver to remove the flywheel.



7. Mark the stator plate and crankcase as shown to retain the same engine timing when re-assembling. Note the three retaining screws.

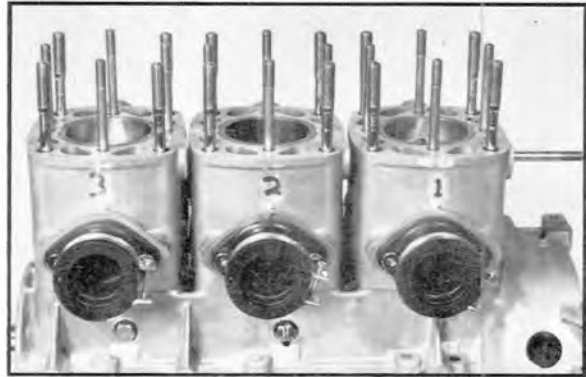


8. Using an appropriate driver, remove the stator plate. It will be necessary to force the rubber wire harness grommet through the magneto housing.



Disassembly Procedures – PL Three Cylinder Series

9. Mark the cylinders and pistons to maintain the same position during reassembly.



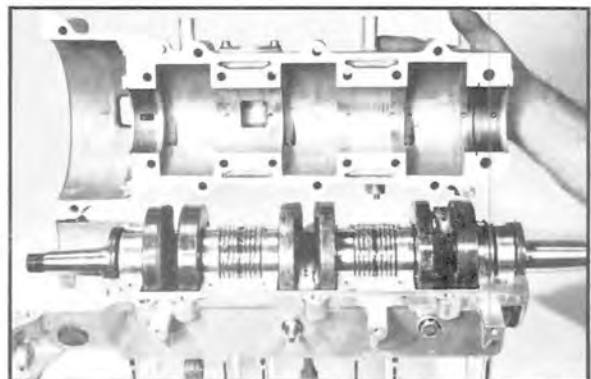
10. Remove the spiral lock rings from each piston. Use a sharp pointed object to make this an easier procedure.



11. Use the piston pin puller (PN 2870386) to remove the piston pin.



12. Remove the crankcase attaching bolts (20). It may be necessary to tap the crankcase lightly to split the halves. Tap in areas that will not danger the sealing of the two halves during reassembly.

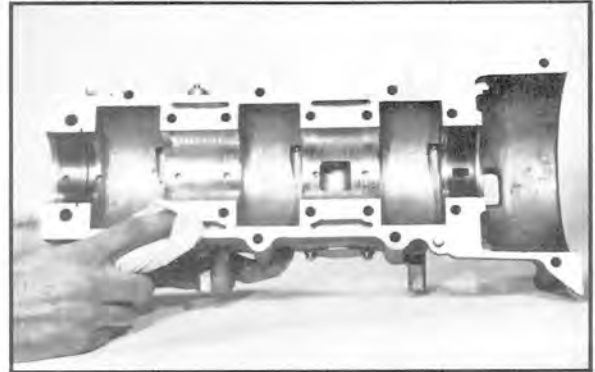


ENGINES


Reassembly Procedures – PL Three Cylinder Series

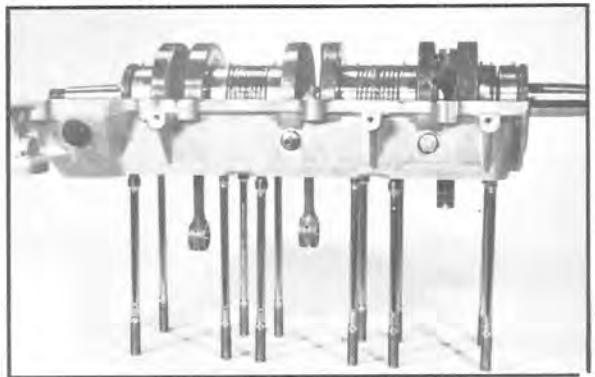
1. Before reassembling the engine, clean all parts with solvent and remove the old sealer from the crankcase halves.

If the reason for disassembly was from crankshaft bearing failure or piston seizure, check the crankcase for damaged bearing surfaces.



2. Crankcase reassembly is made easier by turning the upper case half upside down as shown. Grease the labyrinth seals and end seals. Use extreme care when positioning the crankshaft in the case. Make sure the seals are properly seated in the crankcase groove provided for the seal.

 Make sure the seven bearing locator pins are in direct line with the pin holes in the lower crankcase half.

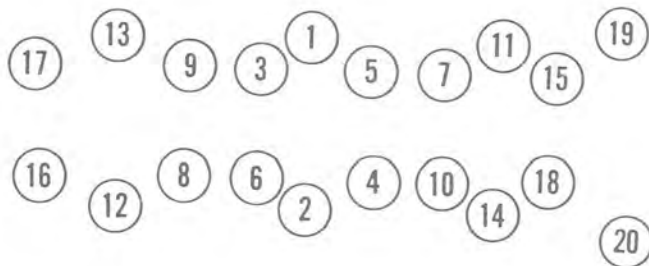
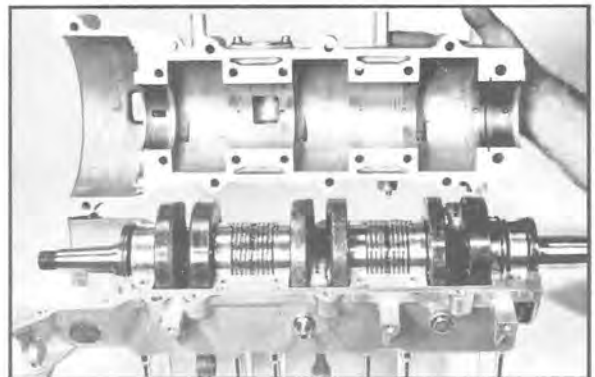


3. Use a small amount of appropriate sealer on each crankcase half.

4. Torque the crankcase bolts following the torque pattern.

8mm bolts: 18 – 20 ft./lbs.
2.5 – 2.8 Kg.-M

10mm bolts: 23 – 25 ft./lbs.
3.2 – 3.5 Kg.-M



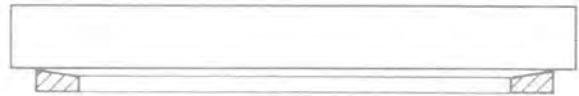
5. Install the piston pin bearings and spacers to the rod and install the pistons with the "F" marking toward the flywheel side or with the ring locator pin to the intake port.



6. Install the spiral lock rings and piston rings.

Keystone Ring Installation:

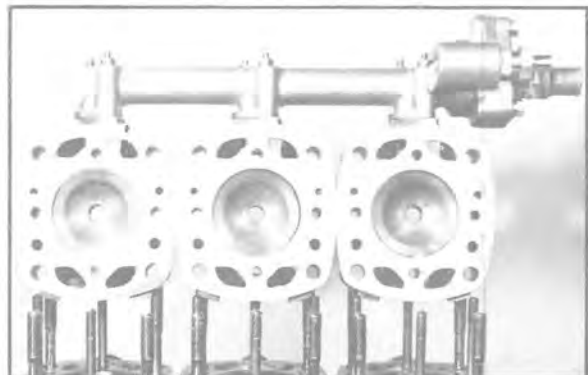
Keystone rings are beveled to the inside. This bevel must be toward the top of the piston. See diagram.



7. Install the cylinder base gaskets; oil the pistons. Support the piston. Compress the ring and install the cylinder over the piston. Use the same procedure for the remaining two cylinders.



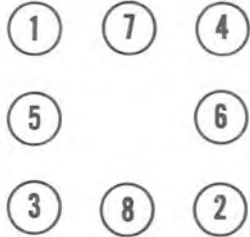
8. Before installing head gaskets, spray each gasket with aluminum high-temperature paint. Install the gasket with the small discharge hole toward the intake side of motor. Install the heads as a unit or individually.



ENGINES

Reassembly Procedures – PL Three Cylinder Series

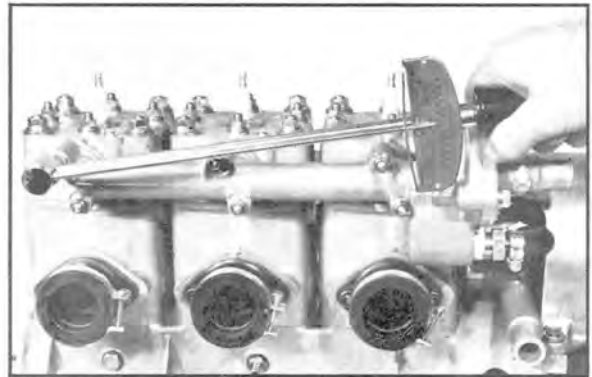
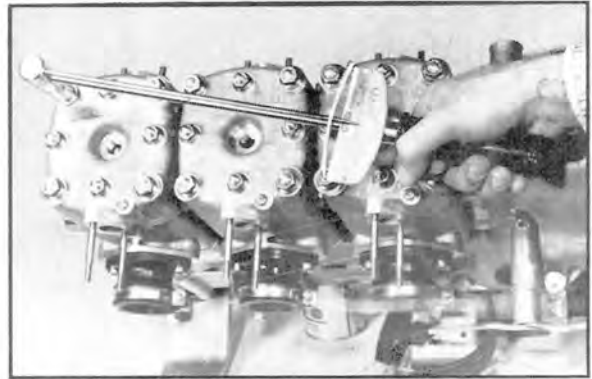
9. Torque the cylinder head nuts. Torque the 10mm nuts first, then torque the 8mm nuts. Follow torque pattern.



3 Cylinder Head

10. Install the water manifold gaskets and water manifolds.

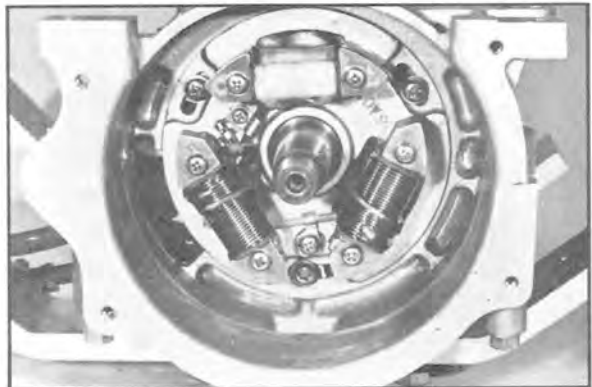
▲ Be extremely careful when torquing these nuts (5-6 ft./lbs.).



11. Install the engine mount straps, torquing bolts to 55-60 ft./lbs.



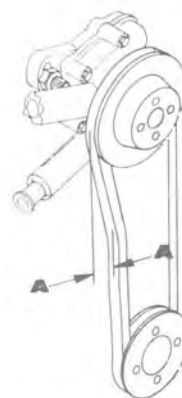
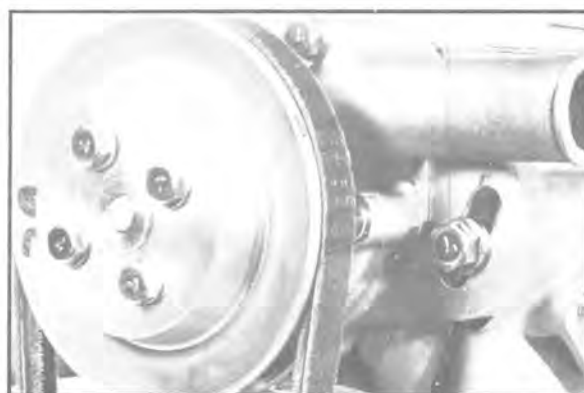
12. Install the stator plate. Note the chisel marks for timing reference.



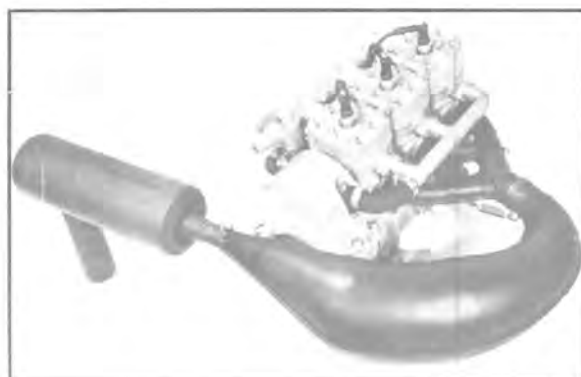
13. Install the flywheel key, the flywheel, the water pump pulley, and the starter cup. Torque the flywheel nut to 60 ft./lbs. Use the chain wrench (PN 2870203) to secure the flywheel while torquing.



14. Install the water pump and water pump belt. Adjust the belt deflection to 1/4" (A). Torque the 8mm pump retaining bolt and nut to 15 ft./lbs. Install the bypass hose and the water pump to manifold hose elbow.



15. Install recoil and water pump cover. Install coils, carburetors, and exhaust manifold. **IMPORTANT:** Refer to pages V – 42, 42a and 42b for filling and bleeding procedure.



ENGINES

Cylinder Service

Maximum performance of an engine 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 inherently built into them, however, with the stresses and heat of operation the bore may distort or score resulting in loss of compression and power. It is then that the serviceman's job of reconditioning the cylinder and restoring it to its new condition must be performed.

INSPECTION

A simple way of checking for cylinder/piston condition is to remove the exhaust manifold and look into the exhaust port. If there is a considerable amount of blow-by (carbon deposit usually brown or black) 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.

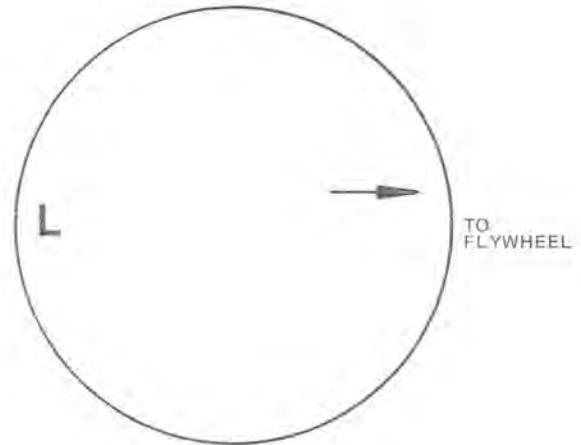
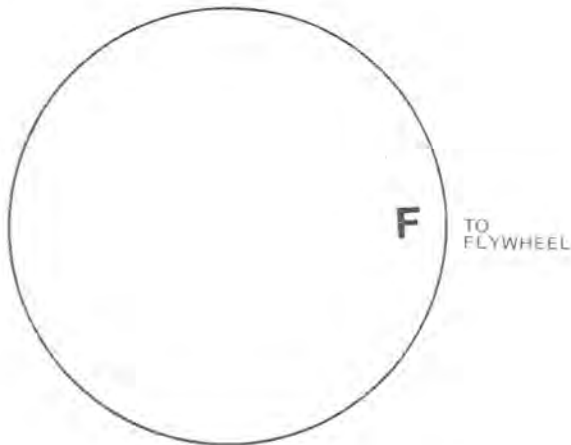


This cylinder has been damaged by the engine overheating to the point of piston seizure. Honing this cylinder would restore it to service. Damage such as this may be the result of improper fuel/oil mixture, carburetor jetting, or ignition timing too far advanced.

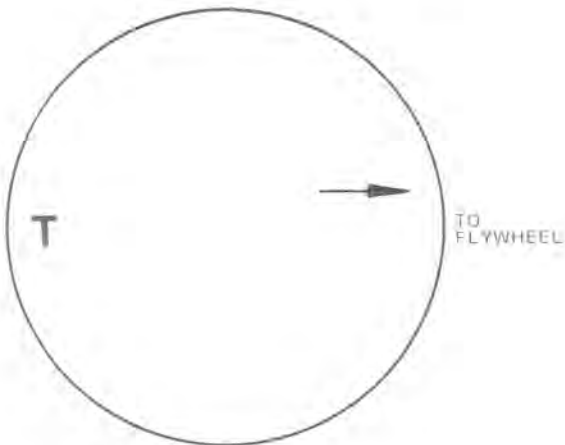
Cylinder Service — Piston Identification

Correct installation of pistons into the cylinders during assembly is required to prevent ring breakage and seizure due to the ring ends passing over open ports. Viewing the pistons from the top, note the directional and engine model series identification marks.

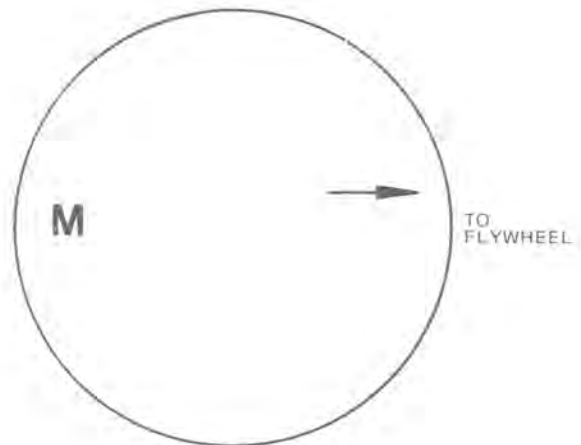
The letter "F," "→," or "▶" must always be toward the flywheel side of engine. Pistons may carry a letter such as "L," "T," "M," "M1," or "M2" to indicate its engine series designation. Oversize pistons and rings carry an additional marking of "25" indicating .010 oversize or "50" indicating .020 oversize. Piston identifications are shown below.



PL Series



PT Series



PM Series

ENGINE DESIGNATION

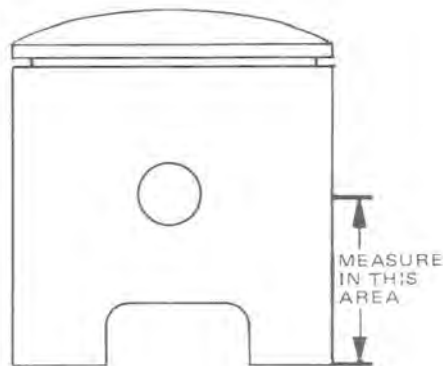
- M1 designates 44-2PM-1100/2100
- M2 designates 44-2PM-3100/3300/5000/5100
- 4L designates 40PL
- 6L designates 60PL
- L designates 340/500 PL

ENGINES

Cylinder Service – Piston/Cylinder Clearance

PISTON MEASUREMENT

Whenever cylinders are honed or bore clearance 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.

NOTE: These are total piston to cylinder clearances, which will result in an installed clearance of one-half the specified dimension.

Engine Model	Standard Bore		Piston/Cylinder Clearance \pm .002"
	Inches	MM	
EC17PM	2.4409	62	.007"
EC25PS	2.8346	72	.006"
EC29PF	2.283	58	.005"
EC25PT-06/07	2.1017	53.4	Chrome*
EC25PT	2.1063	53.5	.005"
EC25PC	2.1063	53.5	.006"
EC25PM	2.082	52.9	.005"
EC34PC/PS	2.4409	62	.006"
EC34PM	2.432	61.78	.006"
EC34-2PM	2.4410	62	.005"
EC34PQ	2.3622	60	.0065"
EC34PT	2.441	62	Chrome*
EC34PL	2.432	61.78	.005"
EC40PM	2.556	65	.008"
EC44PM	2.6557	67.72	.008"
EC44PQ	2.6673	67.75	.008"
EC44PT	2.6673	67.75	Chrome*
EC50PM	2.8346	72	.0055"
EC54PM	2.952	75	.008"
EC51PL	2.432	61.78	.005"
EC44-2PM	2.6557	67.72	.006"
EC60PL/40PL	2.559	65	.0055" \pm .002 -.001

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

Cylinder Service — Oversize Pistons and Rings

Before discarding any cylinder it should be honed. If the cylinder is damaged so that it cannot be cleared without exceeding the maximum standard piston-cylinder clearance recommendations it may be oversized.

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

**.020 OVERSIZE PISTON AND RING CHART
TO FIT ALL ENGINES AS DESIGNATED BELOW**

Part Number	Description	Engine															44-2	3100/	44-2	PM	PM	PF								
		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	5000/	1100/	PM 50				PM 530	PM 530						
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																								X		
3083717	Ring																										X		X	
3081734	Piston									X																				
3081735	Piston													X																
3081736	Ring									X																				
3081737	Ring												X																	
3081738	Piston																												X	
3081739	Ring																		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	Second Ring	X																												
3082701	Piston					X																								
3082702	Ring					X																								
3083718	Piston													X																
3083719	Ring													X																
3082705	Piston																													
3082706	Ring																													
3082845	Piston																			X										
3082846	Ring																		X	X										
3083173	Piston																										X			
3083174	Piston																									X				

LIQUID COOLED ENGINES

<u>.020 Oversize</u>			<u>.010 Oversize</u>		
Part Number	Description	Engine	Part Number	Description	Engine
3082705	Piston	34-51PL	3082849	Piston	34-51PL
3082706	Ring	34-51PL	3082559	Ring	34-51PL
3083262	Piston	60PL-01	3083260	Piston	60PL-01
3083263	Ring	60PL-01	3083261	Ring	60PL-01
3083293	Piston	60PL-02	3083292	Piston	60PL-02
3083359	Ring	40PL/60PL-02	3083358	Ring	40PL/60PL-02
3083720	Piston	40PL	3083303	Piston	40PL

ENGINES

Cylinder Hone Selection and Honing

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., North Chicago, Illinois; or others.

Shown is the Ammco No. 3950 hone which has roughing and finishing stone sets available to include the large 75MM bore engines.



Honing:

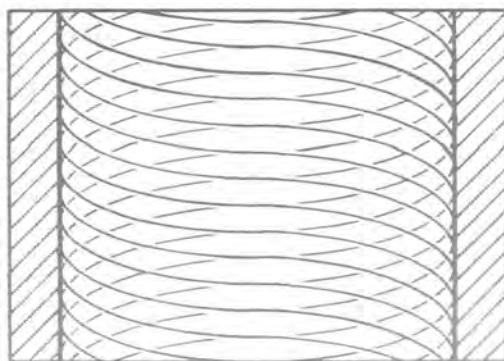
1. Wash the cylinder with solvent and clamp in a vice around the exhaust port studs protecting them from the vice jaw serrations with brass stock, wood or cardboard.



2. Place the hone in the cylinder, tighten the stone adjusting knob until the stone contacts the cylinder walls (DO NOT OVER TIGHTEN).



3. Cylinders may be wet or dry honed depending on the hone manufacturer's recommendations. Wet honing removes more material faster and leaves a more distinct pattern in the bore. A finished cylinder should have a cross-hatch pattern. This aids in the retention of fuel/oil mixture and initial break-in.



4. With a 1/2" drill motor using a speed of 300 - 500 RPM run the hone in and out of the cylinder rapidly until cutting tension decreases. Remember to keep the hone drive shaft centered and to bring the stone approximately 1/2" beyond the bore at the end of each stroke. Release the hone at regular intervals inspecting the bore to determine if it has been cleared and to check piston fit.



Measuring Piston Clearance:

5. With the cylinder thoroughly cleaned install a new piston into the bore as shown, slipping a feeler thickness gauge alongside the skirt at right angles to the pin. Start with a thinner gauge and progressively work up to the thickest which may be inserted between the piston and wall. The thickest gauge which may be inserted as a sliding fit will be the total cylinder-piston clearance.

NOTE: Refer to the Engine Data Chart to determine if the clearance is within tolerance for that engine.



HONING TO OVERSIZE

If the piston-cylinder clearance measures greater than that in the chart for a standard bore, it will be necessary to oversize the cylinder to .020 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 of the clearance recommended, then complete the sizing with fine grit stones to provide the proper cross-hatch finish and clearance.

IMPORTANT:

Cleaning the Cylinder After Honing:

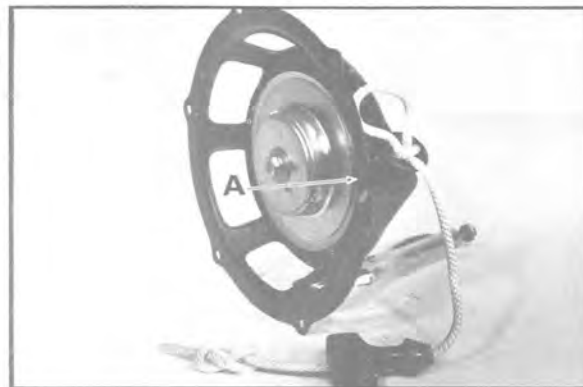
It is very important that the cylinder be thoroughly cleaned after honing to remove all grindings. Wash the cylinder in a solvent, then in hot soapy water, rinse, blow dry and lightly oil.



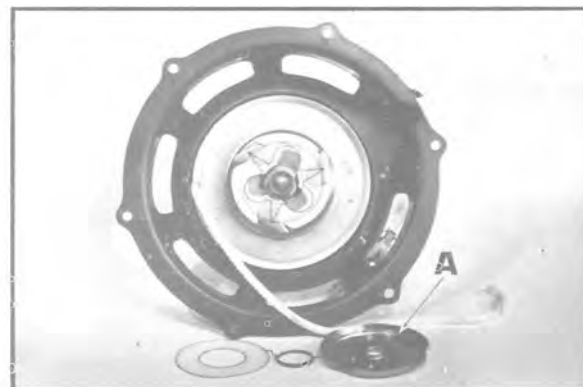
ENGINES

Recoil Starter Rope Replacement

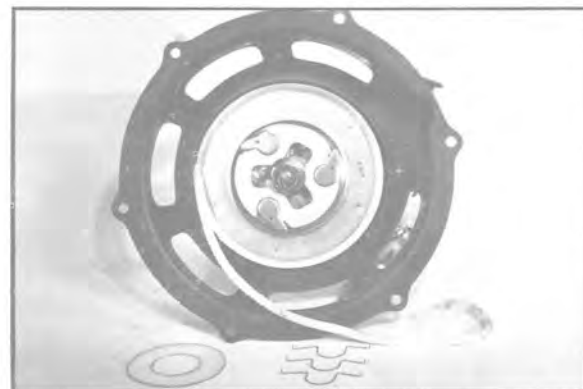
1. Tie the rope in a slip knot. Pull the rope out of the handle. Untie the knot and remove the handle. Pull the rope into the notch (A) on the reel and slowly unwind the spring. Remove the retaining nut.



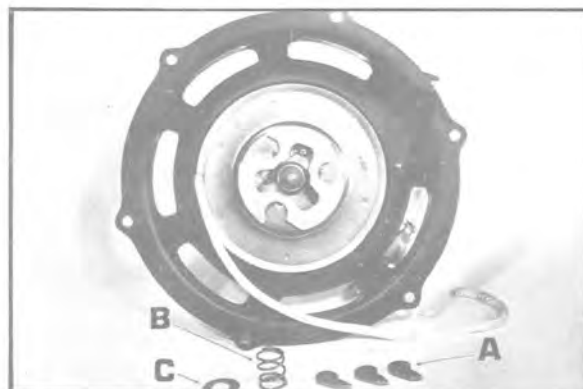
2. Remove the ratchet retainer (A), the spring, and the retainer disc.



3. Remove the three ratchet return springs and the smaller plastic disc.

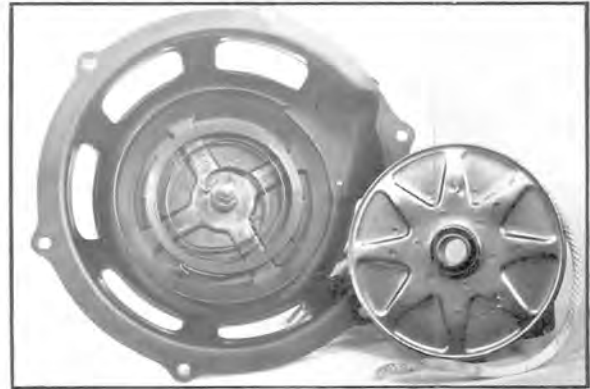


4. Remove the three ratchets (A), the small spring (B), and the washer (C).

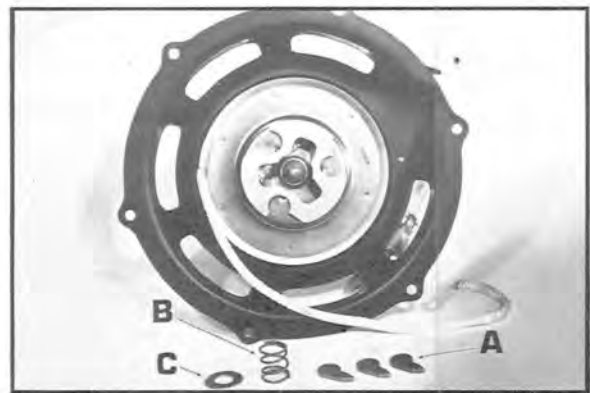


Recoil Starter Rope Replacement

5. Lift the reel from the housing, taking care that the reel is free of the recoil spring. Install a new rope and replace the reel.



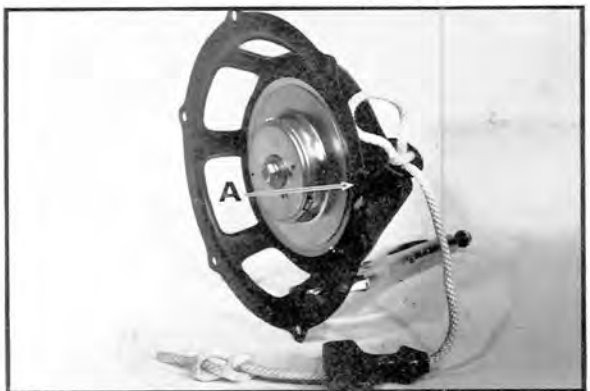
6. Install the ratchets (A), the spring (B), and the washer (C).



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



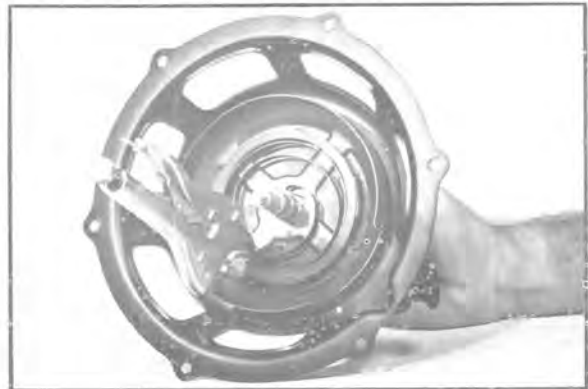
8. Install the retaining nut. Tighten the recoil spring by putting the rope in the notch (A). Three to four turns will give sufficient spring tension. Tie a slip knot in the rope to prevent it from rewinding. Attach the handle and tie a figure eight knot on the rope end and push into the handle. Loosen the slip knot and re-install.



ENGINES

Recoil Starter Spring Replacement

1. To replace the spring, follow the disassembly procedures. Clamp the defective spring with a small vice grip. Use caution when removing the spring.



2. Rewind the spring and install in the housing, hooking the end of the spring (A) as shown.



3. Continue reassembly as outlined in rope replacement instructions.

NOTES: