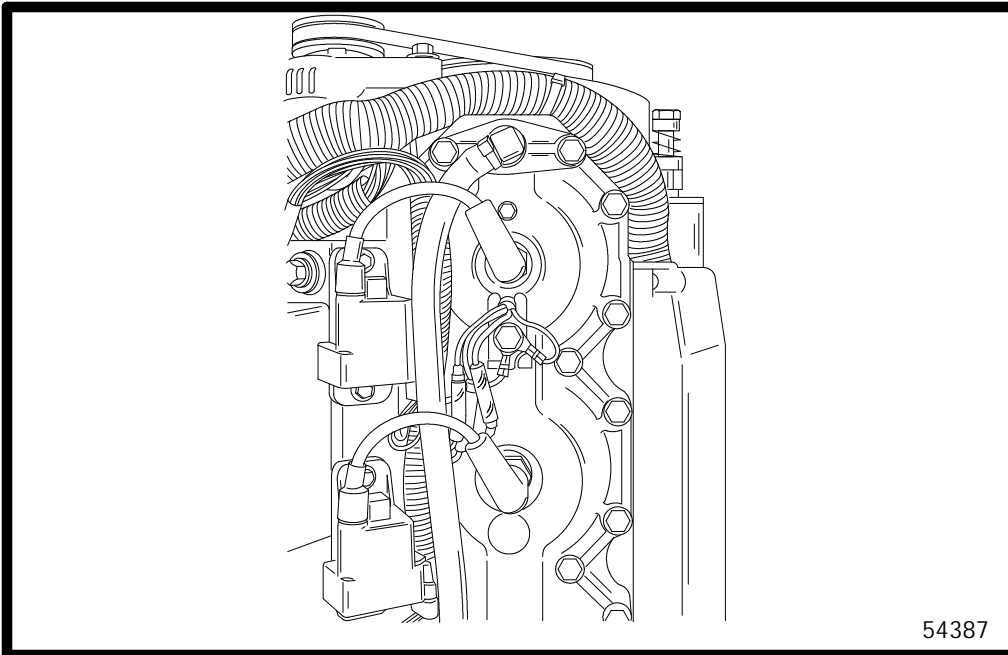




ELECTRICAL

2

A



IGNITION SYSTEM



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Ignition Specifications

Ignition System	
Type	Capacitor Discharge
Spark Plug Type 1994 - 1996 S/N 0D280813 - 0G437999 3 Litre Work/225 Carb	NGK BPZ8H-N-10
1997 S/N 0G438000 and UP 3 Litre Work/225 Carb 1994/95/96/97 225 EFI/250EFI	Champion QL77CC Champion QL77CC
Spark Plug Gap NGK BPZ8H-N-10 Champion QL77CC	0.040 in. (1.0mm) 0.035 in. (0.889mm)
Voltage @ Spark Plugs	45000 Volts

Stator Ohms Test

Test Leads to	Resistance Ohms
Connect meter leads between the 2 leads coming out of each bobbin.	1994 Models 1100 ± 10%
Connect meter leads between lead coming out of each bobbin and engine ground.	1995 and Newer Models 1100 ± 10%

Crank Position Sensor

Test Leads to	Resistance Ohms
Connect meter leads between the 2 sensor leads	1100 ± 200

Throttle Position Sensor

At Idle		W.O.T.	
Carb Models	EFI Models	Carb Models	EFI Models
.950 ?	0.050 VDC	3.8? .10	3.80? .25

Engine Temperature Sensor

Between Black and EACH Tan/Blk wire.	No Continuity
--------------------------------------	---------------

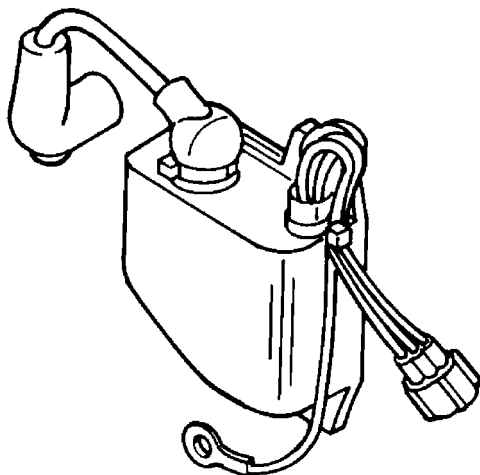
Insert digital or analog ohmmeter test leads into both TAN/BLACK sensor leads. With engine at temperature (C° or F°) indicated, ohm readings should be as indicated ± 10%.

Block Temperature		Resistance (Ohms)
C°	F°	
-15	5	7465
-10	14	5636
-5	23	4288
0	32	3287
5	41	2551
10	50	1996
15	59	1574
20	68	1250
25	77	1000
30	86	805
35	95	652
40	104	532
45	113	436
50	122	360
55	131	298
60	140	248
65	149	208
70	158	175
75	167	148
80	176	126
85	185	107
90	194	92
95	203	79
100	212	68
105	221	59
110	230	51
115	239	44
120	248	38
125	257	34



CAPACITOR DISCHARGE MODULE (PN 822779) OHMS TEST

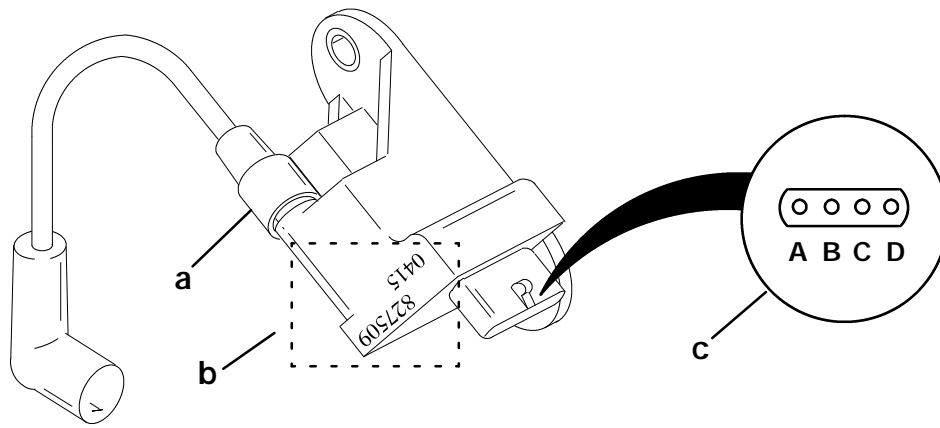
Spark Gap Test - With battery @ a minimum of 9 volts, CDM should produce a spark to jump a 3/8 in. gap @ a cranking speed of 350 RPM



TESTED PART	MULTIMETER WIRES	CONNECTED TO	SCALE	READING
IGNITION MODULE	RED BLACK	GROUND WHITE	R X 1	40 ± 10 OHMS
	RED BLACK	GRN/WHT GROUND	R X 1	CONTINUITY
	RED BLACK	GROUND GRN/WHT	R X 1K	NO CONTINUITY
	RED BLACK	GRN/WHT BLK/YEL	R X 1K	NO CONTINUITY
	RED BLACK	BLK/YEL GRN/WHT	R X 1	CONTINUITY
	RED BLACK	COIL TOWER GROUND	R X 10	1000 ± 300 OHMS



CAPACITOR DISCHARGE MODULE (PN 827509) OHMS TEST



- a - 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

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			
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 ? 100 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
Ground Pin (A)/ or Black test harness lead	Black/Yellow (B)/ or Black/ Yellow test harness lead	R x 100	No Continuity
Black/Yellow (B)/ or Black/ Yellow test harness lead	Ground Pin (A)/ or Black test harness lead	R x 100	Continuity

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



Stator and ECM DVA Tests

Stator and ECM DVA tests can be made using Quicksilver Multimeter/DVA Tester 91-99750 and TPS/CDM Harness Assembly 84-825207A1 for 1994/1995 models or CDM Harness Assembly 84-825207A2 for 1996/1997 models. Connect the harness in series at a CDM connector. Attach the appropriate DVA test leads to the harness as listed below:

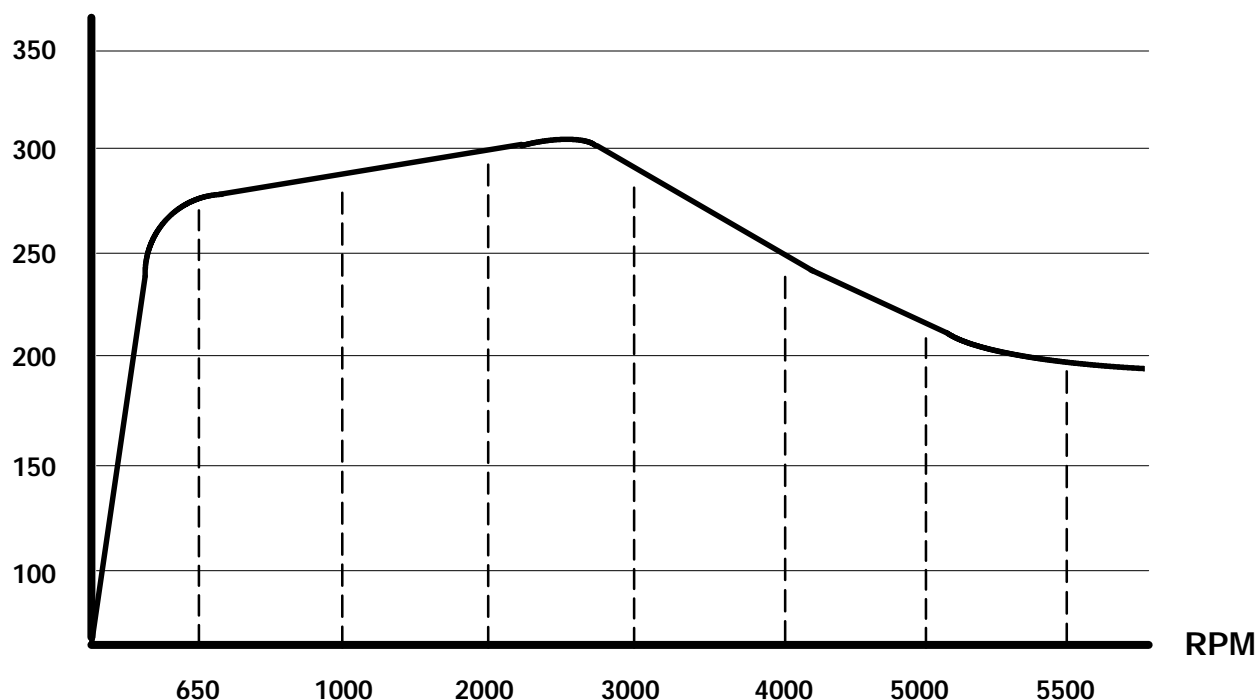
TEST	DVA POSITION	DVA LEAD	TPI/CDM LEAD	VOLTAGE @ CRANKING	VOLTAGE @ 650-3000 RPM	VOLTAGE @ 4000-5500 RPM
Stator	400 DVA	RED	1994/1995 RED	100 - 225	250 - 300	230 - 200
		BLACK - To GRD	1996/1997 GREEN			
ECU Trigger	40 DVA	RED	WHITE	2 - 10		
		BLACK - To GRD				

IMPORTANT: Use the Quicksilver Multimeter/DVA Tester 91-99750 to obtain comparable voltages as listed when testing the 3.0 Liter ignition system.

IMPORTANT: The TPS/CDM Harness BLACK lead is not a ground when the TPS/CDM Harness is connected in series with a CDM connector. The BLACK lead is the engine stop lead and should not be connected to the DVA BLACK lead as a ground.

NOTE: The 3.0 Liter CDM is charged by a single stator coil whose efficiency is greatest (highest voltage) at low and mid-range RPM.

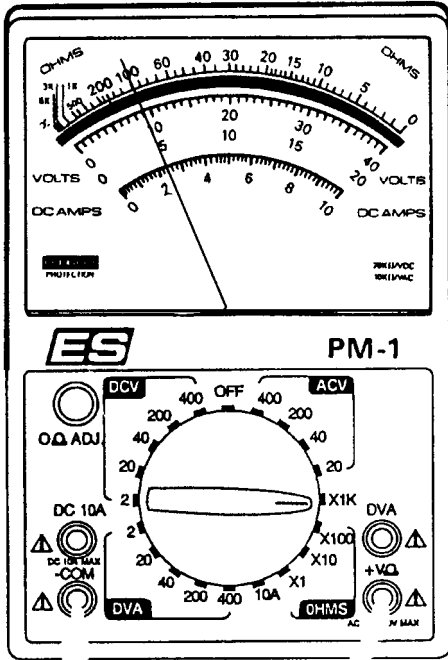
STATOR VOLTAGE





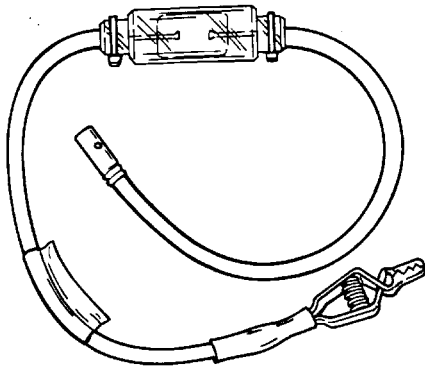
Special Tools

Multi-Meter DVA Tester 91-99750

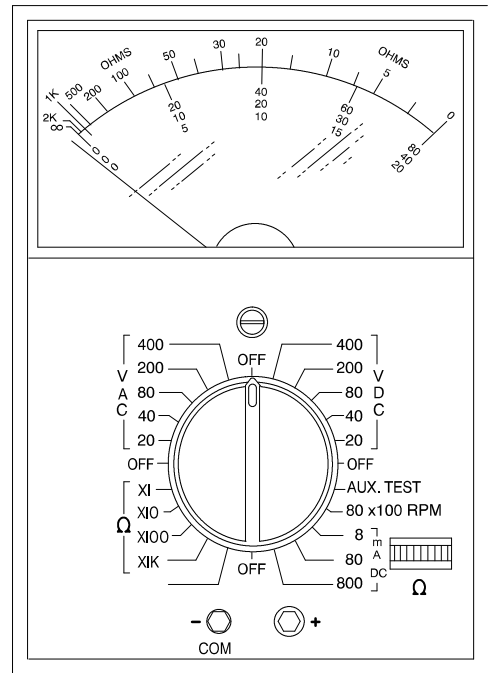


NOTE: There are 3 different Multi-Meter DVA Testers using the part number 91-99750 or 91-99750A1 having a DVA built in. Any one of these testers will work with the 3.0 Liter V-6 ignition system.

Spark Gap Tester 91-63998A1

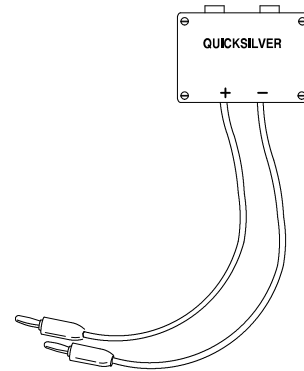


Volt/Ohm Multi-Meter 91-62562



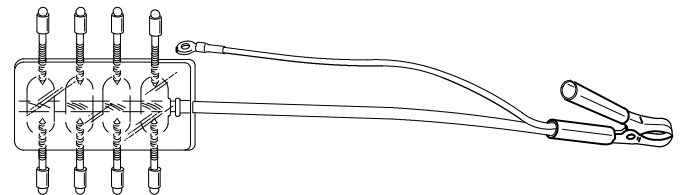
NOTE: Volt/Ohm Multi-Meter 91-62562 can be used to test ignition system voltages if used in conjunction with DVA ADAPTOR 91-89045.

DVA Adapter 91-89045



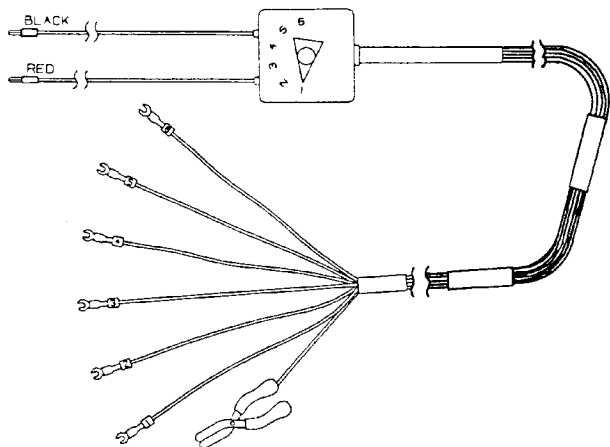
NOTE: There are 2 versions of the DVA adapter - 1 with studs and 1 with leads. Both are designed to be used with Volt/Ohm Multi-Meter 91-62562 or any volt/ohm meter that has a 400 vdc or higher scale.

Spark Gap Board 91-850439

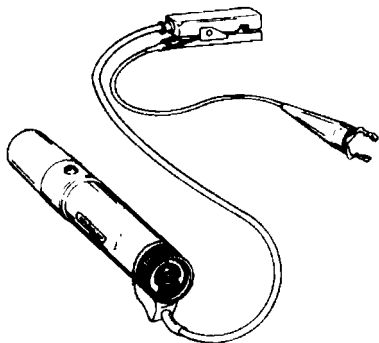




Test Harness 91-14443A1



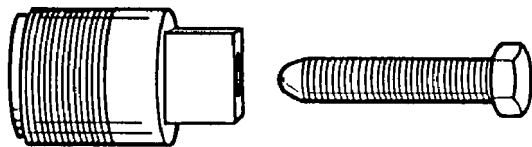
Timing Light 91-99379



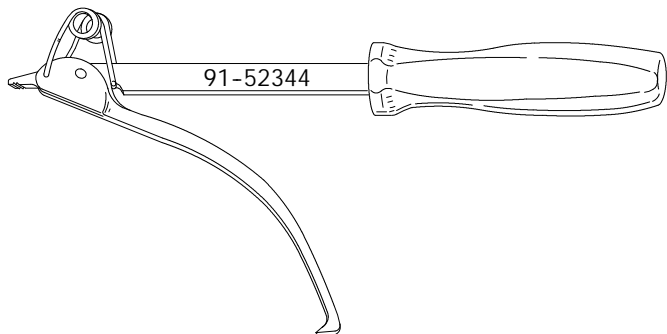
Crank Shaft Protector Cap 91-24161



Flywheel Puller 91-73687A2



Flywheel Holder 91-52344

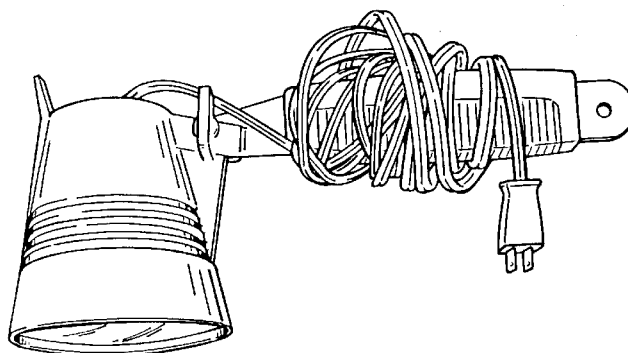


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Service Tachometer 91-59339

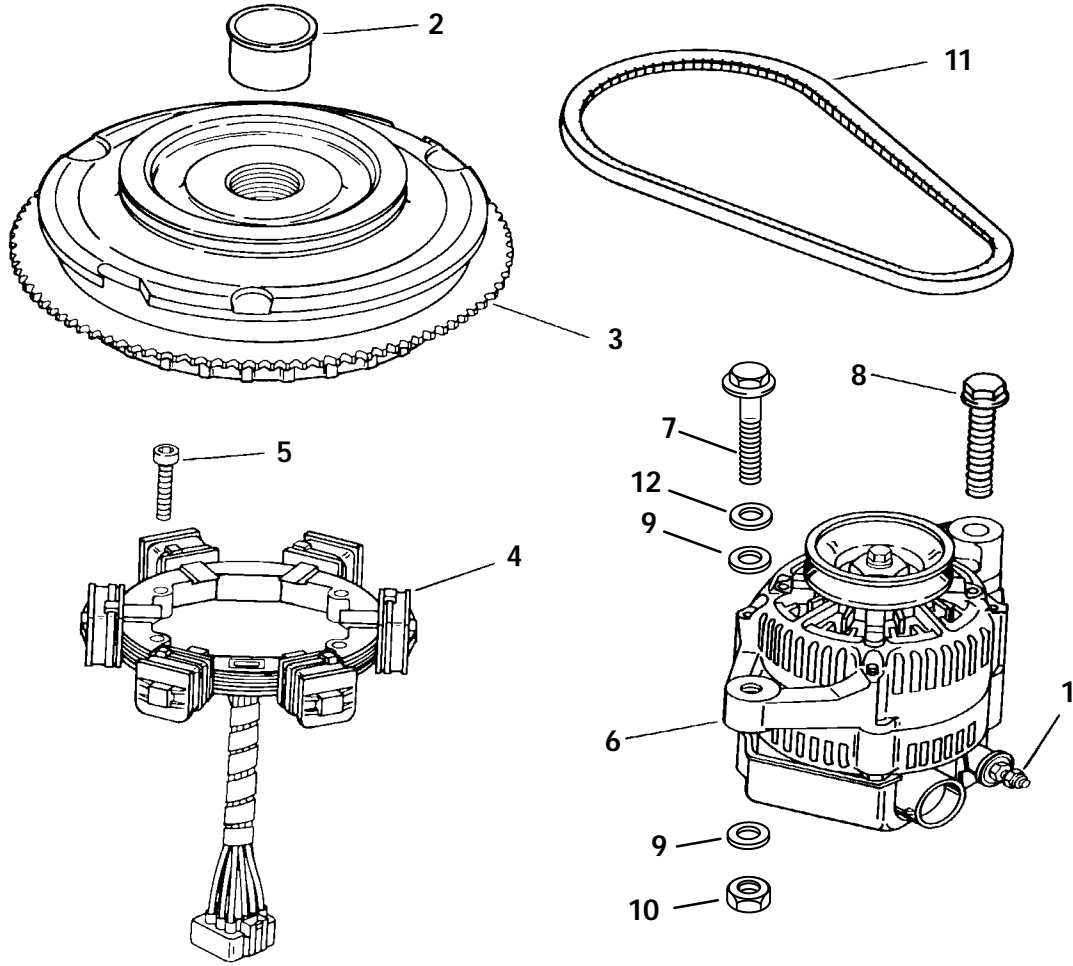


Heat Lamp 91-63209





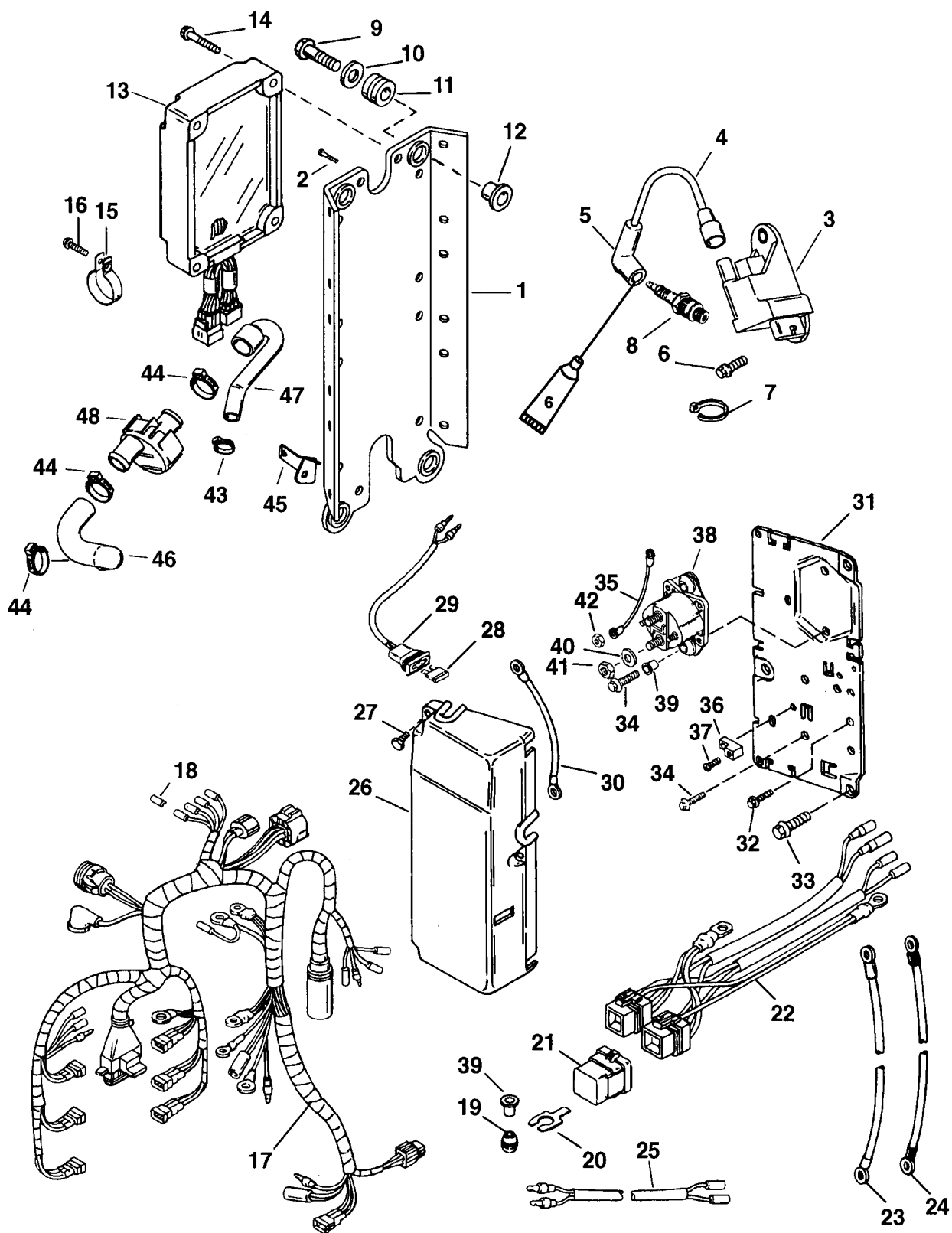
Flywheel/Stator



REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	NUT	36		4.1
2	1	PLUG			
3	1	FLYWHEEL			
4	1	STATOR (S/N-0G129221 & BELOW)			
4	1	STATOR (S/N-0G129222 & UP)(SEAPRO/MARATHON)			
5	4	SCREW (M6 x 1 x 30)	100		11.3
6	1	ALTERNATOR			
7	1	SCREW (M10 x 55) DESIGN II		60	81.0
8	1	SCREW (M10 x 40)	240	20	27.0
9	2	WASHER			
10	1	NUT			
6	1	ALTERNATOR DESIGN I			
7/8	2	SCREW (M10 x 40)		40	54.0
11	1	V-BELT			
12	1	WASHER			



Electrical Components (All Models-S/N-0G303046 & UP)



 Dielectric Grease (92-823506--1)

 Liquid Neoprene (92-25711--2)

Note: Coat all ring terminal wiring connections with Liquid Neoprene.

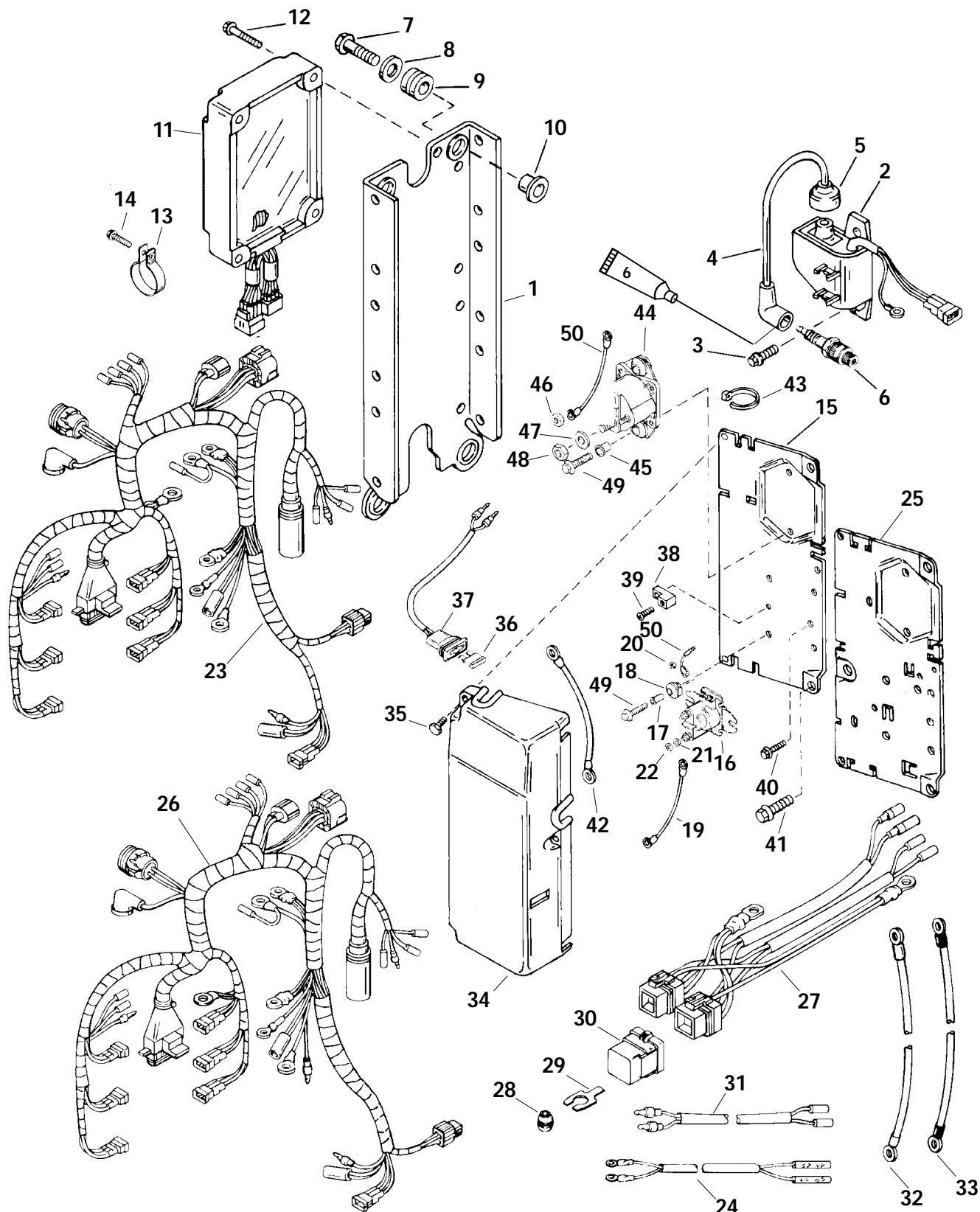


Electrical Components (All Models-S/N-0G303046 & UP)

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	ELECTRICAL MOUNTING PLATE			
2	2	SCREW (M6 x 14)			
3	6	CDM ASSEMBLY			
4	1	HI-TENSION CABLE (SET OF 6)			
	6	HI-TENSION CABLE (SINGLE CABLE)			
5	6	BOOT			
6	12	SCREW (M6 x 14)	80		9.0
7	AR	STA-STRAP			
8	6	SPARK PLUG (NGK #BPZ8H-N-10)	240	20	27.0
	6	SPARK PLUG (CHAMPION #QL77CC)	240	20	27.0
9	4	SCREW (M8 x 35)	235	19.0	26.0
10	4	WASHER			
11	4	GROMMET			
12	4	BUSHING			
13	1	ECU ASSEMBLY S/N-0G303046 THRU 0G437999			
	1	ECU ASSEMBLY (SEAPRO/MARATHON)			
	1	ECU ASSEMBLY S/N-0G438000 & UP			
	1	ECU ASSEMBLY (SEAPRO/MARATHON)			
14	4	SCREW (M6 x 40)	80		9.0
15	1	CLAMP			
16	1	SCREW			
17	1	HARNESS-Ignition			
18	AR	PLUG (SEAPRO/MARATHON)			
19	2	GROMMET			
20	2	BRACKET			
21	2	RELAY			
22	1	HARNESS-Trim			
23	1	BATTERY CABLE (POSITIVE)			
24	1	BATTERY CABLE (NEGATIVE)			
25	1	HARNESS (26 IN.)			
26	1	COVER			
27	3	SCREW (M5 x 0.8)		Drive Tight	
28	1	FUSE			
29	1	FUSE SOCKET			
30	1	CABLE (BLACK)			
31	1	SOLENOID MOUNTING PLATE			
32	1	SCREW (M6 x 10)	100	8.0	11.3
33	3	SCREW (M8 x 25)	200	17.0	23.0
34	4	SCREW (M6 x 25)	100	8.0	11.3
35	1	CABLE (BLACK)			
36	1	TERMINAL BLOCK			
37	1	SCREW (10-16 x 1/2)		Drive Tight	
	1	SCREW (10-16 x 3/8 IN.)		Drive Tight	
38	1	STARTER SOLENOID			
39	AR	BUSHING			
40	2	LOCKWASHER			
41	2	NUT (5/16-18)	45		5.1
42	2	NUT (10-32)	20		2.3
43	1	CLAMP			
44	3	CLAMP			
45	1	BRACKET			
46	1	HOSE (INLET)			
47	1	HOSE (OUTLET)			
48	1	PULSE FLUSH			



Electrical Components (S/N-0G129222-0G303045) (Non Seapro/Marathon)



 6 Dielectric Grease (92-823506--1)

 7 Liquid Neoprene (92-25711--2)

Note: Coat all ring terminal wiring connections with liquid neoprene.

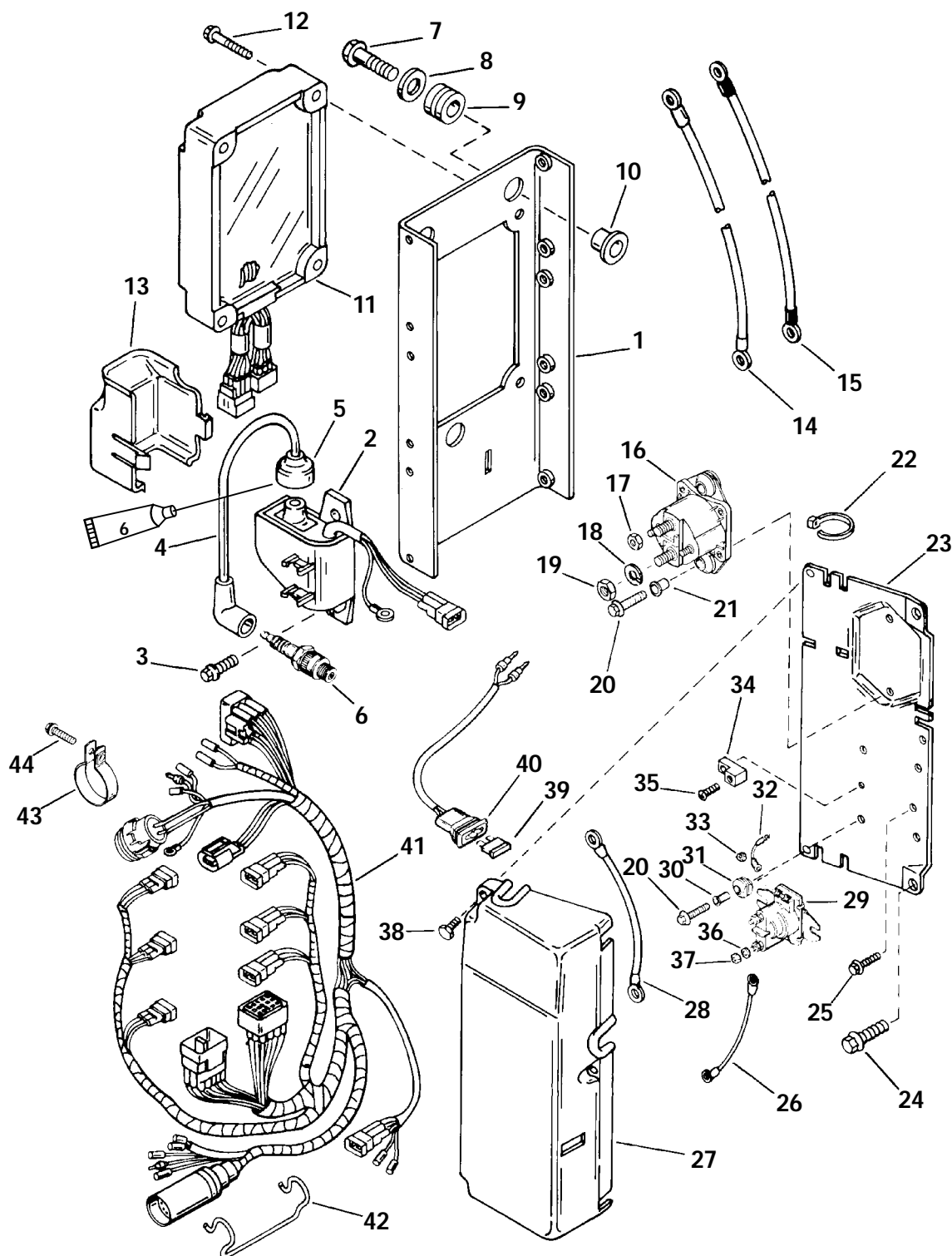


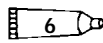
Electrical Components (S/N-0G129222-0G303045) (Non Seapro/Marathon)

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	ELECTRICAL MOUNTING PLATE			
2	6	CDM ASSEMBLY			
3	13	SCREW (M6 x 14)	80		9.0
4	1	HI-TENSION CABLE			
5	6	BOOT			
6	6	SPARK PLUG (BPZ8H-N-10)	240	20	27.0
7	4	SCREW (M8 x 35)	235	19.0	26.0
8	4	WASHER			
9	4	GROMMET			
10	4	BUSHING			
11	1	E.C.U. ASSEMBLY			
12	4	SCREW (M6 x 40)	80		9.0
13	1	CLAMP			
14	1	SCREW			
15	1	SOLENOID MOUNTING PLATE			
16	2	TRIM SOLENOID			
17	4	BUSHING			
18	4	GROMMET			
19	2	CABLE (RED) DESIGN I			
20	4	NUT (#8-32) W/ TRIM SOLENOIDS			
21	2	LOCKWASHER			
22	2	NUT (1/4-20)			
23	1	HARNESS - Ignition			
24	1	HARNESS - Trim			
25	1	SOLENOID MOUNTING PLATE			
26	1	HARNESS - Ignition			
27	1	HARNESS - Trim DESIGN II			
28	2	GROMMET			
29	2	BRACKET			
30	2	RELAY			
31	1	HARNESS - Shift Interrupt (26 IN.)			
32	1	BATTERY CABLE (POSITITIVE)			
33	1	BATTERY CABLE (NEGATIVE)			
34	1	COVER-plate			
35	3	SCREW (M5 x 0.8)		Drive Tight	
36	1	FUSE			
37	1	FUSE SOCKET			
38	1	TERMINAL BLOCK			
39	1	SCREW (#10-16 x 1/2 IN.)			
	1	SCREW (#10-16 x 3/8 IN.)			
40	1	SCREW (M6 x 10)	100	8.0	11.3
41	3	SCREW (M8 x 25)	200	17.0	23.0
42	1	CABLE (BLACK)			
43	AR	STA-STRAP			
44	1	STARTER SOLENOID			
45	AR	BUSHING			
46	2	NUT (10-32)	20		2.3
47	2	LOCKWASHER			
48	2	NUT (5/16-18)	45		5.1
49	AR	SCREW (M6 x 25)	100	8.0	11.3
50	AR	CABLE (BLACK)			



Electrical Components (S/N-0G129221 & Below) (Non Seapro/Marathon)



 Dielectric Grease (92-823506--1)

 Liquid Neoprene (92-25711--2)

Note: Coat all ring terminal wiring connections with liquid neoprene.

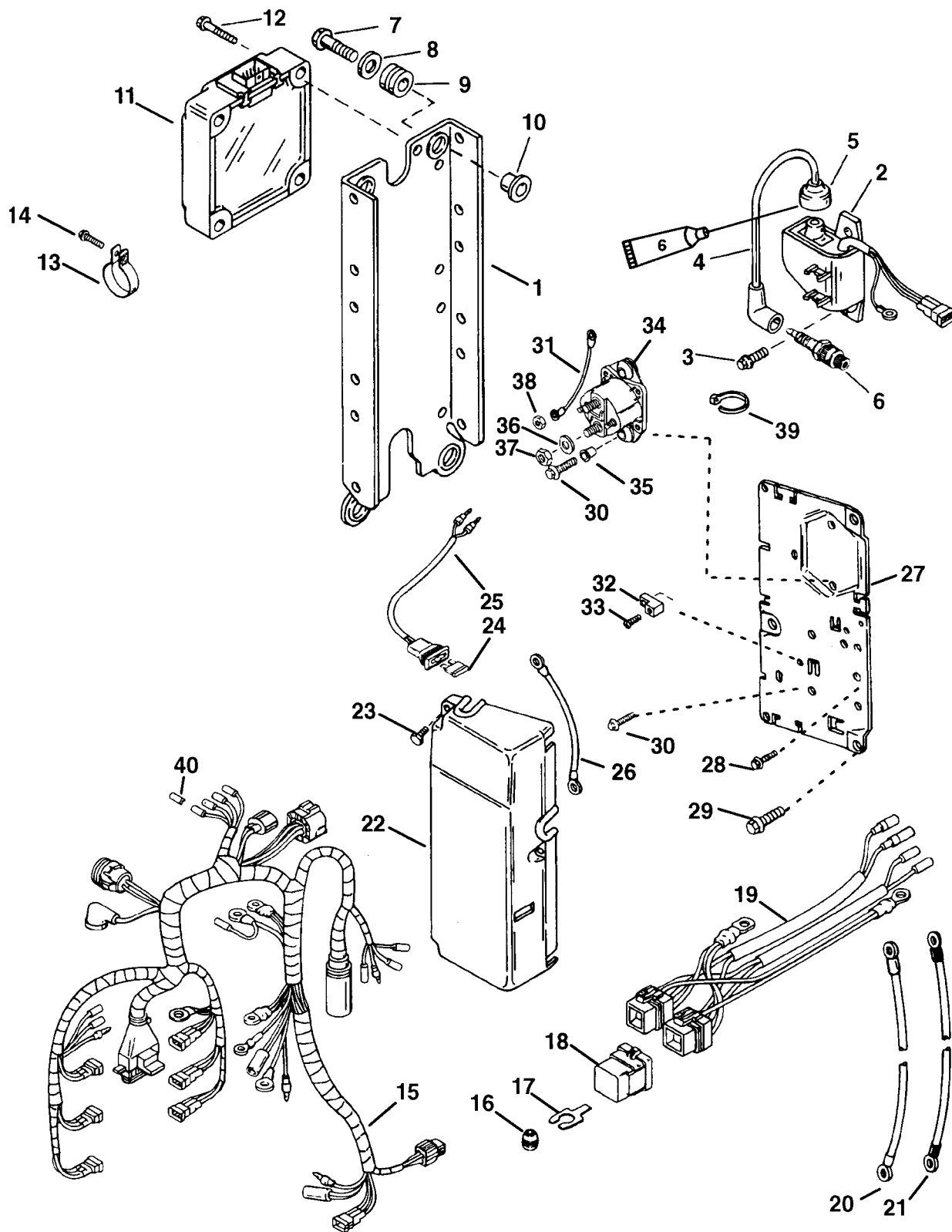



Electrical Components (S/N-0G129221 & Below) (Non Seapro/Marathon)

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	ELECTRICAL MOUNTING PLATE			
2	6	CDM ASSEMBLY			
3	13	SCREW (M6 x 14)	80		9.0
4	1	HI-TENSION CABLE			
5	6	BOOT			
6	6	SPARK PLUG (BPZ8H-N-10)	240	20	27.0
7	3	SCREW (M8 x 35)	235	19.0	26.0
8	3	WASHER			
9	3	GROMMET			
10	3	BUSHING			
11	1	E.C.U. ASSEMBLY			
12	4	SCREW (M6 x 40)	80		9.0
13	1	COVER			
14	1	BATTERY CABLE (POSTITIVE)			
15	1	BATTERY CABLE (NEGATIVE)			
16	1	STARTER SOLENOID			
17	2	NUT (10-32)	20		2.3
18	2	LOCKWASHER			
19	2	NUT (5/16-18)	45		5.1
20	6	SCREW (M6 x 25)	50		5.6
21	2	BUSHING			
22	AR	STA-STRAP			
23	1	SOLENOID MOUNTING PLATE			
24	3	SCREW (M8 x 25)	200	17.0	23.0
25	1	SCREW (M6 x 10)	100	8.0	11.3
26	2	CABLE (RED)			
27	1	COVER-plate			
28	1	CABLE (BLACK)			
29	2	TRIM SOLENOID			
30	4	BUSHING			
31	4	GROMMET			
32	3	CABLE (BLACK)			
33	4	NUT (#8-32)			
34	1	TERMINAL BLOCK			
35	2	SCREW (#10-16 x 1/2 IN.)		Drive Tight	
36	2	LOCKWASHER			
37	2	NUT (1/4-20)			
38	3	SCREW (M5 x 0.8)		Drive Tight	
39	1	FUSE			
40	1	FUSE SOCKET			
41	1	ENGINE HARNESS (See Service Bulletin 94-8)			
42	1	RETAINER			
43	1	CLAMP			
44	1	SCREW			



Electrical Components (Seapro/Marathon) S/N-0G303045 & Below



 Dielectric Grease (92-823506--1)

 Liquid Neoprene (92-25711--2)

Note: Coat all ring terminal wiring connections with liquid neoprene.



Electrical Components (Seapro/Marathon) S/N-0G303045 & Below

REF. NO.	QTY.	DESCRIPTION	TORQUE		
			lb. in.	lb. ft.	N·m
1	1	ELECTRICAL MOUNTING PLATE			
2	6	CDM ASSEMBLY			
3	13	SCREW (M6 x 14)	80		9.0
4	1	HI-TENSION CABLE			
5	6	BOOT			
6	6	SPARK PLUG (BPZ8H-N-10)	240	20	27.0
7	4	SCREW (M8 x 35)	235	19.0	26.0
8	4	WASHER			
9	4	GROMMET			
10	4	BUSHING			
11	1	ECU ASSEMBLY			
12	4	SCREW (M6 x 40)	80		9.0
13	1	CLAMP			
14	1	SCREW			
15	1	HARNESS-Ignition			
16	2	GROMMET			
17	2	BRACKET			
18	2	RELAY			
19	1	HARNESS-Trim			
20	1	BATTERY CABLE (POSITIVE)			
21	1	BATTERY CABLE (NEGATIVE)			
22	1	COVER			
23	3	SCREW (M5 x 0.8)	Drive Tight		
24	1	FUSE			
25	1	FUSE SOCKET			
26	1	CABLE (BLACK)			
27	1	SOLENOID MOUNTING PLATE			
28	1	SCREW (M6 x 10)	100	8.0	11.3
29	3	SCREW (M8 x 25)	200	17.0	23.0
30	4	SCREW (M6 x 25)	100	8.0	11.3
31	1	CABLE (BLACK)			
32	1	TERMINAL BLOCK			
33	1	SCREW (10-16 x 1/2)	Drive Tight		
	1	SCREW (10-16 x 3/8)	Drive Tight		
34	1	STARTER SOLENOID			
35	AR	BUSHING			
36	2	LOCKWASHER			
37	2	NUT (5/16-18)	45		5.1
38	2	NUT (10-32)	20		2.3
39	AR	STA-STRAP			
40	AR	PLUG			

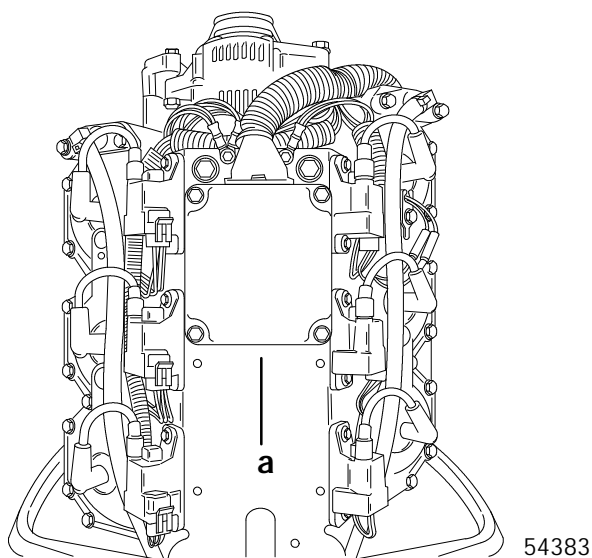


Theory of Operation

Ignition current is generated by the stator under the flywheel. The stator consists of six bobbins - one for each cylinder. The positive current wave charges the capacitor in the capacitor discharge module (CDM). The electronic control module (ECM) activates the switching device (SCR) in the CDM which allows the capacitor to discharge, causing the spark to occur. Ignition timing is regulated by the ECM which receives status input from a variety of sensors. These sensors include: crank position, throttle position sensor (TPS), engine temperature. There are six CDMs - one for each cylinder. The CDM consists of a capacitor, switching device, primary winding, secondary winding, and spark plug lead.

Ignition Component Description

ELECTRONIC CONTROL MODULE (ECM)



a - Electronic Control Unit

Under normal conditions, ECM controls and provides:

Spark timing by monitoring engine RPM, throttle shutter opening and coolant temperature.

Cold engine starting by advancing spark timing and opening fuel enrichment valve.

Over-speed protection in the event engine RPM exceeds 6000 for carb models and 6100 for EFI models. This is accomplished in two stages. Initially timing is gradually retarded to reduce RPM to 5900 for carb models and 6000 for EFI models. If RPM continues to increase above 6400 for carb models and 6500 for EFI models - i.e.- propeller breaks water surface - timing will rapidly retard to 2° ATDC to pre-

vent any further RPM increase. When an over-speed condition occurs, the low-oil and overheat lamps will illuminate alternately and the warning horn will be activated.

Warning control of LOW-OIL, WATER SEPARATOR and OVER-HEAT conditions. Warning is provided through activation of a horn and indicator lamps. A LOW-OIL condition exists when switch in engine-mounted oil tank is shorted to ground (CLOSED). A WATER SEPARATOR condition exists when excessive water accumulates in the bottom of the separator to short out the sensor. In either case, 30 seconds after switch is closed, the warning lamp will illuminate and the warning horn will be activated. The horn will beep 4 times in 1 second intervals followed by a 2 minute off-period. It will then repeat its beep sequence. Continuous lamp illumination and horn beep sequence will occur until the key switch is turned off. If there is no LOW-OIL condition then the WATER SEPARATOR must be checked. An OVER-HEAT condition occurs when the coolant temperature rises above 200°F (93.3°C). The warning lamp will illuminate and the over-heat horn will sound continuously. The ECM will retard the ignition timing until a maximum RPM of approximately 3000 is obtained. The ECM will maintain this RPM until engine temperature drops to 190°F (87.8°C).

Idle stabilizer function by advancing the ignition timing the number of degrees indicated, following, at the respective RPM.

RPM	DEGREES
450	3°
Below 450	6°

Throttle position and engine temperature sensor failure warning to boat operator. Sensor failure is indicated by alternately illuminating the low-oil and overheat lamps as well as activating the warning horn. This warning will occur 15 seconds after a sensor failure has been detected by the ECM. The warning will continue until the key switch is turned off or sensor problem is corrected.

Controls Power-Up Sequence - 1/2 second after ignition key is turned to "ON", and power is applied to ECM, warning lamps will illuminate for 1/2 second and horn will beep for 1/2 second.

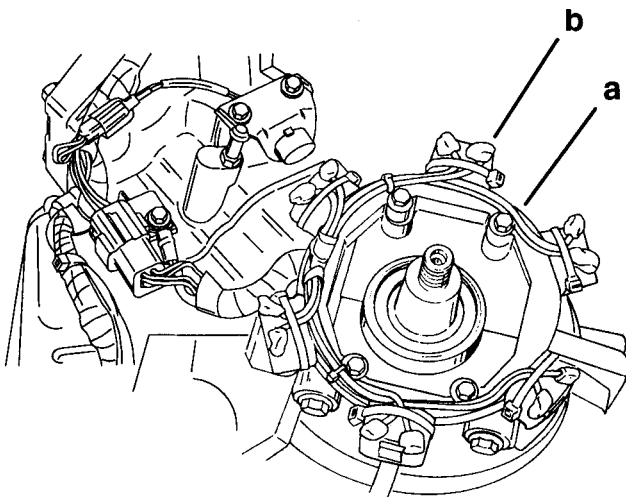


1996/1997/1998 Model Additional ECM Features

- Prom identification with Digital Diagnostic Terminal. Refer to Quicksilver Technician Reference Manual shipped with new diagnostic cartridge.
- Air temperature and/or MAP sensor failure will sound an intermittent warning horn and alternately flash the low oil and overheat lights on the dash.
- Fuel ECM wire harness plug disconnect will sound an intermittent warning horn and alternately flash the low oil and overheat lights on the dash. Engine will not run.

NOTE: An ignition ECM failure will not activate the warning horn as the warning signal originates from the ignition ECM.

STATOR



53459

- a - Stator
- b - Bobbins

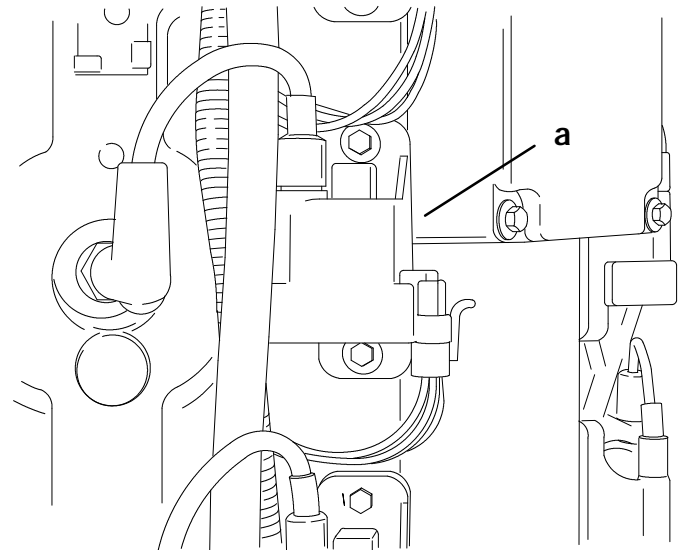
Stator has 6 charging bobbins - 1 bobbin for each ignition module.

Each stator bobbin charges the ignition capacitor in each module.

1994 Model 225 - Stator has 2 functions - charges ignition capacitor in each module and in the event of ECM failure, stator controls spark timing @ $9^\circ \pm 1^\circ$ ATDC by triggering ignition modules. One lead of each bobbin provides voltage for CDM while other lead provides trigger voltage.

1995/1996/1997/1998 Model 3 Litre Work/225 Carb/225 EFI/250 EFI - Stator charges ignition capacitor in each module only. 1995/1996/1997/1998 models do not have "LIMP HOME" capability.

IGNITION MODULES (CDM)



a - Capacitor Discharge Module

Each module contains a capacitor, switching device and ignition coil which can produce approximately 45000 volts (open circuit) at the spark plugs.

1994 MODEL 225 - Module is triggered by the ECM under normal conditions and, in the event of ECM failure, by the stator.

1995/1996/1997/1998 MODEL 3.0 Litre WORK/225/225 EFI/250 EFI - Module is triggered by ECM only. Ground wire for each CDM is incorporated in the wire harness. Capacitor is internally protected from being overcharged by the stator.

FLYWHEEL

Contains two magnets which charge stator bobbins.

Flywheel has 22 teeth on outside rim which, by passing through crank position sensor's magnetic field, informs the ECM of engine RPM and crankshaft angle.



CRANK POSITION SENSOR

Contains a permanent magnet and is positioned 0.040 ± 0.020 (1.02mm \pm 0.51mm) from the flywheel teeth.

The timed passing of the flywheel teeth through the sensor's magnetic field enables the ECM to determine engine RPM and crankshaft angle.

THROTTLE POSITION SENSOR

Measures the amount of throttle opening and sends corresponding voltage signal to ECM.

ENGINE TEMPERATURE SENSOR

Monitors powerhead temperature.

ECM uses this signal to activate fuel enrichment valve on carburetor models and increase fuel injector pulse on EFI models for cold starts and to retard timing in the event of an over-heat condition.

Engine Temperature Sensor Graph -

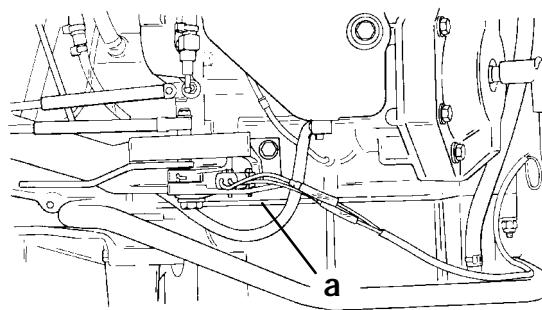
NOTE: Engine timing is advanced as a function of engine coolant temperature, which, in conjunction with fuel enrichment, aids in cold starting.

BLOCK TEMPERATURE

Block Temperature		Timing Advanced by:
C°	F°	
5	41	10°
10	50	10°
15	59	10°
20	68	10°
25	77	8°
30	86	6°
40	104	4°
50	122	2°
60	146	0°
And Above		

NOTE: The amount of sensor timing advance listed above is in addition to the normal engine timing at a given RPM. Engine timing will not advance as a function of block temperature if crank shaft RPM is above 3000.

SHIFT INTERRUPT SWITCH



_2152

a - Shift Interrupt Switch

A shift interrupt switch is mounted below the shift cable on the PORT side of the engine.

1994 MODEL 225 - This switch momentarily grounds out the capacitor voltage within the ignition modules on cylinders 2,4,6 when shifting from FORWARD or REVERSE into NEUTRAL. The dropping of 3 cylinders reduces the torque load on the sliding clutch allowing the gear case to be shifted into NEUTRAL. A diode within the interrupt switch wiring prevents all 6 cylinders from being shut down when shifting into NEUTRAL.

If high effort is required to shift outboard into NEUTRAL, or outboard quits running when shifting into NEUTRAL, or there is weak spark or no spark on cylinders 2,4,6; test diode as follows:

- Disconnect BLK/YEL female connector from switch.
- Insert one ohm meter test lead into female connector and second test lead into PIN 1 of engine harness connector.
- Observe meter reading.
- Reverse test leads and observe meter.

Ohm meter should indicate CONTINUITY in one direction and NO CONTINUITY in the other direction. If correct results are not obtained, order SHIFT INTERRUPT DIODE REPLACEMENT KIT (17461A5) as described in **SERVICE BULLETIN 94-8**.

1995/1996/1997/1998 MODEL 3.0 Litre WORK/225 Carb/225 EFI/250 EFI - When shift interrupt switch is activated, the ECM retards ignition timing to 20° ATDC. If switch is activated for longer than 2 seconds, the ECM detects switch failure and returns ignition timing to normal.



Ignition Diagnostic Procedures

⚠ CAUTION

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

- **INSURE** the Positive (+) meter lead is connected to the DVA receptacle on the meter.
- **DO NOT CHANGE** meter selector switch position while engine is running and/or being "cranked".

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. To mark off flywheel to check for individual cylinder timing advance, temporarily tape a degree wheel on top of the flywheel with 0° on the degree wheel aligning with the TDC mark on the flywheel; this would be #1 cyl. timing mark. 60° in a clockwise direction would be #2 cyl. - use a magic marker to mark the flywheel; 120° = #3 cyl.; 180° = #4 cyl.; 240° = #5 cyl. and 300° = #6 cyl.

If a degree wheel is not available, install a dial indicator in each cylinder, consecutively. Bring each respective piston up to top dead center. Mark the flywheel in-line with the timing pointer.

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

1. All grounds should be checked for proper continuity.
2. Disconnect, inspect and reconnect ignition harness connectors to verify proper continuity.

IMPORTANT: The following corrections are listed in sequence of probable occurrence. Refer to "TESTING IGNITION COMPONENTS" to determine individual component failure. Verify harness integrity **BEFORE** replacing components.



Ignition Troubleshooting

“TESTING IGNITION COMPONENTS” to determine individual component failure. Verify harness integrity BEFORE replacing components.

IMPORTANT: The following corrections are listed in sequence of probable occurrence. Refer to

PROBLEM	CORRECTION
<p>1. No spark or weak spark on all 6 cylinders. <i>NOTE: Disconnect all CDMs' and then reconnect 1 CDM at a time to determine if CDM produces spark. If a CDM is good, disconnect that CDM and then try another CDM until all CDMs' have been tested.</i></p>	<p>No Spark</p> <ul style="list-style-type: none"> - Stop lead (BLK/YEL) shorted to ground. - Stator harness disconnected. - Defective Crank Position Sensor - 1 or More Defective CDM - No DC Voltage to ECM - Flywheel Key Sheared <p>Weak Spark</p> <ul style="list-style-type: none"> - High resistance on stop lead (BLK/YEL) resulting in voltage being bled off to ground. - Ignition module (CDM) defective. - 1 stator bobbin defective.
<p>2. No spark or weak spark on 1 cylinder</p>	<ul style="list-style-type: none"> - Loose/poor ground connection. - Crank Position Sensor not properly set up or defective. - Defective Throttle Position Sensor. - Defective Engine Temperature Sensor. - Defective ECM.
<p>3. Timing fluctuates</p> <ul style="list-style-type: none"> - Note: It is normal for timing to fluctuate 2° @ idle. - If engine over-heats [above 200°F(93.3°C)], Engine Temperature Sensor will retard timing to limit RPM to 3000. - If engine RPM exceeds 6000, over-rev circuit in ECM will retard timing to reduce RPM. - If engine RPM drops below 475, idle stabilizer in ECM will advance timing 3° to 6°. 	<ul style="list-style-type: none"> - Defective Crank Position Sensor. - Defective Throttle Position Sensor. - Defective ECM.
<p>4. Timing will not advance</p> <ul style="list-style-type: none"> - Note: If timing will not advance on only 1 cylinder, check wiring between Ignition Module and ECM. If wiring is OK, replace Ignition Module. 	<ul style="list-style-type: none"> - Defective Ignition Module. - Defective Crank Position Sensor. - Alternator RED output lead is loose. - Defective ECM.
<p>5. Engine misfires at high RPM.</p>	<ul style="list-style-type: none"> - Defective Enrichment Solenoid. - Defective Engine Temperature Sensor. - Defective Crank Position Sensor. - Defective ECM.
<p>6. Engine hard to start when cold.</p>	<ul style="list-style-type: none"> - Defective harness (loose connections) between ECM and Ignition Modules. - Defective Ignition Modules.
<p>7. Engine misfires @ low RPM but runs smooth @ high RPM</p>	<ul style="list-style-type: none"> - Defective Ignition Module. - Defective Crank Position Sensor. - Alternator RED output lead is loose. - Defective ECM.



8. Engine starts hard when hot.	<ul style="list-style-type: none"> - Defective Enrichment Solenoid. - Defective Crank Position Sensor. - Defective Engine Temperature Sensor.
9. Engine will not run over 3000 RPM and is not overheating	<ul style="list-style-type: none"> - Defective Engine Temperature Sensor. - Defective Throttle Position Sensor. - Defective ECM.
10. Engine will not run.	<ul style="list-style-type: none"> - Defective Crank Position Sensor. - Wrong Spark Plugs Installed. Install Champion QL77CC. - Tach Signal (GREY Lead) is shorted to ground. Inspect Tach Wiring - Fuel ECM disconnected.

ECM Sensor Specifications using Digital Diagnostic Terminal 91-823686A2		
DISPLAY	TERMINAL RANGE	NORMAL OPERATING RANGE
Engine RPM	0 - 9000	650 - 5800 NOTE: Above 6100 RPM engine RPM limiter is activated. Dash mounted OIL and TEMP lights will flash, horn will beep and timing will be retarded to limit RPM.
Coolant Temp Deg F	0 - 199	Ambient Air Temp - 160° F NOTE: Water temperature that engine is operating in will affect engine coolant temp. Engine is equipped with 142° F thermostats. When coolant temperature exceeds 200° F, over-heat warning system is activated. Dash mounted TEMP light will illuminate and horn will sound continuously. Timing will be retarded to reduce RPM to a maximum of 3000.
Throttle Pos Volts	0.95 - 4.0	0.95 @ Idle for all Models 3.80 @ W.O.T. for Carb Models 4.00 @ W.O.T. for EFI Models



Spark Angle	20 ATDC - 30 BTDC	4 - 9 ATDC @ Idle for all Models 1994 225 Carb - 22 BTDC @ 5500 w/ECM 821717 1994 225 Carb - 25-27 BTDC @ 5500 w/ECM 284866-1 1995 WORK/225 Carb - 20 BTDC @ 5000 and 23 BTDC @ 5500 1996/7/8 WORK/225 Carb - 19 BTDC @ 5000 and 26 BTDC @ 5500 1995 225 EFI - 20 BTDC @ 5000 and 23 BTDC @ 5800 1996/7/8 225 EFI - 24 BTDC @ 5000 and 24 BTDC @ 5800 1996/7/8 250 EFI - 24 BTDC @ 5000 and 28 BTDC @ 5800 NOTE: When engine is shifted out of gear, timing may retard to 20 ATDC to reduce torque load on gears to ease shifting effort.
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DISPLAY	TERMINAL RANGE	NORMAL OPERATING RANGE
Knock Volts	0 - 10	Knock Voltage Circuitry is not incorporated in 1994/1995/1996/1997 Models.
Battery Volts	0 - 15	11 - 15
Atmosph PSI	0 - 16	11 - 16 PSI NOTE: Atmosphere PSI will vary with the altitude above sea level that engine is operated at. The higher the altitude, the lower the PSI.
MAP PSI	0 - 16	9 - 16 PSI NOTE: Manifold Absolute Pressure (MAP) will vary with the altitude above sea level that engine is operated at. The higher the altitude, the lower the PSI.
Air Temp Deg F	0 - 199	Ambient Air Temperature
Inject Msec	0 - 16	3.5 - 8.0 Fuel Injector Pulse Width will vary due to the following: Air Temperature Coolant Temperature Barometric Pressure (Altitude) RPM Throttle Position Sensor Setting Battery Voltage An Average Pulse Width Readout for either a 225 EFI or 250 EFI would be as follows: Idle - 4 1000 RPM - 4.5 2000 RPM - 5 3000 RPM - 5.5 4000 RPM - 6 5000 RPM - 6.5
Fuel Pump % On	0 - 100	100 The fuel pump runs continuously; 100% duty cycle, when the engine RPM is above 2500.

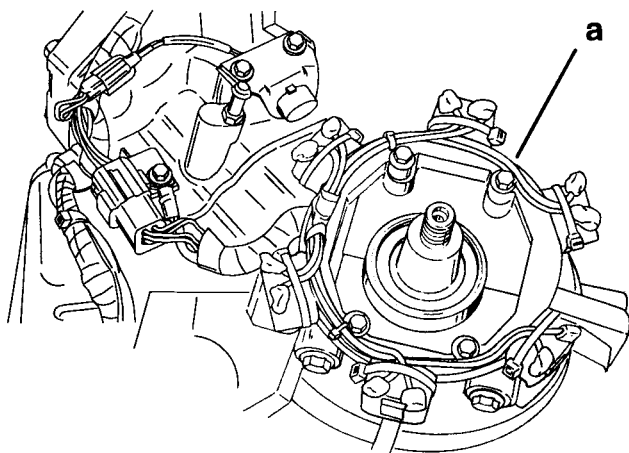


TESTING IGNITION COMPONENTS

Normally, if timing advances and retards with corresponding changes in throttle, most likely the ECM is functioning correctly. In order to determine if all aspects of the ECM are functioning correctly, a CAPACITOR DISCHARGE MODULE (CDM) must be attached to the ECM. Refer to page 21 for a DVA test of the trigger circuit of the ECM.

STATOR

When performing an OHM check of the stator, disconnect the stator wires.



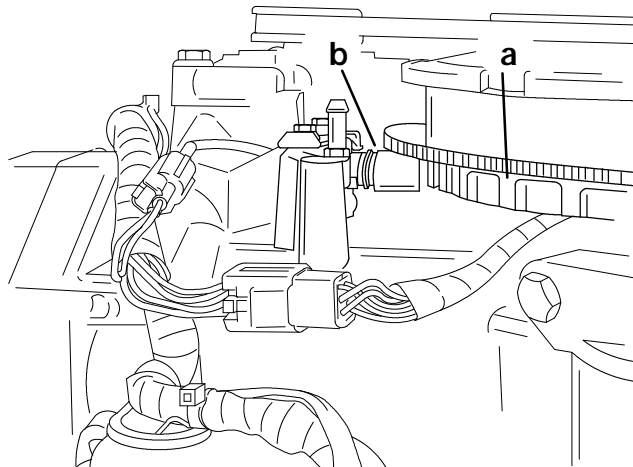
53459

a - Stator

Stator Ohms Test	
Connect meter leads between the two leads coming out of each bobbin.	1994 Models 1100 ? 10%
Connect meter leads between lead coming out of each bobbin and engine ground	1995 and Newer Models 1100 ? 10%

CRANK POSITION SENSOR

NOTE: If boat tachometer is reading properly, then Crank Position Sensor is functioning normally.

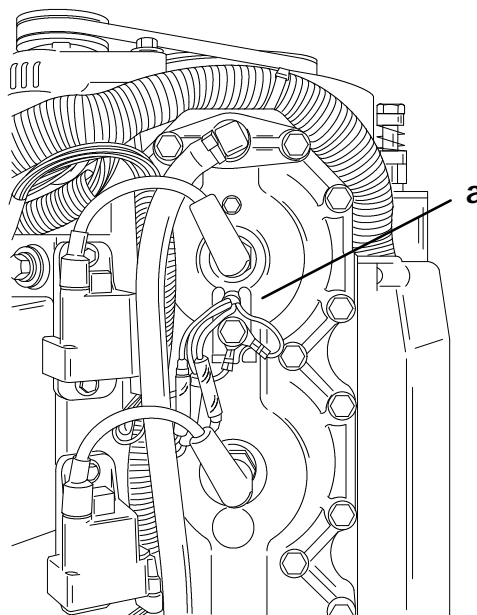


53455

a - Flywheel Teeth
b - Crank Position Sensor

Crank Position Sensor Ohms Test	
Connect meter leads between the two sensor leads	1100 ? 200

ENGINE TEMPERATURE SENSOR



54387

a - Engine Temperature Sensor



Insert digital or analog ohmmeter test leads into both TAN/BLACK sensor leads. With engine at temperature (C° or F°) indicated, ohm readings should be as indicated $\pm 10\%$.

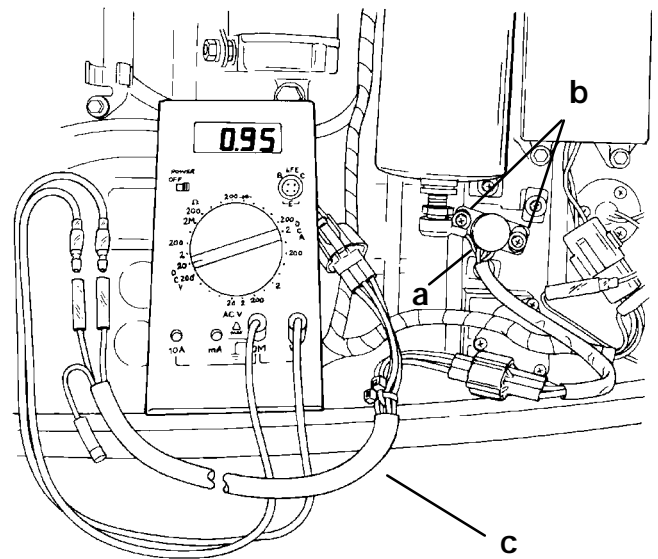
Block Temperature		Resistance (Ohms)
C°	F°	
-15	5	7465
-10	14	5636
-5	23	4288
0	32	3287
5	41	2551
10	50	1996
15	59	1574
20	68	1250
25	77	1000
30	86	805
35	95	652
40	104	532
45	113	436
50	122	360
55	131	298
60	140	248
65	149	208
70	158	175
75	167	148
80	176	126
85	185	107
90	194	92
95	203	79
100	212	68
105	221	59
110	230	51
115	239	44
120	248	38
125	257	34

Engine Temperature Sensor and Ground	
Between Black and EACH Tan/Blk wire.	No Continuity

THROTTLE POSITION SENSOR (TPS)

A digital or an analog volt meter can be used to test or adjust the TPS. However, only very expensive analog meters have the capability to measure the small voltage readings. With outboard NOT running, connect voltmeter using sensor test lead assembly (84-825207A1) between sensor connector and ignition harness connector. With ignition key turned to the "ON" position, voltage reading at idle should be 0.950 ± 0.050 VDC. Voltage progression from idle to wide-open-throttle should be smooth. If voltage reading of 3.80 ± 0.10 VDC (for carb models) or 3.80 ± 0.25 (for EFI models) cannot be obtained, replace sensor. Refer to page 2C-4 for carb model TPS test harness setup or 2C-10 for EFI model TPS test harness setup.

TPS Voltage Readings			
At Idle		W.O.T.	
Carb Models	EFI Models	Carb Models	EFI Models
.950	± 0.050 VDC	3.8	$\pm .10$ / $3.80 \pm .25$



- a - TPS
- b - Set Screws
- c - TPS/CDM TEST HARNESS (84-825207A1)

53330



IGNITION MODULE (CDM - PN 822779)

Possible CDM failure modes and test procedures:

1. Secondary Coil Winding Failure -
 - a. Internal short in secondary coil winding.
 - b. Failure will only affect that CDM.
2. Detected by:
 - a. DVA voltage within specification.
 - b. Weak spark - unable to jump 3/8 in. (9.5mm) spark gap at cranking.
 - c. Ohm test - not valid.

Improved coil winding procedure beginning with date code 2703 - 270 day of 1993. Any previous CDM is suspect.

3. Stop Circuit Failure -
 - a. Common cause is moisture and/or resultant carbon track to ground.
 - b. CDM case may be separating from the potting.
4. Detected by:
 - a. Low DVA voltage.
 - b. Weak spark - unable to jump 3/8 in. (9.5mm) spark gap at cranking.
 - c. Ohm test - BLACK/YELLOW and BLACK - good CDM will have continuity in one direction only. CDM MUST BE DISCONNECTED FROM THE ELECTRICAL HARNESS.

- d. Weak spark on other cylinder(s) - bad CDM will affect other cylinders.

(1.) 1994 225 - Bad CDM on 2, 4, 6 will affect only 2, 4, 6 individual or multiple cylinders. Defective CDM on 1, 3, 5 will affect individual or multiple cylinders. Disconnecting bad CDM will allow good CDMs to operate.

(2.) 1995 All Models - Defective CDM will affect any cylinder.

5. SCR Failure -

Premature SCR switch closing. Lower than specified voltage closes switch and produces a spark. A CDM with this type failure does not affect the operation of other good CDMs.

- a. SCR failures of this type have been found in CDMs with printed numbers 822779A5.
- b. CDMs with printed numbers 822779A8 have an improved SCR.
- c. As the SCR degrades, any voltage pulse above the reduced break-over (trigger) point will produce a spark. Continued operation may cause the SCR to short to ground.

6. Detected Failure -

Shorts to ground - Failed SCR will only affect that CDM.

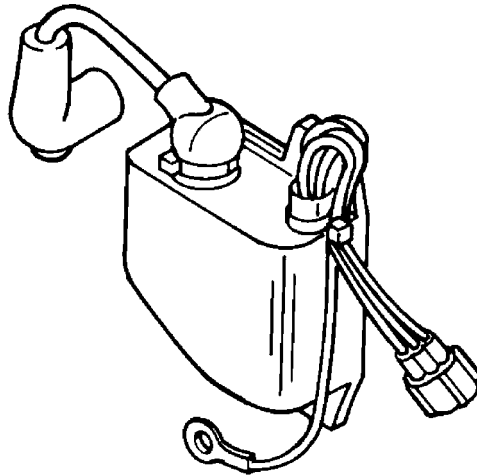
7. Detected by:

- a. Low DVA voltage.
- b. Weak spark - unable to jump 3/8 in. (9.5mm) spark gap at cranking.
- c. Ohm test - not valid.



CAPACITOR DISCHARGE MODULE (PN 822779) OHMS TEST

Spark Gap Test - With battery @ a minimum of 9 volts, CDM should produce a spark to jump a 3/8 in. gap @ a cranking speed of 350 RPM



TESTED PART	MULTIMETER WIRES	CONNECTED TO	SCALE	READING
IGNITION MODULE	RED BLACK	GROUND WHITE	R X 1	40 ± 10 OHMS
	RED BLACK	GRNWHT GROUND	R X 1	CONTINUITY
	RED BLACK	GROUND GRNWHT	R X 1K	NO CONTINUITY
	RED BLACK	GRNWHT BLK/YEL	R X 1K	NO CONTINUITY
	RED BLACK	BLK/YEL GRNWHT	R X 1	CONTINUITY
	RED BLACK	COIL TOWER GROUND	R X 10	1000 ± 300 OHMS

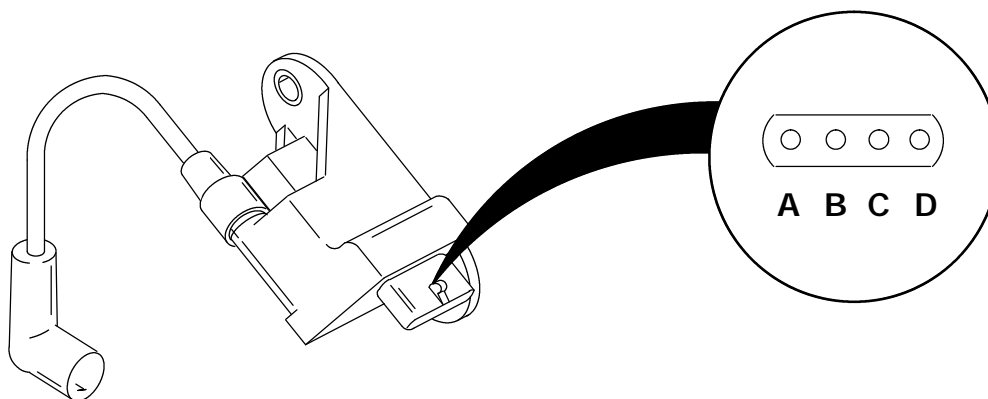


CDM (P/N 827509) Trouble Shooting Flowchart

Chart 1

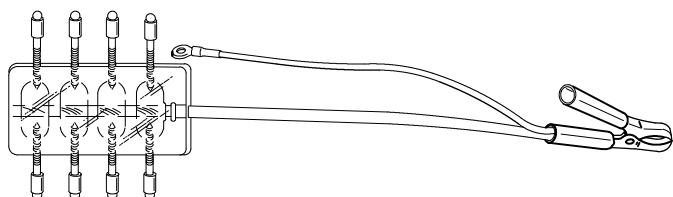
Step	Action	Value	Yes	No	Tools
1	Verify High Tension Leads, Spark Plug and Spark Boots are in good condition. Inspect wires for chafing. Visual Inspection	-	Step 2	Replace Failed Component Step 2	High Tension lead pin P/N 84-813706A56
2	Verify 4 Pin Connector Integrity Visual Inspection	-	Step 3	Repair/Replace Connector Components Step 3	-
3	Verify Ground from CDM connector to block	0.2 Ohms and below	Step 4	Correct Ground Path Step 4	DVA/Multimeter P/N 91-99750 Test Harness P/N 84-825207A2
4	Test all CDMs at Cranking with Spark Gap Tester Spark on All CDMs? Will spark jump a 7/16 in. (11.11 mm) gap?	7/16 in. (11.11 mm) gap	If at least one CDM has spark, continue with Chart #3	Continue with Chart #2	Spark Gap Tester P/N 91-850439

CDM (P/N 827509)



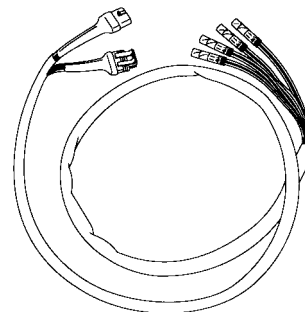
- a - Ground
- b - Black/Yellow
- c - Trigger Connection
- d - Stator Connection

Spark Gap Tester P/N 91-850439



55117

CDM Test Harness 84-825207A2





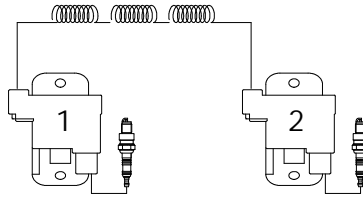
CDM Stop Diode Trouble Shooting

2 Cyl.:

CDM #1 gets its charging ground path through CDM #2

CDM #2 gets its charging ground path through CDM #1

A shorted Stop Diode in either CDM would prevent the opposite one from sparking.



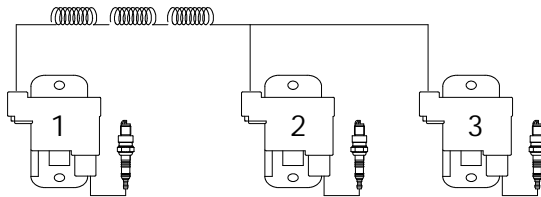
3 Cyl.:

CDM #1 gets its charging ground path through CDM #2 or #3

CDM #2 and #3 get their charging ground path through CDM #1

A shorted Stop Diode in CDM #1 would prevent CDMs #2 and #3 from sparking.

A shorted Stop Diode in CDM #2 or #3 would prevent CDM #1 from sparking.



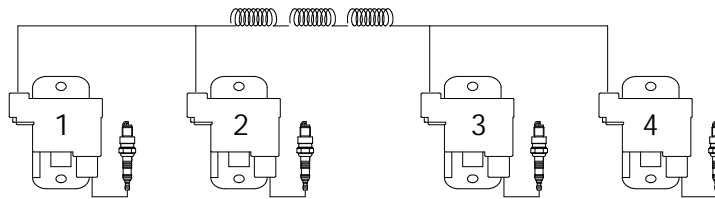
4 Cyl.:

CDM #1 and #2 get their charging ground path through CDM #3 or #4

CDM #3 and #4 get their charging ground path through CDM #1 or #2

A shorted Stop Diode in CDM #1 or #2 would prevent CDMs #3 and #4 from sparking.

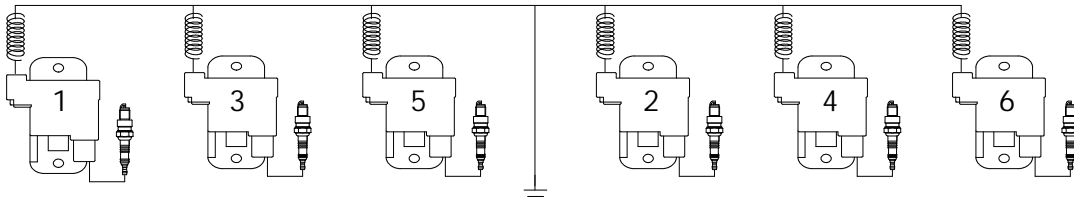
A shorted Stop Diode in CDM #3 or #4 would prevent CDM #1 and #2 from sparking.



6 Cyl.:

All CDMs get their charging ground path independently through the stator's white leads.

A shorted Stop Diode in any one CDM will prevent at least 2 other CDMs from sparking





CDM Trouble Shooting Flowchart

Chart #2 (No Spark on any CDM)

Step	Action	Value	Yes	No	Tools
1	With the key switch ON: Verify continuity between BLK/YEL harness wire and ground. This Test Checks: Lanyard Switch Key Switch Rev Limiter (external) Chafed BLK/YEL wire CDM Stop Circuit	NO continuity	Step 2	Repair or Replace Component Run Engine Verify Repair Step 6	DVA/Multimeter P/N 91-99750
2	Check Stator Resistance between GRN/WHT and WHT/GRN Open circuit voltage at cranking should be no less than 100 Volts on the DVA	660-710 Ohms 2, 3 & 4 Cyl. Models 990 - 1210 Ohms 6 Cyl.	Step 3	Replace Stator Run Engine Verify Repair Step 6	DVA/Multimeter P/N 91-99750
3	Check Trigger/Crank Shaft Position Sensor Output: Cranking with CDM disconnected. Cranking with CDM connected.	1 Volt and above - CDM disconnected. 0.2 - 5 Volts- CDM connected.	Step 5	2, 3, & 4 Cyl Replace Trigger Run Engine Verify Repair Step 6 6 Cyl. - Step 4	DVA/Multimeter P/N 91-99750 TPI/CDM Test Harness 84-825207A2
4	V-6 Models Resistance Check Crank Position Sensor	900 - 1300 Ohms	Step 5	Replace Crank Position Sensor Run Engine Verify Repair Step 6	DVA/Multimeter P/N 91-99750
5	Test all CDMs at Cranking with Spark Gap Tester Spark on All CDMs? Will spark jump a 7/16 in. (11.11 mm) gap?	7/16 in. (11.11 mm) gap	Step 6	Verify All Preceding Steps	Spark Gap Tester P/N 91-850439
6	If mis-firing is in a repeatable range: Perform DVA readings on stator and trigger at all running speeds.*	Stator: 200 Volts and above Trigger: 2 Volts and above	Run Engine Verify Repair END	Refer to *Note Below	DVA/Multimeter P/N 91-99750 TPI/CDM Test Harness 84-825207A2

* Note: Stator tests will only isolate problem down to a charging pair. Further testing is necessary to determine faulty CDM. Disconnecting one CDM of the charging pair is recommended.



CDM Trouble Shooting Flowchart

Chart #3 (At least one CDM has spark)

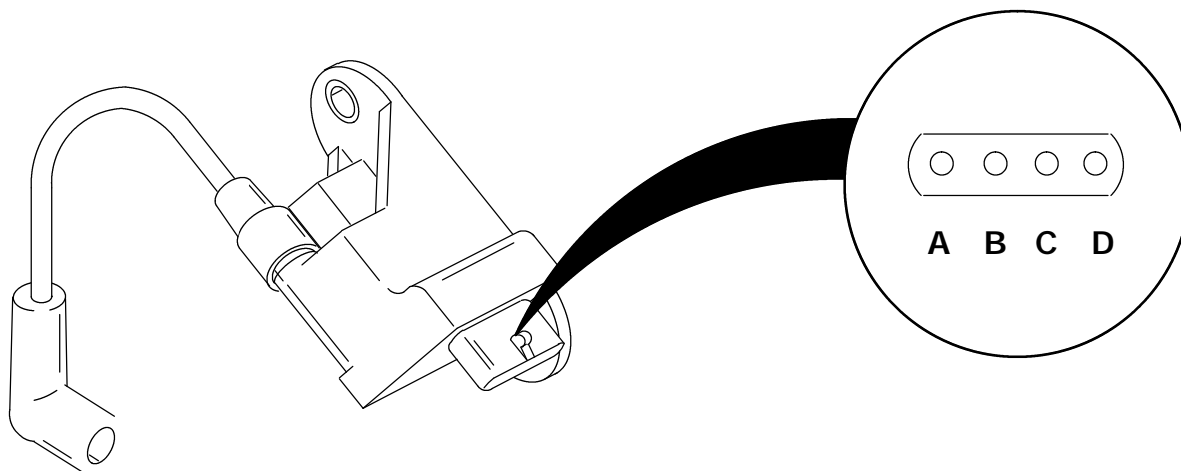
Step	Action	Value	Yes	No	Tools
1	Resistance Check ALL CDMs	Refer to chart	Step 3	Replace any CDMs that do not pass specifications even if they fire Step 2	DVA/Multimeter P/N 91-99750
2	Test all CDMs at Cranking with Spark Gap Tester Spark on All CDMs Will spark jump a 7/16 in. (11.11 mm) gap?	7/16 in. (11.11 mm) gap	Run Engine Verify Repair Step 6	Step 3	Spark Gap Tester P/N 91-850439
3	Check Trigger Output: Cranking with CDM disconnected. Cranking with CDM connected.	1 Volt and above - CDM disconnected. 0.2 - 5 Volts - CDM connected.	Step 5	2, 3, & 4 Cyl - Replace Trigger Run Engine Verify Repair Step 6 6 Cyl-Step 4	DVA/Multimeter P/N 91-99750 TPI/CDM Test Harness 84-825207A2
4	V6 Models Resistance Check Crank Position Sensor	900 - 1300 Ohms	Step 5	Replace Crank Position Sensor Run Engine Verify Repair Step 6	DVA/Multimeter P/N 91-99750
5	Test all CDMs at Cranking with Spark Gap Tester Spark on All CDMs? Will spark jump a 7/16 in. (11.11 mm) gap?	7/16 in. (11.11 mm) gap	Run Engine Verify Repair Step 6	Replace any non-firing CDMs Step 6	Spark Gap Tester P/N 91-850439
6	If mis-firing is in a repeatable range: Perform DVA readings on stator and trigger at all running speeds.*	Stator: 200 Volts and above Trigger: 2 Volts and above	Run Engine Verify Repair END	Refer to *Note Below.	DVA/Multimeter P/N 91-99750 TPI/CDM Test Harness 84-825207A2

* Note: Stator tests will only isolate problem down to a charging pair. Further testing is necessary to determine faulty CDM. Disconnecting one CDM of the charging pair is recommended.



CAPACITOR DISCHARGE MODULE

IMPORTANT: Spark plug wires are screwed into CDM.



- a - Ground
- b - Black/Yellow
- c - Trigger Connection
- d - Stator Connection

A resistance check is required and can be performed on the CDM as follows:

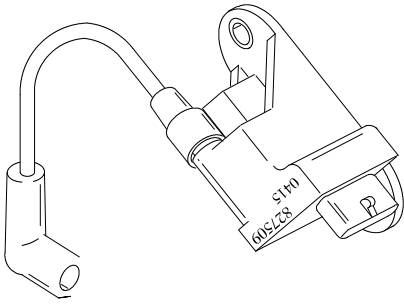
NOTE: This test can be performed using the test harness (P/N 84-825207A2). Do Not connect the test harness plug to the stator/trigger engine wire harness.

CAPACITOR DISCHARGE MODULE				
Circuit Test	Connect Negative (-) Meter Lead To:	Connect Positive (+) Meter Lead To:	Ohms Scale	Results:
Stop Diode Forward Bias	Green (D)/ or Green test harness lead	Black/Yellow (B)/ or Black/Yellow test harness lead	R x 100 Diode Reading*	Continuity
Stop Diode Reverse Bias	Black/Yellow (B)/ or Black/Yellow test harness lead	Green (D)/ or Green test harness lead	R x 100 Diode Reading*	No Continuity
Return Ground Path Diode, Reverse Bias	Green (D)/ or Green test harness lead	Ground Pin (A) or Black test harness lead	R x 100 Diode Reading*	No Continuity
Return Ground Path Diode, Forward Bias	Ground Pin (A)/ or Black test harness lead	Green (D)/ or Green test harness lead	R x 100 Diode Reading*	Continuity
CDM Trigger Input Resistance	Ground Pin (A)/ or Black test harness lead	White (C)/ or White test harness lead	R x 100	1000 - 1250 Ohms
Coil Secondary Impedance	Ground Pin (A) or Black test harness lead	Spark Plug Terminal (At Spark Plug Boot)	R x 100	900 - 1200 Ohms

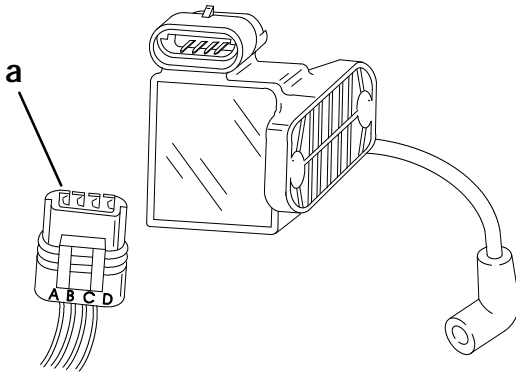
*Diode Readings: Due to the differences in test meters, results other than specified may be obtained. In such a case, reverse meter leads and re-test. If test results then read as specified CDM is O.K. The diode measurements above will be opposite if using a Fluke equivalent multimeter.



CAPACITOR DISCHARGE MODULE (PN 827509)



NOTE: Each CDM is grounded through the engine wiring harness via the connector plug. It is not necessary to have the CDM mounted on the ignition plate for testing.



a - Ground Wire

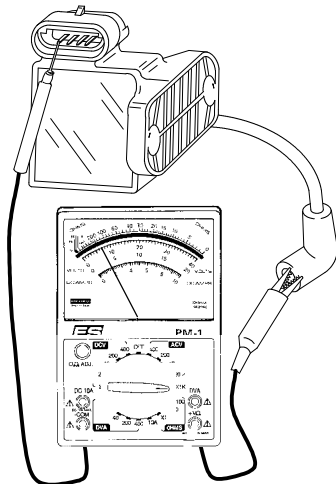
Possible CDM failure modes and test procedures:

1. Secondary Coil Winding Failure -

- a. Internal short in secondary coil winding.
- b. Failure will only affect that CDM.

• Detected by:

- (1.) DVA voltage within specification.
- (2.) Weak spark - unable to jump 3/8 in. (9.5mm) spark gap at cranking.
- (3.) Ohm test - 900-1200 ohms

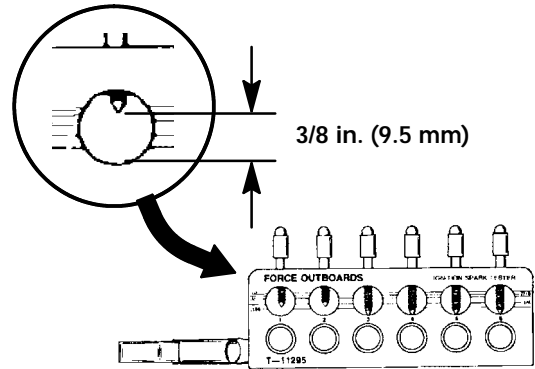


2. Stop Circuit Failure -

- a. Common cause is moisture and/or resultant carbon track to ground.
- b. CDM case may be separating from the potting.
- c. Potting Cracked.

• Detected by:

- (1.) Low DVA voltage.
- (2.) Weak spark - unable to jump 3/8 in. (9.5mm) spark gap at cranking.



FT-11295

- (3.) Ohm test - BLACK/YELLOW and BLACK - good CDM will have continuity in one direction only. CDM MUST BE DISCONNECTED FROM THE ELECTRICAL HARNESS.

- (4.) Weak spark on other cylinder(s) - bad CDM will affect other cylinders.

- (5.) Defective CDM will affect any cylinder.

3. SCR Failure -

Premature SCR switch closing. Lower than specified voltage closes switch and produces a spark. A CDM with this type failure does not affect the operation of other good CDMs.

- a. As the SCR degrades, any voltage pulse above the reduced break-over (trigger) point will produced a spark. Continued operation may cause the SCR to short to ground. A failed SCR will only affect that CDM.

• Detected by:

- (1.) Low DVA voltage.
- (2.) Weak spark - unable to jump 3/8 in. (9.5mm) spark gap at cranking.
- (3.) Ohm test - not valid.
- (4.) Advanced ignition timing on that cylinder.



Stator and ECM DVA Tests

Stator and ECM DVA tests can be made using Quicksilver Multimeter/DVA Tester 91-99750 and TPS/CDM Harness Assembly 84-825207A1 for 1994/1995 models or CDM Harness Assembly 84-825207A2 for 1996/1997 models. Connect the harness in series at a CDM connector. Attach the appropriate DVA test leads to the harness as listed below:

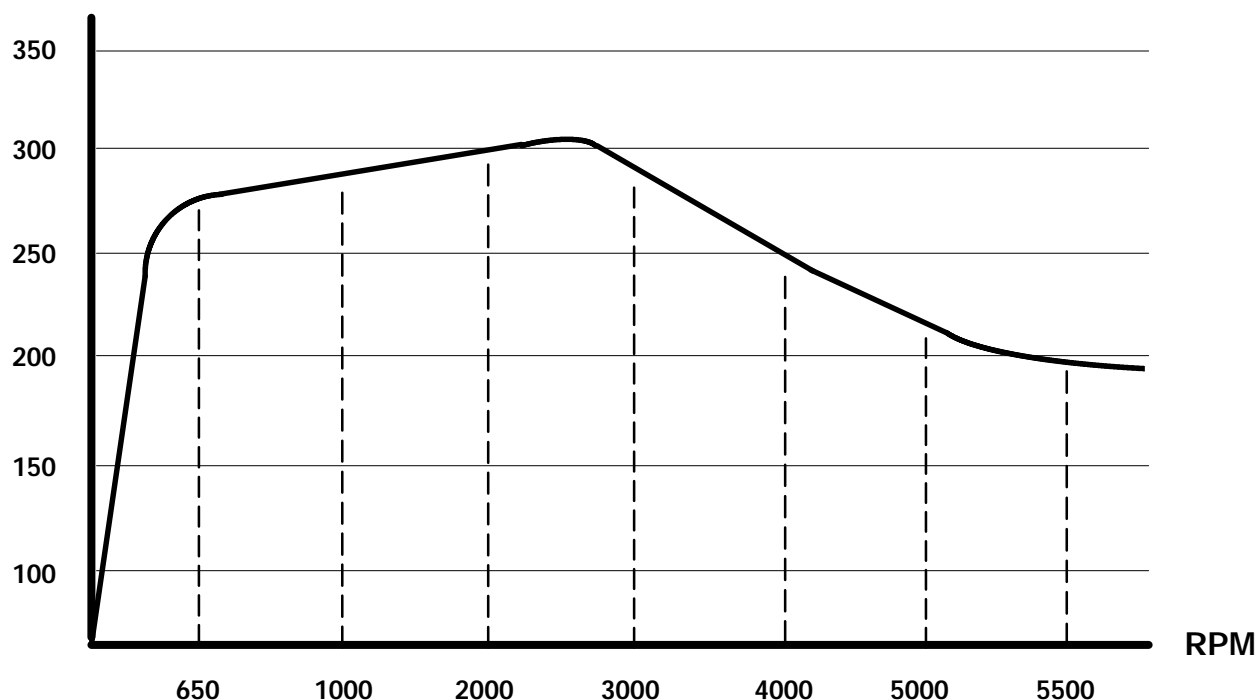
TEST	DVA POSITION	DVA LEAD	TPI/CDM LEAD	VOLTAGE @ CRANKING	VOLTAGE @ 650-3000 RPM	VOLTAGE @ 4000-5500 RPM
Stator	400 DVA	RED	1994/1995 RED	100 - 225	250 - 300	230 - 200
		BLACK - To GRD	96/97/98 GREEN			
ECU Trigger	40 DVA	RED	WHITE	2 - 10		
		BLACK - To GRD				

IMPORTANT: Use the Quicksilver Multimeter/DVA Tester 91-99750 to obtain comparable voltages as listed when testing the 3.0 Liter ignition system.

IMPORTANT: The TPS/CDM Harness BLACK lead is not a ground when the TPS/CDM Harness is connected in series with a CDM connector. The BLACK lead is the engine stop lead and should not be connected to the DVA BLACK lead as a ground.

NOTE: The 3.0 Liter CDM is charged by a single stator coil whose efficiency is greatest (highest voltage) at low and mid-range RPM.

STATOR VOLTAGE





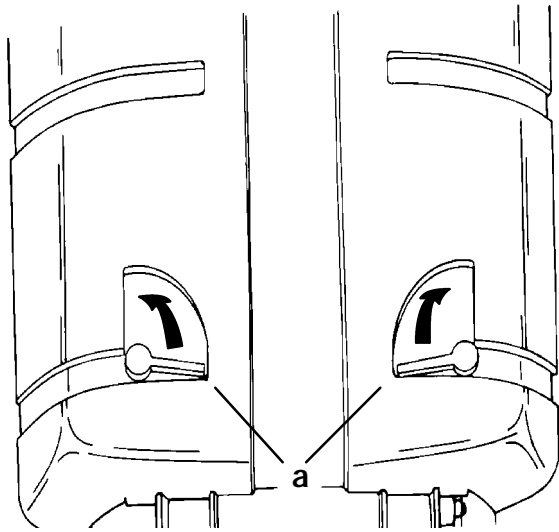
Ignition Components Removal and Installation

FLYWHEEL REMOVAL AND INSTALLATION

Removal

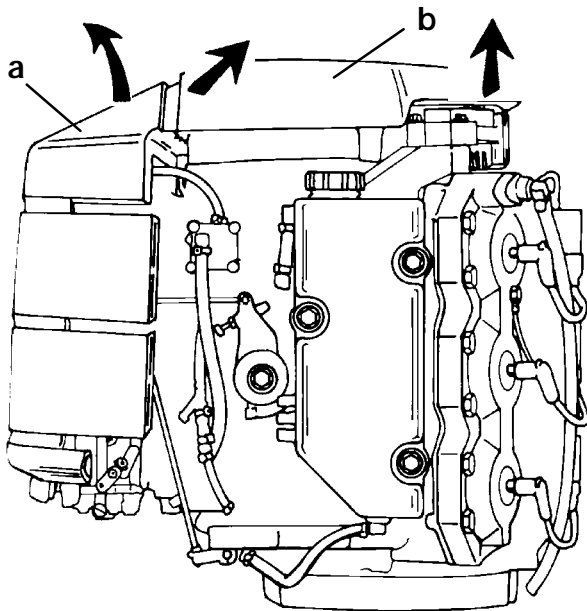
IMPORTANT: Ignition key switch should be in the "OFF" position to prevent accidental starting while removing flywheel.

1. Remove top cowling.
2. Remove flywheel cover and attenuator. Remove flywheel cover by sliding back and lifting cover in a simultaneous motion. Remove attenuator by releasing two latches at bottom of attenuator.



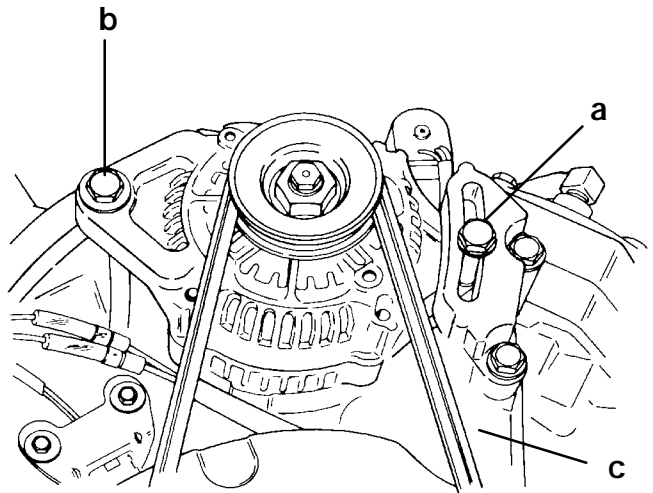
51696

a - Latches



a - Attenuator
b - Flywheel Cover

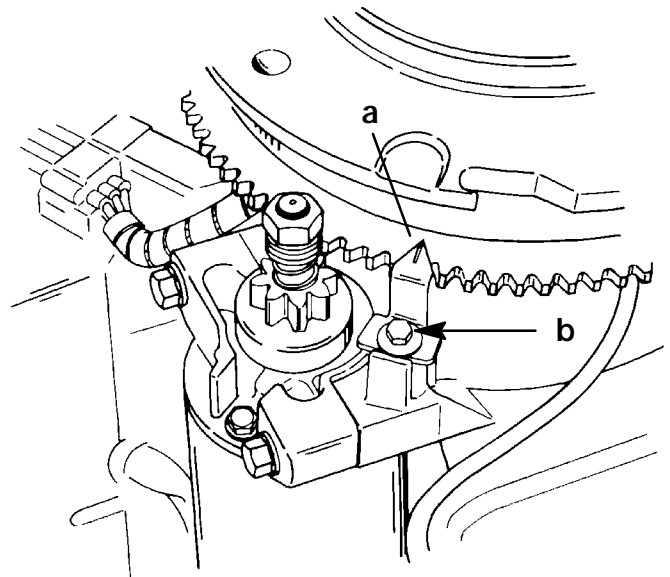
3. Loosen alternator tension bolt and pivot bolt.
4. Remove alternator belt.



51629

a - Tension Bolt
b - Pivot Bolt
c - Belt

5. Remove timing pointer.

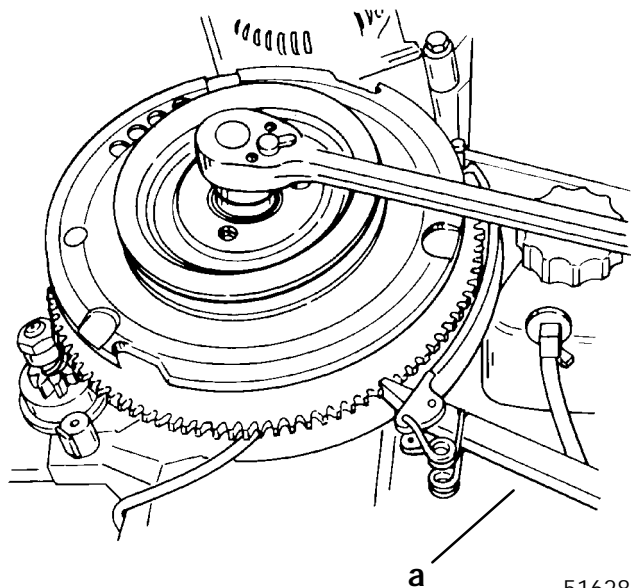


51628

a - Timing Pointer
b - Bolt



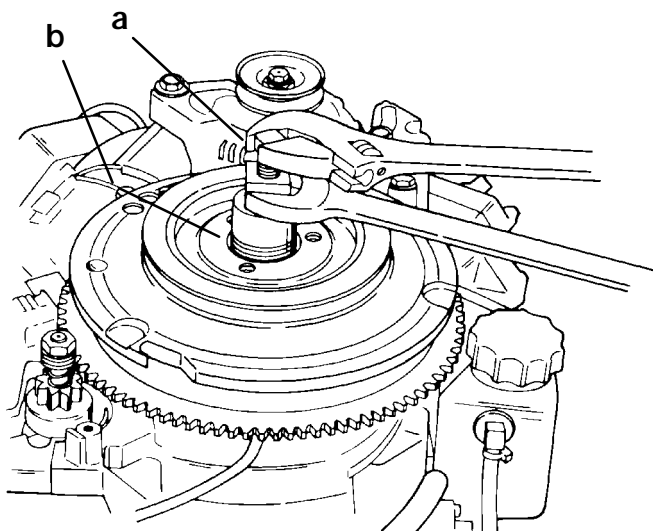
6. Remove flywheel nut.



51628

a - Flywheel Holding Tool (91-52344)

7. Remove flywheel.



51628

a - Puller (91-73687A1)

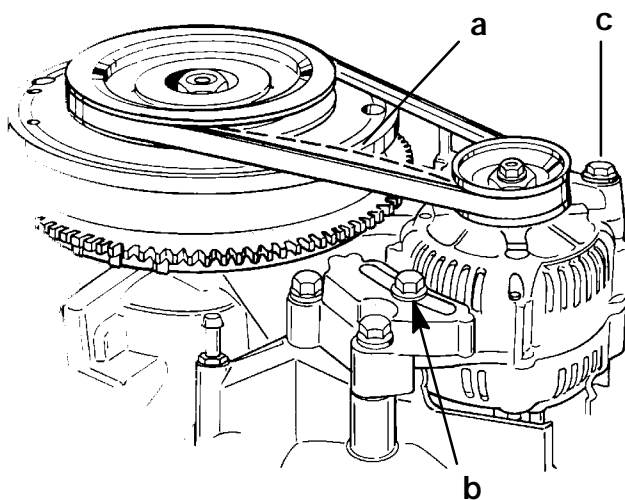
b - Protector Cap (91-24161) (HIDDEN)

Installation

IMPORTANT: Inspect flywheel magnets for clinging debris. Failure to remove debris from magnets will result in damage to stator and magnets when outboard is initially started.

1. Reinstall flywheel with nut and washer.
2. Torque flywheel nut to 125 lb. ft. (169.5 N·m)
3. Reinstall alternator belt.
4. Pull alternator away from flywheel until belt deflects 1/2 in. (12.7mm) with a 22 lb. ft. (98.0 N·m) side load.
5. Tighten tension adjustment bolt [Torque to 35 lb. ft. (47.5 N·m)] and pivot bolt [Torque to 35 lb. ft. (47.5 N·m)].

NOTE: A belt tensioning tool (obtain locally) may also be used to adjust belt tension. Adjust belt tension to 80 lb. (356.0 N·m).



51533

a - Deflection [1/2 in. (12.7mm) under 22 lb. ft. (98.0 N·m) side load]

b - Tension Bolt [Torque to 35 lb. ft. (47.5 N·m)]

c - Pivot Bolt [Torque to 35 lb. ft. (47.5 N·m)]

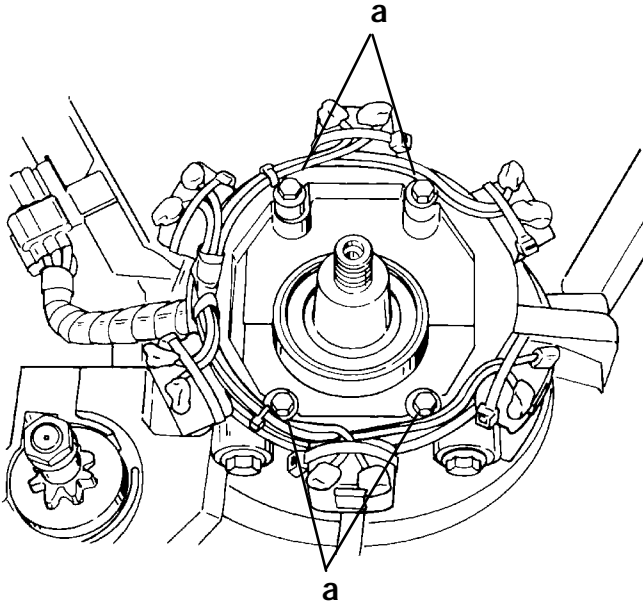
6. Reinstall timing pointer. Refer to "TIMING/ SYNCHRONIZING/ADJUSTING" for proper pointer alignment. Torque pointer attaching bolt to 105 lb. in. (12.0 N·m).
7. Reinstall flywheel cover and attenuator.
8. Reinstall top cowling.



STATOR

Removal

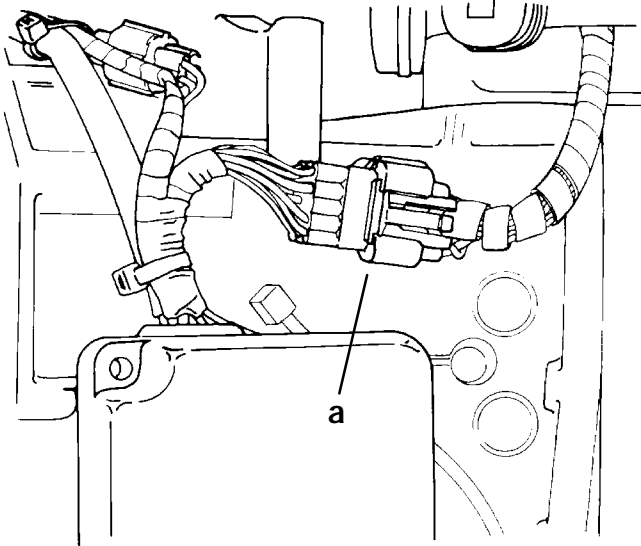
1. Refer to "Flywheel Removal" to remove flywheel.
2. Remove 4 allen screws securing stator.



51629

a - Bolts

3. Disconnect stator harness.



51629

a - Harness

4. Remove stator.

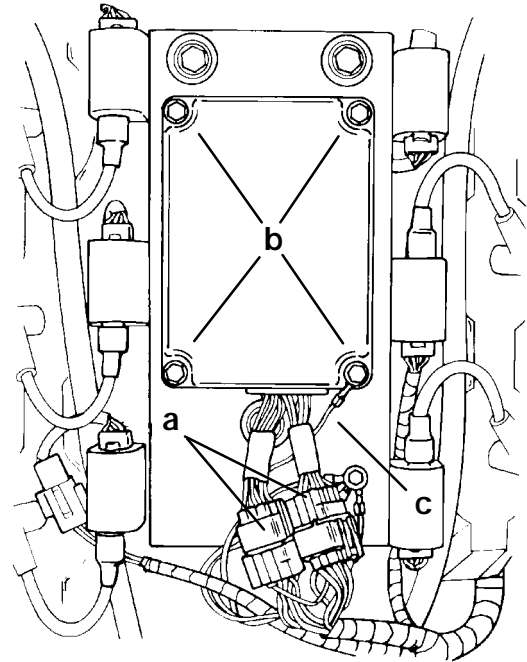
Installation

1. Position stator on powerhead. Torque attaching screws to 105 lb. in. (11.9 N-m).
2. Reconnect stator harness.
3. Refer to "FLYWHEEL INSTALLATION" to complete reassembly.

ELECTRONIC CONTROL MODULE (ECM)

Removal (1994 Models)

1. Remove top cowling.
2. Disconnect ECM harness connector(s).
3. Remove 4 bolts securing ECM.



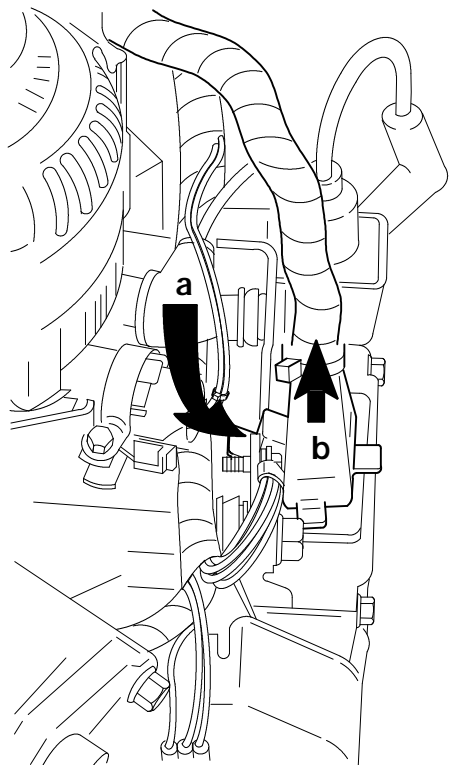
1994 MODEL 225

51627

- a - Harness Connectors
 b - Bolts
 c - Ground Lead

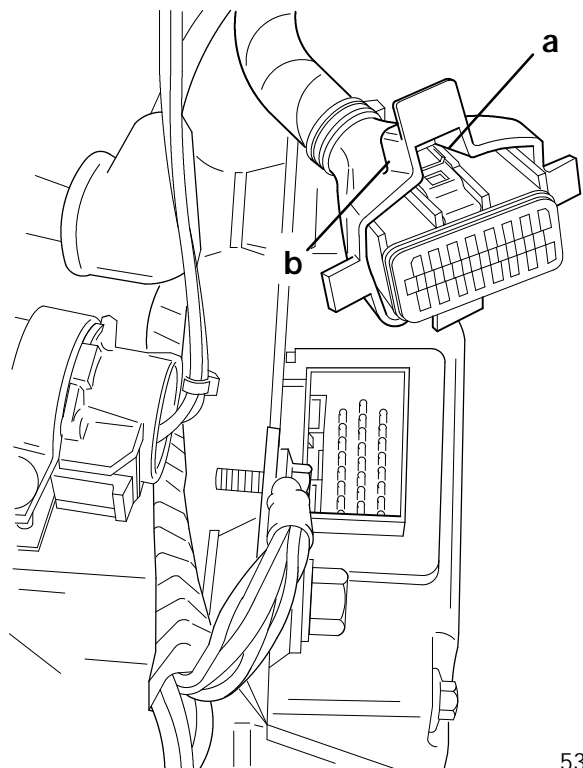


NOTE: On 1995 Model ECM harness connectors, squeeze in on the rubber boot tab (to disconnect retaining clip) while pulling harness away from ECM.



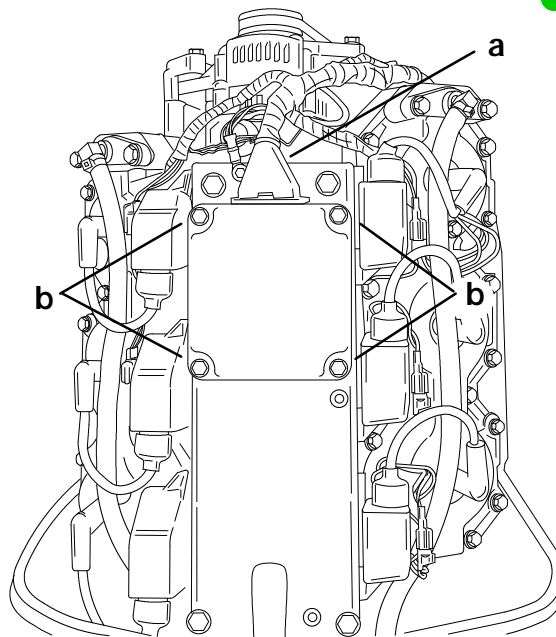
53787

a - Bottom Tab (Squeeze in)
b - Harness Connector



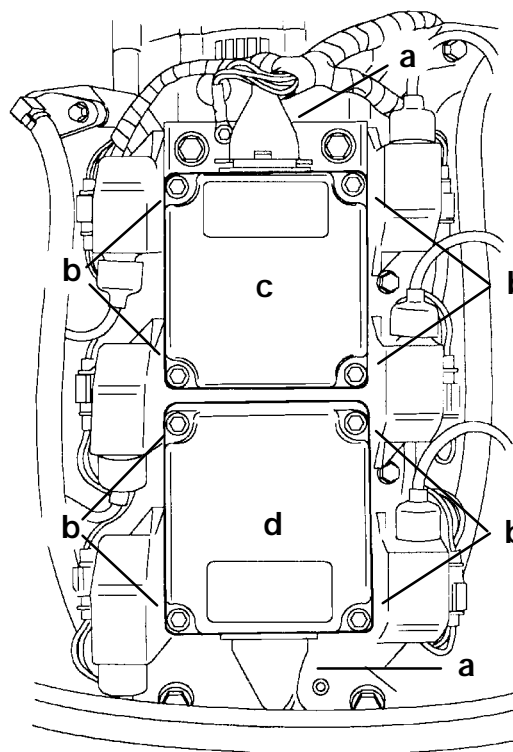
53788

a - Retainer Clip
b - Rubber Boot Tab



1995 MODEL 3.0 Litre WORK/225 53459

a - Harness Connector
b - Bolts



1995/6 225 EFI/250 EFI

53638

a - Harness Connectors
b - Bolts
c - Ignition ECM
d - Fuel ECM



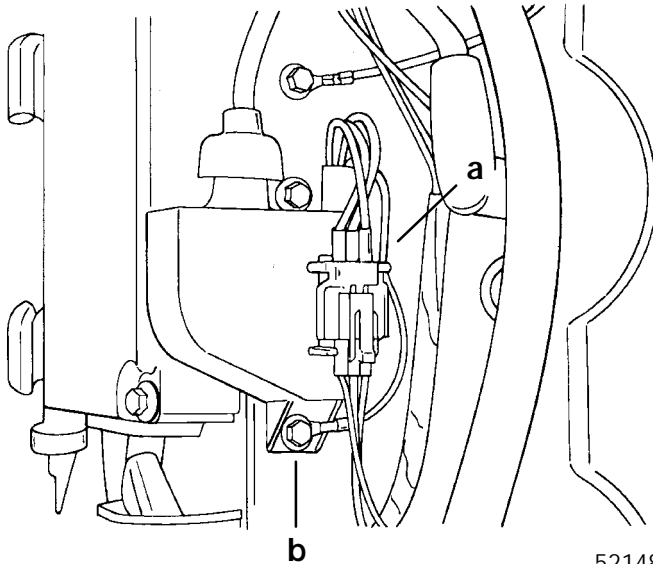
Installation

1. Secure ECM to powerhead with 4 bolts. Torque bolts to 80 lb. in. (9.0 N·m).
2. Verify ECM ground lead is secured with attaching bolt.
3. Reconnect harness connector(s).
4. Reinstall top cowling.

IGNITION MODULE

Removal

1. Remove top cowling.
2. Disconnect module harness.
3. Remove spark plug lead from spark plug.
4. Remove module attaching bolt.



a - Harness
b - Attaching Bolt

52148

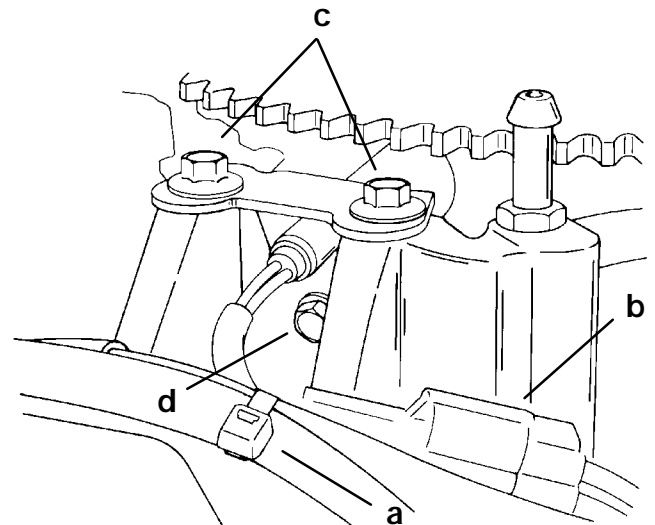
Installation

1. Secure module to ignition plate with bolt. Torque bolt to 80 lb. in. (9.0 N·m).
2. Secure module ground lead with bolt. Torque bolt to 80 lb. in. (9.0 N·m).
3. Reconnect harness.
4. Reconnect spark plug lead.
5. Reinstall top cowling.

CRANK POSITION SENSOR

Removal

1. Remove top cowling.
2. Remove sta-strap securing sensor harness and disconnect harness.
3. Remove two bolts securing sensor bracket.
4. Remove bolt securing sensor to bracket.



a - Sta-strap
b - Harness
c - Bracket Bolts
d - Sensor Bolt

51627

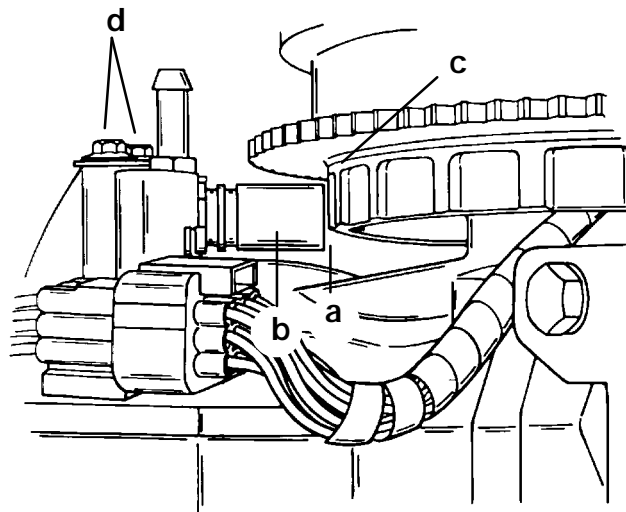


Installation

1. Secure sensor to bracket with bolt. Torque bolt to 50 lb. in. (5.6 N·m).
2. Secure bracket to powerhead with 2 bolts.

NOTE: Position bracket/sensor assembly to allow a .040 in. \pm .020 in. (1.02mm \pm 0.51mm) air gap between sensor and flywheel teeth.

3. Torque bracket bolts to 100 lb. in. (11.5 N·m).



51533

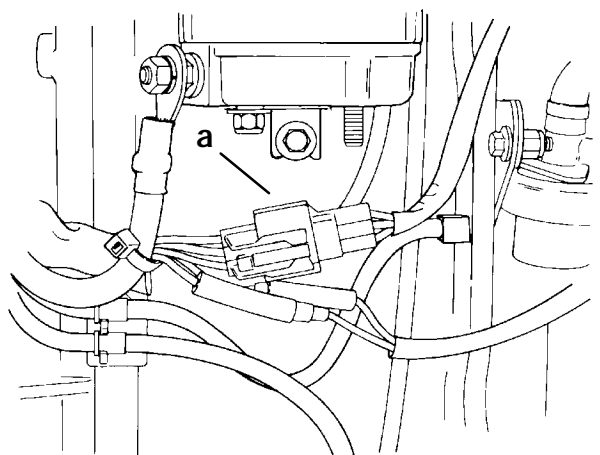
- a - Air Gap [.040 in. \pm .020 in. (1.02mm \pm 0.51mm)]
- b - Crank Position Sensor
- c - Flywheel Tooth
- d - Bracket Bolts [Torque to 100 lb. in. (11.5 N·m)]

4. Reconnect sensor harness.
5. Secure harness with sta-strap.
6. Reinstall top cowling.

THROTTLE POSITION SENSOR

Removal

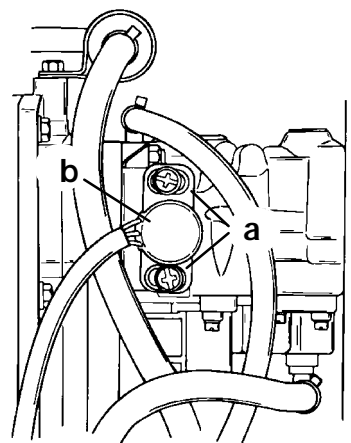
1. Remove top cowling.
2. Disconnect sensor harness.



53333

- a - Sensor Harness Connector

3. Remove 2 screws securing sensor to bracket.

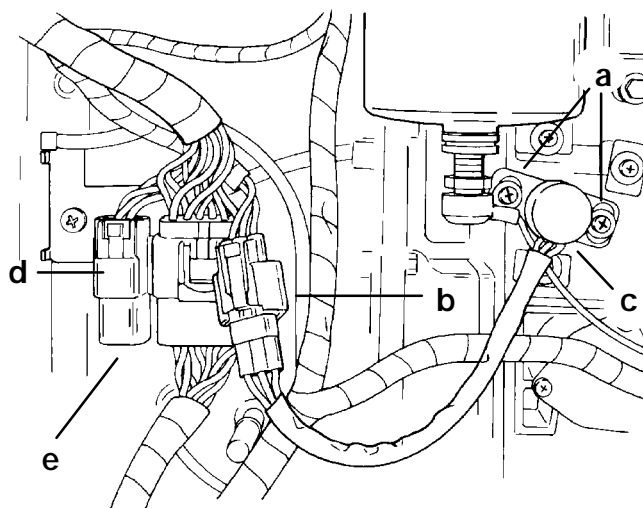


51535

MODEL 3 LITRE WORK/225 CARB

- a - Screws
- b - Sensor

NOTE: 1995 CARBURETOR and EFI outboards have an on-board test harness connector for plugging in the DIGITAL DIAGNOSTIC TERMINAL (91-823686A-2) to monitor various engine functions while outboard is running. Remove connector plug and connect DDT harness to test connector.



MODEL 225 EFI/250 EFI

53329

- a - Screws
- b - Harness
- c - Sensor
- d - Test Harness Connector for Digital Diagnostic Tester
- e - Plug

Installation

1. Secure sensor to bracket with 2 screws. Torque screws to 20 lb. in. (2.3 N·m).
2. Reconnect harness.
3. Refer to SECTION 2C "TIMING/SYNCHRONIZING/ADJUSTING" for proper sensor set-up.
4. Reinstall top cowling.



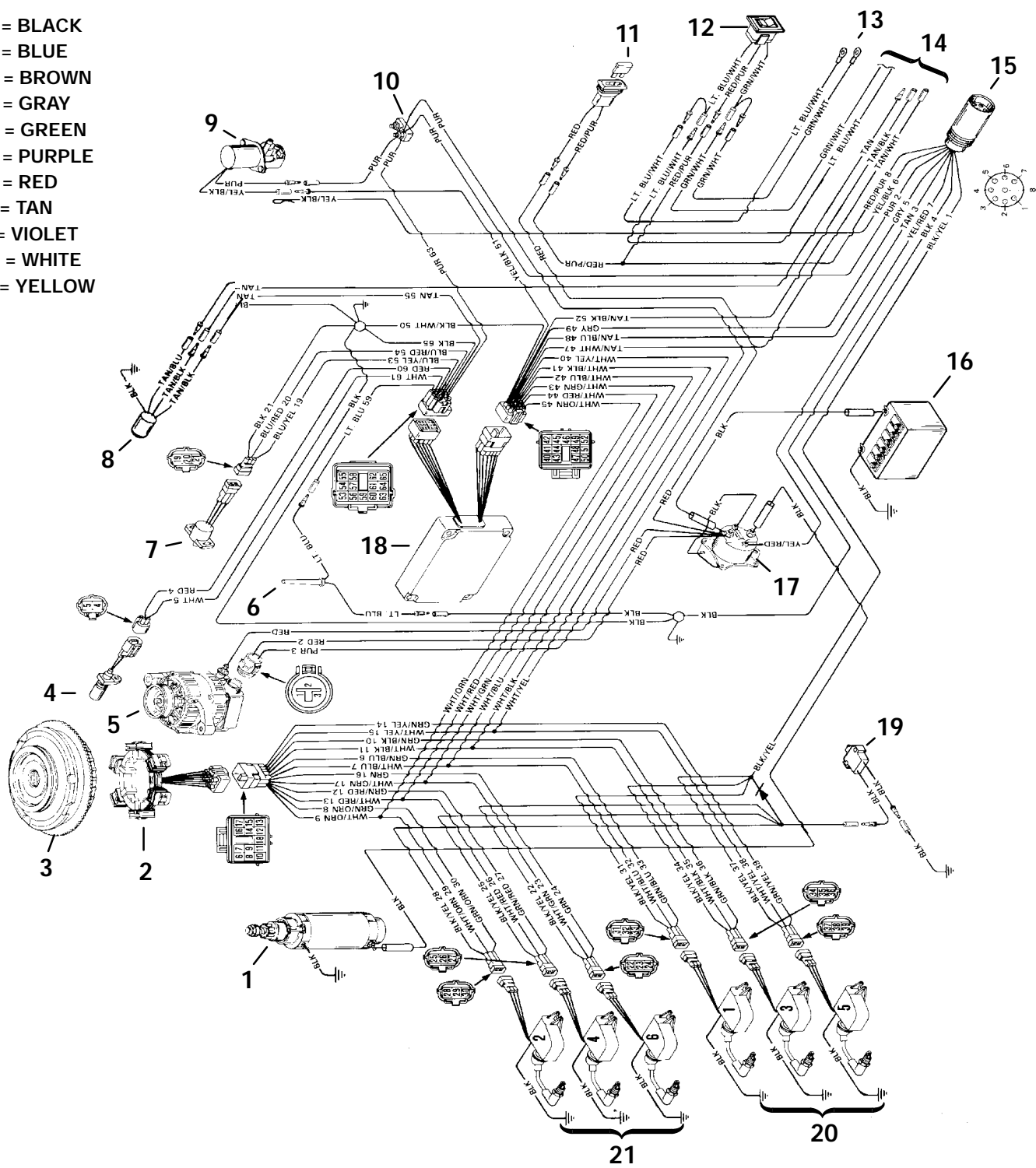
Notes:





1994 225 IGNITION DIAGRAM

BLK = BLACK
 BLU = BLUE
 BRN = BROWN
 GRY = GRAY
 GRN = GREEN
 PUR = PURPLE
 RED = RED
 TAN = TAN
 VIO = VIOLET
 WHT = WHITE
 YEL = YELLOW

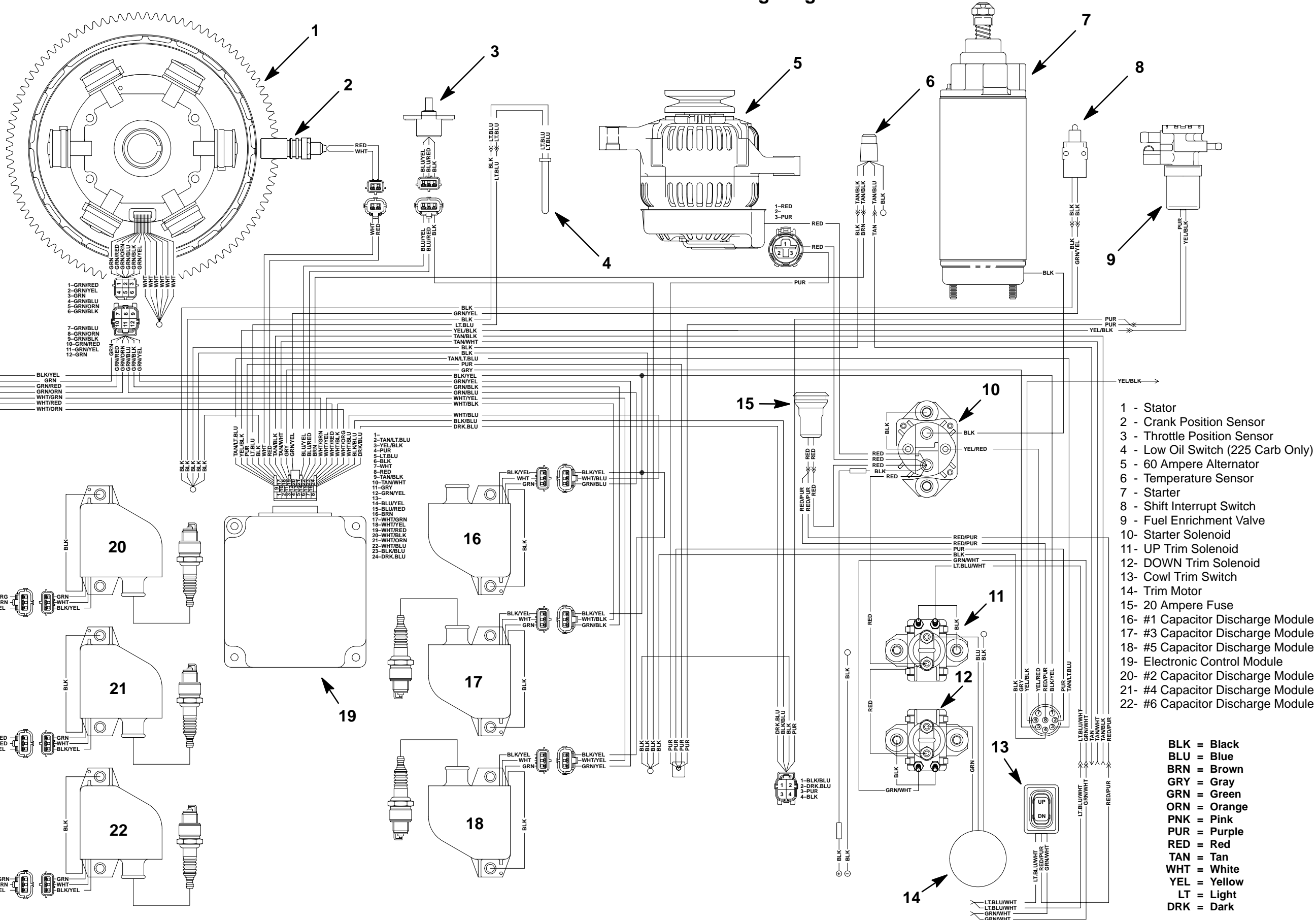


- 1 - Starter
- 2 - Ignition Stator
- 3 - Flywheel
- 4 - Crank Position Sensor
- 5 - 60 Ampere Alternator
- 6 - Low Oil Sensor
- 7 - Throttle Position Sensor
- 8 - Overheat Sensor
- 9 - Fuel Enrichment Valve
- 10 - Terminal Block
- 11 - 20 Ampere Fuse
- 12 - Cowl Trim Switch

- 13- To Trim Solenoids
- 14- To Remote Control Harness
- 15- Engine Harness Plug
- 16- 12 Volt Battery
- 17- Starter Solenoid
- 18- Electronic Control Module (ECM)
- 19- Shift Interrupt Switch
- 20- Starboard Ignition Modules - 1,3,5
- 21- Port Ignition Modules - 2,4,6
- 22- Ignition Stator



1995 3 Litre Work/225 Carb Wiring Diagram



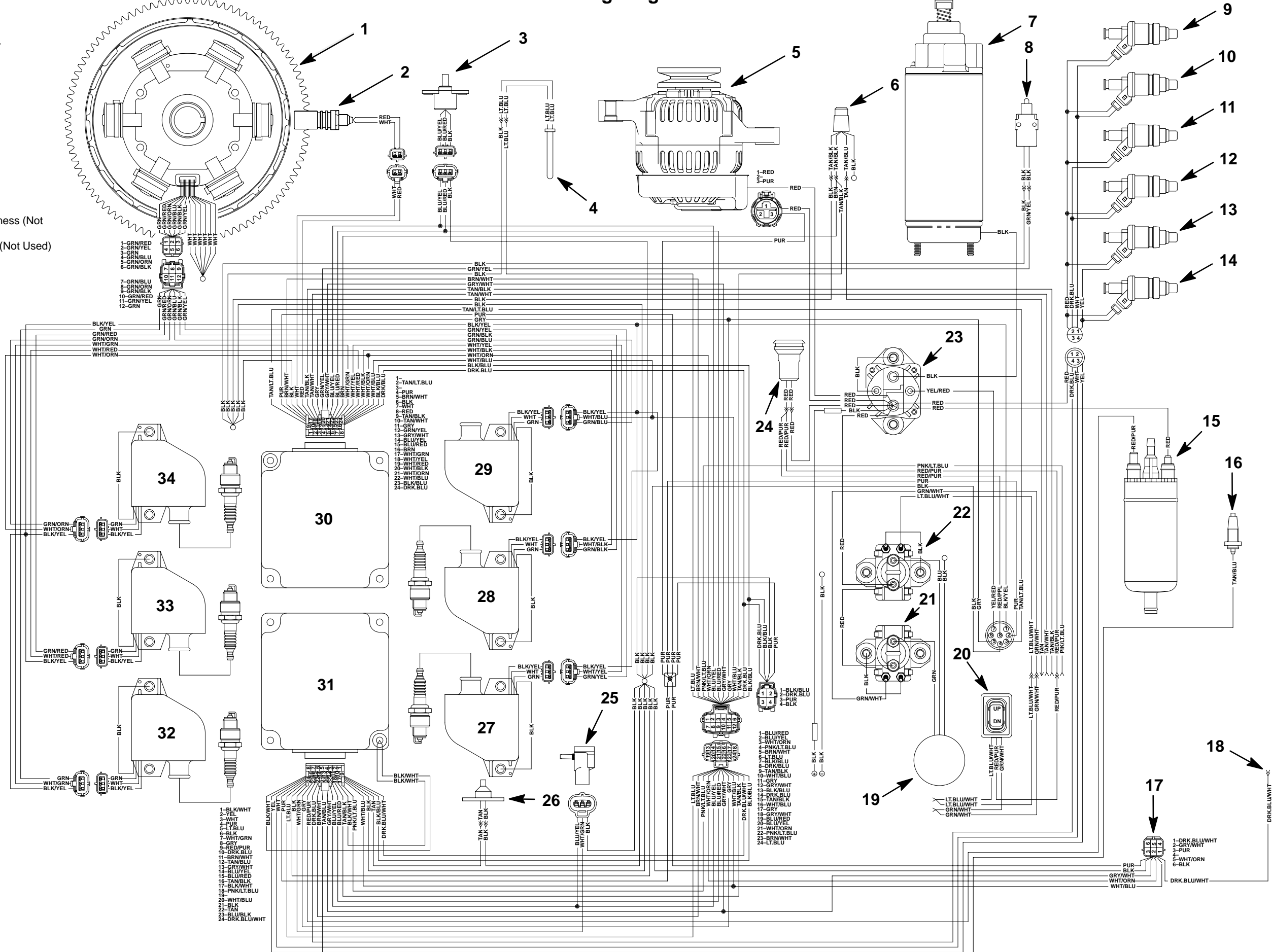
- 1 - Stator
- 2 - Crank Position Sensor
- 3 - Throttle Position Sensor
- 4 - Low Oil Switch (225 Carb Only)
- 5 - 60 Ampere Alternator
- 6 - Temperature Sensor
- 7 - Starter
- 8 - Shift Interrupt Switch
- 9 - Fuel Enrichment Valve
- 10- Starter Solenoid
- 11- UP Trim Solenoid
- 12- DOWN Trim Solenoid
- 13- Cowl Trim Switch
- 14- Trim Motor
- 15- 20 Ampere Fuse
- 16- #1 Capacitor Discharge Module
- 17- #3 Capacitor Discharge Module
- 18- #5 Capacitor Discharge Module
- 19- Electronic Control Module
- 20- #2 Capacitor Discharge Module
- 21- #4 Capacitor Discharge Module
- 22- #6 Capacitor Discharge Module

BLK = Black
 BLU = Blue
 BRN = Brown
 GRY = Gray
 GRN = Green
 ORN = Orange
 PNK = Pink
 PUR = Purple
 RED = Red
 TAN = Tan
 WHT = White
 YEL = Yellow
 LT = Light
 DRK = Dark



1995 225 EFI Wiring Diagram

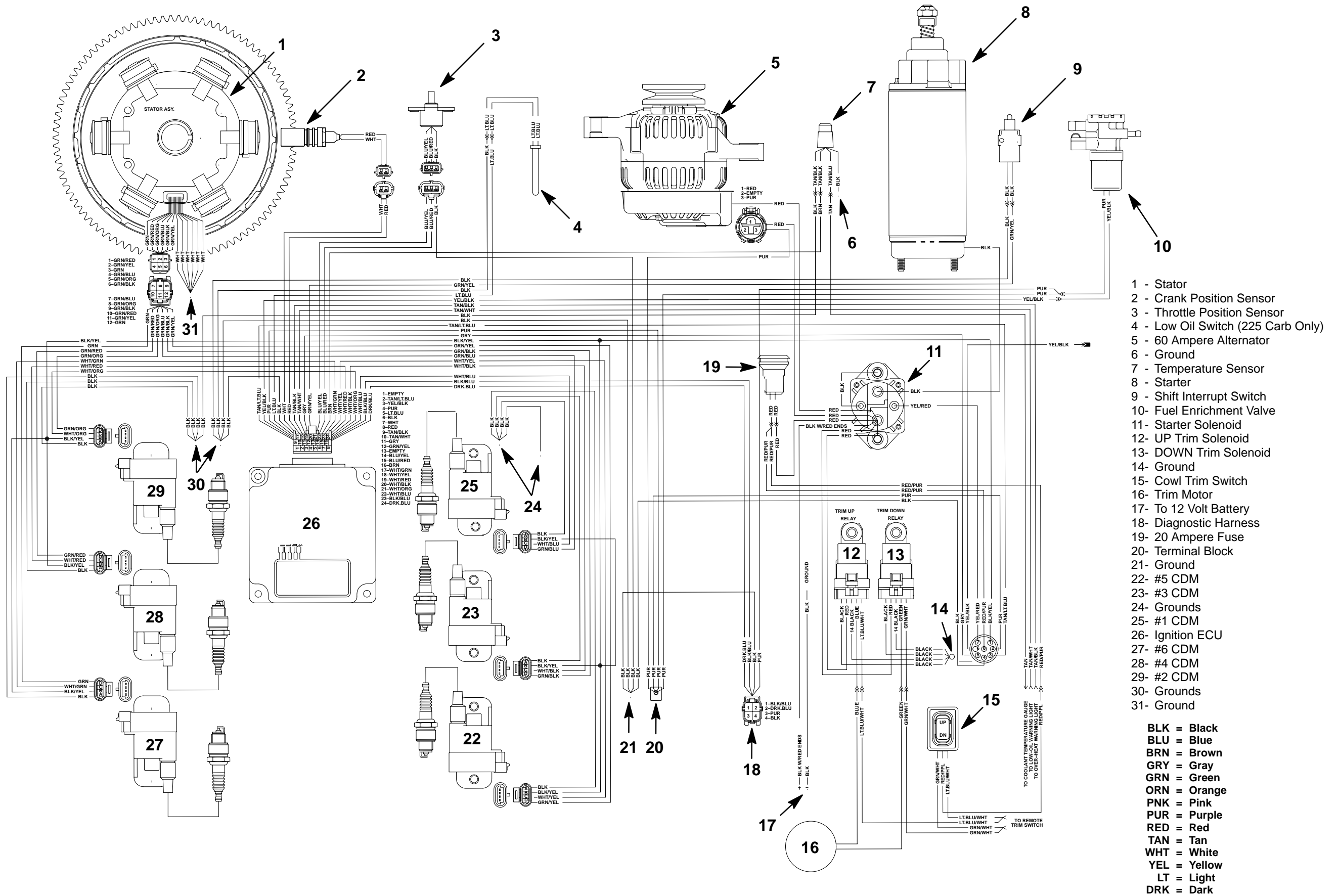
- Stator
- Crank Position Sensor
- Throttle Position Sensor
- Low Oil Switch
- 60 Ampere Alternator
- Temperature Sensor
- Starter
- Shift Interrupt Switch
- #1 Fuel Injector
- #2 Fuel Injector
- #3 Fuel Injector
- #4 Fuel Injector
- #5 Fuel Injector
- #6 Fuel Injector
- Fuel Pump
- Water Sensor
- Detonation Module Harness (Not Used)
- Knock Sensor Harness (Not Used)
- Trim Motor
- Cowl Trim Switch
- DOWN Trim Solenoid
- UP T rim Solenoid
- Starter Solenoid
- 20 Ampere Fuse
- MAP Sensor
- Air Temperature Sensor
- #5 CDM
- #3 CDM
- #1 CDM
- Ignition ECM
- EFI (Fuel) ECM
- #6 CDM
- #4 CDM
- #2 CDM



- BLK = Black
- BLU = Blue
- BRN = Brown
- GRY = Gray
- GRN = Green
- ORN = Orange
- PNK = Pink
- PUR = Purple
- RED = Red
- TAN = Tan
- WHT = White
- YEL = Yellow
- LT = Light
- DRK = Dark



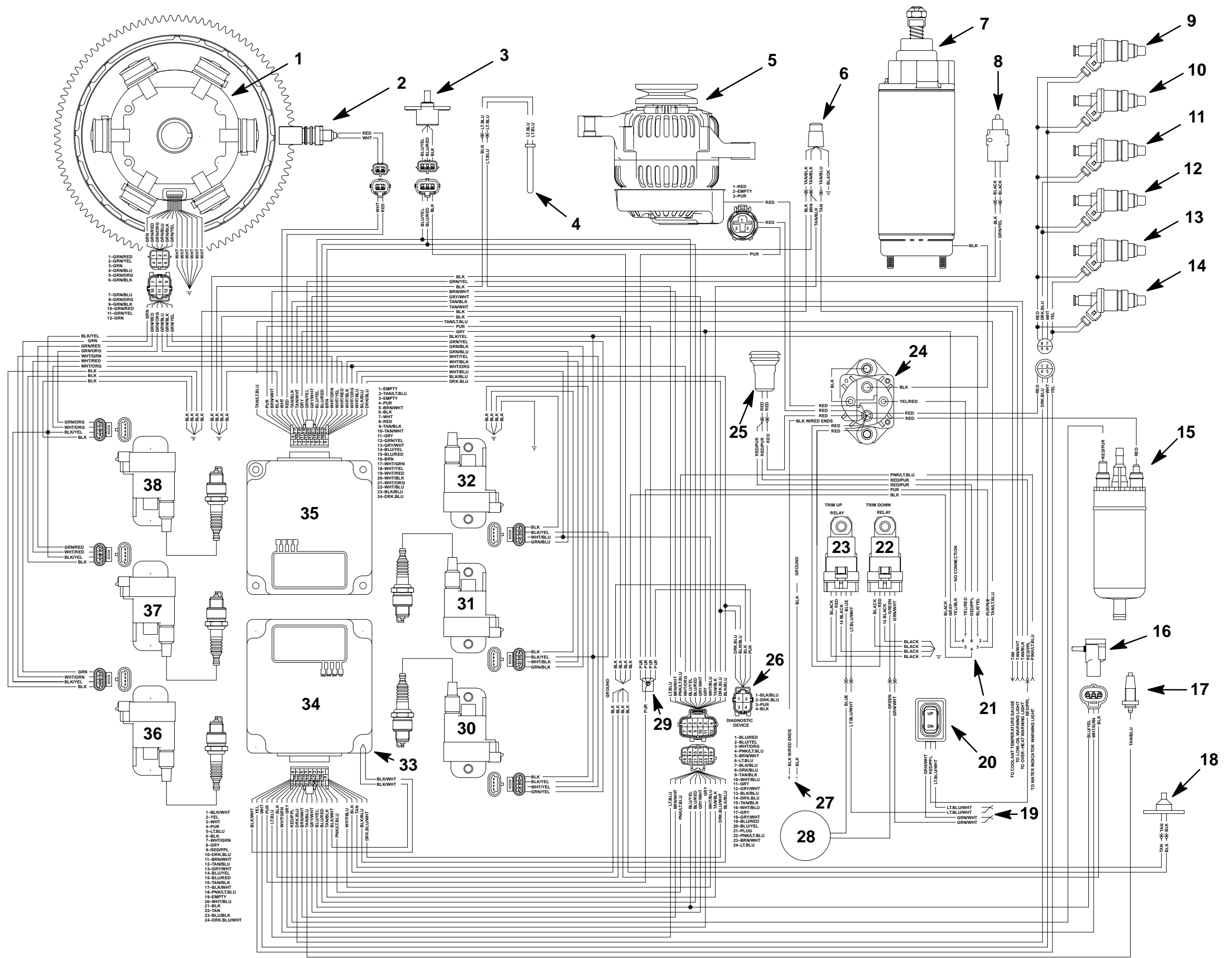
1996/1997/1998 3 Litre Work/225 Carburetor Wiring Diagram





1996/1997/1998 225 EFI/250 EFI Wiring Diagram

- Stator
- Crank Position Sensor
- Throttle Position Sensor
- Low Oil Switch
- 60 Ampere Alternator
- Temperature Sensor
- Starter
- Shift Interrupt Switch
- #1 Fuel Injector
- #2 Fuel Injector
- #3 Fuel Injector
- #4 Fuel Injector
- #5 Fuel Injector
- #6 Fuel Injector
- Fuel Pump
- Map Sensor
- Water Sensor
- Air Temperature Sensor
- To Remote Trim Switch
- Cowl Trim Switch
- Remote Control Harness
- DOWN Trim Solenoid
- UP Trim Solenoid
- Starter Solenoid
- 20 Ampere Fuse
- Diagnostic Harness
- To 12 Volt Battery
- Trim Motor
- Terminal Block
- #5 CDM
- #3 CDM
- #1 CDM
- Ground
- EFI (Fuel) ECM
- Ignition ECM
- #6 CDM
- #4 CDM
- #2 CDM



- BLK = Black
- BLU = Blue
- BRN = Brown
- GRY = Gray
- GRN = Green
- ORN = Orange
- PNK = Pink
- PUR = Purple
- RED = Red
- TAN = Tan
- WHT = White
- YEL = Yellow
- LT = Light
- DRK = Dark