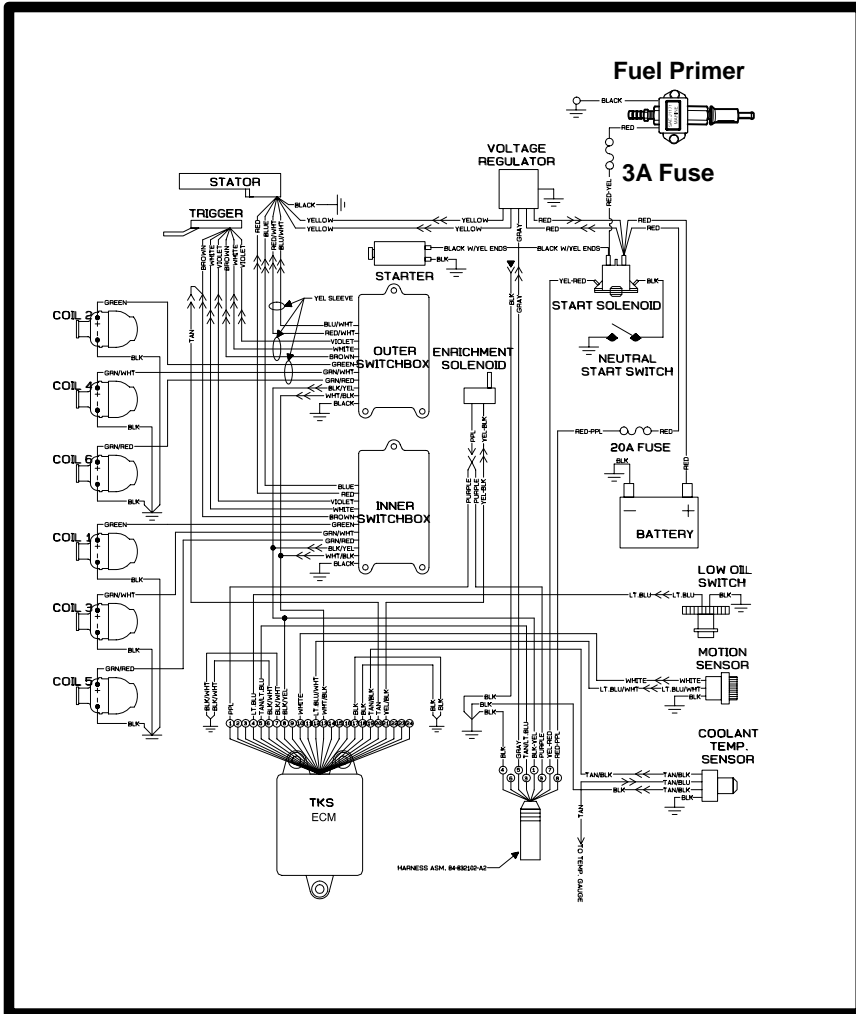




ELECTRICAL

2

A



IGNITION SYSTEM



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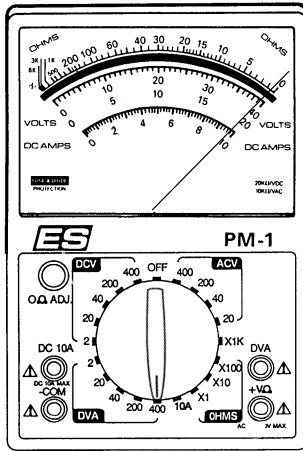


Specifications

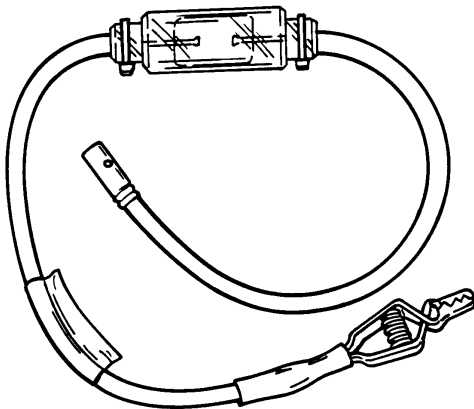
Ignition System	
Type	Capacitor Discharge
Spark Plug Type	NGK BU8H
Spark Plug Gap	Surface Gap
Voltage @ Spark Plugs	40,000 Volts

Special Tools

Multi Meter DVA Tester 91-99750A1



Spark Gap Tester 91-63998A1



Quicksilver Lubricant/Sealant

Description	Part Number
Loctite 271	92-809820
Loctite Primer N	92-59327-1
Liquid Neoprene	92-25711--2
Dielectric Grease	92-823506--1

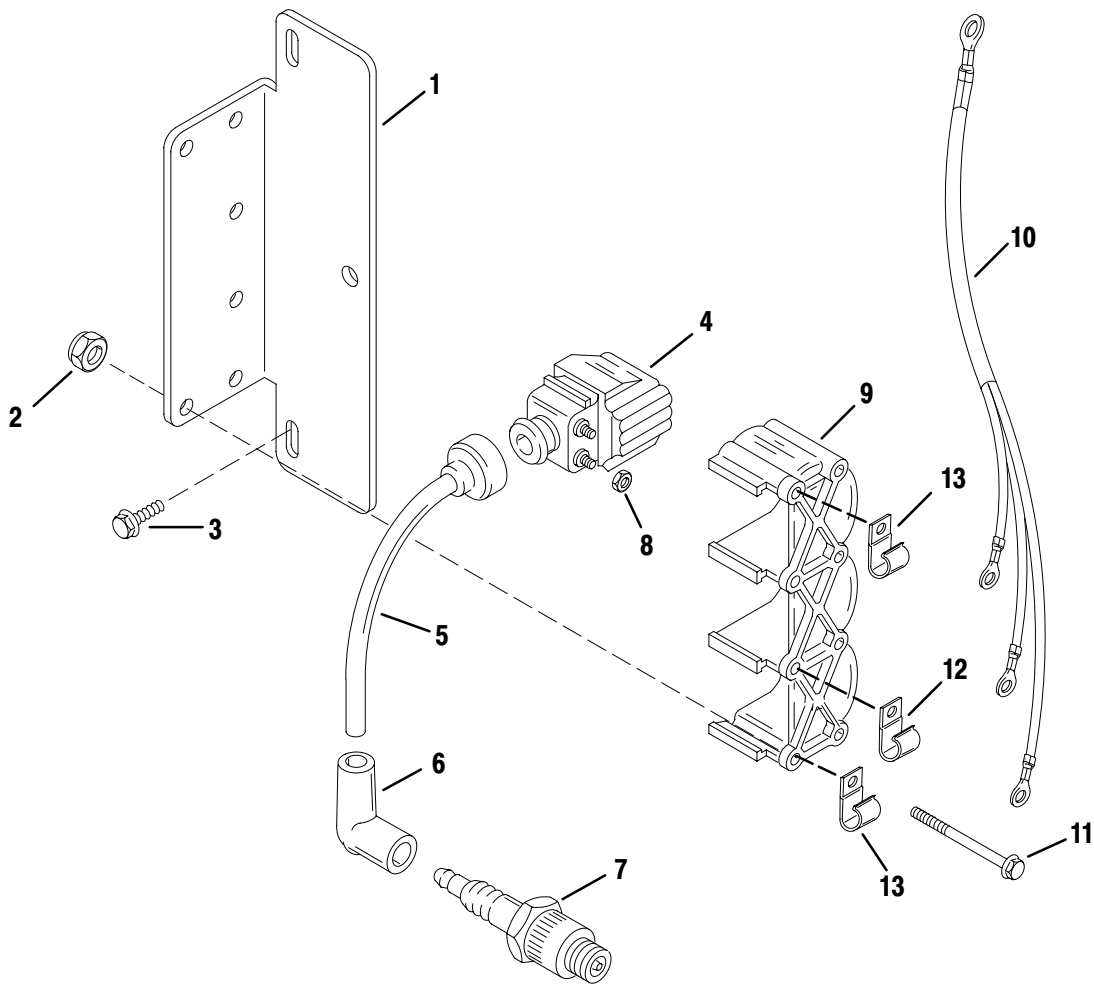


Notes:





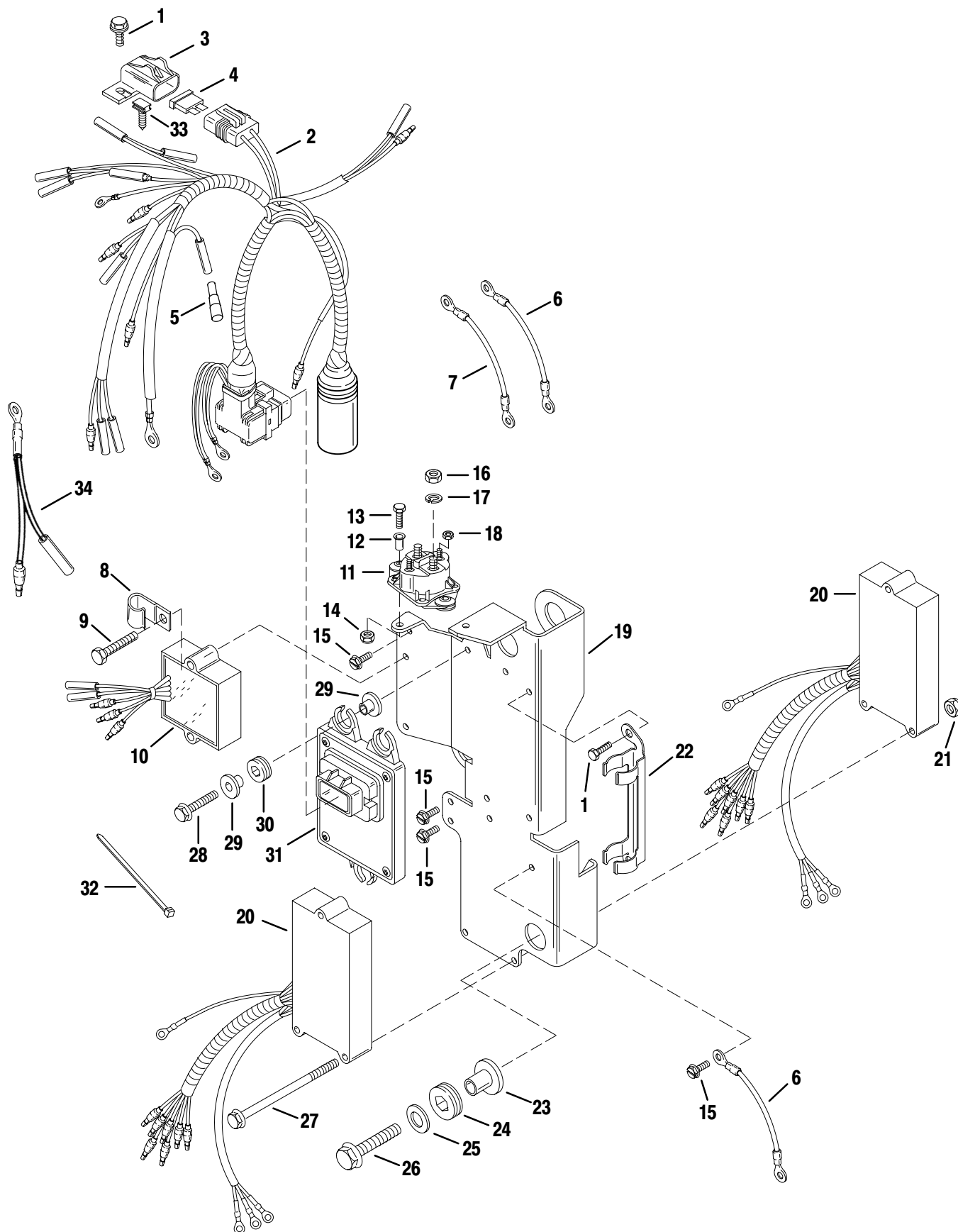
COIL ASSEMBLY



REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
1	2	BRACKET-Coil Mounting			
2	12	NUT (#10-32)-Cover Screw			
3	6	SCREW (.250-20 x .620)			
4	6	COIL ASSEMBLY-Ignition			
5	1	CABLE KIT-High Tension			
6	6	BOOT KIT-High Tension Cable			
7	6	SPARK PLUG (NGK # BU8H)			
	6	SPARK PLUG (NGK # BUZ8H) (RFI)			
8	12	NUT (#10-32)-Ignition Coil Terminal			
9	2	COVER-Ignition Coil			
10	2	HARNESS ASSEMBLY (Black)			
11	12	SCREW (#10-32 x 2.125)-Ignition Coil Cover			
12	1	J CLIP (PORT)			
13	2	J CLIP (STARBOARD)			



ELECTRICAL COMPONENTS



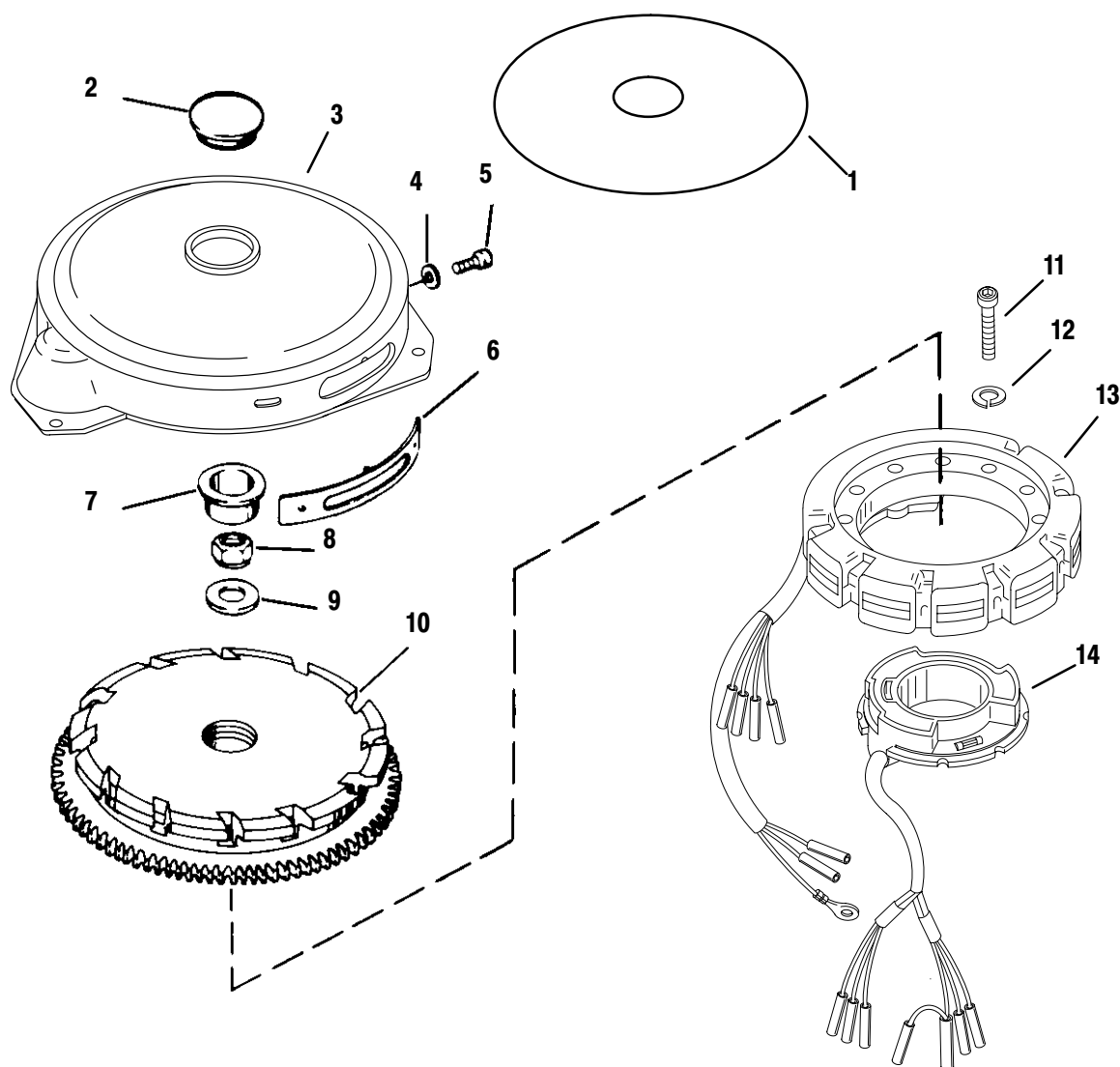


ELECTRICAL COMPONENTS

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
1	3	SCREW (#10-32 x .375)			
2	1	HARNESS ASSEMBLY-Engine			
3	1	COVER-Fuse			
4	1	FUSE (20 AMP)			
5	1	PLUG			
6	2	CABLE ASSEMBLY (Black) (9.600 in.)			
7	1	CABLE ASSEMBLY (Black) (6.250 in.)			
8	1	CLIP			
9	2	SCREW (.250-20 x 1.500)			
10	1	REGULATOR-Voltage			
11	1	SOLENOID KIT-Starter			
12	2	BUSHING			
13	2	SCREW (.250-20 x 1.00)			
14	2	NUT (.250-20)			
15	4	SCREW (#10-24 x .500)			
16	2	NUT (.312-18)			
17	2	LOCKWASHER (.312)			
18	2	NUT (#10-32)			
19	1	PLATE-Ignition Mount			
20	2	SWITCH BOX ASSEMBLY			
21	3	NUT (#10-32)			
22	1	CLAMP			
23	3	BUSHING			
24	3	GROMMET			
25	3	WASHER			
26	3	SCREW (.312-18 x 1.120)			
27	3	SCREW (#10-32 x 2.380)			
28	3	SCREW (.250-20 x .875)			
29	6	BUSHING			
30	3	GROMMET			
31	1	ECM ASSEMBLY-Turn Key Start			
32	5	CABLE TIE (8.00 in.)			
33	1	CLIP			
34	1	CABLE ASSEMBLY			



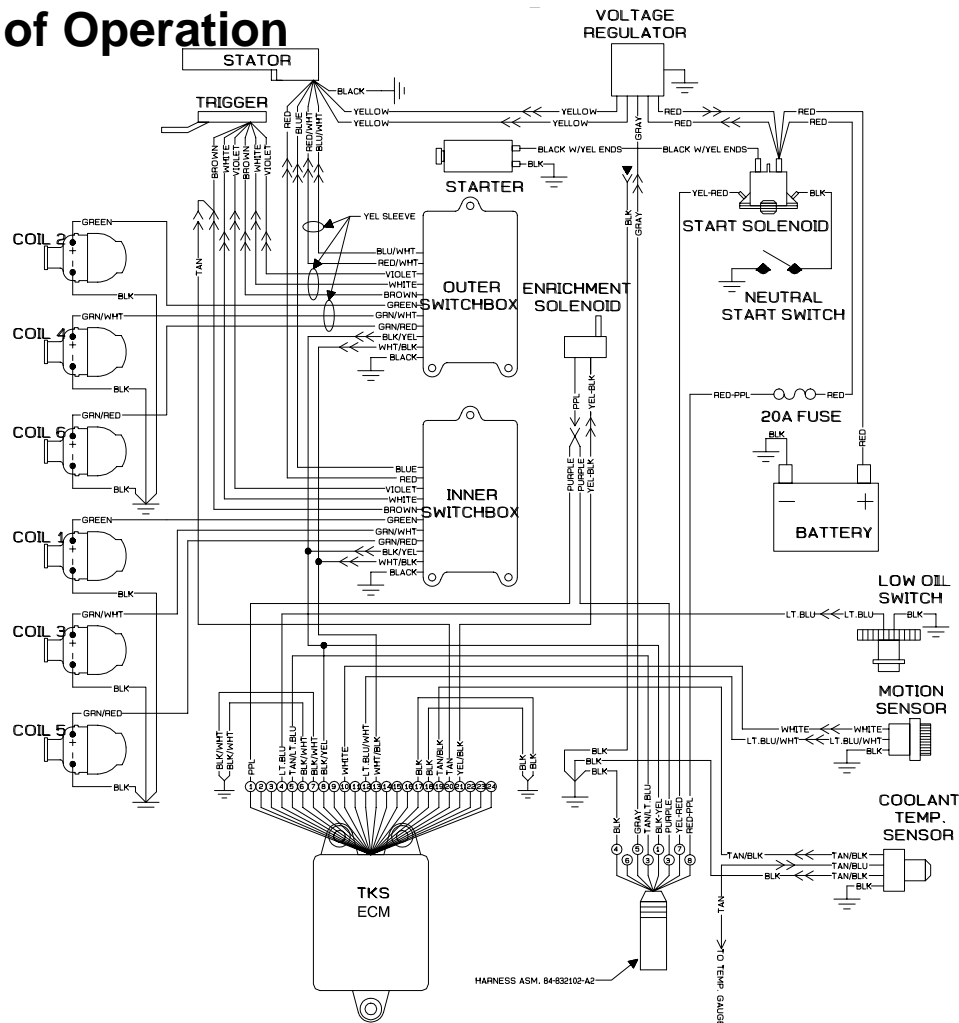
FLYWHEEL, STATOR AND TRIGGER ASSEMBLY



REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N-m
1	1	DECAL-Sport Jet 175XR ²			
2	1	PLUG			
3	1	COVER KIT-Flywheel			
4	2	WASHER			
5	2	SCREW (.190-32 x .380)			
6	1	MARKER-Timing			
7	1	PLUG			
8	1	NUT (.625-18)		120	163
9	1	WASHER			
10	1	FLYWHEEL ASSEMBLY			
11	4	SCREW (#10-32 x 1.00)			
12	4	LOCKWASHER (#10)			
13	1	STATOR ASSEMBLY			
14	1	TRIGGER PLATE ASSEMBLY			



Theory of Operation



Description

The V-6 ignition system is alternator-driven with distributor-less capacitor discharge. Major components of the system are the flywheel, stator assembly, trigger assembly, 2 switch boxes, 6 ignition coils and 6 spark plugs.

The stator assembly is mounted below the flywheel and has 4 capacitor charging coils. The 4 capacitor charging coils are composed of 2 high speed and 2 low speed coils-1 high speed and 1 low speed coil for each switch box. The low speed coils provide primary voltage for the switch boxes from idle to approximately 2500 RPM. The high speed coils provide primary voltage from 2000 RPM to the maximum RPM the outboard is capable of achieving.

The flywheel is fitted with permanent magnets inside the outer rim. As the flywheel rotates, the permanent magnets pass the capacitor charging coils producing AC voltage. The AC voltage is conducted to the switch boxes where it is rectified and stored in a capacitor.

The trigger assembly (also mounted under the flywheel) has 3 coils. Each coil controls the spark to 2 cylinders -1 cylinder each bank. The flywheel also has a second set of permanent magnets located around the center hub. As the flywheel rotates, the magnets pass the trigger coils producing AC voltage. The AC voltage is conducted to an electronic switch (SCR) in the switch box. The switch discharges the capacitor voltage into the ignition coil at the correct time and in firing order sequence.

Capacitor voltage is conducted to primary side of ignition coil. As this voltage goes to ground through the primary circuit of the coil, it induces a voltage rise in the secondary side of the ignition coil. This voltage can increase to approximately 40,000 volts before bridging the spark plug gap and returning to ground.

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

Spark timing is advanced or retarded by the movement of the trigger assembly attached to the throttle/spark arm.



Ignition Test Procedures

⚠ WARNING

When testing or servicing the V-6 ignition system, high voltage is present. Be extremely cautious. DO NOT TOUCH OR DISCONNECT any ignition parts while engine is running, while key switch is on or while battery cables are connected.

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 switch boxes are not grounded to engine.

A process of elimination must be used when checking the ignition system without a voltmeter (capable of measuring 400 volts DC, or higher) and Direct Voltage Adaptor (91-89045), as the switch boxes and ignition coils cannot be thoroughly checked with conventional test equipment.

All other components can be tested with an ohmmeter. Before troubleshooting the ignition system, check the following:

1. Make sure that electrical harness and ignition switch are not the source of the problem.
2. Check that plug-in connectors are fully engaged and terminals are free of corrosion.
3. Make sure that wire connections are tight and free of corrosion.
4. Check all electrical components, that are grounded directly to engine, and all ground wires to see that they are grounded to engine.
5. Check for disconnected wires and short and open circuits.

Direct Voltage Adaptor (DVA)

The DVA can be used with Quicksilver VOA Meter 91-99750A1, Quicksilver Volt/Ohm meter 91-93572, or an equivalent volt meter (capable of measuring 400 volts DC or higher) to check primary ignition voltage on Alternator Driven Ignition (ADI) systems. (Models are specified in Test Charts, following.)

⚠ CAUTION

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

- MAKE CERTAIN that Positive (+) lead/terminal of DVA is connected to Positive (+) receptacle of meter.
- 400 VDC test position (or higher) MUST BE used for all tests, except “switch box bias” test.
- DO NOT CHANGE meter selector switch position while engine is running and/or “cranked.”
- Switch boxes MUST REMAIN GROUNDED during tests. Running or cranking engine with switch boxes ungrounded may damage switch boxes. If removed for easier access, the ground wire MUST BE INSTALLED.

⚠ WARNING

DANGER - HIGH VOLTAGE/SHOCK HAZARD! Do Not touch ignition components and/or metal test probes while engine is running and/or “cranked.”

Test procedures and specifications are provided for checking primary ignition voltage while the engine is running and/or being “cranked.”

Troubleshooting Tips

1. Intermittent, weak or no spark output at two spark plugs (one plug from each bank of three cylinders) usually is caused by a bad TRIGGER.
2. Intermittent, weak or no spark output at three spark plugs (a complete bank of three cylinders) usually is caused by a bad STATOR or SWITCH BOX.
3. Intermittent, weak or no spark output at any one spark plug (single cylinder) usually is a bad COIL or SWITCH BOX.

Ignition Troubleshooting

Multimeter/DVA Tester 91-99750A1

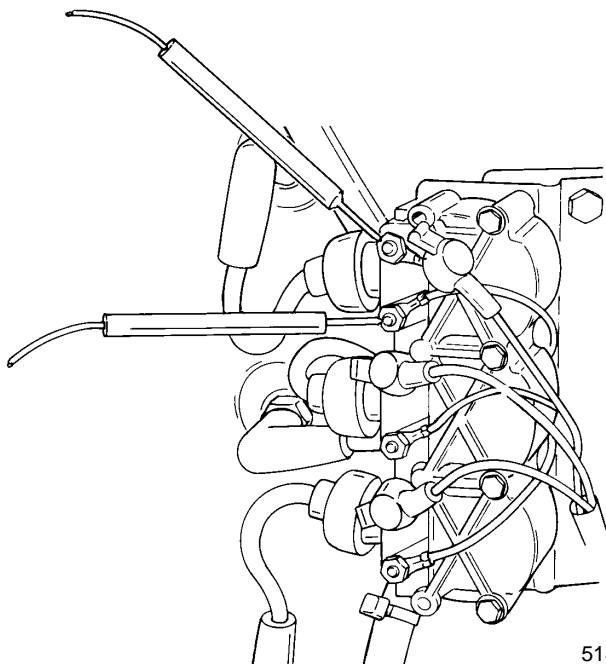
⚠ WARNING

DANGER - HIGH VOLTAGE/SHOCK HAZARD! Do Not touch ignition components and/or metal test probes while engine is running and/or “cranked.”



Test Sequence

1-A. Check primary input voltage to coils. (See Test Chart, following)



1. If voltage readings to coil(s) are **BELOW** specification, proceed with Step 2-A.
2. If voltage readings to coil(s) are **WITHIN** specification, proceed with Step 1-B.

1-B. Check coils for spark. [Connect Spark Gap Tester (91-63998A1) between coil high voltage tower and spark plug.]

1. If no spark or weak spark, COIL is bad.
2. If spark is OK, proceed with Step 1-C.

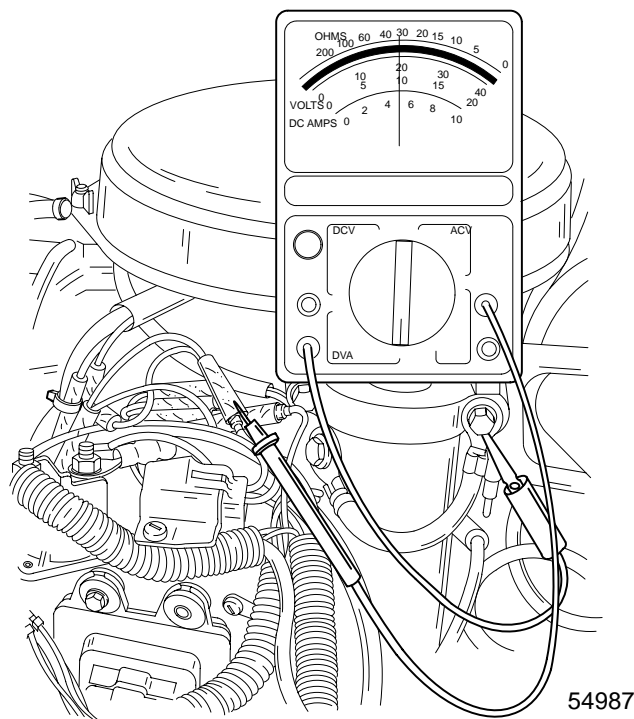
1-C. If Steps 1-A and 1-B check OK, replace spark plugs.

If problem still is evident after replacing spark plugs, proceed with Step 1-D.

1-D. If Steps 1-A, 1-B and 1-C check OK, check ignition timing.

1. If ignition timing **DOES NOT** check to specification (sudden and unexplained timing change), check trigger advance linkage for loose or broken parts and check trigger magnet ring in flywheel (affixed to flywheel hub) for tightness and/or shift in position.
2. If ignition timing is **UNSTABLE** (timing jumps around, at "cranking" speed and/or low RPM), proceed to Step 5-A.
3. If ignition timing checks to specification and engine still does not run or runs poorly, trouble exists with fuel system or engine mechanical.

2-A. Check switch box "stop" circuit. (See Test Chart, following.)



1. If reading is **BELOW** specification, proceed with Step 2-B.
2. If reading is **ABOVE** specification, either the trigger or switch box is bad (test trigger: if trigger checks to specification replace switch box and repeat check).
3. If reading is **WITHIN** specification, proceed with Step 3-A.



2-B. Check ignition switch/wiring, as follows:

WARNING

DANGER--HIGH VOLTAGE SHOCK/FIRE HAZARD. STAY CLEAR OF SPARK PLUG LEADS. To assure personal safety, each individual spark plug lead should be grounded to the engine.

1. To prevent engine from starting, remove spark plug leads from ALL spark plugs, then ground ALL spark plug leads to the engine.
2. Remove ignition switch h lead wire(s) from switch box(es) [lead wire(s) are connected to BLACK/YELLOW bullet terminal].

NOTE: Be sure to disconnect ignition switch lead wire from both switch boxes.

3. With ignition switch ISOLATED (removed in preceding Step 2), repeat check in Step 2-A.
 - a. If reading still is BELOW specification, proceed with Step 3-A.
 - b. If reading now is WITHIN specification, either the ignition switch or wiring is bad.

3-A. Check stator low speed and high speed input to switch box. (See Test Chart, following.)

NOTE: This is OUTER switch box.

1. If either the low speed or high speed reading to switch box is BELOW specification, stator or switch box is bad (test stator: if stator checks to specification replace stator and repeat check).

2. If both the low speed and high speed readings are WITHIN specification, proceed with Step 4-A.

4-A. Check stator low speed and high speed input to INNER switch box. (See Test Chart, following.)

1. If either the low speed or high speed reading to switch box is BELOW specification stator or switch box is bad (test stator: if stator checks to specification replace stator and repeat check)
2. If both the low speed and high speed readings are WITHIN specification, proceed with Step 5-A.

5-A. Check switch box bias. Bias circuit may be checked using either a voltmeter or an ohmmeter. (To use a voltmeter, see Test Chart, following. Use VOLT METER only; DVA not required.)

Ohm Test:

1. Disconnect WHITE/BLACK wire from switch box at bullet connector.
2. With ohmmeter set to 1K scale, connect one ohm lead to WHT/BLK switch box terminal and one ohm lead to switch box case ground.
3. Ohmmeter should indicate 1300 - 1500 ohms.

Voltage Test

NOTE: Switch Box Bias Voltage is NEGATIVE (-) voltage applied to the ignition system to raise the trigger firing threshold as engine RPM is increased, thus stabilizing ignition timing and preventing random ignition firing.

4. If bias reading is BELOW specification, one or both switch boxes are bad.

Replace OUTER switch box and recheck bias; if necessary, replace INNER switch box and recheck bias.

5. If bias reading is WITHIN specification, and engine still does not run or runs poorly, one or both switch boxes or trigger is bad. [Test trigger: if trigger checks to specification replace switch box(es) and repeat check.]



Ignition System Test Chart

IMPORTANT: BEFORE attempting the ignition system checks, below, thoroughly read the preceding pages of these instructions to become familiar with the proper test sequence and procedures (particularly any “Warnings” and

“Cautions”). ALL tests are performed with lead wires connected--terminals exposed. **SWITCH BOXES MUST BE GROUNDED (CASE TO ENGINE BLOCK) FOR ALL TESTS--IF NOT, SWITCH BOXES MAY BE DAMAGED.**

Test	Selection Sw. Position	DVA Lead RED	DVA Lead BLACK	Scale Reading @ 400 RPM	Scale Reading @ 1000 RPM	Scale Reading @ 3000 RPM
Coil Primary	400 VDC*	Coil (+) Terminal	Coil (-) Terminal	90 - 145	125 - 175	175 - 240
Sw. Box - Stop Circuit	400 VDC*	Black/Yellow Sw. Box Bullet	Ground	200 - 300	225 - 400	225 - 400
Stator Low Speed	400 VDC*	Blue Sw. Box Bullet	Ground	100 - 265	195 - 265	255 - 345
Stator High Speed	400 VDC*	Red Sw. Box Bullet	Ground	25 - 50	120 - 160	230 - 320
Sw. Box - Bias	20VDC or 40VDC	[See Note 1] Ground	[See Note 1] White/Black Sw. Box Bullet	1 - 6	3 - 15	10 - 30

(1) Using meter only, REVERSE LEAD POLARITY; Connect leads as specified.

(*) If using a meter with a built-in DVA, place selector switch in the DVA/400 VDC position.

Ignition System

STATOR ASSEMBLY

The stator assembly has a BLACK ground wire which grounds the stator to the engine.

IMPORTANT: Stator must be grounded to engine.

STATOR TEST

- To test, disconnect BLUE/WHITE and RED/WHITE stator leads from outer switch box and BLUE and RED stator leads from inner switch box.
- Use an ohmmeter and perform the following tests:

12 AMPERE STATOR

Test Leads to	Resistance Ohms	Scale Reading
Between BLUE and RED Stator Leads	3500-4200	R x 1000
Between BLUE/WHITE and RED/WHITE Stator Leads	3500-4200	R x 1000
Between RED Stator Lead and BLACK Stator Lead	90-140	R x 1
Between RED/WHITE Stator Lead and BLACK Stator Lead	90-140	R x 1

- If meter readings are other than specified, replace stator assembly. Refer to stator assembly removal and installation (see “Table of Contents”).

CAUTION

Switch boxes must be grounded to engine before cranking engine, or switch boxes will be damaged.



TRIGGER ASSEMBLY TEST

1. Disconnect all trigger leads from switch boxes.
2. Use an ohmmeter and perform the following checks:

Test Leads to	Resistance Ohms	Scale Reading
Between BROWN Trigger Lead (without YELLOW Sleeve) and WHITE Trigger Lead (with YELLOW Sleeve)	1100-1400	R x 100
Between WHITE Trigger Lead (without YELLOW Sleeve) and VIOLET Trigger Lead (with YELLOW Sleeve)	1100-1400	R x 100
Between VIOLET Trigger Lead (without YELLOW Sleeve) and BROWN Trigger Lead (with YELLOW Sleeve)	1100-1400	R x 100

3. If meter readings are not as specified, replace trigger assembly. Refer to “**Trigger Assembly Removal and Replacement,**” following.

CAUTION

Switch boxes must be grounded to engine before cranking engine, or switch boxes will be damaged.

IGNITION COIL TEST

IMPORTANT: Ohmmeter tests can only detect certain faults in the ignition coils. Replace ignition coil, if ohm- meter readings (listed in chart, following) are not as specified. If coil tests OK, and coil is still suspected of being faulty, use Multi-Meter/DVA Tester (91-99750A1) or a voltmeter and Direct Voltage Adaptor (91-89045) to thoroughly check coil.

1. Disconnect wires from the positive (+) and negative (-) coil terminals.
2. Remove the spark plug (hi-tension) lead from coil tower.

3. Use an ohmmeter and perform the following tests:

NOTE: Copper wire is an excellent conductor, but it will have a noticeable difference in resistance from cold to hot temperatures. Reasonable variations from these specified readings are acceptable.

Test Leads to	Resistance Ohms	Scale Reading
Between (+) and (-) Coil Terminals	.02-.04	R x 1
On BLUE Color Coils Between Coil Tower and Either (+) or (-) Coil Terminal (Mounted or Removed)	800-1100	R x 100

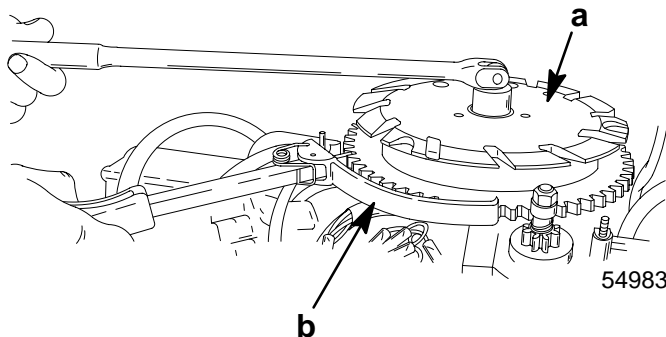
4. If meter readings are not as specified, replace ignition coil. Refer to “**Ignition Coil Removal and Installation,**” following.

Ignition Components Removal and Installation

FLYWHEEL REMOVAL AND INSTALLATION

Flywheel Removal

1. Remove 3 wing nuts and lift flywheel cover off engine.
2. While holding flywheel with Flywheel Holder (91-52344), remove flywheel nut and washer.



- a - Flywheel
- b - Flywheel Holder (91-52344)

3. Install a crankshaft protector cap on end of crankshaft, then install Flywheel Puller (91-73687A2) into flywheel.



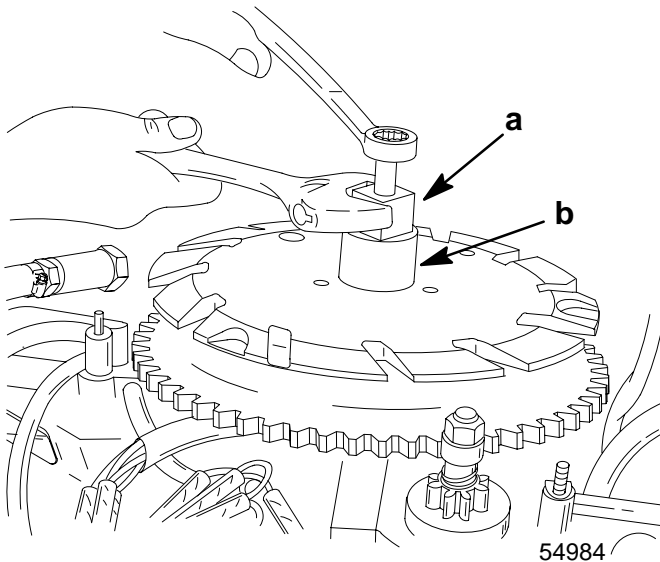
⚠ CAUTION

Crankshaft damage may result if a protector cap is not used between crankshaft and puller.

4. Remove flywheel by operating flywheel puller, as shown.

⚠ CAUTION

CAUTION DO NOT hammer on end of puller center bolt to remove flywheel, or damage may result to crankshaft or bearings. DO NOT use heat to aid flywheel removal, as excessive heat may seize flywheel to crankshaft.



- a - Flywheel Puller (91-73687A2)
b - Crankshaft Protector Cap (Hidden)

Flywheel Installation

IMPORTANT: Do not apply oil to crankshaft taper or flywheel taper as flywheel will not seat properly against crankshaft when torqued.

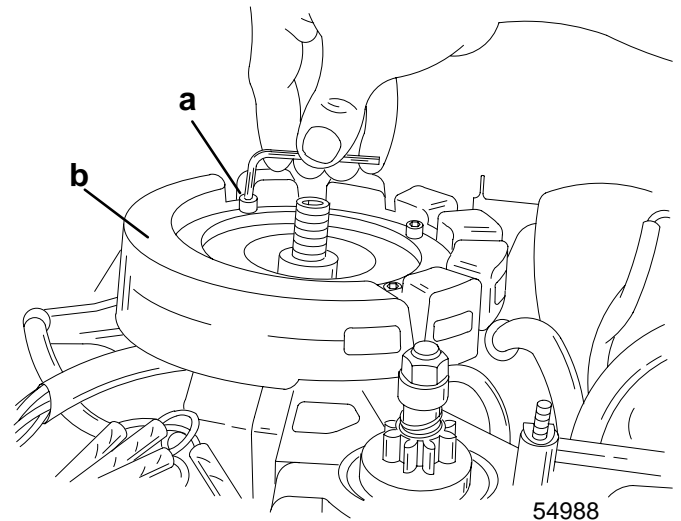
1. Reinstall flywheel on crankshaft. Secure flywheel with flat washer and locknut. While holding flywheel with Flywheel Holder (91-52344), torque flywheel nut to 120 lb. ft. (163 N·m).
2. Reinstall flywheel cover on engine.

STATOR ASSEMBLY REMOVAL AND INSTALLATION

Stator Assembly Removal

1. Remove flywheel, as outlined in “Flywheel Removal and Installation,” preceding.

2. Remove 4 screws which secure stator to the upper end cap.



- a - Stator Attaching Screws
b - Stator

3. Disconnect all stator leads from their respective terminals, cut sta-strap(s) and remove stator assembly from engine.

Stator Assembly Installation

1. Clean stator attaching screw threads with Loctite Primer T (92-59327--1) and apply Loctite 271 (92-809820). Install stator assembly in position on upper end cap and secure with attaching screws. Torque screws to 50 lb. in. (5.5 N·m).
2. Reconnect wires to proper terminals of voltage regulator/rectifier and switch boxes. Reconnect ground lead to ground. Refer to wiring diagram, following in this section. Wires with yellow identification sleeve must be connected to outer switch box.

⚠ CAUTION

Switch boxes must be grounded to engine before cranking engine, or switch boxes will be damaged.

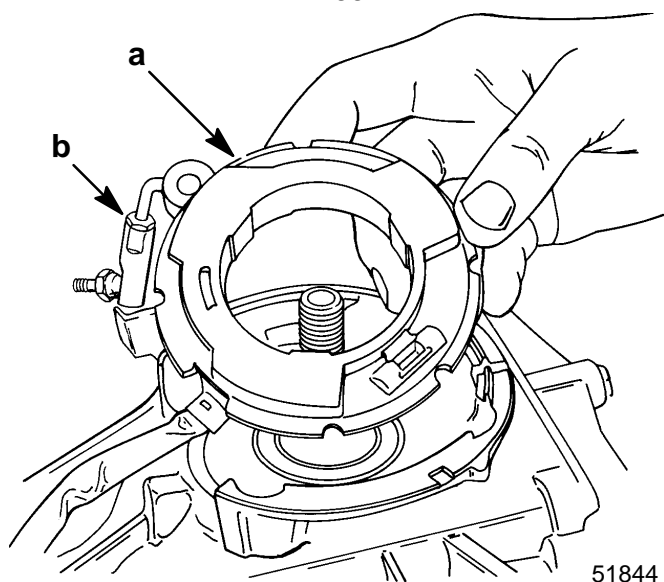
3. Route stator wiring harness as shown. Secure with sta-strap and clamp.
4. Reinstall flywheel, as outlined in “Flywheel Removal and Installation,” preceding.



TRIGGER PLATE ASSEMBLY REMOVAL AND INSTALLATION

Trigger Plate Assembly Removal

1. Remove flywheel, as outlined in “Flywheel Removal and Installation,” preceding.
2. Remove 4 screws which secure stator assembly to upper end cap. Lift stator off end cap and move to the side.
3. Remove locknut that secures link rod swivel into spark advance lever. Pull link rod out of lever.
4. Remove 3 screws and remove switches boxes from ignition plate.
5. Disconnect all trigger leads from their respective terminals. Cut sta-strap and remove trigger plate assembly from engine.
6. If trigger assembly is faulty, remove and retain link rod swivel from trigger.

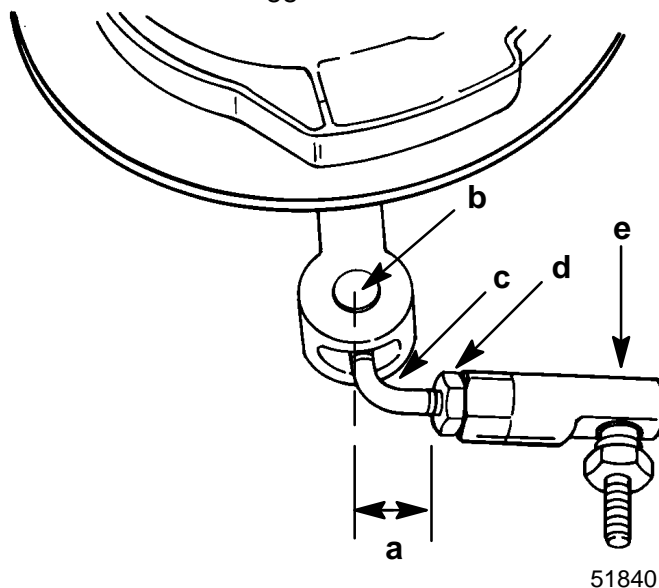


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- a - Trigger
- b - Link Rod Swivel

Trigger Plate Assembly Installation

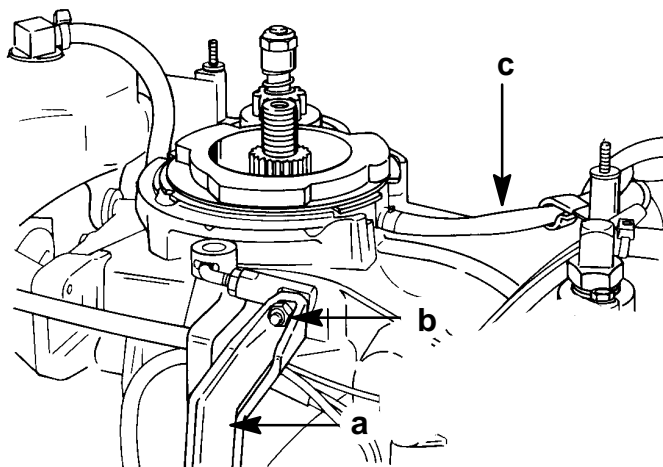
1. If link rod swivel was disassembled or removed, reassemble to trigger as shown.



51840

- a - Retain This [11/16 in. (17.5 mm)] Dimension
- b - Pivot
- c - Link Rod
- d - Hex Nut
- e - Ball Joint

2. Place trigger plate assembly in upper end cap. Fasten link rod swivel to spark advance lever with locknut.



51840

- a - Spark Advance Lever
- b - Locknut
- c - Trigger Harness

3. Route trigger wiring harness as shown. Reconnect wires to proper terminals of switch boxes. Refer to wiring diagram, following in this section. Wires with yellow identification sleeve must be connected to outer switch box.



4. Install switch boxes to ignition plate with 3 screws retained from disassembly. Refer to switch box(es) removal and installation (see “**Table of Contents**”). Make sure that both switch boxes are grounded to ignition plate thru mounting screws and spacers.

⚠ CAUTION

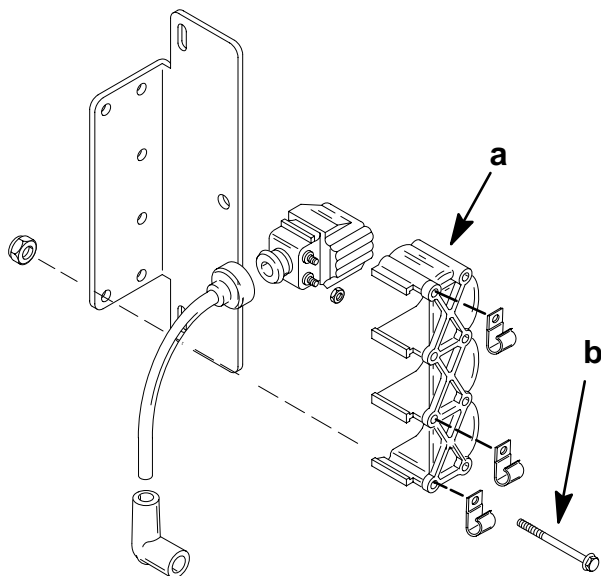
Switch boxes must be grounded to engine before cranking engine, or switch boxes will be damaged.

5. Clean stator attaching screw threads with Loctite Primer T (92-59327--1) and apply Loctite 222 (obtain locally). Install stator assembly in position on upper end cap and secure with attaching screws. Torque screws to 50 lb. in. (5.5 N m).
6. Secure wires with sta-strap and.
7. Reinstall flywheel as outlined in “**Flywheel Removal and Installation,**” preceding.

IGNITION COIL REMOVAL AND INSTALLATION

Ignition Coil Removal

1. Remove the spark plug (high tension) lead from the defective coil.
2. Disconnect wires from (+) and (-) terminals on defective coil.
3. Remove 6 screws and nuts, lift coil cover along with coils from engine. Remove defective coil from cover.



a - Cover
b - Screws

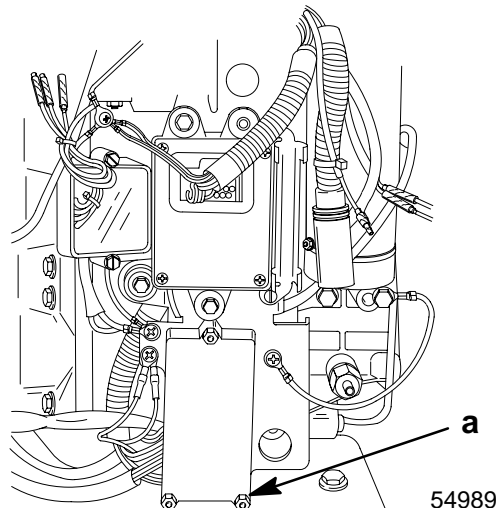
Ignition Coil Installation

1. Place coil in coil cover and install to engine with 6 screws and nuts.
2. Reconnect switch box wire to (+) terminal of coil and black ground wire to (-) terminal.
3. Pull the boot back and insert spark plug lead into coil. Caution must be taken to ensure a complete connection of lead into coil. Form a water tight seal between coil tower and spark plug lead using Quicksilver Insulating Compound (92-823506--1). Assemble boot over coil terminal.

SWITCH BOX(ES) REMOVAL AND INSTALLATION

Switch Box(es) Removal

1. Remove 3 screws and lift switch boxes from engine.



a - Screws

2. Disconnect wires from switch boxes.

Switch Box(es) Installation

1. Reconnect wires to proper bullet terminals of switch boxes. Secure a ground lead to ignition plate using a screw. Refer to wiring diagram, following. Wires with yellow identification sleeve must be connected to outer switch box. Outer switch box fires cylinders No. 2, 4 and 6.
2. Install switch boxes to ignition plate with 3 screws and nuts. Make sure that both switch boxes are grounded to engine through ground leads.

⚠ CAUTION

Switch boxes must be grounded to engine before cranking engine, or switch boxes will be damaged.

