ELECTRICAL

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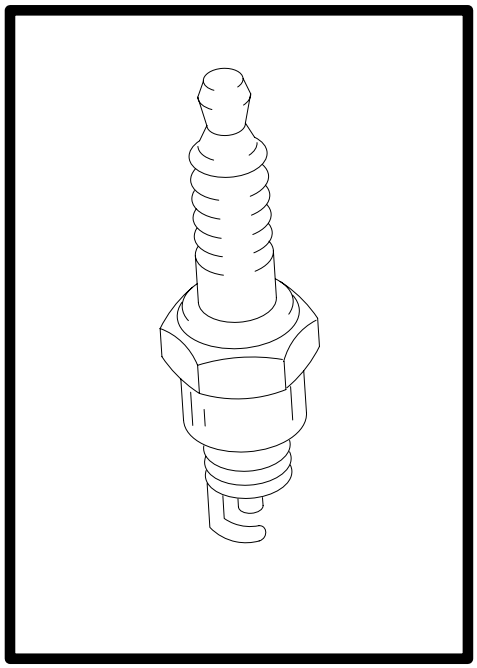


IGNITION

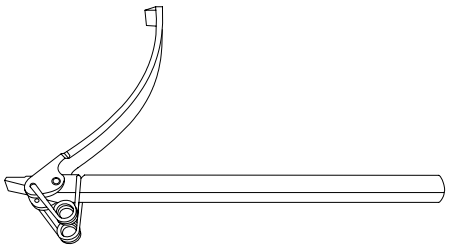
Table of Contents

Specifications

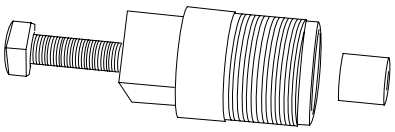
IGNITION SYSTEM	**Type** **Spark Plug Type (NGK)** **Spark Plug Gap** **Optional Plug (NGK)** **Spark Plug Gap** **Firing Order**	Capacitor Discharge BP8H-N-10 0.040 in. (1.0mm) BPZ8H-N-10* 0.040 in. (1.0mm) 1-2
TIMING SPECIFICATIONS	**Models With (S/N-0G589999 & Below) Idle** **Maximum BTDC @ 2500-5500 RPM (Not Adjustable)**	3° BTDC ± 3° (Not Adjustable) 25° BTDC ± 3°
	Models With (S/N-0G590000 & Above) Idle **Maximum Spark Advance**	8° BDTC ± 1° 1 Turn Clockwise After Contacting Throttle Plate

Special Tools

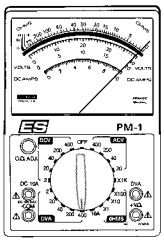
1. Flywheel Holder 91-52344



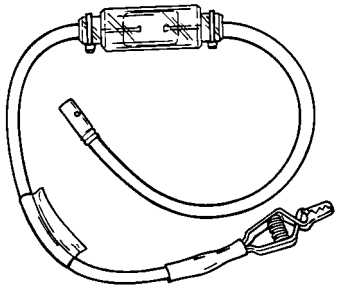
2. Flywheel Puller 91-73687A1



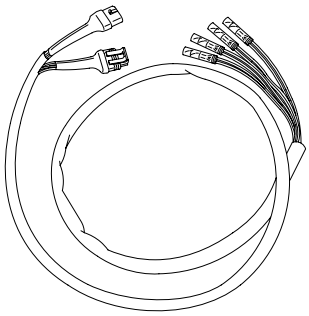
3. Volt/Ohm/DVA Meter 91-99750



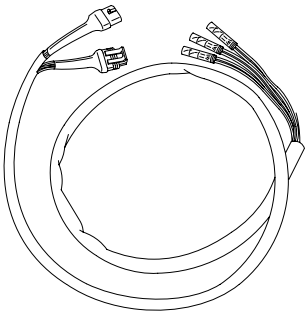
4. Spark Gap Tester 91-63998A1



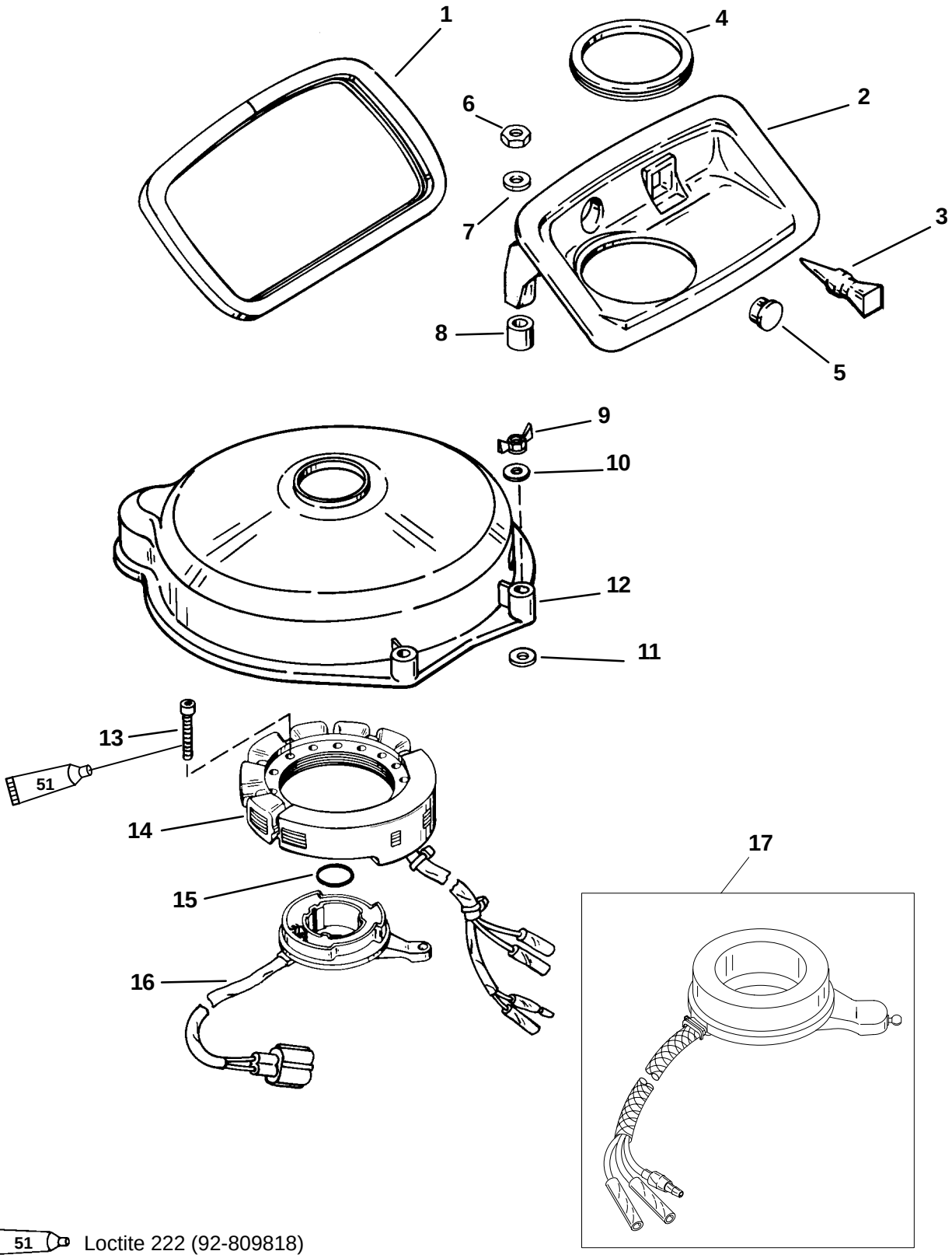
5. TPI/CDM Test Harness 84-825207A1 (S/N-0G589999 & Below)



6. TPI/CDM Test Harness 84-825207A2 (S/N-0G590000 & Above)



STATOR/TRIGGER (ELECTRIC MODELS)

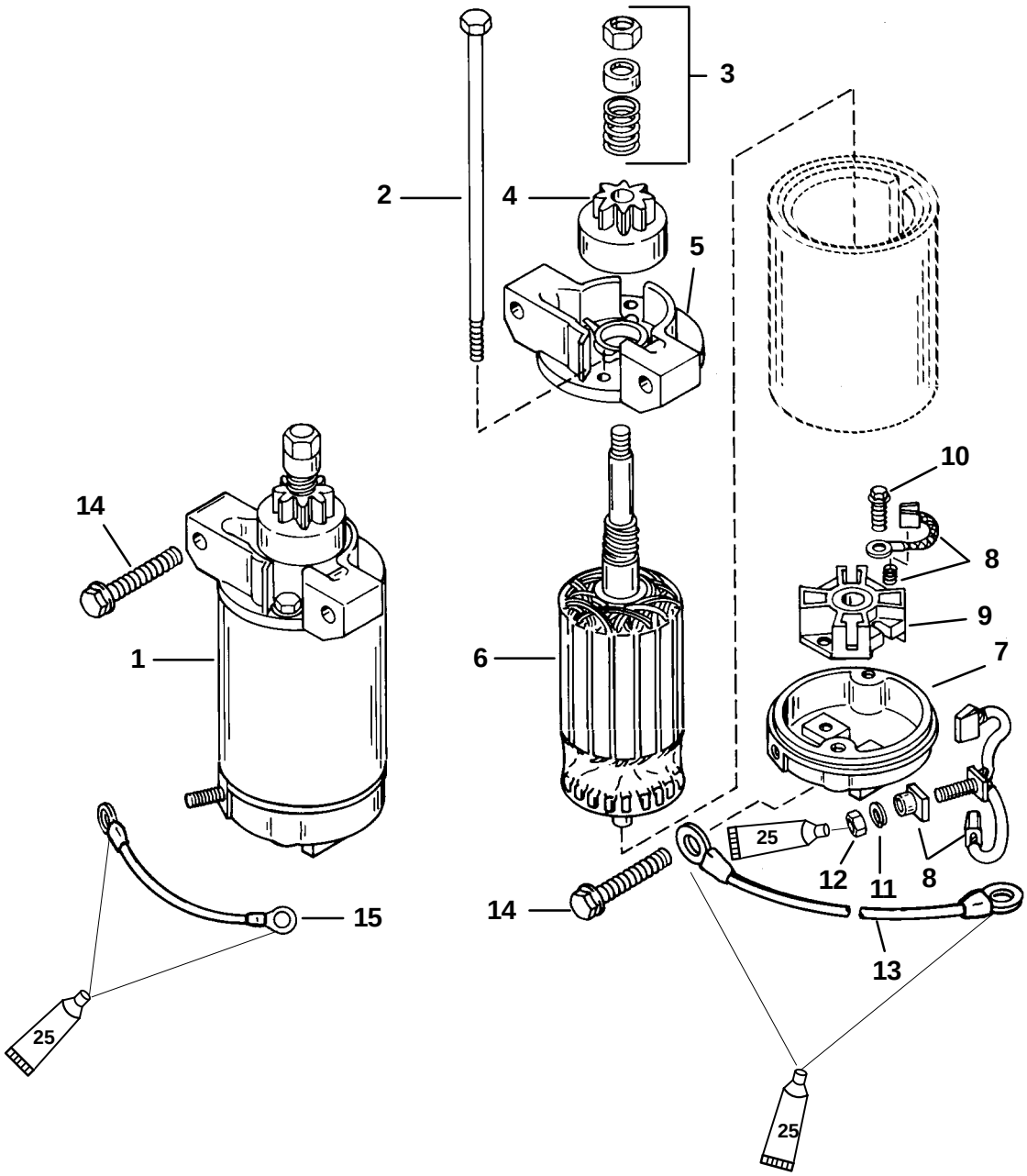


51 Loctite 222 (92-809818)

STATOR/TRIGGER (ELECTRIC MODELS)

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	SEAL–Rest (Use where applicable)			
2	1	REST (OIL INJECTION) **I.D. of rest rope hole is 1/4 IN.**			
3	1	PLUG–Starter Handle			
2	1	REST KIT **I.D. of rest rope hole is 1/3 IN.**			
3	1	PLUG–Starter Handle			
4	1	GROMMET–Oil Tank			
5	1	PLUG–Primer Hole			
6	2	NUT (M6 x 1)			
7	2	WASHER			
8	2	SPACER			
9	4	WING NUT			
10	4	WASHER			
11	4	WASHER (Neoprene)			
12	1	COVER–Flywheel			
13	5	SCREW (M5 x 30)	50		5.6
14	1	STATOR			
15	1	O RING **(S/N-USA-0G589999/BEL-9973099 & BELOW)**			
16	1	TRIGGER ASSEMBLY			
17	1	TRIGGER ASSEMBLY **(S/N-USA-0G590000/BEL-9973100 & ABOVE)**			

Starter Motor Components

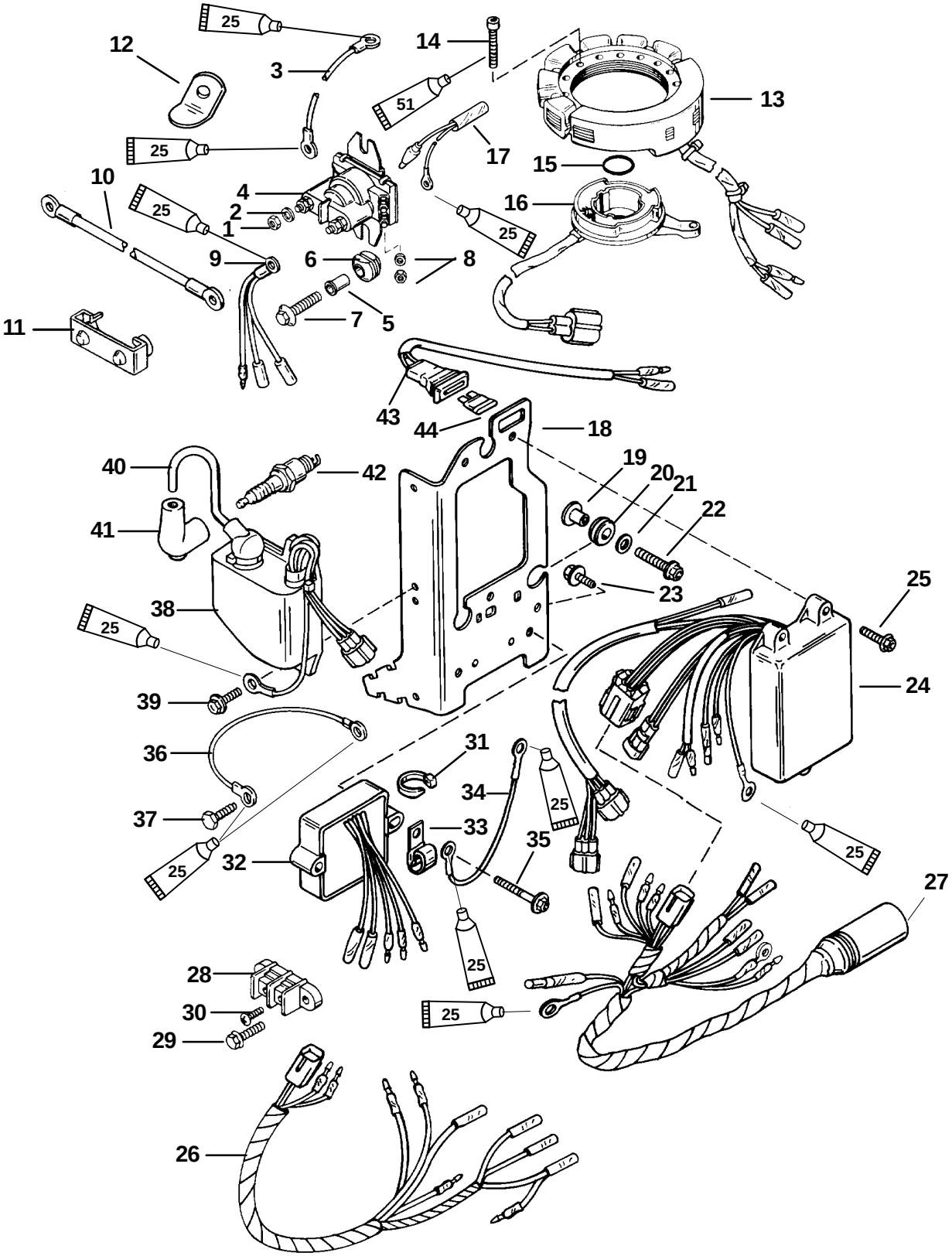


25 Liquid Neoprene (92-25711--2)

Starter Motor Components

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	STARTER MOTOR			
2	1	THRU BOLT	70		7.9
3	1	DRIVE KIT			
4	1	DRIVE ASSEMBLY			
5	1	DRIVE CAP			
6	1	ARMATURE			
7	1	COMMUTATOR CAP			
8	1	BRUSH & SPRING KIT			
9	1	BRUSH HOLDER			
10	2	SCREW			
11	1	LOCKWASHER			
12	1	NUT (1/4-20)	60		6.8
13	1	BATTERY CABLE (5/16) **(POSITIVE)**			
14	3	SCREW (M8 x 45)		16.5	22.3
15	1	CABLE (BLACK–6 IN. – 1/4 IN. Terminals)			

ELECTRICAL COMPONENTS (S/N-0G380074/ BEL-MANUAL-9928507/BEL-ELEC-9928480 & Below)



25 Liquid Neoprene (92-25711--2)

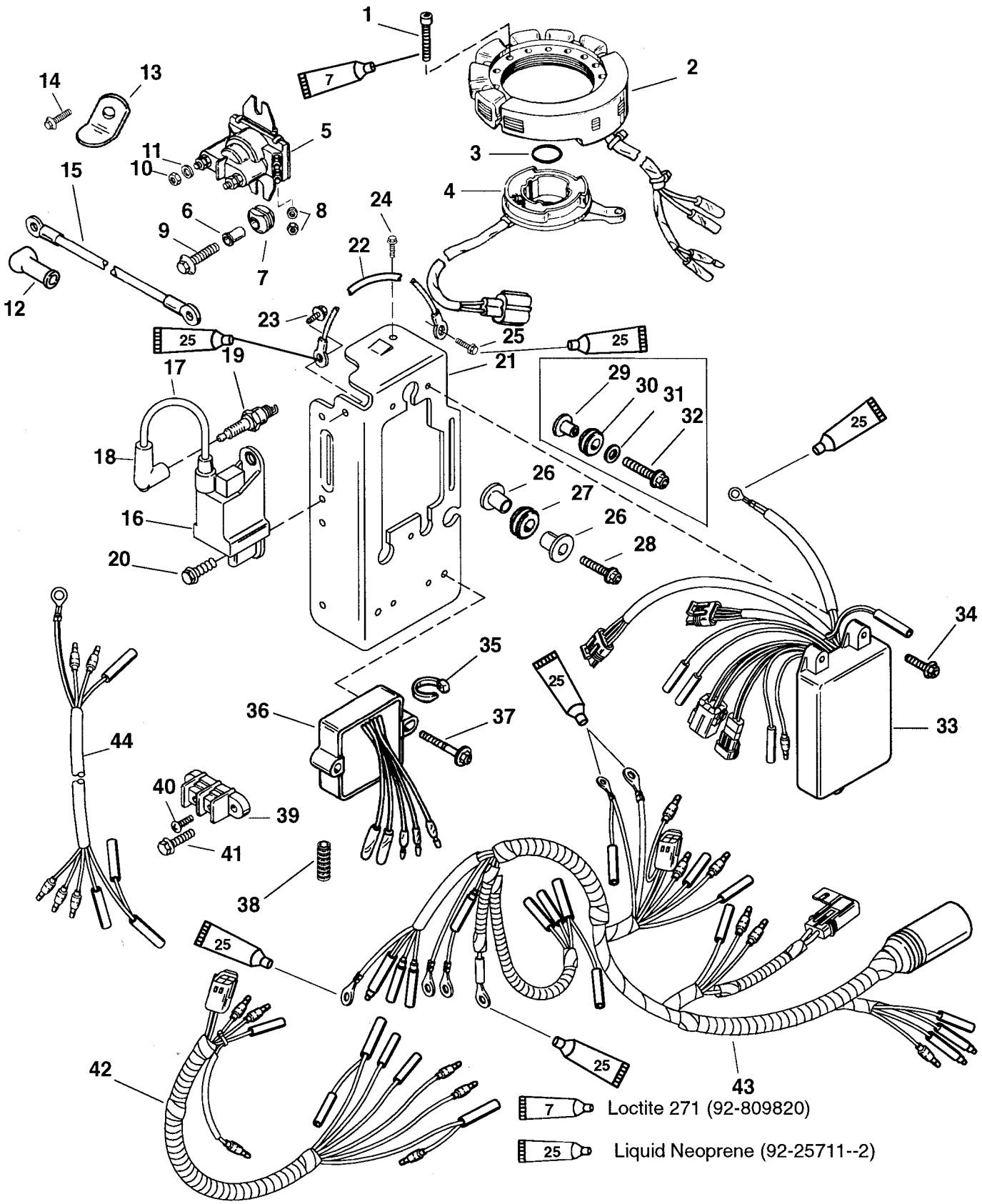
51 Loctite “222” Small Screw Threadlocker (92-809818)

Note: Apply Liquid Neoprene to all ring eyelet wiring terminals.

S/N-0G380074/BEL-MAN-9928507/BEL-ELEC-9928480 & Below

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	2	NUT (1/4-20)	50		5.6
2	2	LOCKWASHER			
3	1	CABLE ASSEMBLY (BLACK–4 IN.)			
4	1	SOLENOID ASSEMBLY			
5	1	BUSHING **ELECTRIC**			
6	1	GROMMET			
7	2	SCREW (M6 x 25)	40		4.5
8	2	NUT (8–32)	20		2.3
9	1	CABLE (RED) **ELECTRIC**			
10	1	BATTERY CABLE **(NEGATIVE)**			
11	1	INSULATOR			
12	1	RETAINER			
13	1	STATOR **(MANUAL)**			
14	5	SCREW (M5 x 30)	50		5.6
15	1	O RING			
16	1	TRIGGER			
17	1	HARNESS ASSEMBLY			
18	1	PLATE–Electrical			
19	3	BUSHING–Flanged			
20	3	GROMMET			
21	3	WASHER			
22	3	SCREW (M6 x 25)	100		11.3
23	1	SCREW (M6 x 14)	Drive Tight		
24	1	TPM ASSEMBLY			
25	3	SCREW (M5 x 20)	80		9.0
26	1	HARNESS ASSEMBLY–Engine **(MANUAL)**			
27	1	HARNESS ASSEMBLY–Engine **(ELECTRIC)**			
28	1	TERMINAL BLOCK			
29	2	SCREW (M5 x 12) **MANUAL**			
30	2	SCREW (10–16 x 3/8 IN.)			
31	AR	STA–STRAP			
32	1	VOLTAGE REGULATOR			
33	1	J–CLIP **ELECTRIC**			
34	1	CABLE **(BLACK–11 IN.)**			
35	2	SCREW (M6 x 35)	80		9.0
36	1	CABLE (BLACK–9 IN.)			
37	1	SCREW (10-16 x 3/5 IN.)			
38	2	CDM ASSEMBLY			
39	4	SCREW (M6 x 14)	80		9.0
40	2	HI–TENSION CABLE KIT			
41	2	BOOT KIT			
42	2	SPARK PLUG (NGK# BP8H-N-10)	240	20	27.1
42	2	SPARK PLUG (NGK# BPZ-8H-N-10)	240	20	27.1
43	1	SOCKET ASSEMBLY–FUSE **ELECTRIC**			
44	1	FUSE			

ELECTRICAL (S/N-USA-0G380075 Thru 0G589999/ BEL-MANUAL-9928508/BEL-ELEC-9928481 THRU 9973099)

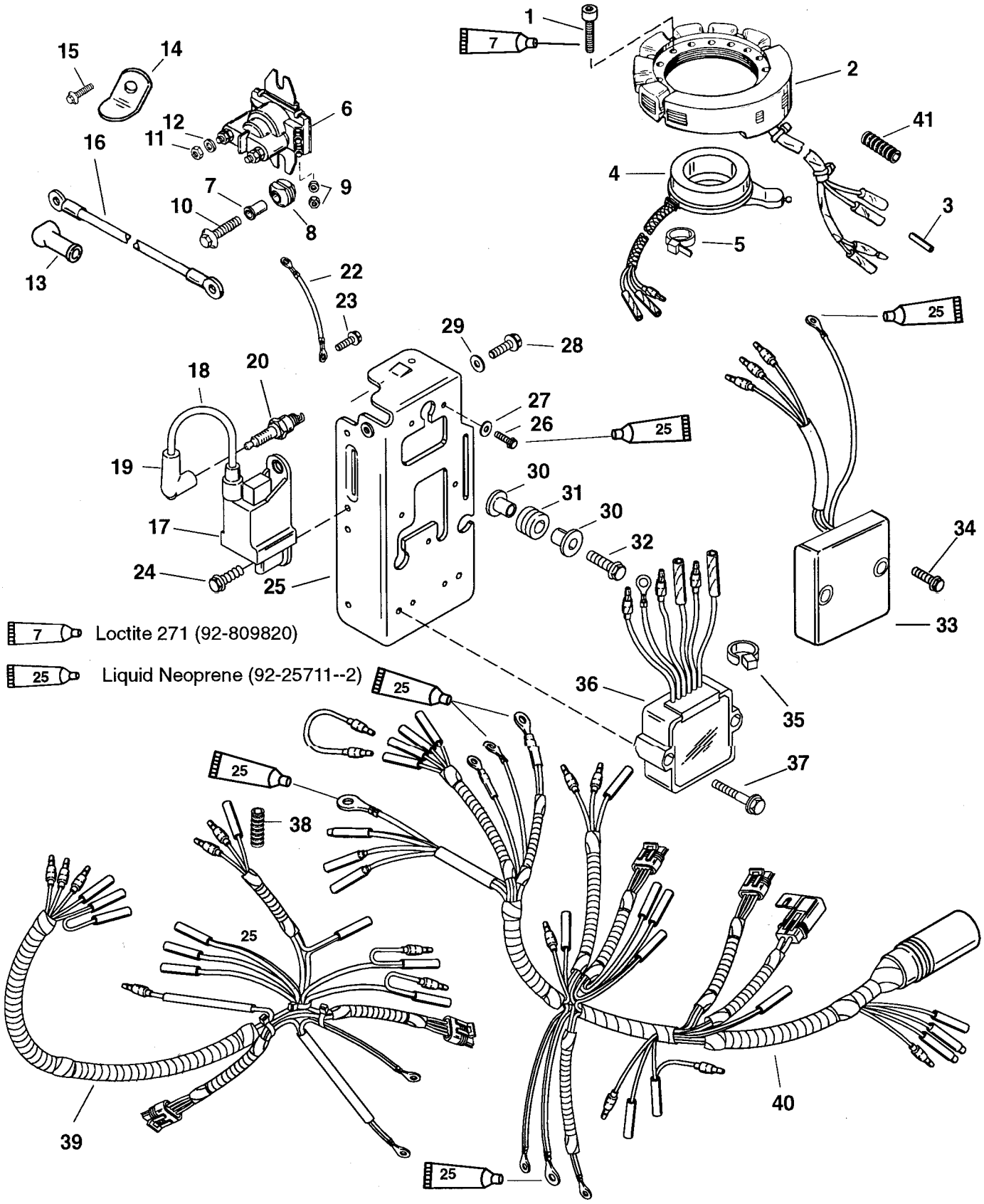


NOTE: APPLY LIQUID NEOPRENE TO ALL RING END WIRING TERMINALS.

ELECTRICAL (S/N-USA-0G380075 THRU 0G589999/ BEL-MANUAL-9928508/BEL-ELEC-9928481 THRU 9973099)

REF. NO.	QTY.	DESCRIPTION	TORQUE lb. in.	TORQUE lb. ft.	TORQUE N·m
1	5	SCREW (M5 x 30) **MANUAL**	50		5.6
2	1	STATOR			
3	1	O RING			
4	1	TRIGGER			
5	1	SOLENOID ASSEMBLY			
6	2	BUSHING			
7	2	GROMMET			
8	2	NUT (8-32)			
9	2	SCREW (M6 x 25) **ELECTRIC**	40		4.5
10	2	NUT (1/4-20)	50		5.6
11	2	LOCKWASHER			
12	1	INSULATOR (RED)			
13	1	RETAINER (ELECTRIC HANDLE)			
14	1	SCREW			
15	1	BATTERY CABLE (NEGATIVE–ELECTRIC)			
16	2	CDM ASSEMBLY			
17	2	HI-TENSION CABLE			
18	1	BOOT			
19	2	SPARK PLUG (NGK# BP8H-N-10)	240	20	27.1
	2	SPARK PLUG (NGK#BPZ–8H–N–10)	240	20	27.1
20	4	SCREW (M6 x 14)	80		9.0
21	1	PLATE–Electrical			
22	1	CABLE (MANUAL)			
23	1	SCREW (M6 x 14)	80		9.0
24	1	SCREW (M5 x 12)(ELECTRIC)			
25	1	SCREW (M8 x 12)(MANUAL)			
26	6	BUSHING			
27	3	GROMMET **DESIGN I**			
28	3	SCREW (M6 x 30)			
29	3	BUSHING–Flanged			
30	3	GROMMET **DESIGN II**			
31	3	WASHER			
32	3	SCREW (M6 x 35)	100		11.3
33	1	TPM ASSEMBLY			
34	3	SCREW (M5 x 20)	80		9.0
35	3	STA–STRAP			
36	1	VOLTAGE REGULATOR **ELECTRIC**			
37	2	SCREW (M6 x 35)	80		9.0
38	1	CONDUIT			
39	1	TERMINAL BLOCK			
40	2	SCREW (10–16 x 3/8 IN.) **MANUAL**			
41	2	SCREW (M5 x 12)			
42	1	HARNESS ASSEMBLY–Engine **(MANUAL)**			
43	1	HARNESS ASSEMBLY–Engine **(ELECTRIC)**			
44	1	HARNESS **(ELECTRIC)**			

ELECTRICAL COMPONENTS
(S/N-USA-0G590000/ BEL-9973100 & Above)



NOTE: APPLY LIQUID NEOPRENE TO ALL RING END WIRING TERMINALS.

ELECTRICAL COMPONENTS (S/N-USA-0G590000/BEL-9973100 & ABOVE)

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	5	SCREW (M5 x 30)	50		5.6
2	1	STATOR **MANUAL**			
3	2	PLUG			
4	1	TRIGGER			
5	1	CABLE TIE (4 IN.)			
6	1	SOLENOID ASSEMBLY			
7	2	BUSHING			
8	2	GROMMET			
9	2	NUT (8-32)			
10	2	SCREW (M6 x 25) **ELECTRIC**	40		4.5
11	2	NUT (1/4-20)	50		5.6
12	2	LOCKWASHER			
13	1	INSULATOR (RED)			
14	1	RETAINER **(ELECTRIC HANDLE)**			
15	1	SCREW			
16	1	BATTERY CABLE (NEGATIVE–ELECTRIC)			
17	2	CDM ASSEMBLY			
18	2	HI-TENSION CABLE			
19	1	BOOT			
20	2	SPARK PLUG (NGK# BP8H-N-10)	240	20	27.1
21	2	SPARK PLUG (NGK#BPZ–8H–N–10)	240	20	27.1
22	1	CABLE **MANUAL**			
23	1	SCREW (M8 x 12)			
24	4	SCREW (M6 x 14)	60		6.7
25	1	PLATE–Electrical			
26	1	SCREW (M5 x 12)	60		6.7
27	1	WASHER			
28	1	SCREW (M6 x 14)	60		6.7
29	1	WASHER			
30	6	BUSHING			
31	3	GROMMET			
32	3	SCREW (M6 x 30)			
33	1	REV LIMITER **(MANUAL)**			
	1	REV LIMITER **(ELECTRIC)**			
34	2	SCREW (M6 x 25)	30		3.4
35	4	STA–STRAP (8 IN.)			
36	1	VOLTAGE REGULATOR			
37	2	SCREW (M6 x 35) **ELECTRIC**	60		6.7
38	1	CONDUIT			
39	1	HARNESS ASSEMBLY–Engine **(MANUAL)**			
40	1	HARNESS ASSEMBLY–Engine **(ELECTRIC)**			
41	1	CONDUIT			
	1	**POWERHEAD**			

Theory of Operation

The ignition system is alternator-driven with distributor-less capacitor discharge. Major components of the ignition system are the flywheel, stator, trigger, timing protection module (TPM), capacitor discharge modules (CDM) and spark plugs.

The stator assembly is mounted stationary below the flywheel and has 2 (red stator has 3) capacitor charging coils wound in series. The flywheel is fitted with 6 permanent magnets inside the outer rim. As the flywheel rotates the permanent magnets pass the capacitor charging coils causing the coils to produce AC voltage (230 - 330 volts). The AC voltage then is conducted to the capacitor discharge module (CDM) where it is rectified and stored in a capacitor. Part of the stator voltage (20 - 25 volts) is sent to the timing protection module (TPM) to power the timing circuit.

The trigger assembly (also mounted under the flywheel) has 1 coil. The flywheel has a another permanent magnet located around the center hub. As the flywheel rotates, this hub magnet passes the trigger coil. This causes the trigger coil to produce a AC voltage pulse which is sent to the TPM. The TPM delays this signal depending on engine RPM and forwards a trigger signal to a electronic switch (SCR) within the CDM.

The SCR switch discharges the stored voltage of the capacitor into the primary side of the CDM's ignition coil.

Capacitor voltage within the CDM is amplified as high as 45000 volts to jump the gap at the spark plug.

The preceding sequence occurs once-per-engine-revolution for each cylinder.

Spark timing is changed (advanced/retarded) electronically by the TPM monitoring trigger pulses.

IMPORTANT: If the engine misfires, runs rough or does not start, the ignition system should be checked using a Multi-Meter/DVA Tester (91-99750), or a voltmeter (capable of measuring 400 volts DC, or higher) and Direct Voltage Adaptor (91-89045).

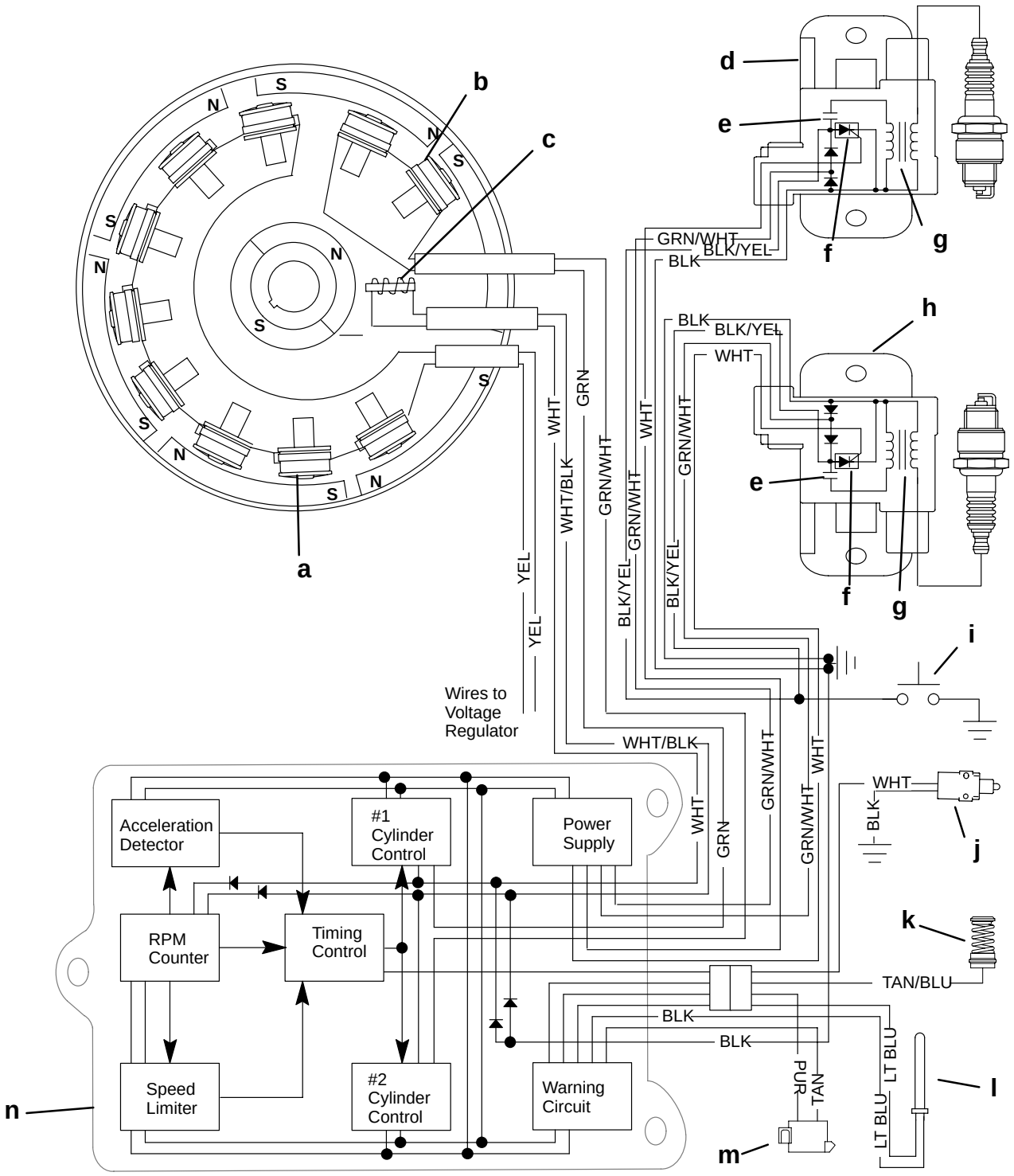
Ignition Component Description

Principle of Operation with Timing Protection Module (TPM)

Under normal circumstances, the TPM controls:

1. Spark timing by monitoring the trigger pulses and engine temperature.
2. Advances spark timing quickly to 25° BTDC under hard acceleration conditions.
3. Provides over-speed protection if engine RPM exceeds 5800. This occurs in 2 stages. Initially, timing is retarded from 25° BTDC to 14° BTDC. If RPM continues to increase above 6500, TPM will shut ignition off momentarily until RPM drops below 6500.
4. Provides an idle stabilizer function by advancing timing when engine RPM drops below 600. At crank speed of 300 RPM, timing can be as high as 10° BTDC.
5. Provides warning control of OVER-HEAT and LOW-OIL conditions. Warning is provided through activation of a continuous tone warning horn for either condition. An OVER-HEAT condition occurs when engine temperature rises above 190° F ± 8° (88° C ± 13°). The TPM will intermittently interrupt the ignition voltage to the capacitor discharge modules (CDM) to reduce maximum RPM to approximately 2500. The RPM will be limited and the warning horn will activate until engine temperature drops below 170° F ± 8° (77° C ± 13°).
   During a LOW-OIL condition, the TPM activates the warning horn when switch in engine-mounted oil tank is shorted to ground (closed). Engine RPM is NOT limited during a LOW-OIL condition.

Mercury/Mariner 30/40 (2 cyl.) ADI IGNITION SYSTEM (With Electronic Spark Advance)



a - Battery Charging Coils (8)
b - Ignition Charge Coils (2)
c - Trigger
d - CDM #1
e - Capacitor
f - SCR
g - Coil
h - CDM #2
i - Stop Switch
j - Neutral Start Switch
k - Temperature Sender
l - Low Oil Switch
m - Warning Horn
n - Timing & Protection Module

Principle Of Operation, CDM without Timing Protection Module (TPM)

The ignition system is alternator-driven with distributor-less capacitor discharge. Major components of the ignition system are the flywheel, stator, trigger, capacitor discharge modules (CDM and spark plugs.

The stator assembly is mounted stationary below the flywheel and has 3 capacitor charging coils wound in series. The flywheel is fitted with 6 permanent magnets inside the outer rim. As the flywheel rotates the permanent magnets pass the capacitor charging coils causing the coils to produce AC voltage (**260 - 320** volts). The AC voltage then is conducted to the capacitor discharge module (CDM) where it is rectified and stored in a capacitor.

The trigger assembly (also mounted under the flywheel) has 2 coil. The flywheel has another permanent magnet located around the center hub. As the flywheel rotates, the magnet passes the trigger coil. This causes the trigger coil to produce a AC voltage pulse which is sent to an electronic switch (SCR) within the CDM.

The SCR switch discharges the stored voltage of the capacitor into the primary side of the CDM's ignition coil.

Capacitor voltage within the CDM is amplified as high as 45000 volts to jump the gap at the spark plug.

The proceeding sequence occurs once-per-engine-revolution for each cylinder.

Spark timing is changed (advanced/retarded) by rotating the trigger assembly which changes each trigger coil position in relation to the permanent magnets on the flywheel center hub.

A rev-limiter (over-speed protection) circuit is contained inside the trigger assembly. The trigger pulse(s) provide power for the rev-limiter circuit, this circuit in turn counts the trigger pulses to determine engine RPM. IF the engine RPM increases above the specified RPM limit, the rev limiter will prevent the trigger pulses from reaching the CDM eliminating spark delivery to the cylinder. The Rev limiter will start to limit at 5900 ± 150 RPM and fully limit at 6200 ± 150 RPM.

Trigger Coil

One Piece assembly, containing two trigger coils-one for each cylinder located under flywheel. Is charged by single magnet on flywheel hub. Trigger pulses are sent to TPM or CDM.

NOTE: Trigger assemblies are different between TPM and non-TPM systems.

Stator

Located under the flywheel in the stator assembly are 3 charge coils wound in series, they provide voltage to the capacitor discharge modules (CDM). The charge coils also provide voltage to power the timing circuit in the TPM or CDM.

Capacitor Discharge Modules (CDM)

Each module contains an ignition coil and amplifier circuitry which produces approximately 45000 volts at the spark plugs.

Flywheel

Contains 6 magnets (12 pole) around circumference. One magnet located on inner hub for trigger. Outer magnets are for battery charge coils and ignition charge coils.

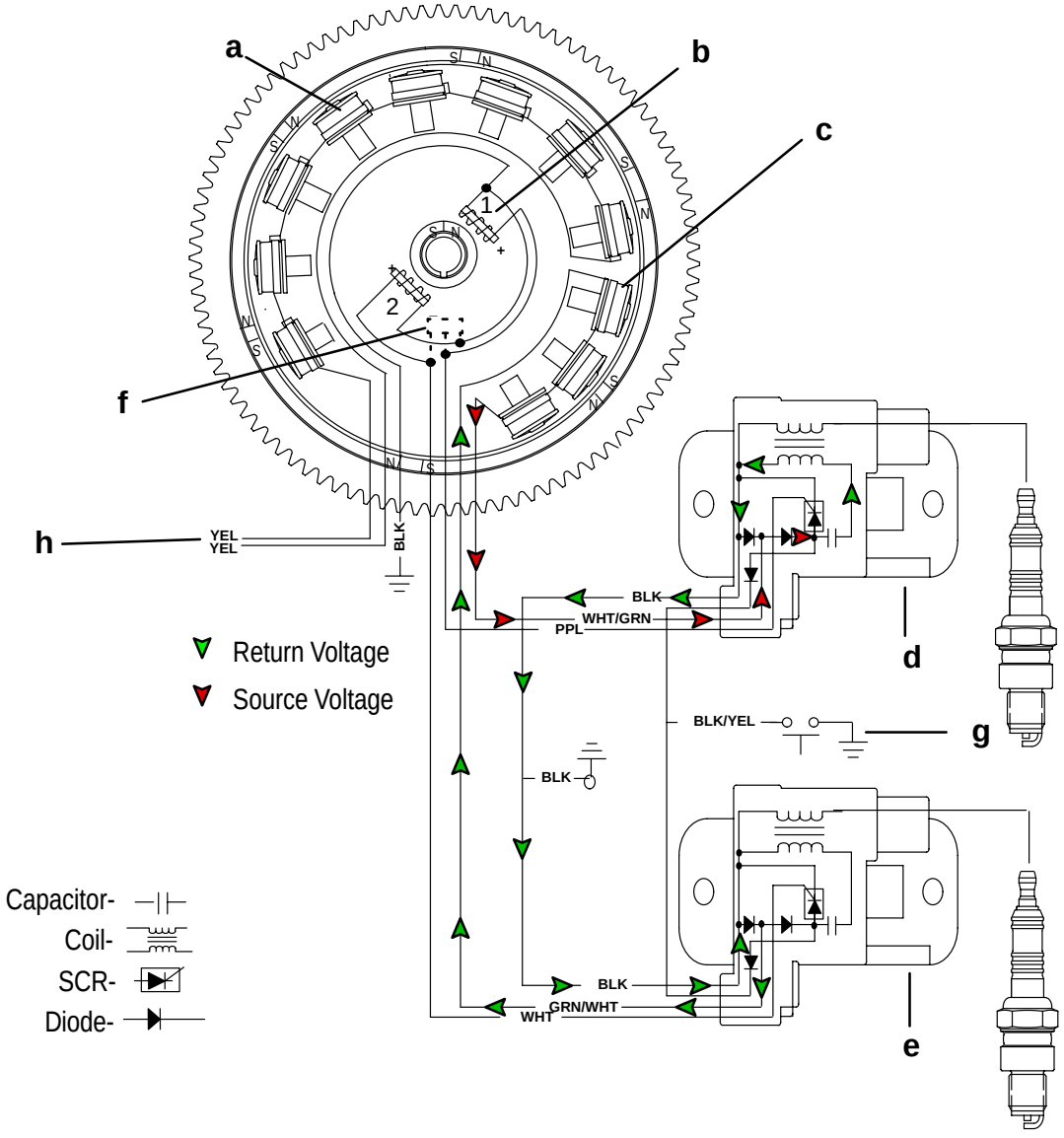
NOTE: The inner trigger hub are different between TPM and non-TPM systems.

Theory of Operation

This outboard ignition system is alternator–driven (distributor–less) capacitor discharge system. Major components of the ignition system are the flywheel, stator, trigger, capacitor discharge modules (CDM's) and spark plugs. Each capacitor discharge module functions as a combination switchbox and secondary ignition coil.

CAPACITOR CHARGING #1 CDM

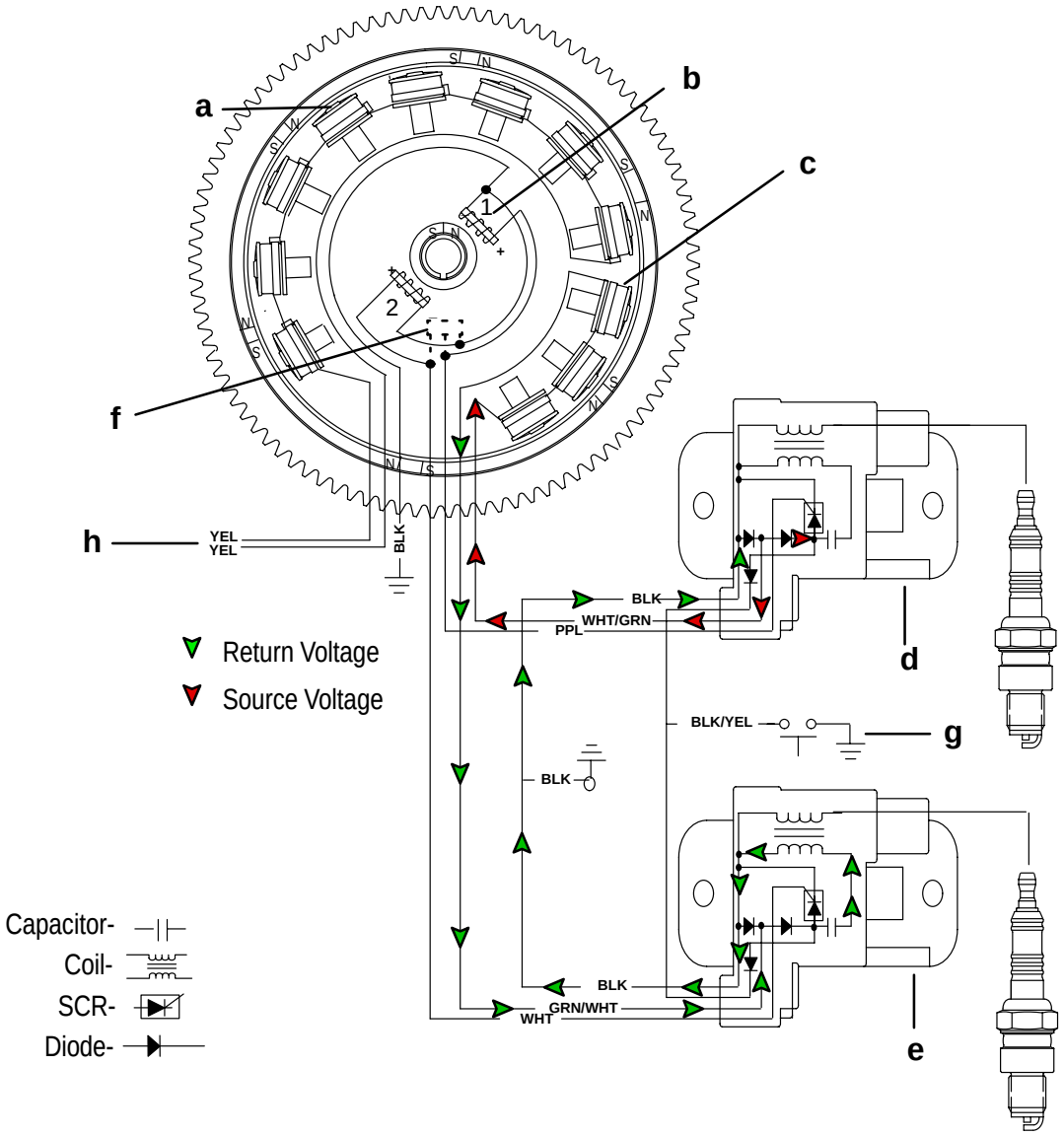
The STATOR assembly is mounted to the block below the flywheel and has 3 CAPACITOR CHARGING COILS wound in series. The FLYWHEEL is fitted with 6 permanent magnets inside the outer rim. The flywheel rotates the permanent magnets past the capacitor charging coils–causing the coils to produce AC voltage (260–320 volts). The AC voltage is then conducted to the CAPACITOR DISCHARGE MODULES (CDM), where it is rectified (DC) and stored in a capacitor. The stator voltage return path is through the ground wire of the other CDM and back through that CDM's charging coil wire to the capacitor charging coils.



a - Battery Charging Coils
b - Trigger Coils
c - Capacitor Charge Coils
d - CDM #1
e - CDM #2
f - Rev. Limiter
g - Stop Switch
h - To Voltage Regulator

CAPACITOR CHARGING #2 CDM

The flywheel rotates the permanent magnets past the capacitor charging coils–causing the coils to produce AC voltage (260–320 volts). The opposite voltage pulse is then conducted to the CAPACITOR DISCHARGE MODULES (CDM), where it is rectified (DC) and stored in a capacitor. The stator voltage return path is through the ground wire of the other CDM and back through that CDM's charging coil wire to the capacitor charging coils.

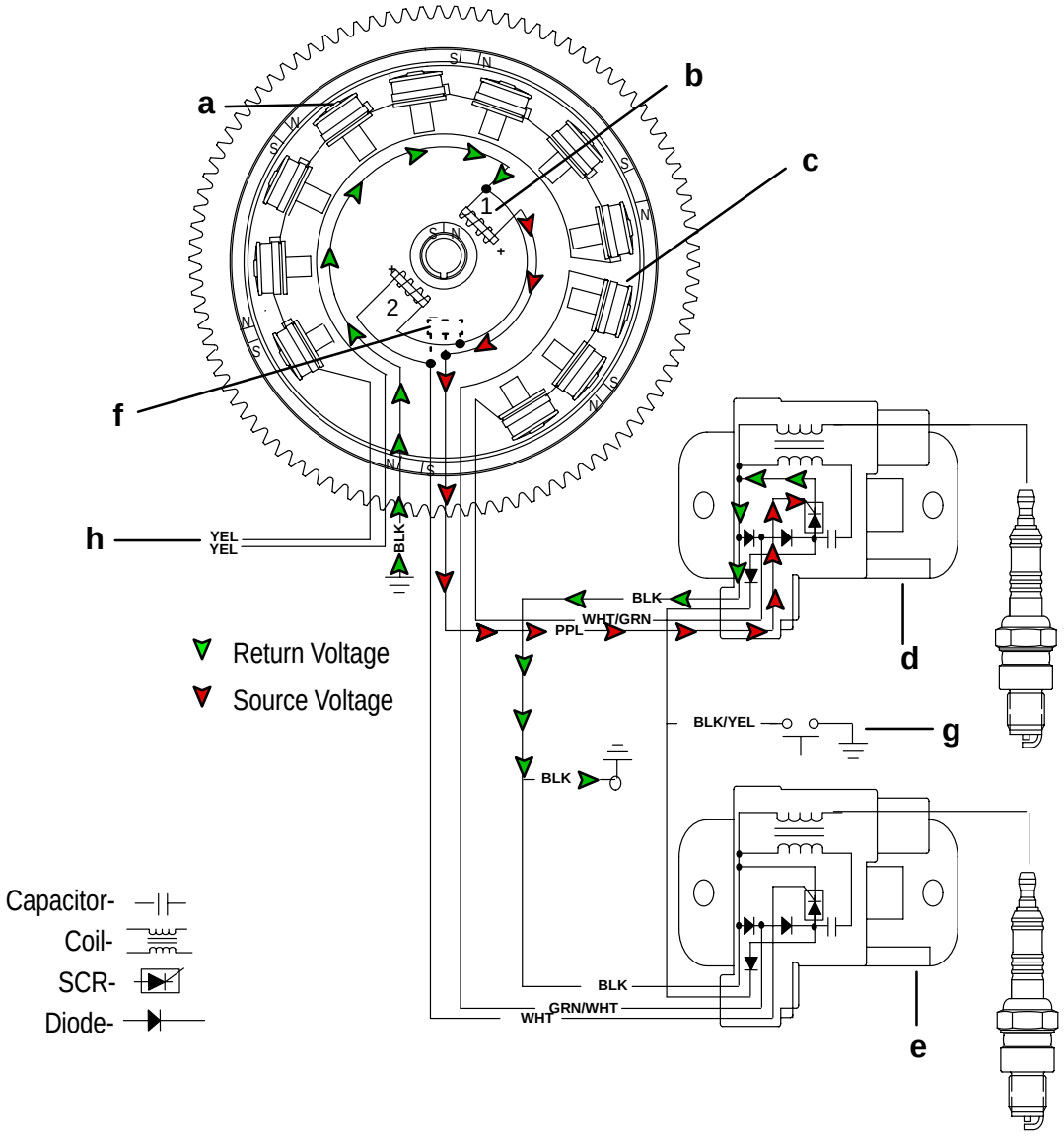


a - Battery Charging Coils
b - Trigger Coils
c - Capacitor Charge Coils
d - CDM #2
e - CDM #2
f - Rev. Limiter
g - Stop Switch
h - To Voltage Regulator

#1 Cylinder Trigger Circuit

The TRIGGER assembly (also mounted under the flywheel) has one coil for each cylinder. These coils are mounted adjacent to the flywheel center hub. The center hub of the flywheel contains a permanent magnet with one north–south transitions. As the flywheel rotates, the magnet north–south transitions pass the trigger coils. This causes the trigger coils to produce a voltage pulse which is sent to the respective capacitor discharge module (CDM).

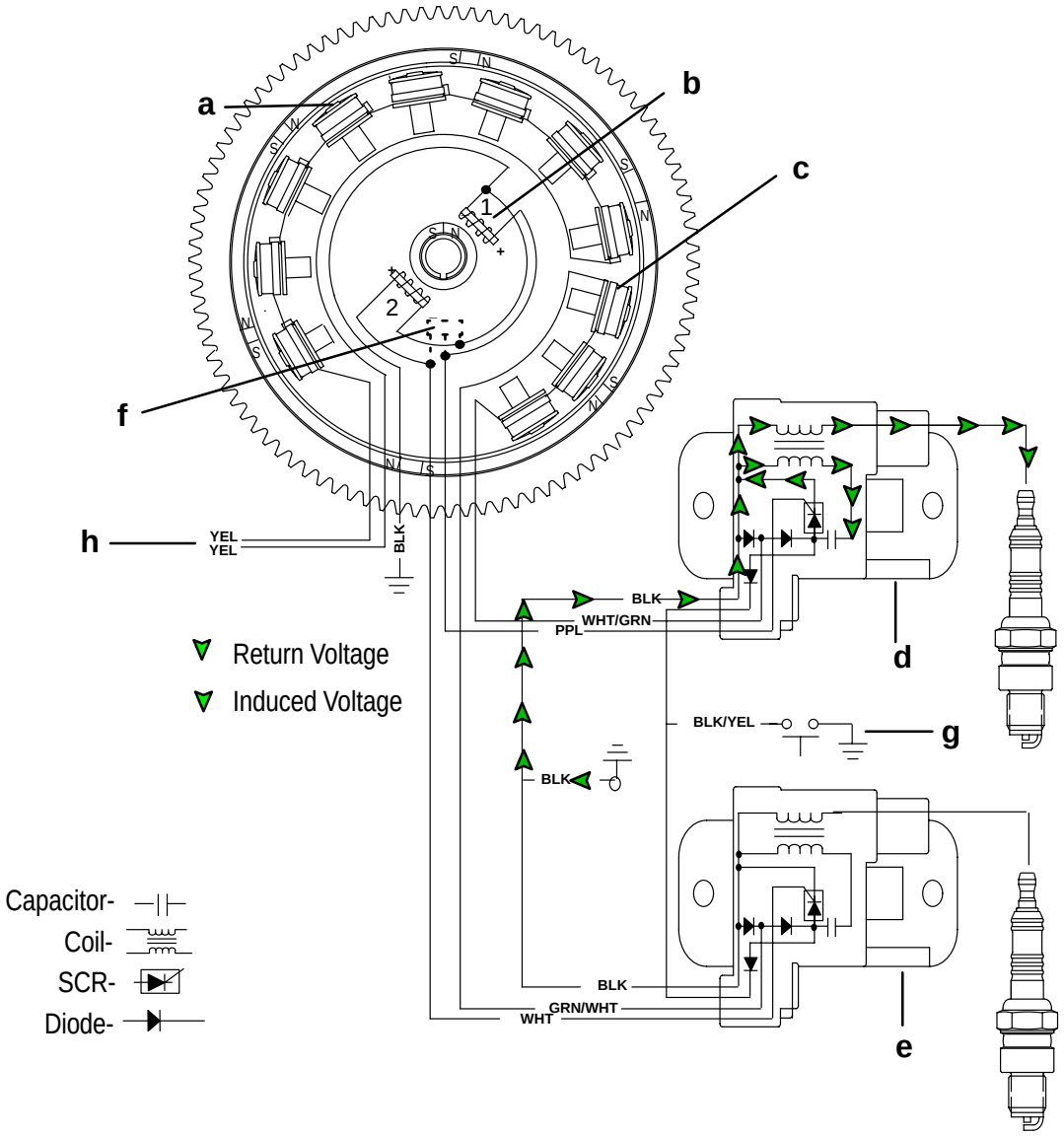
A positive voltage pulse (N–S) will activate the electronic switch (SCR) inside the capacitor discharge module (CDM). The switch discharges the capacitor voltage through the coil primary windings. The return voltage pulse exits the CDM through the ground wire and returns through the trigger ground. Once inside the trigger the voltage will supply the bias capacitor with a negative charge. For the next trigger in sequence to activate its CDM (SCR), the positive trigger voltage must first over come this offset bias capacitor voltage. The delay produced by having to over come this offset bias capacitor voltage prevents the timing from electronically advancing as engine speed increases.



a - Battery Charging Coils
b - Trigger Coils
c - Capacitor Charge Coils
d - CDM #1
e - CDM #2
f - Rev. Limiter
g - Stop Switch
h - To Voltage Regulator

Ignition Coil Circuit

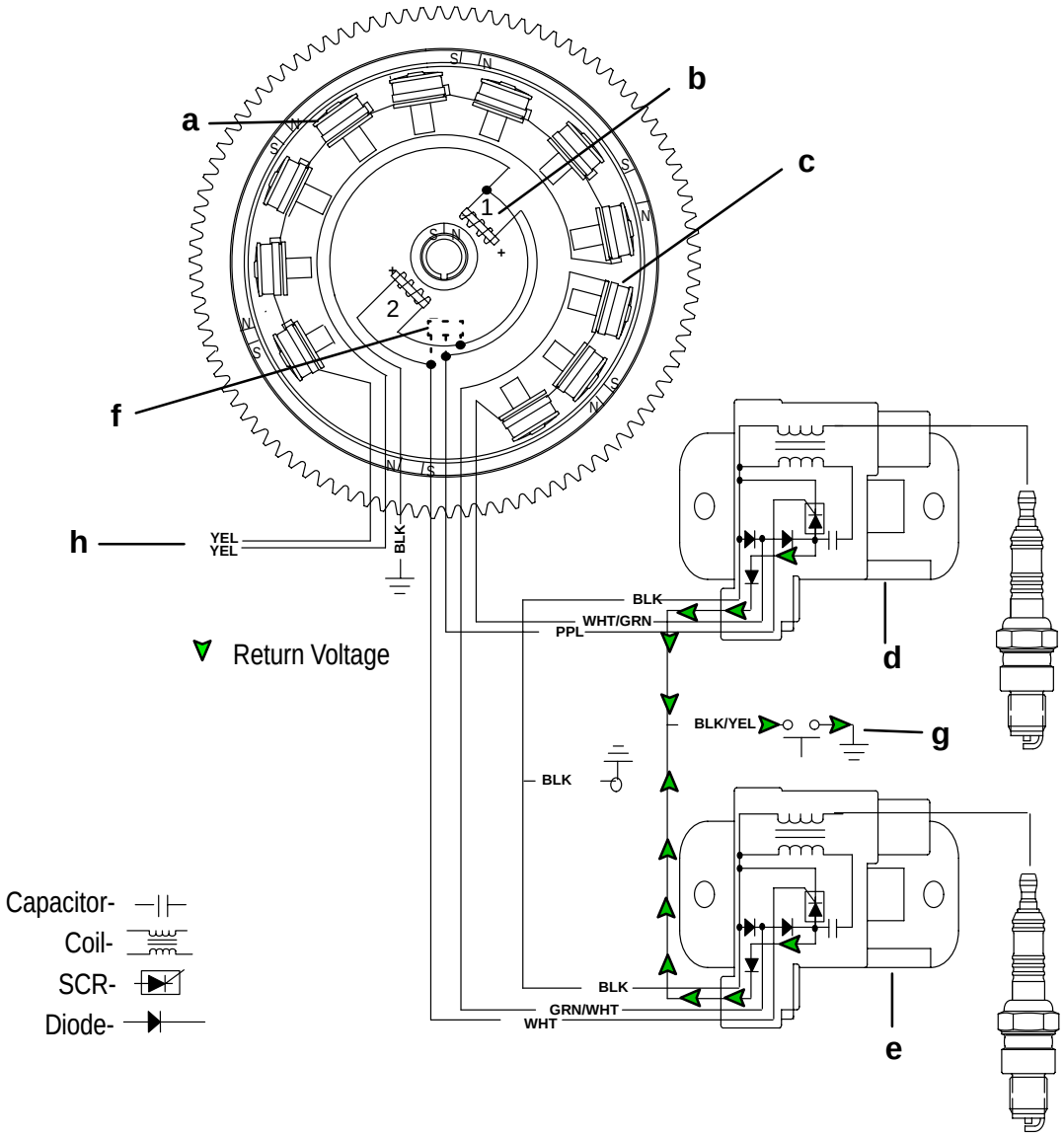
As the capacitor voltage flows through the primary windings of the ignition coil, a voltage is induced into the ignition coil secondary windings. This secondary voltage rises to the level required to jump the spark plug gap and return to ground. This secondary voltage can, if necessary, reach approximately 40,000 volts. To complete the secondary voltage path, the released voltage enters the ground circuit of CDM module.



a - Battery Charging Coils
b - Trigger Coils
c - Capacitor Charge Coils
d - CDM #1
e - CDM #2
f - Rev. Limiter
g - Stop Switch
h - To Voltage Regulator

Stop Circuit

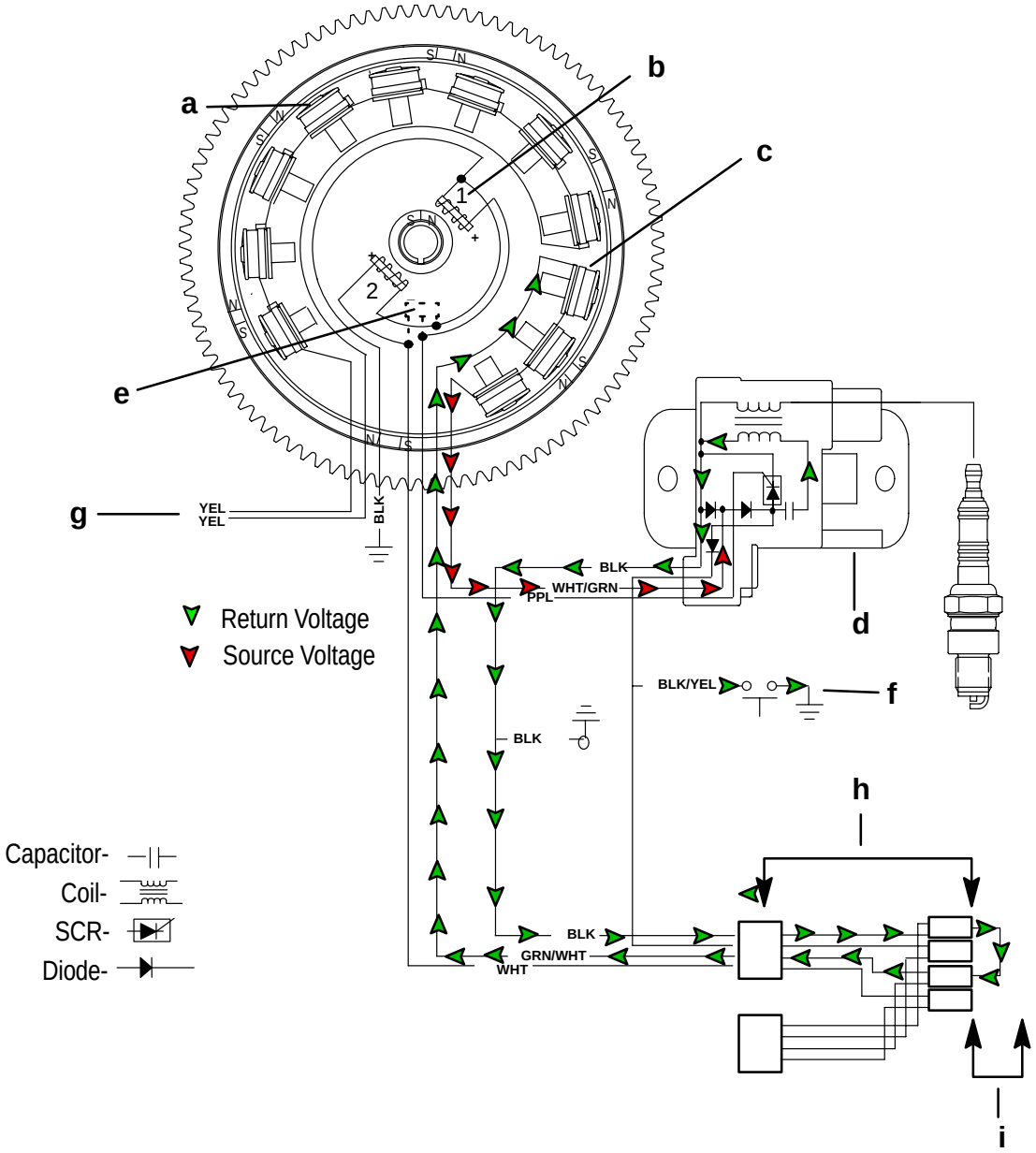
To stop the engine, the stop switch is closed allowing the capacitor charge current from the stator to drain directly to ground. NOTE: The CDM contains a zener diode (not shown for clarity). This diode prevents overcharging of the capacitor (and possible failure) if the SCR does not receive a trigger pulse.



a - Battery Charging Coils
b - Trigger Coils
c - Capacitor Charge Coils
d - CDM #1
e - CDM #2
f - Rev. Limiter
g - Stop Switch
h - To Voltage Regulator

To bypass a CDM with a failed stator voltage return path, install the DVA adaptor harness (to allow easy access to the wire connectors) and using the test jumper P/N 91–818812A1 (or equavilant) connect the stator charge wire to the CDM ground lead. This will allow the remaining CDM to function correctly.

NOTE 1: This test will work on 3 & 4 cylinder engines, however the number of CDM's (cylinders) that function correctly will vary.
NOTE 2: It is possible to ground one of the stator leads to ground (bypassing the CDM and harness). Do Not damage the wire connector by clamping the connector to ground with a bolt.



a - Battery Charging Coils
b - Trigger Coils
c - Capacitor Charge Coils
d - CDM #1
e - Rev. Limiter
f - Stop Switch
g - To Voltage Regulator
h - DVA Adaptor Harness P/N 84-825207A2
i - Test Jumper P/N 91-818812A1

Ignition Test Procedures

Direct Voltage Adapter (DVA) Test for Stator

⚠ WARNING

DANGER - HIGH VOLTAGE/SHOCK HAZARD! Do not touch ignition components and/or metal test probes while engine is running and/or being "cranked". STAY CLEAR OF SPARK PLUG LEADS. To assure personal safety, each individual spark plug lead should be grounded to engine.

⚠ WARNING

When testing or servicing the ignition system, high voltage is present. DO NOT TOUCH OR DISCONNECT any ignition parts while engine is running, while key switch is on or while battery cables are connected.

⚠ CAUTION

Failure to comply with the following items may result in damage to the ignition system.

1. DO NOT reverse battery cable connections. The battery negative cable is (-) ground.
2. DO NOT "spark" battery terminals with battery cable connections to check polarity.
3. DO NOT disconnect battery cables while engine is running.
4. DO NOT crank engine when CDMs or TPM are not grounded to engine.

⚠ CAUTION

To protect against meter and/or component damage, observe the following precautions:

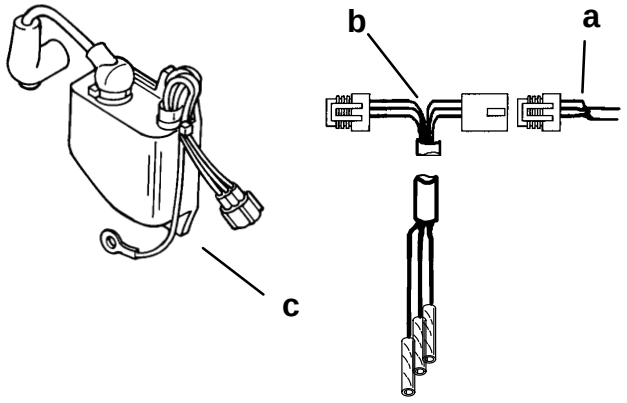
- **400 VDC* test position (or higher) MUST BE used for all tests.**
- **INSURE the Positive (+) lead/terminal of DVA is connected to the Positive (+) receptacle of meter**
- **DO NOT CHANGE meter selector switch position while engine is running and/or being "cranked".**
- **ALL COMPONENTS MUST BE GROUNDED during tests. Running or "cranking" engine with TPM or CDM ungrounded may damage components.**

*If using a meter with a built-in DVA, the DVA/400 VDC (or higher) test position should be used.

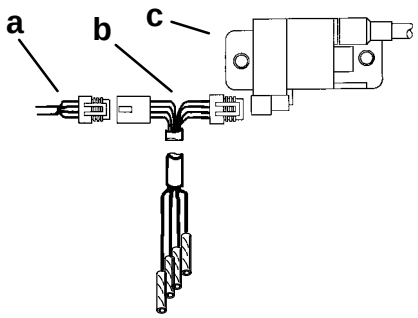
NOTE: *Test leads are not supplied with the DVA. Use test leads supplied with meter.*

Test procedures and specifications are provided for **checking primary ignition voltage** while the engine is **running** and/or being **"cranked" with all harnesses connected.**

Install test harness between ignition harness and CDM as shown.



a - Stator/Trigger Harness
b - Test Harness (P/N 91-825207A1)
c - Capacitor Discharge Module (P/N 822779)



a - Stator/Trigger Harness
b - Test Harness (P/N 91-825207A2)
c - Capacitor Discharge Module (P/N 827509)

TEST	Selector Switch Position	RED Lead	BLACK Lead	Voltage Reading* @ (300 - 4000) RPM
Stator	400 DVA	Red Test Harness (Green/White)	Ground	190 - 320
Stator	40 DVA	Green or White/Green	Ground	20 - 40

*** If voltage is low, disconnect one Capacitor Discharge Module (CDM) connector at a time while monitoring voltage reading.**

If voltage rises, replace that CDM. If voltage does not rise, replace stator.

Ignition Diagnostic Procedures

TROUBLESHOOTING TIP: With engine running, use inductive timing light to check spark advance of each cylinder as throttle is opened and closed. If timing advances and retards smoothly on each cylinder, ignition system is MOST LIKELY functioning properly.

IMPORTANT: If outboard appears to have an ignition system failure, it is recommended that before beginning in-depth troubleshooting:

a. Check ground leads on Timing Protection Module, Capacitor Discharge Modules and ground lead between ignition plate and engine block for proper continuity.

b. Disconnect and reconnect ignition harness connectors to verify proper continuity.

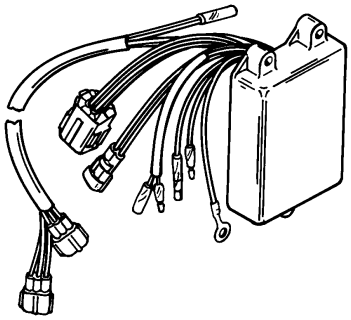
PROBLEM	CORRECTION
1. No Spark or Weak Spark on Both Cylinders	No Spark - Trigger, Stator or Timing Protection Module (TPM) Weak Spark - Stator
2. No Spark or Weak Spark on 1 Cylinder	Capacitor Discharge Module (CDM)
3. Timing Fluctuates - Note: It is normal for timing to fluctuate 2°-3° @ Idle. - If engine over-heats [above 190° F (88° C)], TPM will limit engine RPM to 2500. - If engine RPM exceeds 5800, TPM will retard timing from 25 BTDC TO 14° BTDC. - If RPM exceeds 6500 RPM, TPM will momentarily shut ignition off until RPM drops below 6500. - If engine RPM drops below 600, idle stabilizer in TPM will advance timing to as high as 10° BTDC @ cranking speed of 300 RPM.	Defective Engine Temperature Sensor Defective TPM
4. Timing will not Advance on both Cylinders	Defective TPM
5. Timing will not Advance on 1 Cylinder	Check wiring between CDM and TPM. If wiring is OK, replace CDM.
6. Engine Misfires @ High RPM	Defective CDM Defective TPM
7. Engine Hard to Start when Cold	Defective Fuel Enrichment Valve Defective TPM
8. Engine Misfires @ Low RPM but Runs Smooth @ High RPM	Defective Harness (loose connections) between TPM and CDM Defective CDM Defective TPM Defective Stator
9. Engine Starts Hard when Hot	Defective TPM
10. Engine will not Run over 2500 RPM and is not Over-Heating.	Defective Temperature Sensor Defective TPM
11. Engine Occasionally Misfires	Replace Standard Spark Plug with Inductor Plug

Testing Ignition Components

Resistance Tests

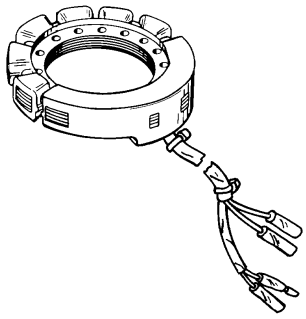
TIMING PROTECTION MODULE

Normally, if timing advances and retards with corresponding changes in RPM, most likely the TPM is functioning correctly. Refer to **"Ignition Diagnostic Procedures"** preceding, for individual failure scenarios.



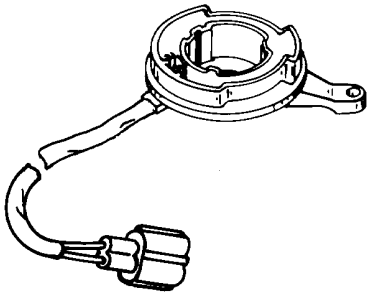
STATOR

A resistance check can be made on charge coils. Ohmmeter should indicate as follows:
Black Stator between GREEN/WHITE and GREEN leads (525-625 ohms)
Red Stator between GREEN/WHITE and WHITE/GREEN leads (660-710 ohms).

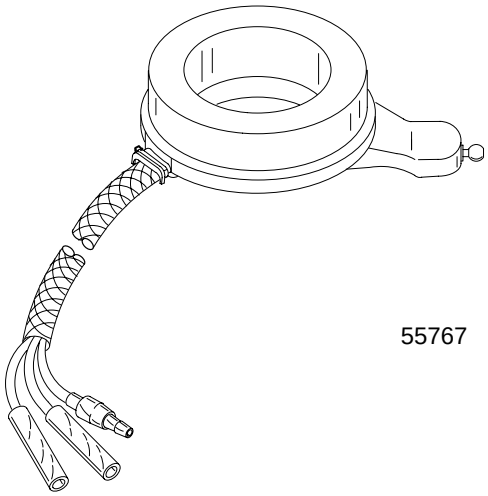


TRIGGER (S/N-0G589999 & BELOW)

A resistance check can be made on trigger coil between WHITE/BLACK and WHITE leads. Ohmmeter should indicate between 1100 - 1300 ohms.



TRIGGER (S/N-0G590000 & ABOVE)



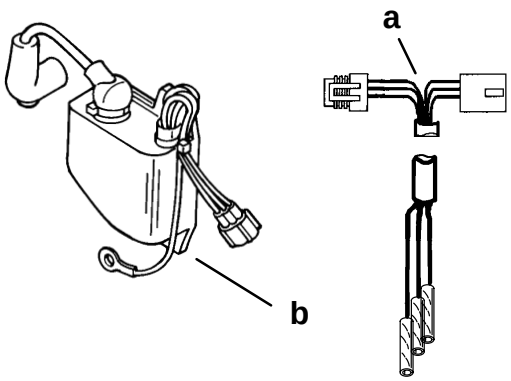
A resistance test is not used on the trigger. Test trigger as outlined under "Trigger Output Test".

Trigger Output Test		20 DVA Scale
Positive Meter Lead (+)	Negative Meter Lead (–)	DVA Reading
White Test Harness Lead	Black Test Harness Lead	2 - 8 Volts

If reading is below specifications replace trigger. If reading is above specifications check CDM.

NOTE: *If voltage remains low after installing a new trigger, replace CDM.*

CAPACITOR DISCHARGE MODULE P/N822779



a - Test Harness P/N 91-825270A1
b - Capacitor Discharge Module P/N 822779

A resistance check can be made of the CDM as follows:

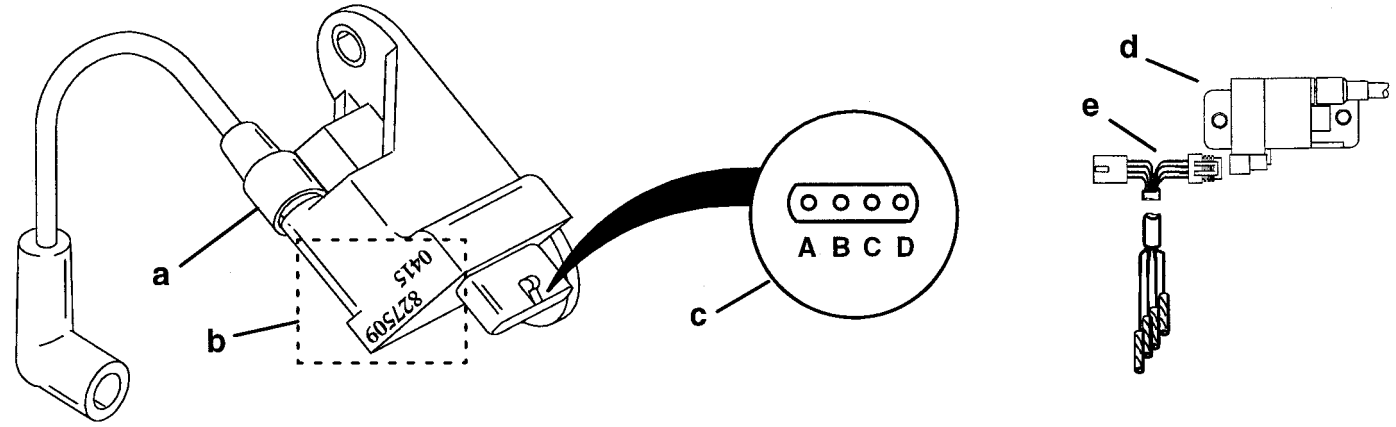
CAPACITOR DISCHARGE MODULE RESISTANCE CHECK-ANALOG METER			
Connect Positive (+) Meter Lead To:	**Connect Negative (–) Meter Lead To:**	**Ohms Scale**	**Reading**
Ground Lead	White Pin or White Test Harness Lead	R X 1	40 ± 10
GRN/WHT Pin or Red Test Harness Lead	Ground Lead	R X 1* Diode Reading	Continuity
Ground Lead	GRN/WHT Pin or Red Test Harness Lead	R X 1K* Diode Reading	No Continuity
GRN/WHT Pin or Red Test Harness Lead	BLK/YEL Pin or Black Test Harness Lead	R X 1K* Diode Reading	No Continuity
BLK/YEL Pin or Black Test Harness Lead	GRN/WHT Pin or Red Test Harness Lead	R X 1* Diode Reading	Continuity
Coil Tower	Ground Lead	R X 10	1000 ± 300

NOTE: *Due to the differences in test meters battery polarity, results other than specified may be obtained. In such a case, reverse meter leads and re-test. If test results then read as specified on all tests CDM is O.K.. The diode measurements above will be opposite if using a Fluke® equivalent multimeter.*

CAPACITOR DISCHARGE MODULE RESISTANCE CHECK-DIGITAL METER			
Connect Positive (+) Meter Lead To:	**Connect Negative (–) Meter Lead To:**	**Ohms Scale**	**Reading**
Ground Lead	White PIn or White Test Harness Lead	Ω or 200	40 ± 10 Ohms
GRN/WHT Pin or Red Test Harness Lead	Ground Lead	 *	OL or OUCH
Ground Lead	GRN/WHT Pin or Red Test Harness Lead	 *	.400-.900
GRN/WHT Pin or Red Test Harness Lead	BLK/YEL Pin or Black Test Harness Lead	 *	.400-.900
BLK/YEL Pin or Black Test Harness Lead	GRN/WHT Pin or Red Test Harness Lead	 *	OL or OUCH or 1.
Coil Tower	Ground Lead	Ω or 2K	.800-1.200 KΩ

NOTE: *Due to the differences in test meters battery polarity, results other than specified may be obtained. In such a case, reverse meter leads and re-test. If test results then read as specified on all tests CDM is O.K.. The diode measurements above will be as specified if using a Fluke® equivalent multimeter.*

Capacitor Discharge Module (P/N 827509) Ohms Test



a - Spark Plug Wire **IMPORTANT:** Spark Plug Wires Are Screwed into CDM.
b - Part Number: 827509
Date Code:0415 (Julian Date and Year: 5=1995)
c - Pins are Labeled: A:Black - Ground
B:Black/Yellow - Stop Circuit
C:White - Trigger
D:Green - Stator
d - Capacitor Discharge Module P/N 827509
e - Test Harness P/N 91-825207A2

A resistance check, although not necessary for any troubleshooting procedure, can be made of the CDM as follows:

NOTE: *This test can be performed using the test harness (p/n 84-825207A2). Do Not connect the test harness plug to the stator/trigger engine wire harness.*

CAPACITOR DISCHARGE MODULE RESISTANCE CHECK - ANALOG METER			
Connect Positive (+) Meter Lead To:	**Connect Negative (–) Meter Lead To:**	**Ohms Scale**	**Results:**
Ground Pin (A)/ or Black Test Harness Lead	White (C)/ or White Test Harness Lead	R x 100	1250 ± 300 Ohms
Green (D)/ or Green Test Harness Lead	Ground Pin (A)/ or Black Test Harness Lead	R x 100 Diode Reading*	Continuity
Ground Pin (A) or Black Test Harness Lead	Green (D)/ or Green Test Harness Lead	R x 100 Diode Reading*	No Continuity
Green (D)/ or Green Test Harness Lead	Black/Yellow (B)/ or Black/ Yellow Test Harness Lead	R x 100 Diode Reading*	No Continuity
Black/Yellow (B)/ or Black/ Yellow Test Harness Lead	Green (D)/ or Green Test Harness Lead	R x 100 Diode Reading*	Continuity
Spark Plug Terminal (At Spark Plug Boot)	Ground Pin (A) or Black Test Harness Lead	R x 100	1000 ± 300 Ohms

NOTE: *Due to the differences in test meters battery polarity, results other than specified may be obtained. In such a case, reverse meter leads and re-test. If test results then read as specified on all tests CDM is O.K.. The diode measurements above will be opposite if using a Fluke equivalent multimeter.*

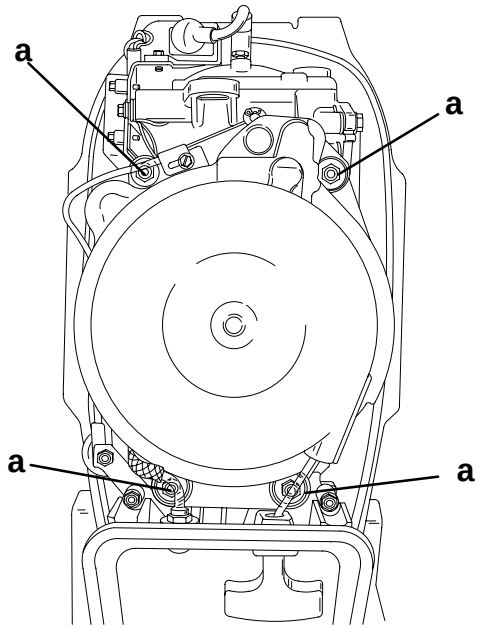
CAPACITOR DISCHARGE MODULE RESISTANCE CHECK - DIGITAL METER			
Connect Positive (+) Meter Lead To:	**Connect Negative (–) Meter Lead To:**	**Ohms Scale**	**Results:**
Ground Pin (A)/ or Black Test Harness Lead	White (C)/ or White Test Harness Lead	Ω or 2K	1.125-1.375 KΩ
Green (D)/ or Green Test Harness Lead	Ground Pin (A)/ or Black Test Harness Lead		OL or OUCH
Ground Pin (A) or Black Test Harness Lead	Green (D)/ or Green Test Harness Lead		.400-.900
Green (D)/ or Green Test Harness Lead	Black/Yellow (B)/ or Black/ Yellow Test Harness Lead		.400-.900
Black/Yellow (B)/ or Black/ Yellow Test Harness Lead	Green (D)/ or Green Test Harness Lead		OL or OUCH
Spark Plug Terminal (At Spark Plug Boot)	Ground Pin (A) or Black Test Harness Lead	Ω or 2K	.950-1.150 KΩ

NOTE: *Due to the differences in test meters battery polarity, results other than specified may be obtained. In such a case, reverse meter leads and re-test. If test results then read as specified on all tests CDM is O.K.. The diode measurements above will be as specified if using a Fluke equivalent multimeter.*

Ignition Components Removal

Flywheel

1. Remove flywheel nuts and washers.
2. Remove flywheel cover.



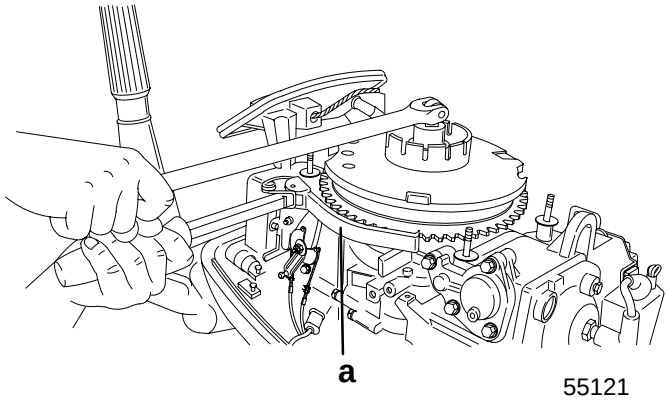
55120

a - Nuts and Washers

⚠ WARNING

Engine could possibly start when turning flywheel during removal and installation; therefore, disconnect (and isolate) spark plug leads from spark plugs to prevent engine from starting.

3. Disconnect spark plug leads from spark plugs.
4. While holding flywheel with Flywheel Holder (91-52344), remove flywheel nut and washer.

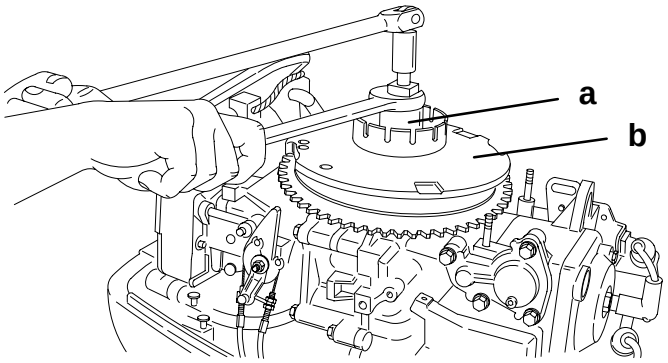


55121

a - Flywheel Holder (91-52344)

5. Install Crankshaft Protector Cap (91-24161) on the end of crankshaft, then install Flywheel Puller (91-73687A1) into flywheel.
6. Remove flywheel.

NOTE: *Neither heat or hammer should be used on flywheel to aid in removal as damage to flywheel or electrical components under flywheel may result.*



55122

a - Flywheel Puller (91-73687A1)
b - Flywheel