

SECTION IV

ENGINE ELECTRICAL

Contents of this Section

Ignition Data (1972 through 1987)	1 – 5 ^h
Ignition Timing Curves	6
Timing Charts	6 ^a
Magneto Point Ignition System – Exploded View	7
Magneto Point Ignition System Timing Procedures	8 – 12
Capacitor Discharge Ignition System – Exploded View	14
CDI Stator Plate Installation	15
Pre-1978 CDI Dynamic Timing Procedures	16
CDI Dynamic Timing Procedures – Twin Cylinder	17 – 18
Magneto – EC40PL Exploded View	18 ^a
Magneto – Exploded View – Three Cylinder PL Series	18 ^b
CDI Dynamic Timing Procedures – Three Cylinder PL Series	19
Magneto – 44-2PM – Exploded View	20
CDI Dynamic Timing Procedures – 44-2PM	20 ^a
Magneto – Single Cylinder CDI Exploded View/Timing	20 ^b
Magneto – EC34-PM CDI Exploded View/Timing	20 ^c
Magneto – EC50-PM CDI Exploded View/Timing	20 ^d
CDI Exciter and Pulse Coil Testing	21 – 22
Alternator Output Tests	23
Twin Cylinder CDI Exciter and Pulser Coil Replacement	24
Stevens MA-75/MA-80 Coil Test Specifications	25
Ignition Testing – Secondary Coil Part Number Applications	26
Ignition – Merc-O-Tronic Test Specifications	27
Merc-O-Tronic Coil Test Procedures	28 – 29
Merc-O-Tronic Condenser Test Procedures	30
Ignition – Graham-Lee Test Specifications	31
Graham-Lee Coil-Condenser Test Procedures	32
Graham-Lee Coil Test Procedures	33 – 38
Graham-Lee Condenser Test Procedures	39 – 41
Graham-Lee Rectifier Test Procedures	42
Graham-Lee Model 31 Single Coil Testing	43 – 43 ^a

Graham-Lee Model 31 Twin Coil Testing	44 — 44a
CDI Diagnostic Test Sequence	45
Magneto Point Ignition Diagnostic Test Sequence	46

ENGINE ELECTRICAL

Ignition Data

Engine Model	Ignition Type	Alternator Output	Spark Plug Equivalent	Original Timing*	Recommended Timing*
EC17P	Mag. Pt.	35 watt	B7ES	.100D	---
EC25P	Mag. Pt.	75 watt	B7ES	.012S	---
EC29P	Mag. Pt.	75 watt	B7ES	.012S	---
EC29PF	Mag. Pt.	75 watt	B7ES	.012S	---
EC34PS	CDI	75 watt	N-2	.130D	.110D
EC40P	Mag. Pt.	75 watt	B7ES	.018S	---
EC40PF	Mag. Pt.	75 watt	B7ES	.018S	---
EC51PS	CDI	75 watt	N-2	.130D	---
EC54P	CDI	75 watt	B7ES	.140D	.120D
EC54PF	CDI	75 watt	B8ES	.140D	.120D

Engine Model	Ignition Type	Alternator Output	Spark Plug Equivalent	Original Timing*	Recommended Timing*
EC17P	Mag. Pt.	55 watt	B7ES	.100D	---
EC25PS	Mag. Pt.	75 watt	B7ES	.018S	.014S
EC29PM	Mag. Pt.	75 watt	B7ES	.016S	.012S
EC29PF	Mag. Pt.	75 watt	B7ES	.016S	.012S
EC29PS	CDI	140 watt	N-2	.130D	.120D
EC34PF	Mag. Pt.	75 watt	B7ES	.016S	.012S
EC34PS	CDI	140 watt	N-2	.130D	.120D
EC40PM	Mag. Pt.	140 watt Custom 75 watt	B7ES	.018S	.016S
EC40PS	CDI	140 watt	N-2	.140D	.130D
EC44PS	CDI	140 watt	N-2G	.140D	.130D
EC51PS	CDI	140 watt	N-2	.130D	.120D
EC54PM	CDI	140 watt Custom 75 watt	N-2	.140D	.130D

*D - Dynamic timing/5,000 RPM

S - Static timing

ENGINE ELECTRICAL

Ignition Data

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Engine Model	Ignition Type	Alternator Output	Spark Plug Equivalent	Original Timing*	Recommended Timing*
EC17PM	Mag. Pt.	55 watt	B7ES	.100D	---
EC25PS	Mag. Pt.	75 watt	B7ES	.018S	.014S
EC25PC	Mag. Pt.	75 watt	N-2	.016S	.005S
EC25PT	CDI	75 watt	N-2	.135D	.089D ¹
EC25PF	Mag. Pt.	75 watt	B7ES	.016S	.005S
EC34PC	Mag. Pt.	75 watt	N-2	.016S	.005S
EC34PQ	CDI	140 watt	N-3	.110D	---
EC34PS	CDI	140 watt	N-2	.135D	.120D
EC40PM	Mag. Pt.	140 watt	B7ES	.018S	.016S
EC44PQ	CDI	140 watt	N-3	.110D	---
EC44PT	CDI	140 watt	N-2G	.140D	.095D ²
EC51PT	CDI	140 watt	N-2G	.135D	.095D ²
EC54PM	CDI	140 watt	B8ES	.140D	.130D

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Engine Model	Ignition Type	Alternator Output	Spark Plug Equivalent	Original Timing*	Recommended Timing*
EC17PM	Mag. Pt.	55 watt	B7ES	.100D	---
EC25PS	Mag. Pt.	75 watt	B7ES	.018S	.016S
EC25PC	Mag. Pt.	75 watt	N-2	.012S	.005S
EC25PT	CDI	75 watt	N-2	.089D	---
EC34PC	Mag. Pt.	75 watt	N-2	.012S	.005S ³
EC34PQ	CDI	140 watt	B7ES	.089D	---
EC34PT	CDI	75 watt	N-2	.089D	---
EC44PQ	CDI	140 watt	B7ES	.089D	---
EC44PT	CDI	75 watt	N-57	.089D	---
EC51PT	CDI	140 watt	N-2	.089D	---

*D – Dynamic timing/5,000 RPM

S – Static timing

1 – Reference Service Bulletin No. 84

2 – Reference Information Bulletin No. 29

3 – Reference Service Bulletin No. 101

ENGINE ELECTRICAL

Ignition Data

Engine Model	Ignition Type	Alternator Output	Spark Plug Equivalent	Original Timing*	Recommended Timing*
EC17PM	Mag. Pt.	55 watt	B7ES	.113D	---
EC25PS	Mag. Pt.	75 watt	B7ES	.014S	---
EC25PC	Mag. Pt.	75 watt	B8ES	.005S	---
EC25PT-06	CDI	75 watt	N-2	.082D	.053D
EC25PT-05	CDI	75 watt	N-1 or N-57G	.082D	.053D
EC34PC	Mag. Pt.	75 watt	N-3	.005S	---
EC34PQ	CDI	140 watt	B7ES	.083D	---
EC34PT-05	CDI	75 watt	N-2	.082D	.053D
EC34PT-06	CDI	75 watt	B10EV	.082D	.053D
EC44PQ	CDI	140 watt	B7ES	.083D	---
EC44PT-05	CDI	75 watt	B8ES	.083D	.057D

Engine Model	Ignition Type	Alternator Output	Spark Plug Equivalent	Original Timing*	Recommended Timing*
EC25PS	Mag. Pt.	75 watt	N-3	.014S	---
EC25PC	Mag. Pt.	75 watt	N-2	.005S	---
EC25PM-01	Mag. Pt.	75 watt	N-2	.005S	---
EC25PT-07	CDI	75 watt	B9ES	.042-.067D	.053D
EC34PM-03	Mag. Pt.	75 watt	N-3	.005S	---
EC34PQ	Mag. Pt. CDI	75 watt 140 watt	N-3	.006S .088D	---
EC34PT-05	CDI	75 watt	B9ES	.042-.067D	.053D
EC34PL-01	CDI	75 watt	B9ES	.042-.067D	.053D ⁴
EC44PQ	Mag. Pt. CDI	75 watt 140 watt	N-3	.006S .088D	---
EC44PT-05	CDI	75 watt	B9ES	.050-.072D	.057D
EC44PT-06	CDI	75 watt	B9ES	.050-.072D	.057D

*D - Dynamic timing/5,000 RPM
S - Static timing

4 - Reference Racing Bulletin No. 77-2

ENGINE ELECTRICAL

Ignition Data

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Machine Model	Engine Model	Ignition Type	Alternator Output	Spark Plug RFI/NGK
Colt	EC25PS	Mag. Pt.	75 watt	BR8ES
Colt	EC25PC	Mag. Pt.	75 watt	BR9ES
S/S 340	EC34PM-03/04N	Mag. Pt.	75 watt	BR8ES
Cobra	EC34PM-04	Mag. Pt.	75 watt	BR9ES
Cobra	EC44PM-01	Mag. Pt.	75 watt	BR9ES
TX	EC25PT-07	CDI	75 watt	BR9ES
TX	EC34PT-05	CDI	75 watt	BR9ES
TX	EC44PT-05	CDI	90 watt	BR9ES
TX-L	EC34PL-02	CDI	75 watt	BR9ES

Engine Model	Point Gap		Ignition Timing			
			Static		Running	
			MM BTDC	Inches BTDC	MM BTDC	Inches BTDC
EC25PS	.35	.014	.360	.014	2.96	.116
EC25PC	.35	.014	.048	.002	1.69	.067
EC34PM-03/04N	.35	.014	.048	.002	1.69	.067
EC34PM-04	.35	.014	.048	.002	1.69	.067
EC44PM-01	.35	.014	.051	.002	1.83	.072
EC25PT-07	---	---	---	---	4.31*1	.169*1
EC34PT-05	---	---	---	---	4.31*1	.169*1
EC44PT-05	---	---	---	---	4.19*2	.165*2
EC34PL-02	---	---	---	---	5.05*3	.198*3

*Timing specified at 3,000 RPM

1 — EC25PT-07/EC34PT-05
Acceptable Variance
4.02mm — 4.59mm BTDC
.158 in. — .180 in. BTDC
28° — 30° BTDC

2 — EC44PT-05
Acceptable Variance
3.76mm — 4.65mm BTDC
.148 in. — .183 in. BTDC
26° — 29° BTDC

3 — EC34PL-02
Acceptable Variance
4.60mm — 5.52mm BTDC
.181 in. — .217 in. BTDC
30° — 33° BTDC

ENGINE ELECTRICAL

Ignition Data

Machine Model	Engine Model	Ignition Type	Alternator Output	Spark Plug		Plug Gap Inches
				RFI NGK	Champion	
Gemini	EC25PS	Mag. Pt.	75 watt	BR8ES	N-3	.020
Gemini	EC25PM-01	Mag. Pt.	75 watt	BR8ES	N-3	.020
Apollo	EC34PM-03	Mag. Pt.	75 watt	BR8ES	N-3	.020
Cobra	EC34PM-04	Mag. Pt.	75 watt	BR9ES	N-2	.020
Cobra	EC44PM-01	Mag. Pt.	75 watt	BR8ES	N-3	.020
TX	EC25PT-07	CDI	75 watt	BR9ES	N-2	.020
TX	EC34PT-05	CDI	90 watt	BR9ES	N-2	.020
TX	EC44PT-05	CDI	90 watt	BR9ES	N-2	.020
TX-L	EC34PL-02	CDI	90 watt	BR9ES	N-2	.020
Centurion	EC51PL-01	CDI	120 watt	BR9ES	N-2	.020

Engine Model	Point Gap Inches	Ignition Timing					
		Static			Running		
		MM BTDC	Inches BTDC	Degrees BTDC	MM BTDC	Inches BTDC	Degrees BTDC
EC25PS	.014	.3646	.014	8 ± 3	2.958	.116	23 @ 2,000
EC25PM-01	.014	.0476	.002	3 ± 3	1.690	.067	18 @ 2,000
EC34PM-03	.014	.0476	.002	3 ± 3	1.690	.067	18 @ 2,000
EC34PM-04	.014	.0476	.002	3 ± 3	1.690	.067	18 @ 2,000
EC44PM-01	.014	.0513	.002	3 ± 3	1.826	.072	18 @ 2,000
EC25PT-07	---	---	---	---	4.305*1	.169*1	29 @ 3,000*1
EC34PT-05	---	---	---	---	4.305*1	.169*1	29 @ 3,000*1
EC44PT-05	---	---	---	---	4.192*2	.164*2	27.5 @ 3,000*2
EC34PL-02	---	---	---	---	5.050*3	.198*3	31.5 @ 3,000*3
EC51PL-01	---	---	---	---	3.748*4	.147*4	27 @ 3,000*4

*Timing specified at 3,000 RPM

1 - EC25PT-07/EC34PT-05

Acceptable Variance

4.02mm - 4.59mm BTDC

.158 in. - .180 in. BTDC

28° - 30° BTDC

2 - EC44PT-05

Acceptable Variance

3.76mm - 4.65mm BTDC

.148 in. - .183 in. BTDC

26° - 29° BTDC

3 - EC34PL-02

Acceptable Variance

4.60mm - 5.52mm BTDC

.181 in. - .217 in. BTDC

30° - 33° BTDC

4 - EC51PL-01

Acceptable Variance

3.48mm - 4.02mm BTDC

.137 in. - .158 in. BTDC

26° - 28° BTDC

RFI spark plug cap resistance: 3,700-6,300 ohms

ENGINE ELECTRICAL

Ignition Data

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Machine Model	Engine Model	Ignition Type	Alternator Output	Spark Plug		Plug Gap Inches
				RFI NGK	Champion	
Gemini	EC25PS	Mag. Pt.	75 watt	BR8ES	N-3	.020
Gemini	EC25PM-01	Mag. Pt.	75 watt	BR8ES	N-3	.020
Apollo	EC34PM-03	Mag. Pt.	75 watt	BR8ES	N-3	.020
Galaxy	EC34PM-04	Mag. Pt.	75 watt	BR9ES	N-2	.020
Galaxy	EC44PM-01/02	Mag. Pt.	75 watt	BR8ES	N-3	.020
TX/TX-C	EC34PT-07	CDI	90 watt	BR9ES	N-2	.020
TX	EC44PT-05	CDI	90 watt	BR9ES	N-2	.020
TX-L/TX-L Indy	EC34PL-02/05	CDI	90 watt	BR9ES	N-2	.020
Centurion	EC51PL-02	CDI	120 watt	BR9ES	N-2	.020

Engine Model	Point Gap Inches	Ignition Timing					
		Static			Running		
		MM BTDC	Inches BTDC	Degrees BTDC	MM BTDC	Inches BTDC	Degrees BTDC
EC25PS	.014	.3646	.014	8 ± 3	2.958	.116	23 @ 2,000
EC25PM-01	.014	.0476	.002	3 ± 3	1.690	.067	18 @ 2,000
EC34PM-03	.014	.0476	.002	3 ± 3	1.690	.067	18 @ 2,000
EC34PM-04	.014	.0476	.002	3 ± 3	1.690	.067	18 @ 2,000
EC44PM-01/02	.014	.0513	.002	3 ± 3	1.826	.072	18 @ 2,000
EC34PT-07	---	---	---	---	4.305*1	.169*1	29 @ 3,000*1
EC44PT-05	---	---	---	---	4.192*2	.164*2	27.5 @ 3,000*2
EC34PL-02/05	---	---	---	---	5.050*3	.198*3	31.5 @ 3,000*3
EC51PL-02	---	---	---	---	3.748*4	.147*4	27 @ 3,000*4

*Timing specified at 3,000 RPM

1 — EC34PT-07

Acceptable Variance

4.02mm — 4.59mm BTDC

.158 in. — .180 in. BTDC

28° — 30° BTDC

2 — EC44PT-05

Acceptable Variance

3.76mm — 4.65mm BTDC

.148 in. — .183 in. BTDC

26° — 29° BTDC

3 — EC34PL-02/05

Acceptable Variance

4.60mm — 5.52mm BTDC

.181 in. — .217 in. BTDC

30° — 33° BTDC

4 — EC51PL-02

Acceptable Variance

3.48mm — 4.02mm BTDC

.137 in. — .158 in. BTDC

26° — 28° BTDC

RFI spark plug cap resistance: 3,700–6,300 ohms

ENGINE ELECTRICAL

Ignition Data

Machine Model	Engine Model	Ignition Type	Alternator Output	Spark Plug		Plug Gap Inches
				RFI NGK	Champion	
Gemini	EC25PS	Mag. Pt.	75 watt	BR8ES	N-3	.020
Galaxy	EC44PM-02	Mag. Pt.	75 watt	BR8ES	N-3	.020
Cutlass	EC34PM-03	Mag. Pt.	75 watt	BR9ES	N-2	.020
Cutlass SS	EC44-2PM-3100/3300	CDI	120 watt	BR9ES	N-2	.020
TX-C	EC44-2PM-1100	CDI	120 watt	BR9ES	N-2	.020
TX-L/TX-L Indy	EC34PL-05	CDI	90 watt	BR9ES	N-2	.020
Centurion Indy	EC51PL-02	CDI	120 watt	BR9ES	N-2	.020

1981

Engine Model	Point Gap Inches	Ignition Timing					
		Static			Running		
		MM BTDC	Inches BTDC	Degrees BTDC	MM BTDC	Inches BTDC	Degrees BTDC
EC25PS	.014	.3646	.014	8 ± 3	2.958	.116	23 @ 2,000
EC44PM-02	.014	.0513	.002	3 ± 3	1.826	.072	18 @ 2,000
EC34PM-03	.014	.0513	.002	3 ± 3	1.826	.072	18 @ 2,000
EC44-2PM-3100/3300	----	----	----	----	3.93* ¹	.155* ¹	26.5 @ 3,000* ¹
EC44-2PM-1100	----	----	----	----	3.93* ¹	.155* ¹	26.5 @ 3,000* ¹
EC34PL-05	----	----	----	----	5.050* ²	.198* ²	31.5 @ 3,000* ²
EC51PL-02	----	----	----	----	3.748* ³	.147* ³	27 @ 3,000* ³

*Timing specified at 3,000 RPM

*1 - EC44-2PM-3100
 EC44-2PM-3300
 EC44-2PM-1100
 Acceptable Variance
 3.39mm-4.56mm BTDC
 .133 in.-.179 in. BTDC
 24.5° -28.5° BTDC

*2 - EC34PL-05
 Acceptable Variance
 4.60mm-5.52mm BTDC
 .181 in.-.217 in. BTDC
 30° -33° BTDC

*3 - EC51PL-02
 Acceptable Variance
 3.48mm-4.02mm BTDC
 .137 in.-.158 in. BTDC
 26° -28° BTDC

RFI spark plug cap resistance: 3,700-6,300 ohms

ENGINE ELECTRICAL

Ignition Data

Machine Model	Engine Model	Ignition Type	Alternator Output	Spark Plug		Plug Gap Inches
				RFI NGK	Champion	
Cutlass SS	EC44-2PM-3100	CDI	120 watt	BR9ES	N-2	.020
TX-C	EC44-2PM-1100	CDI	120 watt	BR9ES	N-2	.020
TX-L/TX-L Indy	EC34PL-05	CDI	90 watt	BR9ES	N-2	.020
Centurion Indy	EC51PL-02	CDI	120 watt	BR9ES	N-2	.020

1982

Engine Model	MM BTDC	Ignition Timing Running Inches BTDC	Degrees BTDC
EC44-2PM-3100	3.93*1	.155*1	26.5 @ 3,000*1
EC44-2PM-1100	3.93*1	.155*1	26.5 @ 3,000*1
EC34PL-05	5.050*2	.198*2	31.5 @ 3,000*2
EC51PL-02	3.748*3	.147*3	27 @ 3,000*3

*Timing specified at 3,000 RPM

*1 – EC44-2PM-3100
EC44-2PM-1100
Acceptable Variance
3.39mm–4.56mm BTDC
.133 in.–.179 in. BTDC
24.5° – 28.5° BTDC

*2 – EC34PL-05
Acceptable Variance
4.60mm–5.52mm BTDC
.181 in.–.217 in. BTDC
30° – 33° BTDC

*3 – EC51PL-02
Acceptable Variance
3.48mm–4.02mm BTDC
.137 in.–.158 in. BTDC
26° – 28° BTDC

RFI spark plug cap resistance: 3,700–6,300 ohms

ENGINE ELECTRICAL

Ignition Data

Machine Model	Engine Model	Ignition Type	Alternator Output	Spark Plug		Plug Gap Inches
				RFI NGK	Champion	
Gemini/Star	EC25PS	Point	75 watt	BR8ES	RN-2C	.020
Sport	EC44-2PM-5100	CDI	120 watt	BR9ES	RN-2C	.020
SS	EC44-2PM-3100	CDI	120 watt	BR9ES	RN-2C	.020
Indy Trail	EC44-2PM-2100	CDI	120 watt	BR9ES	RN-2C	.020
Indy Cross Country	EC34PL-05	CDI	90 watt	BR9ES	RN-2C	.020
Indy 600	EC60PL-01	CDI	120 watt	BR9ES	RN-2C	.020
Long Track	EC44-2PM-5000	CDI	120 watt	BR9ES	RN-2C	.020

		Ignition Timing					
		Static			Running		
Engine Model	Point Gap Inches	MM BTDC	Inches BTDC	Degrees BTDC	MM BTDC	Inches BTDC	Degrees BTDC
EC25PS	.014	.3646	.014	8 ± 3	2.958	.116	23 @ 2,000
EC44-2PM-5100	—	—	—	—	3.93* ¹	.155* ¹	26.5 @ 3,000* ¹
EC44-2PM-3100	—	—	—	—	3.93* ¹	.155* ¹	26.5 @ 3,000* ¹
EC44-2PM-2100	—	—	—	—	3.93* ¹	.155* ¹	26.5 @ 3,000* ¹
EC34PL-05	—	—	—	—	5.05* ²	.198* ²	31.5 @ 3,000* ²
EC60PL-01	—	—	—	—	4.10* ³	.162* ³	27 @ 3,000* ³
EC44-2PM-5000	—	—	—	—	3.93* ¹	.155* ¹	26.5 @ 3,000* ¹

*Timing specified at 3,000 RPM

*1 — All EC44-2PM
Acceptable Variance
3.39mm-4.56mm BTDC
.133 in.-.179 in. BTDC
24.5° -28.5° BTDC

*2 — EC34PL-05
Acceptable Variance
4.60mm-5.52mm BTDC
.181 in.-.217 in. BTDC
30° -33° BTDC
All EC34PL Engines require a minimum of $R + \frac{M}{2}$ 90 octane gasoline, if less than 90 octane is to be used the timing must be adjusted to 29.5° @ 3000 RPM

*3 — EC60PL-01
Acceptable Variance
3.81mm-4.40mm BTDC
.150 in.-.173 in. BTDC
26° -28° BTDC

RFI spark plug cap resistance: 3,700—6,300 ohms

ENGINE ELECTRICAL

Ignition Data

Machine Model	Engine Model	Ignition Type Alternator Output	Spark Plug		Plug Gap Inches
			Champion	NGK	
Star/Star LT	EC25PS-05	CDI - 100 Watt	RN-3C	BR8ES	.020
SS	EC44-2PM-3100	CDI - 120 Watt	RN-2C	BR9ES	.020
Indy Trail	EC44-2PM-2100	CDI - 120 Watt	RN-2C	BR9ES	.020
Indy 600	EC60PL-02	CDI - 120 Watt	RN-2C	BR9ES	.020
Long Track	EC44-2PM-5000	CDI - 120 Watt	RN-2C	BR9ES	.020

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Running Ignition Timing at 3000 RPM						
Engine Model	MM BTDC	Inches BTDC	Degrees BTDC	Acceptable Variances		
				Degrees	MM	Inches
EC25PS-05	4.19	.165	27.5	24.5 - 30.5	3.35 - 5.12	.132 - .202
EC44-2PM-3100	3.93	.155	26.5	24.5 - 28.5	3.39 - 4.56	.133 - .179
EC44-2PM-2100	3.93	.155	26.5	24.5 - 28.5	3.39 - 4.56	.133 - .179
EC60PL-02	4.10	.162	27.0	26 - 28	3.81 - 4.40	.150 - .173
EC44-2PM-5000	3.93	.155	26.5	24.5 - 28.5	3.39 - 4.56	.133 - .179



All above engines require a minimum of 88 (R+M)/2 octane fuel. If fuels of a lesser octane number are used or engines are subjected to frequent overheated situations, the timing must be adjusted to the low side of the accepted variance.

R.F.I. spark plug cap resistance: 3,700 to 6,300 ohms.

Machine Model	Engine Model	Ignition Type Alternator Output	Spark Plug		Plug Gap Inches
			Champion	NGK	
Star	EC25PS-06	CDI - 100 Watt	RN-3C	BR8ES	.020
SS	EC44-2PM-3100	CDI - 120 Watt	RN-2C	BR9ES	.020
Indy Trail	EC44-2PM-2100	CDI - 120 Watt	RN-2C	BR9ES	.020
Indy 400	EC40PL-02	CDI - 120 Watt	RN-2C	BR9ES	.020
Indy 600	EC60PL-02	CDI - 120 Watt	RN-2C	BR9ES	.020
Long Track	EC44-2PM-5000	CDI - 120 Watt	RN-2C	BR9ES	.020

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Running Ignition Timing at 3000 RPM						
Engine Model	MM BTDC	Inches BTDC	Degrees BTDC	Acceptable Variances		
				MM	Inches	Degrees
EC25PS-06	4.19	.165	27.5	3.35 - 5.12	.132 - .202	24.5 - 30.5
EC44-2PM-3100	3.93	.155	26.5	3.39 - 4.56	.133 - .179	24.5 - 28.5
EC44-2PM-2100	3.93	.155	26.5	3.39 - 4.56	.133 - .179	24.5 - 28.5
EC40PL-02	5.19	.204	30.5	4.55 - 5.85	.179 - .230	28.5 - 32.5
EC60PL-02	4.10	.162	27.0	3.81 - 4.40	.150 - .173	26 - 28
EC44-2PM-5000	3.93	.155	26.5	3.39 - 4.56	.133 - .179	24.5 - 28.5



All above engines require a minimum of 88 (R+M)/2 octane fuel. If fuels of a lesser octane number are used or engines are subjected to frequent overheated situations, the timing must be adjusted to the low side of the accepted variance.

R.F.I. spark plug cap resistance: 3,700 to 6,300 ohms.

ENGINE ELECTRICAL

Ignition Data

Machine Model	Engine Model	Ignition Type Alternator Output	Spark Plug		Plug Gap Inches
			Champion	NGK	
Star	EC25PS-06	CDI - 100 Watt	RN-3C	BR8ES	.020
Sprint (ES)	EC34-2PM-01/02	CDI - 120 Watt	RN-2C	BR9ES	.020
SS	EC44-2PM-3100	CDI - 120 Watt	RN-2C	BR9ES	.020
Indy Trail	EC50PM-01	CDI - 120 Watt	RN-2C	BR9ES	.020
Indy 400	EC40PL-02	CDI - 120 Watt	RN-2C	BR9ES	.020
Indy 600 (LE)	EC60PL-02	CDI - 120 Watt	RN-2C	BR9ES	.020
Long Track	EC44-2PM-5100	CDI - 120 Watt	RN-2C	BR9ES	.020

1986

Running Ignition Timing at 3000 RPM						Operating Timing and RPM
Engine Model	MM BTDC	Inches BTDC	Degrees BTDC	Acceptable Variances		
				MM	Inches	
EC25PS-06	4.19	.165	27.5 $\pm$ 3	3.35 - 5.12	.132 - .202	20.5° @ 6000
EC34-2PM-01/02	3.41	.134	25.5 $\pm$ 2	2.90 - 3.94	.114 - .160	15.5° @ 7000
EC44-2PM-3100	3.93	.155	26.5 $\pm$ 2	3.39 - 4.56	.133 - .179	14.5° @ 6500
EC50PM-01	3.26	.128	24.0 $\pm$ 2	2.75 - 3.53	.108 - .150	16° @ 6500
EC40PL-02	5.19	.204	30.5 $\pm$ 2	4.55 - 5.85	.179 - .230	15° @ 7500
EC60PL-02	4.10	.162	27.0 $\pm$ 1	3.81 - 4.40	.150 - .173	20° @ 7500
EC44-2PM-5100	3.40	.134	24.5 $\pm$ 2	2.87 - 3.93	.113 - .155	12.5° @ 6500



All above engines require a minimum of 88 (R+M)/2 octane fuel. If fuels of a lesser octane number are used or engines are subjected to frequent overheated situations, the timing must be adjusted to the low side of the accepted variance.

R.F.I. spark plug cap resistance: 3,700 to 6,300 ohms.

ENGINE ELECTRICAL

Ignition Data

Machine Model	Engine Model	Ignition Type Alternator Output	Spark Plug		Plug Gap Inches
			Champion	NGK	
Star, Star Trak	EC25PS-06	CDI - 100 Watt	RN-3C	BR8ES	.025
Sprint (ES)	EC34-2PM-01/02	CDI - 120 Watt	RN-2C	BR9ES	.025
Indy Sport	EC34-2PM-03	CDI - 120 Watt	RN-2C	BR9ES	.025
Indy Trail (All)	EC50PM-01/02	CDI - 120 Watt	RN-2C	BR9ES	.025
Indy 400	EC40PL-02	CDI - 120 Watt	RN-2C	BR9ES	.025
Indy 600	EC60PL-02	CDI - 120 Watt	RN-2C	BR9ES	.025
Long Track (RLR)	EC44-2PM-5100	CDI - 120 Watt	RN-2C	BR9ES	.025

Running Ignition Timing at 3000 RPM						Operating Timing and RPM
Engine Model	MM BTDC	Inches BTDC	Degrees BTDC	Acceptable Variances		
				MM	Inches	
EC25PS-06	4.19	.165	27.5 $\pm$ 3	3.35 - 5.12	.132 - .202	20.5° @ 6000
EC34-2PM-01/02	3.41	.134	25.5 $\pm$ 2	2.90 - 3.94	.114 - .160	15.5° @ 7000
EC34-2PM-03	3.41	.134	25.5 $\pm$ 2	2.90 - 3.94	.114 - .160	15.5° @ 7000
EC50PM-01/02	3.26	.128	24.0 $\pm$ 2	2.75 - 3.53	.108 - .150	16° @ 6500
EC40PL-02	5.19	.204	30.5 $\pm$ 2	4.55 - 5.85	.179 - .230	15° @ 7500
EC60PL-02	4.10	.162	27.0 $\pm$ 1	3.81 - 4.40	.150 - .173	20° @ 7500
EC44-2PM-5100	3.40	.134	24.5 $\pm$ 2	2.87 - 3.93	.113 - .155	12.5° @ 6500

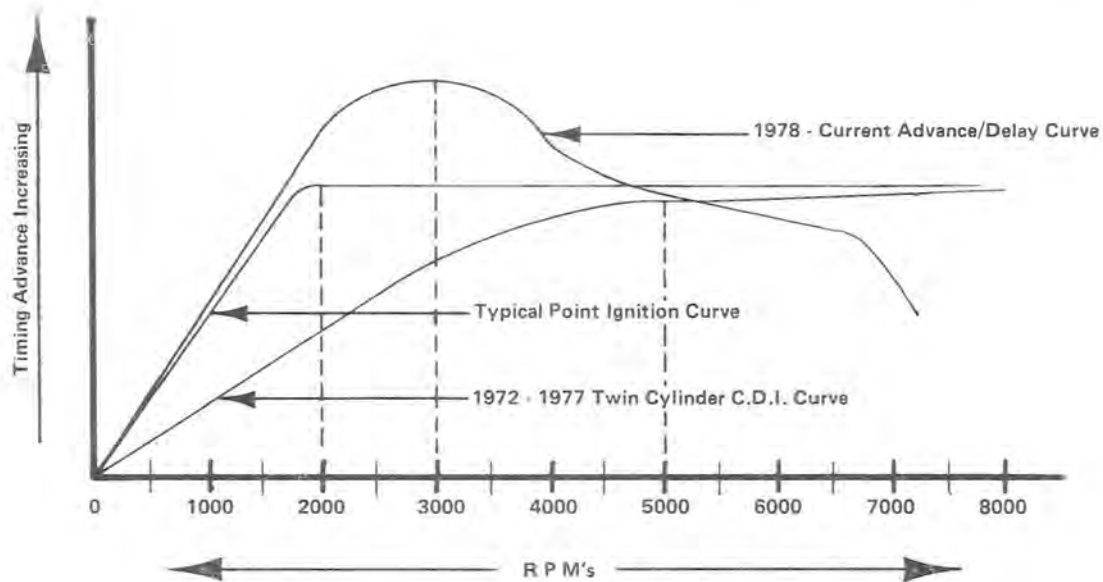


All above engines require a minimum of 88 (R+M)/2 octane fuel. If fuels of a lesser octane number are used or engines are subjected to frequent overheated situations, the timing must be adjusted to the low side of the accepted variance.

R.F.I. spark plug cap resistance: 3,700 to 6,300 ohms.

ENGINE ELECTRICAL

Typical 1972 – 1986 Timing Advance Curves



- All Polaris point ignition engines reach peak advance at approximately 2000 RPM's. Check timing static.
- All 1972 - 1977 CDI engines peak advance is at approximately 5000 RPM's. Check timing running at 5000 RPM.
- All 1978 - Current engines peak advance is at 3000 RPM's. Check timing at that RPM.

NOTE: On 1978 to current CDI engines, if overheating is evident, the ignition timing should be checked at the operating RPM for proper timing delay or retard.

1978 – 1986 CDI TIMING CHECKS

Engine Model	Peak Timing/RPM	Operating Timing/RPM
EC25/34 PT	29° @ 3000	16° @ 7500
EC44PT	27.5° @ 3000	16° @ 6750
EC34PL	31.5° @ 3000	16° @ 8000
EC51/60PL	27° @ 3000	20° @ 7500
EC44-2PM except 5100	26.5° @ 3000	14.5° @ 6500
EC44-2PM-5100	24.5° @ 3000	12.5° @ 6500
EC25PS-05/06	27.5° @ 3000	20.5° @ 6000
EC40PL	30.5° @ 3000	15° @ 7500
EC34-2PM	25.5° @ 3000	15.5° @ 7000
EC50PM	24° @ 3000	16° @ 6500

ENGINE ELECTRICAL

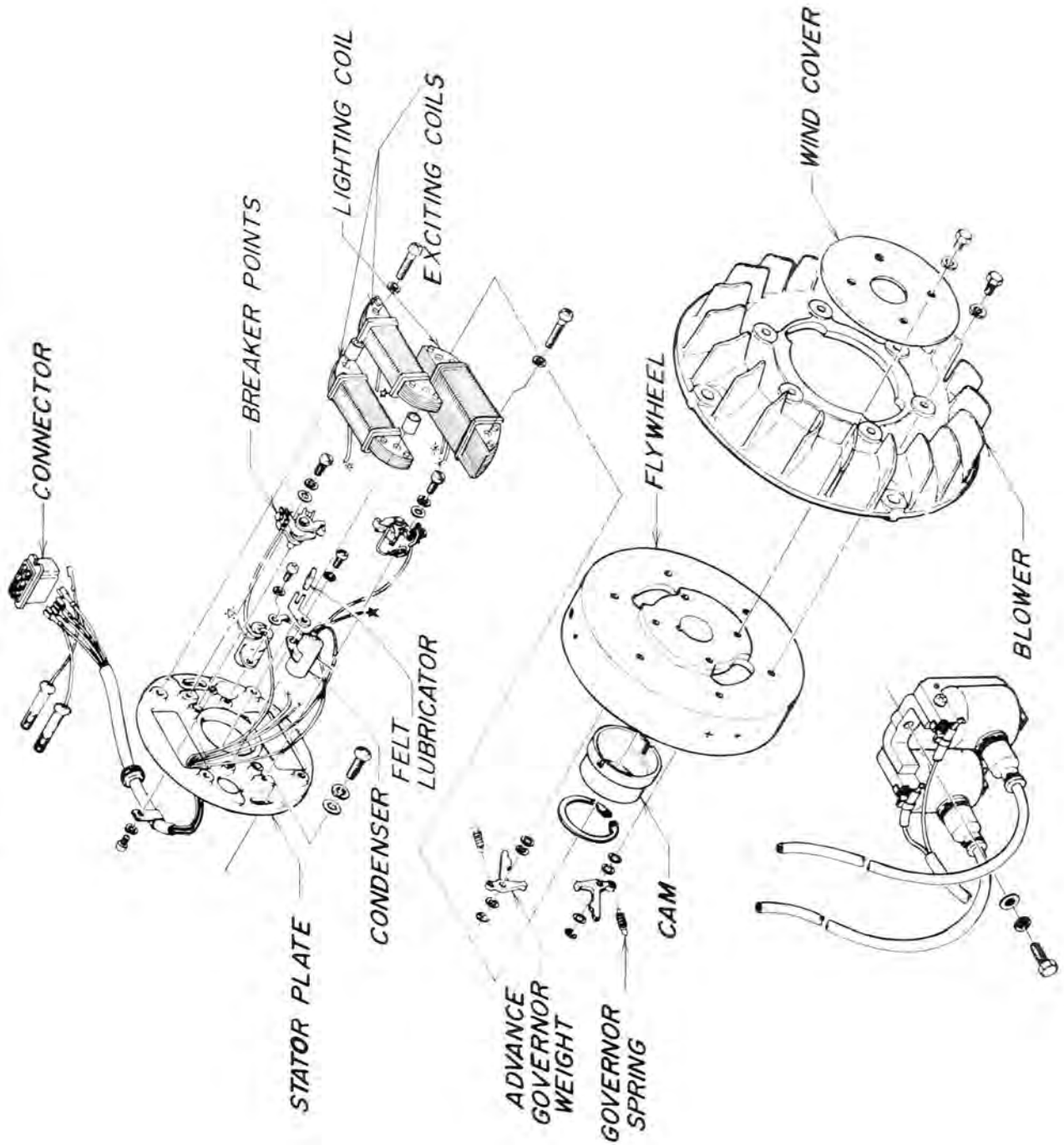
Timing Chart

DEGREES BTDC	103 MM ROD 55.6 MM STROKE		111.2 MM ROD 55.6 MM STROKE		112 MM ROD 60 MM STROKE		120 MM ROD 60 MM STROKE	
	MM	INCHES	MM	INCHES	MM	INCHES	MM	INCHES
1	0.0054	0.0002	0.0053	0.0002	0.0058	0.0002	0.0057	0.0002
2	0.0215	0.0008	0.0212	0.0008	0.0232	0.0009	0.0228	0.0009
3	0.0484	0.0019	0.0476	0.0019	0.0521	0.0021	0.0514	0.0020
4	0.0860	0.0034	0.0846	0.0033	0.0926	0.0036	0.0913	0.0036
5	0.1343	0.0053	0.1322	0.0052	0.1447	0.0057	0.1426	0.0056
6	0.1933	0.0076	0.1903	0.0075	0.2083	0.0082	0.2053	0.0081
7	0.2630	0.0104	0.2588	0.0102	0.2833	0.0112	0.2793	0.0110
8	0.3432	0.0135	0.3379	0.0133	0.3698	0.0146	0.3646	0.0144
9	0.4341	0.0171	0.4273	0.0168	0.4677	0.0184	0.4612	0.0182
10	0.5355	0.0211	0.5272	0.0208	0.5770	0.0227	0.5689	0.0224
11	0.6474	0.0255	0.6374	0.0251	0.6976	0.0275	0.6878	0.0271
12	0.7698	0.0303	0.7578	0.0298	0.8294	0.0327	0.8178	0.0322
13	0.9025	0.0355	0.8885	0.0350	0.9724	0.0383	0.9588	0.0377
14	1.0456	0.0412	1.0293	0.0405	1.1265	0.0444	1.1108	0.0437
15	1.1989	0.0472	1.1803	0.0465	1.2917	0.0509	1.2737	0.0501
16	1.3624	0.0536	1.3413	0.0528	1.4678	0.0578	1.4474	0.0570
17	1.5359	0.0605	1.5122	0.0595	1.6548	0.0652	1.6318	0.0642
18	1.7195	0.0677	1.6930	0.0667	1.8526	0.0729	1.8269	0.0719
19	1.9130	0.0753	1.8835	0.0742	2.0611	0.0811	2.0326	0.0800
20	2.1163	0.0833	2.0838	0.0820	2.2802	0.0898	2.2487	0.0885
21	2.3294	0.0917	2.2936	0.0903	2.5098	0.0988	2.4752	0.0974
22	2.5521	0.1005	2.5130	0.0989	2.7497	0.1083	2.7119	0.1068
23	2.7843	0.1096	2.7418	0.1079	3.0000	0.1181	2.9587	0.1165
24	3.0260	0.1191	2.9798	0.1173	3.2603	0.1284	3.2156	0.1266
25	3.2769	0.1290	3.2270	0.1270	3.5307	0.1390	3.4824	0.1371
26	3.5370	0.1393	3.4833	0.1371	3.8110	0.1500	3.7590	0.1480
27	3.8062	0.1498	3.7486	0.1476	4.1010	0.1615	4.0452	0.1593
28	4.0843	0.1608	4.0226	0.1584	4.4007	0.1733	4.3410	0.1709
29	4.3712	0.1721	4.3054	0.1695	4.7098	0.1854	4.6461	0.1829
30	4.6667	0.1837	4.5967	0.1810	5.0282	0.1980	4.9604	0.1953
31	4.9708	0.1957	4.8964	0.1928	5.3559	0.2109	5.2839	0.2080
32	5.2832	0.2080	5.2044	0.2049	5.6926	0.2241	5.6163	0.2211
33	5.6039	0.2206	5.5206	0.2173	6.0381	0.2377	5.9575	0.2345
34	5.9326	0.2336	5.8447	0.2301	6.3924	0.2517	6.3073	0.2483
35	6.2693	0.2468	6.1768	0.2432	6.7552	0.2660	6.6656	0.2624

ENGINES	EC34-2PM	EC34PT	EC44-2PM	EC44PT
		EC34PL	EC60PL	EC44PQ
		EC34PM	EC40PL	EC44PM
		EC51PL	EC50PM	EC25PS

Magneto Point Ignition System — Exploded View

TWIN CYLINDER MAGNETO IGNITION SYSTEM



ENGINE ELECTRICAL

Magneto Point Ignition System Timing Procedures

Ignition timing is the proper time to ignite the compressed gas in the combustion chamber, as the piston reaches the top of its stroke. Timing is usually measured in distance from top dead center or in degrees of crankshaft rotation.

Correct timing greatly influences performance. Improper timing causes a decrease in H.P., overheating and increased fuel consumption and can also shorten engine life.

Standard timing for each individual engine can be found in the general specification section of this manual.

Any ignition setting that is less than the standard setting (measured in distance from top dead center, or degrees of crankshaft rotation) is "retarded timing" and any ignition setting that is more than the standard setting is advanced.

STANDARD BREAKER POINT ENERGY TRANSFER SYSTEMS

Contact Breaker — The contact breaker (points) on the magneto stator plate is a kind of switch which cuts the primary current generated in the primary coil by the action of the rotating cam inside the flywheel.

Point Gap — To generate high voltage in the ignition coil, it is necessary to interrupt the flow of current in the primary coil. The current flow is interrupted when the contact points open. If the point gap is too small, the current is not completely interrupted because some current will "jump the gap." If the gap is too large, the quantity of current decreases. In either case performance is influenced because high voltage cannot be produced consistently.

Point Gap should be between .011 and .017 (.014 is a good average).

Point Gap Adjustment — To adjust point gap, rotate the flywheel until the cam opens the points. Stop the flywheel when the point gap is the greatest. Measure the gap with a common feeler type thickness gauge. If the gap must be reset, loosen the point anchor screw and move the point anchor plate in the necessary direction to either increase or decrease the gap as necessary, Fig. 1 (A).

Note: When the flywheel is in the position that opens the point gap to the maximum, this adjustment can be done through the "window" in the flywheel, Fig. 2.



Fig. 1



Fig. 2

Timing Adjustment — To check and/or adjust timing it is necessary to know at what instant the breaker points open and where the piston is in relation to top dead center at the same instant.

The timing kit (PN 2870201) contains a dial indicator, which, when properly installed in the cylinder head, gives an accurate indication of piston position; and a flashlight type indicator that, when properly attached, dims at the instant the points open.

If the points open at the correct crankshaft position the timing is correct. (With the point gap within the correct limitations.)

ENGINE ELECTRICAL

Magneto Point Ignition System Timing Procedures

On all models, the crankshaft should be rotated counterclockwise past the point of correct timing and then rotate the crankshaft clockwise until the light or buzzer changes. This will eliminate slack or free play within the internal workings of the engine.

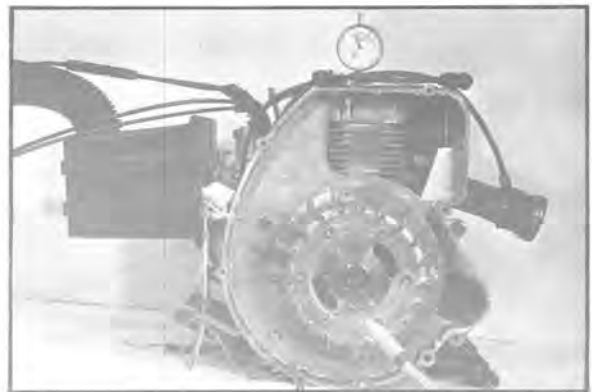
Static (retarded) Timing vs. Running (advanced) Timing:

1. Static timing is performed without the engine running. At this position, the governor weights in the flywheel are in the retarded position.
2. Running timing is done with the governor weights in the flywheel manually locked open, simulating a top RPM situation. This can be done by locking the weights open by inserting a cap screw through one of the rope starter pulley holes in the flywheel.
3. The 175cc engine is timed in the advanced position as there is no cam advance on the 175cc flywheel. All other engines with magneto ignition can be timed in either the static or running position. Check the Engine Specification section in this manual for correct timing specs.

Dial indicator and timing light properly installed on a twin cylinder engine — The timing light and the dial indicator should be attached to the No. 2 cylinder first, (clutch side).

The No. 2 cylinder should be timed first on twin cylinder engines. The No. 2 cylinder wire in the wire loom is the white wire.

The No. 1 cylinder wire is the red wire.



It is good practice to set the point gap (or gaps) at .014 at the beginning of the timing procedure. (This gap setting is only a good average and can be changed if necessary.)

Installing the Dial Indicator — Shown here installed in the No. 2 cylinder of a twin cylinder engine. Once the indicator is installed, rotate the crankshaft to find top dead center, (TDC).

T.D.C. is the point when the pointer of the gauge just begins to change direction of rotation. Once this point is found, loosen the set screw holding the face of the gauge and rotate until the "zero" aligns with the pointer, as shown. The piston should then be at T.D.C. in its stroke and the dial indicator pointer at "zero." Any movement of the piston (crankshaft rotation) will then be registered by the pointer in thousandths (.001).



Attaching the Timing Light — One lead of the timing light can be attached to ground anywhere on the engine. The remaining lead must be attached to the wire from the stator plate for the cylinder being timed. On the single cylinder models, the ignition wire is the red wire in the engine wire loom. On twin cylinder models the red wire is the No. 1 cylinder lead and the white wire is the No. 2 cylinder lead.

ENGINE ELECTRICAL

Magneto Point Ignition System Timing Procedures

TIMING INSTRUCTIONS

175cc

1. Timing checked and set at running specs.
2. No mechanical advance.
3. Cam is on crankshaft (not on flywheel).
4. Timing achieved by setting point gap.
5. Stator plate is not movable.
6. Engine can be timed with flywheel removed.

Procedure:

1. Install dial indicator.
2. Connect one lead of timing light to the red wire and the other wire to ground.
3. Rotate crankshaft to find T.D.C. (top dead center) and zero dial indicator.
4. Rotate crankshaft counterclockwise past the point where the light changes, then rotate clockwise to this point (this will eliminate loose play).
5. If timing is incorrect, adjust point gap.
 - A. If timing is too far advanced, closing the point gap will retard the timing.
 - B. If timing is retarded, opening the point gap will advance timing.
 - C. Point gap should be within .011 – .017.



Twin Cylinder Flywheel
With Automatic Spark Advance



175cc Flywheel Without
Automatic Spark Advance

244cc Single

1. Timed in static position, can be timed in advanced position by locking the cam. See Ignition Data section in this manual for advanced specs.
2. Has mechanical advance on flywheel.
3. Cam is on flywheel.
4. Stator plate is movable.

Procedure:

1. Set point gap at .014 inches at high point of cam.
2. Install dial indicator, rotate crankshaft to find T.D.C., and zero the dial.
3. Connect timing light to red wire and ground.
4. Rotate crankshaft counterclockwise past the place where the light changes, and then rotate clockwise back to the point where the light changed.
5. If timing is incorrect, move the stator plate.
 - A. Rotating the stator plate clockwise will retard the timing.
 - B. Rotating the stator plate counterclockwise will advance the timing.
 - C. Point adjustment can be changed but should remain within .011 – .017.

Magneto Point Ignition System Timing Procedures

All Twin Cylinders With Magneto Ignition

1. Timed in static position. Can be timed in advanced position by locking the cam. See Ignition Data charts for the advanced specs.
2. Has mechanical advance.
3. Cam on flywheel.
4. Stator plate is movable.

Procedure:

1. No. 2 cylinder (clutch side of engine).
 - A. Set points at .014 in. (No. 2 identified by white wire coming from points and condenser) on the high point of the cam.
 - B. Hook timing light to white wire coming from engine, and also ground timing light.
 - C. Install dial indicator, find T.D.C. and zero.
 - D. Rotate crankshaft counterclockwise past the point where the light changes, then rotate clockwise back to the point where the light changes.
 - E. If the timing is incorrect, the stator plate can be adjusted.
 1. Moving the plate clockwise will retard the timing.
 2. Moving the plate counterclockwise will advance the timing.

Example: If .018 is the desired static timing and the timing light dims when the pointer is at .008, rotate the stator in the direction shown. (.008 is "retarded" and the stator plate must be advanced until the pointer reads .018 when the light dims.)



NOTE: Refer to the Ignition Data charts in this section for detailed individual engine timing recommendations.

ENGINE ELECTRICAL

Magneto Point Ignition System Timing Procedures

If the timing light dims when the pointer is past .018, then the timing is too advanced and the stator plate must be rotated in the direction shown to "retard" it to .018.

Remember: Move the stator plate to time only the No. 2 cylinder on twin cylinder models.

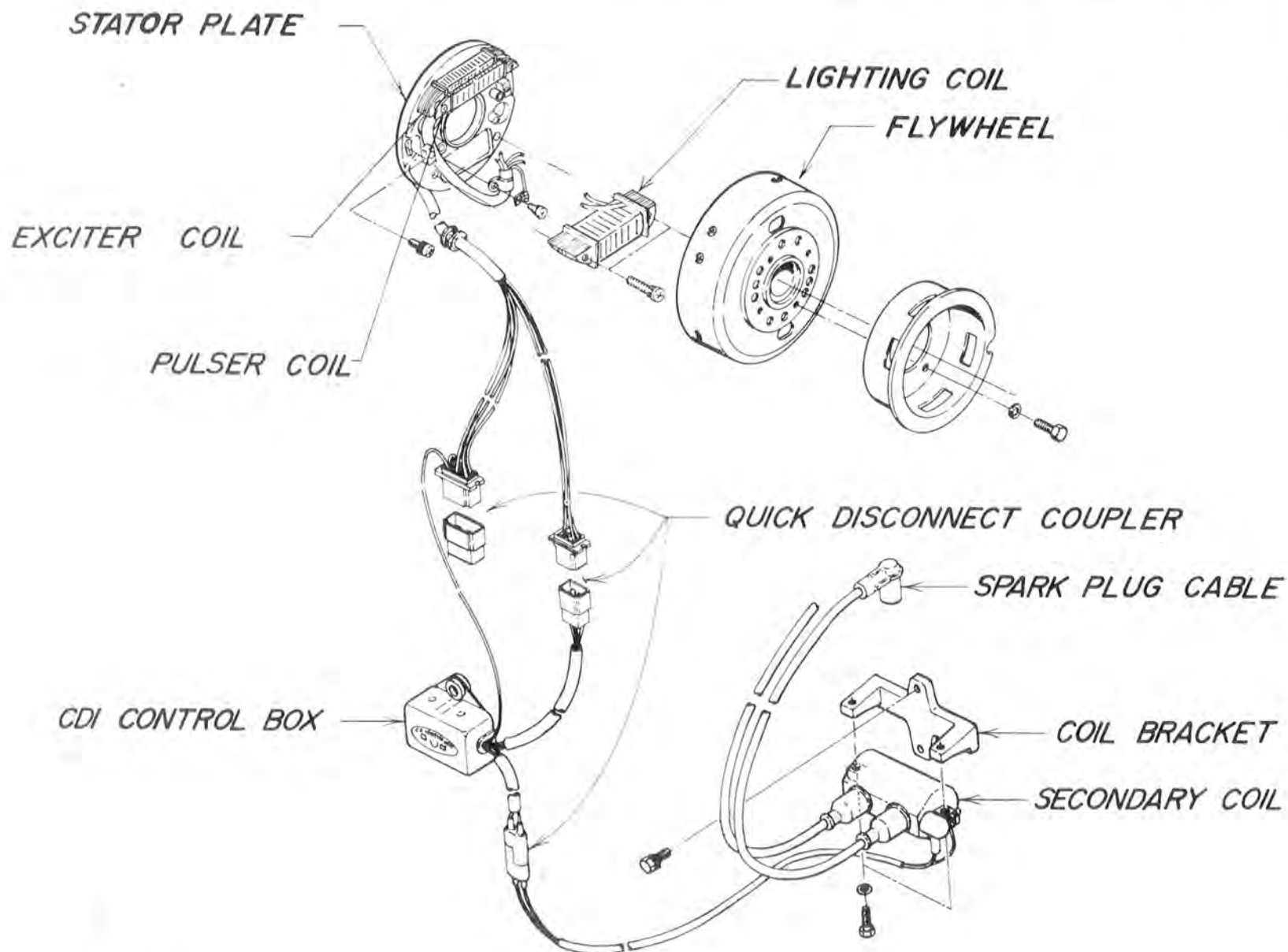


2. No. 1 cylinder (flywheel side of engine).
 - A. Install dial in No. 1 cylinder.
 - B. Find T.D.C. and zero dial.
 - C. Connect timing light to red wire coming from engine.
 - D. Rotate crankshaft counterclockwise past the point where the light changes, then rotate clockwise back to the point of change.
 - E. If the timing is incorrect, the No. 1 set of points must be adjusted.
 1. The No. 1 cylinder points are identified by the red wires connecting the points and condenser.
 2. If the timing is too far advanced, the point gap must be closed.
 3. If the timing is too far retarded, the points must be opened.
 4. After correct timing is achieved, the point gap must be checked to assure that it is within the .011 — .017 range provided.
 5. In the event that the point gap on No. 1 set of points is not within the .011 — .017 range after the correct timing has been achieved, the engine must be retimed using a different point gap on No. 2 cylinder. To correct this should it occur

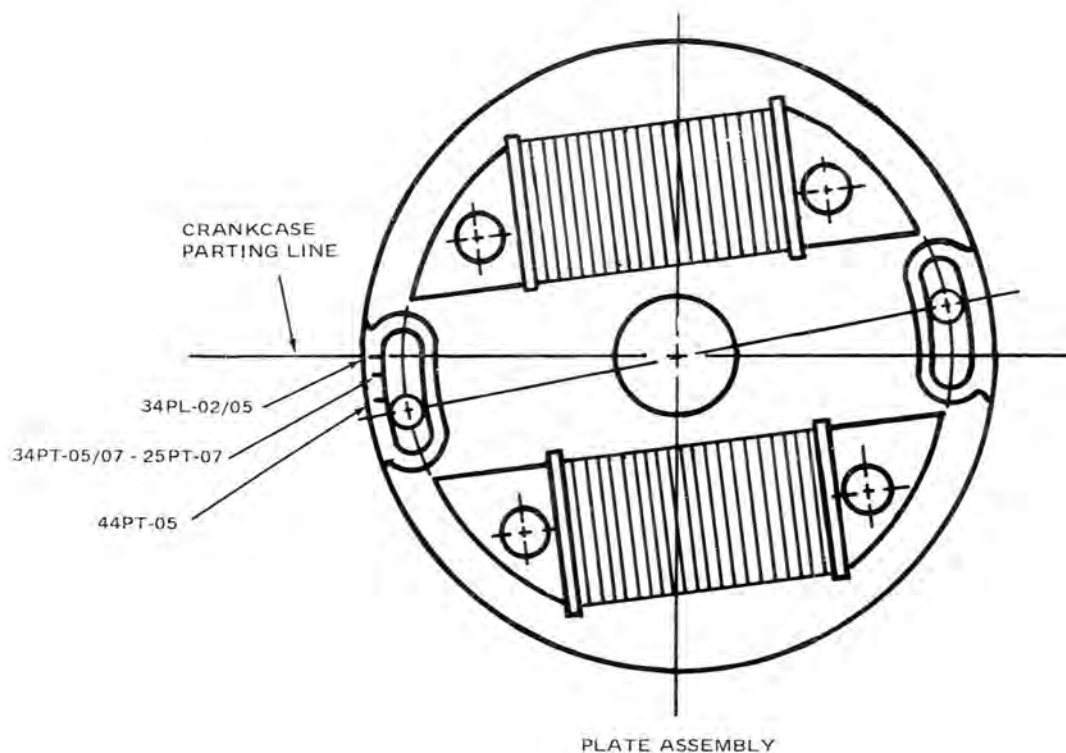
*Point gap too wide (over .017) on No. 1 cylinder. The point gap on No. 2 cylinder should be closed slightly (.001 — .002). Then the stator plate must be advanced (moved counterclockwise) to maintain the correct timing of No. 2 cylinder. Then No. 1 cylinder can be retimed. After achieving correct timing, check the point gap to assure it is within tolerance (.011 — .017).

*If point gap on No. 1 cylinder is too close, (under .012). The point gap on No. 2 cylinder should be opened slightly, then the stator plate must be retarded (moved clockwise) to maintain the correct timing on No. 2 cylinder. Then No. 1 cylinder must be retimed. When the correct timing is reached, the point gap on No. 1 cylinder must be checked. Repeat the above procedure if point gap is still incorrect.

TWIN CYLINDER CAPACITOR DISCHARGE IGNITION SYSTEM



ENGINE ELECTRICAL
CDI Stator Plate Installation



The CDI system used on Polaris engines incorporates predetermined static timing settings for three different engine applications. During assembly of the stator plate to engine, observe the following:

1. Identify engine model number from the tag located on the crankcase.
2. Refer to the above drawing to identify the correct stator plate timing mark to coincide with the engine model number.
3. Install the stator plate and mounting screws, aligning the respective mark with the crankcase half parting line.
4. Tighten plate mounting screws.

ENGINE ELECTRICAL

Pre-1978 CDI Dynamic Timing Procedures

CAPACITOR DISCHARGE IGNITION

1. Obtain the proper timing specification from the ignition data section of this manual.
2. Install a dial indicator into one of the cylinder heads.* From top dead center (T.D.C.) rotate the engine backward from the normal engine rotation. When the needle of the indicator corresponds with the recommended timing spec (A), a reference mark should be made on the flywheel and recoil housing (B).



A



B

3. Remove drive belt.
4. Use a strobe light to check for proper alignment of the timing marks.
5. When the engine is run at the recommended RPM for checking ignition timing, the two reference marks should line up.
6. If the timing is retarded too much, the stator plate will have to be turned counterclockwise from normal engine rotation. If advanced too much, rotate the stator plate clockwise to normal engine rotation.
7. Access to the stator plate is achieved by removing the recoil or recoil housing and starter cup.
8. After timing is achieved, reassemble the engine.

*Because the spark plugs fire at the same time it is only necessary to time one of the cylinders and it follows that the remaining cylinder(s) must be the same.

ENGINE ELECTRICAL
CDI Dynamic Timing Procedures – Twin Cylinder

1. On engines with CD ignition, each spark plug fires twice per revolution of the crankshaft.
2. The spark advance mechanism is controlled electrically, therefore, there is no cam on the flywheel, nor any governor weights in the flywheel.
3. Because both spark plugs fire at the same time it is only necessary to time one of the two cylinders and it follows that the remaining one must be the same.
4. A strobe light is needed to time engines with CD ignition. Use a strobe light that can withstand high CD voltage.
5. Engines are timed in full advance position with engines running at specified RPM.

Procedure:

-  1. Remove the drive belt or safely support the rear of machine in a secured area prior to performing any checks.
2. Connect positive and negative leads from timing light to power source and clamp the remaining lead to a spark plug wire. Remove the dust cover grommet from the magneto cover to gain access to the timing marks.

NOTE: EC34PL-02 timing is checked from the engine front side using the machined surface provided after the water pump cover is removed.

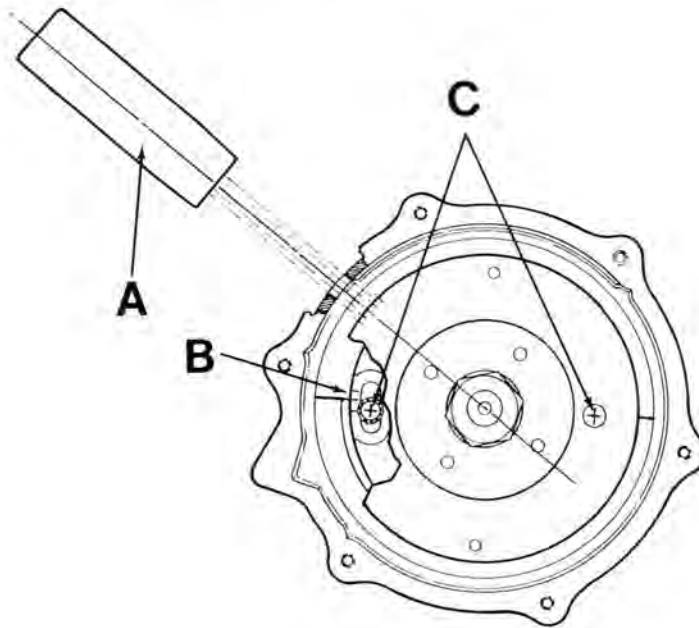


Figure 1

-  3. Start the engine and slowly accelerate to 3,000 RPM. Check the timing by sighting directly above the hole in the magneto cover.
- NOTE: On TX engines with the timing access plug provided in the magneto housing, install timing fixture (PN 2870422) to increase timing accuracy.

ENGINE ELECTRICAL

CDI Dynamic Timing Procedures – Twin Cylinder

4. Noting the timing mark position from the dynamic check, refer to the timing mark diagram for proper mark identification and allowable variance range.

NOTE: Identify engine model with respective diagram.

5. If the timing marks are within the variance range shown, engine timing is correct.

6. If the timing needs to be adjusted, proceed as follows:
(Refer to Figure 1 on IV – 17)

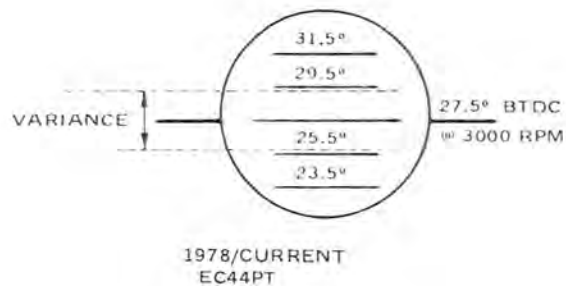
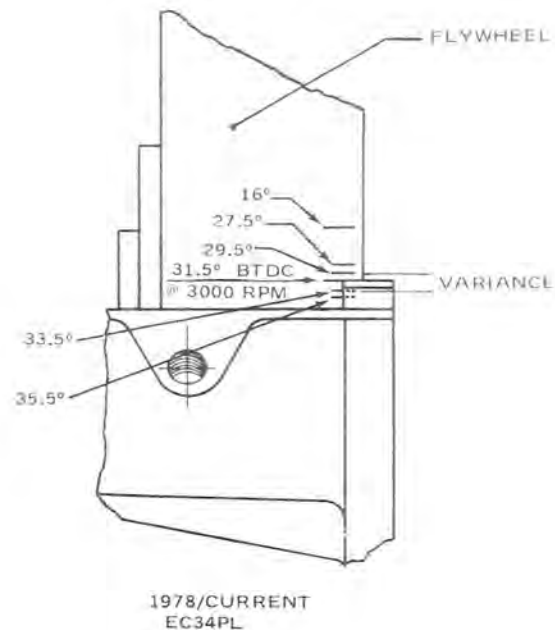
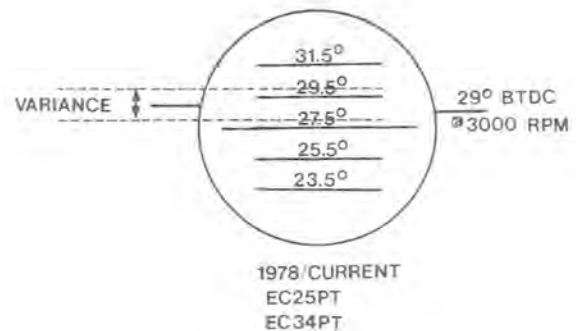
- A. Remove the recoil starter and starter cup.

- B. Using a flashlight, locate and reference the stator plate index marks. These marks are located on the left side of stator plate (B), Fig. 1.

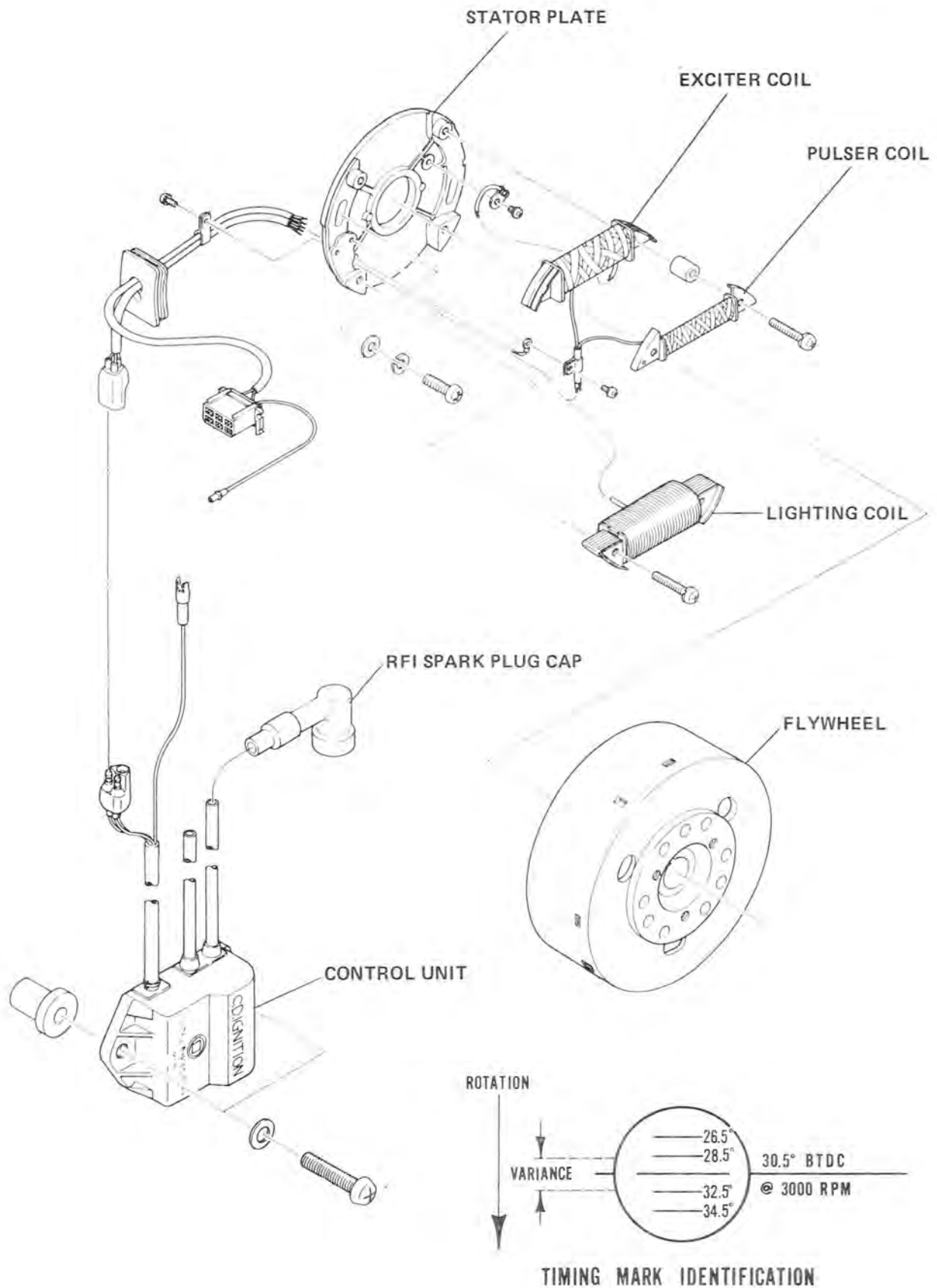
- C. Timing adjustment is accomplished by rotating the stator plate. Loosen the two stator plate fastening screws (C), Fig. 1, and rotate the plate in the direction required. (Counterclockwise advances timing.) Refer to the respective engine timing diagram for mark identification and range.

- D. Tighten the two stator plate screws. Install the starter cup and re-check dynamic timing.

- E. When timing is properly adjusted, re-check the two stator plate attaching screws for tightness and re-assemble engine.

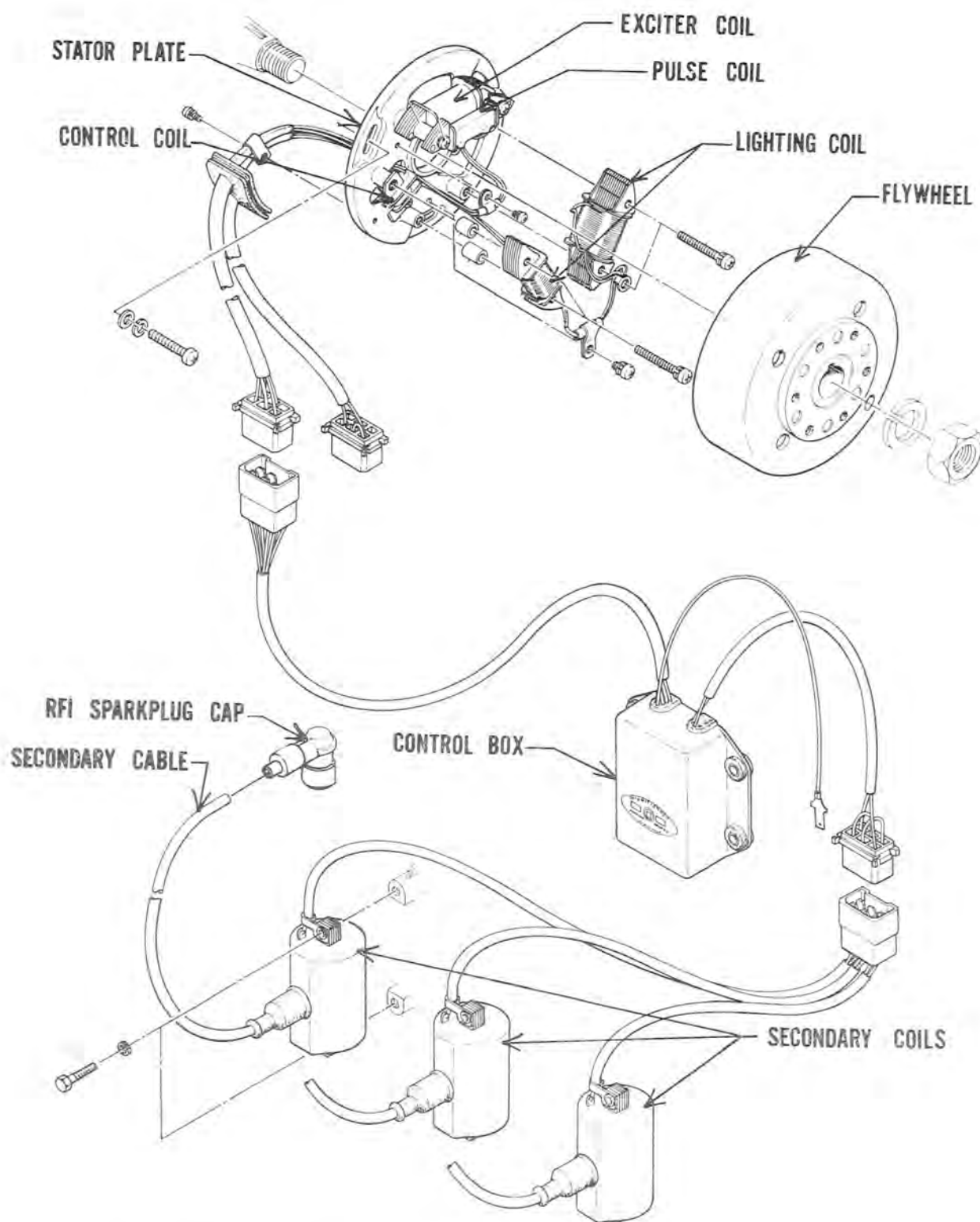


ENGINE ELECTRICAL
Magneto — EC40PL — Exploded View



ENGINE ELECTRICAL

Magneto — Exploded View — Three Cylinder PL Series



THREE CYLINDER PL SERIES CAPACITOR DISCHARGE IGNITION SYSTEM

CDI Dynamic Timing Procedures — Three Cylinder PL Series

THREE CYLINDER CAPACITOR DISCHARGE IGNITION

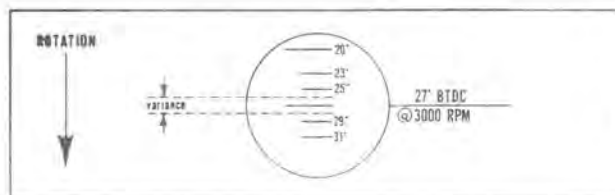
1. The three-cylinder PL series engine fires each spark plug three times per revolution, every 120° of rotation.
2. The timing advance mechanism is controlled by the CDI control box.
3. This ignition is designed to gradually retard the spark as engine RPM increases. For example: At 3,000 RPM the timing should be set at 27°. As the RPM increases the ignition will retard automatically to approximately 20° at 7,500 RPM.

Procedure:

1. Remove the drive belt.
2. Using a strobe light capable of high CDI voltage, connect the positive and negative leads to a power source (6 or 12 volt battery) and the remaining lead to one of the three spark plug leads that run to the spark plugs. Remove the rubber dust cover grommet from the magneto housing to gain access to the timing marks on the flywheel.



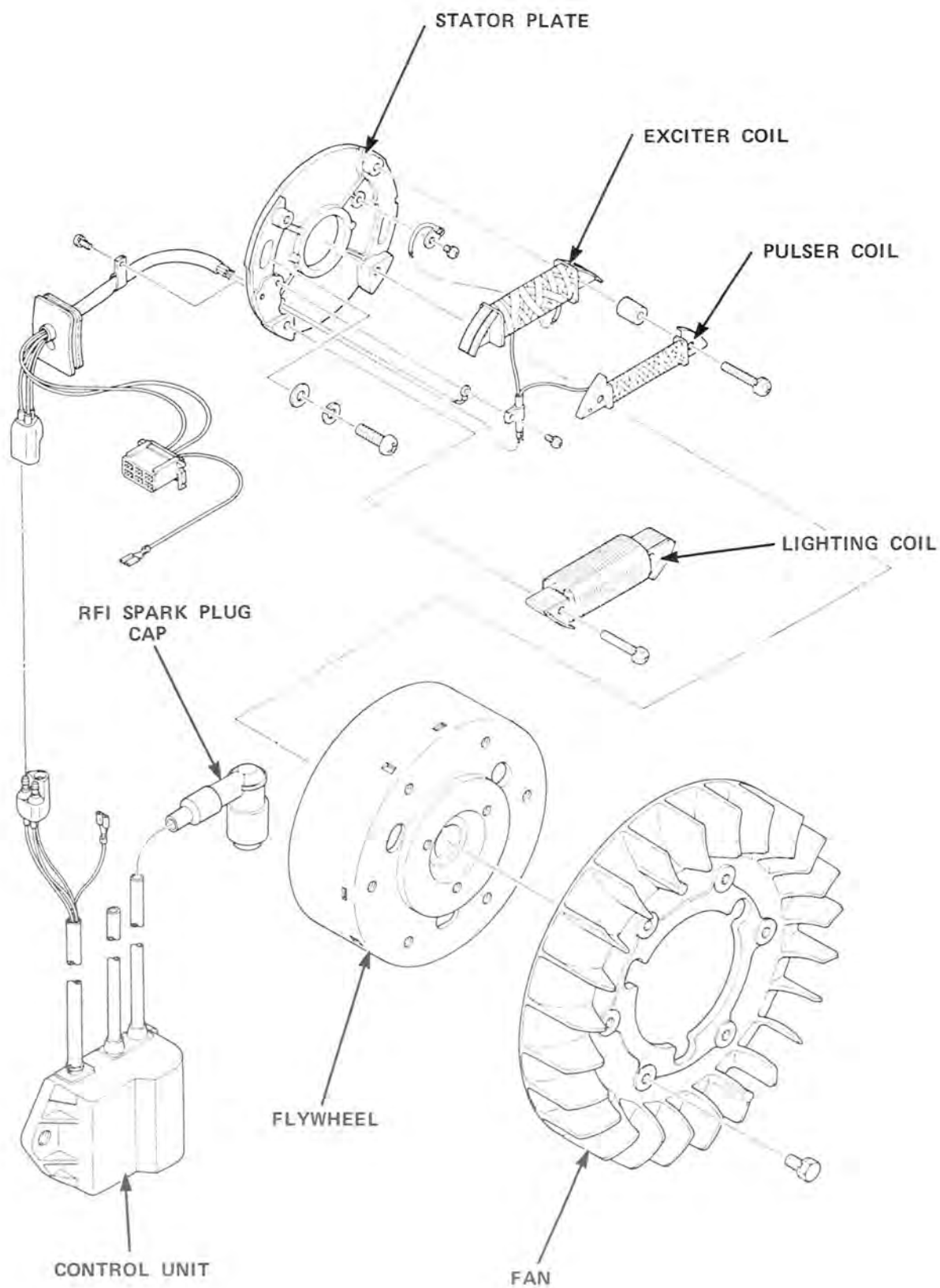
3. Start the engine and slowly accelerate to 3,000 RPM. Check the timing with the timing light aimed directly at the hole in the magneto cover.
NOTE: Using the timing light, sight perpendicular to the center line of the crankshaft.
4. Note the timing mark position from the dynamic check. Refer to the timing mark diagram for proper mark identification and allowable variance range.



5. If the timing marks are within the variance range shown, engine timing is correct.
6. If the timing needs to be adjusted, proceed as follows:
 - A. Remove the water pump cover, the recoil starter, and the starter cup.
 - B. The timing adjustment is changed by rotating the stator plate counterclockwise to advance and clockwise to retard the timing. Loosen the three stator plate hold-down screws and rotate the stator plate in the direction required.
 - C. Tighten the three stator hold-down screws. Install the starter cup, recoil starter, and water pump cover. Re-check timing.
 - D. When the timing is properly adjusted, re-check the three stator hold-down screws and pump belt tension. Reassemble the engine.

ENGINE ELECTRICAL

Magneto – 44–2PM – Exploded View



PROCEDURE

 Remove the drive belt or safely support the rear of the machine in a secured area prior to performing the timing check.

1. Use a quality strobe timing light that can withstand high voltage.
2. Connect the timing light to either spark plug cable.
3. Start the engine and slowly accelerate to 3,000 RPM. Check the timing by directing the strobe timing light at blower housing marks beneath the CDI control unit.

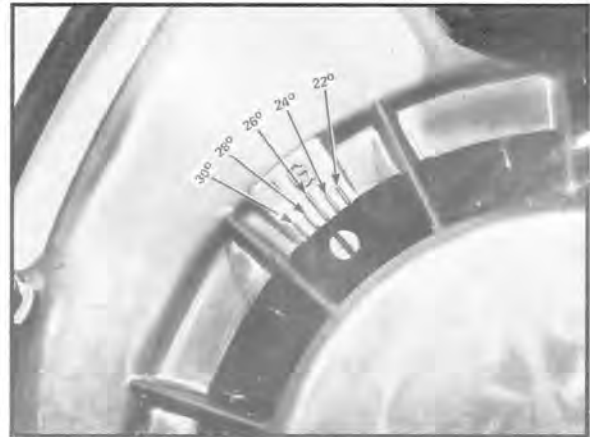
 NOTE: To avoid inaccurate readings, always sight directly at the marks.

4. The timing mark on the flywheel blower vane should be in the position as shown, for most but not all EC44-2PM engines. Refer to the specification pages before timing checks are made.
5. In the event the marks do not align, refer to the allowable variance range shown to determine if ignition timing is within this range.

TIMING ADJUSTMENT

If the ignition timing needs adjusting, proceed as follows:

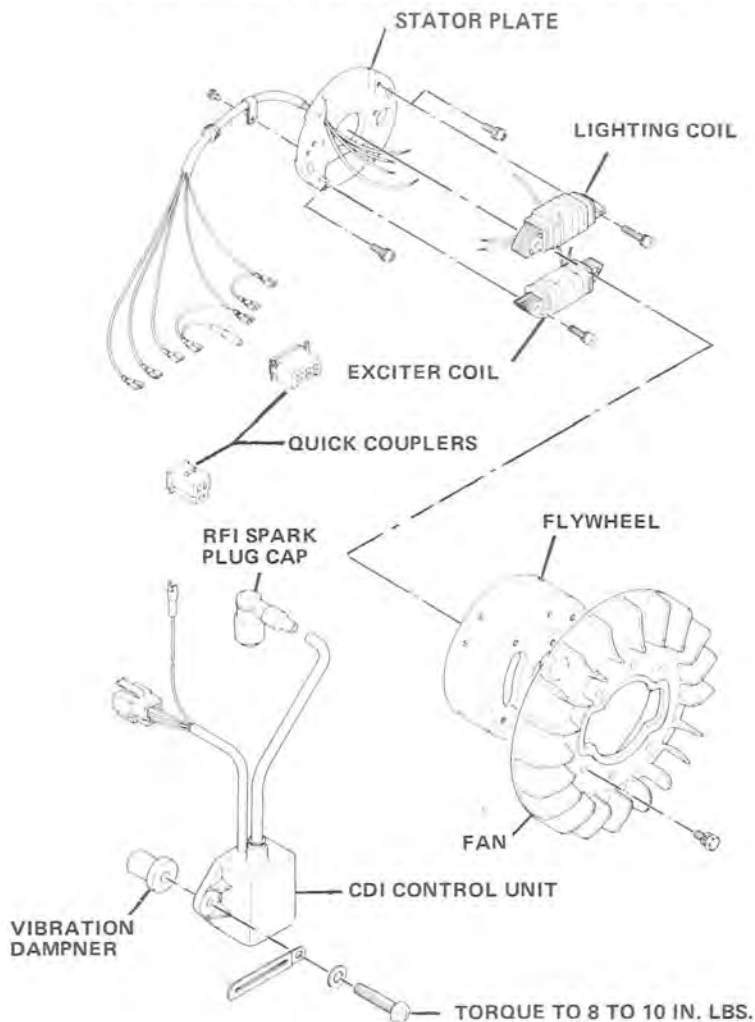
1. Remove the outer blower housing.
2. Remove the recoil starter cup.
3. Timing adjustment is accomplished by rotating the stator plate. Access to the two stator plate adjusting screws is gained through the windows provided in the flywheel. Loosen the stator attaching screws.
4. Rotate the stator plate in the same direction and approximate distance the timing mark on the flywheel blower vane needed to be moved to be in the allowable timing variance range. Retighten stator attaching screws.
5. Reassemble engine.
6. Recheck timing.



ENGINE ELECTRICAL

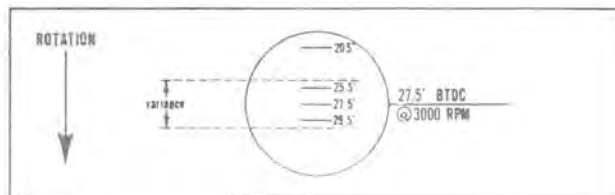
Magneto — Single Cylinder CDI — Exploded View

SINGLE CYLINDER CAPACITOR IGNITION SYSTEM



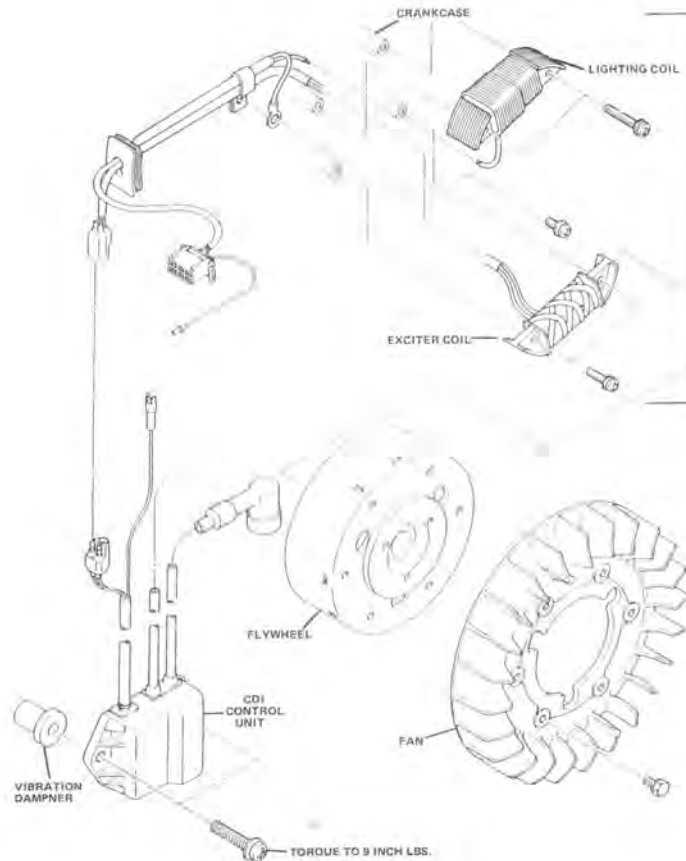
Timing Procedure:

1. After a 5 minute warm up connect the timing light to a power source and the secondary cable.
2. Connect a tachometer (preferable Polaris 2 pulse). Start engine and slowly accelerate to 3000 rpm. Sight directly in line with the blower housing hole and observe timing marks.
3. If timing is within the variance range shown, the timing is correct.



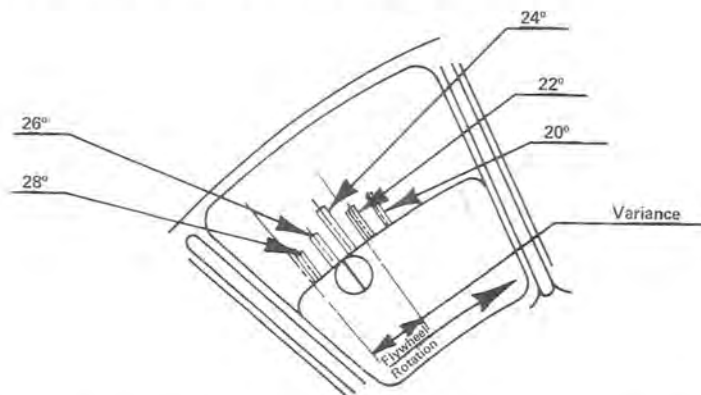
4. If timing needs to be corrected, remove the recoil starter and starter cup. Loosen stator screws and rotate the stator plate in same direction and approximate distance the timing marks on blower needed to be moved.
5. Retighten stator screws, reassemble engine and recheck timing.

Magneto – EC34–2PM CDI Exploded View – Timing



Timing Procedure:

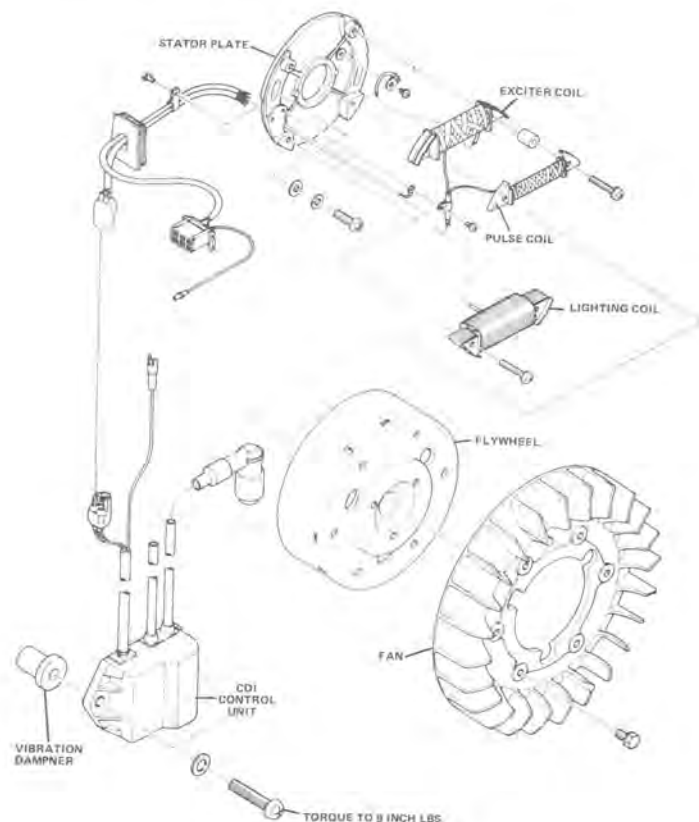
1. After a 5 minute warm up, connect the timing light to a power source and the secondary cable.
2. Connect a tachometer (preferable Polaris 2 pulse). Start engine and slowly accelerate to 3000 rpm. Sight directly in line with the blower housing hole and observe timing marks.
3. If timing is within the variance range shown, the timing is correct.



4. If the timing is not correct, check exciter coil resistance and/or replace CDI control unit or replace flywheel.
5. Recheck ignition timing.

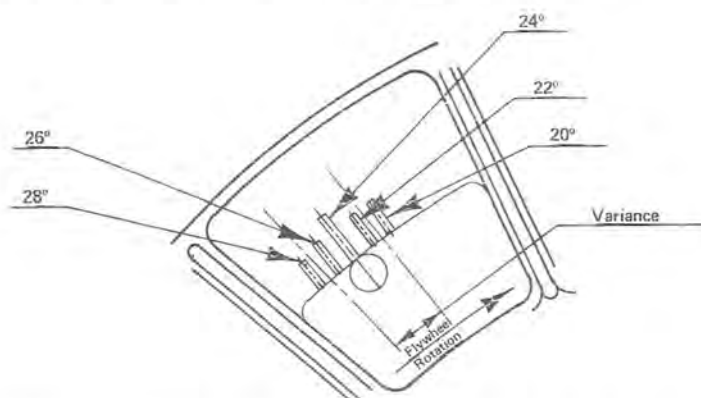
ENGINE ELECTRICAL

Magneto – EC50PM CDI Exploded View – Timing

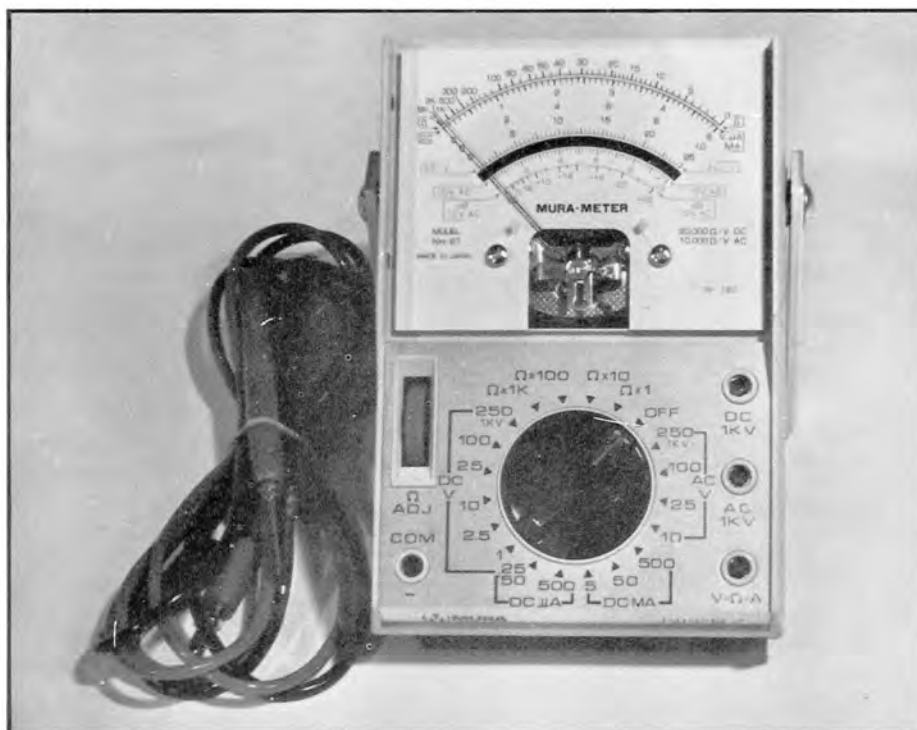


Timing Procedure:

1. After a 5 minute warm up, connect the timing light to a power source and the secondary cable.
2. Connect a tachometer (preferable Polaris 2 pulse). Start engine and slowly accelerate to 3000 rpm. Sight directly in line with the blower housing hole and observe timing marks.
3. If timing is within the variance range shown, the timing is correct.



4. If timing needs to be corrected, remove the recoil starter and starter cup. Loosen stator screws and rotate the stator plate in same direction and approximate distance the timing marks on blower needed to be moved.
5. Retighten stator screws, reassemble engine and recheck timing.



SPECIFICATIONS:

DC Voltage:	0-.25, 1, 2.5, 10, 25, 100, 250, 1000 volts. 20,000 ohms/volt.
AC Voltage:	0-10, 25, 100, 250, 1000 volts. 10,000 ohms/volt.
Decibels:	-20 to +22 dB.
DC Current:	0-50, 500 μ A; 0-5, 50, 500 mA.
Ohmmeter:	0-6 Megohms in 4 ranges.
Power Supply:	One 1.5-volt size "AA" cell for ohmmeter.

Polaris Multitester (Part No. 2870335)

This tester may be used in the following tests on Polaris CD ignition and alternator components.

ENGINE ELECTRICAL

CDI Testing

PROCEDURE

Disconnect the engine primary stator circuit from the CDI control box at the junction block. Adjust the tester in Ohms x 1 position with ohms adjust knob before test by contacting the two test leads together and setting the needle to 0 ohms.



	EXCITER COIL		PULSER COIL	
	Check Position	Resistance Readings	Check Position	Resistance Readings
<u>SINGLE CYLINDER MODELS</u> 1984-Current Star/Star LT	Brown/White to Black/Red	123 Ohms	Not Applicable	
<u>TWIN CYLINDER MODELS</u> All EC34-2PM	Brown/White to Black/Red	225 Ohms <i>135 - 175</i>	Not Applicable	
All EC40-PL All EC44-2PM	Brown/White to White	164 Ohms	Brown/White to Black/Red	45 Ohms
All EC50-PM	Brown/White to White	164 Ohms	Brown/White to Black/Red	17 Ohms
1978-Current 340 L Engines 1978-1980 TX - TX-C	Brown/White to White	114 Ohms	Brown/White to Black	63 Ohms
1977 TX-L	Black to White	246 Ohms	Brown/White to Black	61 Ohms
1975-1977 TX	Black to White	246 Ohms	Brown/White to Black	61 Ohms
1976 Starfire	Black to White	246 Ohms	Brown/White to Black	61 Ohms
1972-1977, Except Above Models	Black to White	192 Ohms	Brown/White to Black	24 Ohms
<u>THREE CYLINDER MODELS</u> 1972 TX 500 Limited 1972 Starfire 439, 650, 795 1973 Starfire 439, 650	Red to Stator (Engine Ground)	470 Ohms	No. 1 Green to Blue No. 2 Green or Blue to Stator (Engine Ground)	20-22 Ohms Infinity
1973-1975 TX 500	Red to Stator (Engine Ground)	275 Ohms	White to Red	42 Ohms
CONTROL COIL —	Blue to Green	18 Ohms		

3 CYL. PL ENGINES	CHECK POSITION	RESISTANCE READINGS
Exciter Coil	Black to White	261 Ohms
Pulser Coil	Red to White	20 Ohms
Control Coil	Green to Blue	29.4 Ohms
Ignition Coil Primary	Orange to Black	.106 Ohms
Ignition Coil Secondary	Black to High Tension Lead	2,016 Ohms

RFI spark plug cap resistance: 3,700-6,300 ohms

NOTE: All readings have a $\pm$ 10% variance.

NOTE: Readings taken at 68° F (20° C).

ALTERNATOR OUTPUT TESTS

CAUTION: Before performing this test, be sure the Multitester selector is set to the 100 ACV scale to prevent damage to the tester.

1. Disconnect the alternator connector from the engine.
2. Insert red tester lead into one yellow wire coming from the engine alternator.
3. The black tester lead must be grounded to either the engine or the brown wire at connector block.
4. Start engine; observe AC voltage reading on Multitester; slowly increase engine speed to 3,000 RPM. The voltage should read approximately 20 volts. Readings of 15-45 volts are considered normal.

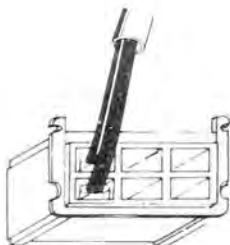


NOTE: On lighting systems with two yellow wires at the connector block, each yellow wire must be checked separately as in steps above. If output on one or both sides is zero or low, the lighting coil must be replaced.

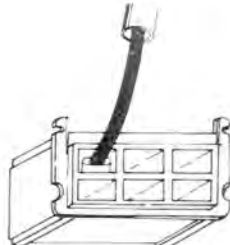
NOTE: On all 140 watt twin cylinder systems alternator output is checked with test leads connected to both yellow wires from the engine.



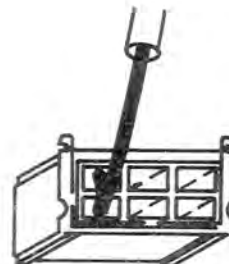
LIGHTING SYSTEM IDENTIFICATION



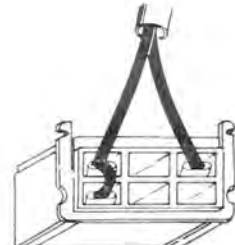
Yellow Wires
75 Watt
Single and Twin Cylinders



Yellow Wire
90 Watt
Twin Cylinders



Yellow Wires
120 Watt
Three Cylinders

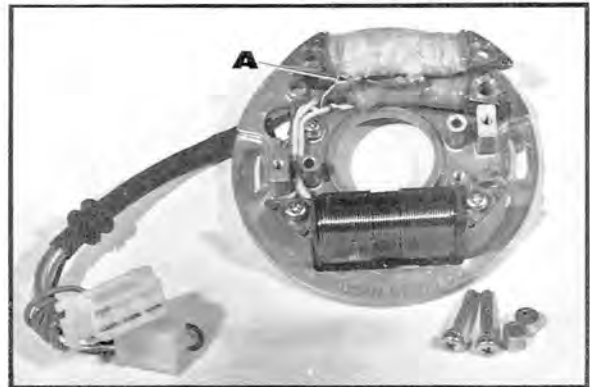


Yellow Wires
140 Watt
Twin Cylinders

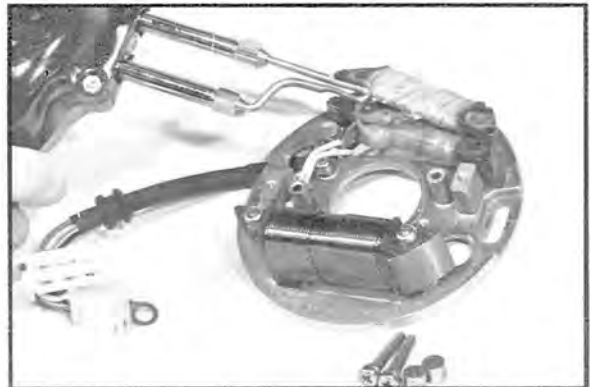
ENGINE ELECTRICAL

Twin Cylinder CDI Exciter and Pulser Coil Replacement

1. Remove the coil retaining screws and spacers. Using a pliers, remove the epoxy from the solder joints (A) on the coil to be replaced.



2. Unsolder the connections from the coil.

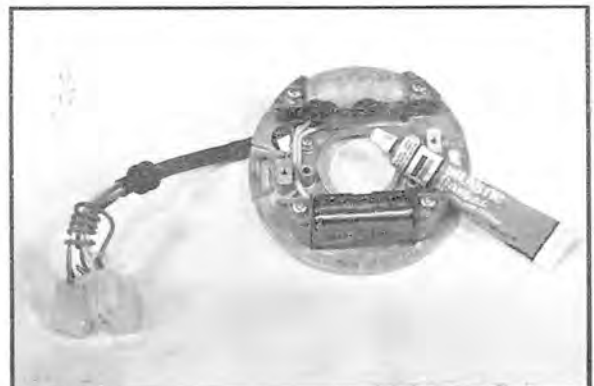


3. Clean the solder terminals (B) on the replacement coil and resolder to their proper wires. **NOTE:** Always position with numbers towards the outside.



4. Reinstall the retaining screws and spacers. Using a moisture-proof sealant, seal the solder joints as shown. Test resistance of each coil prior to stator plate installation. Lighting and point ignition exciter coils are replaced in a similar manner. All soldering must be done using rosin core solder.

IMPORTANT: After the stator plate is re-installed on the engine check placement of all coil leads to prevent possible contact with the flywheel.



ENGINE ELECTRICAL
Stevens MA-75/MA-80 Coil Test Specifications

TESTING POLARIS COILS ON STEVENS MA-75/MA-80 MAGNETO ANALYZER

The following specifications consist of coil number, "A" or "B" switch setting, index number, adaptor if required, and reference to special notes on making the proper hookups:

3080838	A 28 (Note 1)	3081954	A 20 CD-1 (Note 3)
3081177	A 28 (Note 2)	3081573	A 22
3081272	A 28	3081602	A 24 CD-1
3081303	A 20 CD-1 (Note 3)		
3081389	A 24 CD-1		

NOTE

1. Connect Black Test Clip to coil frame, Red Clip to single red lead. Connect Hi Tension clip to secondary of coil which has red leads. For second test, transfer red test clip and Hi Tension clip to other coil.
2. Connect test clips to coil primary leads. Connect Hi Tension clip to secondary of coil to which Red test clip is connected. Other secondary must be grounded to Black test clip. To test other coil, reverse primary leads and reverse secondary leads.
3. Connect test clips to primary leads. Ground one secondary to black test clip. Test other secondary – if no spark is obtained, interchange secondary leads and retest. To test other secondary, reverse primary leads and reverse secondary leads.

Stevens Model AT-100 Volt-Ohmmeter may be used to check Coil Primary and Secondary Resistance.

ENGINE ELECTRICAL

Ignition Testing – Secondary Coil Part Number Applications

	Model and/or Cyl. Disp.	Ignition Type	Original Part Number Coil	Superseded by Part Number Coil	Original Part Number Condenser	Superseded by Part Number Condenser
1973						
	175	Magneto	3081573	3081980	3081569	
	244	Magneto	3081272	3081974	3081254	3081970
	294 fan, 398 fan, 294, 335 free	Magneto	3081177		*3081134/3081133	3081970
	TX 294, 335, 398, 432, 530	CDI	3081514	3081954		
	TX 500	CDI	3081602	3081903		
1974						
	175	Magneto	3081980		3081569	
	Single Cylinder 250	Magneto	3081974		3081254	3081970
	250 SS, 295, 295 SS, 340 SS	Magneto	3081958	3081177	*3081254/3081133	3081970
	400	Magneto	3081177		*3081254/3081133	3081970
	TX 250, 340, 440, Custom 530	CDI	3081514	3081954		
	Electra 340, 440	CDI	3081254			
	TX 500	CDI	3081603			
1975/76						
	175	Magneto	3081980		3081569	
	Single Cylinder 250	Magneto	3081974		3081970	
	250 SS, 340 SS	Magneto	3081177		3081970/3081133	
	TX 250, 340, 440	CDI	3081627	3081954		
	Electra 340, 440	CDI	3081954			
	TX 500	CDI	3081603			
1977/78						
	Single Cylinder 250	Magneto	3081974		3081970	
	Colt Twin Cylinder 250	Magneto	3081177		3081970/3081133	
	250 SS, 340 SS	Magneto	3081177		3081133/3081134	
	Electra 340, 440	CDI	3081954			
	Cobra and Electra 340, 440	Magneto	3081177		3081133/3081134	
	TX 250, 340, 440	CDI	3081954			
	TXL 340	CDI	3081954			
1979/80						
	Gemini Single Cylinder 244	Magneto	3081974		3081970	
	Gemini Twin Cylinder 250	Magneto	3081177		3081133/3081134	
	Apollo 340	Magneto	3081177		3081133/3081134	
	Cobra 340, 440	Magneto	3081177		3081133/3081134	
	TX 250, 340, 440, TX-C 340	CDI	3081954			
	TX-L 340, TX-L Indy	CDI	3081954			
	Centurion 500	CDI	3082974			
1981/82/83						
	Gemini, Star	Magneto	3081974		3081970	
	All EC44-2PM Engines	CDI Control Unit PN 3083215				
	Indy 340	CDI	3081954			
	3 Cyl. PL Engines	CDI	3082974			
1984/85/86						
	Star/Star LT	CDI Control Unit PN 3083293				
	All EC34-2PM Engines	CDI Control Unit PN 3083601				
	All EC44-2PM Engines	CDI Control Unit PN 3083215				
	Indy 400	CDI	3083366			
	All EC50-PM Engines	CDI Control Unit PN 3083561				
	Indy 600	CDI	3082974			

* Indicates which of the two numbers is superseded.

ENGINE ELECTRICAL
Ignition — Merc-O-Tronic Test Specifications

Polaris Specifications for Merc-O-Tronic Instruments Corp.
Model No. 98, 98A, & 73

POLARIS COIL NO.	MIN. COIL OPERATING AMPERAGE	PRIMARY RESISTANCE		SECONDARY CONTINUITY	
		MIN.	MAX.	MIN.	MAX.
*3080838	1.7	1.4	1.8	40	50
+*3081974	1.7	1.4	1.8	40	50
3081573	1.9	.1	.2	45	55
3081980	1.6	.1	.2	45	55
***3081303	2.0	.35	.45	55	65
+***3081954	2.0	.35	.5	55	65
+*3081177	1.9	1.4	1.8	40	50
**3081389	3.0	.15 or less		20	30
3081603	1.2	.5	.7	60	70
*3081272	1.7	1.4	1.8	40	50
+3082974	1.8	.1	.2	20	30

CONDENSER SPECIFICATIONS

CONDENSER NO.	CAPACITY IN MICROFARADS	
	MIN.	MAX.
3081132	.24	.28
3081569	.24	.30
3081133	.22	.27
3081970	.22	.27

*Disconnect internal battery and connect leads from analyzer to a 12 volt storage battery or equal. This test is for COIL POWER TEST ONLY. DO NOT USE THE 12 VOLTS FOR ANY OTHER TESTS AS READING WILL BE INCORRECT.

**To test this coil, use C.D. Adaptor Part No. 55-980.

***There is no continuity between primary and secondary leads, however, continuity is between secondary leads.

+Test with RFI spark plug cap disconnected.

ENGINE ELECTRICAL

Merc-O-Tronic Coil Test Procedures

The following tests were made with a Model 98A Merc-O-Tronic tester, using the self-contained 7-1/2 volt battery, except where noted.

Connect the test leads together and zero the meter as shown.



POINT SYSTEMS SECONDARY COIL TESTS

NOTE: All coils are tested individually.

1. Secondary Continuity — Scale No. 3:
Attach the red test lead to the primary wire on the coil (either red or white). The black test lead is connected to the high tension lead of the coil being tested. Readings are read from the top of scale No. 3 and must be between the two values specified.



2. Primary Resistance — Scale No. 2:
Without connecting the test leads together, zero the meter. Connect the red test lead to the appropriate primary on the coil to be tested and the black test lead to ground. Readings are taken from the red figures on scale No. 2 and must be within the two values specified.



3. Operating Amperage (Coil Power Test) — Scale No. 1:

The two test leads are connected the same as for resistance. The large single red test lead (coming from the rear of the tester) is attached to the high tension lead of the coil to be tested. The control knob on the upper left-hand side of the tester is then slowly turned clockwise until the value specified is reached. The 5mm spark gap (located in the upper right-hand corner of the tester) should then be firing steadily. If a steady spark occurs below this value, the coil is very good.



ENGINE ELECTRICAL

Merc-O-Tronic Coil Test Procedures

TWIN CYLINDER CDI COIL

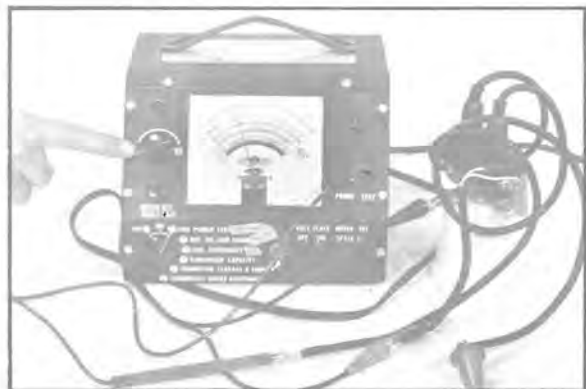
1. Secondary Continuity – Scale No. 3:
Turn the knob to scale No. 3. Connect the two test leads (red and black) together and zero the meter. Connect the red test lead to one high tension lead and the black test lead to the other high tension lead. The readings must be within the values specified. Take the readings from the top of scale No. 3.



2. Primary Resistance – Scale No. 2:
Without connecting the test leads together, turn to scale No. 2 and zero the meter. Attach the red test lead to the orange lead on the coil. The black test lead is connected to the ground on the coil. The readings must fall within the values specified.



3. Operating Amperage (Coil Power Test) – Scale No. 1:
The red test lead is connected to the orange lead on the coil and the black test lead is attached to ground. The large single red test lead (coming from the rear of the tester) is connected to one high tension lead. One end of the extra test probe that comes with the tester is plugged into the other high tension lead and one end is plugged into the tester located above the words "probe test." The knob (located in the upper left-hand corner) is slowly turned clockwise until the meter reaches the value specified. The 5mm spark gap should then be firing steadily. If a steady spark occurs below the specification, the coil is considered very good.



ENGINE ELECTRICAL

Merc-O-Tronic Condenser Test Procedures

The tester must be plugged into a 115 volt AC outlet.

1. **Condenser Capacity — Scale No. 4:**
Turn the meter to scale No. 4. Clip the red and black test leads together and zero the meter. The zero adjustment for scale No. 4 is located just above the selector knob. Attach the red test lead to the condenser terminal and the black test lead to the condenser body. Press the red button and read scale No. 4. The values must be within the specifications.



2. **Condenser Leakage and Short Test — Scale No. 5:**
Connect the red test lead to the condenser terminal and the black test lead to the condenser body. Turn to scale No. 5; depress the red button and hold for a minimum of 15 seconds. The meter pointer will move to the right and must return within the range of the narrow black bar to the left. Readings other than within this narrow range indicate the condenser is leaking or shorted.



3. **Condenser Series Resistance — Scale No. 6:**
Turn the selector to scale No. 6. Clip the test leads together and zero the meter. The zero adjustment for scale No. 6 is located just above the selector switch. Connect the red test lead to the condenser terminal and the black test lead to the condenser body. The meter must be within the "ok green block" on scale No. 6.



ENGINE ELECTRICAL

Ignition — Graham—Lee Test Specifications

Coil No.	Maximum Secondary	Maximum Primary	(Point Test) Maximum Primary DC Ohms	Coil Index	**** Minimum Coil Test ****	Maximum Gap Index
3080270	10,000	5.5	.09	60	25	50
3080838	10,000	9.0	2.0	60	24	50
3081177**	10,000+	9.0	2.0	60	24	50
3081303	20,000	1.8	.45	60	18	50*
3081514	20,000	1.0	.45	60	19	50
3081602***	5,000	.4	.09	60	75 AMPLIFIED	50
3081603	20,000	4.5	.9	50	18	50
3081954	15,000+	.8	.7	50	16	50
3081974	10,000+	9.5	2.0	55	21	55
3081980	10,000	2.0	.25	50	13	50
3082974***	3,000+	.5	.15	50	70 AMPLIFIED	50

Condensers — All numbers to date — .22 to .30 Mfd.

*One end of secondary must be grounded to most convenient primary terminal.

**Twin ignition number but each coil is tested separately as a single coil.

***Set of three (3) coils with each coil tested separately as a single coil.

****On this list test limits for "Minimum Coil Test" are given with the secondary cable attached to coil. If secondary cable is removed, reduce test limit two (2) divisions.

+Test with RFI spark plug cap disconnected.

For use with all models Graham-Lee Coil and Condenser Testers.

GRAHAM—LEE ELECTRONICS, INC.
4220 Central Avenue Northeast
Minneapolis, Minnesota 55421

ENGINE ELECTRICAL

Graham—Lee Coil-Condenser Test Procedures

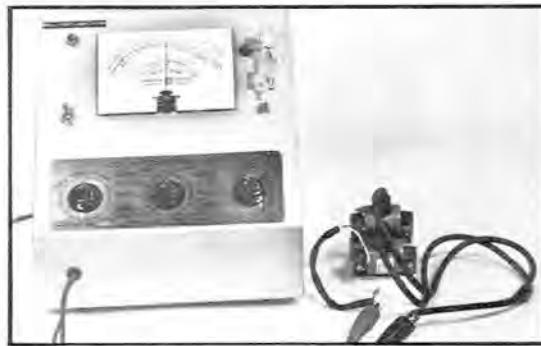
	TUBE LOCATION	TUBE TYPES	
LEAKAGE 	TOP OF CHASSIS OSCILLATOR  COIL  OSCILLATOR  THYRATRON	THYRATRON 2D21 or 2050 OSCILLATOR 6J5 OR 6J5GT CALIBRATE AFTER CHANGING TUBES	SECONDARY CONTINUITY 
SERIES RESISTANCE 	CALIBRATION Set SELECTOR SWITCH to "STAND-BY" Position, Turn LINE SWITCH "ON" and Allow Unit To Warm Up For At Least 10 Minutes. CALIBRATION of CAPACITY, SERIES RESISTANCE, LEAKAGE, SECONDARY CONTINUITY and PRIMARY CONTINUITY— 1. Short PRIMARY TEST LEADS By Clipping Together. 2. Turn SELECTOR SWITCH To "CAPACITY" and Note METER reading. Adjust CAPACITY Control Very Slowly Until the METER Pointer Lines Up With The RIGHT HAND End of The METER Scale. 3. Repeat With Other Tests, Finishing With PRIMARY CONTINUITY. 4. Open (Dis-connect) PRIMARY TEST LEADS. CALIBRATION of COIL INDEX— COIL INDEX IS PERMANENTLY CALIBRATED. ZERO ADJUSTMENT IS NOT REQUIRED. (SEE BELOW)		PRIMARY CONTINUITY 
CAPACITY 	COIL INDEX 		
SERIAL NO.	117 VOLTS A.C. 60 CYCLE		

With main selector switch in "Coil Index" position, this unit is calibrated so with normal voltage and a good 2D21 tube meter pointer will go off scale to right when coil index knob is turned to right as far as it will go and "coil tests" spring switch is turned "ON." If line voltage is low or tube is weak, meter reading may be below "100." This is OK if a steady meter reading of 90 or more can be obtained on top meter scale. To check "steadiness" of meter reading when pointer goes off scale, turn coil index knob back slightly to a reading between 95 and 100. If pointer is steady tube and circuits are good.

For maximum tube life, allow tester to "warm up" a couple of minutes before operating the spring switch on coil test. Also, do not hold spring switch "ON" for more than a few seconds at a time. A few seconds "ON" and a few seconds "OFF" is best.

There is a definite reason for the sequence or order of the tests. A coil or condenser must pass each test. Failure on any test in the sequence indicates replacement of the affected part.

POINT SYSTEMS SECONDARY COIL TESTS



Test No. 1 — Secondary Continuity

Connect the red test to the primary wire (red or white) of the coil to be tested. The black test lead is attached to the high tension lead of the coil to be tested. Refer to the Test Specifications in this manual for Maximum Secondary Ohms. The meter reading must be under maximum specified. No reading or a high reading indicates a defective coil.

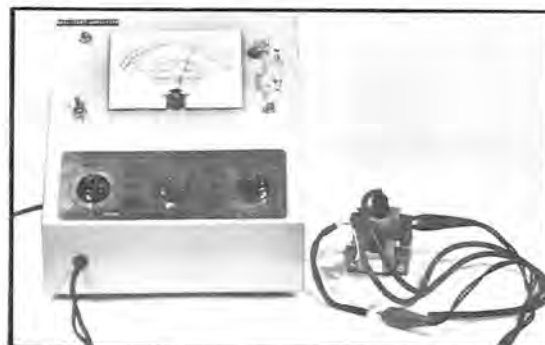
NOTE: Test all coils individually and take meter readings from secondary continuity scale.



Test No. 2 — Primary Continuity

Attach the red test lead to the primary wire of the coil to be tested and connect the black test lead to ground. Meter reading must not exceed specifications or coil is not fit for further service.

NOTE: The test circuit is powered by alternating current and resultant meter readings are of primary impedance. Do not confuse with the resistance readings obtained with an Ohmmeter.

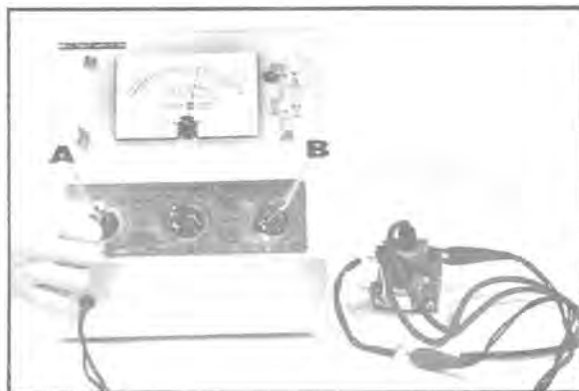


Test No. 3 — Point Test

Maximum primary DC ohms. The test leads are connected the same as for primary continuity. Readings above the maximum render the coil unusable.

ENGINE ELECTRICAL

Graham—Lee Coil Test Procedures



Coil Index Adjustment

Coil Index Adjustment — Look up the correct coil index setting for coil being tested. Test clips need not be disconnected when setting coil index. Hold the "Coil Tests" knob (A) in the "ON" position and adjust the "Coil Index" knob (B) until the meter reads the selected figure on the "Coil Index" scale. Release the "Coil Tests" knob and do not change index setting during the next test. The coil index setting determines the amount of primary firing power necessary to generate the required secondary open voltage.

CAUTION: Do not exceed the coil index specifications at any time.



Test No. 4 — Minimum Coil Firing Test
(Do not make this test on a metal bench)

Coil index setting must be correct. On this coil test there is nothing connected to the coil secondary terminal. Hold "Coil Test" knob and observe meter reading on "Coil Index" scale. Meter reading must remain steady at or above the figures given in the specifications under "Coil Test." Most good coils will read above the minimum test figures.



Test No. 5 — Gap Index Test
(Do not make this test on a metal bench)

This test uses practically the same procedure as the regular Coil Firing Test, except that the coil index setting is now called the gap index setting and the coil secondary is connected to and fires across the spark gap on the tester. Connect coil secondary to spark gap, using high tension lead and test probe. Look up the gap index setting and use this figure to set the coil index as described in the coil index adjustment. Fire the coil as described under Coil Firing — Test No. 4. Spark must jump the spark gap regularly. Observe the meter pointer. Regular firing is indicated by a steady pointer. The reading of the meter pointer is not important as long as the pointer remains steady. Missing or failure to jump the gap indicates a defective coil. Before discarding coil, make sure the spark gap points on the tester are clean. If you use a longer test probe lead than the one supplied with the tester, add a few points to the gap index specification (3 to 5) to compensate for the longer lead. Keep the spark gap clean, using a soft brush or cloth. Do not use abrasive materials. The electrodes are made of stainless steel and are factory set to close tolerances.

Test No. 6 — Check for Leaks on Coil Insulation and High Tension Lead:

Leave connected as previous test except the test probe connected to the spark gap. One end of this probe is disconnected from the high tension lead. Hold the "Coil Tests" knob on and run the probe up and down the high tension lead and over the coil. Any time a spark gap is jumped, this indicates a leak.

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Graham—Lee Coil Test Procedures

TWIN CYLINDER CDI COIL



Test No. 1 – Secondary Continuity

Place the scale selector switch to "Reverse – Secondary." Attach one test lead to each high tension lead on the coil as shown. Readings must be below the maximum specified. No reading or a high reading indicates a defective coil.



Test No. 2 – Primary Continuity

Place the scale selector to "Primary Continuity." Attach the red test lead to the orange primary lead on the coil and connect the black test lead to ground. Readings must not exceed the maximum specified.



Test No. 3 – Point Test

Maximum primary DC ohms. Connect the test leads the same as for primary continuity. Readings must be under the maximum specified.



Coil Index Adjustment

Coil Index Adjustment — Look up the correct coil index setting for coil being tested. Test clips need not be disconnected when setting coil index. Hold the "Coil Tests" knob (A) in the "ON" position and adjust the "Coil Index" knob (B) until the meter reads the selected figure on the "Coil Index" scale. Release the "Coil Tests" knob and do not change index setting during the next test. The coil index setting determines the amount of primary firing power necessary to generate the required secondary open voltage.

CAUTION: Do not exceed the coil index specifications at any time.



Test No. 4 — Minimum Coil Firing Test
(Do not make this test on a metal bench)

Turn the selector to "Coil Test." Hold "Coil Test" knob on and read meter. Readings should be at or above the minimum specified.

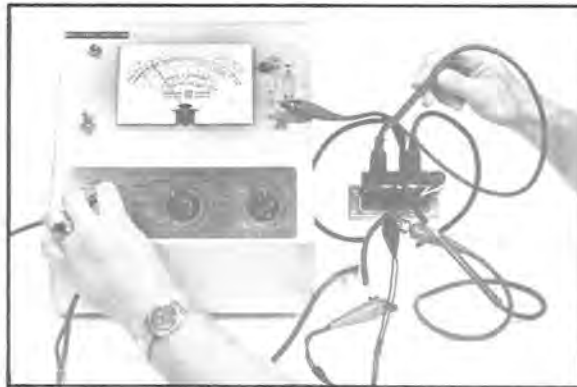
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Graham—Lee Coil Test Procedures



Test No. 5 — Gap Index Test
(Do not make this test on a metal bench)

Connect the red test lead to the orange primary on coil. Connect black test lead to ground. One test probe is connected to the spark gap and one high tension lead. Another test probe is connected to the other high tension lead and ground as shown. The gap index must be set to the proper specification. Hold the "Coil Tests" knob on and a steady spark must jump in the spark gap. The reading on the meter is not important as long as the pointer remains steady.



Test No. 6 — Check for Leaks on Coil Insulation
and High Tension Lead

Leave connected as above except the test probe is connected to the spark gap. One end of this probe is disconnected from the high tension lead. Hold the "Coil Tests" knob on and run the probe up and down the high tension lead and over the coil. Any time a spark gap is jumped, this indicates a leak.



Test No. 1 — Condenser Capacity

Test No. 1 — Condenser Capacity. Turn scale selector switch to "capacity" position. After this is done, attach one test clip to condenser terminal. Attach the other test clip to bracket on body of condenser. Lay condenser with clips attached on any dry insulated surface. Capacity is read directly in Micro-farads. Nominal capacity is .22 Micro-farads. An open condenser will be indicated by no reading. If condenser passes next two tests of Series Resistance and Condenser Leakage, it may be assumed that its capacity has not changed since manufacture. Sometimes a condenser may be of the capacity specified but the type of service may indicate a condenser of another capacity should be used. For instance, if an automobile is used in taxicab service with continual engine idling time, the capacity of the condenser should be higher than when the same vehicle is used mainly for high speed driving. An examination of the breaker points will indicate when a slightly different capacity condenser should be installed. If the negative breaker point is losing material or has a crater in it, the condenser capacity is too small. If the positive point is the one losing material, the capacity is too great.

Testing Condenser in Distributor or Magneto — Disconnect condenser from primary circuit, either at terminal or ground. If opened at ground, insulate the condenser body from the housing during tests. It is true that condensers may be tested by opening the breaker points alone, but results are not reliable. Attach one test clip to condenser terminal and attach other test clip to condenser case and use regular procedures in testing.

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Graham—Lee Condenser Test Procedures



Test No. 2 — Condenser Series Resistance

Test No. 2 — Condenser Series Resistance. Without disturbing connections made for Capacity Test, turn selector switch to "Series Resistance." Normal automotive and magneto condensers will show a meter reading of $1/2$ to $3/4$ OHMS. Meter reading over 1 OHM indicates high series resistance and the condenser should be replaced. Series Resistance is an important test and must not be confused with the Condenser Leakage Test where the results are also given in terms of resistance. Measurements in the Condenser Leakage test are made with a high voltage, filtered direct current. Meter readings are in MEGOHMS (millions of ohms) and indicate the amount of resistance in the insulation to the passage of current between the terminal side of the condenser and ground. This insulation consists of the paper between the foil layers, the impregnating compound and the bushing where the terminal comes out. The Series Resistance test uses an oscillating circuit tuned to approximately 1600 Kilocycles. The meter readings indicate any resistance to the flow of current into and out of the condenser. Sometimes a condenser will fail on the first Series Resistance Test and after passing Leakage Test will then pass on a Re-Test of Series Resistance. Do not be confused by this. The condenser should still be discarded. Just be sure the tester itself is properly zeroed in for the first test. Any high Series Resistance indication will then be in the condenser.



Test No. 3 — Condenser Leakage

Test No. 3 — Condenser Leakage. Without disturbing connections after Series Resistance Test, turn selector switch to "Condenser Leakage." Meter will come to rest at some point on the "Leakage in Megohms" scale which will indicate the amount of insulation resistance to leakage. A shorted condenser will cause the meter pointer reading to the extreme right. A good condenser, at room temperature (80° F) is indicated by the meter pointer returning to between 20 megohms and infinity as the condenser becomes fully charged. If the meter shows readings of less than 20 megohms, the condenser should be heated and re-tested. Heat it by the best means available to operating temperature (about 180° F). If it is inconvenient or impossible to heat the condenser, it should be replaced. After heating, the condenser should show resistance equal to or higher than that called for in the specifications. Where no figure is given a minimum resistance of 2 Megohms may be used. Turning selector switch off Condenser Leakage in either direction drains high voltage charge so that condenser will not shock.

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Graham—Lee Rectifier Test Procedures



Figure 1 — Forward Test

Rectifier Tests (Model 51-R Only)

Forward Test — Turn selector switch to "Forward." Connect test clips so meter reads up. The better the rectifier, the higher the reading on top meter scale. Alternating current is applied at the test leads. When testing full wave type rectifiers, test one side at a time. Both sides must test "Good." Suggested minimum on top scale — 85. There is no "zero adjust" for this test.



Figure 2 — Reverse Test

Reverse Test — Without changing connections, turn selector switch to "Reverse." On this test direct current is applied at the test leads. To set "Zero," clip leads together and adjust proper potentiometer at back of tester so meter reads "100." Test clips are connected the same as for Forward Test. Make Forward Test first to determine correct polarity. Suggested maximum on top scale for this test is "85." This is for the larger plate type rectifiers. For the smaller rectifiers and diodes, the maximum will be much lower — in some cases 5 may be the maximum permissible.

ENGINE ELECTRICAL
Graham-Lee Model 31 Single Coil Testing

TEST PROCEDURES

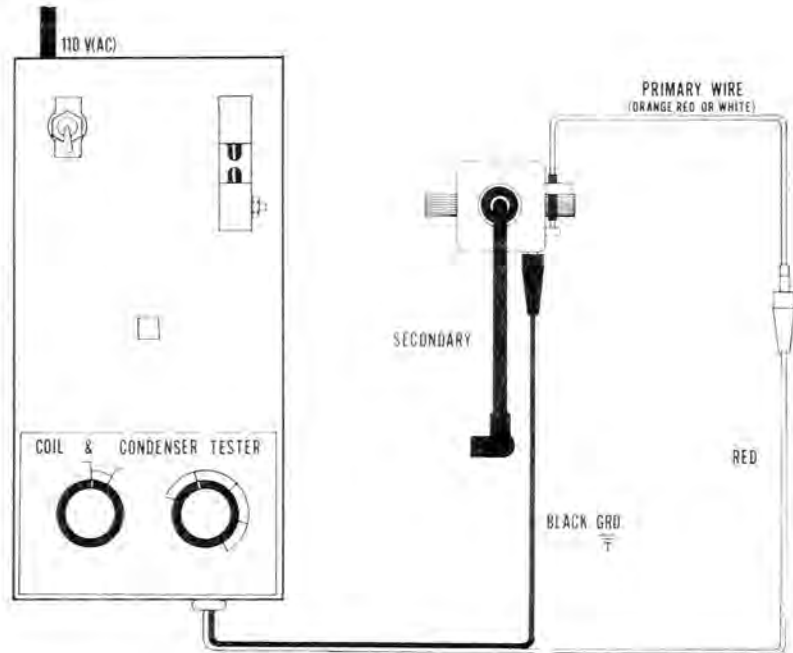
The test hookups are given below and on following page. Individual coil part numbers by model are given on page 26 of this section. Graham-Lee test specifications are given on page 31 of this section.

Test Number 1

Primary Continuity

- a. Connect test leads to coil as shown.
- b. Plug tester into 110 V (AC) outlet.
- c. Turn tester on.
- d. Test light should come on and remain bright.
- e. If test light does not come on or is dim the primary windings or primary wire has an open or partial open.

Note: On some coils there will be a black wire for ground. This wire is used for ground hookup.

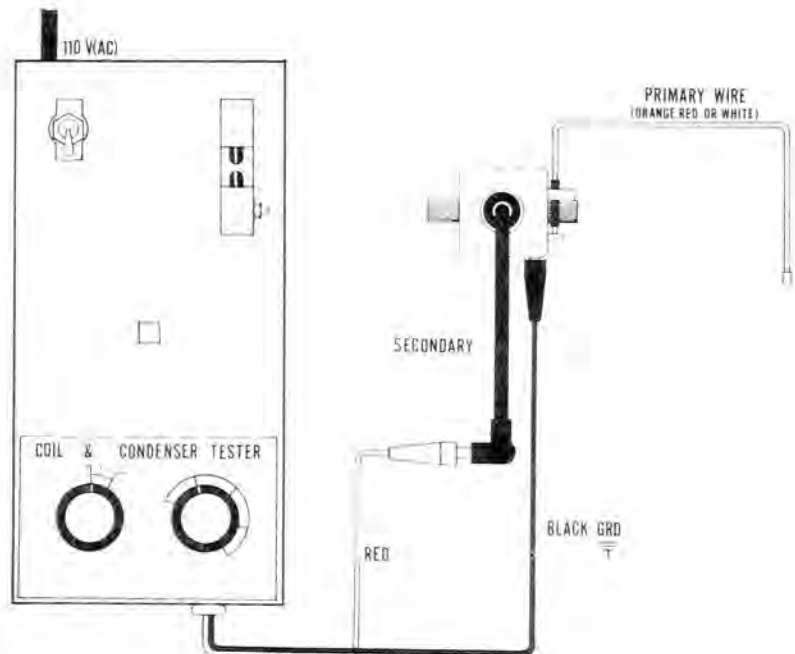


Test Number 2

Secondary Continuity

- a. Connect test leads to coil as shown.
- b. Plug tester into 110 V (AC) outlet.
- c. Turn tester on.
- d. Test light should come on and remain bright.
- e. If test light does not come on or is dim the secondary windings or secondary cable has an open or partial open.

Note: This test should be made with RFI cap removed. RFI cap should be tested with an ohmmeter and reinstalled for next test. Acceptable RFI cap readings are from 3700 to 6500 ohms.



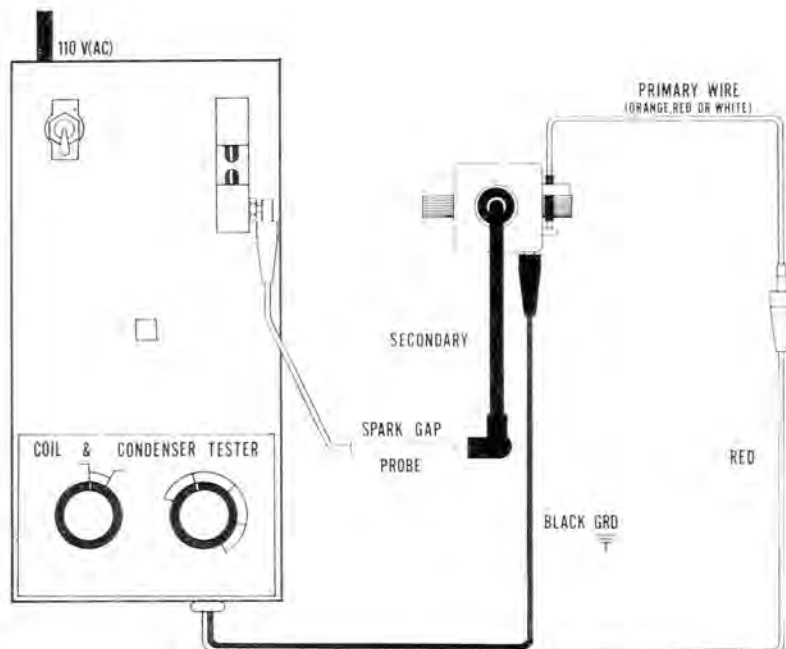
ENGINE ELECTRICAL

Graham-Lee Model 31 Single Coil Testing

Test Number 3

Coil Power Test

- Connect test leads as shown.
- Plug tester into 110 V (AC) outlet.
- Determine coil part number and coil index setting, pages 26 and 31 of this section.
- With coil index set in the correct position turn coil test spring switch and observe gap firing.
- If the spark is regular and not intermittent the coil has passed this test.

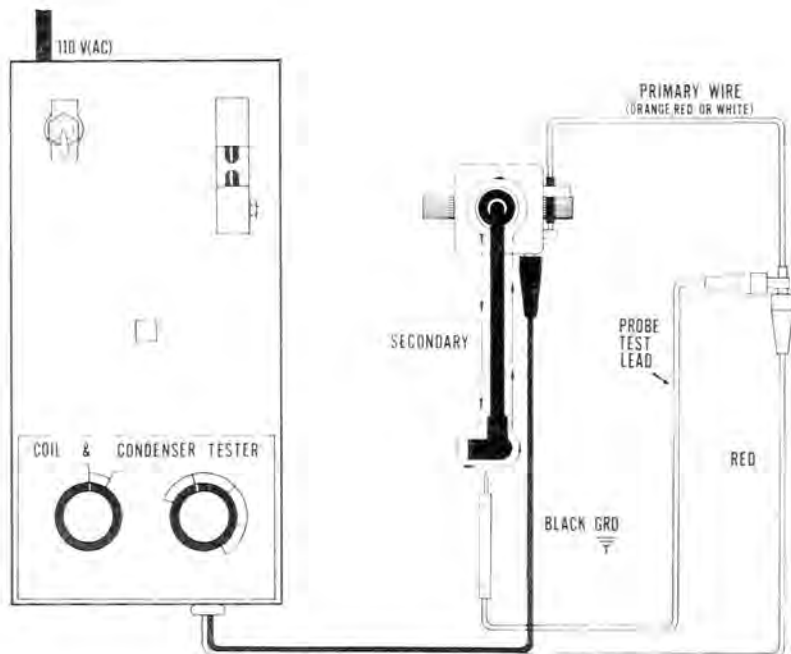


Test Number 4

Coil Leakage Test

- Connect test leads as shown.
- Plug tester into 110 V (AC) outlet.
- With coil index set to above spec. turn the coil test spring switch and follow the secondary cable to the base of coil and around the cable end boots.
- There should be no leakage from coil, secondary cable, or insulated cable ends.

Note: For maximum tester life allow a two minute warm up and do not hold the spring switch in ON position for more than a few seconds. A few seconds on and a few seconds off is best.



ENGINE ELECTRICAL
Graham-Lee Model 31 Twin Coil Testing

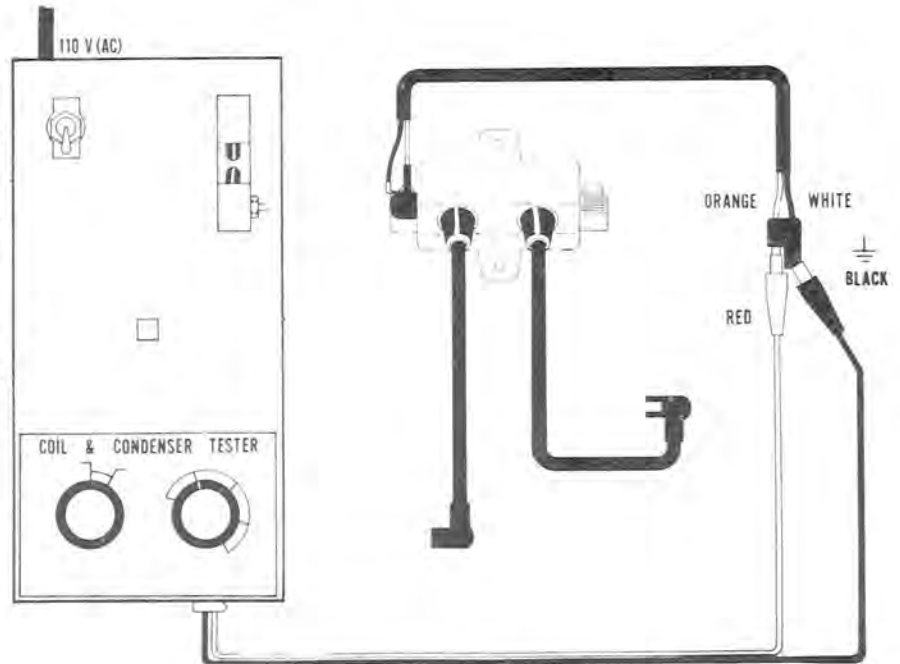
TEST PROCEDURES

The test hookups are given below and on following page. Individual coil part numbers by model are given on page 26 of this section. Graham-Lee test specifications are given on page 31 of this section.

Test Number 1

Primary Continuity

- a. Connect test leads to coil as shown and plug tester in.
- b. Turn tester on and observe test light.
- c. Test light should come on and remain bright.
- d. If test light does not come on or is dim the primary windings or primary wire has an open or partial open.

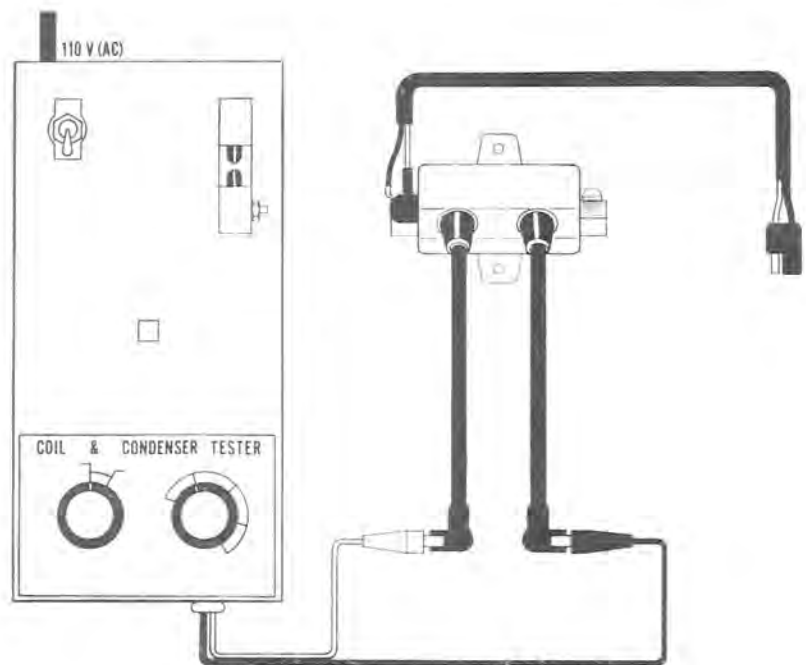


Test Number 2

Secondary Continuity

- a. Connect test leads to coil as shown and plug tester in.
- b. Turn tester on and observe test light.
- c. Test light should come on and remain bright.
- d. If test light does not come on or is dim the secondary windings or cables have an open or partial open.

Note: This test should be made with RFI caps removed. RFI caps should be tested with an ohmeter and reinstalled for next test. Acceptable RFI cap readings are from 3700 to 6500 ohms.



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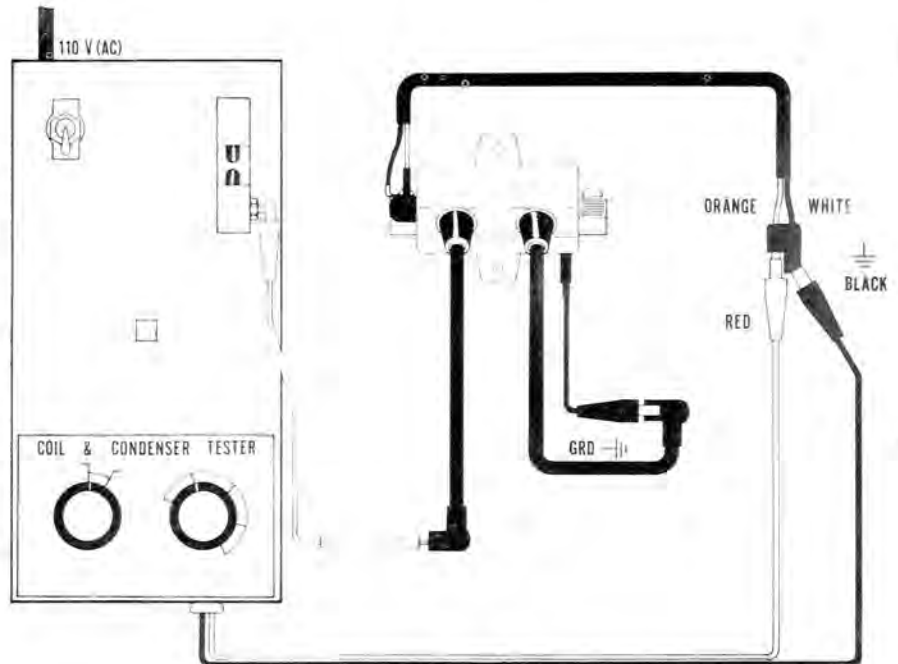
Graham-Lee Model 31 Twin Coil Testing

Test Number 3

Coil Power Test

- Connect test leads as shown and plug tester in.
- Determine coil part number and coil index setting, pages 26 and 31 of this section.
- With coil index set in correct position turn coil test spring switch and observe gap firing.
- If spark is regular and not intermittent the coil has passed this test.

Note: One secondary cable must be grounded.

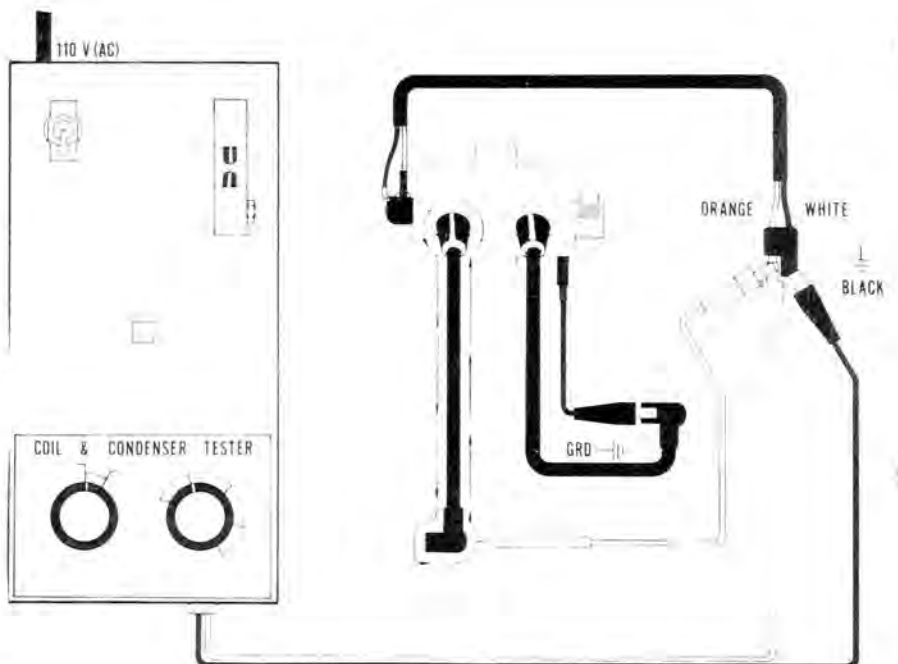


Test Number 4

Coil Leakage Test

- Connect test leads as shown.
Note: One secondary cable is grounded.
- With coil index set to above spec. turn the coil test spring switch and follow the secondary cable with spark probe lead as shown.
- Now ground the opposite secondary cable and make the same path with probe tester on the ungrounded cable.
- If leakage is evident, the failing part must be replaced.

The spring switch should be held in to on position for short periods only. A few seconds on and a few seconds off is best.



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CDI Diagnostic Test Sequence

CONDITION

1. Weak (yellow) or no spark at spark plugs
- 2* Failure to arc 3/8" needle gap
3. Hard starting
4. Plug fouling
5. Misfire
6. Loss of power

* To prevent an inaccurate test when checking 3 cylinder engines it is important to test one secondary cable only and keep the remaining two connected to the spark plugs.

Ignition
Switches
Disconnect - Test

Auxiliary
Kill

Master
Switch

INSPECT

Wire Harness
Connector Junction Blocks
Corroded Terminals

Stator to
CDI Box

CDI Box
to Sec. Coil

Stator Plate
Resistance Test

Exciter Coil

Pulser Coil

Secondary Coil
Test

Secondary
Resistance

Primary
Resistance

Coil Power
Test

High Tension
Cable Leakage

CDI Control
Box

Replace

ENGINE ELECTRICAL

Magneto Point Ignition Diagnostic Test Sequence

